

iE 150

Non-sync generator, Core software

Data sheet



1. iE 150 Non-sync generator, Core SW

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1. iE 150 Non-sync generator, Core SW

1.1 About the controller

1.1.1 About

The iE 150 Non-sync generator controller with core software provides flexible protection and control for one genset in non-synchronising applications. The controller contains all the functions needed to protect and control the genset, the genset breaker, and also a mains breaker.

The iE 150 is a compact, all-in-one controller. Each iE 150 contains all necessary 3-phase measuring circuits.

The values and alarms are shown on the LCD display screen, which is sunlight-readable. Operators can easily control the genset and breakers from the display unit. Alternatively, use the communication options to connect to an HMI/SCADA system.

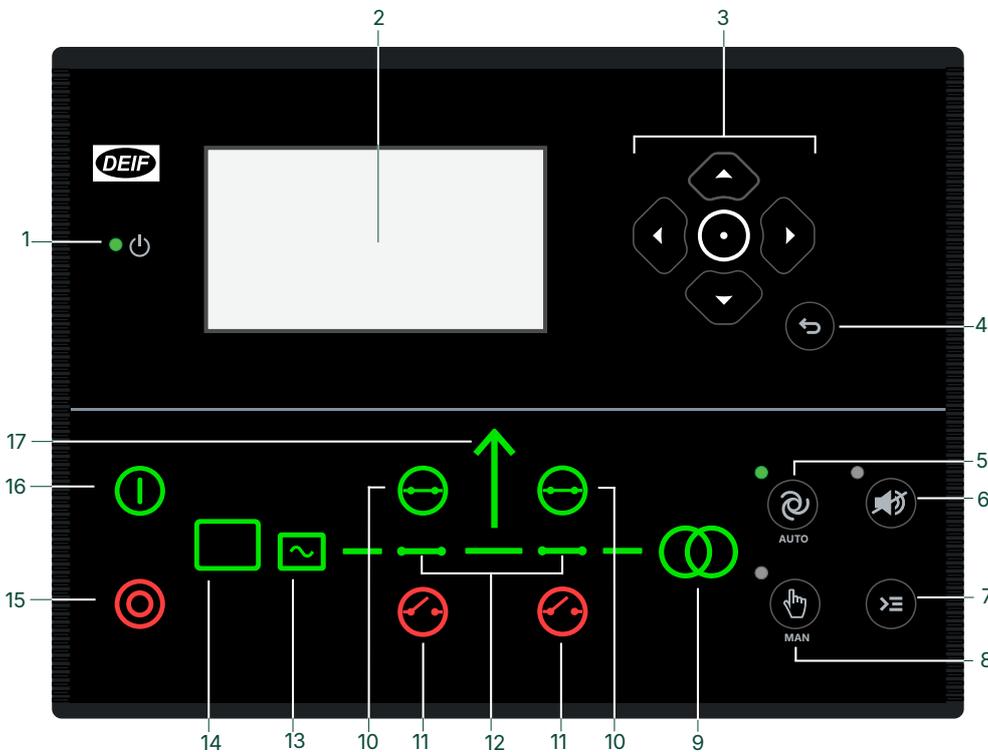
1.1.2 Software versions

The information in this document relates to software version:

Software	Details	Version
iE 150	Controller application	1.35.0

The controller comes with the **Core** software package.

1.1.3 Display layout



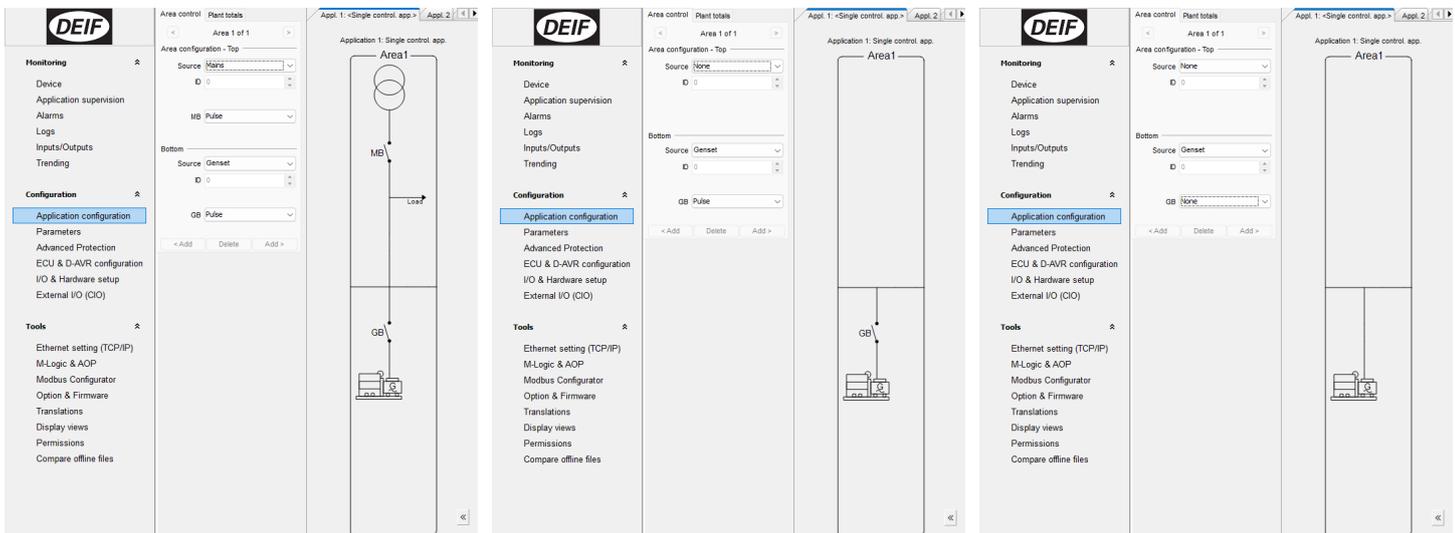
No.	Name	Function
1	Power	Green: The controller power is ON.

No.	Name	Function
		OFF: The controller power is OFF.
2	Display screen	Resolution: 240 x 128 px. Viewing area: 88.50 x 51.40 mm. Six lines, each with 25 characters.
3	Navigation	Move the selector up, down, left and right on the screen.
	 Enter button	Confirms the selection.
4	 Back button	Go to the previous page.
5	 AUTO mode	The controller automatically starts and stops (and connects and disconnects) the genset. No operator actions are needed. The controller also automatically opens and closes the mains breaker (open transitions, since there is no synchronisation).
6	 Silence horn	Turns off an alarm horn (if configured) and enters the Alarm menu.
7	 Shortcut menu	Access the Jump menu, Mode selection, Test, Lamp test
8	 Manual mode	The operator or an external signal can start, stop, connect or disconnect the genset, or open or close the mains breaker. The controller cannot automatically perform these actions.
9	Mains symbol	Green: Mains voltage and frequency are OK. The controller can close the breaker. Red: Mains failure.
10	 Close breaker	Push to close the breaker.
11	 Open breaker	Push to open the breaker.
12	Breaker symbols	Green: Breaker is closed. Red: Breaker failure.
13	Generator	Green: Generator voltage and frequency are OK. The controller can close the breaker. Green flashing: The generator voltage and frequency are OK, but the V&Hz OK timer is still running. The controller cannot close the breaker. Red: The generator voltage is too low to measure.
14	Engine	Green: There is running feedback. Green flashing: The engine is getting ready. Red: The engine is not running, or there is no running feedback.
15	 Stop	Stops the genset if manual is selected.
16	 Start	Starts the genset if manual is selected.
17	Load symbol	Green: The supply voltage and frequency are OK. Red: Supply voltage/frequency failure.

1.1.4 Easy configuration with the utility software

Set up an application easily with a PC and the utility software.

You can also use the utility software to quickly configure the inputs, outputs, parameters, and settings.



Application with two breakers

Application with one breaker

Application with no breakers

1.2 Functions and features

1.2.1 Non-sync generator controller functions

Engine features

Start and stop sequences

Engine communication

Speed sensing using CAN, MPU or frequency

Tier 4 final support

Temperature-dependent cooling down

Time-based cooling down

Fuel usage monitoring

Maintenance alarms

Configurable crank and run coil

Fuel pump monitoring, logic, and refill

Diesel exhaust fluid monitoring, logic, and refill

Generic fluid monitoring, logic, and refill

Protection packages

Engine protection

Communication with KWG ISO5 isolation monitor (CAN bus)

Operation modes

Island mode

AMF mode

Load take-over

AC functions

4 sets of nominal settings

Select the AC configuration:

- 3-phase/3-wire
- 3-phase/4-wire
- 2-phase/3wire (L1/L2/N or L1/L3/N)
- 1-phase/2-wire L1

100 to 690 V AC (selectable)

CT -/1 or -/5 (selectable)

4th current measurement (select one)

- Mains/busbar current (and power)
- Neutral current (1 × true RMS)
- Earth fault current (with 3rd harmonic filter)

Ground relay

4th current transformer measurement

Alarms

High current alarms

2

High reverse alarms

2

High power alarms

2

General functions

Built-in test sequences

(Simple test, Full test, and Battery test)

40 lines of PLC logic (M-Logic)

Counters, including:

- Breaker operations
- kWh meter (day, week, month, total)
- kvarh meter (day, week, month, total)

Setting and parameter functions

Quick setup

User-defined permission level

Password-protected setup

Trending on USW

Event logs with password, up to 500 entries

Display and language functions

Supports multiple languages

(including Chinese, Russian, and other languages with special characters)

20 configurable graphical screens

Graphical display with six lines

Parameters can be changed on the display unit

3 engine function shortcuts

Display and language functions

20 configurable shortcut buttons

5 configurable display screen "LED lamps" (on/off/blink)

Modbus functions

Modbus RS-485

Modbus TCP/IP

Configurable Modbus area

1.2.2 Supported ECUs and engines

The controller can communicate with the following ECUs and engines.

Manufacturer	ECUs	Engines	Tier 4/Stage V	Controller setting Engine I/F [7561]
Generic J1939	Any ECU that uses J1939	Any engine that uses J1939	●	Generic J1939
ANGLE	-	-	-	ANGLE
Baudouin	CPCB IV	-	-	Baudouin CPCB IV
Baudouin	WOODWARD PG+	-	-	Baudouin Gas
Baudouin	Wise 10B	-	-	Baudouin Wise10B
Baudouin	Wise 15	-	●	Baudouin Wise15
Bosch	EDC17	-	-	Bosch EDC17CV54TMTL
Caterpillar	ADEM3	C4.4, C6.6, C9, C15, C18, C32, 3500, 3600	-	Caterpillar ADEM3
Caterpillar	ADEM4	C4.4, C6.6, C9, C15, C18, C32, 3500, 3600	-	Caterpillar ADEM4
Caterpillar	ADEM5	-	-	Caterpillar ADEM5
Caterpillar	ADEM6	-	-	Caterpillar ADEM6
Caterpillar	ADEM3, ADEM4	C4.4, C6.6, C9, C15, C18, C32, 3500, 3600	-	Caterpillar Generic*
Caterpillar	-	-	-	Caterpillar with C7.1 AT
Cummins	CM 500	QSL, QSB5, QSX15 and 7, QSM11, QSK 19/23/50/60	-	Cummins CM500
Cummins	CM 558	QSL, QSB5, QSX15 and 7, QSM11, QSK 19/23/50/60	-	Cummins CM558
Cummins	CM 570	QSL, QSB5, QSX15 and 7, QSM11, QSK 19/23/50/60	-	Cummins CM570
Cummins	Cummins CM 570 Industrial	-	●	Cummins CM570 Industrial
Cummins	CM 850	QSL, QSB5, QSX15 and 7, QSM11, QSK 19/23/50/60	-	Cummins CM850
Cummins	CM 2150	QSL, QSB5, QSX15 and 7, QSM11, QSK 19/23/50/60	●	Cummins CM2150

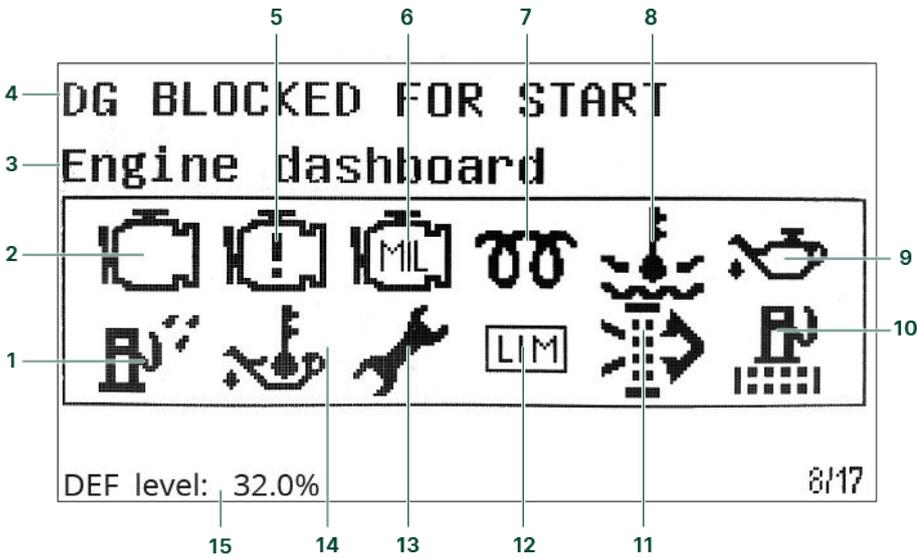
Manufacturer	ECUs	Engines	Tier 4/Stage V	Controller setting Engine I/F [7561]
Cummins	CM 2250	QSL, QSB5, QSX15 and 7, QSM11, QSK 19/23/50/60	●	Cummins CM2250
Cummins	CM 2350	-	●	Cummins CM2350
Cummins	CM 2350 Industrial	-	●	Cummins CM2350 Industrial
Cummins	CM 2358	-	●	Cummins CM2358
Cummins	CM 2850	-	●	Cummins CM2850
Cummins	CM 2880	-	●	Cummins CM2880
Cummins	CM 2880 Industrial	-	●	Cummins CM2880 Industrial
Cummins	CM 500, CM 558, CM 570, CM 850, CM 2150, and CM 2250	QSL, QSB5, QSX15 and 7, QSM11, QSK 19/23/50/60	ECU-dependent	Cummins Generic*
Cummins	-	Industrial	-	Cummins Generic Industrial
Cummins	-	KTA19	-	Cummins KTA19
Cummins	PGI	-	●	Cummins PGI
Detroit Diesel	DDEC III	Series 50, 60, and 2000	-	DDEC III
Detroit Diesel	DDEC IV	Series 50, 60, and 2000	-	DDEC IV
Detroit Diesel	DDEC III, DDEC IV	Series 50, 60, and 2000	-	DDEC Generic*
Deutz	EMR2	-	-	Deutz EMR 2
Deutz	EMR3	-	-	Deutz EMR 3
Deutz	EMR4	-	-	Deutz EMR 4
Deutz	EMR4 Stage V	-	●	Deutz EMR 4 Stage V
Deutz	EMR5	-	-	Deutz EMR 5
Deutz	EMR5 Stage V	-	●	Deutz EMR 5 Stage V
Deutz	EMR 2, EMR 3	-	-	Deutz EMR Generic*
Doosan	EDC17	-	-	Doosan G2 EDC17
Doosan	MD1	-	●	Doosan MD1
Doosan	G2 EDC17	-	●	Doosan stage 5
FPT Industrial	EDC17	-	-	FPT EDC17CV41
FPT Industrial	Bosch MD1	-	●	FPT stage V
Guascor	GCS-e ECU	-	-	Guascor GCS
Hatz Diesel	-	3/4H50 TICD	●	Hatz
Hatz Diesel	EDC17	-	-	Hatz EDC17
Isuzu	ECM	4JJ1X, 4JJ1T, 6WG1X FT-4	-	Isuzu
Iveco	CURSOR	-	-	Iveco CURSOR
Iveco	EDC7 (Bosch MS6.2),	-	-	Iveco EDC7
Iveco	CURSOR, NEF, EDC7, VECTOR 8	-	●**	Iveco Generic*
Iveco	NEF	-	-	Iveco NEF
Iveco	Bosch MD1	-	●	Iveco Stage V

Manufacturer	ECUs	Engines	Tier 4/Stage V	Controller setting Engine I/F [7561]
Iveco	Iveco NEF67	-	●	Iveco Stage V NEF67
Iveco	VECTOR 8	-	-	Iveco Vector8
JCB	-	ECOMAX DCM3.3+	●	JCB
JCB	-	P745 & P740 DieselMax Stage V Version 7	●	JCB 430/448 Stage V
Jichai	JC15D-ECU22	-	-	JC15D Weifu***
Jichai	JC15D WYS	-	-	JC15D WYS
Jichai	JC190	-	-	JC190
Jichai	JC15T JG	-	-	Jichai JC15T JG
Jing Guan	-	Gas	-	Jing Guan
John Deere	JDEC	PowerTech M, E, and Plus	●	John Deere
John Deere	FOCUS controls (version 2.1)	-	●	John Deere Stage V
Kingbang			●	Kingbang
Kohler	ECU2-HD	KD62V12	●	Kohler KD62V12
Kohler	-	KDI 3404	-	Kohler KDI 3404
Kubota	KORD3	-	●	Kubota Stage V
MAN	EDC17	-		MAN EDC17
MAN	EMC 2.0	-	-	MAN EMC Step 2.0
MAN	EMC 2.5	-	-	MAN EMC Step 2.5
MAN	EMC 2.0, EMC 2.5	-	-	MAN Generic*
MTU	MDEC module M.201	-		MDEC 2000/4000 M.201
MTU	MDEC module M.302	Series 2000 and 4000	-	MDEC 2000/4000 M.302
MTU	MDEC module M.303	Series 2000 and 4000	-	MDEC 2000/4000 M.303
MTU	MDEC module M.304	-		MDEC 2000/4000 M.304
MTU	ADEC	Series 2000 (ECU7), Series 4000 (ECU7), and MTU PX	-	MTU ADEC
MTU	ADEC, ECU7 without SAM module (software module 501)	Series 2000 and 4000	-	MTU ADEC module 501
MTU	ECU7 with SAM module	Series 2000 (ECU7), Series 4000 (ECU7), and MTU PX	-	MTU ECU7 with SAM
MTU	ECU8	-	-	MTU ECU8
MTU	ECU9	-	●	MTU ECU9
MTU	ECU9 EMINOX	-	●	MTU ECU9 EMINOX
MTU	J1939 Smart Connect, ECU8, ECU9	Series 1600	● (ECU9 or later)	MTU J1939 Smart Connect
Perkins	ADEM3	-	-	Perkins ADEM3
Perkins	ADEM4	-	-	Perkins ADEM4
Perkins	CPCB IV			Perkins CPCB IV

Manufacturer	ECUs	Engines	Tier 4/Stage V	Controller setting Engine I/F [7561]
Perkins	EDC17	-	-	Perkins EDC17C49
Perkins	ADEM3, ADEM4	Series 850, 1100, 1200, 1300, 2300, 2500, and 2800	-	Perkins Generic*
Perkins	-	Series 400 and 1200	●	Perkins Stage V
Perkins	-	Series 400 Model IQ IR IW IY IF	●	Perkins StV 400
Perkins	-	Series 1200F Model MT, MU, MV, MW, BM, and BN	●	Perkins StV 1200
Perkins	-	Series 1200J Model SU, VM	●	Perkins StV 120xJ (SU/VM)
PSI/Power Solutions	-	PSI/Power Solutions	●	PSI/Power Solutions
QiYao	-	-	-	QiYao Gas
Scania	EMS	-	-	Scania EMS
Scania	EMS S6 (KWP2000)	Dx9x, Dx12x, Dx16x	-	Scania EMS 2 S6
Scania	EMS 2 S8	DC9, DC13, DC16	●	Scania EMS 2 S8
Scania	EMS S6 (KWP2000)	Dx9x, Dx12x, Dx16x industrial engines	-	Scania S6 Industrial
Scania	EMS 2 S8	DC9, DC13, DC16 industrial engines	●	Scania S8 Industrial
SDEC	F20	-	-	SDEC F20
SDEC	F31	-	-	SDEC F31
SDEC	F36	-	-	SDEC F36
SDEC	F45	-	-	SDEC F45
Steyr	EDC17	-	-	Steyr EDC17
VECV	E694	-	-	VECV E694
Volvo Penta	CPCB4	-	-	Volvo Penta CPCB4
Volvo Penta	D12 marine	-	-	Volvo Penta D12
Volvo Penta	EDC3	-	-	Volvo Penta EDC3
Volvo Penta	EDC4	-	-	Volvo Penta EDC4
Volvo Penta	EMS, EMS2.0 to EMS2.3	D6, D7, D9, D12, D16 (GE and AUX variants only)	● (ECU v 2.3 or later)	Volvo Penta EMS2
Volvo Penta	EMS2.3	-	●	Volvo Penta EMS2.3
Volvo Penta	EMS2.4	-	●	Volvo Penta EMS2.4
Volvo Penta	EDC3, EDC4	TAD4x, TAD5x, TAD6x, TAD7x	-	Volvo Penta Generic*
Weichai	-	-	-	Weichai Baudouin E6 Gas
Weichai	WOODWARD PG+	Diesel	●	Weichai Diesel
Weichai	WOODWARD PG+	Gas	●	Weichai Gas
Weichai	Wise 10B	-	●	Weichai Wise10B
Weichai	Wise 15	-	●	Weichai Wise15

No.	Referent	Symbol	Description
3	Diesel Particle Filter (DPF)		Regeneration is needed.
4	Page name	-	
5	Controller status	-	
6	Diesel Particle Filter (DPF) Inhibit		Regeneration is inhibited.
7	High temperature - Regeneration		There is a high temperature and regeneration is in process.
8	HC burn-off		Hydrocarbon accumulation that requires burn-off.
9	Engine emission system failure level	 LOW  HIGH  WARN.	Emission failure or malfunction, with the severity.
10	Diesel Particle Filter (DPF) level	 HIGH  V.HIGH  CRITICAL	Regeneration needed, with the severity.
11	DEF level warning		Low DEF level.
12	DEF shutdown		DEF problem stops normal operation.
13	DEF level inducement		Mid-level inducement.
			Severe inducement.
14	Diesel Exhaust Fluid (DEF)		DEF quality is low.
15	Diesel Exhaust Fluid (DEF) % level		Shows the level (%) of the Diesel Exhaust Fluid.

Engine dashboard



No.	Referent	Symbol	Description
1	Water in fuel		There is water in the fuel.
2	Engine interface status		An engine warning.
3	Page name	-	-
4	Controller status	-	-
5	Engine interface status		An engine shutdown.
6	Engine interface status		An engine malfunction.
7	Cold start		The engine is cold.
8	High engine coolant temperature		The engine coolant temperature is high.
9	Low engine oil pressure		The engine oil pressure is low.
10	Fuel filter clogging		The fuel filter is blocked.
11	Air filter clogging		The air filter is blocked.
12	LIMIT lamp		Only for MTU engines.
13	Oil change		The engine needs an oil change.

No.	Referent	Symbol	Description
14	High engine oil temperature		The engine oil temperature is high.
15	Diesel Exhaust Fluid (DEF) % level		Shows the level (%) of the Diesel Exhaust Fluid.

NOTE Grey symbols show that communication is available for the referent. An engine type might not support all of the referents.

1.3 Alarms and protections

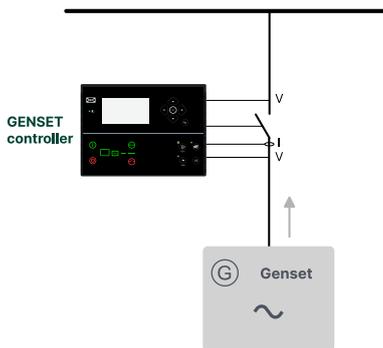
AC protections	Alarms	ANSI	Operate time
Reverse power	2	32R	<200 ms
Fast over-current	2	50P	<40 ms
Over-current	4	50TD	<200 ms
Voltage dependent over-current	1	50V	
Over-voltage	2	59	<200 ms
Under-voltage	3	27P	<200 ms
Over-frequency	3	81O	<300 ms
Under-frequency	3	81U	<300 ms
Unbalance voltage	1	47	<200 ms
Unbalance current	1	46	<200 ms
Under-excitation or reactive power import	1	32RV	<200 ms
Over-excitation or reactive power export	1	32FV	<200 ms
Overload	5	32F	<200 ms
Inverse time earth over-current	1	50G	<100 ms
Inverse time neutral over-current	1	50N	<100 ms
Mains over-voltage	3	59P	<50 ms
Mains under-voltage	4	27P	<50 ms
Mains over-frequency	3	81O	<50 ms
Mains under-frequency	3	81U	<50 ms
Emergency stop	1		<200 ms
Low auxiliary supply	1	27DC	
High auxiliary supply	1	59DC	
Generator breaker external trip	1		
Mains breaker external trip	1		
Breaker open failure	1/breaker	52BF	
Breaker close failure	1/breaker	52BF	
Breaker position failure	1/breaker	52BF	
Phase sequence error	1	47	
Hz/V failure	1		
Not in Auto	1		
Neutral inverse time over-current (4th CT)	1	50N	

AC protections	Alarms	ANSI	Operate time
Earth fault inverse time over-current (4th CT)	1	50G	
Neutral over-current (4th CT)	2		
Earth fault over-current (4th CT)	2		

Engine protections	Alarms	ANSI	Operate time
Overspeed	2	12	<400 ms
Crank failure	1	48	
Running feedback error	1	34	
MPU wire break	1	-	
Start failure	1	48	
Stop failure	1	-	
Stop coil, wire break alarm	1	-	
Engine heater	1	26	
Max. ventilation/radiator fan	1	-	
Fuel fill check	1	-	

1.4 Applications

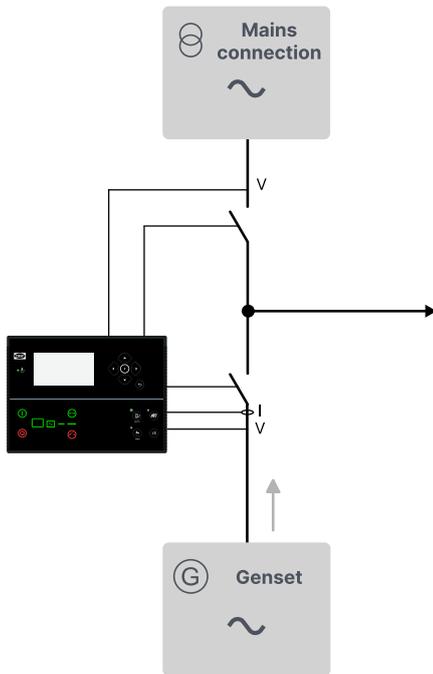
Island mode



Island mode operation is typically used in power plants that are isolated from the national (or local) electricity distribution network. Non-sync generators are not connected to the electricity grid.

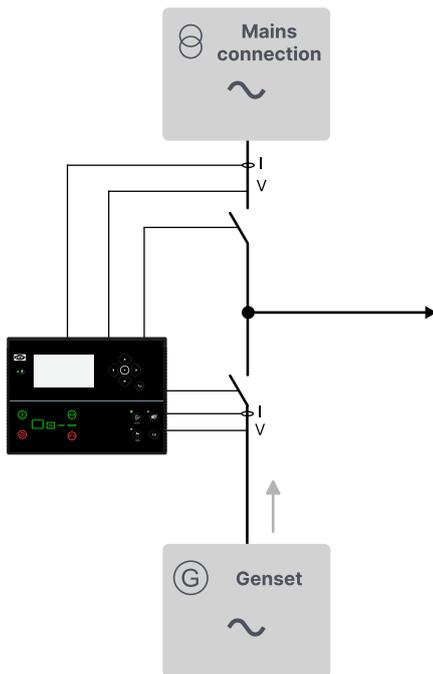
NOTE For the iE 150 Non-sync generator controller, you can disable breaker control.

Automatic mains failure (AMF)



If there is a significant loss of mains power or a total blackout, the controller automatically changes the supply to the emergency generator. This makes sure that there is power during a mains failure and prevents damage to electrical equipment.

Load take-over



Plant mode where the load is moved from mains to generator. There is a short blackout during the changeover. This can be useful during peak demand periods or periods with a risk of power outages.

NOTE Alternatively, these applications can have an externally controlled mains breaker.

1.5 Compatible products

1.5.1 Remote monitoring service: Insight

Insight is a responsive remote monitoring service (www.deif.com/products/insight). It includes real-time genset data, a customisable dashboard, GPS tracking, equipment and user management, email and/or SMS alerts, and cloud data management.

1.5.2 Additional inputs and outputs

The controller uses CAN bus communication with these:

- **CIO 116** is a remote input expansion module. See www.deif.com/products/cio-116
- **CIO 208** is a remote output expansion module. See www.deif.com/products/cio-208
- **CIO 308** is a remote I/O module. See www.deif.com/products/cio-308
- **IOM 220** and **IOM 230** each have two analogue outputs. See www.deif.com/products/iom-200230

1.5.3 Additional operator panel, AOP-2

The controller uses CAN bus communication to the additional operator panel (AOP-2). Configure the controller using M-Logic. On the AOP-2, the operator can then:

- Use the buttons to send commands to the controller.
- See LEDs light up to show statuses and/or alarms.

You can configure and connect two AOP-2s if the controller has the premium software package.

1.5.4 Remote display: iE 150

The remote display is an iE 150 that only has a power supply and an Ethernet connection to an iE 150 controller. The remote display allows the operator to see the controller's operating data, as well as operate the controller remotely.

1.5.5 Other equipment

DEIF has a wide variety of other equipment that is compatible. Here are some examples:

- **Synchrosopes**
 - **CSQ-3** (www.deif.com/products/csq-3)
- **Battery chargers/power supplies**
 - **DBC-1** (www.deif.com/products/dbc-1)
- **Current transformers**
 - **ASK** (www.deif.com/products/ask-asr)
 - **KBU** (www.deif.com/products/kbu)
- **Transducers**
 - **MTR-4** (www.deif.com/products/mtr-4)

1.5.6 Controller types

Parameter	Setting	Controller type	Minimum software
9101	Genset unit	Non-sync generator controller	Core
	Genset unit	Generator controller	Sync
	Mains unit	Mains controller	Sync
	Bus Tie Breaker unit	BTB controller	Sync
	Genset Hybrid unit	Hybrid Genset-Solar controller	Core
	Engine Drive unit	Engine drive controller	Core
	Remote display unit	Remote display	None
	Battery unit	Battery storage controller	Premium
	Solar unit	Solar controller	Premium
	ATS unit	Automatic transfer switch (open transition)	Core
	ATS unit	Automatic transfer switch (closed transition)	Sync
	Genset PMS lite unit	PMS lite controller	Sync

Software packages and controller types

The controller software package determines which functions the controller can use.

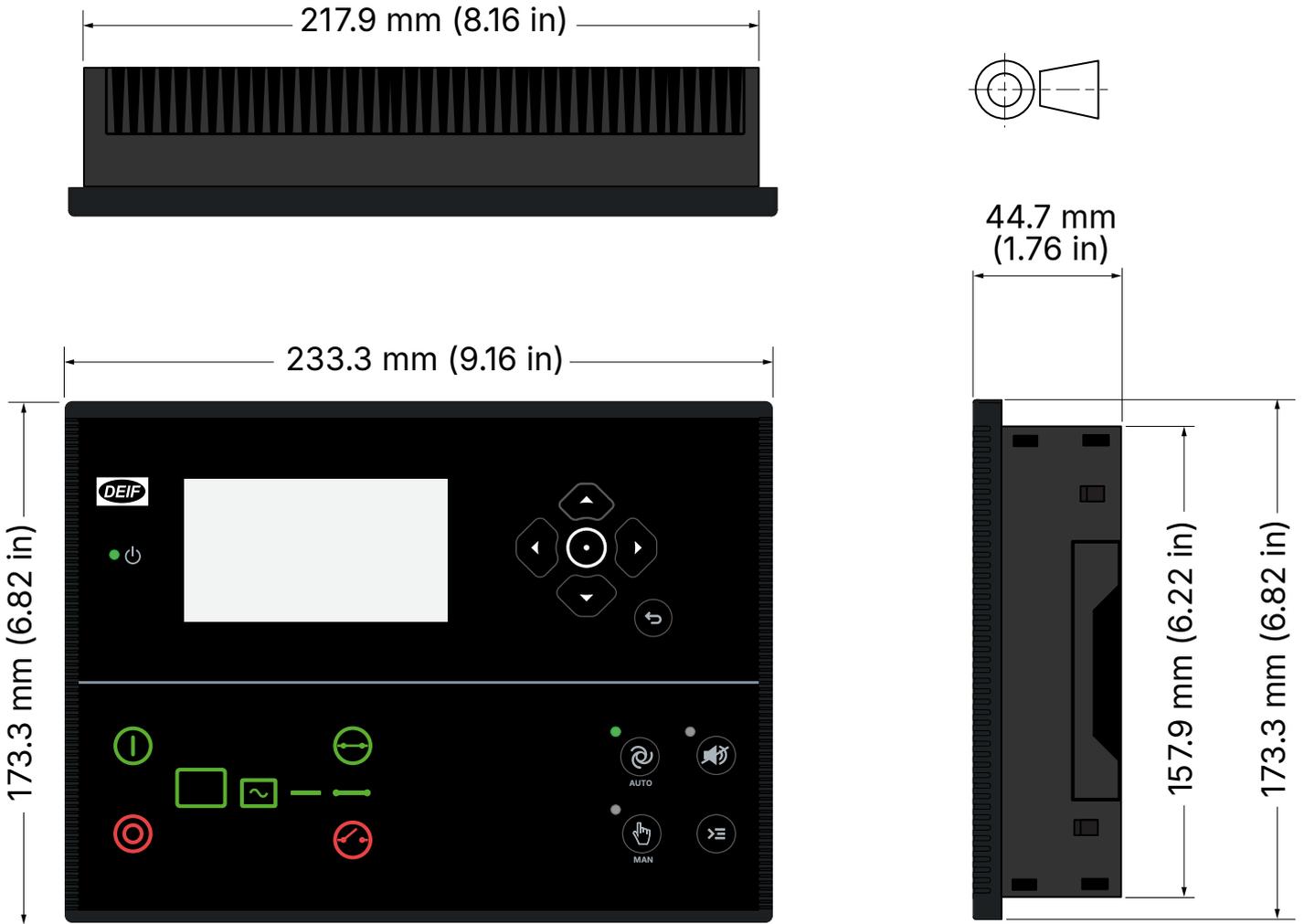
- **Core**
 - You can change the controller type to any other controller that uses **Core**.
 - **Core** software only supports non-synchronisation applications.
- **Sync**
 - You cannot change the controller type.
 - **Sync** software supports synchronisation applications.
- **PM** (power management)
 - You cannot change the controller type.
- **Premium**
 - You can change the controller type to any other controller type.
 - All functions are supported.

You can select the controller type under `Basic settings > Controller settings > Type`.

NOTE For the iE 150 Marine controllers, see www.deif.com/products/ie-150-marine.

2. Technical specifications

2.1 Dimensions



Dimensions and weight

Dimensions	Length: 233.3 mm (9.16 in) Height: 173.3 mm (6.82 in) Depth: 44.7 mm (1.76 in)
Panel cutout	Length: 218.5 mm (8.60 in) Height: 158.5 mm (6.24 in) Tolerance: ± 0.3 mm (0.01 in)
Max. panel thickness	4.5 mm (0.18 in)
Mounting	UL/cUL Listed: Type complete device, open type 1 UL/cUL Listed: For use on a flat surface of a type 1 enclosure
Weight	0.79 kg

2.2 Mechanical specifications

Operation conditions

Vibration	Response: <ul style="list-style-type: none"> 10 to 58.1 Hz, 0.15 mmpp
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Operation conditions

	<ul style="list-style-type: none"> 58.1 to 150 Hz, 1 g. To IEC 60255-21-1 (Class 2) <p>Endurance:</p> <ul style="list-style-type: none"> 10 to 150 Hz, 2 g. To IEC 60255-21-1 (Class 2) <p>Seismic vibration:</p> <ul style="list-style-type: none"> 3 to 8.15 Hz, 15 mmpp 8.15 to 35 Hz, 2 g. To IEC 60255-21-3 (Class 2)
Shock	<p>10 g, 11 ms, half sine. To IEC 60255-21-2 Response (Class 2)</p> <p>30 g, 11 ms, half sine. To IEC 60255-21-2 Withstand (Class 2)</p> <p>50 g, 11 ms, half sine. To IEC 60068-2-27, test Ea</p> <p>Tested with three impacts in each direction in three axes (total of 18 impacts per test)</p>
Bump	<p>20 g, 16 ms, half sine IEC 60255-21-2 (Class 2)</p> <p>Tested with 1000 impacts in each direction on three axes (total of 6000 impacts per test)</p>
Galvanic separation	<p>CAN port 2 (CAN B): 550 V, 50 Hz, 1 minute</p> <p>RS-485 port 1: 550 V, 50 Hz, 1 minute</p> <p>Ethernet: 550 V, 50 Hz, 1 minute</p> <p>Analogue output 51-52 (GOV): 550 V, 50 Hz, 1 minute</p> <p>Analogue output 54-55 (AVR): 3000 V, 50 Hz, 1 minute</p> <p>Note: No galvanic separation on CAN port 1 (CAN A) and RS-485 port 2</p>
Safety	<p>Installation CAT. III 600 V</p> <p>Pollution degree 2</p> <p>IEC/EN 60255-27</p>
Flammability	All plastic parts are self-extinguishing to UL94-V0
EMC	IEC/EN 60255-26

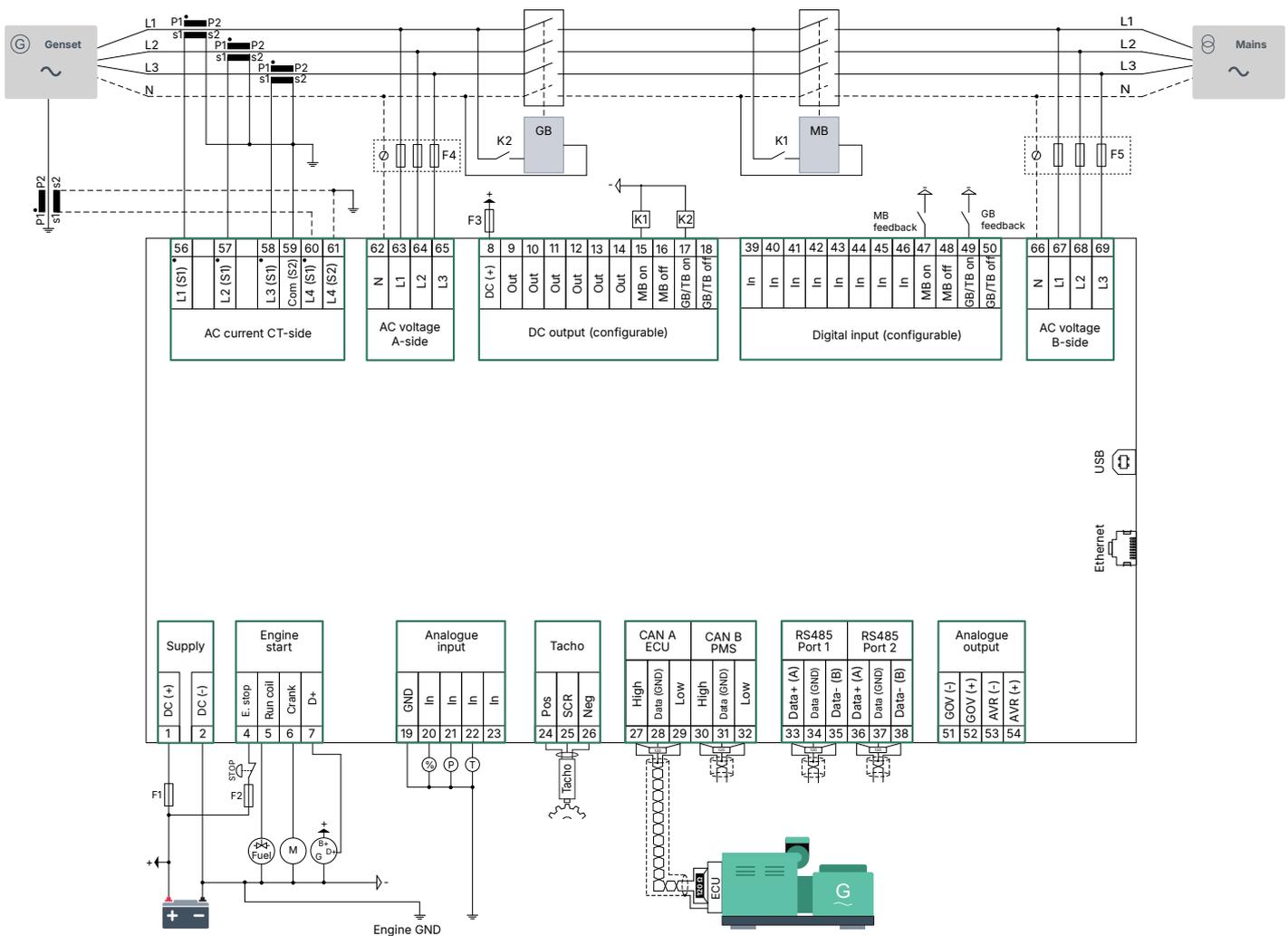
2.3 Environmental specifications

Operation conditions

Operating temperature (incl. display screen)	-40 to +70 °C (-40 to +158 °F)
Storage temperature (incl. display screen)	-40 to +85 °C (-40 to +185 °F)
Accuracy and temperature	Temperature coefficient: 0.2 % of full scale per 10 °C
Operating altitude	0 to 4000 m with derating
Operating humidity	Damp Heat Cyclic, 20/55 °C at 97 % relative humidity, 144 hours. To IEC 60255-1 Damp Heat Steady State, 40 °C at 93 % relative humidity, 240 hours. To IEC 60255-1
Change of temperature	70 to -40 °C, 1 °C / minute, 5 cycles. To IEC 60255-1
Protection degree	<p>IEC/EN 60529</p> <ul style="list-style-type: none"> IP65 (front of module when installed into the control panel with the supplied sealing gasket) IP20 on terminal side

2.4 Controller

2.4.1 Typical wiring for non-sync generator controller



Fuses

- F1: 2 A DC max. time-delay fuse/MCB, c-curve
- F2: 6 A DC max. time-delay fuse/MCB, c-curve
- F3: 4 A DC max. time-delay fuse/MCB, b-curve
- F4, F5: 2 A AC max. time-delay fuse/MCB, c-curve

2.4.2 Electrical specifications

Power supply	
Power supply range	Nominal voltage: 12 V DC or 24 V DC Operating range: 6.5 to 36 V DC
Voltage withstand	Reverse polarity
Power supply drop-out immunity	0 V DC for 50 ms (coming from min. 6 V DC)
Power supply load dump protection	Load dump protected according to ISO16750-2 test A
Power consumption	5 W typical 12 W max.
RTC clock	Time and date backup

Supply voltage monitoring

Measuring range	0 V to 36 V DC Max. continuous operating voltage: 36 V DC
Resolution	0.1 V
Accuracy	± 0.35 V

Voltage measurement

Voltage range	Nominal range: 100 to 690 V phase-to-phase (above 2000 m derate to max. 480 V)
Voltage withstand	$U_n + 35$ % continuously, $U_n + 45$ % for 10 seconds Measuring range of nominal: 10 to 135 % Low range, nominal 100 to 260 V: 10 to 351 V AC phase-to-phase High range, nominal 261 to 690 V: 26 to 932 V AC phase-to-phase
Voltage accuracy	± 1 % of nominal within 10 to 75 Hz $+1/-4$ % of nominal within 3.5 to 10 Hz
Frequency range	3.5 to 75 Hz
Frequency accuracy	± 0.01 Hz within 60 to 135 % of nominal voltage ± 0.05 Hz within 10 to 60 % of nominal voltage
Input impedance	4 M Ω /phase-to-ground, and 600 k Ω phase/neutral

Current measurement

Current range	Nominal: -/1 A and -/5 A Range: 2 to 300 %
Number of CT input	4
Max. measured current	3 A (-/1 A) 15 A (-/5 A)
Current withstand	7 A continuous 20 A for 10 seconds 40 A for 1 second
Current accuracy	From 10 to 75 Hz: <ul style="list-style-type: none">± 1 % of nominal from 2 to 100% current± 1 % of measured current from 100 to 300 % current From 3.5 to 10 Hz: <ul style="list-style-type: none">$+1/-4$ % of nominal from 2 to 100 % current$+1/-4$ % of measured current from 100 to 300 % current
Burden	Max. 0.5 VA

Power measurement

Accuracy power	± 1 % of nominal within 35 to 75 Hz
Accuracy power factor	± 1 % of nominal within 35 to 75 Hz

D+

Excitation current	210 mA, 12 V 105 mA, 24 V
Charging fail threshold	6 V

Tacho input	
Voltage input range	+/- 1 V _{peak} to 70 V _{peak}
W	8 to 36 V
Frequency input range	10 to 10 kHz (max.)
Frequency measurement tolerance	1 % of reading

Digital inputs	
Number of inputs	12 x digital inputs Negative switching
Maximum input voltage	+36 V DC with respect to plant supply negative
Minimum input voltage	-24 V DC with respect to plant supply negative
Current source (contact cleaning)	Initial 10 mA, continuous 2 mA

DC outputs	
Number of 3 A outputs	2 x outputs (for fuel and crank) 15 A DC inrush and 3 A continuous, supply voltage 0 to 36 V DC Endurance tested according to UL/ULC6200:2019 1.ed: 24 V, 3 A, 100000 cycles (with an external freewheeling diode)
Number of 0.5 A outputs	10 x outputs 2 A DC inrush and 0.5 A continuous, supply voltage 4.5 to 36 V DC
Common	12/24 V DC

Analogue inputs	
Number of inputs	4 x analogue inputs
Electrical range	Configurable as: <ul style="list-style-type: none"> Negative switching digital input 0 V to 10 V sensor 4 mA to 20 mA sensor 0 Ω to 2.5 kΩ sensor
Accuracy	Current: <ul style="list-style-type: none"> Accuracy: ±20 uA ±1.00 % rdg Voltage: <ul style="list-style-type: none"> Range: 0 to 10 V DC Accuracy: ±20 mV ±1.00 % rdg RMI 2-wire LOW: <ul style="list-style-type: none"> Range: 0 to 800 Ω Accuracy: ±2 Ω ±1.00 % rdg RMI 2-wire HIGH: <ul style="list-style-type: none"> Range: 0 to 2500 Ω Accuracy: ±5 Ω ±1.00 % rdg

Voltage regulator output	
Output types	Isolated DC voltage output
Voltage range	-10 to +10 V DC
Resolution in voltage mode	Less than 1 mV

Voltage regulator output	
Maximum common mode voltage	±3 kV
Minimum load in voltage mode	500 Ω
Accuracy	±1 % of setting value

Speed governor output	
Output types	Isolated DC voltage output Isolated PWM output
Voltage range	-10 to +10 V DC
Resolution in voltage mode	Less than 1 mV
Maximum common mode voltage	±550 V
Minimum load in voltage mode	500 Ω
PWM frequency range	1 to 2500 Hz ±25 Hz
PWM duty cycle resolution (0-100%)	12 bits (4096 steps)
PWM voltage range	1 to 10.5 V
Voltage accuracy	±1% of setting value

Display unit	
Type	Graphical display screen (monochrome)
Resolution	240 x 128 pixels
Navigation	Five-key menu navigation
Log book	Data log and trending function
Language	Multi-language display

2.4.3 Communication

Communication	
CAN A	<p>You can connect these in a daisy chain (and operate them at the same time):</p> <ul style="list-style-type: none"> • Engine CAN Port • CIO 116, CIO 208, CIO 308, IOM 220, and IOM 230 <p>Data connection 2-wire + common, or 3-wire Not isolated External termination required (120 Ω + matching cable) DEIF engine specification (J1939 + CANopen)</p>
CAN B	<p>Used for: AOP-2 Data connection 2-wire + common, or 3-wire Isolated External termination required (120 Ω + matching cable) PMS 125 kbit and 250 kbit</p>
RS-485 Port 1	<p>Used for: Modbus RTU, PLC, SCADA, Remote monitoring (Insight) Data connection 2-wire + common, or 3-wire Isolated External termination required (120 Ω + matching cable) 9600 to 115200</p>
RS-485 Port 2	<p>Used for: Modbus RTU, PLC, SCADA, Remote monitoring (Insight) Data connection 2-wire + common, or 3-wire Not isolated</p>

Communication	
	External termination required (120 Ω + matching cable) 9600 to 115200
RJ45 Ethernet	Used for: <ul style="list-style-type: none"> • Modbus to PLC, SCADA, and so on • NTP time synchronisation with NTP servers • PC utility software Isolated Auto detecting 10/100 Mbit Ethernet port
USB	Service port (USB-B)

2.5 Approvals

Standards
CE
UL/cUL Listed to - UL/ULC6200:2019 1.ed. Controllers for Use in Power Production

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

2.5.1 UL/cUL Listed

Requirements	
Installation	To be installed in accordance with the NEC (US) or the CEC (Canada)
Enclosure	A suitable type 1 (flat surface) enclosure is required Unventilated/ventilated with filters for controlled/pollution degree 2 environment
Mounting	Flat surface mounting
Connections	Use 90 °C copper conductors only
Wire size	AWG 30-12
Terminals	Tightening torque: 5-7 lb-in.
Current transformers	Use Listed or Recognized isolating current transformers
Communication circuits	Only connect to communication circuits of a listed system/equipment

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