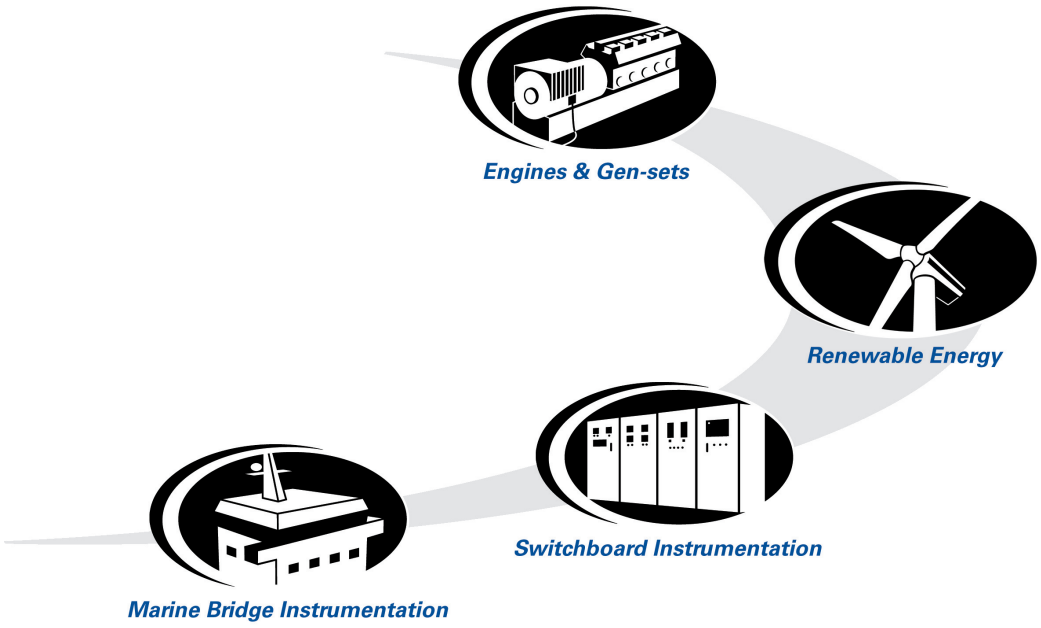
-power in control

On-line catalogue print



24/8-2006

DEIF A/S, Skive, Denmark, Tel.: +45 9614 9614
DEIF Norge A.S, Tønsberg, Norway, Tel.: +47 3338 1600
DEIF (UK) Limited, Manchester, England, Tel.: +44 (0) 161 776
DEIF GmbH, Bensheim, Germany, Tel.: +49 (0) 6251 1756-0
DEIF Electrical (Shanghai) Co. Ltd., China, Tel.: +86 21 50811815
DEIF do Brasil, Sao Paolo, Brazil, Tel.: +55 19 3254-2600

Table of content

Engines & Gen-sets				**6**
Engine starters, mains failure units				7
Table of Products		4921240159	A	7
Emergency Power Automatics	Epomatic EC-2, MS-2	4921240002	D	8
Key Starter	KSE72-1N	4921240029	C	16
Stop Relay	SR-1	4921240041	C	20
Multi-line 2, Gen-set Controls				22
Table of Products		4921240209	P	22
Automatic Gen-set Controller	AGC	4921240257	F	25
Basic Gen-set Controller	BGC	4921240273	D	35
Engine Controller	EC-1	4921240292	B	42
Generator Controller	GC-1	4921240293	B	48
Multi Differential Relay	MDR-2	4921240275	C	56
Generator Paralleling And Protection Unit	PPU	4921240193	L	58
Generator Paralleling Controller	GPC	4921240189	L	63
Generator Protection Unit	GPU	4921240191	L	68
PPU Power Management	PPM	4921240291	A	73
Specification of Options, vers. 2.00.0 and later	GPC	4921240270	B	82
Specification of Options, vers. 2.00.0 and later	GPU	4921240270	B	see page 82
Specification of Options, vers. 2.00.0 and later	PPU	4921240270	B	see page 82
Synchronising equipment Electr. Pot. Meters				86
Table of Products		4921240160	H	86
Check synchronising relay, UL approved	CSQ-3	4921240263	C	89
Double Frequency Meter	2FQ	4921240005	E	91
Double Voltmeter	2EVQ, 2EQ	4921240005	E	see page 91
Double Frequency Meter	2FTQ	4921240005	E	see page 91
Electronic Potentiometer	EPQ96	4921240020	C	93
Lamp Synchronoscope	LSQ	4921240073	D	95
Phase Sequence Meter	PHQ	4921240014	D	97
Phase Sequence Relay	RMT-111Q96	4921240131	F	99
Read synchroscope, UL approved	RSQ-3	4921240265	B	101
Zero Voltage Meter	NEQ	4921210049	D	103
Uni-line relays, synchronisers, load sharing units				105
Table of Products		4921240130	L	105
Short circuit relay	RMC-111D	4921240102	D	111
Current Relay	RMC-122D	4921240102	D	see page 111
Current Relay	RMC-132D	4921240102	D	see page 111
Stator Earth Fault Relay	RMC-142D	4921240148	C	113
Differential Current Relay	RMC-131D	4921240104	F	115
Electronic Potentiometer	EPN-110DN	4921240126	E	117
Frequency Relay	RMF-112D	4921240223	B	119
Load Sharing Unit	LSU-114DG	4921240122	E	121
Load Sharing Unit	LSU-113DG	4921240120	G	125
Load Sharing Unit	LSU-112DG	4921240118	E	129
Excitation Relay	RMQ-121D	4921240112	D	133
Excitation Relay	RMQ-111D	4921240112	D	see page 133
Loss Of Mains relay	LMR-111D	4921240214	C	135
Loss Of Mains relay	LMR-122D	4921240220	B	137
Overload (Power) Relay	RMP-111D	4921240108	E	139
Overload/Reverse Power Relay	RMP-112D	4921240110	E	141
Paralleling Relay (Synchroniser)	HAS-111DG	4921240144	E	143
Protection Relay Package	G59	4921240217	C	147
Reverse Power Relay	RMP-121D	4921240106	F	149
Short circuit relay	RMC-121D	4921240260	A	151
Synchroniser	FAS-125DG	4921240141	D	153
Synchroniser	FAS-115DG	4921240116	E	155
Synchroniser	FAS-113DG	4921240114	E	159
var Load Sharing Unit	LSU-122DG	4921240124	E	163
Voltage Relay	RMV-142D	4921240128	D	167

Voltage Relay	RMV-132D	4921240096	E	169
Voltage Relay	RMV-112D	4921240096	E	see page 169
Voltage Relay	RMV-122D	4921240096	E	see page 169
Power Management Systems				171
Power Management System	Delomatic	4921240164	D	171
Marine Bridge Instrumentation				**173**
Illuminated instruments, Rudder transmitters				174
Table of Products		4921240143	N	174
Rudder Angle Transmitter	RT-2	4921250052	C	177
Bridgewing Instrument	BRW-1	4921250008	F	179
Illuminated 360 deg. azimuth indicator	DLQA96/144	4921250055	C	181
Illuminated indicators	XL/BW	4921250057	E	185
Rudder Angle Indicator	VTR-3	4921250002	D	197
Rudder Angle Indicator, Panoramic	TRI-2	4921250043	E	199
Illuminated Instrument, IP52/IP54	DLQ96	4921250014	F	201
Illuminated Instrument, IP52/IP54	DLQ144	4921250014	F	see page 201
Illuminated Instrument, IP52/IP54	DLQ72	4921250014	F	see page 201
Illuminated Instrument, IP52/IP54	DLQ192	4921250014	F	see page 201
Waterproof Marine Instrument	VTR-5	4921250005	D	205
Illuminated Instrument, Waterproof (IP66)	DLQW72/96	4921250050	E	207
Other bridge and alarm equipment				210
Table of Products		4921240161	A	210
Alarm And Monitoring System	845	4921230013	C	211
Extension Alarm Systems	869	4921250037	B	217
Group Alarm Panels	869.25, 869.26	4921250039	B	221
Lantern Control Panel	827	4921250023	C	223
Unfitness And Alarm System	UAS-1	4921250041	D	227
Wind Measuring System	879	4921250011	E	229
Other Products				**233**
Audio-Visual equipment				234
Table of Products		4921240162	B	234
Bells	117, 118R, 124	4921200005	C	236
Diapraghm Horns	172, 173	4921200008	C	238
Rotating Beacons	754H	4921200011	C	240
Sirens	212, 208	4921200002	C	242
Switchboard Instrumentation				**244**
Battery chargers				245
Table of Products		4921240286	B	245
Battery charger	DCP2	4921210105	F	247
Current transformers				251
Table of Products	MAK	4921240157	G	251
Table of Products	SCT	4921240157	G	see page 251
Energy Meters				258
Table of Products		4921240252	A	258
DC Integrator, Pulse Transmitter	DCF-Q96	4921220014	D	259
Energy Meter, DIN Rail Mount	TAE-2	4921220030	D	261
Energy Meter, Panel Mount	WQR96	4921210083	D	265
Energy Meter, Panel Mount	WQR96-c	4921210083	D	see page 265
Energy Meter, Panel Mount	WQR96-x	4921210083	D	see page 265
Energy Meter, Panel Mount	WQ2R96	4921210083	D	see page 265

Panel meters, Accessories				269
Table of Products		4921240140	T	269
Alarm Panels	AL8-2	4921230002	D	274
Panel Meter, Bimetallic, Currents	BQ	4921210015	D	282
Panel Meter, Combined Bimetallic And Moving Iron, Ammeter	BEQ	4921210018	C	284
Panel Meter, Moving Coil, DIN Rail Mounting	D45	4921210027	D	286
Panel Meter, Moving Iron, DIN Rail Mounting	E45	4921210027	D	see page 286
Insulation Meters	AAL-110Q96	4921230016	E	288
Insulation monitor	DIM-Q	4921230018	C	292
Insulation Monitors	AAL-111Q96	4921230011	G	298
Multi-instrument	MIC	4921210107	A	302
Multi-instrument	MIQ96-2	4921210108	A	307
Panel Meter, Power factor	PFQ	4921210002	E	309
Panel Meter, Temperature pt100	PTQ	4921210021	F	311
Remote Position Indicator	PIR25-1	4921210033	D	313
Remote Position Indicator	PIR25-2	4921210033	D	see page 313
Running Hours Counters	HC36/24	4921210080	B	315
Running Hours Counters	HC48	4921210090	D	317
Shunt Resistors	Shunts	4921210042	G	319
Panel meter, Frequency, Pointer	FQ	4921210047	H	321
Panel Meter, Frequency, Reed	FTQ	4921210047	H	see page 321
Panel Meter, Moving Coil, AC Current/Voltage	VDQ	4921210012	K	323
Panel Meter, Moving Coil, DC Current/Voltage	DQ	4921210012	K	see page 323
Panel Meter, Moving Iron, AC Current And Voltages	EQ	4921210012	K	see page 323
Panel Meter, Moving Coil, Edgewise, DC Current/Voltages	DSM	4921210012	K	see page 323
Panel Meter, Moving Coil, Edgewise, DC Current/Voltage	DPR	4921210012	K	see page 323
Panel Meter, AC Current, Built In Switch	VDQ96-sw	4921210077	F	331
Panel Meter, AC Voltage, Built In Switch	EQ96-sw7	4921210077	F	see page 331
Panel Meter, Watt or var	WQ	4921210005	F	333
Transducers				337
Table of Products		4921240158	M	337
Transducer, Current	TAC-321DG	4921220034	E	340
Transducer, Current	TAC-311DG	4921220034	E	see page 340
Transducer, Voltage	TAV-311DG	4921220032	E	344
Transducer, Voltage	TAV-321DG	4921220032	E	see page 344
Transducer, Dual Output, Watt, var	TAX-312DG/1	4921240181	F	348
Transducer, DC/DC Insulation Amplifier	TDG-210DG/2	4921220011	E	350
Transducer, Multi Function	MTR-1	4921220026	I	354
Transducer, Selectable, Voltage, Current, Frequency, Phase Angle	TAS-311DG	4921220038	E	356
Transducer, Selectable, Watt, var	TAS-331DG	4921220036	E	360
Selectable AC-transducer, bi-directional current measurements,	TAS-321DG	4921220040	D	364
Transducer, Temperature	TEMAX-3	4921220022	C	368
Transducer, Voltage	TAV-210DG/3	4921220002	E	372
Transducer, Power	TAP-210DG/3	4921220002	E	see page 372
Transducer, Current	TAC-230DG/2	4921220002	E	see page 372
Transducer, Current	TAC-220DG/3	4921220002	E	see page 372
Transducer, Voltage	TAV-220DG/3	4921220002	E	see page 372
Transducer, Current	TAC-210DG/3	4921220002	E	see page 372
Transducer, Reactive Power	TAQ-210DG/3	4921220002	E	see page 372
Transducer, Frequency	TMF-210DG/2	4921220002	E	see page 372
Transducer, Phase Angle	TAA-210DG	4921220002	E	see page 372

Engines & Gen-sets

	Key Starters, KSE72-1N	Stop Relays, SR-1	
Main functions:	Manual start/stop and automatic supervision / emergency shutdown of smaller engines. Suitable for both 12V and 24V starting batteries. For diesel engines with "stop coil" a seperate stop relay type SR-1 is applied. The *Key switch* can be set in 3 positions: "START", "RUN", "STOP" *4 inputs:* Oil pressure , temperature and A & B (customisable alarm inputs) *Protection:* IP41 *Aux. voltage*: 12 and 24V DC	Stop relay designed for internal combustion engines fitted with a stop solenoid. The relay is for use with the key starter KSE72-1N and is designed for 35 mm DIN rail mounting. *Activation time:* appr. 20 s *Output:* relay output (change-over switch) for connection of stop solenoid) *Aux. voltage:* 9…30V DC *Protection:* IP53	

	Emergency Power Automatics, EPOMATIC MS-2, EC-2		
Main functions:	Supervision and control of emergency gen-sets.The system carries out an automatic changeover from mains to emergency generator on mains failure, and back from emergency generator to mains when the mains is restored. **Functions on mains failure:** Automatic start of engine, Change of circuit breakers to generator operation, Supervision of engine during operation, Automatic shutdown of engine in case of serious failures, Change of circuit breakers to mains operation when mains voltage has been restored. **Epomatic consists of:** MS-2 Mains supervision unit EC-2: Engine control unit *Aux. voltage:* 12, 24 or 48V DC *Protection:* IP52		

DEIF A/S, Frisenborgvej 33, DK-7800 Skive, Tel.: +45 9614 9614, Fax: +45 9614 9615, E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

Emergency power automatics

Type EPOMATIC MS-2, EC-2

4921240002D

EC-2

MS-2

- ***All necessary functions:***
  - ***mains supervision***
  - ***start/supervision/stop of diesel engine***
  - ***control of circuit breakers and contactors***
- ***High resistance to shock, vibrations and transients***
- ***All output are 2A relay contacts***
- ***May be fitted with lockable cover for front panel***

CE

Typical applications

EPOMATIC-2 (Emergency Power Automatics) provides supervision of the normal mains supply and the engine of the emergency generator.

The system carries out an automatic changeover from mains to emergency generator on mains failure, and from emergency generator to mains when the mains is restored.

EPOMATIC-2 is robust and well suited for use in harsh environments and is CE marked for residential, commercial and light industry plus industrial environment. It can thus be applied in all types of emergency plant, e.g. in:

- Hospitals
- Factories
- Data processing centres
- Marine vessels

Function

EPOMATIC-2 carries out the following major functions on mains failure:

- Automatic start of engine
- Change of circuit breakers to generator operation
- Supervision of engine during operation
- Automatic shutdown of engine in case of serious failures
- Change of circuit breakers to mains operation when mains voltage has been restored
- Automatic stop of engine

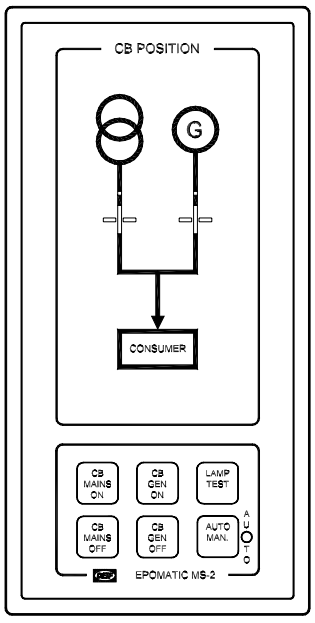
EPOMATIC-2 consists of two units, which can also be applied separately. Two or more MS-2 units may be connected to one EC-2, thus providing supervision of the power supply and ensure emergency power supply of more than one incoming power lines.

MS-2: Mains supervision unit

Control of: All types of engine start/stop units.

MS-2 monitors the mains and generator voltages. The unit transmits the required start and stop signals to the Engine Control Unit, and furthermore controls the opening and closing of the circuit breakers.

The position of the circuit breakers and the status of the mains/generator voltages are shown by means of red and green light emitting diodes (LEDs) in the mimic diagram on the front panel.



Manual control of the circuit breakers is possible by means of push-buttons on the panel. A built-in interlock system prevents simultaneous closing of both circuit breakers.

Remote indication on change between automatic and manual operation.

If the engine fails to start, or failure occurs during emergency operation, a swift change-over to mains operation is automatically carried out, provided mains voltage has been restored.

For use in conjunction with motor-driven circuit breakers and contactors with or without hold-on circuit.

Mains failure is registered if just one of the following failures exists continuously for more than 0.5..5 s:

A) Overvoltage/undervoltage (adjustable ±3..25% of $V_{nom.}$)

B) asymmetric voltage (adjustable ±3..25% of $V_{nom.}$)

C) Phase loss (at reflected voltage as well).

On mains failure::

1) Transmission of a start signal to EC-2 after 0.5..5 s.
2) (The engine is started by EC-2)
3) Opening of the mains circuit breaker, when the generator voltage has exceeded 80% of $V_{nom.}$ for 0.5..5 s.
4) Closing of the generator circuit breaker after a 0.5..5 s time delay.
(The MS-2 first having checked that the mains circuit breaker is open).

When mains is restored:

1) Opening of the generator circuit breaker after a 1..10 min. time delay.
2) Closing of the mains circuit breaker after a 0.5..5 s time delay.
(The MS-2 first having checked that the generator circuit breaker is open).
3) Transmission of a stop signal to the EC-2 - provided that mains voltage remains normal.
4) (The engine is stopped by EC-2).

EC-2: Engine control unit

Control of:

- Engines with generator
- Engines without generator (e.g. pumps)
- Generator sets running in parallel with the mains
- Generator sets in island operation

This unit starts and stops the engine, indicates the status of operation and transmits alarm signals. In case of serious failures, a shutdown of the engine and opening of the generator circuit breaker are at the same time carried out. Manual start and stop of the engine is possible by means of push-buttons on the operation panel of the unit.

EC-2 can be supplemented by DEIF alarm panels type AL8-2 if more alarm channels are required.

All relevant functions of the EC-2 are provided with adjustable timing facilities.

Main functions of the unit

1) Activation of the pre-heater and/or lubricating pump of the engine upon receipt of a start signal from the MS-2 or by activation of the MAN. START push-button.

2) Activation of the starter motor for 2..8 start attempts. In case of start failure an alarm signal is transmitted.

3) Supervision of alarm points during operation. In case of failure an alarm signal is transmitted and if required, a shutdown of the engine and opening of the generator circuit breaker are carried out.

4) Carrying out of a cooling down procedure upon receipt of a stop signal from MS-2.

"Status" section
7 LEDs indicate the actual operational status of the engine.

"Alarm" section
The 12 LEDs have the following functions:

1-7: Available alarms: Inhibit of alarm and shutdown function possible.

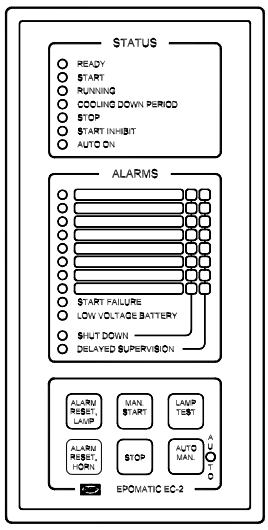
8: "TACHO FAILURE" alarm: Released if the tacho generator fails (see page 4)

9: "START FAILURE" alarm: Released in case of start failure.

10: "LOW VOLTAGE BATTERY" alarm: Released if the voltage drops below 75%.

11: "SHUTDOWN" indicator: Lit if an alarm with shutdown function is received from alarms 1..7.

12: DELAYED SUPERVISION: Lit for the preset period of time after start of the engine. Prolonged inhibit of connected alarms.



For marking of alarms 1-8 a plastic sheet is enclosed on delivery. This is easily placed under the front plate when the front bezel is removed. Texts may be selected from 30 adhesive pre-printed texts supplied with the unit, or printed directly on the sheet by means of a typewriter.

Marking of inhibit and shutdown functions for each channel is likewise possible on the sheet.

Connection diagram

The diagram (page 5) shows how the EPOMATIC-2 is in principle connected in emergency plants with one generator.

Indication of circuit breaker positions
In the mimic diagram on the front plate of MS-2 the actual position of the circuit breakers is shown by LEDs.

A closed circuit breaker is indicated by a vertical green line, and an open circuit breaker by a horizontal red line.

The presence of the mains and generator voltages is likewise indicated by means of red and green LEDs.

Interlock of circuit breakers
The MS-2 is provided with an interlock function preventing simultaneous closing of both circuit breakers.

If protection against failures in the electronics is furthermore required, the circuit breakers can be provided with an external interlock circuit via the auxiliary contacts of the circuit breakers.

"Running" signals
The EC-2 is based on a "RUN" signal being received from an external tacho relay and a "GEN. ON" signal being received, when the engine is running.

If a "RUN" signal is not received or is later on interrupted, a "TACHO FAILURE" alarm is released.

If only one of these signals is needed to indicate that the engine is running, this signal is connected to both input terminals of the EC-2. In this case a possible tacho failure will not be registered.

Further applications
EPOMATIC-2 can in conjunction with other DEIF products for control and protection of generators be applied in more advanced emergency plants with one or more generators.

The following functions can e.g. be carried out:

- Automatic re-synchronisation to the mains of one or more generators
  ensuring continuous supply without blackout when returning to mains operation.
- Automatic load sharing between more generators in emergency operation.
- Automatic load sharing between one or more generators and the mains.
- Complete protection of generators against:

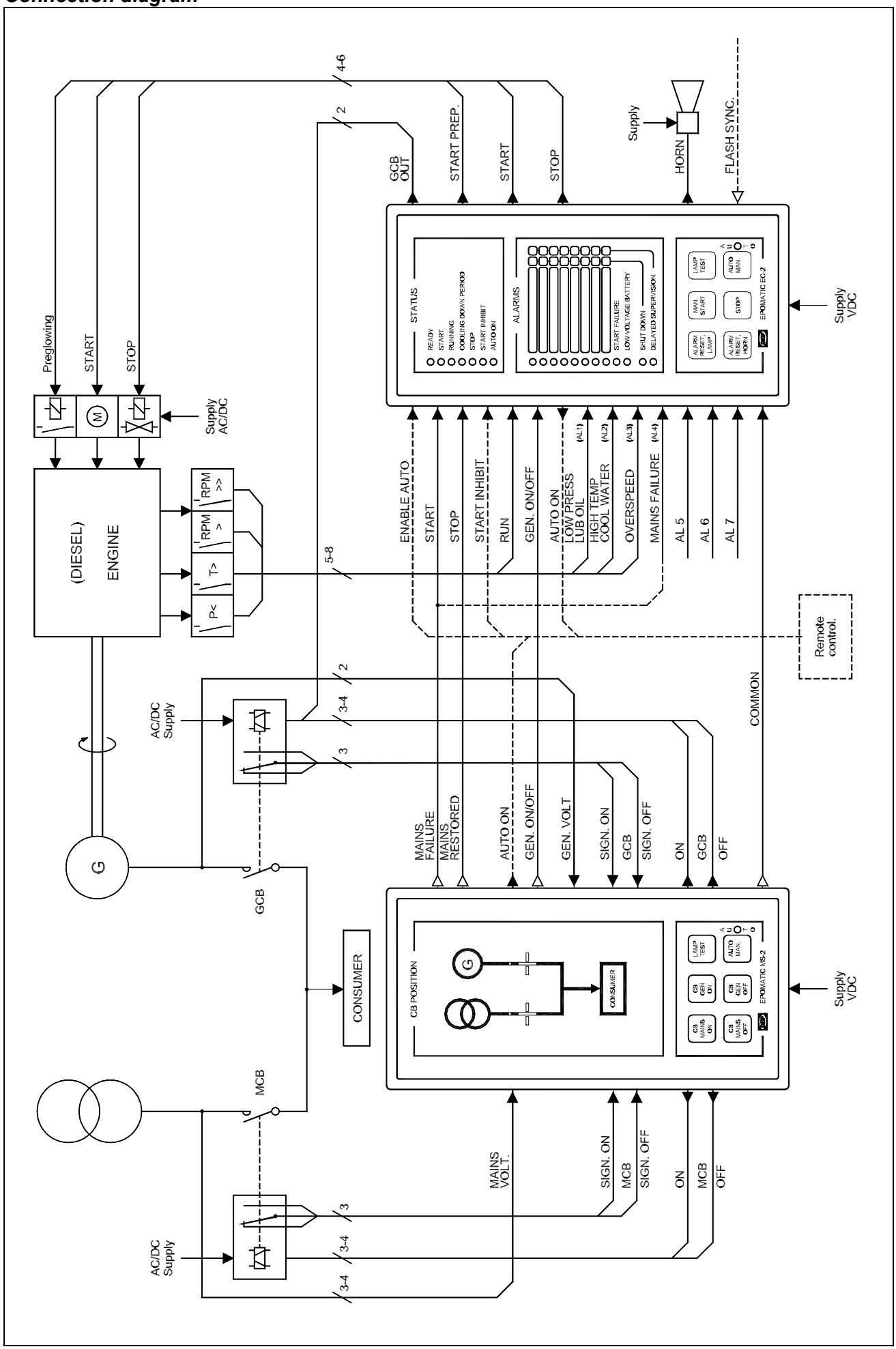
  - reverse power

  - overload/overcurrent

  - short-circuit current

  - faulty insulation, etc.

Connection diagram



Adjustment of MS-2

All potentiometers are accessible on the rear of the MS-2, whereas dip switches are set on the side of the housing. No dismounting of cables is required if the unit is pulled out from the panel (two-piece terminals).

"SET V-NOM.":	Nominal/actual mains voltage (fine adjustment). Voltage range is selected by means of an internal 7 position dip switch.
"BAL. V-ERROR":	Max. allowable undervoltage and overvoltage: ±3...25% of V_{nom}.
"ASYM. V-ERROR":	Max. allowable asymmetry between the phases: ±3...25% of V_{nom}.
(DELAY) GEN. VOLT.:	Delay of generator voltage signal (V_{gen} > 80% of V_{nom}.): 0.5...5 s.
(DELAY) INTERLOCK:	Delay of closing signal after opening of the other circuit breaker: 0.5...5 s.
(DELAY) MAINS FAIL.:	Delay of automatic start signal to EC-2 on mains failure: 0.5...5 s.
(DELAY) MAINS REST.:	Delay of automatic stop signal to EC-2 after the mains has been restored: 1...10 min.

Adjustment of EC-2

All timers are accessible on the rear of the EC-2, whereas dip switches are set on the side of the housing. No dismounting of cables is required if the unit is pulled out from the panel (two-piece terminals).

Alarms 1-7:	The functions of each alarm point are set by means of 3 sets of dip switches: 1. switch: **closed**: The alarm is inhibited during start and stop of the engine. 2. switch: **closed**: The alarm is released when the ext. contact OPENS (N/C). 3. switch: **closed**: The alarm causes a shutdown stop of the engine and opening of the generator circuit breaker.
Alarm 6:	Delay of alarm for 2..10 s. Adj. by means of the potentiometer "DELAY AL 6".
Alarm 7:	Delay of alarm for 2..10 s. Adj. by means of the potentiometer "DELAY AL 7".
Alarm flashing:	Synchronous alarm flashing of multiple alarm panels: Set jumper marked "FLASH" to position "EXT." and connect an external flash signal to the terminals marked "FLASH SYNC.". Below timers are standard set to 2...10 s, except: "COOL. DOWN PERIOD" = 2..10 min. and "STOP TIME" = 6..60 s.
"START PREP.":	Typically used for pre-heat. The LED marked "START" is lit at half intensity, the output relay "START PREP." is energized, and the relay contact closes for the preset period of time.
"START ON":	Activation time of the starter motor. After the time "START PREP." the LED marked "START" is lit at full intensity, the output relay "START" is energized and the relay contact closes for the preset period of time.
"START OFF":	Waiting time of the starter motor. After the activation time the LED marked "START" is switched off, the output relay "START" is de-energized and the relay contact opens for the preset period of time.
"DELAY SUPERVISION":	Prolonged inhibit of alarms after start of the engine. Upon receipt of the "RUNNING" signal, a timer is started and the LED marked "DELAYED SUPERVISION" is lit for the preset period of time.
"COOL. DOWN PERIOD":	Cooling down period. When the EC-2 receives an automatic stop signal, a timer is started for 2...10 min. and the LED marked "COOLING DOWN PERIOD" is lit. If the push-button "MAN. STOP" is activated, or a shutdown alarm is received within this period of time, the cooling down procedure is interrupted, the generator circuit breaker is opened and the engine is stopped immediately. If the EC-2 receives an automatic start signal, the cooling down procedure is likewise interrupted, enabling reloading of the generator.
"STOP TIME EXT.":	Prolongation of stop sequence, lasting the preset period of time after the "RUNNING" signal has been interrupted. The LED marked "STOP" remains lit during the whole stop sequence.
Stop function:	The relays "STOP" and "GCB OUT" can be set to function in conjunction with a "running coil" (the relays are de-energized on stop) or a "stop coil" (the relays are energized on stop).
Start attempts:	The number of start attempts is as a standard set at 3, but can by means of an internal rotary switch be set at 2...8 attempts. **Note:** Is set to required number + 1.

Signals to/from MS

Term.	Function	Type	Designation	Application	Remarks
1 + 2	Input	N/O opto	GCB-SIGN. ON	Position signal from generator circuit breaker	Opto coupler
3 + 2	Input	N/O opto	GCB-SIGN. OFF	Position signal from generator circuit breaker	Opto coupler
4 + 5	Input	N/O opto	MCB-SIGN. ON	Position signal from mains circuit breaker	Opto coupler
6 + 5	Input	N/O opto	MCB-SIGN. OFF	Position signal from mains circuit breaker	Opto coupler
7 + 10	Output	N/O opto	MAINS FAIL.	Automatic start signal to EC-2	Opto coupler
8 + 10	Output	N/O opto	MAINS REST.	Automatic stop signal to EC-2	Opto coupler
9 + 10	Output	N/O opto	GEN. ON/OFF	U_{gen} > 80%: "GEN. ON" signal to EC-2	Opto coupler
11 + 12	Output	N/O	GCB ON	Control signal to generator circuit breaker	
13 + 14	Output	N/O	GCB OFF	Control signal to generator circuit breaker	
15 + 16	Output	N/O	MCB ON	Control signal to mains circuit breaker	
17 + 18	Output	N/O	MCB OFF	Control signal to mains circuit breaker	
20 + 21	Input	Analog	GEN. VOLT. R-S	Measurement of generator voltage: R + S	
22 + 23	Input	Analog	MAINS R-S	Measurement of mains voltage: R + S	
25 + 26	Input	Analog	MAINS T-N	Measurement of mains voltage: T + (N)	(Neutral)
28 + 29	Supply	±V DC	SUPPLY	Aux. supply: 12, 24 or 48V DC -3W	Isolated
30 + 31	Output	N/O	AUTO ON	Relay contact closes in auto mode	

Input (analog): Input (N/O opto): Output (N/O): Output (N/O opto):	100-110-220-240-380-415-440V AC. Calibrated using 7 dip switches and 1 potentiometer. From potential free contact. Internal supply voltage: +12V/4-8mA with "pull up" resistor. Relay contact: Max. 250V-2A-400VA (AC), 250-2A-50W (DC) resistive load. NPN transistor in opto coupler, supplied from the input of the EC-2.
Mains failure: Failure 1: Failure 2: Failure 3: Timers:	Registration of failure(s) continuously during preset period of time (DELAY MAINS FAIL.) Voltage deviation: ±3...25% of $V_{nom.}$ Set using potentiometer "BAL. V-ERROR". Asymmetrical voltage: ±3...25% of $V_{nom.}$ Set using potentiometer "ASYM. V-ERROR" Phase loss (also at reflected voltage from motors). "DELAY MAINS REST.": 1...10 min. (±20%), "DELAY INTERLOCK": 0.5...5 s (±20%). "DELAY MAINS FAIL.": 0.5...5 s (±20%), "DELAY GEN. VOLT.": 0.5...5 s (±20%).

Signals to/from EC

Term.	Function	Type	Designation	Application	Remarks
1 + 2	Input	Opto	FLASH SYNC.	0-8..60V DC from external flash signal	Opto coupler
3 + 4	Input	N/O	STOP	Automatic stop signal (cooling down period)	(From MS-2)
5 + 6	Input	N/O	RUN	RPM > $RPM_{ign.}$ from external tacho relay	
7 + 8	Input	N/O	GEN. ON/OFF	V_{gen} > 80% $V_{nom.}$ from ext. voltage relay	(From MS-2)
9 + 10	Input	N/O	START INHIBIT	Inhibit of all start attempts	
11 + 12	Input	N/O	ENABLE AUTO	Enabling of automatic start/stop	
13 + 14	Input	N/O	START	Automatic start signal	(From MS-2)
15 + 16	Input	N/O-N/C	AL7 - DELAYED	ALARM 7: (Shutdown and/or inhibit)	Timer: 2...10 s
17 + 18	Input	N/O-N/C	AL6 - DELAYED	ALARM 6: (Shutdown and/or inhibit)	Timer: 2...10 s
19 + 20	Input	N/O-N/C	AL5	ALARM 5: (Shutdown and/or inhibit)	
21 + 22	Input	N/O-N/C	AL4	ALARM 4: (Shutdown and/or inhibit)	
23 + 24	Input	N/O-N/C	AL3	ALARM 3: (Shutdown and/or inhibit)	
25 + 26	Input	N/O-N/C	AL2	ALARM 2: (Shutdown and/or inhibit)	
27 + 28	Input	N/O-N/C	AL1	ALARM 1: (Shutdown and/or inhibit)	
29 + 30	Output	N/O	STOP	Control of "running coil"/"stop coil"	"S4+S5+S6+S7"
31 + 32	Output	N/O	START PREP.	Pre-heat or similar of engine before start	Timer: 2...10 s
33 + 34	Output	N/O	START	Activation of relay for starter motor	Timer: 2...10 s
35 + 36	Output	N/C	HORN	Relay contact closes on alarm	
37 + 38	Output	N/O	AUTO ON	Relay contact closes in auto mode	
39 + 41	Output	C/O	GCB OUT	Opening of GCB on shutdown/manual stop	Changeover contact
42 + 43	Supply	±V DC	SUPPLY	Aux. supply: 12, 24 or 48V DC -6W	Isolated

Input (N/O-N/C): Output (N/O-N/C): Timers (tol. ±20%):	From potential free contact/opto coupler. Int. aux. supply: +12V/2kΩ "pull-up" resistor. Relay contacts: Max. 250V-2A-400VA (AC), 250-2A-50W (DC) resistive load. "COOLING DOWN": 2...10 min., "STOP TIME": 6...60 s, others: 2...10 s.

Common technical specifications

Temperature: -10...55°C (nominal), -25...60°C (operating), -25...70°C (storage).

Galvanic separation:

All digital input signals mutually	None
Between input signals and remaining circuits	2kV - 50Hz - 1 min.
All analog input signals mutually	2kV - 50Hz - 1 min.
Between input, “flash sync.” and remaining circuits	2kV - 50Hz - 1 min.
All output signals mutually	2kV - 50Hz - 1 min.
Between output signals and remaining circuits	2kV - 50Hz - 1 min.
Between aux. supply and remaining circuits	2kV - 50Hz - 1 min.

Climate: Class HUE, to DIN 40040.

EMC: To EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4) and IEC 255-22-1 (class 3).

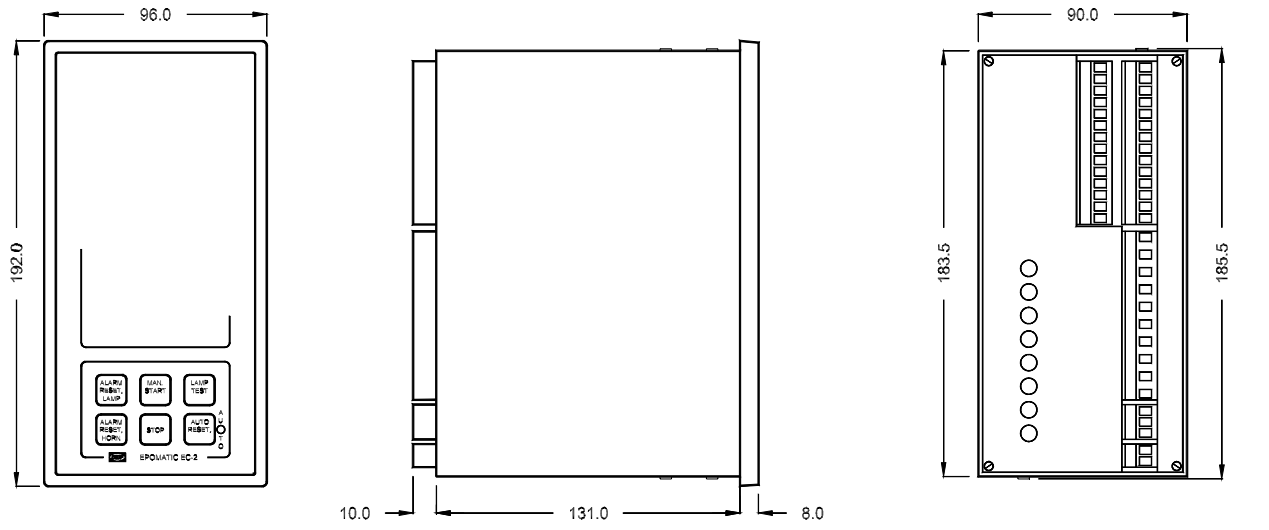
Materials: All plastic parts are self-extinguishing, to UL94 (V0).

Connections: Two-piece terminals with screws. Max. 1.5 mm² (single/multi-stranded).

Protection: IP52 (front), IP20 (rear), to EN 60529 and IEC529.

Dimensions

All dimensions in mm



MS-2/EC-2 Weight: MS-2: approx. 0.900 kg EC-2: approx. 0.950 kg

Order specifications

Type:	**MS-2** and/or **EC-2**
Range of time delay:	Specify designation of timer and time delay **if non-standard.** EC-2 timers with range 2..10 s may be prolonged to max. 20...100 s.
Auxiliary voltage:	12V DC, 24V DC or 48V DC

Due to our continous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

Key starter

Type KSE72-1N

4921240029C

- *2 standard alarm inputs*
- *2 customer selectable alarm inputs*
- *Charge circuit indicator*
- *Inhibit of alarms during start sequence*
- *Automatic emergency shutdown of engine*

CE

Application
KSE72-1N is a compact, generally applicable unit for manual start/stop and automatic supervision/emergency shutdown of smaller diesel or petrol engines. For diesel engines with "stop coil" a separate stop relay type SR-1 (see specific data sheet) is applied. The KSE72-1N is CE classified for residential, commercial and light industry plus industrial environment.

The KSE72-1N is without adjustment suitable for both 12V and 24V starting batteries.
A maximum of 4 alarm devices can be connected to the key starter. In case of failure, the LED indicator for the relevant alarm input is lit, the engine is stopped and a signal is transmitted to an external alarm device.

The alarms remain inhibited for 10 s. after start of the engine, to allow e.g. normal oil pressure to be established during this period of time. A pre-exciting current is fed to the charging generator and an LED is lit in case of insufficient charging voltage.

Mechanical construction
KSE72-1N is housed in a robust plastic housing for flush mounting. The key switch is mounted in a solid aluminium plate. The front plate and the 5 red LEDs are covered by a hard-wearing polycarbonate film provided with text on the inside. The rear consists of an epoxy plate with spade plugs (6.3 x 0.8 mm) for electrical connections, provided with text (terminal No./designation).

Key switch
The key switch can be set in 3 positions:

”START”	Starts the engine. When the engine starts the key is released which then returns to the "RUN" position (spring loaded).
”RUN”	Normal position when the engine is running.
”STOP”	Manually stops the engine. Reset of alarm after automatic shutdown of the engine upon detection of a failure. The key can only be removed when set to this position.

Inputs
KSE72-1N is provided with 4 inputs for connection of the following alarm contacts:

”OIL SW.”	Oil pressure sensor (too low oil pressure).
”TEMP. SW.”	Termostat (too high engine temperature).
”A and ”B”	Other alarm contacts, e.g. overspeed, low coolant level, etc. Descriptive texts can be filled in using black marking pen.

Activation of alarm inputs
The alarm inputs are activated at either N/O or N/C contact function - determined by the position of the jumper marked "J1" on the rear of the unit. The setting is COMMON to all 4 inputs. See detailed instruction (in English/German) on the side panel of the unit. NOTE: "J1" is mounted (CLOSED) on delivery.

"J1" closed:	An alarm is registered when the first external alarm contact OPENS (N/C). NB: unused inputs should be short-circuited !
"J1" open:	An alarm is registered when the first external alarm contact CLOSES (N/O). NB: unused inputs should be left open!

Outputs
The unit is provided with 4 outputs for connection of the following external components:

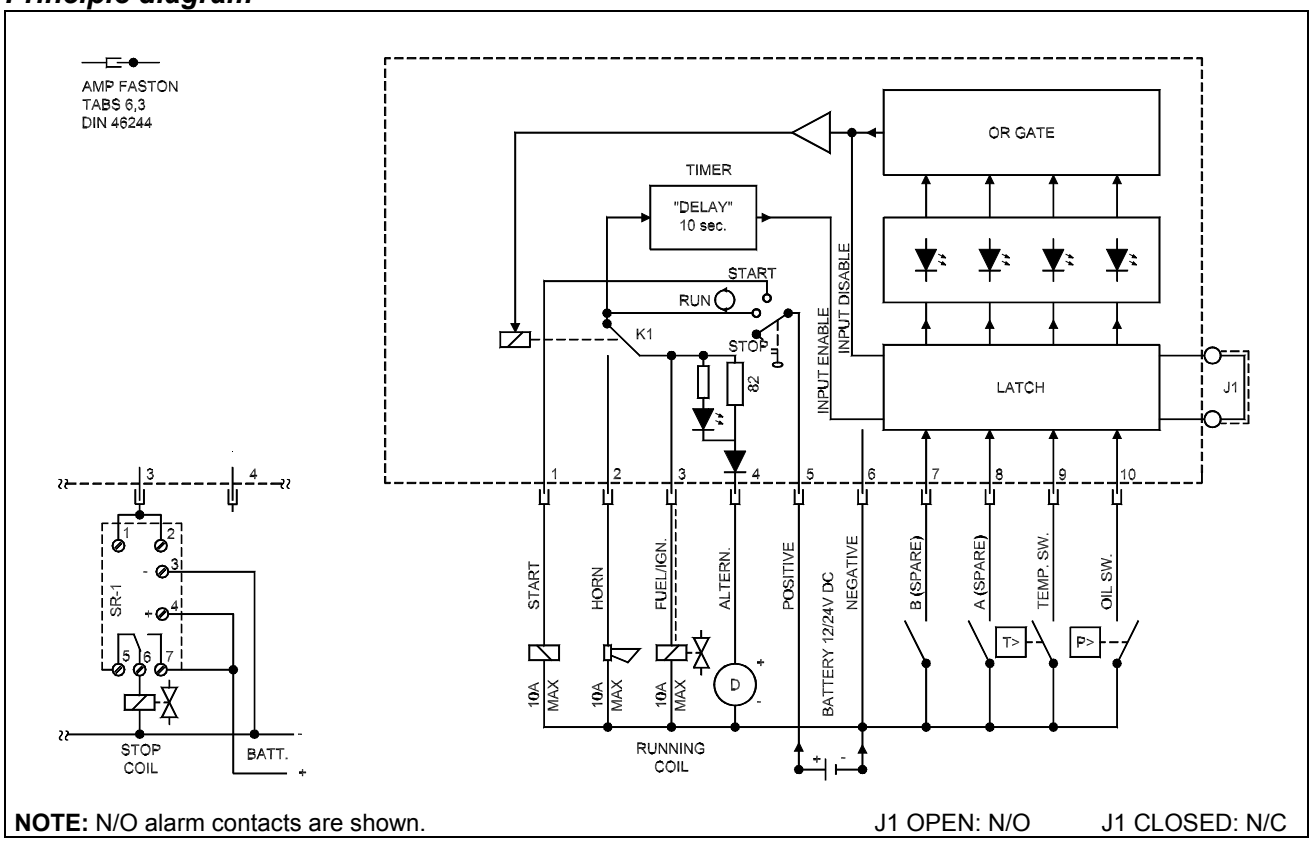
"START"	Relay for starting motor (max. 10A DC).
"FUEL/IGN."	Fuel solenoid or ignition coil (max. 10A DC). For stop coils use external stop relay type SR-1 (See specific data sheet).
"ALTERNATOR"	Charging generator (pre-exciting current: 120mA through internal resistor).
"HORN"	For connection of alarm device (max. 10A DC).

Alarm inhibit during start sequence
When the key is set to the "START" or "RUN" position, all alarm inputs remain inhibited for the next 10 secs. Unwanted stop of the engine, e.g. due to low oil pressure during the start sequence, is thus prevented.

Emergency shutdown of the engine
If an alarm condition is detected after the above period of time, the LED indicator for the first received alarm signal is lit, the engine is stopped and the alarm horn is activated.

The horn may then be reset by turning the key to the "STOP" position.

Principle diagram



NOTE: N/O alarm contacts are shown. J1 OPEN: N/O J1 CLOSED: N/C

Function

Pre-glowing of the diesel engine (if required) must be carried out before the key is turned from the "STOP" position!

To start the engine, turn the key to the "START" position. This results in:

1) Activation of the starting motor through an external starter relay.

2) Activation of the fuel starting coil and/or the ignition coil.

3) Connection of a pre-exciting current (ca. 120mA) for the charging generator.

4) Inhibit of all alarm channels.

5) Start of the "DELAY" timer.
If the engine starts, the key is released. It returns to the "RUN" position which results in:

6) Disconnection of the starting motor.

7) Switch off of the LED indicator for the charge circuit, if the generator works normally.

8) Release of all alarm channels after the time delay ("DELAY").

In case of failure in one of the supervised functions, the following steps are carried out:

1) Illumination of the relevant LED indicator.

2) Inhibit of remaining alarm channels (i.e. indication of the first alarm only).

3) Activation of the internal relay ("K1"). The relay contact changes position.

4) Activation of the alarm horn (or the like).

5) Disconnection of the fuel starting coil and/or the ignition coil.

6) Disconnection of the pre-exciting current for the charging generator.

7) Shutdown of the engine.

The alarm is reset by turning the key to the "STOP" position.

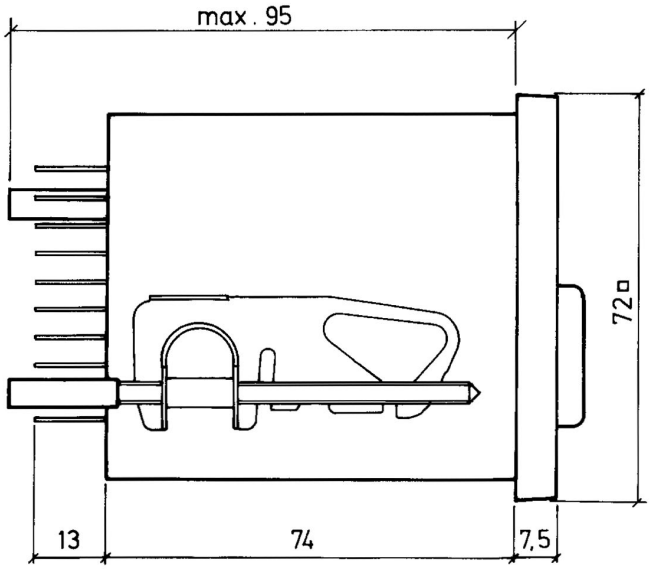
To stop the engine manually, turn the key to the "STOP" position, i.e. steps 5-8 are carried out.

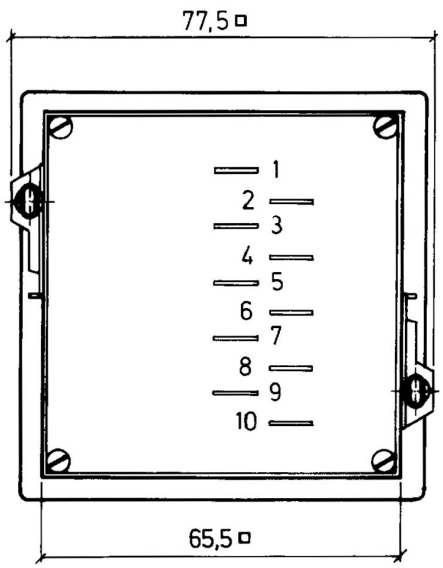
Technical specifications

Auxiliary voltage:	Suitable for both 12V DC and 24V DC. Protected against polarization errors. Functional range: 0..30V DC during start sequence. 9..30V DC after the engine has been started.
Consumption:	Max. 20mA DC (no alarm). Max. 120mA DC (at alarm).
Alarm contacts:	Open contact: 6V DC. Closed contact: 12mA DC.
Outputs:	"START", "FUEL/IGN." and "HORN": Max. 10A DC. "ALTERNATOR": 120mA for pre-excitation of charger circuit. Short-circuit protection, max. 420mA.
Alarm inhibit:	10 s Tolerance: ±2 s.
Key system:	Standard: All units identically coded. 2 keys supplied with each unit. Individually coded key/lock available on request.
Ambient temperature:	-10...55°C (nominal), -25..+70 C (operating), -40..+70 C (storage).
Climate:	Class HSE, to DIN 40040.
Vibration:	3..30Hz: 100 mm/s, 30..100Hz: 1.9 g, to GL + LR: Test 1 and DNV: Class B.
Shock:	15 g, tested 6 times in 3 directions, to IEC 68-2-27, Test: Ea.
EMC:	To EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4), IEC 255-22-1 (class 3).
Plastic materials:	Self-extinguishing, to UL94 (V0).
Connections:	Standard spade plug, 6.3 x 0.8 mm.
Protection:	IP41, to IEC 529 and EN 60529.

Dimensions

All dimensions in mm





KSE-1N Weight: approx. 0.350 kg Panel cut-out: 68 x 68 mm +0.7 to DIN 43700

Order specifications

KSE72-1N
Individually coded keys/lock and front panel to customer design – on request

Due to our continous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

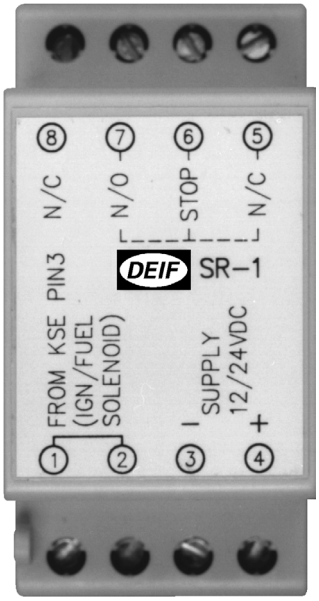
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

Stop relay

Type SR-1

4921240041C



- *For internal combustion engines*
- *For use with key starter type KSE72*
- *Activation time: approx. 20 s*
- *For DIN rail mounting*

Application

The stop relay type SR-1 is designed for internal combustion engines fitted with a stop solenoid.

The relay is for use with the key starter **KSE72-1N** and is CE classified for residential, commercial and light industry plus industrial environment.

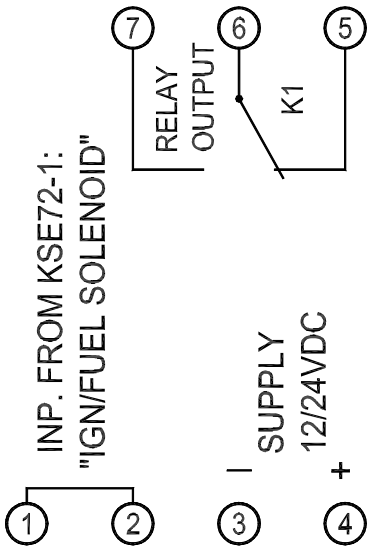
The SR-1 is provided with a built-in relay, which is activated for approx. 20 s. when the unit receives a signal from the key starter.

The SR-1 is housed in a plastic housing complete with screw terminals for connection of stop solenoid, auxiliary voltage and key starter.

Technical specifications

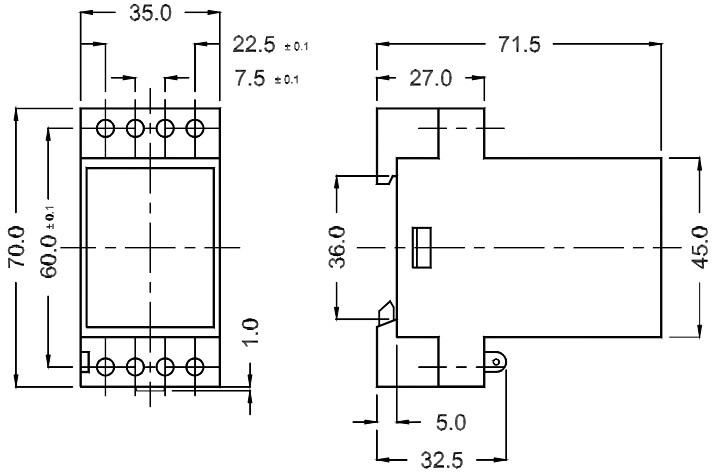
Input:	Connection to KSE72-1N (terminal marked "IGN./FUEL").
Output:	Relay output (change-over switch) for connection of stop solenoid. Max. load: 30V/10A DC.
Auxiliary voltage:	9...30V DC (protected against incorrect polarity).
Consumption:	Activated: max. 120mA. De-activated: max. 20mA.
Temperature:	-10...55°C (nominal), -25...65°C (operating). -25...65°C (storage).
EMC:	To EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4) and IEC 255-22-1 (class 3).
Climate:	Class HSE, to DIN 40040.
Vibration:	To DNV: Class B.
Materials:	Polystyrene HSF 13.
Connections:	Screw terminal, max. 1 x 4 mm².
Protection:	Case: IP53, terminals: IP20, to IEC 529 and EN 60529.
Mounting:	35 mm DIN rail.

Connections



Dimensions

All dimensions in mm



Weight: approx. 0.010 kg

SR-1

Order specifications

Type

Due to our continous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

	Generator Protection Unit (GPU)	Generator Paralleling Controller (GPC)	Paralleling and Protection Unit (PPU)
Aux.: 8-36V DC	√	√	√
Meas. voltage: 100-690V	√	√	√
Current transformer: -/1A or -/5A	√	√	√
Frequency: 30-70Hz	√	√	√
Loss of mains protection package	A	A	A
df / dt	A	A	A
Vector jump	A	A	A
Busbar and generator protection package	B1	B1	B1
Generator add-on protection package	C1	C1	C1
Zero + negative sequence	C2	C2	C2
Voltage control	D2	D1	D1
Var / cos phi control	-	D1	D1
Analogue controller output	-	E1	E1
Analogue transducer output	F	F	F
Combination outputs	-	EF	EF
Start / stop relay output to next generator	G1	√	√
Power management	-	-	-
AMF logic	-	-	-
Synchronising	G2	√	√
Load sharing	-	√	√
Engine communication	H4/H5/H6	H4/H5/H6	H4/H5/H6
Serial communication	H1/H2/H3	H1/H2/H3	H1/H2/H3
Remote mountable display	√	√	√
Display / PC cables	J	J	J
IP54 protection of display	L	L	L
Available without display	√	√	√
Configurable ext. cards	M	M	M
Engine protection	M1/M2	M1/M2	M1/M2
Approved by classification societies	√	-	√
BASE / DIN rail mounting	√	√	√
Additional Operator Panel	-	-	-

DEIF A/S, Frisenborgvej 33, DK-7800 Skive, Tel.: +45 9614 9614, Fax: +45 9614 9615, E-mail: deif@deif.com, URL: www.deif.com

	Automatic Gen-set Controller (AGC)	Basic Gen-set Controller (BGC)	Multi Differential Relay (MDR-2)
Main function:	Island mode, AMF, fixed power, peak shaving, mains power export, load take over.	Island mode, AMF, fixed power, peak shaving, load take over, load sharing.	Multi Differential Relay for protection against short circuits and leakage currents of the generator
Aux.: 8-36V DC	√	√	√
Meas. voltage:	100-690V	100/110V + 380/480V	-
Differential relay:	-	-	√
Current transformer: -/1A or -/5A	√	√	√
Frequency: 30-70Hz	√	√	√
Loss of mains protection package	A	A	-
df / dt	A	A	-
Vector jump	A	A	-
Busbar and generator	B1	B1	-
Generator add-on protection package	C1	C1	-
Negative sequence	C2	-	-
Voltage control	D1	D1	-
Var / cos phi control	D1	D1	-
Analogue controller output	E1	G2/G3	-
Analogue transducer output	F1	F1/F2	-
Combination outputs	EF	-	-
Start / stop relay output to next generator	√	G1	-
Power management	G5	-	-
AMF logic	√	√	-
Synchronising	√	G2	-
Load sharing	G3	G3	-
Engine communication	H4/H5/H6	H4/H5/H6	-
Serial communication	H1/H2/H3	H1/H2/H3	-
Remote mountable display	√	-	√
Display / PC cables	J	J5	J
IP54 protection of display	L	L	L
Available without display	√	-	√
Configurable ext. cards	M	M	-
Engine protection	√	√	-
Approved by classification societies	-	-	√
BASE / DIN rail mounting	√	-	√
Additional Operator Panel	√	-	-

DEIF A/S, Frisenborgvej 33, DK-7800 Skive, Tel.: +45 9614 9614, Fax: +45 9614 9615, E-mail: deif@deif.com, URL: www.deif.com

	Engine Controller (EC-1)	Generator Controller (GC-1)	
Main function:	Engine control and protection.	Engine and generator control and protection.	
Aux.: 8-36V DC	√	√	
Meas. voltage:	50-480V	50-480V	
Differential relay:	-	-	
Current transformer: -/1A or -/5A	-	√	
Frequency: 30-70Hz	√	√	
Loss of mains protection package	-	-	
df / dt	-	-	
Vector jump	-	-	
Busbar and generator protection package	B2 (Generator only)	Generator only	
Generator add-on protection package	-	-	
Negative sequence	-	-	
Voltage control	-	-	
Var / cos phi control	-	-	
Analogue controller output	-	-	
Analogue transducer output	-	-	
Combination outputs	-	-	
Engine start / stop relay output	√	√	
Power management	-	-	
AMF logic	-	B3	
Synchronising	-	-	
Load sharing	-	-	
Engine communication	H5	H5	
Serial communication	H1	-	
Remote mountable display	-	-	
Display / PC cables	J5	J5	
IP54 protection of display	L	L	
Available without display	-	-	
Configurable ext. cards	-	-	
Engine protection	√	√	
Approved by classification societies	-	-	
BASE / DIN rail mounting	-	-	
Additional Operator Panel	-	-	

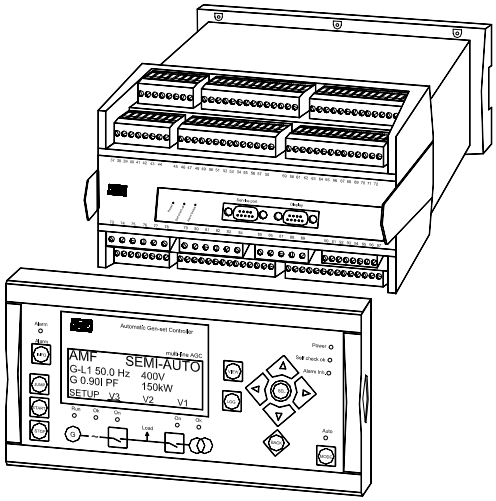
DEIF A/S, Frisenborgvej 33, DK-7800 Skive, Tel.: +45 9614 9614, Fax: +45 9614 9615, E-mail: deif@deif.com, URL: www.deif.com

Data sheet

Automatic Gen-set Controller

Multi-line 2

4921240257F



CE

Standard functions

Operation modes

- Automatic mains failure
- Island operation
- Fixed power/base load
- Peak shaving
- Load take over
- Mains power export

Engine control

- Start/stop sequences
- Fuel solenoid selection
- Relay outputs for governor control

Protection (ANSI)

- Overcurrent, 2 levels (51)
- Reverse power (32)
- 4-20 mA inputs
- PT100 or VDO inputs
- Digital inputs

Display

- Prepared for remote mounting
- Push-buttons for start and stop
- Push-buttons for breaker operations
- Status texts

M-logic

- Simple logic configuration tool
- Selectable input events
- Selectable output commands

GSM communication

- SMS messages at all alarms
- Dial up from PC utility software to control unit

© DEIF A/S

DEIF A/S

Application

The Automatic Gen-set Controller is a micro-processor based control unit containing all necessary functions for protection and control of a gen-set. It contains all necessary 3-phase measuring circuits and all values and alarms are presented on the LCD display

The AGC is a compact all-in-one unit designed for the following applications:

1. Automatic mains failure
2. Island operation
3. Fixed power/base load
4. Peak shaving
5. Load take over
6. Mains power export (fixed power to mains)

Optional applications:

7. Multiple gen-sets, load sharing
8. Power management (island operation)
9. Power management (parallel with mains)

The AGC can operate in automatic mains failure mode as a secondary mode regardless of the type of application - except the island applications.

The AGC automatically carries out a cyclical self-test at start-up. If any errors are found, they will be displayed in clear text in the display and indicated with a relay output.

The display is separate and can be installed directly on the main unit or in the front of the switchboard door (requires option J1 – display cable).

The AGC is supplied with an engine interface I/O card. Two selections are possible:

PCB / I/O	**M1** (standard)	**M2** (option)
4-20 mA	4 (3)*	3 (2)*
Tacho	1	1
Digital inputs	5 (3)	9 (7)
PT100	2	-
VDO	-	3
Relay outputs	3 (0)	3 (0)

**Depends on the selected gen-set mode*

The number in parenthesis indicates the number of user configurable digital inputs/relay outputs.

M1 is supplied, if M2 is not specified.

Test

The available gen-set modes except island operation include a test mode. The test can be configured to include either:

- gen-set starting and running for a preset time. Generator breaker is open during the test,

or

- gen-set starting and synchronisation of the generator breaker. The test is carried out for a preset period of time at a fixed power set point parallel to the mains.

Setup

Setup is easily done via a menu structure in the display (password protected) or via the RS232 PC connection and the multi-line 2 Windows® based PC utility software. The PC utility software can be downloaded free of charge from www.deif.com. The utility software offers additional features such as monitoring of all relevant information during commissioning, saving and downloading of settings and downloading of software updates.

Options

In order to perfectly match the product solution to specific applications, the functionality of the AGC can be equipped with a number of available options. The options selected by the customer will be integrated in the standard AGC hereby securing the same user interface unaffected by whether the application needs a highly complex or a more basic gen-set controller.

Unit definitions

AGC: The standard control unit designed for a number of applications (1-9). An extensive list of hardware and software options is available for the AGC.

AGC mains: A special power management control unit used in the parallel with mains power management application (9). Several options are available for the AGC mains.

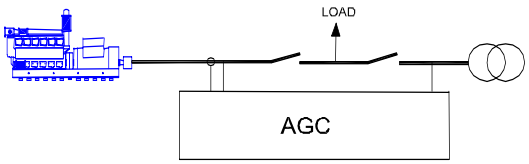
M-logic

This configuration tool is part of the PC utility software which is free of charge. With this tool it is possible to customise the application to your needs. It is possible to dedicate specific functions or logical conditions to different inputs and outputs.

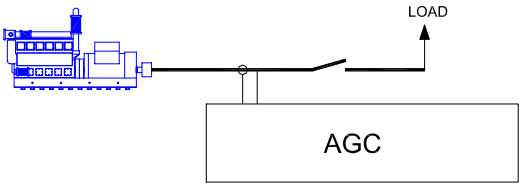
Single line application diagrams

Standard

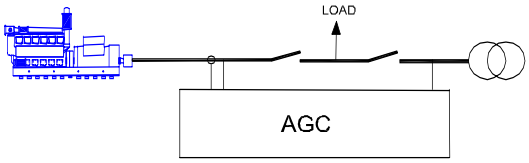
Automatic mains failure **(1)**



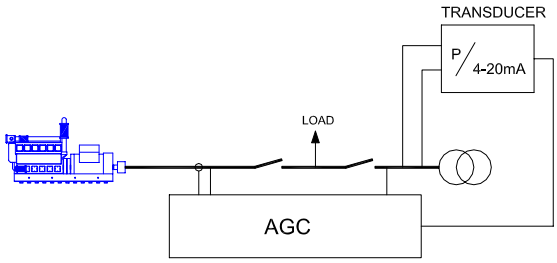
Island operation **(2)**



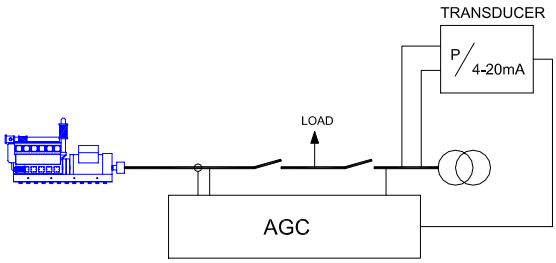
Fixed power/base load **(3)**



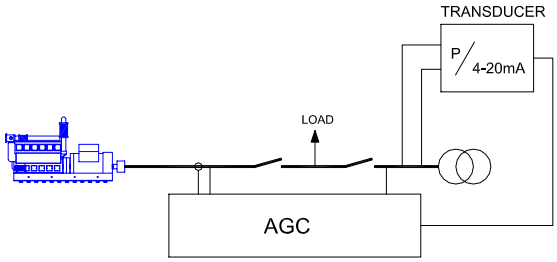
Peak shaving **(4)**



Load take over **(5)**

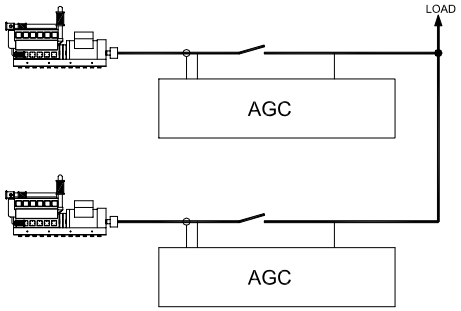


Mains power export **(6)**



Optional

Multiple gen-sets, load sharing **(7)**



Power management **(8-9)**

See separate page in this data sheet

Power management (option G5)

Description
The AGC can be equipped with a power management option (G5). Using this possibility the AGC will be able to handle applications with up to 16 gen-sets.

The basic functions are:

- Multi-master system
- Control of up to 16 gen-sets
- Load dependent operation
- Priority selection
- Ground relay control
- Tie breaker control (selectable)
- Mains breaker control

In a multi-master system the power management control is automatically performed by the available gen-set AGCs. This means that the system is not dependent on one master unit. The communication between the AGC units is CAN bus.

Application
The power management option supports two basic configurations only:

- Island operation
- Parallel to mains

The gen-set modes supported by the power management option are:

- Automatic mains failure
- Island operation
- Fixed power/base load
- Peak shaving
- Load take over
- Mains power export (fixed power to mains)

These are the selectable gen-set modes of the entire plant, and they are adjusted on the *AGC mains* unit. The AGC mains is not necessarily in island operation configuration, since no mains breaker is to be controlled.

Test
The available gen-set modes except island operation include a test mode. The test can be configured to include either:

- gen-set starting and running for a preset time. Generator breaker is open during the test, or
- gen-set starting and synchronisation of the generator breaker. The test is carried out for a preset period of time at a fixed power set point parallel to the mains.

Priority selection
The priority routines in the AGC are based on:

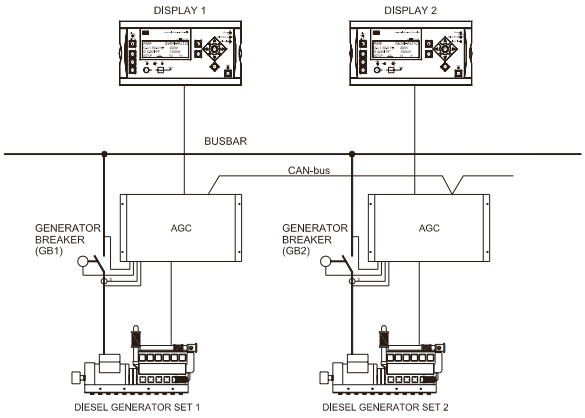
- manual selection
- running hours
- fuel optimising

Load dependent operation
The load dependent starting and stopping of the gen-sets are based on a *power available* calculation. The next generator will start, when the available power decreases below the adjustable set point. It will stop, when too much power is available.

Ground relay
If configurable relays are available in the specific AGC units (option dependent), it is possible to control the star point ground connection of the generators. This is in order to have only one ground connection at a time.

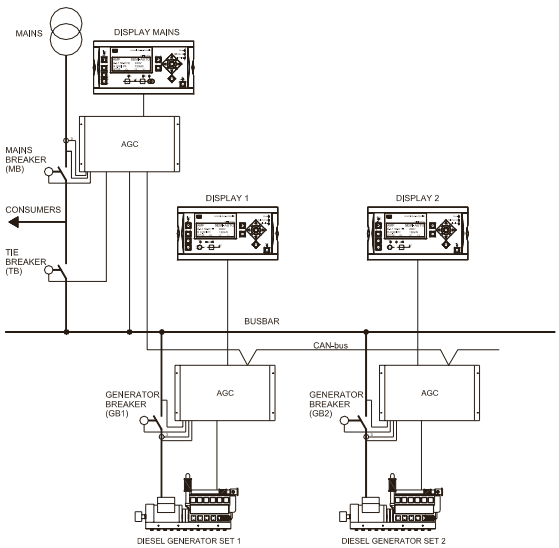
Optional power management applications

Island operation application **(8)**



Parallel with mains application **(9)**

The tie breaker can be selected on the AGC mains depending on applicational needs.



Available options

Please notice that not all options can be selected for the same unit. Please refer to page 8 in this data sheet for further information about the location of the options in the unit.

Option	Description	Type	Note
A	**Loss of mains protection package**		
A1	Over- and undervoltage (generator and busbar/mains) **(27/59)** Over- and underfrequency (generator and busbar/mains) **(81)** Vector jump **(78)** df/dt (ROCOF) **(81)**	Software option	
A2	Over- and undervoltage (generator and busbar/mains) **(27/59)** Over- and underfrequency (generator and busbar/mains) **(81)** df/dt (ROCOF) **(81)**	Software option	
A3	Over- and undervoltage (generator and busbar/mains) **(27/59)** Over- and underfrequency (generator and busbar/mains) **(81)** Vector jump **(78)**	Software option	
A4	Positive sequence (mains voltage low) **(27)**	Software option	
B	**Generator/busbar/mains protection package**		
B1	Over- and undervoltage (generator and busbar/mains) **(27/59)** Over- and underfrequency (generator and busbar/mains) **(81)**	Software option	
C	**Generator add-on protection package**		
C1	Over- and undervoltage (generator) **(27/59)** Over- and underfrequency (generator) **(81)** Overload **(32)** Peak current **(50)** Current unbalance **(46)** Voltage asymmetry **(47)** Reactive power import (excitation loss) **(32)** Reactive power export (overexcitation) **(32)**	Software option	This option is not available for AGC mains
C2	Negative sequence voltage high **(47)** Negative sequence current high **(46)** Zero sequence voltage high **(59)** Zero sequence current high **(50)**	Software option	This option is not available for AGC mains
D	**Voltage/var/PF control**		This option is not available for AGC mains
D1	Selection between: Constant voltage control (stand-alone) Constant reactive power control (parallel with mains) Constant power factor control (parallel with mains) Reactive load sharing (island paralleling with other generators)	Software option	Not with EF2
E	**Analogue controller outputs**		This option is not available for AGC mains
E1	+/-20mA for speed governor +/-20mA for AVR	Hardware option	AVR outputs are available if D1 is selected Refer to page 8 See note 2
EF	**Combination outputs**		
EF2	+/-20mA for speed governor 1 x 0(4)...20mA transducer output	Hardware option	Refer to page 8 See note 2
EF3	1 x PWM (Pulse Width Modulated) output for CAT speed governor 1 x PWM (Pulse Width Modulated) output for droop +/-20mA for speed governor or AVR 2 x relay outputs for speed governor or AVR	Hardware option	Refer to page 8 See note 2
EF4	+/-20mA for speed governor or AVR 2 x relay outputs for speed governor or AVR	Hardware option	Refer to page 8 See note 2
F	**Analogue transducer outputs**		This option is not available for AGC mains
F1	2 transducer outputs, 0...20mA or 4...20mA	Hardware option	Refer to page 8
G	**Load sharing/power management**		
G3	Load sharing with analogue lines	Hardware option	M12 is possible Refer to page 8 This option is not available for AGC mains
G5	Power management, 16 gen-sets	Hardware option	Refer to page 8

H	**Serial communication**		
H2	Modbus RTU	Hardware option	Refer to page 8
H3	Profibus DP	Hardware option	Refer to page 8
H4	CAT CCM	Hardware option	Refer to page 8 This option is not available for AGC mains
H5	**CAN bus (J1939)** MTU Detroit Deutz John Deere Volvo Penta		Refer to page 8 This option is not available for AGC mains
H6	Cummins GCS	Hardware option	Refer to page 8 This option is not available for AGC mains
J	**Cables**		
J1	Display cable with plugs, 3 m. UL94 (V1) approved	Other	
J2	Display cable with plugs, 6 m. UL94 (V1) approved	Other	
J3	PC cable for utility software (RS232). UL94 (V1) approved	Other	
J6	Display cable with plugs, 1 m. UL94 (V1) approved	Other	
K	**Designer's reference handbook (hard copy)**	Other	
L	**Display gasket for IP54**	Other	Standard is IP52
M	**Configurable engine control cards**		
M1	Engine control card with Pt100 sensor inputs 4 x 4…20mA inputs 2 x Pt100 inputs 1 x tacho input (magnetic pick-up) 5 x binary inputs 3 x relay outputs	Hardware option	Refer to page 8 See note 1
M2	Engine control card with VDO sensor inputs 3 x 4…20mA inputs 3 x VDO (resistor) inputs 1 x tacho input (magnetic pick-up) 9 x binary inputs 3 x relay outputs	Hardware option	Refer to page 8 See note 1
M	**Configurable I/O extension cards**		
M12	13 x binary inputs, 4 x relay outputs	Hardware option	G3 is possible Refer to page 8
M13	7 binary inputs, configurable	Hardware option	Refer to page 8
M14	4 relay outputs	Hardware option	Refer to page 8
M15	4 analogue inputs, configurable, 4...20mA	Hardware option	Refer to page 8
N	**Ethernet TCP/IP communication**		
N1	Integrated WebServer with web pages for plant presentation	Hardware option	Option H2 is required Refer to page 8
P	**Printer**		
P1	Event and alarm printer software	Software option	Printer and cable are included in this option
X	**Display**		
X3	Additional operator panel (AOP) 16 configurable LEDs and 8 configurable buttons	Other	
Y	**Display layout**		
Y1	AGC display for island operation (no mains breaker)	Other	

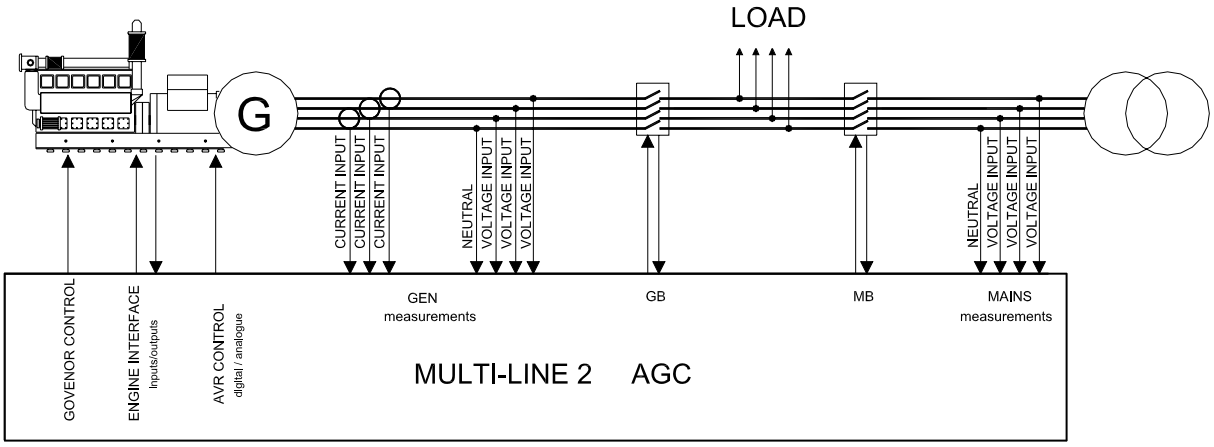
(ANSI# as per IEEE Std C37.2-1996(R2001) in parenthesis).

Option M1/M2 is used for engine control/protection. Option M1 is delivered as standard in the AGC. If option M2 is selected, it will replace option M1.

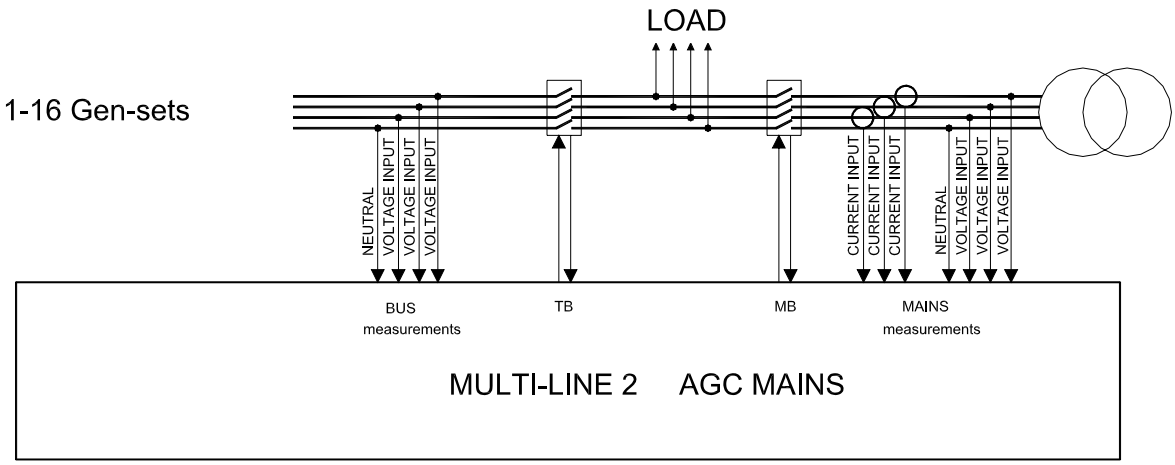
Options E1, EF2, EF3 and EF4 are used for GOV/AVR control. 4 relays are used as standard in the AGC for GOV/AVR control. If selected, these options will replace the 4 relays.

Principle diagrams

AGC



AGC mains



Hardware overview

There can only be one hardware option in each slot. It is e.g. not possible to select option H2 and option H3 at the same time because both options require a PCB in slot #2.

Besides the hardware options shown on this page it is possible to select the software options mentioned on page 5 in this data sheet. Options A, B, C, D and P are software options.

Slot #4, term. 65-72
Governor/AVR outputs

Standard:	4 x relay
Option E1:	2 x +/-20mA out, governor + AVR
Option EF2:	1 x +/-20mA out, governor 1 x 0(4)…20mA out, transducer
Option EF3:	1 x PWM governor out 1 x +/-20mA out, AVR 2 x relay out
Option EF4:	1 x +/-20mA out, AVR 2 x relay out

Ethernet

Option N1:	WebServer

Slot #6, term. 90-97
In-/outputs

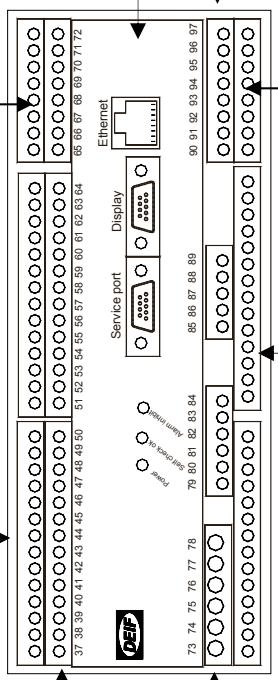
Option F1:	2 x 0(4)…20mA out, transducer
Option EF3:	PWM droop signal
Option M13:	7 x binary inputs
Option M14:	4 x relay outputs
Option M15:	4 x 4…20mA

Slot #8, term. 126-133
Comm./Power man.

Option H4:	Engine RS232 CAT CCM
Option H5:	CAN bus (J1939)
Option H6:	Cummins GCS
Option G5:	Power man.

Slot #2, term. 29-36
Communication

Option H2:	Mod-bus RTU (RS485)
Option H3:	Profi-bus DP (RS485)



Slot #7, term. 98-125
Engine I/F

Option M1: (Standard)	4 x 4…20mA in 2 x Pt100 in 1 x magn. pick-up 5 x binary in 3 x relay out
Option M2:	3 x 4…20mA in 3 x VDO in 1 x magn. pick-up 9 x binary in 3 x relay out

Slot #1, term. 1-28
Power supply (std. board)

12/24V DC supply, 8W
1 x status output relay
5 x relay outputs
2 x pulse outputs (kWh, kvarh)
5 x binary inputs

Slot #3, term. 37-64
In-/outputs/Load sharing

Option M12:	13 x binary inputs 4 x relay outputs
Option G3:	Power load sharing Reactive power load sharing

Slot #5, term. 73-89
AC measuring (std.)

3 x generator voltage
3 x generator current
3 x busbar/mains voltage

Technical specifications

Accuracy: Class 1.0
Class 2.0 for neg. seq. current
(To IEC 688)

Operating temp.: -25…70°C (-13...158° F)

Galvanic separation: Between AC voltage, AC current and other I/Os: 3250V AC, 50Hz, 1 min.
Between analogue outputs: 500V DC, 1 min.

Meas. voltage: 100-690V AC +/-20%

Consumption: Max. 0.25VA/phase

Meas. current: -/1 or -/5A AC

Consumption: Max. 0.3VA/phase

Current overload: 4 x I_n continuously
20 x I_n, 10 sec. (max. 75A)
80 x I_n, 1 sec. (max. 300A)

Meas. frequency: 30…70Hz

Aux. supply: 12/24V DC (8...36V continuously, 6V 1 sec.)
Max. 8W consumption
Recommended power supply is DEIF's DCP-2

Binary inputs: Optocoupler, bi-directional
ON: Input voltage 8…36V DC
Impedance typically 4.7kΩ
OFF: <2V DC

Relay outputs: 250V AC/24V DC, 8A
(Unit status output: 1A)

Analogue inputs: -10…0…+10V DC
Not galvanically separated
Impedance min. 100kΩ
4-20 mA: Impedance max 50Ω, not galvanically separated
PT100: According to EN/IEC 60751 + A2
VDO: Resistor inputs, internal supply max. 480Ω

Mounting: DIN-rail mount or base mount with 6 screws

Climate: Class HSE, to DIN 40040

Load sharing lines: -5…0…+5V DC

Analogue outputs: 0(4)...20mA
Galvanically separated
Active output (internal supply)
Load max. 500Ω

Safety: To EN 61010-1, installation category (overvoltage category) III, 600V, pollution degree 2

Protection: Unit: IP20
Display: IP52 (IP54 with gasket: Option L)
To IEC 529 and EN 60529

EMC/CE: To EN 50081-1/2, EN 50082-1/2 SS4631503 (PL4) and IEC 255-3

Material: All plastic materials are self-extinguishing according to UL94 (V1)

Plug connections: AC current: 4.0 mm^2 multi stranded
Other: 2.5 mm^2 multi stranded
Display: 9-pole Sub-D female
PC: 9-pole Sub-D male

Protection: Unit: IP20
Display: IP52 (IP54 with gasket: Option L)
To IEC 529 and EN 60529

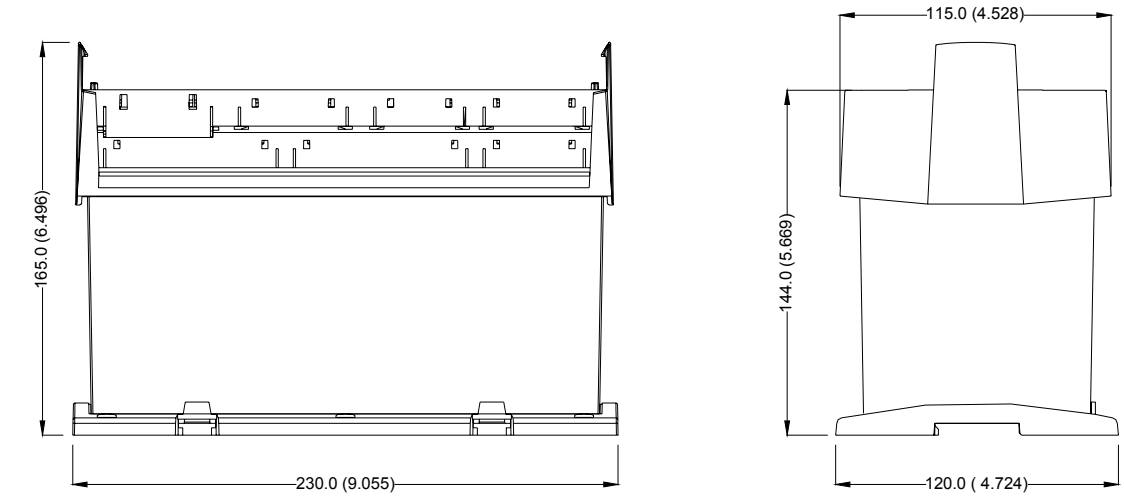
Governors: multi-line 2 interfaces to all governors, including GAC, Barber-Colman, Woodward and Cummins.
See interfacing guide at www.deif.com

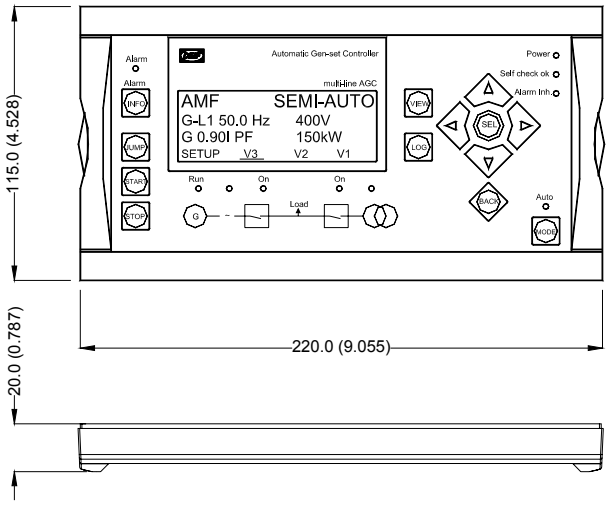
Open collector outputs: Supply 8…36V DC, max. 10mA

Weight: Main unit: 1.6 kg (3.5 lbs.)
Option J1/J3: 0.2 kg (0.4 lbs.)
Option J2: 0.4 kg (0.9 lbs.)

Approval: UL 508

Unit dimensions in mm (inches)





Panel cutout:

H x W = 10 (0.393”) x 30 (1.181”)

Display size:

H x W = 115 (4.528”) x 220 (8.661”)

Order specifications

AGC – □ – □ – □

Option
Option
Option

Example: AGC - C1- E1 - H2

AGC mains – G5 – □ – □

Option
Option
Option

Example: AGC mains - A2 - F1 - G5 - H2
As the AGC mains unit is only usable with option G5, this option is already included when ordered.

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

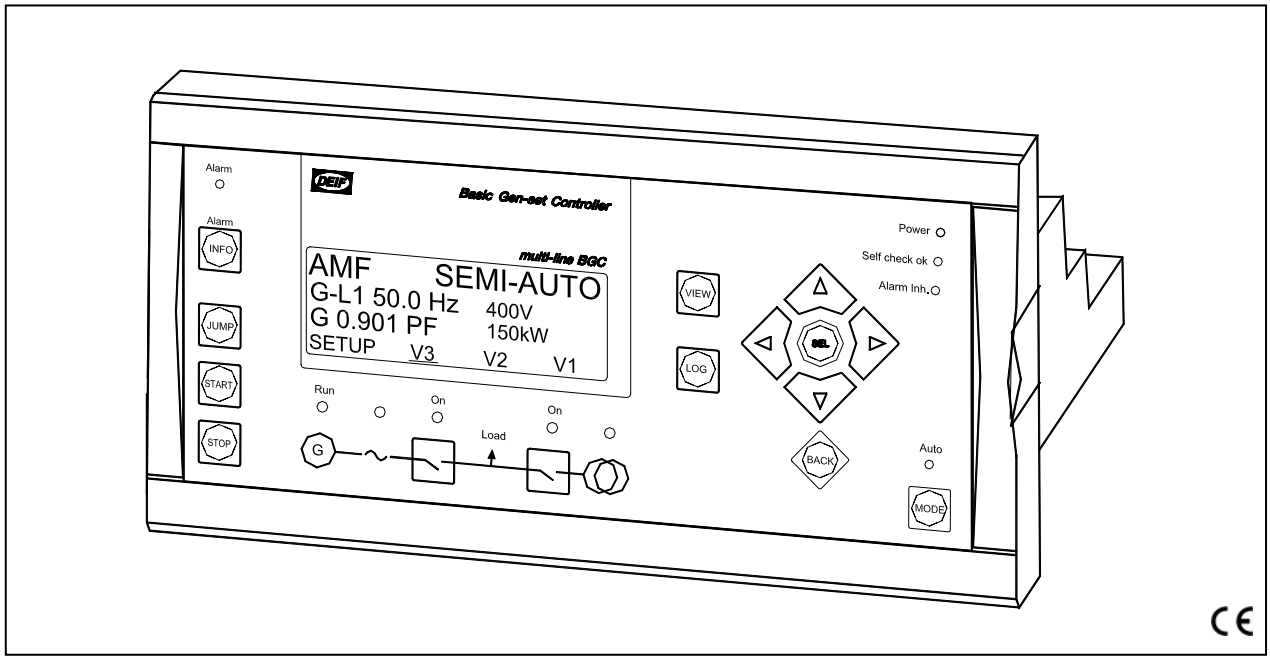
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

Data sheet

Basic Gen-set Controller

multi-line 2

4921240273D



Standard functions

Automatic mains failure

- Engine start up
- From mains to generator supply at a mains failure
- From generator to mains supply at mains return

Island operation

- Semi-automatic control of the gen-set
- Semi-automatic control of the breakers

Time dependent start/stop

- Automatic gen-set and breaker control
- 8 different start/stop commands

Engine control

- Start preparation
- Start/stop sequences
- Fuel solenoid selection (coil type)

Protection (ANSI)

- Overcurrent, 2 levels (51)
- Reverse power (32)
- 3 configurable VDO inputs
- 5 configurable binary inputs

Generator and mains breaker

- Contactor (constant signal)
- Circuit breaker (400 ms pulse)

© DEIF A/S

Application

The Basic Gen-set Controller is a micro-processor based control unit containing all necessary functions for protection of a gen-set and control of mains and generator breaker. It contains all necessary 3-phase measuring circuits and all values and alarms are presented on the LCD display.

The BGC is a compact all-in-one unit designed for the following applications:

1. Automatic mains failure (no back sync.)
2. Island operation

Optional applications:

3. Multiple gen-sets, load sharing
4. Peak shaving
5. Fixed power to mains
6. Automatic mains failure (back sync.)

The BGC automatically carries out a cyclical self-test at start-up. If any errors are found, they will be displayed in clear text in the display.

The generator and mains breaker types can be configured to be either a circuit breaker or a contactor. Speed governor control and automatic voltage regulation are optional functions.

Setup

Setup is easily done via a menu structure in the display (password protected, 3 levels) or via the RJ45/RS232 PC connection and the multi-line 2 Windows® based PC utility software. The PC interface box needed for this operation is optional equipment for the BGC. The utility software offers additional features such as monitoring of all relevant information during commissioning, saving and downloading of settings and downloading of software updates.

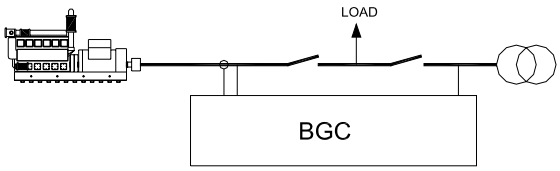
Options

In order to perfectly match the product solution to specific applications, the functionality of the BGC can be equipped with a number of available options. The options selected by the customer will be integrated in the standard BGC hereby securing the same user interface unaffected by whether the application needs a highly complex or a more basic gen-set controller.

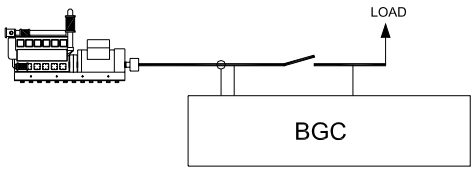
Single line application diagrams

Standard

Automatic mains failure (no back sync.) **(1)**

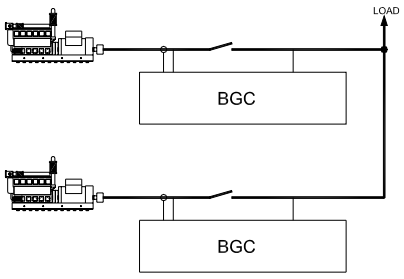


Island operation **(2)**

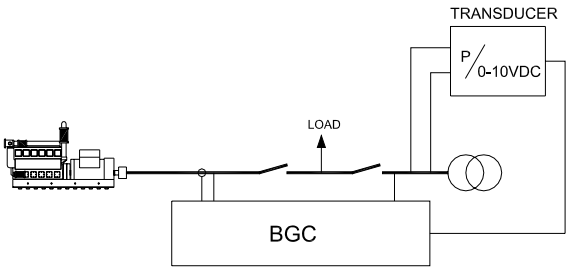


Optional

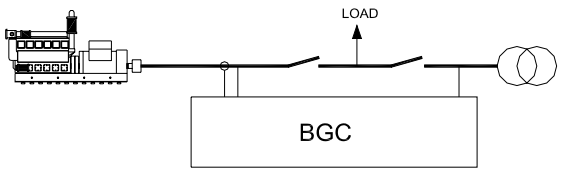
Multiple gen-sets, load sharing **(3)**



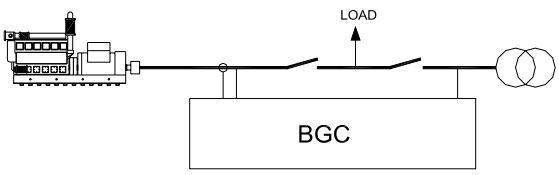
Peak shaving **(4)**



Fixed power to mains **(5)**



Automatic mains failure (back sync.) **(6)**



Available options

Due to the fact that the BGC is limited to two option slots, there is an upper limit of two hardware options per unit (except G2 + G3). Please visit *www.deif.com* or contact us directly for detailed information about available options.

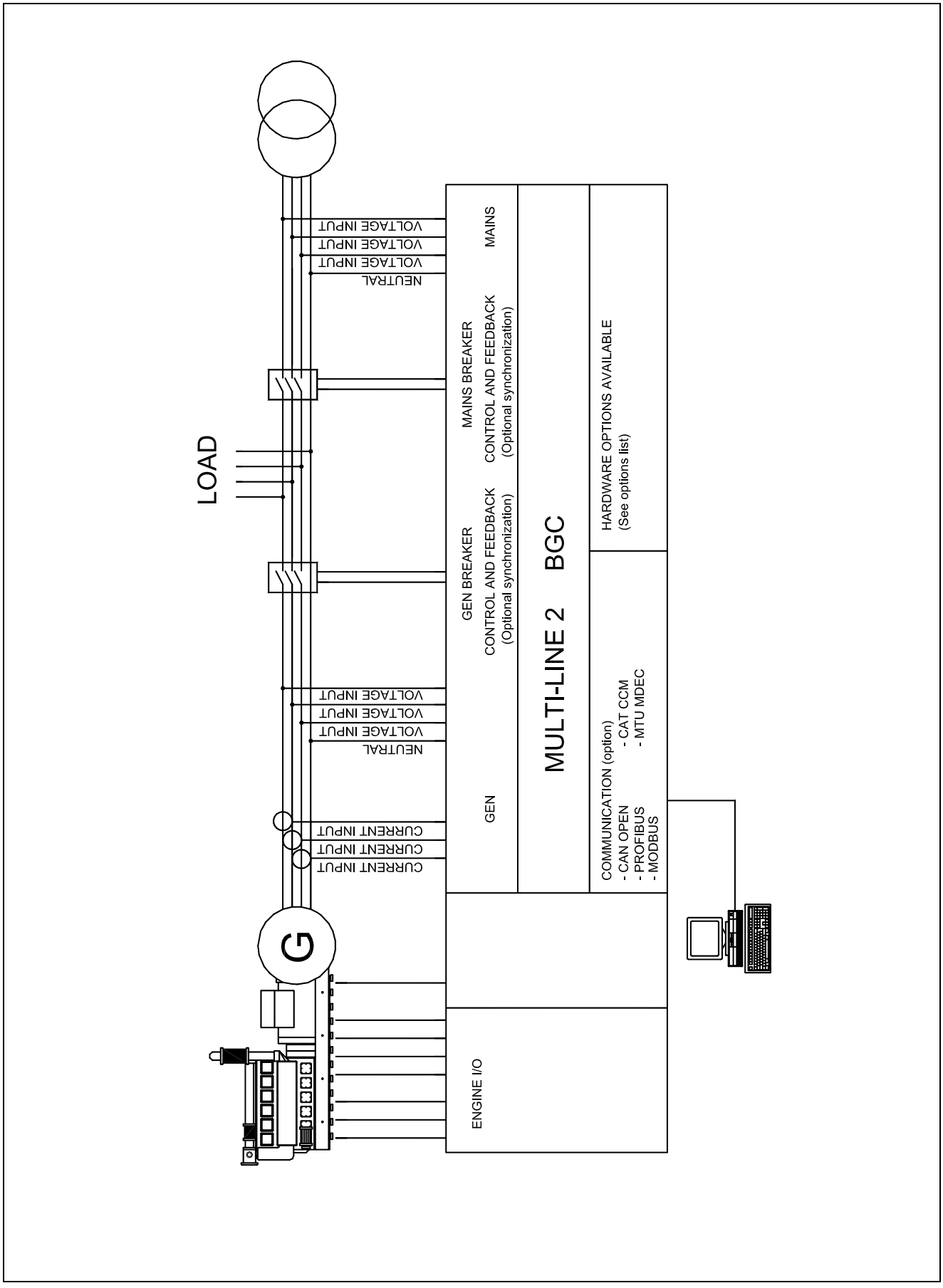
Option	Description	Type	Note
A	**Loss of mains protection package**		
A1	over- and undervoltage (generator and busbar/mains) **(27/59)** over- and underfrequency (generator and busbar/mains) **(81)** vector jump **(78)** df/dt (ROCOF) **(81)**	Software option	
A2	over- and undervoltage (generator and busbar/mains) **(27/59)** over- and underfrequency (generator and busbar/mains) **(81)** df/dt (ROCOF) **(81)**	Software option	
A3	over- and undervoltage (generator and busbar/mains) **(27/59)** over- and underfrequency (generator and busbar/mains) **(81)** vector jump **(78)**	Software option	
B	**Generator/busbar/mains protection package**		
B1	over- and undervoltage (generator and busbar/mains) (**27/59**) over- and underfrequency (generator and busbar/mains) (**81**)	Software option	
C	**Generator add-on protection package**		
C1	over- and undervoltage (generator) (**27/59**) over- and underfrequency (generator) (**81**) overload (**32**) peak current current unbalance voltage asymmetry reactive power import (excitation loss) reactive power export (overexcitation)	Software option	
D	**Voltage/var/PF control**		
D1	Selection between: constant voltage control (stand-alone) constant reactive power control (parallel with mains) constant power factor control (parallel with mains) reactive load sharing (island paralleling with other generators)	Software option	Selection between: D1A: Analogue control D1R: Relay control Requires option M14
D2	constant voltage (stand-alone/sync.)	Software option	
F	**Analogue transducer outputs**		
F1	2 transducer outputs, 0...20mA or 4...20mA	Hardware option	
F2	4 transducer outputs, 0...20mA or 4...20mA	Hardware option	Two boards – no other hardware option available
G	**Control functions**		
G1	2 load dependent relays	Hardware option	Requires option M14
G2	synchronising with analogue lines	Hardware option	Two other hardware options available
G3	load sharing and synchronising	Hardware option	Two other hardware options available
H	**Serial communication**		
H1	Can-open	Hardware option	
H2	Modbus RTU	Hardware option	
H3	Profibus DP	Hardware option	
H4	CAT CCM	Hardware option	
H5	Can-bus engine communication for: MTU MDEC Detroit Diesel DDEC Deutz EMR John Deere JDEC Volvo Penta D12 AUX	Hardware option	
H6	Cummins ECM (RS485) engine communication	Hardware option	
J	**Cables**		
J5	BGC converter box kit	Other	
K1	**Designer's reference handbook (hard copy)**	Other	

Available options (continued from page 3)

Option	Description	Type	Note
M	**Configurable I/O extension cards**		
M13	7 binary inputs, configurable	Hardware option	
M14	4 relay outputs	Hardware option	
M15	4 analogue inputs, configurable, 4...20mA	Hardware option	
Y	**Display layout**		
Y1	BGC display for island operation (no mains breaker)	Hardware option	

(ANSI# as per IEEE Std C37.2-1996(R2001) in parenthesis).

Principle diagram



Technical specifications

Accuracy: Class 1.0, to IEC 688

Operating temp.: -25…70°C

Galvanic separation: Between AC voltage, AC current and other I/Os: 3250V AC, 50Hz, 1 min.
Between analogue outputs: 500V DC, 1 min.

Meas. voltage: Max. 480V phase to phase

Consumption: Max. 0.15VA/phase

Meas. current: -/1 or -/5A AC

Consumption: Max. 0.3VA/phase

Current overload: 4 x I_n continuously
20 x I_n, 10 sec. (max. 75A)
80 x I_n, 1 sec. (max. 300A)

Meas. frequency: 30…70Hz

Aux. supply: 12/24V DC, -25/+30%
Max. 8W consumption

Binary inputs: Bi-directional optocoupler
Input voltage 12…32V DC
Impedance max. 4.7kΩ

Relay outputs: 250V AC / 8A or
24V DC / 2A

Analogue inputs: -10…0…+10V DC
Not galvanically separated
Impedance max. 100kΩ

Mounting: Panel mounted

Climate: Class HSE, to DIN 40040

Load sharing lines: -5…0…+5V DC

Analogue outputs: 0(4)...20mA
Galvanically separated
Active output (internal supply)
Load max. 500Ω

Safety: To EN 61010-1, installation category (overvoltage category) III, 600V, pollution degree 2

Protection: Unit: IP20

EMC/CE: To EN 61000-6-1/2 SS4631503 (PL4) and IEC 255-3

VDO inputs: Resistor inputs, internal supply

Material: All plastic materials are self-extinguishing according to UL94 (V1)

Plug connections: AC current:
4 mm^2 multi stranded
Other:
2.5 mm^2 multi stranded

PC: RS232 converter box
(option J5)

Display: IP52 (IP54 with gasket: Option L)
To IEC 529 and EN 60529

Approval: UL 508 (listing pending)

Weight: Approx. 1 kg (2.2 lbs)

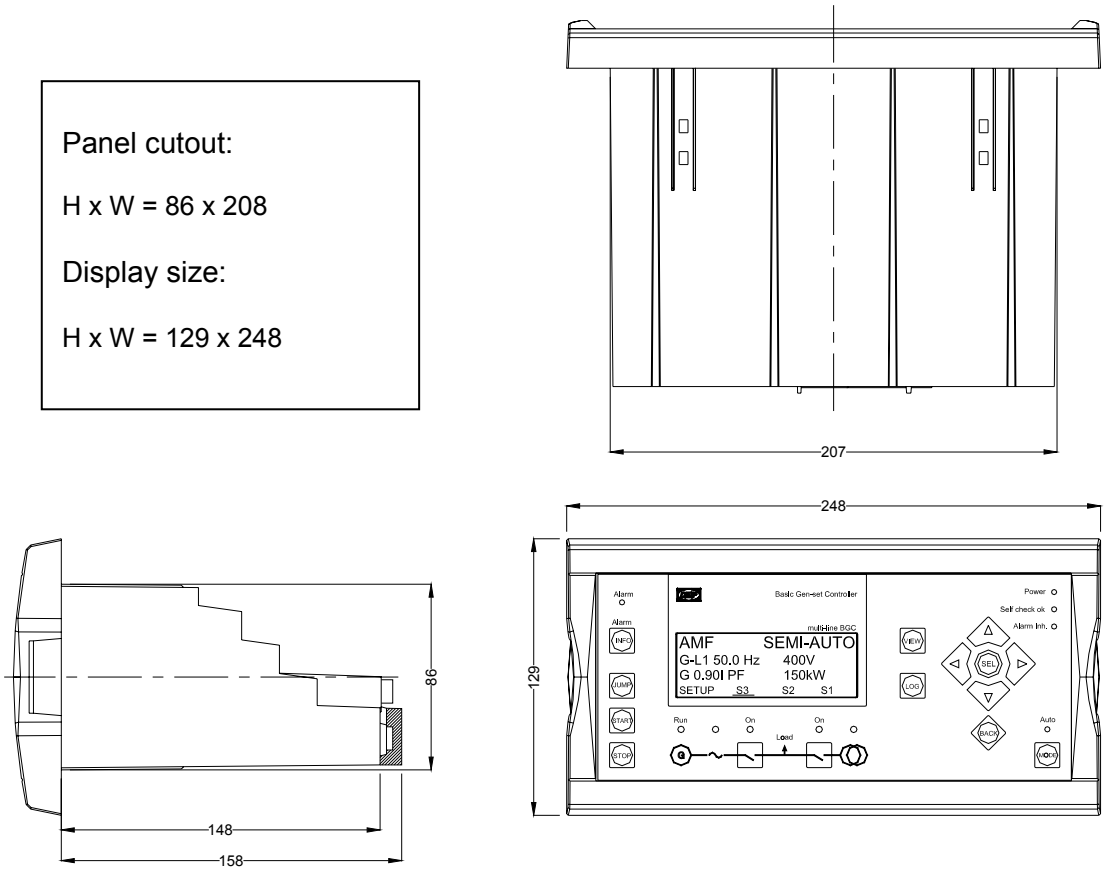
Unit dimensions (mm)

Panel cutout:

H x W = 86 x 208

Display size:

H x W = 129 x 248



Order specifications

BGC – □ – □ – □ – □ – □

1 (100-110V AC)

2 (380-480V AC)

Options

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

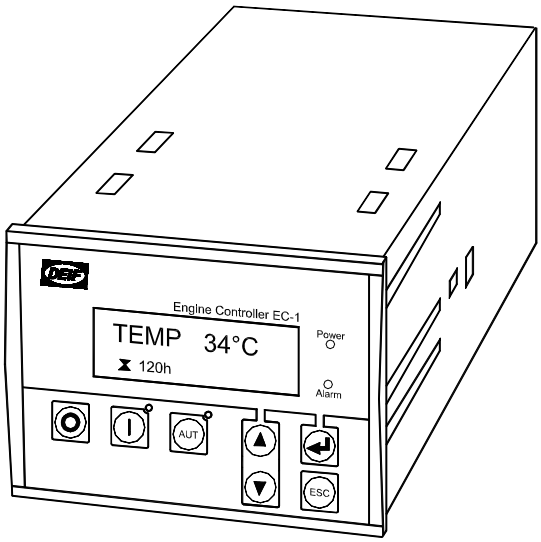
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

Data sheet

Engine Controller EC-1

4921240292B



CE

Standard functions

Engine control

- Start preparation (preheater or prelubrication)
- Start/stop sequences with selectable no. of start attempts
- Fuel solenoid selection (coil type)
- Idle speed control
- Local or remote start/stop
- Stop sequence with cool down
- Running speed detection selectable
    - Charger alternator input (W terminal) (option)
    - Binary input

Applications

- Automatic engine start/stop
- Engine protection

Engine monitoring

- 3 configurable inputs (option)
    - VDO or
    - 4-20mA from active transducer or
    - Binary with cable supervision
- 6 binary inputs, configurable
- RPM input, selectable (option)
    - Magnetic pick-up
    - NPN or PNP pick-up
    - Tacho generator
    - Charger alternator W terminal

Clear text display

- 122 x 32 pixel back-light STN
- Graphic symbol messaging
- Clear text alarm messages
- Clear text diagnostics for both hardwired inputs and CAN bus messages (J1939)
- Log book holding 30 log entries

© DEIF A/S

Application

The Engine Controller EC-1 is a micro-processor based control unit containing all necessary functions for protection and control of a diesel engine. Furthermore, it contains a single-phase AC voltage measuring circuit. The unit is equipped with an LCD display presenting all values and alarms. EC-1 is a compact all-in-one unit designed for the following applications:

1. Automatic engine start/stop
2. Engine protection

Optional applications:

3. Generator voltage and frequency supervision

EC-1 automatically carries out a cyclical self test. If any errors are found, then the status relay output will deactivate (normally closed). In order to save battery power, the display can be set to switch off automatically after a given period of time. The display will turn on again, if events or alarms take place, or if one of the push-buttons is activated.

Setup

Setup is easily done via a PC Windows® based utility software (password protected) using the RJ45/RS232 PC connection. The PC interface box RJ45/RS232 needed for this operation is optional equipment for EC-1. The PC utility software offers additional features such as monitoring of all relevant information during commissioning, saving and downloading of settings and downloading of software updates. Furthermore, the most often used settings can be accessed via the display push-buttons (password protected).

Options

In order to perfectly match EC-1 to specific applications, the unit can be equipped with a number of available options. The options selected by the customer will be integrated in the standard EC-1 hereby securing the same user interface unaffected by whether the application needs a basic or a more complex engine controller.

Terminals

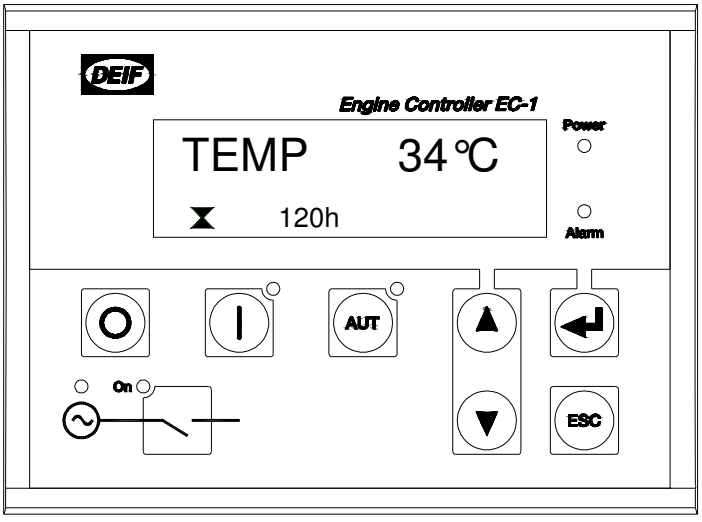
Terminal	Technical data	Description
10…11	Status out. Contact ratings 1 A 30V DC/V AC	General status output for marine approvals
12	Common	Common for term. 13…18
13	Digital input	Start enable/configurable
14	Digital input	Remote start/configurable
15	Digital input	Charge alternator D+ (running)/configurable
16	Digital input	Overspeed/configurable
17	Digital input	Coolant temperature/configurable
18	Digital input	Oil pressure/configurable
23	Common	Common for term. 24, 25 and 32 and emergency stop*
24	Relay output 1. Contact ratings 2 A 30V DC/V AC	Horn. Function NO
25	Relay output 2. Contact ratings 2 A 30V DC/V AC	Alarm/configurable. Function NO
26	Power supply –	GND
27	Power supply +	5…36V DC
28…31	Not used	Note 23 and 31 is internally connected
32	Relay output 3. Contact ratings 2 A 30V DC/V AC	Start prepare/configurable. Function NO
33-34	Relay output 4. Contact ratings 8 A 30V DC/V AC	Run coil/stop coil/configurable. Function NO
35-36	Relay output 5. Contact ratings 8 A 30V DC/V AC	Starter (crank)/configurable. Function NO
Optional configurable inputs (option M17)		
4	Common	Common for term. 5…7
5	VDO1/4...20mA/binary input	Fuel level/configurable
6	VDO2/4...20mA/binary input	Oil pressure/configurable
7	VDO3/4...20mA/binary input	Water temp./configurable
Optional CAN bus #1 engine interface (option H5)		
1	Can-GND	CAN J1939 engine communication
2	Can-L	
3	Can-H	
Optional tacho RPM input (option M17)		
8	Tacho-GND	Magnetic pick-up. PNP or NPN/tacho generator/charge alternator W terminal
9	Tacho input	
Optional single-phase generator voltage input (option B2)		
19	L2 or N	Generator voltage and frequency
20	Not used	
21	L1	
22	Not used	

Available options

Option	Description	Type	Note
B	**Generator protection**		
B2	Single-phase (L-L or L-N), 50 – 550V AC, 50/60Hz - Single-phase over- and undervoltage **(27/59)** - Single-phase over- and underfrequency **(81)**	Software option	
G	**Control functions**		
G6	Generator breaker control. See the display front layout below	Hardware option	Requires B2
H	**Communication**		
H1	CAN open communication	Hardware option	
H5	CAN bus J1939 - Detroit Diesel DDEC - John Deere JDEC - Deutz EMR - Volvo Penta D12 AUX - Scania EMS	Hardware option	
J	**Cables**		
J5	PI-1 converter box kit (for PC connection)	Hardware option	
K	**Installation Instructions and Reference Handbook**		
K1	Installation Instructions and Reference Handbook (hard copy)	Other	
K2	Installation Instructions and Reference Handbook (CD-rom)	Other	
L	**Gasket for IP 54**	Hardware option	
M	**Input options**		
M17	3 configurable VDO, 4…20mA, binary inputs Tacho input (magnetic pick-up, NPN, PNP pick-up, charge generator W input)	Hardware option	

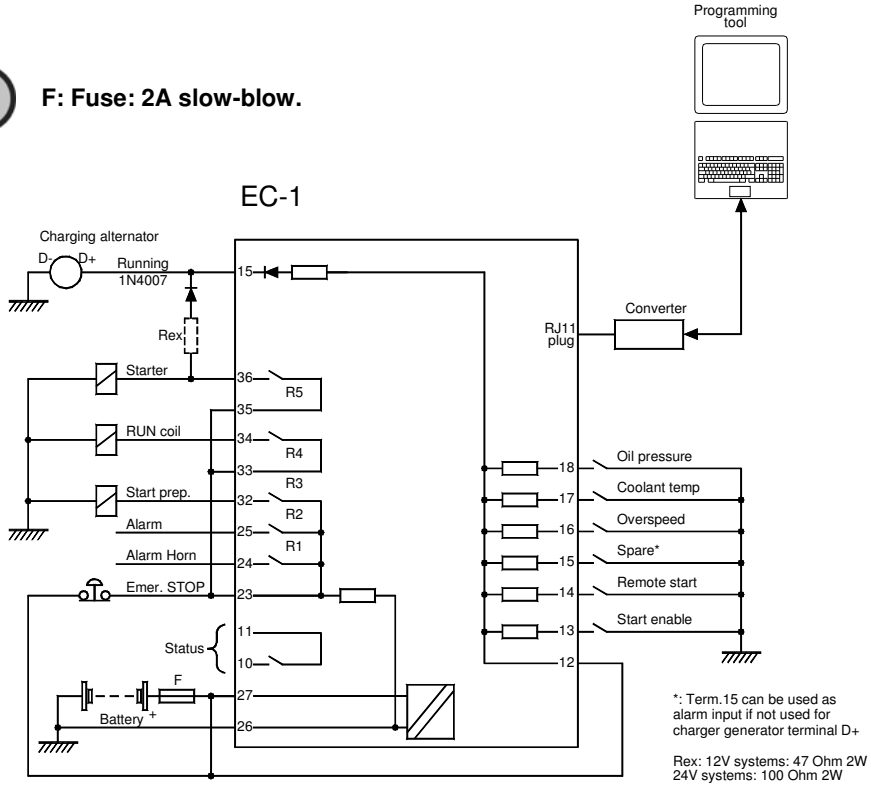
(ANSI# as per IEEE Std C37.2-1996(R2001) in parenthesis).

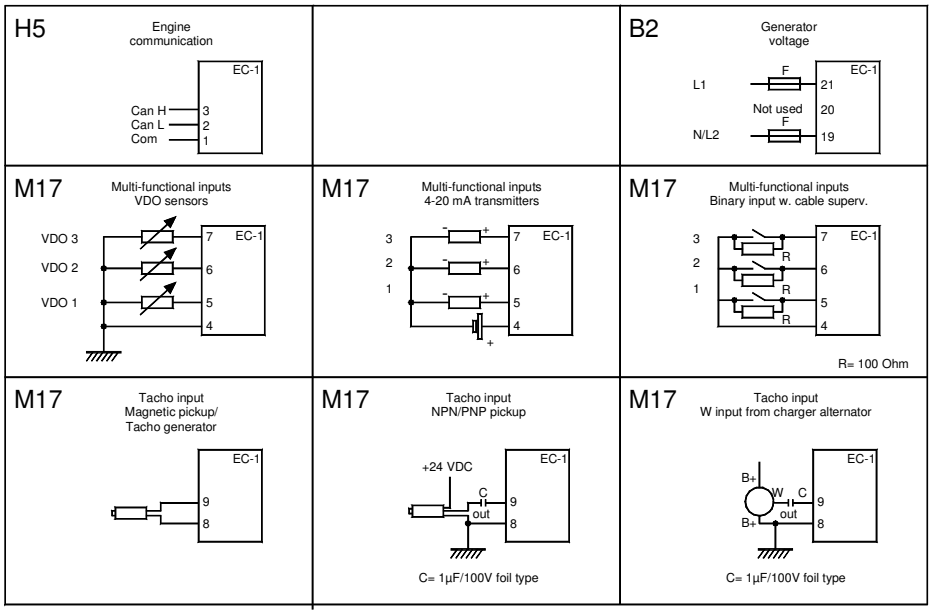
Option G6 display layout



Wiring

F: Fuse: 2A slow-blow.





Technical specifications

Accuracy: Class 2.0 to EN 60688/IEC 688

Operating temp.: -25…70°C

Storage temp.: -40…70°C

Measuring input voltage:

50…550V AC phase to phase

Load: 1.5MΩ

Frequency: 30…70Hz

Pick-up input voltage:

0.5…70V peak
Frequency: 10-10000Hz

Aux. supply: 4-36V DC continuously
Max. 8W consumption

Passive binary in voltage:

Bi-directional optocoupler
8…36V DC

Impedance: 4.7kΩ

VDO inputs: Resistor inputs, internal 4V supply

Analogue input: From active transducer

Current: 4…20mA

Impedance: 50Ω

Active binary in internal voltage:

Dry contact inputs (note 1)
4V DC supply, with cable supervision

Impedance: 240Ω ~ 16mA

Relay outputs:

3 relays: 30V DC/AC 2A
2 relays: 30V DC/AC 8A
1 status relay: 24V DC 1A

Mounting: Panel mounted

Size: 78 x 106 mm

Climate: Class HSE, to DIN 40040

Display: 122 x 32 pixel back-light STN

Safety: To EN 61010-1, installation category (overvoltage category) III, 600V, pollution degree 2

Protection: Front: IP 52 (IP 54 with gasket, option L)
Terminals: IP20
To IEC 529 and EN 60529

EMC/CE: To EN 61000-6-1/2
SS4631503 (PL4)
and IEC 255-3

Material: All plastic materials are self-extinguishing according to UL94 (V1)

Plug connections: AC voltage inputs:
3.5 mm^2 multi stranded
Other:
1.5 mm^2 multi stranded

PC connection: RS232 converter box (option J5)

Approval: CE & C-UL (listing pending)

Weight: Approx. 0.7 kg (1.5 lbs)

Only 3 inputs are available.

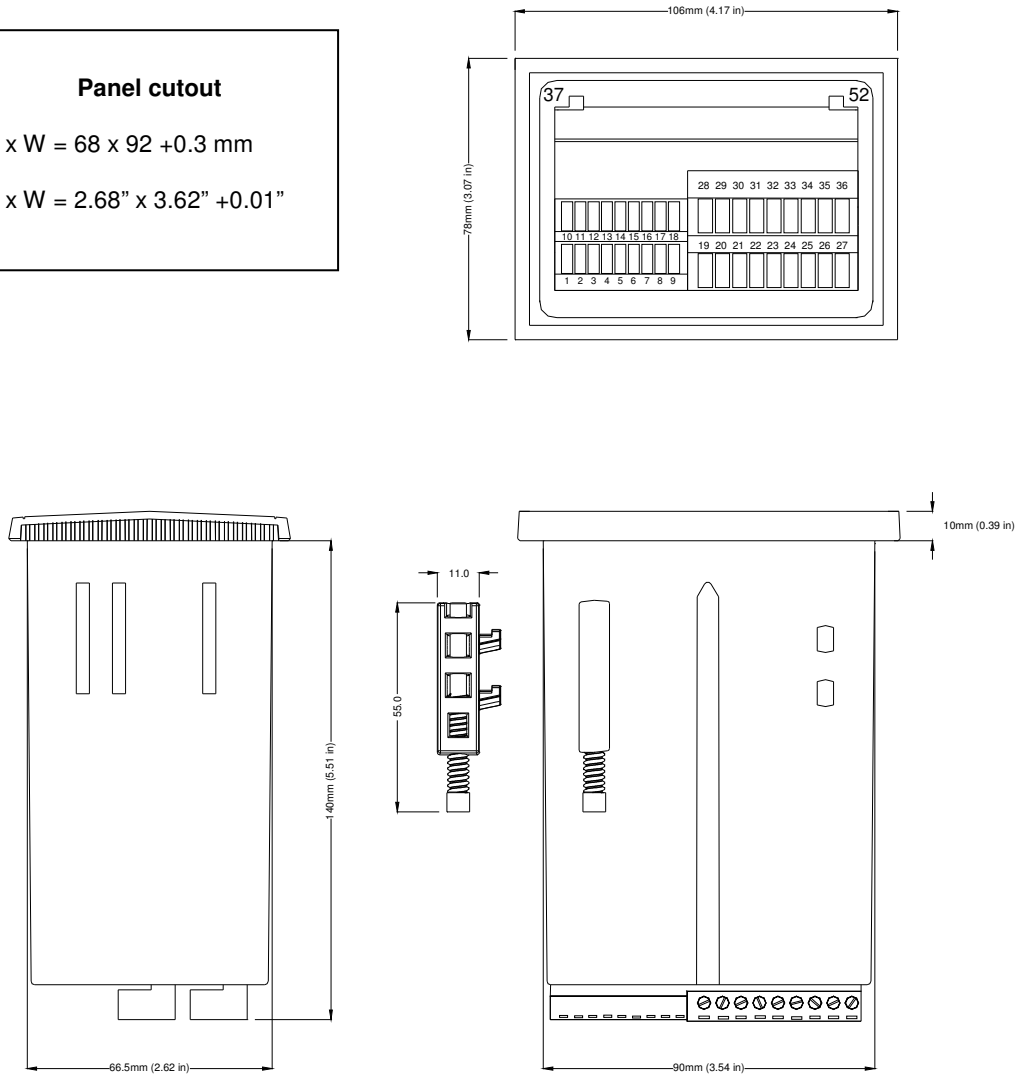
It is possible to combine VDO inputs with binary and 4…20mA inputs in a mix.

Unit dimensions

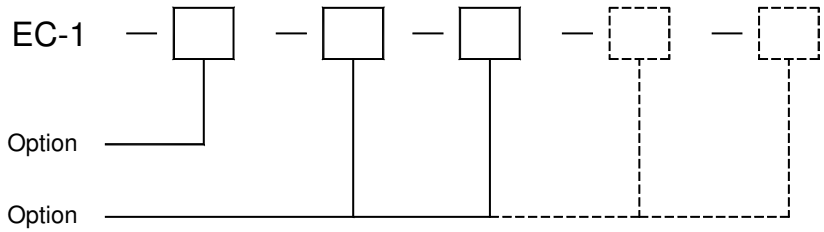
Panel cutout

H x W = 68 x 92 +0.3 mm

H x W = 2.68” x 3.62” +0.01”



Order specifications



Due to our continuous development we reserve the right to supply equipment which may vary from the described.

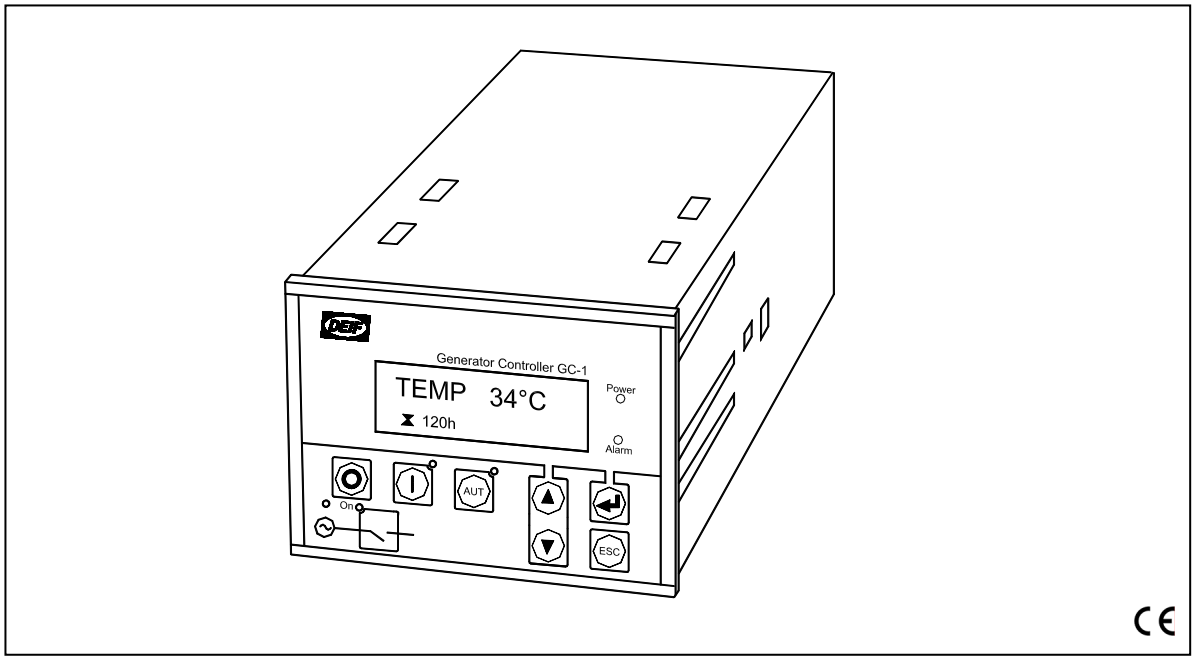
***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

Data sheet

Generator Controller GC-1

4921240293B



Standard functions

Engine control

- Start preparation (preheater or prelubrication)
- Start/stop sequences with selectable no. of start attempts
- Fuel solenoid selection (coil type)
- Idle speed control
- Local or remote start/stop
- Stop sequence with cooldown
- Running speed detection selectable
  - Charger alternator input (W terminal) or tacho generator
  - Binary input (D+)
  - Oil pressure based run detection

Generator monitoring

- 3 or 1-phase generator monitoring
  - Voltage/current/frequency/ power/reactive power

Generator protection (ANSI)

- Over-/undervoltage (27/59)
- Over-/underfrequency (81)
- Overcurrent (51)
- Reverse power (32)

Engine monitoring

- 3 configurable inputs
  - VDO or
  - 4-20mA from active transducer or
  - Binary with cable supervision
- 6 binary inputs, configurable
- RPM input, selectable
  - Magnetic pickup
  - NPN or PNP pickup
  - Tacho generator
  - Charger alternator W terminal

Clear text display

- 122 x 32 pixel backlight STN
- Graphic symbol messaging
- Clear text alarm messages
- Clear text diagnostics for both hardwired inputs and CAN bus messages (J1939)
- Log book holding 30 log entries
- Real time clock for time and date

DEIF A/S

© DEIF A/S

Application

The Generator Controller GC-1 is a micro-processor based control unit containing all necessary functions for protection and control of a diesel engine. Furthermore, it contains a three-phase AC voltage measuring circuit. The unit is equipped with an LCD display presenting all values and alarms. GC-1 is a compact all-in-one unit designed for the following applications:

1. Automatic engine start/stop
2. Engine protection
3. Breaker control
4. Generator protection

Optional applications:

5. Automatic Mains Failure
6. CAN bus J1939 engine communication

GC-1 automatically carries out a cyclical self test. If any errors are found, then the status relay output will deactivate (normally closed). In order to save battery power, the display can be set to switch off automatically after a given period of time.

The display will turn on again, if events or alarms take place, or if one of the push-buttons is activated.

Setup

Setup is easily done via a PC Windows® based utility software (password protected) using the RJ11/RS232 PC connection. The PC interface box RJ11/RS232 needed for this operation is optional equipment for GC-1. The PC utility software offers additional features such as monitoring of all relevant information during commissioning, saving and downloading of settings and downloading of software updates. Furthermore, the most frequently used settings can be accessed via the display push-buttons (password protected).

Options

The options selected by the customer will be integrated in the standard GC-1 hereby securing the same user interface unaffected by whether the application needs a basic or a more complex generator controller.

Terminals

Terminal	Technical data	Description
4	Common for terminals 5-7	
5	VDO1, 4..20mA, dig. inp.	Fuel level/configurable
6	VDO2, 4..20mA, dig. inp.	Oil pressure/configurable
7	VDO3, 4..20mA, dig. inp.	Water temp/configurable
8-9	Tacho input	Magnetic pickup/PNP/NPN/tacho generator/charge alternator W terminal
10-11	Status out, 1 A 30V DC/V AC	General status output for marine approvals
12	Common	Common for term. 13-18
13	Digital input term. 13	Start enable/configurable
14	Digital input term. 14	Remote start/configurable
15	Digital input term. 15	Charge alternator D+ (running)/configurable
16	Digital input term. 16	Overspeed/configurable
17	Digital input term. 17	Coolant temperature/configurable
18	Digital input term. 18	Oil pressure/configurable
23	Common	Common for term. 24, 25 and 32 and emergency stop*
24	NO relay output 1, 2 A 30V DC/V AC	Horn
25	NO relay output 2, 2 A 30V DC/V AC	Alarm/configurable
26	Power supply – (gnd)	
27	Power supply + 8-36V DC	
28-31	Not used	
32	NO relay output 3, 2 A 30V DC/V AC	Start prepare/configurable
33-34	NO relay output 4, 8 A 30V DC/V AC	Run coil/stop coil/configurable
35-36	NO relay output 5, 8 A 30V DC/V AC	Starter (crank)/configurable
37	Generator L3 voltage	Voltage range 50-480V AC Ph-Ph value
38	Generator neutral voltage	
39	Generator L2 voltage	
41	Generator L1 voltage	
49-50	Generator breaker control relay, 2A 30V DC/V AC	
53	I L3 s2	Generator current L3
54	I L3 s1	
55	I L2 s2	Generator current L2
56	I L2 s1	
57	I L1 s2	Generator current L1
58	I L1 s1	

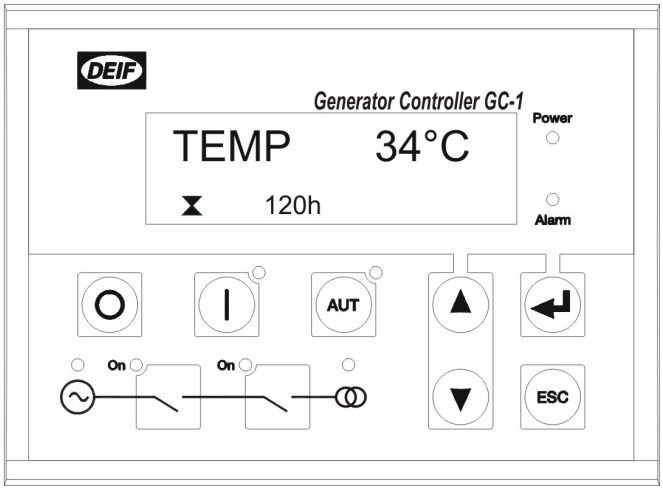
Optional AMF control		
43	Mains L3 voltage	Voltage range 50-480V AC Ph-Ph value
45	Mains L2 voltage	
46	Mains neutral voltage	
47	Mains L1 voltage	
51-52	Mains breaker control relay, 2A 30V DC/V AC	Configurable
Optional CAN bus engine interface		
1	Can-L	Can J1939 engine communication
2	Can-GND	
3	Can-H	

Available options

Option	Description	Type	Note
B	**Generator protection**		
B3	Automatic Mains Failure - Generator and mains breaker control - Change-over (no synchronisation)	Software option	
H	**Communication**		
H5	CAN bus J1939 - Detroit Diesel DDEC - John Deere JDEC - Deutz EMR - Volvo Penta D12 AUX - Scania DEC	Software option	
J	**Cables**		
J5	PI-1 converter box kit (for PC connection)	Hardware option	
K	**Documentation**		
K1	Installation Instructions and Reference Handbook (hard copy)	Other	
K2	CD-ROM with complete documentation	Other	
L	**Gasket for IP54**	Hardware option	

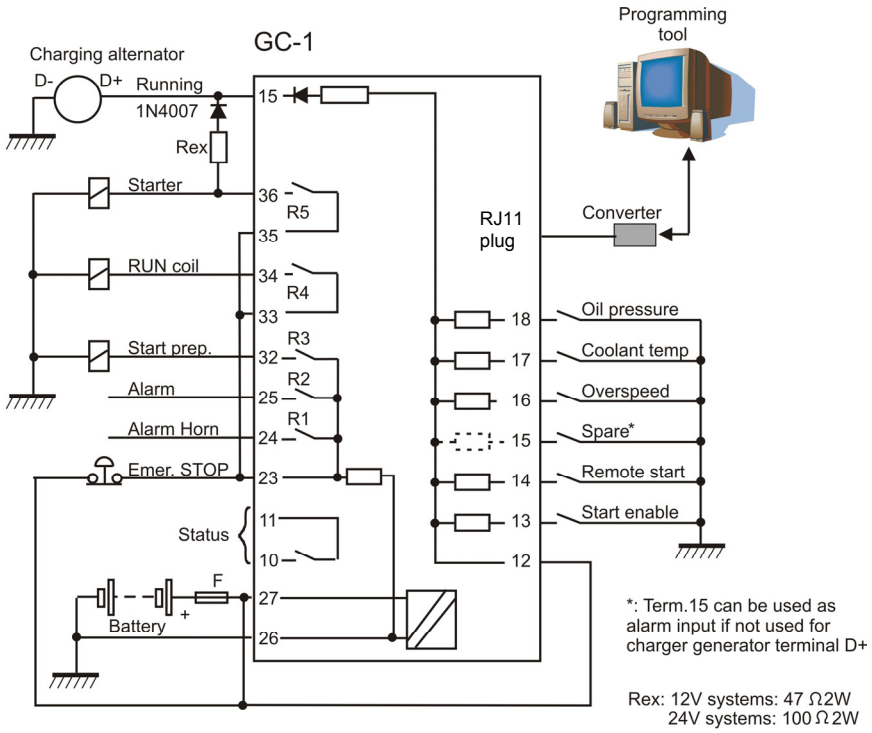
(ANSI# as per IEEE Std C37.2-1996 (R2001) in parenthesis).

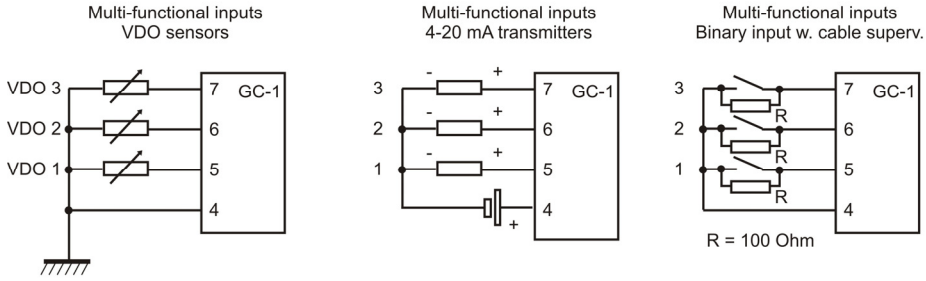
Option B3 display layout

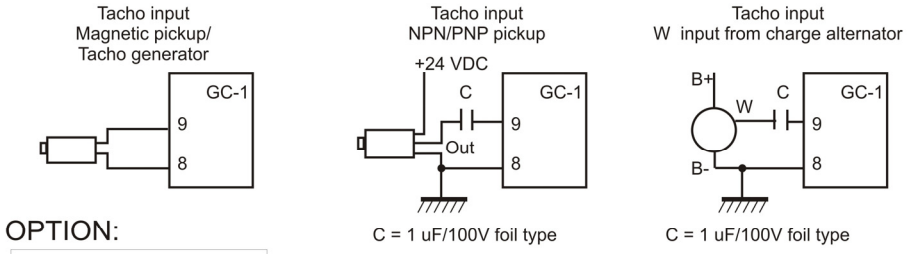


Wiring, engine interface

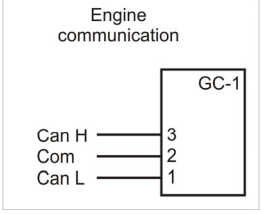
F: Fuse: 2A slow-blow.





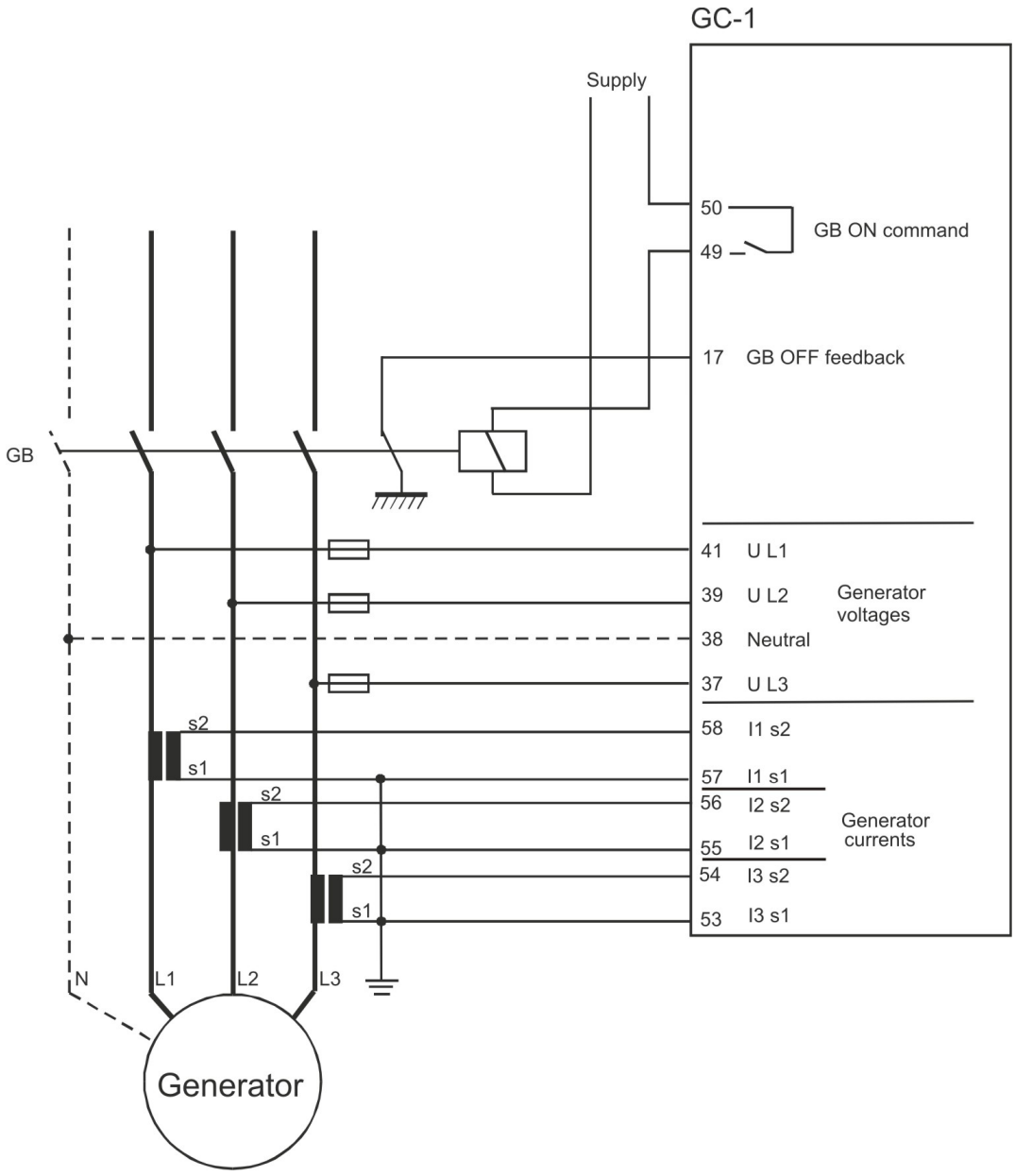


OPTION:



Wiring, AC interface

Connection of the 3-phase voltage and current

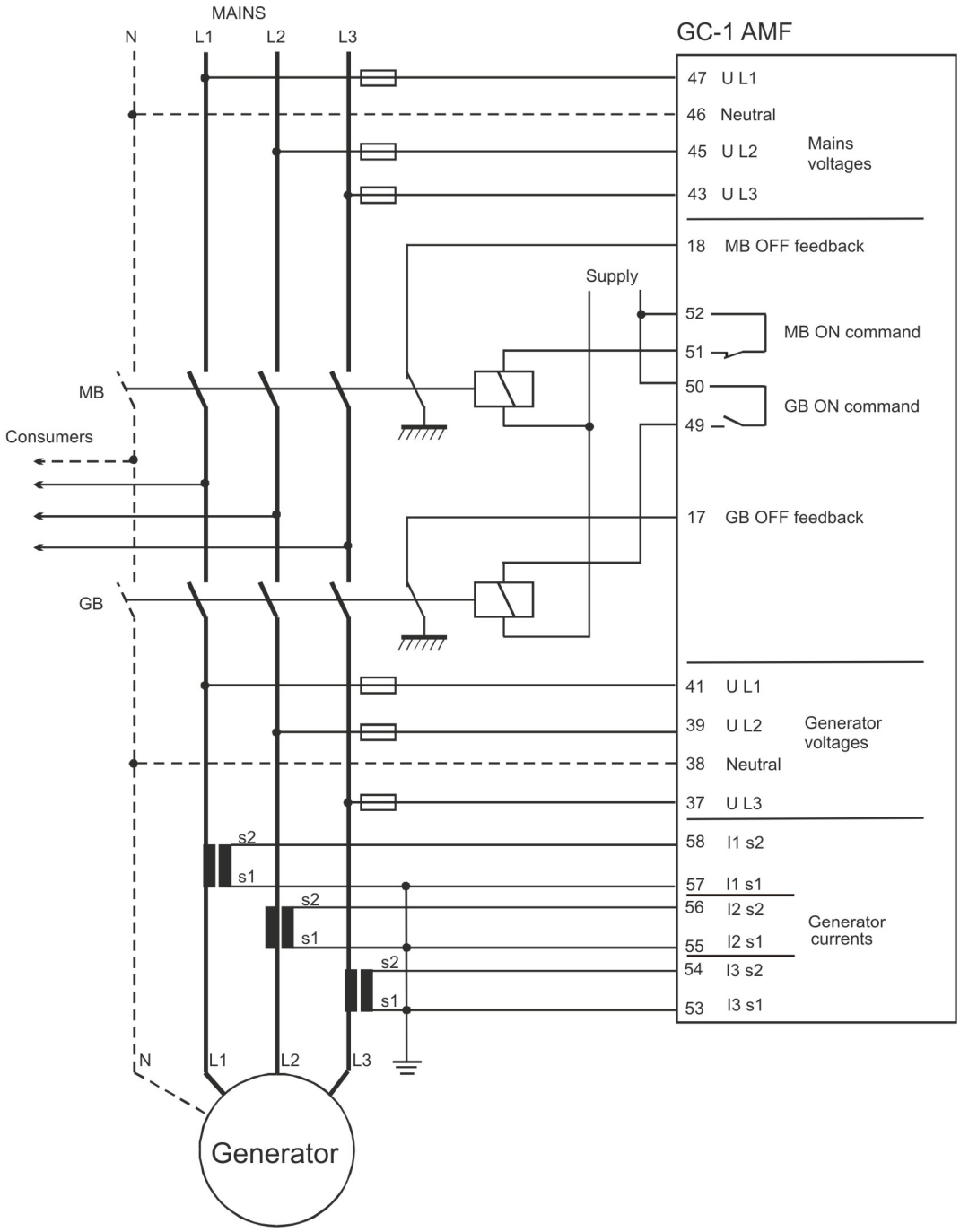


The AC current grounding can be made as required to s1 or s2.

GB: Use a contactor. The ON output from the GC-1 is a constant signal. Remember to use free-wheel diodes across the contactor coils, if DC voltage is used as supply for these.

Fuse for AC voltage: Max. 2A slow-blow.

Wiring, AMF (option B3)



The AC current grounding can be made as required to s1 or s2.

GB and MB: Use contactors. The ON outputs from the GC-1 AMF are constant signals. Remember to use free-wheel diodes across the contactor coils, if DC voltage is used as supply for these.

Fuse for AC voltage: Max. 2A slow-blow.

Technical specifications

Accuracy: Class 2.0 to EN 60688/IEC 688

Operating temp.: -25…70°C (-13…158°F)

Storage temp.: -40…70°C (-40…158°F)

Measuring input voltage:

50…550V AC phase to phase

Load: 1.5MΩ

Frequency: 30…70Hz

Measuring input current:

1 or 5A AC from current transformer

Consumption max.: 0.3 VA/phase

Current overload: 10A continuously, 20A, 5 sec.

Pickup input voltage:

0.5…70V peak

Frequency: 10-10000Hz

Aux. supply: 4-36V DC continuously
Max. 8W consumption

Passive binary in voltage:

Bi-directional optocoupler
8…36V DC

Impedance: 4.7kΩ

VDO inputs: Resistor inputs, internal 4V supply

Analogue input: From active transducer

Current: 4…20mA

Impedance: 50Ω

Active binary in internal voltage:

Dry contact inputs (note 1)
4V DC supply, with cable supervision

Impedance: 240Ω ~ 16mA

Relay outputs:

5 relays: 30V DC/AC 2A
2 relays: 30V DC/AC 8A
1 status relay: 24V DC 1A

Mounting: Panel mounted

Size: 78 x 106 mm (3.07" x 4.17")

Climate: Class HSE, to DIN 40040

Display: 122 x 32 pixel backlight STN

Safety: To EN 61010-1, installation category (overvoltage category) III, 600V, pollution degree 2

Protection: Front: IP52 (IP54 with gasket, option L)
Terminals: IP20
To IEC 529 and EN 60529

EMC/CE: To EN 61000-6-1/2
SS4631503 (PL4)
and IEC 255-3

Material: All plastic materials are self-extinguishing according to UL94 (V1)

Plug connections: AC voltage inputs:
3.5 mm^2 multi stranded
AC current inputs:
4.5 mm^2 multi stranded
Other:
1.5 mm^2 multi stranded

PC connection: RS232 converter box (option J5)

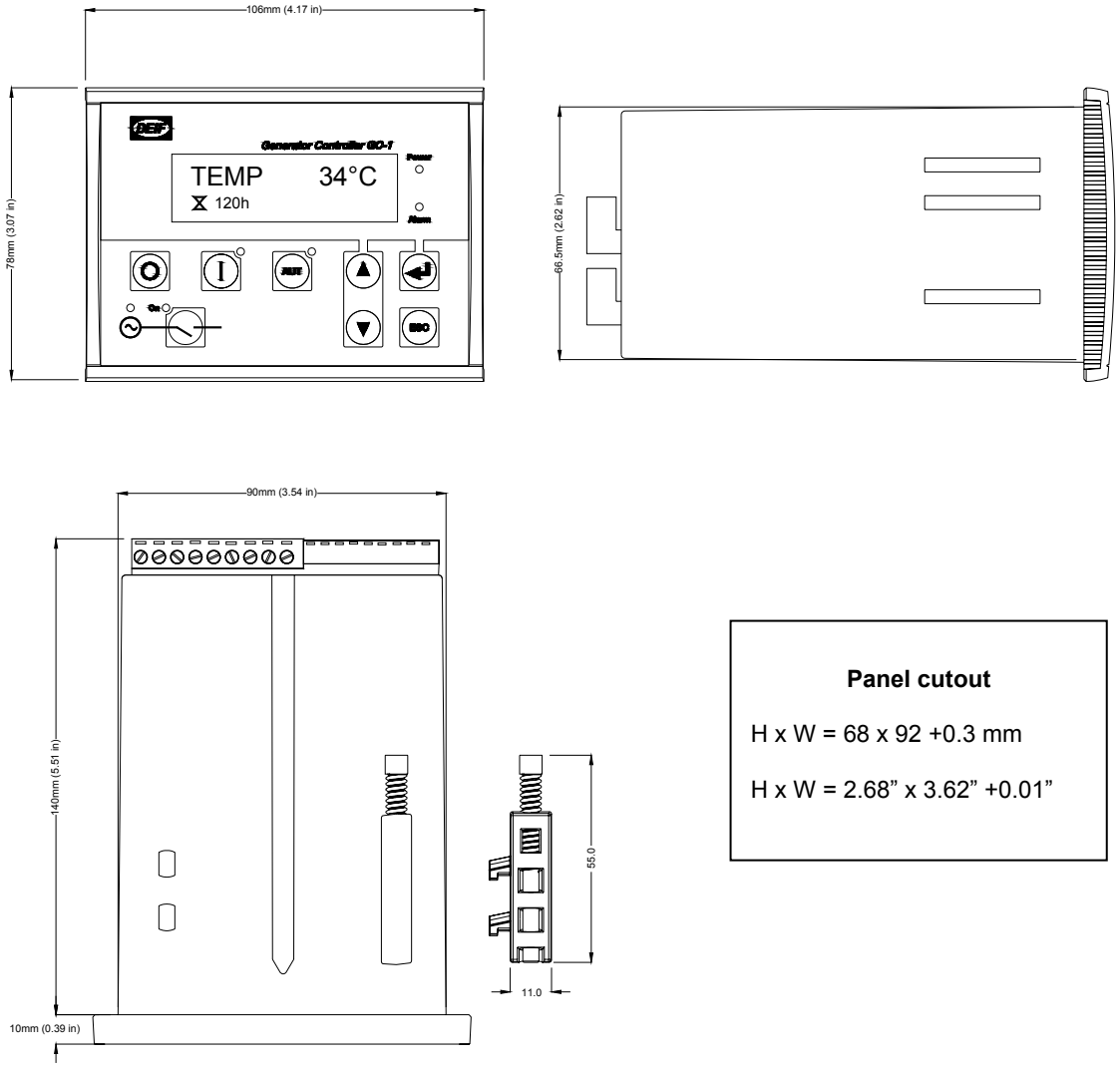
Approval: CE & C-UL (listing pending)

Weight: Approx. 0.9 kg (1.9 lbs)

Only 3 inputs are available.

It is possible to combine VDO inputs with binary and 4…20mA inputs in a mix.

Unit dimensions in mm (inches)

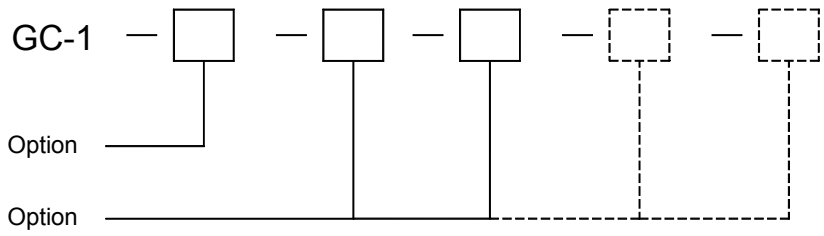


Panel cutout

H x W = 68 x 92 +0.3 mm

H x W = 2.68” x 3.62” +0.01”

Order specifications



Due to our continuous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

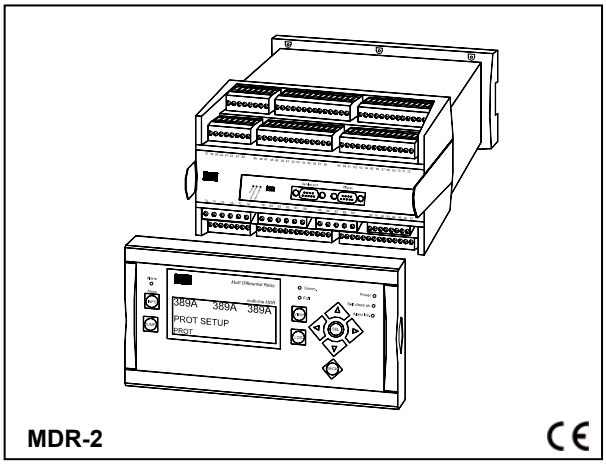
Type MDR-2

Multi differential protection relay

multi-line 2

4921240275C

- ***Relay for generators/electric motors***
- ***3-phase AC measurements***
- ***Dynamic compensation for ext. failures***
- ***Short response time (30 ms)***
- ***Display indicating all measurements***



MDR-2 CE

Application

The MDR-2 differential protection relay is a micro-processor-based control unit containing all necessary functions for monitoring of the differential currents for a synchronous/asynchronous generator or motor (the object).

Via current transformers the MDR-2 measures each phase current on both sides of the object. The current transformers determine the limits of the protection area. Any failure within these limits (2- or 3-phase short circuits or earth leaks) will be detected as an error I_d: Differential currents, the currents flowing through the two current transformers of the phase in question differ, and, if a preset limit value is exceeded, a warning will be given or a tripping signal transmitted.

The MDR-2 dynamic compensation curves for warning and tripping are defined by the user.

Should an error occur outside the limits of the protection area, the MDR-2 will not transmit a tripping signal, as the above-mentioned phase currents are equal. In that way a selective protection is achieved.

Except for external measuring transformers the MDR-2 contains all necessary measuring circuits and presents all values on an LC display. Values and messages are presented in clear text (measuring values in engineering units).

The MDR-2 is a flexible and menu/PC programmed unit, enabling the user to easily adapt the unit to the object in question. The programming procedures are password protected.

Standard functions

The unit is designed for differential current protection of a 3-phase generator/motor.

Inputs and outputs:

Inputs: - 6 currents via current transformers
- 2 binary control inputs

Outputs: - 6 relay outputs
("SYSTEM OK", 5 configurable relays)

Generator protective functions:

- Differential current (3-phase) protection, with programmable dynamic compensation (pick-up curves)
- Warning: Programmable value and delay
- Trip: Programmable value and delay

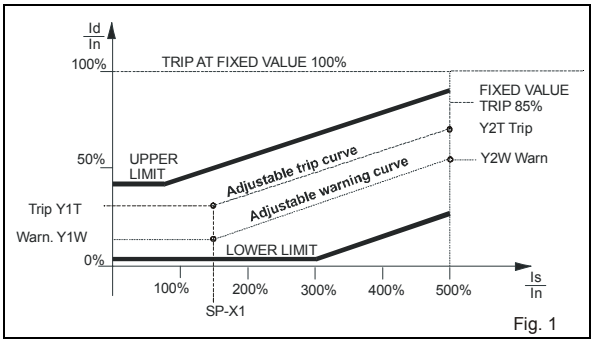


Fig. 1

A pick-up curve is shown in Fig. 1. The curves represent the warning and tripping values (Id/In=Y), defined as the differential current (Id) divided by the nominal generator/motor current (In) referring to the stabilization current (Is) divided by In (Is/In=X).

The starting horizontal limit lines are placed according to the keyed in values of the points P(X1,Y1T) and P(X1, Y2T). These can be positioned anywhere within the marked area and must be decided according to the specifications of the plant in question.

For warning and tripping pick-up curves the following ranges are available:

Id/In > 100%	Fixed tripping point Independent of the stabilization current
Is/In > 500%	Fixed tripping (Id/In>85%)
Id/In > Y2W	Fixed warning Independent of the stabilization current
Is/In < 500%	Trip and warning programmable within "UPPER LIMIT" and "LOWER LIMIT" values and dependent on the Is/In value

DEIF A/S

Type MDR-2

Display of values and texts:
- LEDs: Supervision, alarm
- Alarm and condition indication in clear text on LC display
- AC values (differential and actual currents for all 3 phases) on LC display

Acknowledgement of alarms:
- Automatic acknowledgement YES/NO (programmable)
- Remote acknowledgement via push button input
- Local acknowledgement via display front push button

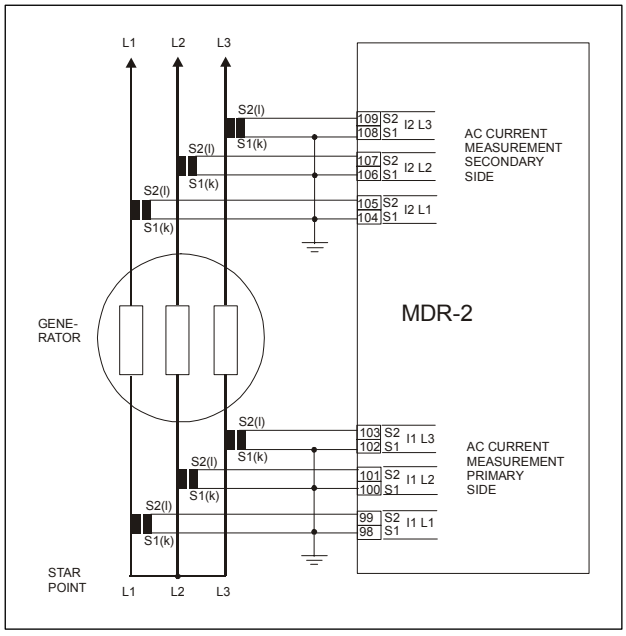
Options

Overcurrent/short circuit protection (option C3):
- 2 x definite time or inverse time (curve with 6 programmable points) overcurrent protection (400% overcurrent max.)
- 1 x definite time short circuit protection (500% short circuit current max.)

Cables (option J):
J1: Display cable, 3m
J2: Display cable, 6m
J3: Serial interface cable for PC utility software
J6: Display cable, 1m

Display gasket (option L):
Rubber gasket makes display protection IP54 (standard IP52)

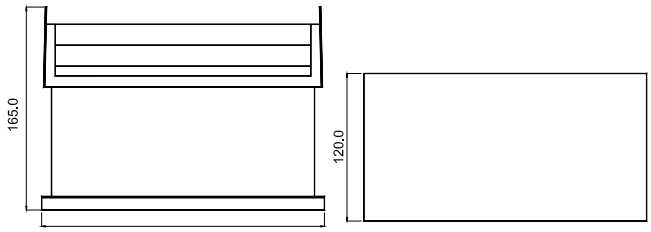
Principle diagram



Technical specifications

Accuracy:	0.1 x I_N < I < I_N: 1% of I_N I_N < I: 1% of I (I_N = 1A or 5A, I = measured value)
Operating temp.:	-25...70°C
Climate:	Class HSE, to DIN 40040
Meas. frequency:	30...70Hz (nominal 50Hz or 60Hz)
Aux. supply:	12/24V DC -25/+30%, max. 8W
Binary inputs:	Input voltage: 6...32V DC (bi-directional) Input impedance: Max. 2.4 kΩ
Meas. current:	-/1A or -/5A, consumption: Max. 0.3VA per phase
Overcurrent:	4 x I_N, continuously 20 x I_N, 10 sec. (max. 75A) 80 x I_N, 1 sec. (max. 300A)
Response times:	Differential current: 30 ms Overcurrent (option): 50 ms Short circuit (option): 30 ms
Fuse:	All voltage inputs should be protected by a 2A fuse
Relay outputs:	Contact rating: 8A/250V AC. ("Status": 1A)
Safety:	To EN 61010-1. Installation cat. III, 600V. Pollution degree 2
Galv. separation:	Between AC inputs and others: 3250V AC – 50Hz – 1 min.
EMC/CE:	To EN 61000-1/2/3/4 and IEC 255-3
Connections:	Current: Max. 4 mm^2 (multi-stranded) 6 mm^2 (single-stranded) Others: Max. 2.5 mm^2 (multi-stranded) Display: 9-pin SUB-D (female) Service port: 9-pin SUB-D (male)
Protection:	Terminals: IP20 Display front: IP52 (IP54 with gasket) According to IEC 529 and EN 60529
Material:	All plastic parts are self-extinguishing to UL 94 (V1)

Dimensions



Weight: Approx. 1 kg

Order specifications

Type – Option – Option
Example: MDR-2 – J1

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

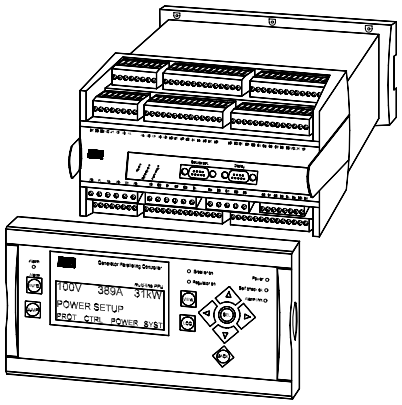
Type PPU / GS

Generator Paralleling and Protection Unit

multi-line 2

4921240193L

- ***Compact system in one unit***
- ***Generator synchronisation, protection and control***
- ***True 3-phase RMS AC measurements, all galvanically separated (GS)***
- ***Easy-readable, separate display***
- ***GSM modem connection***



PPU

Application

The PPU generator controller is a microprocessor-based control unit containing all necessary functions for control of a synchronous/asynchronous generator. The PPU can synchronise the generator and after synchronisation carry out all necessary generator control and protective functions.

The PPU contains all necessary 3-phase measuring circuits and presents all values and alarms on the LCD display. Programming is easily done via a menu structure in the display (password protected) or via the RS232 PC connection and the multi-line 2 Windows® based service software. The service software offers additional features such as monitoring of all relevant information during commissioning, saving/download of settings and download of software updates.

The PPU is a compact all-in-one unit designed for generators running:
- stand-alone
- parallel with other generators
- parallel with the mains

The PPU is well-suited for PLC-controlled systems, interfacing can be done via binary and analogue I/Os or via (optional) serial communication.

The PPU carries out a cyclical self-test, displaying error messages in clear text and indicating errors with relay outputs, should any errors occur.

Display

The display is separate, for mounting directly on the PPU or the panel front, connected via cable (option J).

GSM modem

It is possible to connect a GSM modem to the PPU, enabling the transmission of SMS alarm messages to up to 5 receivers as well as the establishment of telephone line communication using the PC utility software.

Standard functions

Synchronisation
- Frequency control with programmable slip freq.
- Voltage matching possible
- Breaker ON pulse at exact sync. point with programmable generator breaker delay time
- "Black busbar" operation of generator breaker possible

Power or frequency control

The PPU can control the power or frequency in 4 different modes with selection of internal (programmable) or external +/-10V DC set point.

By combining these all operation schemes of a generator can be implemented. The modes are selected via binary inputs or (optional) serial interface.
- Fixed frequency (stand-alone running)
- Fixed power (parallel with mains)
- Droop (controlled frequency drop with increasing load)
- Load sharing (generators in parallel, island operation)

The PPU performs programmable ramp-up and ramp-down of the power in connection with breaker operations.

Generator protection

All protection functions have definite time characteristic.
- Overcurrent (2 levels) (ANSI 51)
- Reverse power (ANSI 32)

Reverse power can also be programmed with inverse time characteristic.

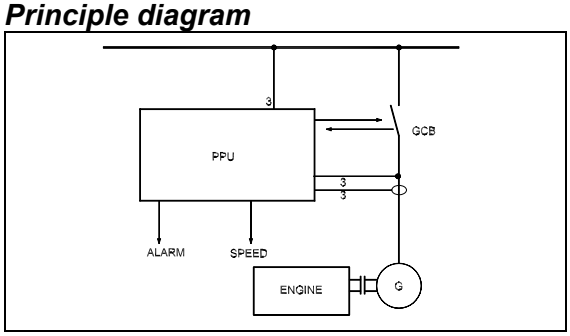
4 programmable relay outputs for alarm/trip.

Measured and calculated values

Generator:
- Voltage (3-phase U + N)
- Current (3-phase I)
- Active power (kW)
- Reactive power (kvar)
- Power factor (cos φ)
- Frequency (f)
- Energy production (kWh)

Busbar:
- Voltage (3-phase U + N)
- Frequency (f)

Principle diagram

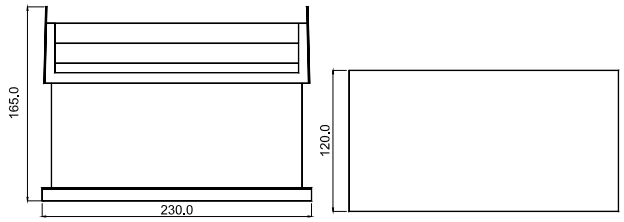


DEIF A/S

Technical specifications

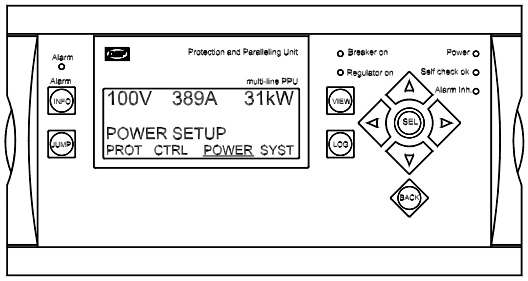
Accuracy:	Class 1.0, to IEC 688
Operating temp.:	-25…70°C
Climate:	Class HSE, to DIN 40040
Meas. voltage:	100/110V AC to 690V AC +/-20% Consumption max. 0.2VA / phase
Meas. current:	-/1 or -/5A AC Consumption max. 0.3VA / phase
Current overload:	4 x I_n continuously 20 x I_n , 10 sec. (max. 75A) 80 x I_n , 1 sec. (max. 300A)
Meas. frequency:	30…70Hz
Aux. supply:	8-32V DC Max. 8W consumption
Binary inputs:	Optocoupler, bi-directional Input voltage 9-32V DC Impedance max. 4.7kΩ
Relay outputs:	250V AC / 24V DC, 8A (Unit status output: 1A)
Open collector outputs:	Supply 12…32V DC, max. 10mA
Analogue inputs:	-10…0…+10V DC Not galvanically separated Impedance max. 100kΩ
Mounting:	DIN-rail mount or base mount
Load sharing lines:	-5…0…+5V DC
Analogue outputs:	0(4)...20mA Galvanically separated Active output (internal supply) Load max. 500Ω
Safety:	To EN 61010-1, installation category (overvoltage category) III, 600V, pollution degree 2
Galvanic separation:	Between AC voltage, AC current and other I/Os: 3250V AC, 50Hz, 1 min. Between analogue outputs: 500V DC, 1 min.
EMC/CE:	To EN 50081-1/2, EN 50082-1/2 SS4631503 (PL4) and IEC 255-3
Material:	All plastic materials are self-extinguishing according to UL94 (V1)
Plug connections:	AC current: 4 mm^2 multi stranded Other: 2.5 mm^2 multi stranded Display: 9-pole Sub-D female PC: 9-pole Sub-D male
Protection:	Unit: IP20 Display: IP52 (IP54 with gasket: Option L) To IEC 529 and EN 60529
Approvals:	The PPU is approved by the major classification societies. Contact DEIF for details
Governors:	multi-line 2 interfaces to all governors, including GAC, Barber-Colman, Woodward and Cummins. See interfacing guide at www.deif.com or request doc. no. 4189340257 from DEIF

Unit: H x W x D = 120 x 230 x 165 mm



Weight:		
	PPU	1.55 kg
	J1, J3	0.20 kg
	J2	0.40 kg

Display: H x W x D: 115 x 220 x 20 mm



Order specifications

PPU - □ – □ – □

Option
Option
Option

Specification of options

Below the available options for the multi-line 2 PPU / GS gen-set control and protection units with software version 2.30.0 or later are specified.

For the placement of hardware (slot #), please refer to the “Placed in” column and specific drawing of the PPU.

Op-tion	Description		Placed in	Note
A	**Loss of mains protection**			
A1	- Over- and undervoltage (generator and busbar/mains) - Over- and underfrequency (generator and busbar/mains) - Vector jump - Df/dt (ROCOF)	(ANSI 27/59) (ANSI 81) (ANSI 78) (ANSI 81)	Software option	
A2	- Over- and undervoltage (generator and busbar/mains) - Over- and underfrequency (generator and busbar/mains) - Df/dt (ROCOF)	(ANSI 27/59) (ANSI 81) (ANSI 81)	Software option	
A3	- Over- and undervoltage (generator and busbar/mains) - Over- and underfrequency (generator and busbar/mains) - Vector jump	(ANSI 27/59) (ANSI 81) (ANSI 78)	Software option	
B	**Generator/busbar/mains protection**			
B1	- Over- and undervoltage (generator and busbar/mains) - Over- and underfrequency (generator and busbar/mains)	(ANSI 27/59) (ANSI 81)	Software option	
C	**Generator add-on protection package**			
C1	- Over- and undervoltage (generator) - Over- and underfrequency (generator) - Overload - Fast overcurrent (<42 ms) - High overcurrent (<350%) - Current unbalance - Voltage asymmetry - Reactive power (import (excitation loss)/export (overexcitation))	(ANSI 27/59) (ANSI 81) (ANSI 32) (ANSI 50) (ANSI 50) (ANSI 46) (ANSI 47) (ANSI 32)	Software option	
C2	- Negative sequence voltage high - Negative sequence current high - Zero sequence voltage high - Zero sequence current high	(ANSI 47) (ANSI 46) (ANSI 59) (ANSI 50)	Software option	
D	**Voltage/var/cos φ control**			
D1	Selection between: - Constant voltage control (stand-alone) - Constant reactive power control (parallel with mains) - Constant power factor control (parallel with mains) - Reactive load sharing (island paralleling with other generators)		Software option	Not with EF2
E	**Analogue controller outputs**			
E1	- +/-20mA for speed governor - +/-20mA for AVR		Slot #4	AVR: Only when option D is chosen Not with EF
F	**Analogue transducer outputs**			
F1	- 2 x 0(4)...20mA transducer outputs		Slot #6	Not when option EF3 is chosen
EF	**Combination outputs**			
EF2	- +/-20mA for speed governor - 1 x 0(4)...20mA transducer output		Slot #4	Not with E1, F2, EF3, EF4
EF3	- 1 x PWM (Pulse Width Modulated) output for CAT speed governor - 1 x PWM (Pulse Width Modulated) output for droop - +/-20mA for speed governor or AVR - 2 x relay outputs for speed governor or AVR		Slot #4 + #6	Not with E1, F1, F2, EF2, EF4 AVR: Requires D
EF4	- +/-20mA for speed governor or AVR - 2 x relay outputs for speed governor or AVR		Slot #4	Not with E1, F2, EF2, EF3 AVR: Requires D

(ANSI # as per IEE std. C37.2 – 1996 (R2001) in parenthesis).

Op-tion	Description	Placed in	Note
H	**Serial communication**		
H1	- Can-open	Slot #2	Not with H2, H3, N1
H2	- Mod-bus RTU (RS485)	Slot #2	Not with H1, H3
H3	- Profi-bus DP (RS485)	Slot #2	Not with H1, H2, N1
H4	- Caterpillar CCM (RS232)	Slot #8	Only limited engine data can be displayed. All data can be read via H2
H5	Can bus engine communication for: - MTU MDEC - Detroit Diesel DDEC - Deutz EMR - John Deere JDEC - Volvo Penta D12 AUX	Slot #8	Only limited engine data can be displayed. All data can be read via H2
H6	- Cummins ECM (RS485) engine communication	Slot #8	Only limited engine data can be displayed. All data can be read via H2
J	**Cables**		
J1	- Display cable with plugs, 3 m. UL94 (V1) approved		
J2	- Display cable with plugs, 6 m. UL94 (V1) approved		
J3	- PC cable for utility software (RS232). UL94 (V1) approved		
J6	- Display cable with plugs, 1 m. UL94 (V1) approved		
K	**Designers reference handbook**		
K1	- Hard copy (as standard enclosed as a CD-ROM)		
L	**Display gasket for IP54**		
M	**Configurable engine control cards**		
M1 *See note	Engine control card with Pt100 sensor inputs - 4 x 4…20mA inputs - 2 x Pt100 inputs - 1 x tacho input (magnetic pick-up) - 5 x binary inputs - 3 x relay outputs	Slot #7	Engine start/stop logic can be selected ON or OFF
M2 *See note	Engine control card with VDO sensor inputs - 3 x 4…20mA inputs - 3 x VDO (resistor) inputs - 1 x tacho input (magnetic pick-up) - 9 x binary inputs - 3 x relay outputs	Slot #7	Engine start/stop logic can be selected ON or OFF
M	**Configurable I/O extension cards**		
M13	- 7 x binary inputs	Slot #8	Not with H4, M14, M15
M14	- 4 x relay outputs	Slot #8	Not with H4, M13, M15
M15	- 4 x 0(4)…20mA analogue inputs	Slot #8	Not with H4, M13, M14
N	**Ethernet TCP/IP communication**		
N1	- Integrated WebServer with web pages for plant presentation Example: See http://ml2.deif.com		Requires H2
O	**Water turbine control**		
O1	- Water turbine control with integrated water level dependent power control		For asynchronous gene-rators also when combined with option M1/M2

*** NOTE:**
If option M1/M2, engine start/stop control, is used in marine applications, separate approved engine protection (overspeed, water temperature and oil pressure) is needed.

Ethernet

Option N1:	WebServer

Slot #4, term. 65-72
Governor/AVR outputs

PPU/GPC: **GPU:**	4 x relay as standard Option G2/D2
Option E1:	2 x +/-20mA out, governor + AVR
Option F2:	2 x 0(4)...20mA out, transducer
Option EF2:	1 x +/-20mA out, governor 1 x 0(4)…20mA out, transducer
Option EF3:	1 x PWM governor out 1 x +/-20mA out, AVR 2 x relay out
Option EF4:	1 x +/-20mA out, AVR 2 x relay out

Slot #6, term. 90-97
In-/outputs

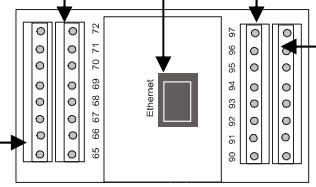
Option F1/F2:	2 x 0(4)…20mA out, transducer
Option EF3:	PWM droop signal

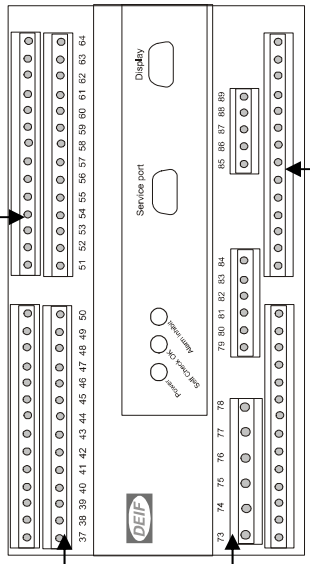
Slot #8, term. 126-133
Communication / in-/outputs

Option H4:	**Engine RS232** Cat. CCM
Option H5:	Engine Can bus
Option H6:	**Engine RS485** Cummins ECM
Option M13:	7 x binary inputs
Option M14:	4 x relay outputs
Option M15:	4 x 4...20mA

Slot #2, term. 29-36
Communication

Option H1:	Can-open
Option H2:	Mod-bus RTU (RS485)
Option H3:	Profi-bus DP (RS485)





Slot #1, term. 1-28
Power supply (std. board)

24V DC supply, 8W
1 x status output relay
5 x relay outputs
2 x pulse outputs (kWh, kvarh)
5 x binary inputs

Slot #7, term. 98-125
Engine I/F

Option M1:	4 x 4…20mA in 2 x Pt100 in 1 x magn. pick-up in 5 x binary in 3 x relay out
Option M2:	3 x 4…20mA in 3 x VDO in 1 x magn. pick-up in 9 x binary in 3 x relay out

Slot #3, term. 37-64
Load sharing (std.)

13 x binary input
4 x relay output
Power load sharing
Reactive power load sharing (option)
Analogue input for set point:
- Fixed power
- Frequency
- Reactive power
- Power factor
- Voltage

Slot #5, term. 73-89
AC measuring (std.)

3 x generator voltage
3 x generator current
3 x busbar/mains voltage

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

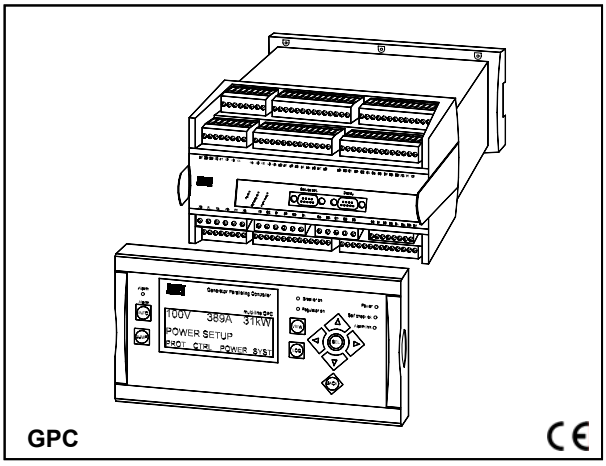
Type GPC / GS

Generator Paralleling Controller

multi-line 2

4921240189L

- ***Compact system in one unit***
- ***Generator synchronisation, protection and control***
- ***True 3-phase RMS measurements, voltages and currents galvanically separated***
- ***Easy-readable, separate display***
- ***GSM modem connection***



GPC

Application

The GPC generator controller is intended for land-based generators. The GPC is a microprocessor-based control unit containing all necessary functions for control of a synchronous/asynchronous generator. The GPC can synchronise the generator and after synchronisation carry out all necessary generator control and protective functions.

The GPC contains all necessary 3-phase measuring circuits and presents all values and alarms on the LCD display. Programming is easily done via a menu structure in the display (password protected) or via the RS232 PC connection and the multi-line 2 Windows® based utility software. The utility software offers additional features such as monitoring of all relevant information during commissioning, saving/download of settings and download of software updates.

The GPC is a compact all-in-one unit designed for generators running:
- stand-alone
- parallel with other generators
- parallel with the mains

The GPC is well-suited for PLC-controlled systems, interfacing can be done via binary and analogue I/Os or via (optional) serial communication.

The GPC carries out a cyclical self-test, displaying error messages in clear text and indicating errors with relay outputs, should any errors occur.

Display

The display is separate, for mounting directly on the GPC or the panel front, connected via cable (option J).

GSM modem

It is possible to connect a GSM modem to the GPC, enabling the transmission of SMS alarm messages to up to 5 receivers as well as the establishment of telephone line communication using the PC utility software.

Standard functions

Synchronisation
- Frequency control with programmable slip freq.
- Voltage matching possible
- Breaker ON pulse at exact sync. point with programmable generator breaker delay time
- "Black busbar" operation of generator breaker possible

Power or frequency control

The GPC can control the power or frequency in 4 different modes with selection of internal (programmable) or external +/-10V DC set point.

By combining these all operation schemes of a generator can be implemented. The modes are selected via binary inputs or (optional) serial interface.
- Fixed frequency (stand-alone running)
- Fixed power (parallel with mains)
- Droop (controlled frequency drop with increasing load)
- Load sharing (generators in parallel, island operation)

The GPC performs programmable ramp-up and ramp-down of the power in connection with breaker operations.

Generator protection

All protection functions have definite time characteristic.
- Overcurrent (2 levels) (ANSI 51)
- Reverse power (ANSI 32)

Reverse power can also be programmed with inverse time characteristic.

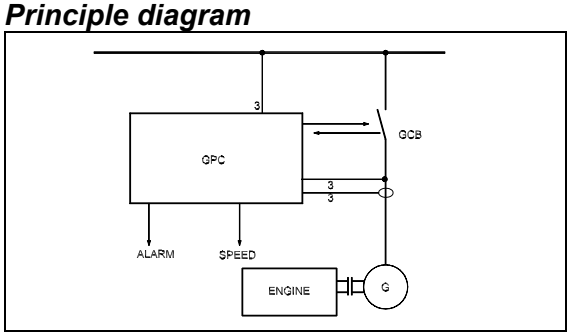
4 programmable relay outputs for alarm/trip.

Measured and calculated values

Generator:
- Voltage (3-phase U + N)
- Current (3-phase I)
- Active power (kW)
- Reactive power (kvar)
- Power factor (cos φ)
- Frequency (f)
- Energy production (kWh)

Busbar:
- Voltage (3-phase U + N)
- Frequency (f)

Principle diagram

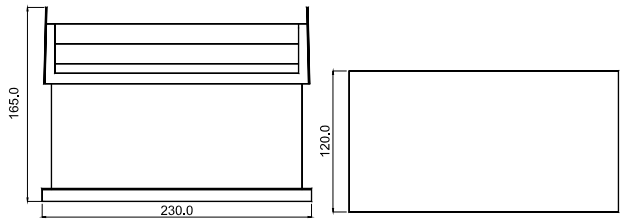


DEIF A/S

Technical specifications

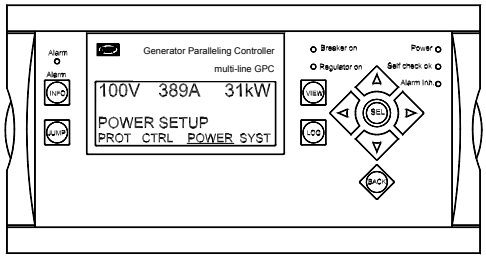
Accuracy:	Class 1.0, to IEC 688
Operating temp.:	-25…70°C
Climate:	Class HSE, to DIN 40040
Meas. voltage:	100/110V AC to 690V AC +/-20% Consumption max. 0.25VA / phase
Meas. current:	-/1 or -/5A AC Consumption max. 0.3VA / phase
Current overload:	4 x I_n continuously 20 x I_n , 10 sec. (max. 75A) 80 x I_n , 1 sec. (max. 300A)
Meas. frequency:	30…70Hz
Aux. supply:	8-32V DC Max. 8W consumption
Binary inputs:	Optocoupler, bi-directional Input voltage 9-32V DC Impedance max. 4.7kΩ
Relay outputs:	250V AC / 24V DC, 8A (Unit status output: 1A)
Open collector outputs:	Supply 12…32V DC, max. 10mA
Analogue inputs:	-10…0…+10V DC Not galvanically separated Impedance max. 100kΩ
Mounting:	DIN-rail mount or base mount
Load sharing lines:	-5…0…+5V DC
Analogue outputs:	0(4)...20mA Galvanically separated Active output (internal supply) Load max. 500Ω
Safety:	To EN 61010-1, installation category (overvoltage category) III, 600V, pollution degree 2
Galvanic separation:	Between AC voltage, AC current and other I/Os: 3250V AC, 50Hz, 1 min. Between analogue outputs: 500V DC, 1 min.
EMC/CE:	To EN 50081-1/2, EN 50082-1/2 SS4631503 (PL4) and IEC 255-3
Material:	All plastic materials are self-extinguishing according to UL94 (V1)
Plug connections:	AC current: 4 mm^2 multi stranded Other: 2.5 mm^2 multi stranded Display: 9-pole Sub-D female PC: 9-pole Sub-D male
Protection:	Unit: IP20 Display: IP52 (IP54 with gasket: Option L) To IEC 529 and EN 60529
Governors:	multi-line 2 interfaces to all governors, including GAC, Barber-Colman, Woodward and Cummins. See interfacing guide at www.deif.com or request doc. no. 4189340257 from DEIF

Unit: H x W x D = 120 x 230 x 165 mm



Weight:		
	GPC	1.55 kg
	J1, J3	0.20 kg
	J2	0.40 kg

Display: H x W x D: 115 x 220 x 20 mm



Order specifications

GPC - □ – □ – □

Option
Option
Option

Specification of options

Below the available options for the multi-line 2 GPC / GS gen-set control and protection units with software version 2.30.0 or later are specified.

For the placement of hardware (slot #), please refer to the “Placed in” column and specific drawing of the GPC.

Op-tion	Description		Placed in	Note
A	**Loss of mains protection**			
A1	- Over- and undervoltage (generator and busbar/mains) - Over- and underfrequency (generator and busbar/mains) - Vector jump - Df/dt (ROCOF)	(ANSI 27/59) (ANSI 81) (ANSI 78) (ANSI 81)	Software option	
A2	- Over- and undervoltage (generator and busbar/mains) - Over- and underfrequency (generator and busbar/mains) - Df/dt (ROCOF)	(ANSI 27/59) (ANSI 81) (ANSI 81)	Software option	
A3	- Over- and undervoltage (generator and busbar/mains) - Over- and underfrequency (generator and busbar/mains) - Vector jump	(ANSI 27/59) (ANSI 81) (ANSI 78)	Software option	
B	**Generator/busbar/mains protection**			
B1	- Over- and undervoltage (generator and busbar/mains) - Over- and underfrequency (generator and busbar/mains)	(ANSI 27/59) (ANSI 81)	Software option	
C	**Generator add-on protection package**			
C1	- Over- and undervoltage (generator) - Over- and underfrequency (generator) - Overload - Fast overcurrent (<42 ms) - High overcurrent (<350%) - Current unbalance - Voltage asymmetry - Reactive power (import (excitation loss)/export (overexcitation))	(ANSI 27/59) (ANSI 81) (ANSI 32) (ANSI 50) (ANSI 50) (ANSI 46) (ANSI 47) (ANSI 32)	Software option	
C2	- Negative sequence voltage high - Negative sequence current high - Zero sequence voltage high - Zero sequence current high	(ANSI 47) (ANSI 46) (ANSI 59) (ANSI 50)	Software option	
D	**Voltage/var/cos φ control**			
D1	Selection between: - Constant voltage control (stand-alone) - Constant reactive power control (parallel with mains) - Constant power factor control (parallel with mains) - Reactive load sharing (island paralleling with other generators)		Software option	Not with EF2
E	**Analogue controller outputs**			
E1	- +/-20mA for speed governor - +/-20mA for AVR		Slot #4	AVR: Only when option D is chosen Not with EF
F	**Analogue transducer outputs**			
F1	- 2 x 0(4)...20mA transducer outputs		Slot #6	Not when option EF3 is chosen
EF	**Combination outputs**			
EF2	- +/-20mA for speed governor - 1 x 0(4)...20mA transducer output		Slot #4	Not with E1, F2, EF3, EF4
EF3	- 1 x PWM (Pulse Width Modulated) output for CAT speed governor - 1 x PWM (Pulse Width Modulated) output for droop - +/-20mA for speed governor or AVR - 2 x relay outputs for speed governor or AVR		Slot #4 + #6	Not with E1, F1, F2, EF2, EF4 AVR: Requires D
EF4	- +/-20mA for speed governor or AVR - 2 x relay outputs for speed governor or AVR		Slot #4	Not with E1, F2, EF2, EF3 AVR: Requires D

(ANSI # as per IEE std. C37.2 - 1996 (R2001) in parenthesis).

Option	Description	Placed in	Note
H	**Serial communication**		
H1	- Can-open	Slot #2	Not with H2, H3, N1
H2	- Mod-bus RTU (RS485)	Slot #2	Not with H1, H3
H3	- Profi-bus DP (RS485)	Slot #2	Not with H1, H2, N1
H4	- Caterpillar CCM (RS232)	Slot #8	Only limited engine data can be displayed. All data can be read via H2
H5	Can bus engine communication for: - MTU MDEC - Detroit Diesel DDEC - Deutz EMR - John Deere JDEC - Volvo Penta D12 AUX	Slot #8	Only limited engine data can be displayed. All data can be read via H2
H6	- Cummins ECM (RS485) engine communication	Slot #8	Only limited engine data can be displayed. All data can be read via H2
J	**Cables**		
J1	- Display cable with plugs, 3 m. UL94 (V1) approved		
J2	- Display cable with plugs, 6 m. UL94 (V1) approved		
J3	- PC cable for utility software (RS232). UL94 (V1) approved		
J6	- Display cable with plugs, 1 m. UL94 (V1) approved		
K	**Designers reference handbook**		
K1	- Hard copy (as standard enclosed as a CD-ROM)		
L	**Display gasket for IP54**		
M	**Configurable engine control cards**		
M1	Engine control card with Pt100 sensor inputs - 4 x 4…20mA inputs - 2 x Pt100 inputs - 1 x tacho input (magnetic pick-up) - 5 x binary inputs - 3 x relay outputs	Slot #7	Engine start/stop logic can be selected ON or OFF
M2	Engine control card with VDO sensor inputs - 3 x 4…20mA inputs - 3 x VDO (resistor) inputs - 1 x tacho input (magnetic pick-up) - 9 x binary inputs - 3 x relay outputs	Slot #7	Engine start/stop logic can be selected ON or OFF
M	**Configurable I/O extension cards**		
M13	- 7 x binary inputs	Slot #8	Not with H4, M14, M15
M14	- 4 x relay outputs	Slot #8	Not with H4, M13, M15
M15	- 4 x 0(4)…20mA analogue inputs	Slot #8	Not with H4, M13, M14
N	**Ethernet TCP/IP communication**		
N1	- Integrated WebServer with web pages for plant presentation Example: See http://ml2.deif.com		Requires H2

Ethernet

Option N1:	WebServer

Slot #4, term. 65-72
Governor/AVR outputs

PPU/GPC: **GPU:**	4 x relay as standard Option G2/D2
Option E1:	2 x +/-20mA out, governor + AVR
Option F2:	2 x 0(4)...20mA out, transducer
Option EF2:	1 x +/-20mA out, governor 1 x 0(4)…20mA out, transducer
Option EF3:	1 x PWM governor out 1 x +/-20mA out, AVR 2 x relay out
Option EF4:	1 x +/-20mA out, AVR 2 x relay out

Slot #6, term. 90-97
In-/outputs

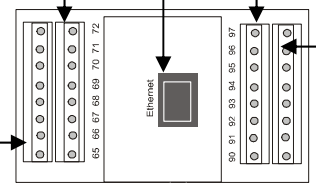
Option F1/F2:	2 x 0(4)…20mA out, transducer
Option EF3:	PWM droop signal

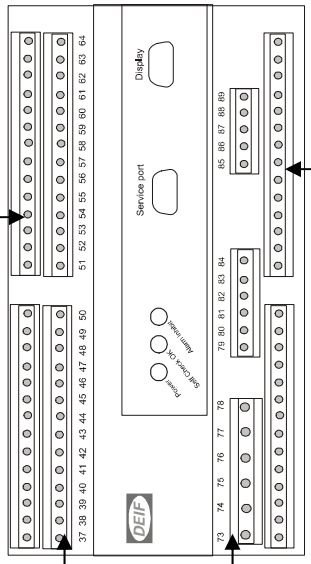
Slot #8, term. 126-133
Communication / in-/outputs

Option H4:	**Engine RS232** Cat. CCM
Option H5:	Engine Can bus
Option H6:	**Engine RS485** Cummins ECM
Option M13:	7 x binary inputs
Option M14:	4 x relay outputs
Option M15:	4 x 4...20mA

Slot #2, term. 29-36
Communication

Option H1:	Can-open
Option H2:	Mod-bus RTU (RS485)
Option H3:	Profi-bus DP (RS485)





Slot #1, term. 1-28
Power supply (std. board)

12/24V DC supply, 8W
1 x status output relay
5 x relay outputs
2 x pulse outputs (kWh, kvarh)
5 x binary inputs

Slot #7, term. 98-125
Engine I/F

Option M1:	4 x 4…20mA in 2 x Pt100 in 1 x magn. pick-up in 5 x binary in 3 x relay out
Option M2:	3 x 4…20mA in 3 x VDO in 1 x magn. pick-up in 9 x binary in 3 x relay out

Slot #3, term. 37-64
Load sharing (std.)

13 x binary input
4 x relay output
Power load sharing
Reactive power load sharing (option)
Analogue input for set point:
- Fixed power
- Frequency
- Reactive power
- Power factor
- Voltage

Slot #5, term. 73-89
AC measuring (std.)

3 x generator voltage
3 x generator current
3 x busbar/mains voltage

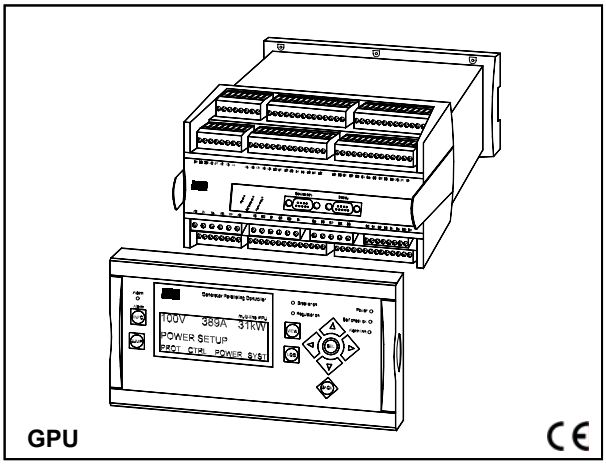
Due to our continuous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

Type GPU / GS

Generator Protection Unit
multi-line 2
4921240191L

- ***Compact system in one unit***
- ***Generator protections***
- ***True 3-phase RMS measurements, voltages and currents galvanically separated***
- ***Easy-readable, separate display***
- ***GSM modem connection***



Application
The GPU generator protection unit is a microprocessor-based protection unit containing all necessary functions for protecting a generator. Furthermore, as an option, the GPU can synchronise the generator.

The GPU contains all necessary 3-phase measuring circuits and presents all values and alarms on the LCD display. Programming is easily done via a menu structure in the display (password protected) or via the RS232 PC connection and the multi-line 2 Windows® based utility software. The utility software offers additional features such as monitoring of all relevant information during commissioning, saving/download of settings and download of software updates.

The GPU is a compact all-in-one unit designed for generators running:
- stand-alone
- parallel with other generators
- parallel with the mains

The GPU is well-suited for PLC-controlled systems, interfacing can be done via binary and analogue I/Os or via (optional) serial communication.

The GPU carries out a cyclical self-test, displaying error messages in clear text and indicating errors with relay outputs, should any errors occur.

Display
The display is separate, for mounting directly on the GPU or the panel front, connected via cable (option J).

GSM modem
It is possible to connect a GSM modem to the GPU, enabling the transmission of SMS alarm messages to up to 5 receivers as well as the establishment of telephone line communication using the PC utility software.

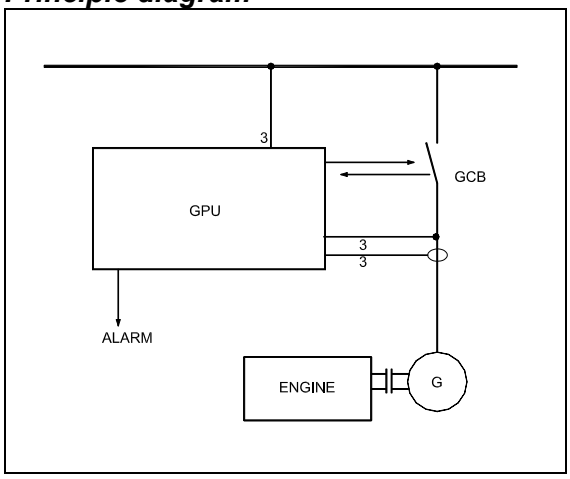
Standard functions
Generator protection
All protection functions have definite time characteristic.
- Overcurrent (2 levels) (ANSI 51)
- Reverse power (ANSI 32)

Inverse time characteristic can be chosen for reverse power.

4 relay outputs (standard) can be configured individually to represent one or more of the above protections.

Measured and calculated values
Generator:
- Voltage (3-phase U + N)
- Current (3-phase I)
- Active power (kW)
- Reactive power (kvar)
- Power factor (cos φ)
- Frequency (f)
- Energy production (kWh)

Busbar:
- Voltage (3-phase U + N)
- Frequency (f)

Principle diagram


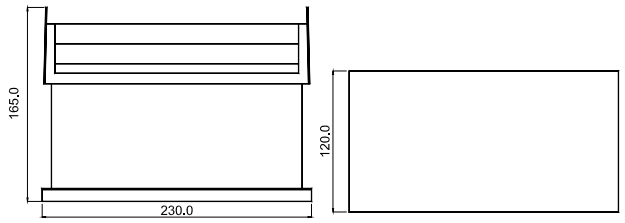
DEIF A/S

Technical specifications

Accuracy:	Class 1.0, to IEC 688
Operating temp.:	-25…70°C
Climate:	Class HSE, to DIN 40040
Meas. voltage:	100/110V AC to 690V AC +/-20% Consumption max. 0.25VA / phase
Meas. current:	-/1 or -/5A AC Consumption max. 0.3VA / phase
Current overload:	4 x I_n continuously 20 x I_n , 10 sec. (max. 75A) 80 x I_n , 1 sec. (max. 300A)
Meas. frequency:	30…70Hz
Aux. supply:	8-32V DC Max. 8W consumption
Binary inputs:	Optocoupler, bi-directional Input voltage 9-32V DC Impedance max. 4.7kΩ
Relay outputs:	250V AC / 24V DC, 8A (Unit status output: 1A)
Open collector outputs:	Supply 9…32V DC, max. 10mA
Analogue outputs:	0(4)...20mA Galvanically separated Active output (internal supply) External load max. 500Ω
Safety:	To EN 61010-1, installation category (overvoltage category) III, 600V, pollution degree 2
Mounting:	DIN-rail mount or base mount
Galvanic separation:	Between AC voltage, AC current and other I/Os: 3250V AC, 50Hz, 1 min. Between analogue outputs: 500V DC, 1 min.
EMC/CE:	To EN 50081-1/2, EN 50082-1/2 SS4631503 (PL4) and IEC 255-3
Material:	All plastic materials are self-extinguishing according to UL94 (V1)
Plug connections:	AC current: 4 mm^2 multi stranded Other: 2.5 mm^2 multi stranded Display: 9-pole Sub-D female PC: 9-pole Sub-D male
Protection:	Unit: IP20 Display: IP52 (IP54 with gasket: Option L) To IEC 529 and EN 60529
Approvals:	The GPU is approved by the major classification societies. Contact DEIF for details

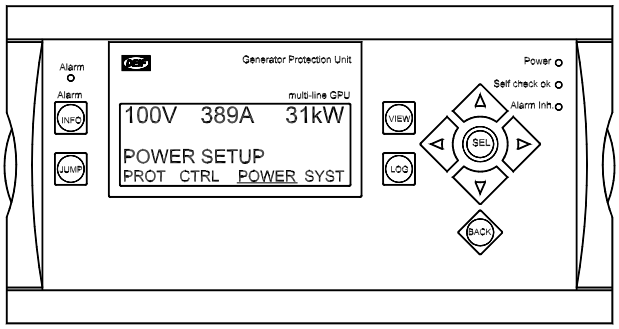
Governors:	multi-line 2 interfaces to all governors, including GAC, Barber-Colman, Woodward and Cummins. See interfacing guide at www.deif.com or request doc. no. 4189340257 from DEIF

Unit: H x W x D = 120 x 230 x 165 mm



Weight:	GPU	1.35 kg
	J1, J3	0.20 kg
	J2	0.40 kg

Display: H x W x D: 115 x 220 x 20 mm



Order specifications

GPU - □ – □ – □

Option
Option
Option

Specification of options

Below the available options for the multi-line 2 GPU / GS gen-set protection units with software version 2.30.0 or later are specified.

For the placement of hardware (slot #), please refer to the "Placed in" column and specific drawing of the GPU.

For detailed description of the options, please see the relevant "Description of Option" documents. These can be found on the internet at our website www.deif.com.

Op-tion	Description		Placed in	Note
A	**Loss of mains protection**			
A1	- Over- and undervoltage (generator and busbar/mains) - Over- and underfrequency (generator and busbar/mains) - Vector jump - Df/dt (ROCOF)	(ANSI 27/59) (ANSI 81) (ANSI 78) (ANSI 81)	Software option	
A2	- Over- and undervoltage (generator and busbar/mains) - Over- and underfrequency (generator and busbar/mains) - Df/dt (ROCOF)	(ANSI 27/59) (ANSI 81) (ANSI 81)	Software option	
A3	- Over- and undervoltage (generator and busbar/mains) - Over- and underfrequency (generator and busbar/mains) - Vector jump	(ANSI 27/59) (ANSI 81) (ANSI 78)	Software option	
B	**Generator/busbar/mains protection**			
B1	- Over- and undervoltage (generator and busbar/mains) - Over- and underfrequency (generator and busbar/mains)	(ANSI 27/59) (ANSI 81)	Software option	
C	**Generator add-on protection package**			
C1	- Over- and undervoltage (generator) - Over- and underfrequency (generator) - Overload - Fast overcurrent (<42 ms) - High overcurrent (<350%) - Current unbalance - Voltage asymmetry - Reactive power (import (excitation loss)/export (overexcitation))	(ANSI 27/59) (ANSI 81) (ANSI 32) (ANSI 50) (ANSI 50) (ANSI 46) (ANSI 47) (ANSI 32)	Software option	
C2	- Negative sequence voltage high - Negative sequence current high - Zero sequence voltage high - Zero sequence current high	(ANSI 47) (ANSI 46) (ANSI 59) (ANSI 50)	Software option	
D	**Voltage/var/cos φ control**			
D2	- Constant voltage control (stand-alone/synchronisation)		Slot #4	Only available with option G2
F	**Analogue transducer outputs**			
F1	- 2 x 0(4)...20mA transducer outputs		Slot #6	
F2	- 4 x 0(4)...20mA transducer outputs		Slot #4 + #6	Not with G2
G	**Start/stop/synchronisation outputs**			
G1	- 2 x relay outputs for starting and stopping of other generators (programmable)		Slot #8	Not with H4, M13, M15
G2	- Synchronisation with relay speed governor outputs		Slot #3 + #4	Not with F2, M1, M2
H	**Serial communication**			
H1	- Can-open		Slot #2	Not with H2, H3, N1
H2	- Mod-bus RTU (RS485)		Slot #2	Not with H1, H3
H3	- Profi-bus DP (RS485)		Slot #2	Not with H1, H2, N1
H4	- Caterpillar RS232 CCM communication		Slot #8	Not with M13, M14, M15
H5	Can-bus engine communication for: - MTU MDEC - Detroit Diesel DDEC - Deutz EMR - John Deere JDEC - Volvo Penta D12 AUX		Slot #8	Only limited engine data can be displayed. All data can be read via H2
H6	- Cummins ECM (RS485) engine communication		Slot #8	Only limited engine data can be displayed. All data can be read via H2

(ANSI # as per IEE std. C37.2 - 1996 (R2001) in parenthesis).

Op-tion	Description	Placed in	Note
J	**Cables**		
J1	- Display cable with plugs, 3 m. UL94 (V1) approved		
J2	- Display cable with plugs, 6 m. UL94 (V1) approved		
J3	- PC cable for utility software (RS232). UL94 (V1) approved		
J6	- Display cable with plugs, 1 m. UL94 (V1) approved		
K	**Designers reference handbook**		
K1	- Hard copy (as standard enclosed as a CD-ROM)		
L	**Display gasket for IP54**		
M	**Configurable engine control cards**		
M1 See note	Engine control card with Pt100 sensor inputs - 4 x 4…20mA inputs - 2 x Pt100 inputs - 1 x tacho input (magnetic pick-up) - 5 x binary inputs - 3 x relay outputs	Slot #7	Engine start/stop logic can be selected ON or OFF Not with M2
M2 See note	Engine control card with VDO sensor inputs - 3 x 4…20mA inputs - 3 x VDO (resistor) inputs - 1 x tacho input (magnetic pick-up) - 9 x binary inputs - 3 x relay outputs	Slot #7	Engine start/stop logic can be selected ON or OFF Not with M1
M	**Configurable I/O extension cards**		
M13	- 7 x binary inputs	Slot #8	Not with G1, H4, H5, H6, M14, M15
M14	- 4 x relay outputs	Slot #8	Not with G1, H4, H5, H6, M13, M15
M15	- 4 x 0(4)…20mA analogue inputs	Slot #8	Not with G1, H4, H5, H6, M13, M14
N	**Ethernet TCP/IP communication**		
N1	- Integrated WebServer with web pages for plant presentation Example: See http://ml2.deif.com		Requires H2

NOTE:
If option M1/M2, engine start/stop control, is used in marine applications, separate approved engine protection (overspeed, water temperature and oil pressure) is needed.

Ethernet

Option N1: WebServer

Slot #4, term. 65-72
Governor/AVR outputs

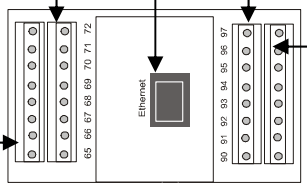
Option G2/ D2:	4 x relay output
Option F2:	2 x 0(4)…20mA out, transducer

Slot #6, term. 90-97
In-/outputs

Option F1/F2:	2 x 0(4)…20mA out, transducer

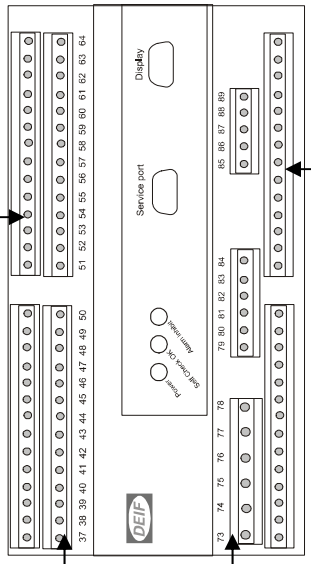
Slot #8, term. 126-133
Communication / in-/outputs

Option H4:	CAT CCM comm. (RS232)
Option H5:	Engine Can-bus
Option H6:	**Engine RS485** Cummins ECM
Option M13:	7 x binary inputs
Option M14:	4 x relay outputs
Option M15:	4 x 4...20mA



Slot #2, term. 29-36
Communication

Option H1:	Can-open
Option H2:	Mod-bus RTU (RS485)
Option H3:	Profi-bus DP (RS485)



Slot #1, term. 1-28
Power supply (std. board)

12/24V DC supply, 8W
1 x status output relay
5 x relay outputs
2 x pulse outputs (kWh, kvarh)
5 x binary inputs

Slot #7, term. 98-125
Engine I/F

Option M1:	4 x 4…20mA in 2 x Pt100 in 1 x magn. pick-up in 5 x binary in 3 x relay out
Option M2:	3 x 4…20mA in 3 x VDO in 1 x magn. pick-up in 9 x binary in 3 x relay out

Slot #3, term. 37-64

Option G2:	13 x binary input 4 x relay output

Slot #5, term. 73-89
AC measuring (std.)

3 x generator voltage
3 x generator current
3 x busbar/mains voltage

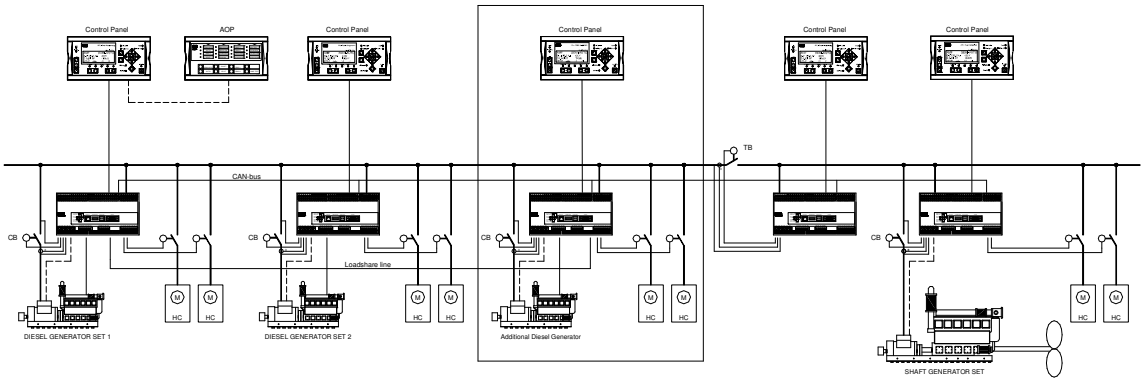
Due to our continuous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

Data sheet

PPU Power Management (PPM)

4921240291A



Standard functions

Power management

- Load dependent start/stop
- Programmable start priority
- Heavy consumer control
- Blackout start sequence
- Supervision of a shore breaker
- Supervision of a bus coupler
- Additional operator panel (AOP)
- Black box recording tool
- Symmetrical and asymmetrical load sharing
- Trip of non-essential load groups

Generator protection

- Over- and undervoltage
- Over- and underfrequency
- Reverse power
- Overcurrent (2 levels)
- Fast overcurrent (< 42ms)
- High overcurrent (< 350%)
- Overload
- Current unbalance
- Voltage asymmetry
- Loss of excitation and overexcitation

Busbar protection

- Over- and undervoltage
- Over- and underfrequency

Engine control

- Start/stop sequences
- AVR/speed governor control
- Overspeed protection
- Low lub. oil pressure protection
- High cooling water temp. protection
- Basic engine protections (back-up)

Display

- Push-buttons for start/stop
- Push-buttons for breaker operations
- Information messages
- Status text
- Alarm indication
- Start/stop priority change

General

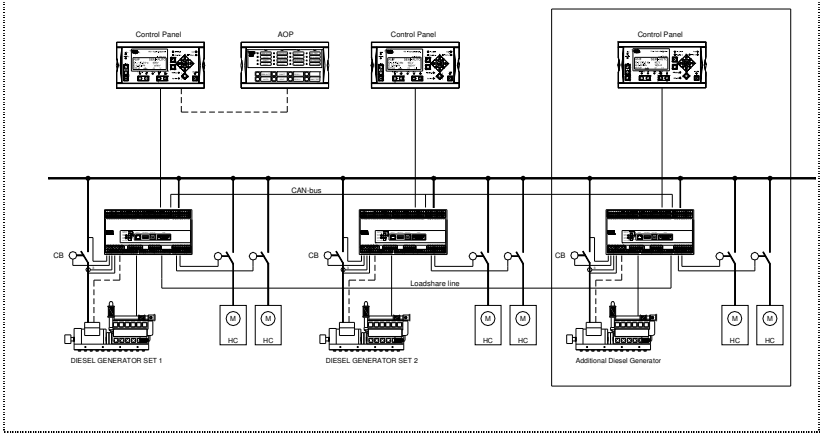
- Up to 3 displays for each unit (on request)
- Four standard languages
- Interfacing to alarm and monitoring systems and the world wide web
- USB technology
- SMS and e-mail function
- Password protected parameter changes via display or PC software
- PC software as commissioning tool
- Programmable I/Os, set points, timers and alarms

© DEIF A/S

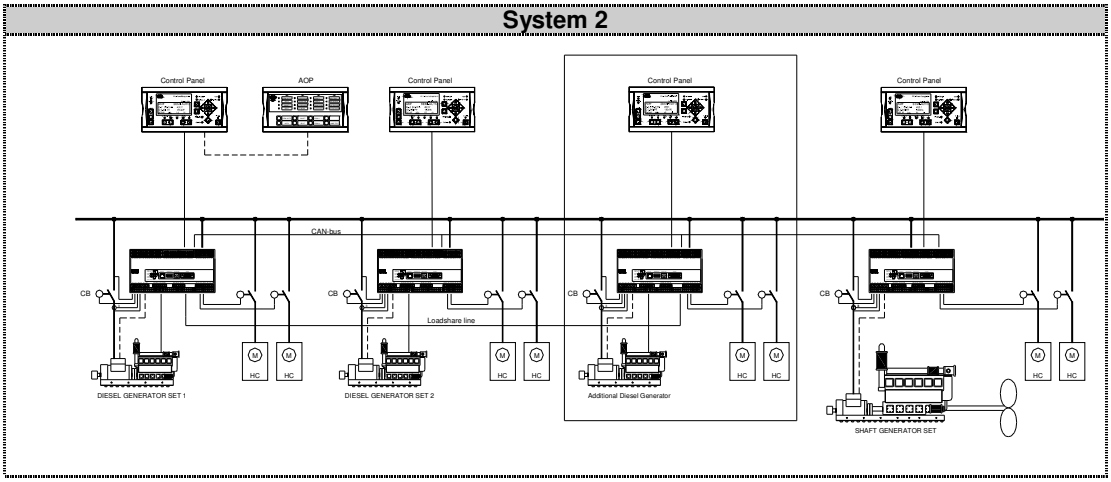
Application illustrations

SYSTEM	SYSTEM OVERVIEW	COMMENTS
SYSTEM 01	DG 1 + DG 2 + DGn	Minimum 2 diesel generators Maximum 8 diesel generators
SYSTEM 02	DG 1 + DG 2 + DGn + SG	Minimum 2 diesel generators and 1 shaft generator Maximum 8 diesel generators and 1 shaft generator
SYSTEM 03	DG 1 + DG 2 + DGn + SG + TB	Minimum 2 diesel generators, 1 shaft generator and 1 bus tie breaker Maximum 8 diesel generators, 1 shaft generator and 1 bus tie breaker

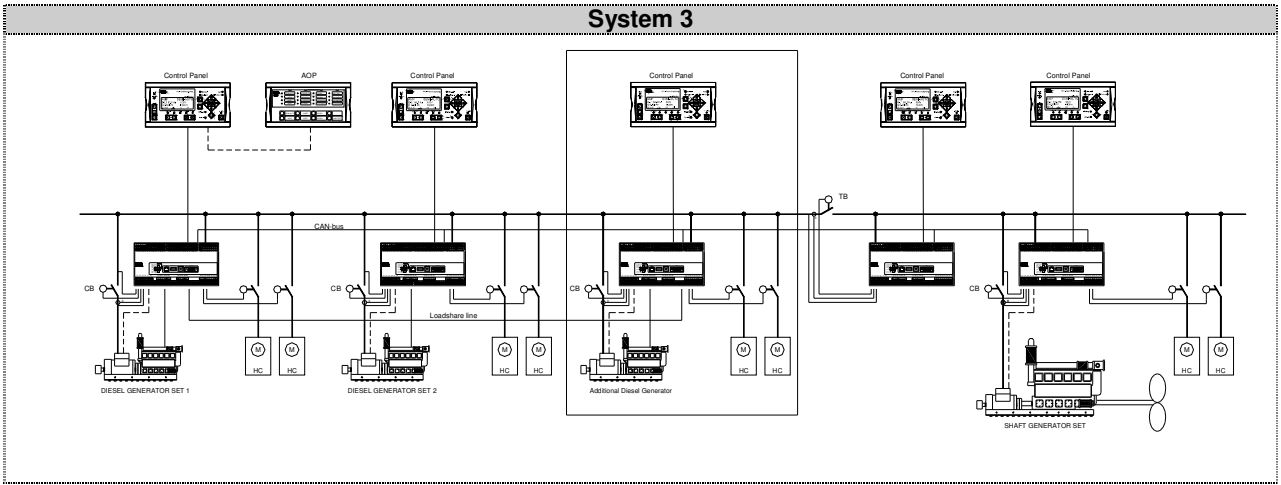
System 1



System 2



System 3



Application

The **P**PU **P**ower **M**anagement (PPM) is a standard power management system for marine applications. The system has been designed to carry out *generator control*, *supervision* and *protection* functions of up to 8 generators running in parallel. The PPM supports three main systems depending on the individual application.

The system performs PM features such as Multiple Master, load dependent start/stop, programmable start priority, heavy consumer control, blackout start sequence, supervision of a shore breaker and a bus coupler, symmetrical and asymmetrical load sharing, trip of non-essential load groups and programmable I/Os etc. The PPM system covers the requirements for most simple and medium-sized marine systems. For more complex applications, the Delomatic system can be offered.

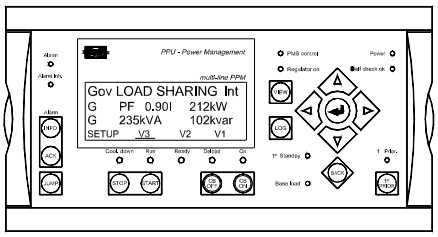
Each unit contains all necessary 3-phase measuring circuits and presents all values and alarms on the LCD display.

Besides the LCD display, the power management unit has an additional operator panel (AOP) with 8 push-buttons and 16 LEDs. The AOP has a CANbus connection to the display unit and can be placed anywhere in the switchboard (max. 500 m from display unit). Up to 5 AOPs can be connected to the CANbus line (on request). The AOP enables status information over the system and includes plant mode control. Communication to an external alarm and monitoring system can be done via Ethernet TCP/IP Modbus, Ethernet XML or RS485 Modbus.

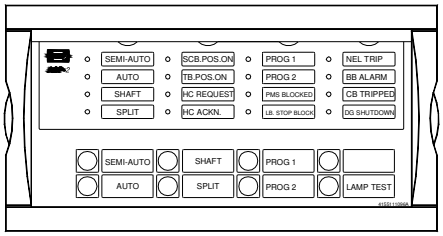
Display

The display is separate and can be mounted directly on the PPM base unit or in the switchboard via the display cable. Up to three displays can be connected to each main unit enabling the user interface to be placed at different locations (e.g. in the engine control room and on the bridge).

Diesel generator



Additional operator panel (AOP)



Power Management

The power management functions are handled in a separate 32-bit processor. As default the PM processor is placed in DG unit 1. For Multi Master systems, the PM processor can be placed in additional units as "hot stand-by" (option on request). The load dependent start/stop function can be adjusted as predicted available rated power (kW), as predicted available apparent power (KVA) or as percentage rated power (%). The start priority selection can either be handled from the PM unit for the entire system or locally via a 1st priority push-button on each display unit.

The HC control is able to be adjusted as fixed load or variable load (e.g. thrusters). The output signal can also be adjusted as either pulse signal or steady signal. If a blackout situation occurs, the operator can define the following functions:

- Start one or two diesel generators,
- automatically change plant mode to SEMI-AUTO or AUTO mode, and
- in case of short circuit to use one or no start attempts

In case of an open bus coupling switch, the system will automatically be forced into switchboard control. This will be indicated at the AOP and additionally at each display unit by a yellow PMS control LED.

Protection functions

All protection functions have definite time characteristics.

Generator protection

- Over- and undervoltage
- Over- and underfrequency
- Reverse power
- Overcurrent (2 levels)
- Fast overcurrent (< 42ms)
- High overcurrent (< 350%)
- Overload
- Current unbalance
- Voltage asymmetry
- Loss of excitation and overexcitation

Reverse power and overcurrent can also be programmed with inverse characteristic.

Busbar protection

- Over- and undervoltage
- Over- and underfrequency

Power and frequency control

The **P**PU **P**ower **M**anagement (PPM) can control speed governors/AVRs by using relay or analogue output signals. The load sharing has a separate analogue load share line. This allows placing of additional bus tie breakers anywhere in the switchboard and ensures active load sharing at open bus tie breaker positions.

The following load share functions are available:

- Active load sharing
- Reactive load sharing
- Voltage control
- Power factor control

Available options

Option	Description	Placed in	Note
D	***Voltage/var/cos φ control***		
D1	Selection between: - Constant voltage control (stand-alone) - Reactive load sharing (island paralleling with other generators)	Software option	Not with EF2
D2	- Constant voltage (stand-alone/synchronisation)	Software option	Not with EF2
E	***Analogue controller outputs***		
E1	+/-20mA for speed governor +/-20mA for AVR	Slot #4	AVR: Only when option D is chosen Not with EF functions
F	***Analogue transducer outputs***		
F1	2 x 0(4)...20mA transducer outputs	Slot #6	
EF	***Combination outputs***		
EF2	+/-20mA for speed governor 1 x 0(4)...20mA transducer output	Slot #4	Not with E1
EF3	1 x PWM (Pulse Width Modulated) output for CAT speed governor 1 x PWM (Pulse Width Modulated) output for droop +/- 20mA for speed governor or AVR	Slot #4 + slot #6	Not with E1, EF2, EF4, F1, M15, M16, M18
EF4	+/-20mA for speed governor or AVR 2 x relay outputs for speed governor or AVR	Slot #4	Not with E1, EF2 AVR: Requires D
H	***Serial communication***		
H2	Modbus RTU (RS485)	Slot #2	
J	***Cables***		
J1	Display cable with plugs, 3 m. UL94 (V1) approved		
J2	Display cable with plugs, 6 m. UL94 (V1) approved		
J7	PC USB cable 3 m		
K	***Technical documentation***		
K1	Hard copy (as standard enclosed as CD ROM)		
L	***Display gasket for IP54***		
M	***Configurable I/O extension cards***		
M15	4 x 0(4)…20mA analogue inputs	Slot #6	Not with F1, M16, M18
M16	7 x binary inputs	Slot #6	Not with F1, M15, M18
M18	4 x relay outputs	Slot #6	Not with F1, M15, M16
N	***Webarm functions***		
N4	Ethernet TCP/IP XML	Software option	
N5	Ethernet TCP/IP MODBUS	Software option	
N6	Advanced logging	Software option	
X	***Graphical display unit***		
X2	Replacement of normal display with GDU		

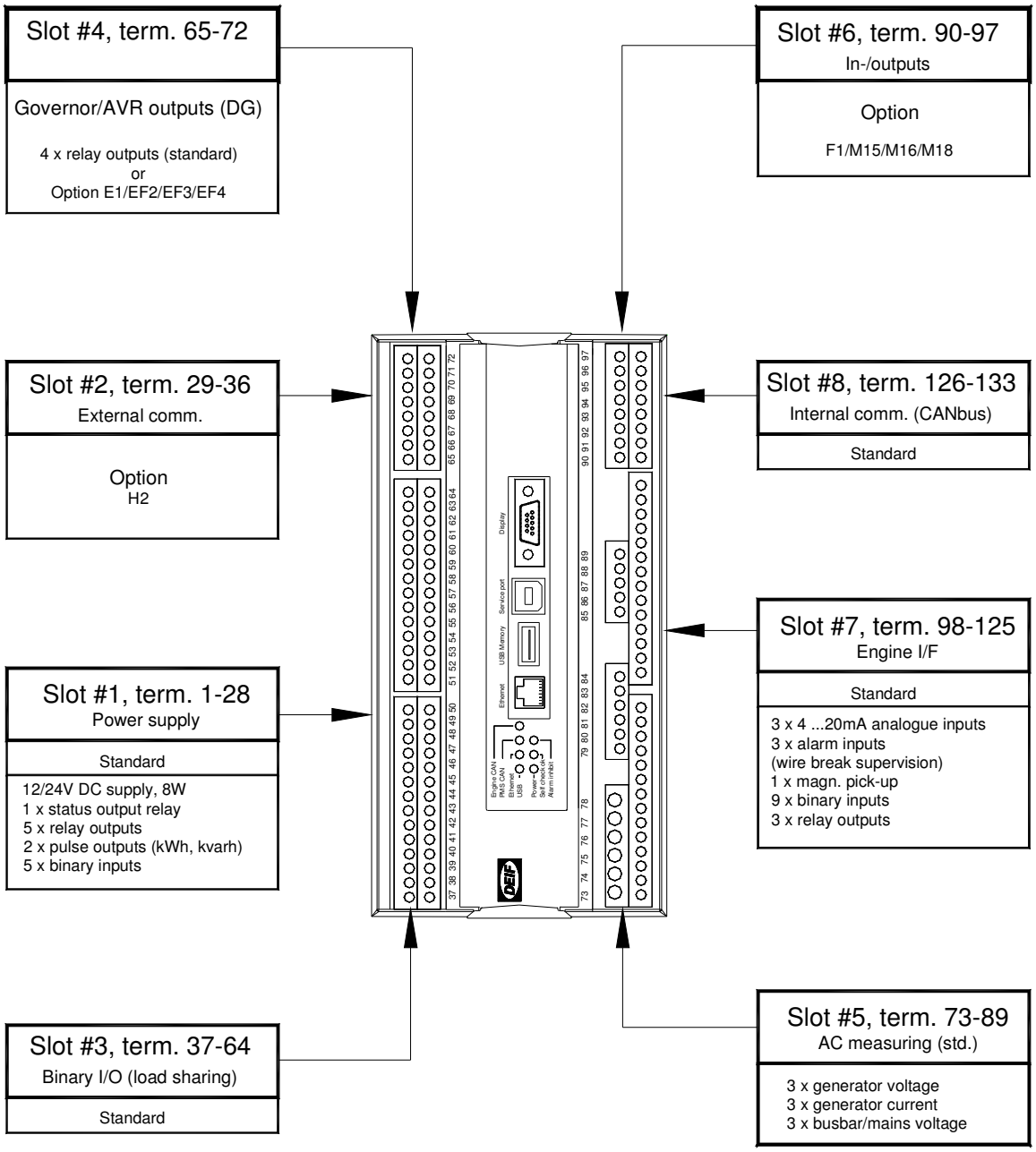
For detailed information about hardware options, please see hardware overview on page 5.

For detailed order information, please see order specifications on page 9.

Hardware overview

There can only be one hardware option in each slot. It is e.g. not possible to select option F1 and options M15, M16 and M18 at the same time because all options require a PCB in slot #6.

Besides the hardware options shown on this page it is possible to select the software options mentioned on page 4 in this data sheet.



Technical specifications

Accuracy: Class 1.0, to IEC 688

Operating temp.: -25…70°C (-13...158°F)

Climate: Class HSE, to DIN 40040

Meas. voltage: 100/110-690V AC +/-20%

Consumption: Max. 0.2VA / phase

Meas. current: -/1 or -/5A AC

Consumption: Max. 0.3VA / phase

Current overload: 4 x I_n continuously
20 x I_n , 10 sec. (max. 75A)
80 x I_n , 1 sec. (max. 300A)

Meas. frequency: 30…70Hz

Aux. supply: 8-32V DC
Max. 8W consumption

Binary inputs: Optocoupler, bi-directional
Input voltage 9-32V DC
Impedance max. 4.7kΩ

Relay outputs: 250V AC / 24V DC, 8A
(Unit status output: 1A)

Open collector outputs: Supply 12…32V DC, max. 10mA

Analogue inputs: -10…0…+10V DC
Not galvanically separated
Impedance max. 100kΩ

Mounting: DIN-rail mount or base mount

Load sharing lines: -5…0…+5V DC

Analogue outputs: 0(4)...20mA
Galvanically separated
Active output (internal supply)
Load max. 500Ω

Safety: To EN 61010-1, installation category (overvoltage category) III, 600V, pollution degree 2

Galv. separation: Between AC voltage, AC current and other I/Os: 3250V AC, 50Hz, 1 min.

Between analogue outputs: 500V DC, 1 min.

EMC/CE: To EN 50081-1/2, EN 50082-1/2 SS4631503 (PL4) and IEC 255-3

Material: All plastic materials are self-extinguishing according to UL94 (V1)

Plug connections: AC current: 4 mm^2 multi stranded

Other: 2.5 mm^2 multi stranded

Display: 9-pole Sub-D female

PC: USB A-B

Ethernet: RJ45

Protection: Unit: IP20
Display: IP52 (IP54 with gasket: Option L)
To IEC 529 and EN 60529

Approvals: The PPM is approved by the major classification societies. Contact DEIF for details

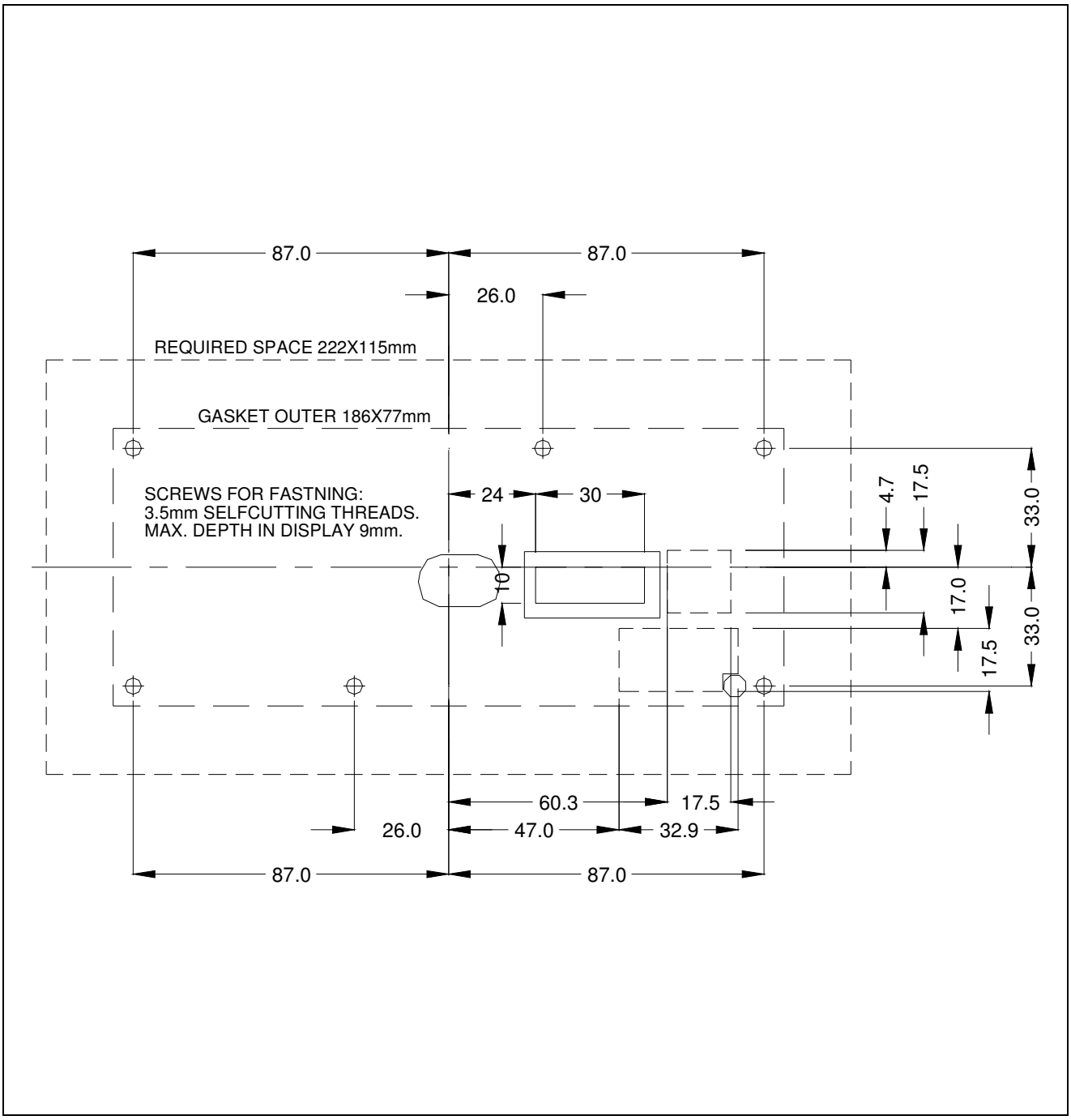
Governors: Multi-line 2 interfaces to all governors, including GAC, Barber-Colman, Woodward and Cummins

See interfacing guide at www.deif.com

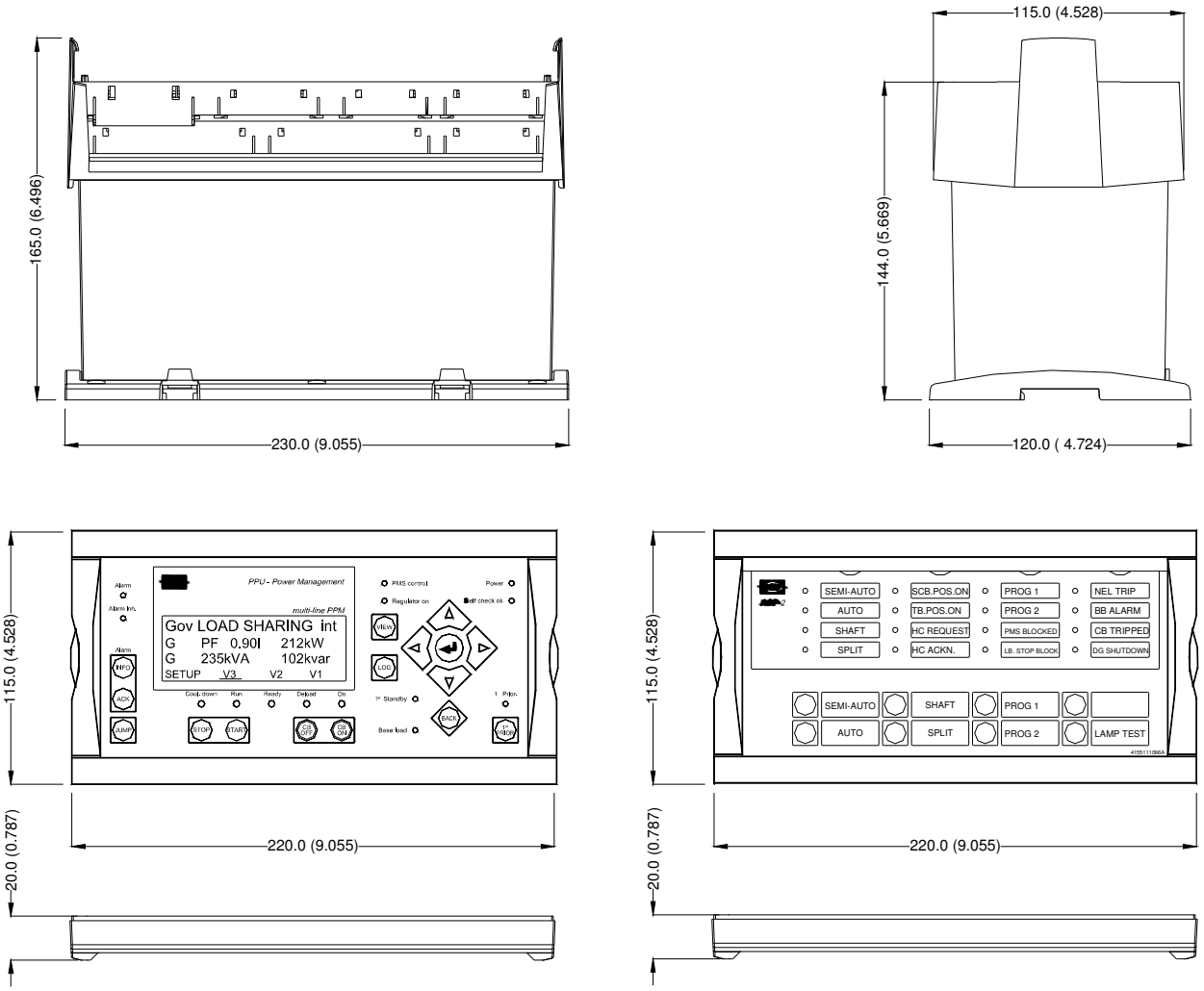
Weight:

Main unit:	1.5 kg (3.4 lbs.)
J1, cable 3 m:	0.2 kg (0.2 lbs.)
Option J2:	0.4 kg (0.4 lbs.)
Option J7:	0.2 kg (0.2 lbs.)

Panel cutout (mm)



Unit dimensions in mm (inches)



Display size: H x W x D = 115 (4.528”) x 220 (8.661”) x 20 (0.787)

Order information

The PPM system is ordered in two steps:

Step 1: System information

Please indicate your type of PMS system and the number of DGs:

	1	2	3
PMS system			

Number of DGs (2…8)	

Step 2: Unit option information

Option / Unit	D1	D2	E1	F1	EF2	EF3	EF4	H2	J1	J2	J7	K1	L	M15	M16	M18	N4	N5	N6
DGM																			
DG2																			
DG3																			
DG4																			
DG5																			
DG6																			
DG7																			
DG8																			
TB																			
SG																			

For detailed information about options, please see option list on page 4.

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

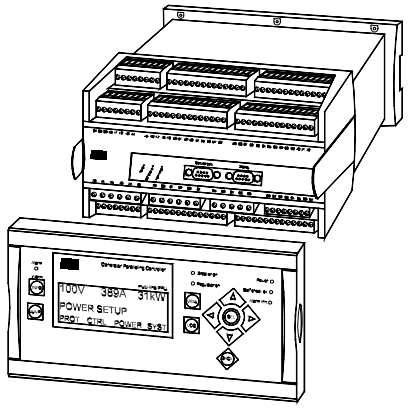
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

Specification of options

multi-line 2

4921240270B

- ***Perfect matching solutions***
- ***Pay only for what you need***
- ***Same basic unit no matter the application***
- ***Upgradeable functionality***
- ***Simplified engineering***
- ***Self-detectable plug and play modularity***



PPU

For software version 2.00.0 and later

(PPU/GPU/GPC – version 2)

Application

Standard protection functions for all units:

- 2 x overcurrent protection
- Reverse power protection

Specification of options:
Below the available options for the multi-line 2 PPU, GPU and GPC gen-set control and protection units are specified.

Please note that not all functions can be chosen for all three products. Please refer to the 'Note' column to see which functions are available for each type.

For the placement of hardware (slot #), please refer to the "Placed in" column and specific drawing of the PPU/GPU/GPC (page 4).

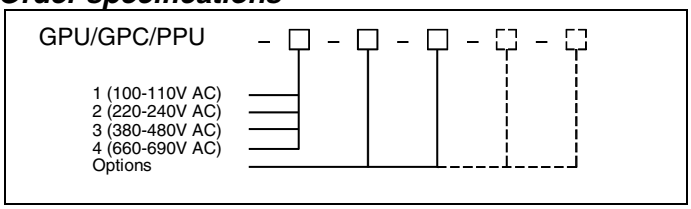
Op-tion	Description	Placed in	Note
A	**Loss of mains protection**		
A1	- Over- and undervoltage (generator and busbar/mains) - Over- and underfrequency (generator and busbar/mains) - Vector jump - Df/dt (ROCOF)	Software option	
A2	- Over- and undervoltage (generator and busbar/mains) - Over- and underfrequency (generator and busbar/mains) - Df/dt (ROCOF)	Software option	
A3	- Over- and undervoltage (generator and busbar/mains) - Over- and underfrequency (generator and busbar/mains) - Vector jump	Software option	
B	**Generator/busbar/mains protection**		
B1	- Over- and undervoltage (generator and busbar/mains) - Over- and underfrequency (generator and busbar/mains)	Software option	
C	**Generator add-on protection package**		
C1	- Over- and undervoltage (generator) - Over- and underfrequency (generator) - Overload - Fast overcurrent (<42 ms) - High overcurrent (<200%) - Current unbalance - Voltage asymmetry - Reactive power (import (excitation loss)/export (overexcitation))	Software option	
C2	- Negative sequence voltage high - Negative sequence current high	Software option	

Op-tion	Description	Placed in	Note
D	**Voltage/var/cos φ control**		
D1	Selection between: - Constant voltage control (stand-alone) - Constant reactive power control (parallel with mains) - Constant power factor control (parallel with mains) - Reactive load sharing (island paralleling with other generators)	Software option	PPU/GPC: Not with EF2 GPU: Not available
D2	- Constant voltage (stand-alone/synchronisation)	Slot #4	GPU: Only when option G2 is also chosen (same board used)
E	**Analogue controller outputs**		
E1	- +/-20 mA for speed governor - +/-20 mA for AVR	Slot #4	PPU/GPC: AVR: Only when option D is chosen Not with EF GPU: Requires G2 Not with F2
F	**Analogue transducer outputs**		
F1	- 2 x 0(4)...20 mA transducer outputs	Slot #6	PPU/GPC: Not when option EF3 is chosen
F2	- 4 x 0(4)...20 mA transducer outputs	Slot #4 + #6	PPU/GPC: Not available GPU: Not with G2
EF	**Combination outputs**		
EF2	- +/-20 mA for speed governor - 1 x 0(4)...20 mA transducer output	Slot #4	PPU/GPC: Not with E1, F2, EF3, EF4 GPU: Not available
EF3	- 1 x PWM (Pulse Width Modulated) output f. CAT speed governor - 1 x PWM (Pulse Width Modulated) output for droop - +/-20 mA for speed governor or AVR - 2 x relay outputs for speed governor or AVR	Slot #4 + #6	PPU/GPC: Not with E1, F1, F2, EF2, EF4 AVR: Requires D GPU: Not available
EF4	- +/-20 mA for speed governor or AVR - 2 x relay outputs for speed governor or AVR	Slot #4	PPU/GPC: Not with E1, F2, EF2, EF3 AVR: Requires D GPU: Not available
G	**Start/stop/synchronising control relay outputs**		
G1	- 2 x relay outputs for start and stop of other generators (programmable)	GPU: Slot #8	PPU/GPC: Standard function GPU: Not with H4, M13, M15
G2	- Synchronisation with relay speed governor outputs (GPU only)	GPU: Slot #4	PPU/GPC: Standard function GPU: Not with F2
H	**Serial communication**		
H1	- Can-open	Slot #2	Not with H2, H3, N1
H2	- Mod-bus RTU (RS485)	Slot #2	Not with H1, H3
H3	- Profi-bus DP (RS485)	Slot #2	Not with H1, H2, N1
H4	- CAT CCM (RS232)	Slot #8	Only limited engine data can be displayed. All data can be read via H2
J	**Cables**		
J1	- Display cable with plugs, 3 m. UL94 (V1) approved		
J2	- Display cable with plugs, 6 m. UL94 (V1) approved		
J3	- PC cable for utility software (RS232). UL94 (V1) approved		
K	**Designers reference handbook**		
K1	- Hard copy (as standard enclosed as a CD-ROM)		
L	**Display gasket for IP54**		
M	**Configurable engine control cards**		
M1 See note	Engine control card with Pt100 sensor inputs - 4 x 4…20 mA inputs - 2 x Pt100 inputs - 1 x tacho input (magnetic pick-up) - 5 x binary inputs - 3 x relay outputs	Slot #7	GPU: Not with G2
M2 See note	Engine control card with VDO sensor inputs - 3 x 4…20 mA inputs - 3 x VDO (resistor) inputs - 1 x tacho input (magnetic pick-up) - 9 x binary inputs - 3 x relay outputs	Slot #7	GPU: Not with G2

Option	Description	Placed in	Note	
M	**Configurable I/O extension cards**			
M13	- 7 x binary inputs	Slot #8		Not with H4, M14, M15
M14	- 4 x relay outputs	Slot #8		Not with H4, M13, M15
M15	- 4 x 0(4)…20 mA analogue inputs	Slot #8		Not with H4, M13, M14
N	**Ethernet TCP/IP communication**			
N1	- Integrated WebServer with web pages for plant presentation Example: See http://ml2.deif.com			Requires H2
O	**Water turbine control**			
O1	- Water turbine control, parallel with mains generator	Software option	PPU/GPC: GPU:	Requires M15 Not available

NOTE:
If option M1/M2, engine start/stop control, is used in marine applications, separate approved engine protection (overspeed, water temperature and oil pressure) is needed.
Only the PPU and GPU are marine approved.

Order specifications



Ethernet

Option N1:	WebServer

Slot #4, term. 65-72
Governor/AVR outputs

PPU/GPC: **GPU:**	4 x relay as standard Option G2/D2
Option E1:	2 x +/- 20 mA out, governor + AVR
Option F2:	2 x 0(4)…20 mA out, transducer
Option EF2:	1 x +/- 20 mA out, governor 1 x 0(4)…20 mA out, transducer
Option EF3:	1 x PWM governor out 1 x +/- 20 mA out, AVR 2 x relay out
Option EF4:	1 x +/- 20 mA out, AVR 2 x relay out

Slot #6, term. 90-97
In-/outputs

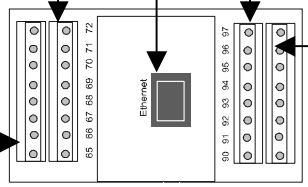
Option F1/F2:	2 x 0(4)…20 mA out, transducer
Option EF3:	PWM droop signal

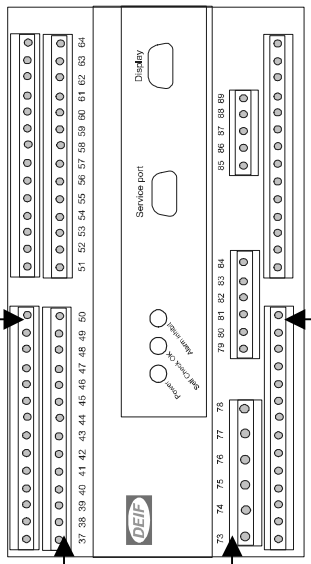
Slot #8, term. 126-133
Communication/outputs

Option H4:	CAT CCM communication (RS232)
Option M13:	7 x binary inputs
Option M14:	4 x relay outputs
Option M15:	4 x 4...20 mA

Slot #2, term. 29-36
Communication

Option H1:	Can-open
Option H2:	Mod-bus RTU (RS485)
Option H3:	Profi-bus DP (RS485)





Slot #1, term. 1-28
Power supply (std. board)

24 VDC supply, 8W
1 x status output relay
5 x relay outputs
2 x pulse outputs (kWh, kvarh)
5 x binary inputs

Slot #7, term. 98-125
Engine I/F

Option M1:	4 x 4…20 mA in 2 x Pt100 in 1 x magn. pick-up in 5 x binary in 3 x relay out
Option M2:	3 x 4…20 mA in 3 x VDO in 1 x magn. pick-up in 9 x binary in 3 x relay out

Slot #3, term. 37-64
Load sharing (std. in PPU/GPC)

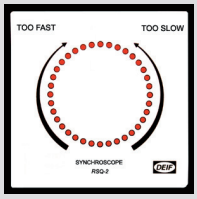
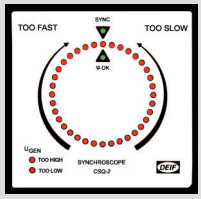
Option D2:	Constant voltage, synchronisation/stand-alone (GPU only and only with option G2)
Option G2:	Synchronisation with relay outputs (GPU only)

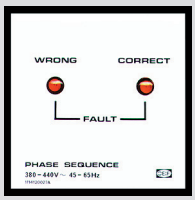
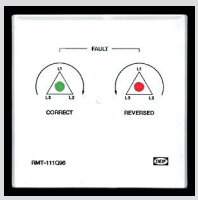
Slot #5, term. 73-89
AC measuring (std. board)

3 x generator voltage
3 x generator current
3 x busbar/mains voltage

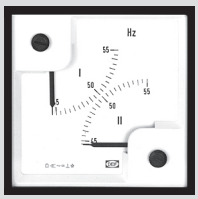
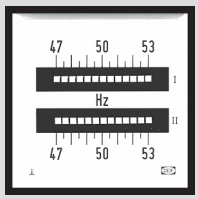
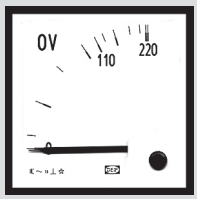
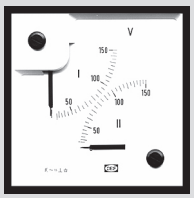
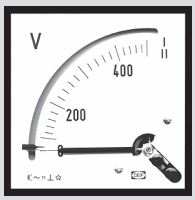
Due to our continuous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

	LED Synchroscopes, RSQ-3	Check Synchronising Relays, CSQ-3	
			
Main function:	Electronic synchroscope.	Combined check synchronising relay and synchroscope.	
Size (mm):	Q96	Q96	
Customised scale:	✓	✓	
Exchangeable scale:	-	-	
Protection IP52:	✓	✓	
Protection IP54 on request:	-	-	
Mains voltage:	100…127V AC (115V AC) 220…240V AC (230V AC) 380…415V AC (400V AC) 440...480V AC (450V AC)	100…127V AC (115V AC) 220…240V AC (230V AC) 380…415V AC (400V AC) 440...480V AC (450V AC)	
Frequency range:	40…70Hz	40…70Hz	
Contact rating:	-	250V-8A-2000VA (AC) 24V-8A-200W (DC)	
Approved by classification societies:	-	✓	
UL approved:	✓	✓	

	Phase Sequence Meters, PHQ	Phase Sequence Relays, RMT-111Q96	Lamp Synchroscopes, LSQ
			
Main function:	PHQ is a solid state phase sequence meter provided with 2 glow discharge lamps for indication of correct or incorrect connection of the phases and phase breakage.	RMT-111Q96 is a phase sequence relay with contacts and is applied for check of the phase sequence. Provided with long-life LED indicators.	Lamp synchroscope for indication of phase sequence accordance between generator and bus-bar prior to connection.
Size (mm):	Q96	Q96 (flush mounting)	Q96, Q144
Customisable scale:	✓	✓	✓
Exchangeable scale:	-	-	-
Protection IP52:	✓	✓	✓
Protection IP54 on request:	✓	✓	-
Mains voltage:	380...440V AC	230V AC ±20% Max. 3W 400V AC ±20% Max. 3W	100-110 / 220-230-240 / 380-415-440V AC ±20%
Frequency range:	45…65Hz	47…63Hz	40…70Hz
Relay output:	-	Changeover switch	-
Approved by classification societies:	-	✓	-

DEIF A/S, Frisenborgvej 33, DK-7800 Skive, Tel.: +45 9614 9614, Fax: +45 9614 9615, E-mail: deif@deif.com, URL: www.deif.com

	Double Frequency Meters, 2FQ	Double Frequency Meters, 2FTQ	Zero Voltage Meters, NEQ
			
Main function:	Double pointer frequency meter, based on 2 moving coil instruments mounted diagonally. Accurate and linear read-out.	Double reed frequency meter with 2 rows of reeds.	Zero voltage meter for indication of voltage match between generator and bus-bar prior to connection.
Size (mm):	Q96	Q96, Q144	Q72, Q96
Pointer deflection:	90°	-	90°
Customised scale:	✓	✓	✓
Exchangeable scale:	-	✓	-
Protection IP52:	✓	✓	✓
Protection IP54 on request:	-	✓	-
Accuracy class:	0.5 (1.0 at 45…65Hz)	0.5	1.5 and 3.0
Scale / measuring range:	45…55 / 55…65 / 45…65Hz	47…53 / 45…55 / 57…63 / 55…65Hz	110-220 / 220-440 / 400-800V AC (1.5…4VA)
Measuring voltage:	100-220 / 230-440V AC ±15%	100-110-220-230-240-380-400-415--440V AC ±15%	-
	Double Voltmeters, 2EVQ	**Double Voltmeters, 2EQ**	
			
Main function:	Double voltmeter based on 2 moving iron systems mounted diagonally.	Double voltmeter based on 2 inde-pendent moving iron systems with joint scale.	
Size (mm):	Q96	Q96	
Pointer deflection:	90°	90°	
Customised scale:	✓	✓	
Exchangeable scale:	-	-	
Protection IP52:	✓	✓	
Protection IP54 on request:	-	-	
Accuracy class:	1.5	1.5	
Scale / measuring range:	0…150 / 300 / 600V	0…150 / 250 / 500V	
Measuring frequency:	50 or 60Hz	50 or 60Hz	

DEIF A/S, Frisenborgvej 33, DK-7800 Skive, Tel.: +45 9614 9614, Fax: +45 9614 9615, E-mail: deif@deif.com, URL: www.deif.com

	Electronic Potentiometers, EPQ-96		
Main function:	Maintenance-free electronic potentiometer with manual / auto switch for control of AVR's and speed governors.		
Size (mm):	Q96		
Output (2 ranges):	0...±5V or 0…±10V (at output signals without load)		
Ripple:	Max. 5mV RMS		
Resolution:	5m DC (12-bit D/A-converter)		
Integrating time (2 ranges):	2.5…25 s or 12.5…125 s		
Response time:	< 0.1 s		
Reproduceability:	±2%		
Accuracy of adjustment:	±20%		
Supply voltage:	24V DC ±25%		
Protection:	IP52		

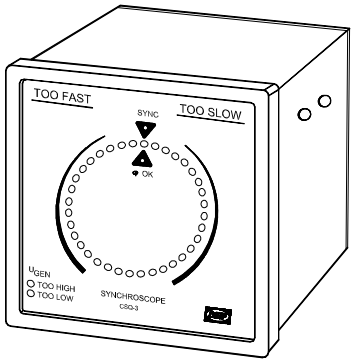
DEIF A/S, Frisenborgvej 33, DK-7800 Skive, Tel.: +45 9614 9614, Fax: +45 9614 9615, E-mail: deif@deif.com, URL: www.deif.com

Check Synchronising Relay

Type CSQ-3

4921240263C

- ***Multifunction precision LED synchronoscope***
- ***Easy push-button programming of all set points***
- ***Very high user safety***
- ***High immunity to harmonic distortion***
- ***Dead-bus functionality***
- ***Version for marine applications***



CSQ-3 CE

Application
The CSQ-3 is a microprocessor based synchronising unit. It can be used in any kind of installation where manual or semi-automatic synchronising is required.

Versions
Two versions optimised for land or marine applications exist.

Measuring principle
The unit measures the busbar (U_{BUSBAR}) and generator (U_{GEN}) voltages and frequencies and compares these, plus compares the phase angle relationship.

Settings
The unit is equipped with several user settings, hidden under the front foil. This placement gives a high degree of user safety because no hazardous voltages are present, i.e. the unit can be programmed while running without the risk of electric shock or damage to installations.

Phase window, $\Delta\varphi$
Here the phase window for synchronisation is chosen. It can be set both symmetrically and asymmetrically.

Voltage difference, ΔU
Here the allowed voltage difference between U_{GEN} and U_{BUSBAR} is set. It can be set both symmetrically and asymmetrically. Measurement is done relatively to U_{BUSBAR}

Length of SYNC pulse, T_R
Determines the length of the SYNC pulse (SYNC relay activating time). This value must be matched to the time characteristic of the circuit breaker.

SYNC relay delay, T_d
Determines the time U_{GEN} and U_{BUSBAR} have to be within the phase window before the SYNC relay is activated. This parameter can only be adjusted when $T_R = \infty$ is selected.

Dead-bus function/offset voltage, T_R
The allowed noise level voltage on U_{BUSBAR} can be set to determine dead-bus mode. It is measured relatively to U_{GEN}.

Factory settings
All the above mentioned settings are preset from the factory. At any time these factory defaults can be re-stored.

Sealing of settings
If necessary the settings can be sealed when the wanted functionality is obtained. This is very easy because of the placement under the front foil/cover.

Operation
The rotation of the red LED circle indicates the frequency difference. The faster the rotation, the larger the frequency difference. One rotation per second equals 1Hz difference.

The position of the lit red LED indicates the phase difference between U_{GEN} and U_{BUSBAR}. The circle represents a degree-scale from 0-360 degrees with zero degree at the 12 o'clock position. With 36 LEDs the resolution on the reading is 10 degrees.

If the frequency difference between U_{GEN} and U_{BUSBAR} is higher than 3Hz, the rotation of the LED circle stops. If it stops with a lit red LED at "TOO SLOW", the frequency of the U_{GEN} is lower than U_{BUSBAR}. If it stops with a lit red LED at "TOO FAST", the frequency of the U_{GEN} is higher than U_{BUSBAR}.

When the phase angle between U_{GEN} and U_{BUSBAR} is within the preset $\Delta\varphi$ window, then the yellow LED "$\Delta\varphi$ OK" will be lit.

If the voltage difference between U_{GEN} and U_{BUSBAR} is outside the preset ΔU range, one of the two red LEDs will be lit and the SYNC relay cannot be activated. If the voltage on U_{GEN} is higher than U_{BUSBAR}, LED "U_{GEN} TOO HIGH" will be lit. If the voltage on U_{GEN} is lower than U_{BUSBAR}, LED "U_{GEN} TOO LOW" will be lit.
If both the "U_{GEN} TOO LOW" and "U_{GEN} TOO HIGH" LEDs are lit simultaneously, it indicates an overvoltage error at the input.

Normal synchronising
The unit automatically calculates the synchronising parameters to check if there is the required space for the synchronising signal inside the preset phase window. These calculations compare the frequency difference with T_R and the size of the phase window. When T_R is set to ∞, T_d can be set by the user and is included in the calculations.
If the $\Delta\varphi$ window is set symmetrically, both underfrequency synchronising and overfrequency synchronising is possible.

Under- or overfrequency synchronising
When the $\Delta\varphi$ window is set asymmetrically, the following functionality is possible:

If the $\Delta\varphi$ window is set asymmetrically with a lower positive than negative $\Delta\varphi$ value, only synchronising with the generator input at higher frequency than the busbar input is possible (positive slip frequency).

If the $\Delta\varphi$ window is set asymmetrically with a higher positive than negative $\Delta\varphi$ value, only synchronising with the generator input at lower frequency than the busbar input is possible (negative slip frequency).

Dead-bus function
When activated, the dead-bus function enables the SYNC relay to be activated, when no busbar voltage is present (i.e. during a power failure). When the generator voltage is within 80% of nominal level and the busbar voltage is under the preset busbar offset level, the SYNC relay will be activated, regardless of all other parameters.
Therefore, be careful when using this feature!

Technical specifications

Accuracy: ±2 electrical degrees

Resolution: 10 electrical degrees

Max. freq. difference: No limit

Frequency range: 40...70Hz (supply)

SYNC output: 1 SPST-NO-contact

Relay contact ratings: (Gold plate silver alloy)
AC1: 8A, 250V AC
DC1: 8A, 24V DC
AC15: 3A, 250V AC
DC13: 3A, 24V DC

Mechanical life: 2×10^7

Electrical life: 1×10^5 (nominal value)

Optocoupler output: (Only on marine version)
System status off = failure
2 wires AWG 20 (red/black)
30 mm length
Max. 40V, 10mA

Temperature: -25...70°C (operating)

Temperature drift: Set points:
Max. ±0.2% of full scale per 10°C

Shock test: 15g – 6 times – 3 directions
50g/6ms
22g/20ms

Galvanic separation: Between inputs, output and ground:
3750V - 50Hz - 1 min

Input range (U_N):
100...127V AC (115V AC) ±20%
220...240V AC (230V AC) ±20%
380...415V AC (400V AC) ±20%
440...480V AC (450V AC) +20%/-10%
(Above 450V AC: +10% only)

Busbar input: Load: 2kΩ/V

Generator input: (Max. 2VA at nominal voltage)
Supply for the unit

Max. input voltage: 1.2 x U_N, continuously
Above 450V: 1.1 x U_N, continuously
2 x U_N, for 10 sec.

Climate: HSE, to DIN 40040

EMC: CE marked according to EN 50081-1/2, EN 50082-1/2 and IEC 255-3

Safety: To EN 61010-1. Installation cat. III, 600V. Pollution degree 2

Connections: Max. 2.5 mm² (single-stranded)
Max. 1.5 mm² (multi-stranded)

Materials: All plastic parts are self-extinguishing to UL94 (V0)

Protection: Front: IP52. Terminals: IP20, to IEC 529 and EN 60529

Type approval: For current approvals see www.deif.com or contact DEIF A/S

UL approval: UL508, E230690

Settings

Setting of		Range
Δφ	Phase difference	±5...20° in 1° step or ±10...40° in 2° step
ΔU	Voltage difference	±1...10% in 1% step
T_R	Length of SYNC pulse	0...1 sec. in 0.1 sec. step or ∞
T_d	SYNC relay delay	0...1 sec. in 0.1 sec. step
U_{OFFSET}	Dead-bus offset voltage	Off or 4 levels of noise suppression

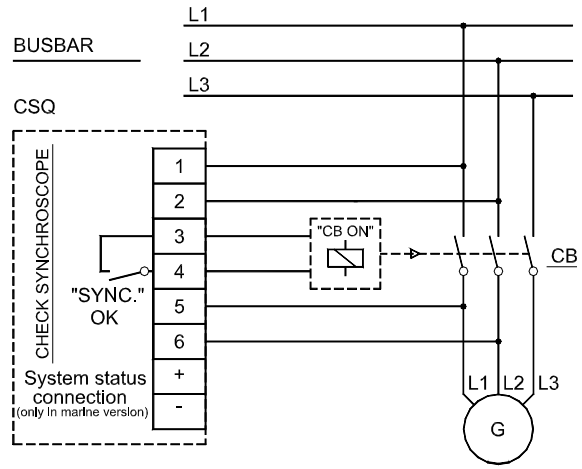
Indication

LEDs	Light
SYNC	Green, when the SYNC relay is activated
Δφ OK	Yellow, when inside the phase window
TOO FAST	Red LED stopped. Frequency difference too high. GEN too high
TOO SLOW	Red LED stopped. Frequency difference too high. GEN too low
$U_{G\ TOO\ LOW}$	Red, when outside the ΔU level
$U_{G\ TOO\ HIGH}$	Red, when outside the ΔU level
$U_{G\ TOO\ LOW}$ $U_{G\ TOO\ HIGH}$	When both are red simultaneously, there is an overvoltage error on the input

Once the relay has been mounted and adjusted, the front cover may be sealed, preventing unwanted change of the setting.

For more information about the product a User's manual (document no. 4189340263) is available on www.deif.com.

Connections



Dimensions: 96 x 96 x 76 mm Weight: Approx 0.40 kg

Order specifications

Type - Input voltage - Version			
Example:	CSQ-3	230V AC	Land
	CSQ-3	230V AC	Marine

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

Double frequency meters and double voltmeters

Types 2FQ, 2FTQ, 2EVQ, 2EQ

4921240005E

2EVQ

2FTQ

2FQ

2EQ

- ***Robust and thoroughly tested construction***
- ***DIN size design***
- ***High accuracy***
- ***High immunity to 3rd harmonics***

CE

Available types

Type	Double frequency meters		Double voltmeters	
	Pointer frequency	Reed frequency	Double scale	Joint scale
96 x 96 mm 144 x 144 mm	2FQ96-x	2FTQ96-x 2FTQ144-x	2EVQ96-x	2EQ96/2

Construction

2FQ Double pointer frequency meter, consisting of 2 moving coil instruments mounted diagonally in one housing. A compact instrument with accurate and linear read-out.

2FTQ Double reed frequency meter with 2 rows of reeds mounted in one housing. Exchangeable scale.

2EVQ Double voltmeter consisting of 2 moving iron systems mounted diagonally in one housing.

2EQ Double voltmeter consisting of 2 mutually independent moving iron systems with a joint scale. Point of rotation of pointer for both systems at lower right corner.

Technical specifications

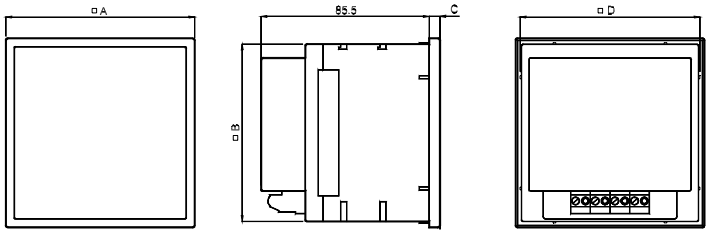
Type	2FQ	2FTQ	2EVQ	2EQ
Accuracy[1]	Class 0.5 (Class 1.0[2])	Class 0.5	Class 1.5	
Scale/meas. range	45...55/55...65/45...65Hz	47..53/45..55/57..63/55..65Hz	0...150/300/600V	0...150/250/500V
Measuring voltage	100-220V AC ±15% or 230-440V AC ±15%	100-110-220-230-240-380-400-415-440V AC ±15%	Frequency: 50 or 60Hz	
Consumption	3...6mA[3]	10...15mA[3]	1.5...4VA[3]	5VA[3]
Temperature	-10...55°C (nominal) -25...60°C (operating) -25...65°C (storage)			
Shock test	15g – 6 times – 3 directions, 50g/6ms, 22g/20ms			15g – 6 times – 3 directions
EMC	To EN 50081-1/2 and EN 50082-1/2 CE marked for residential, commercial and light industry plus industrial environment			
Protection	IP52	IP52[4]	IP52	IP52

[1] (-10..15..30..55°C) to EN 60051 and IEC 51.
[2] 2FQ..: Measuring range 45..65Hz
[3] Per system
[4] IP54 from front with gasket.

Further technical specifications: See data sheet No. 4921210012.

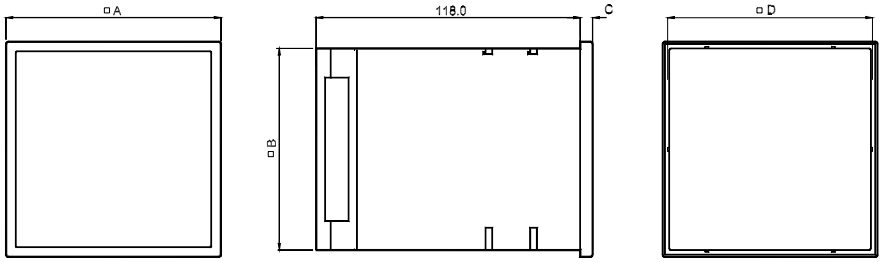
Dimensions

All dimensions in mm

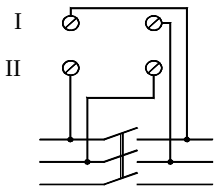


2FQ/2FTQ/2EVQ 2FTQ and 2EVQ: Connecting screw is positioned under the cover

All dimensions in mm



Connections



2EQ Connecting screw is positioned under the cover

Generator Mains

Type	A (mm)	B (mm)	C (mm)	D (mm)	Depth behind panel	Weight (approx. kg)
2FQ96-x	96 x 96	90 x 90	5.5	92 x 92 +0.8	85.5 mm	0.310
2EQ96/2	96 x 96	91 x 91	5.5	92 x 92 +0.8	118 mm	0.400
2FTQ96-x/2EVQ96-x 2FTQ144-x	96 x 96 144 x 144	90 x 90 136 x 136	5.5 8.0	92 x 92 +0.8 138 x 138 +1.0	63 mm 63 mm	0.440 / 0.260 0.780

Order specifications

Type	Scale/measuring range	Measuring voltage

Due to our continous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

Electronic potentiometers

Type EP-Q96

4921240020C

- *Replace normal motor potentiometers*
- *Setting of integrating time (like variable gearboxes)*
- *Adjustment of output signal*
- *Offset adjustment*
- *Manual/auto switch*
- *Flush mounting*
- *Control of electronic speed governors*

CE

Application/function

The EP-Q96 is an electronic unit to replace normal motor potentiometers. It contains no moveable parts and is thus maintenance-free. The EP-Q96 is CE marked for residential, commercial and light industry plus industrial environment.

The EP-Q96 converts the relay output of a PI step controller to a control voltage for the electronic speed governor. Due to the digital construction offset drift during manual load sharing between the diesel generators is avoided. In case of supply voltage drop-out, the potentiometer is automatically reset after reconnection of the supply voltage. The signal from the electronic potentiometer is shunted internally by means of a 500Ω potentiometer, resulting in the output signals shown below. Switch on the front for change of mode of operation:

Automatic: The speed is controlled by signals fed via electrical switches, e.g. by the DEIF diesel generator controller type DGC-1T and/or a DEIF synchronising relay type FAS.

Manual: The speed in controlled upwards/downwards by activating the 2 push-buttons marked "INCR." and "DECR." respectively.

Potentiometer adjustments

Integrating time: To be set within the range: 2.5...25 s (jumper set to "x1") or 12.5...125 s (jumper set to "x5") - like variable gearboxes.

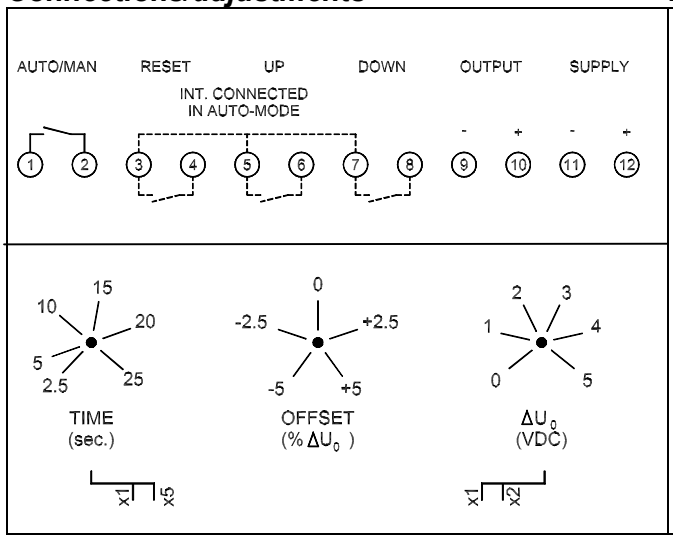
Output: To be set within the range: 0...±5V DC (jumper set to "x1") or 0...±10V DC (jumper set to "x2").

Offset: -5...0...+5% of ΔU_{out}, used to change the point where the control loop starts and to which the unit returns after reset - needed to operate together with some types of speed governors.

Technical specifications

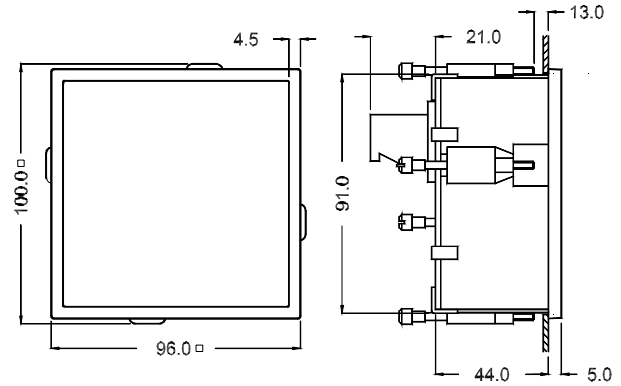
Accuracy of adjustment	±20%
Output (2 ranges)	0...±5V or 0...±10V (without load)
Offset adjustment	±5% of ΔU_{out}
Ripple	Max. 5mV RMS
Resolution	5mV DC (12-bit D/A-converter)
Integrating time (2 ranges)	2.5...25 s or 12.5...125 s (0…±100% output)
Response time	<0.1 s
Supply voltage	24V DC -25/+30%
Temperature	-10...55°C (nominal), -25...70°C (operating), -40...70°C (storage)
Galvanic separation	Between supply voltage and remaining circuits: 2kV - 50Hz - 1 min. None between input/output
Climate:	Class HSE, to DIN 40040
EMC	To EN 50081-1/2 and EN 50082-1/2
Materials	Self-extinguishing plastic (polycarbonate), to UL94 (V0)
Terminals	Max. 2.5 mm^2, insulated screw terminals
Protection	IP52 (panel front), IP20 (panel rear). To IEC 529 and EN 60529

Connections/adjustments



Dimensions

All dimensions in mm



EP-Q96 Weight: approx. 0.300 kg

Order specifications

	EP-Q96	**24V DC**

Due to our continous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

Lamp synchroscopes

Type LSQ

4921240073D

- ***For indication of phase and voltage accordance***
- ***Robust, 3 lamp synchroscope***
- ***DIN standard sizes: Q96 and Q144***

Available types

Type	LSQ96	LSQ144
Size	96 x 96 mm	144 x 144 mm

Application/function

The lamp synchroscope is applied for indication of phase and voltage accordance between generator and busbar. The LSQ is CE marked for residential, commercial and light industry plus industrial environment.

The synchroscope is equipped with 3 LEDs and is housed in a DIN standard case.

The LEDs are lit in turn if all phase voltages are present. When the phases and voltages of the generator are in accordance with those of the bus bar, the top LED is switched off, while the two others are lit with half intensity.

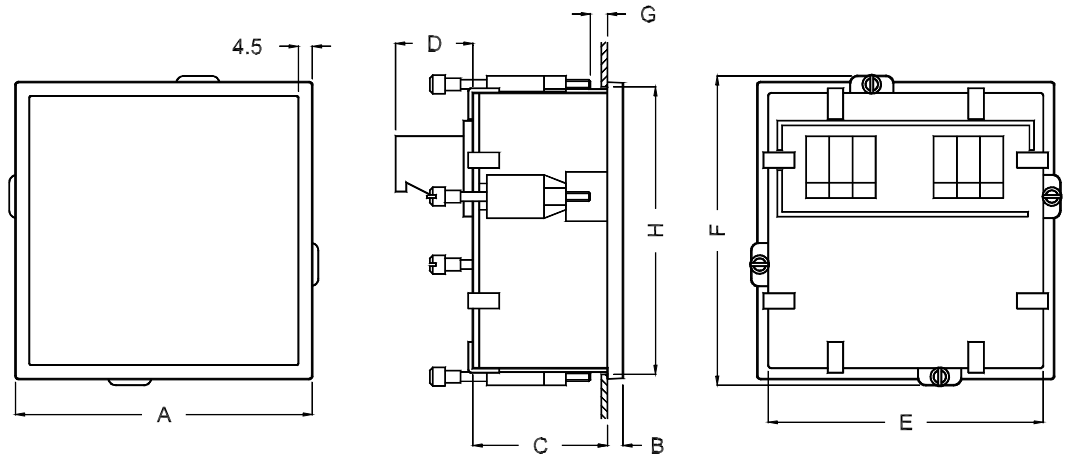
Technical specifications

Measuring voltage:	100-110V AC, 220-230-240V AC, 380-415-440V AC ±20%
Frequency range:	40...70Hz
Temperature:	-10...55°C (nominal) -25...60°C (operating) -25...65°C (storage)
Shock test:	15g – 6 times – 3 directions, 50g/6ms, 22g/20ms
Measuring current:	0...4mA per phase between V_{GEN} and V_{BB}
Galvanic separation:	None
EMC:	To EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4) and IEC 255-4 (class 3)
Materials:	All plastic materials are self-extinguishing to UL94 (V0)
Connections:	Max. 2.5 mm^2 (multi-stranded). Max. 4 mm^2 (single-stranded)
Protection:	Front: IP52, terminals: IP20, to EN 60529 and IEC 529

Connections

Dimensions

All dimensions in mm



LSQ

Type	A	B	C	D	E	F	G	H	Weight (kg)
LSQ96	96 x 96	5.5	44	21.5	91 x 91	103	12	92 x 92 +0.8	Approx. 0.300
LSQ144	144 x 144	8.0	46	20.5	137 x 137	150	15	138 x 138+1.8	Approx. 0.550

Order specifications

	Type	Measuring voltage
Example:	LSQ96	380-415-440V AC

Due to our continous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

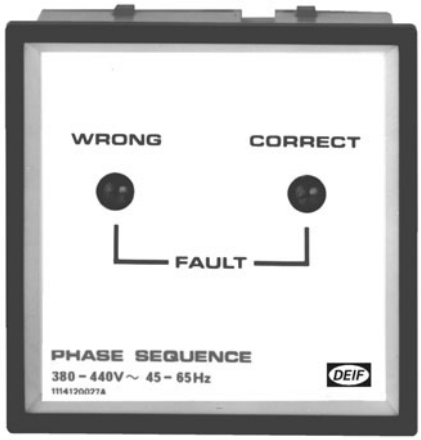
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

Phase sequence indicators

Type PHQ

4921240014D



- ***Continuous operation***
- ***Clear indification of incorrect connection***
- ***Clear indication of phase breakage***
- ***Q96 housing***

Construction

PHQ96 is a solid state phase sequence meter provided with 2 glow discharge lamps for indication of correct and incorrect connection of the phases plus phase breakage.

The meter is CE classified for residential, commercial and light industry plus industrial environment, and is housed in a standard housing, 96 x 96 mm, to DIN 43700.

Indication

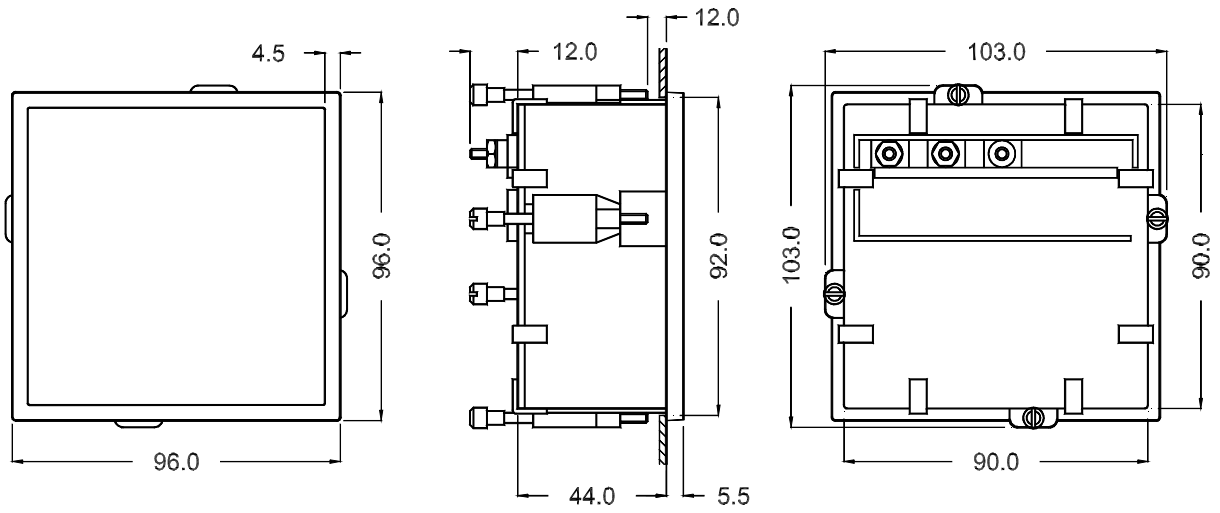
Lamp marked "CORRECT" lit:	On correct connection of the phases
Lamp marked "WRONG" lit:	On wrong connection of the phases
Both lamps lit:	On phase breakage

Technical specifications

Measuring voltage:	380-440V AC ±20%.
Frequency range:	45...65Hz.
Temperature:	-10...55°C (nominal), -25...60°C (operating), -25...65°C (storage).
Climate:	Class HUE, to DIN 40040.
EMC:	To EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4) and IEC 255-22-1 (class 3).
Materials:	Self-extinguishing plastic material, to UL94 (V0).
Connections:	3 terminals on the rear, marked "R" - "S" - "T".
Protection:	IP52 from front terminals IP00, to IEC 529 and EN 60529. IP54 from front on request.

Dimensions

All dimensions in mm



Weight: approx. 0.200 kg
PHQ96

Order specifications

Type

Due to our continous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

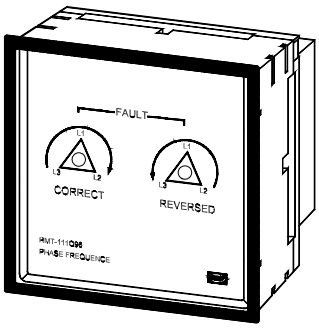
Type RMT-111Q96

Phase sequence relays

Generator controls

4921240131F

- ***With changeover switch***
- ***Clear indication of incorrect connection***
- ***Clear indication of phase breakage***
- ***Long-life LED indicators***
- ***Continuous operation***
- ***Q96 housing for flush mounting***



RMT-111Q96 CE

Application

The phase sequence relay with relay contacts type RMT-111Q96 is applied for check of the phase sequence of a power plant.

The 400V AC version of the RMT-111Q96 is type approved by GL, LR and DNV.

A check of the phase sequence is especially required when connecting equipment to a new voltage source, e.g. when changing from the mains supply of a vessel to the mains at a harbour.

The indicator may furthermore be applied for alarm indication on phase breakage.

The RMT-111Q96 is equipped with 2 LEDs on the front for indication of the phase condition.

Measuring principle

The RMT-111Q96 is connected to all 3 phases of a 3 phase system and registrates the direction of the phase rotation.

If the phase sequence of the supervised power source is correct (L1 - L2 - L3), the LED marked “CORRECT” is lit, and the relay is energised.

If the phase sequence of the supervised power source is incorrect, i.e. the phase sequence is reversed (L1 - L3 - L2), the LED marked “REVERSED” is lit, and the relay is de-energised.

Should a phase breakage occur, both LEDs will be lit for clear indication of the fault condition, and the relay is de-energised.

Relay contacts

The RMT-111Q96 is provided with a changeover switch:

Terminals 1-2 closed:	Shore connection OK (relay energised)
Terminals 2-3 closed.	Shore connection not OK (relay de-energised)

Technical specifications

Meas. voltage:	230V AC ±20% or 400V AC ±20%
Consumption:	Max. 3W.
Frequency range:	47…63Hz.
Relay output:	Changeover switch.
Contact ratings:	250V-6A-1500VA (AC) 24V - 6A – 150W (DC)
Contact voltage:	Max. 250V (AC).

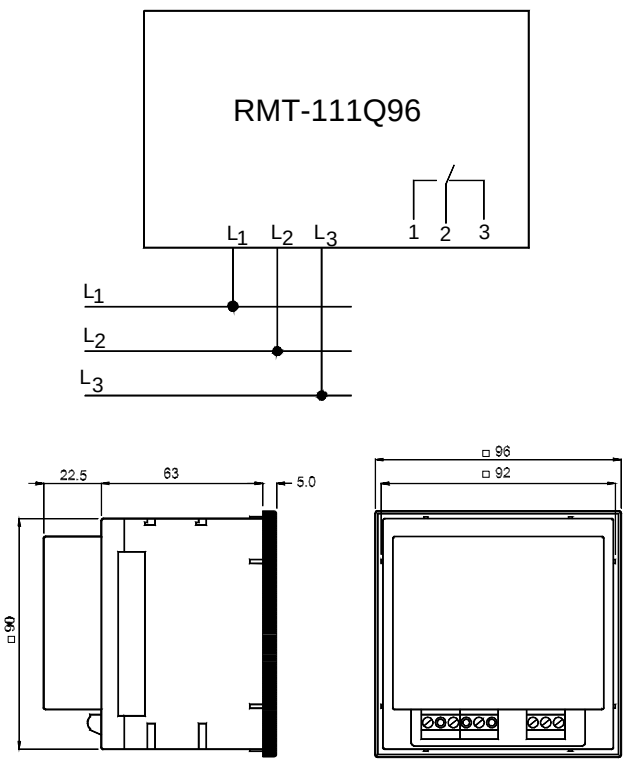
General technical specifications

Temperature:	-10...55°C (nominal) -25...60°C (operating) -25...65°C (storage)
Shock test:	15g – 6 times – 3 directions 50g/6ms 22g/20ms
Climate:	HUE, to DIN 40040.
EMC:	To EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4) and IEC 255-3.
Connections:	Max. 4 mm^2 (single-stranded) Max. 2.5 mm^2 (multi-stranded)
Materials:	All plastic parts are self-extinguishing to UL94 (VO).
Protection:	Case: IP53. Terminals: IP20, to IEC 529 and EN 60529.

DEIF A/S

Type RMT-111Q96

Connections/dimensions (in mm)



Weight: approx. 0.200 kg

Order specifications

Type – Measuring Voltage
Example: RMT-111Q96 – 400V AC

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

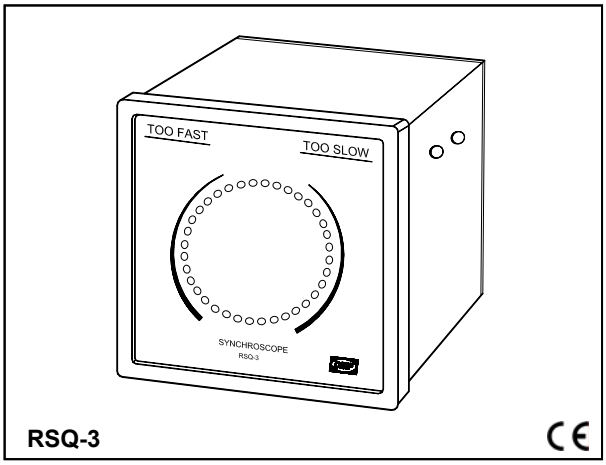
***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

Read Synchroscope

Type RSQ-3

4921240265B

- ***Precision LED synchronoscope***
- ***High immunity to harmonic distortion***



RSQ-3

Application
The RSQ-3 is a microprocessor-based synchronising unit, providing visual indication of relevant values for synchronising a generator to a net (busbar). It can be used in any kind of installation where manual synchronising is required.

Measuring principle
The unit measures the busbar (U_{BUSBAR}) and generator (U_{GEN}) voltages and frequencies and compares these, plus compares the phase angle relationship.

Operation
The rotation of the red LED circle indicates the frequency difference. The faster the rotation, the larger the frequency difference. One rotation per second equals 1Hz difference.

The position of the lit red LED indicates the phase difference between U_{GEN} and U_{BUSBAR}. The circle represents a degree scale from 0-360 degrees with zero degree at the 12 o'clock position. With 36 LEDs the resolution on the reading is 10 degrees.

If the frequency difference between U_{GEN} and U_{BUSBAR} is higher than 3Hz, the rotation of the LED circle stops. If it stops with a lit red LED at 'TOO SLOW', the frequency of the U_{GEN} is lower than U_{BUSBAR}. If it stops with a lit red LED at 'TOO FAST', the frequency of the U_{GEN} is higher than U_{BUSBAR}.

DEIF A/S

Type RSQ-3

Technical specifications

Accuracy: ±2 electrical degrees

Resolution: 10 electrical degrees

Max. freq. difference: No limit

Frequency range: 40...70Hz (supply)

Temperature: -25...70°C (operating)

Temperature drift: Set points:
Max. ±0.2% of full scale per 10°C

Shock test: 15g – 6 times – 3 directions
50g/6ms
22g/20ms

Galvanic separation: Between inputs and ground:
3750V - 50Hz - 1 min.

Input range (U_N): 100...127V AC (115V AC) ±20%
220...240V AC (230V AC) ±20%
380...415V AC (400V AC) ±20%
440...480V AC (450V AC) ±20%
(Above 450V AC: +10% only)

Busbar input: Load: 2kΩ/V

Generator input: (Max. 3.0VA at nominal voltage)
Supply for the unit

Max. input voltage: 1.2 x U_N, continuously
Above 450V: 1.1 x U_N, continuously
2 x U_N, for 10 sec.

Climate: HSE, to DIN 40040

EMC: CE marked according to EN 50081-1/2, EN 50082-1/2 and IEC 255-3

Safety: To EN 61010-1. Installation cat. III, 600V. Pollution degree 2

Connections: Max. 2.5 mm² (single-stranded)
Max. 1.5 mm² (multi-stranded)

Materials: All plastic parts are self-extinguishing to UL94 (V0)

Protection: Front: IP52. Terminals: IP20, to IEC 529 and EN 60529

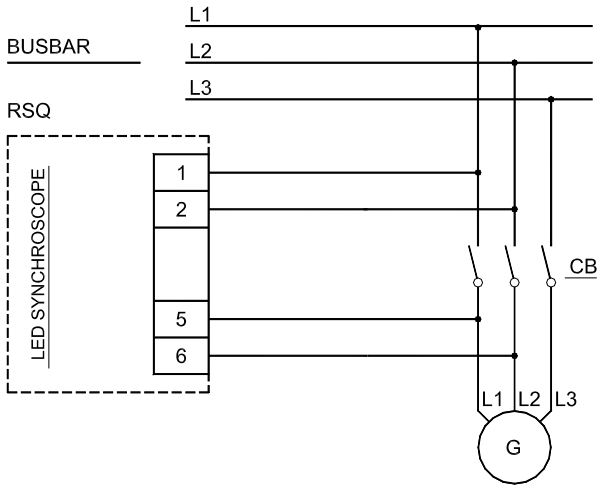
Type approval: For current approvals see www.deif.com or contact DEIF A/S

UL approval: UL508, E230690

Indication

LEDs	Light
TOO FAST	Red LED stopped. Frequency difference too high. GEN too high
TOO SLOW	Red LED stopped. Frequency difference too high. GEN too low

Connections



Dimensions: 96 x 96 x 76 mm Weight: Approx 0.40 kg

Order specifications

Type - Input voltage
Example: RSQ-3 - 230V AC

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

Zero voltage meters

Type NEQ

4921210049D

- *Simple and thoroughly tested synchronisation supervision*
- *Easily read scale*
- *DIN standard sizes: Q72 and Q96*

CE

Construction and application

The zero voltage meter type NEQ is a moving iron instrument calibrated to full scale deflection at twice the nominal mains voltage, whereas 2/3 deflection corresponds to nominal mains voltage.

Because of the expanded scale graduation within the range 0...0.5 of full scale, the NEQ is highly applicable to supervise the synchronisation of a generator to the busbar.

The neutrals of the busbar and the generator are connected together, and the NEQ is then connected to the same phase of the busbar and of the generator respectively. The NEQ thus measures the differential voltage between the two units. (At absolute phase accordance the voltage is zero).

As the NEQ solely measures the differential voltage without indicating the polarity of this, a frequency measurement is recommended as a supplement.

Using this low-priced combination, manual synchronisation is easily and with certainty obtained.

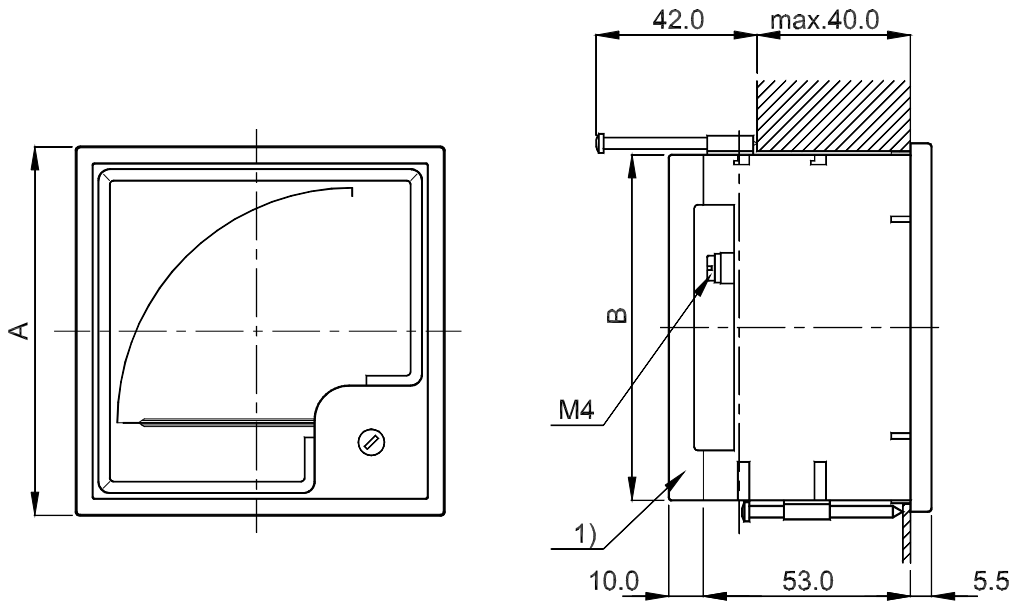
Technical specifications

Accuracy:	Class 1.5 within the range 0.45...0.75 of full scale deflection Class 3 outside this range. (-10...15...30...55°C)
Measuring range:	110/220V AC, 220/440V AC, 400/800V AC
Consumption:	1.5...4VA
Temperature:	-10...55°C (nominal), -25...60°C (operating), -25...65°C (storage)
Shock test:	15g – 6 times – 3 directions, 50g/6ms, 22g/20ms
EMC:	The NEQ is CE marked for residential, commercial and light industry plus industrial environment, to EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4) and IEC 255-4 (class 3)

Further technical specifications: See data sheet No. 4921210012

Dimensions

All dimensions in mm



1) Protective cover

NEQ

Type	A	B	Panel cut-out	Weight
NEQ72 NEQ96	72 x 72 96 x 96	66.5 x 66.5 90 x 90	68 x 68 +0.4 92 x 92 +0.4	Approx. 0.200 kg Approx. 0.210 kg

Order specifications

	Type	Measuring range
Example:	NEQ96	400/800V AC

Due to our continous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

	ANSI code 27, 59	ANSI code 59	ANSI code 27
	RMV-112D	**RMV-122D**	**RMV-132D**
Main functions:	**Under- /overvoltage protection:** - timer controlled tripping - adjustable hysteresis	**Overvoltage protection (2 levels):** - timer controlled tripping - adjustable hysteresis	**Undervoltage protection (2 levels):** - timer controlled tripping - adjustable hysteresis
Aux. voltage (U_n): 57.7...690V AC 24-48-110-220V DC	v	v	v
Meas. voltage (U_n): 57.7...690V AC	v	v	v
Meas. current (I_n): 0.4...5.0A	-	-	-
Frequency range: 40..45..65..70Hz	v	v	v
Outputs:	1 minimum and 1 maximum relay output. Settings: ± 20% of U nom. Delay: 0.5...10 s. Hysteresis.: 1...10% of U nom.	2 maximum relay outputs. Settings: 0...+20% of U nom. Delay: 0.5...10 s. Hysteresis.: 1...10% of U nom.	2 minimum relay outputs. Settings: -0...-20% of U nom. Delay: 0.5...10 s. Hysteresis.: 1...10% of U nom.
Measuring system:	Δ, 3 phase 3 wire, Y, 3 phase 4 wire	Δ, 3 phase 3 wire, Y, 3 phase 4 wire	Δ, 3 phase 3 wire, Y, 3 phase 4 wire
Approved by classification societies:	v	v	v

	ANSI code 27, 59
	RMV-142D
Main functions:	**Under- /overvoltage protection:** - timer controlled tripping - adjustable hysteresis
Aux. voltage (U_n): 57.7...690V AC 24-48-110-220V DC	v
Meas. voltage (U_n): 57.7...690V AC	v
Meas. current (I_n): 0.4...5.0A	-
Frequency range: 40..45..65..70Hz	v
Outputs:	1 minimum and 1 maximum relay output. Settings: ± 20% of U nom. Delay: 0.5...10 s. Hysteresis.: 1...10% of U nom.
Measuring system:	2 phase, Single phase
Approved by classification societies	v

DEIF A/S, Frisenborgvej 33, DK-7800 Skive, Tel.: +45 9614 9614, Fax: +45 9614 9615, E-mail: deif@deif.com, URL: www.deif.com

	ANSI code 50, 51	ANSI code 50, 51	ANSI code 50, 51
	RMC-111D	**RMC-121D**	**RMC-122D**
Main functions:	**Short circuit relay:** - short circuit protection. - timer controlled tripping.	**Short circuit current relay:** - short circuit protection. - timer controlled tripping.	**Overcurrent and short circuit relay:** - short circuit/overcurrent protection. - timer controlled tripping.
Aux. voltage (U_n): 57.7...690V AC 24-48-110-220V DC	v	v	v
Meas. voltage (U_n): 57.7...690V AC	-	-	-
Meas. current (I_n): 0.4...5.0A	v	v	v
Frequency range: 40..45..65..70Hz	v	v	v
Outputs:	1 maximum relay output. Setting: 100...400% of I nom. Delay: 0.1...1/5/10 s.	1 maximum relay output with 2 sets of contacts. Setting: 100...400% of I nom. Delay: 0.1...1/5/10 s.	2 maximum relay outputs. Settings: 50...150% of I nom., 100...400% of I nom. Delay: 0.1...1/5/10 s. 0.5…20/60/120 s.
Measuring system:	3 phase	3 phase	3 phase
Approved by classification societies:	v	v	v

	ANSI code 87	ANSI code 50, 51	ANSI code 50N, 51N
	RMC-131D	**RMC-132D**	**RMC-142D**
Main functions:	**Differential current relay:** - protection against short circuits and leakage current in the generator winding. - timer controlled tripping.	**Dual overcurrent relay:** - overcurrent protection. - timer controlled tripping.	**Stator earth fault relay:** - earth fault protection at 2 levels. - built-in filter for 3rd harmonic. - timer controlled tripping.
Aux. voltage (U_n): 57.7...690V AC 24-48-110-220V DC	v	v	v
Meas. voltage (U_n): 57.7...690V AC	-	-	-
Meas. current (I_n): 0.4...5.0A	v	v	v
Frequency range: 40..45..65..70Hz	v	v	v
Outputs:	1 maximum relay output. Settings: 4...40% of I nom. Delay: 0.1...1/5/10 s.	2 maximum relay outputs. Settings: 50…150% of I nom. Delay: 0.5…20/60/120 s.	2 maximum relay outputs. Settings: 2…20%, 10…110% of I nom. Delay: 0.5…20/60/120 s.
Measuring system:	3 phase	3 phase	Single phase
Approved by classification societies	v	v	v

DEIF A/S, Frisenborgvej 33, DK-7800 Skive, Tel.: +45 9614 9614, Fax: +45 9614 9615, E-mail: deif@deif.com, URL: www.deif.com

	ANSI code 32	ANSI code 32	ANSI code 32
	RMP-111D	RMP-112D	RMP-121D
Main functions:	**Overload relay:** - overload protection of generator and prime mover. - real power relay. - timer controlled tripping.	**Overload/reverse power relay:** - combined overload and reverse power protection. - protection against "motoring". - timer controlled tripping.	**Reverse power relay:** - "motoring" protection of generator and prime mover. - timer controlled tripping.
Aux. voltage (U_n): 57.7...690V AC 24-48-110-220V DC	v	v	v
Meas. voltage (U_n): 57.7...690V AC	v	v	v
Meas. current (I_n): 0.4...5.0A	v	v	v
Frequency range: 40..45...65..70Hz	v	v	v
Outputs:	1 maximum relay output. Settings: 25...125% of P nom. Delay: 0.4...20 s.	1 max. + 1 min. relay output. Settings: 25...125%,-0...-25% of P nom. Delay: 0.4...20 s.	1 minimum relay output. Settings:-0...-25% of P nom. Delay: 0.4...20 s.
Measuring system:	2W3, 3 phase 3 wire unbal. load 3W3, 3 phase 3 wire unbal. load 3W4, 3 phase 4 wire unbal. load	2W3, 3 phase 3 wire unbal. load 3W3, 3 phase 3 wire unbal. load 3W4, 3 phase 4 wire unbal. load	1W, single phase 1W3, 3 phase 3 wire bal. load 1W4, 3 phase 4 wire bal. load
Approved by classification societies:	v	v	v

	ANSI code 32	ANSI code 32	
	RMQ-111D	RMQ-121D	
Main functions:	**Loss of excitation relay:** - protection of generators against loss of excitation. - timer controlled tripping.	**Overexcitation relay:** - protection of generator against overexcitation (over Var). - timer controlled tripping.	
Aux. voltage (U_n): 57.7...690V AC 24-48-110-220V DC	v	v	
Meas. voltage (U_n): 57.7...690V AC	v	v	
Meas. current (I_n): 0.4...5.0A	v	v	
Frequency range: 40..45...65..70Hz	v	v	
Outputs:	1 maximum relay output. Settings: -25...-25% of Q nom. Delay: 0.4...20 s.	1 maximum relay output. Settings: 25...125% of Q nom. Delay: 0.4...20 s.	
Measuring system:	1var3, 3 phase 3 wire bal. load. 1var4, 3 phase 4 wire bal. load.	1var3, 3 phase 3 wire bal. load. 1var4, 3 phase 4 wire bal. load.	
Approved by classification societies	v	v	

DEIF A/S, Frisenborgvej 33, DK-7800 Skive, Tel.: +45 9614 9614. Fax: +45 9614 9615, E-mail: deif@deif.com, URL: www.deif.com

	ANSI code 81	ANSI code 78	ANSI code 78
	RMF-112D	**LMR-111D**	**LMR-122D**
Main functions:	**Frequency relay:** - combined underfrequency/ overfrequency protection. - timer controlled tripping.	**Loss of mains relay:** - detection of vector shift. - generator disconnection on mains failure.	**Loss of mains relay:** - detection of vector shift. - detection of ROCOF (df/dt).
Aux. voltage (U_n): 57.7...690V AC 24-48-110-220V DC	v	v	v
Meas. voltage (U_n): 57.7...690V AC	v	v	v
Meas. current (I_n): 0.4...5.0A	-	-	-
Frequency range: 40..45...65..70Hz	v	v	v
Outputs:	1 min. and 1 max. relay output. Settings: ± 10% of f nom. ± 20% of f nom at f nom = 55Hz. Delay: 0...10 s. Nom. frequency: 50Hz, 55Hz, 60Hz.	2 relay outputs. Settings: 2...20 electr. deg. Delay: 0.5...5 s.	2 relay outputs. Settings: 2...20 electr. deg. / 0.3…5 Hz/s Delay: 0.5...5 s.
Measuring system:	2 phase, Single phase	2 phase, Single phase	2 phase, Single phase
Approved by classi-fication societies:	v	v	v

	ANSI code 27, 59, 78, 81	
	G59	
Main functions:	**Protection relay package:** - combined vector shift and ROCOF. - protection of over/under frequency. - 3 phase protection of over/under voltage.	
Aux. voltage (U_n): 57.7...690V AC 24-48-110-220V DC	v	
Meas. voltage (U_n): 57.7...690V AC	v	
Meas. current (I_n): 0.4...5.0A	-	
Frequency range: 40..45...65..70Hz	v	
Outputs:	4 relay outputs, Setting of setpoint: 2...20 electr. deg. / 0.3…5 Hz/s / 90…100% of f_n / 100…110% of f_n / 80…100% of U_n / 100…120% of U_n, Hysteresis:1…10% of U_n	
Measuring system:	2 phase, Single phase: Vector shift, ROCOF, frequency, 3 phase 3 wire, U, 3 phase 4 wire: Voltage	
Approved by classi-fication societies	-	

DEIF A/S, Frisenborgvej 33, DK-7800 Skive, Tel.: +45 9614 9614, Fax: +45 9614 9615, E-mail: deif@deif.com, URL: www.deif.com

	ANSI code 25	ANSI code 25	ANSI code 25
	FAS-113DG	**FAS-115DG**	**FAS-125DG**
Main functions:	**Synchroniser:** - synchronisation of generator to busbar. - circuit breaker time compensation.	**Synchroniser:** - synchronisation of generator to busbar. - voltage matching. - circuit breaker time compensation.	**Synchroniser:** - synchronisation of generator to busbar. - automatic, static synchronisation. - voltage matching.
Aux. voltage (U_n): 57.7...690V AC 24-48-110-220V DC	v	v	v
Meas. voltage (U_n): 57.7...690V AC	v	v	v
Meas. current (I_n): 0.4...5.0A	-	-	-
Frequency range: 40..45...65..70Hz	v	v	v
Outputs:	Synch. pulse output: 1 relay output. Freq. control outputs: 2 relay outputs.	Synch. pulse output: 1 relay output. Freq. control outputs: 2 relay outputs. Voltage control: 2 relay outputs.	Synch. pulse output: 1 relay output. Freq. control outputs: 2 relay outputs. Voltage control: 2 relay outputs.
Measuring system:	2 phase, Single phase	2 phase, Single phase	2 phase, Single phase
Approved by classification societies:	v	v	v

	ANSI code 25	ANSI code 18	
	HAS-111DG	**EPN-110DN**	
Main functions:	**Paralleling relay:** - synchronisation of generator to busbar. - setting of phase angle. - setting of maximum frequency and voltage difference.	**Electronic potentiometer:** - control of electronic governor. - setting of integrating time. - adjustment of output signal.	
Aux. voltage (U_n): 57.7...690V AC 24-48-110-220V DC	v	v	
Meas. voltage (U_n): 57.7...690V AC	v	-	
Meas. current (I_n): 0.4...5.0A	-	-	
Frequency range: 40..45...65..70Hz	v	-	
Outputs:	Synch. pulse output: 1 relay output.	1 analog output. Settings: 0...± 1V/0...± 5V	
Measuring system:	2 phase, Single phase	-	
Approved by classification societies	v	v	

DEIF A/S, Frisenborgvej 33, DK-7800 Skive, Tel.: +45 9614 9614, Fax: +45 9614 9615, E-mail: deif@deif.com, URL: www.deif.com

	ANSI code 90	ANSI code 90	ANSI code 90
	LSU-112DG	**LSU-113DG**	**LSU-114DG**
Main functions:	**Load sharing unit**: - built-in power and freq. transducer. - constant power or isochronous mode.	**Load sharing unit:** - reverse power protection and low power detection. - built-in power and freq. transducer. - constant power or isochr. mode.	**Load sharing unit:** - automatic start/ stop outputs. - built-in power and freq. transducer - constant power or isochronous mode.
Aux. voltage (U_n): 57.7...690V AC 24-48-110-220V DC	v	v	v
Meas. voltage (U_n): 57.7...690V AC	v	v	v
Meas. current (I_n): 0.4...5.0A	v	v	v
Frequency range: 40..45..65..70Hz	v	v	v
Outputs:	Speed control: 2 relay outputs.	Speed control: 2 relay outputs. Reverse power protection: 1 relay output, fixed settings: -P> 5% / 5 s, -P> 5% / 10 s, -P> 10% / 5 s or -P> 10% / 10 s. Low power detect.: 1 relay output, fixed setting: P<5%.	Speed control: 2 relay outputs. Start/stop: 2 relay outputs, fixed settings: P>80%, P<20%.
Measuring system:	1W3, 3 phase 3 wire bal. load Single phase	1W3, 3 phase 3 wire bal. load Single phase	1W3, 3 phase 3 wire bal. load Single phase
Approved by classi-fication societies:	v	v	v

	ANSI code 90		
	LSU-122DG		
Main functions:	**var load sharing unit**: - built-in reactive power transducer. - control of AVR. - input for external voltage transducer.		
Aux. voltage (U_n): 57.7...690V AC 24-48-110-220V DC	v		
Meas. voltage (U_n): 57.7...690V AC	v		
Meas. current (I_n): 0.4...5.0A	v		
Frequency range: 40..45..65..70Hz	v		
Outputs:	Voltage control: 2 relay outputs.		
Measuring system:	1var3, 3 phase 3 wire bal. load Single phase		
Approved by classi-fication societies	v		

DEIF A/S, Frisenborgvej 33, DK-7800 Skive, Tel.: +45 9614 9614, Fax: +45 9614 9615, E-mail: deif@deif.com, URL: www.deif.com

ANSI codes 50/51

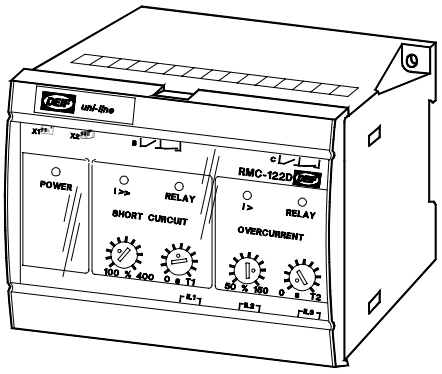
Types RMC-111D, RMC-122D, RMC-132D

Current relays

uni-line

4921240102D

- ***Short circuit/overcurrent***
- ***3 phase measurement***
- ***LED indication of fault condition***
- ***Timer controlled tripping***
- ***LED indication for activated relay***
- ***35 mm DIN rail or base mounting***



RMC-122D CE

Application

The protective current relays types RMC-111D, RMC-122D and RMC-132D form part of a complete DEIF series of relays for protection and control of generators. The relays are applicable to both marine and land-based installations. Also available are differential current relays (RMC-131D).

The relays are type approved by major classification societies.

RMC-111D (ANSI codes 50/51)
This short circuit relay is applied in cases where only protection against short circuit currents is required (I>>).

RMC-122D (ANSI codes 50/51)
This combined short circuit and overcurrent relay is applied for protection of generators against both over-currents and short circuit currents (I> + I>>).

RMC-132D (ANSI codes 50/51)
This double overcurrent relay is applied in cases where protection against overcurrents at two levels is required (I> + I>).

Measuring principle

The relays measure the highest of the 3 phase currents, providing an RMS measurement at sinusoidal currents.

The measurement is based on average values for I>, peak values for I>>. If a current exceeds a set point, the output is activated.

The set point values are set on the front of the relays by means of potentiometers. If exceeded, a fault signal is generated, and the associated yellow LED is lit.

Timer functions

When the set point is exceeded, its timer starts and will run as long as the fault condition prevails.

The delay (3 ranges) does not depend on the exceeding of the set point.

If the fault disappears, the timer is reset. When the timer expires, the contact is activated and the associated red LED is lit.

Relay outputs

The relays are provided with outputs as follows:

RMC-111D:	I>>	1 max. contact
RMC-122D:	I> + I>>	2 max. contacts
RMC-132D:	I> + I>	2 max. contacts

which are either normally energised or normally de-energised contacts. The contact(s) may be set to open or to close on activation.

Normally energised contact
Recommended for land-based installation for warning and alarm purposes. In case of an auxiliary supply drop-out, the contact is immediately activated.

Normally de-energised contact
Recommended for marine installations for regulating and control purposes. An auxiliary supply failure will not result in an unwanted activation of the contact.

Latch circuit
The contacts can then be locked in their warning position, even if the input currents return to normal (add "L" to contact type in order specifications, if this is required).

The latch circuit is reset by disconnecting the auxiliary supply.

Hysteresis
In order to avoid "chatter" on the relay contacts the contact functions are provided with a hysteresis, i.e. a difference of 2% of full scale between energising and de-energising of the relay.

Power-up/power-down circuits
The relays are provided with a 200 ms power-up circuit, ensuring the correct function of the relay on connection of the auxiliary voltage.

Note: Normally energised contacts are not activated (contact does not open/close) until 200 ms after connection of the auxiliary voltage.

Likewise, the relays are provided with a 200 ms power-down circuit, ensuring supervision and maintenance of any set point exceedings for 200 ms after disconnection of the auxiliary voltage.

Technical specifications

Meas. range (I_n): 0.3-0.4-0.5-0.6-0.8-1.0-1.3-1.5-2.0-2.5-3.0-4.0-5.0A AC

adjusted ranges: 75...100% of I_n (e.g. 0.4, 0.45, etc.) (lowest meas. range: 0.3A).

Frequency range: 40...45...65...70Hz.

Short circuit current: 1.0...4.0 x I_n.

Overcurrent: 0.5...1.5 x I_n

Max. input current: 4 x I_n, continuously,
20 x I_n for 10 s (max. 75A)
80 x I_n for 1 s (max. 300A).

Load: Max. 0.3VA per phase.

Output(s): 1(2) maximum contact(s)

contact type: Relay B (+relay C):
normally energised ("NE"), or
normally de-energised ("ND")
with or without latch circuit ("L")

relay contacts: 1 change-over switch per relay

contact ratings: 250V-8A-2000VA (AC)
24V-8A-200W (DC)
(200 x 10^3 change-overs at resistive load)

contact voltage: Max. 250V (AC).
Max. 150V (DC).

Hysteresis: 2% of full scale (F.S.).

Response time: <50 ms short circuit current
<500 ms overcurrent.

Temperature: -25...70°C (operating).

Temperature drift: Set points:
max. 0.2% of full scale per 10°C.

Galvanic separation: Between inputs, outputs and aux. voltage: 3250V - 50Hz - 1 min.

Supply voltage (U_n): 57.7-63.5-100-110-127-200-220-230-240-380-400-415-440-450-660-690VAC ±20% (max. 3.5VA)

24-48-110-220V DC -25/+30% (max. 2W).

Climate: HSE, to DIN 40040.

EMC: To EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4) and IEC 255-3.

Connections: Max. 4 mm² (single-stranded).
Max. 2.5 mm² (multi-stranded).

Materials: All plastic parts are self-extinguishing to UL94 (V1).

Protection: Case: IP40. Terminals: IP20, to IEC 529 and EN 60529.

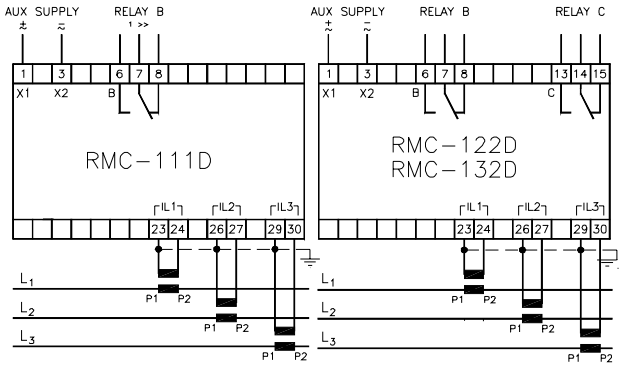
Type approval: The uni-line components are approved by the major classification societies. For current approvals see www.deif.com or contact DEIF A/S.

Settings and indication

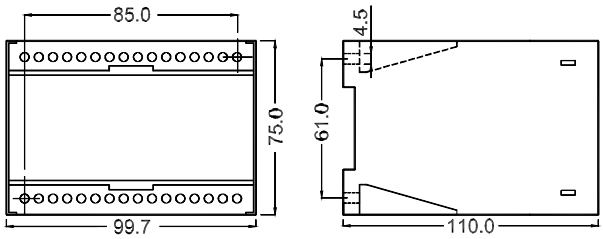
Setting of	LED/relay
Short circuit current set point: (100...400%) of I_n	"I>>" yellow LED is lit when the set point has been exceeded, but the output contact not yet activated.
Time delay: (0-T1) in seconds 0...1/0...5/0...10 s	Contact is activated and red LED lit after the timer has expired.
Overcurrent set point(s): (50...150%) of I_n	"I>" yellow LED is lit when the set point has been exceeded, but the output contact not yet activated.
Time delay: (0...T2) in seconds 0...20/0...60/0...120 s	Contact is activated and red LED lit after the timer has expired.

The relays are furthermore equipped with a green LED marked "POWER" for indication of power ON. Once the relay has been mounted and adjusted, the transparent front cover may be sealed, preventing unwanted change of the setting.

Connections/dimensions (in mm)



Shown contact positions: aux. voltage not connected



Weight: approx. 0.650 kg

Order specifications

Type – Meas. current (I_n) – Relay B – (Relay C) – Time delay (T1 – T2) – Supply voltage
Examples:
RMC-122D – 5A AC – NDL – ND – 1 s – 400V AC
RMC-111D – 1A AC – NE – 5 s – 380V AC

Due to our continous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

ANSI codes 50N/51N

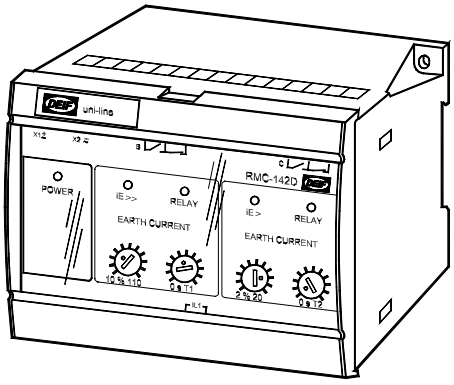
Type RMC-142D

Stator earth fault relays

uni-line

4921240148C

- ***Earth fault protection at 2 levels***
- ***Built-in filter for 3rd harmonic***
- ***LED indication of fault condition***
- ***Timer controlled tripping***
- ***LED indication for activated relay***
- ***35 mm DIN rail or base mounting***



RMC-142D CE

Application

The protective stator earth fault relay type RMC-142D forms part of a complete DEIF series of relays for protection and control of generators. The RMC-142D is primarily designed for land based installations. Also available are short circuit relays (RMC-111D), combined short circuit and overcurrent relays (RMC-122D) and double overcurrent relays (RMC-132D).

The RMC-142D is CE marked and is applied for protection of voltage sources and load networks against earth fault in a solid earthing or a low-resistance earthing system.

Measuring principle

The relay measures the leakage or a short circuit from one or more of the phases to earth.

In order to obtain a short response time on a fault condition, the measurement is based on peak values.

The earth fault current protection is i.e. obtained by connecting an external current transformer in the star point of the protected voltage source.

In order to prevent malfunction due to 3rd harmonic the RMC-142D is equipped with a special filter cutting off frequencies higher than 50/60Hz.

The set point values are set on the front of the relay by means of potentiometers. If exceeded, a fault signal is generated, and the associated yellow LED is lit.

Timer function

When the set point is exceeded, its timer starts and will run as long as the fault condition prevails.

The delay (3 ranges) does not depend on the exceeding of the set point.

If the fault disappears, the timer is reset.

When the timer expires, the contact is activated and the associated red LED is lit.

Relay outputs

The RMC-142 is provided with 2 outputs with maximum contacts either normally energised or normally de-energised. The contact may be set to open or close on activation.

Normally energised contact

Recommended for warning and alarm purposes.

In case of an auxiliary supply drop-out, the contact is immediately activated.

Normally de-energised contact

Recommended for installations for regulating and control purposes.

An auxiliary supply failure will not result in an unwanted activation of the contact.

Latch circuit

The contact can then be locked in its warning position, even if the earth faulty current (leakage current) return to normal (add “L” to contact type in order specifications, if this is required).

The latch circuit is reset by disconnecting the auxiliary supply.

Hysteresis

In order to avoid “chatter” on the relay contacts the contact functions are provided with a hysteresis, i.e. a difference of 2% of full scale between energising and de-energising of the delay.

Power-up/power-down circuits

The RMC-142D is provided with a 200 ms power-up circuit, ensuring the correct function of the relay on connection of the auxiliary voltage.

Note: Normally energised contacts are not activated (contact does not open/close) until 200 ms after connection of the auxiliary voltage.

Likewise, the RMC-142D is provided with a 200 ms power-down circuit, ensuring supervision and maintenance of any set point exceedings for 200 ms after disconnection of the auxiliary voltage.

DEIF A/S

Technical specifications

Meas. range (I_n): 0.3-0.4-0.5-0.6-0.8-1.0-1.3-1.5-2.0-2.5-3.0-4.0-5.0A AC

adjusted range: 75...100% of I_n (e.g. 0.4, 0.45, etc.). (lowest meas. range: 0.3A)

Frequency range: 40...50/60...70Hz.

Nominal frequency: 50Hz or 60Hz.

3rd harmonic reject.: Better than 18db.

Max. input current: 4 x I_n, continuously,
20 x I_n for 10 s (max. 75A)
80 x I_n for 1 s (max. 300A).

Load: Max. 0.3VA per phase.

Outputs: 2 maximum contacts.

contact type: Relays B + C:
normally energised ("NE"), or
normally de-energised ("ND")
with or without latch circuit ("L")

relay contact: 1 change-over switch per relay

contact ratings: 250V-8A-2000VA (AC)
24V-8A-200W (DC)
(200 x 10^3 change-overs at resistive load)

contact voltage: Max. 250V (AC). Max. 150V (DC).

Hysteresis: 2% of full scale (F.S.).

Response time: <50 ms.

Temperature: -25...70°C (operating).

Temperature drift: Set points:
max. 0.2% of full scale per 10°C.

Galvanic separation: Between inputs, outputs and aux. voltage: 3250V - 50Hz - 1 min.

Supply voltage (U_n): 57.7-63.5-100-110-127-200-220-230-240-380-400-415-440-450-660-690VAC ±20% (max. 3.5VA)
24-48-110-220V DC -25/+30% (max. 2W).

Climate: HSE, to DIN 40040.

EMC: To EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4) and IEC 255-3.

Connections: Max. 4 mm² (single-stranded).
Max. 2.5 mm² (multi-stranded).

Materials: All plastic parts are self-extinguishing to UL94 (V1).

Protection: Case: IP40. Terminals: IP20, to IEC 529 and EN 60529.

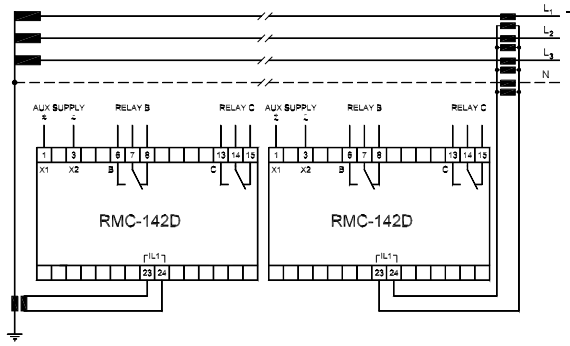
Type approval: The uni-line components are approved by the major classification societies. For current approvals see www.deif.com or contact DEIF A/S.

Settings and indication

Setting of	LED	Relay
Earth current set point: (10...110%) of I_n **Time delay:** (0-T1) in seconds 0...1/0...5/0...10s	iE>>	Yellow LED is lit when the set point has been exceeded, but the output contact not yet activated. Contact is activated and red LED lit after the timer has expired.
Earth current set point: (2...20%) of I_n **Time delay:** (0-T2) in seconds 0...20/0..60/0...120s	iE>	Yellow LED is lit when the set point has been exceeded, but the output contact not yet activated. Contact is activated and red LED lit after the timer has expired.

The relays are furthermore equipped with a green LED marked "POWER" for indication of power ON. Once the relay has been mounted and adjusted, the transparent front cover may be sealed, preventing unwanted change of the setting.

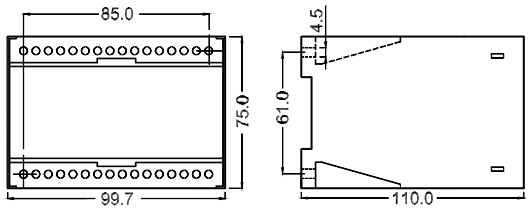
Connections/dimensions (in mm)



Protection of the voltage source and the load network.

Only protection of the load network.

Shown contact positions: aux. voltage not connected



Weight: approx. 0.650 kg

Order specifications

Type – Measuring current (I_n) – Nom. frequency – relay B – Relay C – Time delay (T1-T2) – Supply voltage
Example: RMC-142D – 5A AC – 50Hz – NDL – 1 s – 20 s – 440VAC

Due to our continous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

ANSI code 87

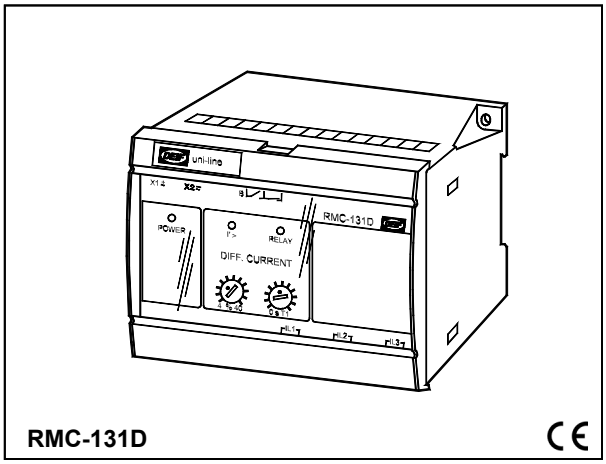
Type RMC-131D

Differential current relays

uni-line

4921240104F

- ***Measurement of 3 phase currents***
- ***Non-stabilised measurement***
- ***LED indication of fault condition***
- ***Timer controlled tripping***
- ***LED indication for activated relay***
- ***35 mm DIN rail or base mounting***



RMC-131D CE

Application

The protective differential current relay type RMC-131D forms part of a complete DEIF series of relays for protection and control of generators, and is primarily designed for marine applications. Also available are short circuit relays (RMC-111D), combined short circuit and overcurrent relays (RMC-122D) and double overcurrent relays (RMC-132D).

The RMC-131D is type approved by major classification societies and is applied for protection of e.g. generators in 3-phase networks against leakage currents.

Measuring principle

The relay compares the differential current of each of the 3 phases, providing an RMS measurement at sinusoidal currents.

In order to obtain a short response time on a fault condition, the measurement is based on peak values.

The differential currents are obtained by connecting the external current transformers for each winding in parallel with inverse polarity.

The measurement is not stabilized, implying that the relay contact is activated for disconnection of the supervised unit when the differential current of the individual phases exceeds its set point, irrespective of the amperage of these.

The 3 differential currents are measured by the relay and the highest of these is selected. If this exceeds the set point, the output is activated.

The set point value is set on the front of the relay by means of a potentiometer. If exceeded, a fault signal is generated, and the associated yellow LED is lit.

Timer function

When the set point has been exceeded, the associated timer starts and will run as long as the fault condition prevails.

The delay (3 ranges) does not depend on the exceeding of the set point. If the fault disappears, the timer is reset. When the timer expires, the contact is activated and the associated red LED is lit.

Relay output

The RMC-131D is provided with an output with a maximum contact, either normally energised or normally de-energised. The contact may be set to open or to close on activation.

Normally energised contact

Recommended for marine installation for warning and alarm purposes.

In case of an auxiliary supply drop-out, the contact is immediately activated.

Normally de-energised contact

Recommended for marine installations for regulating and control purposes.

An auxiliary supply failure will not result in an unwanted activation of the contact.

Latch circuit

The contact can then be locked in its warning position, even if the input currents return to normal (add ”L” to contact type in order specifications, if this is required).

The latch circuit is reset by disconnecting the auxiliary supply.

Hysteresis

In order to avoid ”chatter” on the relay contacts the contact functions are provided with a hysteresis, i.e. a difference of 2% of full scale between energising and de-energising of the relay.

Power-up/power-down circuits

The RMC-131D is provided with a 200 ms power-up circuit, ensuring the correct function of the relay on connection of the auxiliary voltage.

Note: Normally energised contacts are not activated (contact does not open/close) until 200 ms after connection of the auxiliary voltage.

Likewise, the RMC-131D is provided with a 200 ms power-down circuit, ensuring supervision and maintenance of any set point exceedings for 200 ms after disconnection of the auxiliary voltage.

Type RMC-131D

Technical specifications

Meas. range (I_n): 0.3-0.4-0.5-0.6-0.8-1.0-1.3-1.5-2.0-2.5-3.0-4.0-5.0A AC

adjusted range: 75...100% of I_n (e.g. 0.4, 0.45, etc.). (lowest meas. range: 0.3A)

Frequency range: 40...45...65...70Hz.

Differential current: 0.04...0.4 x I_n.

Max. input current: 4 x I_n, continuously,
20 x I_n for 10 s (max. 75A)
80 x I_n for 1 s (max. 300A).

Load: Max. 0.3VA per phase.

Output: 1 maximum contact.

contact type: Relay B:
normally energised ("NE"), or
normally de-energised ("ND")
with or without latch circuit ("L")

relay contact: 1 change-over switch

contact ratings: 250V-8A-2000VA (AC)
24V-8A-200W (DC)
(200 x 10^3 change-overs at resistive load)

contact voltage: Max. 250V (AC). Max. 150V (DC).

Hysteresis: 2% of full scale (F.S.).

Response time: <50 ms.

Temperature: -25...70°C (operating).

Temperature drift: Set points:
max. 0.2% of full scale per 10°C.

Galvanic separation: Between inputs, outputs and aux. voltage: 3250V - 50Hz - 1 min.

Supply voltage (U_n): 57.7-63.5-100-110-127-200-220-230-240-380-400-415-440-450-660-690V AC ±20% (max. 3.5VA)

24-48-110-220V DC -25/+30% (max. 2W).

Climate: HSE, to DIN 40040.

EMC: To EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4) and IEC 255-3.

Connections: Max. 4 mm² (single-stranded).
Max. 2.5 mm² (multi-stranded).

Materials: All plastic parts are self-extinguishing to UL94 (V1).

Protection: Case: IP40. Terminals: IP20, to IEC 529 and EN 60529.

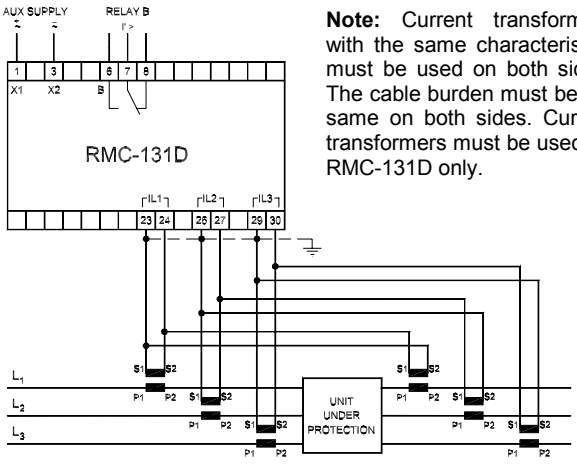
Type approval: The uni-line components are approved by the major classification societies. For current approvals see www.deif.com or contact DEIF A/S.

Settings and indication

Setting of	LED/relay
Differential current set point: (4…40%) of I_n	"I'>" yellow LED is lit when the set point has been exceeded, but the contact not yet activated.
Time delay: (0…T1) in seconds 0…1/0…5/0…10 s	Contact is activated and red LED lit after the timer has expired.

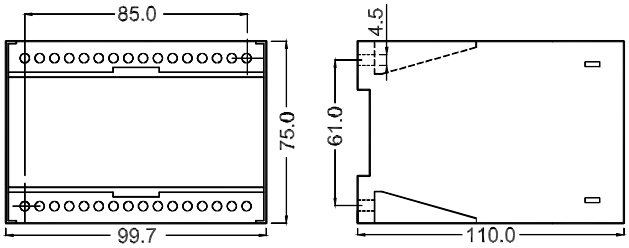
The relay is furthermore equipped with a green LED marked "POWER" for indication of power ON. Once the relay has been mounted and adjusted, the transparent front cover may be sealed, preventing unwanted change of the setting.

Connections/dimensions (in mm)



Note: Current transformers with the same characteristics must be used on both sides. The cable burden must be the same on both sides. Current transformers must be used for RMC-131D only.

Shown contact positions: auxiliary voltage not connected



Weight: approx. 0.650 kg

Order specifications

Type – Measuring current (I_n) – Relay B – Time delay (T1) – Supply voltage
Example:
RMC-131D – 5A AC – NEL - 5 s – 440V AC

Due to our continous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

ANSI code 18

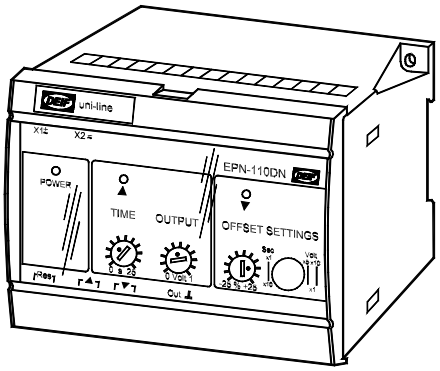
Type EPN-110DN

Electronic potentiometers

uni-line

4921240126E

- ***Control of electronic governors***
- ***Setting of integrating time***
- ***Adjustment of output signal***
- ***Offset adjustment***
- ***LED indication for activated input***
- ***35 mm DIN rail or base mounting***



EPN-110DN CE

Application

The electronic potentiometer type EPN-110DN forms part of a complete DEIF series of relays for protection and control of generators, and is applicable to both marine and land-based installations.

The EPN-110DN is type approved by major classification societies and is an electronic unit to replace normal motor potentiometers.

The potentiometer converts the relay output of a PI step controller - e.g. one of the DEIF load sharing units type LSU.. or one of the DEIF synchronisers type FAS.., or any other type of PI step controller provided with relay outputs - to a control voltage for the speed governor/AVR.

Measuring principle

The EPN-110DN is provided with 3 inputs:

"▲" (frequency or voltage increase)
"▼" (frequency or voltage decrease)
"RES" (reset of the unit).

Note: During power up the potentiometer is automatically reset.

On activation of one of the inputs "▲" and "▼", the analog output of the potentiometer to the speed governor/the AVR is changed correspondingly.

The EPN-110DN is furthermore provided with an offset adjustment for change of the point where the control loop starts and to which the unit returns after reset. Both the output signal, the rate of change of this (the integrating time) and the offset are set on potentiometers on the front of the EPN-110DN.

Outputs/settings

The EPN-110DN is equipped with 2 LED indicators on the front of the unit, which are lit when their input ("▲" and "▼" respectively) has been activated.

To ensure that the EPN-110DN can be connected to all common electronic speed governors and AVR's, the analog output of the EPN-110DN has been designed as a current generator shunted by a 500Ω potentiometer.

Output signal
Potentiometer "OUTPUT" (0...±1V DC x 1, x 5 or x 10)

The maximum and minimum change of the frequency/voltage of the connected speed governor/AVR, controlled by the EPN-110DN.

The range ("x 1", "x 5" or "x 10") is selected by means of 2 DIP switches accessible from the front of the relay.

A special output 0...5...10V DC is available for interfacing between a DEIF synchroniser type FAS-115DG and a var load sharing unit type LSU-122DG, applied for voltage adaption to obtain simultantous synchronisation of all generators of a plant to the busbar.

Integrating time
Potentiometer "TIME" (2.5 s...25 s x 1 or x 10)

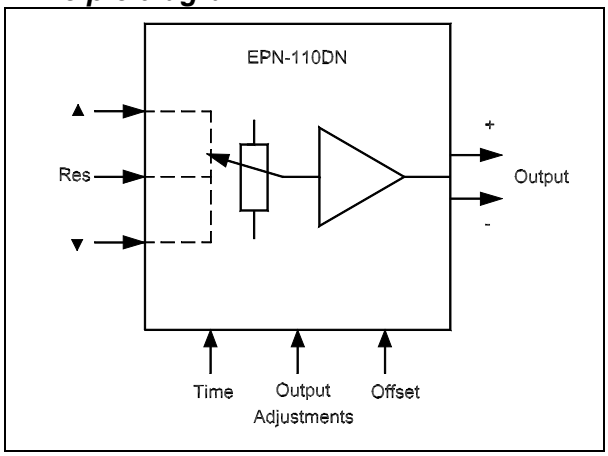
How quickly the output integrates from the minimum to the maximum setting (or vice versa). This setting thus determines how quickly e.g. a load sharing will be carried out.

The range ("x 1" or "x 10") is selected by means of a DIP switch accessible from the front of the relay.

Offset
Potentiometer "OFFSET" (-25...0...25% of output)

The point where the control loop starts. This setting determines e.g. to which frequency the generator should be reset instantaneously during power-up or on activation of the reset input.

Principle diagram



Type EPN-110DN

Technical specifications

Relay input: Potential-free relay contacts
open contact: 15V DC
closed contact: 4mA

Analog output: 0...±1V DC (DIP switches set to "x1")
or:
0...±5V DC (DIP switches set to "x5")
or:
0…±10V DC (DIP switches set to "x10")

output resistance: 0...500Ω potentiometer.

Offset adjustment: -25...0...25% of output.

Ripple: Max. 5mV RMS.

Resolution: 5mV DC (12-bit D/A converter).

Response time: <100 ms, input to output.

Temperature: -25...70°C (operating).

Temperature drift: Set points:
max. ±0.2% of full scale per 10°C.

Galvanic separation: 3250V - 50Hz - 1 min.
Supply voltage to other circuits.

None between inputs and DC output.

Supply voltage (U_n): 57.7-63.5-100-110-127-200-220-230-240-380-400-415-440-450-660-690V AC ±20% (max. 3.5VA)

24-48-110-220V DC -25/+30% (max. 2W).

Climate: HSE, to DIN 40040.

EMC: To EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4) and IEC 255-3.

Connections: Max. 4mm² (single-stranded).
Max. 2.5mm² (multi-stranded).

Materials: All plastic parts are self-extinguishing to UL94 (V1).

Protection: Case: IP40. Terminals: IP20, to IEC 529 and EN 60529.

Type approval: The uni-line components are approved by the major classification societies. For current approvals see www.deif.com or contact DEIF A/S.

Settings

Setting of	Range
Integrating time:	2.5 s...25 s or 25...250 s
Output:	-1...0...1V DC, -5...0...5V DC or -10…0…10V DC
Offset:	-25...0...25% of output

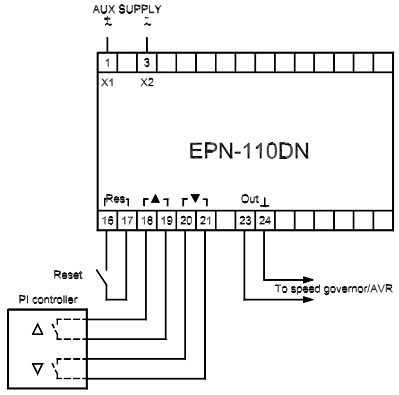
Indication

LED	Light
"▲" (Increase)	Yellow, when relay is activated
"▼" (Decrease)	

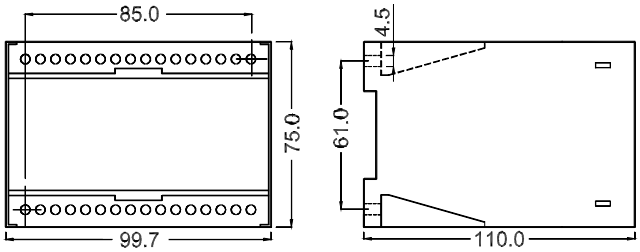
The relay is furthermore equipped with a green LED marked "POWER" for indication of power ON.

Once the relay has been mounted and adjusted, the transparent front cover may be sealed, preventing unwanted change of the setting.

Connections/dimensions (in mm)



Note: Terminals no. 16, 18 and 20 are internally connected to each other.



Weight: Approx. 0.650 kg

Order specifications

Type - (Output)* - Supply voltage
Example: EPN-110DN -5...0...5V DC - 24V DC
*) Specify if non-standard

Due to our continous development we reserve the right to supply equipment which may vary from the described.

DEIF A/S, Frisenborgvej 33
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

ANSI code 81

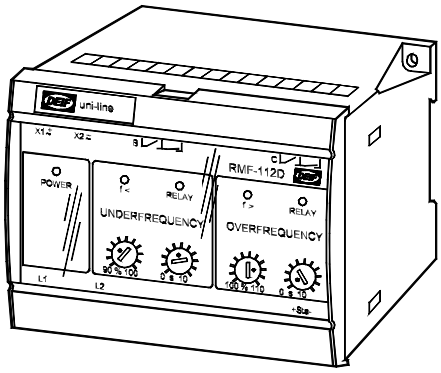
Type RMF-112D

Frequency relays

uni-line

4921240223B

- ***Combined underfrequency/overfrequency***
- ***For single and 3 phase networks***
- ***LED indication of fault condition***
- ***Timer controlled tripping***
- ***LED indication for activated relay***
- ***35 mm DIN rail or base mounting***



RMF-112D CE

Application

The digital, combined underfrequency and overfrequency relay type RMF-112D forms part of a complete DEIF series of relays for protection and control of generators.

The relay is type approved by major classification societies and is applicable to both marine and landbased installations.

The RMF-112D is applied for protection against underfrequency and overfrequency by supervising the frequency (of generators) in single phase and 3 phase networks.

Measuring principle

The relay measures the voltage between 2 phases or between one phase and the neutral.

To avoid unwanted underfrequency alarms, the RMF-112D relay is not activated until the measuring voltage exceeds 60% of U_n.

If either the underfrequency or overfrequency exceeds its set point, its associated output is activated.

The set point values are set on the front of the relay by means of potentiometers. If exceeded, a fault signal is generated, and the associated yellow LED is lit.

Timer functions

When the set point is exceeded, its associated timer starts and will run as long as the fault conditions prevails. The delay does not depend on the exceeding of the set point.

If the fault disappears, the timer is reset. When the timer expires, the contact is activated and the associated red LED is lit.

Relay outputs

The RMF-112D is provided with 2 outputs:

f< a minimum contact
(normally energised or normally de-energised)

f> a maximum contact
(normally energised or normally de-energised)

The contacts may be set to open or to close on activation.

Normally energised contact

Recommended for land-based installation for warning and alarm purposes.

In case of an auxiliary supply drop-out, the contact is immediately activated.

Normally de-energised contact

Recommended for marine installations for regulating and control purposes.

An auxiliary supply failure will not result in an unwanted activation of the contact.

Latch circuit

The contact can then be locked in its warning position, even if the input frequency returns to normal (add “L” to contact type in order specifications, if this is required).

The latch circuit is reset by disconnecting the auxiliary supply.

Hysteresis

In order to avoid “chatter” on the relay contacts the contact functions are provided with a hysteresis, i.e. a difference of 0.25Hz between energising and de-energising of the relay.

Power-up/power-down circuits

The RMF-112D is provided with a 200 ms power-up circuit, ensuring the correct function of the relay on connection of the auxiliary voltage.

Note: Normally energised contacts are not activated (contact does not open/close) until 200 ms after connection of the auxiliary voltage.

Likewise, the RMF-112D is provided with a 200 ms power-down circuit, ensuring supervision and maintenance of any set point exceedings for 200 ms after disconnection of the auxiliary voltage.

DEIF A/S

Type RMF-112D

Technical specifications

Meas. voltage (U_n): See supply voltage - AC ranges.
voltage range: 60...120% of U_n.

overload: 1.2 x U_n, continuously,
2 x U_n for 10 s.

load: 2kΩ/V.

Frequency range: 40...45...65...70Hz.

Nom. frequency (f_n): 50Hz, 55Hz or 60Hz.

Output: 1 min. and 1 max. contact.

contact type: Relays B + C:
normally energised ("NE"), or
normally de-energised ("ND")
with or without latch circuit ("L").

relay contacts: 1 change-over switch per relay.

contact ratings: 250V-8A-2000VA (AC).
24V-8A-200W (DC).
(200 x 10^3 change-overs at resistive load)

contact voltage: Max. 250V (AC). Max. 150V (DC)

Optocoupler output: System status off = failure.

Hysteresis: 0.25Hz.

Response time: <90 ms.

Temperature: -25...70°C (operating).

Temperature drift: ±0.1Hz per 10°C.

Galvanic separation: Between inputs and outputs:
3250V - 50Hz - 1 min.

Supply voltage: 57.7-63.5-100-110-127-200-220-230-240-380-400-415-440-450-660-690VAC ±20% (max. 4VA)

24-48-110-220V DC -25/+30% (max. 3.5W).

Climate: HSE, to DIN 40040.

EMC: To EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4) and IEC 255-3.

Connections: Max. 4 mm² (single-stranded).
Max. 2.5 mm² (multi-stranded).

Materials: All plastic parts are self-extinguishing to UL94 (V1).

Protection: Case: IP40. Terminals: IP20, to IEC 529 and EN 60529.

Type approval: The uni-line components are approved by the major classification societies. For current approvals see www.deif.com or contact DEIF A/S.

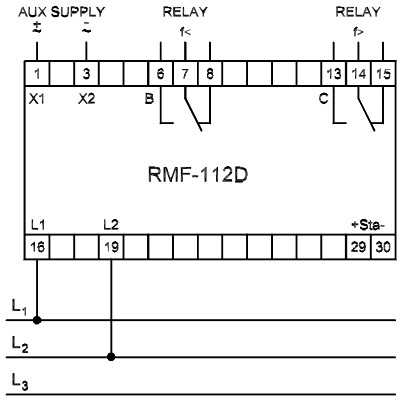
Settings and indication

Setting of	LED/relay
Underfrequency set point: (90...100%) of f_n (80...100%) of f_n at f_n = 55Hz	"f<" yellow LED is lit when the frequency has dropped below the set point, but the relay not yet activated.
Overfrequency set point: (100...110%) of f_n (100...120%) of f_n at f_n = 55Hz	"f>" yellow LED is lit when the set point is exceeded, but the relay not yet activated.
Time delay: (0...10 s) in seconds	Contact is activated and red LED lit after the timer has expired.

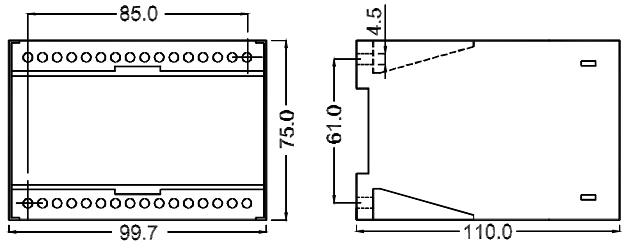
The relay is furthermore equipped with a green LED marked "POWER" for indication of power ON.

Once the relay has been mounted and adjusted, the transparent front cover may be sealed, preventing unwanted change of the setting.

Connections/dimensions (in mm)



Shown contact positions: aux. voltage not connected.
See installation instruction for information about status output (29-30).



Weight: approx. 0.650 kg

Order specifications

Type – Meas. Voltage – Nom. Frequency – Relay B – Relay C – Supply voltage
Example:
RMF-112D – 380V AC – 50Hz – NE – ND – 24V DC

Due to our continous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

ANSI code 90

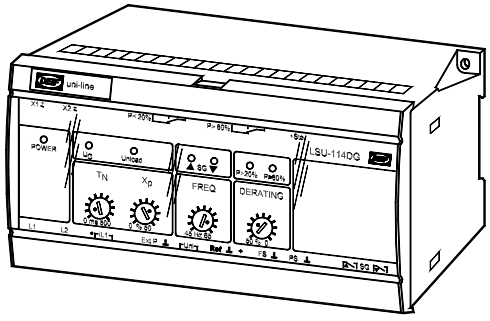
Type LSU-114DG

Load sharing units

uni-line

4921240122E

- ***For control of diesel and gas generators***
- ***Built-in power and frequency transducer***
- ***Constant power or isochronous mode***
- ***LED indication for status/activated control***
- ***With start/stop outputs***
- ***35 mm DIN rail or base mounting***



LSU-114DG CE

Application

The LSU-114DG is a control unit for control of the prime mover in a power unit.

The LSU-114DG can control the power unit
- in stand-alone mode, performing frequency control
- parallel with grid, performing power control
- parallel with other power units, performing frequency and power control

The unit is designed for connection to a mechanical speed governor, however in conjunction with the DEIF electronic potentiometer type EPN-110DN or EPQ-96 it can control electronic speed governors as well.

The LSU-114DG has a built-in frequency transducer. If a very stable frequency is wanted, an external frequency transducer common for all the LSU-114DGs in the power plant can be connected. If a number of power units are to be synchronised to the busbar at the same time, the frequency may likewise be controlled externally.

Function

The LSU-114DG is measuring the voltage and the current from which the frequency and the power produced by the power unit are measured. The built-in power transducer is based on an I x cos phi principle.

The following couplings are available:
- 1W(4) – single phase
- 1W3 – 1 element 3 phase, 3 wire, balanced load

If unbalanced load can be expected, an external power transducer with an output of 4…20mA can be connected to the LSU-114DG. In this case the built-in I x cos phi transducer is automatically interrupted.

The power and frequency measured by each LSU-114DG are fed to 2 paralleling lines for comparison with the frequency (FS) and power (PS) of the other connected LSU-114DG.

If L1 or L2 is disconnected from the LSU-114DG at the same time as a power unit in a power plant is disconnected from the power line (busbar), built-in relays in the LSU-114DG ensure that the power output and the frequency output of the associated unit are disconnected from the paralleling lines. Likewise the power and frequency outputs are disconnected if the auxiliary voltage to the LSU-114DG is disconnected.

The LSU-114DG is equipped with an unload input. When activated the input will control the power unit to zero power, and at the same time the power output of the LSU-114DG is disconnected from the paralleling line.

The LSU-114DG is equipped with 2 outputs for start and stop of the next PU. The start output is activated if P_n >80%, and the stop output is activated if P_n <20%.

NOTE: Start/stop signals are transmitted without time delay.

The calibration of the LSU-114DG is done so it matches its power unit. This means that load sharing between power units with different size will be performed according to the actual size of the individual power unit in the plant. E.g. a 100kW PU and a 150kW PU running in parallel will share a total load of 125kW into 50kW and 75kW. If the 150kW PU is derated to 100kW by means of the DERATING potentiometer on the front of the LSU-114DG, the load in the above example will then be shared equally between the 2 power units.

Outputs

The unit is provided with 2 contact outputs for speed control:

Power and frequency control:
The regulating speed of the servomotors for the prime mover is controlled by the built-in P controller of the LSU-114DG according to its setting for:

T_N (pulse length):
The min. duration of the control pulse.

X_P (proportional band):
The zone within which the pulse/pause ratio changes proportionally to the frequency/power deviation from the required value.

Dead band:
The zone within which no control pulses are emitted:
Power: ±0.5% of P_n (or for derated value)
Frequency: ±0.1Hz

Start/stop outputs:
2 change-over contacts, normally de-energized, for start and stop of next PU.

Self-monitoring

The LSU-114DG is equipped with a self-monitoring function. The function supervises the built-in micro-controller and hereby verifies if the programme is running correctly. The green LED marked “POWER” is connected to this function. Constant green light indicates that the supply voltage is accepted and the unit is running correctly. Flashing green light 2-3Hz indicates that the supply voltage is accepted but the unit is running incorrectly. In this situation the status output terminals 17 and 18 are activated (open).

Type LSU-114DG

Terminals/function

Connection type	Connect	
1W3 (standard)	L1 to term. 24	L2 to term. 26
1W (betw. phase/neutral)	L1 (P) to term. 24	Neutral to term. 26

Terminal no.	Description/action
1 and 3 X1/X2	Input for supply voltage
8, 9 and 10 ("P <20%")	Relay output for stop of the next stand-by PU. **NOTE: Signal is transmitted without time delay**
13, 14 and 15 ("P >80%")	Relay output for start of the next stand-by PU. **NOTE: Signal is transmitted without time delay**
17 and 18 Sta	Status output, activated (closed) when the supply voltage is connected and the unit is working correctly
28 and 29 IL1	Input for the current measurement. Note that S1 on the external current transformer is connected to terminal 28, and S2 is connected to terminal 29
31 and 32 Ext. P.	Must be short-circuited, if the internal power transducer is used (normal). For applications with unbalanced load it is recommended to use an external power transducer (replacing the built-in one). Connect external power transducer to 31 (+) and 32 (-). The output of the external transducer must be 4…20mA DC. The output of the connected transducer must limit the output to min. 2mA and max. 22mA. DEIF transducer type TAS-331DG is recommended
33 and 34 ("Unl")	May be connected to a potential-free N/O relay contact. When this contact is activated, the power of the generator is regulated to zero (unloading) and the LSU-114DG is disconnected from the PS power line
35 ("Ref.")	Reference input. Must be connected to term. 36 ("⊥"), if not used. This input is used to control the power unit running in power control mode (fixed load to grid). A +0.5V…5V connected to the input with respect to ⊥ will control the PU in the range 10…100% power. The input activates at 0.55V and deactivates at 0.45V. Please notice that when this input is active the LSU-114DG is still connected to the PS and FS lines. In this mode the PS line acts only as an output
37 ("+5V")	Reference output. This voltage output can be used for local power control mode. If terminal 37 is feeding a voltage divider, and the output from the voltage divider is connected to terminal 35, local power control can be performed
36 ("⊥")	Common earth terminal for the above reference input/output
38 (FS) and 39 ("⊥")	Paralleling line for frequency sharing of the connected LSU-114DGs
40 (PS) and 41 ("⊥")	Paralleling line for power sharing of the connected LSU-114DGs. Normally 5V at nominal busbar voltage and cos phi = 1. If cos phi 0.8 is stated on the label, 4V correspond to 100% power
43 and 44 Relay contacts "SG"	Relay contact for increase of the speed
45 and 46 Relay contacts "SG"	Relay contact for decrease of the speed
NOTE: Relay contacts	Relays (SG) should always be connected via external auxiliary relays when a DC pilot motor is applied. A transient suppressor should always be connected across the relay coil of the external relays

NOTE:
All terminals marked "⊥" are internally connected.

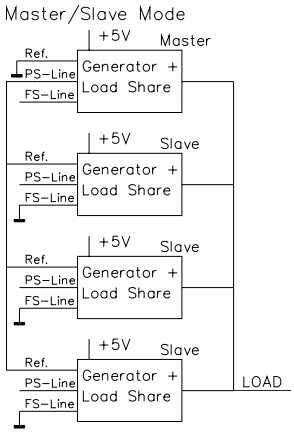
For correct function of the LSU-114DG any analogue DC input must not exceed 110% of its nominal value. To ensure correct power measurement it is important that the AC current input does not exceed 110% of its nominal value. To accomplish this it is important to take the value of the max. cos phi into consideration when ordering/configuring the LSU-114DG, e.g. by using the kVA figure of the generator and cos phi = 1.

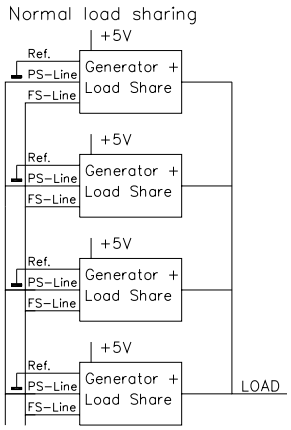
Application

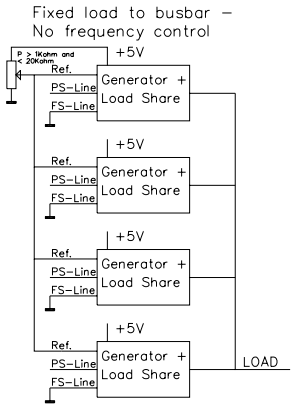
The schematic drawings on the next page show the different couplings for the LSU-114DG. For further information see the Application notes for uni-line, doc. no. 4189340150.

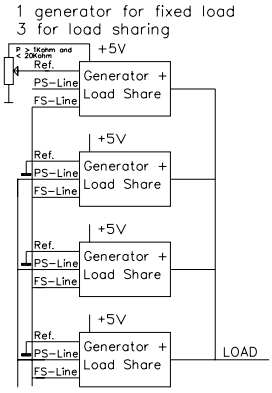
Type LSU-114DG

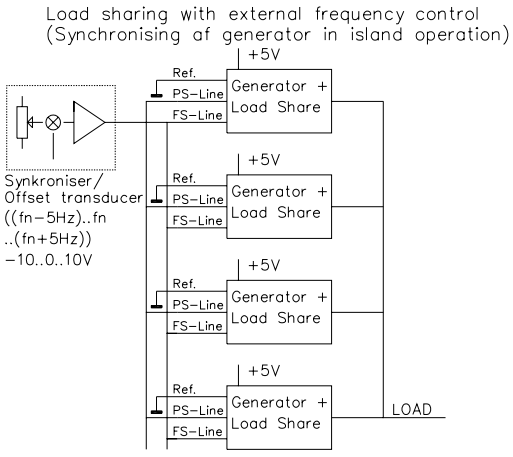
Schematic drawings











Technical specifications

Meas. current (I_n): 0.3-0.4-0.5-0.6-0.8-1.0-1.3-1.5-2.0-2.5-3.0-4.0-5.0A AC (calibration modules)

Adjusted range: 75...100% of I_n (e.g. 0.45, adjusted by means of a built-in potentiometer)
(Lowest meas. range: 0.3A)

Overload: 4 x I_n, continuously
20 x I_n for 10 s (max. 75A)
80 x I_n for 1 s (max. 300A)

Load: Max. 0.5VA (per phase) at I_n

Meas. voltage (U_n): (See supply voltage - AC ranges)

Voltage range: U_n 60...120%

Overload: 1.2 x U_n, continuously
2 x U_n for 10 s

Load: 2kΩ/V

Frequency range: 40...45...65...70Hz

Inputs:
Unload: Potential-free relay contact
Open: 5V. Closed: 5mA

Reference input: 0.5...5V ±1% (10...100% power)
Input resistance: ≥2MΩ

Ext. power input: 4...20mA DC ±2%

Ext. frequency input: -5...0...5V ±2% ~ 0...±2.5Hz
Max. -10...0...10V ~ -5...0...5Hz

Contact outputs:
Speed control: 2 make contacts

Start/stop: 2 change-over contacts

Contact ratings: AC1: 8A, 250V AC
DC1: 8A, 24V DC
AC15: 3A, 250V AC
DC13: 3A, 24V DC

Life electrical: 1 x 10^5 (nominal value)

Analogue outputs:
PS line, FS line: 2 parallel, analogue lines (-5...0...5V)
5V ±2% = 2.5Hz ~ 100% power
0V ±2% = 0Hz ~ 0% power

Reference output: Reference voltage: 5.0V ±1%
Load: Max. 5mA (R ≥ 1kΩ)

Optocoupler output: System status off = Failure
Max. voltage 30V DC, max. current 5mA

Temperature: -25...70°C (operating)

Temperature drift: Set-points:
Max. ±0.2% of full scale per 10°C

Technical specifications, continued

Galvanic separation: Between meas. voltage, meas. current, relay outputs, analogue inputs/outputs and aux. voltage: 3250V - 50Hz - 1 min.

Supply voltage (U_n): 57.7-63.5-100-110-127-200-220-230-240-380-400-415-440-450-660-690V AC ±20% (max. 3.5VA)
24-48-110-220V DC -25/+30% (max. 2W)

Climate: HSE, to DIN 40040

EMC: To EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4) and IEC 255-3

Connections: Max. 4mm² (single-stranded)
Max. 2.5mm² (multi-stranded)

Materials: All plastic parts are self-extinguishing to UL94 (V1)

Protection: Case: IP40. Terminals: IP20, to IEC 529 and EN 60529

Type approval: The uni-line components are approved by the major classification societies. For current approvals see www.deif.com or contact DEIF A/S

Settings

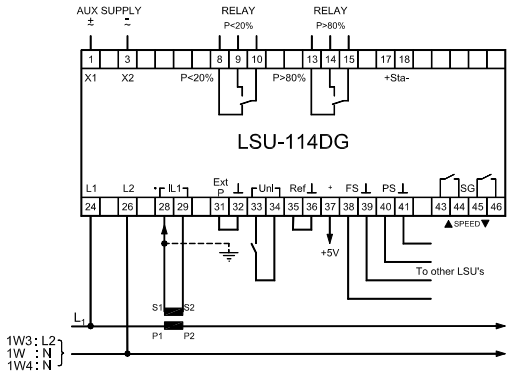
Setting of	Range
T_N Control pulse length	25…500 ms
X_P Proportional band	0…±50% of P_n 0…±2.5Hz of set frequency
Frequency	45…65Hz
Derating	50…0% of P_n
Start/stop (fixed)	80% of P_n and 20% of P_n

Indication

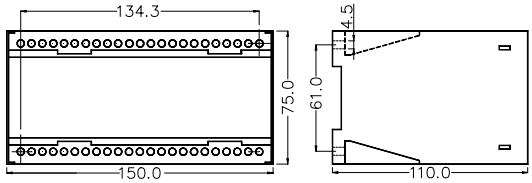
LEDs		Lit	Switched off
U_G	Generator voltage	(Green) Present	Failure
P >80%	Start	(Yellow) Exceeded	Normal Associated relay deactivated
P <20%	Stop		
Unload	Unloading of this generator	(Green) Gen. unloaded	Normal load
SG▲	Increase speed (power)	(Yellow) Relay activated	Relay not activated
SG▼	Decrease speed (power)		

Once the unit has been mounted and adjusted, the transparent front cover may be sealed, preventing unwanted change of the setting.

Connections/dimensions (in mm)



See installation instructions for information about status output (17-18)



Weight: Approx. 0.750 kg

Order specifications

Type – Coupling – Measuring power (P_n) – Cos-φ – Measuring voltage – Supply voltage
Example:
LSU-114DG – 1W3 – 100W – 0.8 – 100V – 24V DC

$$Meas.\ power = \frac{Primary\ power}{CT\ ratio\ x\ VT\ ratio}$$

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

ANSI code 90

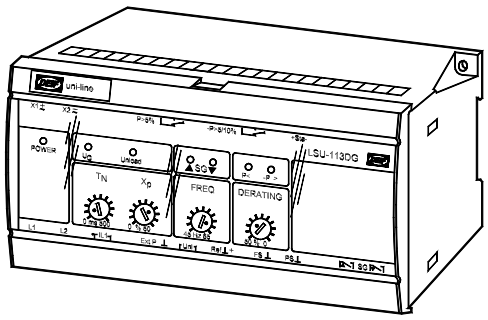
Type LSU-113DG

Load sharing units

uni-line

4921240120G

- ***For control of diesel and gas generators***
- ***Built-in power and frequency transducer***
- ***Reverse power protection/unload and trip***
- ***Constant power or isochronous mode***
- ***LED indication of status/activated control***
- ***35 mm DIN rail or base mounting***



LSU-113DG CE

Application

The LSU-113DG is a control unit for control of the prime mover in a power unit.

The LSU-113DG can control the power unit
- in stand-alone mode, performing frequency control
- parallel with grid, performing power control
- parallel with other power units, performing frequency and power control

The unit is designed for connection to a mechanical speed governor, however in conjunction with the DEIF electronic potentiometer type EPN-110DN or EPQ-96 it can control electronic speed governors as well.

The LSU-113DG has a built-in frequency transducer. If a very stable frequency is wanted, an external frequency transducer common for all the LSU-113DGs in the power plant can be connected. If a number of power units are to be synchronised to the busbar at the same time, the frequency may likewise be controlled externally.

Function

The LSU-113DG is measuring the voltage and the current from which the frequency and the power produced by the power unit are measured. The built-in power transducer is based on an I x cos phi principle.

The following couplings are available:
- 1W(4) – single phase
- 1W3 – 1 element 3 phase, 3 wire, balanced load

If unbalanced load can be expected, an external power transducer with an output of 4…20mA can be connected to the LSU-113DG. In this case the built-in I x cos phi transducer is automatically interrupted.

The power and frequency measured by each LSU-113DG are fed to 2 paralleling lines for comparison with the frequency (FS) and power (PS) of the other connected LSU-113DG.

If L1 or L2 is disconnected from the LSU-113DG at the same time as a power unit in a power plant is disconnected from the power line (busbar), built-in relays in the LSU-113DG ensure that the power output and the frequency output of the associated unit are disconnected from the paralleling lines. Likewise the power and frequency outputs are disconnected if the auxiliary voltage to the LSU-113DG is disconnected.

The LSU-113DG is equipped with an unload input and a "low power" output. When activated the input will control the power unit to zero power, and the output will trip the breaker below P <5% of P_{nom}. At the same time the input is activated, the power output of the LSU-113DG is disconnected from the paralleling line.

The LSU-113DG is provided with a reverse power output. The set-point for this output is:
-P >5% fixed delay 5 s or 10 s
-P >10% fixed delay 5 s or 10 s

The calibration of the LSU-113DG is done so it matches its power unit. This means that load sharing between power units with different size will be performed according to the actual size of the individual power unit in the plant. E.g. a 100kW PU and a 150kW PU running in parallel will share a total load of 125kW into 50kW and 75kW. If the 150kW PU is derated to 100kW by means of the DERATING potentiometer on the front of the LSU-113DG, the load in the above example will then be shared equally between the 2 power units.

Outputs

The unit is provided with 2 contact outputs for speed control:

Power and frequency control:
The regulating speed of the servomotors for the prime mover is controlled by the built-in P controller of the LSU-113DG according to its setting for:

T_N (pulse length):
The min. duration of the control pulse.

X_P (proportional band):
The zone within which the pulse/pause ratio changes proportionally to the frequency/power deviation from the required value.

Dead band:
The zone within which no control pulses are emitted:
Power: ±0.5% of P_n (or for derated value)
Frequency: ±0.1Hz

Tripping output:
2 change-over contacts, normally de-energized, for low power and reverse power tripping.

Self-monitoring

The LSU-113DG is equipped with a self-monitoring function. The function supervises the built-in micro-controller and hereby verifies if the programme is running correctly. The green LED marked "POWER" is connected to this function. Constant green light indicates that the supply voltage is accepted and the unit is running correctly. Flashing green light 2-3Hz indicates that the supply voltage is accepted but the unit is running incorrectly. In this situation the status output terminals 17 and 18 are activated (open).

Type LSU-113DG

Terminals/function

Connection type	Connect	
1W3 (standard)	L1 to term. 24	L2 to term. 26
1W (betw. phase/neutral)	L1 (P) to term. 24	Neutral to term. 26

Terminal no.	Description/action
1 and 3 X1/X2	Input for supply voltage
8, 9 and 10 ("P <5%")	After unloading (short-circuit of terminals 33 and 34 ("Unl")) an opening signal is transmitted to the generator circuit breaker when the power has dropped to 5% or less of P_n
13, 14 and 15 ("-P >5/10% 5 s/10 s")	Relay output for reverse power protection. The -P > set-point is set by DEIF to either -P >5% (delay: 5 s or 10 s) or -P >10% (delay: 5 s or 10 s)
17 and 18 Sta	Status output, activated (closed) when the supply voltage is connected and the unit is working correctly
28 and 29 IL1	Input for the current measurement. Note that S1 on the external current transformer is connected to terminal 28, and S2 is connected to terminal 29
31 and 32 Ext. P.	Must be short-circuited, if the internal power transducer is used (normal). For applications with unbalanced load it is recommended to use an external power transducer (replacing the built-in one). Connect external power transducer to 31 (+) and 32 (-). The output of the external transducer must be 4…20mA DC. The output of the connected transducer must limit the output to min. 2mA and max. 22mA. DEIF transducer type TAS-331DG is recommended
33 and 34 ("Unl")	May be connected to a potential-free N/O relay contact. When this contact is activated, the power of the generator is regulated to zero (unloading) and the LSU-113DG is disconnected from the PS power line
35 ("Ref.")	Reference input. Must be connected to term. 36 ("⊥"), if not used. This input is used to control the power unit running in power control mode (fixed load to grid). A +0.5V…5V connected to the input with respect to ⊥ will control the PU in the range 10…100% power. The input activates at 0.55V and deactivates at 0.45V. Please notice that when this input is active the LSU-113DG is still connected to the PS and FS lines. In this mode the PS line acts only as an output
37 ("+5V")	Reference output. This voltage output can be used for local power control mode. If terminal 37 is feeding a voltage divider, and the output from the voltage divider is connected to terminal 35, local power control can be performed
36 ("⊥")	Common earth terminal for the above reference input/output
38 (FS) and 39 ("⊥")	Paralleling line for frequency sharing of the connected LSU-113DGs
40 (PS) and 41 ("⊥")	Paralleling line for power sharing of the connected LSU-113DGs. Normally 5V at nominal busbar voltage and cos phi = 1. If cos phi 0.8 is stated on the label, 4V correspond to 100% power
43 and 44 Relay con- tacts "SG"	Relay contact for increase of the speed
45 and 46 Relay con- tacts "SG"	Relay contact for decrease of the speed
NOTE: Relay contacts	Relays (SG) should always be connected via external auxiliary relays when a DC pilot motor is applied. A transient suppressor should always be connected across the relay coil of the external relays

NOTE:
All terminals marked "⊥" are internally connected.

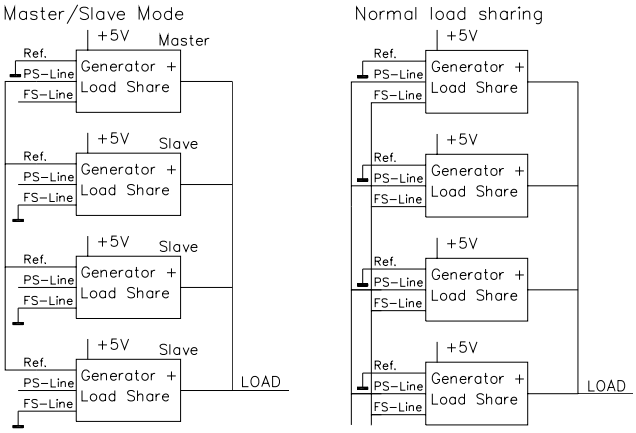
For correct function of the LSU-113DG any analogue DC input must not exceed 110% of its nominal value. To ensure correct power measurement it is important that the AC current input does not exceed 110% of its nominal value. To accomplish this it is important to take the value of the max. cos phi into consideration when ordering/configuring the LSU-113DG, e.g. by using the kVA figure of the generator and cos phi = 1.

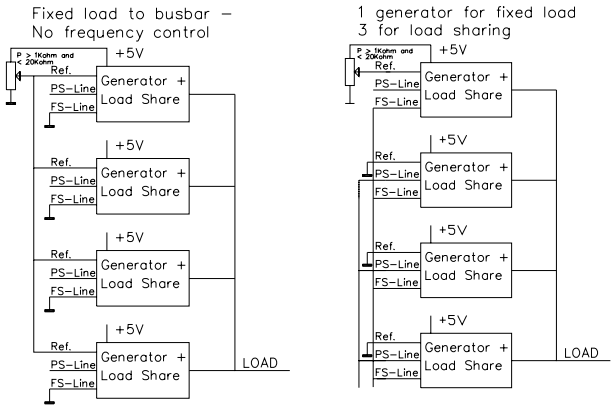
Application

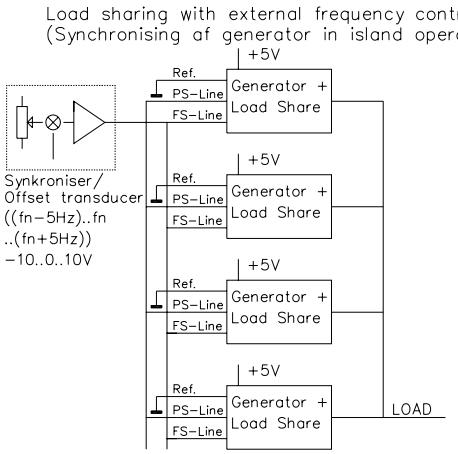
The schematic drawings on the next page show the different couplings for the LSU-113DG. For further information see the Application notes for uni-line, doc. no. 4189340150.

Type LSU-113DG

Schematic drawings







Technical specifications

Meas. current (I_n): 0.3-0.4-0.5-0.6-0.8-1.0-1.3-1.5-2.0-2.5-3.0-4.0-5.0A AC (calibration modules)

Adjusted range: 75...100% of I_n (e.g. 0.45, adjusted by means of a built-in potentiometer) (Lowest meas. range: 0.3A)

Overload: 4 x I_n, continuously
20 x I_n for 10 s (max. 75A)
80 x I_n for 1 s (max. 300A)

Load: Max. 0.5VA (per phase) at I_n

Meas. voltage (U_n): (See supply voltage - AC ranges)

Voltage range: U_n 60...120%

Overload: 1.2 x U_n, continuously
2 x U_n for 10 s

Load: 2kΩ/V

Frequency range: 40...45...65...70Hz

Inputs:
Unload: Potential-free relay contact
Open: 5V. Closed: 5mA

Reference input: 0.5...5V ±1% (10...100% power)
Input resistance: ≥2MΩ

Ext. power input: 4...20mA DC ±2%

Ext. frequency input: -5...0...5V ±2% ~ 0...±2.5Hz
Max. -10...0...10V ~ -5...0...5Hz

Contact outputs:
Speed control: 2 make contacts

P< -P>: 2 change-over contacts

Contact ratings: AC1: 8A, 250V AC
DC1: 8A, 24V DC
AC15: 3A, 250V AC
DC13: 3A, 24V DC

Life electrical: 1 x 10^5 (nominal value)

Analogue outputs:
PS line, FS line: 2 parallel, analogue lines (-5...0...5V)
5V ±2% = 2.5Hz ~ 100% power
0V ±2% = 0Hz ~ 0% power

Reference output: Reference voltage: 5.0V ±1%
Load: Max. 5mA (R ≥ 1kΩ)

Optocoupler output: System status off = Failure
Max. voltage 30V DC, max. current 5mA

Temperature: -25...70°C (operating)

Temperature drift: Set-points:
Max. ±0.2% of full scale per 10°C

Type LSU-113DG

Technical specifications, continued

Galvanic separation: Between meas. voltage, meas. current, relay outputs, analogue inputs/outputs and aux. voltage: 3250V - 50Hz - 1 min.

Supply voltage (U_n): 57.7-63.5-100-110-127-200-220-230-240-380-400-415-440-450-660-690V AC ±20% (max. 3.5VA)
24-48-110-220V DC -25/+30% (max. 2W)

Climate: HSE, to DIN 40040

EMC: To EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4) and IEC 255-3

Connections: Max. 4mm² (single-stranded)
Max. 2.5mm² (multi-stranded)

Materials: All plastic parts are self-extinguishing to UL94 (V1)

Protection: Case: IP40. Terminals: IP20, to IEC 529 and EN 60529

Type approval: The uni-line components are approved by the major classification societies. For current approvals see www.deif.com or contact DEIF A/S

Settings

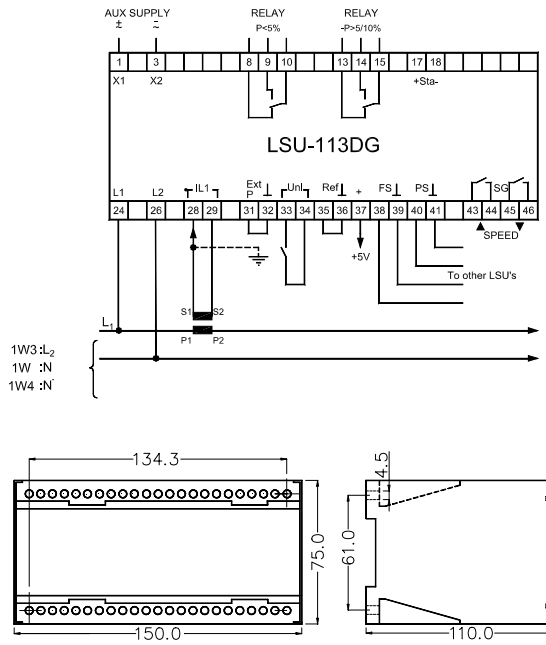
Setting of	Range
T_N Control pulse length	25…500 ms
X_P Proportional band	0…±50% of P_n 0…±2.5Hz of set frequency
Frequency	45…65Hz
Derating	50…0% of P_n
Reverse power	-5% of P_n or -10% of P_n, 5s or 10s
Low power	5% of P_n

Indication

LEDs		Lit	Switched off
U_G	Generator voltage	(Green) Present	Failure
-P> 5%/10%	Reverse power	(Yellow) Fault	Normal Associated relay deactivated
P<5%	Low power	(Yellow)	
Unload	Unloading of this generator	(Green) Gen. unloaded	Normal load
SG▲	Increase speed (power)	(Yellow) Relay activated	Relay not activated
SG▼	Decrease speed (power)		

Once the unit has been mounted and adjusted, the transparent front cover may be sealed, preventing unwanted change of the setting.

Connections/dimensions (in mm)



Weight: Approx. 0.750 kg

Order specifications

Type – Coupling – Measuring power (P_n) – Set point "-P>" – Delay – Cos-φ – Measuring voltage – Supply voltage
Example:
LSU-113DG – 1W3 – 100W – 5% – 10 s – 0.8 – 100V – 24V DC

$$Meas.\ power = \frac{Primary\ power}{CT\ ratio \times VT\ ratio}$$

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

DEIF A/S, Frisenborgvej 33
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

ANSI code 90

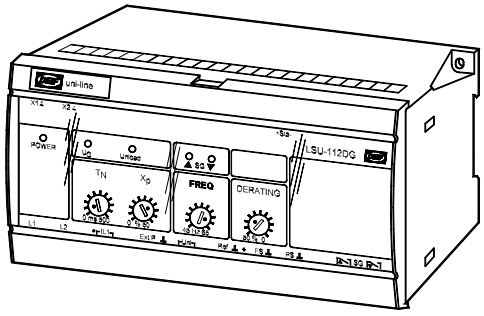
Type LSU-112DG

Load sharing units

uni-line

4921240118E

- ***For control of diesel and gas generators***
- ***Built-in power and frequency transducer***
- ***Constant power or isochronous mode***
- ***LED indication of status***
- ***LED indication for activated control***
- ***35 mm DIN rail or base mounting***



LSU-112DG CE

Application

The LSU-112DG is a control unit for control of the prime mover in a power unit.

The LSU-112DG can control the power unit
- in stand-alone mode, performing frequency control
- parallel with grid, performing power control
- parallel with other power units, performing frequency and power control

The unit is designed for connection to a mechanical speed governor, however in conjunction with the DEIF electronic potentiometer type EPN-110DN or EPQ-96 it can control electronic speed governors as well.

The LSU-112DG has a built-in frequency transducer. If a very stable frequency is wanted, an external frequency transducer common for all the LSU-112DGs in the power plant can be connected. If a number of power units are to be synchronised to the busbar at the same time, the frequency may likewise be controlled externally.

Function

The LSU-112DG is measuring the voltage and the current from which the frequency and the power produced by the power unit are measured. The built-in power transducer is based on an I x cos phi principle.

The following couplings are available:
- 1W(4) – single phase
- 1W3 – 1 element 3 phase, 3 wire, balanced load

If unbalanced load can be expected, an external power transducer with an output of 4…20mA can be connected to the LSU-112DG. In this case the built-in I x cos phi transducer is automatically interrupted.

The power and frequency measured by each LSU-112DG are fed to 2 paralleling lines for comparison with the frequency (FS) and power (PS) of the other connected LSU-112DG.

If L1 or L2 is disconnected from the LSU-112DG at the same time as a power unit in a power plant is disconnected from the power line (busbar), built-in relays in the LSU-112DG ensure that the power output and the frequency output of the associated unit are disconnected from the paralleling lines. Likewise the power and frequency outputs are disconnected if the auxiliary voltage to the LSU-112DG is disconnected.

The LSU-112DG is equipped with an unload input. When activated this input will control the power unit to zero power, and at the same time the power output of the LSU-112DG is disconnected from the paralleling line.

The calibration of the LSU-112DG is done so it matches its power unit. This means that load sharing between power units with different size will be performed according to the actual size of the individual power unit in the plant. E.g. a 100kW PU and a 150kW PU running in parallel will share a total load of 125kW into 50kW and 75kW. If the 150kW PU is derated to 100kW by means of the DERATING potentiometer on the front of the LSU-112DG, the load in the above example will then be shared equally between the 2 power units.

Regulator output

The unit is provided with 2 contact outputs for speed control:

Power and frequency control:
The regulating speed of the servomotors for the prime mover is controlled by the built-in P controller of the LSU-112DG according to its setting for:

T_N (pulse length):
The min. duration of the control pulse.

X_P (proportional band):
The zone within which the pulse/pause ratio changes proportionally to the frequency/power deviation from the required value.

Dead band:
The zone within which no control pulses are emitted:
Power: ±0.5% of P_n (or for derated value)
Frequency: ±0.1Hz

Self-monitoring

The LSU-112DG is equipped with a self-monitoring function. The function supervises the built-in micro-controller and hereby verifies if the programme is running correctly. The green LED marked “POWER” is connected to this function. Constant green light indicates that the supply voltage is accepted and the unit is running correctly. Flashing green light 2-3Hz indicates that the supply voltage is accepted but the unit is running incorrectly. In this situation the status output terminals 17 and 18 are activated (open).

Type LSU-112DG

Terminals/function

Connection type	Connect	
1W3 (standard)	L1 to term. 24	L2 to term. 26
1W (betw. phase/neutral)	L1 (P) to term. 24	Neutral to term. 26

Terminal no.	Description/action
1 and 3 X1/X2	Input for supply voltage
17 and 18 Sta	Status output, activated (closed) when the supply voltage is connected and the unit is working correctly
28 and 29 IL1	Input for the current measurement. Note that S1 on the external current transformer is connected to terminal 28, and S2 is connected to terminal 29
31 and 32 Ext. P.	Must be short-circuited, if the internal power transducer is used (normal). For applications with unbalanced load it is recommended to use an external power transducer (replacing the built-in one). Connect external power transducer to 31 (+) and 32 (-). The output of the external transducer must be 4…20mA DC. The output of the connected transducer must limit the output to min. 2mA and max. 22mA. DEIF transducer type TAS-331DG is recommended
33 and 34 ("Unl")	May be connected to a potential-free N/O relay contact. When this contact is activated, the power of the generator is regulated to zero (unloading) and the LSU-112DG is disconnected from the PS power line
35 ("Ref.")	Reference input. Must be connected to term. 36 ("⊥"), if not used. This input is used to control the power unit running in power control mode (fixed load to grid). A +0.5V…5V connected to the input with respect to ⊥ will control the PU in the range 10…100% power. The input activates at 0.55V and deactivates at 0.45V. Please notice that when this input is active the LSU-112DG is still connected to the PS and FS lines. In this mode the PS line acts only as an output
37 ("+5V")	Reference output. This voltage output can be used for local power control mode. If terminal 37 is feeding a voltage divider, and the output from the voltage divider is connected to terminal 35, local power control can be performed
36 ("⊥")	Common earth terminal for the above reference input/output
38 (FS) and 39 ("⊥")	Paralleling line for frequency sharing of the connected LSU-112DGs
40 (PS) and 41 ("⊥")	Paralleling line for power sharing of the connected LSU-112DGs. Normally 5V at nominal busbar voltage and cos phi = 1. If cos phi 0.8 is stated on the label, 4V correspond to 100% power
43 and 44 Relay contacts "SG"	Relay contact for increase of the speed
45 and 46 Relay contacts "SG"	Relay contact for decrease of the speed
NOTE: Relay contacts	Relays (SG) should always be connected via external auxiliary relays when a DC pilot motor is applied. A transient suppressor should always be connected across the relay coil of the external relays

NOTE:
All terminals marked "⊥" are internally connected.

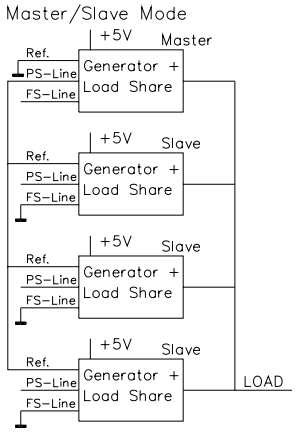
For correct function of the LSU-112DG any analogue DC input must not exceed 110% of its nominal value. To ensure correct power measurement it is important that the AC current input does not exceed 110% of its nominal value. To accomplish this it is important to take the value of the max. cos phi into consideration when ordering/configuring the LSU-112DG, e.g. by using the kVA figure of the generator and cos phi = 1.

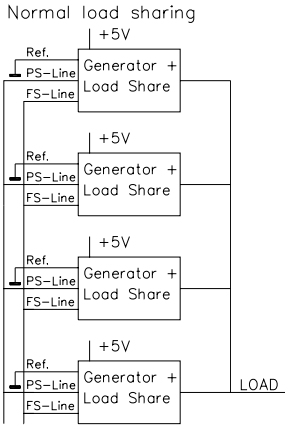
Application

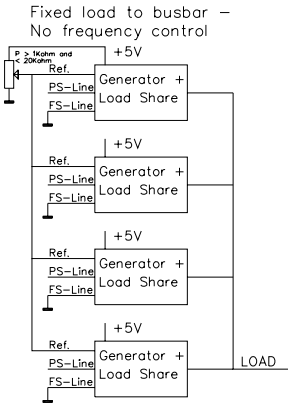
The schematic drawings on the next page show the different couplings for the LSU-112DG. For further information see the Application notes for uni-line, doc. no. 4189340150.

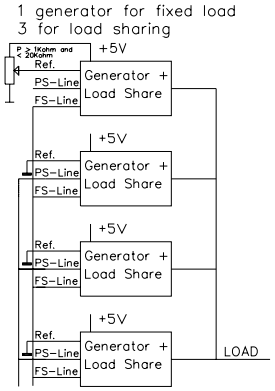
Type LSU-112DG

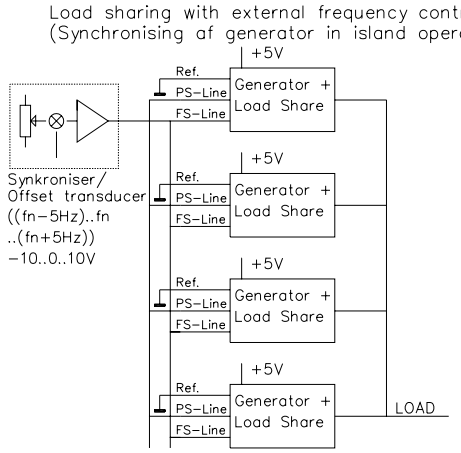
Schematic drawings











Technical specifications

Meas. current (I_n): 0.3-0.4-0.5-0.6-0.8-1.0-1.3-1.5-2.0-2.5-3.0-4.0-5.0A AC (calibration modules)

Adjusted range: 75...100% of I_n (e.g. 0.45, adjusted by means of a built-in potentiometer)
(Lowest meas. range: 0.3A)

Overload: 4 x I_n, continuously
20 x I_n for 10 s (max. 75A)
80 x I_n for 1 s (max. 300A)

Load: Max. 0.5VA (per phase) at I_n

Meas. voltage (U_n): (See supply voltage - AC ranges)

Voltage range: U_n 60...120%

Overload: 1.2 x U_n, continuously
2 x U_n for 10 s

Load: 2kΩ/V

Frequency range: 40...45...65...70Hz

Inputs:
Unload: Potential-free relay contact
Open: 5V. Closed: 5mA

Reference input: 0.5...5V ±1% (10...100% power)
Input resistance: ≥2MΩ

Ext. power input: 4...20mA DC ±2%

Ext. frequency input: -5...0...5V ±2% ~ 0...±2.5Hz
Max. -10...0...10V ~ -5...0...5Hz

Contact outputs:
Speed control: 2 make contacts

Contact ratings: AC1: 8A, 250V AC
DC1: 8A, 24V DC
AC15: 3A, 250V AC
DC13: 3A, 24V DC

Life electrical: 1 x 10^5 (nominal value)

Analogue outputs:
PS line, FS line: 2 parallel, analogue lines (-5...0...5V)
5V ±2% = 2.5Hz ~ 100% power
0V ±2% = 0Hz ~ 0% power

Reference output: Reference voltage: 5.0V ±1%
Load: Max. 5mA (R ≥ 1kΩ)

Optocoupler output: System status off = Failure
Max. voltage 30V DC, max. current 5mA

Temperature: -25...70°C (operating)

Temperature drift: Set-points:
Max. ±0.2% of full scale per 10°C

Technical specifications, continued

Galvanic separation: Between meas. voltage, meas. current, relay outputs, analogue inputs/outputs and aux. voltage: 3250V - 50Hz - 1 min.

Supply voltage (U_n): 57.7-63.5-100-110-127-200-220-230-240-380-400-415-440-450-660-690V AC ±20% (max. 3.5VA)
24-48-110-220V DC -25/+30% (max. 2W)

Climate: HSE, to DIN 40040

EMC: To EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4) and IEC 255-3

Connections: Max. 4mm² (single-stranded)
Max. 2.5mm² (multi-stranded)

Materials: All plastic parts are self-extinguishing to UL94 (V1)

Protection: Case: IP40. Terminals: IP20, to IEC 529 and EN 60529

Type approval: The uni-line components are approved by the major classification societies. For current approvals see www.deif.com or contact DEIF A/S

Settings

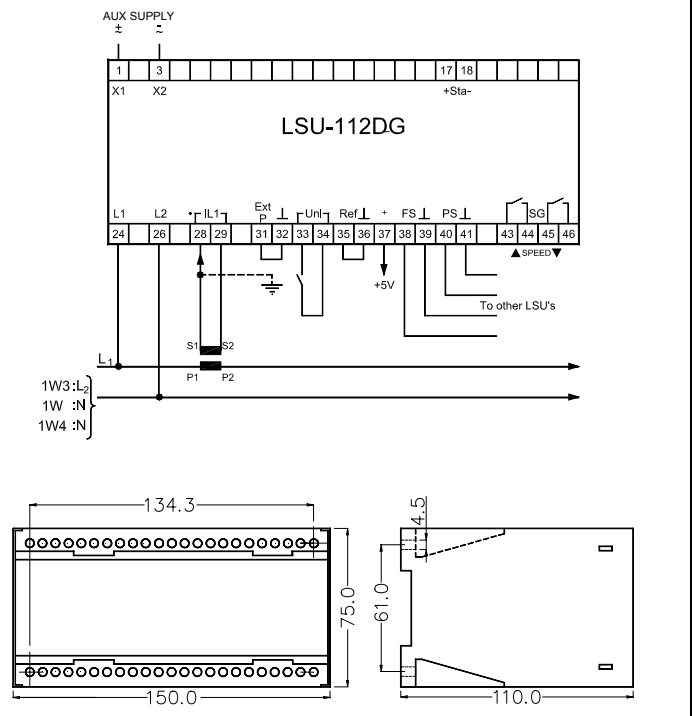
Setting of	Range
T_N Control pulse length	25…500 ms
X_P Proportional band	0…±50% of P_n 0…±2.5Hz of set frequency
Frequency	45…65Hz
Derating	50…0% of P_n

Indication

LEDs		Lit	Switched off
U_G	Generator voltage	(Green) Present	Failure
Unload	Unloading of this generator	(Green) Gen. unloaded	Normal load
SG▲	Increase speed (power)	(Yellow) Relay activated	Relay not activated
SG▼	Decrease speed (power)		

Once the unit has been mounted and adjusted, the transparent front cover may be sealed, preventing unwanted change of the setting.

Connections/dimensions (in mm)



Weight: Approx. 0.750 kg

Order specifications

Type – Coupling – Measuring power (P_n) – Cos-phi – Measuring voltage – Supply voltage
Example:
LSU-112DG – 1W3 – 100W – 0.8 – 100V – 24V DC

$$Meas.\ power = \frac{Primary\ power}{CT\ ratio\ x\ VT\ ratio}$$

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

ANSI code 32

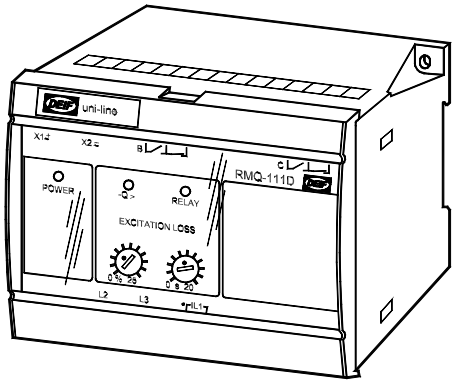
Type RMQ-111D, RMQ-121D

Excitation relays

uni-line

4921240112D

- ***Loss of excitation/overexcitation***
- ***Protection of generators***
- ***Single phase measurement***
- ***Timer controlled tripping***
- ***LED indication of fault/activated relay***
- ***35 mm DIN rail or base mounting***



RMQ-111D CE

Application

The protective loss of excitation relay type RMQ-111D and the overexcitation relay type RMQ-121D form part of a complete DEIF series of relays for protection and control of generators.

The relays are type approved by major classification societies and is applicable to both marine and land-based installations.

Loss of excitation relay type RMQ-111D (ANSI code 32)
This relay is applied to protect a generator running in parallel with other generators from running as an induction generator due to underexcitation.

The RMQ-111D will thus protect the generator against damages caused by excessive heating due to slip frequency current flow, at the same time preventing transfer of reactive load from a faulty generator.

The RMQ-111D is especially applied in cases where applying an undervoltage relay for protection does not suffice, because the remaining generators of the system can supply sufficient reactive power to magnetize the faulty generator, thus maintaining the terminal voltage of the generators.

Overexcitation relay type RMQ-121D (ANSI code 32)
This relay is applied to protect a generator against over-excitation and will prevent it from generating too high currents in case of heavy inductive loads.

The RMQ-121D will thus protect the generator against damages caused by excessive heating of its windings, at the same time preventing transfer of reactive load to a faulty generator.

Measuring principle

The applied TDM (Time-Division-Multiplication) principle ensures an accurate measurement of the RMS value of the reactive power (U x I x sin-φ), irrespective of wave form. The relays are available with connection 1var3(4), i.e. 1 element 3 phase 3 wire (4 wire), balanced load.

If the reactive power exceeds the set point, the output is activated. The set point value is set on the front of the relay by means of a potentiometer. If the reactive power exceeds this, a fault signal is generated, and the associated yellow LED is lit.

Timer function

When the set point is exceeded, the associated timer starts and will run as long as the fault condition prevails. The delay does not depend on the exceeding of the set point. If the fault disappears, the timer is reset. When the timer expires, the contact is activated and the associated red LED is lit.

Relay output
The relays are provided with outputs as follows:

RMQ-111D	-Q>	1 minimum contact
RMQ-121D	Q>	1 maximum contact

either normally energised or normally de-energised. The contact may be set to open or to close on activation.

Normally energised contact
Recommended for land-based installation for warning and alarm purposes. In case of an auxiliary supply drop-out, the contact is immediately activated.

Normally de-energised contact
Recommended for marine installations for regulating and control purposes. An auxiliary supply failure will not result in an unwanted activation of the contact.

Latch circuit
The contacts can then be locked in their warning position, even if the input returns to normal (add “L” to contact type in order specifications, if this is required). The latch circuit is reset by disconnecting the auxiliary supply.

Hysteresis
In order to avoid “chatter” on the relay contacts the contact functions are provided with a hysteresis, i.e. a difference of 2% of full scale between energising and de-energising of the relay.

Power-up/power-down circuits
The relays are provided with a 200 ms power-up circuit, ensuring the correct function of the relay on connection of the auxiliary voltage.

Note: Normally energised contacts are not activated (contact does not open/close) until 200 ms after connection of the auxiliary voltage.

Likewise, the relays are provided with a 200 ms power-down circuit, ensuring supervision and maintenance of any set point exceedings for 200 ms after disconnection of the auxiliary voltage.

Technical specifications

Meas. range (I_n): 0.3-0.4-0.5-0.6-0.8-1.0-1.3-1.5-2.0-2.5-3.0-4.0-5.0A AC

adjusted ranges: 75...100% of I_n (e.g. 0.4, 0.45, etc.) (lowest meas. range: 0.3A)

overload: 4 x I_n, continuously,
20 x I_n for 10 s (max. 75A)
80 x I_n for 1 s (max. 300A)

load: Max. 0.5VA per phase.

Meas. voltage (U_n): (see supply voltage - AC ranges).
overload: 1.2 x U_n, continuously,
2 x U_n for 10 s

load: 2kΩ/V.

Frequency range: 40...45...65...70Hz.

Output: 1 minimum contact

contact type: Relay B:
normally energised ("NE"), or
normally de-energised ("ND")
with or without latch circuit ("L")

relay contact: 1 change-over relay

contact ratings: 250V-8A-2000VA (AC)
24V-8A-200W (DC)
(200 x 10^3 change-overs at resistive load)

contact voltage: Max. 250V (AC). Max. 150V (DC).

Hysteresis: 2% of full scale (F.S.).

Response time: <400 ms

Temperature: -25...70°C (operating).

Temperature drift: Set points:
max. ±0.2% of full scale per 10°C.

Galvanic separation: Between inputs, outputs and aux. voltage: 3250V - 50Hz - 1 min.

Supply voltage (U_n): 57.7-63.5-100-110-127-200-220-230-240-380-400-415-440-450-660-690VAC ±20% (max. 3.5VA)

24-48-110-220V DC -25/+30% (max. 2W).

Climate: HSE, to DIN 40040.

EMC: To EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4) and IEC 255-3.

Connections: Max. 4 mm² (single-stranded).
Max. 2.5 mm² (multi-stranded).

Materials: All plastic parts are self-extinguishing to UL94 (V1).

Protection: Case: IP40. Terminals: IP20, to IEC 529 and EN 60529.

Type approval: The uni-line components are approved by the major classification societies. For current approvals see www.deif.com or contact DEIF A/S.

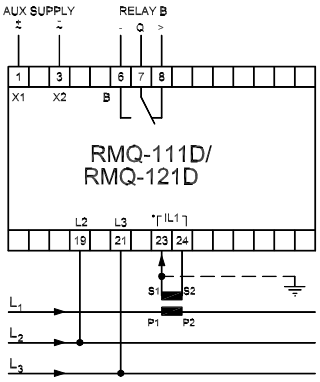
Settings and indication

Setting of	LED	Relay
Reactive power set point: RMQ-111D: (0...25%) of Q_n	"-Q>"	Yellow LED is lit when the reactive power has dropped below the set point, but the relay has not yet been activated.
Reactive power set point: RMQ-121D: (25...125%) of Q_n	"Q>"	Yellow LED is lit when the reactive power exceeds the set point, but the relay has not yet been activated.
Time delay: (0...20 s) in seconds	"RELAY"	Contact is activated and red LED lit after timer has expired.

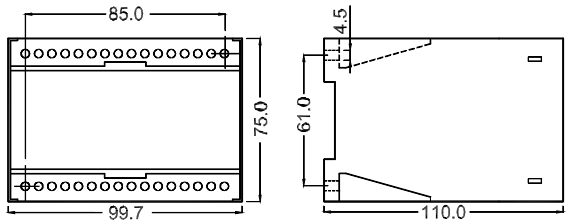
The relay is furthermore equipped with a green LED marked "POWER" for indication of power ON. Once the relay has been mounted and adjusted, the transparent front cover may be sealed, preventing unwanted change of the setting.

Connections/dimensions (in mm)

1var3(4)



Shown contact positions: aux. voltage not connected



Weight:approx. 0.650 kg

Order specifications

Type - Measuring power (Q_n) - Measuring voltage - Relay B - Supply voltage

Examples:
RMQ-111D - 0...100var - 110V AC - NDL - 220V DC
RMQ-121D - 0...1000var - 660V AC - NE - 24V DC

$$\textit{Meas. power } (Q_n) = \frac{\textit{Primary power}}{\textit{CT ratio x VT ratio}}$$

Due to our continous development we reserve the right to supply equipment which may vary from the described.

DEIF A/S, Frisenborgvej 33
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

ANSI code 78

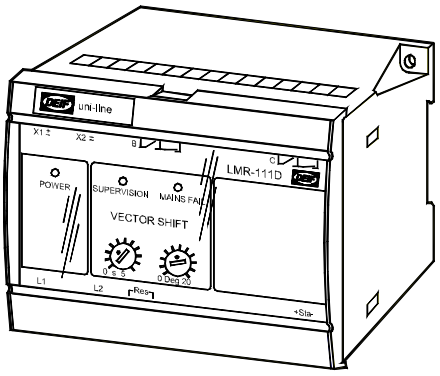
Type LMR-111D

Loss of mains relay

uni-line

4921240214C

- ***Detection of vector shift***
- ***Mains disconnection on mains failure***
- ***Ensures no asynchronous reconnection***
- ***LED indication of fault condition***
- ***LED indication for activated relay***
- ***35 mm DIN rail or base mounting***



LMR-111D CE

Application

The loss of mains relay type LMR-111D forms part of a complete DEIF series of relays for protection and control generators.

This relay is applied for protection of synchronous generators, running in parallel with the mains.

A mains failure will be detected, provided a disconnection at an arbitrary point of the network results in a swift change of the generator frequency (vector shift). An opening signal is then transmitted to the mains circuit breaker, and the generator will thus be protected against damages caused by an automatic reconnection to the high-voltage network.

The LMR-111D will on the other hand not detect the normal relatively slow and acceptable changes of the frequency of the network (the mains).

Furthermore, separation of a generator from the mains in case of mains failure is also stipulated as a condition in most national rules for connection of synchronous generators to the mains. Regarding Great Britain, see Engineering Recommendation G59.

Measuring principle

The relay supervises the angular velocity of the phases of the mains. The velocity is supervised by comparing the times for the latest two full cycles with the times for the full cycles of the previous 4th and 5th period.

After 5 periods have passed (after connection to the mains) the relay will thus have performed the first measurement. After this the LMR-111D will within one period detect a vector shift.

This method of measurement (comparing periods 1 and 2 with periods 4 and 5) ensures correct detection of a vector shift occurring very close to the zero crossing of the AC voltage.

If the difference between the measurements exceeds the set point, the output is activated. Within 30 ms (inclusive of contact delay), an opening signal is transmitted to mains circuit breaker, and the LED marked "MAINS FAIL" is lit. The set point value is set on the front of the relay by means of a potentiometer marked “SENS”.

The LMR-111D is provided with 1 reset input connected to contacts to the generator circuit breaker and to the mains circuit breaker. These 2 contacts should close when their respective circuit breaker is opened.

When the RESET (22-23) is activated, the LMR-111D will not detect a possible mains failure. This function ensures that the relay is only active when both circuit breakers are closed and the generator thus is running in parallel with the mains.

On receipt of a reset signal (transmitted by the mains circuit breaker auxiliary contact during opening of its circuit breaker), an internal timer is started. When this expires (after 2 s), the opening signal to the mains circuit breaker is cancelled, and the LED “MAINS FAIL” is switched off.

The LMR-111D is provided with an adjustable initialising timer, which is activated on cancellation of the reset signal (closing of circuit breakers). When this timer expires, the LMR-111D is activated and the LED “Supervision” is lit. The time delay is set on the front of the relay by means of the potentiometer "Delay".

Relay outputs

The LMR-111D is provided with 2 output contacts (with common set points), either normally energised or normally de-energised. The contacts may be set to open or to close on activation.

<u>Normally energised contact</u>

Recommended for warning and alarm purposes. In case of an auxiliary supply drop-out, the contact is immediately activated.

<u>Normally de-energised contact</u>

Recommended for regulating and control purposes. An auxiliary supply failure will not result in an unwanted activation of the contact.

<u>Power-up circuit</u>

The relays are provided with a 200 ms power-up circuit, ensuring the correct function of the relay on connection of the auxiliary voltage.

Note: Normally energised contacts are not activated (contact does not open/close) until 200 ms after connection of the auxiliary voltage.

Technical specifications

Meas. voltage (U_n): See supply voltage - AC ranges.

overload: 1.2 x U_n, continuously,
2 x U_n for 10 s

load: 2kΩ/V.

Frequency range: 40...45...65...70Hz.

"RESET" inputs: Input voltage:
18…250V AC/DC for "activated" condition
Input impedance: 100kΩ

Output: 2 change-over switches

contact type: Relays B + C:
normally energised ("NE"), or
normally de-energised("ND")

contact ratings: 250V-8A-2000VA (AC)
24V-8A-200W (DC)
(200 x 10^3 change-overs at resistive load).

contact voltage: Max. 250V (AC). Max. 150V (DC).

Response time: <30 ms.

Temperature: -25...70°C (operating).

Temperature drift: Set points:
max. ±0.2% of full scale per 10°C.

Galvanic separation: Between inputs and outputs:
3250V - 50Hz - 1 min.

Supply voltage (U_n): 57.7-63.5-100-110-127-200-220-230-240-380-400-415-440-450-660-690VAC ±20% (max. 4VA).

24-48-110-220V DC -25/+30% (max. 3.5W).

Climate: HSE, to DIN 40040.

EMC: To EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4) and IEC 255-3.

Connections: Max. 4 mm^2 (single-stranded).
Max. 2.5 mm^2 (multi-stranded).

Materials: All plastic parts are self-extinguishing to UL94 (V1).

Protection: Case: IP40. Terminals: IP20, to IEC 529 and EN 60529.

Type approval: The uni-line components are approved by the major classification societies. For current approvals see www.deif.com or contact DEIF A/S.

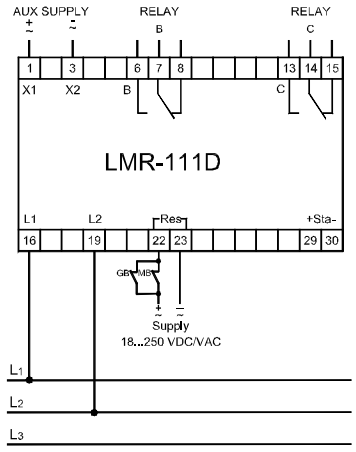
Settings and indication

Setting of	LED/relay
Initialising ("DELAY") (0.5…5 s)	Yellow LED "SUPERVISION" is lit after the timer has expired.
Sensitivity ("SENS"): (2…20 electr. degr.)	Red LED "MAINS FAIL" is lit during fault condition.

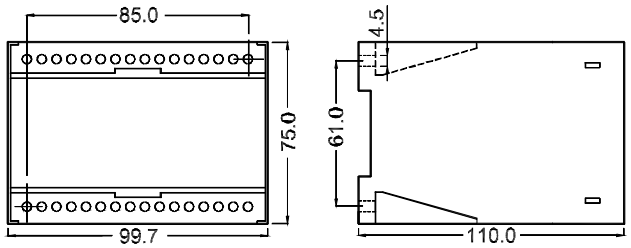
The relay is furthermore equipped with a green LED marked "POWER" for indication of power ON.

Once the relay has been mounted and adjusted, the transparent front cover may be sealed, preventing unwanted change of the setting.

Connections/dimensions (in mm)



Shown contact positions: aux. voltage not connected
See installation instructions for information about status output (29-30).



Weight: Approx. 0.650 kg

Order specifications

Type – Meas. voltage – Relay B – Relay C – Supply voltage
Example:
LMR-111D – 380V AC – NE – NE – 24V DC

Due to our continous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

ANSI code 78

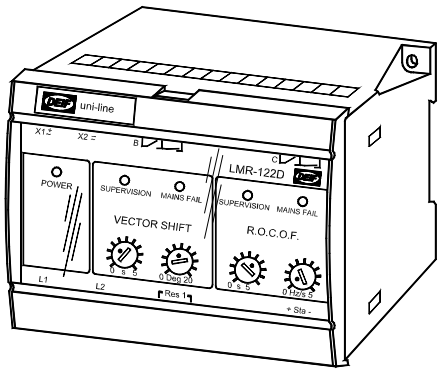
Type LMR-122D

Loss of mains relays

uni-line

4921240220B

- ***Detection of vector shift and ROCOF** (df/dt)*
- ***Generator disconnection on mains failure***
- ***Ensures no asynchronous reconnection***
- ***LED indication of fault condition***
- ***LED indication for activated relay***
- ***35 mm DIN rail or base mounting***



LMR-122D CE

Application

The loss of mains relay type LMR-122D forms part of a complete DEIF series of relays for protection and control of generators.

This relay is applied for protection of synchronous generators, running in parallel with the mains.

A mains failure will be detected, provided a disconnection at an arbitrary point of the network results in a swift change of the generator frequency. An opening signal is then transmitted to the mains circuit breaker, and the generator will thus be protected against damages caused by an automatic reconnection to the high-voltage network.

The LMR-122D will on the other hand not detect the normal relatively slow and acceptable changes of the frequency of the network (the mains).

Furthermore, separation of a generator from the mains in case of mains failure is also stipulated as a condition in most national rules for connection of synchronous generators to the mains. Regarding Great Britain, see Engineering Recommendation G59.

Measuring principle

After 5 periods have passed (after connection to the mains) the relay will thus have performed the first measurement. After this the LMR-122D will within 30 ms for vector shift and 100 ms for ROCOF (df/dt) detect a possible mains failure.

The ROCOF (Rate of change of frequency - df/dt) supervises the change in frequency for every period. If the change in frequency for four periods in a row exceeds the setpoint, the output is activated. Within 100 ms (inclusive of contact delay), an opening signal is transmitted to mains circuit breaker, and the LED marked “MAINS FAIL” is lit.

The vector shift function supervises the angular velocity of the phases of the mains. The velocity is supervised by comparing the times for the latest two full cycles with the times for the full cycles of the previous 4th and 5th period. If the difference between the measurements exceeds the set point, the output is activated. Within 30 ms (inclusive of contact delay) an opening signal is transmitted to mains circuit breaker, and the LED marked “MAINS FAIL” is lit.

The LMR-122D is provided with 1 reset input connected to contacts to the generator circuit breaker and to the mains circuit breaker. These 2 contacts should close when their respective circuit breaker is opened.

When RESET (22-23) is activated the LMR-122D will not detect a possible mains failure

On receipt of a reset signal (transmitted by the mains circuit breaker auxiliary contact during opening of its circuit breaker), an internal timer is started. When this expires (after 2 s), the opening signal to the mains circuit breaker is cancelled, and the LED “MAINS FAIL” is switched off.

The LMR-122D is provided with an adjustable initialising timer, which is activated on cancellation of the reset signal (closing of circuit breakers). When this timer expires, the LMR-122D is activated and the LED “SUPERVISION” is lit. The time delay is set on the front of the relay by means of a potentiometer.

Furthermore the relay is equipped with a self-check function. This function supervises the micro-processor and will switch the status output (29-30) to position OFF and start flashing with the power led, should the function detect a fault.

Relay outputs

The LMR-122D is provided with 2 output contacts
B: Vector shift, C: ROCOF,
either normally energised or normally de-energised. The contacts may be set to open or to close on activation.

<u>Normally energised contact</u>
Recommended for warning and alarm purposes. In case of an auxiliary supply drop-out, the contact is immediately activated.

<u>Normally de-energised contact</u>
Recommended for regulating and control purposes. An auxiliary supply failure will not result in an unwanted activation of the contact.

DEIF A/S

Power-up circuit
The relays are provided with a 200 ms power-up circuit, ensuring the correct function of the relay on connection of the auxiliary voltage.

Note: Normally energised contacts are not activated (contact does not open/close) until 200 ms after connection of the auxiliary voltage.

Technical specifications

Meas. voltage (U_n): See supply voltage - AC ranges.

overload: 1.2 x U_n, continuously,
2 x U_n for 10 s

load: 2kΩ/V.

Frequency range: 40...45...65...70Hz.

"RESET" inputs: Input voltage:
18…250V AC/DC for "activated" condition
Input impedance: 100kΩ

Output: 2 change-over switches

contact type: Relays B + C:
normally energised ("NE"), or
normally de-energised("ND")

contact ratings: 250V-8A-2000VA (AC)
24V-8A-200W (DC)
(200 x 10^3 change-overs at resistive load)

contact voltage: Max. 250V (AC). Max. 150V (DC).

Response time: ROCOF (df/dt) <100 ms
Vector shift <30 ms.

Optocoupler output: System status off = failure.

Temperature: -25...70°C (operating).

Temperature drift: Set points:
max. ±0.2% of full scale per 10°C.

Galvanic separation: Between inputs and outputs:
3250V - 50Hz - 1 min.

Supply voltage (U_n): 57.7-63.5-100-110-127-200-220-230-240-380-400-415-440-450-660-690VAC ±20% (max. 4VA).

24-48-110-220V DC -25/+30% (max. 3.5W).

Climate: HSE, to DIN 40040.

EMC: To EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4) and IEC 255-3.

Connections: Max. 4 mm² (single-stranded).
Max. 2.5 mm² (multi-stranded).

Materials: All plastic parts are self-extinguishing to UL94 (V1).

Protection: Case: IP40. Terminals: IP20, to IEC 529 and EN 60529.

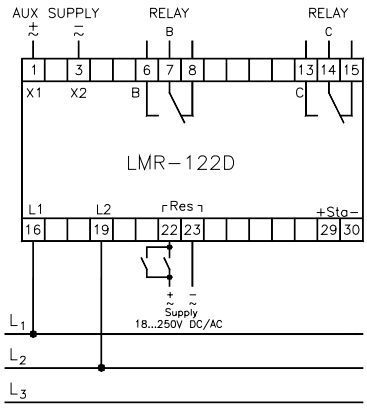
Settings and indication

Setting of	LED/relay
Sensitivity: Vector shift set point (2...20 elect. degr.)	Red LED "MAINS FAIL" is lit during fault condition.
Sensitivity: ROCOF (df/dt) set point (0.3...5) Hz/s	Red LED "MAINS FAIL" is lit during fault condition.
For both initialising delays: (0.5...5 s)	Yellow LED "SUPERVISION" is lit after the timer has expired.

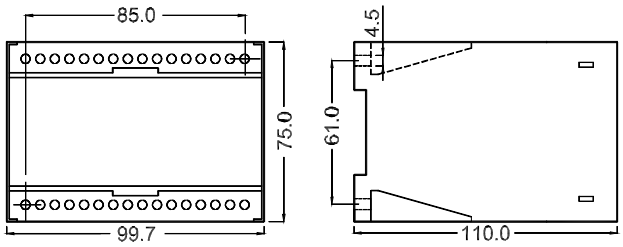
The relay is furthermore equipped with a green LED marked "POWER" for indication of power ON.

Once the relay has been mounted and adjusted, the transparent front cover may be sealed, preventing unwanted change of the setting.

Connections/dimensions (in mm)



Shown contact positions: aux. voltage not connected.
See installation instructions for information about status output (29-30)



Weight: approx. 650 kg

Order specifications

Type - Meas. voltage - Relay B - Relay C - Supply voltage
Example:
LMR-122D - 380V AC - NE - NE - 24V DC

Due to our continous development we reserve the right to supply equipment which may vary from the described.

DEIF A/S, Frisenborgvej 33
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

ANSI code 32

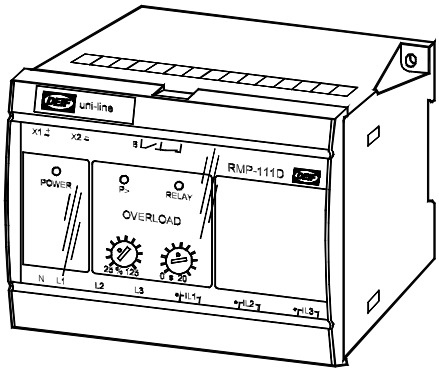
Type RMP-111D

Overload relays

uni-line

4921240108E

- ***Protection of prime mover***
- ***3 phase measurement***
- ***LED indication of alarm condition***
- ***Timer controlled tripping***
- ***LED indication for activated relay***
- ***35 mm DIN rail or base mounting***



RMP-111D CE

Application

The protective overload relay type RMP-111D forms part of a complete DEIF series of relays for protection and control of generators, and is applicable to both marine and land-based installations. Also available are reverse power relays (RMP-121D) and combined overload and reverse power relays (RMP-112D).

The RMP-111D is type approved by major classification societies and is applied for protection of the prime mover against overload.

This is especially required if the prime mover is underdimensioned in proportion to the AC generator.

Measuring principle

The relay measures all 3 phase currents and phase voltages.

The TDM (Time-Division-Multiplication) principle ensures an accurate measurement of the RMS value of the power (3 x U x I x cos-φ), irrespective of wave form and asymmetry.

The RMP-111D is available with the following couplings:

2W3	2 element 3 phase 3 wire, unbalanced load.
3W3(4)	3 element 3 phase 3 wire (4 wire), unbalanced load.

If the power exceeds a set point, the output is activated.

The set point value is set on the front of the relay by means of a potentiometer. If exceeded, a fault signal is generated, and the associated yellow LED is lit.

Timer function

When the set point is exceeded, the associated timer starts and will run as long as the fault condition prevails.

The delay does not depend on the exceeding of the set point.

If the fault disappears, the timer is reset.

When the timer expires, the contact is activated and the associated red LED is lit.

Relay output

The RMP-111D is provided with an output with a maximum contact, either normally energised or normally de-energised.

The contact may be set to open or to close on activation.

Normally energised contact

Recommended for land-based installation for warning and alarm purposes.

In case of an auxiliary supply drop-out, the contact is immediately activated.

Normally de-energised contact

Recommended for marine installations for regulating and control purposes.

An auxiliary supply failure will not result in an unwanted activation of the contact.

Latch circuit

The contacts can then be locked in their warning position, even if the input power returns to normal (add “L” to contact type in order specifications, if this is required).

The latch circuit is reset by disconnecting the auxiliary supply.

Hysteresis

In order to avoid “chatter” on the relay contacts the contact functions are provided with a hysteresis, i.e. a difference of 2% of full scale between energising and de-energising of the relay.

Note: Normally energised contacts are not activated (contact does not open/close) until 200 ms after connection of the auxiliary voltage.

Likewise, the RMP-111D is provided with a 200 ms power-down circuit, ensuring supervision and maintenance of any set point exceedings for 200 ms after disconnection of the auxiliary voltage.

DEIF A/S

Type RMP-111D

Technical specifications

Meas. current (I_n): 0.3-0.4-0.5-0.6-0.8-1.0-1.3-1.5-2.0-2.5-3.0-4.0-5.0A AC

adjusted range: 75...100% of I_n (e.g. 0.4, 0.45, etc.) (lowest meas. range: 0.3A)

overload: 4 x I_n, continuously,
20 x I_n for 10 s (max. 75A)
80 x I_n for 1 s (max. 300A)

load: Max. 0.5VA per phase.

Meas. voltage (U_n): (see supply voltage - AC ranges).
overload: 1.2 x U_n, continuously,
2 x U_n for 10 s

load: 2kΩ/V.

Frequency range: 40...45...65...70Hz.

Output: 1 maximum contact.

contact type: Relay B:
normally energised ("NE"), or
normally de-energised ("ND")
With or without latch circuit ("L").

relay contact: 1 change-over relay.

contact ratings: 250V-8A-2000VA (AC).
24V-8A-200W (DC).
(200 x 10^3 change-overs at resistive load)

contact voltage: Max. 250V (AC). Max. 150V (DC).

Hysteresis: 2% of full scale.

Response time: <400 ms.

Temperature: -25...70°C (operating).

Temperature drift: Set points:
max. ±0.2% of full scale per 10°C.

Galvanic separation: Between inputs, outputs and aux. voltage: 3250V - 50Hz - 1 min.

Supply voltage (U_n): 57.7-63.5-100-110-127-200-220-230-240-380-400-415-440-450-660-690V AC ±20% (max. 3.5VA)

24-48-110-220V DC -25/+30% (max. 2W).

Climate: HSE, to DIN 40040.

EMC: To EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4) and IEC 255-3.

Connections: Max. 4 mm² (single-stranded).
Max. 2.5 mm² (multi-stranded).

Materials: All plastic parts are self-extinguishing to UL94 (V1).

Protection: Case: IP40. Terminals: IP20, to IEC 529 and EN 60529.

Type approval: The uni-line components are approved by the major classification societies. For current approvals see www.deif.com or contact DEIF A/S.

Settings and indication

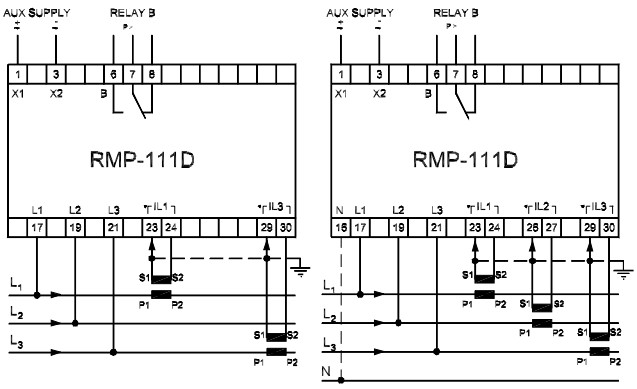
Setting of	LED/relay
Overload set point: (25...125%) of P_n	"P>" yellow LED is lit when the set point has been exceeded, but the contact not yet activated.
Time delay: (0...20 s) in seconds	Contact is activated and red LED lit after the timer has expired.

The relay is furthermore equipped with a green LED marked "POWER" for indication of power ON.

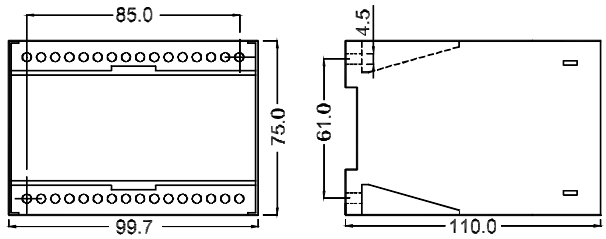
Once the relay has been mounted and adjusted, the transparent front cover may be sealed, preventing unwanted change of the setting.

Connections/dimensions (in mm)

2W3 **3W(4)**



Shown contact positions: aux. voltage not connected



Weight: approx. 0.650 kg

Order specifications

Type – Coupling – Meas. power (P_n) – Measuring voltage – Relay B – Supply voltage

Example: RMP-111D – 3W4 – 0..100W – 3 x 63.5V AC
NDL – 230V AC

$$\textbf{Meas. power } (P_n) = \frac{\textbf{Primary power}}{\textbf{CT ratio x VT ratio}}$$

Due to our continous development we reserve the right to supply equipment which may vary from the described.

DEIF A/S, Frisenborgvej 33
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

ANSI code 32

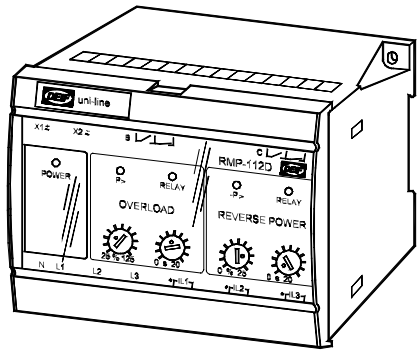
Type RMP-112D

Overload/reverse power relays

uni-line

4921240110E

- ***Combined overload and reverse power***
- ***3 phase measurement***
- ***LED indication of fault condition***
- ***Timer controlled tripping***
- ***LED indication for activated relay***
- ***35 mm DIN rail or base mounting***



RMP-112D CE

Application

The protective overload and reverse power relay type RMP-112D forms part of a complete DEIF series of relays for protection and control of generators, and is applicable to both marine and land-based installations. Also available are overload relays (RMP-111D) and reverse power relays (RMP-121D).

The RMP-112D is type approved by major classification societies and is applied for protection of the prime mover against overload and for protection against reverse power.

Protection of the prime mover against overload is especially required if this is underdimensioned in proportion to the AC generator. Supervision of the reverse power will prevent a generator running in parallel with other generators from running as a motor - thus protecting the prime mover - and will at the same time ensure that the remaining generators connected to the system are not disconnected due to overload of these.

Measuring principle

The relay measures all 3 phase currents and phase voltages. The TDM (Time-Division-Multiplication) principle ensures an accurate measurement of the RMS value of both the active power and the reverse power (3 x U x I x cos-φ), irrespective of wave form and asymmetry. The RMP-112D is available with the following couplings:

2W3 2 element 3 phase 3 wire, unbalanced load.

3W3(4) 3 element 3 phase 3 wire (4 wire), unbalanced load.

If either the power (P>) or the reverse power (-P>) exceeds its set point, the associated output is activated. The set points are set on the front of the relay by means of potentiometers. If exceeded, a fault signal is generated, and the associated yellow LED is lit.

Timer functions

When the set point is exceeded, the associated timer starts and will run as long as the fault condition prevails. The delay does not depend on the exceeding of the set point. If the fault disappears, the timer is reset. When the timer expires, the contact is activated and the associated red LED is lit.

Relay outputs

The RMP-112D is provided with 2 outputs:

- overload, a maximum contact (normally energised or normally de-energised)
- reverse power, a minimum contact (normally energised or normally de-energised)

The contacts may be set to open or to close on activation.

Normally energised contact

Recommended for land-based installation for warning and alarm purposes. In case of an auxiliary supply drop-out, the contact is immediately activated.

Normally de-energised contact

Recommended for marine installations for regulating and control purposes. An auxiliary supply failure will not result in an unwanted activation of the contact.

Latch circuit

The contacts can then be locked in their warning position, even if the input power returns to normal (add “L” to contact type in order specifications, if this is required).

The latch circuit is reset by disconnecting the auxiliary supply.

Hysteresis

In order to avoid “chatter” on the relay contacts the contact functions are provided with a hysteresis, i.e. a difference of 2% of full scale between energising and de-energising of the relay.

Power-up/power-down circuits

The RMP-112D is provided with a 200 ms power-up circuit, ensuring the correct function of the relay on connection of the auxiliary voltage.

Note: Normally energised contacts are not activated (contact does not open/close) until 200 ms after connection of the auxiliary voltage.

Likewise, the RMP-112D is provided with a 200 ms power-down circuit, ensuring supervision and maintenance of any set point exceedings for 200 ms after disconnection of the auxiliary voltage.

DEIF A/S

Technical specifications

Meas. current (I_n): 0.3-0.4-0.5-0.6-0.8-1.0-1.3-1.5-2.0-2.5-3.0-4.0-5.0A AC

adjusted range: 75...100% of I_n (e.g. 0.4, 0.45, etc.) (lowest meas. range: 0.3A)

overload: 4 x I_n, continuously,
20 x I_n for 10 s (max. 75A)
80 x I_n for 1 s (max. 300A)

load: Max. 0.5VA per phase.

Meas. voltage (U_n): (see supply voltage - AC ranges).

overload: 1.2 x U_n, continuously,
2 x U_n for 10 s

load: 2kΩ/V.

Frequency range: 40...45...65...70Hz.

Outputs: 1 max. and 1 min. contact.

contact type: Relays B + C:
normally energised ("NE"), or
normally de-energised ("ND")
with or without latch circuit ("L").

relay contacts: 1 change-over switch per contact.

contact ratings: 250V-8A-2000VA (AC).
24V-8A-200W (DC).
(200 x 10^3 change-overs at resistive load)

contact voltage: Max. 250V (AC). Max. 150V (DC)

Hysteresis: 2% of full scale (F.S.)

Response time: <400 ms

Temperature: -25...70°C (operating).

Temperature drift: Set points:
max. ±0.2% of full scale per 10°C.

Galvanic separation: Between inputs, outputs and aux. voltage: 3250V - 50Hz - 1 min.

Supply voltage (U_n): 57.7-63.5-100-110-127-200-220-230-240-380-400-415-440-450-660-690VAC ±20% (max. 3.5VA)

24-48-110-220V DC -25/+30% (max. 2W).

Climate: HSE, to DIN 40040.

EMC: To EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4) and IEC 255-3.

Connections: Max. 4 mm² (single-stranded).
Max. 2.5 mm² (multi-stranded).

Materials: All plastic parts are self-extinguishing to UL94 (V1).

Protection: Case: IP40. Terminals: IP20, to IEC 529 and EN 60529.

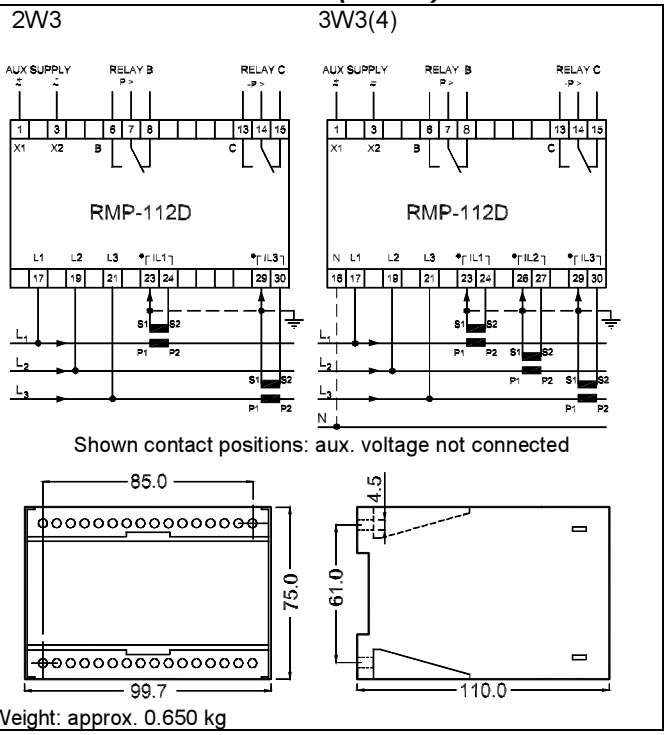
Type approval: The uni-line components are approved by the major classification societies. For current approvals see www.deif.com or contact DEIF A/S.

Settings and indication

Setting of	LED/relay
Overload set point: (25...125%) of P_n	"P>" yellow LED is lit when the set point has been exceeded, but the ouput contact not yet activated.
Reverse power set point: (0...25%) of P_n	"-P>" yellow LED is lit when the set point has been exceeded, but the output contact not yet activated.
For both: **Time delay:** (0...20 s) in seconds	Contact is activated and red LED lit after the timer has expired.

The relay is furthermore equipped with a green LED marked "POWER" for indication of power ON. Once the relay has been mounted and adjusted, the transparent front cover may be sealed, preventing unwanted change of the setting.

Connections/dimensions (in mm)



Weight: approx. 0.650 kg

Order specifications

Type - Coupling – Meas. Power (P_n) – Meas. voltage – Relay B – Relay C – Supply voltage

Example:
RMP-112D – 3W3 – 0..100W – 3 x 110V AC – NDL – NE 230V AC

$$\textit{Meas. power } (P_n) = \frac{\textit{Primary power}}{\textit{CT ratio x VT ratio}}$$

Due to our continous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

ANSI code 25

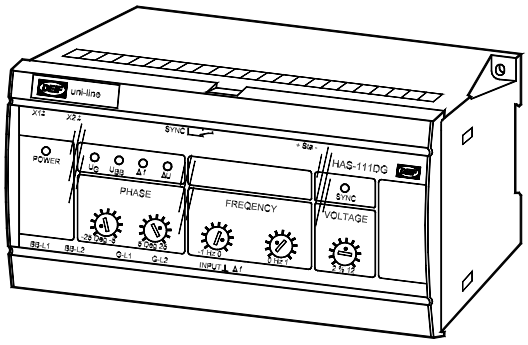
Type HAS-111DG

Paralleling relays

uni-line

4921240144E

- ***Synchronisation of generator to busbar***
- ***Setting of phase angle difference***
- ***Setting of frequency and voltage diff.***
- ***LED indication of status***
- ***LED for synchronising signal***
- ***35 mm DIN rail or base mounting***



HAS-111DG CE

Application

The HAS-111DG synchroniser is applied to check the synchronisation conditions. The paralleling relay transmits a synchronisation pulse when the phase angle, frequency and voltage deviations are within the set limits. Besides this the HAS-111DG is equipped with 2 analogue outputs. These outputs can be used for regulating purposes together with DEIF A/S load sharing units.

Function

The HAS-111DG can be used in installations where manual or semi-automatic synchronising is required, or by using the ∆f and/or the ∆U output for automatic synchronisation of a generator island to another utility (shaft generator).

Settings

The HAS-111DG is equipped with 5 potentiometers accessible from the front of the unit.

Phase:

Here the phase window for synchronisation is chosen. It can be set symmetrically or asymmetrically.

Frequency:

Here the max. slip frequency difference is chosen. It can be set both symmetrically and asymmetrically around 0Hz.

Voltage:

Here the allowed voltage difference between U_{GEN} and U_{BUSBAR} is chosen. It can be set symmetrically.

Because of the separate adjustments for positive and negative slip frequency the HAS-111DG may be set to transmit a synchronisation pulse so that either a supersynchronous or a subsynchronous connection of the generator will be obtained.

In case of harmonic distortion or noise on the voltage inputs, the HAS-111DG is equipped with special filters on the AC voltage inputs to avoid incorrect synchronisation pulse to be transmitted. Furthermore a df/dt (ROCOF) function is implemented, if the filters are unable to make the necessary filtering of the input signals, the df/dt function will prevent unprecise activation of the sync. relay. If the df/dt function is active, the situation will be indicated by a flashing ∆f LED (see option C).

The HAS-111DG is provided with an analogue frequency output and an analogue voltage output, intended for common control of the frequency and the voltage of DEIF load sharing units type LSU-112/113/114-DG and LSU-122DG, a function applied for simultaneous synchronisation of all generators of a plant to the busbar. By means of the input marked INPUT a supersynchronous or a subsynchronous connection of the generator(s) can be obtained.

The HAS-111DG measures the busbar and generator voltages in order to obtain data on frequency, phase and voltage deviation. A synchronising signal is transmitted when the following conditions are fulfilled:

1. The voltage difference is within ±2...±12% of the busbar voltage set on the VOLTAGE potentiometer, and
2. the frequency difference ∆f is within -1...0Hz and 0...1Hz of the values set on the FREQUENCY potentiometers, and
3. the phase angle difference is within -25...-5° el. and 5...25° el. of the value set on the PHASE potentiometers, and
4. the ∆f allows a synchronisation pulse of min. 100 ms without exceeding the setting of the PHASE potentiometers.

When the above 4 conditions are fulfilled, a synchronising signal is transmitted and the yellow LED SYNC is lit. The pulse length (100 ms ...3 s) depends on the other settings of the relay, but the signal continues as long as the above conditions are fulfilled, however max. 3 s (see option D).

Self-monitoring

The HAS-111DG is equipped with a self-monitoring function. The function supervises the built-in micro-controller and hereby verifies if the programme is running correctly. The green LED marked POWER is connected to this function. Constant green light indicates that the supply voltage is accepted and the unit is running correctly. Flashing green light 2-3Hz indicates that the supply voltage is accepted but the unit is running incorrectly. In this situation the status output terminals 17 and 18 are activated (open).

DEIF A/S

Type HAS-111DG

Terminals/function

Connection	Connect	
Busbar	L1 to term. 24	L2 to term. 26
Generator	L1 to term. 29	L2 to term. 31

Terminal no.	Description/action
1 and 3 X1/X2	Input for supply voltage
8, 9 and 10	Relay contact for circuit breaker
17 and 18 Sta	Status output, activated (closed) when the supply voltage is connected and the unit is working correctly
24 and 26 BB/L1 BB/L2	Input for busbar voltage measurement. This input becomes active when the voltage level exceeds 60% of nominal voltage
29 and 31 G/L1 G/L2	Input for generator voltage measurement. This input becomes active when the voltage level exceeds 60% of nominal voltage
33 ("ΔU") Option E	This output is intended for common control of the voltage of all the connected reactive power load sharing units type LSU-122DG in a generator island. If terminal 33 is connected to the common voltage line (US) on the LSU-122DGs, the HAS-111DG will regulate the voltage on the generator island so it matches the voltage on the unit the island is about to be connected to
34 and 35 ("INPUT")	May be connected to a potential-free N/O contact. When this contact is activated, the HAS-111DG will control the connected LSU-112/113/114DG unit(s) to control the generator island frequency towards the busbar frequency less 50% of the setting of the negative FREQUENCY potentiometer. Vice versa if the input is opened
36 ("Δf")	This output is intended for common control of the frequency of all the connected load sharing units type LSU-112/113/114DG in a generator island. If terminal 36 is connected to the common frequency line (FS) on the LSUs, the HAS-111DG will control the frequency on the generator island so it matches the frequency on the unit the island is about to be connected to (see above regarding INPUT)
35 ("⊥")	Common earth terminal for the above input/output

Options

The HAS-111DG can be configured with the following options:

Increased phase window, option A
When implemented the accept phase window can be adjusted in the range from -50…-10° el. and 10…50° el.

Dead bus, option B
When implemented the dead bus function enables the HAS-111DG to transmit a closing signal to the generator breaker when no busbar voltage is present. When the generator voltage is within the setting on the potentiometer marked VOLTAGE with nominal voltage as reference and no busbar voltage is present (below 20% of nominal voltage), the HAS-111DG will transmit a closing signal to the breaker (400 ms).

Deactivation of the df/dt protection function, option C
If instability in the speed loop control system occurs resulting in jitter on the voltage signals (fast instability typically occurs, if the governor is responding to engine firings), and it is not possible to adjust this on the governor, or in applications with much noise and harmonic distortion (frequency converters), the df/dt protection function can be activated resulting in NO sync. pulse. If this is the case, and the switchgear is properly protected against wrong synchronisation, the df/dt protection function can be disabled. Please note that when this function is disabled, noise on the busbar and the generator inputs of the HAS-111DG can, at worst, result in a 180° out of phase synchronisation.

Continuous sync. pulse, option D
When implemented the sync. relay contact will stay on, as long as the conditions are OK. The following will deactivate the relay: If the voltage gets outside the settings on the potentiometer marked VOLTAGE, or the phase angle gets outside the set phase window, or if the busbar or the generator voltage drops below 60% or goes higher than 120% of nominal voltage.

Voltage difference analogue output, option E
This output is standard 0…5…10V corresponding to 80…100…120% of U_{nom} for controlling of the LSU-122DG. If option E is selected, the output is changed to -10…0…10V corresponding to 90…100…110% of U_{nom} for control of the units in the multi-line series, e.g. PPU/GPC.

Type HAS-111DG

Technical specifications

Accuracy:
Breaker closing: Slip frequency 0Hz: ±2° el.
Slip frequency 0.1...0.5Hz: ±3° el.
Slip frequency 0.5...1Hz: ±5° el.

Meas. voltage: See supply voltage - AC ranges

Load: 2kΩ/V

Frequency range: 40...45...65...70Hz

Digital input: Potential-free contact
Open: 5V. Closed: 5mA

Contact output:
Sync. pulse output: 1 change-over switch

Contact ratings: AC1: 8A, 250V AC
DC1: 8A, 24V DC
AC15: 3A, 250V AC
DC13: 3A, 24V DC

Life electrical: 1 x 10^5 (nominal value)

Analogue output:
Freq. difference: 1 analogue output:
-10...0...10V DC ~ -5...0...5Hz

Volt. difference: 1 analogue output:
0...5...10V DC ~ 80...100...120% of U_n
-10...0...10V DC ~ 90...100...110% of U_n
with option E activated

Optocoupler output: System status off = Failure
Max. voltage 30V DC, max. current 5mA

Temperature: -25...70°C (operating)

Temperature drift: Set points:
Max. ±0.2% of full scale per 10°C

Galv. separation: Between inputs and outputs:
3250V - 50Hz - 1 min.

Supply volt. (U_n): 57.7-63.5-100-110-127-200-220-230-240-380-400-415-440-450-660-690 V AC ±20% (max. 3.5VA)
24-48-110-220V DC -25/+30% (max. 2W)

Climate: HSE, to DIN 40040

EMC: To EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4) and IEC 255-3

Connections: Max. 4 mm² (single-stranded)
Max. 2.5 mm² (multi-stranded)

Materials: All plastic parts are self-extinguishing to UL94 (V1)

Protection: Case: IP40. Terminals: IP20, to IEC 529 and EN 60529

Type approval: The uni-line components are approved by the major classification societies. For current approvals see www.deif.com or contact DEIF A/S

Settings

Setting of	Range
Acceptable phase angle difference	Negative: -25...-5° el. Positive: 5...25° el.
Acceptable frequency difference	Negative: -1...0Hz Positive: 0...1Hz
Acceptable voltage difference	±2...±12% of U_n

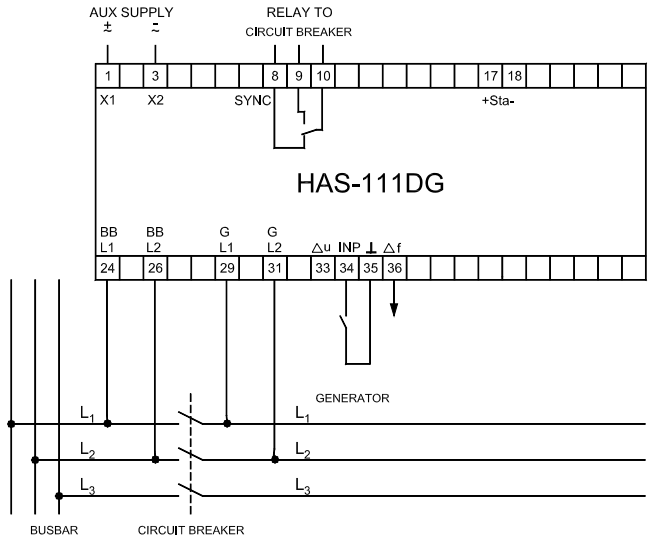
Indication

LEDs		Light
U_G	Generator voltage	Green, when value is within the acceptable range Switched off, if outside this range
U_{BB}	Busbar voltage	
Δf	Frequency difference	
ΔU	Voltage difference	
SYNC	Synchronising	Yellow, when relay is activated

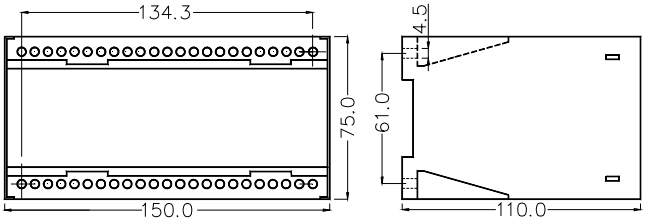
Once the relay has been mounted and adjusted, the transparent front cover may be sealed, preventing unwanted change of the setting.

Type HAS-111DG

Connections/dimensions (in mm)



See installation instructions for information about status output (17-18)



Weight: Approx. 0.750 kg

Order specifications

Type - Measuring voltage - Supply voltage - (Option)
Example:
HAS-111DG - 380V AC - 24V DC - Option A

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

ANSI codes 27, 59, 78, 81

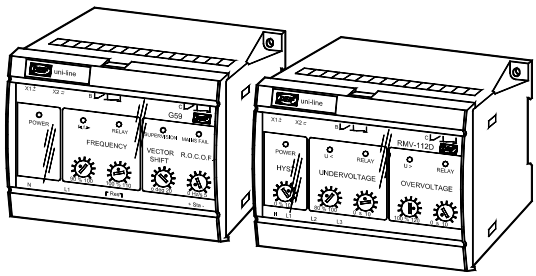
Type G59 package

G59 protection relay package

uni-line

4921240217C

- ***Combined vector shift and ROCOF** (df/dt)*
- ***Protection of over-/underfrequency***
- ***3 phase protection of over-/undervoltage***
- ***Digital data processing***
- ***Fast decoupling of the generator***
- ***Ensures no asynchronous reconnection***



G59 package CE

Application

The mains decoupling relay - type G59 package - forms part of a complete DEIF series of relays for the protection and control of generators.

This package is applied for the protection of synchronous generators, running in parallel with the mains. The package protects against over/under frequency, over-/undervoltage, vector shift and/or ROCOF (Rate of change of frequency, df/dt).

In applications with only vector shift or ROCOF, the set-point for the unwanted part is set at maximum and this part is hereby disabled.

A mains failure will be detected, provided a disconnection at an arbitrary point of the network results in a swift change of the generator frequency. An opening signal is then transmitted to the mains circuit breaker, and the generator will then be protected against damage caused by an automatic reconnection to the high-voltage network.

On the other hand the vector shift / ROCOF will not detect the relatively slow and acceptable changes of the network frequency (the mains).

Frequency and voltage protection is needed to protect loads against unacceptable voltages and frequencies.

Furthermore, separating the generator from the mains in case of mains failure is also stipulated as a condition in most national rules for connection of synchronous generators to the mains.

Measuring principle

ROCOF, vector shift and frequency measure the voltage between 2 phases or between one phase and neutral. High measuring accuracy is achieved by digital data processing.

The ROCOF supervises the frequency change for every period. If the frequency change exceeds the set-point for four periods in a row, the ROCOF has detected a failure.

The vector shift supervises the angular velocity of the mains by comparing the times for the latest two full cycles (1st, 2nd) with the times for the full cycles of the previous 4th and 5th period. If the vector shift or the ROCOF detects a failure, an opening signal is transmitted to the mains circuit breaker, and the LED marked “MAINS FAIL” is lit.

The over-/underfrequency supervises the frequency by supervising the latest 4 periods. If the under or over-frequency set-point is exceeded, the output is activated and the associated red LED is lit.

The over-/undervoltage part measures all 3 phase voltages. If the voltage drops below the set-point or exceeds the upper set-point, the associated output is activated and the associated red LED is lit.

The vector shift and the ROCOF are provided with 1 reset input connected to contacts to the generator circuit breaker and to the mains circuit breaker. These 2 contacts close when the respective circuit breaker is opened. When RESET (22-23) is activated the vector shift and the ROCOF part will not detect a possible mains failure. This function ensures that the relay is only active when both circuit breakers are closed and the generator is thus running in parallel with the mains.

The vector shift and the ROCOF are provided with an initializing timer, which is activated when cancelling the reset signal (closing of circuit breakers). When this timer expires, the vector shift and the ROCOF are activated and the LED “SUPERVISION” is lit. The time delay is fixed at 5s.

Relay outputs

The package is provided with 4 outputs either normally energised or normally de-energised. The contacts may be set to open or to close on activation.

Power-up circuit

The relays are provided with a 200 ms power-up circuit, ensuring the correct function of the relay on connection of the auxiliary voltage.

DEIF A/S

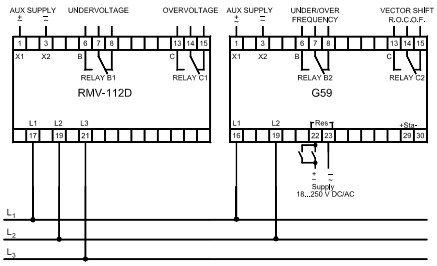
Type G59 package

Technical specifications

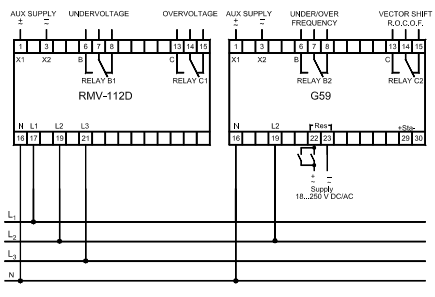
Meas. voltage (U_n):	See supply voltage - AC ranges
Overload:	1.2 x U_n, continuously 2 x U_n for 10 s
Load:	2kΩ/V
Frequency range:	40...45...65...70Hz
Nom. frequency (f_n):	50Hz or 60Hz
"RESET" inputs:	Input voltage: 18…250V AC/DC for "activated" condition Input impedance: 100kΩ
Output:	4 change-over switches
Contact type:	Relays B_1+C_1, B_2+C_2: Normally energised ("NE"), or normally de-energised ("ND") with or without latch circuit ("I")
Contact ratings:	250V-8A-2000VA (AC) 24V-8A-200W (DC) (200 x 10^3 change-overs at resistive contact voltage: Max. 250V (AC))
Response time:	Vector shift <30 ms R.O.C.O.F. <100 ms Frequency <100 ms Voltage <100 ms
Galvanic separation:	Between inputs and outputs: 3250V - 50Hz - 1 min.
Supply voltage (U_n):	57.7-63.5-100-110-127-200-220-230-240-380-400-415-440-450-660-690V AC ±20% (max. 4VA) 24-48-110-220V DC -25/+30% (max. 5.5W)
Climate:	HSE, to DIN 40040
EMC:	To EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4) and IEC 255-3
Connections:	Max. 4.0 mm² (single-stranded) Max. 2.5 mm² (multi-stranded)
Materials:	All plastic parts are self-extinguishing to UL94 (V1)
Protection:	Case: IP40. Terminals: IP20, to IEC 529 and EN 60529

Connections

DELTA



STAR



Weight: Approx. 0.950 kg (See **NOTE**)

NOTE:
See installation instructions for information about status output (29-30).

Settings and indications

Setting of	LED/relay
Vector shift set-point: (2...20 elect. degr.) **Initializing delay:** Fixed at 5s	Red LED "MAINS FAIL" is lit during fault condition
R.O.C.O.F. set-point: (0.3...5) Hz/s **Initializing delay:** Fixed at 5s	Red LED "MAINS FAIL" is lit during fault condition
Underfrequency set-point: (90...100%) of f_n	"f>, f<" yellow LED is lit when the frequency has dropped below the set-point, but the relay is not yet activated
Overfrequency set-point: (100...110%) of f_n	"f>, f<" yellow LED is lit when the set-point is exceeded, but the relay is not yet activated
Undervoltage limit: (80...100%) of U_n	"U<" yellow LED is lit when the input voltage is lower than the preset limit, but the relay is not yet activated
Overvoltage limit: (100...120%) of U_n	"U<" yellow LED is lit when the input voltage is lower than the preset limit, but the relay is not yet activated
Hysteresis: (1...10%) of U_n	Relay contact is reset when fault voltage equals or is less than the preset hysteresis

Once the relay has been mounted and adjusted, the transparent front cover may be sealed, preventing unwanted change of the setting.

Order specifications

Relay B_1:	Undervoltage
Relay C_1:	Overvoltage
Relay B_2:	Over-/underfrequency
Relay C_2:	Vector shift/ROCOF
Star coupling:	Specify phase-neutral voltage
Delta coupling:	Specify phase-phase voltage

Type – Coupling – Meas. voltage – Nom. frequency – Relay B_1 – Relay C_1 – Relay B_2 – Relay C_2 – Supply voltage
Examples:
G59 package – delta – 400V AC – 50Hz – NDL – NDL – NDL – ND – 24V DC
G59 package – star – 230V AC – 50Hz – NDL – NDL – NDL – ND – 230V AC

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

DEIF A/S, Frisenborgvej 33
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

ANSI code 32

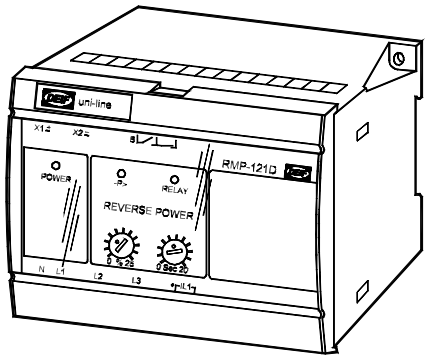
Type RMP-121D

Reverse power relays

uni-line

4921240106F

- ***Protection against "motoring"***
- ***Single phase measurement***
- ***LED indication of fault condition***
- ***Timer controlled tripping***
- ***LED indication for activated relay***
- ***35 mm DIN rail or base mounting***



RMP-121D CE

Application

The protective reverse power relay type RMP-121D forms part of a complete DEIF series of relays for protection and control of generators, and is applicable to both marine and land-based installations. Also available are overload relays (RMP-111D) and combined overload and reverse power relays (RMP-112D).

The RMP-121D is type approved by major classification societies.

The protective reverse power relay will prevent a generator running in parallel with other generators from running as a motor ("motoring") in case of lost prime mover torque, and will thus protect the prime mover, at the same time ensuring that the remaining generators connected to the system are not overloaded.

The RMP-121D likewise protects against reverse power arisen from an increase of the power of other generators connected to the system.

Measuring principle

The applied TDM (Time-Division-Multiplication) principle ensures an accurate measurement of the RMS value of the power (U x I x cos-φ), irrespective of wave form. The RMP-121D is available with the following connections:

1W single phase
1W3 1 element 3 phase 3 wire, balanced load
1W4 1 element 3 phase 4 wire, balanced load

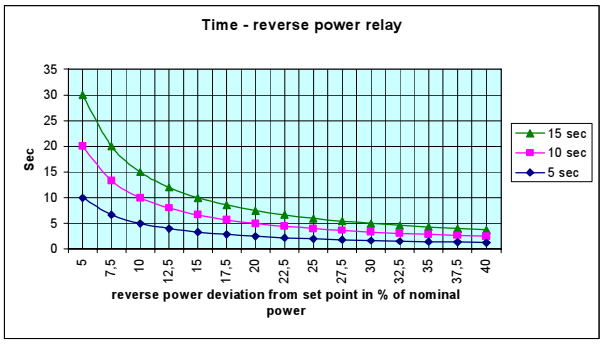
The set point value is set on the front of the relay by means of a potentiometer. If exceeded, a fault signal is generated, and the associated yellow LED is lit.

Timer function

The RMP-121D can be delivered with two different timer characteristics:

- Normal timer characteristic means that the delay does not depend on the exceeding of the set point.

- Inverse timer characteristic means that if the –P set point is exceeded by 10% of nominal power, the inverse timer functionality gives the same delay as the time potentiometer. If the –P set point is exceeded by 20% of nominal power, the delay will be half the value set on the time potentiometer.



Relay output

The RMP-121D is provided with an output with a minimum contact, either normally energised or normally de-energised. The contact may be set to open or to close on activation.

Normally energised contact

Recommended for land-based installation for warning and alarm purposes. In case of an auxiliary supply drop-out, the contact is immediately activated.

Normally de-energised contact

Recommended for marine installations for regulating and control purposes. An auxiliary supply failure will not result in an unwanted activation of the contact.

Latch circuit

The contact can then be locked in its warning position, even if the input returns to normal (add "L" to contact type in order specifications, if this is required). Disconnecting the auxiliary supply resets the latch circuit.

Hysteresis

In order to avoid "chatter" on the relay contacts the contact functions are provided with a hysteresis, i.e. a difference of 2% of full scale between energising and de-energising of the relay.

Power-up/power-down circuits

The RMP-121D is provided with a 200 ms power-up circuit, ensuring the correct function of the relay on connection of the auxiliary voltage.

Note: Normally energised contacts are not activated until 200 ms after connection of the auxiliary voltage.

Likewise, the RMP-121D is provided with a 200 ms power-down circuit, ensuring supervision for 200 ms after disconnection of the auxiliary voltage.

Type RMP-121D

Technical specifications

Meas. current (I_n): 0.3-0.4-0.5-0.6-0.8-1.0-1.3-1.5-2.0-2.5-3.0-4.0-5.0A AC

adjusted range: 75...100% of I_n (e.g. 0.4, 0.45, etc.) (lowest meas. range: 0.3A)

overload: 4 x I_n, continuously,
20 x I_n for 10 s (max. 75A)
80 x I_n for 1 s (max. 300A)

load: Max. 0.5VA per phase

Meas. voltage (U_n): (see supply voltage - AC ranges).

overload: 1.2 x U_n, continuously,
2 x U_n for 10 s

load: 2kΩ/V

Frequency range: 40...45...65...70Hz.

Output: 1 minimum contact.

contact type: Relay B:
normally energised ("NE"), or
normally de-energised ("ND")
with or without latch circuit ("L").

relay contact: 1 change-over switch.

contact ratings: 250V-8A-2000VA (AC).
24V-8A-200W (DC).
(200 x 10^3 change-overs at resistive load)

contact voltage: Max. 250V (AC). Max. 150V (DC)

Hysteresis: 2% of full scale (F.S.)

Response time: <400 ms

Temperature: -25...70°C (operating).

Temperature drift: Set points:
max. ±0.2% of F.S. per 10°C.

Galvanic separation: Between inputs, outputs and aux. voltage: 3250V - 50Hz - 1 min.

Supply voltage (U_n): 57.7-63.5-100-110-127-200-220-230-240-380-400-415-440-450-660-690V AC ±20% (max. 3.5VA)

24-48-110-220V DC -25/+30% (max. 2W).

Climate: HSE, to DIN 40040.

EMC: To EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4) and IEC 255-3.

Connections: Max. 4 mm² (single-stranded).
Max. 2.5 mm² (multi-stranded).

Materials: All plastic parts are self-extinguishing to UL94 (V1).

Protection: Case: IP40. Terminals: IP20, to IEC 529 and EN 60529.

Type approval: The uni-line components are approved by the major classification societies. For current approvals see www.deif.com or contact DEIF A/S.

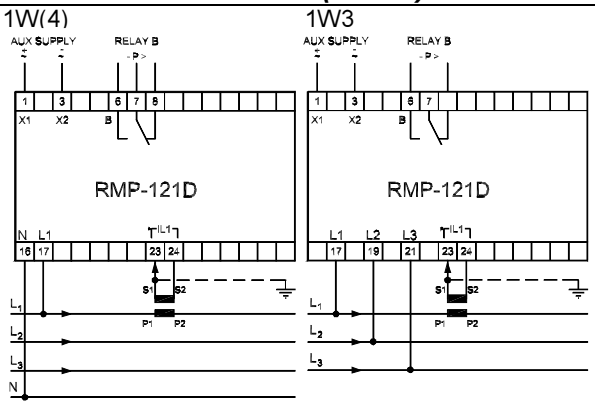
Settings and indication

Setting of	LED/relay
Reverse power set point: (0...25%) of -P_n	"-P>" yellow LED is lit when the set point has been exceeded, but the relay not yet activated.
Time delay: (0...20 s) in seconds	Contact is activated and red LED lit after the timer has expired.

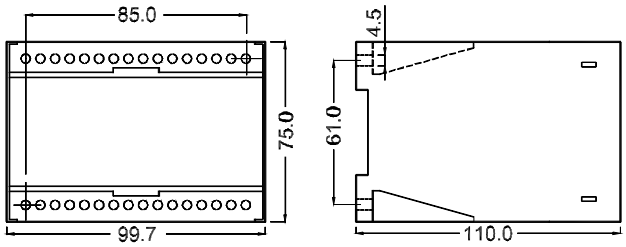
The relay is furthermore equipped with a green LED marked "POWER" for indication of power ON.

Once the relay has been mounted and adjusted, the transparent front cover may be sealed, preventing unwanted change of the setting.

Connections/dimensions (in mm)



Shown contact positions: aux. voltage is not connected.



Weight: approx. 0.650 kg

Order specifications

Type - Coupling - Meas. power (-P_n) - Measuring voltage - Relay B - Supply voltage – Timer characteristic

Example:
RMP-121D - 1W3 - 0...100W - 110V AC – NEL – 220V DC – Normal timer characteristic

Meas. power (P_n) = $\dfrac{\textit{Primary power}}{\textit{CT ratio x VT ratio}}$

Due to our continous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

ANSI codes 50/51

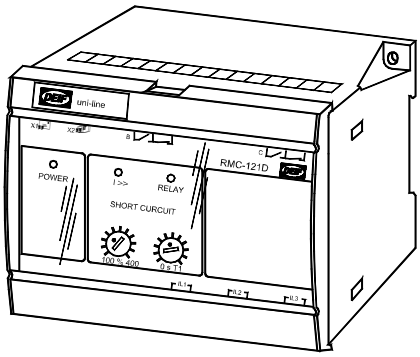
Type RMC-121D

Short circuit current relay

uni-line

4921240260A

- ***Measurement of 3 phase currents***
- ***LED indication of fault condition***
- ***Timer controlled tripping***
- ***LED indication for activated relay***
- ***35 mm DIN rail or base mounting***



RMC-121D

Application

The protective current relay type RMC-121D forms part of a complete DEIF series of relays for protection and control of generators and is primarily designed for marine applications. Also available are short circuit relays (RMC-111D), combined short circuit and overcurrent relays (RMC-122D) and double overcurrent relays (RMC-132D).

Measuring principle

The relay measures the highest of the 3 phase currents, providing an RMS measurement at sinusoidal currents.

In order to obtain a short response time on a fault condition, the measurement is based on peak values.

The set point value is set on the front of the relay by means of a potentiometer. If exceeded, a fault signal is generated, and the associated yellow LED is lit.

Timer function

When the set point has been exceeded, the associated timer starts and will run as long as the fault condition prevails.

The delay (3 ranges) does not depend on the exceeding of the set point. If the fault disappears, the timer is reset. When the timer expires, the contact is activated and the associated red LED is lit.

Relay output

The RMC-121D is provided with one relay coil with 2 maximum contacts. The relay can be configured either to normally energised or normally de-energised. The contacts may be set to open or to close on activation (same function on both contacts).

Normally energised contact

Recommended for marine installation for warning and alarm purposes.

In case of an auxiliary supply drop-out, the contacts are activated immediately.

Normally de-energised contact

Recommended for marine installations for regulating and control purposes.

An auxiliary supply failure will not result in an unwanted activation of the contact.

Latch circuit

The contacts can then be locked in their warning position, even if the input currents return to normal. (Add ”L” to contact type in order specifications, if this is required).

The latch circuit is reset by disconnecting the auxiliary supply.

Hysteresis

In order to avoid ”chatter” on the relay contacts the contact functions are provided with a hysteresis, i.e. a difference of 2% of full scale between energising and de-energising of the relay.

Power-up/power-down circuits

The RMC-121D is provided with a 200 ms power-up circuit, ensuring the correct function of the relay on connection of the auxiliary voltage.

Note: Normally energised contacts are not activated (contact does not open/close) until 200 ms after connection of the auxiliary voltage.

Likewise, the RMC-121D is provided with a 200 ms power-down circuit, ensuring supervision and maintenance of any set point exceedings for 200 ms after disconnection of the auxiliary voltage.

Note: A special version is available where the 200 ms power-down is enlarged to 1 sec.

DEIF A/S

Type RMC-121D

Technical specifications

Meas. range (I_n): 0.3-0.4-0.5-0.6-0.8-1.0-1.3-1.5-2.0-2.5-3.0-4.0-5.0A AC

Adjusted ranges: 75...100% of I_n (e.g. 0.4, 0.45, etc.) (Lowest measuring range: 0.3A)

Frequency range: 40...45...65...70Hz

Short circuit current: 1.0...4.0 x I_n

Max. input current: 4 x I_n, continuously
20 x I_n for 10 s (max. 75A)
80 x I_n for 1 s (max. 300A)

Load: Max. 0.3VA per phase

Outputs: 2 maximum contacts

Contact type: Contact B, contact C:
Normally energised ("NE"), or
normally de-energised ("ND")
with or without latch circuit ("L")

Relay contacts: 2 sets of change-over switches

Contact ratings: 250V-8A-2000VA (AC)
24V-8A-200W (DC)
(200 x 10^3 change-overs at resistive load)

Contact voltage: Max. 250V (AC). Max. 150V (DC)

Hysteresis: 2% of full scale (F.S.)

Response time: <50 ms short circuit current

Temperature: -25...70°C (operating)

Temperature drift: Set points:
Max. 0.2% of full scale per 10°C

Galvanic separation: Between inputs, outputs and aux. voltage: 3250V - 50Hz - 1 min.

Supply voltage (U_n): 57.7-63.5-100-110-127-200-220-230-240-380-400-415-440-450-660-690V AC ±20% (max. 3.5VA)

24-48-110-220V DC -25/+30% (Max. 2W)

Climate: HSE, to DIN 40040

EMC: To EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4) and IEC 255-3

Connections: Max. 4.0 mm² (single-stranded)
Max. 2.5 mm² (multi-stranded)

Materials: All plastic parts are self-extinguishing to UL94 (V1)

Protection: Case: IP40. Terminals: IP20, to IEC 529 and EN 60529

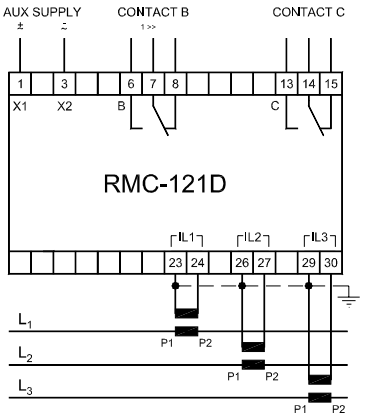
Type approval: The uni-line components are approved by the major classification societies. For current approvals see www.deif.com or contact DEIF A/S

Settings and indication

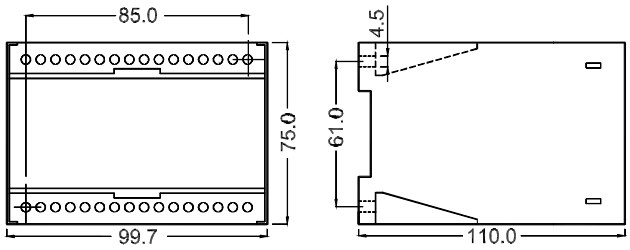
Setting of	LED/relay
Short circuit current set point: (100…400%) of I_n	"I>>" yellow LED is lit when the set point has been exceeded, but the output contact not yet activated
Time delay: (0…T1) in seconds 0…1/0…5/0…10 s	Contact is activated and red LED lit after the timer has expired

The relays are furthermore equipped with a green LED marked "POWER" for indication of power ON. Once the relay has been mounted and adjusted, the transparent front cover may be sealed, preventing unwanted change of the setting

Connections/dimensions (in mm)



Shown contact positions: Auxiliary voltage not connected



Weight: Approx. 0.650 kg

Order specifications

Type – Measuring current (I_n) – Relay – Time delay (T1) – Supply voltage
Example:
RMC-121D – 5A AC – NDL – 1 s – 400V AC

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

ANSI code 25

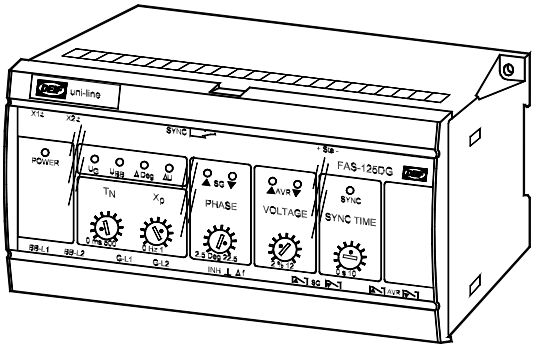
Type FAS-125DG

Synchronisers

uni-line

4921240141D

- ***Synchronisation of generator to busbar***
- ***Automatic, static synchronisation***
- ***With voltage matching***
- ***LED indication of status***
- ***LED for synchronising signal***
- ***35 mm DIN rail or base mounting***



FAS-125DG CE

Application

The static synchroniser type FAS-125DG forms part of a complete DEIF series of relays for protection and control of generators and is applicable to both marine and land-based installations.

The FAS-125DG synchroniser with voltage matching compares the frequency and voltage of the generator with the busbar frequency and voltage, and controls the generator frequency and voltage - if necessary - till they match the busbar values.

It can be applied in conjunction with a wide range of prime movers, as its control pulses may be set to fit several types - from slowly reacting diesel engines to swiftly reacting gas turbines.

A static synchronisation is achieved by regulating the voltage and frequency of the generator plus the phase angle of the voltages of the generator.

The FAS-125DG is especially applicable to installations with no circuit breakers, e.g. where the generators/the mains are connected by mounting the relevant fuse.

In such applications the FAS-125DG will keep the phase angle difference between the generator and busbar voltages constantly at less than ±10° el. The phase angle difference is set on the potentiometer marked “PHASE”.

Measuring principle

The synchroniser measures the busbar and generator voltages and frequencies and compare these, plus compares their phase angles.

If the voltage difference exceeds the span set on the potentiometer marked “VOLTAGE”, the synchroniser will control the generator voltage, until the difference is within the set limits.

The generator frequency is regulated by the FAS-125DG, until it matches the busbar frequency ±0.04Hz.

The synchroniser then checks the phase angle of the generator voltage and if necessary regulates this, until it is within the “phase angle window” set on the potentiometer marked “PHASE”.

The FAS-125DG will continue keeping the generator frequency within this range of ±0.04Hz.

When the phase angle has remained within the range set on the potentiometer marked “PHASE” for the period of time set on the potentiometer marked “SYNC TIME”, the relay “SYNC” will be activated and the LED “SYNC” will be lit.

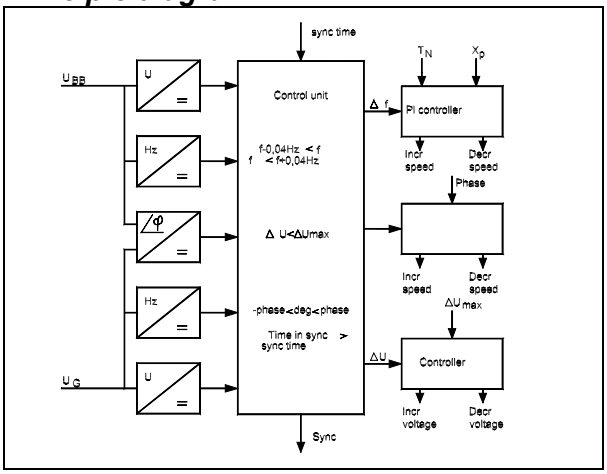
Should a phase angle shift occur at any time after this matching of the phase angles, or should the generator frequency exceed its tolerances, the FAS-125DG will reactivate its control of the frequency/phase angle.

T_N Pulse length
min. duration of the control pulse (ON time).

X_P Proportional band
Within which the pulse ratio changes proportionally to the frequency deviation from the busbar frequency.

Furthermore the relay is equipped with a self-check function. This function supervises the micro-processor and will switch the status output (17-18) to position OFF and start flashing with the power led, should the function detects a fault.

Principle diagram



Type FAS-125DG

Technical specifications

Meas. voltage: (See supply voltage - AC ranges)
load: 2kΩ/V.

Frequency range: 40...45...65...70Hz.

Inhibit input: Potential-free relay contact.
Open: 5V. Closed: 5mA.

Contact outputs:
synch. pulse output: 1 change-over switch

freq. control outputs: 2 make contacts

volt. control outputs: 2 make contacts

contact ratings: 250V-8A-2000VA (AC).
24V-8A-200W (DC).
(200 x 10^3 change-overs at resistive load)

contact voltage: Max. 250V (AC). Max. 150V (DC).

Optocoupler output: System status off = failure.

Temperature: -25...70°C (operating).

Temperature drift: Set points:
max. ±0.2% of full scale per 10°C.

Galvanic separation: Between inputs and outputs:
3250V - 50Hz - 1 min.

Supply voltage (U_n): 57.7-63.5-100-110-127-200-220-230-240-380-400-415-440-450-660-690VAC ±20% (max. 3.5VA)

24-48-110-220V DC -25/+30% (max. 2W).

Climate: HSE, to DIN 40040.

EMC: To EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4) and IEC 255-3.

Connections: Max. 4 mm² (single-stranded).
Max. 2.5 mm² (multi-stranded).

Materials: All plastic parts are self-extinguishing to UL94 (V1).

Protection: Case: IP40. Terminals: IP20, to IEC 529 and EN 60529.

Type approval: The uni-line components are approved by the major classification societies. For current approvals see www.deif.com or contact DEIF A/S.

Settings

Setting of		Range
T_N	Control pulse length	25...500 ms
X_P	Proportional band	±0.25...±1Hz
PHASE	Acceptable phase diff.	2.5...22.5°el.
$_{\Delta}U_{max}$	Acceptable volt. diff.	±2...±12% of U_{BB}
SYNC	Synchronisation time	0.5...10 s

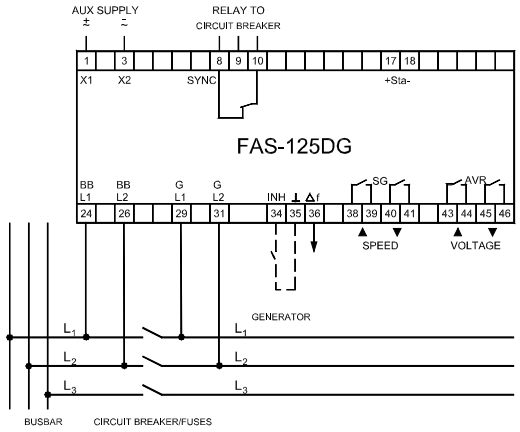
Indication

LED's		Light
U_G	Generator voltage	Green, when value is within the acceptable range. Switched off, if outside this range.
U_{BB}	Busbar voltage	
$_{\Delta}$Deg	Phase difference	
$_{\Delta}$U	Volt. difference	
Sync	Synchronising	Yellow, when relay is activated.
SG ▲	Incr. speed (freq.)	
SG ▼	Decr. speed (freq.)	
AVR ▲	Increasing voltage	
AVR ▼	Decreasing voltage	

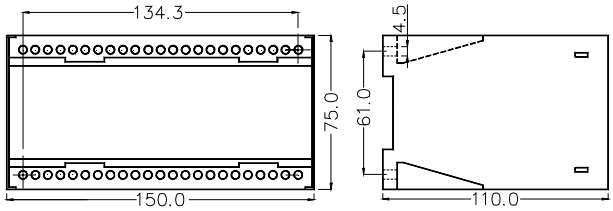
The relay is furthermore equipped with a green LED marked "POWER" for indication of power ON.

Once the relay has been mounted and adjusted, the transparent front cover may be sealed, preventing unwanted change of the setting.

Connections/dimensions (in mm)



See installation instructions for information about status output (17-18).



Weight: approx 0.750 kg

Order specifications

Type - Measuring voltage - Supply voltage
Example: FAS-125DG - 380V AC - 24V DC

Due to our continous development we reserve the right to supply equipment which may vary from the described.

DEIF A/S, Frisenborgvej 33
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

ANSI code 25

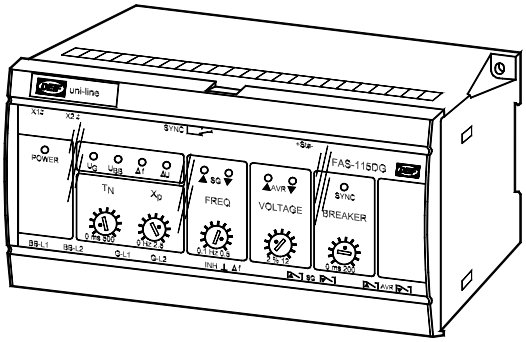
Type FAS-115DG

Synchronisers

uni-line

4921240116E

- ***Synchronisation of generator to busbar***
- ***Circuit breaker time compensation***
- ***Voltage matching***
- ***LED indication of status***
- ***LED for activated control***
- ***LED for synchronising signal***
- ***35 mm DIN rail or base mounting***



FAS-115DG CE

Application

The FAS-115DG synchroniser is applied for synchronisation of a generator to the busbar and closing of its circuit breaker when the voltage difference, the slip frequency and the phase angles are within the preset limits. The synchroniser can be applied in conjunction with a wide range of prime movers, as its control pulses may be set to fit several types - from slowly reacting diesel engines to swiftly reacting gas turbines.

Function

The FAS-115DG performs a dynamic synchronisation, ensuring that the slip frequency is always positive to prevent reverse power conditions to occur (see option D). Furthermore the FAS-115DG is provided with relay outputs for controlling the AVR for voltage matching. In order to calculate when to transmit the closing signal to the generator breaker, the synchroniser measures the actual slip frequency and compares this with the circuit breaker closing time (potentiometer marked BREAKER). When the slip frequency and the voltage deviation are within the settings (potentiometers marked FREQ and VOLTAGE), the above calculation is performed, and the synchroniser transmits the closing signal to the breaker "x" degrees before top allowing time for this to close.

In case of harmonic distortion or noise on the voltage inputs the FAS-115DG is equipped with special filters on the AC voltage inputs to avoid unprecise synchronisation pulse to be transmitted. Furthermore a df/dt (ROCOF) function is implemented, if the filters are unable to make the necessary filtering of the input signals, the df/dt function will prevent unprecise synchronisation pulse to be transmitted. If the df/dt function is active, the situation will be indicated by a flashing Δf LED (see option C).

The FAS-115DG is provided with an analogue frequency output and an analogue voltage output, intended for common control of the frequency and the voltage of DEIF load sharing units type LSU-112/113/114DG and LSU-122DG, a function applied for simultaneous synchronisation of all generators of a plant to the busbar.

Regulator output

The unit is provided with 2 contact outputs for speed control and 2 contact outputs for voltage control:

Frequency control:
The regulating speed of the servomotors for the prime mover is controlled by the built-in P controller of the FAS-115DG according to its setting for:

T_N (pulse length):
The min. duration of the control pulse.

X_P (proportional band):
The zone within which the pulse/pause ratio changes proportionally to the frequency deviation from f_{set}.

Dead band 0.05Hz:
The zone within which no control pulses are emitted.

Voltage control:
Regulation of the servomotor for the AVR is controlled by the built-in on/off regulator of the FAS-115DG.

The phase angle advance is calculated and a synchronising signal transmitted provided that:

1. the voltage difference is within ±2...±12% of the busbar voltage, and
2. the frequency difference is within ±90% of the value set on the FREQ potentiometer, and
3. the generator frequency is higher than the busbar frequency (see option D also).

When the above 3 conditions are fulfilled, a synchronising signal is transmitted, the yellow LED SYNC is lit, and the output contact is activated for 400 ms.

Special function for commissioning

The FAS-115DG is equipped with a function for checking of the phase sequence. When the frequency and the voltage between the busbar and the generator inputs are the same and the phase is inside ±5° for 1 s, the sync. relay is activated. If the generator is stopped and the star point is opened and the generator breaker is closed, the FAS-115DG will transmit a closing signal if the phase sequence is OK.

Self-monitoring

The FAS-115DG is equipped with a self-monitoring function. The function supervises the built-in micro-controller and hereby verifies if the programme is running correctly. The green LED marked POWER is connected to this function. Constant green light indicates that the supply voltage is accepted and the unit is running correctly. Flashing green light 2-3Hz indicates that the supply voltage is accepted but the unit is running incorrectly. In this situation the status output terminals 17 and 18 are activated (open).

Type FAS-115DG

Terminals/function

Connection	Connect	
Busbar	L1 to term. 24	L2 to term. 26
Generator	L1 to term. 29	L2 to term. 31

Terminal no.	Description/action
1 and 3 X1/X2	Input for supply voltage
8, 9 and 10	Relay contact for circuit breaker. On time 400 ms
17 and 18 Sta	Status output, activated (closed) when the supply voltage is connected and the unit is working correctly
24 and 26 BB/L1 BB/L2	Input for busbar voltage measurement. This input becomes active when the voltage level exceeds 80% of nominal voltage
29 and 31 G/L1 G/L2	Input for generator voltage measurement. When the voltage level on this input exceeds 60% of nominal voltage, the FAS-115DG is activated and the regulator outputs (SG) become active. Note that with an auxiliary contact on the generator circuit breaker this function can be used for resetting of the FAS-115DG after synchronisation and hereby deactivation of the SG outputs. This function allows the supply voltage to be connected at any time
33 ("ΔU") Option F	This output is intended for common control of the voltage of all the connected reactive power load sharing units type LSU-122DG in a generator island. If terminal 33 is connected to the common voltage line (US) on the LSU-122DGs, the FAS-115DG will regulate the voltage on the generator island so it matches the voltage on the unit the island is about to be connected to
34 and 35 ("INH")	May be connected to a potential-free N/O contact. When this contact is activated, the FAS-115DG will not transmit a closing signal (terminals 9 and 10), but the SYNC LED will be lit when the sync. pulse is transmitted. This function can be used for testing purposes. Note that if the FAS-115DG is equipped with option A or B, this input has a different function
36 ("Δf")	This output is intended for common control of the frequency of all the connected load sharing units type LSU-112/113/114DG in a generator island. If terminal 36 is connected to the common frequency line (FS) on the LSUs, the FAS-115DG will control the frequency on the generator island so it matches the frequency on the unit the island is about to be connected to
35 ("⊥")	Common earth terminal for the above input/output
38 and 39 Relay contacts "SG"	Relay contact for increase of the speed
40 and 41 Relay contacts "SG"	Relay contact for decrease of the speed
43 and 44 Relay contacts "AVR"	Relay contact for increase of the voltage
45 and 46 Relay contacts "AVR"	Relay contact for decrease of the voltage
NOTE: Relay contacts	Relays (SG) should always be connected via external aux. relays when a DC pilot motor is applied. A transient suppressor should always be connected across the relay coil of the external relays

Options

The FAS-115DG can be configured with the following options:

Frequency controller, option A

The FAS-115DG is set to act as a frequency controller ensuring a stable generator frequency according to the setting (50Hz or 60Hz). The function is activated when the INH input is closed. Please note that with option A implemented, disabling of the sync. relay output is not possible. If the INH input is open, the FAS-115DG functions as a normal synchroniser. When the input INH is activated, the FAS-115DG will act as a frequency and voltage controller and regulate the generator to the frequency setting (50Hz or 60Hz) ±0.05Hz and the voltage to nominal ±2%. No sync. pulse will be transmitted.

Dead bus, option B

When implemented the dead bus function enables the FAS-115DG to transmit a closing signal to the generator breaker when no busbar voltage is present. When the generator voltage is within 60% of nominal level and the busbar voltage is below 20% of nominal level, the FAS-115DG will start to control the generator frequency and voltage according to the setting (50Hz or 60Hz). When the frequency becomes nominal ±0.05Hz and the voltage level is nominal ± the setting (potentiometer marked VOLTAGE), the sync. pulse is transmitted to the breaker. Please note that after closing of the breaker (voltage on both inputs on the FAS-115DG), the FAS-115DG will start controlling the frequency to the setting on the FREQ potentiometer. If this setting is 0.5Hz, the resulting busbar frequency will be 50.5Hz or 60.5Hz. This can be avoided, if the generator voltage input (terminal 29 or 31) is disconnected from the FAS-115DG after closing of the breaker. To make it possible to open the generator breaker from another system and prevent the FAS-115DG from performing a new dead bus closing of the breaker, the time when the generator breaker must close can be controlled by means of the INH input. If the INH input is activated (closed), the FAS-115DG will not activate the sync. relay even if there is a dead bus situation. When INH is deactivated, the FAS-115DG will transmit the closing signal. Please note that with option B implemented, disabling of the sync. relay is not possible.

Deactivation of the df/dt protection function, option C

If instability in the speed loop control system occurs resulting in jitter on the voltage signals (fast instability typically occurs, if the governor is responding to engine firings), and it is not possible to adjust this on the governor, or in applications with much noise and harmonic distortion (frequency converters), the df/dt protection function can be activated resulting in NO sync. pulse. If this is the case, and the switchgear is properly protected against wrong synchronisation, the df/dt protection function can be disabled. Please note that when this function is disabled, noise on the busbar and the generator inputs of the FAS-115DG can, at worst, result in a 180° out of phase synchronisation.

Options, continued

Accept of both undersynchronisation and oversynchronisation of the generator breaker, option D

Option D can be activated in applications where a fast synchronisation has priority and the risk for reverse power is unimportant. With this option activated the FAS-115DG will regulate the generator to perform either an under- or an oversynchronisation, the parameter used for either under- or oversynchronisation is the parameter which first obtains a synchronisation as fast as possible.

Extended circuit breaker closing time, option E

In applications with very slow generator circuit breakers with closing time up to 400 ms this option will prolong the setting of the closing time (potentiometer marked BREAKER) to cover the range 200…400 ms.

Voltage difference analogue output, option F

This output is standard 0…5…10V corresponding to 80…100…120% of U_{nom} for control of the LSU-122DG. If option F is selected, the output is changed to -10…0…10V corresponding to 90…100…110% of U_{nom} for control of the units in the multi-line series, e.g. PPU/GPC.

Technical specifications

Accuracy:

Breaker closing:	Slip frequency 0.1…0.25Hz: ±3° el. Slip frequency 0.25…0.5Hz: ±5° el.
Meas. voltage:	See supply voltage - AC ranges
Load:	2kΩ/V
Frequency range:	40…45…65…70Hz
Breaker closing pulse length:	400 ms ±10 ms
Inhibit input:	Potential-free contact Open: 5V. Closed: 5mA

Contact outputs:

Sync. pulse output:	1 change-over switch
Freq. control outp.:	2 make contacts
Volt. control outp.:	2 make contacts
Contact ratings:	AC1: 8A, 250V AC DC1: 8A, 24V DC AC15: 3A, 250V AC DC13: 3A, 24V DC
Life electrical:	1 x 10^5 (nominal value)

Analogue output:

Freq. difference:	1 analogue output: -10…0…10V DC ~ -5…0…5Hz
Volt. difference:	1 analogue output: 0…5…10V DC ~ 80…100…120% of U_n -10…0…10V DC ~ 90…100…110% of U_n with option F activated
Optocoupler outp.:	System status off = Failure Max. voltage 30V DC, max. current 5mA
Temperature:	-25…70°C (operating)
Temperature drift:	Set-points: Max. ±0.2% of full scale per 10°C
Galv. separation:	Between inputs and outputs: 3250V - 50Hz - 1 min.
Supply volt. (U_n):	57.7-63.5-100-110-127-200-220-230-240-380-400-415-440-450-660-690V AC ±20% (max. 3.5VA) 24-48-110-220V DC -25/+30% (max. 2W)
Climate:	HSE, to DIN 40040
EMC:	To EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4) and IEC 255-3
Connections:	Max. 4 mm^2 (single-stranded) Max . 2.5 mm^2 (multi-stranded)
Materials:	All plastic parts are self-extinguishing to UL94 (V1)
Protection:	Case: IP40. Terminals: IP20, to IEC 529 and EN 60529
Type approval:	The uni-line components are approved by the major classification societies. For current approvals see www.deif.com or contact DEIF A/S

Type FAS-115DG

Settings

Setting of		Range
T_N	Control pulse length	25...500 ms
X_P	Proportional band	±0.25...±2.5Hz
f_{set}	Slip frequency	0.1...0.5Hz *
$\Delta U_{max.}$	Acceptable volt. diff.	±2...±12% of U_{BB}
T_{BC}	Breaker closure time	20...200 ms (200...400 ms) option E

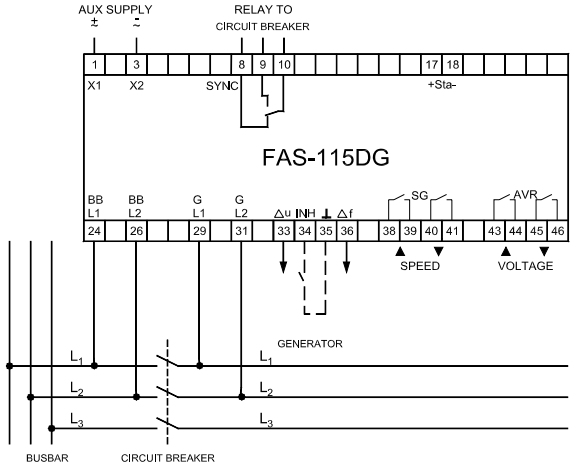
* Accept of max. df/dt depends on f_{set}
0.1Hz ~ 2.5Hz/sec.
0.5Hz ~ 12.5Hz/sec.

Indication

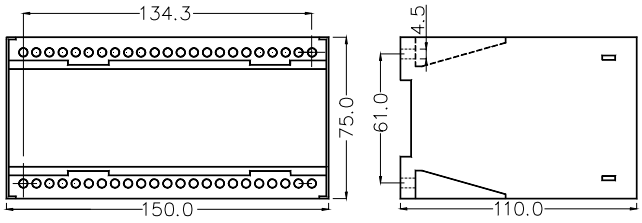
LEDs		Light
U_G	Generator voltage	Green, when value is within the acceptable range Switched off, if outside this range
U_{BB}	Busbar voltage	
Δf	Frequency difference	
ΔU	Voltage difference	
SYNC	Synchronising	Yellow, when relay is activated
SG▲	Increase speed (freq.)	
SG▼	Decrease speed (freq.)	
AVR▲	Increase voltage	
AVR▼	Decrease voltage	

Once the relay has been mounted and adjusted, the transparent front cover may be sealed, preventing unwanted change of the setting.

Connections/dimensions (in mm)



See installation instructions for information about status output (17-18)



Weight: Approx. 0.750 kg

Order specifications

Type – Measuring voltage – Supply voltage – (Option – Generator frequency)
Example:
FAS-115DG – 380V AC – 24V DC – Option A – 50Hz

NOTE:
Option A and option B cannot be chosen at the same time.

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

ANSI code 25

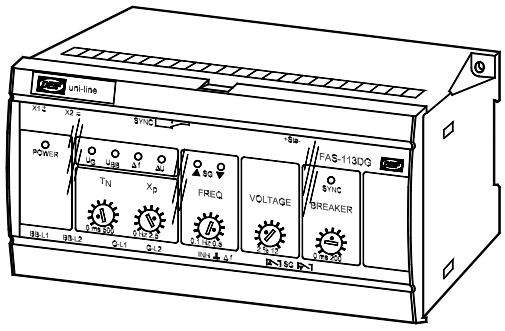
Type FAS-113DG

Synchronisers

uni-line

4921240114E

- ***Synchronisation of generator to busbar***
- ***Circuit breaker time compensation***
- ***LED indication of status***
- ***LED for activated control***
- ***LED for synchronising signal***
- ***35 mm DIN rail or base mounting***



FAS-113DG CE

Application

The FAS-113DG synchroniser is applied for synchronisation of a generator to the busbar and closing of its circuit breaker when the voltage difference, the slip frequency and the phase angles are within the preset limits. The synchroniser can be applied in conjunction with a wide range of prime movers, as its control pulses may be set to fit several types - from slowly reacting diesel engines to swiftly reacting gas turbines.

Function

The FAS-113DG performs a dynamic synchronisation, ensuring that the slip frequency is always positive to prevent reverse power conditions to occur (see option D). In order to calculate when to transmit the closing signal to the generator breaker, the synchroniser measures the actual slip frequency and compares this with the circuit breaker closing time (potentiometer marked BREAKER). When the slip frequency and the voltage deviation are within the settings (potentiometers marked FREQ and VOLTAGE), the above calculation is performed, and the synchroniser transmits the closing signal to the breaker "x" degrees before top allowing time for this to close.

In case of harmonic distortion or noise on the voltage inputs the FAS-113DG is equipped with special filters on the AC voltage inputs to avoid unprecise synchronisation pulse to be transmitted. Furthermore a df/dt (ROCOF) function is implemented, if the filters are unable to make the necessary filtering of the input signals, the df/dt function will prevent unprecise synchronisation pulse to be transmitted. If the df/dt function is active, the situation will be indicated by a flashing Δf LED (see option C).

The FAS-113DG is provided with an analogue frequency output and an analogue voltage output, intended for common control of the frequency and the voltage of DEIF load sharing units type LSU-112/113/114DG and LSU-122DG, a function applied for simultaneous synchronisation of all generators of a plant to the busbar.

Regulator output

The unit is provided with 2 contact outputs for speed control:

Frequency control:
The regulating speed of the servomotors for the prime mover is controlled by the built-in P controller of the FAS-113DG according to its setting for:

T_N (pulse length):
The min. duration of the control pulse.

X_P (proportional band):
The zone within which the pulse/pause ratio changes proportionally to the frequency deviation from f_{set}.

Dead band 0.05Hz:
The zone within which no control pulses are emitted.

The phase angle advance is calculated and a synchronising signal transmitted provided that:

1. the voltage difference is within ±2...±12% of the busbar voltage, and
2. the frequency difference is within ±90% of the value set on the FREQ potentiometer, and
3. the generator frequency is higher than the busbar frequency (see option D also).

When the above 3 conditions are fulfilled, a synchronising signal is transmitted, the yellow LED SYNC is lit, and the output contact is activated for 400 ms.

Special function for commissioning

The FAS-113DG is equipped with a function for checking of the phase sequence. When the frequency and the voltage between the busbar and the generator inputs are the same and the phase is inside ±5° for 1 s, the sync. relay is activated. If the generator is stopped and the star point is opened and the generator breaker is closed, the FAS-113DG will transmit a closing signal if the phase sequence is OK.

Self-monitoring

The FAS-113DG is equipped with a self-monitoring function. The function supervises the built-in micro-controller and hereby verifies if the programme is running correctly. The green LED marked POWER is connected to this function. Constant green light indicates that the supply voltage is accepted and the unit is running correctly. Flashing green light 2-3Hz indicates that the supply voltage is accepted but the unit is running incorrectly. In this situation the status output terminals 17 and 18 are activated (open).

FAS-113DG

Terminals/function

Connection	Connect	
Busbar	L1 to term. 24	L2 to term. 26
Generator	L1 to term. 29	L2 to term. 31

Terminal no.	Description/action
1 and 3 X1/X2	Input for supply voltage
8, 9 and 10	Relay contact for circuit breaker. On time 400 ms
17 and 18 Sta	Status output, activated (closed) when the supply voltage is connected and the unit is working correctly
24 and 26 BB/L1 BB/L2	Input for busbar voltage measurement. This input becomes active when the voltage level exceeds 80% of nominal voltage
29 and 31 G/L1 G/L2	Input for generator voltage measurement. When the voltage level on this input exceeds 60% of nominal voltage, the FAS-113DG is activated and the regulator outputs (SG) become active. Note that with an auxiliary contact on the generator circuit breaker this function can be used for resetting of the FAS-113DG after synchronisation and hereby deactivation of the SG outputs. This function allows the supply voltage to be connected at any time
33 ("ΔU") Option F	This output is intended for common control of the voltage of all the connected reactive power load sharing units type LSU-122DG in a generator island. If terminal 33 is connected to the common voltage line (US) on the LSU-122DGs, the FAS-113DG will regulate the voltage on the generator island so it matches the voltage on the unit the island is about to be connected to
34 and 35 ("INH")	May be connected to a potential-free N/O contact. When this contact is activated, the FAS-113DG will not transmit a closing signal (terminals 9 and 10), but the SYNC LED will be lit when the sync. pulse is transmitted. This function can be used for testing purposes. Note that if the FAS-113DG is equipped with option A or B, this input has a different function
36 ("Δf")	This output is intended for common control of the frequency of all the connected load sharing units type LSU-112/113/114DG in a generator island. If terminal 36 is connected to the common frequency line (FS) on the LSUs, the FAS-113DG will control the frequency on the generator island so it matches the frequency on the unit the island is about to be connected to
35 ("⊥")	Common earth terminal for the above input/output
38 and 39 Relay contacts "SG"	Relay contact for increase of the speed
40 and 41 Relay contacts "SG"	Relay contact for decrease of the speed
NOTE: Relay contacts	Relays (SG) should always be connected via external aux. relays when a DC pilot motor is applied. A transient suppressor should always be connected across the relay coil of the external relays

Options

The FAS-113DG can be configured with the following options:

Frequency controller, option A

The FAS-113DG is set to act as a frequency controller ensuring a stable generator frequency according to the setting (50Hz or 60Hz). The function is activated when the INH input is closed. Please note that with option A implemented, disabling of the sync. relay output is not possible. If the INH input is open, the FAS-113DG functions as a normal synchroniser. When the input INH is activated, the FAS-113DG will act as a frequency controller and regulate the generator to the frequency setting (50Hz or 60Hz) ±0.05Hz, and no sync. pulse will be transmitted.

Dead bus, option B

When implemented the dead bus function enables the FAS-113DG to transmit a closing signal to the generator breaker when no busbar voltage is present. When the generator voltage is within 60% of nominal level and the busbar voltage is below 20% of nominal level, the FAS-113DG will start to control the generator frequency according to the setting (50Hz or 60Hz). When the frequency becomes nominal ±0.05Hz and the voltage level is nominal ± the setting (potentiometer marked VOLTAGE), the sync. pulse is transmitted to the breaker. Please note that after closing of the breaker (voltage on both inputs on the FAS-113DG), the FAS-113DG will start controlling the frequency to the setting on the FREQ potentiometer. If this setting is 0.5Hz, the resulting busbar frequency will be 50.5Hz or 60.5Hz. This can be avoided, if the generator voltage input (terminal 29 or 31) is disconnected from the FAS-113DG after closing of the breaker. To make it possible to open the generator breaker from another system and prevent the FAS-113DG from performing a new dead bus closing of the breaker, the time when the generator breaker must close can be controlled by means of the INH input. If the INH input is activated (closed), the FAS-113DG will not activate the sync. relay even if there is a dead bus situation. When INH is deactivated, the FAS-113DG will transmit the closing signal. Please note that with option B implemented, disabling of the sync. relay is not possible.

Deactivation of the df/dt protection function, option C

If instability in the speed loop control system occurs resulting in jitter on the voltage signals (fast instability typically occurs, if the governor is responding to engine firings), and it is not possible to adjust this on the governor, or in applications with much noise and harmonic distortion (frequency converters), the df/dt protection function can be activated resulting in NO sync. pulse. If this is the case, and the switchgear is properly protected against wrong synchronisation, the df/dt protection function can be disabled. Please note that when this function is disabled, noise on the busbar and the generator inputs of the FAS-113DG can, at worst, result in a 180° out of phase synchronisation.

Options, continued

Accept of both undersynchronisation and oversynchronisation of the generator breaker, option D

Option D can be activated in applications where a fast synchronisation has priority and the risk for reverse power is unimportant. With this option activated the FAS-113DG will regulate the generator to perform either an under- or an oversynchronisation, the parameter used for either under- or oversynchronisation is the parameter which first obtains a synchronisation as fast as possible.

Extended circuit breaker closing time, option E

In applications with very slow generator circuit breakers with closing time up to 400 ms this option will prolong the setting of the closing time (potentiometer marked BREAKER) to cover the range 200…400 ms.

Voltage difference analogue output, option F

This output is standard 0…5…10V corresponding to 80…100…120% of U_{nom} for control of the LSU-122DG. If option F is selected, the output is changed to -10…0…10V corresponding to 90…100…110% of U_{nom} for control of the units in the multi-line series, e.g. PPU/GPC.

Technical specifications

Accuracy:

Breaker closing:	Slip frequency 0.1…0.25Hz: ±3° el. Slip frequency 0.25…0.5Hz: ±5° el.
Meas. voltage:	See supply voltage - AC ranges
Load:	2kΩ/V
Frequency range:	40…45…65…70Hz
Breaker closing pulse length:	400 ms ±10 ms
Inhibit input:	Potential-free contact Open: 5V. Closed: 5mA

Contact outputs:

Sync. pulse output:	1 change-over switch
Freq. control outp.:	2 make contacts
Contact ratings:	AC1: 8A, 250V AC DC1: 8A, 24V DC AC15: 3A, 250V AC DC13: 3A, 24V DC
Life electrical:	1 x 10^5 (nominal value)

Analogue output:

Freq. difference:	1 analogue output: -10…0…10V DC ~ -5…0…5Hz
Volt. difference:	1 analogue output: 0…5…10V DC ~ 80…100…120% of U_n -10…0…10V DC ~ 90…100…110% of U_n with option F activated
Optocoupler outp.:	System status off = Failure Max. voltage 30V DC, max. current 5mA
Temperature:	-25…70°C (operating)
Temperature drift:	Set-points: Max. ±0.2% of full scale per 10°C
Galv. separation:	Between inputs and outputs: 3250V - 50Hz - 1 min.
Supply volt. (U_n):	57.7-63.5-100-110-127-200-220-230-240-380-400-415-440-450-660-690V AC ±20% (max. 3.5VA) 24-48-110-220V DC -25/+30% (max. 2W)
Climate:	HSE, to DIN 40040
EMC:	To EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4) and IEC 255-3
Connections:	Max. 4 mm^2 (single-stranded) Max . 2.5 mm^2 (multi-stranded)
Materials:	All plastic parts are self-extinguishing to UL94 (V1)
Protection:	Case: IP40. Terminals: IP20, to IEC 529 and EN 60529
Type approval:	The uni-line components are approved by the major classification societies. For current approvals see www.deif.com or contact DEIF A/S

Type FAS-113DG

Settings

Setting of		Range
T_N	Control pulse length	25...500 ms
X_P	Proportional band	±0.25...±2.5Hz
f_{set}	Slip frequency	0.1...0.5Hz *
$\Delta U_{max.}$	Acceptable volt. diff.	±2...±12% of U_{BB}
T_{BC}	Breaker closure time	20...200 ms (200...400 ms) option E

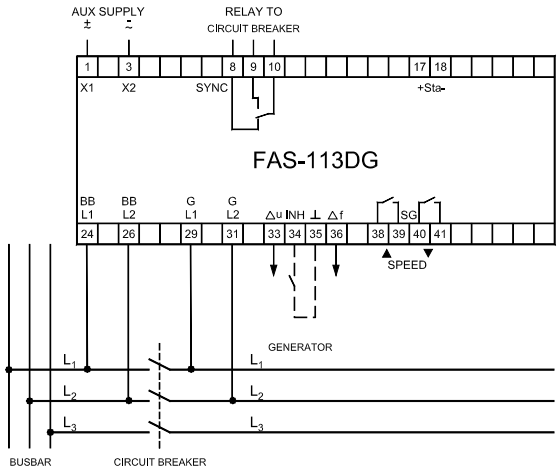
* Accept of max. df/dt depends on f_{set}
0.1Hz ~ 2.5Hz/sec.
0.5Hz ~ 12.5Hz/sec.

Indication

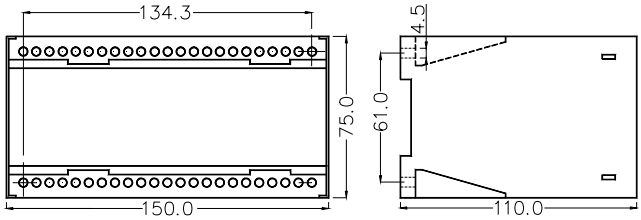
LEDs		Light
U_G	Generator voltage	Green, when value is within the acceptable range Switched off, if outside this range
U_{BB}	Busbar voltage	
Δf	Frequency difference (df/dt check)	
ΔU	Voltage difference	
SYNC	Synchronising	Yellow, when relay is activated
SG▲	Increase speed (freq.)	
SG▼	Decrease speed (freq.)	

Once the relay has been mounted and adjusted, the transparent front cover may be sealed, preventing unwanted change of the setting.

Connections/dimensions (in mm)



See installation instructions for information about status output (17-18)



Weight: Approx. 0.750 kg

Order specifications

Type – Measuring voltage – Supply voltage – (Option – Generator frequency)
Example:
FAS-113DG – 380V AC – 24V DC – Option A – 50Hz

NOTE:
Option A and option B cannot be chosen at the same time.

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

ANSI code 90

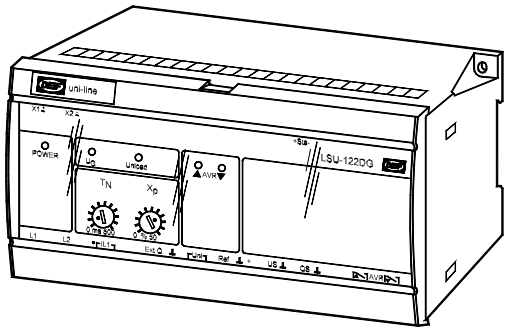
Type LSU-122DG

var load sharing units

uni-line

4921240124E

- ***For control of diesel or gas generators***
- ***Built-in reactive power transducer***
- ***Control of AVR***
- ***LED indication of status***
- ***LED indication for activated control***
- ***35 mm DIN rail or base mounting***



LSU-122DG CE

Application

The LSU-122DG is a control unit for control of the generator in a power unit.

The LSU-122DG can control the power unit
- in stand alone mode, performing voltage control
- parallel with grid, performing reactive power control
- parallel with other power units, performing voltage and reactive power control

The unit is designed for connection to a motor potentiometer for control of the AVR, however in conjunction with the DEIF electronic potentiometer type EPN-110DN or EPQ-96 it can control most electronic AVRs.

All the LSU-122DGs in the power plant must be connected to a common voltage transducer. If a number of generators are to be synchronised to the busbar at the same time, the voltage may likewise be controlled externally.

Function

The LSU-122DG is measuring the voltage and the current from which the reactive power produced by the power unit is calculated. The built-in reactive power transducer is based on an I x sin phi principle.

The following couplings are available:
- 1var single phase
- 1var3 1 element, 3 phase 3 wire balanced load

If unbalanced load can be expected an external reactive power transducer with an output of 4…20mA can be connected to the LSU-122DG. In this case the built-in I x sin phi transducer is automatically interrupted.

The reactive power measured by each LSU-122DG is fed to a common line for comparison with the reactive power (QS) of the other connected LSU-122DG. The voltage line (US) from each LSU-122DG is connected to the common voltage transducer.

If L1 or L2 is disconnected from the LSU-122DG at the same time as a power unit in a power plant is disconnected from the power line (busbar), built-in relays in the LSU-122DG ensure that the reactive power output (QS) and the voltage input (US) of the associated unit are disconnected from the paralleling lines. Likewise the reactive power and voltage lines are disconnected, if the auxiliary voltage to the LSU-122DG is disconnected.

The LSU-122DG is equipped with an unload input. When activated this input will control the power unit (generator) to zero reactive power, and at the same time the reactive power output of the LSU-122DG is disconnected from the paralleling line.

The calibration of the LSU-122DG is done so it matches its power unit. This means that load sharing between power units with different size will be performed according to the actual size of the individual power units in the plant. E.g. a 100kVA generator and a 150kVA generator running in parallel will share a total load of 125kvar into 50kvar and 75kvar.

Regulator output

The unit is provided with 2 contact outputs for voltage control:

Reactive power and voltage control:
The regulating speed of the motor potentiometer for the AVR is controlled by the built-in P controller of the LSU-122DG according to its setting for:

T_N (pulse length):
The min. duration of the control pulse.

X_P (proportional band):
The zone within which the pulse ratio changes proportionally to the voltage/reactive power deviation from the required value.

Dead band:
The zone within which no control pulses are emitted:
Power: ±0.5% of P_n
Voltage: ±1% of U_n

Self-monitoring

The LSU-122DG is equipped with a self-monitoring function. The function supervises the built-in micro-controller and hereby verifies if the programme is running correctly. The green LED marked “POWER” is connected to this function. Constant green light indicates that the supply voltage is accepted and the unit is running correctly. Flashing green light 2-3Hz indicates that the supply voltage is accepted but the unit is running incorrectly. In this situation the status output terminals 17 and 18 are activated (open).

Type LSU-122DG

Terminals/function

Connection type	Connect	
1var3 (standard)	L1 to term. 24	L2 to term. 26
1var (betw. phase/neutral)	L1 (P) to term. 24	Neutral to term. 26

Terminal no.	Description/action
1 and 3 (X1/X2)	Input for supply voltage
17 (+) and 18 (-) (Sta)	Status output, activated (closed) when the supply voltage is connected and the unit is working correctly
28 and 29 (IL1)	Input for the current measurement. Note that S1 on the external current transformer is connected to terminal 28, and S2 is connected to terminal 29
31 and 32 ("Ext. Q.")	Must be short-circuited, if the internal reactive power transducer is used (normal). For applications with unbalanced load it is recommended to use an external reactive power transducer (replacing the built-in one). Connect external transducer to 31 (+) and 32 (-). The output of the external transducer must be 4…20mA DC. The output of the connected transducer must limit the output swing to min. 2mA and max. 22mA. DEIF transducer type TAS-331DG is recommended
33 and 34 ("Unl")	May be connected to a potential-free N/O relay contact. When this contact is activated, the reactive power of the generator is regulated to zero (unloading), and the LSU-122DG is disconnected from the paralleling QS power line
35 ("Ref.")	Reference input. Must be connected to term. 36 ("⊥"), if not used. This input is used to control the power unit running in reactive power control mode (fixed reactive load to grid). A +0.5V…5V connected to the input with respect to (⊥) will control the generator in the range 10…100% reactive power. The input activates at 0.55V and deactivates at 0.45V. Please notice that when this input is active the LSU-122DG is still connected to the QS and US lines. In this mode the QS line acts only as an output
37 ("+5V")	Reference output. This voltage output can be used for local reactive power control mode. If terminal 37 is feeding a voltage divider, and the output from the voltage divider is connected to terminal 35, local power control can be performed
36 ("⊥")	Common earth terminal for the above reference input/output
38 ("US") and 39 ("⊥")	Paralleling line for voltage regulation of the generator. Normally connected to an external voltage transducer. The output of the external common voltage transducer must be 0...5...10V corresponding to 80...100...120% of U_n and must be connected to terminal 37 if voltage control is not used
40 ("QS") and 41 ("⊥")	Paralleling line for reactive power sharing of the connected LSU-122DGs. Normally 5V at nominal busbar voltage and cos phi = 1. If cos phi 0.8 is stated on the label, 4V correspond to 100% reactive power. Cos phi is used instead of sin phi 0.6 to make it comparable to the LSU-112/113/114DG
43 and 44 Relay contacts "AVR"	Relay contact for increase of the excitation (voltage)
45 and 46 Relay contacts "AVR"	Relay contact for decrease of the excitation (voltage)
NOTE: Relay contacts	Relays (AVR) should always be connected via external auxiliary relays when a DC pilot motor is applied. A transient suppressor should always be connected across the relay coil of the external relays

NOTE:
All terminals marked "⊥" are internally connected.

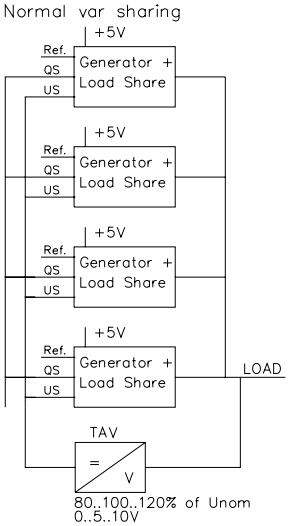
For correct function of the LSU-122DG any analogue DC input must not exceed 110% of its nominal value. To ensure correct reactive power measurement it is important that the AC current input does not exceed 110% of its nominal value. To accomplish this it is important to take the value of the max. cos phi for the generator into consideration when ordering/configuring the LSU-122DG, e.g. by using the kVA figure of the generator and cos phi = 1. Please notice that if the LSU-122DG is to be used in an installation which also includes our LSU-112/113/114DG, the measuring power (W/var) and the cos phi must be identical for both units, because the current input values for both units are alike.

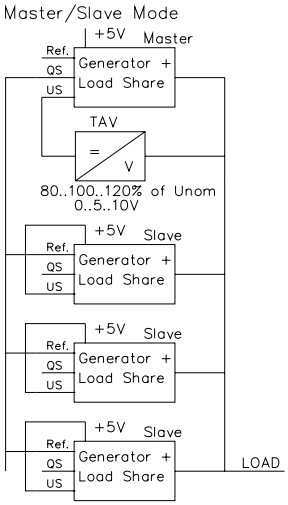
Application

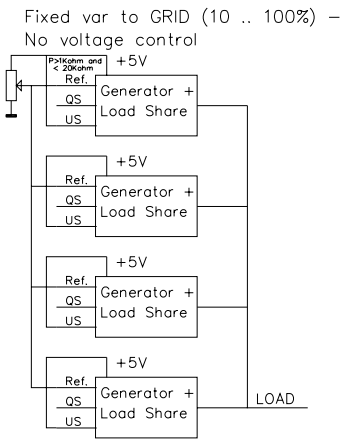
The schematic drawings on the next page show the different couplings for the LSU-122DG. For further information see the Application notes for uni-line, doc. no. 4189340150.

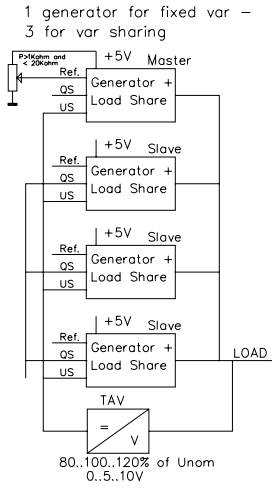
Type LSU-122DG

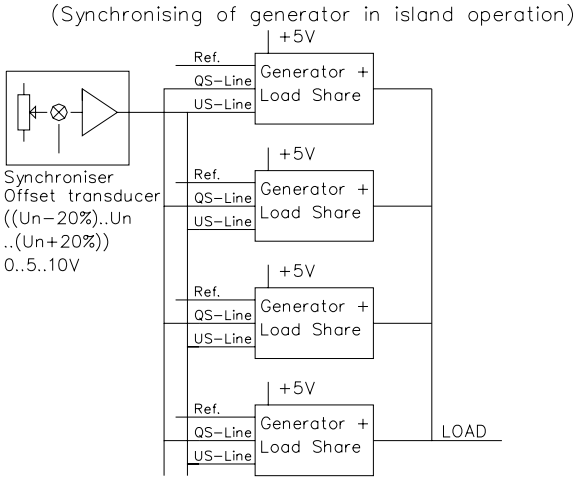
Schematic drawings











Please notice that unused ref. inputs must be connected to terminal 36 ("⊥").

Technical specifications

Meas. current (I_n): 0.3-0.4-0.5-0.6-0.8-1.0-1.3-1.5-2.0-2.5-3.0-4.0-5.0A AC (calibration modules)

Adjusted range: 75...100% of I_n (e.g. 0.45 adjusted by means of a built-in potentiometer) (Lowest meas. range: 0.3A)

Overload: 4 x I_n, continuously
20 x I_n for 10 s (max. 75A)
80 x I_n for 1 s (max. 300A)

Load: Max. 0.5VA (per phase) at I_n

Meas. voltage (U_n): (See supply voltage - AC ranges)

Voltage range: U_n 60...120%

Overload: 1.2 x U_n, continuously
2 x U_n for 10 s

Load: 2kΩ/V

Frequency range: 40...45...65...70Hz

Inputs:
Unload: Potential-free relay contact
Open: 5V. Closed: 5mA

Reference input: 0.5...5V ±1% (10...100% reactive power)
Input resistance: ≥2MΩ

Ext. power input: 4...20mA DC ±2%

Ext. voltage input: 0...5...10V ±2% ~ 80...100...120% of U_n from external voltage transducer

Contact outputs:
Voltage control: 2 make contacts

Contact ratings: AC1: 8A, 250V AC
DC1: 8A, 24V DC
AC15: 3A, 250V AC
DC13: 3A, 24V DC

Life electrical: 1 x 10^5 (nominal value)

Analogue outputs:
QS line: 1 analogue line (-5...0...5V)
5V ±2% = 100% reactive power
0V = 0% reactive power

Reference output: Reference voltage: 5.0V ±1%
Load: Max. 5mA (R ≥ 1kΩ)

Optocoupler output: System status off = Failure
Max. voltage 30V DC, max. current 5mA

Temperature: -25...70°C (operating)

Temperature drift: Set-points:
Max. ±0.2% of full scale per 10°C

Type LSU-122DG

Technical specifications, continued

Galvanic separation: Between meas. voltage, meas. current, relay outputs, analogue inputs/outputs and aux. voltage: 3250V - 50Hz - 1 min.

Supply voltage (U_n): 57.7-63.5-100-110-127-200-220-230-240-380-400-415-440-450-660-690 V AC ±20% (max. 3.5VA)
24-48-110-220V DC -25/+30% (max. 2W)

Climate: HSE, to DIN 40040

EMC: To EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4) and IEC 255-3

Connections: Max. 4mm² (single-stranded)
Max. 2.5mm² (multi-stranded)

Materials: All plastic parts are self-extinguishing to UL94 (V1)

Protection: Case: IP40. Terminals: IP20, to IEC 529 and EN 60529

Type approval: The uni-line components are approved by the major classification societies. For current approvals see www.deif.com or contact DEIF A/S

Settings

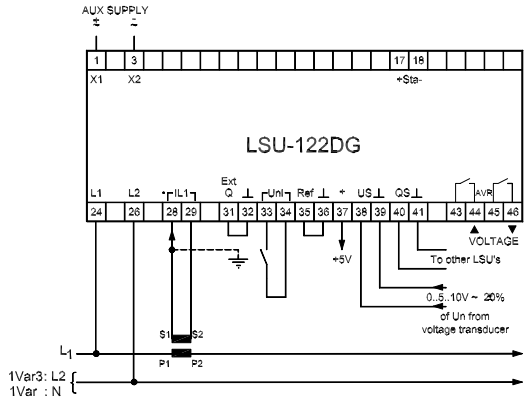
Setting of	Range
T_N Control pulse length	25…500 ms
X_P Proportional band	0…±50% of Q_n 0…±10% of U_n

Indication

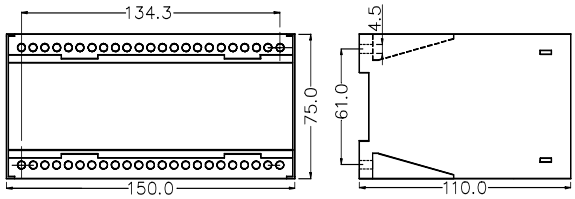
LEDs		Lit	Switched off
U_G	Generator voltage	(Green) Present	Failure
Unload	Unloading of this generator	(Green) Gen. unloaded	Normal load
AVR▲	Increase voltage (reactive power)	(Yellow) Relay activated	Relay not activated
AVR▼	Decrease voltage (reactive power)		

Once the unit has been mounted and adjusted, the transparent front cover may be sealed, preventing unwanted change of the setting.

Connections/dimensions (im mm)



See installation instructions for information about status output (17-18)



Weight: Approx. 0.750 kg

Order specifications

Type – Coupling – Measuring power (P_n*) – Cos-φ – Measuring voltage – Supply voltage
Example:
LSU-122DG – 1var3 – 100var – 0.8 – 100V – 24V DC

$$Meas.\ power = \frac{Primary\ power}{CT\ ratio\ x\ VT\ ratio}$$

*) The reactive power should be calibrated to equal the active power of the generator

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

ANSI codes 27/59

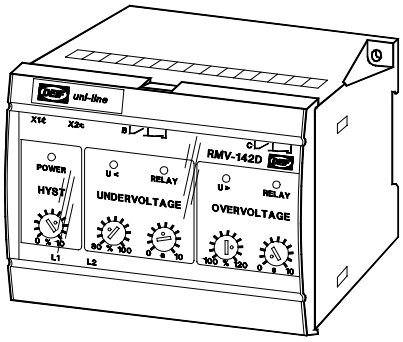
Type RMV-142D

Voltage relays

uni-line

4921240128D

- ***Undervoltage/overvoltage***
- ***Single phase measurement***
- ***LED indication of fault condition***
- ***Timer controlled tripping***
- ***LED indication for activated relay***
- ***35 mm DIN rail or base mounting***



RMV-142D CE

Application

The protective voltage relay type RMV-142D forms part of a complete DEIF series of relays for protection and control of generators.

The RMV-142D is type approved by major classification societies and is applicable to both marine and land-based installations.

Voltage relays performing a 3 phase measurement are also available:

- RMV-112D for undervoltage/overvoltage
- RMV-122D for overvoltage
- RMV-132D for undervoltage

The RMV-142D is a combined undervoltage and overvoltage relay (U< + U>) and is applied for protection of generators, motors and transformers against adverse system voltage conditions.

Measuring principle

The relay measures the voltage of one phase (single phase measurement) or measures the voltage between 2 phases, providing an RMS measurement of sinusoidal voltages.

If the voltage either drops below the lower set point, or exceeds the upper set point, the associated output is activated.

The set point values are set on the front of the relay by means of potentiometers.

Timer functions

When the voltage drops below the lower set point or exceeds the upper set point, the associated timer starts and will run as long as the fault condition prevails. The delay does not depend on the exceeding of the set point. If the fault disappears, the timer is reset.

When the timer expires, the contact and its built-in hysteresis circuit are activated, and the associated red LED is lit.

Hysteresis

The relays are provided with an adjustable hysteresis (common to both contacts), i.e. a difference of 1...10% of U_n between energising and de-energising of the relay. The relay is deactivated when the fault voltage equals or is less than the preset hysteresis.

Relay outputs

The RMV-142D is provided with 2 outputs:

- undervoltage (U<) a minimum contact (normally energised/normally de-energised)
- overvoltage (U>) a maximum contact (normally energised/normally de-energised)

The contact may be set to open or to close on activation.

Normally energised contact

Recommended for land-based installation for warning and alarm purposes.

In case of an auxiliary supply drop-out, the contact is immediately activated.

Normally de-energised contact

Recommended for marine installations for regulating and control purposes.

An auxiliary supply failure will not result in an unwanted activation of the contact.

Latch circuit

The contact can then be locked in its warning position, even if the input voltage returns to normal (add “L” to contact type in order specifications, if this is required).

The latch circuit is reset by disconnecting the auxiliary supply.

Power-up/power-down circuits

The relays are provided with a 200 ms power-up circuit, ensuring the correct function of the relay on connection of the auxiliary voltage.

Note: Normally energised contacts are not activated (contact does not open/close) until 200 ms after connection of the auxiliary voltage.

Likewise, the relays are provided with a 200 ms power-down circuit, ensuring supervision and maintenance of any set point exceedings for 200 ms after disconnection of the auxiliary voltage.

DEIF A/S

Type RMV-142D

Technical specifications

Meas. range (U_n): (See supply voltage - AC ranges).

Frequency range: 40...45...65...70Hz.

Max. input voltage: 1.2 x U_n, continuously,
2 x U_n for 10 s.

Load: 2kΩ/V.

Outputs: 1 minimum + 1 maximum contact

contact type: Relays B + C:
normally energised ("NE"), or
normally de-energised ("ND")
with or without latch circuit ("L")

relay contacts: 1 change-over switch per relay

contact ratings: 250V-8A-2000VA (AC)
24V-8A-200W (DC)
(200 x 10^3 change-overs at resistive load)

contact voltage: Max. 250V (AC).
Max. 150V (DC).

Response time: <100 ms.

Temperature: -25...70°C (operating).

Temperature drift: Set points:
max. 0.2% of full scale per 10°C.

Galvanic separation: Between inputs and outputs:
3250V - 50Hz - 1 min.

Supply voltage (U_n): 57.7-63.5-100-110-127-200-220-230-240-380-400-415-440-450-660-690VAC ±20% (max. 3.5VA)

24-48-110-220V DC -25/+30% (max. 2W).

Climate: HSE, to DIN 40040.

EMC: To EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4) and IEC 255-3.

Connections: Max. 4 mm² (single-stranded).
Max. 2.5 mm² (multi-stranded).

Materials: All plastic parts are self-extinguishing to UL94 (V1).

Protection: Case: IP40. Terminals: IP20, to IEC 529 and EN 60529.

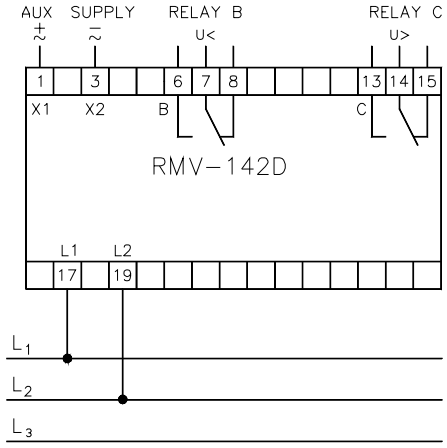
Type approval: The uni-line components are approved by the major classification societies. For current approvals see www.deif.com or contact DEIF A/S.

Settings and indication

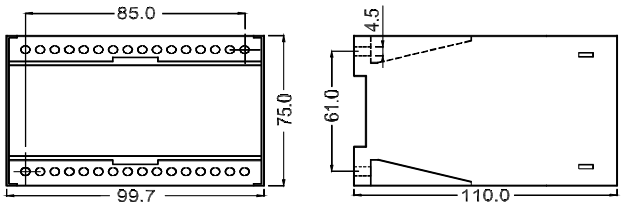
Setting of	LED	Relay
Undervoltage limit: (80...100%) of U_n	"U<"	Yellow LED is lit when input voltage is lower than the preset limit, but the relay has not yet been activated.
Overvoltage limit: (100...120%) of U_n	"U>"	Yellow LED is lit when the input voltage exceeds the preset limit, but the relay has not yet been activated.
Time delay: (0...10 s) in seconds	"RELAY"	Relay is activated and red LED lit after the timer has expired.
Hysteresis: (1...10%) of U_n		Relay contact is reset when the fault voltage equals or is less than the preset hysteresis.

The relays are furthermore equipped with a green LED marked "POWER" for indication of power ON. Once the relay has been mounted and adjusted, the transparent front cover may be sealed, preventing unwanted change of the setting.

Connections/dimensions (in mm)



Shown contact posistions: aux. voltage not connected



Weight: approx. 0.650 kg

Order specifications

Type – Meas.volt. (U_n) – Relay B – Relay C – Supply volt.
Example:
RMV-142D – 400V AC – ND – ND – 24V DC

Due to our continous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

ANSI codes 27/59, 59, 27

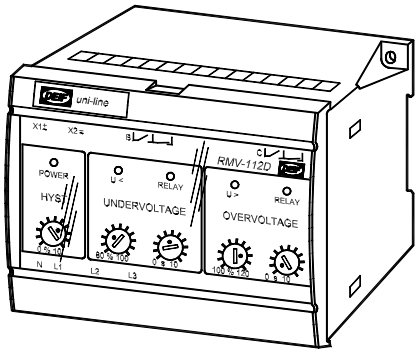
Type RMV-112D, RMV-122D, RMV-132D

Voltage relays

uni-line

4921240096E

- ***Undervoltage/overvoltage***
- ***3 phase measurement***
- ***LED indication of fault condition***
- ***Timer controlled tripping***
- ***LED indication for activated relay***
- ***35 mm DIN rail or base mounting***



RMV-112D CE

Application

The protective voltage relays types RMV-112D, RMV-122D and RMV-132D form part of a complete DEIF series of relays for protection and control of generators and are applicable to both marine and land-based installations. Also available are voltage relays for single phase measurement (RMV-142D).

The relays are type approved by major classification societies.

The voltage relays are applied for protection of generators, motors and transformers against adverse system voltage conditions. The relay supervises all 3 phase voltages. The following types are available:

- type RMV-112D (ANSI codes 27/59)
  undervoltage and overvoltage relay (U< + U>)
- type RMV-122D (ANSI code 59)
  overvoltage relay (2 levels: U> + U>)
- type RMV-132D (ANSI code 27)
  undervoltage relay (2 levels: U< + U<).

Measuring principle

The relays measure all 3 phase voltages, providing an RMS measurement of sinusoidal voltages.

Undervoltage/overvoltage (U< + U>)
If the voltage either drops below the lower set point or exceeds the upper set point, the associated output is activated.

Overvoltages (U> and U>)
The highest input voltage is detected, and if this exceeds its set point, the output is activated.

Undervoltages (U< and U<)
The lowest input voltage is detected, and if this is lower than the set value, the output is activated.

The set point values are set on the front of the relays by means of potentiometers.

Timer functions

When a set point is exceeded, its timer starts and will run as long as the fault condition prevails. The delay does not depend on the exceeding of the set point. If the fault disappears, the timer is reset. When the timer expires, the contact and its built-in hysteresis circuit are activated, and the associated red LED is lit.

Hysteresis
The relays are provided with an adjustable hysteresis (common to both contacts), i.e. a difference of 1...10% of U_n between energising and de-energising of the relay. The relay is deactivated when the fault voltage equals or is less than the preset hysteresis.

Relay outputs

The relays are provided with 2 outputs: U< outputs with a minimum contact, U> outputs with a maximum contact, either normally energised or normally de-energised. The contact may be set to open or to close on activation.

Normally energised contact
Recommended for land-based installation for warning and alarm purposes.

In case of an auxiliary supply drop-out, the contact is immediately activated.

Normally de-energised contact
Recommended for marine installations for regulating and control purposes.

An auxiliary supply failure will not result in an unwanted activation of the contact.

Latch circuit
The contact can then be locked in its warning position, even if the input voltages return to normal (add “L” to contact type in order specifications, if this is required).

The latch circuit is reset by disconnecting the auxiliary supply.

Power-up/power-down circuits
The relays are provided with a 200 ms power-up circuit, ensuring the correct function of the relay on connection of the auxiliary voltage.

Note: Normally energised contacts are not activated (contact does not open/close) until 200 ms after connection of the auxiliary voltage.

Likewise, the relays are provided with a 200 ms power-down circuit, ensuring supervision and maintenance of any set point exceedings for 200 ms after disconnection of the auxiliary voltage.

Technical specifications

Meas. range (U_n): (See supply voltage - AC ranges)

Frequency range: 40...45...65...70Hz

Max. input voltage: 1.2 x U_n, continuously,
2 x U_n for 10 s

Load: 2KΩ/V

Outputs: RMV-112D 1 minimum + 1 maximum contact
RMV-122D 2 maximum contacts
RMV-132D 2 minimum contacts

Contact type: Relays B + C:
Normally energised ("NE"), or
normally de-energised ("ND")
with or without latch circuit ("L")

Relay contacts: 1 change-over switch per relay

Contact ratings: 250V-8A-2000VA (AC)
24V-8A-200W (DC)
(200 x 10^3 change-overs at resistive contact voltage: Max. 250V (AC))

Response time: <100 ms

Temperature: -25...70°C (operating)

Temperature drift: Set points:
Max. 0.2% of full scale per 10°C

Galvanic separation: Between inputs and outputs:
3250V - 50Hz - 1 min.

Supply voltage (U_n): 57.7-63.5-100-110-127-200-220-230-240-380-400-415-440-450-660-690V AC ±20% (max. 3.5VA)

24-48-110-220V DC -25/+30% (max. 2W)

Climate: HSE, to DIN 40040

EMC: To EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4) and IEC 255-3

Connections: Max. 4.0 mm² (single-stranded)
Max. 2.5 mm² (multi-stranded)

Materials: All plastic parts are self-extinguishing to UL94 (V1)

Protection: Case: IP40. Terminals: IP20, to IEC 529 and EN 60529

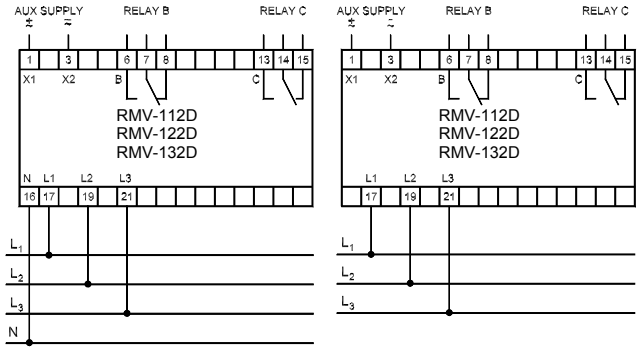
Type approval: The uni-line components are approved by the major classification societies. For current approvals see www.deif.com or contact DEIF A/S.

Settings and indication

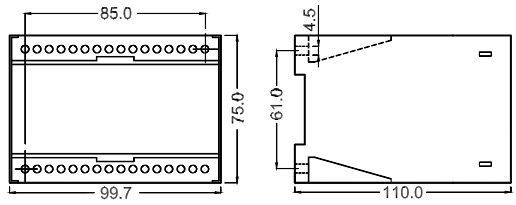
Setting of	LED	Relay
Undervoltage limit: (80...100%) of U_n	"U<"	Yellow LED is lit when the input voltage is lower than the preset limit, but the relay has not yet been activated
Overvoltage limit: (100...120%) of U_n	"U>"	Yellow LED is lit when the input voltage exceeds the preset limit, but the relay has not yet been activated
Time delay: (0...10 s) in seconds	"RELAY"	Relay is activated and red LED lit after the timer has expired
Hysteresis: (1...10%) of U_n		Relay contact is reset when fault voltage equals or is less than the preset hysteresis

The relays are furthermore equipped with a green LED marked "POWER" for indication of power ON. Once the relay has been mounted and adjusted, the transparent front cover may be sealed, preventing unwanted change of the setting.

Connections/dimensions (in mm)



Shown contact posistions: Aux. voltage not connected



Weight: Approx. 0.650 kg

Order specifications

Type – Coupling – Meas. volt. (U_n) – Relay B – Relay C – Supply voltage
Star coupling: Specify phase-neutral voltage
Delta coupling: Specify phase-phase voltage
Examples:
RMV-112D – delta – 400V AC – NDL + NDL – 24V DC
RMV-122D – star – 230V AC – NDL + NDL – 230V AC
RMV-132D – delta – 400V AC – NE + NE – 110V DC

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

DEIF A/S, Frisenborgvej 33
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

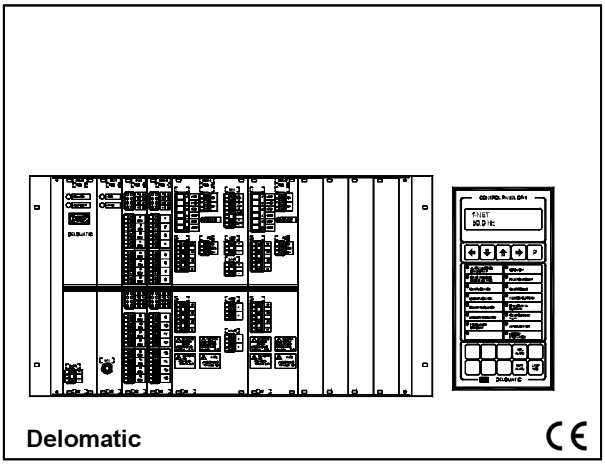
Delomatic

Multi-function System

4921240164D

Type Delomatic

- ***Power management system***
- ***Built-in 3-phase measurements of U, I, P etc.***
- ***All necessary generator protections***
- ***User configurable setpoints and timers***
- ***Synchronising and load sharing***
- ***Shaft generator / mains breaker / tie breaker control***



Application

The multi-function system Delomatic has been designed for control and protection of up to 8 parallel running generators and can also carry out engine control and protection. The system can perform a wide variety of the functions normally needed on board a ship or in a power station.

System Components

The system consists of a DEIF generator unit (DGU) per generator and a number of control panels (CPs). Basically, there is one control panel per DGU, but up to 3 CPs can be connected per DGU, enabling user interface to be placed in separate places for each generator (e.g. in the engine room and on the bridge).

DGUs are 19" dual-height racks with a number of plug-in modules. The module configuration is made according to the specific task.

CPs are panel front mounted unit panels (1 per generator) with display, pushbuttons and LED status and alarm indicators. Via the CP, the user can see all values, statuses and alarms, and setpoints and timers can be configured. The configuration is password protected.

DGUs and CPs communicate via a coaxial line (ARC net).

Delomatic Modules

Power supply module PSM-1
Supplies power to the other modules.

Control module CM-2
Microprocessor and memory (PROM) of the DGU.
ARC net communication port.
CM-2 is available with the communication modules RS232, RS422, RS485 or without communication module.

Synchronising and control module SCM-1
3-phase AC measurement, generator voltage/current.
3-phase AC measurement busbar voltage.
Synchroniser.
Relay or analog output(s) for speed and voltage.

Synchronising and control module SCM-2
Shaft generator breaker / tie breaker / mains breaker synchronising and control module.
3-phase AC measurement, busbar 1/shaft generator / mains voltage/current.
3-phase AC measurement busbar (2) voltage.
Synchroniser.

Current relay module CRM-1
3-phase AC measurement, generator current. The module can be configured as short circuit protection or differential current protection module.

Binary / analog input module IPM-1
16 input channels freely selectable binary/analog.

Binary output module
16 relay output channels.

Analog output module AOM-1
8 analog outputs.

Power Management

Delomatic measures the actual power of each running generator. Based on this and the nominal power of the generators, the system will start and stop generators according to the power demand. Start priority can be selected by the user or can be based on the internal running hour counters.

Control of bus tie breaker(s) can be carried out with synchronisation and load ramping before opening.

Shaft generators linked directly to the main engine (no speed control) can be monitored. And a synchronisation to running generator(s) can be carried out with short time parallelling and load transfer.

Mains breaker(s) can be controlled with synchronisation and load control during parallelling. Peak lopping (peak shaving) is also a possibility.

DEIF A/S

Technical specifications

Meas. range (U_n): Max. 690 VAC direct.
Other ranges via voltage transformer ../100 or ../110V AC
Burden: Max. 0.5VA/phase
Overload: 2 x U_n for 10 s.
External fuse: Max. 2A slow-blow

Meas. range (I_n): Current transformer ../1 or ../5A AC
Burden: Max. 0.4VA/phase
Overload: 10A cont.
< 75A for 10 s.
< 300A for 1 s.

Meas. range (f_n): 40....70Hz

Accuracy: Class 1 acc. to IEC 688.

Harmonics: Up to 500Hz are measured.

Galvanic separation AC inputs: 2.5kV / 2.0kV / 1.0kV according to GL, LR and DNV.

Binary inputs: Galvanically separated contacts.
ON detection max. resistance 250Ω

Cable supervision, binary inputs: 6.9kΩ resistor across contacts.

Analog inputs: 0(2)...10V DC
Impedance 15kΩ

0(4)…20 mA
Impedance 50.0Ω

Accuracy, analog inputs: Class 1 according to IEC688

Binary outputs: Relay. Contact rating 250V, 5A (AC)/ 1A (DC).

Galvanic separation, analog/binary inputs: 1.0kV - 50Hz - 1 min. according to GL, LR and DNV.

Analog outputs (AOM-1 module): +/- 20mA
+/- 10V DC
0(4)...20mA
0(2)...10V DC

Galvanic separation, analog outputs: 2.0kV - 50Hz - 1 min. according to GL, LR and DNV.

Analog outputs, control panel: 16 x 0...1mA pulse width modulated, multiplexed.

Galvanic separation, control panel: 1.0/2.0kV - 50Hz - 1 min. according to GL, LR and DNV.

Power supply: 24V DC +30%, -25% incl. peak-peak ripple, max. 32V DC.
Power consumption dependent on DGU configuration.

External fuse max. 6A slow-blow.

Galvanic separation, power supply: 1kV – 50Hz – 1 min. according to GL, LR and DNV.

Flamability All plastic parts are self-extinguishing according to UL94-VO

Temperature:
Reference: +15...+30°C
Nominal: -10...+50°C
Operational: -25...+70°C
Storage: -40...+70°C

Climate: Class HSE according to DIN40040.

Protection: IP20, modules mounted in a DGU rack and CP rear.
IP52, CP front.

Type approval: The system, both hard-ware and soft-ware, is approved by the major classification societies. For current approvals see www.deif.com or contact DEIF A/S.

Due to our continous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

Marine Bridge Instrumentation

	XL	XL front mounted	BW
Types:	XL72, XL96, XL144, XL192	XL96, XL144	BW144, BW192
Panel cutout according to DIN:	Q72, Q96, Q144, Q192	Q96, Q144	-
Pointer deflection:	180°, 240°, 300°, 360°	180°, 240°, 300°, 360°	180°, 240°, 300°, 360°
Customised scale available:	√	√	√
Exchangeable scale:	√	√	√
Protection IP52:	√	√	-
Protection IP66:	On request	On request	√
Built-in dimmer:	-	-	√
Long life LED illumin.:	√	√	√
Accuracy class:	0.5-1.0	0.5-1.0	0.5-1.0
Scale base colour:	White or black	White or black	White or black
Figures, div. lines:	Black, yellow, red, green, etc.	Black, yellow, red, green, etc.	Black, yellow, red, green. etc.
Pointer:	Yellow illuminated or black shadow	Yellow illuminated or black shadow	Yellow illuminated or black shadow
Interface:	Analogue or CANopen	Analogue or CANopen	Analogue or CANopen
Type approved by:	MED	MED	MED

DEIF A/S, Frisenborgvej 33, DK-7800 Skive, Tel.: +45 9614 9614, Fax: +45 9614 9615, E-mail: deif@deif.com, URL: www.deif.com

	DLQ-pc	DLQ-pv	DLQ-ph
Size (mm):	Q72, Q96, Q144	Q96	Q96, Q144
Pointer deflection:	240°	90°	80°
Customised scale avail-able:	√	√	√
Protection IP52:	√	√	√
Protection IP54 on request:	√	√	√
Long life LED Illumin.:	√	√	√
Accuracy class:	1.5	1.5	1.5
Scale base colour:	White or black	White or black	White or black
Figures, div. lines:	Black, yellow, red, green	Black, yellow, red, green	Black, yellow, red, green
Pointer:	Black or yellow	Black or yellow	Black or yellow
Standard measuring ranges, voltage:	0…1/100V DC, ±0.5/±100V DC	0…1/100V DC, ±0.5/±100V DC	0…1/100V DC, ±0.5/±100V DC
Standard measuring ranges, current:	0…1/100mA DC, ±0.5/±100mA DC and 4...20mA	0…1/100mA DC, ±0.5/±100mA DC and 4...20mA	0…1/100mA DC, ±0.5/±100mA DC and 4...20mA
Type approved by:	MED	MED	MED

	DLQ192-pc	DLQW-pc, IP66	DLQA96/144
Size (mm):	Q192	Q72, Q96	Q96, Q144
Pointer deflection:	240°	240°	360°
Customised scale available:	√	√	√
Protection IP52:	√	-	√
Protection IP54, IP66:	IP54	IP66	IP54
Long life LED Illumin.:	√	√	√
Accuracy class:	1.5	1.5	0.5
Scale base colour:	White or black	Black	Black
Figures, div. lines:	Black, yellow, red, green	Black, yellow, red, green	Yellow, red, green, white
Pointer:	Black, yellow, white	Yellow, white	Yellow, white
Standard measuring ranges, voltage:	0…1/100V DC, ±0.5/±100V DC	0…1/100V DC, ±0.5/±100V DC	±10V DC
Standard measuring ranges, current:	0…1/100mA DC, ±0.5/±100mA DC and 4...20mA	0…1/100mA DC, ±0.5/±100mA DC and 4...20mA	0…1mA/4...20mA
Type approved by:	MED	MED	MED

DEIF A/S, Frisenborgvej 33, DK-7800 Skive, Tel.: +45 9614 9614, Fax: +45 9614 9615, E-mail: deif@deif.com, URL: www.deif.com

	Bridge Wing Indicator, BRW-1	Bridge Wing Indicator, VTR-3	Bridge Wing Indicator, VTR-5
Pointer deflection:	240°	90°	240°
Customisable scale:	√	√	√
Protection IP66:	√	√	√
Built-in dimmer:	√	√	√
Long life LED Illumin.:	√	√	√
Accuracy class:	1.5	1.5	1.5
Scale base colour:	White or black	White or black	White or black
Figures, lines, pointer:	Black or yellow	Black or yellow	Black or yellow
Standard scales, (°):	-	±45, ±65	±35, ±40, ±60, ±65, ±70, ±90
Standard scales, (RPM):	0…250, ±100, ±120, ±150, ±200, ±250, ±300	-	0…250, ±100, ±120, ±150, ±200, ±250, ±300
Standard measuring ranges, voltage:	0…1/100V DC, ±0.5/±100V DC	0…1/300V DC, ±0.5/±300V DC, 0...25/300V AC	0…1/300V DC, ±0.5/±300V DC, 0...25/300V AC
Standard measuring ranges, current:	0…1/100mA DC or 4...20mA, ±0.5/±100mA DC	0…1/100mA DC, ±1/±100mA DC, 0...1/100mA AC or 4...20mA DC	0…1/100mA DC, ±1/±100mA DC, 0...1/100mA AC or 4...20mA DC
Type approved by:	MED	Major classification societies and MED	Major classification societies and MED

	Panorama Rudder Indicator , TRI-2 (Ø370)	Rudder Angle Transmitters, RT-2	
Customisable scale:	√	-	
Protection IP54:	√	-	
Built-in dimmer:	√	-	
Accuracy class:	1.5	0,5	
Scale base colour:	White or black	-	
Figures, lines, pointer:	Black or yellow	-	
Readability range:	5 m	-	
Standard scales (°):	±35, ±45, ±60, ±70	-	
Meas. ranges, voltage:	0…4V/100V DC, ±2/±100V DC	-	
Measuring ranges, current:	0…1/100mA DC, ±1/±100mA DC or 4...20mA DC	0...90°, 0...140°	
Output:	-	0…20mA or 4…20mA	
Operating angle:	-	Adjustable within: -30°…+5°	
Type approved by:	MED	Major classification societies	

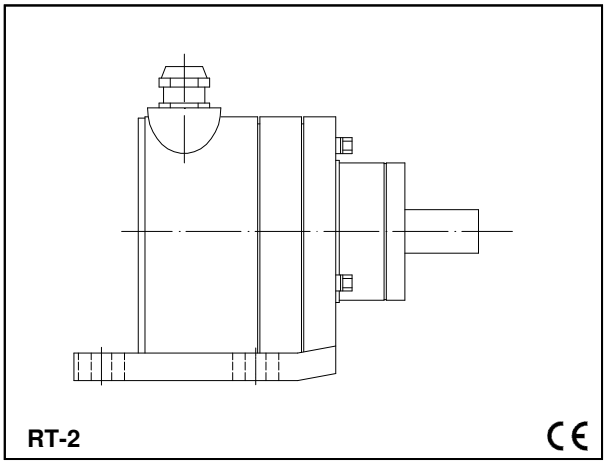
DEIF A/S, Frisenborgvej 33, DK-7800 Skive, Tel.: +45 9614 9614, Fax: +45 9614 9615, E-mail: deif@deif.com, URL: www.deif.com

Type RT-2

Rudder angle transmitter

4921250052C

- ***Analogue output for direct connection of one or more indicators***
- ***Measuring output: DC-current signal 0..20mA or 4..20mA***
- ***Angle position 0..90° or 0..140°***
- ***Continuous shaft rotation***
- ***Potentiometers for adjustment of span and zero***



Application

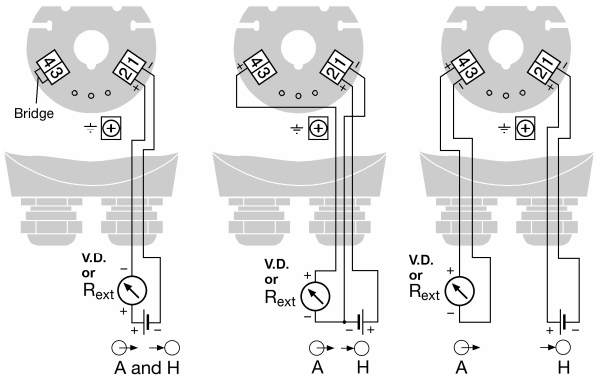
The RT-2 converts the position angle of shaft into a load-independent direct current signal, proportional to the angle position. The output signal has two operations: 0..20mA or 4..20mA (live zero).

The robust housing has made it ideal for machines and e.g. as rudder transmitter aboard ships.

Selection of output signal

Remove the 3 screws that fasten the cover. Undo the gland nut and remove the pinch ring and seal from the gland opening. Place these parts over the cable in the correct order and pass the end of the cable through the gland hole into the rear of the transmitter. The maximum wire gauge the terminals can accept is 1.5 mm^2.

Strip the insulation to a suitable length of the leads and connect them to the terminals gnd, (-1, +2) supply and (-3, +4) output signal according to the fig. 1.



A = Measuring output ...
- ... as 2-wire connection (4..20mA, signal in output/powering circuit)
- ... as 3 or 4 wire connection (0-20mA)

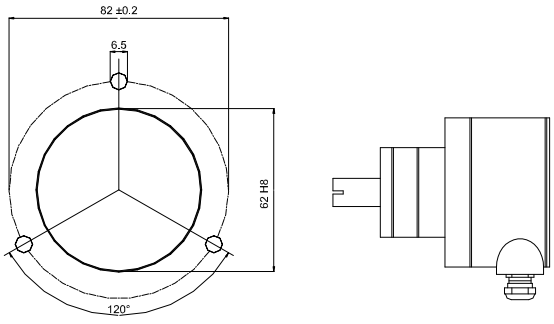
H = DC power supply
(H = 12...33V)

R_{ext} = External resistance

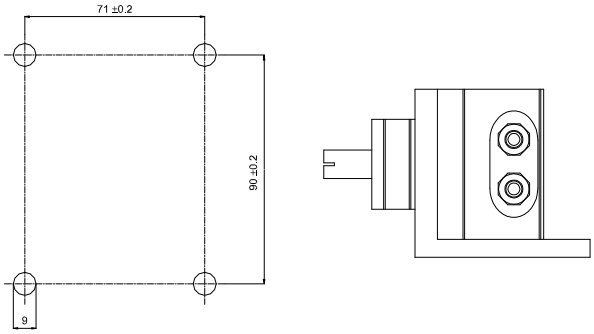
V.D. = External voltage drop (e.g. specified in datasheet for DEIF indicators)

Mounting

RT-2 is intended for either mounting directly on the device being measured or on a flange where the mounting bracket is fixed with 4 bolts.



Direct mounting



Mounting bracket

The M6 screws are needed for the directly mounted version and 4 M8 nuts and bolts for mounting bracket version. The screws, respectively nuts and bolts are not supplied, because the required length varies according to the thickness of the mounting surface.

Technical specifications

Measuring input:	0-90° or 0-140° (span adjustment –30/+5% of full range)
Measuring output:	
Output variable I_A:	Load-independent DC current proportional to the input angle.
Ranges:	4..20mA, 2-wire connection 0..20mA, 3-wire connection 0..20mA, 4-wire connection
Accuracy:	Limit of error ≤ 0.5%
Power supply H:	12..33V DC
Max. residual ripple:	10% p.p.
Max. current consumption:	Approx. 5 mA + I_A
Mechanical withstand:	
Permissible vibration:	0..200Hz, → 10 g continuous 0..200Hz, → 15 g for 2 hours 200..500Hz, → 5 g continuous 200..500Hz, → 10 g for 2 hours
Shock:	3 x 50 g every 10 impulses in all 3 axes
Permissible static load on the shaft:	Max. 1000 N (radial) Max. 500 N (axial) (If subjected to vibration the shaft load should be as low as possible to ensure optimum life of the bearing)
Mounting position:	Any
Material:	
Housing (main part):	Steel, Finish QPQ (nitro-carbonated)
Rear (cover):	Metal (aluminium)
Cable glands:	Metal
Regulations:	
Test voltage:	500 Veff, 50 Hz, 1 min. all electrical connections against housing
Housing protection:	IP66 acc. to EN 60 529
Environmental conditions:	
Climatic rating:	Temperature –25 to +70°C Annual mean relative humidity ≤ 90%
Transportation and storage:	-40 to +80°C

Order specifications

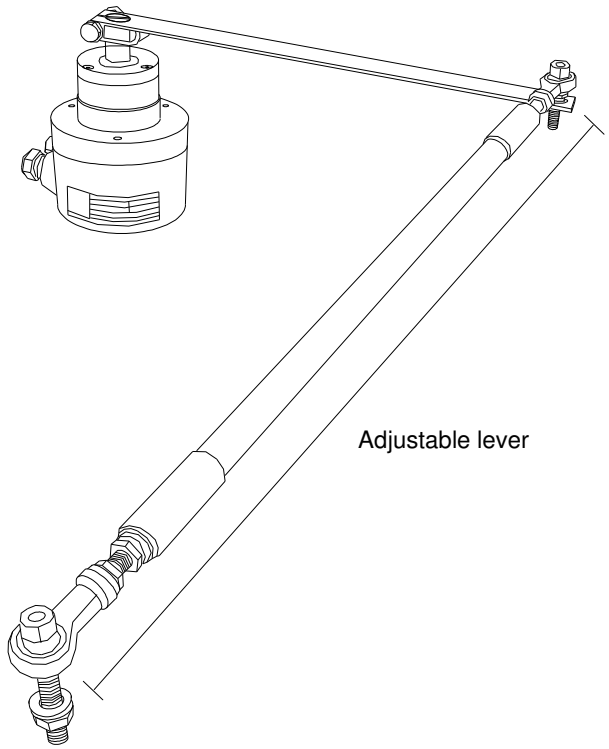
Type	Angle	Bracket
RT-2	0-140°	with
RT-2	0-90°	with
RT-2	0-140°	without
RT-2	0-90°	without

Position linkage	1124410004
Adjustable lever	1124410003

Weight

With bracket	3.3 kg
Without bracket	2.9 kg

Position linkage



Due to our continuous development we reserve the right to supply equipment which may vary from the described.

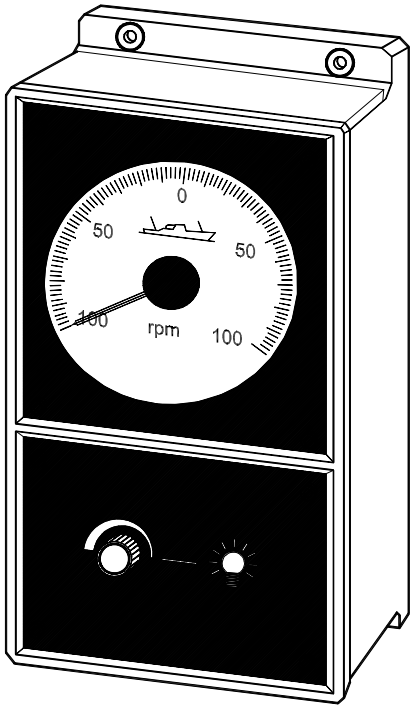
***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

Bridge wing indicators

Type BRW-1

4921250008F



- *IP66, waterproof construction*
- *Large, easily-read scale*
- *Black scale version with separate pointer illumination*
- *Built-in dimmer potentiometer*
- *LED illumination (long life)*
- *Approved according to the European Marine Directive*

Waterproof bridge wing indicator type BRW-1

The BRW-1 consists of a 240° moving coil system in a waterproof housing, equipped with a large, easily-read scale and built-in dimmer. The instrument is available for base mounting. The BRW-1 is CE classified and MED approved for marine, residential, commercial and light industry plus industrial environment.

Technical specifications

Standard measuring ranges • Voltage			Standard measuring ranges • Current		
Lowest range	**Highest range**	**Load**	**Lowest range**	**Highest range**	**Load**
0…1V DC	0…100V DC	0.5kΩ/V	0…1mA DC	0…100mA DC	0.6V
-1…0…1V DC	-100…0…100V DC	1kΩ/V	-1…0…1mA DC	-100…0…100mA DC	0.3V

Additional measuring range: 4...20mA

Accuracy: Class 1.5 (-10…15…30…55°C) to EN 60051 and IEC 51

Scale types:
1) White scale base: Figures, division lines and standard pointer: Black
Indirect illumination

2) Black scale base: Figures, division lines and triangular pointer: Yellow
Separate pointer illumination

Standard scales:
(Others on request)

0…250 rpm	-100…0…100 rpm	-120…0…120 rpm	-150…0…150 rpm
	-200…0…200 rpm	-250…0…250 rpm	-300…0…300 rpm

Illumination: LED illumination with built-in dimmer (external dimmer on request)

Aux. voltage (illumination): 24V AC ±20%, 24V DC ±25% (consumption: Approx. 200mA) or:
With built-in transformer: 110/220V AC ±20% (consumption: Approx. 5VA)

Connection: Built-in screw terminals
Conductor dimensions: Multi-stranded: 2.5 mm², single-stranded: 4 mm²
Cable entry via 2 PG 21 glands. Cable diameter: 10/13/16/19 mm

Safety: 300/600V – CAT. III. Pollution deg. 2. EN 61010-1

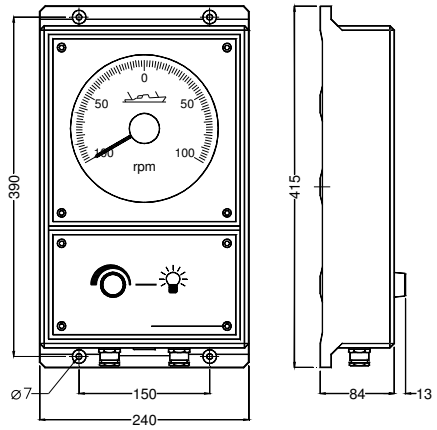
Temperature: -10…55°C (nominal), -25…60°C (operating), -25…65°C (storage)

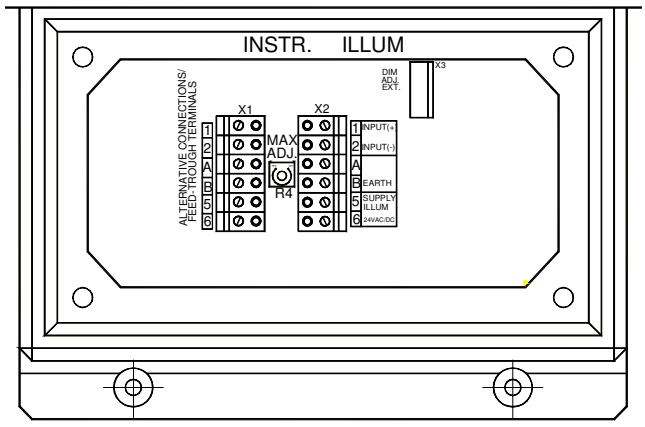
Materials: Plastic housing: Matt grey VALOX
Fire retarding and self-extinguishing to UL94 (VO)
All metal parts made out of corrosion-resistant materials

Protection: IP66 to IEC 529 and EN 60529

Dimensions

All dimensions in mm





BRW-1 Weight: Approx. 2.8 kg

Order specifications

	Type	**Scale**	**Scale type**	**Measuring range**
Example:	BRW-1	0…250 rpm	Black	-1...0...1mA

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

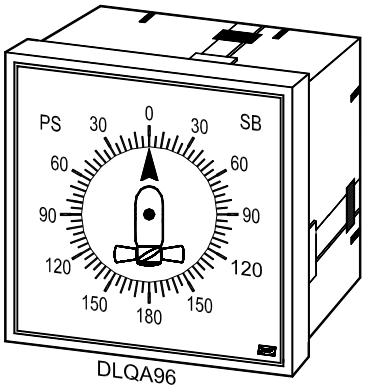
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

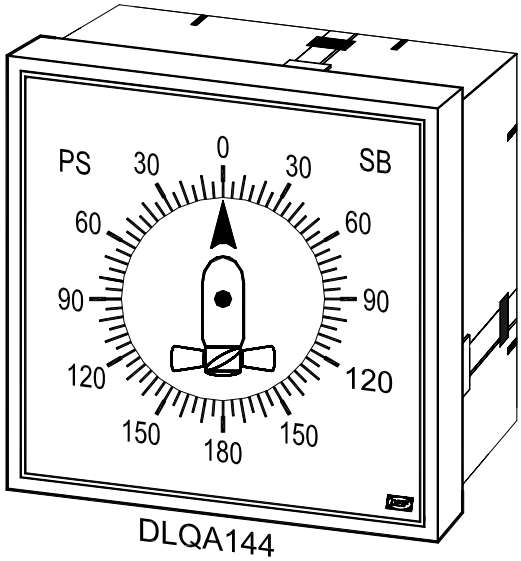
Illuminated 360° azimuth indicators

Types DLQA96/144

4921250055C



DLQA96



DLQA144

- ***360° indication with disc pointer***
- ***Linearized to class 0.5***
- ***LED illumination of scale and disc***
- ***100% identical illumination of scale and disc***
- ***Shock resistant up to 50 g***
- ***Enclosure IP52/54 or IP66 (only Q96 size)***
- ***Approved according to the European Marine Directive***

Description

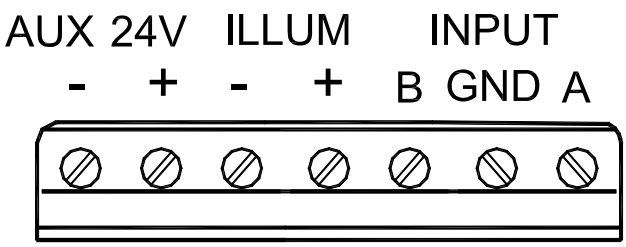
The illuminated X-coil instruments types DLQA96/144 are designed for marine applications. The instruments can be applied as rudder indicator, azimuth indicator, compass indicator or wind direction indicator where a reliable and accurate instrument is prescribed.

Technical specifications

Basic accuracy:	Class 0.5 (-10...15...30...55°C) according to EN 60051 and IEC 51
Adjustments:	None
Instrument sizes:	96 x 96mm and 144 x 144mm according to DIN 43700
Bezel:	Slim bezels according to DIN 43718
Scale:	Figures, lines and font size according to customer design and specification Base material: Scale printed directly on front glass Design only on black scale base!
Pointer:	Rotation disc according to customer specification/design Design only on black pointer base (disc)!
Glass:	Antiglare, thickness 2mm
Mounting angle:	May be mounted at any angle between 0…360° to horizontal without this affecting the linearity according to DIN 16257
Compass safety distance:	To be mounted at least 1m from the compass according to IEC 945 and EN 60945
Analogue inputs:	Single or double (for SIN/COS input)
Measuring ranges:	-10...0...10V Load: 10kΩ 0…1mA Load: 1.0V 4…20mA Load: 1.0V
Response time:	Max. pointer movement: 90°/second, no overshoot
Protection:	IP52 from front, IP20 from back (terminals) according to IEC 529 and EN 60529 (IP54 from front is optional with special gasket) or IP66 option in special DLQW housing, IP20 from back (terminals) according to IEC 529 and EN 60529
Climate:	Class H U E, short term condensing allowed Max. 95% RH: Max. 30 days per year Max. 85% RH: Remaining days Max. 75% RH: Average per year According to DIN 40040
Temperature:	-10…55°C (nominal) -25…60°C (operating) -25…65°C (storage) Temperature coefficient: Max. ±0.5% of full scale within -10…55°C according to IEC 51 and EN 60051
Panel influence:	Linearity is not affected by the panel (thickness or material) according to IEC 51 and EN 60051
Shock:	18 x 50 g half sine (11mS) according to IEC 68-2-27. Test: Ea
Vibration:	3…13.2Hz: 2.0mm peak-peak (±1.0mm) according to GL + LR: Test 1 13.2…100Hz: 0.7 g according to DNV: Class A
Safety:	300V – cat. III, pollution degree 2 according to EN 61010-1
Galv. separation:	500V between all groups
Supply voltage:	Power supply: 24V DC -25/+30% (18…24…31.2V DC) Illumination: 12mA/24V DC
Consumption:	<3W (24V/120mA), excl. illumination
EMC:	CE marked for residential, commercial and light industry plus industrial environment according to EN 50081-1/2 and EN 50082-1/2
Class approval:	Marine Equipment Directive 96/98/EC (MED)
Connections:	Separate screw terminals for instrument input, power supply and illumination Max. 2.5mm² multi-stranded or 4.0mm² single-stranded
Materials:	All outer materials are self-extinguishing according to UL94 (V0)

Connection

The DLQA96/144 instruments differ from the other DLQ instruments, as the DLQA96/144 instruments are based on an X-coil system and not on a moving-coil system like the other instruments in the product programme of DEIF A/S. Due to the X-coil technology it is possible to have an instrument with a scale curve of 360°, which is not possible in the conventional moving-coil systems. As the X-coil system requires a special controller integrated in the instrument, the DLQA96/144 instruments are to be connected to an auxiliary supply – unlike conventional instruments.

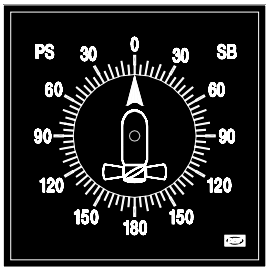


Auxiliary supply: AUX 24V -/+

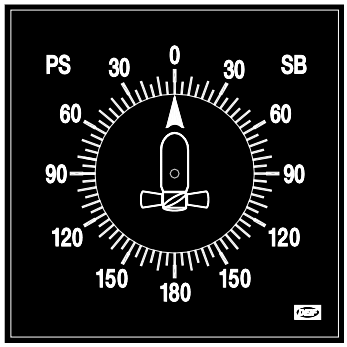
Illumination: ILLUM -/+

Input: INPUT B/GND/A (see the table for single/double input)

Examples with black scale base:



DLQA96



DLQA144

Coloured division lines and figures are transilluminated	Only division lines, figures and the broad section below the division lines are transilluminated The following colours are available: Red, green, yellow, white
Note: To ensure vision, calibration lines in the following points are needed: 0-60-120-180-240-300°	

Measuring ranges

Notice that the instrument can be configured for either “single input” or “double input” (sin/cos).

Single input:

Measuring range	Input A	Input B	Disc position in degrees	Clock position of disc
4...20mA (Disc moves CW with positive input)	4.00mA	Not connected	0	12
	8.00mA		90	3
	12.00mA		180	6
	16.00mA		270	9
	20.00mA		360	12
0...1mA (Disc moves CW with positive input)	0.00mA	Not connected	0	12
	0.25mA		90	3
	0.50mA		180	6
	0.75mA		270	9
	1.00mA		360	12
-10...0...10V (Disc moves CW with positive input)	-10.00V	Not connected	0	12
	-5.00V		90	3
	0.00V		180	6
	+5.00V		270	9
	+10.00V		360	12

Measuring ranges, cont.

Double input (SIN/COS):

Measuring range	Input A SIN	Input B COS	Disc position in degrees	Clock position of disc
-10...0...10V	0.0V	+10.0V	0/360	12
	+10.0V	0.0V	90	3
	0.0V	-10.0V	180	6
	-10.0V	0.0V	270	9

The combination SIN/COS and current input is not available as standard. The reason is that only one indicator can be connected per transmitter. Contact DEIF for further information.

As the instruments are linearized to a max. indication error of 0.5% corresponding to a max. deviation of ±1.8° over the entire scale curve of 360°, they are not provided with an adjustment device.

Illumination

Illumination: 24V DC. Adjustment range: 10...30V DC

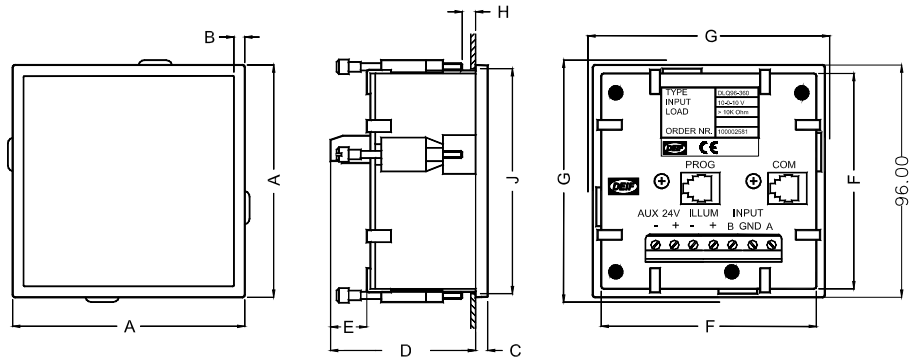
The light intensity can be altered by means of a common dimmer for all instruments. Dimming of an instrument can be done by means of a 1kΩ potentiometer arranged as a voltage divider.

Connection: Screw terminals for instrument input and illumination
Maximum 2.5mm^2 (multi-stranded) or 4.0mm^2 (single-stranded)

If required by the class, suitable protection against voltage transients (surge pulses) must be built into the power supply (e.g. light dimmer unit) to the instrument illumination input.

Dimensions

All dimensions in mm



Type	A	B	C	D	E	F	G	H (max.)	J	Weight (kg)
DLQA96	96 x 96	4.5	5.5	66.0	19	90 x 90	103	12	92 x 92 +0.8	0.230
DLQA144	144 x 144	4.5	8.0	69.0	19	136 x 136	150	12	137 x 137 +1.0	0.385
DLQAW96	102 x 102	5.3	4.2	68.3	19	90 x 90	103	12	92 x 92 +0.8	0.250

Note: The above drawing is a DLQA96, the other types may vary in details

Order specifications

	Type	Scale	DISC	Measuring range
Example:	DLQA96	180...0…180°	POD symbol	4…20mA, single

When ordering new scales, always forward detailed drawing

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

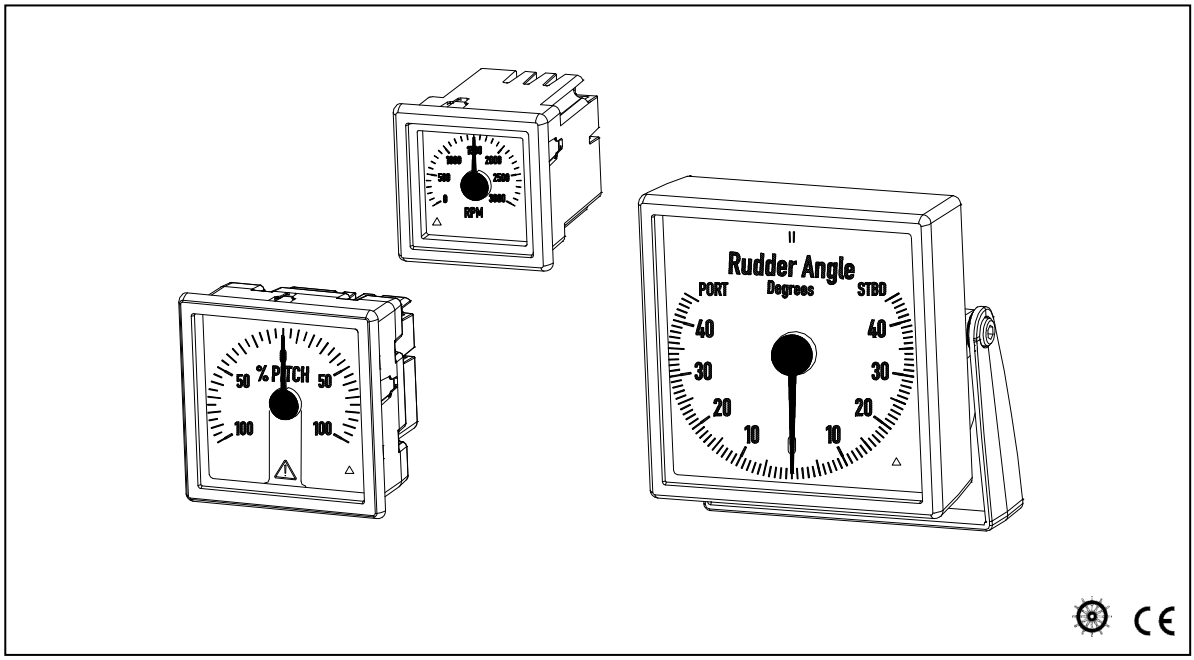
DEIF A/S

Data sheet

XL/BW series

Illuminated indicators

4921250057E



Product design

Class 0.5 linearity

- Class 0.5 with fixed scale
- Class 1.0 with exchangeable scale

Scales

- Fixed or exchangeable scales
- Custom-design scale design

Robust design

- Shock: 100g 11ms
- Vibration: 2.1g

MED approval

- According to European Marine Directive 96/98/EC as amended

Housing

- Panel mounting (rear or front fastened)
- Pivot foot/bracket mounting
  IP52 standard protection
  IP66 with special gasket or bracket types

Illumination

- Direct pointer illumination
- Transillumination of the scale with white LEDs

CAN interface

- Dual communication line for redundancy, according to marine standard

Analogue interface

- Single analogue input with several ranges
- Dual analogue input for direct connection to SIN/COS transmitter

Pointers

- Pointer
- Disc

© DEIF A/S

Technology
The new DEIF indicators use a center placed, microprocessor-controlled x-coil system. This patent pending x-coil technology is the core of this new product series. The clear advantages of this indicator principle compared to the more fragile moving-coil system are e.g. superb accuracy (class 0.5), improved response time with practically no overshoot, excellent torque of the x-coil system, direct pointer illumination, connection to CAN bus, improved shock resistance, more robust construction, 360° pointer movement etc.

For supplying the built-in microprocessor the XL/BW indicators need connection to an aux. supply.

Housing
XL type

The XL type is designed for panel mounting in standard cutout DIN holes. Since the frame sizes are not according to DIN norms, IP66 protection is possible without compromising the unique design of the indicator.

Special front mounted panel versions are available in sizes XL96 and XL144. These also come with the option of IP66 protection.

BW type

The BW type is designed for bridge wing mounting and is basically an XL indicator with a pivot foot, a rear part and a built-in dimmer. IP66 protection is standard.

Interface
Due to the microprocessor-controlled x-coil technology, the indicators have a wide range of interfaces:

Analogue interface

Both single and dual analogue signals are supported by the analogue interface. This enables the indicators to replace a number of existing products, e.g. all standard analogue ranges and special SIN/COS indicators.

Galvanic separation between analogue inputs, aux. supply and dimmer. Dual inputs share common ground.

CAN interface

The CAN open interface offers functionality with 1 or 2 CAN lines and full redundancy from two galvanically separated CAN lines.

Galvanic separation between CAN 1, CAN 2 and supply.

The CAN open application is based on:

- CiA Draft Standard 301 - Application Layer and Communication Profile - Version 4.02
- CiA Draft Standard Proposal 302 - Framework for CAN open Managers and Programmable CAN open Devices - Version 3.3.0
- CiA Draft Standard Proposal 305 - Layer Setting Services and Protocol - Version 1.1.1

More detailed CAN information is available on www.deif.com (documentation), and EDS file is available from the software download section.

Illumination
Direct pointer illumination (black scales) is based on separate LEDs (yellow), and the scale is transilluminated using white LEDs. Black shadow pointer is used for white scale designs.

Pointers
Standard pointers are virtually lightguides shaped as needle type pointers. The full length illumination of the pointer makes the read-out extremely easy, even at longer distances. As an option, a pointer disc with illuminated symbol is available.

Pointer deflection
The pointer is able to move 360 degrees (endlessly). Standard pointer movement is clockwise. Counter-clockwise movement is optional.

Scale options
Two scale possibilities exist, namely standard or changeable.

The standard scale offers 0…360 degrees scale design, whereas the changeable scale design reduces the scales to 0…300 degrees due to the scale slot cover used for removal of the scale.

Changeable scales: To change the scales, special training is required. Please contact DEIF A/S.

Error functions
The indicators have two different error functions:

Internal error warning LED

The amber coloured warning LED is triangular and is placed in the lower right corner of the scale, except in XL72 where it is in the lower left corner.

If there is an internal error (microprocessor stops), the flashing warning LED will indicate to the operator that the product is out of order (only analogue types). Using the CAN interface, this function is handled by a missing heartbeat signal on the CAN BUS. On CAN types a missing or invalid CAN signal will also start the warning LED. During start-up the warning LED will flash for a few seconds, until the indicator is ready.

External error pointer indication

This function is a new functionality on this type of product. Due to the possibility for 360 degrees pointer rotation, the unused scale part (typically the 240…0 degrees area) can be used as an error indication field. Under certain conditions the pointer will move to this position:

- Out of range analogue input signal
- Missing CAN signal

More detailed information about error functionality is available on www.deif.com (User's Manual).

CAN setup
When using the CAN interface, the setup of the instrument can be changed from the master using LSS (Layer Setting Services). After changing to configuration state mode, it is then possible to change Baud Rate and Node-ID.

Default setup is:
- Baud rate 125kbit/s
- Node-ID number 1

Customer configuration
The flexibility of the XL/BW series requires the customer to make some selections for use when ordering the indicator. These selections determine how the indicator will appear at delivery. The table below will guide you through the configuration via the necessary selections.

Customer configuration

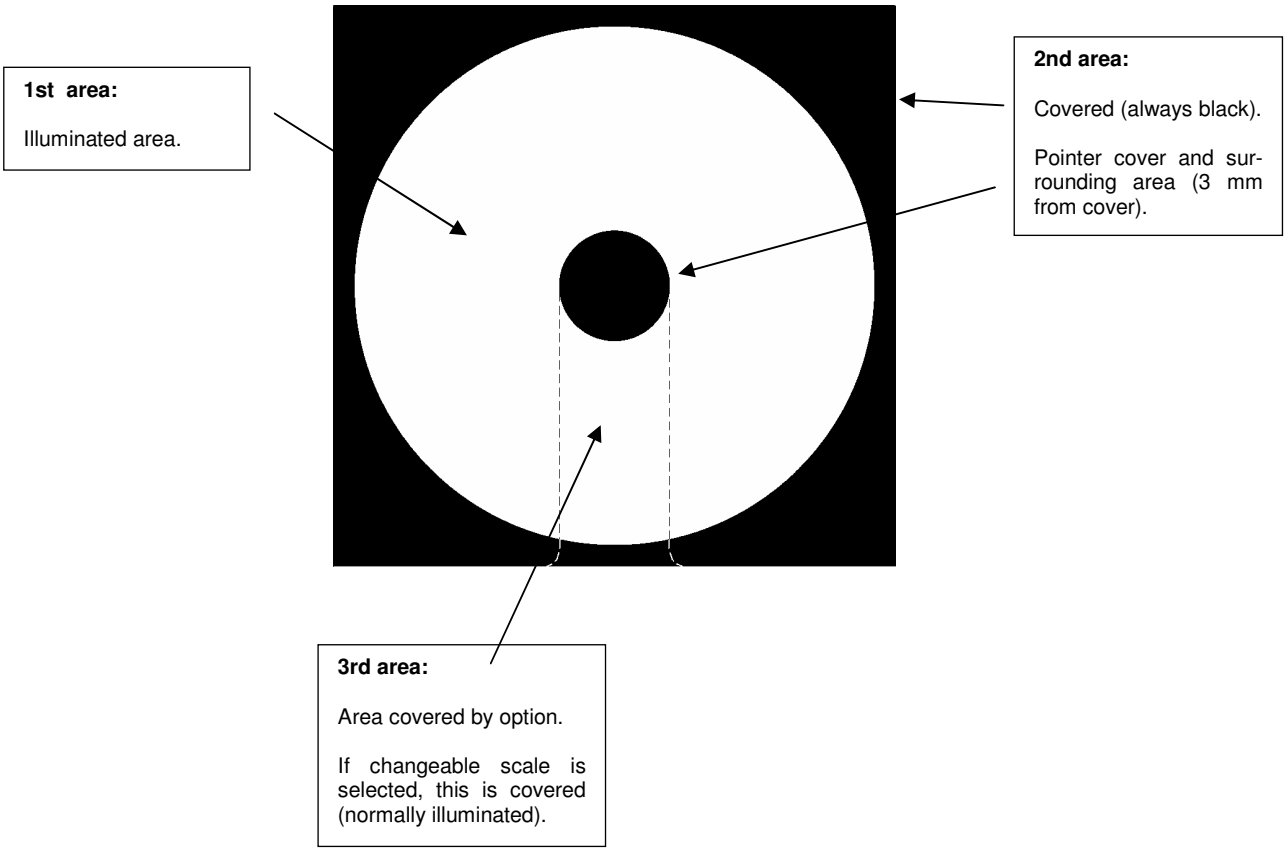
	Customer options			Note
Housing	XL - rear mounted (DIN mounting)	Size:	□ 72	
			□ 96	
			□ 144	
			□ 192	
		Protection:	□ IP52 (standard)	
			□ IP66	
	XL - front mounted	Size:	□ 96	
			□ 144	
		Protection:	□ IP52 (standard)	
			□ IP66	
	BW	Size:	□ 144	IP66 (standard)
			□ 192	IP66 (standard)
Input	Analogue	Type:	□ Single	Input 1 terminals used
			□ Dual (SIN/COS)	(Not current input/loop)[1]
			□ Special	3…12…21V bridge
		Range:	□ 0...1V	Load: 1kOhm
			□ 0...10V	Load: 10kOhm
			□ -1...0...1V	Load: 1kOhm
			□ -5...0...5V	Load: 10kOhm
			□ -10...0...10V	Load: 10kOhm
			□ 0...1mA	Load: 1kOhm
			□ 0...20mA	Load: 50Ohm
			□ 4...20mA	Load: 50Ohm
			□ -0.5...0...0.5mA	Load: 1kOhm
			□ -1...0...1mA	Load: 1kOhm
			□ -10...0...10mA	Load: 50Ohm
			□ -20...0...20mA	Load: 50Ohm
			□ Others	Specify request (within limits, page 6)
	Digital	Type:	□ Dual CAN open	
Pointer	□ Standard		Colour defined by scale design	White with yellow illumination or black shadow without illumination
	□ Disc (Only on XL72/96 and XL/BW144 and only black disc/scale base)		□ Standard (known)	Specify design number
			□ Custom (new)	Specify design
	Pointer position, 360 degree scales (at electrical mid. of input)		□ Pointer at 12 o'clock	Electrical mid. examples: 4…20mA => 12mA 10-0-10V => 0V 0-10V => 5V
			□ Pointer at 3 o'clock	
			□ Pointer at 6 o'clock	
			□ Pointer at 9 o'clock	
	Deflection	□ Standard	Positive input moves pointer clock-wise (CW)	
		□ Reversed	Positive input moves pointer coun-terclockwise (CCW)	
Scale	□ Fixed (standard)	Scale curve:	□ 0…180 degrees	Accuracy ±1.8 degrees
			□ 0…240 degrees	
			□ 0…300 degrees	
			□ 0…360 degrees	
	□ Exchangeable	Scale curve:	□ 0…180 degrees	Accuracy ±3.6 degrees (Not possible with disc and 360 degrees)
			□ 0…240 degrees	
			□ 0…300 degrees	
	Base colour		□ Black	White pointer with yellow illumination
			□ White	Black shadow pointer
	Design		□ Standard (known)	Specify design number
			□ Custom (new)	Specify design. Please see section conc. scale design principles
	Error field		□ Red field in un-used scale area (standard) or on scale cover in changeable scale versions	Not in 360 degrees versions
			□ Custom	Specify design (none, other colours, symbol etc.)

1) SIN/COS input cannot be used in combination with current loops. Due to the design of the input circuit, only one indicator can be used per output in this configuration. If multiple indicators are needed on the same output, please use the voltage versions.

Please notice that not all options can be selected for the same indicator, and that some options may exclude others.

Scale design principles

The scale is divided into 3 different areas:



Design restriction

To ensure the automatic vision based calibration in our production, some restrictions are necessary regarding scale lines, colours etc.

Please read our scale design guide, where examples of different scale designs are shown and where the practical illuminations are described in details.

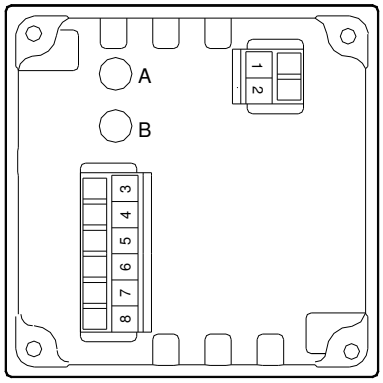
Standard colours used in the design of XL indicator scale

Scale colours are according to DEIF standard: Black, white, red, green, yellow. For further information, please contact DEIF A/S.

Terminals

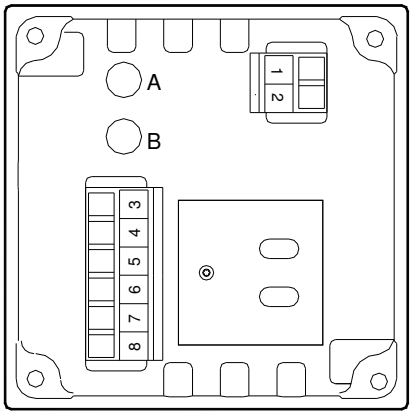
Analogue input version

PIN no.	Function		Note
1	Supply voltage	0V	Consumption aux. supply connection: Max. 150mA
2		24V	
3	Analogue input	Input 1	Input 1 and GND used for single input
4		GND	
5		Input 2	
6	Illumination	Illumination +	Dimmer input. Dimmer range 5…30V DC Consumption max. 30mA
7		Illumination GND	
8	-	NC	Not connected - can be used freely
A	Analogue adjustment	Max. adjustment	Max. and min. adjustment, sealed by label
B		Min. adjustment	



CAN open input version

PIN no.	Function		Note
1	Supply voltage	0V	Consumption aux. supply connection: Max. 150mA
2		24V	
3	CAN connection	CAN 1 H input	CAN 1 line
4		CAN 1 L input	
5		CAN 1 GND	
6		CAN 2 H input	CAN 2 line
7		CAN 2 L input	
8		CAN 2 GND	
A	No function, not used		
B	No function, not used		



Technical specifications

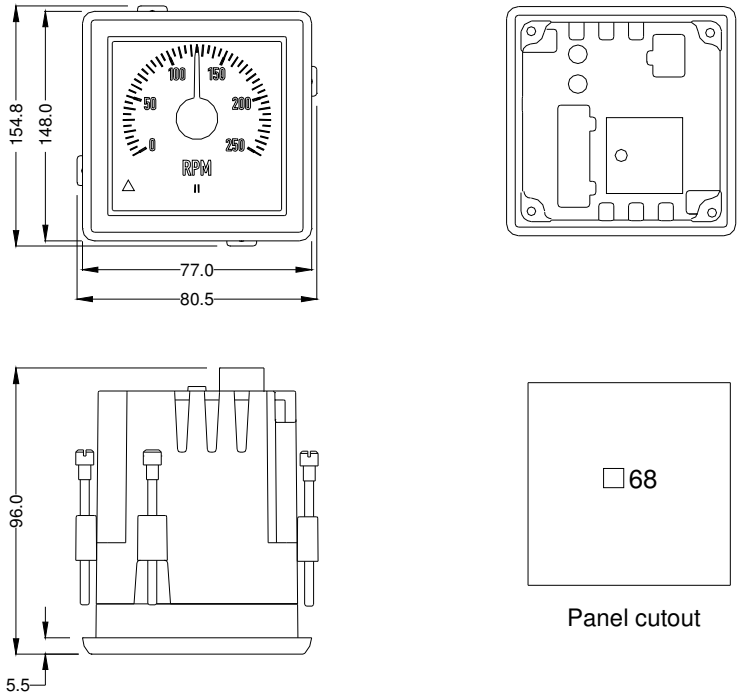
Indicators are designed according to the standards below					**Standards**
Accuracy	Fixed scale: Class 0.5 (-10...15-30...55°C) measured at 360° deflection, corresponds to ±1.8° error Exchangeable scale: Class 1.0 (-10...15-30...55°C) measured at 360° deflection, corresponds to ±3.6° error				According to DEIF interpretation of EN 60051
Response time	90° per sec./no overshoot				
Instrument frame sizes	Size:	XL rear mount	XL front mount	BW	DIN 43700 for panel cutout only
	72	77 x 77 mm	-	-	
	96	102 x 102 mm	127.5 x 127.5 mm	-	
	144	148.5 x 148.5 mm	173 x 173 mm	148.5 x 148.5 mm	
	192	196 x 196 mm	-	196 x 196 mm	
Aux. supply	24V DC -25/+30% (18...24...31.2V DC) Reverse polarity protected				
Illumination supply	7-30V (max. 31.2V DC)				
Galvanic separation	600V AC between the following groups: CAN: Aux. supply; CAN 1; CAN 2 Analogue: Aux. supply; Analogue inputs (common); Dimmer				
Scale	According to customer design and specifications Base material: PMMA				
Pointer	Transparent polycarbonate with white print and yellow illumination (588nm), or Transparent polycarbonate with black print (shadow)				
Window	Antiglare 3 mm polycarbonate with UV blocking				UL94 V0
Disc	XL96		Ø 47 mm		
	XL144		Ø 70.5 mm		
	Always black scale base				
Housing	ASA/PC LURAN-S (plastic)				UL94 V0
Mounting angle	The indicators can be mounted at any angle between 0...150° horizontal without this affecting the calibration				DIN 16257
Compass safety distance	Steering compass: 0.20 m, stand-by/emergency compass: 0.10 m				IEC 945 and EN 60945
Measuring ranges	See standard ranges and load on page 3 Limits are ±1…±30V DC and ±1…±25mA DC Load special inputs: 1KΩ/V on voltage input and 1V on current input				
Adjustments	Analogue interface adjustments on rear side: Max. adjustment ±10% Min. adjustment ±5%				
Protection	XL standard: IP52 from front, mounted in panel, IP20 from rear (IP66 from front when recommended gasket is used) BW standard: IP66				IEC 529 and EN 60529
Climate	Class H S E, short term condensing allowed				DIN 40040
	Max. 95% RH: Max. 30 days per year Max. 85% RH: Remaining days Max. 75% RH: Average per year				
Temperature	Nominal: -10…55°C Operating: -25…70°C Storage: -40…70°C				EN 60051
	Influence: Max. ±1.5% within -15...55°C				
Panel influence	The accuracy is affected neither by the material nor by the thickness of the panel				EN 60051
Panel thickness	Max. 18 mm (on XL versions, DIN rear mounted)				
Mechanical shock test	18 x 50g half sine (11ms)				IEC 600068-2-27
Drop impact resistance	18 x 100g (peak)				
Vibration test	3…13.2Hz: 2 mm (peak-peak) 13.2…100Hz: 0.7g				EN 60945 DNV Class A
	3…13.2Hz: 6 mm (peak-peak) 13.2…50Hz: 2.1g				DNV Class C
Safety	300V – CAT. III. Pollution deg. 2				EN 61010-1

Technical specifications, continued

Indicators are designed according to the standards below		**Standards**
Consumption (analogue)	Aux. supply: 65…75mA/24V DC Illum. supply: 15mA/24V DC (XL72/96), 20mA/24V DC (XL144/192)	
Consumption (CAN) including illumination	100...130mA/24V DC	
EMC	CE marked for residential, commercial and light industry plus industrial environment	EN 61000-6-V2/3/42 and EN 60945

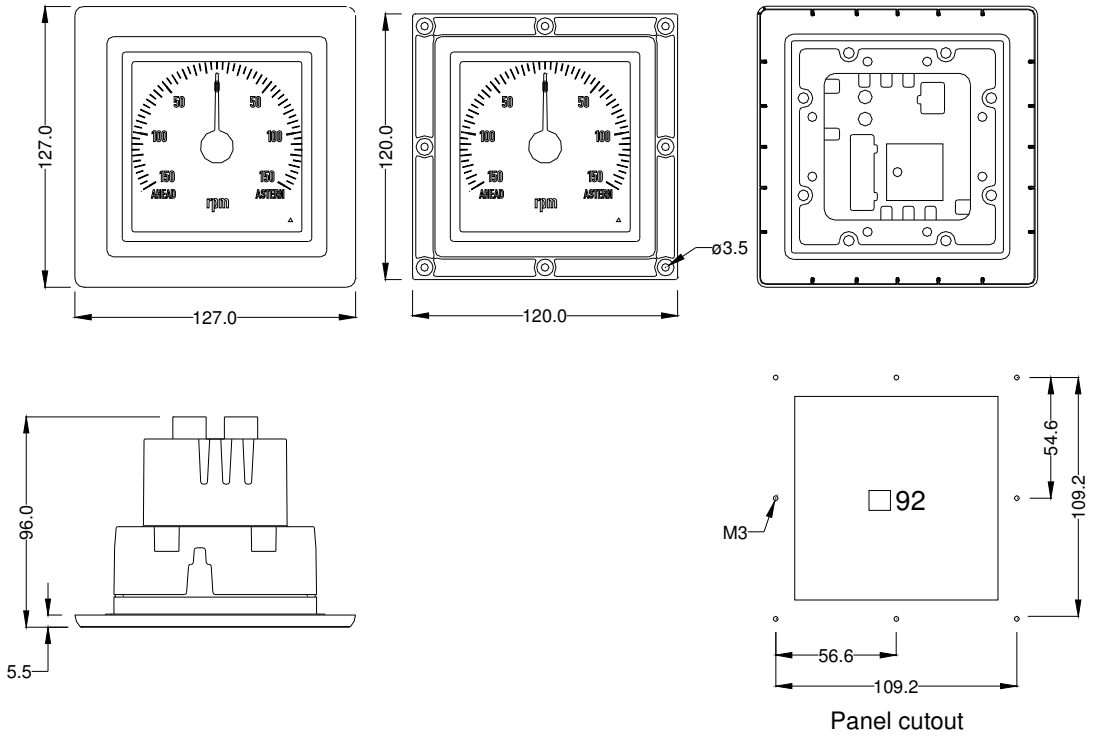
Dimensions in mm

XL72 RM (Rear Mounted)



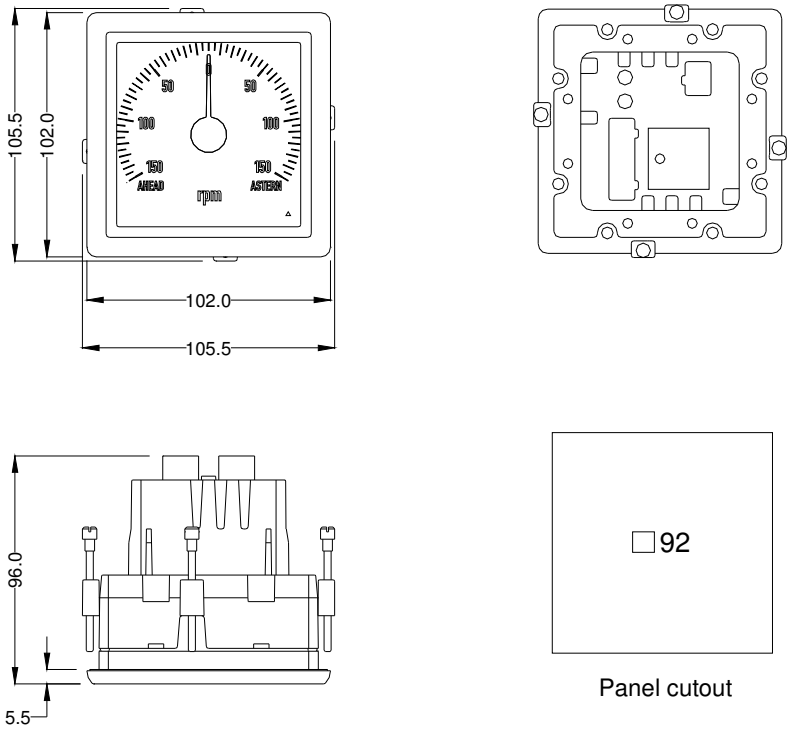
Weight: Approx. 245g

XL96 FM (Front Mounted)



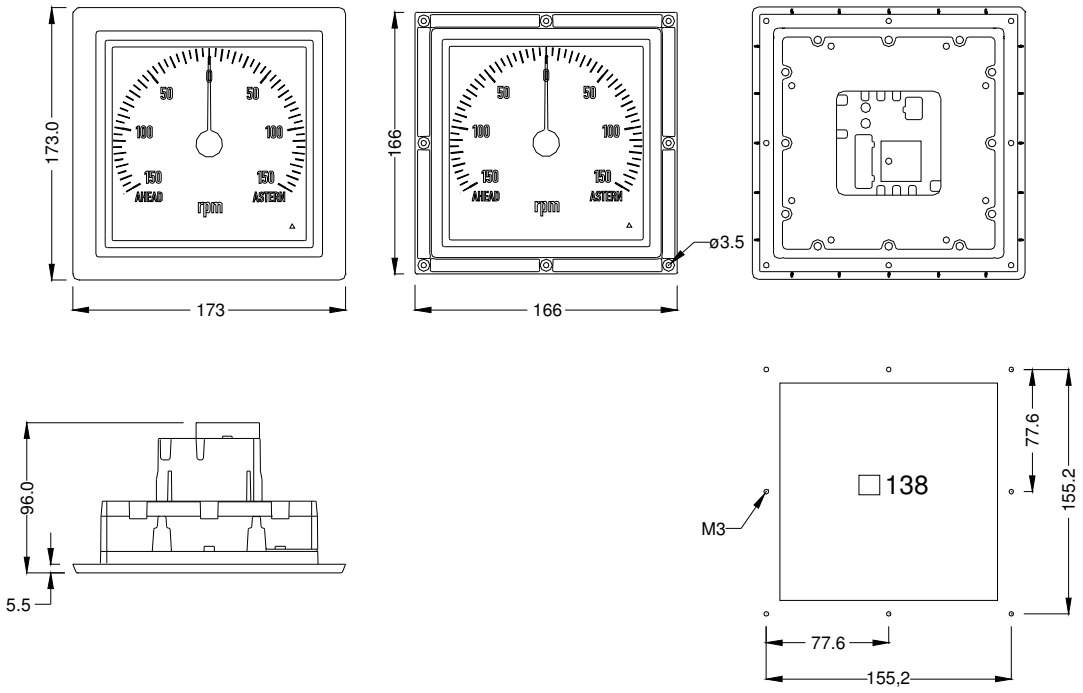
Weight: Approx. 280g

XL96 RM (Rear Mounted)



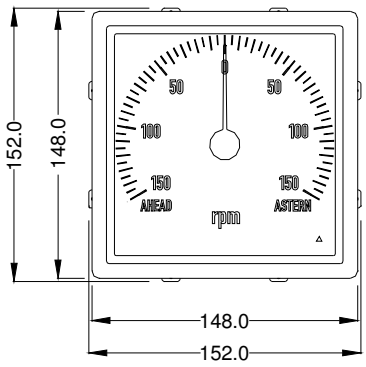
Weight: Approx. 280g

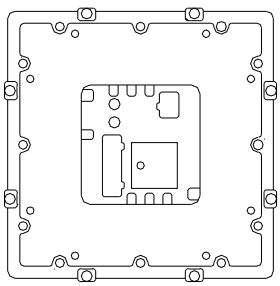
XL144 FM (Front Mounted)

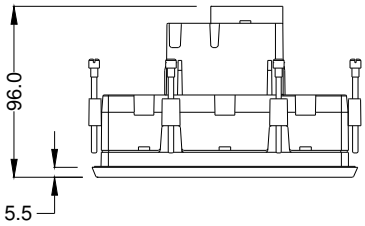


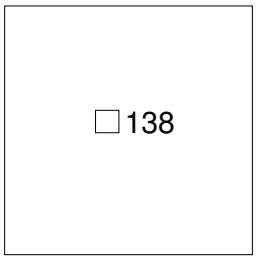
Weight: Approx. 350g

XL144 RM (Rear Mounted)





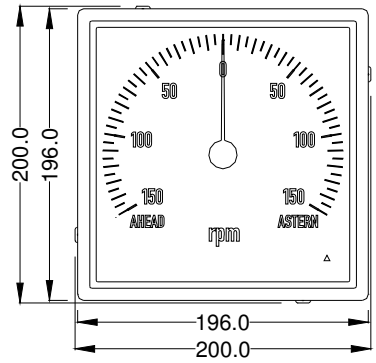


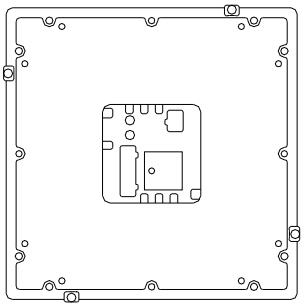


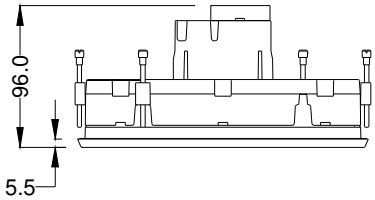
Panel cutout

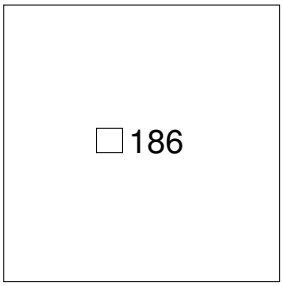
Weight: Approx. 350g

XL192 RM (Rear Mounted)





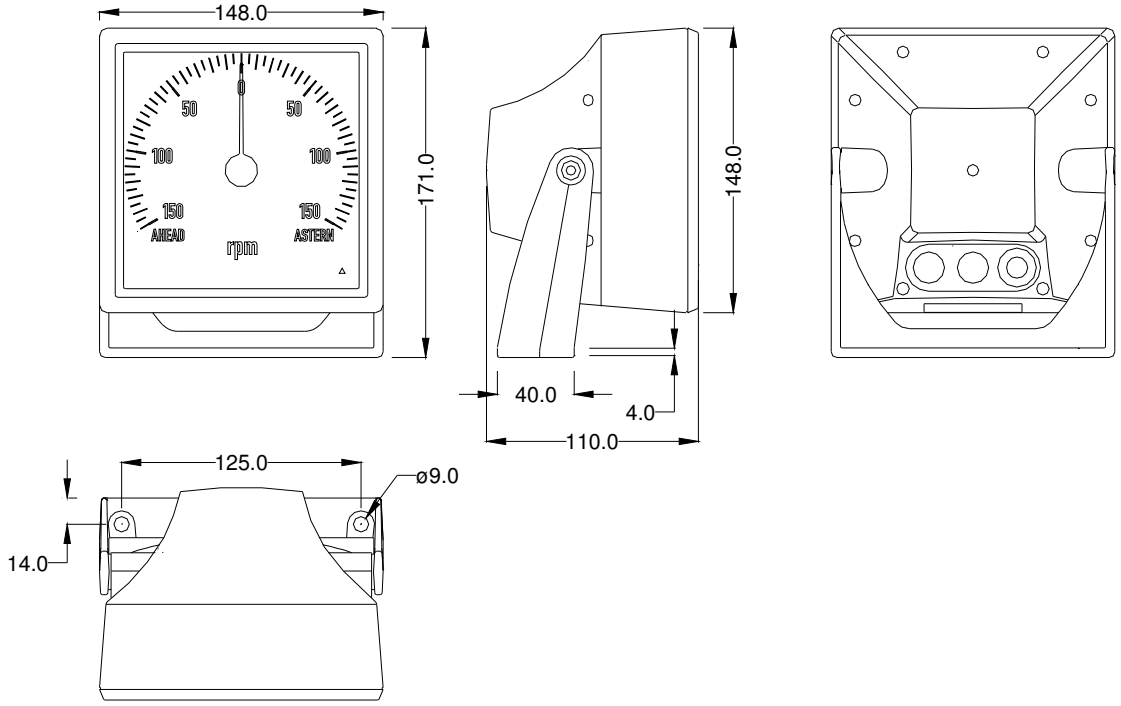




Panel cutout

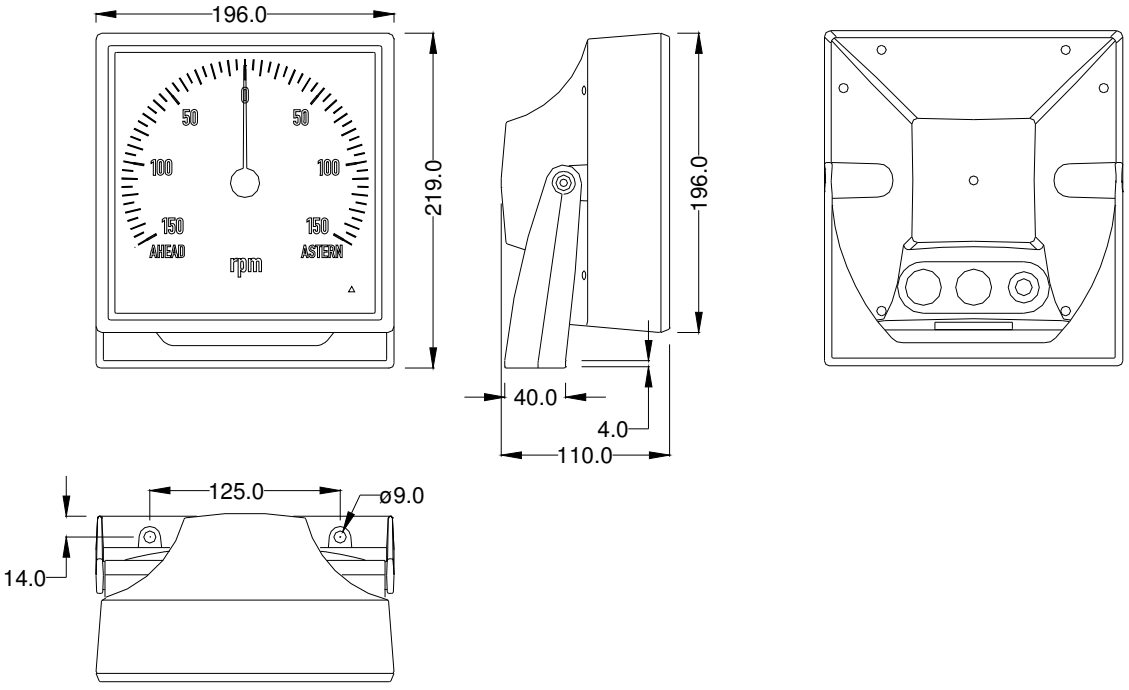
Weight: Approx. 475g

BW144



Weight: Approx. 540g

BW192



Weight: Approx. 800g

Frame size and DIN panel cutout in mm (inches)

Indicator type	Frame size	DIN panel cutout
XL72	77.0 (3.031)	68.0 x 68.0 + 0.7 (2.667 x 2.667 + 0.028)
XL96	102.0 (4.016)	92.0 x 92.0 + 0.8 (3.622 x 3.622 + 0.031)
XL144	148.5 (5.846)	138.0 x 138.0 + 1.0 (5.433 x 5.433 + 0.039)
XL192	196.0 (7.716)	186.0 x 186.0 + 1.1 (7.323 x 7.323 + 0.043)
XL96 front mounted	127.5 (5.020)	92.0 x 92.0 + 0.8 (3.622 x 3.622 + 0.031)
XL144 front mounted	173.0 (6.811)	138.0 x 138.0 + 1.0 (5.433 x 5.433 + 0.039)
BW144	148.5 (5.846)	
BW192	196.0 (7.716)	

Order specifications

Fill in the configuration form on page 3.

↓

Prepare drafts of preferred scale design, e.g. with reference to existing designs. At request DEIF provides scale designs for inspiration. The customer always approves the final scale design.

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

Bridge wing indicator

Type VTR-3

4921250002D

- ***Protection: IP66***
- ***Robust construction***
- ***LED illumination (long life)***
- ***Easily-read scale***
- ***With built-in dimmer***
- ***Approved according to the Marine Equipment Directive***

Bridge wing indicator type VTR-3

The VTR-3 consists of a 90° moving coil system in a waterproof housing, equipped with an easily-read scale and special front glass counteracting reflections. The instrument is equipped with mounting clamp for base mounting and is CE classified for marine, residential, commercial and light industry plus industrial environment.

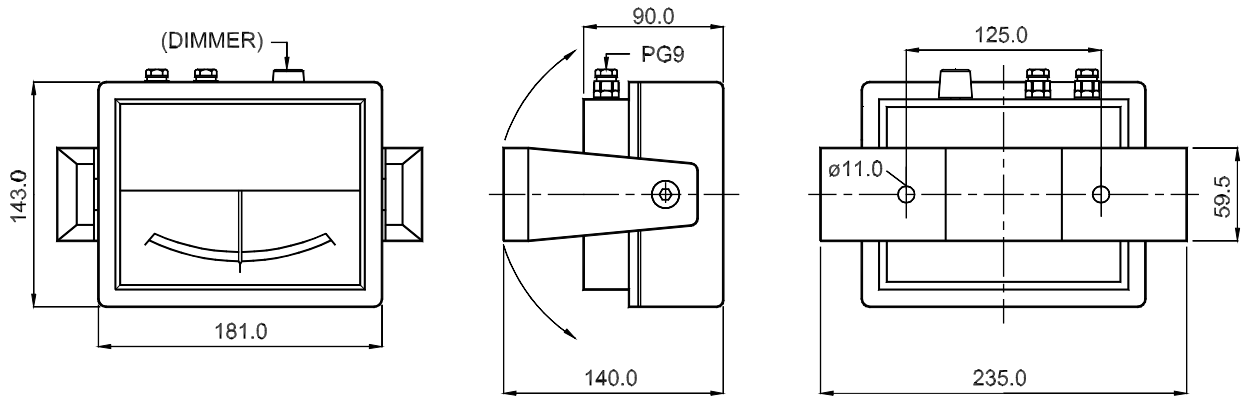
Technical specifications

Standard measuring ranges Voltage			Standard measuring ranges Current		
Lowest range	**Highest range**	**Load**	**Lowest range**	**Highest range**	**Load**
0...1V DC -0.5...0...0.5V DC 0...10V AC	0...300V DC -300...0...300V DC 0...300V AC	0.5kΩ/V 1kΩ/V 0.45kΩ/V	0...1mA DC -1...0...1mA DC 0...1mA AC	0...100mA DC -100...0...100mA DC 0...100mA AC	0.6V 0.3V 1.4V

Further measuring range:	4…20mA .
Accuracy:	Class 1.5 (-10...15...30...55°C) to EN 60051 and IEC 51.
Scale types:	1) White scale base: Figures, division lines, pointer: black. 2) Black scale base: Figures, division lines, pointer: yellow. (Scale with transilluminated section).
Illumination:	LED illumination with built-in dimmer. White scales are translucent. On black scales figures and division lines are transilluminated and the pointer is clearly visible against a yellow transilluminated section.
Aux. voltage (Illumination):	24V AC/DC ±25%. Consumption: 80mA/24V.
Connection:	Built-in screw terminals. Cable dimensions: multi-stranded: 2.5 mm^2, single-stranded: 4 mm^2. Cable entry via 2 PG 9 glands. Cable diameter: 7.5 mm.
Test voltage:	2kV - 50Hz - 1 min.
Magnetic radiation:	None.
Ambient temperature:	-10...55°C (nominal) -25...60°C (operating) -25...65°C (storage).
Materials:	Surface finish: matt black polyurethane. Plastic housing: polyurethane. Fire retarding and self-extinguishing to UL94 (V0). All metal parts made out of corrosion-resistant materials.
Protection:	IP66, to IEC 529 and EN 60529.

Dimensions

All dimensions in mm



VTR-3 Weight: approx. 1.7 kg

Also available with "standing" pointer (connections/dimmer accessible from the bottom of the housing).

Order specifications

	Type	Scale	Scale type	Measuring range
Example:	VTR-3	45…0…45°	Black	0…20mA

Due to our continous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

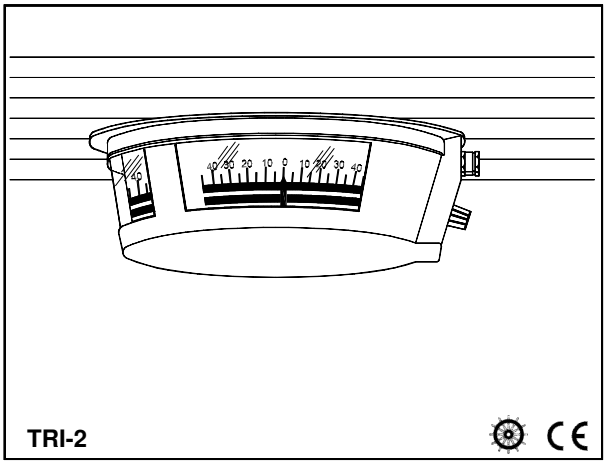
Type TRI-2

Panorama rudder indicator

Marine bridge instrumentation

4921250043E

- ***Approved according to the Marine Equipment Directive***
- ***3 extra large, easily-read scales***
- ***Readable from up to 5 meters***
- ***Black or white scales***
- ***Long-life LED illumination***
- ***Built-in dimmer***



Application

The panorama rudder indicator type TRI-2 is applied for the indication of the rudder position on the bridge.

The TRI-2 is CE marked for marine, residential, commercial and light industry plus industrial environment.

The TRI-2 is housed in a matt black, waterproof case for deck head suspension.

Equipped with 3 large scales, the TRI-2 ensures a quick and easy reading of the rudder angle from any angle up to 250° and from a distance of up to 5 metres from the indicator.

Scale colour

The indicator is available with 2 types of scales:

1) White scales with black figures, division lines and black pointer.
2) Black scales, where the figures, division lines and the pointer are yellow, giving the clearest read-out of the pointer position.

On both white and black scales starboard is marked with a green section (to the right), port with a red section (to the left) underneath the division lines.

Illumination

The TRI-2 is equipped with long-life LEDs, ensuring easy and clear reading of the scales in the dim light on the bridge.

White scales are translucent, implying that the division lines and the figures are clearly visible, and that the pointer is seen clearly as a shadow.

On black scales the figures, the division lines and a broad, yellow section underneath these are transilluminated. The pointer is clearly visible as a shadow against this yellow section.

The light intensity can be changed by means of a built-in dimmer, accessible on the rear plate of the indicator.

If remote dimming is preferred, this built-in dimmer may be removed from the indicator (after dismantling of the rear plate) and mounted e.g. in a control panel. A plug for sealing of the hole in the rear plate is included on delivery.

Measuring principle

The indicator consists of a robust moving coil system equipped with 3 pointers mounted on a common shaft.

Technical specifications

Accuracy: Class 1.5 (-10…15…30…55°C) to EN 60051 and IEC 51.

Temperature: -10…+55°C (nominal)
-25…+70°C (storage)

Measuring ranges:

voltage:	Lowest:	0…4V DC
	Highest:	0…100V DC
	Load:	0.7kΩ/V
	Lowest:	-2…0…2V DC
	Highest:	-100…0…100V DC
	Load:	1.4kΩ/V
current:	Lowest:	0…1mA DC
	Highest:	0…100mA DC
	Load:	3.0V
	Lowest:	-1…0…1mA DC
	Highest:	-100…0…100mA DC
	Load:	1.5V
suppressed current:	4…20mA	
	Load:	4.0V

Scale types:

1) White scale base
   with black figures/division lines and black pointer.
2) Black scale base
   with yellow figures/division lines and yellow pointer.

Standard scales: 35…0…35°, 45…0…45°
60…0…60°, 70…0…70°
Others on request.

Type TRI-2

Technical specifications

Illumination: Long-life LEDs.

Dimmer: Built-in. Can be removed and mounted e.g. in a control panel if remote dimmer is preferred.

Galvanic separation: 2kV - 50Hz - 1 min.

Compass safety distance: 1 m.

Auxiliary voltage:
illumination: 24V AC/DC -25/+30%.

consumption: Max. 113mA.

EMC: To IEC 60945 (1996), EN 50081-1/2, EN 50082-1/2.

Connections: Built-in screw terminals.

cable dimension: 0.2...2.5 mm².

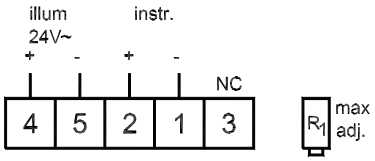
cable entries: Via two PG 13.5 cable glands.
Cable diameter: 11 mm.

Materials:
plastic housing: ABS/PC blend.
Fire retarding and self-extinguishing to UL94 (V0).

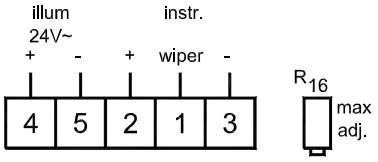
metal parts: All external metal parts are made out of corrosion-resistant materials.

Protection: IP54 to IEC 529 and EN 60529.

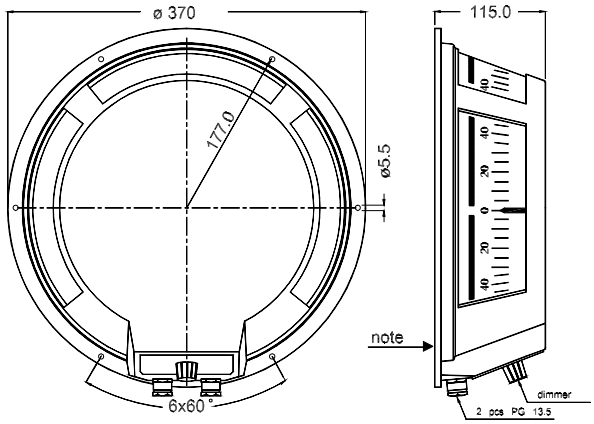
Connections/dimensions (in mm)



For general current/voltage



For potmeter input



Weight: Approx. 1.5 kg

Note: Option:
Cable entry via two PG 13.5 cable glands.

Order specifications

Type – Scale – Scale type – Measuring range
Example:
TRI-2 – 45…0…45° - black - 0…20mA

Due to our continous development we reserve the right to supply equipment which may vary from the described.

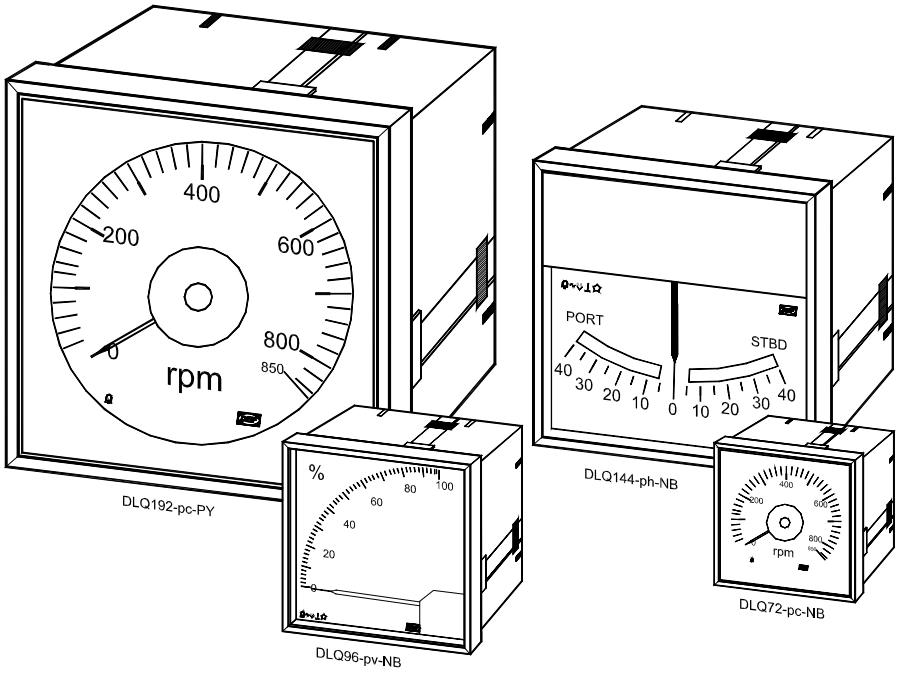
***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

Switchboard instruments with illumination

Types DLQ72, DLQ96, DLQ144 and DLQ192

4921250014F



- ***Wide range of sizes from 72x72 mm to 192x192 mm***
- ***Custom-designed coloured scales***
- ***LED illumination (long life)***
- ***Separate pointer illumination***
- ***Colour spectrum constant throughout dimmer range***
- ***Approved according to the European Marine Directive***

General technical specifications

<table>
<tr><th colspan="5">Instruments are designed according to below mentioned standards</th><th>Standards</th></tr>
<tr><td>Accuracy</td><td colspan="4">Class 1.5 (-10...15...30...55°C)

Linear scales:
±1.5% of Full Scale value (FS)

Non-linear scales:
±1.5% of scale length</td><td>EN 60051 and IEC 51</td></tr>
<tr><td>Instrument sizes</td><td colspan="4">72 x 72 mm, 96 x 96 mm, 144 x 144 mm, 192 x 192 mm</td><td>DIN 43700</td></tr>
<tr><td>Bezel</td><td colspan="4">Slim bezels (except on DLQ192)</td><td>DIN 43718</td></tr>
<tr><td>Scale</td><td colspan="4">Figures, lines, size and font size according to customer design and specifications
Base material: Acrylic</td><td>Customer specified or according to DIN 43802 on request</td></tr>
<tr><td>Pointer</td><td colspan="4"> Standard pointer
Black or yellow for –NB and –NY types

 Triangular pointer
Yellow or white for –PY and –PW types</td><td>According to DIN 43802 or to customer specifications

According to customer specifications</td></tr>
<tr><td>Glass</td><td colspan="4">Antiglare glass, thickness: 2 mm</td><td></td></tr>
<tr><td>Mounting angle</td><td colspan="4">Standard: Vertical (90 ±5°)
However, may be mounted at any angle 0...150° to horizontal without this affecting the calibration</td><td>DIN 16257</td></tr>
<tr><td>Compass safety distance</td><td colspan="4">To be mounted at least 1 metre from the compass</td><td>IEC 945 and EN 60945</td></tr>
<tr><td>Measuring ranges</td><td colspan="4">See page 4
Others on request</td><td>DIN 43701</td></tr>
<tr><td rowspan="5">Protection</td><td colspan="2">Standard version</td><td colspan="2">IP54 version</td><td rowspan="5">IEC 529 and EN 60529
IP54 version is marked:
“IP54 FROM FRONT ONLY WHEN RUBBER GASKET IS MOUNTED”</td></tr>
<tr><td>From front</td><td>From rear</td><td>From front</td><td>From rear</td></tr>
<tr><td>IP52</td><td>IP52</td><td>IP54</td><td>IP52</td></tr>
<tr><td>Terminals</td><td></td><td>Terminals</td><td></td></tr>
<tr><td>IP20</td><td></td><td>IP20</td><td></td></tr>
<tr><td rowspan="2">Climate</td><td colspan="4">Class H U E
Short term condensing allowed</td><td rowspan="2">DIN 40040</td></tr>
<tr><td colspan="4">Max. 95% RH: Max. 30 days per year
Max. 85% RH: Remaining days
Max. 75% RH: Average per year</td></tr>
<tr><td rowspan="2">Temperature</td><td colspan="4">Nominal: -10…55°C
Operating: -25…60°C
Storage: -25…65°C</td><td rowspan="2">EN 60051 and IEC 51</td></tr>
<tr><td colspan="4">Influence: Max. ±1.5% within -10...55°C</td></tr>
<tr><td>Panel influence</td><td colspan="4">The accuracy is affected neither by the material nor by the thickness of the panel</td><td>EN 60051 and IEC 51</td></tr>
<tr><td>Shock test</td><td colspan="4">DLQ72/96/144: 18 x 50g half sine (11mS)
DLQ192: 18 x 15g half sine (11mS)</td><td>IEC 68-2-27, Test: Ea</td></tr>
<tr><td>Vibrations</td><td colspan="4">3…13.2Hz: 2 mm
13.2-100Hz: 0.7g</td><td>GL + LR: Test 1
DNV: Class A</td></tr>
<tr><td>Materials</td><td colspan="4">All outer materials are self-extinguishing</td><td>UL94 (VO)</td></tr>
<tr><td>Safety</td><td colspan="4">300V – CAT. III
Pollution deg. 2</td><td>EN 61010-1</td></tr>
<tr><td>EMC</td><td colspan="4">CE marked for residential, commercial and light industry plus industrial environment</td><td>EN 50081-1/2 and
EN 50082-1/2</td></tr>
</table>

Scales and pointers

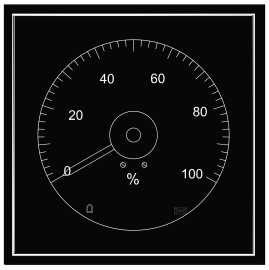
Type	Scale base colour			Possible colour combinations figures/division lines				Pointer		
	White	Black						Standard		Triangular
		No trans-illuminated section	Yellow trans-illuminated section	Black	Yellow/ white	Red	Green	Black NB*	Yellow NY*	Yellow/ white PY*/PW*
DLQ72/96/144/192-pc-XX* 240°	•			•	•	•	•	•		
-pc: center pointer		•			•	•	•			•
DLQ96-pv-XX* 90°	•			•	•	•	•	•		
-pv: horizontal pointer			•		•	•	•		•	
DLQ96/144-ph/-ps-XX* 80°	•			•	•	•	•	•		
-ph: "hanging" pointer -ps: "standing" pointer			•		•	•	•		•	

*) Substitute designation for pointer illumination/colour for "XX"

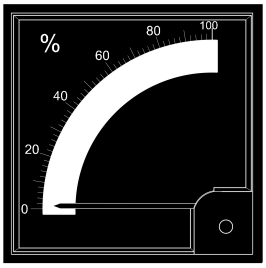
Pointer type: "N": No direct pointer illumination (standard pointer)

"P": With direct pointer illumination (triangular pointer)

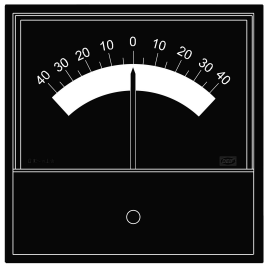
Examples with black scale base:



DLQ72/96/144/192-pc-PY/W



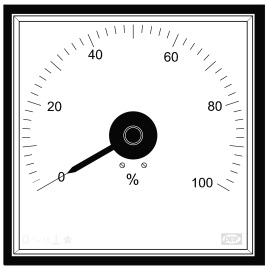
DLQ96-pv-NY



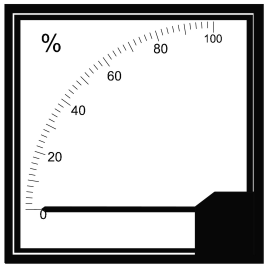
DLQ96/144-ps-NY

Coloured division lines and figures are transilluminated The pointer is triangular and illuminated and colour is yellow or white	Only division lines, figures and the broad section below the division lines are transilluminated The pointer is clearly visible as a shadow. Pointer is standard and colour is yellow

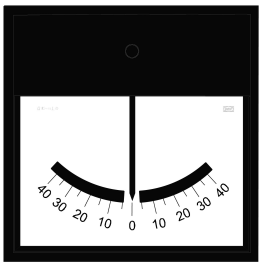
Examples with white scale base:



DLQ72/96/144/192-pc-NB



DLQ96-pv-NB



DLQ96/144-ph-NB

The scale is translucent, implying that division lines and figures are clearly visible, and the pointer is seen clearly as a shadow

Measuring ranges

Standard measuring ranges • Voltage			Standard measuring ranges • Current		
Lowest range	**Highest range**	**Load**	**Lowest range**	**Highest range**	**Load**
0…1V DC -0.5…0…0.5 V DC	0…100V DC -100…0…100V DC	0.5kΩ/V 1kΩ/V	0…1mA DC -0.5…0…0.5mA DC	0…100mA DC -100…0…100mA DC	0.6V 0.3V
			4…20mA		1.6V

The instruments are fitted with a potentiometer with a slotted screw for adjustment of the measuring range (adjustment of ranges 0...1mA, -0.5...0...0.5mA, 4...20mA not possible). The potentiometer is accessible from the rear of the instrument and is marked "INSTR. ADJ". Standard adjustment range: ±10% (on request: up to ±50%).

Other measuring ranges are available on request.

Illumination

Consumption Illumination	DLQ72-pc DLQ96-pv/ph/ps	DLQ96-pc DLQ144-ph/ps	DLQ144-pc	DLQ192
Type –PY	60mA/24V	110mA/24V	200mA/24V	275mA/24V
Types –NB/–NY	40mA/24V	80mA/24V	150mA/24V	150mA/24V

Illumination: 24V DC/AC. Adjustment range: 7...30V (5...30V range is optional on request).

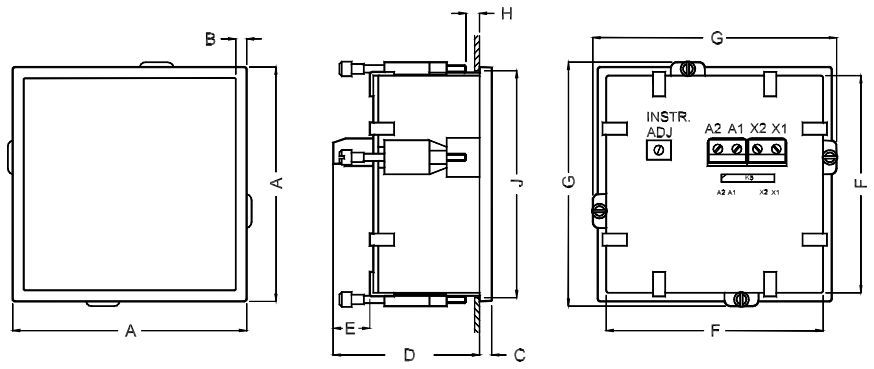
Optional red-only or green-only illumination is available on request for special purposes.

Connection: Screw terminals for instrument input and illumination.
Maximum 2.5 mm^2 (multi-stranded) or 4.0 mm^2 (single-stranded).
Alternative connection: Male/female connector for 26 AWG cable.

If required by the class, suitable protection against voltage transients (surge pulses) must be built into the power supply (e.g. light dimmer unit) to the instrument illumination input.

Dimensions

All dimensions in mm



Connections:

Instrument:

A1 +
A2 –

Illumination:

X1: 24V AC/DC
X2: 24V AC/DC

Type	A	B	C	D	E	F	G	H (max.)	J (panel cut-out)	Weight (kg)
DLQ72	72 x 72	3.5	5.5	63	19	66 x 66	77	12	68 x 68 +0.7	0.220
DLQ96	96 x 96	4.5	5.5	63	19	90 x 90	103	12	92 x 92 +0.8	0.230
DLQ144	144 x 144	4.5	8.0	66	19	136 x 136	150	12	137 x 137 +1.0	0.385
DLQ192	192 x 192	16.0	8.0	71	19	184 x 184	196	12	186 x 186 +1.0	0.500

All dimensions in mm

Note: The above drawing is a DLQ96, the other types may vary in details

Order specifications

	Type	**Scale**	**Measuring range**
Examples:	DLQ96-pc-PY	0…100%	0…10V DC
	DLQ192-pc-NB	-300…0...300RPM	-20...0…20mA

When ordering new scales, always forward detailed drawing

Due to our continous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

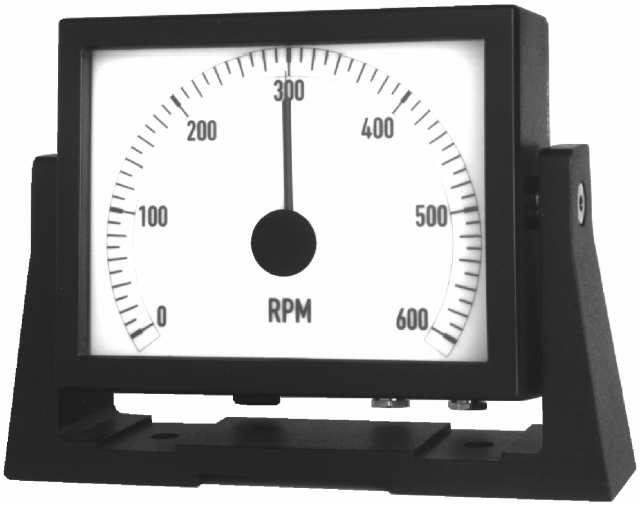
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

Bridge wing indicator

Type VTR-5

4921250005D



- *Protection: IP66*
- *Robust construction*
- *LED illumination (long life) with built-in dimmer*
- *Seperate pointer illumination*
- *Large, easily-read scale*
- *Approved according to the Marine Equipment Directive*

Bridge wing indicator type VTR-5

The VTR-5 consists of a 240° moving coil system in a waterproof housing, which is equipped with a large, easily-read scale and special front glass counteracting reflections. The instrument is equipped with a clamp for base mounting. The VTR-5 is CE classified for marine, residential, commercial and light industry plus industrial environment.

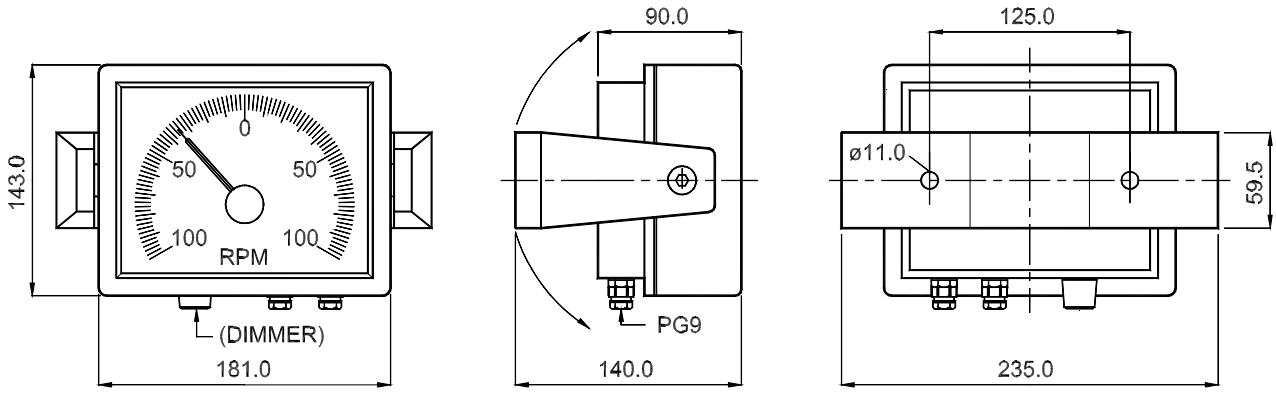
Technical specifications

Standard measuring ranges Voltage			Standard measuring ranges Current		
Lowest range	**Highest range**	**Load**	**Lowest range**	**Highest range**	**Load**
0...1V DC -0.5...0...0.5V DC 0...10V AC	0...300V DC -300...0...300V DC 0...300V AC	0.5kΩ/V 1kΩ/V 0.45kΩ/V	0...1mA DC -1...0...1mA DC 0...1mA AC	0...100mA DC -100...0...100mA DC 0...100mA AC	0.6V 0.3V 1.4V

Further measuring range:	4…20mA.
Accuracy:	Class 1.5 (-10...15...30...55°C) to EN 60051 and IEC 51.
Scale types:	1) White scale base: Figures, division lines, standard pointer: black. Indirect illumination. 2) Black scale base: Figures, division lines, triangular pointer: yellow. Direct pointer illumination.
Ilumination:	LED illumination with built-in dimmer.
Aux. voltage (Illumination):	24V AC/DC ±25%. Consumption: 80mA/120mA for direct pointer illum.
Connection:	Built-in screw terminals. Cable dimensions: multi-stranded: 2.5 mm^2, single-stranded: 4 mm^2. Cable entry via 2 PG 9 glands. Cable diameter: 7.5 mm.
Test voltage:	2kV - 50Hz - 1 min.
Magnetic radiation:	None.
Ambient temperature:	-10...55°C (nominal), -25...60°C (operating), -25...65°C (storage).
Materials:	Surface finish: matt black polyurethane. Plastic housing: polyurethane. Fire retarding and self-extinguishing to UL94 (V0). All metal parts made out of corrosion-resistant materials.
Protection:	IP66, to EN 60529 and IEC 529.

Dimensions

All dimensions in mm



VTR-5 Weight: approx. 2.0 kg

Order specifications

	Type	**Scale**	**Scale type**	**Measuring range**
Example:	VTR-5	0…250 rpm	Black	0…20mA

Due to our continous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

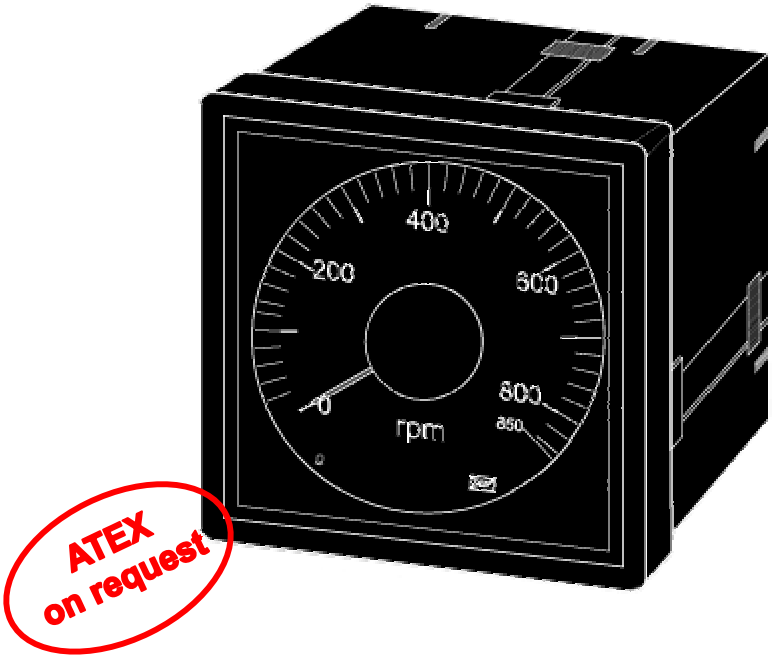
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

Watertight marine instruments with illumination

Types DLQW72 and DLQW96

4921250050E



- DLQW72: Bezel dimension Q78 for IP66 proof switchboard front
- DLQW96: Bezel dimension Q102 for IP66 proof switchboard front
- Custom-designed coloured scales on black base
- LED illumination (long life)
- Separate pointer illumination
- Colour spectrum constant throughout dimmer range
- Shock resistant up to 50 g
- Approved according to the European Marine Directive
- ATEX versions available

General technical specifications

Instruments are designed according to below mentioned standards			Standards
Accuracy	Class 1.5 (-10...15...30...55°C) Linear scales: ±1.5% of Full Scale value (FS) Non-linear scales: ±1.5% of scale length		EN 60051 and IEC 51
Instrument sizes	102 x 102 mm		
Scale/pointer	Scale material: Acrylic **Triangular pointer** Yellow/white		DIN 43802 (standard pointer)
Glass	Antiglare glass		
Mounting angle	Standard: Vertical (90 ±5°), however, may be mounted at any angle 0...150° to horizontal, without this affecting the calibration		DIN 16257
Compass safety distance	To be mounted at least 1 metre from the compass		IEC 945 and EN 60945
Measuring ranges	See page 3 Others on request		DIN 43701
Protection			IEC 529 and EN 60529
	From front	From rear	
(Housings)	IP66	IP52	
(Terminals)		IP20	
Climate	Class H U E Short term condensing allowed		DIN 40040
	Max. 95% RH: Max. 30 days per year Max. 85% RH: Remaining days Max. 75% RH: Average per year		
Temperature	Nominal: -10…55°C Operating: -25…60°C Storage: -25…65°C		EN 60051 and IEC 51
	Influence: Max. ±1.5% within -10...55°C		
Panel influence	The accuracy is affected neither by the material nor by the thickness of the panel		EN 60051 and IEC 51
Shock test	18 x 50g half sine (11ms)		IEC 68-2-27, Test: Ea
Vibrations	3…13.2Hz: 2 mm 13.2-100Hz: 0.7g		GL + LR: Test 1 DNV: Class A
Materials	All outer materials are self-extinguishing		UL94 (V1)
Safety	300V – CAT. III Pollution deg. 2		EN 61010-1
EMC	CE marked for residential, commercial and light industry plus industrial environment		EN 50081-1/2 and EN 50082-1/2

Description

Type	Scale base colour			Possible colour combinations figures/division lines				Pointer		
	White	Black						Standard		Triangular
		No trans-illuminated section	Yellow trans-illuminated section	Black	Yellow/ white	Red	Green	Black NB*	Yellow NY*	Yellow/ white PY*/PW*
DLQW72/96-pc-PY* Quadratic 240° -pc: center pointer		•			•	•	•			•
Coloured division lines and figures are transilluminated. The pointer is triangular and illuminated.										

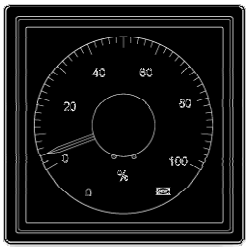
Technical specifications

Standard measuring ranges • Voltage			Standard measuring ranges • Current		
Lowest range	**Highest range**	**Load**	**Lowest range**	**Highest range**	**Load**
0…1V DC	0…100V DC	0.5kΩ/V	0…1mA DC	0…100mA DC	0.6V
-0.5…0…0.5 V DC	-100…0…100V DC	1kΩ/V	-0.5…0…0.5mA DC	-100…0…100mA DC	0.3V
			4…20mA		1.6V

The instruments are fitted with a potentiometer with a slotted screw for adjustment of the measuring range (adjustment of ranges 0...1mA, -0.5...0...0.5mA, 4...20mA and other suppressed measuring ranges is not possible). The potentiometer is accessible from the rear of the instrument and is marked "INSTR. ADJ". Standard adjustment range: ±10% (on request: Up to ±50%).

Consumption Illumination	**DLQW72-pc**	**DLQW96-pc**
Type –PY/PW	60mA/24V	110mA/24V

Illumination: 24V DC/AC. Adjustment range: 5...30V.



DLQW96-pc-PY

Connection: Quadratic instruments: Screw terminals for measuring signal and illumination:
Max. 2.5 mm^2 (multi-stranded), max. 4.0 mm^2 (single stranded).
Alternative connection: Male/female connector for 26 AWG cable.

If required by the class, suitable protection against voltage transients (surge pulses) must be built into the power supply (e.g. light dimmer unit) to the instrument illumination input.

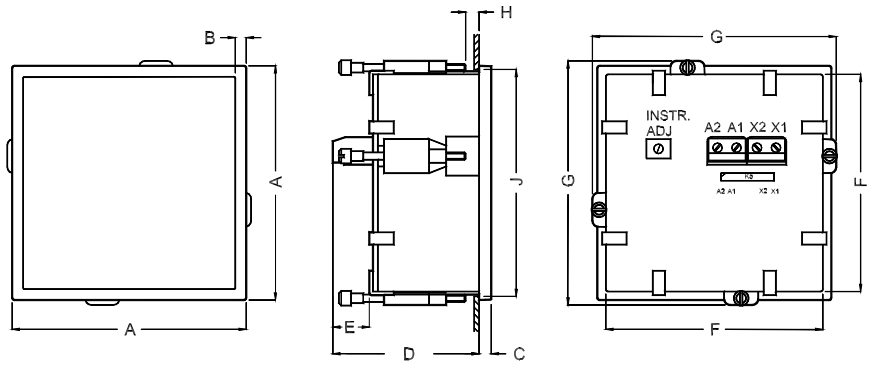
Due to different construction principles, the visual appearance of the DLQW72 differs slightly from that of the DLQW96. The fundamental design is similar, but the user must acknowledge these differences:

Housing: DLQW72: Plastic surroundings and bezel and glass window. Glass is sealed with silicone to ensure IP class. Black cover printed directly on window (glass).
DLQW96: Complete moulded plastic housing, including window. The all-in-one moulding process ensures the IP class. No print on window, but special cover plate inside housing.

Gasket: DLQW72: Black, stamped closed-cell rubber gasket. Gasket is visible when mounted (side-view).
DLQW96: Blue moulded neopren rubber gasket. Gasket is not visible when mounted.

Dimensions

All dimensions in mm



Connection, instr.:

A1 +
A2 –

Connection, illum.:

X1: 24V AC/DC
X2: 24V AC/DC

DLQW

Type	A	B	C	D	E	F	G	H (max.)	J	Weight (kg)
DLQW72	78 x 78	5.3	5.7	63.3	19	65 x 65	78	12	68 x 68 +0.7	0.210
DLQW96	102 x 102	5.3	5.7	68.3	19	90 x 90	103	12	92 x 92 +0.8	0.250

Order specifications

	Type	**Scale**	**Measuring range**
Examples:	DLQW96-pc-PY	0…100%	0…10V DC
	When ordering new scales, always forward detailed drawing.		

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

Other Bridge and Alarm Equipment

	Wind Measuring Systems 879	Lantern Control Panels 827	Unfitness and Alarm Systems UAS-1
Main function:	Wind measuring system indicating wind direction and wind velocity. Read-out unit: Wind direction is indicated on a circle of 64 LED's. Velocity is indicated as m/sec. or knots on a 2½ digit LED display. One sensor can be connected to up to 3 read-out units. Integrated NMEA-output for communication with other bridge equipment requiring no external interface.	Lantern control system for control and supervision of up to 22 navigation or signal lights. Control: switching on and off the lanterns either collectively or individually. Supervision: connection to the lantern, the supply voltage to the lantern, the bulb of the lantern and the 2 fuses for each lantern. Automatic change-over to alternative supply.	Bridge alarm system for transfer of alarm to back-up officers in case of navigator on duty is not responding. Dead mans control to be preset at intervals of up to 15 minutes. Reset via bridge equipment possible. Possibility of calling of up to 4 stand-by officers. Handles up to 38 digital inputs from external bridge equipment.
Approved by classification societies:	-	v	-

	Alarm and Monitoring Systems, Malling 845	Group Alarm Panels, Malling 869.25/-26	Extension Alarm Systems, Malling 869
Main function:	Alarm and monitoring system for measuring and supervision of binary and analog values, such as temperature, pressure, tank level, etc. in machinery and auxiliary equipment, primarily for use in engine rooms. The system consists of a standard 19" rack which accomodates the desired measuring/alarm and auxiliary modules.	Applied in conjunction with MALLING 845 alarm and monitoring system for remote indication of group of alarms. Can be applied as slave panels for indication of alarms in the accomodation. Built-in supervision of power supply. Types: 869.25/4, 869.25/6, 869.26/4, 869.26/6	Extension alarm system for remote indication of duty status and alarms of periodically unattended engine rooms. Transfer of alarms to bridge and accomodation facilities of up to four engineers. Alarm extended to call all engineers if not reset within 3 min. Emergency function for call of all engineers. Indication on bridge of engineer on duty and alarm status. Alarm on bridge on change / unattended engine room.
Approved by classification societies:	v	v	v

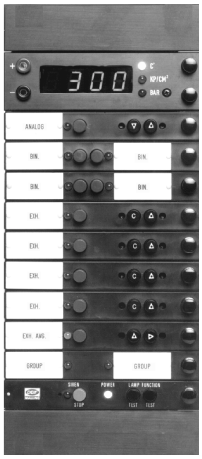
DEIF A/S, Frisenborgvej 33, DK-7800 Skive, Tel.: +45 9614 9614, Fax: +45 9614 9615, E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

Alarm and monitoring system

Type MALLING 845

4921230013C



- *Flexible cassette system with exchangeable modules, easily installed and serviced*
- *Input modules for binary and analog sensors and output module for control of siren and group alarms*
- *Common digital instrument*
- *Indicating instruments may be connected to all analog modules*
- *Over 1000 marine installations*
- *Type approved by major classification societies*

CE

Application

The alarm and monitoring system type MALLING 845 is CE marked for residential, commercial and light industry plus industrial environment, and is applied for:

Measurement and monitoring — The alarm and monitoring system type MALLING 845 is designed to measure and monitor analog and binary values such as temperature, pressure, tank level, etc. in machinery and auxiliary equipment, primary on board ships.

Alarm indication — When the preset alarm limits are exceeded, external audible/visual indicators are activated. Red LEDs and legend plates identify the individual alarms.

Functions

Alarm sequence

- arisen alarm — When an alarm arises, the alarm and monitoring system activates the common siren relay, and affected channels are marked by red flashing of the LEDs.
- siren reset — The siren signal is reset by means of a common push-button. The individual alarms can not be acknowledged on the actual function modules until the siren has been stopped.
- alarm ack./steady alarm — When acknowledged, the LEDs change to a steady light which remains, until the condition has returned to normal. The alarm and monitoring system indicates all newly arisen alarms by flashing LED until acknowledged.

Read-out — Analog measuring values and alarm limits plus the measuring unit are easily read on the common digital instrument. The display is activated by means of push buttons in the front plates of the relevant modules.

Function test

- lamp test
- common function test
- individual function test

Lamp test and common function test may be carried out from the siren and test module. Individual function test, independent of an alarm inhibit if any, may be carried out from the individual modules.

Time delay — Most standard function modules are available in a "DL" version with a continuously adjustable time delay, 1..25 s.

Alarm limits — The individual alarm limits of analog channels are set by means of a screwdriver through small holes in the front plates, easily accessible beside those push-buttons used to read out the alarm limits on the digital instrument.

Alarm inhibit — An alarm may be inhibited if the alarm is unwanted for e.g. low lubricating oil pressure during shutdown of an engine. For all binary, Pt100Ω and 4..20mA channels the alarms may be inhibited by a make contact, which may be common to a number of alarm channels.

Group alarm — The alarms are normally split up into groups according to their importance and are shown on the group alarm modules, on a group alarm panel on the bridge and possibly in the accommodation as well. The group alarm panel is equipped with a lamp for each group plus a buzzer.

Every time a new alarm arises in a group, the relevant group lamp will start flashing at full intensity and the buzzer is activated. When reset on the bridge, the buzzer is stopped and the flashing is dimmed to the light intensity determined by the dimmer. When the siren is reset in the control room, the flashing of the group lamp changes to a steady light, remaining until all alarms in the group have been remedied. The group outputs of the individual channels in each group are connected in parallel to the input of the relevant group amplifier.

Construction

System components — An alarm and monitoring system type MALLING 845 consists of one or more cassettes mounted with common auxiliary modules and individual function modules. Connections to and from the system plus internal codings are made by means of screw terminals on the rear of the cassettes. The cassettes are mutually connected by means of extension cables with connectors.

Cassettes — The standard cassette is a 19" rack for vertical mounting, designed to accommodate 21 modules. A smaller version (a "half cassette") accommodates 12 modules.

As modules — The alarm and monitoring system type MALLING 845 may be delivered as separate modules, however DEIF A/S does not guarantee the performance of systems configured by another company.

Ready-wired systems — Larger systems are typically delivered as prewired systems supplied with fixed cables and terminals to be mounted in a control desk. Internal wiring, codings and settings plus final test are carried out according to the customer's alarm and measuring points list.

Bulkhead mounting — The systems may furthermore be delivered mounted in a cabinet for bulkhead mounting. A power supply and a duty selector switch may be mounted, if required. Please contact DEIF A/S for further information.

Common auxiliary modules

- siren and test module — The siren and test module contains the most important common functions of the system: siren relay, push-buttons for SIREN STOP, COMMON FUNCTION TEST and LAMP TEST plus LEDs for "SIREN" and "POWER ON". An external push-button for reset of siren may be connected.
- earth fault module — The earth fault module monitors the leakage to earth.
- group alarm module — By means of the group alarm modules the alarms may be grouped according to their priority and function. Two alarm groups per group alarm module.
- blank module — The blank modules are used to cover spare places in the cassette.

Binary function modules — The binary alarm modules are designed to monitor potential free (ON/OFF) alarm contacts in thermostats, pressure monitors and level switches, etc. Each binary alarm module contains two alarm circuits.

Analog function modules

- Pt100Ω modules — Standard analog temperature modules for Pt100Ω sensor are designed to measure and monitor e.g. cooling water and lubricating oil temperatures.
- 4..20mA modules — Standard analog modules for 4..20mA transducers are used to measure e.g. signals from pressure and temperature transducers.
- alarm limits — Each analog module for Pt100Ω and 4..20mA is provided with one low and one high alarm limit.

Instrument module — The analog measuring values and alarm limits with the measuring unit are easily read on the common digital instrument. Measuring values are shown in a large, red 7-segment display. The display is activated by means of push buttons in the front plates of the relevant modules. The instrument module occupies two spaces in the cassette.

Exhaust temp. monitoring — For each of the cylinders of the diesel engine the system monitors that the exhaust gas temperature does neither exceed an adjustable, fixed high alarm limit, nor deviates too much from the other exhaust gas temperatures.

- cylinder exhaust temp. module — The temperature after each cylinder is measured by means of a cylinder exhaust temperature module in conjunction with a NiCr-Ni thermocouple.
- average value module — The average temperature value is calculated by means of an average value module.
- deviation alarm — The individual cylinder temperatures are compared with the average value and an alarm will be released, if the deviation exceeds the preset value. Allowable deviation from the average value is conveniently set during the sea trial at an average temperature corresponding to normal service conditions.
- temperature equalization — As the individual cylinder temperatures may differ from each other due to thermodynamic conditions in the engine and the various placings of the temperature sensors, each cylinder temperature module is provided with an equalizing potentiometer by means of which the contribution of the individual cylinders to the average value may be adjusted. During the sea trial the contributions of the individual cylinders are set to the average value.

  In order to avoid unwanted alarms caused by heavy variations of the temperature during start and stop, the deviation alarms are automatically inhibited at low temperatures. In case of sensor failure the monitoring of the relevant cylinder temperature may be by-passed.
- direct connection — NiCr-Ni temperature sensors may be connected by means of a compensating cable from the sensors to the alarm cassette.
- connection through comp. box — A better and less expensive installation is, however, usually obtained by using ordinary installation cables between a common junction box by the engine frame and the alarm cassette. Normally an existing junction box may be used. Compensation of the ambient temperature is carried out by means of a Pt100Ω module in conjunction with a Pt100Ω sensor in the junction box.
- high temperature module — To monitor the temperature after the turbocharger a high temperature module with one high alarm set point but without deviation alarm may be used.

Slave lamps — Smaller installations, e.g. on the bridge, are sometimes delivered for connection of slave lamps in the engine room or on the bridge wings. A number of function modules are available in a version with outputs for external lamps. Slave panels may be delivered as standard cassettes mounted with LED indication modules.

Maintenance — Troubleshooting and repair is possible simply by interchanging and exchanging the modules. Spare modules should be calibrated and tested by DEIF. In an emergency it will normally be possible to exchange electronic parts locally, however, a certain number of spare modules on board is recommended.

External auxiliary equipment

The alarm and monitoring system type MALLING 845 meets - in conjunction with a group alarm panel on the bridge and an extension alarm system in the engineers' accommodation - the requirements of the classification societies to periodically unattended machinery space (see user manual).

Power supply units

Power supply type 849.041 or type 468E3-041 (220V AC/24V DC, 10A) is supplied as a separate unit, applied to change to an alternative 24V DC voltage source on failure of primary voltage. Alarm contact for voltage failure.

Technical specifications

Supply voltage:	24V DC ±20% from transformer/rectifier or battery.					
Allowable ripple voltage:	±20% at 24V.					
Power consumption	15mA per module in normal condition (average for typical configuration). 40mA per module in alarm condition (average for typical configuration).					
Max. load of siren relay:	2A, 24V.					
Galvanic separation:	Between siren relay and circuits. Insulation at 500V DC > 1MΩ.					
Time delay:	Standard: 1 s. "..DL" versions: 1..25 s., continuously adjustable, symmetrical delay.					
Alarm inhibit:	Inhibit is activated by a make contact between the inhibit input of the relevant channel and 0V. Inhibit inputs for channels in the same inhibit group are connected together.					
Analog outputs:	0..1V, max. 2mA for external instruments (if any)					
Load of sensor contact:	**Binary function modules** 1.5mA (closed contact), 20V (open contact).					
Max. load per group output:	**Group alarm modules** 500mA. Internal current limiter.					
Sensitivity:	**Earth fault module** Leakage resistance R < 25kΩ will release an alarm. Back to normal at R > 50kΩ.					
Standard temperature ranges:	**Instrument module** 100°C, 600°C.					
Standard pressure ranges: (Bar or Kp/cm²).	0...1.000	0...1.600	0...2.50	0...4.00	0...6.00	0...10.00
	0...16.00	0...25.0	0...40.0	0...60.0	0...100.0	0...160.0

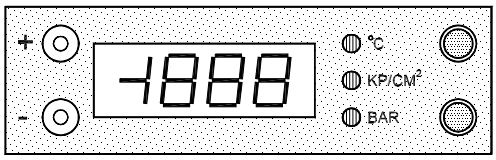
General technical specifications	
Temperature:	-10...55°C (nominal), -25...70°C (operating), -40...70°C (storage)
Climate:	Class HSE, to DIN 40040
Vibration, shock and humidity:	According to the requirements of the classification societies.
EMC:	To EN 50081-1/2 and EN 50082-1/2
Materials:	Front plates: black noryl. Fire retarding and self-extinguishing to UL94 (V0). All metal parts made out of corrosion preventing material.
Connections:	Screw terminals on the rear of the cassette. Cable dimensions: 2.5 mm² (multi-stranded), 4 mm² (single-stranded).
Code pins:	35 pcs included on delivery per cassette.
Protection:	Front: IP31, to EN 60529 and IEC 529 Terminals: IP00, to EN 60529 and IEC 529

Alarm and monitoring system type MALLING 845 - components

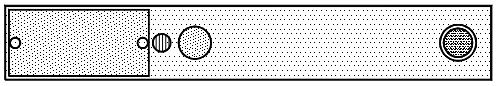
Type	Description	Weight	Consumption (mA)	
		(g)	Normal	Alarm
845.71-CE 845.73-CE	Cassette for 21 modules. H x w x d = 483 x 132 x 210 mm Cassette for 12 modules. H x w x d = 303 x 132 x 210 mm	2750 1850		
845.41-03 845.41-06 845.41-30	Extension cable, 0.3m Extension cable, 0.6m Extension cable, 3.0m	37 70 320		
845.71-1 845.73-1	Fixed cable with terminals, for 845.71-CE, 2.5m or order specified Fixed cable with terminals, for 845.73-CE, 2.5m or order specified	4000 3000		
845.10B	Binary module (ON/OFF) with 2 alarms, N/C sensor	76	7.6	37.3
845.10BDL	Binary module (ON/OFF) with 2 alarms, N/C sensor, 1..25 s.	80	7.6	37.3
845.101	Binary module (ON/OFF) with 2 alarms, N/O sensor	88	9.5	42
845.101DL	Binary module (ON/OFF) with 2 alarms, N/O sensor, 1..25 s.	92	9.5	42
845.11B	Analog temperature module, Pt100Ω, -15..150°C	92	19	31
845.114	Analog temperature module, Pt100Ω, -15..200°C	90	18	32
845.15B	Analog module, 4..20mA	90	22-38	34-50
845.15BDL	Analog module, 4..20mA, 1..25 s.	92	22-38	34-50
845.20	Siren and test module	82	19	55
845.202	Group relay module, 1 group, with reset	70	3	35
845.25	Group alarm module, 2 groups	93	4.5	33[1]
845.31	Instrument module, digital, for pressure and temperature	226	47/95	
845.4	Blank module	33		
845.60	Cylinder temperature module, NiCr-Ni, 0..600°C Deviation from average value, direct connection	100	12	27
845.601	Cylinder temperature module, NiCr-Ni, 0..600°C Deviation from average value, through compensation box	100	12	27
845.61	High temperature module, NiCr-Ni, 0..600°C Direct connection	92	10	25
845.611	High temperature module, NiCr-Ni, 0..600°C Through compensation box	90	10	25
845.69B	Average value module	80	10	10
845.971	Earth fault module	76	5	17
845.L2	Indicating module with 2 slave lamps	56	0	30
845.S	Test and indicating module	61	15	30
	Resopal plate, white, ungraved (h x w: 18 x 38 mm). If engraved plates are required, please specify text.	0.6		
	Rivet, white plastic (2 pcs per plate included on delivery)			

1) Excluding external lamps

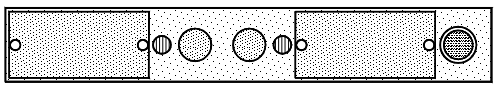
Front plates



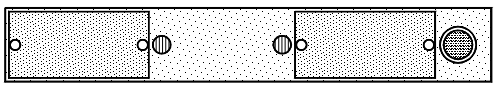
Instrument module



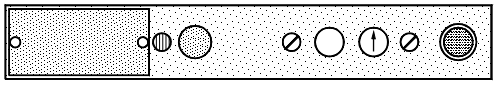
Group relay module



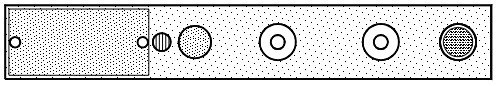
Binary module (ON/OFF)
Test and indicating module



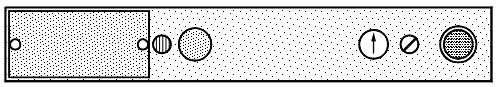
Group alarm module
Indicating module with 2 slave lamps



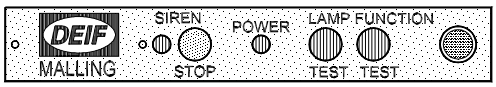
Analog modules, Pt100Ω and 4…20 mA
Cylinder temperature and average value modules



Earth fault module



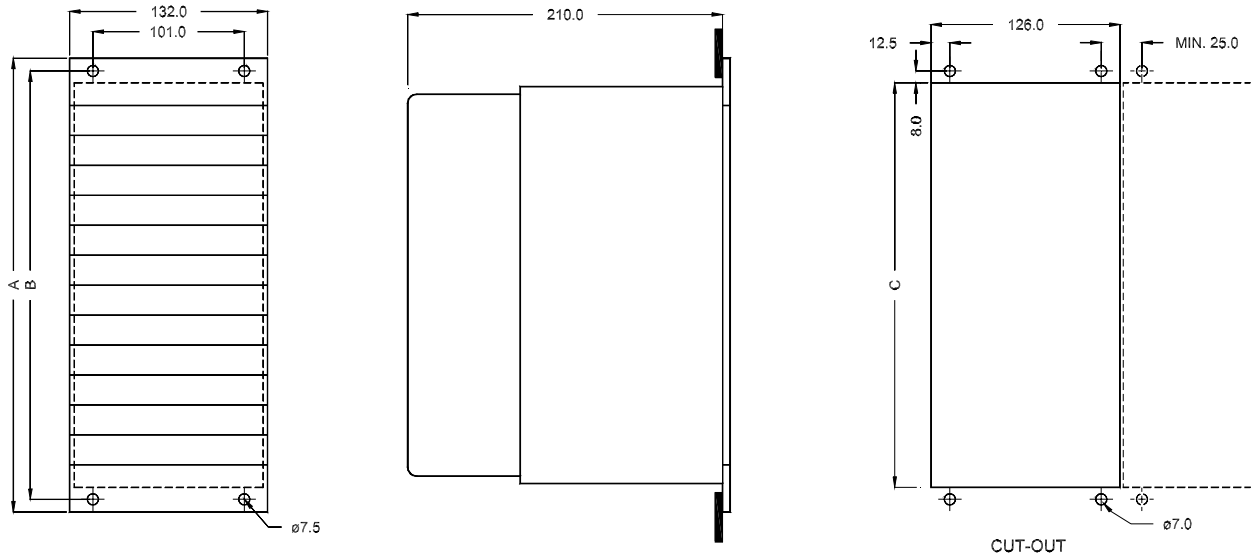
High temperature module



Siren and test module

Dimensions

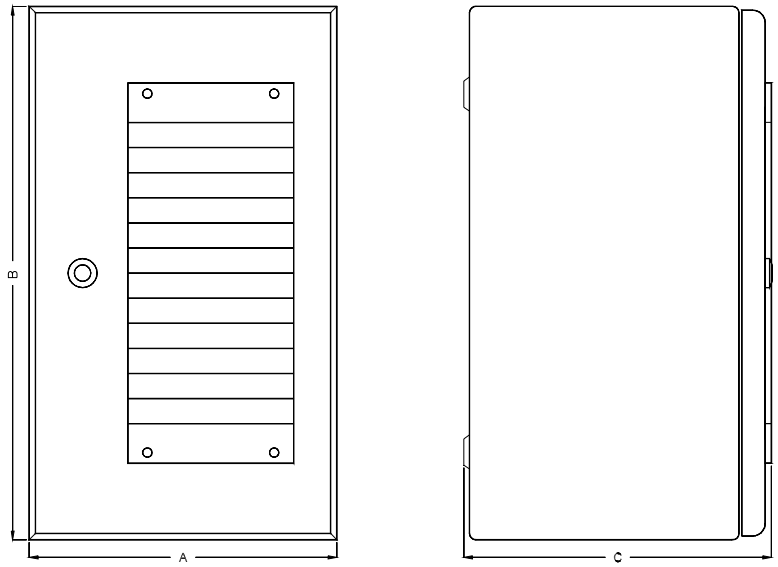
All dimensions in mm



Type MALLING 845 cassette (flush mounting)

Cassette	A	B	C	Average weight (approx.)	
“Small”, for 12 modules	303	286	270	2.9 kg	With typical selection of modules
“Big”, for 21 modules	483	466	450	4.7 kg	With typical selection of modules

All dimensions in mm



Type MALLING 845 in cabinet (bulkhead mounting)

Cabinet (example)	A	B	C	Average weight (approx.)	
”Small”, for 12 modules	425	245	242	6.8 kg	Cabinet without modules
”Big”, for 21 modules	540	305	242	9.9 kg	Cabinet without modules

Order specifications

Example 1: **As components**
Please state quantity and type number for all components plus text for engraved plates.

Example 2: **Ready-wired system for flush mounting**
List of alarms and measuring points (if possible using DEIF form). Wiring diagram if available. Length of fixed cable plus text for engraved plates.

Example 3: **System supplied in cabinet for bulkhead mounting**
List of alarms and measuring points or wiring diagram plus text for engraved plates.

Due to our continous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

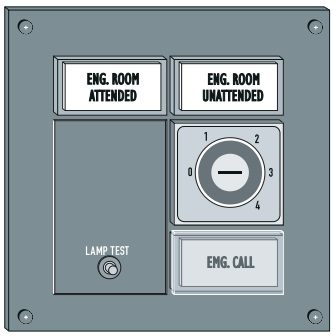
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

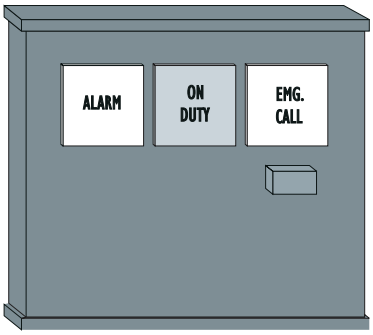
Extension alarm system

Type MALLING 869

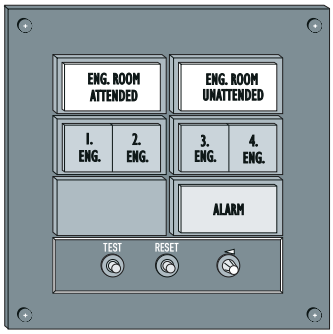
4921250037B



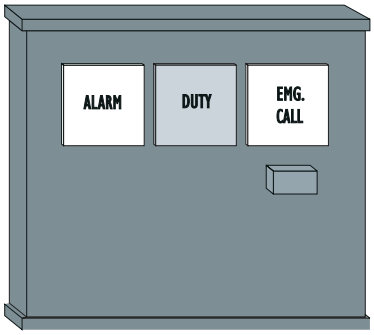
869.124



869.314-07



869.22



869.314-08

- *For operation of periodically unattended engine rooms*
- *Relays alarms to bridge and accomodation facilities*
- *Alarm extended to call all engineers if not reset within 3 min.*
- *Emergency function for emergency call of all engineers*
- *Indication on bridge of engineer on duty and alarm status*
- *Alarm on bridge on change attended/unattended engine room*

CE

Application

The extension alarm system type MALLING 869 has been designed for relaying of alarms received from an external alarm system (e.g. engine room alarms). The system ensures that up to 4 engineers are called on receipt of an alarm.

The MALLING 869 system furthermore provides indication of engineer on duty and status of alarms on the bridge plus in common rooms. An emergency call can be transmitted to all connected panels.

The 869 system is provided with an alarm output, which may be connected to e.g. a siren or horn for release of an audible alarm in case an alarm signal has not been acknowledged within a preset period of time.

Configuration

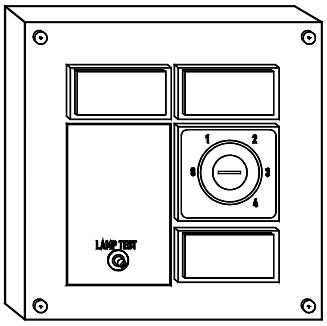
An extension alarm system type MALLING 869 consists of the following components:

• Engine room panel	type 869.124	for flush mounting
• Engineer's panel	type 862.314-07	for base mounting
• Bridge panel	type 869.22	for flush mounting
• Common room panel	type 862.314-08	for base mounting
• Relay box	type 869.62	for base mounting

Below the units are shown with standard texts, however, on request push-buttons and lenses can be provided with customer specified texts as well. Lenses and push-buttons are likewise available in other colours, on request.

Engine room panel type 869.124

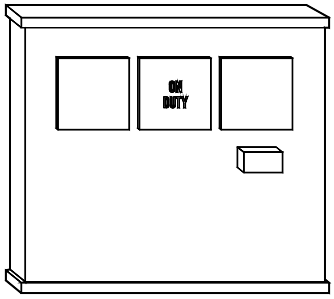
The engine room panel contains:



- A key-operated duty switch: Pos. 0: Attended engine room
  Pos. 1..4: Engineer 1...4 on duty
- 2 signal lamps: White lenses with black text:
  a. "ENG. ROOM ATTENDED"
  b. "ENG. ROOM UNATTENDED"
- Push-button: In plate with white text "LAMP TEST"
  (further text on plate possible)
- Push-button: Red lens with white text behind transparent lid:
  "EMG. CALL" (emergency call)

Engineer's panel type 862.314-07

The engineer's panel contains:

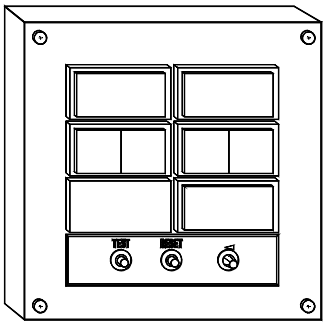


- 3 indicators: Red lenses with white text:
  a. "ALARM" (flashes when activated)
  b. "EMG. CALL" (emergency call)

  Blue lens with white text:
  c. "ON DUTY" (when lit: engine room is unattended, this engineer is on duty)
- Buzzer
- Reset button: Reset of both flashing alarm indicators and buzzers in all accomodation panels plus reset of flashing alarm indicators in bridge panels.

Bridge panel type 869.22

The bridge panel contains:

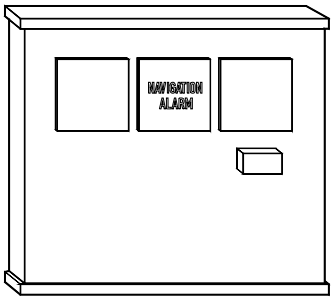


- 7 indicators: White lenses with black text:
  a. "ENG. ROOM ATTENDED"
  b. "ENG. ROOM UNATTENDED"

  Blue lenses with white text:
  c-d. "1. ENG.", "2. ENG.", "3. ENG.", "4. ENG"
  (for indicating of engineer on duty):

  Red lens with white text:
  e. "ALARM"
- 2 push-buttons: In plate with white text:
  a. "TEST" (lamp test)
  b. "RESET" (reset of built-in buzzer)
- 1 adjusting knob: For dimming of indicators

Public space panel type 862.314-08



The public space panel contains:

- 3 indicators: Red lenses with white text:
  a. "ALARM" (flashes when activated)
  b. "EMG. CALL" (emergency call)

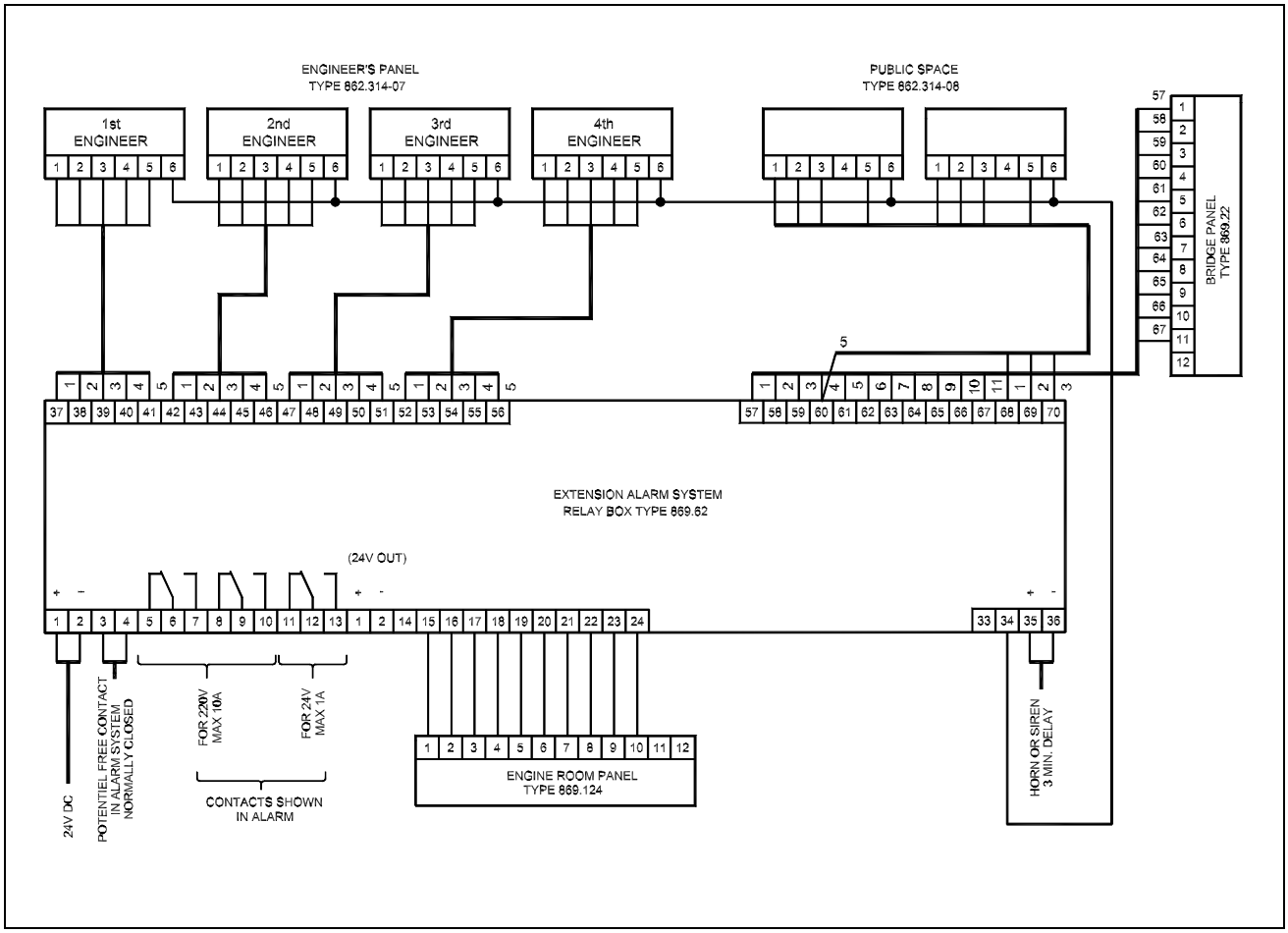
  Blue lens with white text:
  c. "DUTY" (engine room is unattended, an engineer is on duty)
- Buzzer
- Push-button: Reset of built-in buzzer

  (Does not affect a flashing "ALARM" indicator)

Relay box type 869.62
The relay box contains:

- Relay logics for control of connected panels
- Relay outputs for audible/visual alarm indicators (sirens, rotating beacons, etc.)
- Power supply for connected panels

Connections

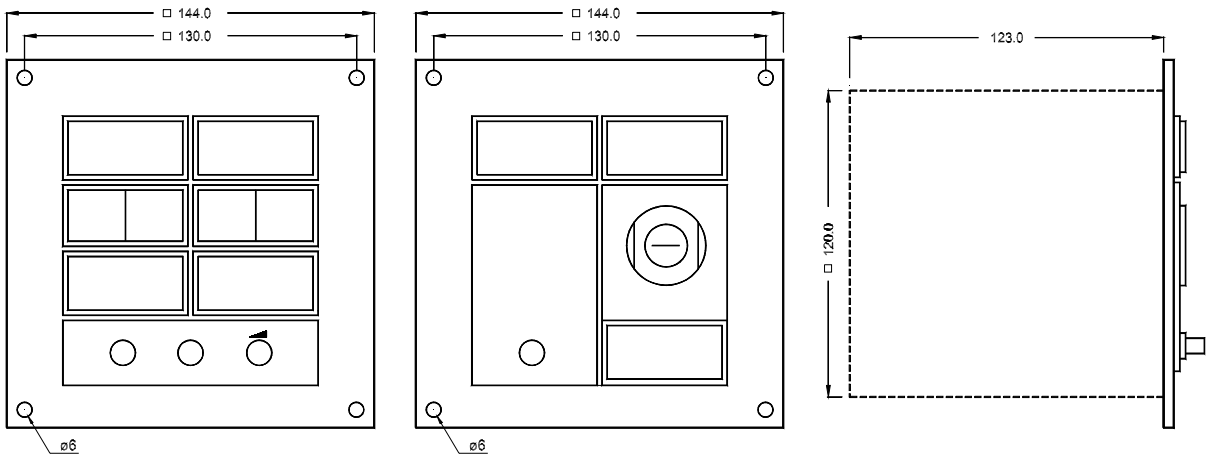


Technical specifications

Auxiliary voltage	24V DC ±20%	
Consumption	50W (for system consisting of 4 engineer's panels and 1 public space panel)	
Relay outputs	2 outputs: 1 output:	220V AC/10A (resistive load) 24V DC/1A (resistive load)
Solid state output	1 output with time delay:	24V DC/1.5A Time delay: 3 min.

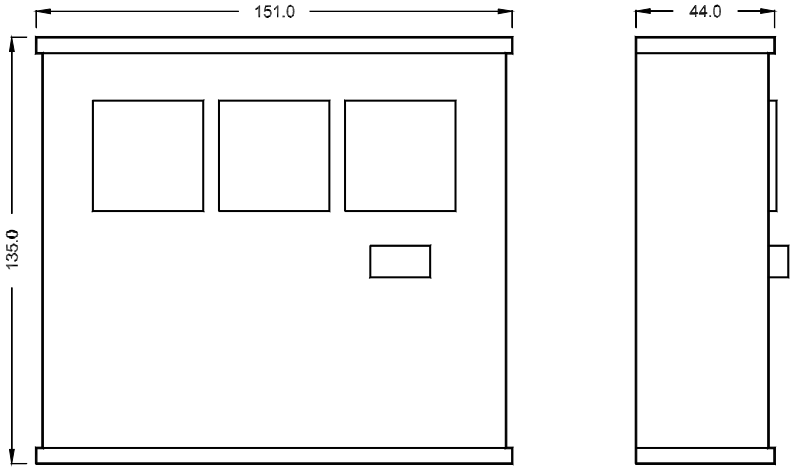
Dimensions

All dimensions in mm



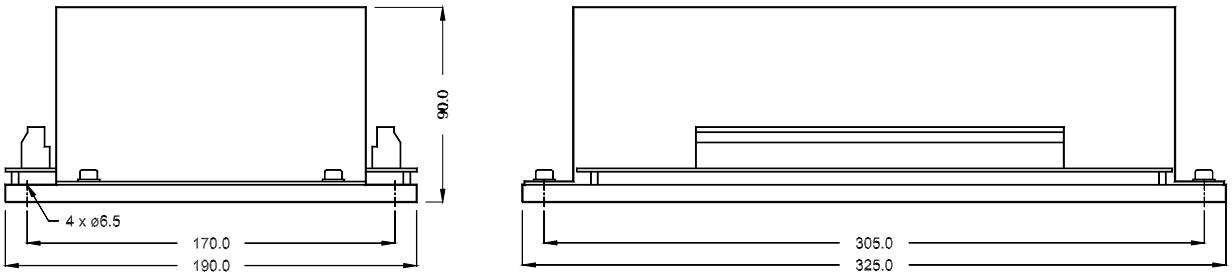
Type 869.124 and 869.22 Weight: approx. 0.740 kg (869.124) and approx. 0.790 kg (869.22)

All dimensions in mm



Type 862.314-07 and 862.314-08 Weight: approx. 1.160 kg

All dimensions in mm



Type 869.62 Weight: approx. 3.200 kg

Order specifications

Type	**(Customer specified text/lens colour)**

Due to our continous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

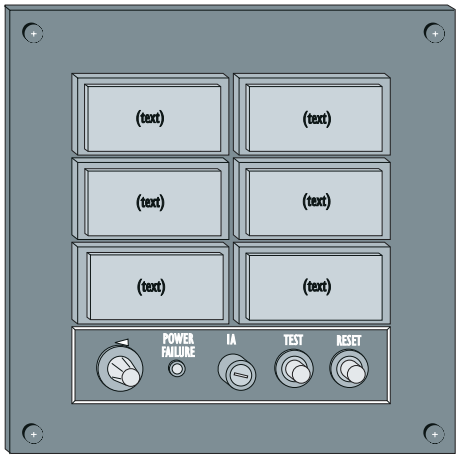
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

Group alarm panels

Types MALLING 869.25/4, 869.25/6, 869.26/4, 869.26/6

4921250039B



- *For indication of group alarms from the engine room to the bridge/accomodation*
- *Central reset of audible alarm*
- *Supervision of power supply*
- *Slave panels applied for further alarm groups or for alarm indication in the accomodation*
- *Custom-designed text on lenses*

CE

Application

The group alarm panels types MALLING 869.25/.. and 869.26/.. are applied in conjunction with a MALLING 845 alarm and monitoring system for remote indication (e.g. on the bridge) of a prearranged group of alarms.

Group alarm panels types 869.25/4 and 869.25/6

The group alarm panels are available for 4 group alarms (type 869.25/4) or 6 group alarms (type 869.25/6), containing:

4 (or 6) red group lamps	for indication of the faulty alarm group
"RESET" push-button	for cancellation of the audible alarm
"TEST" push-button	for lamp test
"POWER FAILURE" LED	for indication of power failure
Adjusting knob	for dimming of the group lamps
"1A" fuse	Fuse, exchangeable from the front
Buzzer	for release of an audible alarm

On the group alarm panels (e.g. on the bridge) the audible alarm is cancelled, whereas the individual alarms are reset on the individual panels, from which they were released.

If fed by an external voltage supply unit (24V AC/DC) the group alarm panels types 869.25/.. can be applied for supervision of the power supply of the system as well. The built-in relay and the buzzer will then be activated and the LED marked "POWER FAILURE" will flash, should the supply voltage drop out.

Slave group alarm panels types 869.26/4 and 869.26/6

These slave panels are often placed in the accomodation, e.g. in the 1st engineer's cabin, enabling identification of the alarm group, for which the audible alarm has been released. Slave panels are furthermore applied as extension units, where more than 6 alarm groups are required. The slave group alarm panels are only equipped with:

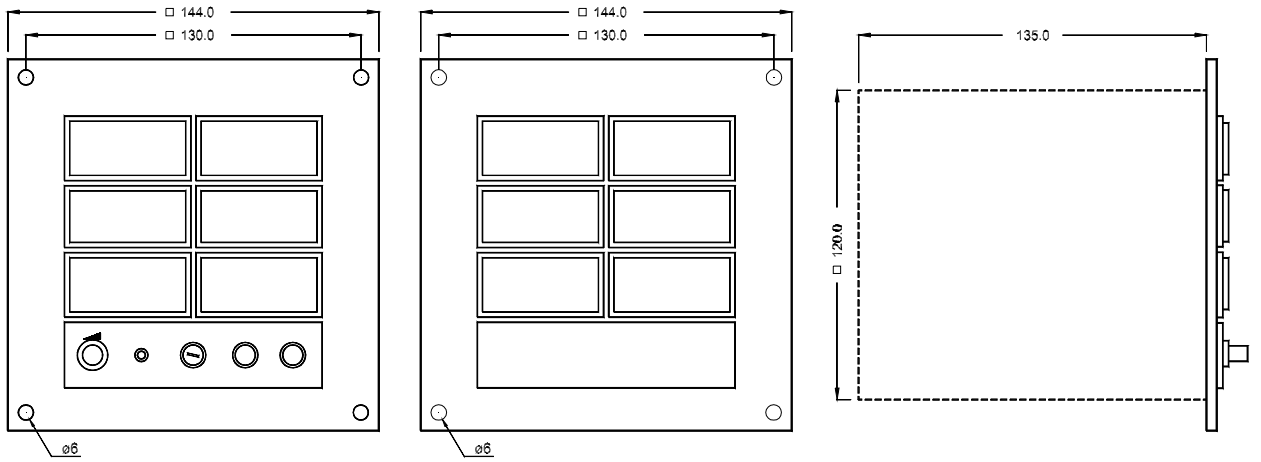
4 (or 6) red group lamps	for indication of the faulty alarm group

Technical specifications

Power supply	24V DC ±20% / 100mA per channel
- separate power supply	For supervision of power supply: 24V AC/DC ±20% / 300mA

Dimensions

All dimensions in mm



Types 869.25/4, 869.25/6, 869.26/4, 869.26/6 Weight: approx. 1.010 kg

Order specifications

Type	**(Customer specified lens text)**

Due to our continous development we reserve the right to supply equipment which may vary from the described.

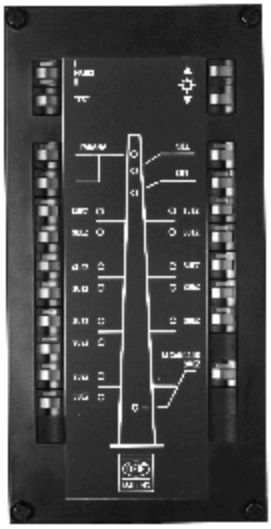
DEIF A/S, Frisenborgvej 33
DK-7800 Skive, Denmark

Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

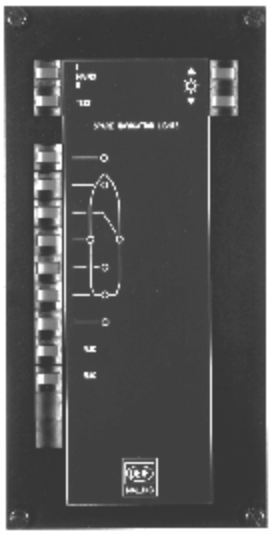
Lantern control panels

Type 827

4921250023C



827.72/18 Signal lights



827.74/09 Navigation lights

- *Compact control panel with push-buttons, pilot lamps (LEDs) and acoustic alarm*
- *Control of up to 22 navigation or signal lights*
- *Automatic change-over to alternative voltage supply*

Available types

Type	**827.72..**	**827.721..**	**827.74..**
Voltage	220V AC	115V AC	24V DC

Application

The lantern control panels types 827 are intended for control and supervision of ships' lanterns. The lanterns (navigation and signal lights) are switched on and off either collectively or individually from the control panel in question.

The supervision includes the 2 fuses of each lantern, the connections to the individual lanterns plus the filaments in the lantern lamp bulb. Furthermore, presence of the supply voltage for the lanterns is also supervised. The lantern control panels are CE marked for residential, commercial and light industry plus industrial environment.

The lantern control panels types 827 are designed according to the international rules of SOLAS (Safety of Life at Sea) and their requirements to control, supervision and supply of navigation lights (position lanterns) from independent panels.

The same panels may also because of their compact construction to advantage be used for signal lights (Suez, Japanese Ocean, Panama, etc.).

Supply sources

Normally 2 alternative supply sources are required for control panels for navigation lights: usually the ship's control board and its emergency control board, or possibly a battery.

Should the normal 220V AC supply (I) fail, the lantern control panels automatically switch (no manual action needed) to the connected alternative 220V AC supply (II).

External alarm equipment, as e.g. the bridge alarm system may be activated via the relay contact for FAULT and POWER FAILURE.

Fault conditions

The condition of the lanterns is indicated by control lamps, i.e. coloured LED's (light emitting diodes).

Fault	**Indication**	**Action**
Filament lamp breaks or fuse blows	LED for defective lantern circuit flashes (full light intensity)	FAULT relay is activated. Acoustic alarm is released (buzzer sounds).
Lantern wire breaks (i.e. no light in lanterns which should be switched on)	LED for defective lantern circuit flashes (full light intensity)	FAULT relay is activated. Acoustic alarm is released (buzzer sounds).
Power supply failure (Only one of the power supplies fails)	LED marked "POWER I" is switched off and LED marked “POWER II” is switched on.	The alternative power supply takes over the supply of the lanterns. The POWER FAULT relay is activated as a warning that at least one of the two power supplies I or II has failed.
Power supply failure (Both power supplies fail)	All LED’s are switched off - including LED’s marked “POWER I” and “POWER II”	A built-in battery ensures activation of the FAULT relay. Acoustic and external alarms are released (buzzer sounds).

Construction

The lantern control panel consists of:

a. A compact control panel for flush mounting in desk or panel front.

b. Multiple cables with plugs.

c. 1 or 2 relay boxes for base mounting inside the panel.

d. A power supply for base mounting inside the panel.

e. An external flasher relay for lanterns (optional).

This construction reduces the panel front space required to a minimum and enables direct connection of the lantern cables to the terminals of the relay box(es).

Additional functions

- Fast flasher relay, complying with Japanese regulations for vessels carrying dangerous cargo (red flashing lantern) and vessels of a length >200 metres (green flashing lantern).
- Electrical connection of more lanterns, e.g. double NUC (“Not Under Command”) lights.
- Manual mains change-over switch (GL).

Dimmer

The light intensity of the LED's of the control panel may be adjusted (8 steps) by pressing the 2 push-button at the top right corner:

▲ Upper push-button: Increases the light intensity.

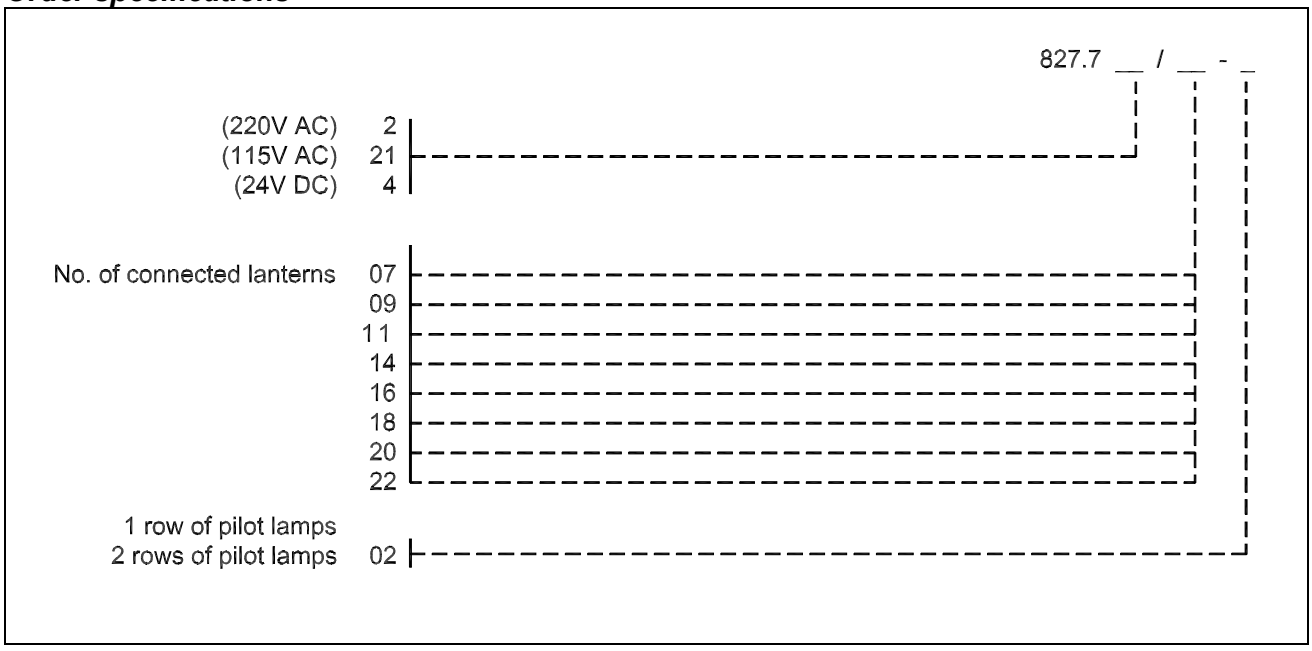
▼ Lower push-button: Decreases the light intensity.

This adjustment only affects the steady light of the LED's. The LED's flash with full light intensity to ensure clear indication of any defective lantern circuits.

Technical specifications

Lantern voltage	220V AC or 24V DC.
Lantern power	45...220W (220V AC), 25...115W (115V AC) or 25...85W (24V DC).
Voltage drop	<3%.
EMC	To EN 50081-1/2 and EN 50082-1/2
Materials	Control panel, relay box(es) and power supply are made out of corrosion protected iron sheet. Relay box(es) and power supply: yellow chromate coating. Control panel front: mat black finish. With engraved mimic diagramme according to application.
Protection	IP22 to IEC 529 and EN 60529

Order specifications

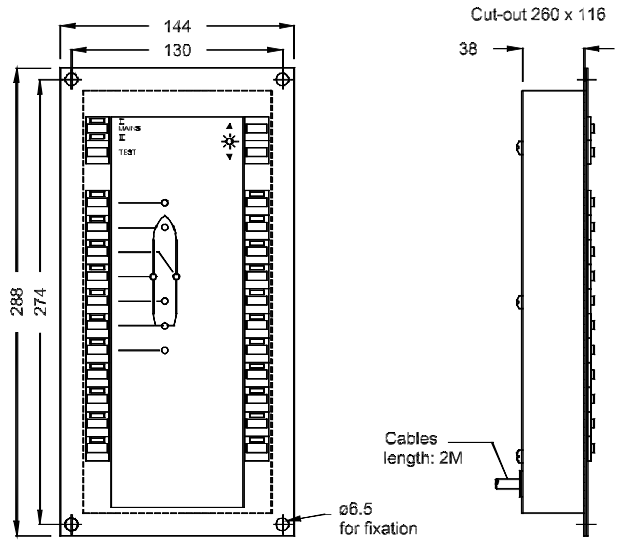


Order specifications: spare parts

Set of spare parts for	Types 827.72..	Types 827.74..
For 2 to 11 lanterns	Order type 827.72S11	Order type 827.74S11
For 12 to 22 lanterns	Order type 827.72S22	Order type 827.74S22

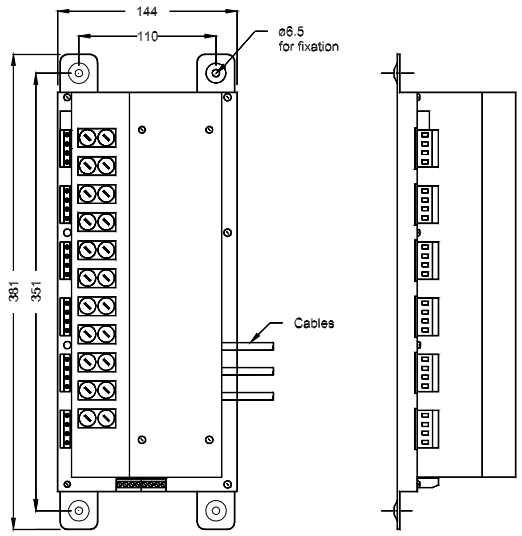
Dimensions

All dimensions in mm



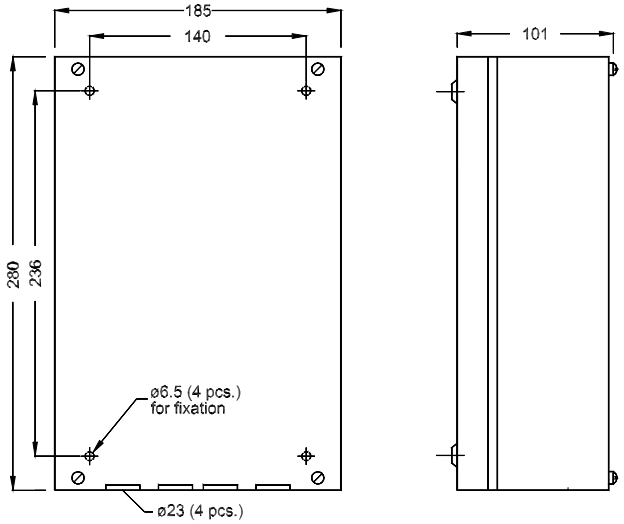
827 Control panel Weight: approx. 1.7 kg

All dimensions in mm



827 Relay box Weight: approx. 3.6 kg

All dimensions in mm



827 Power supply Weight: approx. 4.7 kg

Due to our continous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

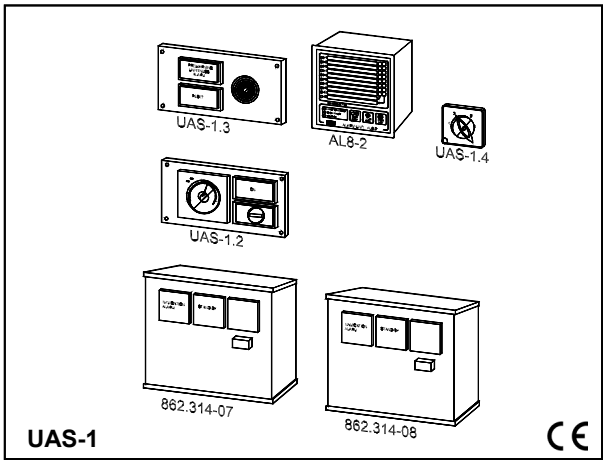
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

Unfitness and Alarm System

Type UAS-1

4921250041D

- ***One-man bridge alarm system***
- ***Easy to install***
- ***User-friendly operation***
- ***Handling of 38 binary alarm signals received from bridge equipment***
- ***Reset of system via bridge equipment***
- ***Call of up to 4 stand-by officers***



Application

The navigator's unfitness and alarm system type UAS-1 is a combined safety and binary alarm system, ensuring alarm release in case the navigator on duty is taken ill or is absent. At intervals of up to 15 min. the system must be reset. If not reset, an alarm sequence is initiated, resulting in prewarning signals, then subsequently an audible alarm in the cabin of the stand-by officer and eventually release of a general alarm.

Configuration

The navigator's unfitness and alarm system consists of:

AL8-2/M Alarm panel (master) (1 unit)
Registration of 1-8 binary alarm signals, with 1 output for activation of alarm extension system in the navigators' cabins and 1 output for transmission of internal fault. Location: bridge console. 1-2 channels are used for the calling system, 3-8 may be connected to other devices. May be programmed to N/O or N/C input, cable supervision with/without time delay.
AL8-2/S Alarm panel (slave) (0-4 units)
Connection of additional alarm channels. 8 additional channels per unit available. To be connected to AL8-2/M. 1 output for transmission of internal fault. Location: bridge console. All 8 channels may be connected to other devices. May be programmed to N/O or N/C input, cable supervision with/without time delay.
UAS-1.1 Prewarning control box (1 unit)
A combined junction box and timer for relaying signal to the UAS-1.3. Location: as required. 2 timers: Delay of buzzer signal and generating of flash signal in panels type UAS-1.3.
UAS-1.2 Timer unit (1 unit)
The dead-man alarm timer unit in Captain's office. 1 selector switch: (key-operated) for activation/de-activation of the dead-man alarm system. 1 timer: for delay of prewarning signals for type UAS-1.3 (normally set to 15 min.).
UAS-1.3 Prewarning panel (1-n units)
Visual and audial prewarning signals and reset push-button. Location: bridge. 1 push-button: "RESET" for reset of prewarning alarm. 1 lamp: "Prewarning unfitness alarm". Indication. 1 buzzer: Audible indication of prewarning.
UAS-1.4 Stand-by selector switch (1 unit)
Selection of stand-by officer. Up to 4 officers can be connected. Location: bridge console. 1 rotary switch for selection of the officer on stand-by duty.
869.62 Calling system relay box (1 unit)
Relaying of alarms to public spaces and officer's calling panels and to horn(s) in alleyway. Location: bridge console or accomodation. 1 relay logic: for relaying of alarm signal to public space panels and to the calling panel of the officer on duty. 3 min. alarm: for activation of horn(s) in alleyway(s).
862.314-07 Officer's calling panel (1-4 units)
Visual and audial call of stand-by officer. Location: officers' cabin. 2 lamps: a. "Navigation Alarm", b. "Stand-by". 1 buzzer: Activated, if the system has not been duly reset. 1 push-button: "RESET" for reset of the lamp and buzzer signal.
862.314-08 Public space panel (n units)
Visual and audial call of officers with local buzzer reset. Location: staff room, mess. 1 lamp: "Navigation alarm". 1 buzzer: Activated if the system has not been duly reset. 1 pushbutton: Local reset of buzzer.
849.041 Power supply unit (1 unit)
Power supply with back-up source and activation of output relay upon power failure. For base mounting inside a panel. Location: as required.

Alarm sequence

1. System is activated on the timer unit in the Captain's office. Reset within 15 min. on UAS-1.3.
2. Lamps mrk. "PREWARN" of panel(s) type UAS-1.3 on the bridge start flashing. To be reset within 15 sec. on UAS-1.3.
3. Buzzer of the prewarning panel(s) sounds and the timer for alarm on the alarm panel type AL8-2/M is started. To be reset within 15 sec. on UAS-1.3.
4. Alarm relay of AL8-2/M is activated and the second timer for transfer of alarm to stand-by officer is started. Local bridge alarm sounds. To be reset within 15 sec. on UAS-1.3 and AL8-2/M.
5. Relay "B" of alarm panel type AL8-2/M is activated. Buzzers in the stand-by officers' calling panels type 862.314-07 plus in all public space panels type 862.314-08 are released. Lamps mrk. "Navigation Alarm" in all panels start flashing. To be reset within 3 min. on UAS-1.3 and AL8-2/M.
6. Release of general alarm (e.g. release of horns in alleyways etc.). Reset on UAS-1.3 and AL8-2/M.

DEIF A/S

Technical specifications

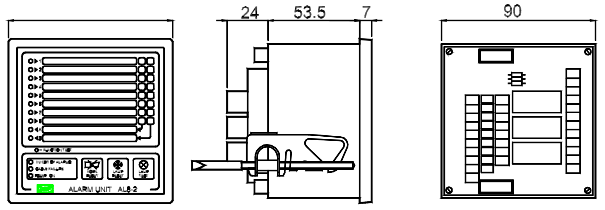
Alarm inputs (AL8): Max. signal, voltage/current:
6V (open contact), 6mA (closed contact)

Alarm outputs (AL8):
A, B and horn: relay output, 1 change-over switch each
Contact rating: 250V-2A-400W(AC).250V-1A-50W(DC)

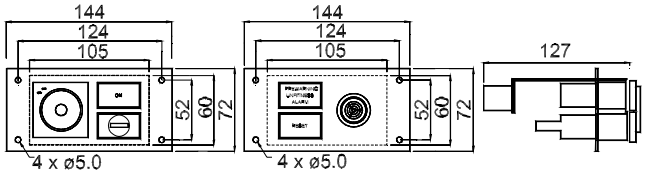
Voltage supply (849.041):
Primary supply: 110V AC or 230V AC +/-20%, 50/60Hz
Back-up supply: 24V DC -25/+30%
Power consumption: max. 70VA

Temperature: -10...55°C (nominal)
-25...70°C (operating)
-40...70°C (storage)

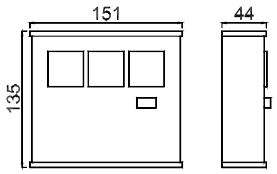
Dimensions (in mm)



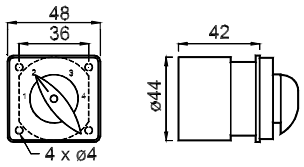
AL8-2M and AL8-2/S Weight: 0.390 kg



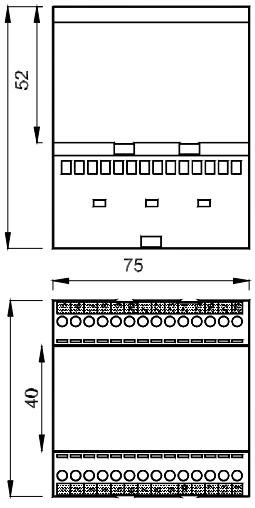
UAS-1.2 and UAS-1.3 Weight: 0.480 kg and 0.350 kg



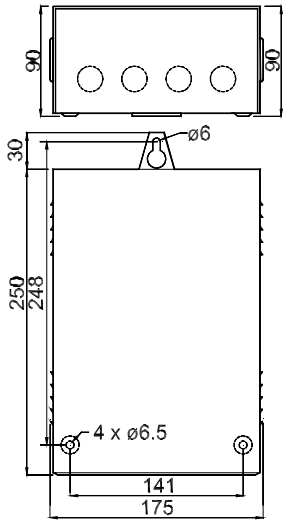
862.314-07 and 862.314-08
Weight: approx. 1.200 kg



UAS-1.4
Weight: approx. 0.080 kg

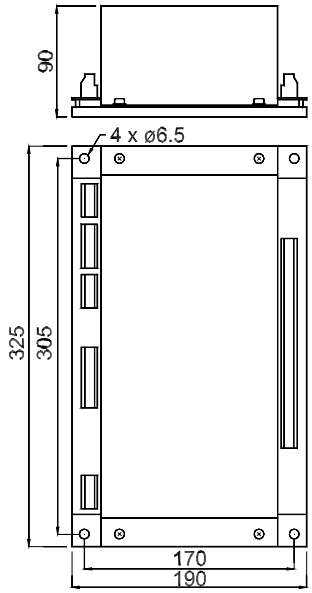


UAS-1.1
Weight: approx. 1.100 kg



849.041
Weight: approx. 5.100 kg

Dimensions (continued)



869.62 Weight: approx. 3.200 kg

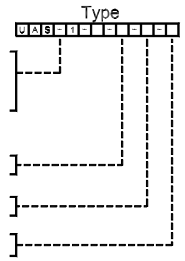
Order specifications

Basic system:
Consisting of:
1 off AL8-2/M alarm panel (6 alarm channels available)
1 off UAS-1.1 prewarning control box
1 off UAS-1.2 timer unit
1 off UAS-1.3 prewarning panel
1 off UAS-1.4 stand-by selector switch
1 off 869.62 calling system relay box
1 off 849.041 power supply unit

1...4 AL8-2/S alarm panel (each additionally 8 channels)

1...4 862.314-07 officers calling panel

Options:
1...n 862.314-08 public space calling panel



Due to our continous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

Wind measuring system

Type 879

4921250011E

- *Robust, seawater-proof construction*
- *Accurate read-out of wind direction/wind speed*
- *NMEA data-output (optional)*
- *1…3 instruments per sensor*
- *More than 300 references worldwide*

CE

Application

Wind measuring system 879 is a fast responding and accurate system, which is designed for measurement of wind velocity and wind direction on board ships, where the demands for reliability - especially under rough weather conditions - are high. Wind measuring system 879 is CE classified for residential, commercial and light industry plus industrial environment.

This system offers the advantage of reading the measuring results at several places on board, e.g. at control desks both on the bridge and on the bridge wings.

The indicating instruments may be provided with data output for serial transfer of measuring values to the navigation computer of the ship and/or to a personal computer.

The system indicates relative velocity and wind direction according to the speed and course of the ship. If indication of absolute velocity and wind speed is required, these values must be calculated manually or automatically by a computer connected to the system.

Construction

Wind measuring system 879 consists of two components: An **anemometer sensor** for measuring of the wind passing the mast of the ship plus an **instrument** for indication of velocity and wind direction.

Anemometer sensor type 879.3C

A combined sensor with 3-cup rotor for measuring of velocity and a vane for measuring of wind direction.

Placing: Ideally the wind sensor should be placed far from large objects which might influence the measuring results, however, in practice this is normally not possible on board a ship. The best result is achieved here by placing the sensor at the top of a mast at the opposite end of the superstructure.

Placing the sensor immediately above the superstructure is disadvantageous, especially where the superstructure consists of wide side faces, over which the wind is forced. This may result in turbulence, velocities and wind directions, which are out of proportion to the actual, undisturbed velocity and wind direction.

Connections: Supplied with 2 metres fixed cable. As the cable at the factory is connected to the sensor via a waterproof gland, it must not be replaced by another cable, may however be extended using a connecting box.

Installation cable: 4 x 0.75 mm^2 screened, length: Max. 300 metres, capacity: Max. 40nF between signal conductors.

Mounting: To enable demounting of the wind sensor, if this is needed later on, without necessitating a subsequent mechanical adjustment of the wind sensor, and furthermore to ensure correct ventilation of the wind sensor housing, the wind sensor has been designed for mounting on a tap (included on delivery).

This tap is first mounted on a pole/tube with an inner ¾ RG thread, and on this tap the wind sensor is then mounted.

However, if the wind sensor is mounted on a solid pole, not using the tap included on delivery, this pole must be designed to ensure adequate ventilation of the wind sensor housing.

Instrument type 879.50 or type 879.521

The indicating instrument (no moveable mechanical parts) is equipped with a digital display for indication of velocity plus a circle of red LEDs for indication of wind direction. On the display a ship's symbol plus graduation lines are printed.

The keyboard on the front of the instrument is provided with 3 push-buttons at the right for setting of:

Light intensity: The light intensity is adjusted to a suitable level by pressing the up arrow (▲)/down arrow (▼) keys to increase/decrease the light intensity (8 steps).

Read-out in "m/s"/"knots": The "MODE" push-button is used to change the measuring unit for the velocity between reading in m/s or knots. A red LED at the centre of the display is lit for the selected measuring unit at the centre of the display.

Technical specifications

Anemometer sensor type 879.3C
Sensor generally:

- Power supply:	5.5V ±20%	
- Power consumption:	8mA	
- Temperature range:	-40...+80°C	
- Electrical connection:	4 x 0.75 mm^2 screened cable between sensor and receiver	
- Materials:	Anemometer sensor housing:	Seawater-proof bronze
	Vane:	Fibre-reinforced polyurethane
	Counterweight:	Corrosion-resistant stainless steel
	3-cup rotor:	Fibre-reinforced polycarbonate
- Surface finish:	(Complete sensor):	Dual component lacquer
- Protection:	IP66, to EN 60529 and IEC 529	

Velocity section: Smooth-running cup anemometer with maintenance free optical scanning of rotor movement

- Measuring range:	0.35...80 m/s (metres per second)	
- Resolution:	0.11 m/s	
- Linearity:	0...10 m/s: 10...80 m/s:	±0.5 m/s ±5% of measured value
- Distance constant:	Max. 2.6 m	
- Rotor:	Polycarbonate	

Direction section: Vane consisting of polyurethane with counterweight. Optically scanned code disk and digital transmitter (UART)

- Measuring range:	0...360° continuously
- Resolution:	8 bit (1.41°)
- Accuracy:	±3° in relation to the wind direction

Instrument type 879.521

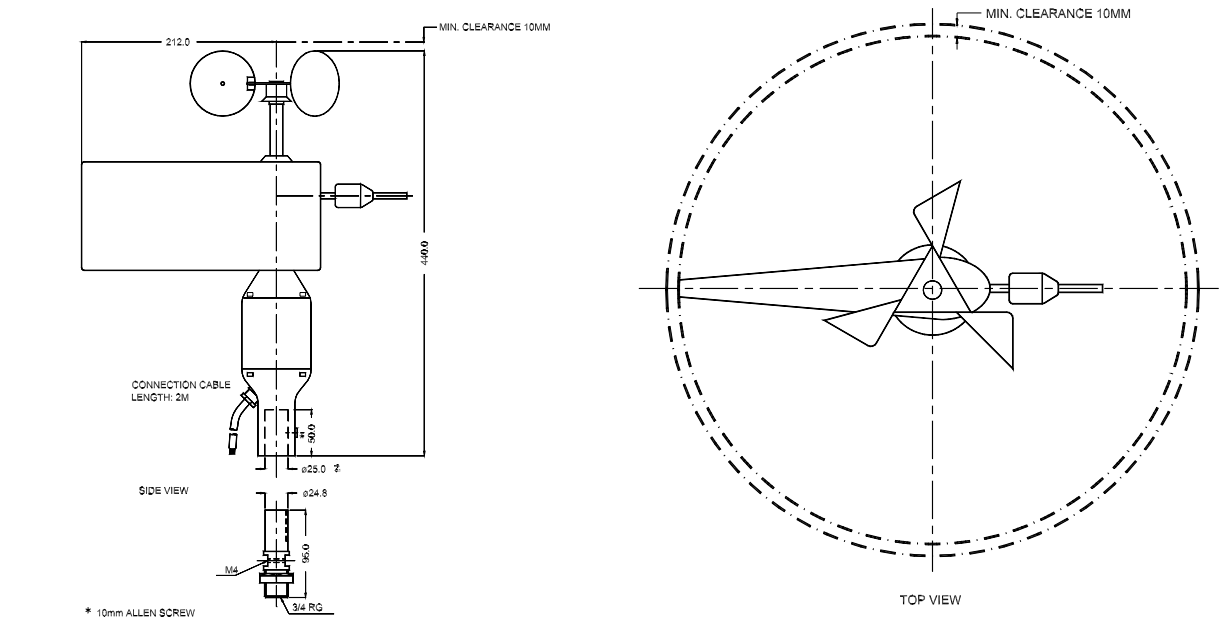
Number of LEDs in circle:	64 pcs
Display:	2½ digit luminous 7-segment display
m/sec. or knots:	Output of m/s or knots is changed by means of the "MODE" push-button
Power supply:	110 or 220V AC, 50-60Hz
Power consumption:	6W

Instrument type 879.50

Data-out (serial):	NMEA-0183 (EIA/RS422), version 2.x-3.0 or IEC 61162-1 Optional: NMEA-0183 version 1.5
Further specifications:	As for type 879.521

Dimensions/mounting: Wind sensor 879.3C

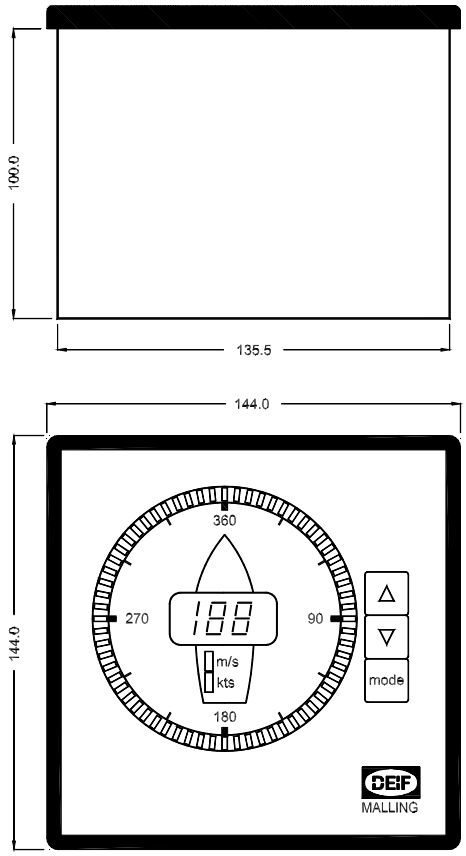
All dimensions in mm



879.3C Weight: Approx. 2.5 kg (Delivered in strong wooden box) **FIG.1**

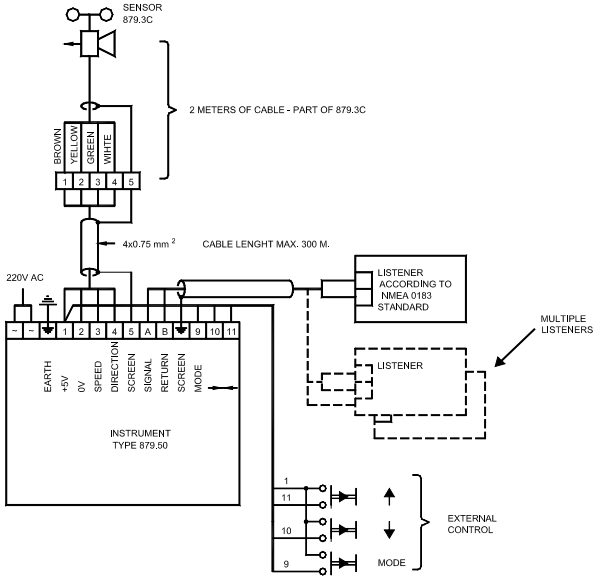
Dimensions: Instrument

All dimensions in mm



879.50/879.521 Weight: Approx. 1 kg

Connections



NOTE:
For further information, please refer to page 11 of the User's manual, document no. 1159040004.

FIG. 2

Order specifications

	Types	**Power supply**
Example:	879.3C, 1 off 879.50, 1 off 879.521	220V AC

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

Other Products

	Sirens (electrical), 212	Sirens (pneumatic), 208	
Description:	Electrical siren applicable for factories, ports, marine use etc.	Pneumatic siren applicable for factories, ports, marine use etc. For compressed air.	
Voltage (AC, DC)	24, 110, 220V AC/DC	-	
Air pressure:	-	3.5 atm., 5.5 atm., 8.5 atm.	
Consumption (Amps and Watt):	9.5, 1.9, 1.1, 3.4, 1.7A, 160, 270W	-	
m3/h:	-	9, 11, 13	
Frequency (Hz):	800, 1000	600, 800, 1000	
Sound pressure (1m dB):	110, 115	110, 114, 118	
Protection:	IP54 (upright mounting only)	IP54	

	Bells, 117	Bells, 118R	Bells, 124
Description:	White bakelite bell with dome of bright nickel plated steel, ø100mm.	Waterproof, grey bakelite bell with dome of grey enamelled steel, ø100mm.	Waterproof, black bell made out of corrosion protected light metal alloy with brass dome, ø200mm.
Voltage (AC, DC):	4, 6, 12, 24V DC 8, 12, 24V AC	4, 6, 12, 24V DC 8, 12, 24, 220V AC	12, 24, 110, 220V DC 24, 110, 220V AC
Coil resistance (Ohms):	1x4, 1x12, 1x50, 1x200	2x2.5, 2x5, 2x20, 2x80, 2000	2x9, 2x37, 2x25, 2x300, 2x1200
Consumption (Amps):	0.6, 0.3, 0.2, 0.1	0.5, 0.3, 0.2, 0.08, 0.03	0.4, 0.3, 0.1, 0.05
Sound pressure (1m dB):	90	93, 96	100
Protection:	IP20	IP54	IP54

DEIF A/S, Frisenborgvej 33, DK-7800 Skive, Tel.: +45 9614 9614, Fax: +45 9614 9615, E-mail: deif@deif.com, URL: www.deif.com

	Diaphragm horns, 172	Diaphragm horns, 173	
Description:	Robust and waterproof diaphragm horns applicable for use in engine rooms, factories etc.	Robust and waterproof diaphragm horns applicable for use in engine rooms, factories etc.	
Voltage (AC, DC)	12, 24, 110, 220V AC	24, 110, 220V DC	
Coil resistance (Ohms):	2x1.5, 2x7, 2x50, 2x200	2x3, 2x50, 2x170	
Consumption (Amps):	1.6, 0.8, 0.6, 0.3	1.2, 0.6, 0.3	
Frequency (Hz):	300	100	
Sound pressure (1m dB):	100	100	
Protection:	IP54	IP54	

	Rotating Beacons, 754H		
Application:	Designed for visual warning in engine rooms in ships etc. Long life, robust construction. Available colours of dome: red, amber, blue.		
Sections:	-		
Illumination:	Halogen lamp H1 24V, 70W		
Voltage:	24V DC, 110V AC, 220V AC		
Cable entry:	-		
Consumption:	70W		
Transformer:	Built-in transformer for 220V AC and 110V AC mains		
Mounting:	Upright, vertical and pendent		
Protection:	IP54		

DEIF A/S, Frisenborgvej 33, DK-7800 Skive, Tel.: +45 9614 9614, Fax: +45 9614 9615, E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

Bells

Type 117, 118R, 124

4921200005C

117

118R

124

- Types 118R and 124 waterproof
- For AC and/or DC voltages
- Typical voltages: 6…12…110…220V
- Sound pressures: 90dB…93dB…96dB…100dB

Description

Type 117 White bakelite bell with dome of bright nickel plated steel, ø100 mm.

Type 118R Waterproof, grey bakelite bell with dome of grey enamelled steel, ø100 mm.

Type 124 Waterproof, black bell made out of corrosion protected light metal alloy with brass dome, ø200 mm.

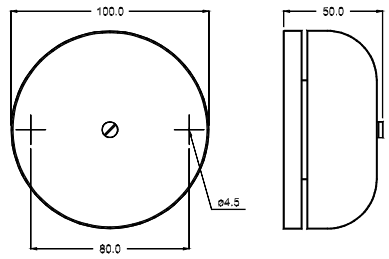
Technical specifications

	Type	Voltage		Coil resistance	Consumption	Sound pressure	EAN. No.
		=/DC	-/AC	(Ohms)	(Amps)	1m dB)	
Bell	117.4	4	8	1 x 4	0.6	90	5703727000012
	117.6	6	12	1 x 12	0.3	90	5703727000029
	117.12	12	24	1 x 50	0.2	90	5703727000036
	117.24	24		1 x 200	0.1	90	5703727000043
Bell (Waterproof)	118R4	4	8	2 x 2.5	0.5	93	5703727000111
	118R6	6	12	2 x 5	0.3	93	5703727000128
	118R12	12	24	2 x 20	0.2	93	5703727000135
	118R24	24		2 x 80	0.08	96	5703727000142
	118R220		220	1 x 2000	0.03	96	5703727000166
Bell (Waterproof)	124.12	12		2 x 9	0.4	100	5703727000210
	124.24	24		2 x 37	0.3	100	5703727000227
	124B24		24	2 x 25	0.3	100	5703727000234
	124.110	110	110	2 x 300	0.1	100	5703727000241
	124.220	220	220	2 x 1200	0.05	100	5703727000258

Temperature: -10...55°C (nominal), -25...60°C (operation), -40...70°C (storage).
Protection: Type 117: IP20, to EN 60529 and IEC 529.
Types 118R, 124: IP54, to EN 60529 and IEC 529.
EMC: To EN 50081-1/2 and EN 50082-1/2. CE marked for residential, commercial and light industry plus industrial environment.

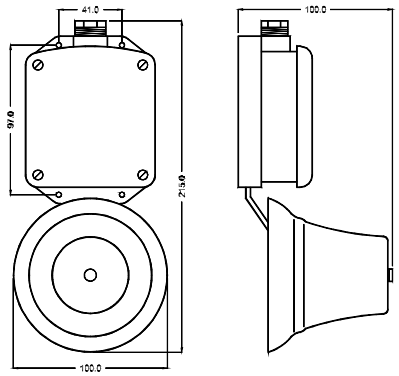
Dimensions

All dimensions in mm



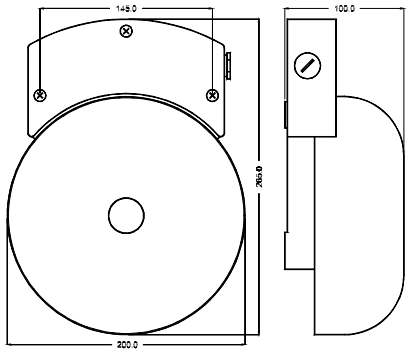
Type 117 Weight: approx. 0.4 kg

All dimensions in mm



Type 118R Weight: approx. 0.5 kg

All dimensions in mm



Type 124 Weight: approx. 4.6 kg

Order specifications

	Type	Voltage	(EAN No.)
Example:	118R220	220V AC	5703727000166

Due to our continous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

Diaphragm horns

Types 172, 173

4921200008C

- *Extremely reliable, thoroughly tested mechanical construction*
- *Protection: IP54*
- *Sound pressure: 100dB*
- *For AC or DC voltages: 12…24…110…220/230V*
- *For engine rooms, factories etc.*

CE

Description

The diaphragm horns types 172 and 173 are typically applied in engine rooms, factories, etc. where a robust, waterproof audial indicator giving a loud and clear signal is needed.

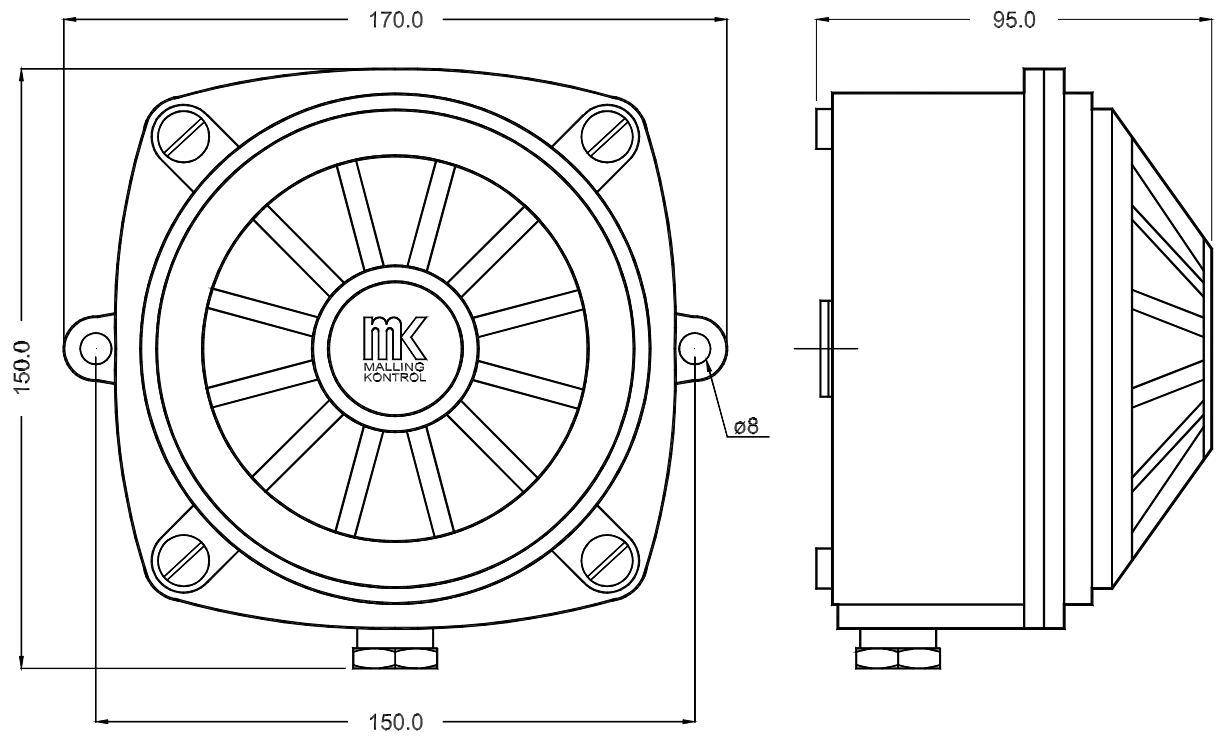
Technical specifications

Type	Voltage		Coil resistance	Consumption	Frequency	Sound pressure	EAN No.
	=/DC	/AC	(Ohms	(Amps)	(Hz)	(1m dB)	
172.12	12		2 x 1.5	1.6	300	100	5703727000319
172.24	24		2 x 7	0.8	300	100	5703727000326
172.110	110		2 x 50	0.6	300	100	5703727000333
172.220	220		2 x 200	0.3	300	100	5703727000340
173.24		24	2 x 3	1.2	100	100	5703727000425
173.110		110	2 x 50	0.6	100	100	5703727000432
173.220		220/230	2 x 170	0.3	100	100	5703727000449

Protection: IP54, to EN 60529 and IEC 529.
EMC: To EN 50081-1/2 and EN 50082-1/2. CE marked for residential, commercial and light industry plus industrial environment.

Dimensions

All dimensions in mm



Types 172, 173 Weight: approx. 1.2 kg

Order specifications

	Type	Voltage	(EAN No.)
Example:	172.12	12V DC	5703727000319

Due to our continous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

Rotating beacons

Type 754H

4921200011C

754H (optical dome)

754H (Plain dome)

- *Long life*
- *Robust construction*
- *Wide range of applications*
- *Suitable for marine use*
- *220/230V AC, 110V AC, 24V DC*

CE

Application

The rotating beacon type 754H is designed for visual warning on engine alarm and fire alarm in engine rooms in ships. It is also suitable for noisy factory premises and dangerous work sites.

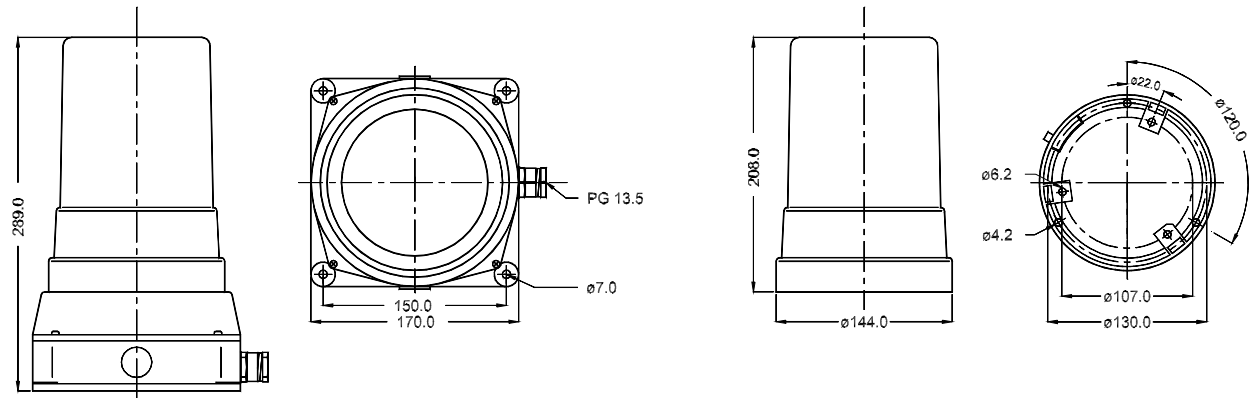
Technical specifications

Consumption:		70W.
Illuminant:		Halogen lamp H1 24V, 70W.
Transformer:		For 220V AC and 110V AC built-in. May be changed by means of jumpers.
Mounting:		For upright, vertical and pendant mounting.
Test voltage:		2kV - 50Hz - 1 min.
Suppression:		Motor: To VDE 0879 class 3, suppression level 5.
Ambient temperature:		-10...55°C (nominal), -25...60°C (operating), -40...60°C (storage).
Materials:		Foot: Black corrosion protected cast light metal alloy.
		Base: Black reinforced plastic.
		Dome: Red, amber with optical pattern, blue.
Connections:	754H110, 754H220:	Built-in screw terminals, cable dimensions: 2.5 mm^2. Earth terminal built-in.
	754H24:	Spade plugs 6.3 mm.
Protection:		IP54, to EN 60529 and IEC 529.
EMC:		To EN 50081-1/2 and EN 50082-1/2. CE marked for residential, commercial and light industry plus industrial environment.

Type	Supply voltage	With/without foot	Dome		Cable entry	EAN No.	Weight kgs
			Colour	Pattern			
754H110/**2**	110V AC	With foot	Red	Plain	1 cable gland PG 13.5 2 hole plugs PG 13.5 Cable diametre: max. Ø13.5 mm	5703727000715	3.4
754H110/**4**			Amber	Optical		5703727000722	
754H110/**6**			Blue	Plain		5703727000739	
754H220/**2**	220/230V AC	With foot	Red	Plain		5703727000746	
754H220/**4**			Amber	Optical		5703727000753	
754H220/**6**			Blue	Plain		5703727000760	
754H24/**2**	24V DC	Without foot	Red	Plain	Through fixing plate (open bottom)	5703727000777	0.85
754H24/**4**			Amber	Optical		5703727000784	
754H24/**6**			Blue	Plain		5703727000791	

Dimensions

All dimensions in mm



754H With foot Without foot

Order specifications

Type	(EAN No.)

Due to our continous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

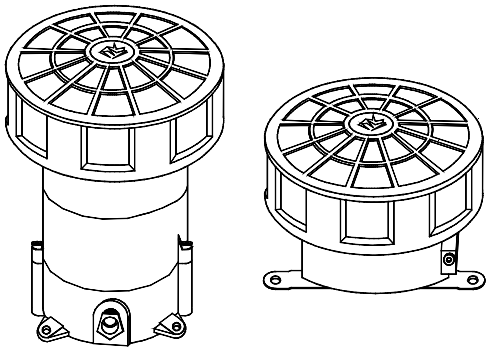
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

Types 212 and 208

Sirens

4921200002C

- ***Extremely reliable***
- ***Enclosure to IP54***
- ***Sound pressures 110…118dB***
- ***Voltages 24…220V***
- ***For compressed air or CO_2 (type 208)***
- ***Pendant or upright mounting***



212, 208

CE

Application

The sirens types 212 and 208 may be used for all applications, as e.g. factories, ports and for marine use.

The DEIF sirens were previously manufactured by the company MALLING. The MALLING marine products were widely recognized for their applicability and reliability, being thorougly tested and very robust.

The DEIF sirens combine these advantages with an updating of the construction to ensure that the sirens now are designed to meet the latest requirements of the Machinery Directive and of the EMC Directive.

Type 212

An electrical siren, available with sound pressures 110dB or 115dB, for voltages from 24V...220/ 230V AC/DC.

Type 208

A pneumatic siren, specifically designed for compressed air or carbon dioxide (CO2), fitted with an air adjusting screw. Connected to a CO2 system with a pressure of up to 50 atm., the supply has to be reduced, until a suitable signal is obtained.

DEIF A/S

Technical specifications

Electrical siren type 212.8…

Type	**212.8.24**	**212.8.110**	**212.8.220**
Voltage	24V AC/DC	110V AC/DC	220/230V AC 220V DC
Consumption	9.5A 160W	1.9A 160W	1.1A 160W
Frequency	800Hz	800Hz	800Hz
Sound pressure	110dB 1 m	110dB 1 m	110dB 1 m
EAN No. 5703..	727000517	727000524	727000531

Electrical siren type 212.10…

Type	**212.10.110**	**212.10.220**
Voltage	110V AC/DC	220/230V AC 220V DC
Consumption	3.4A 270W	1.7A 270W
Frequency	1000Hz	1000Hz
Sound pressure	115dB 1 m	115dB 1 m
EAN No. 5703..	727000555	727000562

Pneumatic siren type 208

Air pressure	3.5 atm. 5,5 atm. 8.5 atm.
m3/h	9 11 13
Frequency	600Hz 800Hz 1000Hz
Sound pressure	110dB 1 m 114dB 1 m 118dB 1 m
EAN No. 5703..	727000616

EMC: EN 50081-1/2 and EN 50082-1/2

Materials: Corrosion protected enamelled light metal.

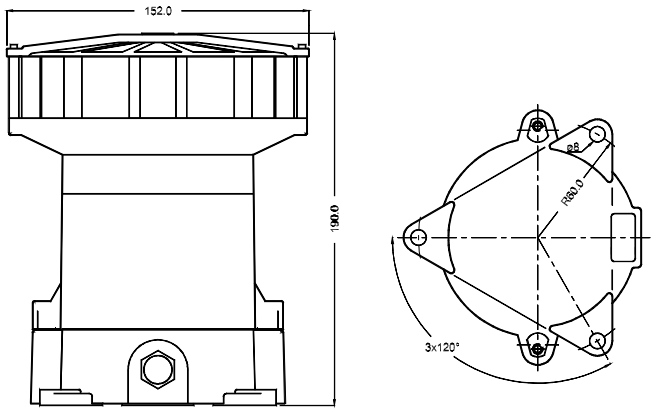
Connections: Type 208: ¼" WRG.

Protection: IP54 to IEC 529 and EN 60529.
(Type 212: upright mounting only).

Mounting: Pendant or upright.

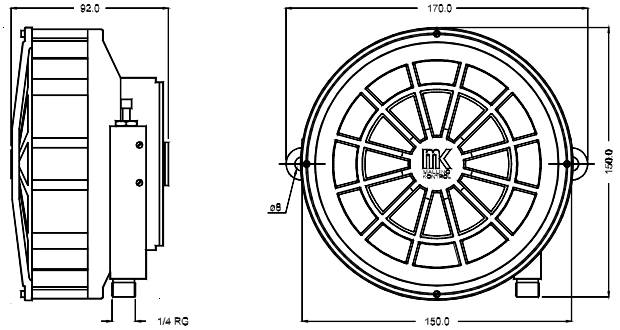
Dimensions (in mm)

Type 212



Weight: approx. 2.3 kg

Type 208



Weight: approx. 1.3 kg

Order specifications

Type - (voltage)
Examples:
212.8.220 – 220/230V AC

Due to our continous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

Switchboard Instrumentation

	Battery Charger, DCP2-1205	Battery Charger, DCP2-2405	Battery Charger, DCP2-1210
Main function:	The DCP2 can be applied as battery charger or as a universal DC voltage supply.	The DCP2 can be applied as battery charger or as a universal DC voltage supply.	The DCP2 can be applied as battery charger or as a universal DC voltage supply.
Input voltage:	1 x 230V AC ±15% 47...63Hz	1 x 230V AC ±15% 47...63Hz	1 x 230V AC ±15% 47...63Hz
Output voltage:	12V DC (adjustable 11.8…13.8V DC)	24V DC (adjustable 23.5…27.5V DC)	12V DC (adjustable 11.8…13.8V DC)
Output current:	5A (typical current limit 6A)	5A (typical current limit 6A)	10A (typical current limit 12.5A)
Protection:	IP20	IP20	IP20
Size:	147 x 123 x 86 mm	147 x 123 x 86 mm	205 x 123 x 86 mm
Weight:	approx. 0.8 kg	approx. 0.8 kg	approx. 1.2 kg

	Battery Charger, DCP2-2410	Battery Charger, DCP2-2420	Battery Charger, DCP2-2420
Main function:	The DCP2 can be applied as battery charger or as a universal DC voltage supply.	The DCP2 can be applied as battery charger or as a universal DC voltage supply.	The DCP2 can be applied as battery charger or as a universal DC voltage supply.
Input voltage:	1 x 230V AC ±15% 47...63Hz	1 x 230V AC ±15% 47...63Hz	3 x 400/480V AC ±15% 47...63Hz
Output voltage:	24V DC (adjustable 23.5…27.5V DC)	24V DC (adjustable 23.5…27.5V DC)	24V DC (adjustable 23.5…27.5V DC)
Output current:	10A (typical current limit 12.5A)	20A (typical current limit 25A)	20A (typical current limit 25A)
Protection:	IP20	IP20	IP20
Size:	205 x 123 x 86 mm	240 x 153 x 86 mm	240 x 153 x 86 mm
Weight:	approx. 1.2 kg	approx. 1.9 kg	approx. 1.9 kg

DEIF A/S, Frisenborgvej 33, DK-7800 Skive, Tel.: +45 9614 9614, Fax: +45 9614 9615, E-mail: deif@deif.com, URL: www.deif.com

	Battery Charger, DCP2-2440		
Main function:	The DCP2 can be applied as battery charger or as a universal DC voltage supply.		
Input voltage:	3 x 400/480V AC ±15% 47...63Hz		
Output voltage:	24V DC (adjustable 23.5…27.5V DC)		
Output current:	40A (typical current limit 45A)		
Protection:	IP20		
Size:	292 x 185 x 130 mm		
Weight:	approx. 3.6 kg		

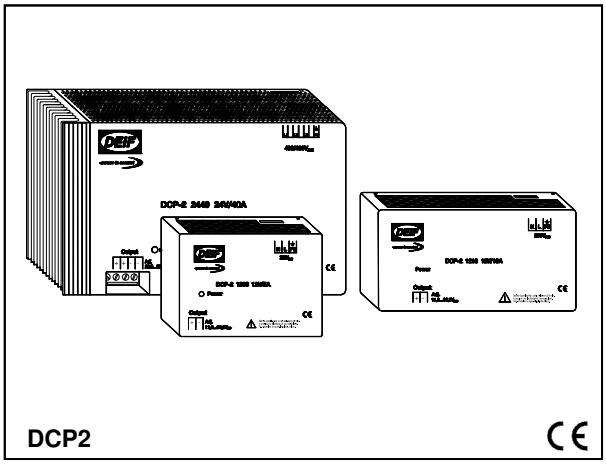
DEIF A/S, Frisenborgvej 33, DK-7800 Skive, Tel.: +45 9614 9614, Fax: +45 9614 9615, E-mail: deif@deif.com, URL: www.deif.com

Type DCP2

Battery charger/Power supply

4921210105F

- ***Easy installation - DIN-rail mounting***
- ***Automatic recovery from overload conditions***
- ***5-10-20-40A types***
- ***Switch mode power technology***
- ***Extremely low ripple <100mV***



DCP2 CE

Application

The DCP2 can be applied as battery charger or stabilized network component as a universal DC voltage supply. As battery charger parallel operation with other DC consumers is possible.

DCP2 as battery charger

As battery charger the DCP2 is applied to charge and to maintain the full-charge condition of closed or gastight 24V (12V) Pb batteries.

In parallel operation with a battery and other consumers the nominal power for the consumers is given until interruption from the battery, e.g. for the reason of recharging/maintenance.

DCP2 as network component (power supply)

As stabilized network component the DCP2 supplies connected consumers with a stabilized DC voltage.

Protection

The DCP2 is protected against continuous short circuit as well as continuous no-load operation. Further characteristics of the DCP2 are the high efficiency and the high voltage stabilization.

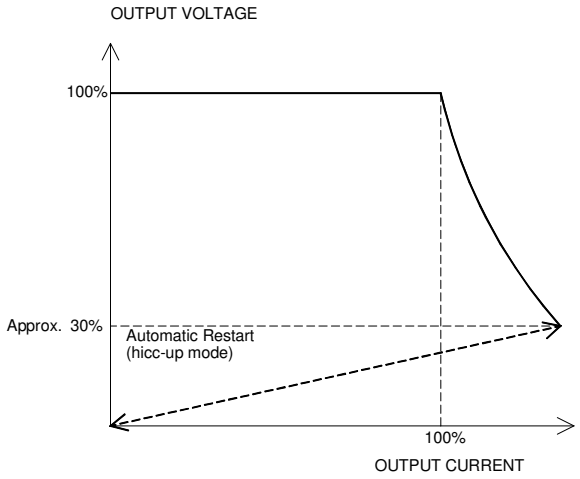
Principle/operation

Application as stabilized net unit (supply)

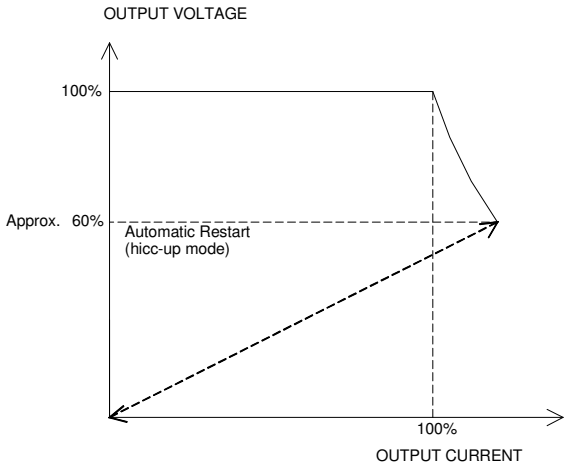
The DCP2 supplies a constant output voltage, according to setting, in the range of 23.5-27.5V DC respectively 11.8-13.8V DC (stabilized network component).

The output voltage is held constant as long as the load does not exceed the nominal current. A load exceeding the current limitation will automatically reduce the output voltage (see the curves in the next column). Typical current limit for each type is specified under Technical specifications, section Output current.

For 10A, 20A and 40A types:



For 5A types:



DEIF A/S

Type DCP2

Application as battery charger
When charging of a discharged battery is initiated, a high charging current will flow, which is limited and controlled by the DCP2. Voltage will immediately jump to approx. 2.1V per cell (12.6V for 12V types and 25.2V for 24V types).

Normally it is recommended from manufacturers of Pb batteries to obtain 2.25V per cell at temperatures up to 30°C, before the battery is fully charged and trickling can start. For a 12V Pb battery this gives a trickle charging voltage of 13.5V (2.25 x 6 cells) and 27V (2.25 x 12 cells) for 24V batteries.

According to information from battery manufacturers, the charging voltage must be reduced by higher ambient temperatures and increased by low temperature.

For that reason it is important to adjust the DC voltage output to the correct level according to the specification for connected batteries. In case the voltage is adjusted too high according to ambient temperature, gassing might occur and cause damage to the sealed battery. As opposed to this, a too low adjustment will cause an insufficient charging.

Factory setting of the output voltage is 26.8V DC for 24V types and 13.4V DC for 12V types.

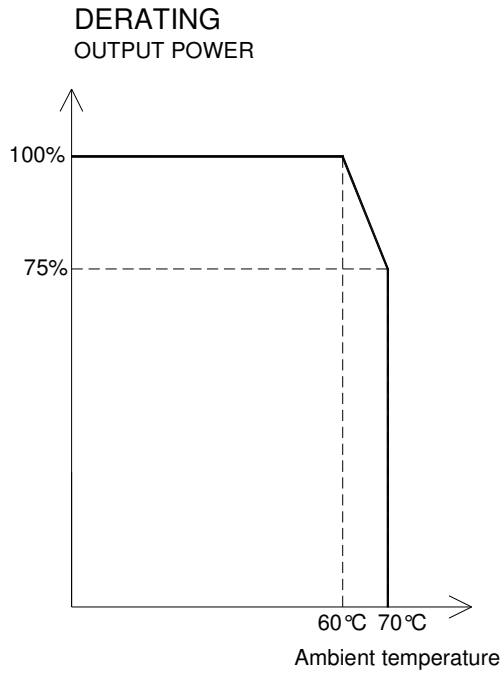
Charging

Charging is carried out according to an I/U characteristic.

When the charging voltage has reached the set value, charging will be with constant voltage. The charging current drops to trickle charging current in addition to the current for other connected consumers.

When reaching the trickle charging voltage the current drops, which prevents overcharge of the battery (no gassing).

At an ambient temperature >60°C the load capacity of the unit drops as illustrated below.



To prevent overheating of the unit, the consumer load must be reduced equivalently.

Type DCP2

Technical specifications

General data:

Duty ratio: Continuous duty is allowed

Cooling: Convection

Maintenance: None

Short circuit: Protected against continuous short circuit

No-load operation: Protected against continuous no-load operation

Mounting: DIN-rail, EN 50022-35

Installation: Wall mounted, input terminals placed at the top and output terminals at the bottom

Input voltage: DCP2-1205, -1210, -2405, -2410 and -2420:
1 x 230V AC ±15%

DCP2-2420 and -2440:
3 x 400/480V AC ±15%

Input current:

0.70A at 230V AC	DCP2-1205
1.32A at 230V AC	DCP2-1210
1.23A at 230V AC	DCP2-2405
2.20A at 230V AC	DCP2-2410
4.20A at 230V AC	DCP2-2420
3 x 1.50A at 3 x 400V AC	DCP2-2420
3 x 3.00A at 3 x 400V AC	DCP2-2440

Peak inrush current: <30A DCP2-1205, -1210, -2405, -2410
<50A DCP2-2420, -2440

Freq. range: 47...63Hz (supply)

Power factor cos φ:

DCP2-1205:
0.46 capacitive at 230V AC

DCP2-1210:
0.48 capacitive at 230V AC

DCP2-2420:
0.53 capacitive at 230V AC

DCP2-2405, -2410:
0.52 capacitive at 400V AC

DCP2-2420, -2440:
0.53 capacitive at 400V AC

Fuse:

DCP2-1205, -2405:
5 x 20 mm T3.15A/250V internal

DCP2-1210, -2410:
5 x 20 mm T6.3A/250V internal

DCP2-2420:
5 x 20 mm T10A/250V internal

DCP2-2420, -2440:
Three poles, C-fuse or motor circuit breaker
Switch - external (setting 3A)

Output voltage:

DCP2-12XX:
12V DC (adjustable 11.8…13.8V DC)
Factory setting 13.4V DC ±1%

DCP2-24XX:
24V DC (adjustable 23.5…27.5V DC)
Factory setting 26.8V DC ±1%

Output current:

DCP2-XX05:
5A (typical current limit 6A)

DCP2-XX10:
10A (typical current limit 12.5A)

DCP2-2420:
20A (typical current limit 25A)

DCP2-2440:
40A (typical current limit 45A)

Power output:

DCP2-1205	60W
Attention:	Max. output power 60W at adjustment 13.8V max. 4.3A
DCP2-2405	120W
Attention:	Max. output power 120W at adjustment 27.5V max. 4.3A
DCP2-1210	120W
Attention:	Max. output power 120W at adjustment 13.8V max. 8.6A
DCP2-2410	240W
Attention:	Max. output power 240W at adjustment 27.5V max. 8.6A
DCP2-2420	480W (1 phase supply)
Attention:	Max. output power 480W at adjustment 27.5V max. 17.4A
DCP2-2420	480W
Attention:	Max. output power 480W at adjustment 27.5V max. 17.4A
DCP2-2440	960W
Attention:	Max. output power 960W at adjustment 27.5V max. 34.8A

Output ripple: <100 mV_{pp}

Efficiency (typical):

DCP2-1205	82%	
DCP2-1210	83%	
DCP2-2405	86%	
DCP2-2410	89%	
DCP2-2420	88%	(1 phase supply)
DCP2-2420	90%	
DCP2-2440	90%	

Regulation:

Line regulation: <0.2% of output voltage at U_{in} ±15%

Load regulation: <1% of output voltage between 0 and rated current

Dynamics: <2 ms at a load distribution of 10 to 90% from rated current, peaks <2%

Hold-up time:

>80 ms at U_{in} =	230V AC	DCP2-XX05
>15 ms at U_{in} =	230V AC	DCP2-XX10
>15 ms at U_{in} =	230V AC	DCP2-2420
>5 ms at U_{in} =	400V AC	DCP2-2420
>5 ms at U_{in} =	400V AC	DCP2-2440

The determined time, during which a power supply/charger's output remains within a specified voltage range after its input ceases

Technical specifications, cont.

EMC: EN 61000-6-3
EN 61000-6-4
EN 61000-6-1
EN 61000-6-2
EN 61000-6-5

RFI suppression: According to VDE0875 T11/EN55011 class B

Static discharge ESD: 8kV contact discharge

IEC 1000-4-2: 15kV free air discharge

Electromagnetic fields: 10V/m according to IEC 1000-4-3

Burst IEC 1000-4-4: 4kV input
2kV output AC-coupled

Surge IEC 1000-4-5: 4kV asymmetrical
4kV symmetrical

Galvanic separation: 4.0kV - 50Hz - 1 min.
Between AC voltage, output and ground:
1.5kV DC between terminals Prim./Sec.
1.5kV DC between terminals Prim./Gnd.
0.5kV DC between terminals Gnd./Sec.

Safety: VDE0805/EN60950/IEC950

Protection: Class I

Deg. of protection: IP20

Leakage current: <0.75mA (47-63Hz line frequency)
(DCP2-2420 3 phase supply and DCP2-2440 <3.5mA)

Temperature: 0...70°C (operating, free convection)
-25...85°C (storage)

Reduction of output power: 2.5%/K above +60°C

Terminals: DCP2-1205, -1210, -2405 and -2410:
Primary max. 2.5 mm²
Secondary 2.5 mm²

DCP2-2420:
Primary max. 2.5 mm²
Secondary 4.0 mm²

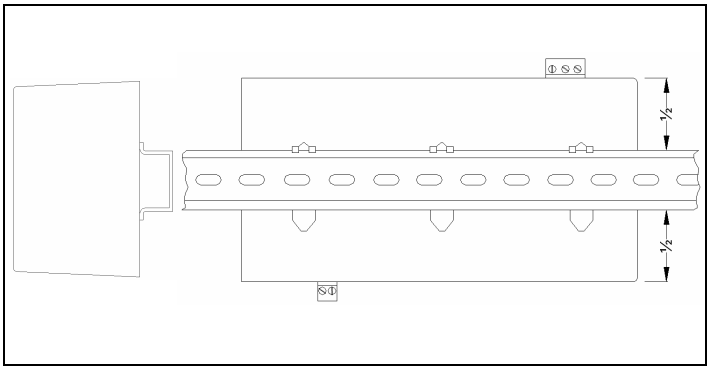
DCP2-2440:
Primary max. 2.5 mm²
Secondary 10.0 mm²

Indication: Green LED – operating indication

Housing:
Materials: All plastic parts are self-extinguishing to UL94 (V0)
DCP2-2440 is encapsulated in a metal housing

Dimensions: LxWxH
147 x 123 x 86 mm (DCP2-1205, -2405)
205 x 123 x 86 mm (DCP2-1210, -2410)
240 x 153 x 86 mm (DCP2-2420)
292 x 185 x 130 mm (DCP2-2440)

Mounting: DIN-rail, EN 50022-35



Distance for convection: 100 mm above and below the DCP2
30 mm to each side

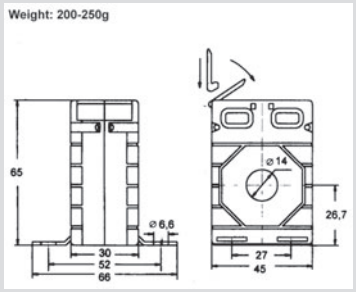
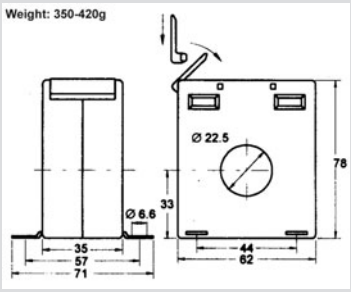
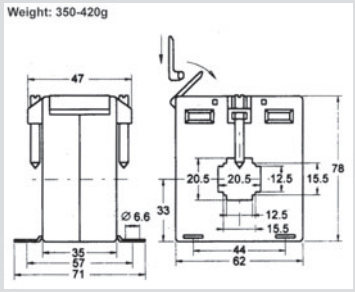
Weight:
DCP2-1205 0.7 kg
DCP2-2405 0.7 kg
DCP2-1210 1.0 kg
DCP2-2410 1.0 kg
DCP2-2420 1.4 kg
DCP2-2440 3.9 kg

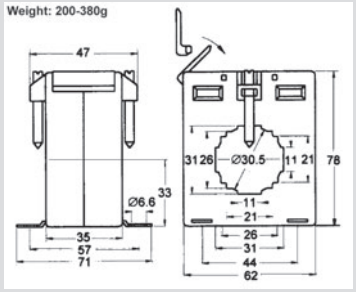
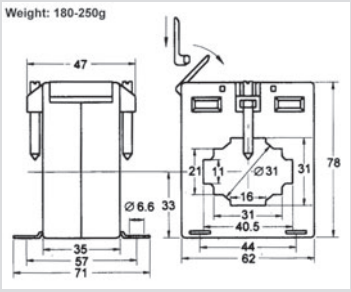
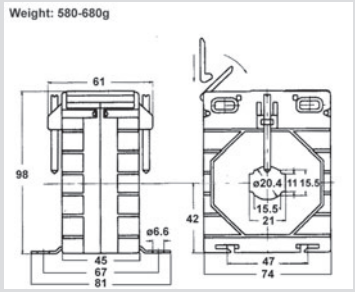
Order specifications

Type – output voltage – output current – supply
Example: DCP2 – 24V DC – 5A DC – 1 x 230V AC

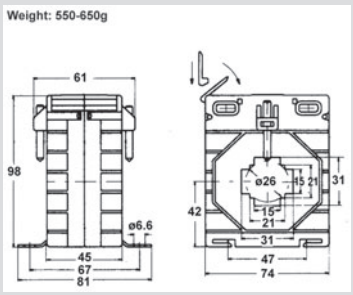
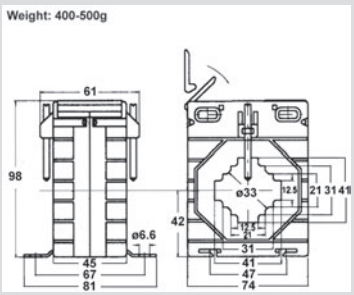
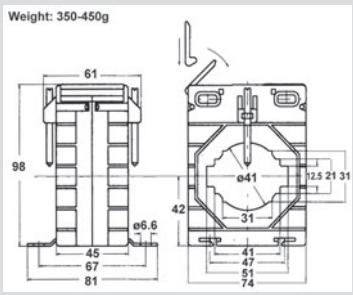
Due to our continuous development we reserve the right to supply equipment which may vary from the described.

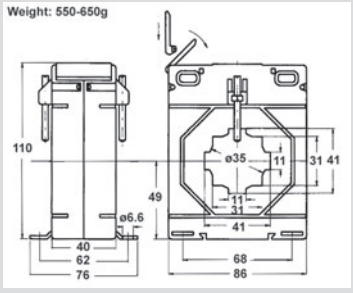
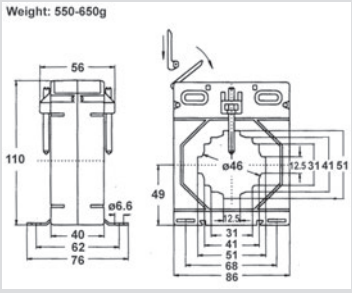
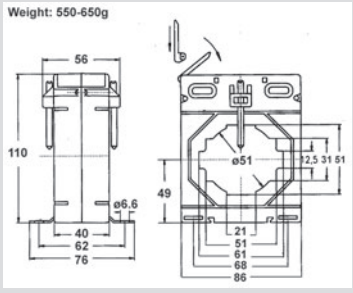
***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

	Current Transformers, MAK 45/14	Current Transformers, MAK 62/R	Current Transformers, MAK 62/20
			
Busbar dim. (mm):	Ø14	Ø22	20x10
Primary current (A):	40, 50, 60, 75, 80, 100, 120, 125, 150, 200, 250, 300	50, 60, 75, 80, 100, 120, 150, 200, 250, 300, 400, 500	50, 60, 75, 80, 100, 120, 125, 150, 200, 250, 300, 400, 500, 600
Secondary current 5A (1A on request):	v	v	v
Rated burden (VA):	1, 1.5, 2.5, 3.75, 5, 7.5, 10 depending on CT ratio	1.5, 2.5, 3.75, 5, 7.5, 10, 12.5, 15 depending on CT ratio	1.5, 2.5, 3.75, 5, 7.5, 10, 12.5, 15 depending on CT ratio
Special variant of the model available:	-	v	v
Accuracy class: 0.2-0.5-1-3	0.5-1-3	v	v
Voltage 720V AC:	v	v	v
Frequency: 50-60Hz		v	v
Security factor:	FS 5 depending on CT ratio	FS 5 or FS 10 depending on CT ratio	FS 5 or FS 10 depending on CT ratio
Std.: BS 3938, IEC 44-1 and DIN 42600	v	v	v

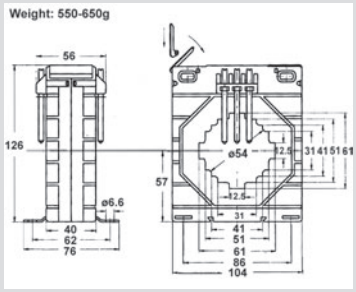
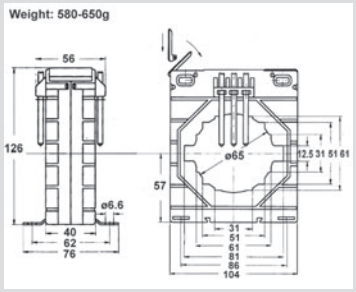
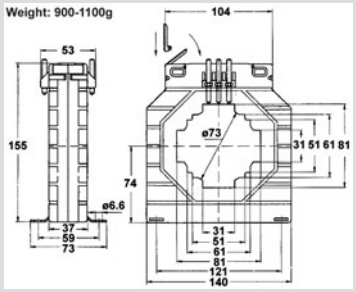
	Current Transformers, MAK 62/30	Current Transformers, MAK 62/40	Current Transformers, MAK 74/20
			
Busbar dim. (mm):	30x10	40x10	20x10
Primary current (A):	50, 60, 75, 80, 100, 120, 125, 150, 200, 250, 300, 400, 500, 600, 750, 800	100, 120, 125, 150, 200, 250, 300, 400, 500, 600, 750, 800	30, 40, 50, 60, 75, 80, 100, 120, 125, 150, 200, 250, 300, 400
Secondary current 5A (1A on request):	v	v	v
Rated burden (VA):	1, 1.5, 2.5, 3.75, 5, 7.5, 10, 12.5, 15 depending on CT ratio	1, 1.5, 2.5, 3.75, 5, 7.5, 10 depending on CT ratio	1.5, 2.5, 3.75, 5, 7.5, 10, 12.5,15, 20 depending on CT ratio
Special variant of the model available:	v	v	v
Accuracy class: 0.2-0.5-1-3	v	v	v
Voltage 720V AC:	v	v	v
Frequency: 50-60Hz	v	v	v
Security factor:	FS 5 or FS 10 depending on CT ratio	FS 5 depending on CT ratio	FS 5 or FS 10 depending on CT ratio
Std.: BS 3938, IEC 44-1 and DIN 42600	v	v	v

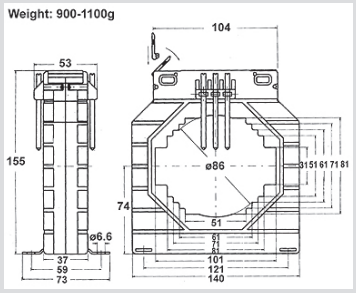
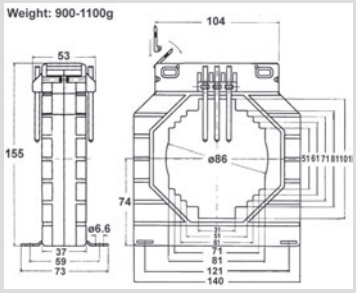
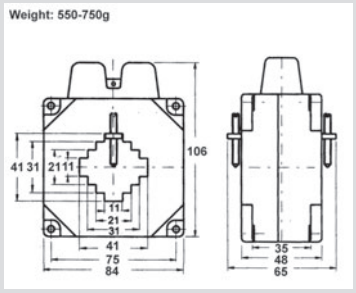
DEIF A/S, Frisenborgvej 33, DK-7800 Skive, Tel.: +45 9614 9614, Fax: +45 9614 9615, E-mail: deif@deif.com, URL: www.deif.com

	Current Transformers, MAK 74/30	Current Transformers, MAK 74/40	Current Transformers, MAK 74/50
			
Busbar dim. (mm):	30x10	40x10	50x10
Primary current (A):	30, 40, 50, 60, 75, 80, 100, 125, 150, 200, 250, 300, 400, 500, 600,750, 800	40, 50, 60, 75, 80, 100, 125, 150, 200, 250, 300, 400, 500, 600, 750, 800, 1000	100, 120, 125, 150, 200, 250, 300, 400, 500, 600, 750, 800, 1000
Secondary current 5A (1A on request):	v	v	v
Rated burden (VA):	1, 1.5, 2.5, 3.75, 5, 7.5, 10, 12.5, 15, 20, 30 depending on CT ratio	1, 1.5, 2.5, 3.75, 5, 7.5, 10, 12.5, 15, 20 depending on CT ratio	1.5, 2.5, 3.75, 5, 7.5, 10, 12.5, 15 depending on CT ratio
Special variant of the model available:	v	v	v
Accuracy class: 0.2-0.5-1-3	v	v	v
Voltage 720V AC:	v	v	v
Frequency: 50-60Hz	v	v	v
Security factor:	FS 5 or FS 10 depending on CT ratio	FS 5 or FS 10 depending on CT ratio	FS 5 or FS 10 depending on CT ratio
Std.: BS 3938, IEC 44-1 and DIN 42600	v	v	v

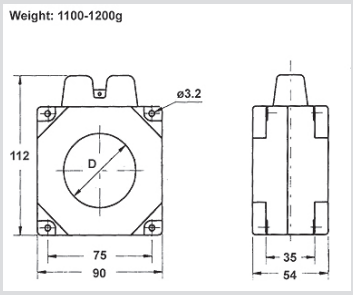
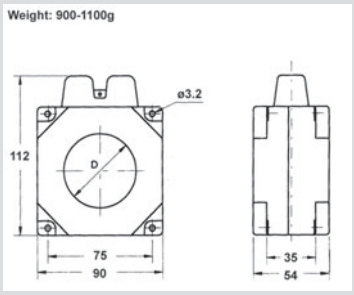
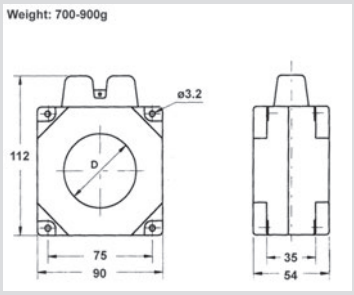
	Current Transformers, MAK 86/40	Current Transformers, MAK 86/50	Current Transformers, MAK 86/60
			
Busbar dim. (mm):	40x10	50x12,5	60x12,5
Primary current (A):	50, 60, 75, 80, 100, 120, 125, 150, 200, 250, 300, 400, 500, 600,750, 800, 1000	100, 120, 125, 150, 200, 250, 300, 400, 500, 600, 750, 800, 1000, 1200, 1250	100, 120, 125, 150, 200, 250, 300, 400, 500, 600, 750, 800, 1000, 1200, 1250, 1500, 1600
Secondary current 5A (1A on request):	v	v	v
Rated burden (VA):	1.5, 2.5, 3.75, 5, 7.5, 10, 12.5, 15, 20, 30 depending on CT ratio	1.5, 2.5, 3.75, 5, 7.5, 10, 12.5, 15, 20, 30 depending on CT ratio	1.5, 2.5, 3.75, 5, 7.5, 10, 12.5, 15, 20 depending on CT ratio
Special variant of the model available:	v	v	v
Accuracy class: 0.2-0.5-1-3	v	v	v
Voltage 720V AC:	v	v	v
Frequency: 50-60Hz	v	v	v
Security factor:	FS 5 or FS 10 depending on CT ratio	FS 5 or FS 10 depending on CT ratio	FS 5 or FS 10 depending on CT ratio
Std.: BS 3938, IEC 44-1 and DIN 42600	v	v	v

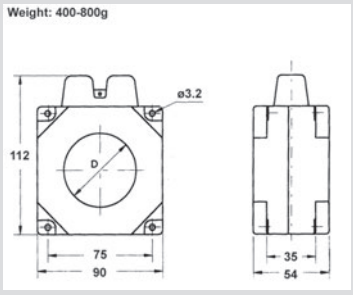
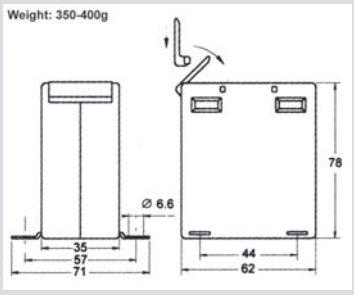
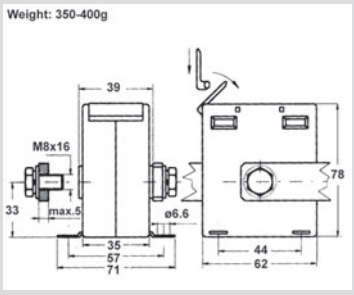
DEIF A/S, Frisenborgvej 33, DK-7800 Skive, Tel.: +45 9614 9614, Fax: +45 9614 9615, E-mail: deif@deif.com, URL: www.deif.com

	Current Transformers, MAK 104/60	Current Transformers, MAK 104/80	Current Transformers, MAK 140/80
			
Busbar dim. (mm):	60x12,5	80x12,5	2x80x10
Primary current (A):	100, 120, 125, 150, 200, 250, 300, 400, 500, 600,750, 800, 1000, 1200, 1250, 1500, 1600	200, 250, 300, 400, 500, 600,750, 800, 1000, 1200, 1250, 1500, 1600, 2000	200, 250, 300, 400, 500, 600,750, 800, 1000, 1200, 1250, 1500, 1600, 2000
Secondary current 5A (1A on request):	v	v	v
Rated burden (VA):	1.5, 2.5, 3.75, 5, 7.5, 10, 12.5, 15, 20, 30, 45 depending on CT ratio	1.5, 2.5, 3.75, 5, 7.5, 10, 12.5, 15, 20, 30 depending on CT ratio	1.5, 2.5, 3.75, 5, 7.5, 10, 12.5, 15, 20, 30, 45, 60 depending on CT ratio
Special variant of the model available:	v	v	v
Accuracy class: 0.2-0.5-1-3	v	v	v
Voltage 720V AC:	v	v	v
Frequency: 50-60Hz	v	v	v
Security factor:	FS 5 or FS 10 depending on CT ratio	FS 5 or FS 10 depending on CT ratio	FS 5 or FS 10 depending on CT ratio
Std.: BS 3938, IEC 44-1 and DIN 42600	v	v	v

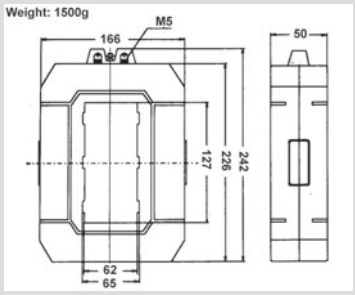
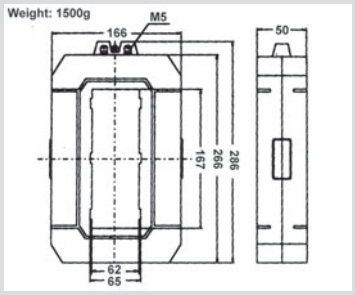
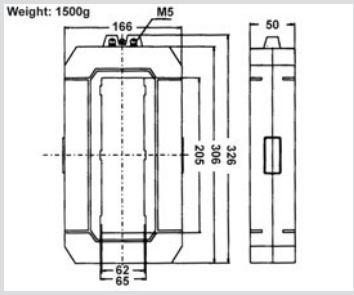
	Current Transformers, MAK 140/100h	Current Transformers, MAK 140/100v	Current Transformers, MAK 84/40
			
Busbar dim. (mm):	2x100x10	2x100x10	40x10
Primary current (A):	200, 250, 300, 400, 500, 600,750, 800, 1000, 1200, 1250, 1500, 1600, 2000, 2500, 3000, 4000	200, 250, 300, 400, 500, 600,750, 800, 1000, 1200, 1250, 1500, 1600, 2000, 2500, 3000, 4000	50, 60, 75, 80, 100, 120, 125, 150, 200, 250, 300, 400, 500, 600,750, 800, 1000
Secondary current 5A (1A on request):	v	v	v
Rated burden (VA):	1.5, 2.5, 3.75, 5, 7.5, 10, 12.5, 15, 20, 30, 45, 60 depending on CT ratio	1.5, 2.5, 3.75, 5, 7.5, 10, 12.5, 15, 20, 30, 45, 60 depending on CT ratio	1.5, 2.5, 3.75, 5, 7.5, 10, 12.5, 15, 20 depending on CT ratio
Special variant of the model available:	v	v	v
Accuracy class: 0.2-0.5-1-3	v	v	v
Voltage 720V AC:	v	v	v
Frequency: 50-60Hz	v	v	v
Security factor:	FS 5 or FS 10 depending on CT ratio	FS 5 or FS 10 depending on CT ratio	FS 5 or FS 10 depending on CT ratio
Std.: BS 3938, IEC 44-1 and DIN 42600	v	v	v

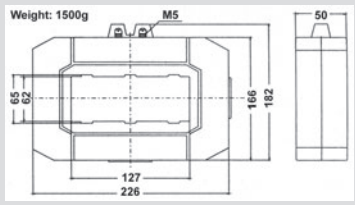
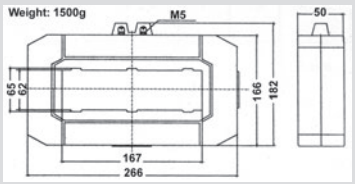
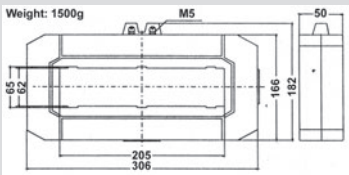
DEIF A/S, Frisenborgvej 33, DK-7800 Skive, Tel.: +45 9614 9614, Fax: +45 9614 9615, E-mail: deif@deif.com, URL: www.deif.com

	Current Transformers, MAK 90/26	Current Transformers, MAK 90/36	Current Transformers, MAK 90/52
			
Busbar dim. (mm):	Ø26	Ø36	Ø52
Primary current (A):	40, 50, 60, 75, 80, 100, 120, 125, 150, 200, 250, 300	40, 50, 60, 75, 80, 100, 120, 125, 150, 200, 250, 300, 400, 500, 600, 750, 800, 1000	100, 120, 125, 150, 200, 250, 300, 400, 500, 600, 750, 800, 1000, 1200, 1250
Secondary current 5A (1A on request):	v	v	v
Rated burden (VA):	1.5, 2.5, 3.75, 5, 7.5, 10, 12.5, 15, 20, 30 depending on CT ratio	1.5, 2.5, 3.75, 5, 7.5, 10, 12.5, 15, 20, 30 depending on CT ratio	1.5, 2.5, 3.75, 5, 7.5, 10, 12.5, 15, 20, 30 depending on CT ratio
Special variant of the model available:	v	v	v
Accuracy class: 0.2-0.5-1-3	v	v	v
Voltage 720V AC:	v	v	v
Frequency: 50-60Hz	v	v	v
Security factor:	FS 5 or FS 10 depending on CT ratio	FS 5 or FS 10 depending on CT ratio	FS 5 or FS 10 depending on CT ratio
Std.: BS 3938, IEC 44-1 and DIN 42600	v	v	v

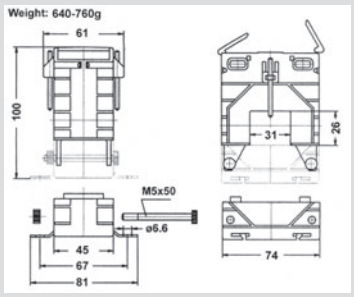
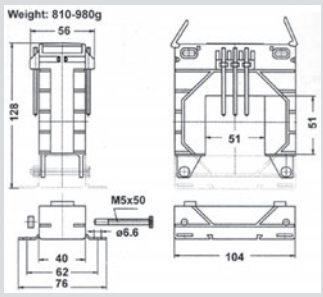
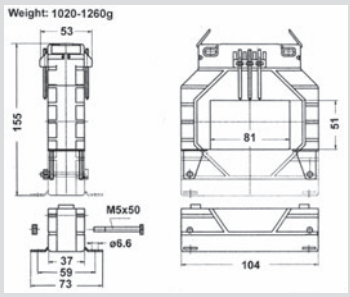
	Current Transformers, MAK 90/61	Current Transformers, MAK 62/W	Current Transformers, MAK 62/WS
			
Busbar dim. (mm):	Ø61	-	-
Primary current (A):	150, 200, 250, 300, 400, 500, 600, 750, 800, 1000, 1200, 1250, 1500, 1600, 2000	1, 2.5, 5, 7.5, 10, 15, 20, 25	1, 2.5, 5, 7.5, 10, 15, 20, 25, 30, 40, 50, 60, 75, 80, 100, 125, 150
Secondary current 5A (1A on request):	v	v	v
Rated burden (VA):	1.5, 2.5, 3.75, 5, 7.5, 10, 12.5, 15 depending on CT ratio	2,5, 5, 10 depending on CT ratio	5, 10, 12.5 depending on CT ratio
Special variant of the model available:	v	v	v
Accuracy class: 0.2-0.5-1-3	v	0.2-0.5-1	0.2-0.5-1
Voltage 720V AC:	v	v	v
Frequency: 50-60Hz	v	v	v
Security factor:	FS 5 or FS 10 depending on CT ratio	FS 5 depending on CT ratio	FS 5 depending on CT ratio
Std.: BS 3938, IEC 44-1 and DIN 42600	v	v	v

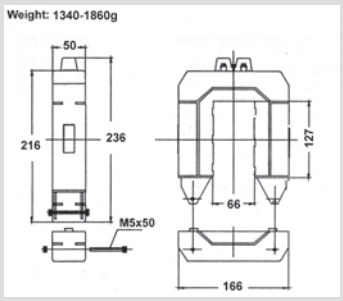
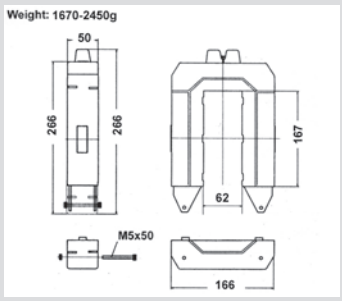
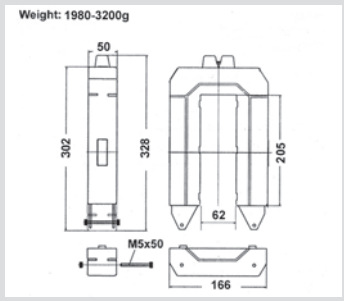
DEIF A/S, Frisenborgvej 33, DK-7800 Skive, Tel.: +45 9614 9614, Fax: +45 9614 9615, E-mail: deif@deif.com, URL: www.deif.com

	Current Transformers, MAK 166/125v	Current Transformers, MAK 166/165v	Current Transformers, MAK 166/205v
			
Busbar dim. (mm):	127x 65	167x65	205x65
Primary current (A):	1000, 1200, 1250, 1500, 1600, 2000, 2500, 3000, 4000, 5000	1000, 1200, 1250, 1500, 1600, 2000, 2500, 3000, 4000, 5000, 6000	1500, 1600, 2000, 2500, 3000, 4000, 5000, 6000, 8000
Secondary current 5A (1A on request):	v	v	v
Rated burden (VA):	15, 30, 40, 50, 60, 90, 100 depending on CT ratio	15, 30, 40, 50, 60, 75, 100, 120, 150 depending on CT ratio	15, 30, 60, 75, 100, 120, 150 depending on CT ratio
Special variant of the model available:	v	v	v
Accuracy class: 0.2-0.5-1-3	v	v	v
Voltage 720V AC:	v	v	v
Frequency: 50-60Hz	v	v	v
Security factor:	-	-	-
Std.: BS 3938, IEC 44-1 and DIN 42600	v	v	v

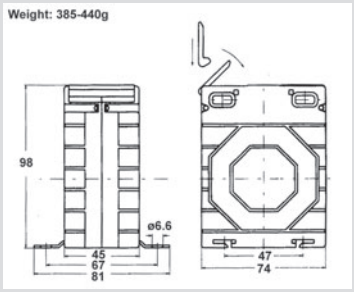
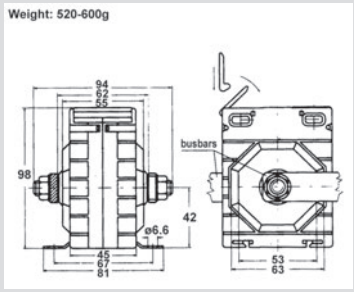
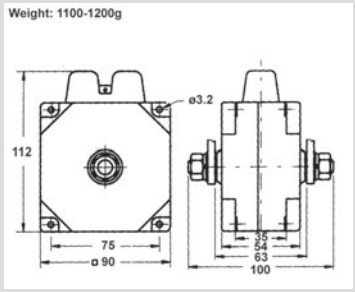
	Current Transformers, MAK 166/125h	Current Transformers, MAK 166/165h	Current Transformers, MAK 166/205h
			
Busbar dim. (mm):	127x 65	167x65	205x65
Primary current (A):	1000, 1200, 1250, 1500, 1600, 2000, 2500, 3000, 4000, 5000	1000, 1200, 1250, 1500, 1600, 2000, 2500, 3000, 4000, 5000, 6000	1500, 1600, 2000, 2500, 3000, 4000, 5000, 6000, 8000
Secondary current 5A (1A on request):	v	v	v
Rated burden (VA):	15, 30, 40, 50, 60, 90, 100 depending on CT ratio	15, 30, 40, 50, 60, 75, 100, 120, 150 depending on CT ratio	15, 30, 60, 75, 100, 120, 150 depending on CT ratio
Special variant of the model available:	v	v	v
Accuracy class: 0.2-0.5-1-3	v	v	v
Voltage 720V AC:	v	v	v
Frequency: 50-60Hz	v	v	v
Security factor:	-	-	-
Std.: BS 3938, IEC 44-1 and DIN 42600	v	v	v

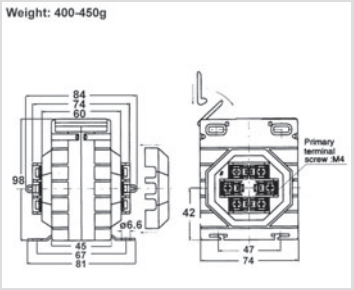
DEIF A/S, Frisenborgvej 33, DK-7800 Skive, Tel.: +45 9614 9614, Fax: +45 9614 9615, E-mail: deif@deif.com, URL: www.deif.com

	Current Transformers, SCT 74/30	Current Transformers, SCT 104/50	Current Transformers, SCT 140/80
			
Busbar dim. (mm):	31x26	51x51	81x51
Primary current (A):	100, 125, 150, 200, 250, 300, 400	100, 125, 150, 200, 250, 300, 400, 500, 600, 750, 800, 1000	400, 500, 600, 750, 800, 1000, 1200, 1250, 1500, 1600
Secondary current 5A (1A on request):	v	v	v
Rated burden (VA):	1.5, 2.5, 5, 7.5, 10 depending on CT ratio	1.5, 2.5, 3.75, 5, 7.5, 10, 15, 20 depending on CT ratio	1.5, 2.5, 3.75, 5, 7.5, 10, 15, 20, 30 depending on CT ratio
Special variant of the model available:	v	v	v
Accuracy class: 0.5...3	v	v	v
Voltage 720V AC:	v	v	v
Frequency: 50-60Hz	v	v	v
Security factor:	-	-	-
Std.: BS 3938, IEC 44-1 and DIN 42600	v	v	v

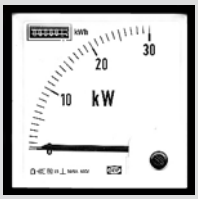
	Current Transformers, SCT 166/125	Current Transformers, SCT 166/165	Current Transformers, SCT 166/205
			
Busbar dim. (mm):	127x66	166x62	205x62
Primary current (A):	500, 600, 800, 1000, 1200, 1250, 1500, 1600, 2000, 2500, 3000	800, 1000, 1250, 1500, 1600, 2000, 2500, 3000, 4000, 5000	1000, 1200, 1250, 1500, 2000, 2500, 3000, 4000, 5000, 6000
Secondary current 5A (1A on request):	v	v	v
Rated burden (VA):	1.5, 2.5, 5, 7.5, 10, 15, 20, 30 depending on CT ratio	1.5, 2.5, 5, 7.5, 10, 15, 20, 30 depending on CT ratio	1.5, 2.5, 5, 7.5, 10, 15, 20, 30 depending on CT ratio
Special variant of the model available:	v	v	v
Accuracy class: 0.2-0.5-1-3	v	v	v
Voltage 720V AC:	v	v	v
Frequency: 50-60Hz	v	v	v
Security factor:	-	-	-
Std.: BS 3938, IEC 44-1 and DIN 42600	v	v	v

DEIF A/S, Frisenborgvej 33, DK-7800 Skive, Tel.: +45 9614 9614, Fax: +45 9614 9615, E-mail: deif@deif.com, URL: www.deif.com

	Current Transformers, MAK 74/W	Current Transformers, MAK 74/WS	Current Transformers, MAK 90/WS
			
Busbar dim. (mm):	-	-	-
Primary current (A):	1, 2.5, 5, 7.5, 10, 15, 20, 25, 30, 40, 50	1, 2.5, 5, 7.5, 10, 15, 20, 25, 30, 40, 50, 60, 75, 80, 100, 125, 150, 200, 250	5, 7.5, 10, 15, 20, 25, 30, 40, 50, 60, 75, 80, 100, 125, 150, 200, 250
Secondary current 5A (1A on request):	v	v	v
Rated burden (VA):	5, 10, 15 depending on CT ratio	5, 10, 15, 20 depending on CT ratio	5, 10, 15, 30 depending on CT ratio
Special variant of the model available:	v	v	v
Accuracy class: 0.2-0.5-1-3	0.2-0.5-1	0.2-0.5-1	v
Voltage 720V AC:	v	v	v
Frequency: 50-60Hz	v	v	v
Security factor:	FS 5 or FS 10 depending on CT ratio	FS 5 or FS 10 depending on CT ratio	FS 5 or FS 10 depending on CT ratio
Std.: BS 3938, IEC 44-1 and DIN 42600	v	v	v

	Current Transformers, MAK 74/S		
			**Further information:** Please contact Support Dept. for document No. 4921210040B
Busbar dim. (mm):	-		
Primary current (A):	2 = 5+5/5A, 3 = 3x5/5A, 4 = 4x5/5A, 5 = 5x5/5A, 6 = 6x5/5A		
Secondary current 5A (1A on request):	v		
Rated burden (VA):	5, 10, 15, 20 depending on CT ratio		
Special variant of the model available:	v		
Accuracy class: 0.2-0.5-1-3	v		
Voltage 720V AC:	v		
Frequency: 50-60Hz	v		
Security factor:	FS 5 depending on CT ratio		
Std.: BS 3938, IEC 44-1 and DIN 42600	v		

DEIF A/S, Frisenborgvej 33, DK-7800 Skive, Tel.: +45 9614 9614, Fax: +45 9614 9615, E-mail: deif@deif.com, URL: www.deif.com

	kWh or kvarh Meters WQ2R96	kWh or kvarh Meters WQR96-x	kWh or kvarh Meters WQR96-c
			
Main function:	Measurement of power or reactive power	Measurement of power or reactive power	Measurement of power or reactive power
Size (mm):	Q96	Q96	Q96
Mounting:	Panel	Panel	Panel
Pointer deflection:	-	90°	240°
Protection:	IP52	IP52	IP52
Accuracy class:	1 (IEC1036)	1 (IEC1036)	1 (IEC1036)
Connection	1W, 1W3, 1W4, 2W3, 3W3 (4)	1W, 1W3, 1W4, 2W3, 3W3 (4)	1W, 1W3, 1W4, 2W3, 3W3 (4)
Frequency:	45...65Hz	45...65Hz	45...65Hz
Measuring range:	Measuring current: direct or from C.T.-/1A or -/5A Measuring voltage: 57-100-230-400V AC	Measuring current: direct or from C.T.-/1A or -/5A Measuring voltage: 57-100-230-400V AC	Measuring current: direct or from C.T.-/1A or -/5A Measuring voltage: 57-100-230-400V AC
Pulse outputs:	2 relays	1 relay	1 relay

	kWh or kvarh Meters WQR96	Energy Meters (kWh) TAE-2	DC Integrators / Pulse-transmitters, DCF-Q96
Main function:	Measurement of power or reactice power.	DIN-rail meter with a 6-digit register for accumulated measurement of energy.	Accumulates momentary measurements from a transducer into reading of fx kWh or Ah.
Size (mm):	Q96	90 x 105	103 x 92
Mounting:	Panel	DIN rail	Panel or base
Protection:	IP52	IP20	IP52
Accuracy class:	1 (IEC 1036)	1	0.5
Connection:	1W, 1W3, 1W4, 2W3, 3W3 (4)	3 phase 3 wire, 2 external C.T.'s 3 phase 4 wire, 3 external C.T.'s Single phase, 1 external C.T.	-
Measuring current:	-	-/1A or -/5A	-
Measuring voltage:	-	3 x 230V/400V AC -20/+25% or 3 x 132V/230V AC -20/+25%	-
Measuring range:	Measuring current: direct or from C.T.-/1A or -/5A Measuring voltage: 57-100-230-400V AC	30...2000/1A or 5A	1V..10V DC, 1…20mA, 4…20mA
Frequency:	45...65Hz	45...65Hz	-
Auxiliary voltage:	-	-	100...440V AC ±20%, 24V DC ±25%
Pulse outputs:	1 relay	Relay contact	1 relay

DEIF A/S, Frisenborgvej 33, DK-7800 Skive, Tel.: +45 9614 9614, Fax: +45 9614 9615, E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

DC integrator
Pulse transmitter

Type DCF-Q96

4921220014D

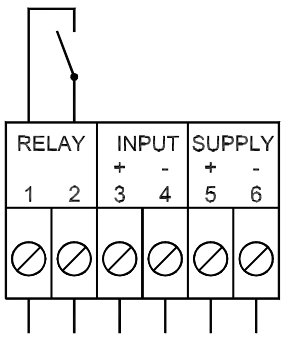
- ***Converts DC signals into a frequency proportional pulse signal***
- ***Recording of kWh and kvarh in conjunction with transducers types TAP/TAQ***
- ***High accuracy (crystal controlled)***
- ***Relay output for connection to external counter***

CE

Technical specifications

Measuring ranges, DC (standard)	Voltage: 1V...10V DC, R_i: 10k /V. Current: 1...20mA, voltage drop: <1.3V. Live zero: 20% of measuring range.
Effective measuring range	2...120% of specified measuring range. Input signals <2% or >170% of the specified measuring range: the function of the transducer is automatically blocked.
Pulse frequency	Proportional to the fed input signal within 2...120% of the specified measuring range. The pulse frequency (~100% input signal) may be set within the range 1...999 p.p.h. (pulses per hour) at intervals of 1 p.p.h. by means of 3 built-in rotary switches.
Accuracy	Class 0.5% of set value (p.p.h.) (-10...15...30...55°C) to EN 60051 and IEC 51.
Temperature drift	Max. 0.15% of set value (p.p.h.) per 10°C.
Non-linearity	Max. 0.1% of set value (p.p.h.) for inputs: 2...120%.
Auxiliary voltage drift	Max. 0.05% of set value (p.p.h) per 10% variation of auxiliary voltage.
Counter	Built-in electromechanical 6 digit counter without reset function.
Relay output	For connection to external counter: potential-free N/O contact (normally open). "ON"-time: approx. 200ms. Rating: Max. 250V-2A-400VA (AC), 250V-2A-50W (DC), at resistive load and 2 x 10^6 changeovers. Mechanical life: 2 x 10^7 changeovers.
Auxiliary voltage	100-110-127-220-230-240-380-400-415-440V AC ±20%, 40...70Hz 24V DC ±25% (DC inverter built in).
Burden	AC voltages: 3...5VA. DC voltages: 4W.
Galvanic separation	Between input, output, auxiliary voltage. 2kV - 50Hz - 1 min. (test voltage).
Temperature	-10...55°C (nominal), -25...60°C (operating), -40...70°C (storage).
Climate	Class HUE, to DIN 40040.
EMC:	EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4), IEC 255-22-1 (class 3). CE marked for residential, commercial and light industry plus industrial environment.
Protection	IP53. Terminals: IP20. To EN 60529 and IEC 529.
Materials	Self-extinguishing plastic materials, to UL94 (V0)
Connections	Screw terminals: Max. 2.5 mm² (multi-stranded), max. 4 mm² (single stranded).
Dimensions (flush mounting)	96 x 96 x 75 mm, to DIN 43700. Panel cut-out: 92 x 92 mm +0.8

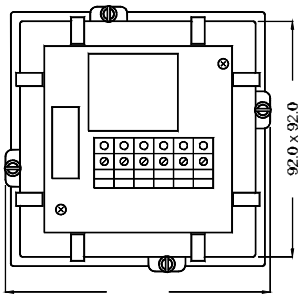
Connections



DCF-Q96

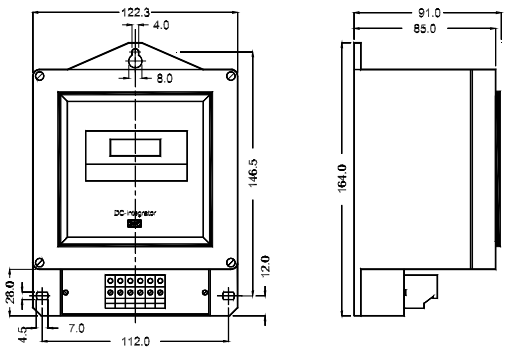
Dimensions

All dimensions in mm



Weight: approx. 0.350 kg
DCF-Q96 (flush mounting)

All dimensions in mm



DCF-Q96 (base mounting) Weight: approx. 0.750 kg

Order specifications

	Type	Mounting	DC input	Pulse frequency	"Unit" (e.g. kWh, m³/h)	Auxiliary voltage
Example:	DCF-Q96	Base	0...10V DC	1...999 p.p.h.	kWh	230V AC

Due to our continous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

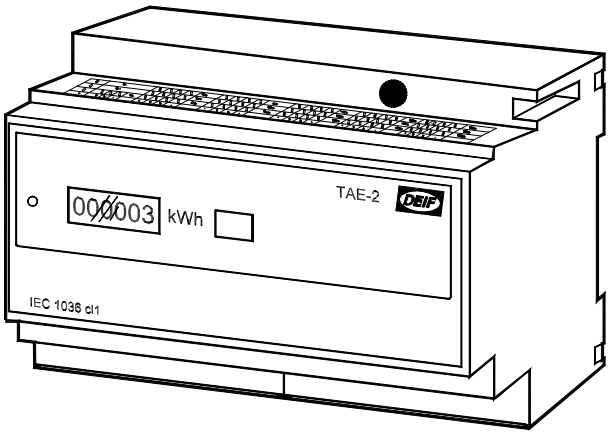
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

Energy meters

Type TAE-2

4921220030D



- ***Direct reading of up to 2000A/1 or 5A***
- ***Pulse output via relay contact***
- ***LED for indication of correct connection and correct function***
- ***User setting of current transformer ratio***
- ***For 35 mm DIN rail***

CE

Application

The energy meter type TAE-2 is applied to kWh measurement, measuring the electricity consumption in 3 phase or single phase networks. The meter is applicable to 3 phase 3 wire, 3 phase 4 wire and single phase networks.

The unit is provided with a microprocessor-based circuit, which is connected to a mechanical counter for registration of the consumption in kWh.

The TAE-2 is furthermore provided with a relay contact output. The unit can consequently be connected to various measuring terminals, tariff units, computers, etc.

The measuring range of the energy meter depends on the ratio of the external current transformers. The measuring range is set by the user on the front of the meter.

On the front the TAE-2 is equipped with a LED for indication of correct connection of the unit. At correct connection the LED flashes at a frequency corresponding to 125Wh, irrespective of the selected current transformer ratio. If the TAE-2 has been incorrectly connected, the LED is lit continuously.

The TAE-2 is CE marked to EN 61036 and IEC 1036.

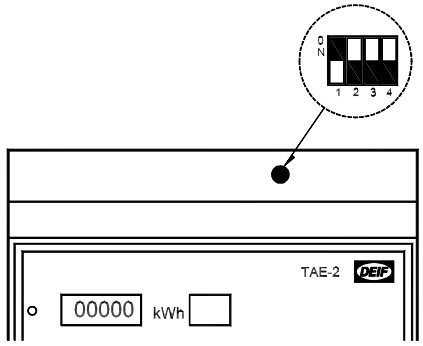
Technical specifications

Connection		3 phase 3 wire (2 external current transformers), or: 3 phase 4 wire (3 external current transformers), or: single phase (1 external current transformer)
Measuring voltage		230V/400V AC –20/+20% or: 132/230 V AC –20/+20% Consumption < 3VA.
		The measuring voltage is internally connected to the supply voltage.
Measuring current		Consumption: 0.1VA. I_n = 1A or 5A, I_b = 0.05 x I_n, I_{max} = 1.2 x I_n
Overcurrent		25 x I_n for 3 s/50 x I_n for 1 s
Measuring range		30-50-60-80-100-150-200-250-300-400-500-600-800-1000-1500-2000/1A or 5A
		Determined by the current transformer ratio.
Measuring frequency		45...65Hz
Read-out		6 digit mechanical counter. No reset function.
Output		Relay contact output.
	Pulse ratio	1 pulse per kWh. Max. number of pulses 4000 per hour.
	Pulse width	100 ms
	Contact ratings	250V-6A-1500VA(AC) 24V-6A-150VA (DC)
	Max. voltage	250V
Safety		600V-Cat II Pollution deg. 2 to EN61010-1
Indication		LED for indication of correct connection and correct function.
		Flash frequency: 125Wh
Accuracy		Class 1 (-10...15...30...55°C), to EN 61036 and IEC 1036
Temperature		-10...55°C (nominal), -20...70°C (storage)
Humidity		Up to 95% (without condensing)
EMC	Emission	To EN 61036 and IEC 1036
	Immunity	To EN 61036 and IEC 1036
Connections		Screw terminals, 2.5 mm²
Protection		IP 20, to EN 60529 and IEC 529
Materials		All plastic parts are self-extinguishing to UL94 (V0).

Selection of current transformer ratio

The measuring range is selected according to the ratio of the external current transformers by means of dip switches. These are easily accessible through a hole in the front plate of the meter. The selected current transformer ratio will not be activated until the TAE-2 has been reconnected (i.e. after disconnection and reconnection of the power supply).

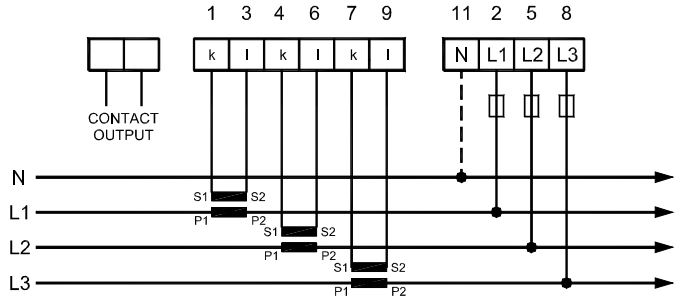
After selection of the current transformer ratio the hole is sealed using a plug, which is included on delivery.



Current transformer ratio

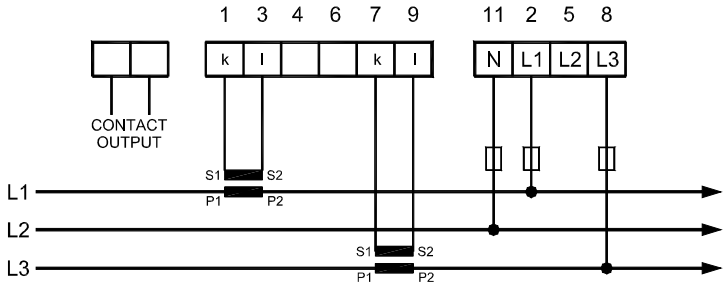
In	1234	In	1234	In	1234	In	1234	In	1234	In	1234
30	○○○○	50	●○○○	100	○○●○	250	●●●○	500	○●○●	1000	●○●●
On	●	60	○●○○	150	●○●○	300	○○○●	600	●●○●	1500	○●●●
Off	○	80	●●○○	200	○●●○	400	●○○●	800	○○●●	2000	●●●●

Connections



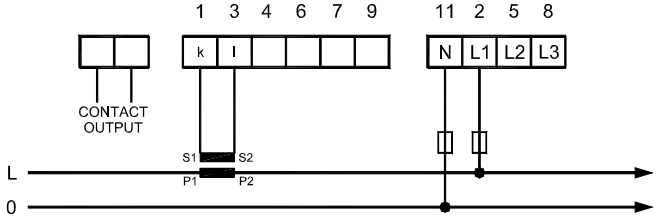
Fuse max. 2A

TAE-2 for 3 phase 4 wire networks (Neutral connected if required)



Fuse max. 2A

TAE-2 for 3 phase 3 wire networks



Fuse max. 2A

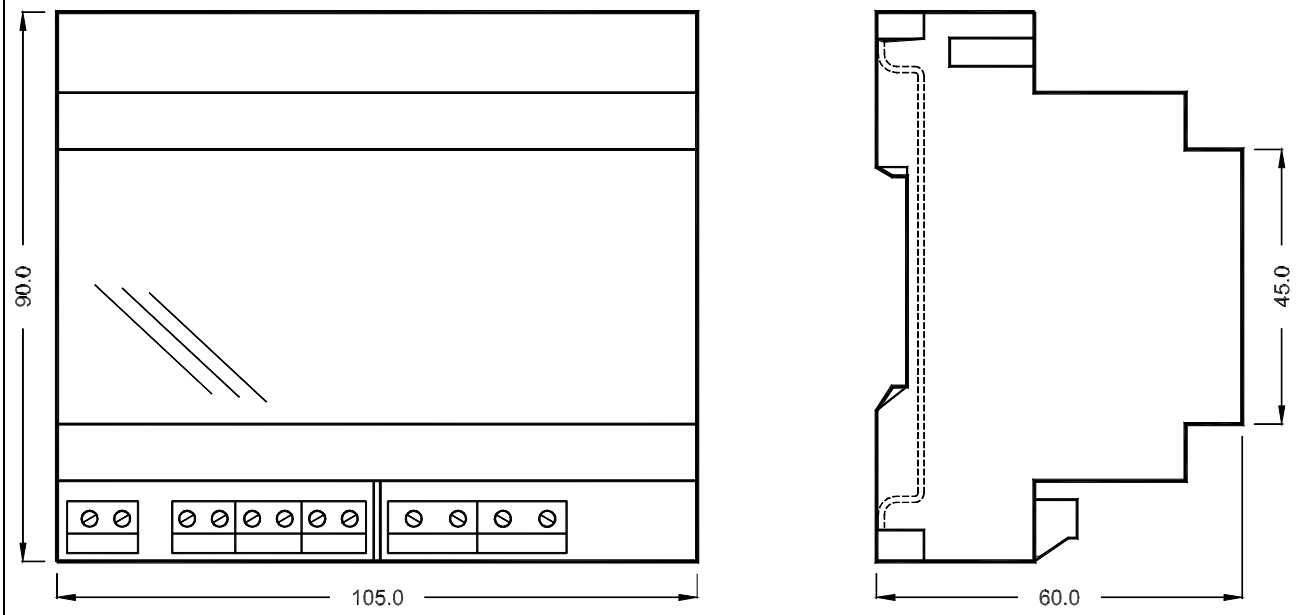
TAE-2 for single phase networks

The power should flow from P1 towards P2.

After connection of the TAE-2, the 2 covers (included on delivery) are placed over the terminals.

Dimensions

All dimensions in mm



TAE-2 Weight: approx. 0.300 kg

Order specifications

Type	Voltage	EAN-number
TAE-2	3 x 132/230V AC 30-2000/5A	5703727001088
TAE-2	3 x 230/400V AC 30-2000/5A	5703727001095
TAE-2	3 x 132/230V AC 30-2000/1A	5703727001101
TAE-2	3 x 230/400V AC 30-2000/1A	5703727001118
TAE-2	1 x 230V AC 5A	5703727001125
TAE-2	1 x 230V AC 1A	5703727001132

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

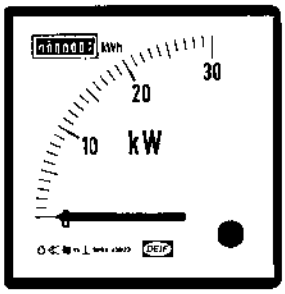
kWh meters

Types WQR96, WQ2R96, WQR96-x, WQR96-c

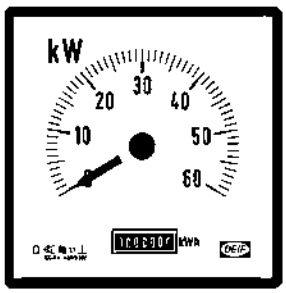
4921210083D

WQR96

WQ2R96



WQR96-x



WQR96-c

- ***Accuracy class 1.0***
- ***For single phase and 3 phase networks***
- ***Microprocessor controlled meters with pulse output***
- ***Simultaneous measurement of two quantities (except type WQR96)***
- ***Standard Q96 DIN housing***

CE

Application

The kWh meters types WQR.. and WQ2R.. are intended for energy measurement in single phase and 3 phase networks, providing a class 1.0 measurement of the imported or exported energy. The meters are microprocessor controlled, equipped with a 7-digit electromechanical counter which retains the reading in case of supply voltage failure. The meters are furthermore equipped with 1 or 2 pulse outputs. The meters can be adapted to the applied current transformers.

WQR96 Meter with a 7-digit register and one pulse output for measurement of one type of energy only (kWh or kvarh).

WQ2R96 Meter with two 7-digit registers and two pulse outputs for measurement of two types of energy (both kWh and kvarh imported or exported).

WQR96-x Meter with both a 7-digit register and one pulse output for energy measurement (kWh or kvarh) and a 90° instrument for simultaneous indication of the momentary power value (active or reactive).

WQR96-c Meter with both a 7-digit register and one pulse output for energy measurement (kWh or kvarh) and a 240° instrument for simultaneous indication of the momentary power value (active or reactive).

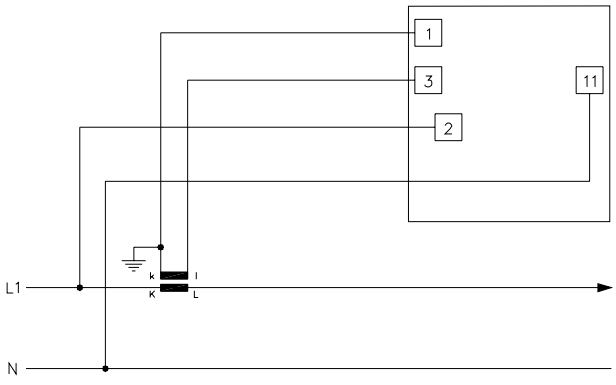
All types can be ordered for single phase networks or 3 phase networks with/without neutral, balanced/unbalanced load.

Technical specifications

Accuracy:	energy power	Class 1.0 (-10...15...30...55°C), to EN 61036 and IEC 1036. ± 1.5% of scale
Frequency:		45...65Hz. Rated frequency: 50Hz or 60Hz
Measuring current:		Current transformer -/1A or -/5A. Max. current 1.6 I_n. Consumption: < 0.1VA.
Measuring voltage:		Standard: 57-100-230-400V AC ±20%. Consumption: < 3VA.
Overloads	currents voltages	3 x I_n, continuously, 25 x I_n for 3 s 50 x I_n for 1 s 1.2 x U_n
Relay outputs		Contact rating: 250V – 6A – 50Hz. Max. switching power 1500VA. 1, 10 or 100 pulses per kWh (or MWh). Max. 4000 pulses per hour. Pulse duration: 100ms.
Electromechanical counter		7 digits, each 4 x 1.2mm
Temperature:		-10...55ºC (nominal) -10...60ºC (operating) -25...65ºC (storage)
Climate:		Class JVF, to DIN 40040
EMC:		To EN 50081-1/2 and EN 50082-1/2
Safety:		To IEC 1010-1. Installation cat. II, 600V. Installation cat. III, 300V. Pollution degree 2.
Materials:		All plastic materials are self-extinguishing to UL94 (V0)
Connections:		Relay output: max. 1mm^2
Protection:		Front: IP52, terminals: IP00, to EN 60529 and IEC 529

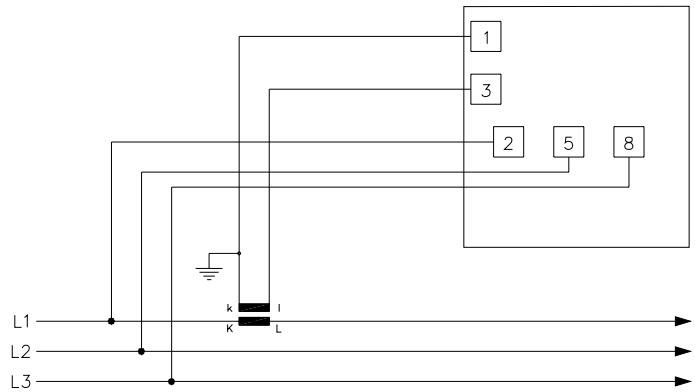
Connections

Single phase networks



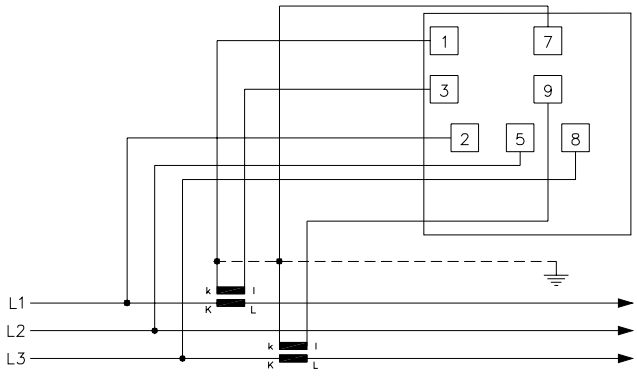
(Connection 1W) WQR96, WQ2R96, WQR96-x, WQR96-c

3 phase, 3 wire networks, balanced load



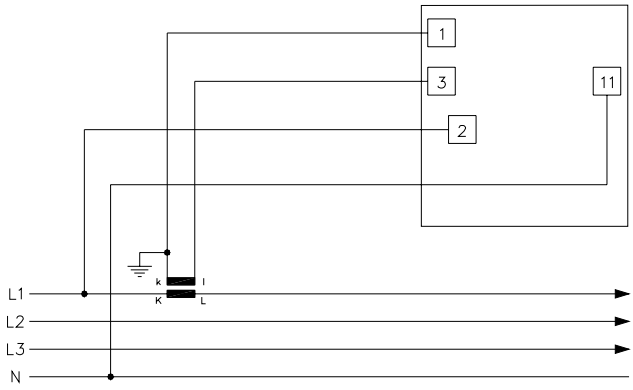
(Connection 1W3) WQR96, WQ2R96, WQR96-x, WQR96-c

3 phase, 3 wire networks, unbalanced load



(Connection 2W3) WQR96, WQ2R96, WQR96-x, WQR96-c

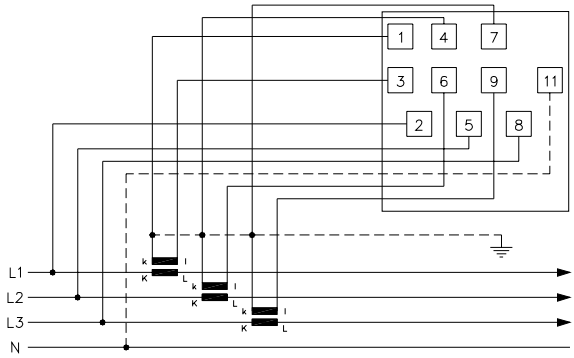
3 phase, 4 wire networks, balanced load



(Connection 1W4) WQR96, WQ2R96, WQR96-x, WQR96-c

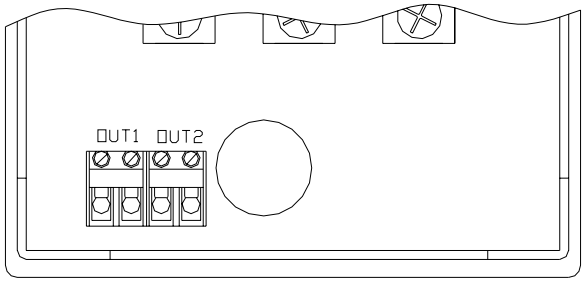
Connections (continued)

3 phase, 4 wire networks, unbalanced load



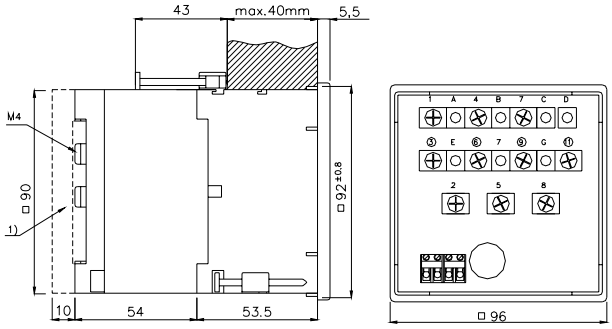
(Connection 3W4) WQR96, WQ2R96, WQR96-x, WQR96-c

Auxiliary voltage/output connections



WQR96, WQ2R96, WQR96-x, WQR96-c

Dimensions



1) Protective cover

Weight: ca. 0.6 kgs

WQR96, WQ2R96, WQR96-x, WQR96-c

Order specifications

WQR96/WQ2R96:

Type	Conn.	VT ratio	CT ratio	Register(s)	Relay 1	Relay 2
Examples:						
WQR96	1W3	10,000/100V	100/1A	10p/Mvarh	10p/Mvarh	
WQ2R96	3W4	10,000/100V	50/1A	1p/MWh E*/MWh I*	1p/Mwh	1p/Mwh

WQR96-x/WQR96-c:

Type	Conn.	VT ratio	CT ratio	Register	Relay 1	Scale
Examples:						
WQR96-x	3W4	10,000/400V	100/5A	10p/MWh	10p/MWh	0...2MW
WQR96-c	3W4	10,000/100V	200/5A	1p/MWh	1p/MWh	0...4MW

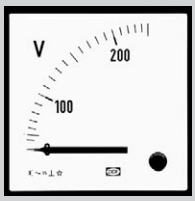
*) E = exported energy
I = imported energy

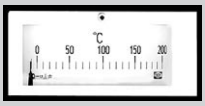
Note: If no VT the pulse duration is normally 1, 10 or 100p/kWh/kvarh

Due to our continous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

	Moving Coil, DQ	Moving Coil, VDQ	Moving Iron, EQ
	(240˚)	 (90˚)	
Main function:	Measurement of DC currents and DC voltages.	Measurement of AC currents and AC voltages.	Measurement of AC currents and AC voltages, adjusted for other frequency range 16..65Hz. The instruments measure true RMS.
Size (mm):	Q48...Q144	Q72...Q144	Q48...Q144
Pointer deflection:	90˚, 240˚	90˚, 240˚	90˚
Customised and exchangeable scale available for 90˚:	v	v	v
Protection IP52:	v	v	v
Protection IP54 on request:	v	v	v
Accuracy class:	1.5	1.5	1.5
Measuring range:	60mV...600V 1mA...5...10...15...40A, 4...20mA (except from Q48: 1mA..600mA, 4...20mA)	25...600V, 1...600mA	40...800V (Q48: 40...600V) 1...60A (Q48: 1...25A)
Approved by classi-fication societies	v	v	v

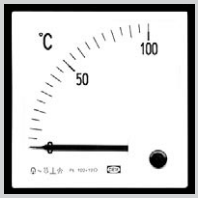
	Edgewise Moving Coil, DPR	Slim Edgewise Moving Coil, DSM	
			
Main function:	Measurement of DC currents and DC voltages.	Measurement of DC currents and DC voltages.	
Size (mm):	48x24, 72x36, 96x48, 144x72 (vertical or horizontal)	72x24, 96x24, 144x36 (vertical or horizontal)	
Pointer deflection:	-	-	
Customised and exchangeable scale available for 90°:	v	v	
Protection IP52:	v	v	
Protection IP54 on request:	-	-	
Accuracy class:	1.5	1.5	
Measuring range:	1...600V 1...600mA, 4...20mA	60mV...600V 1...600mA, 4-20mA	

DEIF A/S, Frisenborgvej 33, DK-7800 Skive, Tel.: +45 9614 9614, Fax: +45 9614 9615, E-mail: deif@deif.com, URL: www.deif.com

	Ammeters w/built-in switch,VDQ96-sw	Voltmeters w/built-in switch, EQ96-sw7	Voltmeters w/built-in switch, EQ96-sw4
Main function:	Measurement of AC currents. Selected with build-in switch, measurement of current in a 3-phase network is possible.	Measurement of AC voltages. Selection of measurement of phase to phase voltage or phase to zero voltage in a 3-phase network is possible by means of built-in switch.	Measurement of AC voltages. Measurement of phase to phase voltage in a 3-phase network is possible by means of built-in switch.
Size (mm):	Q96	Q96	Q96
Pointer deflection:	90°	90°	90°
Customised and exchangeable scale available for 90°:	v	-	-
Protection IP52:	v	(for /120V and /132V)	(for /120V and /132V)
Protection IP54 on request:	-	-	-
Accuracy class:	1.5	1.5	1.5
Measuring range:	0...1A, 0...5A or from current transformer(s) Scale: according to the used current transformer Frequency: 45...65Hz	Phase to phase voltages up to 600V or phase to zero voltages up to 350V Scale: 0...300V, 0...500V, 0...600V, /120V, /132V Frequency: 40...60Hz	Phase to phase voltages up to 600V or phase to zero voltages up to 350V Scale: 0...300V, 0...500V, 0...600V, /120V, /132V Frequency: 40...60Hz

	Bimetallic Instruments, BQ	Combined Ammeters BEQ	
Main function:	Measurement of currents. Provided with a maximum-reading pointer.	Measurement of currents. Combined bimetallic system and moving iron system for maximum and momentary reading. Provided with a maximum-reading pointer.	
Size (mm):	Q48, Q72, Q96	Q72, Q96	
Pointer deflection:	90°	90°	
Customised and exchangeable scale available for 90°:	-	-	
Protection IP52:	v	v	
Protection IP54 on request:	-	-	
Accuracy class:	3	3 (1.5 for moving iron)	
Measuring range:	Measuring range: 0...6A or 0...1.2A Overload: 1.2 x nominal current (-/5A or -/1A) continuously Scale: always 120% of the current transformer Setting time: BQ48: 4 or 8 min, BQ72-x/BQ96-x: 8 or 15 min	Measuring range: 0...6A or 0...1.2A Overload: 1.2 x nominal current (-/5A or -/1A) continuously Scale: always 120% of the current transformer. Setting time: bimetallic system: 8 or 15 min.	

DEIF A/S, Frisenborgvej 33, DK-7800 Skive, Tel.: +45 9614 9614, Fax: +45 9614 9615, E-mail: deif@deif.com, URL: www.deif.com

	Watt or var Meters, WQ	Power Factor Meters, PFQ	Pt100Ohm Temperature Meters, PTQ
			
Main function:	Measurement of power or reactive power	Measurement of CosPhi.	Measurement of temperature.
Size (mm):	Q96, Q144	Q96, Q144	Q96, Q144
Pointer deflection:	90°, 240°	90°, 240°	90°, 240°
Customised and exchangeable scale available for 90°:	v	v	v
Protection IP52:	v	v	v
Protection IP54 on request:	v	v	v
Accuracy class:	1.5	1.5	1.5
Measuring range:	Frequency: 45...65Hz Measuring current: direct or from C.T.-/1A or -/5A Measuring voltage: 100... 110... 127... 220... 230... 240... 380... 400... 415... 440V AC	0.5 cap. ...1... 0.5 ind.,0.7 cap. ...1... 0.3 ind., 0...1 cap., 0...1 ind. Voltage: 57.7... 63.5... 100... 110... 124... 220... 230... 240... 380... 400... 415... 440VAC ±20% Current (Inom): -/1A and -/5A from external current transformer	Pt100 ohm sensor, 2 or 3 wire: Different ranges available within the range of 0...800°C. Min. temperature difference: 25°C Min./max. Temperature: -200°C/ +800°C Aux. supply: 24...48...110...220V AC (AC: 1VA, DC: 15mA)

	Pointer Frequency Meters, FQ	Reed Frequency Meters, FTQ	Shunt Resistors
Main function:	Measurement of frequency.	Measurement of frequency with 13 or 21 reeds.	Dimensions: To DIN 43703 Ranges 1...2500A, 60/150mV Form A and B: 60/150mV 1 Form C: 50mV
Size (mm):	Q72, Q96 (Q144 on request)	Q72, Q96, Q144	-
Pointer deflection:	90°	-	-
Customised and exchangeable scale available for 90°:	v	v	-
Protection IP52:	v	v	-
Protection IP54 on request:	v	v	-
Accuracy class:	0.5 (1 for 45...65Hz)	0.5	0.5
Measuring range:	Measuring voltage: 100...220V AC or 230...440V AC ±15% Scale/meas. range: 45...55Hz, 55...65Hz, 45...65Hz	Measuring voltage: 100...110...220... 230... 240... 380... 400... 415... 440V AC ±15% Scale/meas. range: 47...53Hz, 45..55Hz, 57...63Hz, 55...65Hz	-

DEIF A/S, Frisenborgvej 33, DK-7800 Skive, Tel.: +45 9614 9614, Fax: +45 9614 9615, E-mail: deif@deif.com, URL: www.deif.com

	Multi-instrument, MIQ96-2	Multi-instrument, MIC	
Size (mm):	Q96	Q96	
Main function:	Measurement of voltage, current, active-, reactive- and apparent power, frequency and energy import (kWh, kvarh), export (kWh, kvarh), PF, THD, MD (max. demands)	Measurement of voltage, current, active-, reactive- and apparent power, frequency, energy kWh/kvarh (import, export, net, total), PF, THD	
Connection:	Single phase, 3-phase 3 wire balanced load 3-phase 4-wire balanced load 3-phase 3-wire unbalanced load 3-phase 4-wire unbalanced load	Suitable for all 3-phase network topologies	
Accuracy class:	0.5 of most values 1.0 of a few values	0.2 measured values 0.5 calculated values	
Output:	RS485 serial + 2 relays Pulse output / limit switches	RS485 serial output with Modbus RTU protocol. Optional: 2 digital pulse/limit outputs + 2 relays	
Measuring current:	-/1A or -/5A	-/5A	
Measuring voltage:	230V AC N-Ph (400V AC Ph-Ph) 50/60Hz	230V AC N-Ph (400V AC Ph-Ph) 50/60Hz	
Auxiliary supply:	24-220V DC <5W or 48...230V AC 50/60Hz <5VA	Universal AC/DC power supply 85...264V AC 50/60Hz / 100...280V DC	

	DIN Rail Instruments, D45	DIN Rail Instruments, E45	
Main function:	Moving coil DC instrument for DIN rail mounting (35 x 15 mm)	Moving iron AC instrument for DIN rail mounting (35 x 15 mm)	
Size (mm):	Q45	Q45	
Pointer deflection:	90°	90°	
Customised and exchangeable scale available for 90°:	v	v	
Protection IP52:	v	v	
Protection IP54 on request:	-	-	
Accuracy class:	1.5	1.5	
Measuring range:	1V...600V (Incl. 0...60mV/5mA) 1mA...600mA & (4...20mA)	6V...400V, 100mA...25A Standard ranges: 1...5...10...15...25A, incl. -/1A and -/5A for external CT	

DEIF A/S, Frisenborgvej 33, DK-7800 Skive, Tel.: +45 9614 9614, Fax: +45 9614 9615, E-mail: deif@deif.com, URL: www.deif.com

	Alarm Panels, AL8-2	Digital Insulation Monitor, DIM-Q
Main function:	Suitable to switchboards in industrial and marine plants for alarm and control purposes.	Supervision of the insulation resistance between an insulated low-voltage distribution network and earth cable/safety cable
Size (mm):	Q96	Q96
Pointer deflection:	-	90°
Customised and exchange-able scale available:	-	v
Scales with red section:	-	For 1...0Mohm scales: 1kohm/V For 10...0Mohm scales: 0.1kohm/V
Protection:	IP54	IP52/IP54
Accuracy class:	-	1...0Mohm scale ±5% of scale length 10...0Mohm scale ±2% of scale length
Relay output:	Two user configurable output relays One output for horn (alarm)	Built-in relay can either be selected as NE or ND. Alarm set point adjustable from the rear
Input:	8 alarm inputs	Meas. voltage: ±28V DC ±5% Mains voltage: Max. 690V AC +20% continuously
Mains voltage/ leakage cap.:	-	Selectable for either max. 50µF or max. 500µF
Auxillary supply:	12...24...48...110V DC ±25% (min. 10V DC)	100...110 ...127 or 220...230...240 or 400...450...480V AC ±20% 45...70Hz (< 4VA)
Approved by classification societies:	v	v

	Remote Position Indicators, PIR25-1, PIR25-2	Running Hours Counters, HC48	Running Hours Counters, HC 36/24
Main function:	Indication of circuit breaker position or tie breaker position.	For AC or DC measuring voltage.	Synchronous motor (AC). Step motor (DC). For panel mounting.
Size (mm):	Q25	Q48 Adapter frames 55 x 55 or 72 x 72	36 x 24
Black focusing screen ("round"):	v	-	-
"White focusing screen ("square"):	v	-	-
Frequency 50Hz or 60Hz:	-	v	v
Protection IP40:	-	(special IP65 available)	v
Accuracy class:	-	AC: 1/100 hour (36 sec.) DC: 1/10 hour (6 min.)	-
Measuring range:	Nominal voltages: 4...48...110...230V AC/DC.	Counting range: AC: 99999.99 hours / DC: 999999.9 hours Voltage: 24-110-230V AC ±10% and 10-48V DC, 110V DC ±10%.	Counting range: AC: 99999.99 hours / DC: 999999.9 hours - automatically resets to zero. Voltage: 24...110...230VAC ±10% and 12...36V DC, 110V DC±10%. Resolution: For AC - 1/100 hours (36 s), for DC - 1/10 hours (6 min.)

DEIF A/S, Frisenborgvej 33, DK-7800 Skive, Tel.: +45 9614 9614, Fax: +45 9614 9615, E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

Alarm panels

Type AL8-2

4921230002D

- *Compact Q96 design*
- *Extremely easy push-button programming (no jumpers or the like)*
- *Individual programming of each input: - N/O or N/C, time delay, alarm inhibit, output and cable supervision*
- *Up to 5 units in master/slave configuration*
- *Clear identification of first alarm received in case of successive alarms*

Application

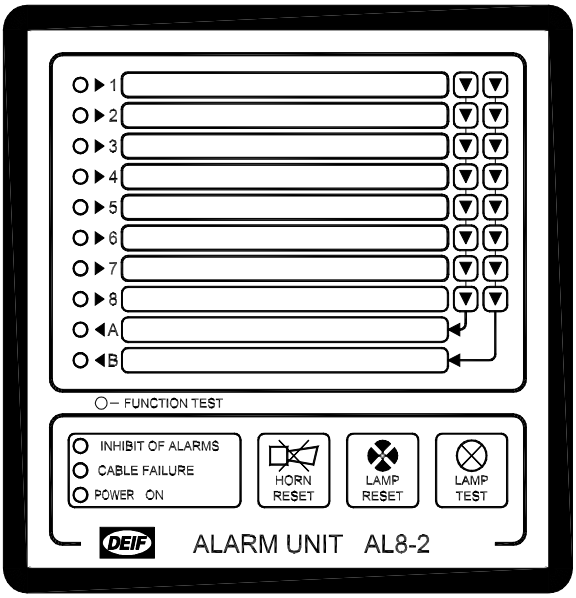
The alarm panel AL-8 is provided with:

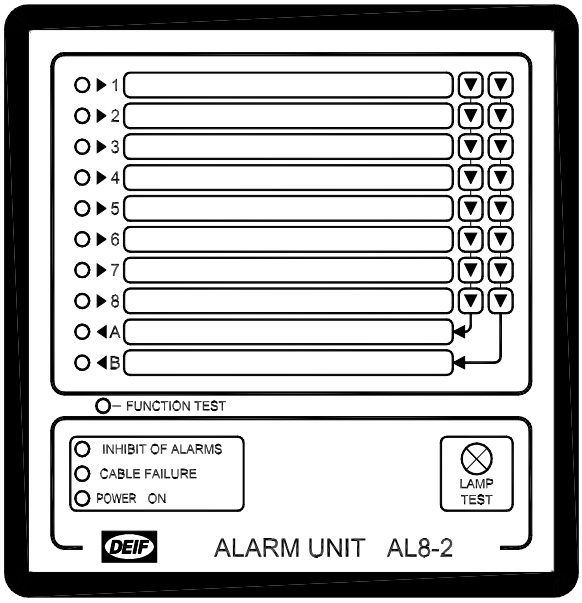
- 8 alarm inputs
- 3 relay outputs:
  - 1 output for connection of horn

  and

  - 2 outputs used for transmission of group alarms, selective disconnection of faulty equipment, etc.

The alarm panel is suitable to switchboards in industrial and marine plants for alarm and control purposes. It is CE marked for residential, commercial and light industry plus industrial environment.





Alarm inputs:

The alarm panel is provided with 8 alarm inputs for connection of external mechanical alarm contacts.

These 8 inputs are individually programmable for N/O or N/C alarm contacts.

Time delay:

The alarm inputs are individually programmable with a time delay, so that an alarm condition will not be registered until after the preset time.

The time delay is individually programmable by the user within the range 0..40 s in steps of 1 s.

Alarm indicators:

The AL8-2 is equipped with 8 LEDs marked 1 to 8 for indication of an alarm condition for the individual alarm inputs.

When an alarm condition occurs, the LED for the relevant input channel will flash with a red light.

If more than one alarm occurs before the push-button "LAMP RESET" is activated, the first alarm LED will flash ahead of the others.

Alarm outputs:

The alarm panel is provided with 3 relay outputs, 1 of which is used for connection to an audible/visual alarm.

The remaining 2 relay outputs are individually programmable by the user to follow certain alarm inputs.

When the relays of 1 of these 2 outputs are activated, the relevant LED marked "A" or "B" on the front will be lit constantly (red light).

Indicator for auxiliary voltage:

The alarm panel is equipped with a LED marked "POWER ON" which when lit (green light) indicates that auxiliary voltage is connected and that the processor is active.

Indicator for cable failure:
(E.g. loose connection)

The user may for each alarm channel determine whether cable failure shall result in an alarm.

Cable failure is indicated by means of the LED marked "CABLE FAILURE" (flashing, yellow light). The LED for the faulty channel will simultaneously be lit (constant, yellow light).

A cable failure results in activation of the relay output used for audible/visual alarm only.

Reset of alarms:

The alarm indicators and the alarm outputs "A" and "B" are reset by means of the push-button marked "LAMP RESET".

On activation of this push-button, the alarm indicators will be lit with a constant red light, until the external alarm conditions are cancelled.

When these have been cancelled, the alarm indicators are switched off and the output relays are reset.

Reset of output for horn:
(Audible/visual alarm)

The relay output designed for connection of horn is reset by activation of the push-button marked "HORN RESET".

This output may be reset even though the external alarm condition prevails.

External reset:

External reset can be achieved by disconnecting the auxiliary voltage for more than 2 s.

Test of indicators:

When the push-button marked "LAMP TEST" is activated, all LEDs of the alarm panel are lit (constant, yellow light).

The normal functions of the alarm unit remain unaffected by activation of this push-button, and the lamp test may thus be carried out when the unit is in operation.

Functional test:

The alarm panel is equipped with a test button marked "FUNCTION TEST".

For safety reasons this is placed behind a hole in the front plate of the unit. The test button is activated by means of a needle or a thin screwdriver. (Do not use a pencil point).

Upon activation of this, all alarm inputs are activated. As a result, all LEDs for alarm inputs will start flashing, and the relay output for connection of horn is activated.

The relay outputs "A" and "B" are likewise activated if these are connected (i.e. in the programming cycle) to one or more alarm inputs. If one or more alarm inputs are programmed to time delayed registration, these will not be activated until after the preset time. Inhibited alarms will not be activated until the inhibit has been cancelled.

The condition "FUNCTIONAL TEST" will continue, until reset by means of the push-buttons marked "HORN RESET" and "LAMP RESET".

Inhibit of alarms:

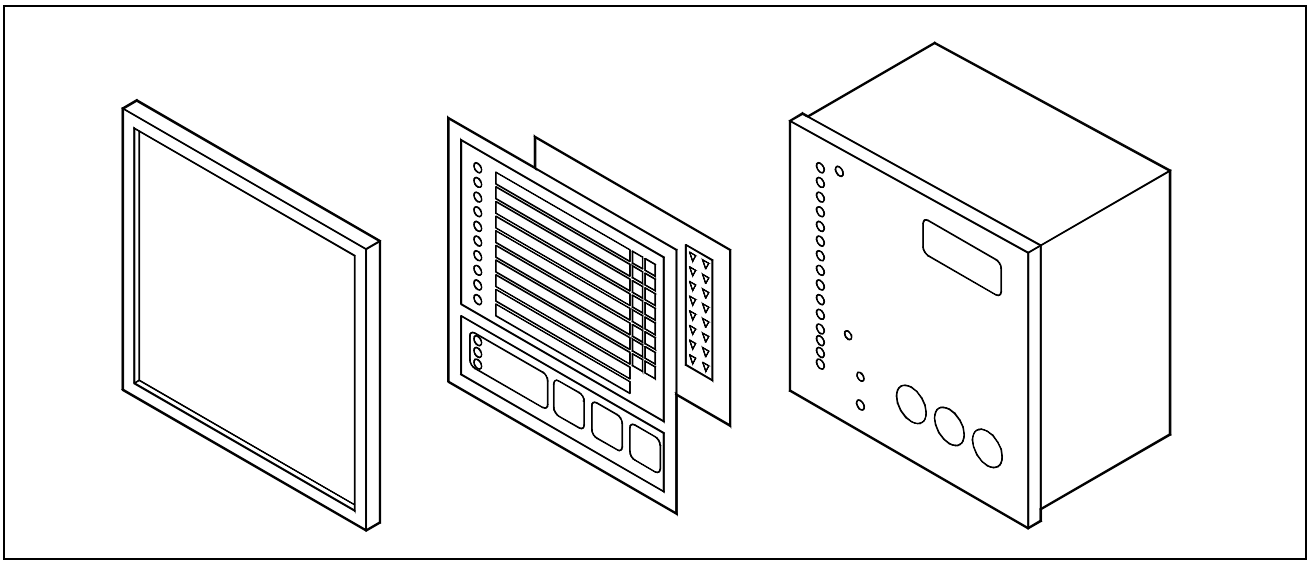
In order to avoid unwanted alarms during normal start and stop of a process, the alarm panel is provided with an inhibit circuit, activated by means of an external contact.

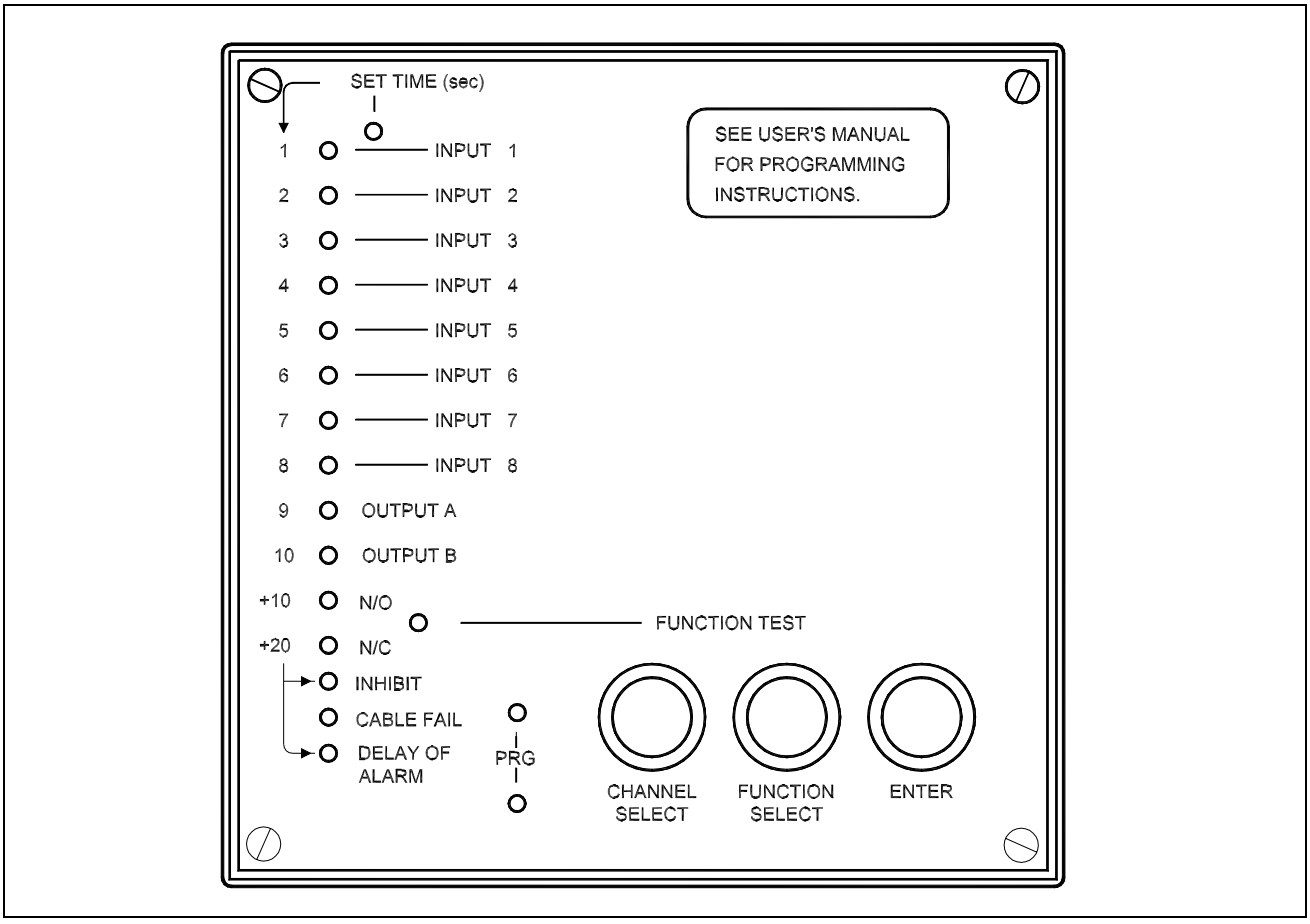
The alarm channels can individually be connected (i.e. in the programming cycle) to the inhibit circuit, implying that new alarms are rejected until the inhibit has been cancelled. The inhibit function does not affect already registered but not yet reset alarms.

The inhibit circuit may be programmed to a time delay, resulting in the inhibit function not being cancelled until after a preset time. This delay is programmable within the range 0..40 s in steps of 1 s.

Programming functions

The programming functions are accessible after removal of the bezel and the front sheet.





By means of the push-buttons marked "CHANNEL SELECT", "FUNCTION SELECT" and "ENTER" and the indication of the LEDs for the individual channels/functions, the alarm panel is programmed. A detailed programming manual is included on delivery.

The following individual functions may be programmed by the user for each individual alarm input (1 to 8):

1	**Registration of alarm at open/closed alarm contact** - i.e. either N/C or N/O contact
2	**Activation of output(s) "A" and/or "B" on an alarm condition**
3	**Inhibit of incoming alarm**
4	**Detection and indication of cable failure** - e.g. broken wire, or termination
5	**Time delayed registration of an alarm condition**

The following common functions may be programmed by the user:

1	**Activation/deactivation of relay for output "a" on an alarm condition (N/O, N/C)**
2	**Time limited activation/deactivation of output "A"** - the time limit may be set within the range 1..10 s in steps of 1 s
3	**Activation/deactivation of relay for output "B" on an alarm condition (N/O, N/C)**
4	**Time limited activation/deactivation of output "B"** - the time limit may be set within the range 1..10 s in steps of 1 s
5	**Delayed cancellation of inhibit function** - the time delay may be set within the range 0..40 s in steps of 1 s

The programming is initiated by pressing the push-button marked "PRG", resulting in the unit being set to programming status.

The principle of programming is to point at the input channel which is to be programmed by means of the push-button "CHANNEL SELECT".

Repeated activation of the push-button results in successive selection of the channels in the order 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 1 - 2 - 3 ..., etc.

When the required input channel has been selected (LED lit), the push-button "FUNCTION SELECT" is applied to indicate the options for the first function (1 to 5 as shown above), and the required function is entered by means of the push-button "ENTER".

The push-button "FUNCTION SELECT" is then applied to indicate the options for the next function in line, etc.

The two push-buttons are likewise applied to program the common functions.

The programming may be interrupted at any time by pressing the push-button "PRG" again. It is hence always possible for the user to change the programming of a single input channel or a single common function, if required.

For detailed description of the programming, please see the programming manual.

Master/slave configuration

By means of connections for jumper cables on the rear of the alarm panel, up to 5 alarm units may be connected together.

In this configuration the alarm unit with no plug in X2 will act as "master" and the remaining as "slave" units.

Upon registration of an alarm condition in a "slave" unit, the relay outputs for horn of both the "slave" unit and the "master" unit are activated, whereas the relay outputs "A" and "B" are activated locally irrespective of the "master"/"slave" configuration.

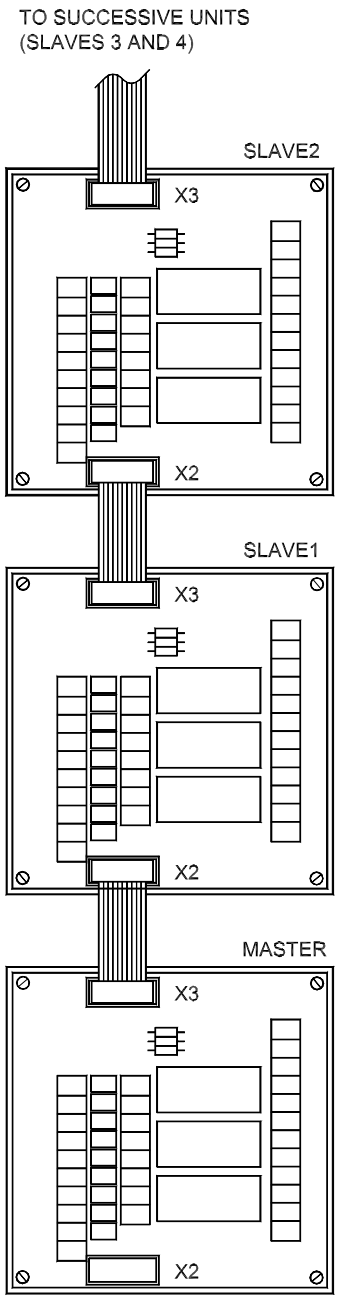
When connected in "master"/"slave" configuration, alarms and relay output for horn may be cancelled centrally by means of the push-buttons marked "LAMP RESET" and "HORN RESET" of the "master" unit.

The "slave" unit is supplied with a special label where the push-buttons marked "LAMP RESET" and "HORN RESET" are left out, if the unit is applied as a "slave" unit.

"Slave" units are likewise supplied with the flat cable applied to couple the units.

The functional test is carried out locally by means of the push-button marked "FUNCTION TEST" but is cancelled centrally on the "master" unit.

Max. distance between two units: 50 cm.

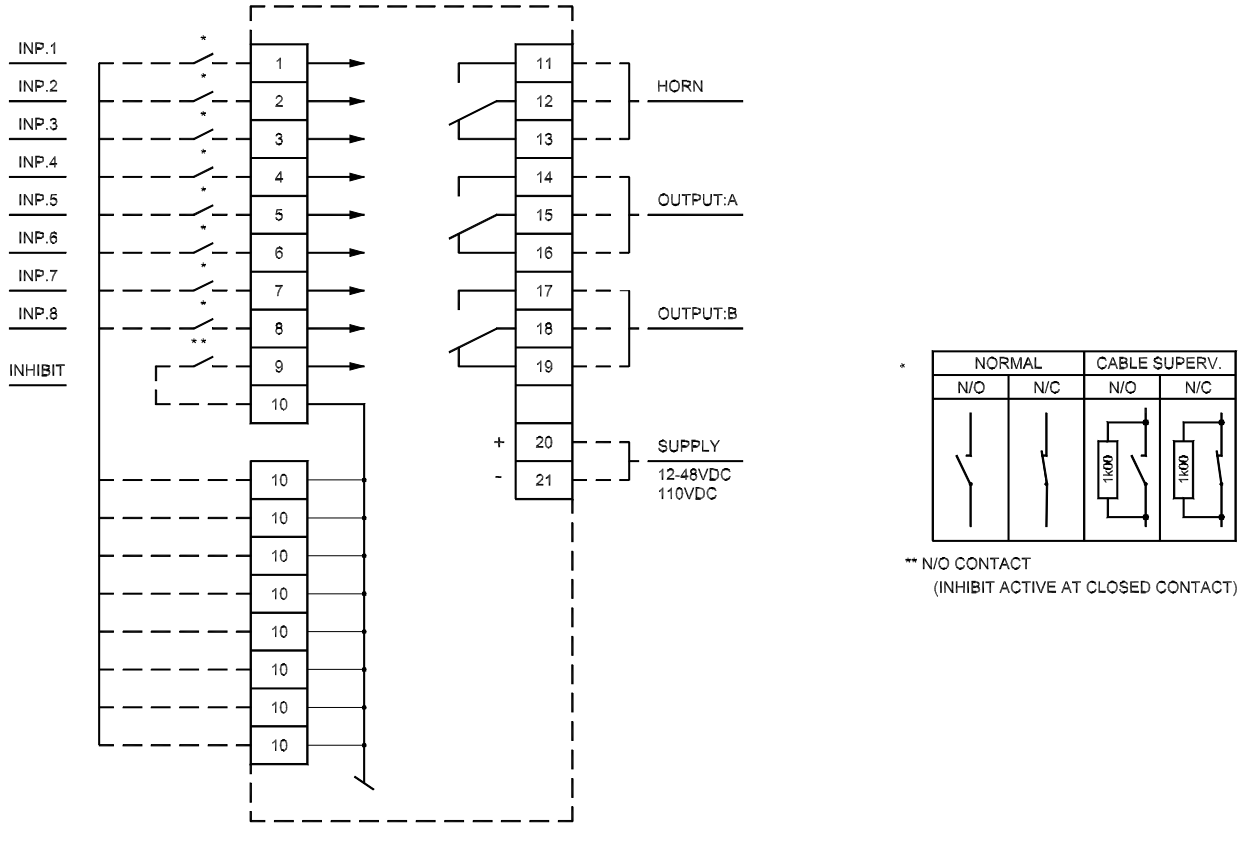


Technical specifications

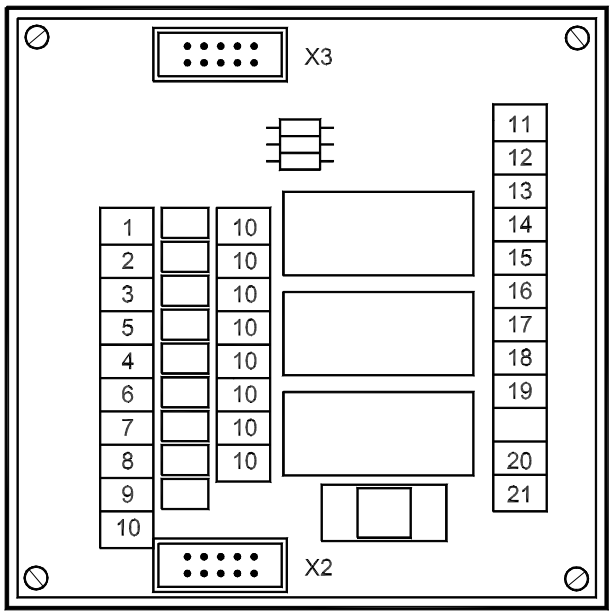
Input	Alarm:	8 channels for connection of potential-free signal contacts (N/O or N/C).
	Inhibit:	1 channel for connection of potential-free signal contact (N/O). Inhibit at closed contact
	Max. signal voltage/current	6V (open contact), 6mA (closed contact)
Output	A, B and horn:	Relay output, 1 change-over switch for each
	Contact rating:	250V - 2A - 400W (AC). 250V - 1A - 50W (DC)

General technical specifications		
Auxiliary voltage	12 - 24 - 48 - 110V DC ±25% (min. 10V DC). Consumption: approx. 6W Max. ripple: 10% pp, to IEC 688 Recommended fuses: 12 - 24 - 48V: 1A T, 110V: 150mA T	
Galvanic separation	Between alarm inputs/"INHIBIT":	None
	Between alarm inputs and remaining circuits:	2kV - 50Hz - 1 min.
	Between alarm outputs and alarm inputs/"INHIBIT":	2kV - 50Hz - 1 min.
	Between alarm outputs and remaining circuits:	2kV - 50Hz - 1 min.
	Between aux. voltage and remaining circuits:	2kV - 50Hz - 1 min.
Temperature:	-10...55°(nominal). -25...70°C (operating). -40...70°C (storage)	
Climate:	Class HSE, to DIN 40040	
EMC:	To EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4) and IEC 255-4 (class 3)	
Materials:	All plastic materials fire retarding and self-extinguishing to UL94 (V0)	
Connections:	Max. 1.5 mm^2	
Protection:	Front: IP54. Terminals: IP20, to IEC 529 and EN 60529	

Connections



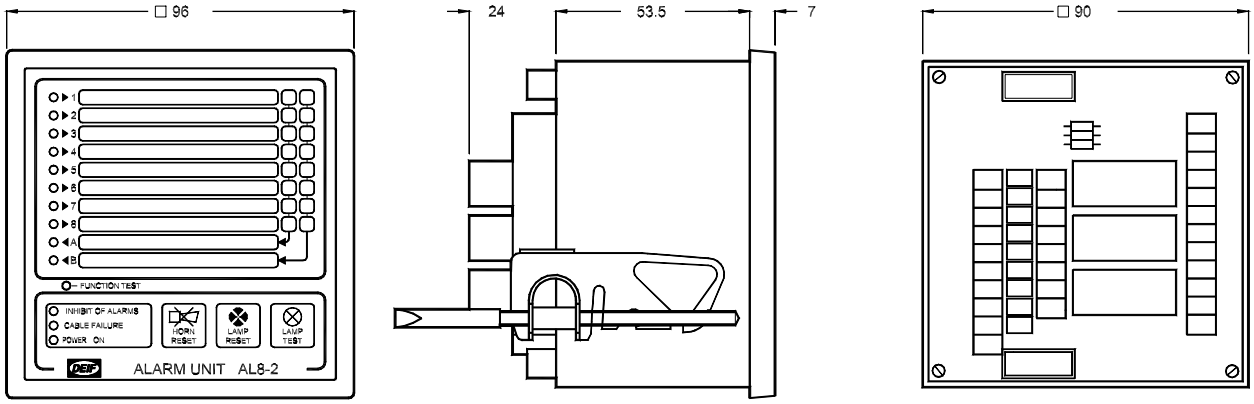
Rear view



Dimensional details

All dimensions in mm

Panel cut-out: 92 x 92 +0.4



AL8-2

Weight: Approx. 0.390 kg

Order specifications

	Type	**"Master"/"Slave"**	**Auxiliary voltage**
Example:	AL8-2	Master	24V DC

Due to our continous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

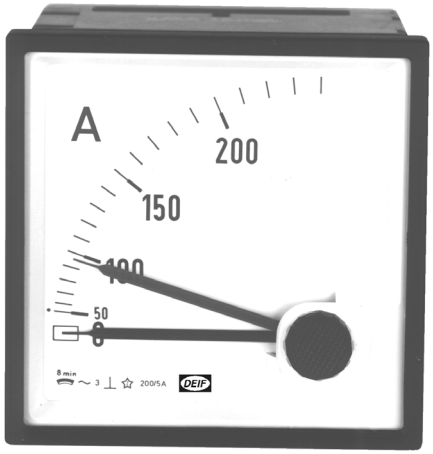
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

Bimetallic instruments

Type BQ

4921210015D



- *DIN standard sizes: Q48, Q72, Q96*
- *Exchangeable scale*
- *All DIN sizes – including Q48 – for direct connection to 1A or 5A CT*

Construction

Bimetallic instruments (maximum demand ammeters) are specifically suitable for thermic control of cables, transformers, etc. Due to the inertia of the system, the instrument is not affected by brief current pulses.

The system consists of 2 mechanically connected bimetallic spiral springs. One of the spiral springs is heated by the measuring current and consequently expands according to the temperature, which gives a quadratic scale graduation. The other spiral spring expands in the opposite direction, compensating for changes in the ambient temperature.

The instrument is provided with a red maximum-reading pointer. This pointer can be reset to the position of the black pointer by means of a knob on the front of the instrument.

Technical specifications

Accuracy: BQ system: class 3.0 (-10...15...30...55°C) to EN 60051 and IEC 51.

Standard scale: Always 120% of the current transformer. Exchangeable scale.
End values: 6-12-18-24-30-36-48-60-72-90-96 and multiples of 10 thereof.

Setting time: BQ48-x: 4 or 8 min. BQ72-x / BQ96-x: 8 or 15 min.

Measuring range: 0...6A or 0...1.2A.

Overload: 1.2 x nominal current (-/5A or -/1A) continuously. 10 x nominal current for 1 s.

Burden: -/1A: approx. 1.2VA. -/5A: approx. 2.2VA.

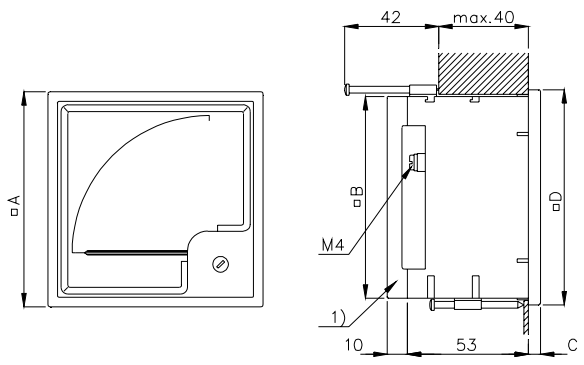
Temperature: -10...55°C (nominal), -25...60°C (operating), -25...65°C (storage).

EMC: To EN 50081-1/2 and EN 50082-1/2.
CE marked for residential, commercial and light industry plus industrial environment.

Materials: Self-extinguishing plastic to UL94 (V0).

Protection: IP52, to EN 60529 and IEC 529.

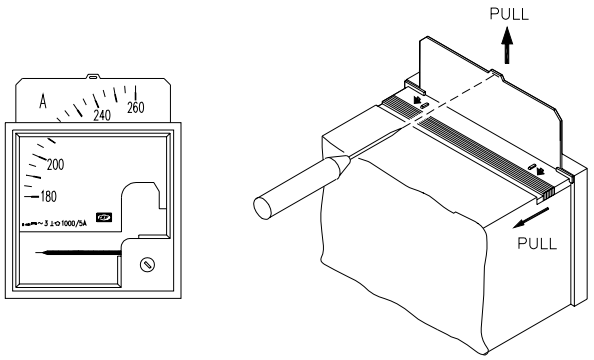
Dimensions



1) Protective cover

BQ

Scale exchange



1) Press cover at top of instrument as shown.
2) Remove scale by means of suitable tool (e.g. screwdriver).
3) After exchange of scale: Refit cover (press till it snaps into place).

Note: Interrupt signal to terminals before exchanging the scale.

Type	A	B	C	D	Weight
BQ48-x	48 x 48	42.8 x 42.8	5.0	45 x 45 +0.6	Approx. 0.100 kg
BQ72-x	72 x 72	66.5 x 66.5	5.5	68 x 68 + 0.7	Approx. 0.150 kg
BQ96-x	96 x 96	90 x 90	5.5	92 x 92 + 0.8	Approx. 0.200 kg

Order specifications

	Type	Setting time	Scale	Current transformer
Example:	BQ48-x	8 min.	0…600A	500/1A

Due to our continous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

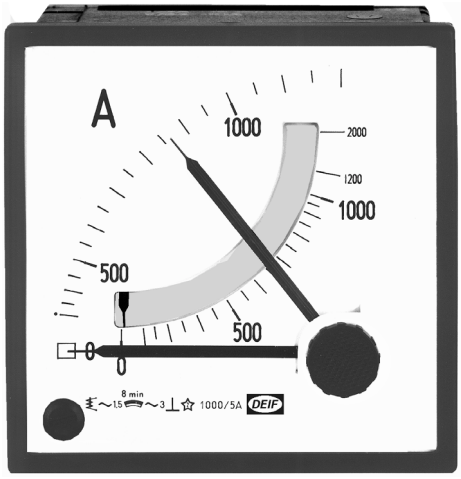
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

Combined ammeters

Type BEQ

4921210018C



- *Maximum and instantaneous readings*
- *DIN standard sizes: Q72 and Q96*
- *Exchangeable scale*
- *8 min or 15 min*
- *For -/1A or -/5A current transformer*

CE

Application and construction

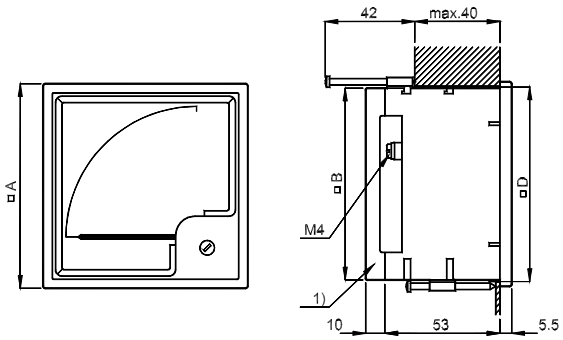
The instrument type BEQ is specifically suited for indication of thermal loads in conjunction with cables, transformers, etc. The instrument is equipped with a bimetallic system and a moving iron system, used for maximum reading and instantaneous reading respectively. Due to the thermal characteristic of the bimetallic system this is not affected by brief current fluctuations. The bimetallic system is provided with a red maximum-reading pointer. This pointer can be reset by means of a knob on the front of the instrument.

Technical specifications

Accuracy:	Bimetallic system: class 3.0, moving iron system: class 1.5. (-10...15...30...55°C) to EN 60051 and IEC 51.
Scale:	Exchangeable scale, with separate divisions for the moving iron and bimetallic systems. For both systems the scale range corresponds to 0...120% of the rated primary current of the current transformer. End values: 6-12-18-24-30-36-48-60-72-90-96 and multiples of 10 thereof.
Setting time:	Bimetallic system: 8 or 15 min.
Measuring range:	0..120% of I_N. I_N: 1A AC or 5A AC, 16...65Hz, for connection to C.T., -/1A or -/5A.
Overload:	120% of I_N, continuously. 10 x I_N for 1 s.
Consumption:	BEQ72-x: 1A: approx. 1.5VA, 5A: approx. 2.5VA. BEQ96-x: 1A: approx. 1.8VA, 5A: approx. 2.8VA.
Ambient temperature:	-10...55°C (nominal), -25...60°C (operating), -25...65°C (storage).
EMC:	To EN 50081-1/2 and EN 50082-1/2. CE marked for residential, commercial and light industry plus industrial environment.
Materials:	Self-extinguishing plastic, to UL94 (V0).
Protection:	IP52, to IEC 529 and EN 60529.

Dimensional details

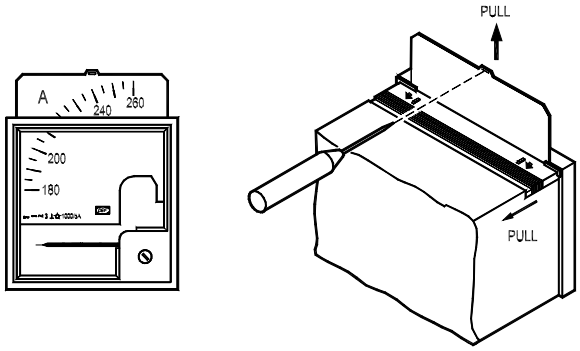
All dimensions in mm.



1) Protective cover

BEQ

Scale exchange



1) Press cover at top of instrument as shown.
2) Remove scale by means of a suitable tool (e.g. screwdriver).
3) After scale change: refit cover. (Press till it snaps into place).

Note: Interrupt signal to terminals before exchanging the scale.

Type	A	B	C	D
BEQ72-x	72 x 72	66.5 x 66.5	68 x 68 +0.7	Approx. 0.150 kg
BEQ96-x	96 x 96	90 x 90	92 x 92 +0.8	Approx. 0.230 kg

Order specifications

	Type	Setting time	Scale	Current transformer
Example:	BEQ72-x	8 min.	0..600A	500/1A

Due to our continous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

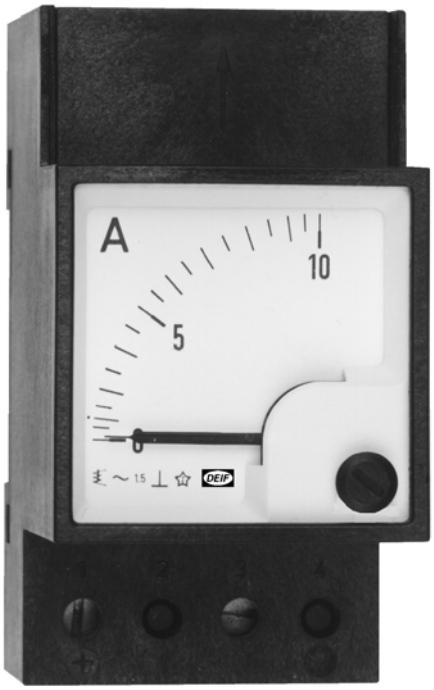
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

DIN rail instruments

Type D45-x, E45-x

4921210027D



- AC and DC measurement
- Exchangeable scale
- For mounting on DIN rail
- Compact and robust

CE

Technical specifications

Accuracy:	Class 1.5 (-10...15...30...55°C), to EN 60051 and IEC 51.
Scale length:	Approx. 41 mm.
Ambient temperature:	-10...55°C (nominal), -25...60°C (operating), -25...65°C (storage).
Test voltage:	2kV.
EMC:	To EN 50081-1/2 and EN 50082-1/2. CE marked for residential, commercial and light industry plus industrial environment.
Protection:	Housing: IP52. Terminals: IP20. To IEC 529 and EN 60529.
Mounting:	Designed for mounting on DIN rail, 35 x 15 mm, to EN 50022.

Type D45-x: moving coil instruments for DC measurement
Type E45-x: moving iron instruments for AC measurement

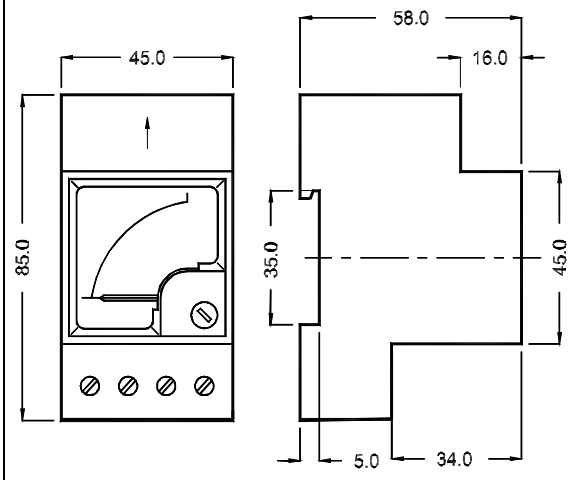
Type	Measuring range - V	Measuring range - A
D45-x	1V...600V (incl. 0...60mV/5mA) [1]	1mA...600mA (incl. 4...20mA) [1]
E45-x	6V...400V [2]	100mA...25A [2]

1) Standard measuring ranges: 1 - 1.5 - 2.5 - 4 - 5 - 6 and multiples of 10 thereof.

2) Standard measuring ranges: 1 - 1.5 - 2.5 - 4 - 6 and multiples of 10 thereof.

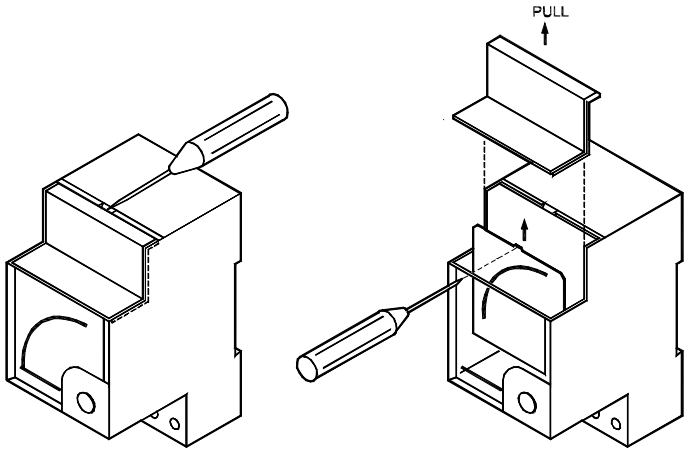
Dimensions

All dimensions in mm



D45-x/E45-x Weight approx. 0.1 kg

Exchange of scale



1. Insert a screwdriwer into the slot in the cover and pull up the cover.
2. Using the screwdriver, pull up the scale.

Order specifications

	Type	Scale	Measuring range
Examples:	D45-x	0..200%	4..20mA DC
	E45-x	0..10A	0..10A AC

Due to our continous development we reserve the right to supply equipment which may vary from the described.

DEIF -power in control

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

Insulation meters

Type AAL-110Q96

4921230016E

- ***Measurement of insulation resistance***
- ***Interchangeable scales***

Application

The AAL-110Q96 is used for measurement of the insulation resistance between an insulated low-voltage distribution network and earth cable/safety cable (“SL”). The instrument is applicable in conjunction with single phase networks and 3-phase networks with/without neutral for voltages up to 440V AC. The AAL-110Q96 is CE marked for residential, commercial and light industry plus industrial environment.

This type of insulation measurement is only carried out on AC networks where the neutral/star point of the generator or supply transformer is **not** earthed.

The AAL-110Q96 is used for marine installations and other types of insulated low-voltage networks.

An AC auxiliary voltage is required for the instrument. This may be selected independently of the monitored network. The instrument is supplied with transformer taps for all typical nominal voltages between 100V and 440V. The instrument may be fed by the monitored network. If the instrument is fed by a separate voltage source, measurement on the current network is also possible in power-down condition.

A high insulation resistance between the mains supply and the hull of a ship is of importance because of safety and counteraction of galvanic corrosion of the hull. Another typical application is monitoring of the insulation resistance of transformer-coupled supply voltages in a control room.

Measurement

The insulation is measured between the complete AC network - irrespective of number of wires - and an earthed safety cable.

The measurement is carried out by applying a DC voltage between a point on the safety cable and a point on the AC network (see Fig. 1). A condition for monitoring of the complete network is thus that the DC voltages of the remaining parts are galvanically connected together. This is normally achieved via the windings of the generator or the supply transformer and the connected loads.

If measurement of cables disconnected at both ends is required, the individual wires are connected mutually by means of choke coils.

Measuring principle

Leakages between the AC network and earth will induce a current, the size of which expresses the insulation resistance. The current is processed in an amplifier circuit, the output signal of which is fed to an indicating instrument equipped with a scale graduated in ohms.

Measuring ranges

220kΩ at scale centre (1kΩ/V).

Marking

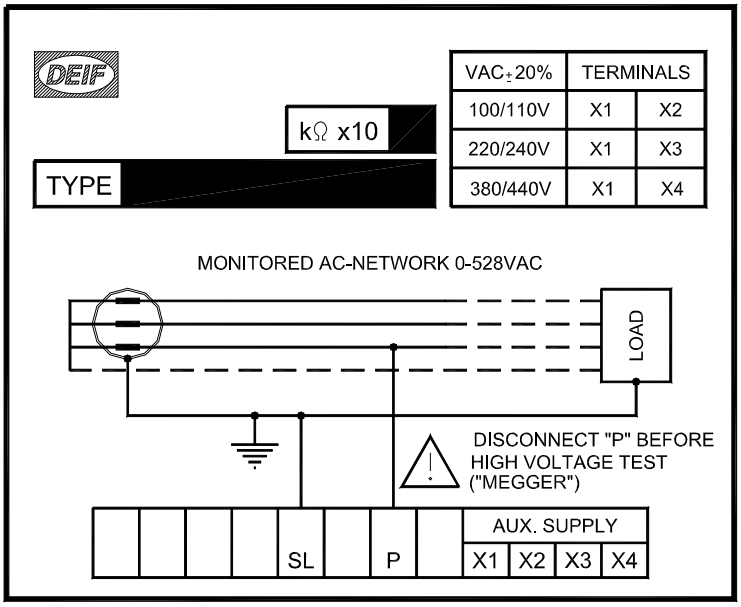


Fig. 1

Standard scales

The range from the lowest permissible insulation resistance to zero is marked in red.

Scale exchange is possible through a slot in the top of the instrument.

Range	Mains Voltage	Scale centre	Red section
1kΩ/V 1kΩ/V 1kΩ/V 1kΩ/V	110V AC 220V AC 380V AC 440V AC	220kΩ 220kΩ 220kΩ 220kΩ	110..0kΩ 220..0kΩ 380..0kΩ 440..0kΩ

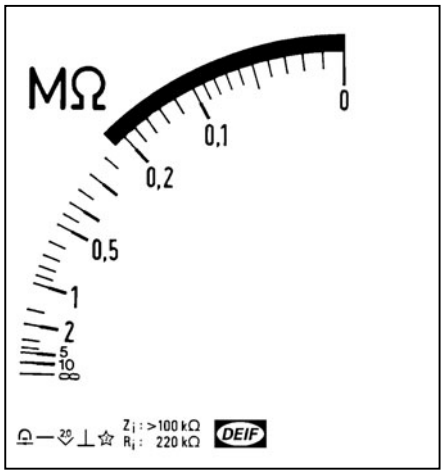


Fig. 2

Limitations

Max. one instrument per insulated network may be connected. If the network on the other hand is divided into a number of insulated networks, e.g. by means of transformers, one measurement may be carried out for each individual group.

Warning: *If the installation is to be tested by means of a high-voltage "MEGGER", the measuring leads to the AAL-110Q96 at terminal "P" must be disconnected* ***before*** *testing is carried out.*

Omitting this may result in damage to the AAL-110Q96.

If the installation contains directly connected AC loads with rectifiers such as magnetic valves or frequency converters, an error in this type of loads will result in indication error on the AAL-110Q96. This indication error can only be avoided if the mentioned loads are connected through a transformer.

Technical specifications

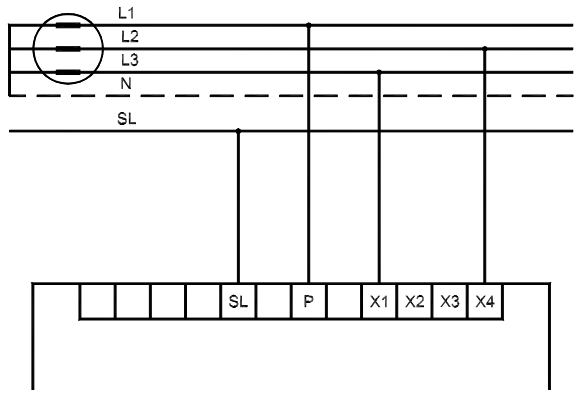
Measuring circuit	DC resistance (R_i):	220kΩ ±5%
	AC impedance (Z_i):	180kΩ ±5%
	Measuring voltage:	12V DC ±10%
	Mains voltage:	Max. 440V AC +20% continuously

Instrument	Measuring range:	220kΩ at scale centre
	- Accuracy:	±2% of scale length
	- Temperature drift:	Max. 0.5% of scale length per 10°C.
	- Voltage drift	Max. 0.2% of scale length at U_s ±20%
	- Response time:	3 s
	Scale:	Exchangeable, with red section

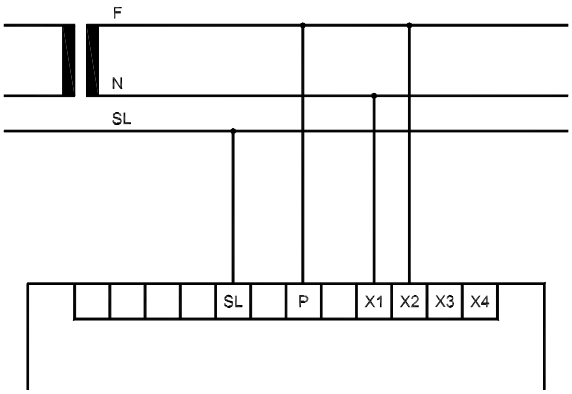
General technical specifications

Auxiliary voltage:	110 - 220 - 380 - 415 - 440V AC ±20%, 45..65Hz (ca. 4VA)
EMC:	To EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4) and IEC 255-4 (class 3)
Galvanic separation:	Measuring circuit/auxiliary voltage: 2kV - 50Hz - 1 min.
Temperature:	-10...55°C (nominal) -25...60°C (operating), -25...65°C (storage)
Climate:	Class HUE, to DIN 40040
Protection:	Instrument: IP52. Electronics: IP20. Terminals: IP20. To IEC 529 and EN 60529
Connections:	Screw terminals: 2.5 mm² (multi-stranded), 4 mm² (single-stranded)
Materials:	All plastic materials self-extinguishing to UL94 (V0)

Connection



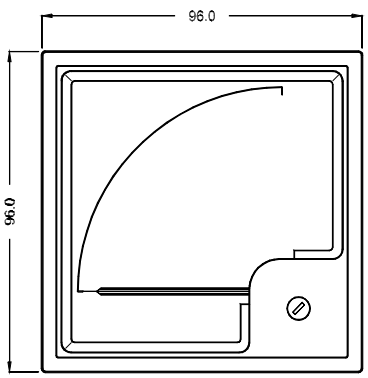
3 or 4 wire networks

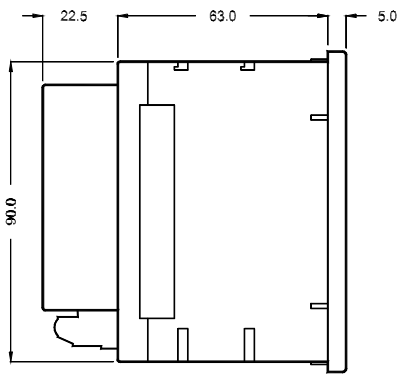


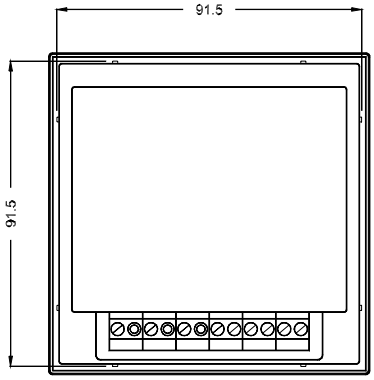
2 wire networks

Dimensions

All dimensions in mm







AAL-110Q96 Weight: approx. 0.450 kg (Panel cut-out: 92.0 x 92.0 +0.8)

Order specifications

	Type	**Red section range**	**Nom. mains voltage**	**Auxiliary voltage**
Example:	AAL-110Q96	22..0kΩ	110V AC	220V AC

Due to our continous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

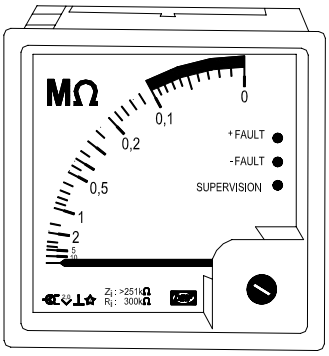
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

Type DIM-Q

Insulation monitor

4921230018C

- ***Monitoring of insulation resistance on an AC network***
- ***Working voltage up to 690V AC, withstands up to 1000V DC***
- ***Measuring range 0...1Mohm or 0...10Mohm***
- ***Alarm on exceeding the adjusted set point***
- ***Interchangeable scales***
- ***AC auxiliary voltage***



DIM-Q

Application

The DIM-Q is used for supervision of the insulation resistance between an insulated voltage distribution network (IT network) and earth cable/safety cable. The instrument is applicable in conjunction with single phase networks and 3-phase networks with/without neutral for voltages up to 690V AC.

This type of insulation measurement is only carried out on AC networks where the neutral/star point of the generator or supply transformer is **not** earthed.

The DIM-Q can be used for marine installations and other types of insulated voltage networks, e.g. containers.

An AC auxiliary voltage is required for the instrument. This may be selected independently of the monitored network, or the DIM-Q can be supplied by the monitored network. If the DIM-Q is supplied from a separate voltage source, the network can also be monitored in power-down condition.

Because of the measuring method used, the DIM-Q is able to measure the insulation correctly on an AC power network containing all kinds of loads, such as frequency converters, valves with rectifiers, thyristor controlled thrusters, switch mode power supplies, transformers, generators etc. The difficulty regarding some of the above-mentioned loads is that an insulation error in e.g. a frequency converter is often located after the rectifier and before the AC output of the converter. This kind of fault will result in a high DC voltage between the power system and the safety cable, which will interrupt the measurement on insulation monitors based on a traditional measuring method.

Measurement

The insulation is monitored between the complete AC network - irrespective of number of wires - and a safety cable.

The measurement is carried out by applying a DC voltage between a point on the safety cable and a point on the AC network. So it is a condition for monitoring of the complete network that the remaining parts are galvanically connected. This is normally achieved via the windings of the generator or the supply transformer and also by the connected loads. If measurement of cables disconnected at both ends is required, the individual wires are connected mutually by means of choke coils.

Note:
Only one insulation monitor can be connected to the same IT power system.

Measuring principle

The DIM-Q is using the traditional measuring method, superimposing of a DC voltage on the system under supervision, but to be able to handle situations where a DC voltage is imposed on the system, the DIM-Q is performing an automatic DC offset adjustment to eliminate the influence from an external DC voltage.

The internal DC voltage generator is based on a 28V voltage source with an internal resistance >251kΩ. When this test voltage is superimposed on the power system under supervision, leakages between the power system and earth (safety cable) will induce a current, the size of which expresses the insulation resistance.

Indicators

The main indicator is the instrument. Besides the instrument the DIM-Q is equipped with 3 LED indicators, 1 green and 2 red LEDs.

Only the green indicator marked SUPERVISION is lit when the unit is connected to auxiliary supply and no insulation error is detected. If the DIM-Q detects a change in the insulation measurement, the SUPERVISION LED starts flashing with a fast rate. If the insulation error detected is fluctuating, the internal integration time is automatically extended, which is indicated by a slower flash rate. As long as the SUPERVISION LED is flashing, the latest measured value is kept and indicated on the instrument until a new value is found, then the reading on the instrument is updated.

Type DIM-Q

The 2 red LED indicators marked +FAULT and -FAULT are illuminated, if an insulation error below the set point is detected. If a DC voltage (component) occurs on the system together with an insulation error, the +FAULT or the -FAULT LED is illuminated, indicating the polarity of the DC voltage. This function will indicate the reason for the insulation error. In case only one red LED is illuminated, the fault is to be found in a load with a built-in rectifier, e.g. a frequency converter.

If a DC voltage is detected, but the alarm limit value is not yet reached, the +FAULT or the -FAULT LED will flash to indicate that there is a DC component higher than 50V DC between the power system and earth (PE), but no insulation error below the alarm limit value yet.

Leakage capacitors

The DIM-Q measures the insulation on a power system with total leakage capacitors of max. 50µF or of max. 500µF.

Response time after a reset

If a leakage capacitor is <1µF and the insulation resistance does not fluctuate, the response time will be ≤10 seconds. For further information on response times - see the table below.

Insulation resistance between P and PE	Leakage capacitor on an IT power system	
kΩ	**50µF**	**500µF**
0	6 sec.	10 sec.
10	6 sec.	125 sec.
100	200 sec.	1000 sec.
1000	200 sec.	1750 sec.
10000	200 sec.	1750 sec.

If a test button is implemented (see the connection diagram) it is recommended to reset the DIM-Q by disconnecting and reconnecting the auxiliary supply (reset time 1 second) in connection with activation of the test button to obtain a response time of 6 seconds. If the DIM-Q is set to 500µF, the response time in connection with a test will likewise be 6 seconds.

Response time on duty

Settings 50µF or 500µF with actual leakage capacitor 1µF:
Step in insulation error
- From 1MΩ to 1kΩ: Response time max. 10 seconds
- From 1kΩ to 1MΩ: Response time max. 10 seconds

Setting 50µF with actual leakage capacitor 50µF:
- From 1MΩ to 1kΩ: Response time max. 120 seconds
- From 1kΩ to 1MΩ: Response time max. 240 seconds

Setting 500µF with actual leakage capacitor 500µF:
- From 1MΩ to 1kΩ: Response time max. 800 seconds
- From 1kΩ to 1MΩ: Response time max. 1600 seconds

Note:
If the insulation error is fluctuating (indicated by a flashing SUPERVISION LED), the above response times will be prolonged.

Power-up

The first 15 seconds after a power-up the DIM-Q is turned into a fast measuring mode. This mode is useful when a switchboard test is carried out, or if the set point has to be adjusted to match a test resistor (see above regarding reset of the DIM-Q). After 15 seconds the DIM-Q is automatically turned into normal measuring mode. If there is a leakage capacitor in the system the DIM-Q will indicate an insulation error for the first 15 seconds after a power-up. If the set point is exceeded the 2 red LEDs will be lit, but the relay output is inhibited for the first 15 seconds after power-up.

Measuring range/scales

1...0MΩ corresponding to 22kΩ at scale centre
10...0MΩ corresponding to 220kΩ at scale centre

The range from the lowest permissible insulation resistance to zero is marked in red, see Fig. 1 and 2.

Scale exchange is possible through a slot in the top of the instrument. The DIM-Q is quickly adapted (by means of a built-in switch) to measuring range 1...0MΩ or 10...0MΩ.

Standard scales

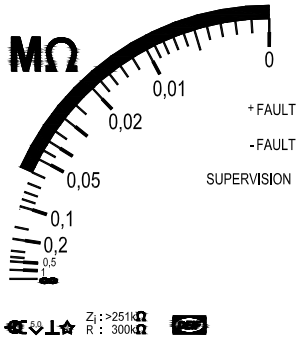


Fig. 1, 1...0MΩ scale

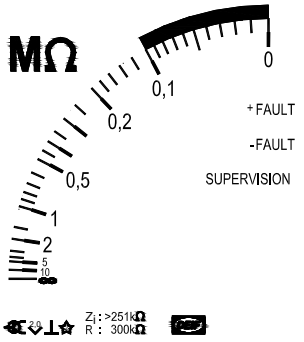


Fig. 2, 10...0MΩ scale

Example:
Fig. 1 above shows a standard 1...0MΩ scale with a standard red section from 0 to 60kΩ.

Fig. 2 above shows a standard 10...0MΩ scale with a standard red section from 0 to 100kΩ.

Red section

1...0MΩ scales	10...0MΩ scales
10...0kΩ	100...0kΩ
11...0kΩ	110...0kΩ
22...0kΩ	220...0kΩ
23...0kΩ	230...0kΩ
38...0kΩ	380...0kΩ
40...0kΩ	400...0kΩ
42...0kΩ	415...0kΩ
44...0kΩ	440...0kΩ
45...0kΩ	450...0kΩ
48...0kΩ	480...0kΩ
60...0kΩ	600...0kΩ
66...0kΩ	660...0kΩ
69...0kΩ	690...0kΩ
	1..0MΩ

In case none of the standard red sections indicated in the table above are applicable for the designer, the required red section must be specified when ordering.

Relay output

The DIM-Q is equipped with one change-over relay contact. By means of a built-in switch the relay can be configured to either:

- NE (normally energized contact). Recommended for alarm purposes. In case of an auxiliary supply drop-out the contact is immediately activated. It is recommended to supply the DIM-Q from a separate source, if this type is used.

- ND (normally de-energized contact). Recommended for control purposes. Also recommended if the auxiliary supply for the DIM-Q is taken from the same power system under supervision. An auxiliary supply failure will not result in an unwanted activation of the relay contact.

Limitations

Max. one DIM-Q can be connected for each insulated network. If on the other hand the network is divided into a number of insulated networks, e.g. by means of transformers, one DIM-Q can be installed for each individual group.

Test

If a periodical test function is required, it can be achieved as shown on the connection diagrams. If a value less than the preset limit value is selected as test resistance, alarm is obtained upon activation of the test button. It is recommended to arrange the test button, so the DIM-Q will be reset just before the test is carried out; if not the test time can be as long as 300 seconds with a setting of 50µF and 1750 seconds with a setting of 500µF.

Warning:
If the installation is to be tested by means of a high-voltage "MEGGER", the measuring leads to the DIM-Q at terminal "P" must be disconnected before testing is carried out. Omitting this may result in damage to the DIM-Q, if the test voltage is higher than 1000V AC/DC. Besides the insulation test will be affected by the built-in DC voltage generator impedance (251kΩ).

Set point

The requested alarm limit value is set on an ohm scale on the rear of the instrument (see Fig. 3 below).

Note:
With a setting of 500µF an alarm will stay on until a new measurement is performed. This can take up to 1750 seconds, even if the insulation error has been corrected, so it is recommended to arrange a push-button close to the DIM-Q so a reset can be carried out.

Range "x10" is marked:
The scale values on the ohm scale are multiplied by 10.

Typical setting:
Insulation resistance corresponding to lower limit of the section marked with red on the scale.

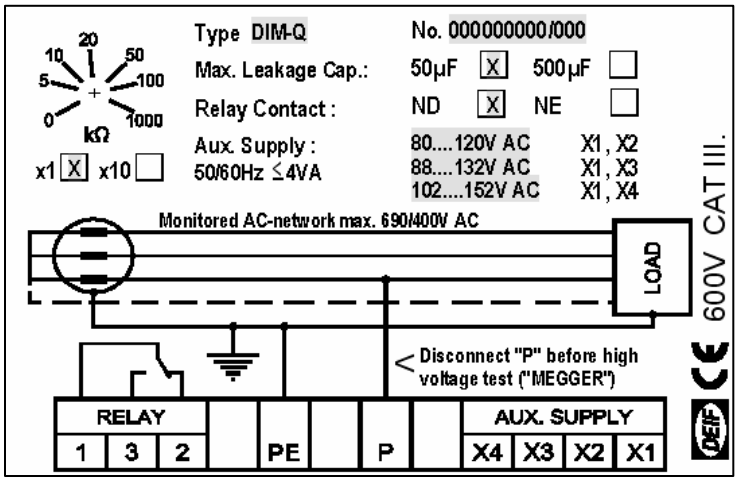
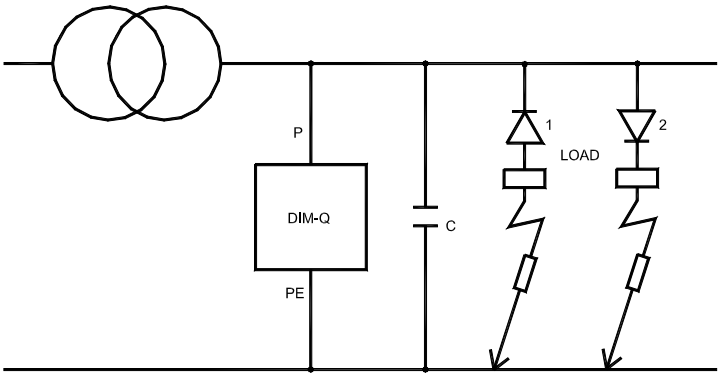


Fig. 3

Illustration of an insulation error in a load with rectifiers



The capacitor marked C illustrates the leakage capacitor.

The P and PE are connectors on the DIM-Q.

The diodes marked 1 and 2 illustrate the rectifier in the load.

If the situation is as illustrated at diode marked 2, the +FAULT LED is illuminated.

If the situation is as illustrated at diode marked 1, the -FAULT LED is illuminated.

Type DIM-Q

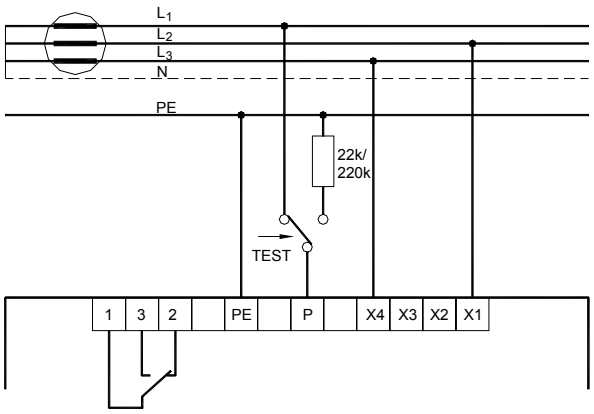
Technical specifications

Measuring circuit	DC resistance (R_i):	300kΩ ±1%
	AC impedance (Z_i):	251kΩ ±1% at 50Hz
	Measuring voltage:	±28V DC ±5%
	Mains voltage / leakage cap.:	Max. 690V AC +20% continuously / max. 1000V DC continuously / max. 50µF leakage capacitor or max. 500µF leakage capacitor
Instrument	Measuring range:	1MΩ / 10MΩ
	- Accuracy:	±5% of scale length (1MΩ) / ±2% of scale length (10MΩ)
	- Temperature drift:	Max. 0.5% of scale length per 10°C
	- Aux. supply influence:	Max. 0.2% of scale length at U_s +20...-15% Max. 5.0% at scale centre at U_s -15...-20%
	- Response time:	Depends on the actual insulation error / leakage capacitor (see section *Response time*)
	Scale:	Exchangeable, with red section
Indicators		
Green LED marked SUPERVISION	The indicator is illuminated when the unit is connected to auxiliary supply and no insulation error is detected. If the DIM-Q detects a change in the measurement, the SUPERVISION LED starts flashing with a fast flash rate. If the integration time is changed to a higher value during the offset procedure, it will be indicated by a slower and slower flash rate. As long as the SUPERVISION LED is flashing, the last reading is kept.	
Red LEDs marked +FAULT -FAULT	AC: Both indicators are illuminated, if a DC potential free insulation error below the set point is detected. If there is a DC component on the system, the +FAULT LED or the -FAULT LED is illuminated, indicating the polarity of the DC voltage. If a DC voltage >50V DC is detected, but the insulation error is higher than the set point, the +FAULT LED or the -FAULT LED will flash to indicate that there is a DC component between the power system and earth (safety cable).	
Relay function	Set point:	0…1000kΩ / 0…10000kΩ corresponding to 22kΩ / 220kΩ at scale centre
	- Accuracy:	±5% of scale length for potentiometer
	- Reproduceability:	±1% of scale length for potentiometer
	- Hysteresis:	±1% of scale length for potentiometer
	- Temperature drift:	Max. 0.2% of scale length for potentiometer per 10°C
	- Voltage drift:	Max. 0.2% of scale length for potentiometer at U_s ±20%
	- Response time:	Same as instrument
	Relay output:	Change-over contact
	Contact rating:	AC1: 8A, 250V AC – DC1: 8A, 24V DC AC15: 3A, 250V AC – DC13: 3A, 24V DC Life mechanical: 2 x 10^7 operations Life electrical: 1 x 10^5 operations
	Relay coupling:	Normally energized NE or normally de-energized ND
General technical specifications		
Auxiliary voltage:	100-110-127V AC or 220-230-240V AC or 400-450-480V AC ±20% 40...70Hz (≤4VA)	
EMC: (See **Note 1**)	To IEC 61000-6-1, 61000-6-2, 61000-6-3, 61000-6-4, SS4361503 (PL4) and IEC 255-4 (class 3)	
Galvanic separation:	Relay output / measuring circuit / aux. voltage: 3.25kV - 50Hz - 1 min.	
Temperature:	-10...55°C (nominal), -25...60°C (operating), -25...65°C (storage)	
Climate:	Class HUE, to DIN 40040	
Protection:	Instrument: IP52 / IP54. Electronics: IP20. Terminals: IP20. To IEC 529 and EN 60529	
Connections:	Screw terminals: 2.5 mm^2 (multi-stranded), 4 mm^2 (single-stranded)	
Materials:	All plastic materials are self-extinguishing to UL94 (V0)	

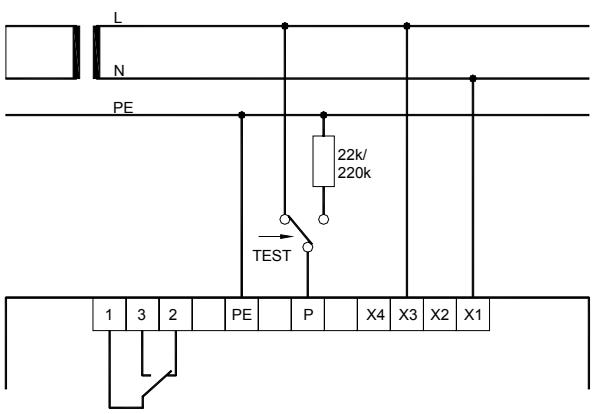
Note 1:
The DIM-Q is CE marked for residential, commercial and light industry plus industrial environment. Regarding approvals, please see our homepage, www.deif.com, search for DIM-Q under the menu Documentation.

Type DIM-Q

Connections



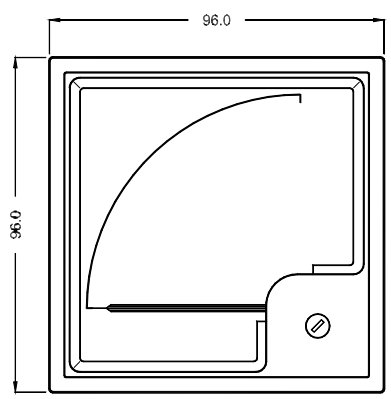
3- or 4-wire networks

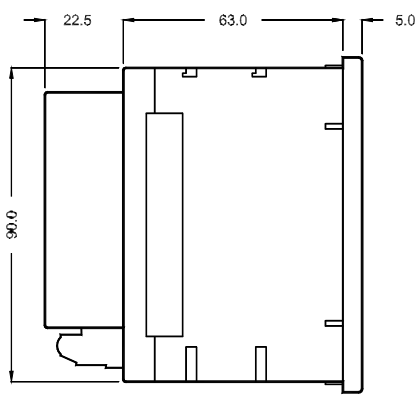


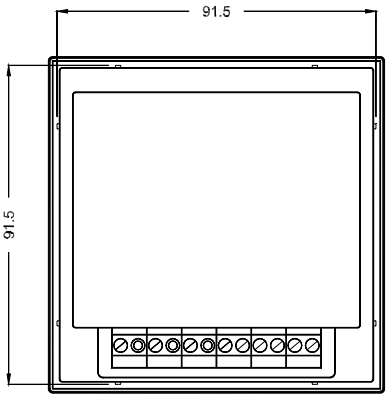
2-wire networks

Dimensions

All dimensions in mm







DIM-Q Weight: Approx. 0.390 kg (Panel cut-out: 92.0 x 92.0 +0.8)

Order specifications

Example:

Type	**Scale range**	**Red section**	**Relay NE/ND**	**Max. leak. cap.**	**Auxiliary voltage**
DIM-Q	1...0MΩ	With	NE	50µF	400V AC

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

Insulation monitors

Type AAL-111Q96

4921230011G

- ***Monitoring of insulation resistance***
- ***Alarm on exceeding of the adjusted set-point***
- ***Interchangeable scales***
- ***AC or DC auxiliary voltage***

Application

The AAL-111Q96 is used for supervision of the insulation resistance between an insulated low-voltage distribution network and earth cable/safety cable. The instrument is applicable in conjunction with single phase networks and 3-phase networks with/without neutral for voltages up to 440V AC. The AAL-111Q96 is CE marked for residential, commercial and light industry plus industrial environment.

This type of insulation measurement is only carried out on AC networks where the neutral/star point of the generator or supply transformer is **not** earthed.

The AAL-111Q96 is used for marine installations and other types of insulated low-voltage networks.

An AC or DC auxiliary voltage is required for the instrument. This may be selected independently of the monitored network. The instrument is supplied for either an AC auxiliary voltage with transformer taps for all typical nominal voltages between 100V and 440V or for 24V DC. Instruments for AC auxiliary voltage may be fed by the monitored network. If the instrument is fed by a separate voltage source, the current network may also be monitored in powerdown condition.

A high insulation resistance between the mains supply and the hull of a ship is of importance because of safety and counteraction of galvanic corrosion of the hull. Another typical application is monitoring of the insulation resistance of transformer-coupled supply voltages in a control room.

Measurement

The insulation is monitored between the complete AC network - irrespective of number of wires - and an earthed safety cable.

The measurement is carried out by applying a DC voltage between a point on the safety cable and a point on the AC network (see Fig. 2). A condition for monitoring of the complete network is thus that the remaining parts are galvanically connected together. This is normally achieved via the windings of the generator or the supply transformer and the connected loads.

If measurement of cables disconnected at both ends is required, the individual wires are connected mutually by means of choke coils.

Measuring principle

Leakages between the AC network and earth will induce a current, the size of which expresses the insulation resistance. The current is processed in an amplifier circuit, the output signal of which is fed to a relay circuit and an indicating instrument equipped with a scale graduated in ohms. If this exceeds a preset limit, the built-in relay is deactivated (normally energized) and a red LED marked "FAULT" is lit. If the failure current then drops below the limit value, the relay is activated and the LED marked "FAULT" is switched off. The relay circuit is not provided with a hold-on function.

A green LED marked "READY" indicates whether the auxiliary voltage of the instrument is present. If this auxiliary voltage drops out, the built-in relay is deactivated which results in transmission of an alarm signal.

The two LEDs are visible through holes in the scale.

Power up

Notice that during power up the AAL-111Q96 will indicate a leakage for about 1 sec. depending on the actual leakage capacitor. This will result in activation of the relay and transmission of an alarm.

Measuring range

220kΩ at scale centre (1kΩ/V).

The range from the lowest permissible insulation resistance to zero is marked in red.

Scale exchange is possible through a slot in the top of the instrument. The instrument is quickly adapted to the voltage in use and insulation resistance.

The following **standard** scales are available:

Standard scales

Range	Mains voltage	Scale centre	Red section
1kΩ/V	110V AC	220kΩ	110..0kΩ
1kΩ/V	220V AC	220kΩ	220..0kΩ
1kΩ/V	380V AC	220kΩ	380..0kΩ
1kΩ/V	440V AC	220kΩ	440..0kΩ

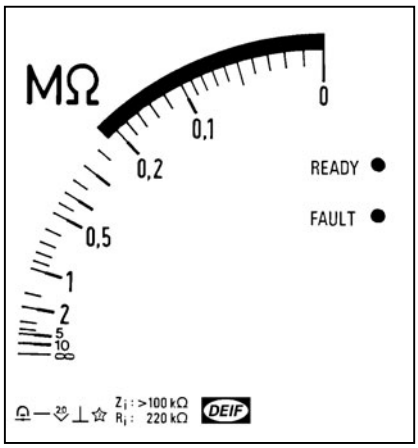


Fig. 1

Limitations

Max. one instrument per insulated network may be connected. If the network on the other hand is divided into a number of insulated networks, e.g. by means of transformers, one measurement may be carried out for each individual group.

Test

If a periodical test function is required, this can be achieved as shown on the connection diagrams. If a value less than the preset limit value is selected as test resistance, alarm is obtained upon activation of the test button.

Warning: *If the installation is to be tested by means of a high-voltage "MEGGER", the measuring leads to the AAL-111Q96 at terminal "p" must be disconnected* ***before*** *testing is carried out. Omitting this may result in damage to the AAL-111Q96.*

If the installation contains directly connected AC loads with rectifiers such as magnetic valves or frequency converters, an error in this type of loads will result in indication error and error alarm on the AAL-111Q96. This indication error/error alarm can only be avoided if the mentioned loads are connected through a transformer.

Set point

The requested limit value is set on an ohm scale on the rear of the instrument (see Fig. 2).

Range "x10" is marked:
The scale values on the ohm scale are multiplied by 10.

Typical setting
Insulation resistance corresponding to lower limit of the section marked with red on the scale.

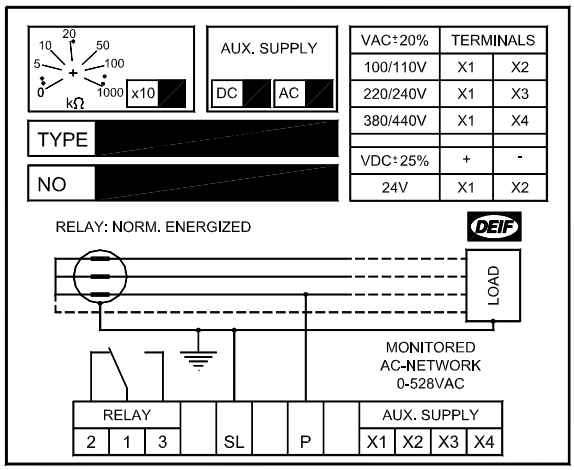


Fig. 2

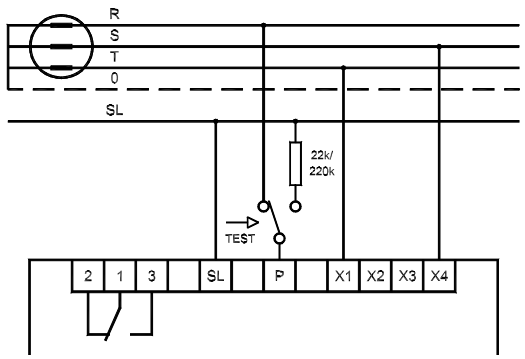
Technical specifications

Measuring circuit	DC resistance (R_i):	220kΩ ±5%
	AC impedance (Z_i):	180kΩ ±5%
	Measuring voltage:	12V DC ±10%
	Mains voltage:	Max. 440V AC +20% continuously
Instrument	Measuring range:	220kΩ at scale centre
	- Accuracy:	±2% of scale length
	- Temperature drift:	Max. 0.5% of scale length per 10°C.
	- Voltage drift	Max. 0.2% of scale length at U_s ±20%
	- Response time:	3 s
	Scale:	Exchangeable, with red section

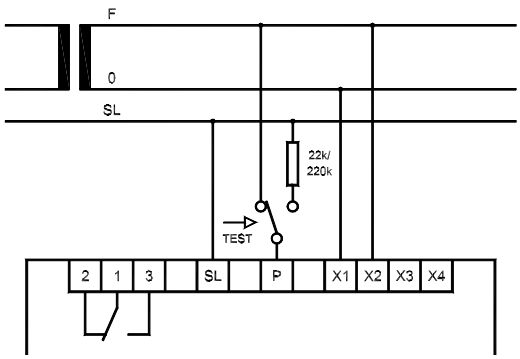
Relay function	Set point	220kΩ at scale centre.
	- Accuracy:	±5% of scale length
	- Reproduceability	±1% of scale length
	- Hysteresis:	±2% of scale length
	- Temperature drift:	Max. 0.2% of scale length per 10°C
	- Voltage drift:	Max. 0.2% of scale length at U_s ±20%
	- Response time:	3 s
	- Indication:	Red LED is lit when resistance is lower than set point
	Relay output:	Change-over contact
	Contact rating:	250V - 2A - 400VA (AC). 250V - 1A - 50W (DC)
	Relay coupling:	Normally energised

General technical specifications	
Auxiliary voltage:	110 - 220 - 380 - 415 - 440V AC ±20%, 45..65Hz (ca. 4VA) 24V DC ±25% (ca. 4W)
"READY" indication:	Green LED is lit, when auxiliary voltage is present
EMC:	To EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4) and IEC 255-4 (class 3)
Galvanic separation:	Relay output/measuring circuit/aux. voltage: 2kV - 50Hz - 1 min.
Temperature:	-10...55°C (nominal) -25...60°C (operating), -25...65°C (storage)
Climate:	Class HUE, to DIN 40040
Protection:	Instrument: IP52. Electronics: IP20. Terminals: IP20. To IEC 529 and EN 60529
Connections:	Screw terminals: 2.5 mm^2 (multi-stranded), 4 mm^2 (single-stranded)
Materials:	All plastic materials self-extinguishing to UL94 (V0)

Connections



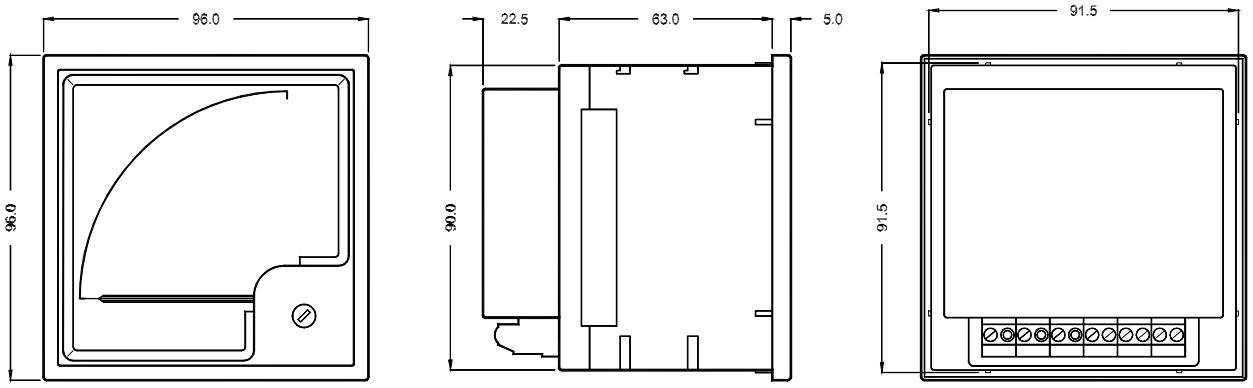
3 or 4 wire networks



2 wire networks

Dimensions

All dimensions in mm



AAL-111Q96 Weight: approx. 0.450 kg (Panel cut-out: 95.0 x 92.0 +0.8)

Order specifications

	Type	**Red section range**	**Nom. mains voltage**	**Auxiliary voltage**
Example:	AAL-111Q96	22..0kΩ	110V AC	24V DC

Due to our continous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

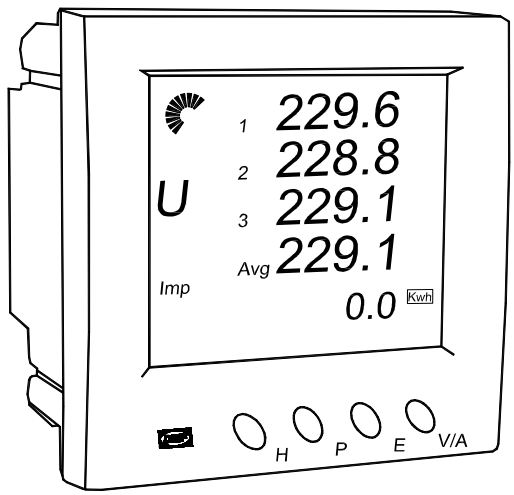
DEIF A/S

Data sheet

MIC

Multi-instrument

4921210107A



CE

Features

Measurements

- All 3-phase AC measurements
- True RMS
- Replaces analogue meters

Intelligent

- Suitable for all 3-phase network topologies
- Replaces transducers

Communication

- Suitable for SCADA systems
- RS485 serial output
- Modbus RTU protocol

Accuracy

- U, I and F class 0.2
- Other values class 0.5

Installation

- Compact dimensions
- Simple wiring

Display

- 5 display rows
- 58 x 66 mm
- Blue backlight

© DEIF A/S

Application

The MIC multi-instrument is a microprocessor-based measuring unit providing measurement of all electrical quantities on a 3-phase electric energy distribution network. The measurements are shown on the built-in display. The MIC also has an RS485 interface that supports data exchange with a control system via Modbus RTU.

The MIC product family includes two versions:

- MIC 4002 (basic)
- MIC 4224 (additional functionality)

The MIC measures true RMS values on all 3-phase network topologies with/without neutral and with both balanced and unbalanced load.

The MIC can replace a large number of standard analogue instruments in all electrical measuring applications. It can be applied both as a regular instrument and as a remote value-reading and control unit, where all measured values are transmitted to the remote control system via the serial interface. The MIC contains all necessary measuring circuits and presents all values on a display with blue backlight. The display has 4 digits resolution for all measurements with the exception of the energy counter values (9 digits). The backlight "on"-time is selectable.

The MIC is a flexible measuring unit that enables the user to easily adapt the instrument to the individual application. Counter reset and change of the instrument settings can be password protected.

Measured and calculated values

Voltage (phase-neutral)
Actual voltage of each phase and average voltage.

Voltage (phase to phase)
Actual voltage of each line and average voltage.

Current
Actual current of each phase, average current and neutral current.

Active power
Actual active power of each phase and total power.

Reactive power
Actual reactive power of each phase and total reactive power.

Apparent power
Actual apparent power of each phase and total apparent power.

Power factor
Actual power factor of each phase and system average power factor.

Frequency
Actual frequency of L1.

Power quality
Voltage/current unbalance factor, total harmonics distortion of voltage/current of each phase and total harmonics distortion of average voltage/current.

Energy counter
The MIC has 8 counters: Export/import kWh, export/import kvarh, absolute sum of export/import kWh, algebraic sum of export/import kWh, absolute sum of export/import kvarh, algebraic sum of export/import kvarh.

Statistics data
Max./min. values of voltage, current, total power, total reactive power, total apparent power, power demand, power factor and frequency.

Running hour
Meters the duration of the operation.

Real time clock
Date and time.

Connection

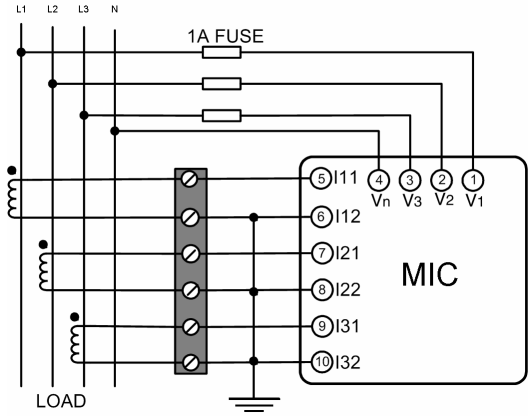
The multi-instrument MIC can be used in almost all 3-phase network topologies with/without neutral and with both balanced and unbalanced load. The voltage and current input wiring modes are set separately in the parameter setting process. The voltage wiring mode can be:

3LN	3-phase 4-line Y
2LN	3-phase 4-line Y with 2 PT
2LL	3-phase 3-line open delta

The current input wiring mode can be:

3CT	Unbalance system
2CT	Unbalance system without N
1CT	Balance system

Any voltage mode can be grouped with any of the current modes. The MIC is supplied configured in 3-phase 4-wire unbalanced mode, i.e. voltage wiring mode 3LN and current input mode 3CT (3W4).

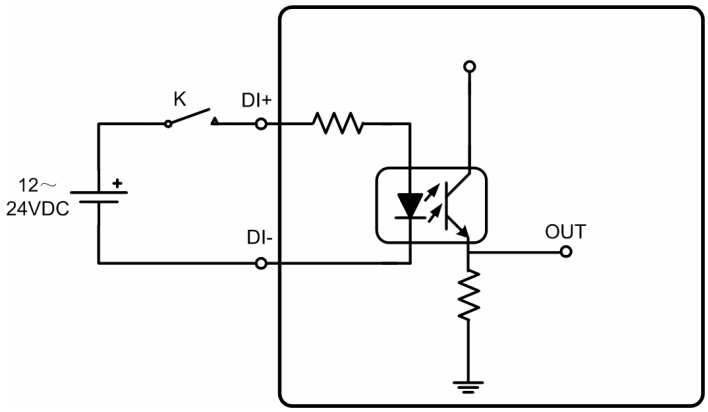


Principle diagram for 3LN, 3CT
Connection (3W4)

MIC 4002

Digital input

MIC 4002 has two digital inputs that can be used to show the status of the switches in the power system:



Digital input circuit

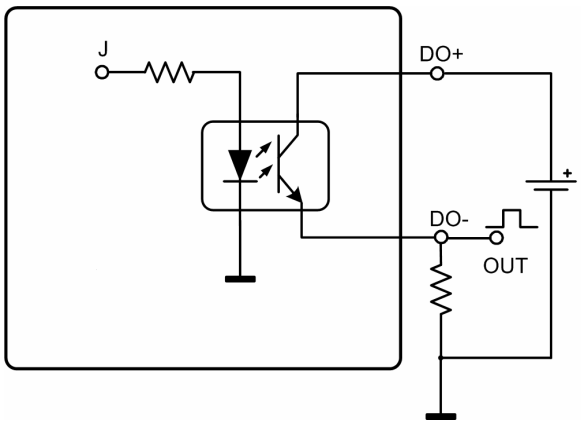
MIC 4224

Relay output

The two relay outputs are used to control electric switches in the power system via the Modbus RTU communication.

Digital output

MIC 4224 has two digital outputs that can be used either as pulse outputs for actual and reactive energy or as over/under the limit alarm signals. The digital outputs are suitable for driving tariff devices or 24V DC relays:



Digital output circuit (pulse)

Digital input

MIC 4224 has four digital inputs that can be used for status of switches in the power system.

Technical specifications

Voltage inputs

Nominal voltage U_N	Ph-N 230V AC Ph-Ph 400V AC
Measuring range	0 to 1.2 x U_N
Overload capacity	2 x U_N continuously 2500V for 1s
PT primary	100V…500kV
PT secondary	100V…400V
Consumption	≤ 0.2VA/phase
Fuse	1A/230V

Current inputs

Nominal current I_N	5A AC
Measuring range	0 to 1.2 x I_N
Overload capacity	10A continuously 100A for 1s
CT primary	5A…10kA
Max. current	9999A
Consumption	≤ 0.5VA/phase

Frequency

Nominal frequency f_N	50/60Hz
Measuring range	45Hz to 65Hz
Measuring point	V1 phase voltage

Accuracy

Ph-N voltage	0.2% of range
Ph-Ph voltage	0.2% of range
Ph current	0.2% of range
Frequency	0.2% of reading
Neutral current	0.5% of range
Active power	0.5% of range
Reactive power	0.5% of range
Apparent power	0.5% of range
Power factor	0.5% of range
Active energy	EN 61036 class 1
Reactive energy	EN 61268 class 2
Demand power	1.0% of range
THD	1.0% of reading

Auxiliary power supply

Universal AC/DC power supply	
Supply voltage	85…264V AC 50/60Hz
or	100…280V DC
Consumption	≤ 2VA
Fuse	1A/250V AC

Digital input

Optical isolation	4000V AC rms
Input resistance	2kΩ
Input voltage	5…30V DC
Input current	Max. 20mA

Digital output

Output form	Open collector, NO
Optical isolation	4kV AC rms
Voltage	+40V DC to -6V DC
Current	Max. 30mA
Pulse rate	0.1…600kWh/pulse 0.1…600kvarh/pulse
Pulse duration	20ms…1s

Relay output

Type	Normally open contact
AC rating (resistive load)	250V-3A-750VA
DC rating (resistive load)	30V-3A-90W
Mechanical life	$5x10^6$ operations
Electrical life at rated load AC	$1x10^5$ operations
Electrical life at rated load DC	$2x10^5$ operations
Dielectric strength	750V AC for 1min.
Isolation contact/coil	4kV AC rms

Communication

Signal levels	RS485
Connection type	Multi-drop
Devices per link	Max. 32 units
Cable type	Screened twisted pair
Maximum cable length	1200m
Transmission mode	Asynchronous
Message format	Modbus RTU
Data rate	1 200 to 38 400 bits/s

Environmental conditions

Working temperature, display	-5…55°C
Working temperature, RS485	-25…55°C
Storage temperature	-25…70°C
Humidity, relative	0-95% non condensing
Temperature drifts	100ppm/°C
Standard	EN 60068-2-1, EN 60068-2-2, EN 60068-2-3

Connections

Measuring inputs	Firm terminal block
Wire max.	5mm² / AWG10
Screw torque	0.5Nm / 5.5 lb-inch
Other	Pluggable block
Wire max.	1.5mm² / AWG16
Screw torque	0.25Nm / 2.5 lb-inch

Mounting

Panel mounted	Max. 6mm thick
Panel cutout	92 x 92mm +0.8mm (3.62” x 3.62”)

Protection

Front	IP40 (EN 60529)
Rear	IP20 (EN 60529)

Weight 350 g (0.8 lbs.)

Material

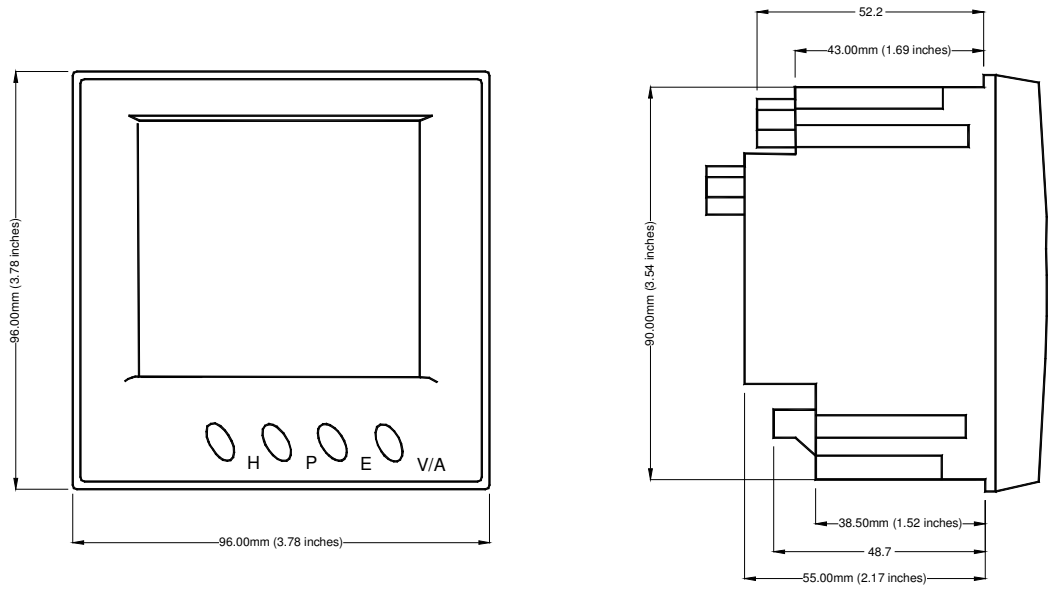
Plastic housing	According to UL94 (V0)

EMC EN 61000-6/2-4

Safety EN 61010-1
Cat. III, pollution degree 2

Test voltage 2.2kV according to EN 61010-1

Unit dimensions in mm (inches)



Panel cutout:

H x W = 92 x 92mm (3.62” x 3.62”)

Order specifications

MIC 4002	**MIC 4224**
400V Ph-Ph, 5A, no relay output, no digital output, 2 digital inputs	400V Ph-Ph, 5A, 2 relay outputs, 2 digital outputs, 4 digital inputs
DEIF no. 1211020002	DEIF no. 1211020004
(EAN no. 5703727105960)	(EAN no. 5703727105953)

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

Tlf.: 9614 9614, Fax: 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

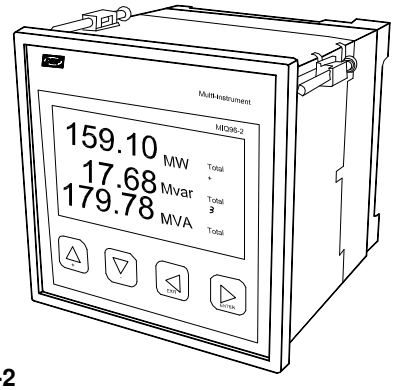
DEIF A/S

Type MIQ96-2

Multi-instrument

4921210108A

- ***All 1 or 3-phase AC measurements, true RMS***
- ***Programmable CT and VT ratios***
- ***More than 50 displayed parameters (V, A, kW, kVA, kvar, kWh, PF, Hz, MD, THD etc.)***
- ***Multi language support***
- ***Serial RS485 output for all values***
- ***Pulse output for kWh and kvarh or limit switches***
- ***Configurable display***



MIQ96-2 CE

Application

The MIQ96-2 multi-instrument is a microprocessor-based measuring unit providing measurement of all electrical quantities on a single phase or 3-phase electric energy distribution network, showing the measurements on the built-in display and transmitting these as:

- 2 pulse outputs for kWh and kvarh
- A serial output RS485

The MIQ96-2 can replace several instruments in all electrical measuring applications and can be applied both as a normal instrument and as a remote value-reading unit, where all measured values are transmitted to the remote control system via the serial interface.

The MIQ96-2 measures true RMS values on all network topologies with/without neutral and with both balanced and unbalanced load.

The MIQ96-2 contains all necessary measuring circuits and presents all values on a graphic LCD with yellow/green backlight. Messages are presented in clear text, all measuring values in engineering units.

The MIQ96-2 is a flexible and programmable unit, which enables the user to easily adapt the unit to the application in question. Reset of counters and change of parameters can be password protected.

Standard functions

The unit is designed for measurement on a 3-phase or 1-phase network.

Measured and calculated values on a 3W4 connection:

- Current (3-phase actual current, neutral current, average current, THD in each phase)
- Phase to neutral voltage (3-phase actual voltage, average voltage, THD in each phase, phase angle)
- Phase to phase voltage (3-phase actual voltage, average voltage, THD between phase 1, 2 and 3)
- Active power (3-phase W total and W for each phase)
- Reactive power (3-phase var total and var for each phase)
- Apparent power (3-phase VA total and VA for each phase)
- Power factor PF (3-phase PF total and PF for each phase)
- Frequency
- Energy measuring counter Export and Import

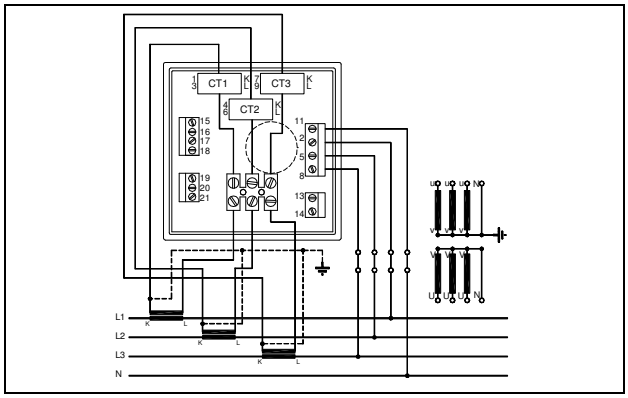
  4 counters: (1) export kWh, (2) export kvarh
  (3) import kWh, (4) import kvarh

- Maximum demands (load from consumer)
  The MIQ96-2 enables measurement of MDs of total active, reactive and apparent power, moreover the sum of currents.
  The MIQ96-2 can be set up for one of three different modes for calculation of MDs:
  a. Thermal (bimetal element)
  b. Fixed window (average value for one window)
  c. Sliding window (average value for more windows)

Connection

In the menu "Setting" set up for the following connections are available: 1W, 1W3, 2W3, 1W4, 3W4.

Principle diagram for 3W4 connection:



RS485 serial output

RS485 remote value-reading of all values measured by the MIQ96-2.
RS485 allows remote entering of password, time, MD, reset of counters etc.
Modbus standard telegram: See User's Manual and Serial Interface Manual, can be downloaded from www.deif.com.

Energy measurement by 2 relay outputs

For counter 1 and 2:
The 2 potential free relay outputs can be programmed to transmit any fixed number of pulses per produced kWh (1) or kvarh (2). Alternatively these relays can be configured as limit switches. See Appendix for User's Manual for further information.

Universal AC and DC aux. supply:
48…230V AC 50/60Hz and 24…220V DC.

Type MIQ96-2

Technical specifications

Meas. voltage Un: Ph-N 230V AC Ph-Ph 400V AC, range 0.1…1.5 x Un
Consumption: < 0.1VA per phase
Overload capacity:
1.5 x Un continuously
2 x Un for 10s

Meas. current In: -/1A or -/5A, range 0…1.6 x In
Consumption: < 0.1VA per phase
Overload capacity:
3 x In continuously
25 x In for 3s
50 x In for 1s

Meas. frequency: 50/60Hz, range 45…65Hz

Auxiliary supply: Working range:
40…276V AC 40...65Hz
19…300V DC
Overload capacity:
1.2 x Un continuously
1.5 x Un for 10s
Consumption: < 5VA

Accuracy:

Phase voltage Ph-N	0.5% of range
Phase - phase voltage	1.0% of range
Current	0.5% of range
Neutral current	1.0% of range
Active power	0.5% of range
Reactive power	0.5% of range
Apparent power	0.5% of range
Power factor	0.5% of range
MD values	1.0% of range
Active energy EN61036:	1996 class1
React. energy EN61268:	1995 class2
Frequency	0.05% of reading
THD	1.0%

Note: All measurements are calculated with harmonics present up to 15th harmonics

Response time: 64 periods ~ 1.28s at 50Hz

Real time clock: 1 minute/month

Back up battery: Producer: Varta
Type: CR 2032 lithium battery

Battery life time: Approx. 6 years (at 23°C – typical)

Relay outputs

Contact ratings: 250V - 6A - 1500VA (AC)
(250V AC - 6A resistive AC load 100.000 operations)
35V - 6A - 210W (DC)
(30V DC - 6A resistive load 500.000 operations)

Contact voltage: Max. 250V (AC)
Max. 100V (DC)

Isolation: 1000V (AC) between open contacts
4000V (AC) between coil and contacts

Pulse: Max. pulses per hour 4000
Pulse duration 10…300ms

Fuse: All voltage inputs ought to be protected by a 2A fuse

RS485 port

Connection type: Multi-drop (32 connections per link)

Signal levels: RS485

Cable type: Screened twisted pair

Max. cable length: 1000m

Connector: Screw terminals

Isolation: 3.7 kV rms for 1 minute between all terminals and all other circuits

Transmission

Mode: Asynchronous

Message format: Modbus RTU

Data rate: 1200 to 115200 bits/s

Safety: To EN 61010-1
Installation Cat. III, 300V. Pollution degree 2
Installation Cat. II, 600V. Pollution degree 2

Test voltage: 3.7 kV rms according to EN 61010-1

EMC: To EN 61036
To EN 61326-1: 1997 for mentioned accuracy. (To EN 50081-1/2 and EN 50082-1/2 for a general 1.0% accuracy on all measurements)

Connections: Permissible cross section of the connection leads:

Wire: Multi stranded: 1.5mm^2
Single stranded: 2.5mm^2

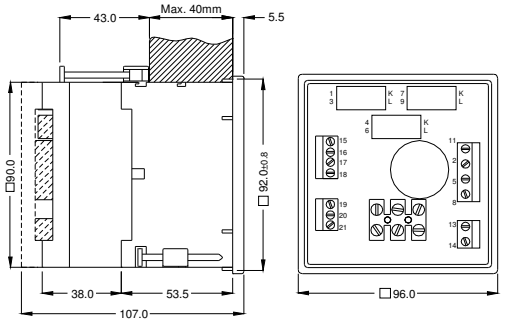
Protection: Enclosure: IP52
Terminals: IP20 with cover mounted
Terminals: IP00
According to EN 60529: 1989

Climate:

According to EN 61036:	1996
According to EN 61268:	1995
Operating temperature:	-10 to +65°C
Storage temperature:	-25 to +70°C
Annual mean relative humidity:	≤ 75% r.h.

Housing: Plastic, in compliance with UL 94 V0

Dimensions (in mm)



Protection lid for terminals

Weight: Approx. 0.65 kg Panel cut-out: 92 x 92 mm + 0.8

Order specifications

MIQ96-2 —

Basic Unit P_h-N 230VAC/P_h-P_h 400VAC

CT -/1A . . . . . 1A —

CT -/5A . . . . . 5A —

Example: MIQ96-2 - 5A

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

Power factor meters

Type PFQ

4921210002E

- *Self-contained meter*
- *Compact design (DIN sizes)*
- *Scale deflection 90° and 240°*
- *Accuracy: Class 1.5*
- *Linear to phase angle*

CE

Available types

Size	Scale deflection 90°	Scale deflection 240°
96 x 96 mm	PFQ96-x	PFQ96-c
144 x 144 mm	PFQ144-x	PFQ144-c

The meter consists of a moving coil movement and an electronic transducer, housed in a standard case. The transducer measures the phase angle between an AC voltage and the corresponding AC current, converting the signal into a proportional DC current, which is fed to the moving coil instrument. The PFQ is CE classified for residential, commercial and light industry plus industrial environment.

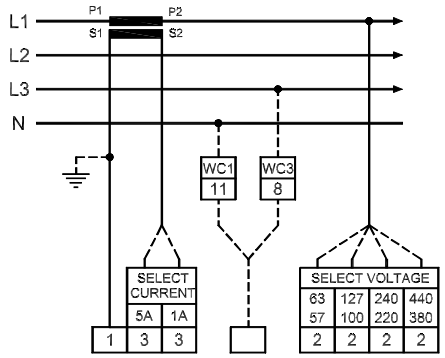
The measuring is principally single-phase (connection WC1), however, in a three-phase network without neutral the voltage is measured between 2 phases. The measurement can in principle not be made, if either the voltage or the current is zero. The pointer will indicate the mechanical zero (always placed at scale start) when the voltage is disconnected. At current signals below 5% of I_n, the pointer can be adjusted to indicate a required value by means of a potentiometer (placed on the rear).

Note: At heavy non-linear loads (e.g. thyristor controlled engines and rectifiers) the zero crossing of the current is delayed, and a power factor measurement is thus not possible. Measurement of var/watt is recommended in these cases (var/watt = tanφ).

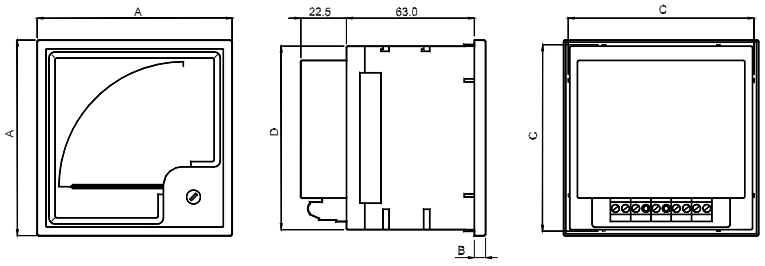
Technical specifications

Accuracy:	Class 1.5, (-10...15...30...55°C) to IEC 51 and EN 60051
Standard measuring ranges:	0.5 cap. ...1... 0.5 ind., 0.7 cap. ...1...0.3 ind., 0...1 cap., 0...1 ind.
Measuring voltage ($V_{nom.}$):	57.7-63.5-100-110-127-220-230-240V AC ±20% (WC1 and WC3) 380-400-415-440V AC ±20% (WC3 only) (Burden: Approx. 10mA)
Effective voltage range:	80...120% of V_{nom}
Measuring current ($I_{nom.}$):	-/1A and -/5A from external current transformer
Effective current range:	5...200% of I_{nom}
Frequency drift:	45...65Hz: Max. ±0.5% (accuracy: Class 1.5%) 300...500Hz: Max. ±0.5% (accuracy: Class 2.0%)
Ambient temperature:	-10...55°C (nominal), -25...60°C (operating), -25...70°C (storage)
Temperature drift:	Typically 0.1%. Max. 0.15% per 10°C
Shock test:	15g – 6 times – 3 directions, 50g/6ms, 22g/20ms
Climate:	Class HUE, to DIN 40040
EMC:	To EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4) and IEC 255-22-1 (class 3)
Test voltage:	2.2kV – 50Hz – 1 min. All circuits mutually and to earth
Materials:	All plastic parts are self-extinguishing, to UL94 (V0)
Terminals:	Max. 2.5 mm² (multi-stranded). Max. 4.0 mm² (single-stranded)
Protection:	Front: IP52 (IP54 on request). Terminals: IP20. To EN 60529, IEC 529

Connections



Dimensions



Type	A	B	C	D	Weight (kg)
PFQ96-x/-c	96 x 96	5	91.5	90	Approx. 0.400
PFQ144-x/-c	144 x 144	8	137.5	136	Approx. 0.700

Order specifications

	Type	Connection	Measuring range	Measuring voltage
Example:	PFQ96-x	WC3	0.5…1…0.5COSφ	380V AC

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

Pt100Ω temperature meters

Type PTQ

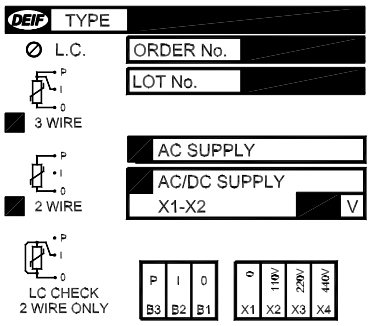
4921210021F

- ***Self-contained meter in DIN sizes: Q96 and Q144 mm***
- ***90° and 240° linear scales***
- ***Built-in lead compensation (2 wire)***
- ***Highly resistant to transients and vibrations***

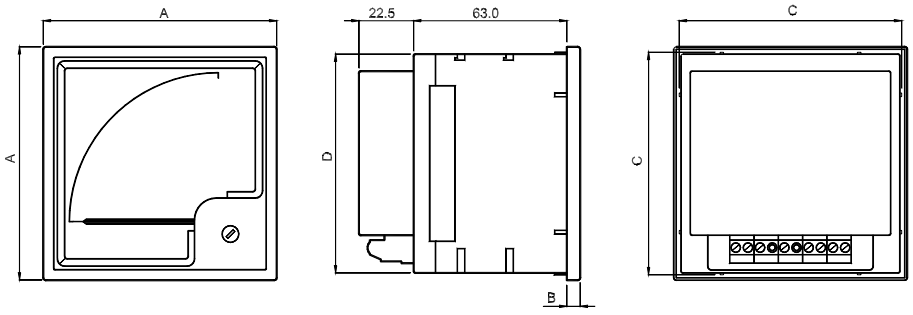
Technical specifications

Types	**PTQ96-x, PTQ144-x** (90°) **PTQ96-c, PTQ144-c** (240°)				
Accuracy	Class 1.5 (-10...15...30...55°C), to EN 60051 and IEC 51				
Standard ranges (°C) Pt100 sensor 2 or 3 wire	0...40 0...150 20...120 250...500	0...50 0...200 50...150 300...600	0...60 0...250 50...250 0...500	0...80 0...300 100...200 0...600	0...100 0...400 200...400 0...800
Min. temperature difference	25°C				
Min./max. temperature	-200°C/+800°C				
Auxiliary supply	24-48-110-220V AC/DC (AC: 3VA, DC: 15mA) Use external surge protection if you use DC supply with supply cable longer than 10 m **With galvanic separation between auxiliary supply and sensor:** 110-220-380/440V AC (3VA) (on request) Not to be connected to systems where phase-zero or phase-earth exceeds 300V				
Auxiliary voltage influence	Max. 0.1% per 10% variation				
Temperature coefficient	Max. 0.2% per 10°C, typically 0.05% per 10°C				
Ambient temperature	-10...55°C (nominal), -25...60°C (operating), -40...65°C (storage)				
Shock test	15g – 6 times – 3 directions, 50g/6ms, 22g/20ms				
EMC	To EN 50081-1/2 and EN 50082-1/2. CE marked for residential, commercial and light industry plus industrial environment				
Climate	Class HUE, to DIN 40040				
Protection	Front: IP52 (IP54 on request). Terminals: IP20. To EN 60529 and IEC 529				
Max. lead resistance	3 wire: 3 x 5Ω 2 wire: 10Ω at ΔT = 51...600°C, 5Ω at ΔT = 50°C, 2Ω at ΔT = 25...49°C				

Connections



Dimensions



Type	A	B	C	D	Weight
PTQ96-x/-c	96 x 96 mm	5.0 mm	92 x 92 mm	90 x 90 mm	Approx. 0.400 kg
PTQ144-x/-c	144 x 144 mm	8.0 mm	138 x 138 mm	136 x 136 mm	Approx. 0.700 kg

Order specifications

	Type	Scale	2 or 3 wire	Aux. voltage
Example:	PTQ96-c	0...150°C	3 wire	24V AC/DC

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

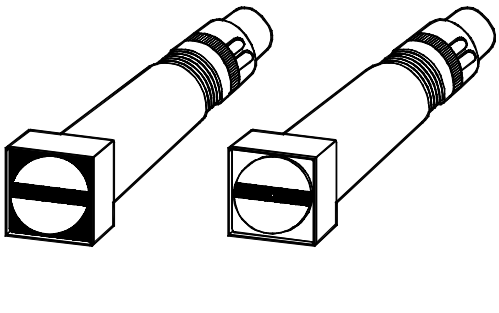
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

Types PIR25-1, PIR25-2

Remote position indicators

4921210033D

- ***PIR25-2: ”round” (black focusing screen)***
- ***PIR25-1: ”square” (white focusing screen)***
- ***Indication of circuit breaker position***
- ***Indication of tie breaker position***



PIR25-2 / PIR25-1

Application

The position indicators types PIR25-1 and PIR25-2 provide remote indication of the position of switches, circuit breakers, solenoid valves, relays etc. The PIR25-1 and PIR25-2 are CE marked for residential, commercial, light industry plus industrial use.

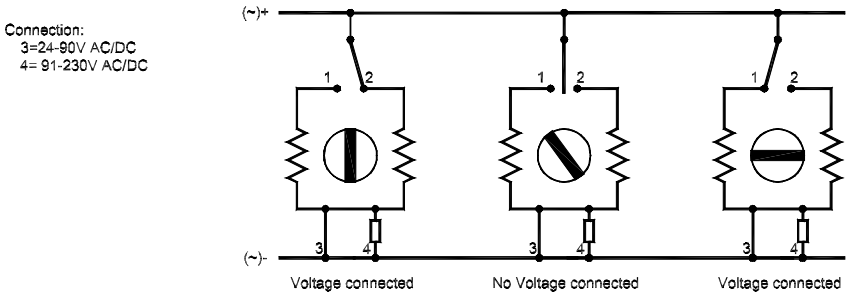
PIR25-1 and PIR25-2 can be used in mimic diagrams or control panels.

The indicator disc is controlled by a moving magnet system. When no voltage is connected, the indicator disc stays in a diagonal position. When voltage is connected to one coil, the indicator disc rotates clockwise. When the other coil is activated, the indicator disc rotates counter-clockwise.

Technical specifications

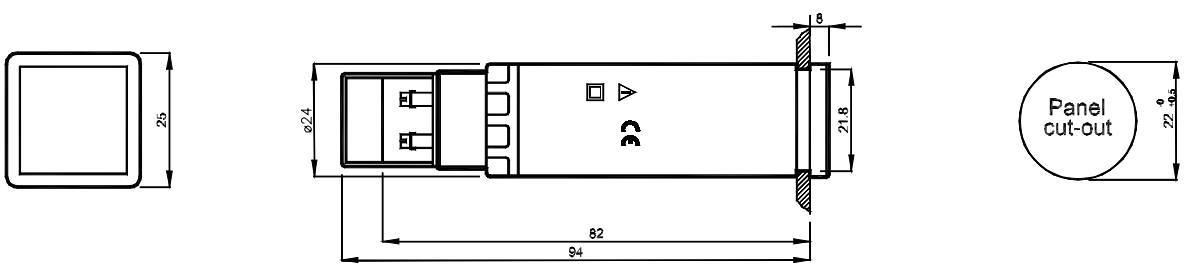
Nominal voltages:	24-48-110-230V AC/DC (Max. working voltage 300V)
Consumption at nominal voltages:	1.5VA
Materials:	Polycarbonate UL94VO
Protection:	IP54
Test voltage:	To EN 61010-1
EMC:	To EN 50081-1/2 + EN 50082-1/2
Connections:	Screw, max. 1.5 mm^2 (IP 00)

Connections



Note: When PIR25 is applied for supply 91-230V AC/DC, other indicators (lamps) between terminals 1 + 4 and 2 + 4 must never be connected.

Dimensions (mm)



Weight: Approx. 0.06 kg

Order specifications

	Type
Example:	PIR25-2

Due to our continous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

Running hours counters

Type HC 36/24

4921210080B

- *Compact design (36 x 24 mm)*
- *Synchronous motor (AC version)*
- *Step motor (DC version)*
- *7 digits read-out (whole figures white, decimals red/black)*
- *For flush mounting*

CE

Application

The running hours counters type HC 36/24 are applied for indication of the operating time (running hours) of all electrically driven machines and devices, e.g. electric motors, electric furnaces, central heating boilers, rectifiers.

As the HC 36/24 is connected in parallel to the electric circuit of the equipment to be monitored, its counter only runs when the equipment is started.

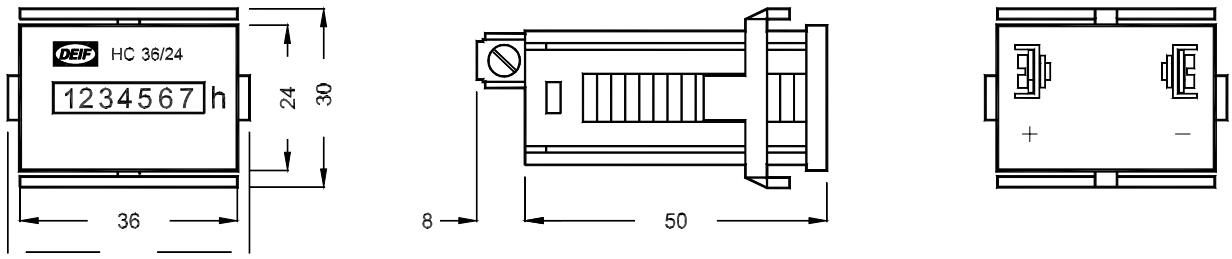
The HC 36/24 is CE marked for residential, commercial and light industry plus industrial environment.

Technical specifications

	AC voltages	**DC voltages**
Counting range	99999.99 hours The meter then automatically resets to zero	999999.9 hours The meter then automatically resets to zero
Resolution	1/100 hours (36 s)	1/10 hour (6 min.)
Digits	4 mm x 1.7 mm - optical. Figures: white. Decimals: red (AC versions for 60Hz: black)	
Measuring voltage	24-110-230V AC ±10%	12...36V DC, 110V DC ±10%
Consumption	Approx. 1W at 230V 50Hz	0.04...0.2W at 12...36V DC
Frequency	50Hz or 60Hz	
Motor	Synchronous	Step
Temperature	-10...55°C (nominal) -25...55°C (operating) -25...60°C (storage)	-10...55°C (nominal) -10...55°C (operating) -25...60°C (storage)
Climate	Class HVE, to DIN 40040	Class JVE, to DIN 40040
Test voltage	2kV - 50Hz - 1 min., to EN 61010-1	
EMC	To EN 50081-1/2 and EN 50082-1/2	
Connections	Flat pins: 6.3 x 0.8 mm with screw terminal	
Protection	Housing: IP40. Terminals: IP00. To EN 60529 and IEC 529	

Dimensions

All dimensions in mm



HC 36/24 Panel cut-out: 22 x 33 mm +0.5 Weight: approx. 0.040 kg

Order specifications

	Type	**Measuring voltage**	**(Frequency)**
Examples:	HC 36/24	230 V AC	60Hz
	HC 36/24	12…36V DC	

Due to our continous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

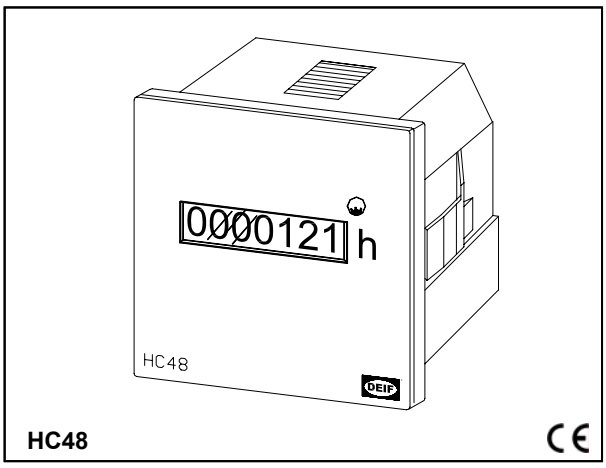
DEIF A/S

Type HC48

Running hours counters

4921210090D

- ***For AC or DC measuring voltage***
- ***AC: Synchronous motor, DC: Step motor***
- ***Standard IP40. Special version IP65***
- ***In DIN size case, 48 x 48 mm, aluminium clamp mounting***
- ***Adapter frames: 55 x 55 mm, 72 x 72 mm***



HC48 CE

Application

Hour meters HC48 are designed for the determination and monitoring of operating time, warranty period and maintenance intervals on electrically driven machines and devices, mainly in mechanical processing, woodworking, textile and paper industry, on central heating boilers, electrical furnaces, power drives and rectifiers etc. They are available in a variety of mounting techniques, for all common voltages and with a mounting depth of only 32 mm. As a special version, they offer a fully sealed plastic housing. Hour meters are connected in parallel to the control circuit behind the start gear, thus working only during the operation of a machine or device. The hour meters cover a time range from 0 to 99,999.99 h (AC) resp. 999,999.9 (DC). They restart automatically at 0 when leaving the range limit. There is no separate reset facility.

Technical specifications

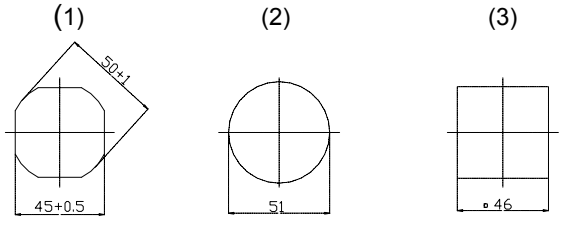
Connection:	AC and DC: combined - flat pins 6.3 x 0.8 mm with screw terminals simple – flat pins 6.3 x 0.8 mm
Supply voltage:	AC: 24V, 110V, 230V, 400V (±10%) DC: 10-48V, 110V (±10%)
Mains frequency:	AC: 50Hz, 60Hz
Motor:	AC: synchronous motor; DC: step motor
Protection class:	AC and DC: IP40 front side
Operating temp. range:	AC: -25°C....+70°C; DC: -20°C....+55°C
Reading accuracy:	AC: 1/100 hour (36 sec.); DC: 1/10 hour (6 min.)
Counting range:	AC: 99,999.99 hours; DC: 999,999.9 hours
Number of digits:	AC: 5 integers, 2 decimals; DC: 6 integers, 1 decimal

The following data applies for AC and DC:

Digit size:	4 mm
Digit colour:	Integers (white), decimals (red)
Housing colour:	Black
Mounting:	Aluminium clamp A, snap fastener F, DIN-rail D. When ordering mounting type aluminium clamp A or DIN-rail D, it is possible to dismount the aluminium clamp or the adaptor for DIN-rail, thus obtaining mounting type F. Please note that the panel cut-out must be (1) for this application.
Front dimensions:	48 x 48 mm
Adapter frames:	55 x 55 mm, 72 x 72 mm
Special versions:	IP65 (only mounting aluminium clamp A and no frame)
EMC:	EN50081-1 and EN50082-2

Dimensional details

All dimensions in mm

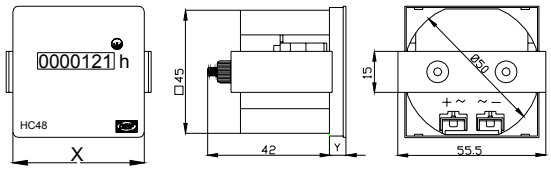


HC48 Panel cut-out Weight: Approx. 0.050 kg

Type HC48

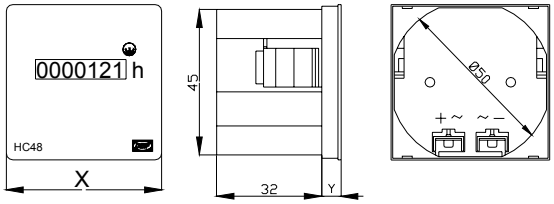
Mounting instructions

Mounting A



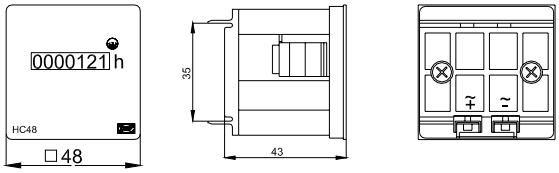
x (mm)	y (mm)	Mounting hole
48 x 48	6	1
55 x 55	7	1, 2 or 3
72 x 72	7	1, 2 or 3

Mounting F



x (mm)	y (mm)	Mounting hole
48 x 48 mm	6	1

Mounting D



Order specifications

	Type	Measuring voltage	(Frequency)
Examples:	HC48	230V AC	50 Hz
	HC48	10-48V DC	-
	HC48	400V AC	60 Hz
	Mounting	**Adapter frame**	**Protection class**
	D	No	IP40
	A	72 x 72 mm	IP40
	A	No	IP65

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

Shunt resistors

Ranges 1…2500A 60/150mV

4921210042G

Shunts 1…25A

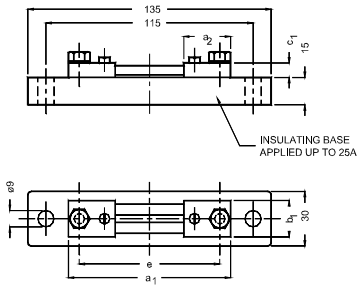
Shunts >25A

- ***Dimensions to DIN 43703***
- ***Class 0.5***
- ***Extensive program***
- ***Standard versions on stock***

CE

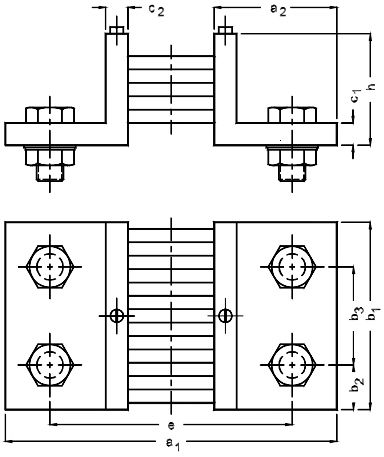
Dimensions

Form A

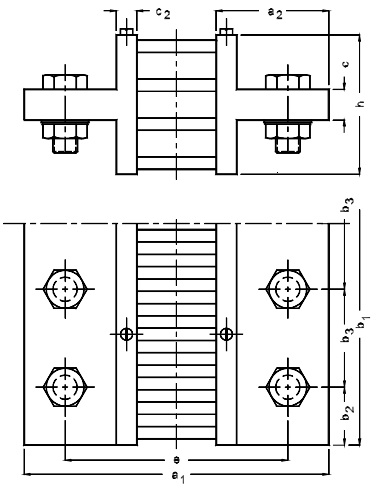


Insulating base can be applied for shunts up to 150A

Form B



Form C



Voltage drop	Dimensions in mm	Amps						
		1-1.5-2.5-4-5-6-8-10-15-25	30-40-50-60-80-100-150	200-250	400-500-600-800	1000	1500	2500
60mV		Form A		Form B				
	a1	90	100	145		165		
	a2	28	33	55		65		
	b1	20		30	40	60	90	120
	b2			15	20	30	21	30
	b3						48	60
	c1	8		10				
	c2			10				
	e	78	80	105		115		
	h			30				
	Weight kg (max.)	0.12…0.13		0.13	0.61	0.83 / 0.85 / 0.9	1.45	1.96	2.9
150mV		Form A		Form B			Form C	
	a1	90	225	270			290	
	a2	26	33	55			65	
	b1	20	25	30	40	70	90	120
	b2			15	20	35	21	30
	b3						48	60
	c1	8		10			15	
	c2			10				
	e	78	205	230			240	
	h			50			60	
	Weight kg (max.)	0.12 0.12…0.13 0.13…0.14	0.16…0.17 0.18…0.20 0.23	0.26…0.68	1.05…1.151.1 1.16…1.30	2.15	3.10	5.20
End block bolts		2 x 1					2 x 2	
Bolt size		M5 x 12	M8 x 15	M12 X 40	M16 x 45	M20 x 50	M16 x 45	M20 x 50
Bolt nut				M12	M16	M20	M16	M20
Voltage screws		5MG X 8CHM with washer						

Accuracy: Class 0.5 (-10…15…30…55°C) to IEC 51 and EN 60051.
EMC: To EN 50081-1/2 and EN 50082-1/2.
CE marked for residential, commercial and light industry plus industrial environment.
Temperature coefficient: 0.05%/10°C. The shunt is calibrated at 75% of I_n.
Overloads: ≤250A 10 x I_n for 5 sec.
250A< ... ≤2000A 5 x I_n for 5 sec.
>2000A 2 x I_n for 5 sec.

Order specifications

	Shunt resistor	Amps/mV
Example:	Shunt resistor	250A/60mV

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

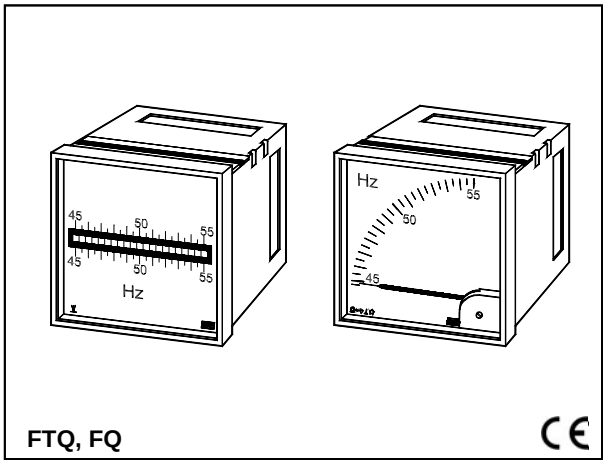
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

Types FQ, FTQ

Single frequency meters

4921210047H

- ***Robust and thoroughly tested construction***
- ***DIN size compact design: Q72, Q96***
- ***High immunity to 3rd harmonics***
- ***Suitable for all types of generating sets***



FTQ, FQ

Available types

Size	Pointer frequency meters (90°)	Reed frequency meters
72 x 72 mm	FQ72-x	FTQ72-x
96 x 96 mm	FQ96-x	FTQ96-x

FQ144-x (144 x 144 mm) available on request only.

Construction

FQ:
Pointer frequency meter consisting of a moving coil instrument with built-in electronics for converting the frequency to a voltage signal. Accurate and linear read-out. Exchangeable scale.

FTQ:
Reed frequency meter, with one row of metal reeds vibrating at the applied frequency (resolution: 1/4Hz). Available with 13 reeds (typically 47...53Hz) or 21 reeds (typically 45...55Hz). Exchangeable scale.
Note FTQ72-x only 47...53Hz and 57...63Hz.

Technical specifications

Type: Pointer frequency meters FQ

Accuracy[1]:	Class 0.5 (class 1.0)[2]
Scale/ measuring range:	45...55Hz 55...65Hz 45...65Hz
Measuring voltage:	100-110-230-400-440V AC ±15%
Consumption:	3...6mA
Temperature:	-10...55°C (nominal) -25...60°C (operating) -25...65°C (storage)
Shock test:	15g - 6 times - 3 directions 50g/6ms 22g/20ms
EMC:	To EN 50081-1/2 + EN 50082-1/2. CE marked for residential, commercial and light industry plus industrial environment.
Protection:	IP52[3]

Type: Reed frequency meters FTQ

Accuracy[1]:	Class 0.5
Scale/ meas. range:	45...55Hz - 55...65Hz - 47...53Hz - 57...63Hz
Measuring voltage:	100-110-220-230-240-380-400-415-440V AC ±15%
Consumption:	max. 15mA
Temperature:	-10...55°C (nominal) -25...60°C (operating) -25...65°C (storage)
EMC:	To EN 50081-1/2 + EN 50082-1/2.

CE marked for residential, commercial and light industry plus industrial environment.

Protection: IP52[3]

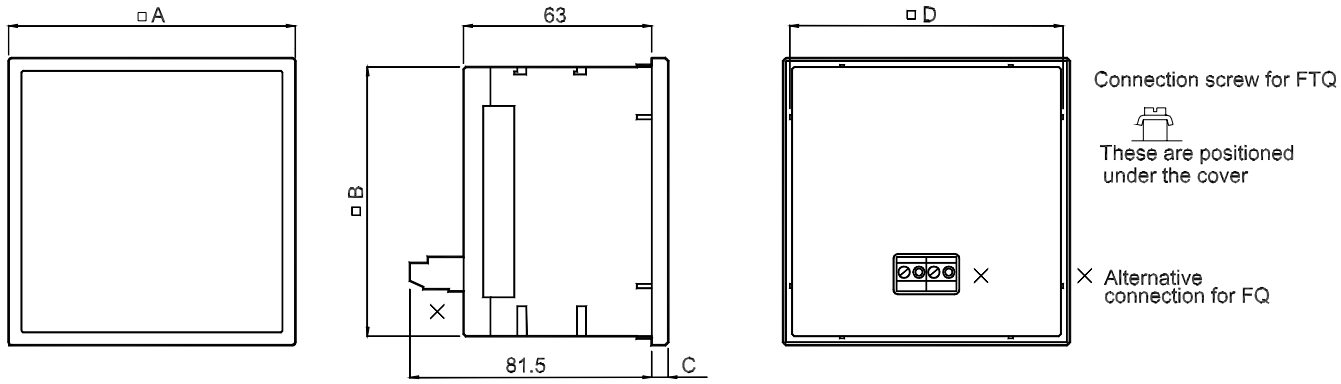
[1]) -10...15...30...55°C, to EN 60051 and IEC 51
[2]) FQ measuring range 45...65Hz
[3]) IP54 from front with gasket.

Further technical specifications:
See data sheet No. 4921210012.

DEIF A/S

Dimensions

All dimensions in mm



Type	A	B	C	D	Weight (approx. kg)
FQ72-x	72 x 72	66.5 x 66.5	5.5	68 x 68 + 0.7	0.189
FQ96-x	96 x 96	90 x 90	5.5	92 x 92 + 0.8	0.240
FTQ72-x	72 x 72	66.5 x 66.5	5.5	68 x 68 + 0.7	0.210
FTQ96-x	96 x 96	90 x 90	5.5	92 x 92 + 0.8	0.280

Order specifications

	Type	Scale/Measuring range	Measuring voltage
Example:	FQ96-x	45...55Hz	230V AC

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

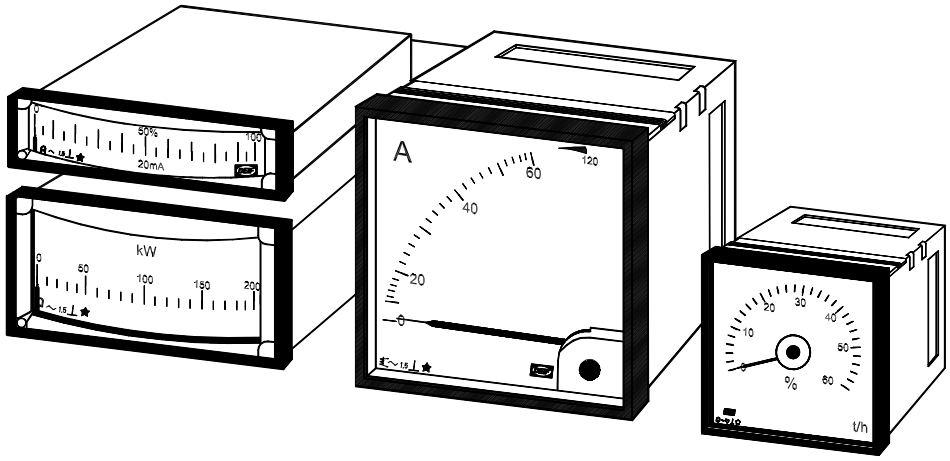
***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

Switchboard instruments

Types DQ, VDQ, DPR, DSM, EQ

4921210012K



- ***Standard DIN sizes***

  Quadratic instruments: ***Q48…Q144***

  Edgewise instruments: ***48 x 24…144 x 72 mm***

  Slim edgewise instruments: ***72 x 24…144 x 36 mm***

- ***Accuracy class 1.5***
- ***Exchangeable scale (quadratic instruments)***

CE

Contents

Special versions ..... page 02
General technical specifications ..... page 03
Quadratic moving coil instruments with/without rectifier ..... page 04
Quadratic moving iron instruments ..... page 05
Edgewise moving coil instruments ..... page 06
Slim edgewise moving coil instruments ..... page 07
Dimensional details ..... page 08

Available types

Quadratic instruments					
		48 x 48 mm	72 x 72 mm	96 x 96 mm	144 x 144 mm
Moving coil	90°	DQ48-x	DQ72-x	DQ96-x	DQ144-x
Moving coil	240°	DQ48-c DQ48-xc	DQ72-c DQ72-xc	DQ96-c DQ96-xc	DQ144-c DQ144-xc
- with rectifier	90°		VDQ72-x	VDQ96-x	VDQ144-x
- with rectifier	240°		VDQ72-c VDQ72-xc	VDQ96-c VDQ96-xc	VDQ144-c VDQ144-xc
Moving iron	90°	EQ48-x	EQ72-x	EQ96-x	EQ144-x
Edgewise instruments					
		48 x 24 mm	72 x 36 mm	96 x 48 mm	144 x 72 mm
Moving coil		DPR48	DPR72	DPR96	DPR144
Slim edgewise instruments					
			72 x 24 mm	96 x 24 mm	144 x 36 mm
Moving coil			DSM72	DSM96	DSM144

Special versions

General	Antiglare glass
	IP54 from front (incl. rubber gasket) (types DQ and EQ)
	Adjustable red pointer (types Q48-x, Q72-x, Q96-x, Q144-x) (IP52)
	Other measuring ranges than those stated in this data sheet
Scale	Non-standard scale e.g. ammeter with 3, 4, 5 or 6 times overload range
	Scale according to table or curve
	Single scale with double row of figures (standard scale)
	Double scale with 2 rows of figures (standard divisions)
	Single scale with fine divisions for standard pointer
	Red line at specified value
	Coloured section for specific scale range
	Additional text on scale, Roman types (e.g. "Generator")
Moving iron instruments	Adjusted to a specified frequency, 100...500Hz
	Adjusted for DC measurement
	Adjusted to accuracy class 1.0
Moving coil instruments	Suppressed zero (DQ..-x/DQ..-c/-xc: Max. 20%)
	Zero at centre of scale or the like
	Integrated adjustment potentiometer (±10% standard, up to ±50% on request)
	Adjusted to accuracy class 1.0

Accessories: Blank covers types Q72, Q96, Q144

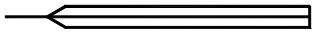
Blank covers are typically applied to cover panel cut-outs provided for later extension of the switchboard.
The blank covers consist of a standard bezel with spring clamp for mounting in the panel, mounted with a white, opal PVC plate instead of glass. (Depth behind panel: Approx. 12 mm).

General technical specifications

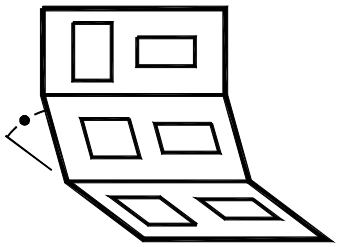
<table>
<tr><th colspan="5">Instruments are designed according to below mentioned standards</th><th>Standards</th></tr>
<tr><td>Accuracy</td><td colspan="4">Class 1.5 (-10...15...30...55°C)

Linear scales:
±1.5% of full scale value (FS)

Non-linear scales:
±1.5% of scale length</td><td>EN 60051 and IEC 51</td></tr>
<tr><td>Instrument sizes</td><td>48 x 24 mm

48 x 48 mm</td><td>72 x 24 mm
72 x 36 mm
72 x 72 mm</td><td>96 x 24 mm
96 x 48 mm
96 x 96 mm</td><td>144 x 36 mm
144 x 72 mm
144 x 144 mm</td><td>DIN 43700</td></tr>
<tr><td>Bezels</td><td colspan="4">Slim bezels</td><td>DIN 43718</td></tr>
<tr><td>Scale/pointer</td><td colspan="4">  Standard pointer</td><td>DIN 43802</td></tr>
<tr><td>Mounting angle</td><td colspan="4">Standard: Vertical (90 ±5°)

Other angles: Specify angle to horizontal

⊥ vertical mounting

∠60° 60° to horizontal (e.g.)

⊓ horizontal mounting

For edgewise instruments only, furthermore specify:
Horizontal or vertical scale</td><td>DIN 16257</td></tr>
<tr><td>Measuring ranges</td><td colspan="4">See pages 4-7.
Others on request.</td><td>DIN 43701</td></tr>
<tr><td rowspan="4">Protection

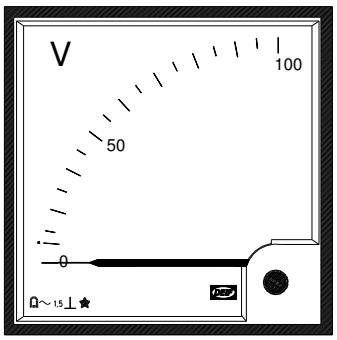
(Housings)

(Terminals)</td><td colspan="2">Standard version</td><td colspan="2">IP54 version*</td><td rowspan="4">*) Marked with label: "IP54 from front only when rubber gasket is mounted"

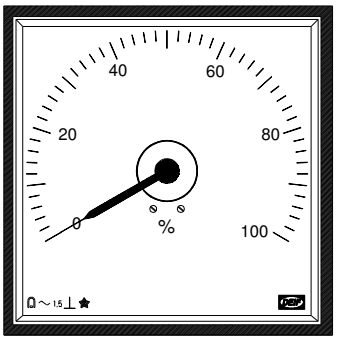
IEC 529 and EN 60529</td></tr>
<tr><td>From front</td><td>From rear</td><td>From front</td><td>From rear</td></tr>
<tr><td>IP52</td><td>IP52</td><td>IP54</td><td>IP52</td></tr>
<tr><td>Quadratic
IP20</td><td>Edgewise
IP00</td><td>Quadratic
IP20</td><td>Edgewise
IP00</td></tr>
<tr><td rowspan="2">Climate</td><td colspan="4">Class HUE
Short-term condensing allowed</td><td rowspan="2">DIN 40040</td></tr>
<tr><td colspan="4">Max. 95% RH: Max. 30 days per year
Max. 85% RH: Remaining days
Max. 75% RH: Average per year</td></tr>
<tr><td>Temperature</td><td colspan="4">-10...55°C (nominal)
-25...60°C (operating)
-25...65°C (storage)</td><td>EN 60051 and IEC 51</td></tr>
<tr><td>Panel influence</td><td colspan="4">The accuracy is affected neither by the material nor by the thickness of the panel</td><td>EN 60051 and IEC 51</td></tr>
<tr><td>Shock test</td><td colspan="4">15g - 6 times - 3 directions
50g/6ms
22g/20ms</td><td>IEC 68-2-27, Test: Ea</td></tr>
<tr><td>Vibrations</td><td colspan="4">3-13.2Hz: 3mm
13.2-100Hz: 1g</td><td>GL + LR: Test 1
DNV: Class A</td></tr>
<tr><td>Materials</td><td colspan="4">All plastic materials are self-extinguishing</td><td>UL94 (V0)</td></tr>
<tr><td>Safety</td><td colspan="4">600V – CAT. III
Pollution deg. 2
Quadratic instruments are supplied with protective cover fitted over terminals</td><td>EN 61010-1</td></tr>
<tr><td>EMC</td><td colspan="4">CE classified for residential, commercial and light industry plus industrial environment</td><td>EN 50081-1/2 and
EN 50082-1/2</td></tr>
</table>

Quadratic moving coil instruments

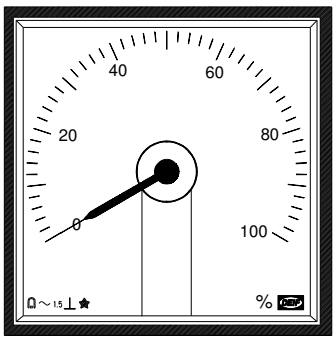
Application:		Measurement of DC currents and DC voltages
Scale:		Linear
Scale lengths:		DQ48/72/96/144-x: 41/62/92/135 mm
		DQ48/72/96/144-xc/-c: 75/113/151/230 mm
Accuracy:		Class 1.5
Burdens:	Voltmeters:	1mA, R_i: 1 kΩ/V
	Ammeters:	60mV...0.5V
	Ammeters:	4…20mA (see note 3 below)
Housings:		Plastic



DQ96-x (exchangeable scale)



DQ96-c (non-exch. scale)



DQ96-xc (exchangeable scale)

Type	Size (mm)	Measuring range - V [1]	Measuring range - A [1]
DQ48-x	48 x 48	60mV ... 600V	1mA ... 600mA [2], 4...20mA [3]
DQ72-x	72 x 72	60mV ... 600V	1mA ... 5-10-15-40A [2], 4...20mA [3]
DQ96-x	96 x 96	60mV ... 600V	1mA ... 5-10-15-40A [2], 4...20mA [3]
DQ144-x	144 x 144	60mV ... 600V	1mA ... 5-10-15-40A [2], 4...20mA [3]
DQ48-xc/DQ48-c	48 x 48	60mV ... 600V	1mA ... 600mA [2], 4...20mA [3]
DQ72-xc/DQ72-c	72 x 72	60mV ... 600V	1mA ... 5-10-15-40A [2], 4...20mA [3]
DQ96-xc/DQ96-c	96 x 96	60mV ... 600V	1mA ... 5-10-15-40A [2], 4...20mA [3]
DQ144-xc/DQ144-c	144 x 144	60mV ... 600V	1mA ... 5-10-15-40A [2], 4...20mA [3]

1) Standard measuring ranges: 1 - 1.2 - 1.5 - 2 - 2.5 - 3 - 4 - 5 - 6 - 8 and multiples of 10 thereof

2) Higher measuring ranges: For use with standard shunt: 60mV or 150mV
Supplied with shunt lead, 2 x 1 m – 1 mm² (0.035Ω)

3) 4…20mA: Electrically suppressed, voltage drop at 20mA = 1.6V for -x and 1.80V for -c/-xc

Quadratic moving coil instruments with rectifier

Application:		Measurement of AC currents and AC voltages. Measures average value, calibrated to R.M.S. value at sinusoidal current/voltage
VDQ.. Voltmeters	25...600V:	R_i: Approx. 1kΩ/V. Range <50V AC: Scale non-linear
VDQ.. Ammeters	1...600mA:	Voltage drop: Approx. 1.2V

Order specifications

	Type/point of rotation of pointer [1]	Measuring range	Scale
Examples:	DQ96-x	0...10V DC	0...100%
	VDQ96-x	0…100V AC	0…100V

"-x": Lower right corner, exchangeable scale, “-c”: Centre, "-xc": Centre, exchangeable scale

Quadratic moving iron instruments

Application: Measurement of AC currents and AC voltages, adjusted for frequency range 16..65Hz. Calibration for other frequency ranges (see page 2). The instruments measure true R.M.S.

Working range: Ammeters are designed with a 2 times overload range. The instruments will withstand starting currents up to 10 times normal load for 5 secs and 5 times continuously

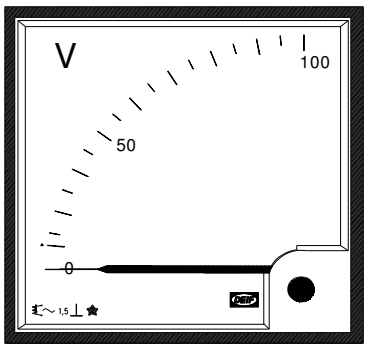
Scale range: The scale is standard designed with a 2 times overload range (non-standard scale – see page 2)

Scale lengths: EQ48/72/96/144-x: 41/62/92/135 mm

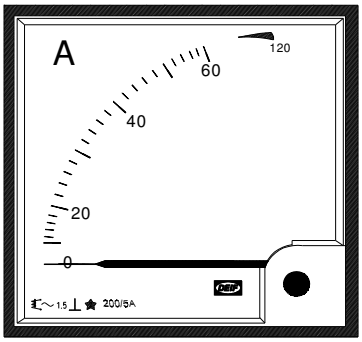
Accuracy: Class 1.5

Burdens: Voltmeters: Approx. 1.5...4VA
Ammeters: Approx. 0.5...1.2VA

Housings: Plastic



EQ96-x (voltmeter)



EQ96-x (ammeter)

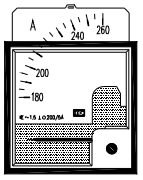
Type	Size (mm)	Measuring range - V [1]	Measuring range - A [1]
EQ48-x	48 x 48	40V ... 600V [3]	1A ... 25A [2]
EQ72-x	72 x 72	40V ... 800V [3]	1A ... 60A [2]
EQ96-x	96 x 96	40V ... 800V [3]	1A ... 60A [2]
EQ144-x	144 x 144	40V ... 800V [3]	1A ... 60A [2]

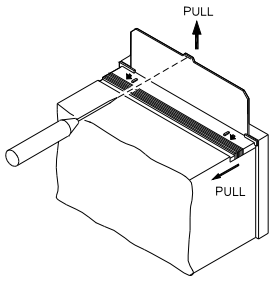
1) Standard measuring ranges: 1 - 1.2 - 1.5 - 2 - 2.5 - 3 - 4 - 5 - 6 - 8 and multiples of 10 thereof

2) Higher measuring ranges: For use with external current transformer, -/5A, -/1A

3) Higher measuring ranges: For use with external voltage transformer, -/100V (-/110V)

Exchange of scale, quadratic instruments





1) Press cover at top of instrument as shown
2) Remove scale by means of a suitable tool (e.g. screwdriver)
3) After exchange of scale: Refit cover (press till it snaps into place)

Note: Interrupt signal to terminals before exchanging the scale.

Order specifications

	Type	Measuring range	Scale
Example:	EQ96-x	0...500A AC, 500/1A	0...500A x 2

Edgewise moving coil instruments

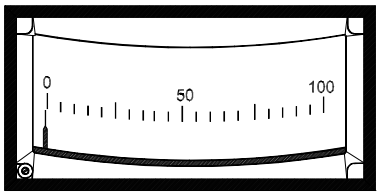
Application: Measurement of DC currents and DC voltages

Scale: Linear

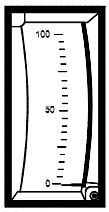
Accuracy: Class 1.5

Burdens: Voltmeters: 1mA, R_i: 1kΩ/V
Ammeters: 60mV...0.5V

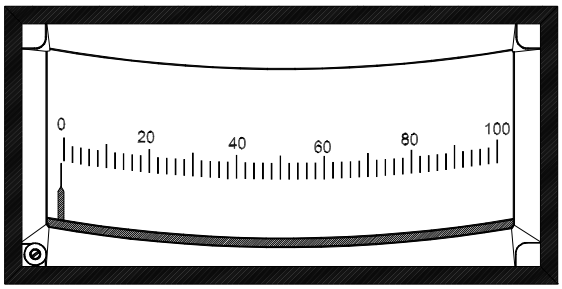
Housings: Plastic



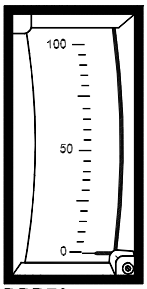
DPR96



DPR48



DPR144



DPR72

Type	Size (mm)	Measuring range - V [1]	Measuring range - A [1]
DPR48	48 x 24	1V ... 600V	1mA ... 600mA [2], 4...20mA
DPR72	72 x 36	1V ... 600V	1mA ... 600mA [2], 4...20mA
DPR96	96 x 48	1V ... 600V	1mA ... 600mA [2], 4...20mA
DPR144	144 x 72	1V ... 600V	1mA ... 600mA [2], 4...20mA

1) Standard measuring ranges: 1 - 1.2 - 1.5 - 2 - 2.5 - 3 - 4 - 5 - 6 - 8 and multiples of 10 thereof

2) Higher measuring ranges: For use with standard shunt: 60mV or 150mV
Supplied with shunt lead, 2 x 1 m – 1 mm² (0.035Ω)

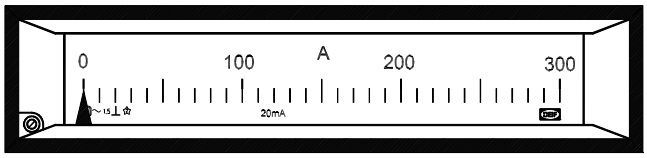
Order specifications

	Type	Scale type/Mounting [1]	Measuring range	Scale
Example:	DPR96	Horizontal	4...20mA DC	0...10 bar

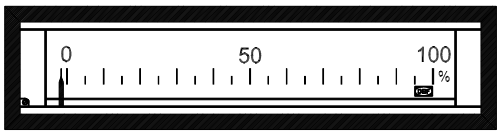
[1]) Horizontal or vertical scale

Slim edgewise moving coil instruments

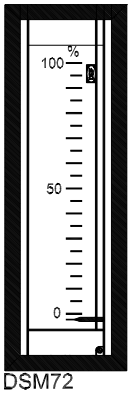
Application:		Measurement of DC currents and DC voltages
Scale:		Linear
Scale lengths:		DSM72/96/144: 52/70/95 mm
Accuracy:		Class 1.5
Burdens:	Voltmeters:	1mA, R_i: 1kΩ/V
	Ammeters:	60mV...0.5V
Housings:		Plastic



DSM144



DSM96



DSM72

Type	Size (mm)	Measuring range - V [1]	Measuring range - A [1]
DSM72	72 x 24	60mV ... 600V	1mA ... 600mA [2], 4...20mA
DSM96	96 x 24	60mV ... 600V	1mA ... 600mA [2], 4...20mA
DSM144	144 x 36	60mV ... 600V	1mA ... 600mA [2], 4...20mA

1) Standard measuring ranges: 1 - 1.2 - 1.5 - 2 - 2.5 - 3 - 4 - 5 - 6 - 8 and multiples of 10 thereof

2) Higher measuring ranges: For use with separate standard shunt: 60mV or 150mV
Supplied with shunt lead, 2 x 1 m – 1 mm² (0.035Ω)

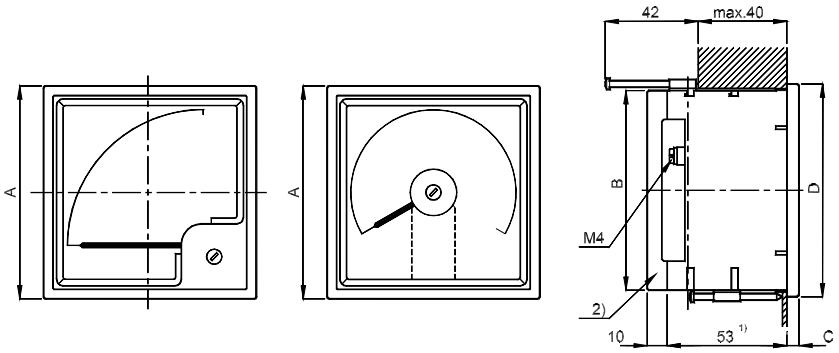
Order specifications

	Type	Scale type/Mounting [1]	Measuring range	Scale
Example:	DSM144	Horizontal	0...20mA DC	0...300A

[1]) Horizontal or vertical scale

Dimensional details

Quadratic instruments (90° and 240°)



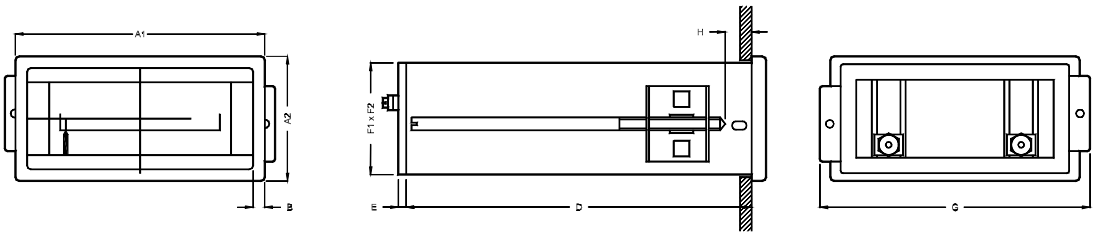
1) For range 15…40A = 59 mm

2) Protective power

All dimensions in mm

Type	A		C			B			Panel cut-out	Weight (approx.)
90° Moving coil and moving iron instruments										
Q48-x	48 x 48		5.0			42.8 x 48.8			45 x 45 +0.3	0.090 kg
Q72-x	72 x 72		5.5			66.5 x 66.5			68 x 68 +0.4	0.200 kg
Q96-x	96 x 96		5.5			90 x 90			92 x 92 +0.4	0.210 kg
Q144-x	144 x 144		8.0			136 x 136			138 x 138 +0.5	0.350 kg
240° Moving coil instruments										
DQ48-xc/c	48 x 48		5.0			42.8 x 48.8			45 x 45 +0.3	0.180 kg
DQ72-xc/c	72 x 72		5.5			66.5 x 66.5			68 x 68 +0.4	0.220 kg
DQ96-xc/c	96 x 96		5.5			90 x 90			92 x 92 +0.4	0.250 kg
DQ144-xc/c	144 x 144		8.0			136 x 136			138 x 138 +0.5	0.400 kg

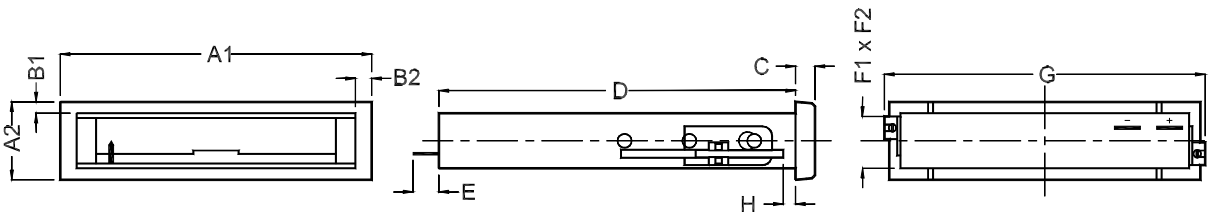
Edgewise moving coil instruments



All dimensions in mm

Type	A	B	C	D + E (max.)	E	F1 x F2	G	H	Panel cut-out	Weight (approx.)
DPR48	48 x 24	3	5	75	8	45 x 18	53	34	43.2 +0.3 x 22.2 +0.3	0.050 kg
DPR72	72 x 36	4	5	99	9	66 x 32.5	79	34	68 +0.7 x 33.0 +0.6	0.100 kg
DPR96	96 x 48	4.5	5.5	143	7	91 x 43	104	17	92 +0.8 x 45.0 +0.6	0.450 kg
DPR144	144 x 72	5.5	8	192	3	136 x 66	150	17	138 +1.0 x 68.0 +0.7	0.950 kg

Slim edgewise instruments



All dimensions in mm

Type	A	B	C	D	E	F1 x F2	G	H (max)	Panel cut-out	Weight (approx.)
DSM72	72 x 24	3.5 x 5	6	90	8	17 x 65	75	40	68 + .7 x 22.2 +0.3	0.080 kg
DSM96	96 x 24	3.5 x 5	6	110	8	17 x 89	99	40	92 +0.8 x 22.2 +0.3	0.100 kg
DSM144	144 x 36	4 x 6.5	7	164	9	32 x 137	147	40	138 +1.0 x 33.0 +0.6	0.240 kg

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

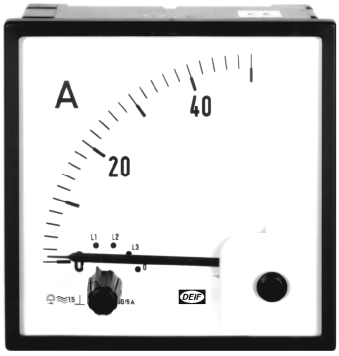
Voltmeters and ammeters with built-in switch

Types EQ96-sw4, EQ96-sw7, VDQ96-sw

4921210077F

EQ96-sw4

EQ96-sw7



VDQ96-sw

- By activation of switch on the front measurement of:
  - phase to phase voltage (EQ96-sw4)
  - phase to phase voltage or phase to zero voltage (EQ96-sw7)
  - current in a 3-phase network (VDQ96-sw)
- DIN size Q96
- Accuracy class 1.5
- Exchangeable scale
- OFF position on switch

CE

Application

The voltmeters type EQ96-sw4/sw7 and ammeters type VDQ96-sw are designed for use in e.g. power stations, distribution substations and transformer stations. In addition to normal measurement of AC voltages and currents respectively, both types are on the front provided with a switch, which can be set to measurement of:

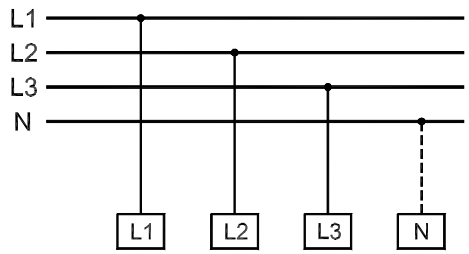
EQ96-sw4 3-phase: L1 - L2, L2 - L3, L3 - L1, OFF
EQ96-sw7 3-phase/4-wire: L1 - L2, L2 - L3, L3 - L1, L1 - 0 (N), L2 - 0 (N), L3 - 0 (N), OFF
3-phase/3-wire: L1 - L2, L2 - L3, L3 - L1, OFF
Note: Error > 1.5% if phase voltages differ more than 10%

VDQ96-sw Phase currents (L1 - L2 - L3) in 3-phase networks
Note: When the switch is in position "0", the internal circuits are short-circuited

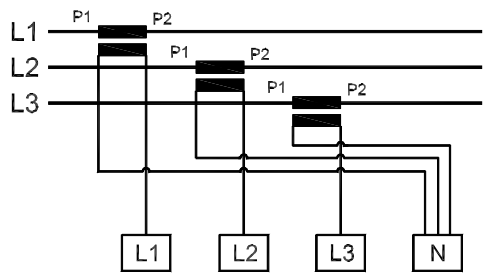
Technical specifications

	Voltmeter type EQ96-sw4/sw7	**Ammeter type VDQ96-sw**
Accuracy	Class 1.5 (-10...15...30...55°C) IEC 51 and EN 60051	
Scale	Exchangeable for -/120 and -/132V Measuring range according to the used voltage transformer	Exchangeable Measuring range according to the used current transformer
Measuring range	300V, 500V, 600V -/120V (100V + 20%), -/132V (110V + 20%)	0...1A, 0...5A or from current transformer(s)
Burden	1kΩ/V	-/1A: Approx. 0.1VA. -/5A: Approx. 0.15VA
Frequency	40...60Hz	45...65Hz
Temperature	-10...55°C (nominal), -25...60°C (operating), -25...65°C (storage)	
Test voltage	2kV - (50Hz - 1 min.)	
EMC	To EN 50081-1/2 and EN 50082-1/2. CE marked for residential, commercial and light industry plus industrial environment	
Materials	Self-extinguishing plastic, to UL94 (V0)	
Protection	IP52, to IEC 529 and EN 60529	
Mounting	Vertical flush mounting	

Connections

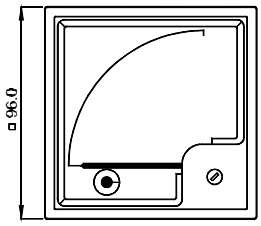


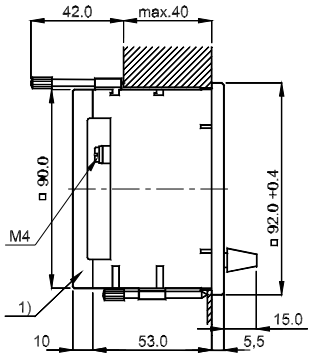
EQ96-sw4/sw7



VDQ96-sw

Dimensions





1) Protective cover

EQ96-sw4/sw7, VDQ96-sw Weight: Approx. 0.250 kg

Order specifications

	Type	**Measuring range**	**Scale**
Examples:	EQ96-sw4	0...500V AC	0...500V
	EQ96-sw7	0...500V AC	0...500V
	VDQ96-sw	500/1A	0...500A

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

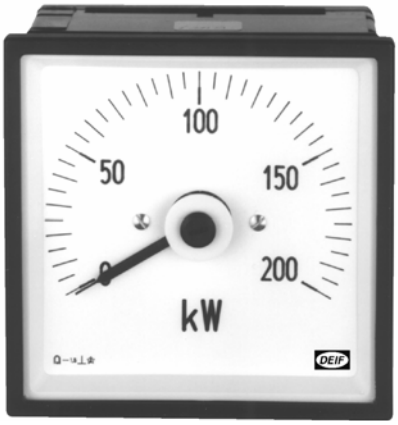
DEIF A/S

Watt and var meters

Type WQ

4921210005F

WQ -x



WQ -c

- *Self-contained meters*
- *Exchangeable scale (type WQ -x)*
- *Accuracy: Class 1.5*
- *High transient protection*
- *Compact design: Q96 and Q144*

Available types

Size	Scale deflection 90°	Scale deflection 240°
96 x 96 mm	WQ96-x	WQ96-c
144 x 144 mm	WQ144-x	WQ144-c

Construction

The meters type WQ consist of a moving coil movement and a built-in electronic watt or var transducer P.C.B., housed in a standard case.

The transducer P.C.B. measures the power in a single-phase or three-phase network, converting the signal into a DC current, which is fed to the moving coil instrument.

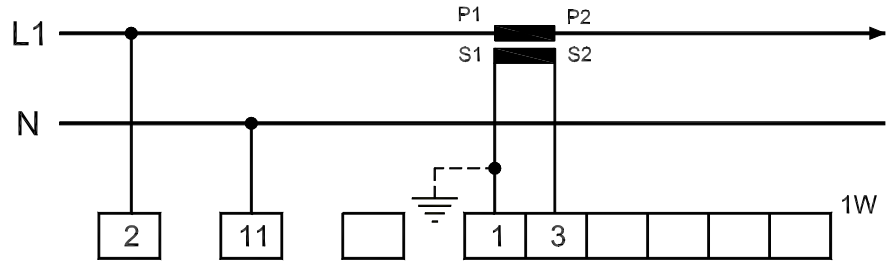
The watt and var meters type WQ are CE marked for residential, commercial and light industry plus industrial environment.

Technical specifications

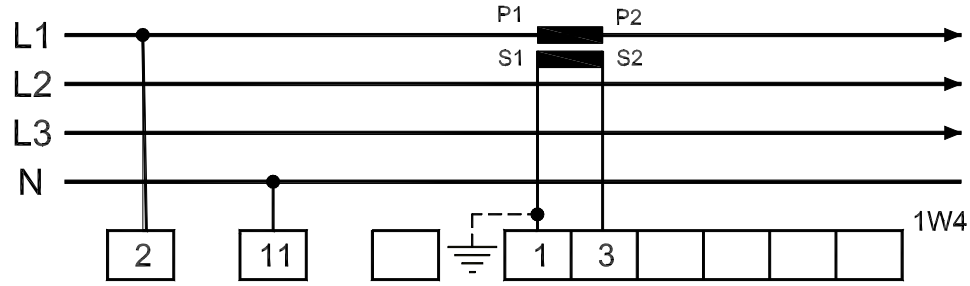
Accuracy:	Class 1.5 (-10...15...30...55°C), to EN 60051 and IEC 51
Wave form distortion:	Does not affect the measurement for crest factor ≤2
Frequency:	45...65Hz
Measuring current:	Direct or from current transformer -/1A or -/5A. Load ≤0.5VA
Measuring voltage/supply:	100-110-115-127-220-230-240V AC ±20% (all connections) 380-400-415-440V AC ±20% (1W3, 2W3, 2W4, 1var3, 1var4, 2var3 and 2var4) Consumption: Max. 3VA
Temperature:	-10...55°C (nominal) -25...60°C (operating) -40...65°C (storage)
Temperature drift:	Typically 0.15%. Max. 0.2% per 10°C
Shock test:	15g - 6 times - 3 directions 50g/6ms 22g/20ms
Climate:	Class HVE, to DIN 40040
EMC:	To EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4) and IEC 255-22-1 (class 3)
Test voltage:	2kV - 50Hz - 1 min. All circuits mutually and to earth
Materials:	All plastic materials are self-extinguishing to UL94 (V0)
Connections:	Max. 2.5 mm² (multi-stranded) Max. 4.0 mm² (single-stranded)
Protection:	Front: IP52 (IP54 on request), terminals: IP20, to EN 60529 and IEC 529
Safety:	To EN 61010-1 and IEC 1010-1

Connections • watt meters

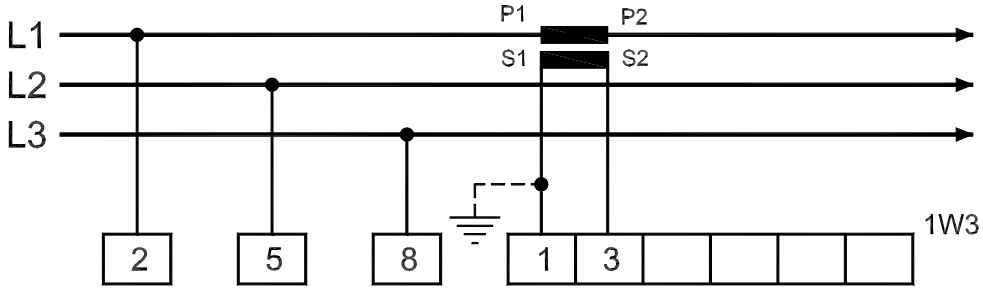
1W Single-phase network



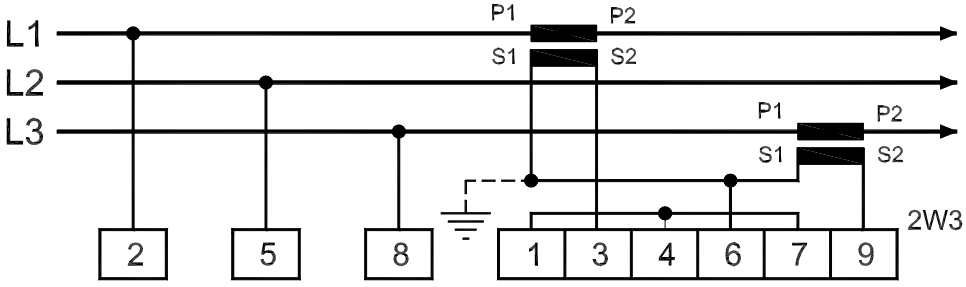
1W4 3-phase network, 4-wire, balanced load



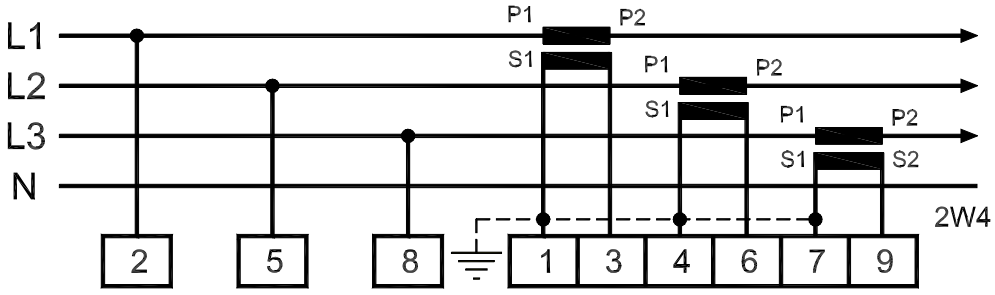
1W3 3-phase network, 3-wire, balanced load



2W3 3-phase network, 3-wire, unbalanced load

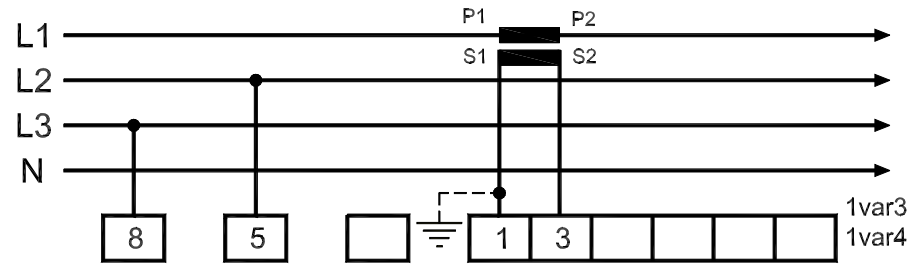


2W4 3-phase network, 4-wire, unbalanced load

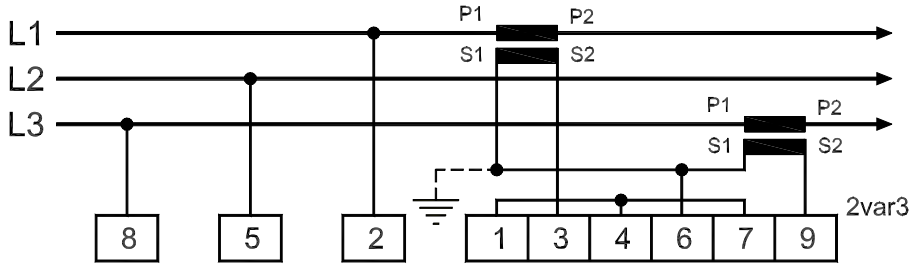


Connections • var meters

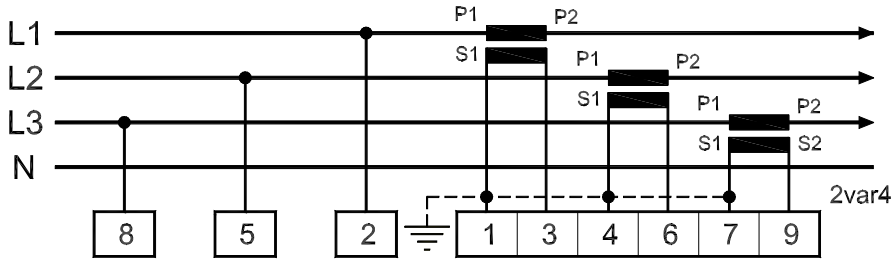
1var3/1var4 — 3-phase network, ¾-wire, balanced load



2var3 — 3-phase network, 3-wire, unbalanced load

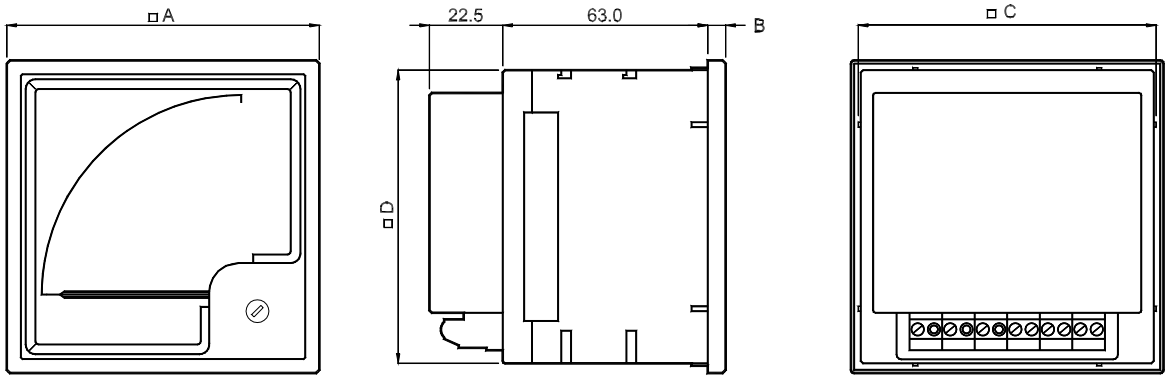


2var4 — 3-phase network, 4-wire, unbalanced load



Dimensions

All dimensions in mm



Type	A	B	C	D	Weight (approx.)
WQ96-x/WQ96-c	96 x 96	5.0	92 x 92	90 x 90	0.400 kg
WQ144-x/WQ144-c	144 x 144	8.0	138 x 138	136 x 136	0.700 kg

Order specifications

	Type	Connection	Meas. range	Meas. current (CT)	Meas. voltage (VT)
Example:	WQ96-x	2W4	0...10MW	500/1A	10kV/100V

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

	Current Transducers, TAC-311DG	Current Transducers, TAC-321DG	Active/Reactive Power Transducers, Tax-312-DG/1
Size, DIN rail (mm):	55 x 75	55 x 75	99.7 x 75
Accuracy class:	0.5	0.5	0.5
Connection:	Single phase	Single phase	Single phase, 3-phase 3 wire balanced load, 3-phase 4-wire balanced load, 3 phase 3 wire unbalanced load, 3-phase 4 wire unbalanced load
Measuring principle:	Average measurement	Average measurement	RMS
Measuring current:	1.0...7.25A AC (≤1.2VA)	0..1A AC (≤2.0VA) 0..5A AC (≤2.3VA)	57.7..690V AC ±20% (≤0.5VA)
Measuring voltage:	-	-	0.3..5A AC (≤0.3VA)
Measuring range:	0..100% I nom	0..100% I nom	0..P/Q nom / -P/-Q nom..0..+P/+Q nom
Meas. frequency:	45..65Hz	45..65Hz	45..50..60..65 Hz
Output (0..100%):	0..5, 0..10, 0..20mA DC, 0..10V DC Span adjustment ±20% of FS output Zero adjustment for all span adjustments	0..10, 0..20mA DC Span adjustm. +10% -20% of FS output	0..1mA, 0..5mA, 0..10mA, 0..20mA, 0..1V, 0..10V
Output (20..100%):	4..20mA, Output limit <22mA Span adjustm. ±20%, Zero adjustm. ±20%	-	0.2..1mA, 1..5mA, 2..10mA, 4..20mA, 0.2..1V, 2..10V
Output (±100%):	-	-	±1mA, ±5mA, ±10mA, ±20mA, ±1V, ±10V
Auxiliary supply:	110/230/440V AC ±20% ≤2.5VA 24V DC -25/+30% ≤2W 48..110, 88..220V DC -25/+30% ≤2W	No separate auxiliary supply	57.7..690V AC ±20%, ≤3.5VA 24..220V DC 25/+30%, ≤2W

	Voltage Transducers, TAV-311DG	Voltage Transducers, TAV-321DG	
Size, DIN rail (mm):	55 x 75	55 x 75	
Accuracy class:	0.5	0.5	
Connection:	Single phase	Single phase	
Measuring principle:	Average measurement	Average measurement	
Measuring voltage:	57.7..500V AC (≤0.3VA) 88..132V AC (≤0.3VA)	57.7..500V AC (≤2.8VA)	
Measuring range:	0..100% U nom / 67..100% U nom	0..100% U nom	
Meas. frequency:	45..65Hz	45..65Hz	
Output (0..100%):	0..5, 0..10, 0..20mA DC, 0..10V DC Span adjustment ±20% of FS output Zero adjustment for all span adjustments	0..10, 0..20mA DC 0..10V DC Span adjustm. +10% -20% of FS output	
Output (20..100%):	4..20mA, Output limit <22mA Span adjustm, ±20%, Zero adjustm. ±20%	-	
Auxiliary supply:	110/230/440V AC ±20% ≤2.5VA 24V DC -25/+30% ≤2W 48..110, 88..220V DC -25/+30% ≤2W	No separate auxiliary supply	

DEIF A/S, Frisenborgvej 33, DK-7800 Skive, Tel.: +45 9614 9614, Fax: +45 9614 9615, E-mail: deif@deif.com, URL: www.deif.com

	Selectable AC-transducers, TAS-331DG	Selectable AC-transducers, TAS-311DG
Size, DIN rail (mm):	99.7 x 75	99.7 x 75
Accuracy class:	0.5	0.5
Connection:	Single phase and 3 phase network	Single phase
Measuring principle:	RMS	RMS
Measuring voltage:	57...690V AC <1VA	-
Measuring range:	0...P/Q - P/Q...0...P/Q	0...57V / 690V, 0...0.5A / 8A, 20...80Hz
Meas. frequency:	20...80Hz	20...80Hz
Output (0...100%):	0...1mA, 0...5mA, 0...10mA, 0..20mA 0...1V, 0...5V 0...10V	0...1mA, 0...5mA, 0...10mA, 0..20mA 0...1V, 0...5V 0...10V
Output (20...100%):	0.2...1mA, 1..5mA, 2...10mA, 4...20mA 0.2...1V, 1...5V, 2...10V	0.2...1mA, 1..5mA, 2...10mA, 4...20mA 0.2...1V, 1...5V, 2...10V
Output (±100%):	±1mA, ±5mA, ±10mA, ±20mA, ±1V, ±5V, ±10V	±1mA, ±5mA, ±10mA, ±20mA ±1V, ±5V, ±10V
Output (±10-100%):	0.1...1mA, 0.5...5mA, 1...10mA, 2...20mA 0.1...1V, 0.5...5V, 1...10V	0.1...1mA, 0.5...5mA, 1...10mA, 2...20mA 0.1...1V, 0.5...5V, 1...10V
Auxiliary supply:	57...690V AC / 24...220V DC	57...690V AC / 24...220V DC

	Selectable AC-transducers, TAS-321DG	
Size, DIN rail (mm):	99.7 x 75	
Accuracy class:	0.5	
Connection:	Single phase and 3 phase network	
Measuring principle:	RMS current with sign	
Measuring voltage:	-	
Measuring range:	-8/-0.5A...0.5/8A, 0...P/Q -P/Q...0...P/Q	
Meas. frequency:	20...80Hz	
Output (0...100%):	0...1mA, 0...5mA, 0...10mA, 0..20mA 0...1V, 0...5V 0...10V	
Output (20...100%):	0.2...1mA, 1..5mA, 2...10mA, 4...20mA 0.2...1V, 1...5V, 2...10V	
Output (±100%):	±1mA, ±5mA, ±10mA, ±20mA, ±1V, ±5V, ±10V	
Output (±10-100%):	0.1...1mA, 0.5...5mA, 1...10mA, 2...20mA 0.1...1V, 0.5...5V, 1...10V	
Auxiliary supply:	57...690V AC / 24...220V DC	

DEIF A/S, Frisenborgvej 33, DK-7800 Skive, Tel.: +45 9614 9614, Fax: +45 9614 9615, E-mail: deif@deif.com, URL: www.deif.com

	Current Transducers, TAC-230DG	DC/DC Insulation Amplifiers, TDG-210DG
Main function:		Converting one type of DC signal into another DC signal, separating a number of earthing points, galvanic separation of current signals, conversion of measuring signal, adaption of measuring range, separation of measuring circuits, measuring on DC shunts or measuring of DC voltages.
Size, DIN rail (mm):	54 x 98.4	108 x 98.4
Accuracy class:	0.5	0.5
Connection:	Single phase	-
Measuring principle:	Average measurement	-
Measuring voltage:	-/1A or -/5A (≤2VA)	-
Current standard input:	-	Different ranges available within the limit of ±1...50mA
Voltage input:	-	Different ranges available within the limit of ±60mV...400V
Measuring range:	0..100% I nom (std) or 0..120% I nom	-
Meas. frequency:	45..65Hz (300..500Hz)	-
Output (0...100%):	-	0..1mA, 0..5mA, 0..10mA, 0..20 mA 0..1V, 0..10V
Output (20...100%):	4..20mA (2 wire connection)	0.2..1mA, 1..5mA, 2..10mA, 4..20mA 0.2..1V, 2..10V
Output (-100...0...100%):	-	±1mA, ±5mA, ±10mA, ±20mA, ±1V, 10V
Auxiliary supply, DC: Auxiliary supply, AC:	Output supply 12..30V DC according to the output load	24-48-110-220V DC (2.5W) DC/DC 57.7…440V AC ±20%, 3.5VA (45...65Hz)

	Multi Transducers, MTR-1	
Size (mm):	96 x 72 (Panel)	
Main function:	Measurement of voltage, current, active-, reactive- and apparent power, CosPhi, frequency and energy production (kWh)	
Connection:	Single phase, 3-phase 3 wire balanced load, 3-phase 4-wire balanced load , 3-phase 3 wire unbalanced load, 3-phase 4 wire unbalanced load	
Accuracy class:	0.5	
Output:	3 analog, one pulse or a serial output (RS485)	
Measuring current:	-/1A or -/5A	
Measuring voltage:	100/110...450V AC ±20%	
Auxiliary voltage, DC:	12…220V DC	
Auxiliary supply, AC:	85…231V AC / DC (±20% max. 6W)	

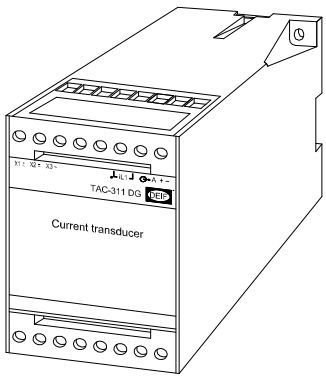
DEIF A/S, Frisenborgvej 33, DK-7800 Skive, Tel.: +45 9614 9614, Fax: +45 9614 9615, E-mail: deif@deif.com, URL: www.deif.com

Type TAC-311DG/TAC-321DG

AC current single function transducer

4921220034E

- ***Wide range of standard measuring/output ranges***
- ***Compact design, 55 x 75 mm***
- ***Easily accessible terminals***
- ***Easy identification of unit/function***
- ***Accuracy class 0.5***
- ***35 mm DIN rail or base mounting***



TAC-311DG or TAC-321DG

CE

Application

The current transducers type TAC-311DG or TAC-321DG are transducers for measurement of a sinusoidal AC current converted into a DC current signal proportional to the measured value on a single phase or 3 phase network.

PLCs, PCs, microprocessor control, indicators, alarm units etc. can be operated by the output signal.

Measuring principle

Average measurement.

The transducer consists of a transformer, which gives galvanic insulation between input and output.

The signal is rectified, smoothed and amplified into an A DC output.

The TAC-311DG with zero adjustment needs a constant aux. supply voltage, which also is insulated from output by a transformer.

DEIF A/S

Type TAC-311DG/TAC-321DG

Available transducers

Order no. Output

TAC-311DG, aux. supply 24V DC				
Input, std.	**Input, span**	**0-5mA DC**	**0-20mA DC**	**4-20mA DC**
0-1.0A AC	0-0.85/1.2A			1207000005
0-1.3A AC	0-1.10/1.6A			1207000015
0-5.0A AC	0-4.25/6.2A	1207000011		1207000006
0-6.0A AC	0-5.00/7.5A		1207000023	
0-6.5A AC	0-5.50/8.1A			1207000020

TAC-311DG, aux. supply 48-110V DC						
Input, std.	**Input, span**	**0-5mA DC**	**0-10mA DC**	**0-20mA DC**	**4-20mA DC**	**0-10V DC**
0-1.00A AC	0-0.85/1.2A				1207000013	
0-1.00A AC	0-1.00/1.1A					1207000029
0-1.20A AC	0-1.00/1.5A		1207000028			
0-1.30A AC	0-1.10/1.6A				1207000016	
0-5.00A AC	0-4.25/6.2A	1207000012	1207000025		1207000018	
0-6.25A AC	0-5.30/7.8A		1207000026			
0-6.50A AC	0-5.50/8.1A			1207000024	1207000021	
0-7.25A AC	0-6.10/9.0A		1207000027			

TAC-311DG, aux. supply 88-220V DC		
Input, std.	**Input, span**	**4-20mA DC**
0-1.0A AC	0-0.85/1.2A	1207000014
0-1.3A AC	0-1.10/1.6A	1207000017
0-5.0A AC	0-4.25/6.2A	1207000019
0-6.5A AC	0-5.50/8.1A	1207000022

TAC-311DG, aux. supply 110/230V AC			
Input, std.	**Input, span**	**0-5mA DC**	**4-20mA DC**
0-1.0A AC	0-0.85/1.2A	1207000009	1207000001
0-5.0A AC	0-4.25/6.2A	1207000010	1207000002

TAC-311DG, aux. supply 440V AC		
Input, std.	**Input, span**	**4-20mA DC**
0-1.0A AC	0-0.85/1.2A	1207000003
0-5.0A AC	0-4.25/6.2A	1207000004

TAC-321DG, without aux. supply			
Input, std.	**Input, span**	**0-10mA DC**	**0-20mA DC**
0-1.0A AC	0-0.91/1.2A		1207000103
0-5.0A AC	0-4.60/6.2A	1207000102	1207000101

Type TAC-311DG/TAC-321DG

Technical specifications

Measuring current (I_{nom}):
TAC-311DG: 1.0...7.25A AC (≤1.2VA)

TAC-321DG: 0…1A AC (≤ 2.0VA)
0…5A AC (≤ 2.3VA)

Overload: 2 x I_{nom} continuously
10 x I_{nom} for 10s
40 x I_{nom} for 1s

Frequency range: 45...65Hz

Range:
Output TAC-311DG (20...100%): 4...20mA DC
Span adjustment ±20% of FS
Zero adjustment ±20% of 4mA
Output limit < 22.0mA DC

Output TAC-311DG (0...100%): 0...5mA, 0...10mA, 0...20mA DC
0...10V DC
Span adjustment ±20% of FS output
Zero adjustment for all span adjustments

Output TAC-321DG (0...100%): 0...10mA, 0...20mA DC
Span adjustment +10/-20% of FS output

Output load current: Max. 12V

Output load voltage: Max. 1mA

Accuracy: Class 0.5 (-10...15...30...55°C) according to IEC 688

For output 0...10V DC: Class 0.5 (-10...15...30...55°C) at load ≥ 100kΩ
Class 1.0 (-10...15...30...55°C) at load ≥ 10kΩ

Response time/ripple: < 300ms/0.5%pp

Temp. coefficient: Max. 0.1% of full scale per 10°C

TAC-311DG
Δout/ΔU_{aux}/ΔF_{aux}/ΔR_{load}: Max. 0.1%/Δ10%U_{aux}/0.1%(45...65Hz) /0.1% R_{load} max.

TAC-321DG
Δout/ΔR_{load}: 0.5% R_{load} max.

Ambient temperature: -10...+55°C (normal)
-25...+70°C (operating)
-40...+70°C (storage)

Galvanic separation: Between inputs, outputs and aux. voltage:
2200V - 50Hz - 1min.

Aux. supply voltage (U_n)
only TAC-311DG: 110/230/440V AC ±20% (max. 2.5VA)
24, 48...110, 88...220V DC -25/+30% (max. 2W)

Connections: Max. 4.0mm^2 (single-stranded)
Max. 2.5mm^2 (multi-stranded)

Materials: All plastic parts are self-extinguishing to UL94 (V1)

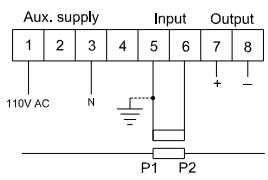
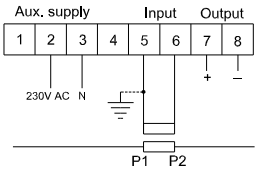
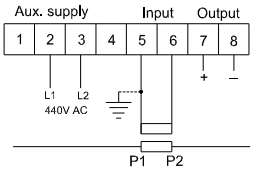
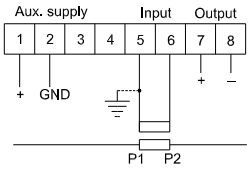
Protection: Case: IP40. Terminals: IP20, to IEC 529 and EN60529

EMC: EN50081-1/2, EN50082-1/2

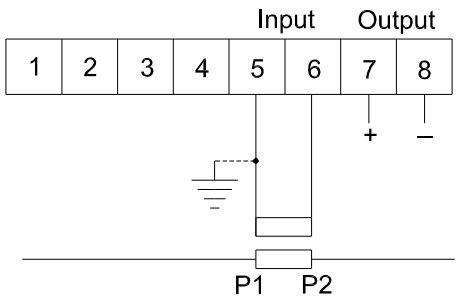
Note: Transducers with V AC supply cannot be connected to supply sources where the frequency in some cases is lower than 35Hz for more than 1min.

Connections – TAC-311DG

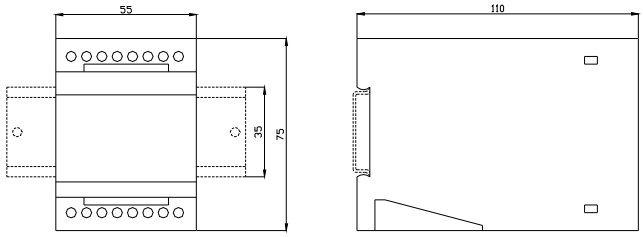
Recommended fuse 2A on aux. supply.

	For aux. supply 110V AC (Please note that transducers with 110V AC supply can also be connected to 230V AC)
	For aux. supply 230V AC (Please note that transducers with 230V AC supply can also be connected to 110V AC)
	For aux. supply 440V AC
	For aux. supply V DC

Connection – TAC-321DG



Mechanical drawing/dimensions (in mm)



Weight:	TAC-311DG	Approx. 0.4 kg
	TAC-321DG	Approx. 0.3 kg

Order specifications

To order a transducer with a standard input, only quote the type and order no.:
Type – Order no.
Example:
TAC-311DG – 1207000018 (see the tables on page 2)

To order a TAC-311DG transducer with a customised input:
Type – Measuring current – Output – Supply
Example:
TAC-311DG – 0…4.5A – 4…20mA – 48…110V DC

To order a TAC-321DG transducer with a customised input:
Type – Measuring current – Output
Example:
TAC-321DG – 0…6A – 0…10mA

Please note that some combinations of input, output and aux. supply are not available as standard.

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

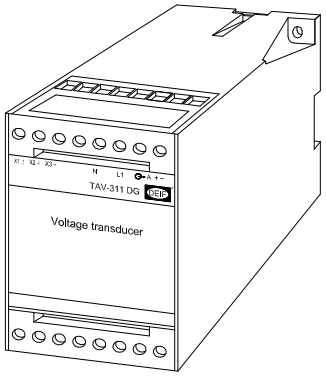
***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

Type TAV-311DG/TAV-321DG

AC voltage single function transducer

4921220032E

- ***Wide range of standard measuring/output ranges***
- ***Compact design, 55 x 75 mm***
- ***Easily accessible terminals***
- ***Easy identification of unit/function***
- ***Accuracy class 0.5***
- ***35 mm DIN rail or base mounting***



TAV-311DG or TAV-321DG

CE

Application

The voltage transducers type TAV-311DG or TAV-321DG are transducers for measurement of a sinusoidal AC voltage converted into a DC current or DC voltage signal proportional to the measured value on a single phase or 3 phase network.

PLCs, PCs, microprocessor control, indicators, alarms units etc. can be operated by the output signal.

Measuring principle

Average measurement.

The transducer consists of a transformer, which gives galvanic insulation between input and output.

The signal is rectified, smoothed and amplified into a V DC or an A DC output.

The TAV-311DG with zero adjustment needs a constant auxiliary supply voltage, which also is insulated from output by a transformer.

DEIF A/S

Available transducers

Order no. Output

TAV-311DG, aux. supply 24V DC				
Input, std.	**Input, span**	**0-5mA DC**	**0-20mA DC**	**4-20mA DC**
0-120V AC	0-105/145V	1207010013		
0-120V AC	0-100/150V			1207010004
0-132V AC	0-110/165V		1207010023	1207010019
0-230V AC	0-192/285V			1207010005
0-440V AC	0-370/550V			1207010006
88-132V AC	88-125/185V	1207010016		
88-132V AC	88-125/143V			1207010007

TAV-311DG, aux. supply 48-110V DC						
Input, std.	**Input, span**	**0-5mA DC**	**0-10mA DC**	**0-20mA DC**	**4-20mA DC**	**0-10V DC**
0-120V AC	0-105/145V	1207010014				
0-120V AC	0-110/133V					1207010027
0-132V AC	0-100/165V		1207010026			
0-132V AC	0-110/165V			1207010024	1207010020	
0-500V AC	0-420/580V				1207010022	
88-132V AC	88-125/185V	1207010017				

TAV-311DG, aux. supply 110/230V AC			
Input, std.	**Input, span**	**0-5mA DC**	**4-20mA DC**
0-100V AC	0-85/125V		1207010018
0-120V AC	0-105/145V	1207010012	
0-120V AC	0-100/150V		1207010001
0-230V AC	0-192/285V		1207010002
0-300V AC	0-250/375V		1207010025
0-440V AC	0-370/550V		1207010003
0-500V AC	0-420/580V		1207010028
88-132V AC	88-125/185V	1207010015	
88-132V AC	88-125/143V		1207010008

TAV-311DG, aux. supply 88-220V DC		
Input, std.	**Input, span**	**4-20mA DC**
0-132V AC	0-110/165V	1207010021

TAV-311DG, aux. supply 440V AC		
Input, std.	**Input, span**	**4-20mA DC**
0-440V AC	0-370/550V	1207010009

TAV-321DG, without aux. supply				
Input, std.	**Input, span**	**0-10mA DC**	**0-20mA DC**	**0-10V DC**
0-100V AC	0-91/125V		1207010102	
0-120V AC	0-110/150V	1207010101	1207010103	1207010106
0-230V AC	0-210/287V		1207010104	1207010107
0-440V AC	0-400/550V		1207010105	1207010108

Technical specifications

Meas. voltage (U_{nom}):
TAV-311DG: 100...500V AC (≤ 0.3VA)

TAV-321DG: 100...440V AC (≤ 2.8VA)

Overload: 1.2 x U_{nom} continuously,
2 x U_{nom} for 10s

Frequency range: 45...65Hz

Range:
Input TAV-321DG: 0…30…120%
0…30% U_n output not linear

Output TAV-311DG
(20…100%): 4...20mA DC
Span adjustment ±20% of FS
Zero adjustment ±20% of 4mA
Output limit < 22.0mA DC

Output TAV-311DG
(0…100%): 0…5mA, 0...10mA, 0...20mA DC
0...10V DC
Span adjustment ±20% of FS output
Zero adjustment for all span adjustments

Output TAV-321DG
(0...100%): 0...10mA, 0...20mA DC
0...10V DC
Span adjustment +10/-20% of FS output

Output load current: Max. 12V TAV-311DG
Max. 8V TAV-321DG

Output load voltage: Max. 1mA

Accuracy: Class 0.5 (-10...15...30...55°C) according to IEC 688
Class 1.0 at U_n ≤ 25%

For output 0...10V DC: Class 0.5 (-10...15...30...55°C) at load ≥ 100kΩ
Class 1.0 (-10...15...30...55°C) at 10kΩ ≤ load < 100kΩ

Response time/ripple: < 300ms/0.5%pp

Temp. coefficient: Max. 0.1% of full scale per 10°C

TAV-311DG
Δout/ΔU_{aux}/ΔF_{aux}/ΔR_{load}: Max.
0.1%/Δ10%U_{aux}/0.1%(45...65Hz)
/0.1% R_{load} max.

TAV-321DG
Δout/ΔR_{load}: 0.5% R_{load} max.

Ambient temperature: -10...+55 °C (nominal)
-25...+70 °C (operating)
-40...+70 °C (storage)

Galvanic separation: Between inputs, outputs and aux. voltage: 2200V - 50Hz - 1min.

Aux. supply voltage (U_n)
only TAV-311DG: 110/230-440V AC ±20% (max. 2.5VA)
24, 48...110, 88...220V DC -25/+30% (max. 2W)

Connections: Max. 4.0mm^2 (single-stranded)
Max. 2.5mm^2 (multi-stranded)

Materials: All plastic parts are self-extinguishing to UL94 (V1)

Protection: Case: IP40. Terminals: IP20,
to IEC 529 and EN60529

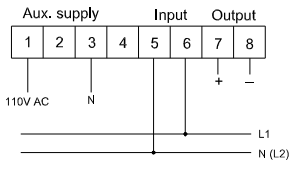
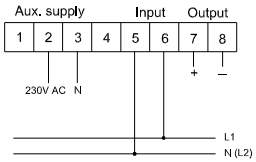
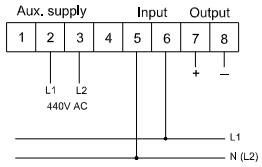
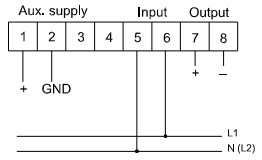
EMC: EN50081-1/2, EN50082-1/2

Note: Transducers with V AC supply cannot be connected to supply sources where the frequency in some cases is lower than 35Hz for more than 1min.

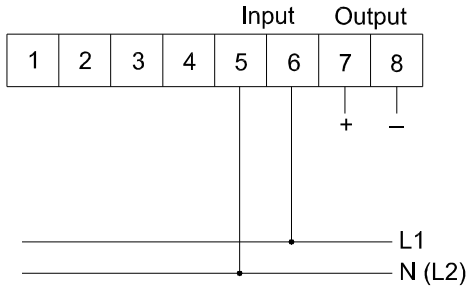
If the measuring frequency in some cases is lower than 35Hz, the transducer cannot be applied.

Connections – TAV-311DG

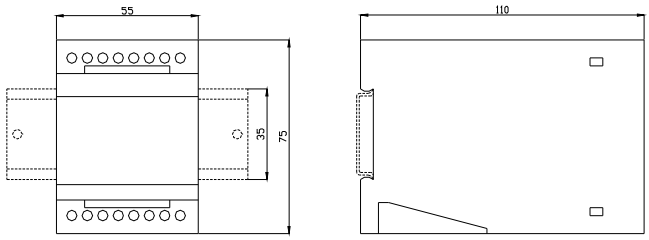
Recommended fuse 2A on aux. supply.

	For aux. supply 110V AC (Please note that transducers with 110V AC supply can also be connected to 230V AC)
	For aux. supply 230V AC (Please note that transducers with 230V AC supply can also be connected to 110V AC)
	For aux. supply 440V AC
	For aux. supply V DC

Connection – TAV-321DG



Mechanical drawing/dimensions (in mm)



Weight:	TAV-311DG	Approx. 0.4 kg
	TAV-321DG	Approx. 0.3 kg

Order specifications

To order a transducer with a standard input, only quote the type and order no.:
Type – Order no.
Example:
TAV-311DG – 1207010022 (see the tables on page 2)

To order a TAV-311DG transducer with a customised input:
Type – Measuring voltage – Output – Supply
Example:
TAV-311DG – 0…450V – 4…20mA – 48…110V DC

To order a TAV-321DG transducer with a customised input:
Type – Measuring voltage – Output
Example:
TAV-321DG – 0…220V – 0…10V

Please note that some combinations of input, output and aux. supply are not available as standard.

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

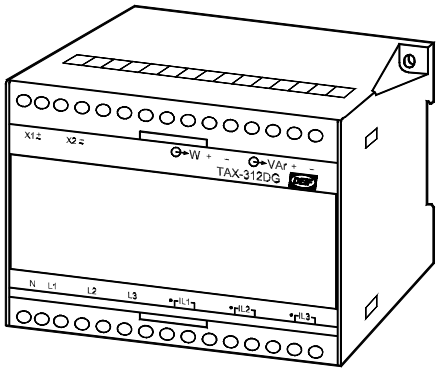
***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

Dual Output Power Transducer

Type TAX-312DG/1

4921240181F

- ***Combined watt and var measurement***
- ***Accuracy class 0.5/1.0***
- ***Voltage up to 690V***
- ***Galvanic separation 4000V***
- ***35 mm DIN rail or base mounting***



TAX-312DG/1

CE

Application

The dual output transducer type TAX-312DG/1 is a power transducer for measurement of active power and reactive power, on a single phase or 3-phase network, providing a separate output for both measurements.

The 2 outputs can be configured for all standard output ranges.

Measuring Principle

The transducer measures current(s) and phase voltage(s). The TDM (Time-Division-Multiplication) principle ensures an accurate measurement of the RMS value of both the active power and the reactive power (U x I x cos-φ) and (U x I x sin-φ), irrespective of wave form. The TAX-312DG/1 is available with the following couplings:

1W/1VAr	single phase[1]
1W3/1VAr3	1 element 3 phase 3 wire, balanced load[1]
1W4/1VAr4	1 element 3 phase 4 wire, balanced load[1]
2W3/2VAr3	2 element 3 phase 3 wire, unbal. load[2]
3W3/3VAr3	3 element 3 phase 3 wire, unbal. load[3]
3W4/3VAr4	3 element 3 phase 4 wire, unbal. load[3]

1) 1 external current transformer
2) 2 external current transformers
3) 3 external current transformers

In order to measure the reactive power of coupling 1VAr and 1VAr4, the voltage input of the transducer is provided with a built-in 90° phase shifter network. To ensure correct measurements in this coupling, the net frequency must be stable and correspond with the information on the transducer type label (50Hz / 60Hz).

Calculation of Measuring Range

3-phase network
Lowest measuring range: $0.5 \times \sqrt{3} \times U \times I$
Highest measuring range: $2 \times \sqrt{3} \times U \times I$
For single phase networks the factor $\sqrt{3}$ is omitted.

Note: The calibration range of the VAr measurement is equal to 50% of the calibration range of the Watt measurement.

DEIF A/S

Technical specifications

Meas. current (I_n): 0.5…5A AC

overload: 4 x I_n, continuously,
20 x I_n for 10 s (max. 75A)
80 x I_n for 1 s (max. 300A)

load: Max. 0.5VA per phase.

Meas. voltage (U_n): (see supply voltage - AC ranges).

overload: 1.2 x U_n, continuously,
2 x U_n for 10 s

load: 2kΩ/V.

Frequency range: 40...45...65...70Hz.

Outputs: 2 analog outputs, referring to mutual ground.

Range:
Output (0…100%): 0..1mA, 0…5mA, 0..10mA, 0..20mA, 0..1V, 0..10V
Output (20…100)%: 0,2..1mA, 1..5mA, 2..10mA, 4..20mA, 0,2V..1V, 2..10V
Output(-100..0..100%): -1..0..1mA, -5..0..5mA, -10..0..10mA, -20..0..20mA, -1..0..1V, -10..0..10V
Output load current: Max. 10V
Output load voltage: Max. 20mA

Accuracy:
Watt: Class 0.5 (-10..15…30…55°C) according to IEC 688.
Var: Class 1.0 (-10..15…30…55°C) according to IEC 688.

Response time/ ripple: 150ms/1%pp

Temperature coefficient: max. +/-0.2% of full scale per 10°C.

Ambient temperature: -10..+55 °C (nominal)
-25..+70 °C (operating)
40..+70 °C (storage)

Galvanic separation: Between inputs, outputs and aux. voltage: 4000V - 50Hz - 1 min.

Supply voltage (U_n): 57.7-63.5-100-110-127-200-220-230-240-380-400-415-440-450-660-690VAC ±20% (max. 3.5VA)

24-48-110-220V DC -25/+30% (max. 2W).

Climate: HSE, to DIN 40040.

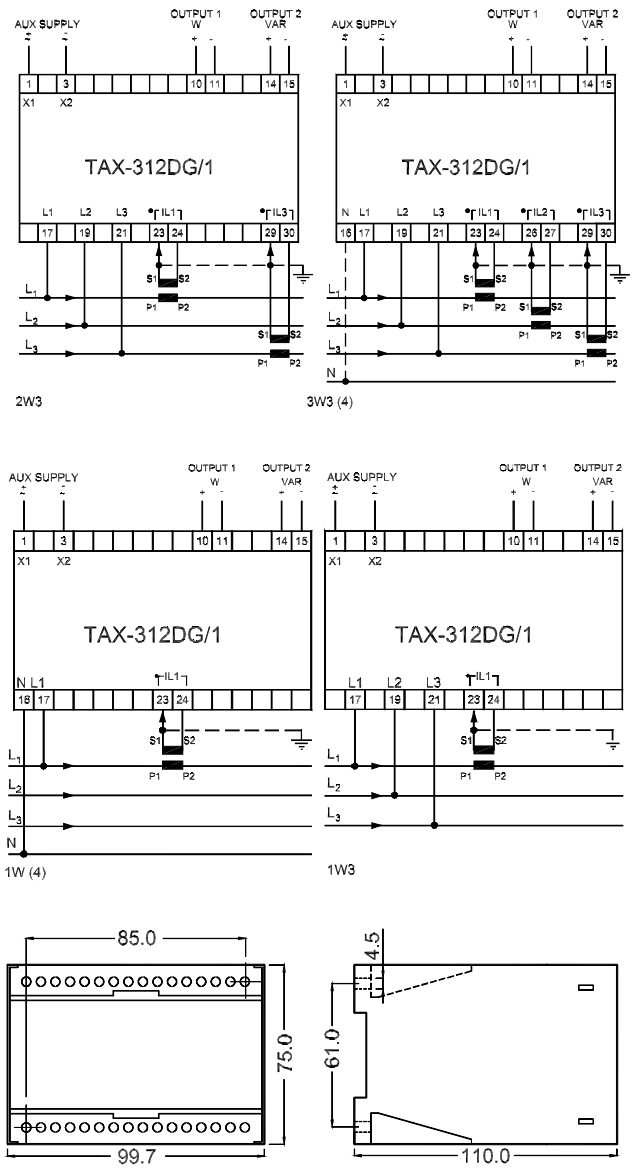
Connections: Max. 4 mm² (single-stranded).
Max. 2.5 mm² (multi-stranded).

Materials: All plastic parts are self-extinguishing to UL94 (V1).

Protection: Case: IP40. Terminals: IP20, to IEC 529 and EN 60529.

The transducer is equipped with a green LED marked "POWER" for indication of power ON.

Connections/dimensions (in mm)



Weight: Approx. 0.650 kg

Order specifications

Type – Coupling – Measuring range (W) – Ct – Measuring voltage – Vt – Nom. frequency (only for coupling 1W/1VAr and 1W4/1VAr4) – Output 1 – Output 2 – Supply

Due to our continous development we reserve the right to supply equipment which may vary from the described.

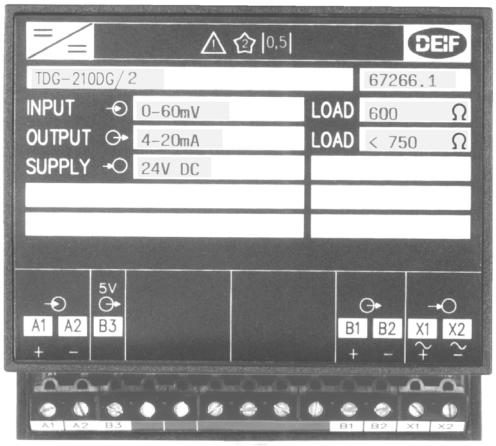
***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

Insulation amplifiers
DC/DC amplifiers

Type TDG-210DG

4921220011E



- *Conversion of measuring signal possible (E.g. –10…0…10mA into 4…20mA)*
- *Suppression of negative input signals possible*
- *Aux. voltage: 57.7…440V AC or 24…220V DC*
- *For mounting on DIN rail*

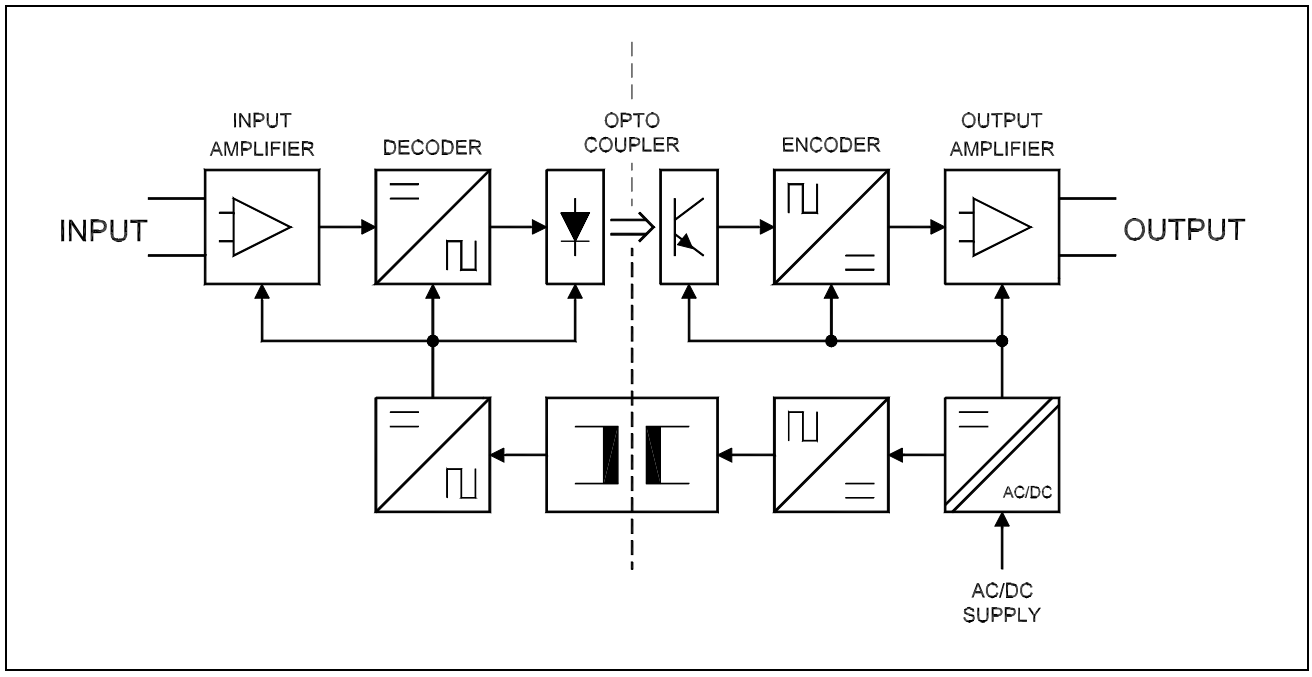
CE

Application

TDG-210DG is a CE marked DC/DC amplifier with galvanic separation between input and output. It is typically used for:

- **Converting one type of DC signal into another DC signal**
  (E.g. from -10...0...10mA into 4...20mA)
- **Converting potentiometer input into a DC signal**
  (E.g. from 0...1kΩ into 0...10V)
- **Separating a number of earthing points**
  If a cable is connected to earth at more than one point, a measuring error may develop or noise problems may arise if the earth potentials of these vary.
- **Galvanic separation of current signals**
  As measuring equipment connected to the current output of a transducer is connected in series, simultaneous earthing of more than one input of connected measuring equipment will result in short-circuit of the input of intermediate measuring units.
- **Conversion of measuring signal**
  If increasing output is requested at decreasing input, this may be achieved by means of the insulation amplifier, at the same time providing galvanic separation between the 2 measuring circuits.
  (E.g. from 10...0V DC into 0...5mA).
- **Adaption of measuring range**
  The input may be suppressed, i.e. only a part of the range is used.
  (E.g. from 10...20mA to 0...10V DC).
- **Separation of measuring circuits**
  In case of remote transmission of a DC signal - typically a 4...20mA signal to a number of measuring points situated well away from each other - separation into galvanically separated measuring circuits is often requested to isolate a possible fault and confine this to the faulty circuit.
- **Measuring on DC shunts**
  The potential of a DC measuring shunt (0...60mV) is sometimes high when compared to earth. A leakage between the measuring cable and earth will result in a measuring error. The galvanic separation at the same time provides protection against accidental contact to the high potential.
- **Measuring of DC voltages**
  Especially when measuring high DC voltages galvanic separation between input and output is an absolute necessity for safety purposes and due to differences in the potentials of input and output. TDG-210DG is available for measuring of voltages up to 500V DC.

Construction



TDG-210DG requires auxiliary voltage and is fed through a transformer or a 24/48/110/220V DC inverter. The secondary voltage is rectified and fed to the encoder and output amplifier shown to the right of the galvanic interface. The input amplifier and the decoder are fed through a DC/DC inverter. The input signal is amplified and is, through optocouplers, transmitted to theoutput amplifier.

This measuring method combines high accuracy of measurement with long-term stability.

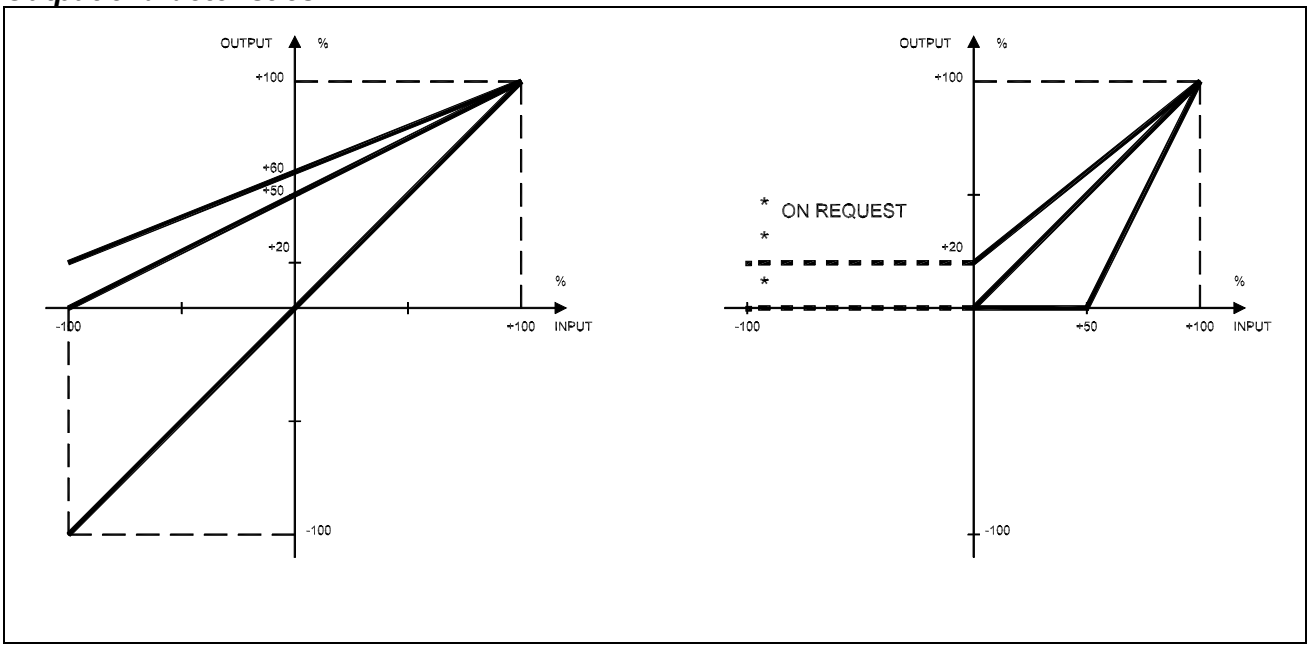
Standard input and output may be set by means of jumpers, whereas special input is factory calibrated.

Technical specifications

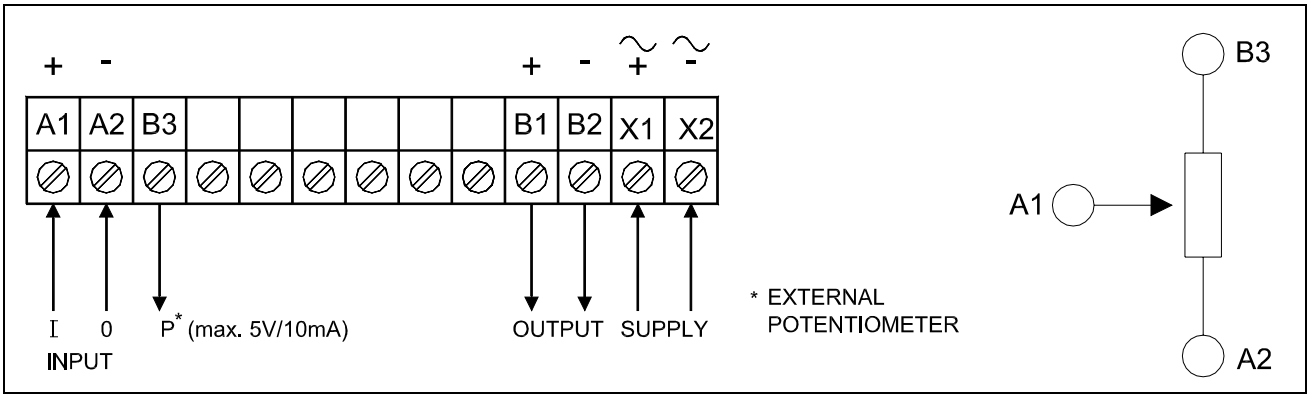
Current input	Standard	0...1mA	0.2..1mA	0...0.5...1mA	-1...0...1mA
	Standard	0...5mA	1...5mA	0...2.5...5mA	-5...0...5mA
	Standard	0...10mA	2...10mA	0...5...10mA	-10...0...10mA
	Standard	0...20mA	4...20mA	0...10...20mA	-20...0...20mA
	Special - min.	0...0.1mA	0.02...0.1mA	0...0.05...0.1mA	-0.1...0...0.1mA
	Special - max.[1]	0...50mA	10...50mA	0...25...50mA	-50...0...50mA
	Load	0...1V voltage drop for all current inputs			
Voltage input	Standard	0...1V	0.2...1V	0...0.5...1V	-1...0...1V
	Standard	0...10V	2...10V	0...5...10V	-10...0...10V
	Special - min.	0...60mV	12...60mV	0...30...60mV	-60...0...60mV
	Special - max.[1]	0...400V	80...400V	0...200...400V	-400...0...400V
	Load	0...0.1mA input current for all voltage inputs (10kΩ/V)			
Potentiom. input		0…50Ω/10kΩ			
Current output	Standard	(See standard current inputs above)			
	Load	Max. 15V/±15V above output			
	Overload	Max. 200% output current			
	Protection	Protected against open output (max. 25V)			
Voltage output	Standard	(See standard voltage inputs above)			
	Load	Max. 20mA/±20mA from output			
	Overload	Max. 150% output voltage			
	Protection	Protected against short-circuited output (max. 45mA)			
Output (General)	Ripple	Max. 0.5% P-P to IEC 688			
	Response time	Max. <10ms to IEC 688			
	Characteristic	(See back page[1])			
Insulation	Test voltage	2500V AC - 50Hz - 1 min.: between input/output/aux. voltage			
	Operating voltage	600V AC - 50Hz - 850V DC: between input/output/aux. voltage			
Auxiliary voltage	V AC ±20% 45...65Hz	57.7-63.5-100-110-120-127-220-240-380-400-415-440V AC (3.5VA)			
	V DC -20/+30%	24-48-110-220V DC (2.5W) DC/DC inverter built in			
Environments	Temperature	-10...55°C (nominal) -25...70°C (operating), -40...70°C (storage)			
	Climate	Class HSE to DIN 40040			
	EMC	To EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4), IEC 255-22-1 (class 3)			
	Protection	Front: IP53. Terminals: IP20 to IEC 529			
Accuracy	Input/output	Class 0.5% (-10...15...30...55°C) to IEC 688			
Drift	Temperature	Typ. 0.15% per 10°C, max. 0.2% per 10°C			
	Load/output	Max. 0.1% for max. variation of output load			
	Auxiliary voltage	Max. 0.1% per 10% variation of auxiliary voltage			
Connection	Screw terminals	Multi-stranded: Max. 2.5 mm². Single-stranded: Max. 4 mm²			
Materials	Flammability	All plastic materials self-extinguishing to UL94 (V0)			

1) Further ranges within the stated minimum and maximum ranges available on request.

Output characteristics

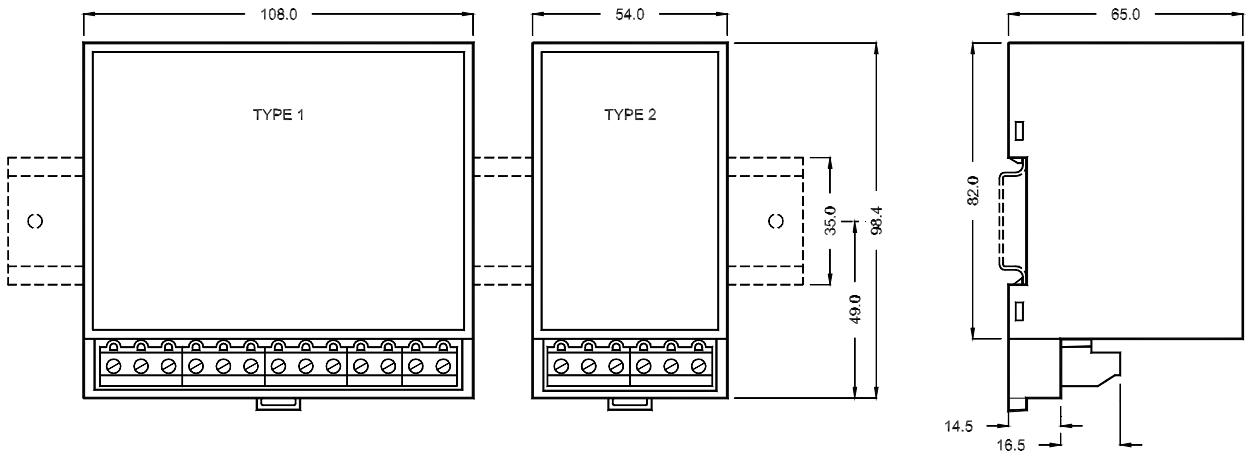


Connections



Dimensions

All dimensions in mm



TDG-210DG

Weight: approx. 0.370 kg

Due to our continous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

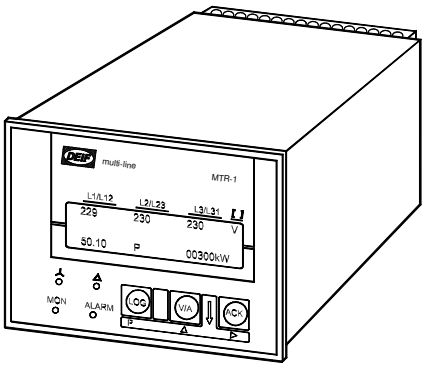
Type MTR-1

multi transducers

multi-line

4921220026I

- ***All 3-phase AC measurements, true RMS***
- ***3 programmable analog outputs*** ***(current can be indicated with signs as function of power direction)***
- ***1 programmable pulse output***
- ***Display showing all measurements***
- ***Optional serial output for all values***
- ***1-, 2- or 3-phase measurements***



MTR-1

CE

Application

The MTR-1 multi transducer is a microprocessor-based measuring unit providing measurement of all electrical values on a single phase or 3-phase network, showing the measurements on the built-in display and transmitting these as:

- 3 analog outputs
  and
- 1 pulse output
  and
- a serial output (option).

The MTR-1 can replace several transducers in all electrical measuring applications, and can be applied both as a normal transducer, where the analog output is connected to a local control system, and as a remote value reading unit, where all measured values are transmitted to the remote control system via the serial interface.

The MTR-1 can measure true RMS values on all network topologies with/without neutral and with both balanced and unbalanced load.

MTR-1 contains all necessary measuring circuits and presents all values on an LC display. Messages are presented in clear text, all measuring values in engineering units.

The MTR-1 is a flexible and menu-programmed unit, enabling the user easily to adapt the unit to the application in question. Programming procedures are password protected.

Standard functions

The unit is designed for measurement on a 3-phase or 1-phase network.

Measured and calculated values

- phase to neutral voltage (3-phase U_{max}, U_{min} and average)
- phase to phase voltage (3-phase U_{max}, U_{min} and average)
- current (3-phase I and average) and direct. current.
- active power
- reactive power
- apparent power
- cos-φ
- frequency

  Each of the 3 analog outputs can be programmed to represent any of the above measurements, and the output signal can be programmed to the required scaling and type.
- energy production (kWh) counter (not for billing purposes)

  The open collector pulse output can be programmed to transmit any fixed number of pulses per produced kWh.

Options

Option A1: Remote value reading
- RS 232 remote value reading of all values measured by MTR-1.
- Siemens 3964, RK512 with standard telegram.

Option A2: Remote value reading
- RS 485 remote value reading of all values measured by MTR-1.
- Modbus standard telegram.

Other communication standards available on request.

Option B0: 12V DC power supply

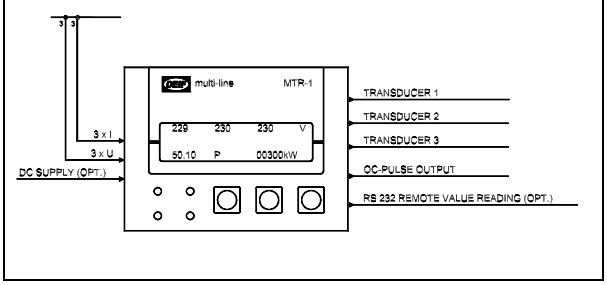
Option B1: 24V DC power supply

Option B2: 48V DC power supply

Option B3: 110V DC power supply

Option B4: 220V DC power supply

Principle diagram



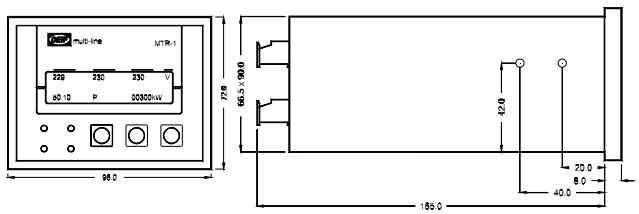
DEIF A/S

Type MTR-1

Technical specifications

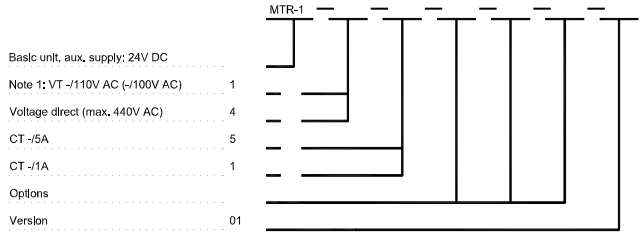
Accuracy:	Class 0.5, to IEC 688 (Modbus class 1.0)
Operating temp.:	-20...70°C (display, however: -20...60°C)
Climate:	Class HSE, to DIN 40040
Measuring voltage:	100/110 (1)..450V AC (4) ±20%. Consumption: max. 0.15VA per phase
Measuring current:	-/1A or -/5A Consumption: max. 0.1VA per phase Overcurrent: max. 20 x I_n for 1 s -/1 A: max. 100 x I_n for 1 s -/5 A: max. 20 x I_n for 1 s
Meas. frequency:	30...70Hz
Auxiliary supply: - Standard: - Optional:	 85...231V AC ±20%, max. 6W 12-24-48-110-220V DC +30/-25%, max. 6W
Open collector output:	Max. 30mA "ON" current. Max. 27V "OFF" voltage.
Fuse:	All voltage inputs should be protected by a 2A fuse
Analog outputs:	(0) 4...20mA or -20...0...20mA: Max. load 400Ω. Max. reading 32MW. See note 1.
Safety:	To EN 61010-1. Installation Cat. III, 300V. Pollution degree 2.
Galvanic separation:	Between open collector output and remaining circuits. Between analog outputs and remaining circuits. Between current inputs and remaining circuits.
EMC:	To EN 50081-1/2 and EN 50082-1/2.
Connections:	Max. 2.5 mm^2 (supply, measuring voltage and measuring current). Max. 1.5 mm^2 (analog outputs, open collector output and optional serial interface).
Protection:	IP21. Front: IP52. To IEC 529 and EN 60529.
Housing:	To DIN 43700.

Dimensions (in mm)



Weight: approx. 0.5 kg Panel cut-out: 68 x 92 mm +0.5

Order specifications



	Type	Voltage	CT	Options	Version
Example: MTR-1-4-1-B1	MTR-1	Direct	-/1A	B1	

Note 1: If max. reading is more than 32MW, please add version 01 in order specifications, and if Vt is more than 65kV, please also add version 01 in order specifications.

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

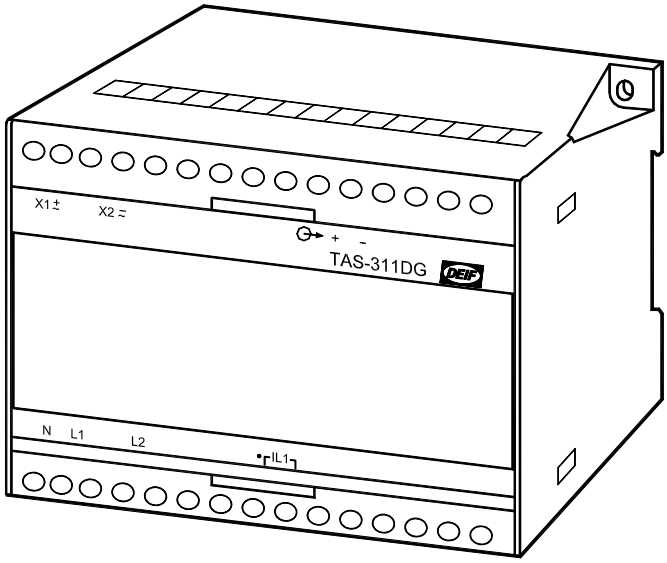
***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

Selectable AC-transducer

Type TAS-311DG

4921220038E



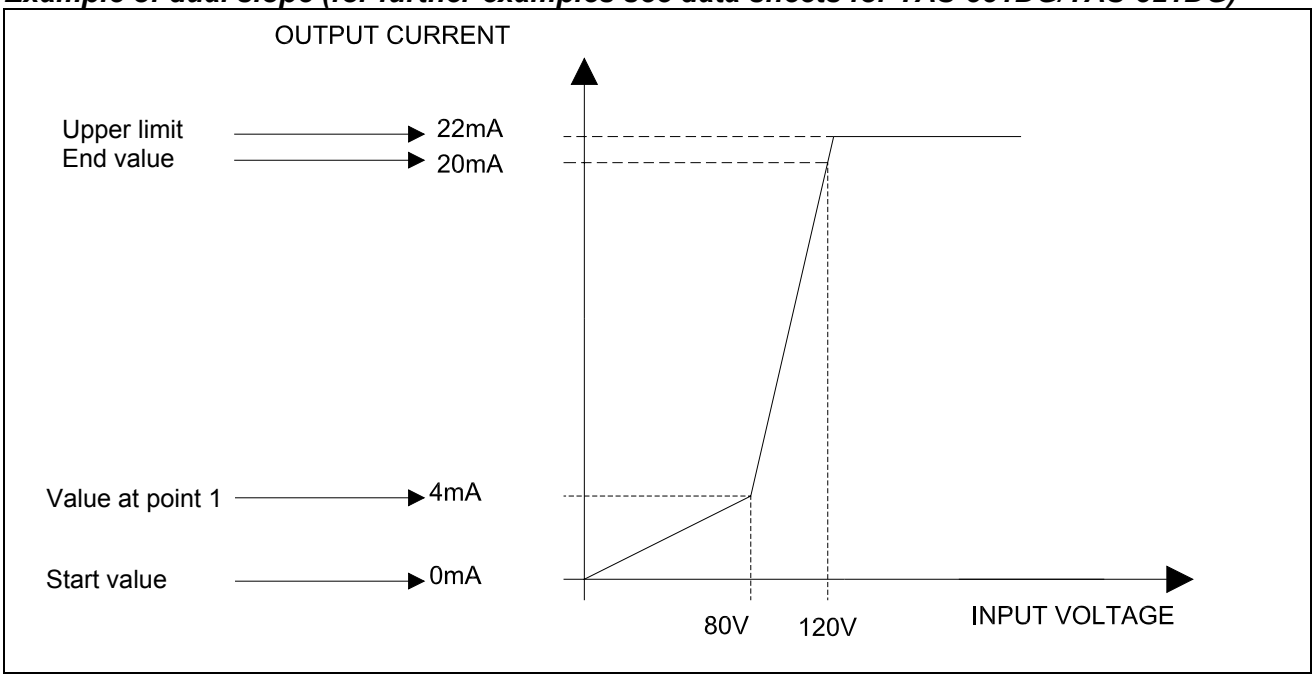
- *Measures voltage, current, frequency or phase angle on AC networks*
- *Class 0.5 (IEC-688) measurement*
- *Supply and measuring voltage up to 690V*
- *Easy configuration via PC-interface possible*
- *Non-linear output characteristics possible*

Application

TAS-311DG is a micro-controller based AC-transducer with 1 analogue output for measurement of RMS-voltages, RMS-current, phase angle or frequency on an AC-network. TAS-311DG can be delivered pre-configured or it can be delivered un-configured for customer configuration through the PC-interface. The PC-configuration software allows free choise of voltage, current, phase angle or frequency measurement including configuration of the measuring range and output range without any mechanical settings or adjustments inside the transducer. The transducer holds no mechanical moving parts like potentiometers and therefore the calibration stability is excellent.

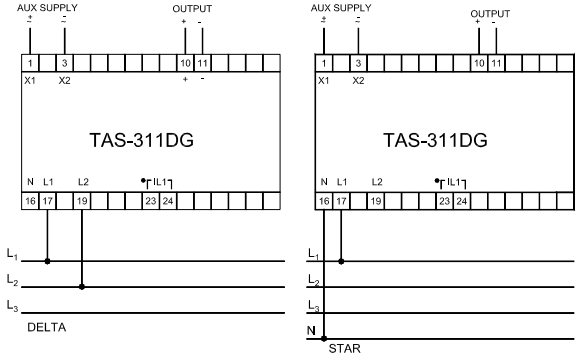
TAS-311DG can be configured as a normal linear transducer or with up to three slopes giving the possibility for a higher resolution in one or two ranges of the measurement. See figure below for an example of two slopes. Upper and lower output limitations can also be configured.

Example of dual slope (for further examples see data sheets for TAS-331DG/TAS-321DG)

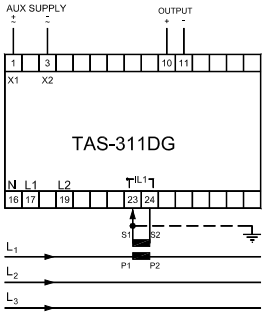


Connection diagram

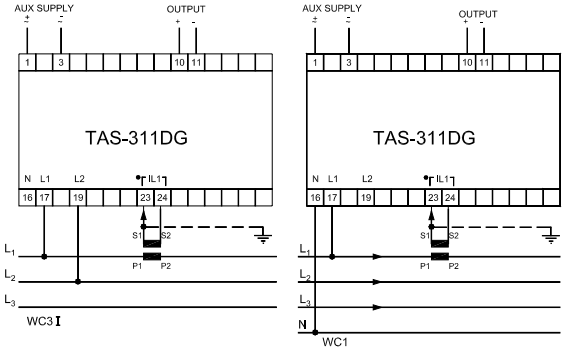
VOLTAGE/FREQUENCY



CURRENT



PHASE ANGLE



Coupling	17	19	23/24
WC3 I	L1	L2	L1
WC3 II	L2	L3	L1
WC3 III	L3	L1	L1

General technical specifications

Accuracy:	Voltage/current:	Class 0.5 (-10…15…30…55°C) according to IEC 688
	Frequency:	Class 0.2 of f max. (-10…15…30…55°C) according to IEC 688
	Phase angle:	Class 1.0 (-10…15…30…55°C) according to IEC 688
Meas. current (In):	0.75/1.5/3.0/6.0A	Meas. range (In): 0…200%
Overload, currents:	20A max., continuously 75A max. for 10 s 240A max. for 1 s	
Load:	Max. 0.5VA	
Meas. voltage (Un):	73/140/254/400V phase to neutral	Meas. range (Un): 1…120%
	127/240/440/690 phase to phase	Meas. range (Un): 1…120%
Overload, voltages:	1.2 x U_n max., continuously 2 x U_n max. for 10 s	
Load:	Min. 480kΩ	
Frequency range:	30…45…65…80Hz	
Indication:	Red LED function:	
	(The LED is located behind the front plate) Calibration error = flash frequency 5Hz Configuration error = flash frequency 1Hz	
Output:	1 analogue output	
Standard range:	Output (0...100%):	0...1mA, 0…5mA, 0...10mA, 0...20mA, 0...1V, 0...5V, 0...10V
	Output (10...100%):	0.1...1mA, 0.5...5mA, 1...10mA, 2...20mA, 0.1...1V, 0.5...5V, 1...10V
	Output (20...100%):	0.2...1mA, 1...5mA, 2...10mA, 4...20mA, 0.2...1V, 1...5V, 2...10V
	Output (-100...0...100%):	-1...0...1mA, -5...0...5mA, -10...0...10mA, -20...0...20mA, -1...0..1V, -5...0...5V, -10...0...10V
	Other ranges possible	
Limit:	Max. ±120% of nominal output	
Output load:	Current: Max. 10V (max. 1kΩ) Voltage: Max. 20mA	
Output cable:	Max. length 30m	
$\Delta out/\Delta R_{load}$:	10V, 5V, 1V, 20mA ranges according to IEC 688 10mA, 5mA, 1mA ranges ±0.5%	
Ambient temperature:	-10…55°C (nominal) -25…70°C (operating) -40…70°C (storage)	
Temperature coefficient:	Max. ±0.2% of full scale per 10°C	
Response time:	Current/voltage:	<105ms in the range 0...90% of nominal input according to IEC 688 <300ms in the range 0...30% of nominal input <85ms in the range 30...100% of nominal input
	Frequency:	<75ms, typical value 50ms
	Phase angle:	<275ms, typical value 200ms
Ripple:	Twice the class index (peak to peak measurement) according to IEC 688	
Galvanic separation:	Between inputs, outputs and aux. supply: 3750V-50Hz-1 min.	
Supply voltage:	57.7-63.5-100-110-127-200-220-230-240-380-400-415-440-450-480-660-690VAC ±20% 24-48-110-220VDC -25/+30%	
Consumption:	(Aux. supply) 3.5VA/2W	
Climate:	HSE, to DIN 40040	
EMC:	According to EN 61000-6-1/2/3/4	
Protection:	Housing: IP40. Terminals: IP20 to IEC 529 and EN 60529	
Connections:	Max. 2.5mm² multi-stranded Max. 4.0mm² single-stranded	
Materials:	All plastic parts are self-extinguishing to UL94 (V1)	

Specific technical specifications

Voltage:	Measuring voltage:	57...690VAC	
	Start value:	0…67% of end value	
	End value:	100…120% of measuring voltage	
	Connection:	Star connection (UL1-N):	57V…400VAC
		Delta connection (UL1-L2):	100V…690VAC
Current:	Measuring current:	0.5...8A	
	Start value:	0...67% of end value	
	End value:	100% of measuring current	

Specific technical specifications, continued

Frequency:	Measuring range:	20Hz...80Hz
	Start value:	20Hz...76Hz
	End value:	40Hz...80Hz
	Measuring span:	4Hz ≤ end value - start value
	Connection:	Star connection (UL1-N): 57V…400VAC Meas. range (Un): 30...120%
		Delta connection (UL1-L2): 100V…690VAC Meas. range (Un): 30...120%
Phase angle:	Reference:	Delta phi = 180°, Sine wave Un and Inom (Inom = 1A or 5A)
		Voltage influence 1.5% between 50…120% Un
		Current influence 1.5% between 50…150% Inom
		2.5% between 20…50% Inom
	Measuring range:	0°…60° / 360° electrical degrees
	Start value:	-359.9°…360°
	End value:	-359.9°…360°
	Measuring span:	60° ≤ difference between start and end values ≤360°
	Connection:	WC1: (IL1 and UL1-N) or (IL2 and UL2-N) or (IL3 and UL3-N): 57…400VAC
		WC3 I: (IL1 and UL1-L2): 100…690VAC
		WC3 II: (IL1 and UL2-L3): 100…690VAC
		WC3 III: (IL1 and UL3-L1): 100…690VAC
		Meas. range (Un): 30...120%

Order specifications (examples)

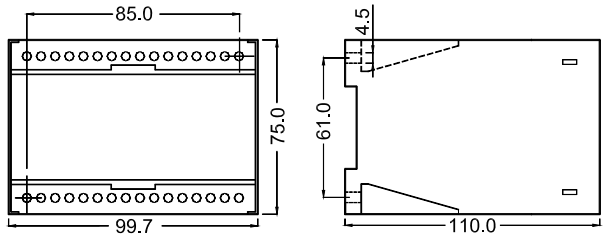
The examples below are order specifications for pre-configured transducers. For un-configured transducers only auxiliary voltage must be specified.

Type	TAS-311DG			
Measurement:	Voltage	Current	Frequency	Phase angle
Measuring range:	0kV…8kV…12kV	0…120A	45…50…55Hz	-90°…-60°…0°…60°…90° 0…0.5cap…1…0.5…0ind
Connection:	Delta (phase-phase)	NA	Star (phase-neutral)	WC3 I
VT ratio:	10kV/100V	NA	-	-
Input voltage:	0…80…120V	NA	400VAC	400V
CT ratio:	NA	100/1A	NA	500/5A
Input current:	NA	1.2A	NA	5A
Transfer curve:	Dual slope	Single slope	Single slope	Triple slope
Output start value:	0mA	4mA	4mA	-10V
Threshold 1:	4mA	-	-	-8V
Mid value:	12mA	-	12mA	0V
Threshold 2:	-	-	-	8V
Output end value:	20mA	20mA	20mA	10V
Output lower limit:	0mA	0mA	4mA	-12V
Output upper limit:	22mA	24mA	21.5mA	12V
Auxiliary voltage:	100VAC	110VDC	400VAC	220VDC

PC-configuration kit containing connection cable and software for customer configuration must be ordered separately.

Dimensions

All dimensions in mm



Weight: approx. 0.600 kg

Mounting instructions

TAS-311DG is designed for panel mounting, being mounted on a 35 mm DIN rail, or by means of two 4 mm screws.

The design of the transducer makes mounting of it close to similar equipment possible, however make sure there is min. 50 mm between the top and bottom of the transducer and other equipment. The DIN rail must always be placed horizontally when several transducers are mounted on the same rail.

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

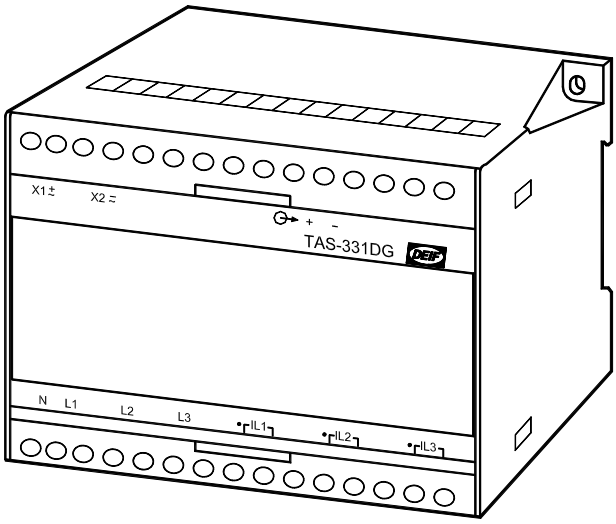
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

Selectable AC-transducer

Type TAS-331DG

4921220036E



- ***Measures power or reactive power on 3-phase AC networks***
- ***Class 0.5 (IEC-688) measurement***
- ***Supply and measuring voltage up to 690V***
- ***Easy configuration via PC-interface possible***
- ***Non-linear output characteristics possible***

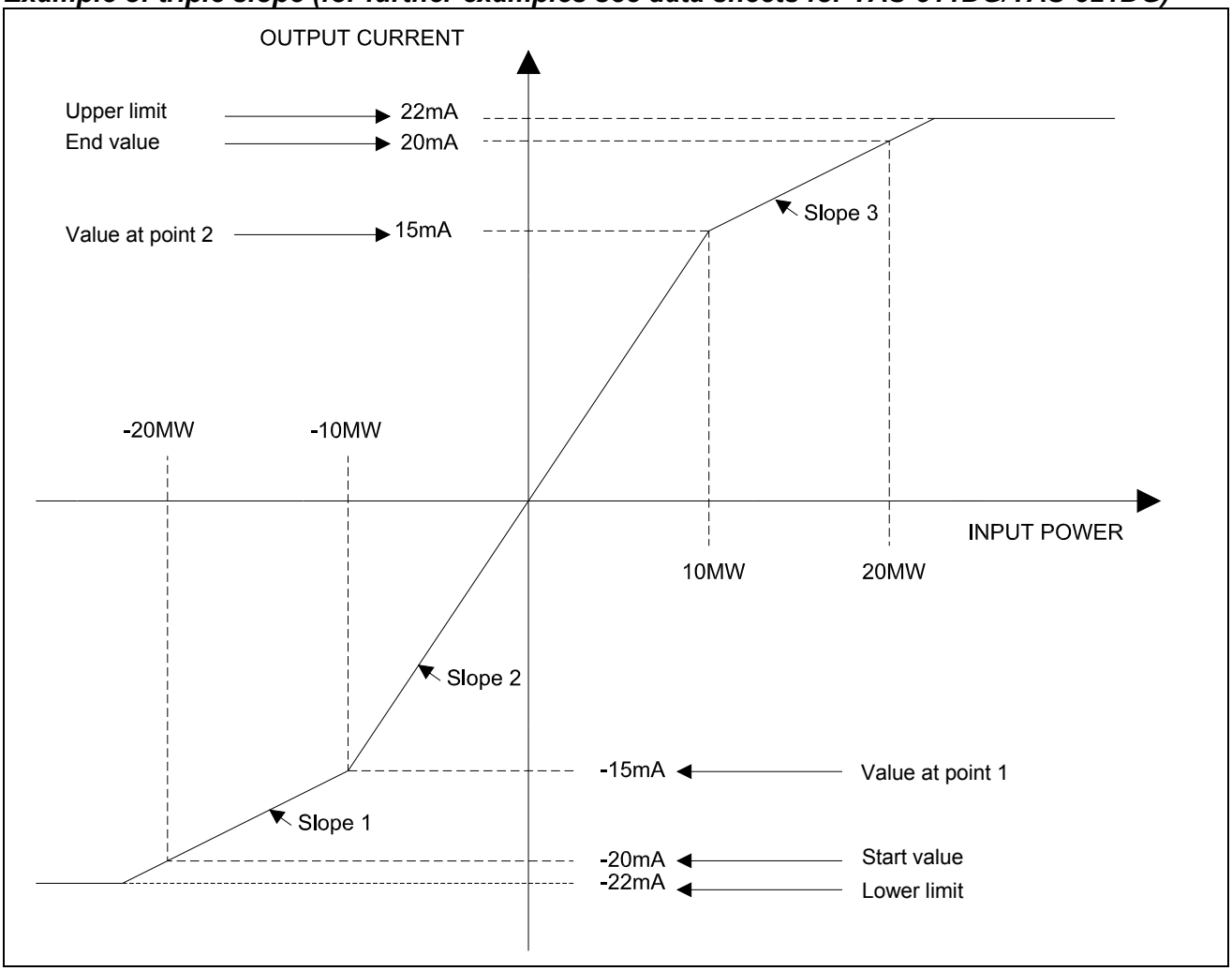
CE

Application

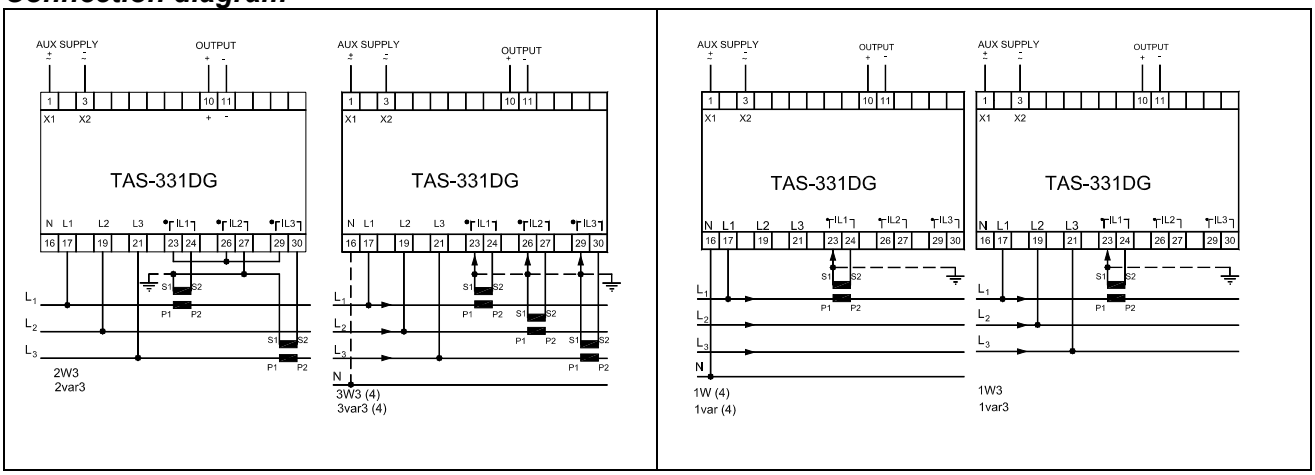
TAS-331DG is a micro-controller based AC-transducer with 1 analogue output for measurement of power or reactive power on an AC-network. TAS-331DG can be delivered pre-configured to the desired measuring value and range or it can be delivered un-configured for customer configuration through the PC-interface. The PC-configuration makes free adjustment of the full input range and output range possible without any mechanical settings or adjustments inside the transducer. The transducer holds no mechanical moving parts like potentiometers and therefore the calibration stability is excellent. TAS-331DG will check the wiring for faults when starting up and indicate possible faults on a LED.

TAS-331DG can be configured as a normal linear transducer or with up to three slopes giving the possibility for a higher resolution in one or two ranges of the measurement. See figure below for an example of three slopes. Upper and lower output limitations can also be configured.

Example of triple slope (for further examples see data sheets for TAS-311DG/TAS-321DG)



Connection diagram



Technical specifications

Accuracy:	Class 0.5 (-10…15…30…55°C) according to IEC 688
Influence, phase angle:	≤ ±0.75°
Meas. current (In):	0.75/1.5/3.0/6.0A Meas. range (In): 0…200%
Overload, currents:	20A max., continuously 75A max. for 10 s 240A max. for 1 s
Load:	Max. 0.5VA per phase
Meas. voltage (Un):	73/140/254/400V phase to neutral Meas. range: 30…120%U_n (57...400V) 127/240/440/690 phase to phase Meas. range: 30…120%U_n (100...690V)
Overload, voltages:	1.2 x U_n max., continuously 2 x U_n max. for 10 s
Load:	Min. 480kΩ
Frequency range:	30…45…65…80Hz Note: For fundamental frequency (1. harmonic) outside 20Hz…80Hz the input is fixed to 0
Indication:	Red LED function: (The LED is located behind the front plate) Incorrect wiring = constant light, only active for coupling 1W3, 2W3, 3W3(4) and 1var3, 2var3, 3var3(4). Check at power up, in case of doubt disconnect supply and reconnect Calibration error = flash frequency 5Hz Configuration error = flash frequency 1Hz
Output:	1 analog output
Standard range:	Output (0...100%): 0...1mA, 0…5mA, 0...10mA, 0...20mA, 0...1V, 0...5V, 0...10V Output (10...100%): 0.1...1mA, 0.5...5mA, 1...10mA, 2...20mA, 0.1...1V, 0.5...5V, 1...10V Output (20...100%): 0.2...1mA, 1...5mA, 2...10mA, 4...20mA, 0.2...1V, 1...5V, 2...10V Output (-100...0...100%): -1...0...1mA, -5...0...5mA, -10...0...10mA, -20...0...20mA, -1...0..1V, -5...0...5V, -10...0...10V Other ranges possible
Limit:	Max. ±120% of nominal output
Output load:	Current: Max. 10V (max. 1kΩ) Voltage: Max. 20mA
Output cable:	Max. length 30m
$\Delta out/\Delta R_{load}$:	10V, 5V, 1V, 20mA ranges according to IEC 688 10mA, 5mA, 1mA ranges ±0.5%
Ambient temperature:	-10…55°C (nominal) -25…70°C (operating) -40…70°C (storage)
Temperature coefficient:	Max. ±0.2% of full scale per 10°C
Response time:	Coupling 2W3/2var3, 3W3/3var3, 3W4/3var4 <225ms, typically 200ms Coupling 1W/1var, 1W4/1var4 <150ms, typically 125ms Coupling 1W3/1var3 <125ms, typically 100ms
Ripple:	Twice the class index (peak to peak measurement) according to IEC 688
Galvanic separation:	Between inputs, outputs and aux. supply: 3750V-50Hz-1 min.
Supply voltage:	57.7-63.5-100-110-127-200-220-230-240-380-400-415-440-450-480-660-690VAC ±20% 24-48-110-220VDC -25/+30%
Consumption:	(Aux. supply) 3.5VA/2W
Climate:	HSE, to DIN 40040
EMC:	According to EN 61000-6-1/2/3/4
Protection:	Housing: IP40. Terminals: IP20 to IEC 529 and EN 60529
Connections:	Max. 2.5mm² multi-stranded Max. 4.0mm² single-stranded
Materials:	All plastic parts are self-extinguishing to UL94 (V1)

Order specifications (examples)

The examples below are order specifications for pre-configured transducers. For un-configured transducers only auxiliary voltage must be specified.

	Example of active power transducer:	Example of reactive power transducer:
Type	TAS-331DG	TAS-331DG
Measuring range:	0…2MW	0…1Mvar (2Mvar) [1]
Coupling [2]:	1W3	1var3
VT ratio:	10kV/100V	10kV/100V
Measuring voltage:	100V	100V
CT ratio:	100/5A	100/5A
Transfer curve:	Single slope	Dual slope
Output start value:	4mA	4mA
Value at point 1:	-	20mA corresponding to 1Mvar [1]
Output end value:	20mA	20mA corresponding to 2Mvar [1]
Output lower limit:	4mA	4mA
Output upper limit:	21.5mA	20mA must be equal to end value [1]
Auxiliary voltage:	110V DC	110V DC

[1] As the transducer for measurement of reactive power is configured at 50% var in proportion to the active power, the function “dual slope” is activated. This method can be used to ensure that the dynamic range of the current input is not exceeded on the var transducer.

[2] At coupling 1W4/1var4 L-L voltage must be stated when ordering.

Check of the chosen measuring range is within the configuration range of the transducer.

$$0.375A = < \frac{\text{Primary power}}{1.73 \times \text{measuring voltage} \times \text{Vt ratio} \times \text{Ct ratio}} = <6A$$

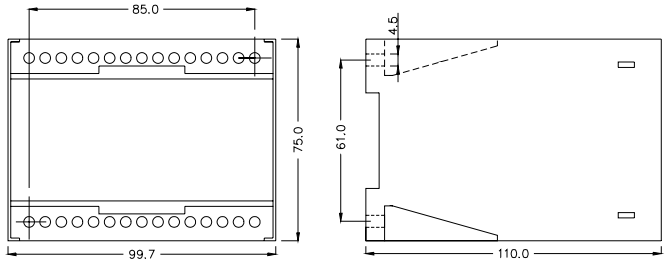
At 1W / 1var coupling the factor 1.73 is left out of the above calculation.

If I (current) is beyond 0.375A…6A another Ct with a larger or smaller ratio is chosen.

PC-configuration kit containing connection cable and software for customer configuration must be ordered separately.

Dimensions

All dimensions in mm



Weight: approx. 0.650 kg

Mounting instructions

TAS-331DG is designed for panel mounting, being mounted on a 35 mm DIN rail, or by means of two 4 mm screws.

The design of the transducer makes mounting of it close to similar equipment possible, however make sure there is min. 50 mm between the top and bottom of the transducer and other equipment. The DIN rail must always be placed horizontally when several transducers are mounted on the same rail.

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

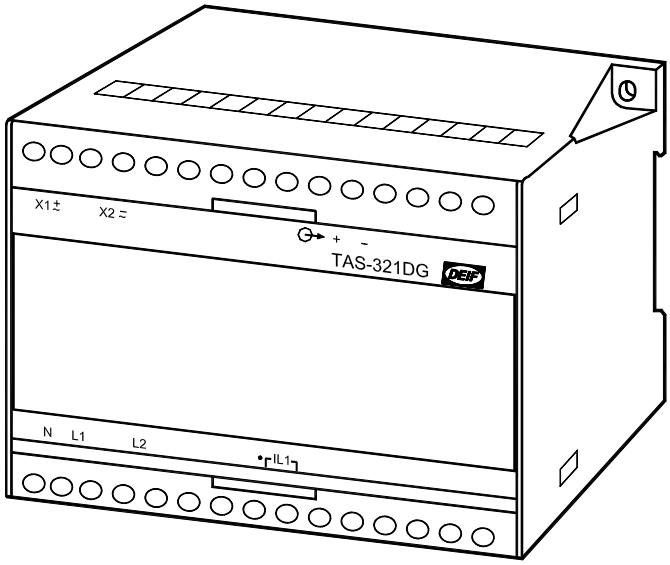
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

Selectable AC-transducer

Type TAS-321DG

4921220040D



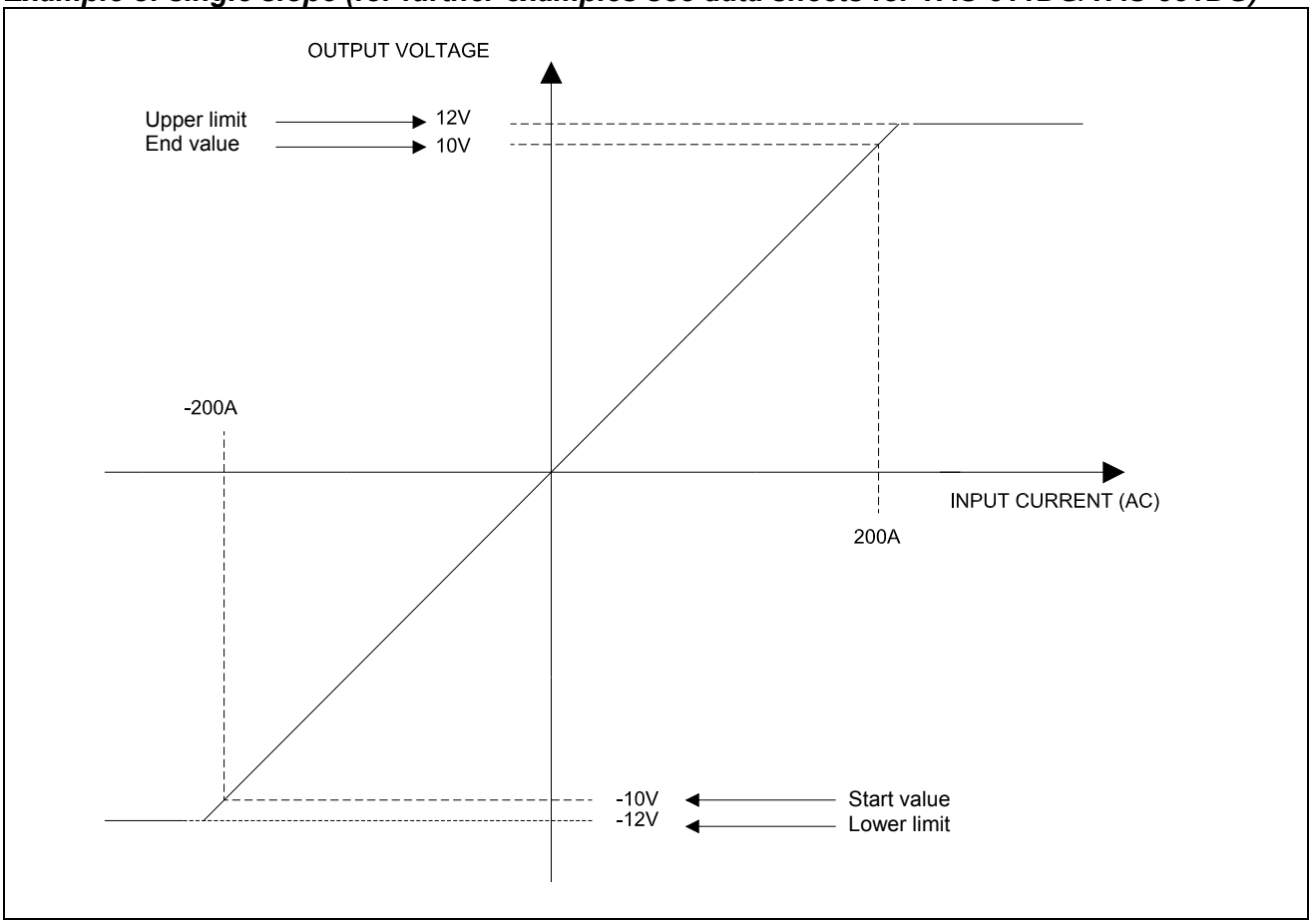
- *Bi-directional current measurement on AC networks*
- *Power measurement using 2 phases on 3-phase networks*
- *Class 0.5 (IEC-688) measurement*
- *Supply and measuring voltage up to 690V*
- *Easy configuration via PC-interface possible*
- *Non-linear output characteristics possible*

Application

TAS-321DG is a micro-controller based AC-transducer with 1 analogue output for measurement of bi-directional current. The sign for current direction is based on the measured power direction. Furthermore the transducer can be used for measurement of active power or reactive power on a 3-phase network where only 2 phases are available for the measurement. TAS-321DG can be delivered pre-configured or it can be delivered un-configured for customer configuration through the PC-interface.

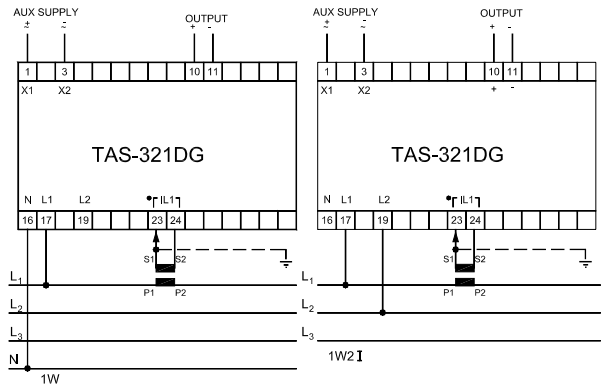
TAS-321DG can be configured as a normal linear transducer or with up to three slopes giving the possibility for a higher resolution in one or two ranges of the measurement. Upper and lower output limitations can also be configured.

Example of single slope (for further examples see data sheets for TAS-311DG/TAS-331DG)

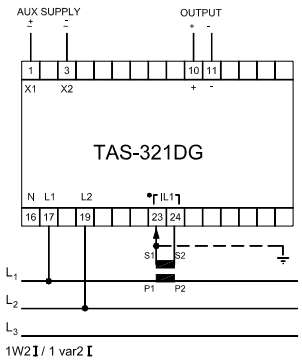


Connection diagram

CURRENT



POWER



Coupling	17	19	23/24
1W2 I / 1var2 I	L1	L2	L1
1W2 II / 1var2 II	L2	L3	L1
1W2 III / 1var2 III	L3	L1	L1

General technical specifications

Accuracy:	Current/power:	Class 0.5 (-10…15…30…55°C) according to IEC 688
Influence, phase angle:	≤ ±0.75°	
Meas. current (In):	0.75/1.5/3.0/6.0A	Meas. range (In): 0…200%
Overload, currents:	20A max., continuously 75A max. for 10 s 240A max. for 1 s	
Load:	Max. 0.5VA	
Meas. voltage (Un):	73/140/254/400V phase to neutral 127/240/440/690 phase to phase	Meas. range (Un): 30…120% (57…400V) Meas. range (Un): 30…120% (100…690V)
Overload, voltages:	1.2 x U_n max., continuously 2 x U_n max. for 10 s	
Load:	Min. 480kΩ	
Frequency range:	30…45…65…80Hz Note: For fundamental frequency (1. harmonic) outside 20Hz...80Hz the input is fixed at 0	
Indication:	Red LED function: (The LED is located behind the front plate) Calibration error = flash frequency 5Hz Configuration error = flash frequency 1Hz	
Output:	1 analogue output	
Standard range:	Output (0...100%): Output (10...100%): Output (20...100%): Output (-100...0...100%): Other ranges possible	0...1mA, 0…5mA, 0...10mA, 0...20mA, 0...1V, 0...5V, 0...10V 0.1...1mA, 0.5...5mA, 1...10mA, 2...20mA, 0.1...1V, 0.5...5V, 1...10V 0.2...1mA, 1...5mA, 2...10mA, 4...20mA, 0.2...1V, 1...5V, 2...10V -1...0...1mA, -5...0...5mA, -10...0...10mA, -20...0...20mA, -1...0..1V, -5...0...5V, -10...0...10V
Limit:	Max. ±120% of nominal output	
Output load:	Current: Max. 10V (max. 1kΩ) Voltage: Max. 20mA	
Output cable:	Max. length 30m	
$\Delta out/\Delta R_{load}$:	10V, 5V, 1V, 20mA ranges according to IEC 688 10mA, 5mA, 1mA ranges ±0.5%	
Ambient temperature:	-10…55°C (nominal) -25…70°C (operating) -40…70°C (storage)	
Temperature coefficient:	Max. ±0.2% of full scale per 10°C	
Response time:	<150ms, typically 125ms	
Ripple:	Twice the class index (peak to peak measurement) according to IEC 688	
Galvanic separation:	Between inputs, outputs and aux. supply: 3750V-50Hz-1 min.	
Supply voltage:	57.7-63.5-100-110-127-200-220-230-240-380-400-415-440-450-480-660-690VAC ±20% 24-48-110-220VDC -25/+30%	
Consumption:	(Aux. supply) 3.5VA/2W	
Climate:	HSE, to DIN 40040	
EMC:	According to EN 61000-6-1/2/3/4	
Protection:	Housing: IP40. Terminals: IP20 to IEC 529 and EN 60529	
Connections:	Max. 2.5mm² multi-stranded Max. 4.0mm² single-stranded	
Materials:	All plastic parts are self-extinguishing to UL94 (V1)	

Specific technical specifications

Current:	Measuring current:	0.5...8A
	Start value:	-100...+67% of end value
	End value:	100% of measuring current

Current/power:	Connection	1W note only current:	(IL1 and UL1-N) or (IL2 and UL2-N) or (IL3 and UL3-N): 57...400VAC
		1W2 I:	(IL1 and UL1-L2): 100…690VAC
		1W2 II:	(IL1 and UL2-L3): 100…690VAC
		1W2 III:	(IL1 and UL3-L1): 100…690VAC

Order specifications (examples)

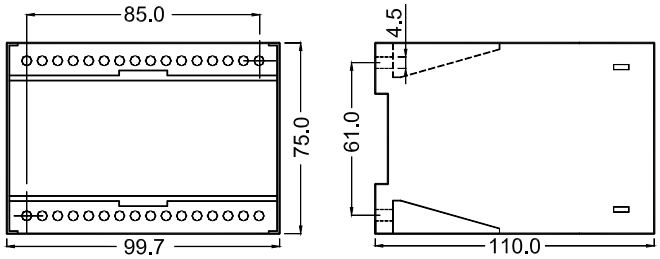
The examples below are order specifications for pre-configured transducers. For un-configured transducers only auxiliary voltage must be specified.

Type	TAS-321DG	
Measurement:	Bi-directional current	Power
Measuring range:	-120…0…120AAC	0…20MW
Coupling:	1W	1W2 II
VT ratio:	-	10kV/100V
Input voltage:	400VAC	100VAC
CT ratio:	100/1A	100/5
Input current:	-1.2…0…1.2A	NA
Transfer curve:	Single slope	Single slope
Output start value:	-10V	4mA
Threshold 1:	-	-
Mid value:	0	12mA
Threshold 2:	-	-
Output end value:	10V	20mA
Output lower limit:	-12V	4mA
Output upper limit:	12V	21.5mA
Auxiliary voltage:	110VDC	400VAC

PC-configuration kit containing connection cable and software for customer configuration must be ordered separately.

Dimensions

All dimensions in mm



Weight: Approx. 0.600 kg

Mounting instructions

TAS-321DG is designed for panel mounting, being mounted on a 35 mm DIN rail, or by means of two 4 mm screws.

The design of the transducer makes mounting of it close to similar equipment possible, however make sure there is min. 50 mm between the top and bottom of the transducer and other equipment. The DIN rail must always be placed horizontally when several transducers are mounted on the same rail.

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

Temperature transducers

Type TEMAX-3

4921220022C

TEMAX-3.4B

- ***2 wire transducer for remote monitoring of 2, 3 or 4 temperatures***
- ***Protected against R.F. magnetic fields***
- ***Read-out of highest output***
- ***Plug-in PCBs***
- ***Protection: IP65***

CE

Available types

Type	TEMAX-3.2B	TEMAX-3.3B	TEMAX-3.4B
For sensors	2 Pt100Ω sensors	3 Pt100Ω sensors	4 Pt100Ω sensors

Introduction

TEMAX-3 is intended for monitoring of 2 to 4 temperatures. TEMAX-3.2B and TEMAX-3.3B may later on at our factory be upgraded to 3 or 4 measuring points (type TEMAX-3.3B and TEMAX-3.4B respectively). The temperature transducers type TEMAX-3 are CE classified for residential, commercial and light industry plus industrial environment.

Application

TEMAX-3 is applied to monitor inputs from 2, 3 or 4 Pt100Ω resistance sensors, indicating the highest temperature on its built-in 240° indicating instrument.

Operating principle

TEMAX-3 is a 2 wire transducer with an output signal of 4...20mA.

The term "2-wire transducer" refers only to the output signal as the power for the electronics is transmitted through the two output wires and not by means of a separate auxiliary voltage (4 wire principle). TEMAX-3 is placed near the measuring points and the two output wires carry the power to supply the electronics as well as the output signal.

The output current can be considered as two components: a constant 4mA for the amplifier etc. of the transducer and a variable signal of 0...16mA, which changes proportionally to the measured input signal. The input signal corresponds to the output 4...20mA.

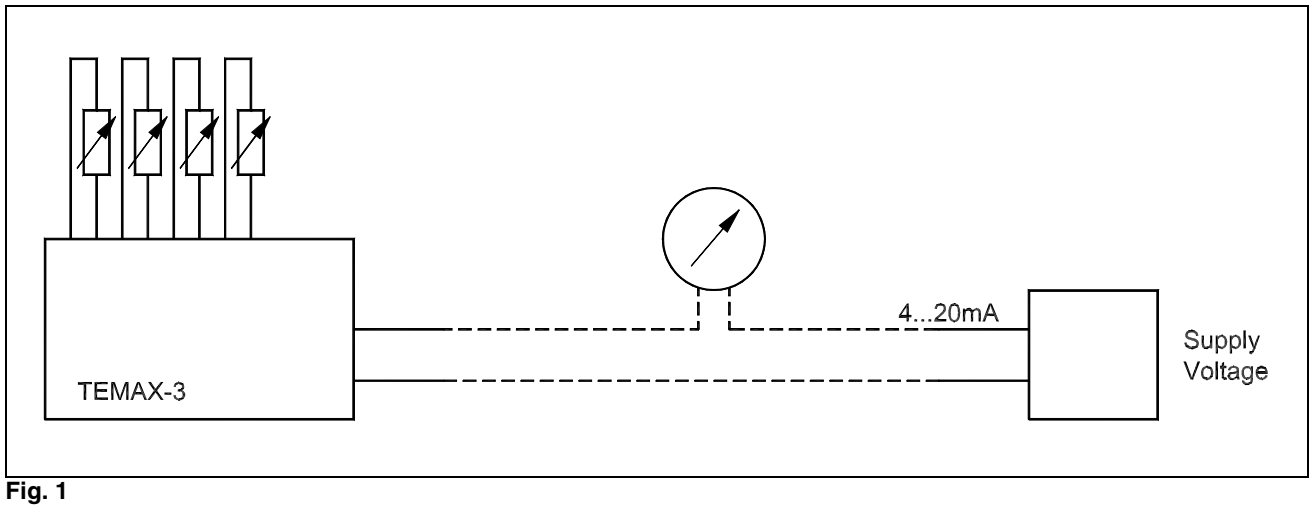


Fig. 1

Indicating instruments, recorders, controllers etc. can be connected as shown in series with the output circuit and the supply voltage.

The output current is proportional to the temperature and independent of varying supply voltage, lead resistance and load within the specified limits.

The 2, 3 or 4 temperatures are measured by means of Pt100Ω sensors connected in 2 wire couplings. Each sensor forms part of a wheatstone bridge, whose diagonal voltage is amplified by an operational amplifier.

The 2, 3 or 4 amplifier outputs are compared and the signal representing the highest temperature is selected. This signal controls an output amplifier which converts the signal into the 4...20mA constant current output.

Output under fault conditions

If one of the sensors or its leads is/are broken, TEMAX-3 will give an output higher than 20mA (max. 32mA).

In this case there will be no temperature measurement but a clear indication of fault.

If one of the sensors or the input leads is/are short-circuited, the other measurements remain unaffected but no typical change of the output signal will occur. However, such faults are not typical. Pt100Ω sensors are very reliable, and if they do fail, it is usually caused by physical damage resulting in an open circuit condition.

A short-circuit fault can only be detected by periodical activation of the push-buttons. At the actual point the meter will indicate less than 0°C.

Installation
In order to fully utilize the 2-wire system, the transducer should be placed near the measuring points to gain the following advantages:

- Noise suppression — The signal is transmitted at a high level and a relative insensitivity to noise and interference is thus achieved.
- Simple wiring — Only 2 wires are to be drawn from the transducer to the switchboard.

The Pt100Ω sensors are connected to the TEMAX-3 in "2-wire couplings". The resistance in the sensor leads is in series with the Pt100Ω sensor, and an error would consequently occur, if not allowed for. To avoid this error, the TEMAX-3 is adjusted to a fixed resistance of 0.35Ω for each sensor.

The mentioned 0.35Ω corresponds to 2 x 15 m - 1.5 mm² or 2 x 10 m - 1.0 mm^2 wires, etc.

In order to simplify the TEMAX-3, it is not provided with variable lead compensations and check resistors. The lead resistance should be as close as possible to the mentioned 0.35Ω to ensure highest achievable accuracy.

Deviations from the 0.35Ω will cause an error of +1°C per +0.38Ω, without recalibration.

Mechanical construction
The transducer is housed in a polycarbonate case (to IP65, i.e. protected against water jets) with a transparent cover and 4 watertight push-buttons.

The case is fitted with 5 PG9 cable glands and has an internal terminal block for connection of up to 4 mm² wires.

All electrical components are protected against mechanical damage and dust by means of the thermoplastic case with plug-in PCBs and a metal cover plate.

The transducer is furthermore equipped with a built-in indicating instrument, 48 x 48 mm with 240° scale.

Electrical construction
TEMAX-3 consists of a base board plus 4-6 plug-in PCBs, which are individually calibrated, facilitating service and repair in the event of faulty function:

- Amplifiers for the Pt100Ω sensors (2-4 PCBs)
- Voltage supply and output amplifier (1 PCB)
- Built-in push-button function (1 PCB)

General technical specifications

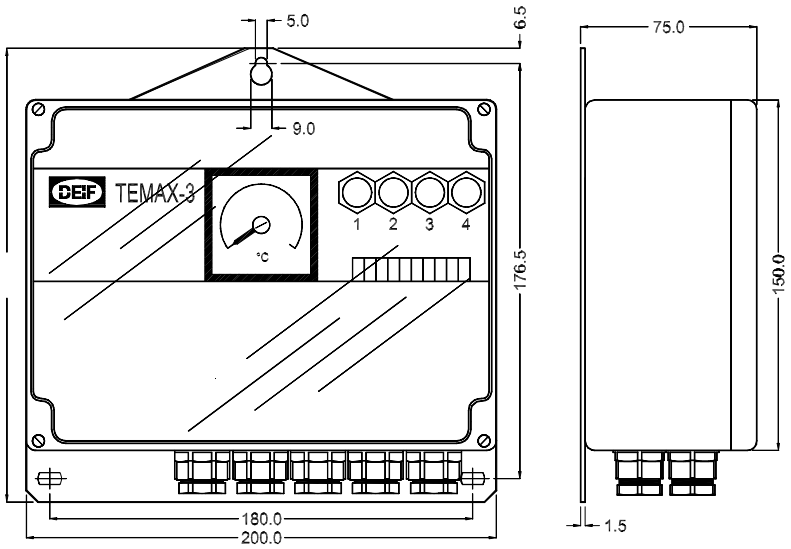
Temperature:	-10...55°C (nominal) -25...70°C (operating) -40...70°C (storage).
Temperature drift:	Max. 0.2% per 10°C.
Test voltage:	2000V AC - 50Hz - 1 min. between mounting plate and input/output. 500V AC - 50Hz - 1 min. between inner screen and input/output.
R.F. electromagnetic fields:	To IEC 801-3 (27...1000MHz, 10V per meter).
Climate:	Class HSE, to DIN 40040.
EMC:	To EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4) and IEC 255-22-1 (class 3).
Protection:	Case: IP65, to IEC 529 and EN 60529.
Materials:	Case: light grey polycarbonate. With 5 PG9 glands and internal terminal block.
Connections:	Cable diametre: 4...10 mm. Wire diametre: max. 4 mm². Extra terminals are provided for looping of any screens from the input/output cables.
Mounting:	For base mounting. Position as required, however, vertical mounting recommended to reduce any ingress of liquid and dust etc. via the cable glands.

Technical specifications

Measuring range:	0...150°C or 0...200°C (other ranges on request).
Temperature sensor:	Pt100Ω, 2 wire.
Lead compensation:	Adjusted for lead resistance 0.35Ω corresponding to a pair of 15 m - 1.5 mm^2 or 10 m - 1 mm^2 copper connecting leads.
Lead compensation resistance:	None.
Maximum continuous overload:	Max. 36V DC (refers to all inputs and output).
Output:	4...20mA constant current. The temperature of any input can be read on the built-in instrument.
Maximum output:	32mA on extended input (e.g. open circuit or disconnected sensor).
Ripple on output:	Max. 0.5% pp at V_S = 2 V_{pp} (10...400Hz).
Output non-linearity:	Max. 0.1%.
Accuracy:	Class 1.0 (1%) ±0.5°C (-10...15...30...55°C), to IEC 688 and EN 60688.
Comparison accuracy:	0.5°C.
Auxiliary voltage (V_S):	13...36V DC at 0.1 V_{pp} ripple. 14...36V DC at 2 V_{pp} ripple.
Max. ripple (V_R):	5 V_{pp}.
Load on output (R_L):	Depends on the aux. voltage V_S: $max.\ R = \frac{V - (0.5\ V + 13)}{0.02}$ (OHMS)
Aux. voltage influence:	Max. 0.1% from 13...36V DC at 0.1V_{pp} ripple.
Response time:	Approx. 1 s for 100% change of input, approx. 2.5 s on initial energisation (for deviation 0.5%).

Dimensions

All dimensions in mm.



Weight: approx. 1.200 kg
TEMAX-3.4B (TEMAX-3.3B, TEMAX-3.2B)

Order specifications

	Type	**Measuring range**
Example:	TEMAX-3.3B	0…200°C

Due to our continuous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

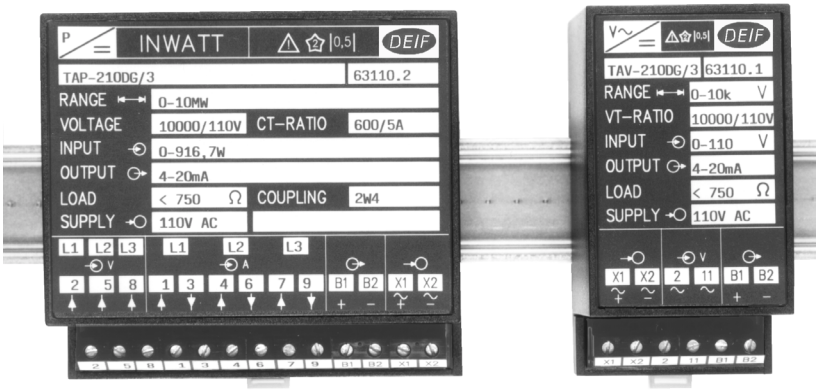
Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com

DEIF A/S

Transducers for AC measurement

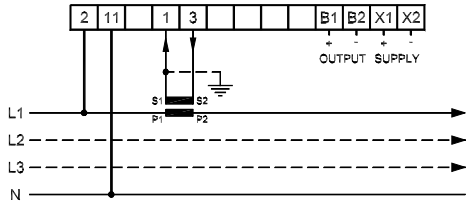
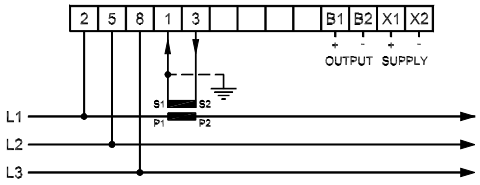
Types TAP, TAQ, TMF, TAA, TAV, TAC

4921220002E



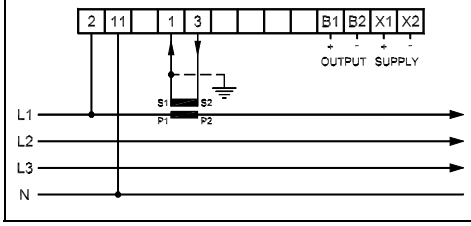
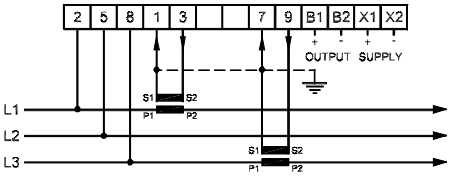
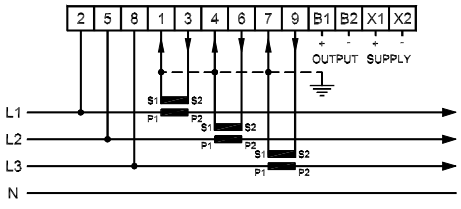
- ***Measurement of:***
  watt, var, frequency, phase angle, voltage, current
- ***Accuracy class 0.5***
- ***For mounting on DIN rail***
- ***Compact design***
- ***Aux. voltage: 57.7...440V AC or 24...220V DC***
- ***According to IEC 688***

CE

Transducer type	*Watt*	
Type	**TAP-210DG/3. 1W**	**TAP-210DG/3, 1W3**
Measuring	**Single phase network**	**3-Phase 3 wire network Balanced load**
Connection diagrams for DEIF transducers for DIN rail mounting **Numbering of terminals according to DIN 43807**		
Measuring principle	Time-Division-Multiplication (TDM) RMS measurement	
Measuring voltage (U_{nom})	57.7..440V AC ±20% (0..120% U_{nom} with separate U_{aux}). (≤ 0.5VA per phase)	
Measuring current (I_{nom})	0.5..10A AC. Measuring range: 0..120% I_{nom} (≤ 0.3VA per phase)	
Measuring range	0..P_{nom} / -P_{nom}..0..+P_{nom}	
Measuring frequency	45..65Hz (300..500Hz)	
Overloads Voltages	1.2 x U_{nom}, cont. / 2 x U_{nom} for 10 s	
Overloads Currents	2 x I_{nom}, cont. / 10 x I_{nom} for 10 s (max. 75A) / 40 x I_{nom} for 1 sec (max. 300A)	
Output (0..100%)	0..1mA, 0..5mA, 0..10mA, 0..20mA, 0..1V, 0..10V	
Output (20..100%)	0.2..1mA, 1..5mA, 2..10mA, 4..20mA, 0.2..1V, 2..10V	
Output (-100%..0..+100%)	-1..0..+1mA, -5..0..+5mA, -10..0..+10mA, -20..0..+20mA, -1..0...+1V, -10..0..+10V	
Output loads	Current Output: max. 15V, voltage Output: max. 20mA	
Accuracy	Class 0.5 (-10..15..30..55°C) according to IEC 688	
Response time/ripple	<150 ms / 1%$_{pp}$ according to IEC 688	
Δout / ΔU_{aux} / Δf_{aux} / ΔR_{load}	Max. 0.1%/ Δ10% U_{aux} / 0.1%/45..65Hz / 0.1%/ ΔR_{load}-max.	
Temperature coefficient	Typically 0.15% per 10°C. Max. 0.2% per 10°C	
Ambient temperature	-10..+55°C (nominal). –25..+70°C (operating). -40..+70°C (storage)	
Auxiliary supply (U_{aux}) (45..65Hz)	57.7 - 63.5 - 100 - 110 - 120 - 127 - 220 - 230 - 240 - 380 - 415 - 440V AC ±20% (3.5VA)	
Test voltage	2000V - 50Hz - 1 min.	
EMC	According to EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4), IEC 255-4 (class 3). CE marked	
Climate	Class HSE, according to DIN 40040	
Protection	Case: IP52. Terminals: IP20. According to IEC 529 and EN 60529	
Terminals	Screw Terminals. Multi-stranded: 2.5 mm² / single-stranded: 4.0 mm²	
Case type See rear page	1	1

Order specifications

Type	**TAP-210DG/3 INWATT**	**TAP-210DG/3 INWATT**
Connection (See drawing)	1W	1W3
Measuring range	x	x
Current transformer (I_{pri} : I_{sec})	x	x
Measuring voltage (U_{nom})	x	x
Voltage transformer (U_{pri} : U_{sec})	x	x
Auxiliary voltage (U_{aux})	x	x
Output signal	x	x

TAP-210DG/3, 1W4	TAP-210DG/3, 2W	TAP-210DG/3, 2W4
3-Phase 4-wire network Balanced load	**3-Phase 3 wire network Unbalanced load**	**3-Phase 4-wire network Unbalanced load**
		

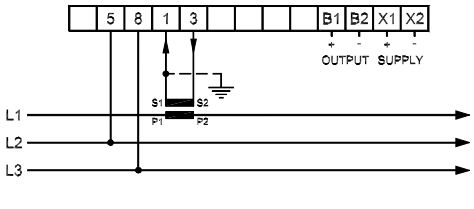
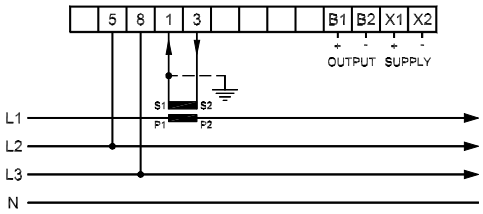
24 - 48 - 110 - 220V DC -25/+30% (≤ 2.5W)

for residential, commercial and light industry plus industrial environment

1	1	1

TAP-210DG/3 INWATT	TAP-210DG/3 INWATT	TAP-210DG/3 INWATT
1W4	2W	2W4
x	x	x
x	x	x
x	x	x
x	x	x
x	x	x
x	x	x

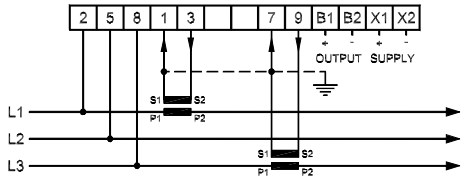
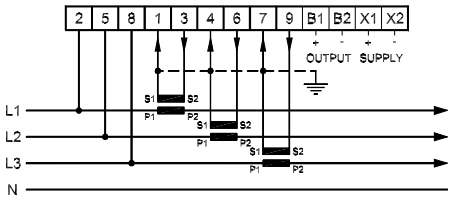
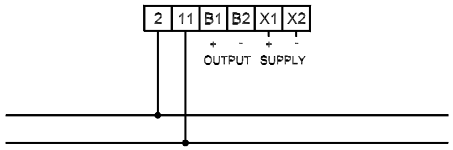
See rear page for calculation of measuring range for watt/var transducers

Transducer type	*Var*	
Type	**TAQ-210DG/3, 1VAR3**	**TAQ-210DG/3, 1VAR4**
Measuring	**3-Phase 3-wire network Balanced load**	**3-Phase 4-wire network Balanced load**
Connection diagrams for DEIF transducers for DIN rail mounting **Numbering of terminals according to DIN 43807**		
Measuring principle	Time-Division-Multiplication (TDM) RMS measurement	
Measuring voltage (U_{nom})	57.7..440V AC ±20% (0..120% U_{nom} with separate U_{aux}), (≤ 0.5VA per phase)	
Measuring current (I_{nom})	0.5..10A AC. Measuring range: 0..120% I_{nom} (≤ 0.3VA per phase)	
Measuring range	0..Q_{nom} / -Q_{nom}..0..+Q_{nom}	
Measuring frequency	45..65Hz (300..500Hz)	
Overloads Voltages	1.2 x U_{nom}, cont. / 2 x U_{nom} for 10 s	
Overloads Currents	2 x I_{nom}, cont. / 10 x I_{nom} for 10 s (max. 75A) / 40 x I_{nom} for 1 sec (max. 300A)	
Output (0..100%)	0..1mA, 0..5mA, 0..10mA, 0..20mA, 0..1V, 0..10V	
Output (20..100%)	0.2..1mA, 1..5mA, 2..10mA, 4..20mA, 0.2..1V, 2..10V	
Output (-100%..0..+100%)	-1..0..+1mA, -5..0..+5mA, -10..0..+10mA, -20..0..+20mA, -1..0..+1V, -10..0..+10V	
Output loads	Current Output: max. 15V, voltage Output: max. 20mA	
Accuracy	Class 0.5 (-10..15..30..55°C) according to IEC 688	
Response time/ripple	<150 ms / 1%$_{pp}$ according to IEC 688	
Δout / ΔU_{aux} / Δf_{aux} / ΔR_{load}	Max. 0.1%/ Δ10% U_{aux} / 0.1%/45..65Hz / 0.1%/ ΔR_{load}-max.	
Temperature coefficient	Typically 0.15% per 10°C. Max. 0.2% per 10°C	
Ambient temperature	-10..+55°C (nominal). -25..+70°C (operating). -40..+70°C (storage)	
Auxiliary supply (U_{aux}) (45..65Hz)	57.7 - 63.5 - 100 - 110 - 120 - 127 - 220 - 230 - 240 - 380 - 415 - 440V AC ±20% (≤3.5VA)	
Test voltage	2000V - 50Hz - 1 min.	
EMC	According to EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4), IEC 255-4 (class 3). CE marked	
Climate	Class HSE, according to DIN 40040	
Protection	Case: IP52. Terminals: IP20. According to IEC 529 and EN 60529	
Terminals	Screw Terminals. Multi-stranded: 2.5 mm² / single-stranded: 4.0 mm²	
Case type See rear page	1	1

Order specifications

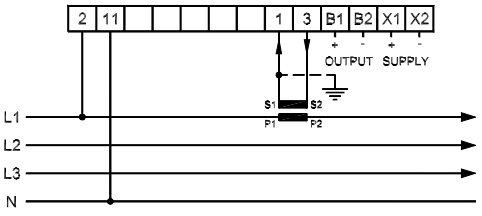
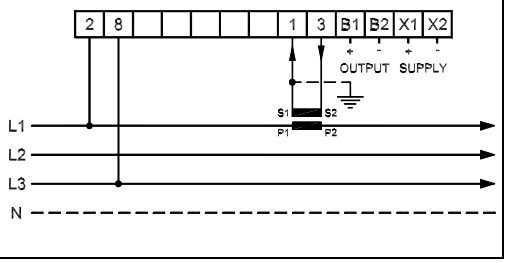
Type	**TAQ-210DG/3 INWATT**	**TAQ-210DG/3 INWATT**
Connection (See drawing)	1VAR3	1VAR4
Measuring range	x	x
Current transformer (I_{pri} : I_{sec})	x	x
Measuring voltage (U_{nom})	x	x
Voltage transformer (U_{pri} : U_{sec})	x	x
Auxiliary voltage (U_{aux})	x	x
Output signal	x	x

Frequency

TAQ-210DG/3, 2VAR	TAQ-210DG/3, 2VAR4	TMF-210DG/2
3-Phase 3-wire network Unbalanced load	**3-Phase 4-wire network Unbalanced load**	**Mains frequency**
		
		Crystal controlled one-shot
		57.7..440V AC ±20% (≤ 0.5VA)
		————
		f_{nom} ±3Hz, ±5Hz, ±10Hz
		f_{nom} 50Hz, 55Hz, 60Hz
		————
		Class 0.2 of f_{max}.
		350 ms / 0.5%$_{pp}$
		Typ. 0.05% per 10°C, max. 0.1% per 10°C
24 - 48 - 110 - 220V DC -25/+30% (≤ 2.5W)		(≤ 2VA/2W)
for residential, commercial and light industry plus industrial environment		
1	1	1

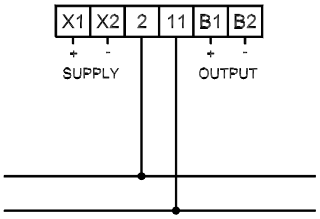
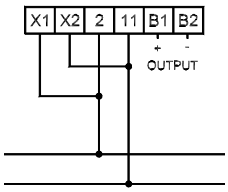
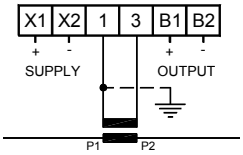
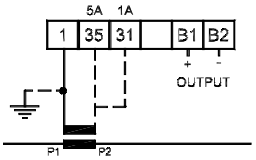
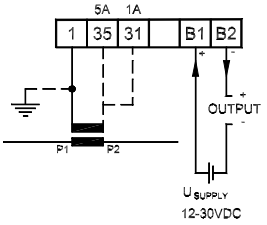
TAQ-210DG/3 INWATT	TAQ-210G/3 INWATT	TMF-210DG/2
2VAR	2VAR4	
x	x	x
x	x	
x	x	x
x	x	x
x	x	x
x	x	x

See rear page for calculation of measuring range for watt/var transducers

Transducer type	*Phase angle*	
Type	**TAA-210DG/2, WC1**	**TAA-210DG/2, WC3**
Measuring	**3-Phase network 4-wire**	**3-Phase network 3- or 4-wire**
Connection diagrams for DEIF transducers for DIN rail mounting **Numbering of terminals according to DIN 43807**		
Measuring principle	Zero crossing detection. NOTE: Output proportional to phase angle (φ)	
Measuring voltage (U_{nom})	57.7..440V AC ±20% (≤ 0.5VA)	
Measuring current (I_{nom})	-/1A - -/5A. Measuring range: 20..120% I_{nom} (class 0.5) 5..20% (class 1) (≤ 0.3VA)	
Measuring range	0.5 cap...1..0.5 ind. / 0.7 cap...1..0.3 ind. / 0..1 cap. / 0..1 ind.	
Measuring frequency	45..65Hz (300..500Hz)	
Overloads Voltages	1.2 x U_{nom}, cont. / 2 x U_{nom} for 10 s	
Overloads Currents	2 x I_{nom}, cont. / 10 x I_{nom} for 10 s (max. 75A) / 40 x I_{nom} for 1 sec (max. 300A)	
Output (0..100%)	0..1mA, 0..5mA, 0..10mA, 0..20mA, 0..1V, 0..10V	
Output (20..100%)	0.2..1mA, 1..5mA, 2..10mA, 4..20mA, 0.2..1V, 2..10V. With separate aux. voltage	
Output (-100%..0..+100%)	-1..0..+1mA, -5..0..+5mA, -10..0..+10mA, -20..0..+20mA, -1..0..+1V, -10..0..+10V	
Output loads	Current Output: max. 15V, voltage Output: max. 20mA	
Accuracy	Class 0.5 (-10..15..30..55°C) according to IEC 688	
Response time/ripple	<300 ms / 1%$_{pp}$ according to IEC 688	
Δout / ΔU_{aux} / Δf_{aux} / ΔR_{load}	Max. 0.1%/ Δ10% U_{aux} / 0.1%/45..65Hz / 0.1%/ ΔR_{load}-max.	
Temperature coefficient	Typically 0.15% per 10°C. Max. 0.2% per 10°C	
Ambient temperature	-10..+55°C (nominal). -25..+70°C (operating). -40..+70°C (storage)	
Auxiliary supply (U_{aux}) (45..65Hz)	57.7 - 63.5 - 100 - 110 - 120 - 127 - 220 - 230 - 240 - 380 - 415 - 440V AC ±20% (≤2VA)	
Test voltage	2000V - 50Hz - 1 min.	
EMC	According to EN 50081-1/2, EN 50082-1/2, SS4361503 (PL4), IEC 255-4 (class 3). CE marked	
Climate	Class HSE, according to DIN 40040	
Protection	Case: IP52. Terminals: IP20. According to IEC 529 and EN 60529	
Terminals	Screw Terminals. Multi-stranded: 2.5 mm² / single-stranded: 4.0 mm²	
Case type See rear page	1	1

Order specifications

Type	**TAA-210DG/2**	**TAA-210DG/2**
Connection (See drawing)	WC1	WC3
Measuring range	x	x
Current transformer (I_{pri} : I_{sec})	x	x
Measuring Voltage (U_{nom})	x	x
Voltage transformer (U_{pri} : U_{sec})	x	x
Auxiliary voltage (U_{aux})	x	x
Output signal	x	x

Voltage		Current		
TAV-210DG/3	**TAV-220DG/3**	**TAC-210DG/3**	**TAC-220DG/3**	**TAC-230DG/2**
AC voltage With aux. supply	No sep. aux. supply	Wiith aux. supply	**AC current** No aux. supply	2-wire transducer
				
Average measurement				
57.7..440V AC (0.5VA)	57.7..440V AC (4.5VA)	————		
————		0.5..10A (≤ 0.3VA)	-/1A & -/5A (≤ 2VA)	
80..120%/0..120% U_{nom}	0...30..120% U_{nom}	0..100% I_{nom}	0..100% I_{nom} (standard) or 0..120% I_{nom}	
		————		
————		As TAA-210DG	1.5 x I_{nom} cont./10 x I_{nom} - 5 s/40 x I_{nom} - 1sec	
	0..25..100%	As TAA-210DG	0..5mA/10mA/20mA	————
	————	As TAA-210DG	————	4..20mA
————	————		————	
			Max. 15V	U_{supply} - 10V
<500 ms / 1%$_{RMS}$	<200 ms / 1%$_{RMS}$		<300 ms / 1%$_{pp}$ - IEC 688	
			≤1% Δout/ ΔR_{load}-max.	As TAA-210DG
24-48-110-220VDC -25/+30%(≤2W)	To terminals 2 - 11	As TAA-210DG	NONE	U_{supply} = 12..30V DC
for residential, commercial and light industry plus industrial environment				
2	2	2	2	2

TAV-210DG/3	TAV-220DG/3	TAC-210DG/3	TAC-220DG/3	TAC-230DG/2
x	x	x	x	x
		x	x	x
x	x			
x		x		
x	x	x	x	

Calculation of measuring range for watt/var transducers

U = Nominal mains voltage. 3-phase network: Between 2 phases (e.g. 3 x 10kV).
Single phase network: Between phase and neutral.

I = Primary rated current (rated value, e.g. 500/1).

	Lowest measuring range	**Highest measuring range**
3-Phase network	0.5 x √3 x U x I	2 x √3 x U x I
Single phase network	0.5 x U x I	2 x U x I

Standard measuring ranges: 1 - 1.2 - 1.5 - 2 - 2.5 - 3 - 4 - 5 - 6 - 7.5 - 8 and multiples of 10 and 100 thereof.

Example

3-phase network, balanced load:	3 x 10kV	
Voltage transformer:	10k/100	
Current transformer:	500/1A	
Lowest Measuring range:	W = 0.5 x √3 x 10.000 x 500 = 4.3MW	Nearest higher standard range: 5.0MW
Highest Measuring range:	W = 2 x √3 x 10.000 x 500 =17.3MW	Nearest lower standard range: 15.0MW
Possible ranges:	5 - 6 - 7.5 - 8 - 10 - 12 - 15MW. Could be chosen according to calculated current consumption, power factor and a suitable deflection or output.	

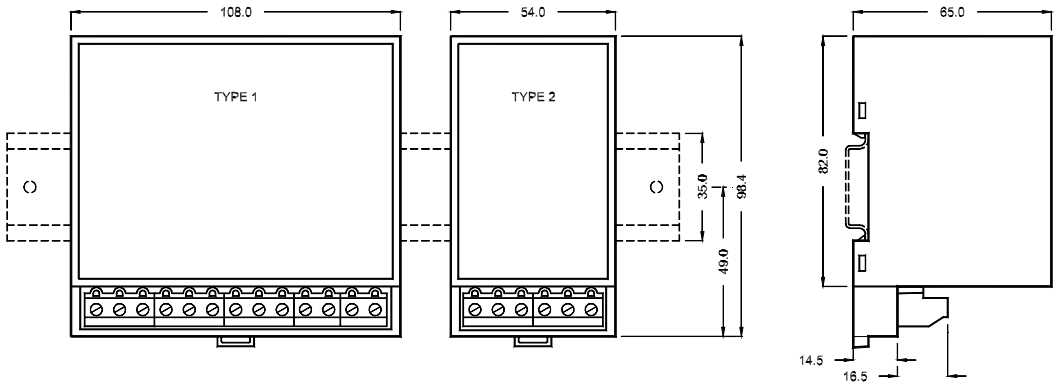
Note: The Measuring range of a VAR transducer should be ≥50% of the selected measuring range of the corresponding WATT transducer, e.g. WATT transducer: -12...0...12MW, VAR transducer: -6...0...6Mvar or higher.

Order specifications for above example

Type		**TAP-210DG/3**
Connection	(See drawing)	1W3
Measuring range		-15..0..+15MW
Current transformer	(I_{pri} : I_{sec})	500/1A
Measuring Voltage	(U_{nom})	3 x 10kV
Voltage transformer	(U_{pri} : U_{sec})	10k/100
Auxiliary voltage	(U_{aux})	220V AC
Output signal		-10..0..+10V

Dimensional details

All dimensions in mm



Weight: max. 0.5 kg max. 0,.35 kg

Transducers for DIN rail mounting Recommended distance between mounted transducers: 30 mm

Due to our continous development we reserve the right to supply equipment which may vary from the described.

***DEIF A/S**, Frisenborgvej 33*
DK-7800 Skive, Denmark

Tel.: +45 9614 9614, Fax: +45 9614 9615
E-mail: deif@deif.com, URL: www.deif.com