DATA SHEET

Generator Protection Unit
GPU 300
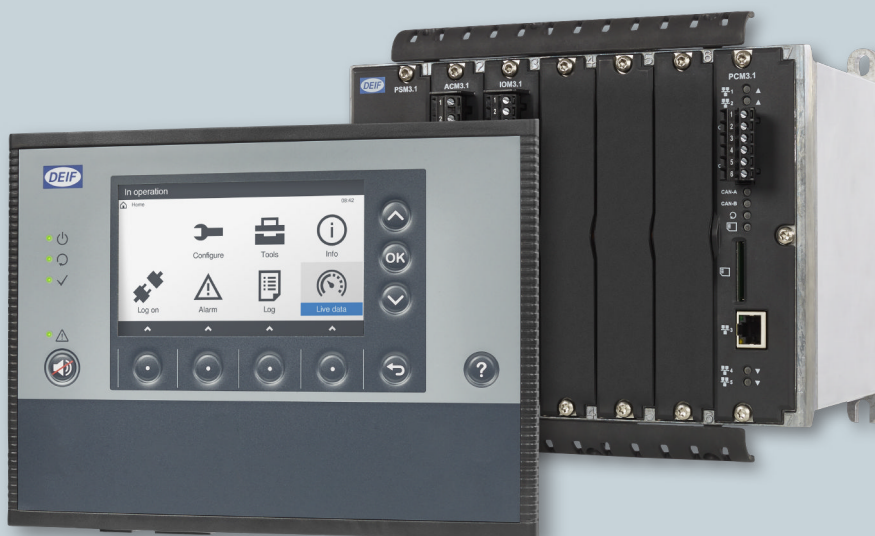
1. Product description

2. Technical specifications

3. Hardware

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1. Product description

1.1 Description

1.1.1 Overall description

The GPU 300 Generator Protection Unit is designed for marine use. Each controller contains all the functions that are needed to protect electrical equipment with a breaker, for example, a diesel generator, a busbar, or a motor.

Each controller includes processor technology and high-speed internal communication to provide fast protection functions.

The controller design is modular. Processor, communication, measurement, and input-output hardware modules may be replaced or added in the field. The controller automatically recognises the new hardware modules.

The controller display unit colour graphic screen allows fast access to live data. The operator can use the screen to manage alarms. With the right authorisation, the operator can also check and/or change the IO and parameter configuration. The light indicators of the display unit are visible over a long distance. The display processor can display all languages.

PICUS is a proprietary, free PC software interface to the controller. Use PICUS to configure the inputs, outputs and parameters for each controller.
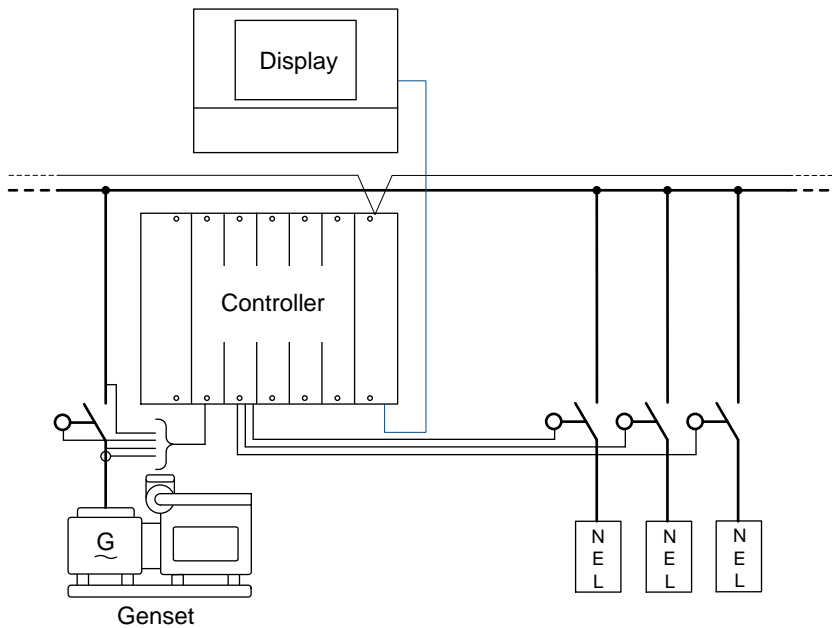
1.1.2 Software version

This data sheet corresponds to GPU 300 application software version 1.0.x.

1.2 Controller description

1.2.1 Application

The controller protects a generator breaker. Each controller can be connected to up to three non-essential load groups (NEL).

Figure 1.1   Example of a controller application, with optional non-essential loads

1.2.2 Controller functions
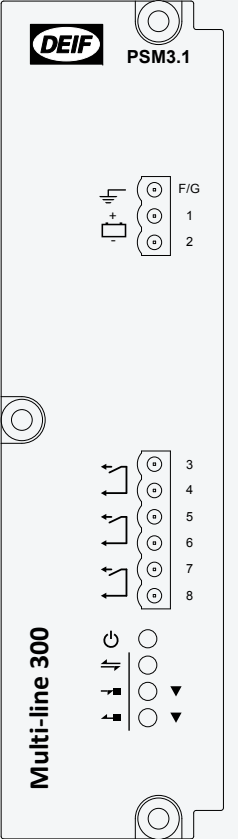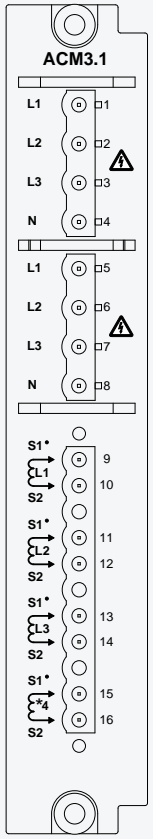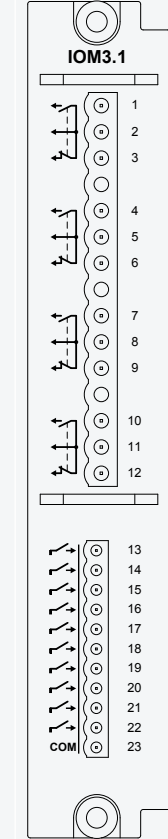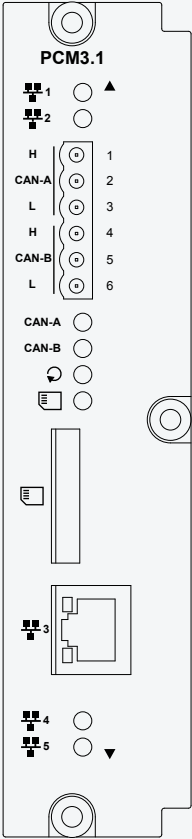
	Functions
Breaker	• Breaker trip and alarms • Synchronisation check • Breaker close (external command) • Breaker position detection
Counters	• Active power (kW) • Reactive power (kvarh) • Running hours • Breaker trips
CustomLogic	• User-friendly logic configuration tool, based on ladder logic and function blocks • Selectable input events and output commands

Communication	• Ethernet network
	• Supports Internet Protocol version 6 (IPv6) and Internet Protocol version 4 (IPv4)
	• Connects the controller to:
	  ◦ Controller display unit
	  ◦ PICUS
	  ◦ Modbus
	• Password protection
	  ◦ Customisable permission levels

Modular design	• Compact, all-in-one controller • Includes all necessary 3-phase measurements • Remove, replace, or add extra hardware modules on-site • Configurable inputs and outputs

	Functions

Plug & play system setup	• Display unit with a 5-inch colour graphic display
	  ◦ Live data monitoring and alarm management
	  ◦ Input, output, and parameter configuration
	  ◦ Context-sensitive help
	• Automatic network configuration
	• Default configuration for standard application
	• Default configuration of hardware modules

Redundancy	• Configurable terminals • Ethernet network ring connection
Advanced troubleshooting	• Controller hardware self-test • Event and alarm log, with real-time clock • Access to 24-hour service and support
PICUS	• Free-of-charge PC software • Set up permissions • Configure controller inputs, outputs, and parameters • See live data • Controller software updates

Documentation	• Free download at www.deif.com
	  ◦ Data sheet
	  ◦ Quick start guide
	  ◦ Designer's handbook
	  ◦ Installation instructions
	  ◦ Commissioning guidelines
	  ◦ Operator's manual
	  ◦ PICUS manual
	  ◦ Modbus table
	• Context-sensitive help in the display unit

1.2.3 Hardware configuration

The controller minimum hardware is described below. Up to three additional IOM3.1 hardware modules can be ordered, and installed in the empty slots. Spare hardware modules may also be ordered for installation in the field.

Table 1.1 Default hardware configuration

Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7
PSM3.1	ACM3.1	IOM3.1	Blind module	Blind module	Blind module	PCM3.1
Power supply module	Alternating current module	Input output module				Processor and communication module

Weight	Controller and display unit: 3180 g (7.0 lb) Controller (including the default hardware modules): 2345 g (5.2 lb) Display unit: 835 g (1.8 lb) Ethernet cable: ±110 g (4 oz)

1.2.4 Display unit options

The LEDs are shown in yellow on the display unit folios below.

Default display unit

Figure 1.2   Default: DU 300 (folio without AC detection LEDs)
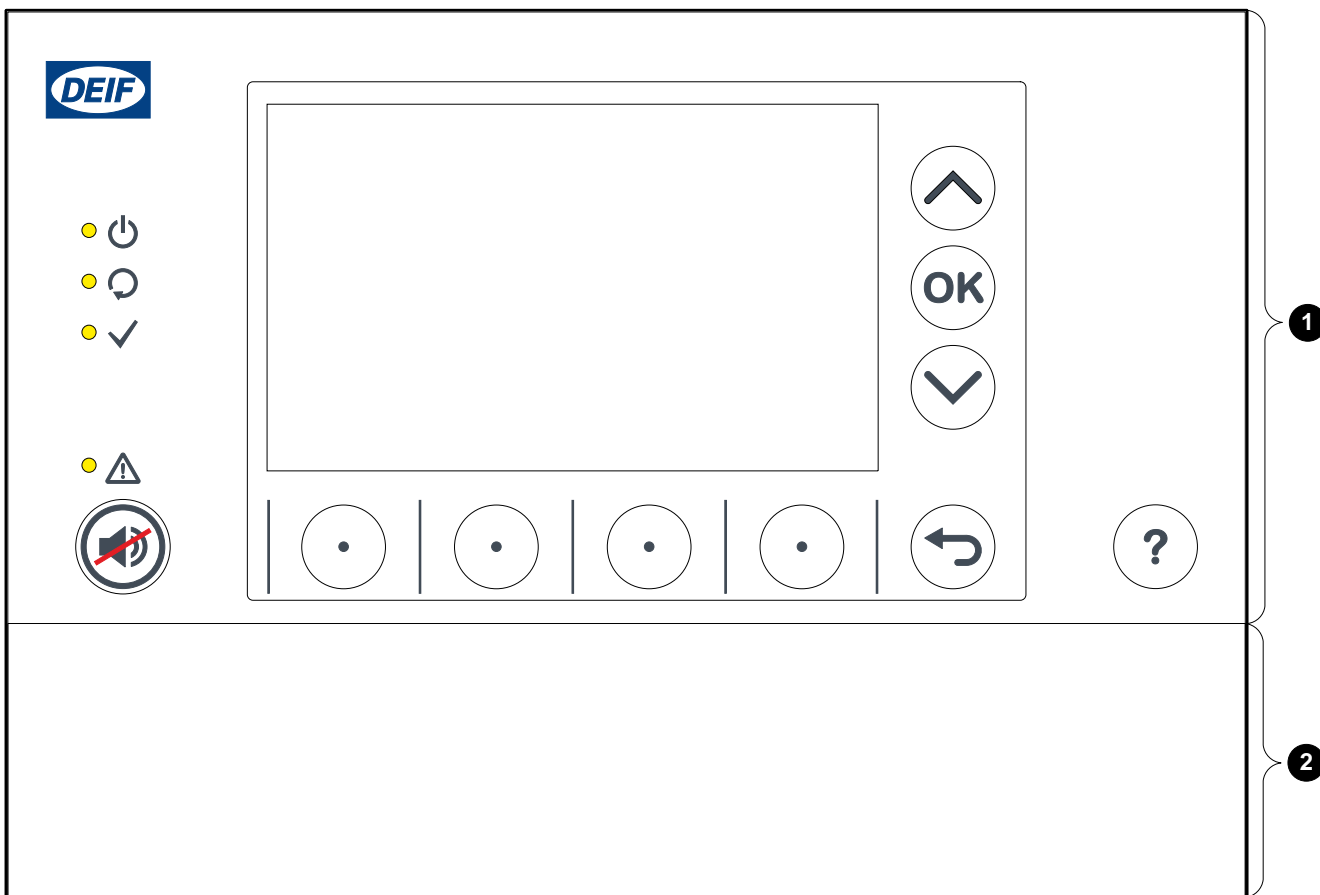
No.	
1	Top part (Same for all display units)
2	Bottom strip (Default bottom strip shown)

	Functions
Default display unit	No LEDs for generator, breaker and busbar status

With LEDs

Figure 1.3   Optional: DU 300 (folio with AC detection LEDs)
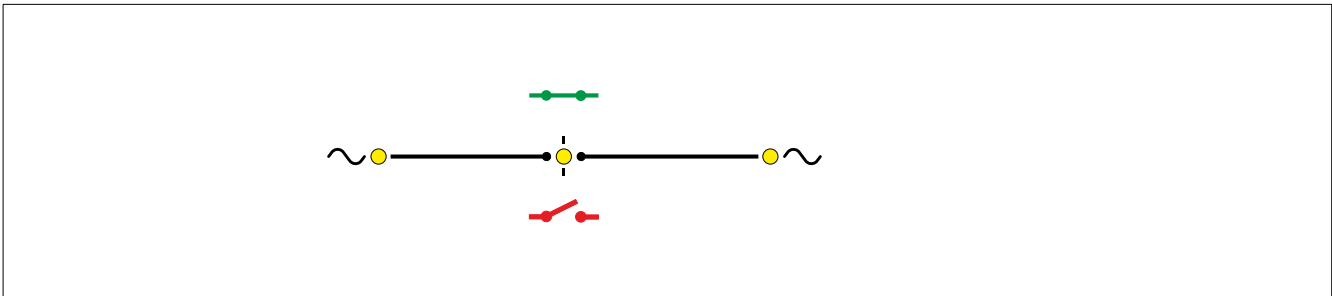
	Functions
Display unit with LEDs	LEDs for generator, busbar and breaker status

1.3 Alarms

1.3.1 Alarm functions

	Functions
Alarm functions	• Pre-defined alarms, alarm actions, and alarm inhibits • Alarms customised by changing parameters • Three customisable inhibits per controller • Horn output, with automatic or manual reset • Alarm latching ◦ Based on ISA 18.2

1.3.2 Alternating current (AC) protections

The controllers include the following alternating current (AC) protections, according to IEEE Std. C37.2-1996 (R2008).

The protections comply with the protection functionality in IEC 61850-5 and IEC 61850-7-4, but not the communication requirements of IEC 61850. The protection names in the following tables are derived from the specification that provides the most accurate description of the protection.

The *operate time* is defined in IEC 60255-151 (the time from the instant when the need for the protection arises, to when the controller output has responded). These *operate times* are based on the minimum user-defined time delay.

Table 1.2   AC protections for the controlled equipment

Protection	IEC symbol (IEC 60617)	ANSI (IEEE C37.2)	IEC 61850	Operate time	Based on	Alarms
Over-voltage	U>, U>>	59	PTOV	< 100 ms	The highest phase-to-neutral voltage, or the highest phase-to-phase voltage	2
Under-voltage	U<, U<<	27	PTUV	< 100 ms	The lowest phase-to-neutral voltage, or the lowest phase-to-phase voltage	2
Voltage unbalance (voltage asymmetry)	UUB>	47	-	< 200 ms	The highest difference between any of the 3 phase-to-phase voltage true RMS values, or the 3 phase-to-neutral voltage true RMS values	1
Negative sequence voltage		60	PNSC	< 200 ms	The sum of the phase voltages, with a correction for the phase angle	1
Zero sequence voltage		59Uo	PZOV	< 200 ms	The sum of the phase voltages	1
Over-current	3I>, 3I>>	50TD	PTOC	< 100 ms	The highest of 3 phase current true RMS values	2
Fast over-current (short circuit)	3I>>>	50/50TD	PIOC	< 50 ms	The highest of all 3 phase current true RMS values	2
Current unbalance	IUB>	46	-	< 200 ms	The highest difference between any of the 3 phase current true RMS values	2
Inverse time over-current	It>	51	PTOC	-	The highest of all 3 phase current true RMS values, based on IEC 60255 part 151	1
Directional over-current		67	PTOC	< 100 ms	The highest of the 3 phase current true RMS values	2
Negative sequence current		46	PUBC	< 200 ms	The sum of the phase currents, with a correction for the phase angle	1
Zero sequence current		51Io	PTOC	< 200 ms	The sum of the phase currents	1
Over-frequency	f>, f>>	81O	PTOF	< 100 ms	The fundamental frequency of the 3-phase voltage system	2
Under-frequency	f<, f<<	81U	PTUF	< 100 ms	The fundamental frequency of the 3-phase voltage system	2
Overload	P>, P>>	32	PDOP	< 100 ms	The 3-phase active power	2
Reverse power	P<, P<<	32R	PDRP	< 100 ms	The 3-phase active power	2
Over-excitation (reactive power export)	Q>, Q>>	40O	POEX	< 100 ms	The 3-phase reactive power	2

Protection	IEC symbol (IEC 60617)	ANSI (IEEE C37.2)	IEC 61850	Operate time	Based on	Alarms
Under-excitation (reactive power import/loss of excitation)	Q<, Q<<	40U	PUEX	< 100 ms	The 3-phase reactive power	2
Synchronisation check (including blackout close)	-	25	RSYN	-	The frequency, rate of change of frequency, 3-phase voltage amplitude and phase	Not an alarm

Table 1.3   AC protections for the busbar

Protection	IEC symbol (IEC 60617)	ANSI (IEEE C37.2)	IEC 61850	Operate time	Based on	Alarms
Over-voltage	U>, U>>	59	PTOV	< 50 ms	The highest phase-to-neutral voltage, or the highest phase-to-phase voltage	2
Under-voltage	U<, U<<	27	PTUV	< 50 ms	The lowest phase-to-neutral voltage, or the lowest phase-to-phase voltage	2
Voltage unbalance (voltage asymmetry)	UUB>	47	-	< 200 ms	The highest difference between any of the 3 phase-to-phase voltage true RMS values	1
Over-frequency	f>, f>>	81O	PTOF	< 50 ms	The fundamental frequency of the 3-phase voltage system	2
Under-frequency	f<, f<<	81U	PTUF	< 50 ms	The fundamental frequency of the 3-phase voltage system	2

Table 1.4   Other AC protections

Protection	IEC symbol (IEC 60617)	ANSI (IEEE C37.2)	IEC 61850	Operate time	Based on	Alarms
Lockout relay		86		-	Protected equipment	1
Earth inverse time over-current*		51G		-	The earth current true RMS value, measured by the 4th current measurement on ACM3.1	1
Neutral inverse time over-current*		51N		-	The neutral current true RMS value, measured by the 4th current measurement on ACM3.1	1

*Note: These alarms are both based on the same measurement hardware. Therefore you can only use one of these alarms at a time.

1.3.3 Protections

ⓘ **INFO**
These protections are in addition to the AC protections.

	Protections	Alarms
Breaker	GB opening failure	1
	GB closing failure	1
	GB position failure	1
	GB tripped (external)	1
	GB short circuit	1
	GB configuration failure	1
Synchronisation check	Phase sequence error terminal A (generator)	1
	Phase sequence error terminal B (busbar)	1
	Vector mismatch	1
	Voltage or frequency not OK	1
	GB synchronisation failure	1
Inputs	Digital inputs	1 customised alarm per input
	Emergency stop	1
Non-essential load (NEL)	NEL over-current	1 × 3 NELs
	NEL under-frequency	1 × 3 NELs
	NEL overload	2 × 3 NELs
	NEL reactive overload	1 × 3 NELs
ACM measurement error*	Generator L1-L2-L3 wire break	1
	Busbar L1-L2-L3 wire break	1
	Generator L1 wire break	1
	Generator L2 wire break	1
	Generator L3 wire break	1
	Busbar L1 wire break	1
	Busbar L2 wire break	1
	Busbar L3 wire break	1
Network	Ethernet redundancy broken	1
	Modbus communication timeout	1
Hardware alarms	System not OK	1
	Controller temperature too high	1
	PCM clock battery failure	1
	PSM 1 supply voltage high	1
	PSM 1 supply voltage low	1

	Protections	Alarms
Hardware alarms	SW mismatch on hardware module(s)	1
	Required IO card(s) not found	1

*Note: These protections can only be active when the breaker is closed.

2. Technical specifications

2.1 General specifications

2.1.1 Introduction

This chapter includes the technical specifications that apply to all hardware. Refer to the **Hardware** chapter for the technical specifications for specific hardware.

These specifications and approvals apply to the rack (with all the hardware modules properly installed), and also to the display unit.

2.1.2 Electrical specifications

Category	Specification
Safety	EN 61010-1, CAT III, 600V, pollution degree 2 IEC/EN 60255-27, CAT III, 600V, pollution degree 2 UL508 UL6200 CSA C22.2 No. 14-13 CSA C22.2 No. 142 M1987
Electromagnetic compatibility (EMC)	EN 61000-6-3 Residential, commercial and light-industrial environments EN 61000-6-2 Industrial environments IEC/EN 60255-26 IEC 60533 power distribution zone IACS UR E10 power distribution zone for controller rack IEC 60945 for display unit
Load dump	ISO 7637-2 pulse 5a

2.1.3 Mechanical specifications

In the table below, *g* refers to gravitational force (g-force).

Category	Specification	
Vibration	Operation	3 to 8 Hz: 17 mm peak-to-peak 8 to 100 Hz: 4 *g* 100 to 500 Hz: 2 *g*
	Response	10 to 58.1 Hz: 0.15 mm peak-to-peak 58.1 to 150 Hz: 1 *g*
	Endurance	58 to 150 Hz: 2 *g*
	Seismic	3 to 8.15 Hz: 15 mm peak-to-peak 8.15 to 35 Hz: 2 *g*
	IEC 60068-2-6, IACS UR E10, IEC 60255-21-1 (class 2), IEC 60255-21-3 (class 2)	
Shock (base mounted)	10 *g*, 11 ms, half sine IEC 60255-21-2 Response (class 2) 30 *g*, 11 ms, half sine IEC 60255-21-2 Endurance (class 2) 50 *g*, 11 ms, half sine IEC 60068-2-27	

Category	Specification
Bump	20 *g*, 16 ms, half sine IEC 60255-21-2 (class 2)
Material	All plastic materials are self-extinguishing according to UL94 (V0)

2.1.4 Environment specifications

Category	Specification
Humidity	97 % relative humidity, to IEC 60068-2-30
Operating temperature	**Rack and modules** -40 to 70 °C (-40 to 158 °F) UL/cUL Listed: maximum surrounding air temperature: 55 °C (131 °F) **Display unit** -20 to 70 °C (-4 to 158 °F) UL/cUL Listed: maximum surrounding air temperature: 55 °C (131 °F)
Storage temperature	**Rack and modules** -40 to 80 °C (-40 to 176 °F) **Display unit** -30 to 80 °C (-22 to 176 °F)
Operating altitude	Up to 4,000 m (13,123 ft). Refer to the module specifications for information on altitude derating over 2,000 m (6,562 ft).

2.1.5 Approvals

These approvals apply to the controller rack (with all the modules properly installed), and also to the display unit.

Standards
CE
UL/cUL Listed to UL508 - Industrial Control Equipment, and CSA C22.2 No. 142 M1987 - Process Control Equipment
UL/cUL Recognised to UL6200 - Controls for stationary engine driven assemblies, and CSA C22.2 No. 14-13 - Industrial Control Equipment

2.1.6 Marine approvals

Refer to www.deif.com for the most recent approvals.

3. Hardware

3.1 Controller hardware

3.1.1 Rack R7.1

The rack is an aluminium box with a rack system that houses the hardware modules. Each controller consists of a rack and a number of hardware modules. The hardware modules are replaceable printed circuit boards, and include power supply, control, measurement and I/O interfaces.

The hardware modules in the rack communicate through the rack backplane. For cable organisation, each rack includes two cable strain relief plates (top and bottom), as well as 12 cable tie slots (6 on the top, 6 on the bottom, 2.5 mm (0.1 in) wide). The rack frame has hexagonal holes to maximise cooling and enhance electromagnetic compatibility.

Figure 3.1   Rack R7.1 with dimensions in mm (followed by approximate dimensions in inches), first-angle projection, includes PSM3.1 and blind modules
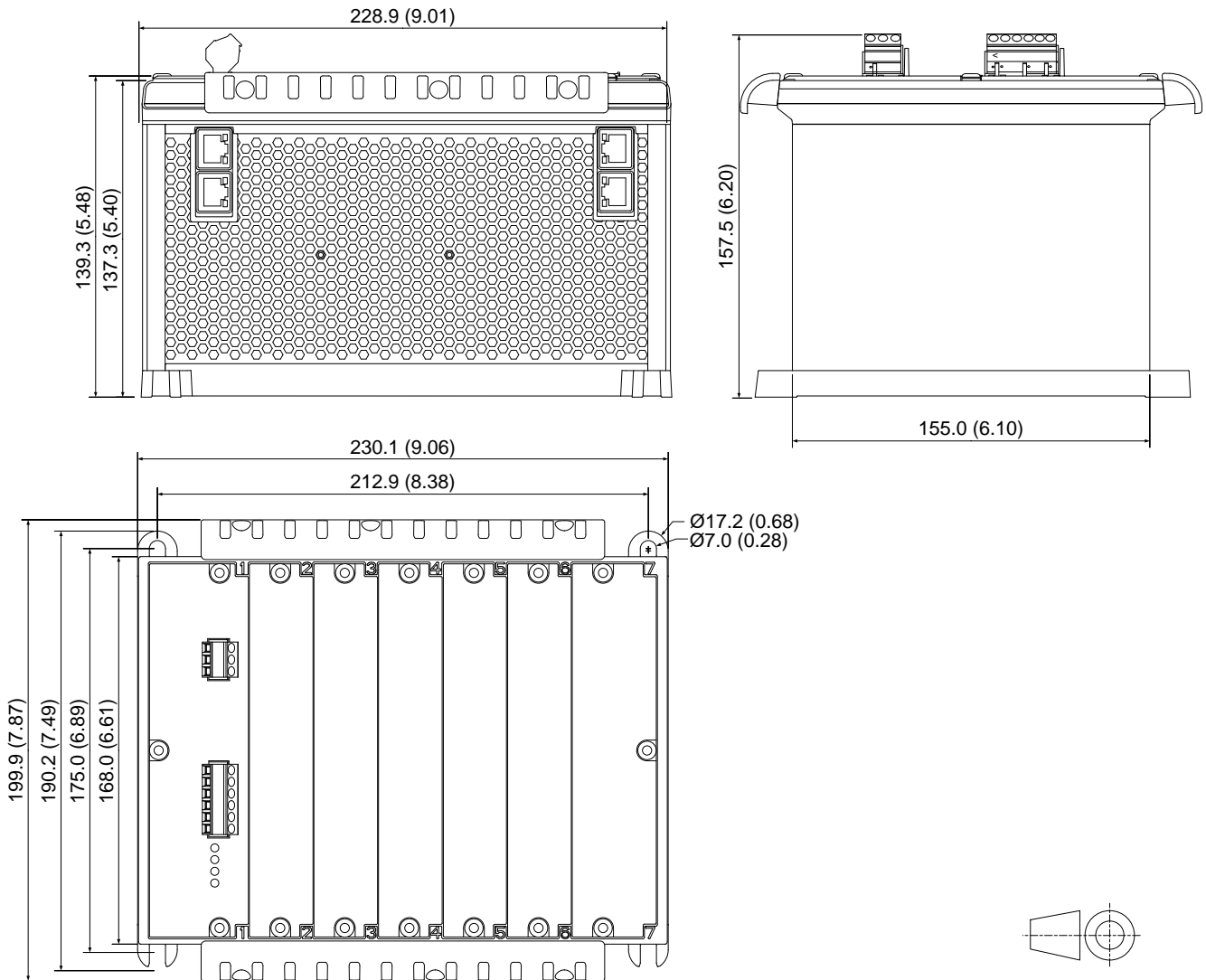
Table 3.1   Rack R7.1 technical specifications

Category	Specification
Protection	IP20 (all slots must have modules or blind modules mounted) according to IEC/EN 60529
UL/cUL Listed	Type Complete Device, Open Type 1
Material	Rack frame: Aluminium
Mounting	Base mount, using four M6 bolts with self-locking washers (or self-locking screws). The bolts and self-locking washers (or self-locking screws) are not included with the rack. UL/cUL Listed: For use on a flat surface of a type 1 enclosure UL/cUL Listed: To be installed in accordance with the NEC (US) or the CEC (Canada)
Tightening torque	Mounting bolts: 4 N·m (35 lb-in)
Size	L 230.1 mm x H 199.9 mm x D 157.5 mm (9.06 in x 7.87 in x 6.20 in) (outer frame, includes cable strain relief plates)
Weight	Without any hardware modules: 1330 g (2.9 lb)

3.1.2 Power supply module PSM3.1

The power supply module provides power to all the hardware modules in the rack. The rack status and alarms activate the PSM's three relay outputs. There are two ports for internal communication with other racks (future use).

PSM3.1 manages the hardware module self-checks for the rack and includes a self-check status LED. The power supply terminals include circuit protection against load dump transients and JEM177 surge transients (rugged design). These terminals also include battery voltage measurement.

Table 3.2   PSM3.1 terminals

Module	Count	Symbol	Type	Name
	1		Ground	Frame ground
	1		12 or 24 V	Power supply
	3		Relay output	Status OK (fixed), and configurable
	2		Internal communication (RJ45)	DEIF internal communication connections (Reserved for future use to connect several extension racks.) (The LEDs are on the front of the hardware module. The connections are at the bottom of the hardware module.)

Table 3.3   PSM3.1 technical specifications

Category	Specification

Controller power supply	Input voltage: 12 or 24 V DC nominal (8 to 36 V DC continuously)
	UL/cUL Listed: 10 to 32.5 V DC
	0 V DC for 50 ms when coming from at least 8 V DC (cranking dropout)
	Consumption: Typical 20 W, maximum 35 W
	
	The power supply inputs are internally protected by a 12 A fuse (not replaceable) (fuse size determined by load dump requirements).
	Voltage withstand: ±36 V DC
	Load dump protected by TVS diodes.
	
	Start current
	• Power supply current limiter
	  ◦ 24 V: 4 A minimum
	  ◦ 12 V: 8 A minimum
	• Battery: No limit

Relay outputs	Relay type: Solid state Electrical rating and UL/cUL Listed: 30 V DC and 1 A, resistive Voltage withstand: ±36 V DC

Category	Specification
Terminal connections	**Frame ground and power supply**: Terminals: Standard 45° plug, 2.5 mm^2 Wiring: 1.5 to 2.5 mm^2 (12 to 16 AWG), multi-stranded **Other connections**: Terminals: Standard 45° plug, 2.5 mm^2 Wiring: 0.5 to 2.5 mm^2 (12 to 22 AWG), multi-stranded
Communication connections	DEIF internal communication: RJ45. Use an Ethernet cable that meets or exceeds the SF/UTP CAT5e specifications.
Torques and terminals	Module faceplate screws: 0.5 N·m (4.4 lb-in) Connection of wiring to terminals: 0.5 N·m (4.4 lb-in) UL/cUL Listed: Wiring must be minimum 90 °C (194 °F) copper conductors only.
Galvanic isolation	Between power supply and other I/Os: 600 V, 50 Hz for 60 s Between relay groups and other I/Os: 600 V, 50 Hz for 60 s Between internal communication ports and other I/Os: 600 V, 50 Hz for 60 s
Protection	Unmounted: No protection rating Mounted in rack: IP20 according to IEC/EN 60529
Size	L 43.3 mm × H 162 mm × D 150 mm (1.5 in × 6.4 in × 5.9 in)
Weight	331 g (0.7 lb)

3.1.3 Alternating current module ACM3.1

The alternating current module measures the voltage and current on one side of a breaker, and the voltage on the other side. The hardware module responds when the measurements exceed the AC alarm parameters. ACM3.1 uses the AC measurements to check the synchronisation before the breaker closes.

ACM3.1 provides robust frequency detection in environments with electrical noise. ACM3.1 allows extended measurement bandwidth up to 40 times the nominal frequency. ACM3.1 includes a configurable 4th current measurement.

By default, ACM3.1 measures 3-phase systems. Alternatively, split-phase (1-phase, 3-wire, for example, L1-N-L2) or single-phase (1-phase, 2-wire, for example, L1-N) can be selected.

Table 3.4   ACM3.1 terminals

Module	Count	Symbol	Type	Name
	2 × (L1, L2, L3 and N)	L1/L2/L3/N	Voltage	3-phase voltage measurements
	1 × (L1, L2, L3 and 4th)	S1 / S2	Current	3-phase current measurement 4th current measurement

Table 3.5   ACM3.1 technical specifications

Category	Specification
Voltage measurements	Nominal value: 100 to 690 V AC phase-to-phase Measurement range: 2 to 897 V AC phase-to-phase Accuracy: Class 0.2 Phase angle accuracy: 0.1° (within nominal voltage range **and** nominal frequency range) Altitude derating from 2,000 to 4,000 m (6,562 to 13,123 ft): 100 to 480 V AC phase-to-phase UL/cUL Listed: 100 to 600 V AC phase-to-phase Load on external voltage transformer: Maximum 0.2 VA/phase Voltage withstand: 1.2 × Nominal voltage continuously; 1.3 × Nominal voltage for 10 s
Current measurements	Nominal value: 1 or 5 A AC from current transformer Measurement range: 0.02 to 17.5 A AC from current transformer; Truncation level: 11 mA Accuracy: Class 0.2 Earth current: 18 dB attenuation of third harmonic of the nominal frequency UL/cUL Listed: From listed or R/C (XOWD2.8) current transformers 1 or 5 A Load on external current transformer: Maximum 0.3 VA/phase Current withstand: 10 A continuously; 17.5 A for 60 s; 100 A for 10 s; 250 A for 1 s
Frequency measurements	Nominal value: 50 Hz or 60 Hz Measurement range: 35 to 78 Hz Accuracy: Class 0.1 of nominal value (35 to 78 Hz) (-40 to 70 °C) (-40 to 158 °F) Class 0.02 of nominal value (40 to 70 Hz) (15 to 30 °C) (59 to 86 °F)
Power measurements	Accuracy: Class 0.5

Category	Specification
Accuracy and temperature	Unless otherwise specified for the above measurements: Nominal range: -40 to 70 °C (-40 to 158 °F) Reference range: 15 to 30 °C (59 to 86 °F) Accuracy: Measurement type specific within reference range. Additional 0.2 % error of full scale per 10 °C (18 °F) outside reference range. Example: The accuracy for Power (P) at 70 °C (158 °F) is 0.5 % + 4 x 0.2 % = 1.3 %.
Torques and terminals	Module faceplate screws: 0.5 N·m (4.4 lb-in) Secure the current measurement terminal block to the module faceplate: 0.5 N·m (4.4 lb-in) Connection of wiring to terminals: 0.5 N·m (4.4 lb-in) UL/cUL Listed: Wiring must be minimum 90 °C (194 °F) copper conductors only.
Terminal connections	AC voltage and current terminals: Standard 45º plugs, 2.5 mm^2 Wiring: 2.5 mm^2 (13 AWG), multi-stranded
Galvanic isolation	Between AC voltage and other I/Os: 3310 V, 50 Hz for 60 s Between AC current and other I/Os: 2210 V, 50 Hz for 60 s
Protection	Unmounted: No protection rating Mounted in rack: IP20 according to IEC/EN 60529
Size	L 28 mm × H 162 mm × D 150 mm (1.1 in × 6.4 in × 5.9 in)
Weight	232 g (0.5 lb)

3.1.4 Input output module IOM3.1

The input output module has four changeover relay outputs, and 10 digital inputs. These IOs are all configurable.
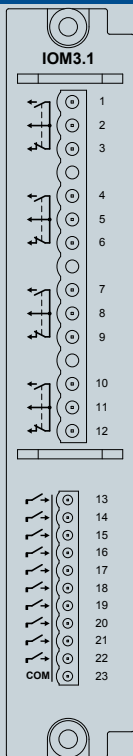
Table 3.6 IOM3.1 terminals

Module	Count	Symbol	Type	Name
	4		Relay output	Configurable
	10		Digital input	Configurable

Table 3.7 IOM3.1 technical specifications

Category	Specification
Relay outputs	Relay type: Electromechanical Electrical rating and UL/cUL Listed: 250 V AC or 30 V DC, and 6 A, resistive; B300, pilot duty (B300 is a power limit specification for inductive loads) Altitude derating from 3,000 to 4,000 m (9,842 to 13,123 ft): Maximum 150 V AC phase-to-phase Voltage withstand: 250 V AC
Digital inputs	Bi-directional input ON: 8 to 36 V DC OFF: 0 to 2 V DC Minimum pulse length: 50 ms Impedance: 4.7 kΩ Voltage withstand: ±36 V DC
Terminal connections	**Relay outputs**: Terminals: Standard 45° plug, 2.5 mm^2 Wiring: 0.5 to 2.5 mm^2 (12 to 22 AWG), multi-stranded **Digital inputs**: Terminals: Standard 45° plug, 1.5 mm^2 Wiring: 0.5 to 1.5 mm^2 (16 to 28 AWG), multi-stranded

Category	Specification
Torques and terminals	Module faceplate screws: 0.5 N·m (4.4 lb-in) Connection of wiring to relay output terminals: 0.5 N·m (4.4 lb-in) Connection of wiring to digital input terminals: 0.25 N·m (2.2 lb-in) UL/cUL Listed: Wiring must be minimum 90 ℃ (194 °F) copper conductors only.
Galvanic isolation	Between relay groups and other I/Os: 2210 V, 50 Hz for 60 s Between digital input groups and other I/Os: 600 V, 50 Hz for 60 s
Protection	Unmounted: No protection rating Mounted in rack: IP20 according to IEC/EN 60529
Size	L 28 mm × H 162 mm × D 150 mm (1.1 in × 6.4 in × 5.9 in)
Weight	196 g (0.4 lb)

3.1.5 Processor and communication module PCM3.1

The processor and communication module has the controller's main microprocessor, which contains and runs the controller application software. It includes the Ethernet switch to manage the controller Ethernet connections, with five 100BASE-TX Ethernet connections. It also has two sets of CAN bus terminals and houses the SD card (future use).

PCM3.1 includes external memory (the SD card) for alarm logging, trending, black box recording, and installing application software (future use).

Table 3.8   PCM3.1 terminals

Module	Count	Symbol	Type	Name
	5		Ethernet (RJ45)	DEIF network (The LEDs are on the front of the hardware module. Two of the connections are at the top of the hardware module, one on the front, and two at the bottom.)
	2	H, CAN-A, L H, CAN-B, L	CAN bus connection	CAN bus (future use for engine communication)
	1		SD card*	External memory (future use)

*Note: To meet the temperature and EMC specifications, you must order this SD card from DEIF.

Table 3.9 PCM3.1 technical specifications

Category	Specification
CAN terminals	Voltage withstand: ±24 V DC
Galvanic isolation	Between CAN A and other I/Os: 600 V, 50 Hz for 60 s Between CAN B and other I/Os: 600 V, 50 Hz for 60 s Between Ethernet ports and other I/Os: 600 V, 50 Hz for 60 s
Battery	CR2430 3V rated for operation at -40 to 85 °C (-40 to 185 °F). This battery can be changed. **Not** a standard CR2430 battery.
Battery life	Design life of the timekeeping battery is 10 years. This is reduced if the ambient temperature is over 40 °C (104 °F).
Communication connections	CAN communication terminals: Standard 45° plug, 1.5 mm^2 Wiring: 0.5 to 1.5 mm^2 (16 to 28 AWG), multi-stranded DEIF network: RJ45. Use an Ethernet cable that meets or exceeds the SF/UTP CAT5e specifications. 100BASE-TX.
Torques and terminals	Module faceplate screws: 0.5 N·m (4.4 lb-in) Connection of wiring to terminals: 0.5 N·m (4.4 lb-in) UL/cUL Listed: Wiring must be minimum 90 °C (194 °F) copper conductors only.
Protection	Unmounted: No protection rating Mounted in rack: IP20 according to IEC/EN 60529
Size	L 36.8 mm × H 162 mm × D 150 mm (1.4 in × 6.4 in × 5.9 in)
Weight	214 g (0.5 lb)

3.1.6 Blind module

A blind module must be used to close off each empty slot in the rack.

Table 3.10 Blind module technical specifications

Category	Specification
Tightening torque	Module faceplate screws: 0.5 N·m (4.4 lb-in)
Size	L 28 mm × H 162 mm × D 18 mm (1.1 in × 6.4 in × 0.7 in)
Weight	44 g (0.1 lb)

3.2 Display hardware

3.2.1 Display unit DU 300

The display unit is the operator's interface to the controller. It allows the operator to use up to 20 push-buttons to set up, operate and supervise the controller. The display unit includes up to 15 tricolour (red, yellow, green), wide angle, high visibility light indicators to show the system status.

The 5-inch (diagonal measurement) colour graphic display shows real-time operating information. The 800 by 480 pixel display supports 24-bit RGB colour and all languages with UTF-8 fonts. It is anti-reflection and has a configurable dimmer function.

For communication, the display unit has two 100BASE-TX connections, and can be placed up to 100 m from the controller rack.

The power supply terminals include circuit protection against load dump transients and JEM177 surge transients (rugged design).

The display unit specifications apply to all controller types. However, the display unit front folio depends on the controller type. The front folio details are included in the description for each controller type.

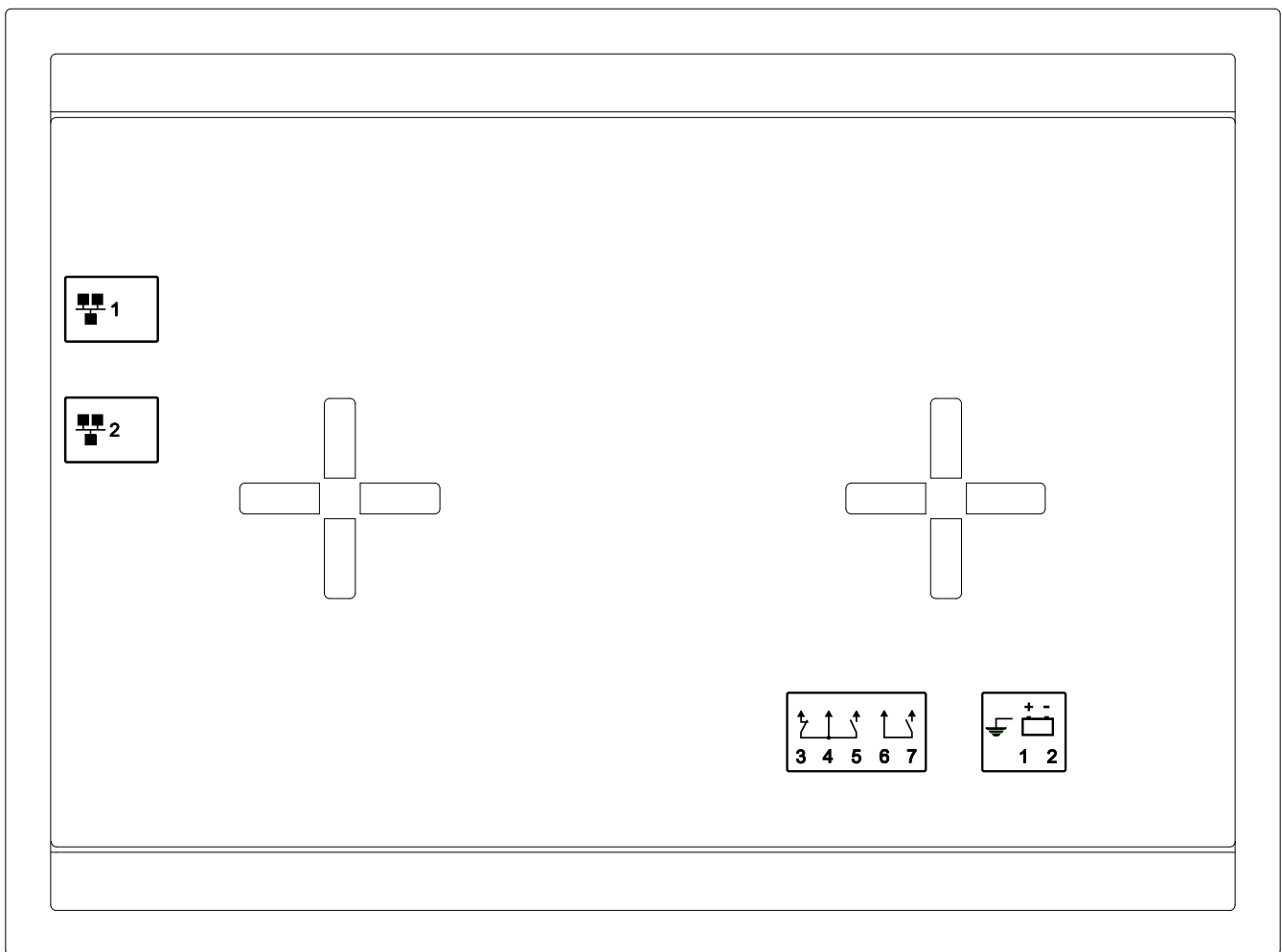**Figure 3.2**   Line drawing of the back of DU 300 with the terminal positions

Table 3.11   DU 300 terminals

Count	Symbol	Type	Name
1	⏚	Ground	Frame ground
1	+ -	12 or 24 V DC	Power supply

Count	Symbol	Type	Name
1		Relay output	For future use
1		Relay output	Display status OK
2		Ethernet (RJ45)	DEIF network

Figure 3.3   Display unit with dimensions in mm (followed by approximate dimensions in inches), first-angle projection
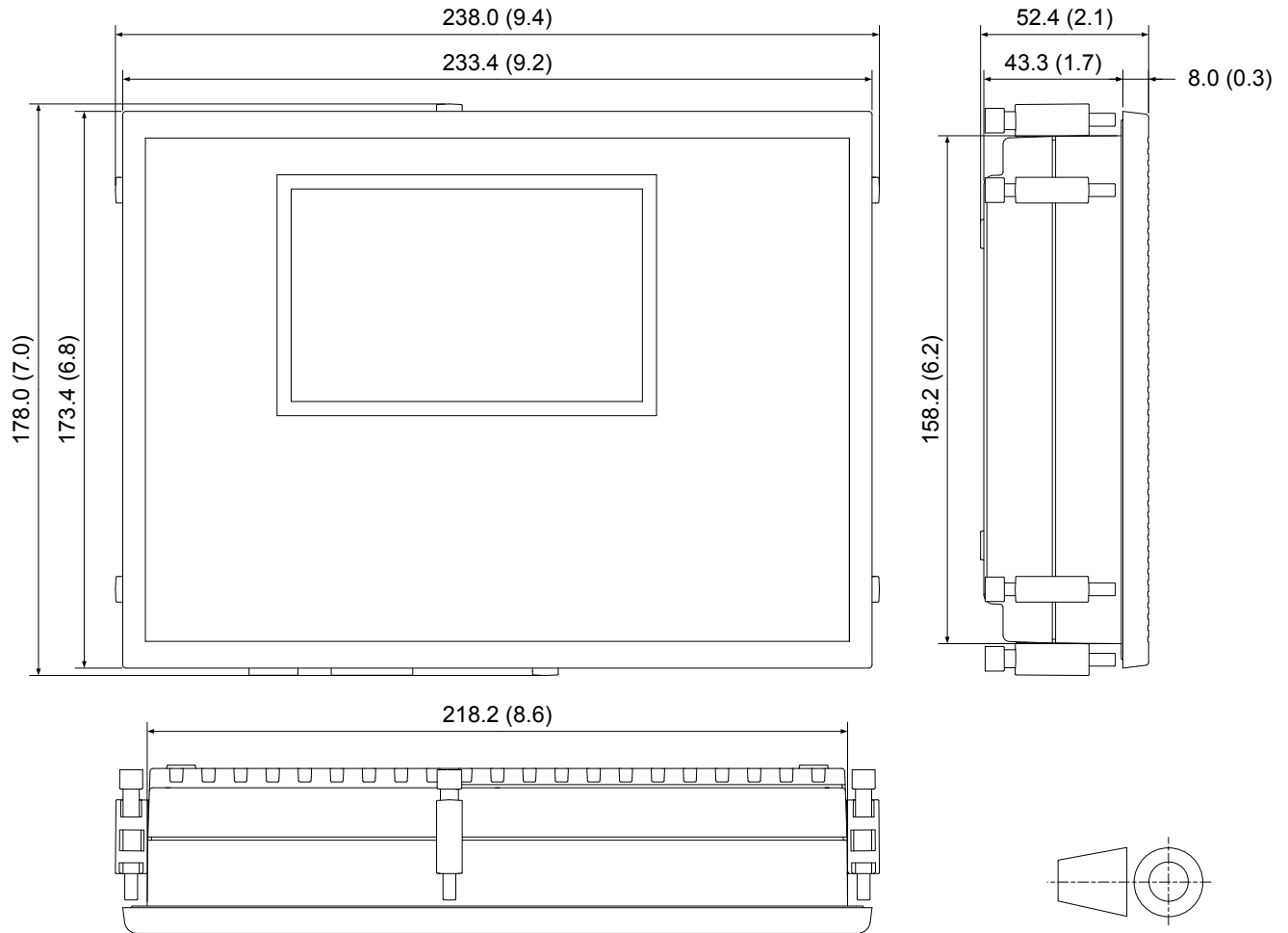

Table 3.12   DU 300 technical specifications

Category	Specification
Protection	From the front: IP65 according to IEC/EN 60529 From the back: IP20 according to IEC/EN 60529
UL/cUL Listed	Type Complete Device, Open Type 1

Category	Specification

Power supply
 	
± -
⊟
	Input voltage: 12 or 24 V DC nominal (8 to 36 V DC continuously)
	UL/cUL Listed: 10 to 32.5 V DC
	0 V DC for 50 ms when coming from at least 8 V DC (cranking dropout)
	Consumption: Maximum 12 W
	
	The power supply inputs are internally protected by a 12 A slow-blow fuse (not replaceable) (fuse size determined by load dump requirements).
	Voltage withstand: ±36 V DC
	Load dump protected by TVS diodes.
	
	Start current
	
	• Power supply current limiter
	  ◦ 24 V: 2.1 A minimum
	  ◦ 12 V: 4.2 A minimum
	• Battery: No limit

Relay output	Relay type: Electromechanical Electrical rating and UL/cUL Listed: 30 V DC and 1 A, resistive Voltage withstand: ±36 V DC
Relay output	Relay type: Solid state Electrical rating and UL/cUL Listed: 30 V DC and 1 A, resistive Voltage withstand: ±36 V DC
Terminal connections	**Frame ground and power supply**: Terminals: Standard plug, 2.5 mm^2 Wiring: 1.5 to 2.5 mm^2 (12 to 16 AWG), multi-stranded **Other connections**: Terminals: Standard plug, 2.5 mm^2 Wiring: 0.5 to 2.5 mm^2 (12 to 22 AWG), multi-stranded
Communication connections	DEIF network: RJ45. Use an Ethernet cable that meets or exceeds the SF/UTP CAT5e specifications. 100BASE-TX.
Torques and terminals	Display unit fixing screw clamps: 0.15 N·m (1.3 lb-in) Connection of wiring to terminals: 0.5 N·m (4.4 lb-in) UL/cUL Listed: Wiring must be minimum 90 °C (194 °F) copper conductors only.
Galvanic isolation	Between power supply, relay groups, and network plugs: 600 V, 50 Hz for 60 s
Mounting	Panel mount, using six fixing screw clamps (included) Minimum panel plate thickness: 2.0 mm Maximum panel plate thickness: 5.0 mm UL/cUL Listed: For use on a flat surface of a type 1 enclosure UL/cUL Listed: To be installed in accordance with the NEC (US) or the CEC (Canada)
Cable organisation	4 cable tie slots for cable strain relief (4 mm (0.16 in) wide)
Size	L 235 mm × H 175 mm × D 52 mm (9.3 in × 6.9 in × 2.0 in) (outer frame) Panel cutout: L 220 mm × H 160 mm (8.7 in × 6.3 in)
Accessory (included)	Ethernet cable: Shielded patch cable SF/UTP CAT5e, 2 metres long
Weight	Display unit: 835 g (1.8 lb) Ethernet cable: ±110 g (4 oz)

3.3 Accessories

3.3.1 Ethernet cable

The Ethernet cable connects the display unit to the controller, or connects controllers to one another. The Ethernet cable from DEIF meets the technical specifications below. Use these Ethernet cables to ensure that the system meets the general specifications.

Category	Specification
Cable type	Shielded patch cable SF/UTP CAT5e
Temperature	Fixed installation: -40 to 80 ºC (-40 to 176 °F) Flexible installation: -20 to 80 ºC (-4 to 176 °F)
Minimum bending radius (recommended)	Fixed installation: 25.6 mm (1.01 in) Flexible installation: 51.2 mm (2.02 in)
Length	2 m (6.6 ft)
Weight	±110 g (4 oz)

3.3.2 SD card

The SD card is mounted in PCM3.1 and stores operating data (future use). The SD card from DEIF meets the technical specifications below. Use this SD card to ensure that the system meets the general specifications.

Category	Specification
Memory	512 MB, 2 GB, 4 GB, or 8 GB
Protection	IP6X and IP7X, to IEC/EN 60529
Electrostatic discharge (ESD)	Contact pad: ±4 kV Non-contact pad: Coupling plane discharge: ±8 kV, Air discharge: ±15 kV To IEC 61000-4-2
Operating temperature	-40 to 70 °C (-40 to 158 °F)
Other	RoHS compliant

4. Ordering information

4.1 Ordering

4.1.1 Your order

Equipment	Product	Number
Controller*	GPU 300	
Display unit	Default: DU 300 (folio without AC detection LEDs)	
	Optional: DU 300 (folio **with** AC detection LEDs)	
Extra hardware modules (optional)	Input output module IOM3.1	
Accessories	Shielded patch cable SF/UTP CAT5e, 2 metres long**	
	512 MB SD card	
	2 GB SD card	
	4 GB SD card	
	8 GB SD card	

*Note: The controller does not include an interface. DEIF recommends that you order a display unit for each controller. Alternatively, you can order and configure a touch display from the AGI 300 series from DEIF.

**Note: A cable is included with each display unit.

4.1.2 Disclaimer

DEIF A/S reserves the right to change any of the contents of this document without prior notice.

The English version of this document always contains the most recent and up-to-date information about the product. DEIF does not take responsibility for the accuracy of translations, and translations might not be updated at the same time as the English document. If there is a discrepancy, the English version prevails.

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