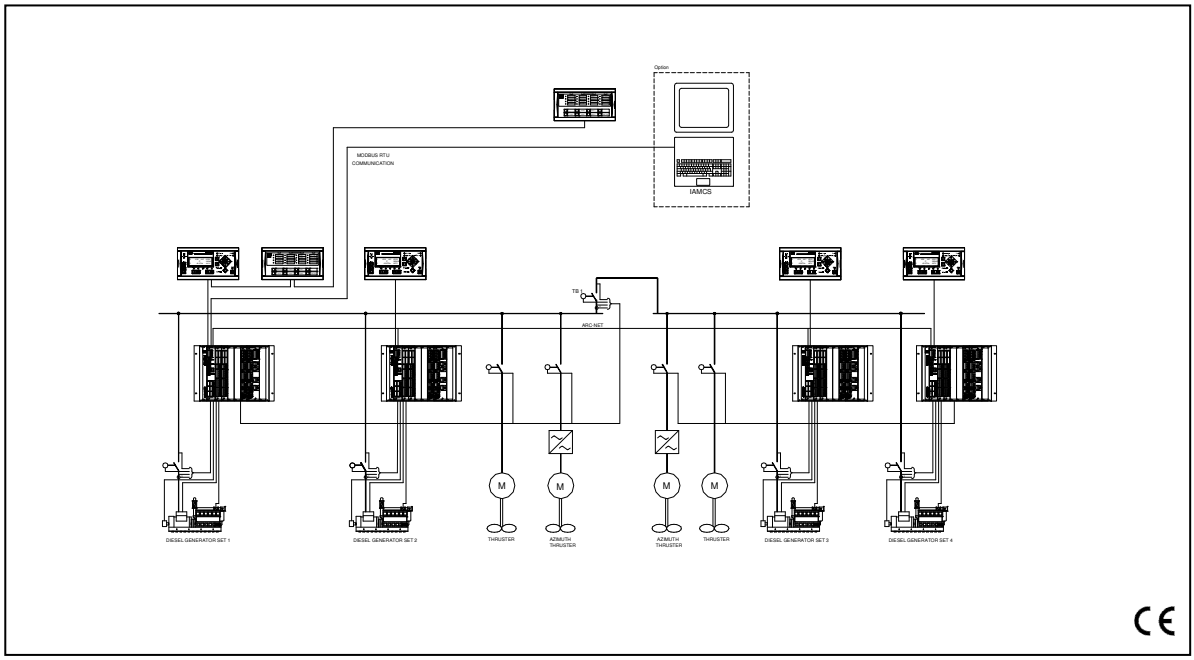
DEIF A/S

Data sheet

Delomatic 4 (DM-4)

PMS systems

4921240294A



CE

Basic functions

General use

- Power Management control and protection of medium and complex power systems
- Highly flexible HW and SW – engineered to specification
- Each case handled as a unique project
- Access to our highly qualified know how for finding the optimal system solution
- Type approvals from all known classification societies

Power Management functions

- Additional Operator Panel (AOP)
- Over all plant modes (from AOP)
- Load dependent start/stop
- Programmable start priority
- Heavy consumer control
- Blackout start sequence
- Control/supervision of shore breakers
- Control/supervision of bus tie breakers
- Black box recording tool
- Symmetrical and asymmetrical load sharing
- Trip of non-essential load groups
- Up to 4 synchronising modules (SCM) in each rack
- Communication to other systems by:
  1 x Modbus RTU RS485
  1 x CAN open
  Possible integration with DEIF Scada system (M-Vision)

Gen-set functions

Start/stop sequences

- Speed governor/AVR control
- Basic engine protections
- Engine communication CAN J1939

GB ON/OFF sequences

- Dynamical or static synchronisation
- Deload gen-set before opening breaker

Protection (GB, SG, TB)

- Various protections available for:
  P>, -P<, I>, U<, U>, f<, f>, Q<, -Q>

Busbar protection

- Over- and undervoltage/frequency

Display (DU)

- Push-buttons for start/stop
- Push-buttons for breaker operations
- Information messages
- Alarm indication
- Start/stop priority change
- Programmable set points, timers

General

- Up to 3 displays for each unit
- PC software as commissioning tool
- Redundant systems

Application

Delomatic 4 is a highly flexible power management system covering a large range of medium and complex applications. Typical examples are:

- Diesel electric propulsion
- Supply vessel with 2 SGs and 2 DGs
- Systems with SG as both generator and motor
- Two or more BB systems with control of TBs
- Combinations of the above.

The system has been designed to carry out *generator control*, *supervision* and *protection* functions of up to 15 generators integrated into one system. Furthermore, the delomatic is able to control shaft generators, tie breakers, shore connections etc.

The system performs a wide range of PM features, such as load dependent start/stop, programmable start priority, heavy consumer control, blackout start sequence, control/supervision of a shore breaker and a bus coupler, symmetrical and asymmetrical load sharing, trip of non-essential load groups etc.

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

In addition to the display unit, an additional operator panel (AOP) with 8 push-buttons and 16 LEDs can be added. AOP-1 is delivered as standard for the master DGU but is not limited to the master DGU only. AOP-1 is connected to the display unit with a 0.5 m cable. Using a CAN bus connection, an extra AOP (AOP-2) can be connected (max. 500 m from DU). Up to 5 AOPs can be connected to the CAN bus line. The AOP delivers status information from the system and includes plant mode control.

Internal communication between DGUs for system calculations, load sharing etc. is performed through ARC net. The total length of the ARC net (without repeaters) depends on the number of DGUs (nodes).

Communication to an external alarm and monitoring system can be performed via RS485 Modbus RTU or by CAN open.

DEIF Generator Unit (DGU)

DM-4's HW modules are placed in the DGU rack. 3 different rack sizes are available, depending on the need for IOs and synchronising modules (please refer to the illustrations on the following pages).

System HW modules

As a quite unique feature the whole DM-4 system is composed of only 4 print modules. All application solutions are based on these 4 modules:

PCM (8TE):
Carrying the rack system power supply, system main CPU and I/O router in distributed configurations and various external interfaces (3 x CAN, 1 x RS485, ARC net, USB service port)

IOM (6 TE):
Universal I/O module for:
16 inputs channels (selectable as binary or analogue by a jumper)
12 relay outputs
2 analogue outputs (0(4)…20mA)

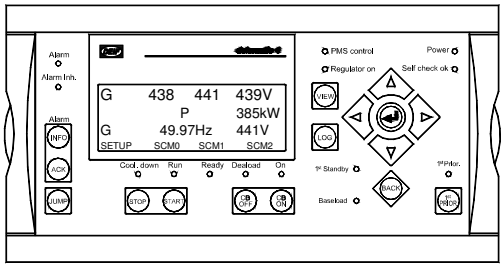
SCM 4-1 (6 TE):
Multi-transducer for a high precision 3-phase electrical measurement (class 0.5)
Integrated synchroniser/breaker control

SCM 4-2 (12 TE):
Multi-transducer for a high precision 3-phase electrical measurement (class 0.5)
Integrated synchroniser/breaker control
Controller board for GOV and AVR (binary or analogue)

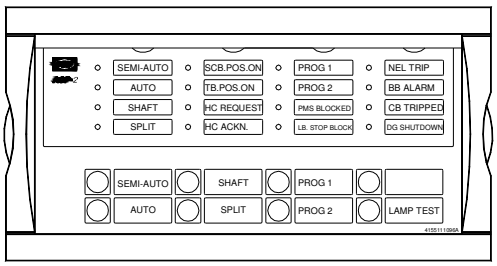
Display possibilities

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

Display Unit (DU)



Additional Operator Panel (AOP)



Power Management

In principle, all DGUs in the system have the same SW. By the node switch on the PCM-4.1, the individual DGUs are able to identify relevant parts of the SW. Therefore, the DM-4 is able to function as a distributed Power Management System in which each DGU can perform individual functions.

With this setup the individual HW modules can be used as spare parts for other DGUs, and hereby it is possible to keep the essential units running in emergency situations.

This system's flexibility is also illustrated in the possibility to control up to 4 synchronising modules from each DGU. As an example this means that one DGU can control 1 GB, 1 TB and 1 SC, if a very compact solution is requested.

Please note that max. 1 GB is controlled from each DGU due to class requirements. However, it is possible to control both a DG and an SG from one DGU. This is possible where protection of the SG and long time parallel between DG and SG are not necessary.

Protection functions

All protection functions have definite time characteristics.

Generator protection
Supervision of generator voltage and frequency
Overcurrent, I> (four step protection)
Overload, P> (two step protection, one step supervision)
Reverse power, -P> (two step protection)
Overload, Q> (two step protection)
Reverse power, -Q> (two step protection)

Busbar protection and supervision
- Over- and undervoltage
- Over- and underfrequency

Special tailor-made protection functions may be available on request.

Governor and AVR control

The governor control ensures:
- Frequency control
- Active load sharing (symmetric or asymmetric)

The AVR control ensures:
- Voltage control
- Reactive load sharing

Order information

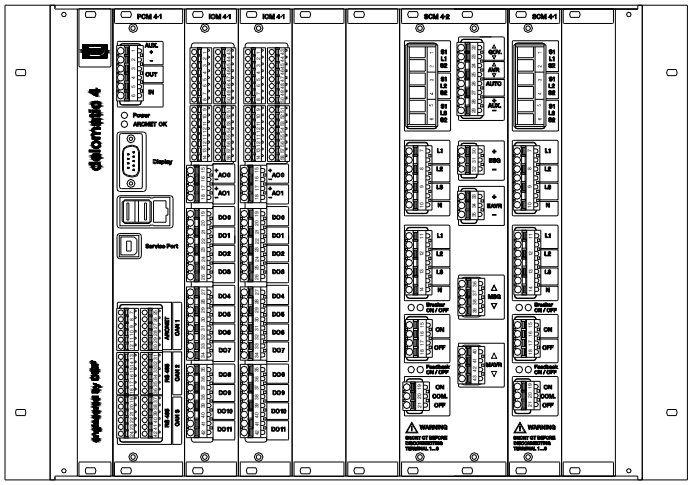
Because of the widespread flexibility of DM-4, DEIF must be contacted directly to order this system. This way we will make sure that our customers gain full advantage of DM-4's flexibility.

Our project managers will then request a single line diagram of the generators and breakers to be controlled and a short description of control philosophy in order to customise the solution perfectly.

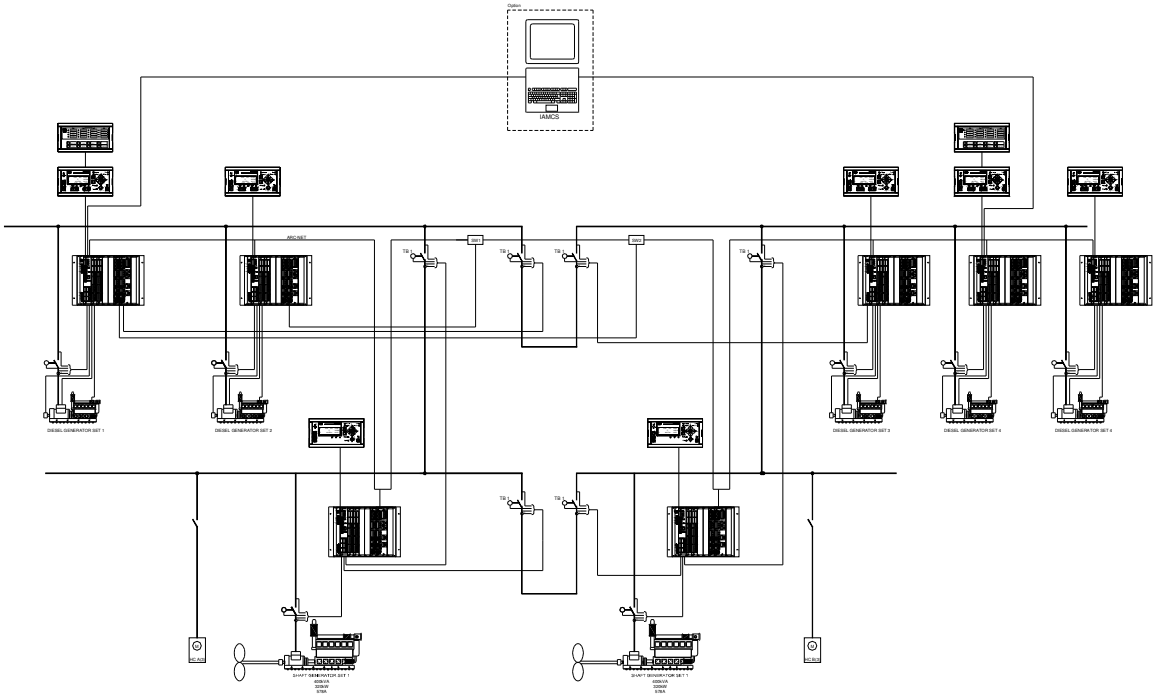
Based on the given information, DEIF will make a quotation for your engineered-to-fit control system.

Application illustrations

All applications are based on individually configured DGUs. This means that the actual HW modules can easily differ between each of the DGUs. Below a typical DGU configuration is illustrated together with an application example.



60TE DGU rack.



Fully flexible one touch auto sequence mode operation for setup of busbar configuration including all TBs according to complex mode selection. SG operates as both generator and motor. Motor operation can be performed either from the other SG or from the DGs.

Technical specifications

DGU rack system

Operating temp.:	-25…70°C (-13...158° F)
Vibration class:	DNV A+C 3 mm: 3.0… 13.2Hz, 2.1g: 13.2…50.0Hz, 0.7g: 50.0…100.0Hz
Protection class:	IP 2x Higher class by application of standard housing for DM-4 racks
Climate:	Class E according to DIN 40040
Mounting:	Vertical mounting
EMC/CE:	To EN 61000-6-V2/3/4, SS4631503 (PL4)
Material:	Plastic headers according to UL94-V0, Al case, steel cover plates
Connectors:	PHÖNIX Self secure feather force 6/8/20 Arms Screw terminals 20 Arms
Weight:	Depends on configuration

PCM module (4.1)

Aux. supply:	18…30V DC Max. 6A
CAN:	3 independent bus lines 125…250 kbit/sec Terminals for route-through of bus lines
RS485:	1 interfaces up to 9600 Baud, terminals for route-through of bus lines

SCM module

Safety:	To EN 61010-1 Overvoltage category III, 690V AC, pollution degree 2
Meas. range (Un):	100…690Vrms direct (phase-phase) Other range with voltage transformer ../100 or ../110V AC Burden max. 0.5A per phase Overload max. 2*Un for 10 s External fuse max. 2A slow-blow
Meas range (In):	Current transformer ../1 Arms or ../-5 Arms Burden max. 0.4VA per phase Overload 10 Aeff continuously <75A for 10 s < 300A for 1 s
Galvanic separation:	2.5kV isolation between voltage measurement inputs and all other potentials
Frequency of grid:	30…70Hz
Accuracy:	Class 0.5 according to IEC 688
Harmonics:	Up to 500Hz are measured

IOM module

16 input channels
The IOM 4·1 contains 16 input channels which may be individually configured as a current input (0...20mA), a voltage input (0..10V) or as a binary input (CC/OC). Live zero (offset) of the analogue inputs (e.g. 2..10V or 4..20mA) are available through the application program. The input channel configuration (analogue/binary) must correspond to the input definitions in the application program (in the PCM).

The status on the binary input is detected by an active voltage level detector circuit in the IOM 4·1, which may be connected to a potential free contact only.

All "COM" terminals are in all three configurations connected to the internal ground. Cable supervision is optional for channels configured as binary input.

Measurement:
Accuracy: Class 1 (to IEC 688)

Resolution: 10bit (0.1% of full scale)

Impedance: mA - input: 50Ω
V - input: 15kΩ

Binary input:
Max. resistance for
ON detection: 100Ω

Resistance for
cable supervision: 270Ω +/-10%

12 relay output channels
The IOM 4·1 contains 12 relay outputs with programmable active position. The active position may be a Closed Contact (CC) or an Open Contact (OC), dependent on the output channel setup in the application program (in the PCM). The relay position is a Closed Contact with an energized coil.

All relay outputs are potential free contacts and each output is galvanically insulated from the delomatic system.

If a power supply or system failure appears, all relay outputs are set to an Open Contact position (OC).

Contact ratings: Max. 250V AC/24V DC, 8A

2 analogue output channels
The IOM 4·1 contains 2 analogue outputs (0..20mA), both galvanically separated. Live zero (offset) of the analogue outputs (e.g. 4..20mA) are available through the application program (in the PCM).

If a power supply or system failure appears, both analogue output channels are set to zero output (0mA).

Output: 0 .. 20mA

Load: Max. 500Ω

Accuracy: Class 0.5 (to IEC 688)

Resolution: 10bit (0.1% of full scale)

Galvanic separation:

Between analogue outputs and other circuits:

500V AC - 50Hz - 1 min.

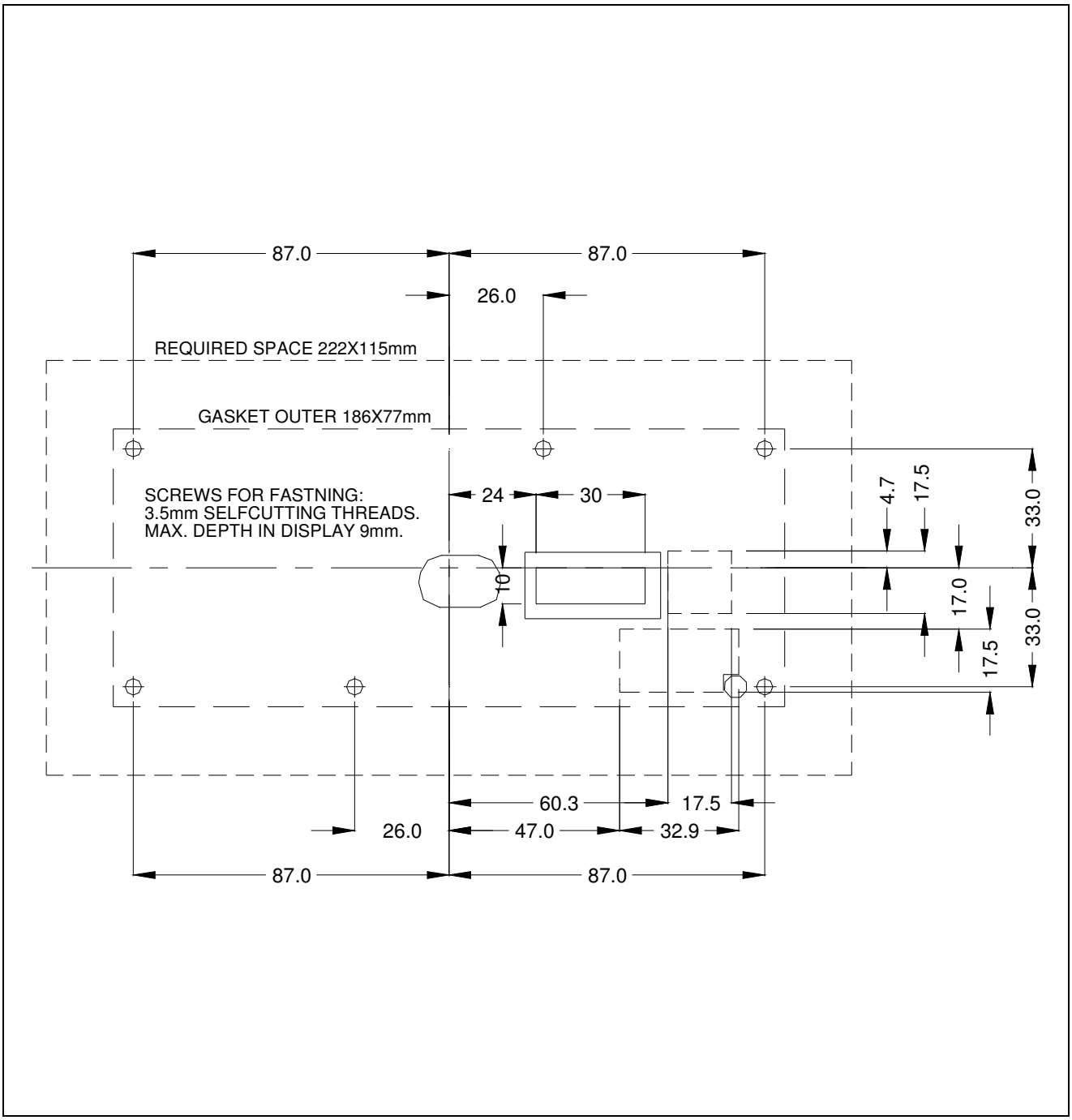
Between two analogue outputs:

500V AC - 50Hz - 1 min.

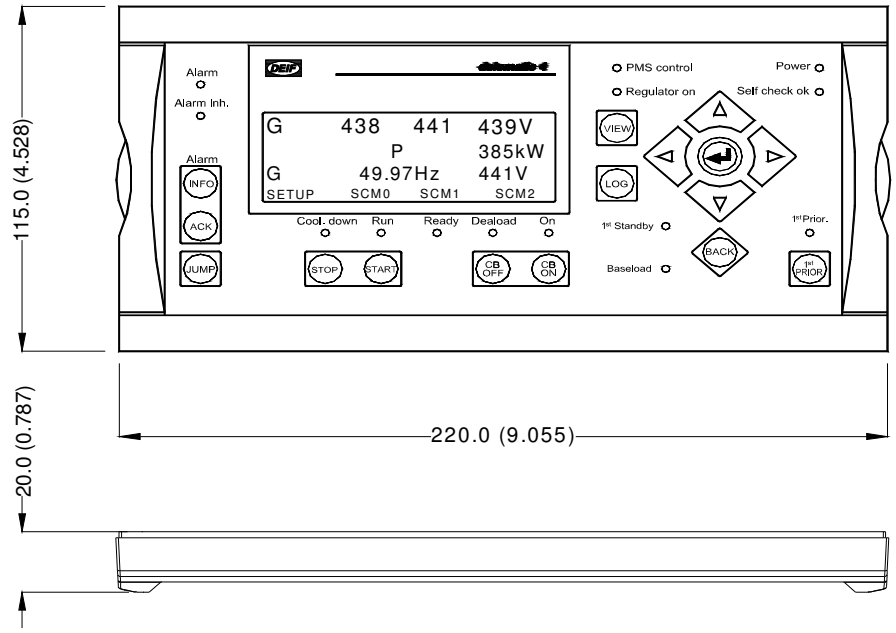
Between analogue outputs and earth (chassis):

500V AC - 50Hz - 1 min.

Panel cutout for display unit and AOP (mm)

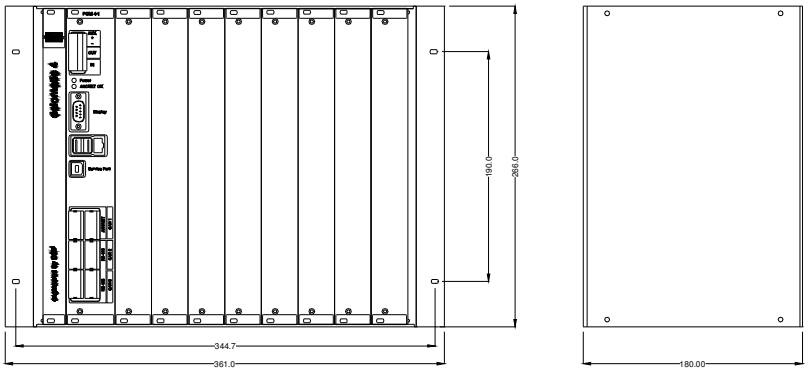


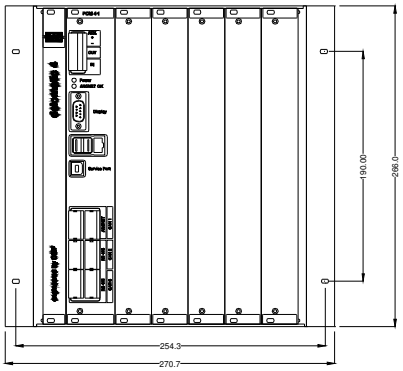
Unit dimensions of display unit and AOP in mm (inches)

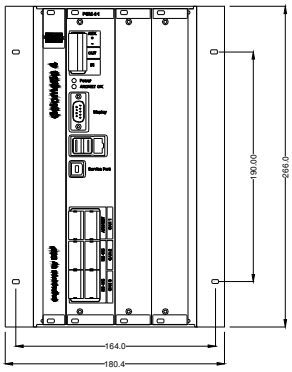


Display size: H x W x D = 115 (4.528”) x 220 (8.661”) x 20 (0.787”)

Unit dimensions of rack system in mm (inches)







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

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