DATA SHEET

AGC 150

1. Product description

2. Power management

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1. Product description

1.1 Controller description

1.1.1 General description

AGC 150 is a controller containing all necessary functions for protection and control of a genset, a mains breaker, and a bus tie breaker. It can be used as a single controller for one genset, or a number of controllers can be connected in a complete power management system for synchronising projects, island applications or running parallel to mains.

AGC 150 is an economical solution for genset builders, who need a flexible generator protection and controller for small to large genset applications.

AGC 150 contains all necessary 3-phase measuring circuits, and all values and alarms are presented on the sunlight readable LCD display screen.

1.1.2 Applications

AGC 150 is a compact all-in-one unit designed for the following applications:

Standard plant modes	Applications
Island mode	Power plant with synchronising generators or a stand-alone generator. It can also be used in critical power plants.
Automatic Mains Failure	Critical power/emergency standby plants, black start generator.
Fixed power	Power plant with fixed kW set point (including building load).
Peak shaving	Power plant where generator supplies peak load demand paralleled to the mains.
Load take-over	Plant mode where the load is moved from mains to generator, e.g. peak demand periods or periods with risk of power outages.
Mains power export	Power plant with fixed kW set point (excluding building load).

The plant modes are configurable. The plant mode can be changed at any time, both in single and in power management applications. All modes can be combined with Automatic Mains Failure mode (AMF).

The genset is easily controlled from the display unit, or a HMI/SCADA system can be implemented via the communication options.

1.1.3 Controller types

The AGC 150 controller comes in six different types.

Select the controller type under **Settings > Basic settings > Controller settings > Type**.

Parameter no.	Controller type	Device type
9101	Genset controller	DG unit
	Mains controller	Mains unit
	BTB controller	BTB unit
	Hybrid controller	DG HYBRID unit
	Engine Drive controller	ENGINE DRIVE unit
	Remote Display	Remote unit

1.1.4 Software packages

To fit the need of the applications you can choose between four software packages:

Software package	Application type
Stand-alone	Non sync. application
Core	
Extended	Sync. application
Premium	

The functions included in the software packages depend on the controller type.

📖 **More information**
See **Functions and features** for more information about the software packages.

1.2 Functions and features

1.2.1 Front overview
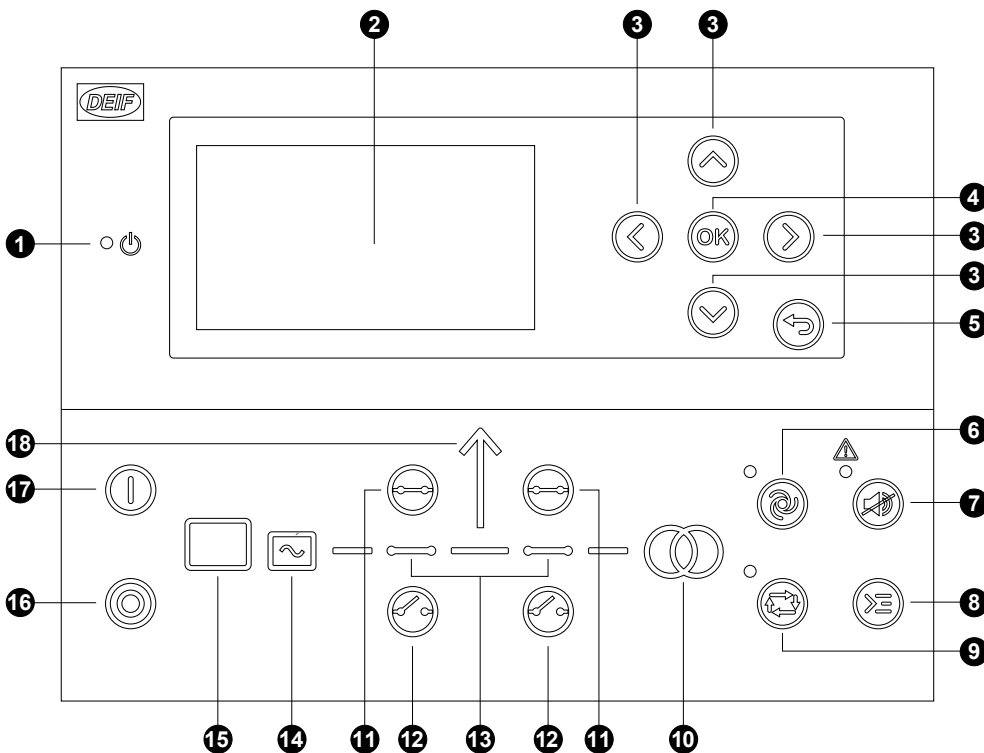
No.	Name	Function
1	Power ON	Green: The controller power is ON. OFF: The controller power is OFF.
2	Display screen	Resolution: 240 x 128 px. Viewing area: 88.50 x 51.40 mm. Six lines, each with 25 characters.
3	Navigation	Move the selector up, down, left and right on the screen.
4	OK	Enter the Menu system. Confirm the selection on the screen.
5	Back	Go to the previous page.

No.	Name	Function
6	AUTO mode	The controller automatically starts and stops gensets according to the system settings. No operator actions are needed.
7	Silence horn	Turns off an alarm horn (if configured) and enters the Alarm menu.
8	Shortcut menu	Gives access to: Jump menu, Mode selection, Test, Lamp test, Hybrid (PV semi start and stop).
9	SEMI-AUTO mode	The controller cannot automatically start, stop, connect or disconnect the genset. The operator can start, stop, connect or disconnect the genset. The controller automatically synchronises before closing a breaker, and automatically de-loads before opening a breaker.
10	Mains symbol	Green: Mains voltage and frequency are OK. The controller can synchronise and close the breaker. Red: Mains failure.
11	Close breaker	Press to close the breaker.
12	Open breaker	Press to open the breaker.
13	Breaker symbols	Green: Breaker is ON. Green flashing: Synchronising or de-loading. Red: Breaker failure.
14	Generator	Green: Generator voltage and frequency are OK. The controller can synchronise and 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.
15	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.
16	Stop	Stops the genset if SEMI-AUTO or Manual is selected.
17	Start	Starts the genset if SEMI-AUTO or Manual is selected.
18	Load symbol	OFF: Power management application. Green: The supply voltage and frequency are OK. Red: Supply voltage/frequency failure.

1.2.2 Genset controller functions

Synchronising features	Software packages			
	Stand-alone	Core	Extended	Premium
Non synchronising	x			
Synchronising (dynamic)		x	x	x
Synchronising (static)			x	x
CBE (run up sync)			x	x
Short time parallel		x	x	x

Engine features	Software packages			
	Stand-alone	Core	Extended	Premium
Start and stop sequences	x	x	x	x
Built-in analogue GOV control		x	x	x
External analogue GOV control via IOM 230		x	x	x
Engine communication	x	x	x	x

Engine features	Software packages			
	Stand-alone	Core	Extended	Premium
Speed sensing via CAN, MPU or frequency	x	x	x	x
Tier 4 final support	x	x	x	x
Derate engine			x	x
Temperature-dependent cooling down	x	x	x	x
Time-based cooling down	x	x	x	x
Fuel usage monitoring	x	x	x	x
Ventilation fan control			x	x
Fuel pump logics	x	x	x	x
Maintenance alarms	x	x	x	x
Power ramp up and down control		x	x	x
Configurable crank and run coil	x	x	x	x

Generator features	Software packages			
	Stand-alone	Core	Extended	Premium
Built-in analogue AVR control		x	x	x
External analogue AVR control via IOM 230		x	x	x
Digital AVR control: Remote configuration, DVC - DEIF		x	x	x
Remote I/Os (CIO module support)	x	x	x	x
Selectable 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	x x x x	x x x x	x x x x	x x x x
Step-up transformer (with phase angle compensation)			x	x

Protection packages	Software packages			
	Stand-alone	Core	Extended	Premium
Engine protection	x	x	x	x
Vector jump			x	x
df/dt (ROCOF)			x	x
Under-voltage and reactive power, U and Q			x	x
Average busbar over-voltage			x	x
AC directional over-current protection			x	x
Negative sequence current (ANSI 46)			x	x
Negative sequence voltage (ANSI 47)			x	x
Zero sequence current (ANSI 51 I0)			x	x
Zero sequence voltage (ANSI 59 U0)			x	x
Power-dependent reactive power (ANSI 40)			x	x
Inverse time over-current (ANSI 51)			x	x
Grid support (frequency-dependent droop)				x

Operation modes	Software packages			
	Stand-alone	**Core**	**Extended**	**Premium**
Island mode	x	x	x	x
AMF mode	x	x	x	x
Load take-over	x	x	x	x
Fixed power		x	x	x
Mains power		x	x	x
Peak shaving		x	x	x
Ventilation	x	x	x	x
Dry alternator	x	x	x	x

Load sharing	Software packages			
	Stand-alone	**Core**	**Extended**	**Premium**
Equal load sharing via power management		x	x	x
Analogue load sharing (with IOM 230)		x	x	x
Digital load sharing (CANshare)		x	x	x

Power management features	Software packages			
	Stand-alone	**Core**	**Extended**	**Premium**
Multi-master system		x	x	x
Power management operation: • Number of genset controllers • Number of mains controllers • Number of BTB controllers		16 8 8	32 32 8	32 32 8
Hybrid ready (compatible with ASC-4)			x	x
Load controller support (compatible with ALC-4)			x	x
Load-dependent Start/Stop		x	x	x
EasyConnect		x	x	x
Asymmetrical load sharing			x	x
Secure mode			x	x
Priority selection: • Manual • Running hours • Fuel optimisation		x x	x x	x x x
Safety stop of genset		x	x	x

General features	Software packages			
	Stand-alone	**Core**	**Extended**	**Premium**
Nominal settings	4	4	4	4
User permission level	x	x	x	x
Password protected setup	x	x	x	x
Language support (incl. Chinese, Russian and other languages)	x	x	x	x

General features	Software packages			
	Stand-alone	**Core**	**Extended**	**Premium**
20 configurable graphical screens	x	x	x	x
Six lines graphical display	x	x	x	x
Trending on USW	x	x	x	x
Event logs with password, up to 500 entries	x	x	x	x
Parameters editable from display unit	x	x	x	x
Ground relay	x		x	x
4th current measurement (Mains, Tie, Neutral, Ground)	x	x	x	x
Emulation for testing and front load commissioning		x	x	x
Quick setup	x	x	x	x
Built-in test sequences (Simple test, Load test, Full test and Battery test)	x	x	x	x
PLC logic (M-logic)	20 lines	20 lines	40 lines	80 lines
Modbus RS485	x	x	x	x
Modbus TCP/IP	x	x	x	x
Configurable Modbus area	x	x	x	x
General purpose PID regulators (2 x built-in analogue outputs)				x
4 additional analogue outputs (via 2 x IOM 230)				x
Simple load shedding and adding			x	x
Changeable controller type			x	x
Number of supported AOP-2	1	1	1	2

1.2.3   Supported controllers and engines

AGC 150 can communicate with the following controllers and engines:

Manufacturer	Controllers	Engines	After treatment	Write commands
Generic J1939	Any controller that uses J1939	Any engine that uses J1939	Tier 4/Stage V	Yes
Caterpillar	ADEM III and A4	C4.4, C6.6, C9, C15, C18, C32, 3500, 3600		Yes
Cummins	CM 500/558/570/850/2150/2250	QSL, QSB5, QSX15 and 7, QSM11, QSK 19/23/50/60		Yes
Detroit Diesel	DDEC III and IV	Series 50, 60 and 2000		Yes
Deutz	EMR3, EMR 2 (EMR)	912, 913, 914 and L2011		Yes
FPT Stage V	Bosch MD1		Tier 4/Stage V	Yes
Hatz		3/4H50 TICD	Tier 4/Stage V	Yes
IOM-220/230				
Isuzu	ECM	4JJ1X, 4JJ1T, 6WG1X FT-4	Tier 4/Stage V (version 2.3 or later)	Yes

Manufacturer	Controllers	Engines	After treatment	Write commands
Iveco	EDC7 (Bosch MS6.2), NEF, CURSOR and VECTOR 8			Yes
Iveco Stage V	Bosch MD1		Tier 4/Stage V	Yes
JCB		Tier 4 Ecomax DCM3.3+	Tier 4/Stage V	Yes
John Deere	JDEC	PowerTech M, E and Plus	Tier 4/Stage V	Yes
John Deere	JDEC Stage V		Tier 4/Stage V	Yes
Kohler	ECU2-HD	KD62V12		Yes
MAN	EMC (MFR) Step 2.0, EMC (MFR) Step 2.5		Tier 4/Stage V	Yes
Moteurs Baudouin	ECU WISE15			Yes
MTU	ADEC, ECU7, with SAM module	Series 2000 and 4000 (ECU7), MTU PX		Yes
MTU	ADEC, (ECU7) without SAM module (software module 501)	Series 2000 and 4000		Yes
MTU	MDEC, module M.201 or M.304	Series 2000 and 4000		Yes
MTU	MDEC, module M.302 or M.303	Series 2000 and 4000		Yes
MTU	J1939 Smart Connect, (ECU8) ECU9	Series 1600	Tier 4/Stage V (version 9 or later)	Yes
Perkins	ADEM III and A4	Series 850, 1100, 1200, 1300, 2300, 2500 and 2800		Yes
Perkins		Series 400	Tier 4/Stage V	Yes
PSI/Power Solutions		PSI/Power Solutions		Yes
Scania	EMS			Yes
Scania	EMS 2 S6 (KWP2000)	Dx9x, Dx12x, Dx16x		Yes
Scania	EMS 2 S8	DC9, DC13, DC16	Tier 4/Stage V	Yes
Volvo Penta	EDC4			Yes
Volvo Penta	EMS			Yes
Volvo Penta	EMS 2.0 to EMS 2.3, EDCIII	D6, D7, D9, D12, D16 (GE and AUX variants only)	Tier 4/Stage V (version 2.3 or later)	Yes
Volvo Penta	EMS 2.4		Tier 4/Stage V	yes
Weichai Diesel	Wise 15		Tier 4/Stage V	Yes
Weichai Gas	Wise 15		Tier 4/Stage V	Yes
Yuchai United Diesel			Tier 4/Stage V	Yes
Yuchai United Gas			Tier 4/Stage V	Yes

NOTE   For support of controller/engine types not listed, contact DEIF A/S.

1.2.4 Mains controller functions

Mains controller functions
Synchronising
Short time parallel between MB and TB
kWh meter, day/week/month/total
kvarh meter, day/week/month/total
Breaker operation counter
Password protected setup
Nominal settings
Customised display views
Mains current (3 × true RMS)
CT selectable -/1 or -/5
100 to 690 V AC selectable
Mains/busbar voltage (3-phase/4-wire)
Mains power, Tie power, neutral current (1 × true RMS) or ground current with 3rd harmonic filter
Selectable 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
Phase angle compensation generator/busbar/mains synchronising over a transformer
Multi-master system
ATS control
Load management
Quick setup for rental groups
Plant PF control
Mains feeder control, feeders paralleled
Main feeders control, main-tie-main for critical power

1.2.5 BTB controller functions

BTB controller functions
Synchronising
kWh meter, day/week/month/total
kvarh meter, day/week/month/total
Breaker operation counter
Password protected setup
Nominal settings for rental gensets
Customised display views
CT selectable -/1 or -/5
100 to 690 V AC selectable

BTB controller functions
Neutral current (1 × true RMS) or ground current with 3rd harmonic filter
Selectable 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
Phase angle compensation generator/busbar/mains synchronising over a transformer
Multi-master system
Section power control

1.2.6 Engine Drive controller functions

Engine Drive controller functions
Engine start and stop sequence
Engine protection (speed, oil pressure, oil temperature)
Tier 4F and Stage V engine support
Fixed speed or variable regulation speed
PIDs for controlling user defined set points
Reference value for PIDs by analogue inputs
Ramp function for loading and unloading
Manual speed control by digital inputs or by buttons in the shortcut menu

1.2.7 Hybrid controller functions

Hybrid controller functions
Minimum genset load requirement
Solar power load calculation
PV integration
PV/diesel applications
PV power counters (kWh)
PV breaker feedback
Inverter monitoring
Inverter start/stop logic
Weather station support

NOTE Hybrid controller functions are only supported by Stand-alone, Core and Extended software packages.

1.2.8 Remote Display controller functions

Remote Display controller functions
The Remote Display mirroring the master controller
All master controller features accessible on the Remote Display
Ethernet connection through switch or directly point-to-point

1.2.9 Additional operator panel, AOP-2

The AOP-2 is an additional operator panel that can be connected to AGC 150 via a CAN bus communication port. It can be used as an interface to the controller for indication of status and alarms together, and with buttons for, for example, alarm acknowledge and mode selection.

- Stand-alone, Core, and Extended software packages support the use of a single AOP-2.
- Premium software package supports the use of two AOP-2.

1.2.10 Emulation

AGC 150 includes an emulation tool to verify and test the functionality of the application, for example plant modes and logics, breaker handling, mains and generator operation.

Application emulation is useful for training, customising plant requirements and for testing basic functionality that needs to be set up or verified.

In a power management system it is possible to control the entire plant, when connected to just one of the controllers.

1.2.11 Easy configuration with the Utility Software

Setup of an application is easily made with a PC and the Utility Software.
The basic plant control is set up with a few basic plant conditions, including mains feeder handling and operation of the generators.
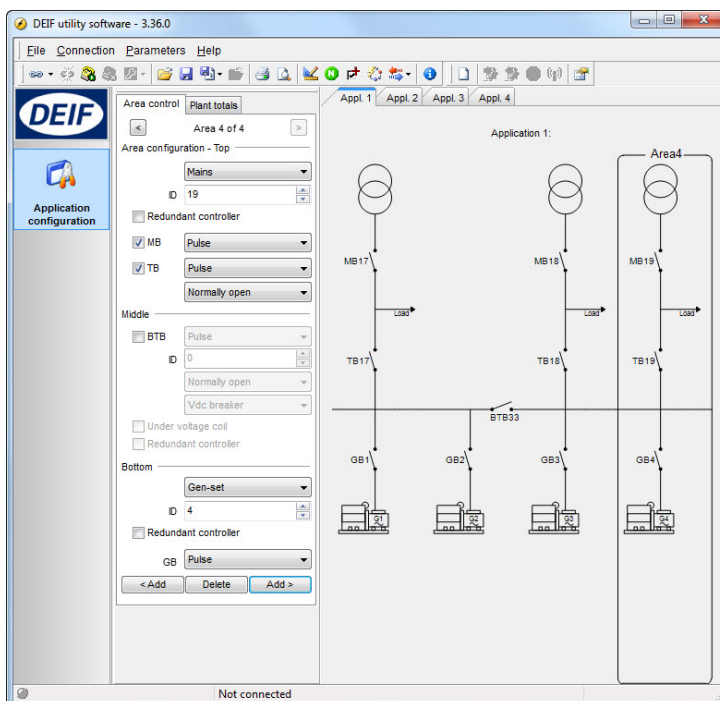
1.3 Protections

1.3.1 Protections overview

Protections	No. of	ANSI	Operate time	Genset	Mains	BTB
Reverse power	x2	32R	<200 ms	x	x	x
Fast over-current	x2	50P	<40 ms	x	x	x
Over-current	x4	50TD	<200 ms	x	x	x
Voltage dependent over-current	x1	51V		x	x	x
Over-voltage	x2	59	<200 ms	x	x	x
Under-voltage	x3	27P	<200 ms	x	x	x
Over-frequency	x3	81O	<300 ms	x	x	x
Under-frequency	x3	81U	<300 ms	x	x	x
Unbalanced voltage	x1	47	<200 ms	x	x	x
Unbalanced current	x1	46	<200 ms	x	x	x
Under-excitation or reactive power import	x1	32RV	<200 ms	x		
Over-excitation or reactive power export	x1	32FV	<200 ms	x		
Overload	x5	32F	<200 ms	x	x	x
Earth current	x1	51G	<100 ms	x	x	x
Neutral current	x1	51N	<100 ms	x	x	x
Busbar/mains over-voltage	x3	59P	<50 ms	x	x	x
Busbar/mains under-voltage	x4	27P	<50 ms	x	x	x
Busbar/mains over-frequency	x3	81O	<50 ms	x	x	x
Busbar/mains under-frequency	X3	81U	<50 ms	x	x	x
Emergency stop	x1	1	<200 ms	x		
Overspeed	x2	12	<400 ms	x		
Low auxiliary supply	x1	27DC		x	x	x
High auxiliary supply	x1	59DC		x	x	x
Generator breaker external trip	x1	5		x		
Tie/mains breaker external trip	x1	5			x	x
Synchronisation failure alarms		25		x	x	x
Breaker open failure		52BF		x	x	x
Breaker close failure		52BF		x	x	x
Breaker position failure		52BF		x	x	x
Close before excitation failure	x1	48		x		
Phase sequence error	x1	47		x	x	x
De-load error	x1	34		x		
Crank failure	x1	48		x		
Running feedback error	x1	34		x		
MPU wire break	x1	NA		x		
Start failure	x1	48		x		

Protections	No. of	ANSI	Operate time	Genset	Mains	BTB
Hz/V failure	x1	53		x		
Stop failure	x1	48		x		
Stop coil, wire break alarm	x1	5		x		
Engine heater	x1	26		x		
Max. ventilation/radiator fan	x2	NA		x	x	x
Not in Auto	x1	34		x	x	x
Fuel fill check	x1	NA		x		
Vector jump	x1	78	<40 ms	x	x	
df/dt (ROCOF)	x1	81R	<130 ms	x	x	x
Under-voltage and reactive power, U and Q	x2		<250 ms	x	x	
Positive sequence (mains) voltage low	x1	27	<60 ms	x	x	
Directional over-current	x2	67	<100 ms	x	x	
Negative sequence voltage high	x1	47	<400 ms	x	x	
Negative sequence current high	x1	46	<400 ms	x		
Zero sequence voltage high	x1	59U0	<400 ms	x	x	
Zero sequence current high	x1	50G	<400 ms	x	x	
Power-dependent reactive power	x1	40	-	x		
IEC/IEEE inverse time over-current	x1	51	-	x	x	

1.4   Single-line application diagrams

1.4.1   Single genset applications

Island mode
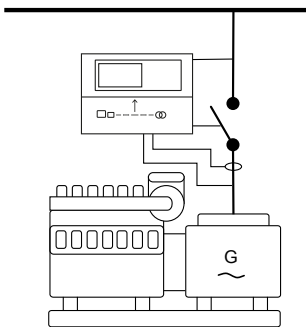
Island mode operation is typically used in power plants that operate in isolation from the national or local electricity distribution network.

There are two key types of island mode operation:

- Stand-alone generators not connected to the electricity grid
- Generators connected to the electricity grid in parallel mode, meaning they can generate power independently on demand
- Breaker control can be disabled with the Stand-alone software package

Automatic mains failure (AMF) and fixed power
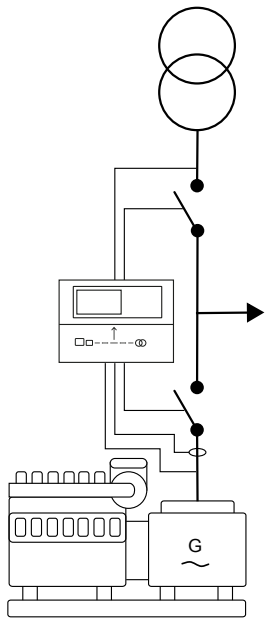
Automatic Mains Failure: In the event of a significant loss of mains power or a total blackout, the Automatic Mains Failure (AMF) controller changes supply to the emergency generator. This ensures power delivery during a mains failure and prevents potential damage to electrical equipment.

Fixed power: When given a signal, the system automatically starts the genset and synchronises to the mains. After the generator breaker closure, the unit ramps up the load to the set point level. When the stop command is given, the genset is de-loaded and stopped after the cooling down period.

Peak shaving, load take-over and mains power export
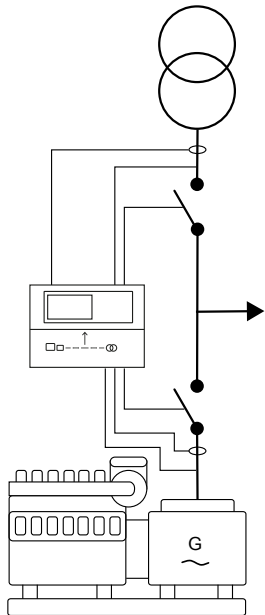
- Peak shaving: Power plant where generator supplies peak load demand parallel to mains.
- Load take-over: Plant mode where the load is moved from mains to generator, e.g. peak demand periods or periods with risk of power outages.
- Mains power export: Power plant with fixed kW set point (excluding increasing load).
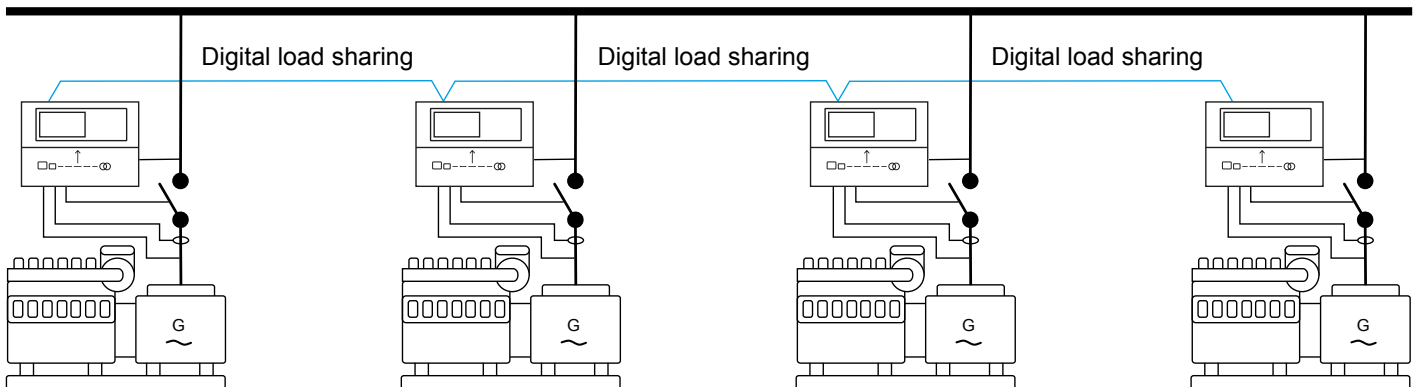
1.4.2   Multiple gensets application

Analogue load sharing (with optional IOM 230 external box)
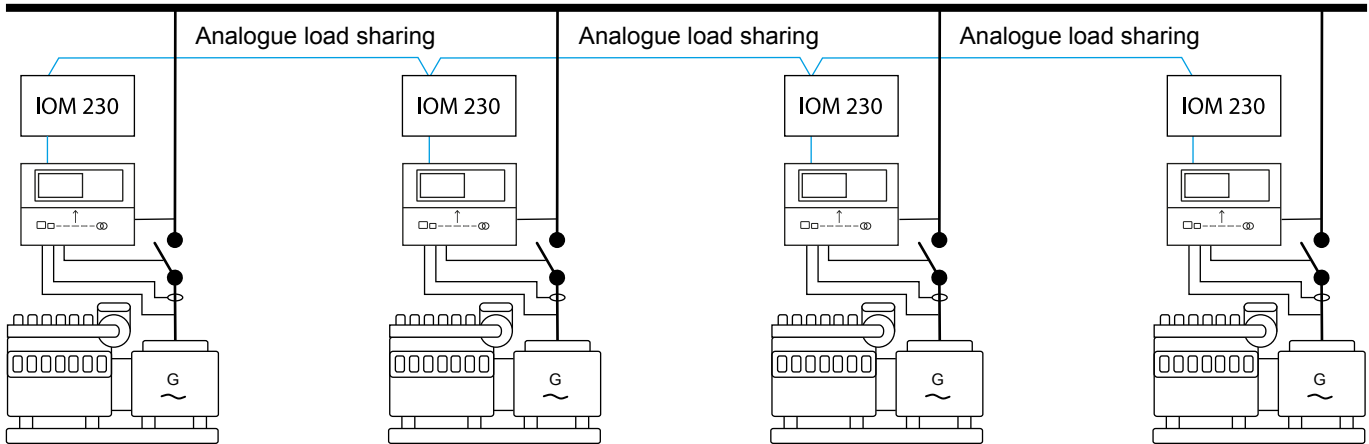
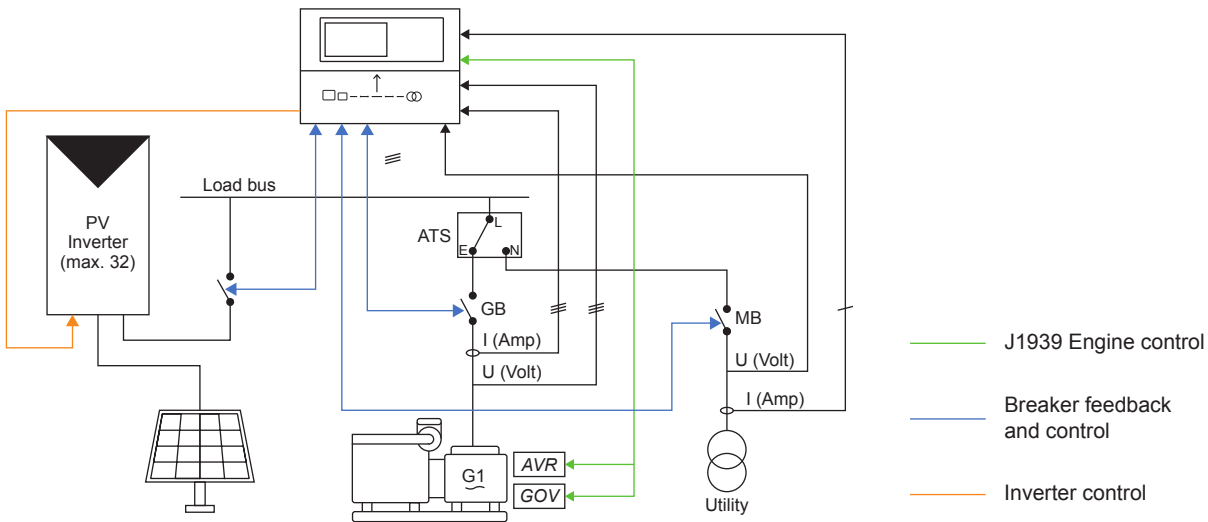**Analogue load sharing with 3rd party controllers**
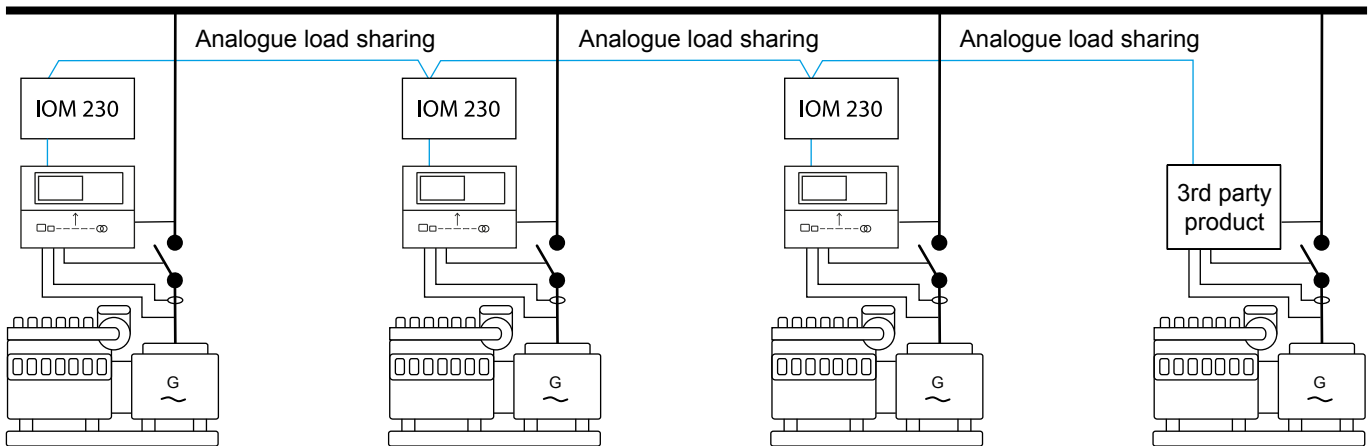
**Digital load sharing (CANshare)**

1.4.3 Hybrid applications

Hybrid application with single generator

In an application with a single generator, the AGC 150 can fully control the generator in connection with AVR and GOV control.
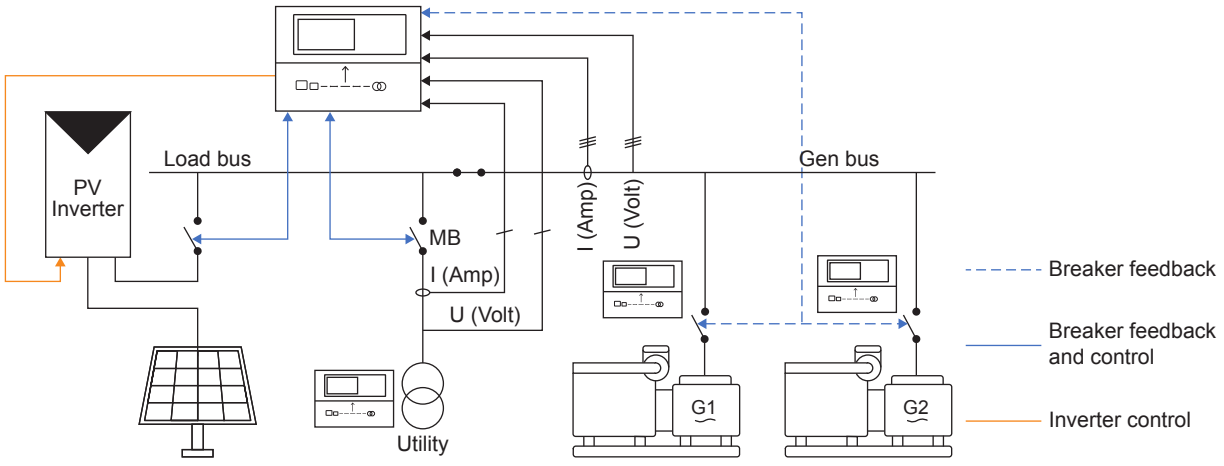

Hybrid application with dual none-sync generators

By switching between AGC 150s four sets of nominal settings, the controller can adapt the minimum genset load to match the connected generator (max. four none-sync generators).
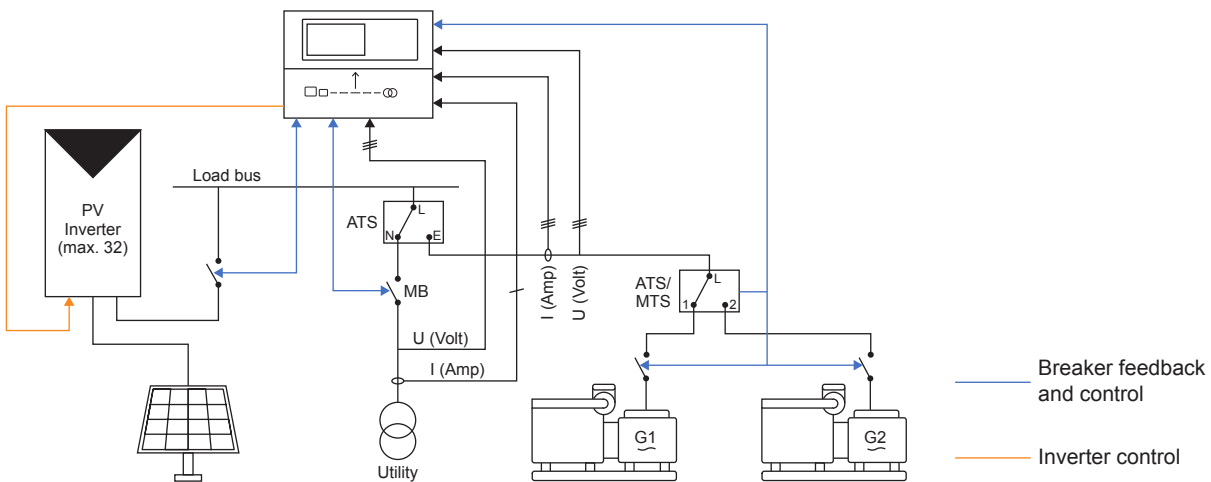
Hybrid application with synchronising generators

The application can max. include two synchronising generators, as shown in this table:

	Generator 1	Generator 2	Generator 1 + 2
Nominal settings 1	ON	-	-
Nominal settings 2	-	ON	-
Nominal settings 3	-	-	ON

PV Inverter

Load bus

MB

I (Amp)

U (Volt)

Utility

I (Amp)

U (Volt)

Gen bus

G1

G2

- - - - Breaker feedback

———— Breaker feedback and control

———— Inverter control

2. Power management

2.1 Power management applications

2.1.1 Introduction

The purpose of the power management system is to supply the required power to the load in an efficient, safe and reliable way.

The power management system is used to

*   Optimise the fuel consumption
*   Balance the loads in the system
*   Implement plant logic
*   Ensure safety

The controller can be used in simple or advanced power plant projects or a wide range of applications. The applications can include projects with synchronising gensets, critical power, emergency standby, or power production.

The complete power management system is monitored from a graphical supervision page. The supervision page can for example show running status, hours in operation, breaker status, condition of mains and busbars, and fuel consumption.

Multi-master system

The power management system is designed as a multi-master system for increased reliability. In a multi-master system all vital data is transmitted between the controllers, giving all units knowledge of the power management status (calculations and position) in the application. This means that the application is not dependent on a single master controller and makes the controller suitable for all types of applications, for example emergency standby or critical power applications.

2.1.2 Plant modes

The plant modes supported by the power management options are:

*   Island mode
*   Automatic Mains Failure
*   Fixed power
*   Peak shaving
*   Load take-over
*   Mains power export

The plant can be divided by one to eight bus tie breakers making it possible to run the plant with different plant modes, for example for test purposes or when dividing the load in primary and secondary loads.
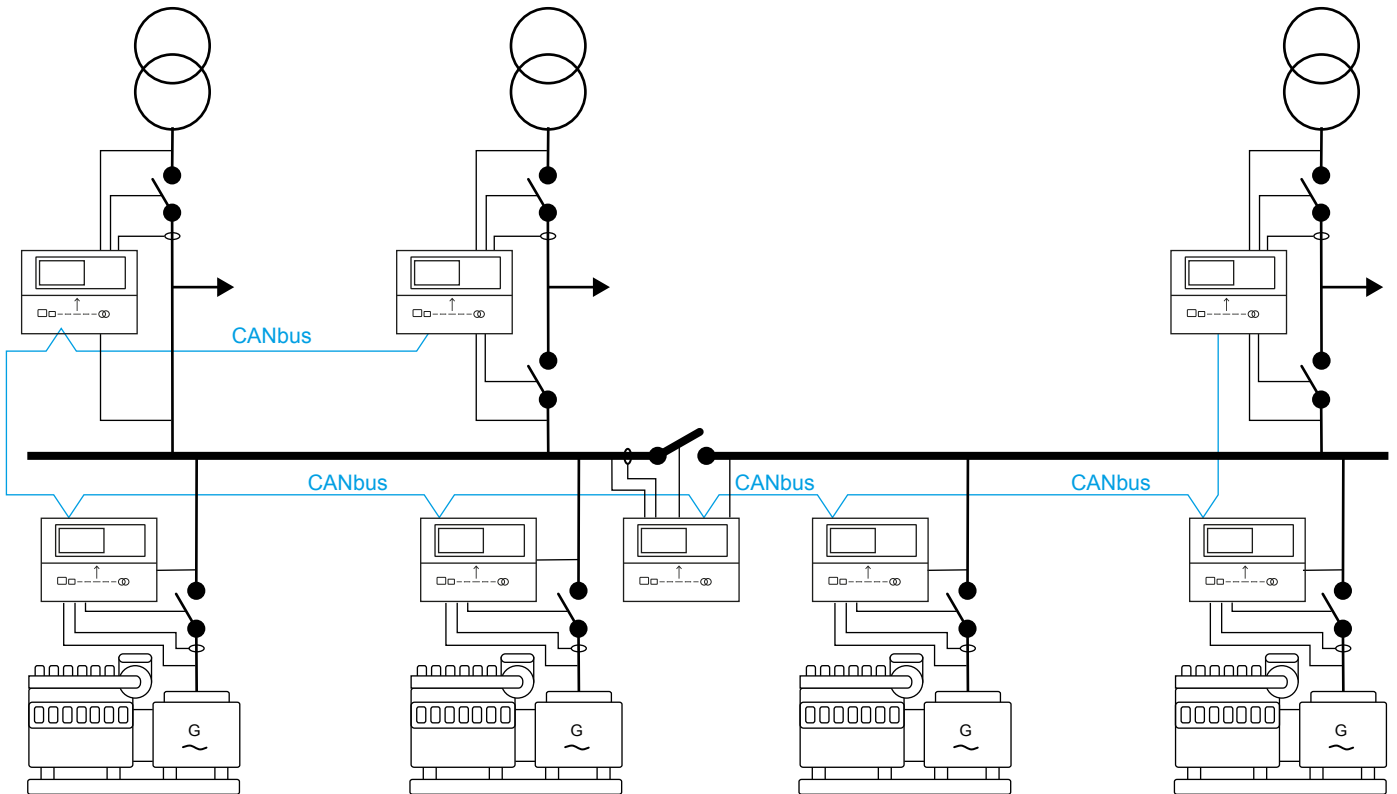
2.1.3   Functions

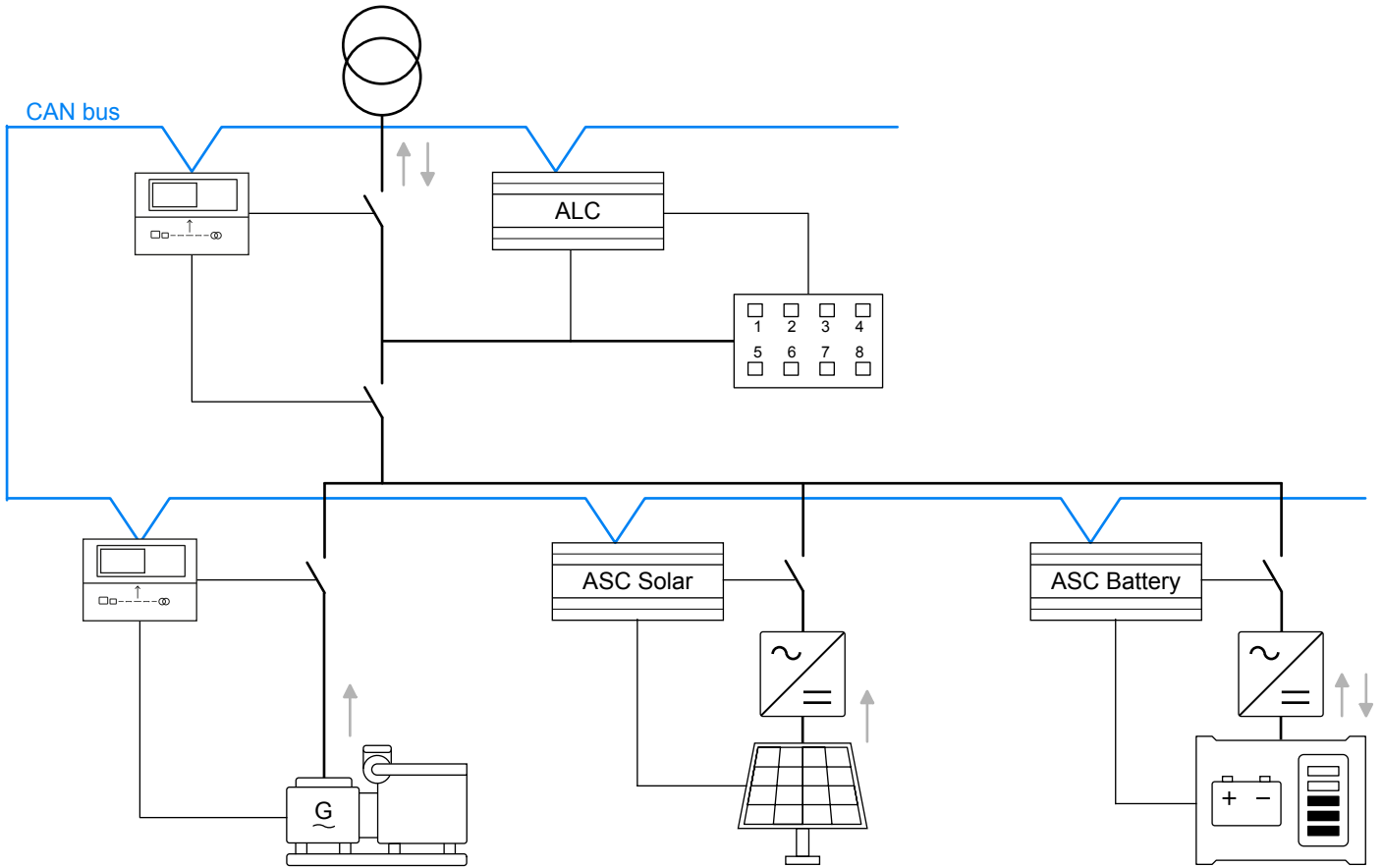### Island operation with power management
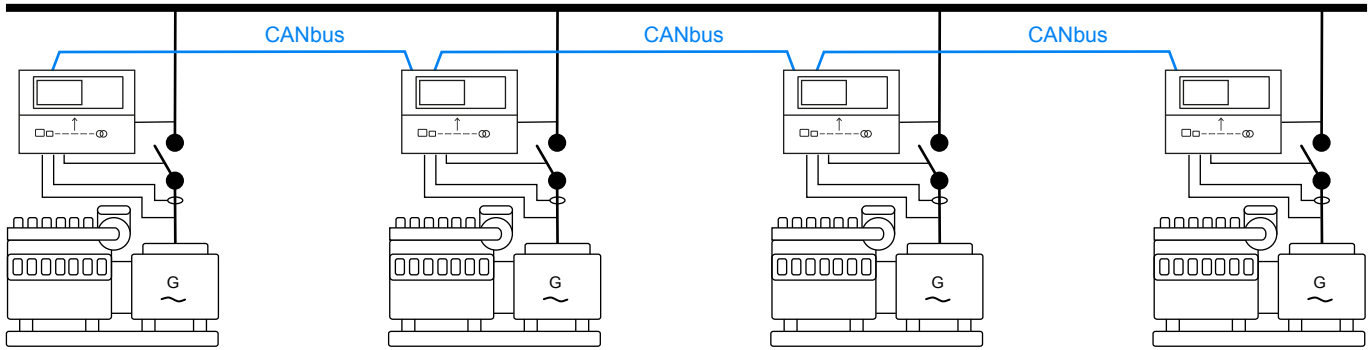
Power plant with synchronising generators. Can also be used in critical power plants with a start signal from an external (ATS) controller.

Power management operations with mains and different sections divided by bus tie breakers

Hybrid power management

NOTE Power management of a hybrid system requires ASC controllers. AGC 150 Hybrid can not be used for power management.

3. Technical specifications

3.1 Technical specifications

3.1.1 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 of 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 MΩ/phase-to-ground, and 600 kΩ 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: • ±1 % of nominal from 2 to 100% current • ±1 % of measured current from 100 to 300 % current From 3.5 to 10 Hz:

Current measurement

	• +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 outputs	2 x outputs, fuel and crank (15 A DC inrush and 3 A continuous, supply voltage 0 to 36 V DC) 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: • 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: • Accuracy: ±20 uA ±1.00 % rdg Voltage: • Range: 0 to 10 V DC

Analogue inputs

	• Accuracy: ±20 mV ±1.00 % rdg
	RMI 2-wire LOW:
	• Range: 0 to 800 Ω
	• Accuracy: ±2 Ω ±1.00 % rdg
	RMI 2-wire HIGH:
	• 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	Better than 1 mV
Max 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
Max 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 & trending facility
Language	Multi language display

3.1.2   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

Operation conditions	
Operating altitude	0 to 4000 meter 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	IEC/EN 60529 • IP65 (front of module when installed into the control panel with the supplied sealing gasket) • IP20 on terminal side
Vibration	Response: • 10 to 58.1 Hz, 0.15 mmpp • 58.1 to 150 Hz, 1 *g*. To IEC 60255-21-1 (Class 2) Endurance: • 10 to 150 Hz, 2 *g*. To IEC 60255-21-1 (Class 2) Seismic vibration: • 3 to 8.15 Hz, 15 mmpp • 8.15 to 35 Hz, 2 *g*. To IEC 60255-21-3 (Class 2)
Shock	10 *g*, 11 ms, half sine. To IEC 60255-21-2 Response (Class 2) 30 *g*, 11 ms, half sine. To IEC 60255-21-2 Withstand (Class 2) 50 *g*, 11 ms, half sine. To IEC 60068-2-27, test Ea Tested with three impacts in each direction in three axes (total of 18 impacts per test)
Bump	20 *g*, 16 ms, half sine IEC 60255-21-2 (Class 2) Tested with 1000 impacts in each direction on three axes (total of 6000 impacts per test)
Galvanic separation	CAN port 2: 550 V, 50 Hz, 1 minute RS-485 port 1: 550 V, 50 Hz, 1 minute Ethernet: 550 V, 50 Hz, 1 minute GOV: 550 V, 50 Hz, 1 minute AVR: 3000 V, 50 Hz, 1 minute
Safety	Installation CAT. III 600 V Pollution degree 2 IEC/EN 60255-27
Flammability	All plastic parts are self-extinguishing to UL94-V0
EMC	IEC/EN 60255-26

3.1.3   Communication

Communication	
CAN A	Engine CAN Port Data connection 2 wire + common Not isolated External termination required (120 Ω + matching cable) DEIF engine specification (J1939 + CANopen)
CAN B	Spare CAN port / power management Data connection 2 wire + common Isolated External termination required (120 Ω + matching cable) PMS 125 kbit and 250 kbit
RS485 Port 1	Data connection 2-wire + common Isolated External termination required (120 Ω + matching cable)

| Communication	
	9600 to 115200
RS485 Port 2	Data connection 2-wire + common Not isolated External termination required (120 Ω + matching cable) 9600 to 115200
RJ45 Ethernet	For Modbus to PLC and similar Isolated Auto detecting 10/100 Mbit Ethernet port
USB	Service port (USB-B)

3.1.4 Approvals

Standards
CE
cULus recognized to ULC6200:2019, 1. ed. controls for stationary engine gensets

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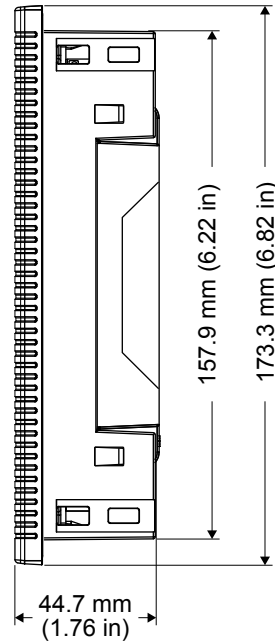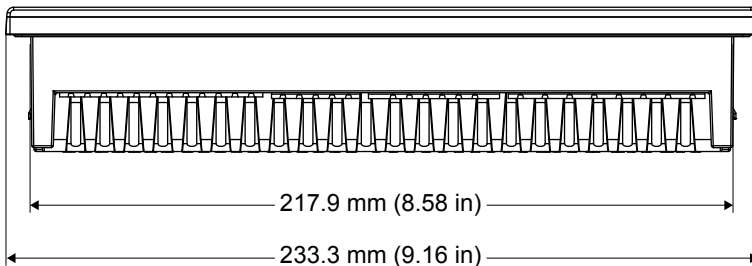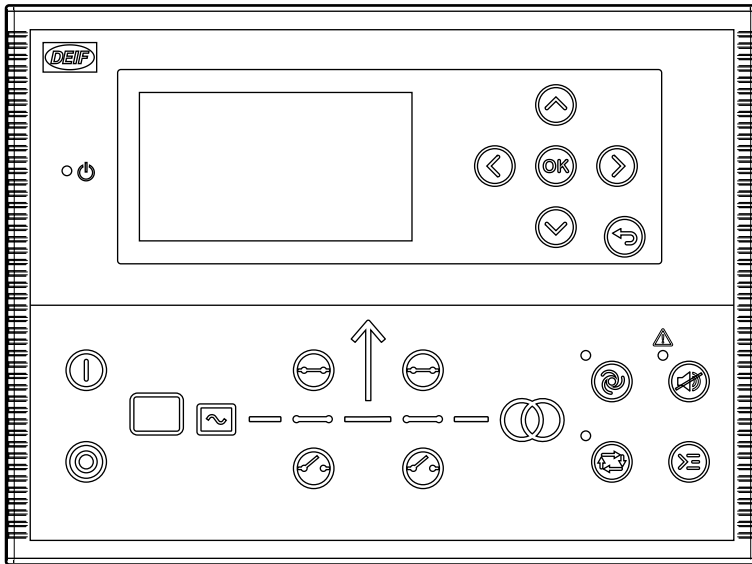
3.1.5 Terminal overview

Figure 3.1   Typical wiring for genset
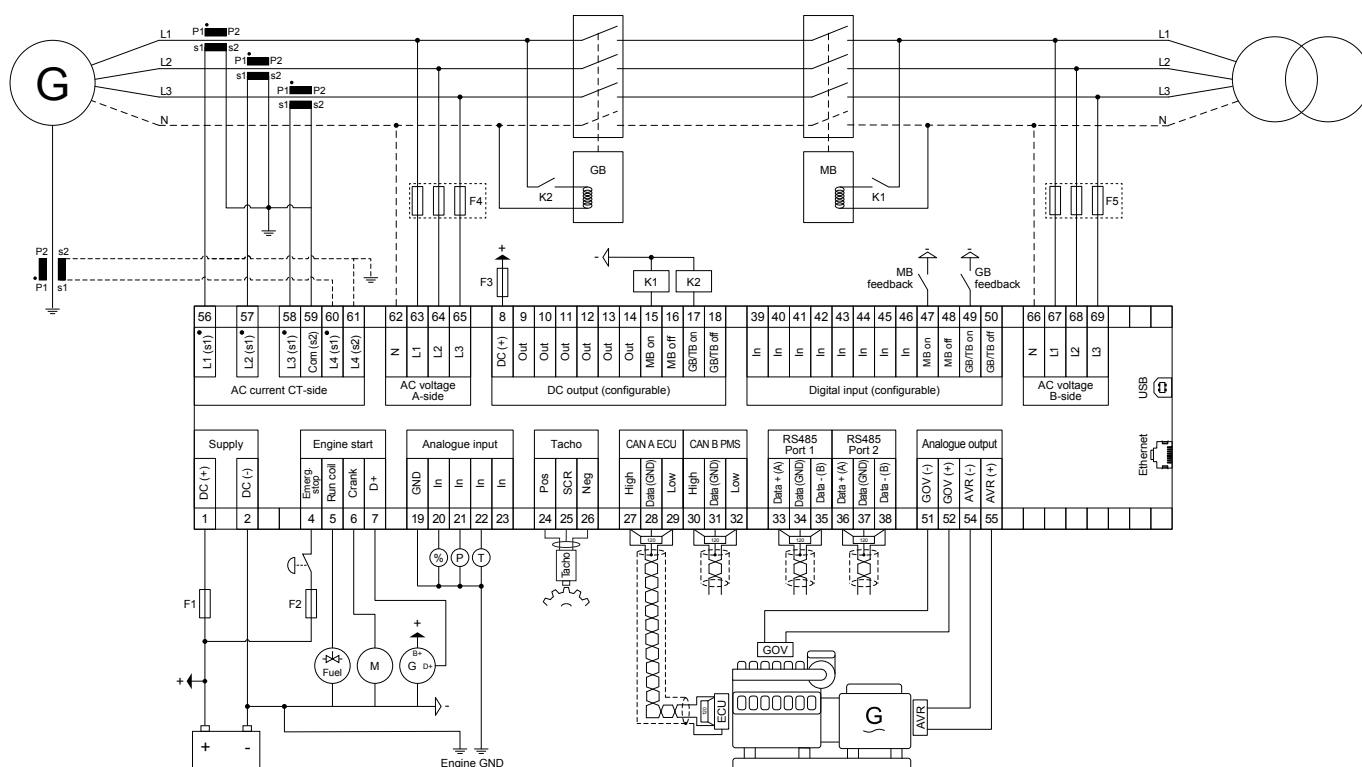
Fuses:

- F1, F4, F5: 2 A MCB, c-curve

- F2: 6 A MCB, c-curve

- F3: 4 A MCB, b-curve

3.1.6 Dimensions and weight

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

4. Legal information

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