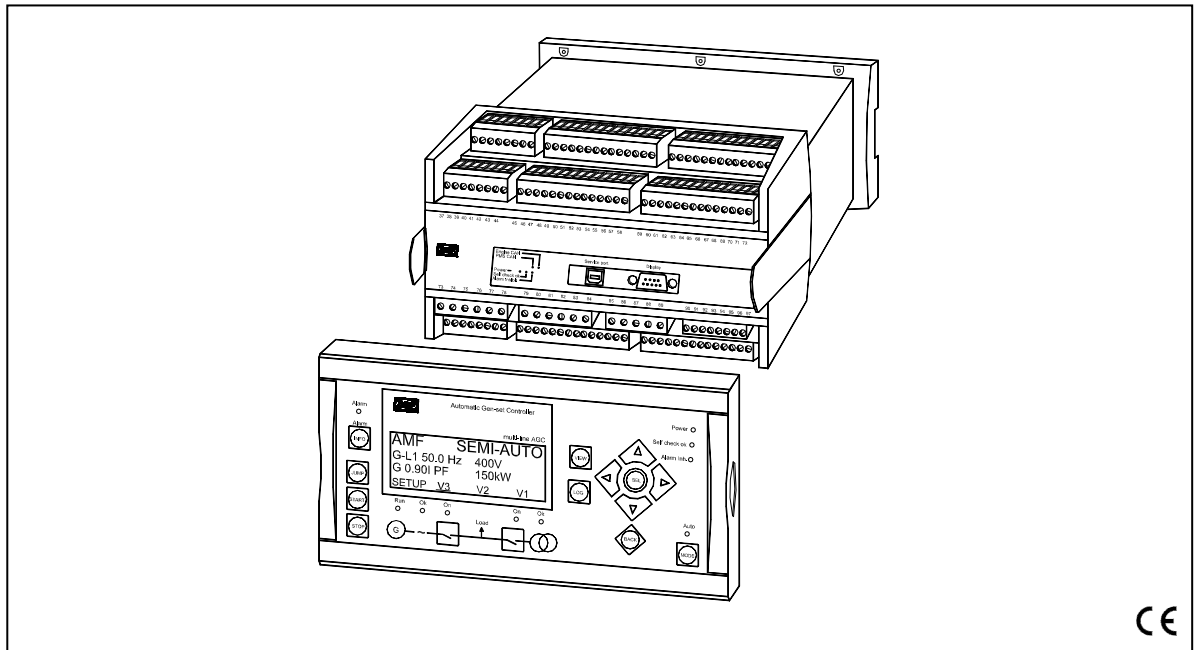




Standard functions

Operation modes

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

Engine control

- Start/stop sequences
- Run and stop coil
- Relay outputs for governor control

Protection (ANSI)

- Overcurrent, 4 levels (51)
- Reverse power, 2 levels (32)
- Multi inputs, 3 configurable

Display

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

M-logic

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

General

- USB interface to PC
- Free PC utility software for commissioning
- Additional functions available

Data sheet

Application

The Automatic Gen-set Controller is a microprocessor 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:

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

Optional applications:

- Multiple gen-sets, load sharing
- Power management (island operation)
- Power management (parallel with 1 or 2 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 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 with separate power supply and processor. The card is equipped with the following I/Os:

In-/outputs	Available
Multi inputs: 4-20mA Digital inputs PT100 PT1000 VDO 0-40V DC	3 (3)
Digital inputs	7 (6)
RPM (MPU)	1
Relays	4
CANbus comm.	2



The number in parenthesis indicates the number of user configurable in-/outputs.



The two CAN communications are only available, if option G5 or H5 is selected.

Automatic Gen-set Controller

Test

The available gen-set modes except island operation include a test mode. The test can be configured in 3 different ways.

Simple: Gen-set starting and running for a preset time. Generator breaker is open during the test.

Load: Gen-set starting, 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.

Full: Gen-set starting, synchronisation of the generator breaker, de-load and opening of the mains breaker. The test is carried out for a preset period of time after which the load is transferred back to the mains connection.

Setup

Setup is easily done via a menu structure in the display (password protected) or via the USB 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.

Please refer to page 6 for the options available.

Unit definitions

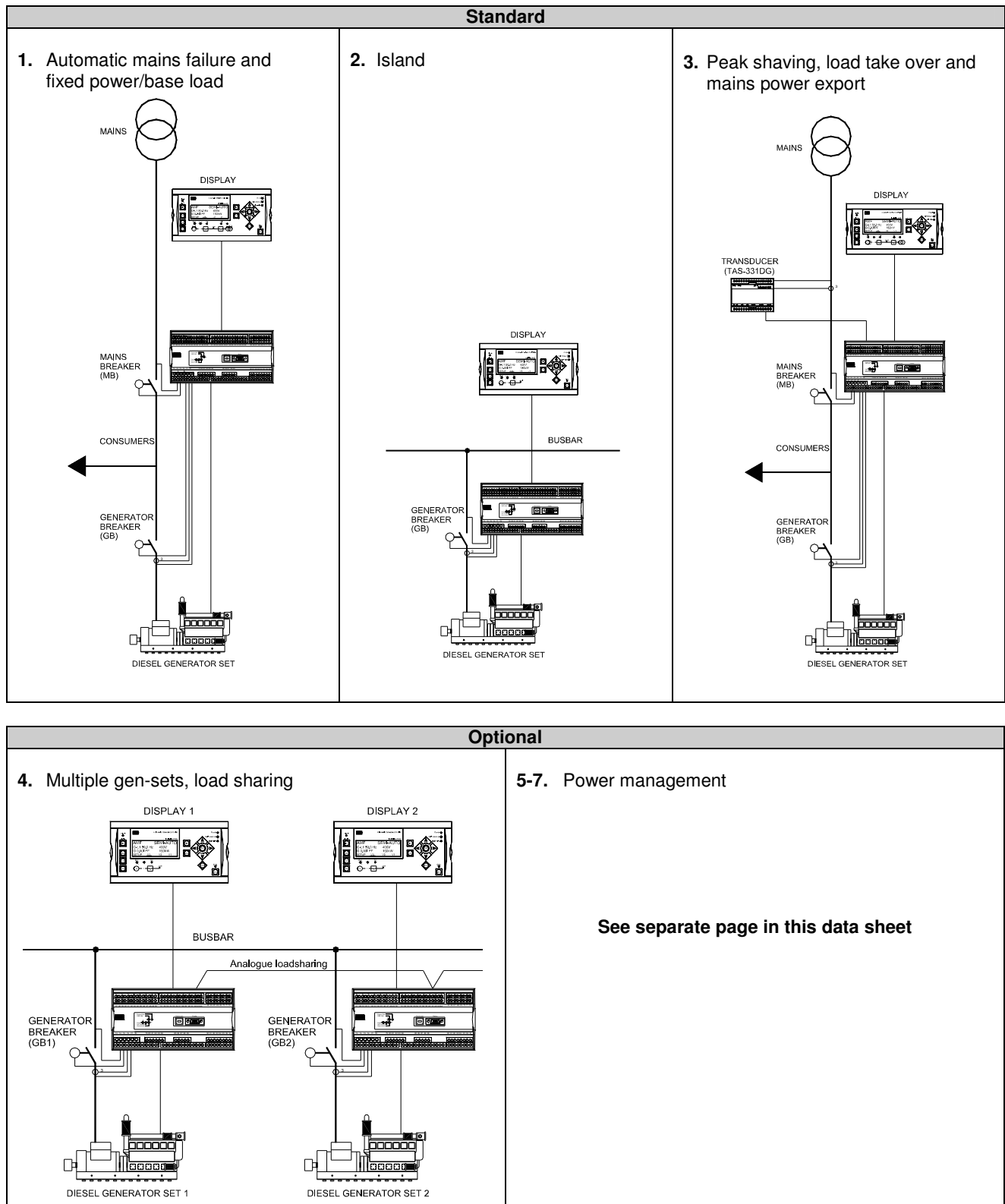
AGC: The standard control unit designed for a number of applications (1-9). An extensive list of hardware and software options is available for the AGC.

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



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 start/stop operation
- Priority selection of gen-sets and mains
- Ground relay control
- Tie breaker control (selectable)
- Mains breaker control
- 2 mains connections

In a multi-master system the power management control is automatically performed by the available gen-set AGC units. This means that the system is not dependent on one master unit. If 2 AGC mains units are available in the power management application, a similar system is made for the mains control. The internal communication between the AGC units is CANbus.

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 required in island operation configuration, since no mains breaker is to be controlled.

Start/stop control

Start and stop of the power management can be done in the following ways:

Local: Start and stop is controlled from the display.

Remote: Start and stop is controlled with a binary input.

Timer: Start and stop is automatically controlled by internal command timers programmed through the PC utility software.

Test

The available gen-set modes except island operation include a test mode. The test can be configured as described on page 2.

Priority selection

The priority routines in the AGC can be based on:

- Manual selection
- Absolute running hours
- Relative running hours
- Fuel optimising

Load dependent operation

The load dependent starting and stopping of the gen-sets is 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.

Load management

If a certain amount of available power on the busbar is required to connect certain load groups, relays can be configured to activate when the specific amount of available power is reached and thereby connect a load group.

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.

Automatic Transfer Switch (ATS)

The AGC supports applications where an ATS is used instead of a mains breaker.

Redundant AGC mains and CANbus

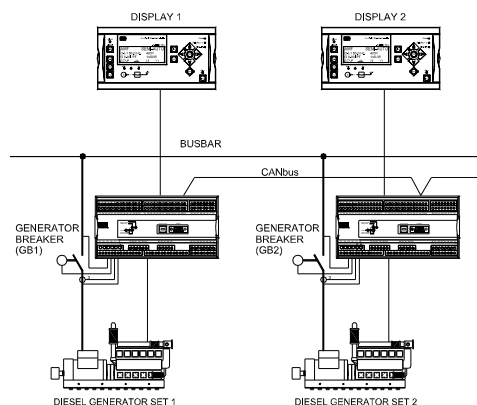
In emergency systems where extra operation reliability is required, redundant AGC mains units and redundant CANbus communication lines can be used to provide back-up.



Redundant AGC mains units are only supported in the application: Parallel with 2 mains.

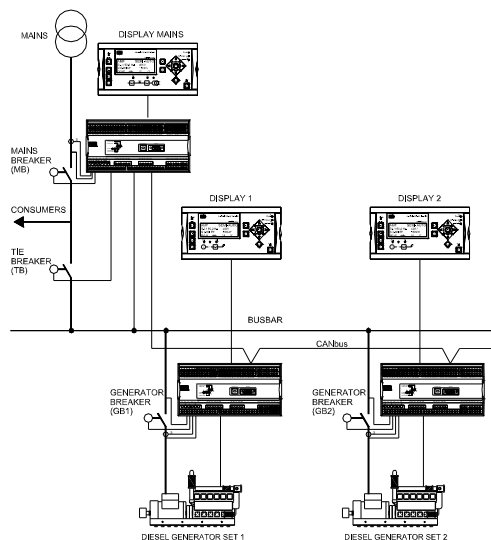
Optional power management applications

5. Island operation



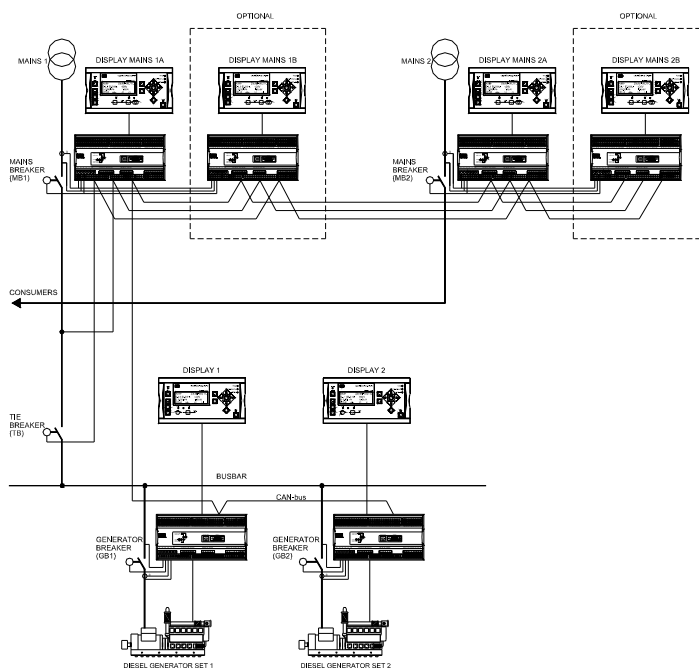
6. Parallel with mains

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



7. Parallel with 2 mains

The tie breaker can be selected on the AGC mains depending on applicational needs. Up to 8 gen-sets can be handled in this application.



Available options

Option	Description	Slot no.	Option 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	
A2	Over- and undervoltage (generator and busbar/mains) (27/59) Over- and underfrequency (generator and busbar/mains) (81) df/dt (ROCOF) (81)		Software	
A3	Over- and undervoltage (generator and busbar/mains) (27/59) Over- and underfrequency (generator and busbar/mains) (81) Vector jump (78)		Software	
A4	Positive sequence (mains voltage low) (27)		Software	
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	
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) (40) Reactive power export (overexcitation) (40)		Software	
C2	Negative sequence voltage high (47) Negative sequence current high (46) Zero sequence voltage high (59) Zero sequence current high (50)		Software	
D	Voltage/VAr/PF control			Not available for AGC mains
D1	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	Not with EF2
E and F	Analogue controller and transducer outputs			
E1	2 x +/-25mA (GOV/AVR or transducer)	4	Hardware	Not with EF2, EF4 or F2 AVR output requires D1 Not available for AGC mains
E2	2 x 0(4)...20mA (GOV/AVR or transducer)	4	Hardware	Not with E1, EF2 or EF4
EF2	1 x +/-25mA (GOV/AVR or transducer) 1 x 0(4)...20mA (GOV/AVR or transducer)	4	Hardware	Not with E1, EF4 or F2 Not available for AGC mains
EF4	1 x +/-25mA (GOV/AVR or transducer) 2 x relay outputs (GOV/AVR or configurable)	4	Hardware	Not with E1, EF2 or F2 AVR output requires D1 Not available for AGC mains
F1	2 x 0(4)...20mA (transducer)	6	Hardware	Not with M13.6, M14.6 or M15
G	Load sharing/power management			
G3	Load sharing with analogue lines	3	Hardware/ software	If M12 is present, G3 is a software option Not available for AGC mains
G5	Power management, 16 gen-sets		Software	Not with H7

Option	Description	Slot no.	Option type	Note
H	Serial communication			
H2	Modbus RTU (RS485)	2	Hardware	Not with H3
H3	Profibus DP	2	Hardware	Not with H2
H5	CANbus: MTU (MDEC) including option H7 functionality	8	Hardware	Not with H6, H7, M13.8 or M14.8 Not available for AGC mains
H6	Cummins GCS	8	Hardware	Not with H5, H7, M13.8 or M14.8 Not available for AGC mains
H7	CANbus (J1939): Caterpillar Detroit Diesel (DDEC) Deutz (EMR) Iveco (NEF/CURSOR) John Deere (JDEC) Perkins Scania (EMS) Scania (EMS S6) Volvo Penta (EMS) Volvo (EMS2)		Software	Not with H5, H6 or G5 Not available for AGC mains
H11	LED I/F card w/RS232 service port		Hardware	Not with N Class 1.0 measurements
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) 3 m. UL94 (V1) approved		Other	Only with H11
J6	Display cable with plugs, 1 m. UL94 (V1) approved		Other	
J7	PC cable for utility software (USB) 3 m. UL94 (V1) approved		Other	Not with H11
K	Designer's Reference Handbook (hard copy)		Other	
L	Display gasket for IP54		Other	Standard is IP52
M	Binary and analogue I/Os			
M12	13 binary inputs, 4 relay outputs, configurable	3	Hardware/ software	If G3 is present, M12 is a software option
M13.X	7 binary inputs, configurable	6, 8	Hardware	M13.6: Not with F1, M14.6 or M15 M13.8: Not with H5, H6 or M14.8
M14.X	4 relay outputs, configurable	6, 8	Hardware	M14.6: Not with F1, M13.6 or M15 M14.8: Not with H5, H6 or M13.8
M15	4 analogue inputs, configurable, 4...20mA	6	Hardware	Not with F1, M13.6 or M14.6
N	Ethernet TCP/IP communication			Not with H11
N5	Ethernet TCP/IP Modbus comm. and alarms via SMS or e-mail		Hardware/ software	If N4, N6 are present, this is a software option
N6	Advanced logging and alarms via SMS or e-mail		Hardware/ software	If N4, N5 are present, this is a software option
P	Printer			
P1	Event and alarm printer software		Software	Only with H11
Q	Measurement accuracy			
Q1	Verified class 0.5		Other	Not with H11
X	Display			
X2	Additional standard display. CANbus comm.		Other	Two X2 options can be ordered for each AGC unit. Only available if the AGC/AGC mains is ordered with a display
X3	Additional operator panel (AOP-1): 16 configurable LEDs and 8 configurable push-buttons		Other	
X4	Additional operator panel (AOP-2): 16 configurable LEDs, 8 configurable buttons and 1 alarm relay. CANbus comm.		Other	Five X4 options can be ordered for each AGC unit. Only available if the AGC/AGC mains is ordered with a display
Y	Display layout			
Y1	AGC display for island operation (no mains breaker)		Other	

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

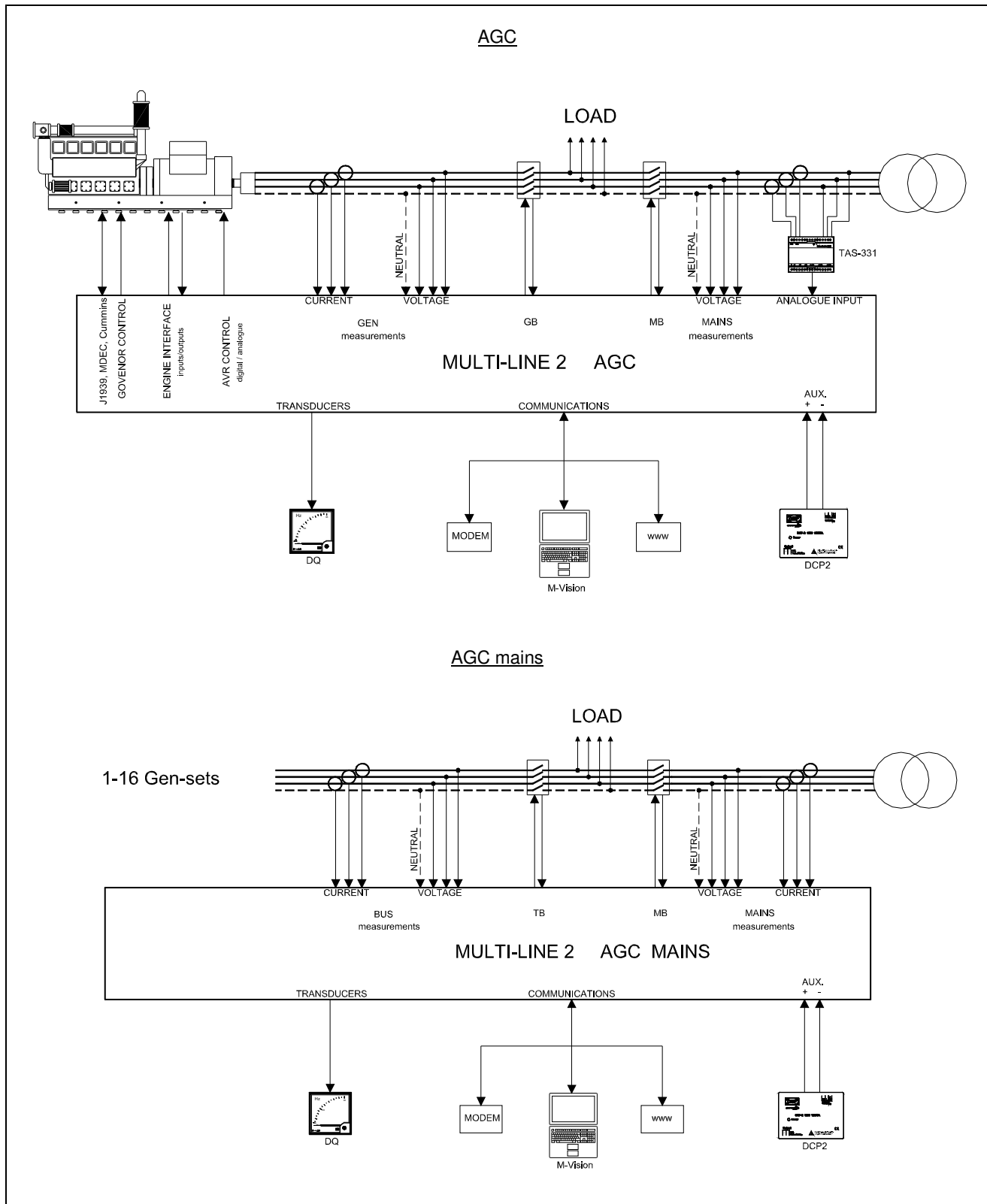


Please notice that not all options can be selected for the same unit. Please refer to page 9 in this data sheet for further information about the location of the options in the unit.



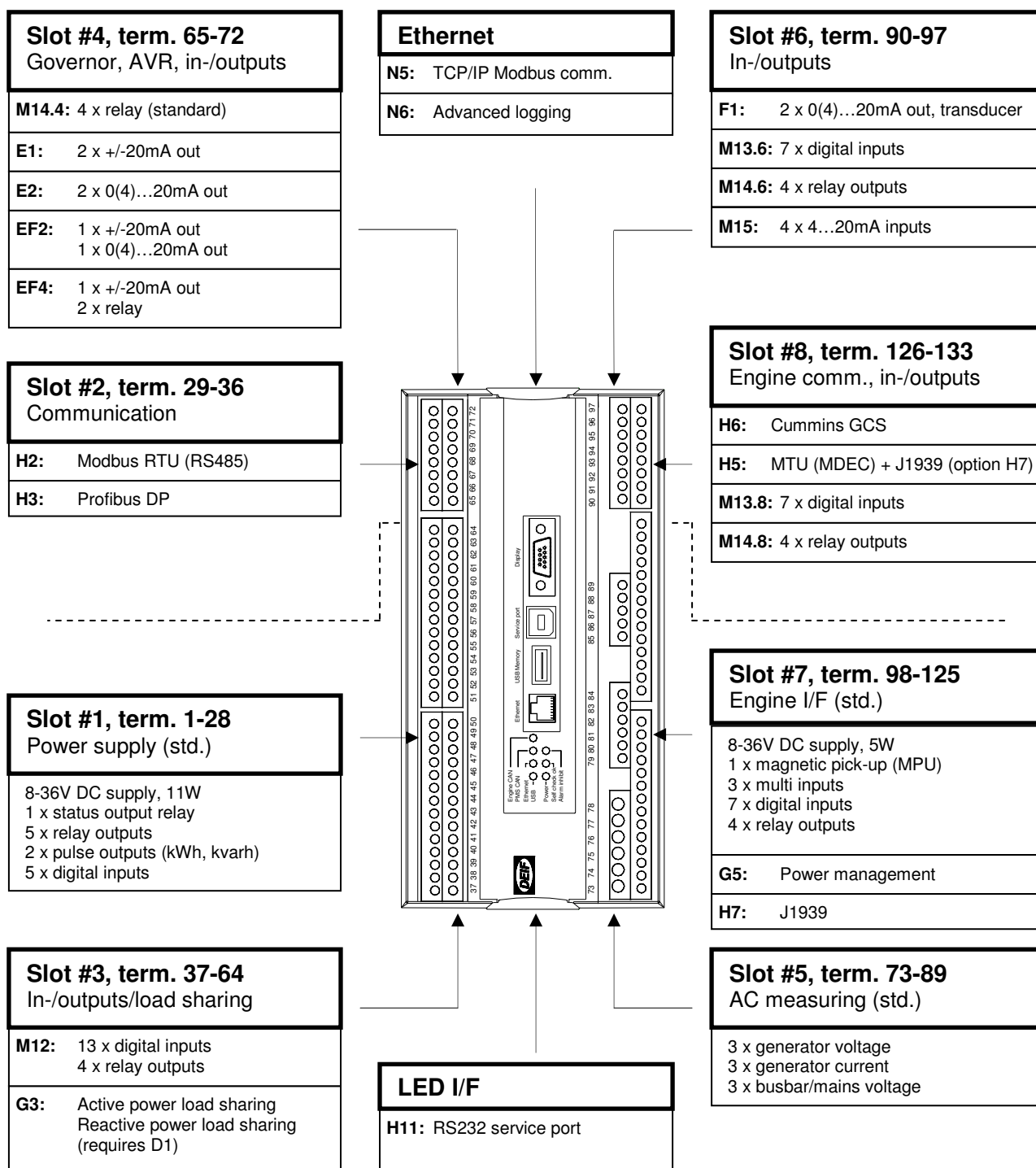
Options E1, EF2, EF4 and F2 are used for GOV/AVR control. 4 relays are used as standard in the AGC for GOV/AVR control. If selected, these options will replace the 4 relays.

Principle diagrams



DEIF supplies a complete range of current transformers (**MAK** range of CTs), power supplies (**DCP** range), meters (**DQ** range) and transducers (**TAS** range) that are suitable for use with our range of generator controls and protection relays - please see www.deif.com for full details.

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 in the chapter 'Available options'.

Technical specifications

Accuracy:	Class 1.0 Class 0.5 with option Q1 Positive, negative and zero sequence alarms: Class 1 within 5% voltage asymmetry Class 1.0 for neg. seq. current Fast overcurrent: 3% of 350%*In Analogue outputs: Class 1 according to total range To IEC 688	Multi inputs:	0(4)...20mA: 0-20mA, +/-1% Not galvanically separated Binary: Max. resistance for ON detection: 100Ω Not galvanically separated PT100/1000: -40...250°C, +/-1% Not galvanically separated To IEC 751 and EN60751 VDO: 0...1700Ω, +/-2% Not galvanically separated V DC: 0...40V DC, +/-1% Not galvanically separated
Operating temp.:	CE: -25...70°C (-13...158°F) UL: -25...50°C (-13...122°F)		
Climate:	Class HSE, to DIN 40040		
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 In continuously 20 x In, 10 sec. (max. 75A) 80 x In, 1 sec. (max. 300A)		
Meas. frequency:	30...70Hz		
Aux. supply:	Terminals 1 and 2: 12/24V DC (8...36V continuously, 6V 1 sec.) Max. 11W consumption Terminals 98 and 99: 12/24V DC (8...36V continuously, 6V 1 sec.) Max. 5W consumption	Relay outputs:	Electrical rating: 250V AC/30V DC, 5A Thermal rating @ 50°C: 2A: Continuously 4A: tON = 5 sec., tOFF = 15 sec. (Unit status output: 1A)
Binary inputs:	Optocoupler, bi-directional ON: 8...36V DC Impedance: 4.7kΩ OFF: <2V DC	Open collector outputs:	Supply: 8...36V DC, max. 10mA
Analogue inputs:	-10...+10V DC: Not galvanically separated Impedance: 100kΩ 0(4)...20mA: Impedance: 50Ω Not galvanically separated RPM (MPU): 2...70V AC, 10...10000Hz, 250...3000Ω	Analogue outputs:	0(4)...20mA and +/-25mA Galvanically separated Active output (internal supply) Load max. 500Ω Update rate: Transducer output: 250 ms Regulator output: 100 ms
		Load sharing lines:	-5...0...+5V DC, Impedance: 23.5 kΩ
		Galv. separation:	Between AC voltage, AC current and other I/Os: 3250V AC, 50Hz, 1 min. Between analogue outputs and other I/Os: 500V DC, 1 min. Between binary input groups and other I/Os: 500V DC, 1 min.

Data sheet

Response times:

Reverse power:	150 ms
Overcurrent::	200 ms
Fast overcurrent:	40 ms
Over-/undervoltage:	150 ms
Over-/underfrequency:	300 ms
df/dt (ROCOF):	75 ms
Vector jump:	20 ms
Positive sequence:	75 ms
Overload:	200 ms
Current unbalance:	200 ms
Voltage unbalance:	200 ms
React. power import/ export:	200 ms
Negative sequence:	600 ms
Zero sequence:	400 ms
Overspeed:	400 ms
Digital inputs:	250 ms
Emergency stop:	200 ms
Multi inputs:	800 ms
Wire failure:	600 ms

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

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

EMC/CE: To EN 61000-6-1/2/3/4
SS4631503 (PL4) and
IEC 255-3

Automatic Gen-set Controller

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

Plug connections: AC current:
4.0 mm² multi stranded

Other:
1.5 mm² and 2.5 mm² multi stranded

Display:
9-pole Sub-D female

Service port:
USB A-B

Protection: Unit: IP20
Display: IP52 (IP54 with gasket: option L)

To IEC 529 and EN 60529

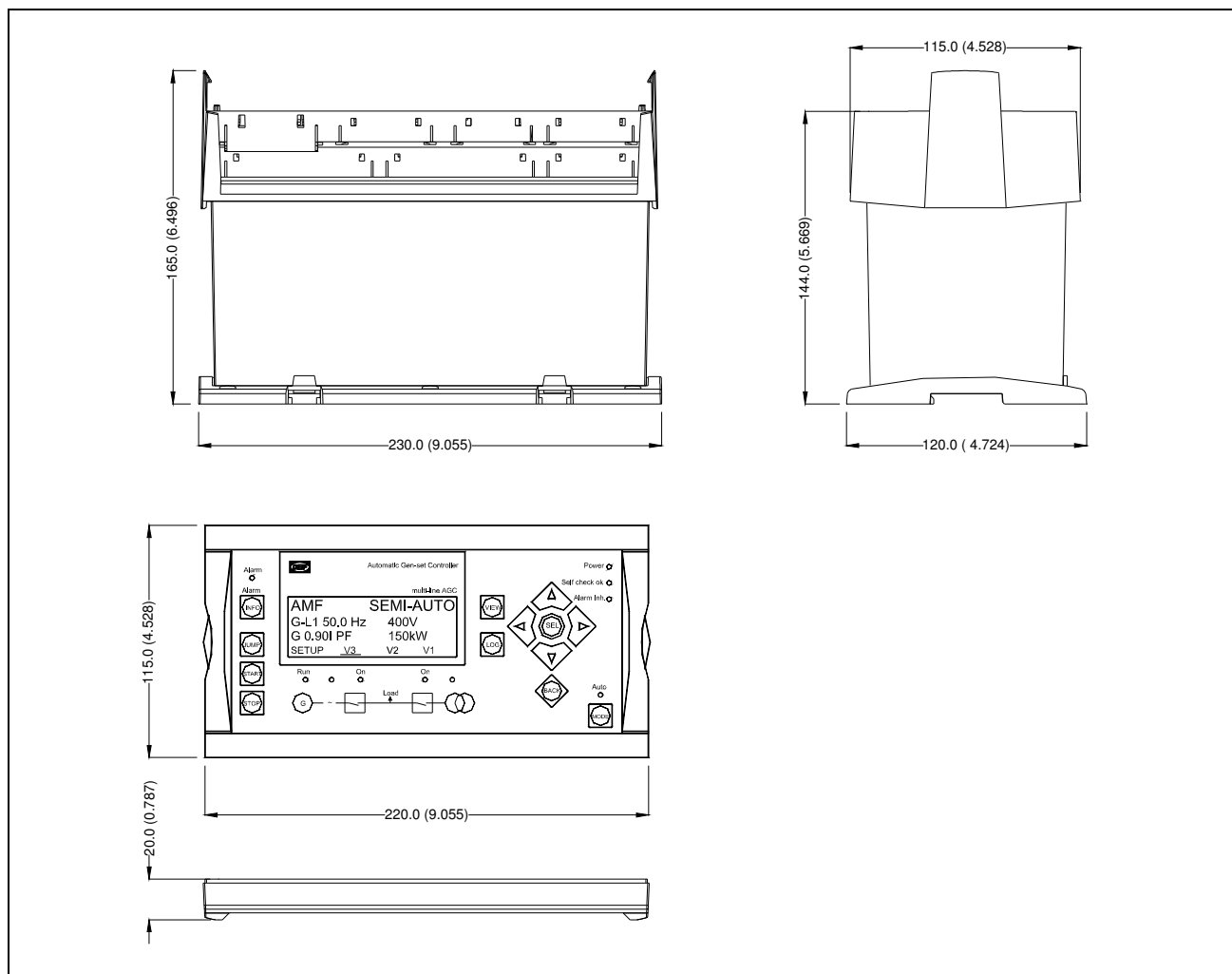
Approvals: CE, UL 508

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: 1.6 kg (3.5 lbs.)
Option J1/J3/J6: 0.2 kg (0.4 lbs.)
Option J2: 0.4 kg (0.9 lbs.)

Unit dimensions in mm (inches)



Order specifications

TYPE	VERSION	OPTION	OPTION	OPTION	OPTION	Displays
AGC						
Example						
AGC	3.x	C1	E1	H5		213

TYPE	VERSION	OPTION	OPTION	OPTION	OPTION	Displays
AGC mains		G5				
Example						
AGC mains	3.x	G5	M13.6	M14.8		105

Displays

213

Total number of displays:
 0: No display
 1: 1 Std. display
 2: 1 Std. + 1 add. display (Option X2)
 3: 1 Std. + 2 add. displays (Option X2)

Total number of AOP-1 (Option X3)

Total number of AOP-2 (Option X4)

As the AGC mains unit is only usable with option G5, this option is already included when ordered.



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

