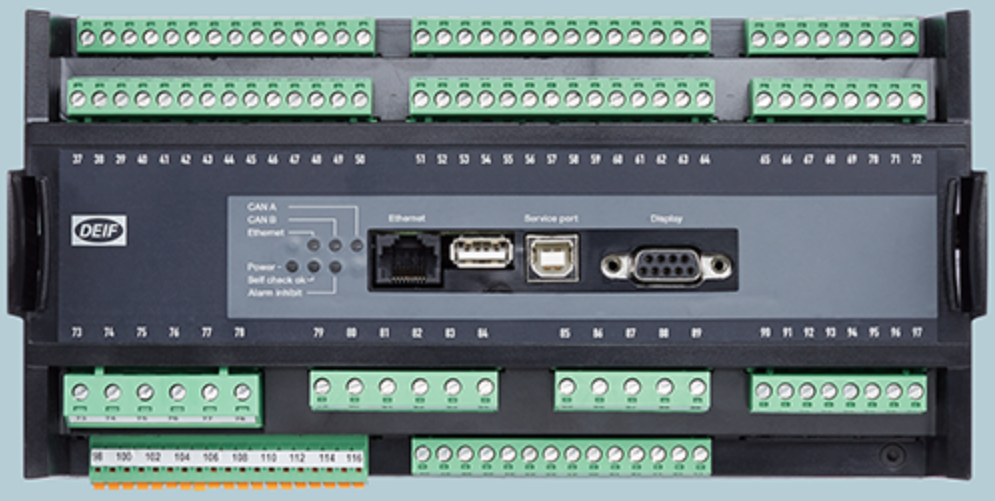
INSTALLATION INSTRUCTIONS

AGC-4



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1. General information

2. Mounting

3. Hardware

1. General information

1.1 Warnings, legal information and safety

1.1.1 Warnings and notes

Throughout this document, a number of warnings and notes with helpful user information will be presented. To ensure that these are noticed, they will be highlighted as follows in order to separate them from the general text.

Warnings

DANGER!
This highlights dangerous situations. If the guidelines are not followed, these situations could result in death, serious personal injury, and equipment damage or destruction.

CAUTION
This highlights potentially dangerous situations. If the guidelines are not followed, these situations could result in personal injury or damaged equipment.

Notes

INFO
Notes provide general information, which will be helpful for the reader to bear in mind.

1.1.2 Legal information and disclaimer

DEIF takes no responsibility for installation or operation of the generator set or switchgear. If there is any doubt about how to install or operate the engine/generator or switchgear controlled by the Multi-line 2 unit, the company responsible for the installation or the operation of the equipment must be contacted.

INFO
The Multi-line 2 unit is not to be opened by unauthorised personnel. If opened anyway, the warranty will be lost.

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.

1.1.3 Safety issues

Installing and operating the Multi-line 2 unit may imply work with dangerous currents and voltages. Therefore, the installation should only be carried out by authorised personnel who understand the risks involved in working with live electrical equipment.

DANGER!
Be aware of the hazardous live currents and voltages. Do not touch any AC measurement inputs as this could lead to injury or death.

1.1.4 Current transformer danger

DANGER!

Electrical shock and arc flash

Risk of burns and electrical shock from high voltage.

Short all current transformer secondaries before breaking any current transformer connections to the controller.

1.1.5 Electrostatic discharge awareness

Sufficient care must be taken to protect the terminal against static discharges during the installation. Once the unit is installed and connected, these precautions are no longer necessary.

1.1.6 Factory settings

The controller is delivered pre-programmed from the factory with a set of default settings. These settings are based on typical values and may not be correct for your system. You must therefore check all parameters before using the controller.

1.2 About the installation instructions

1.2.1 General purpose

These Installation Instructions include hardware information, mounting instructions, terminal strip descriptions, I/O lists and wiring descriptions.

The purpose of this document is to give the user important information to be used in the installation of the controller.

CAUTION

Read this document before starting to work with the Multi-line 2 unit and the genset to be controlled. Failure to do this could result in human injury or damage to the equipment.

1.2.2 Intended users

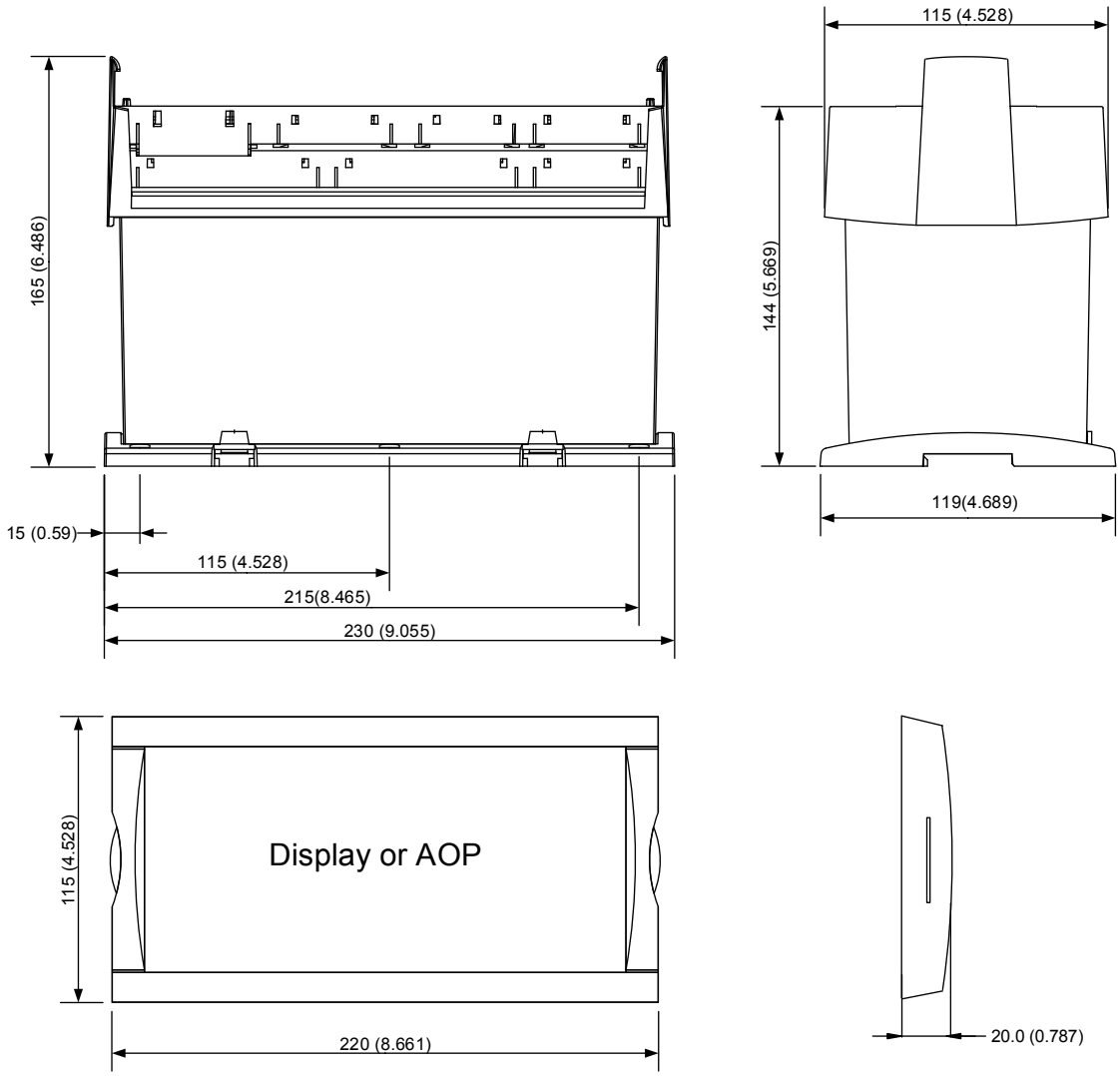
These Installation Instructions are mainly intended for the person responsible for the design and installation. In most cases, this would be a panel builder designer. Naturally, other users might also find useful information in the document.

1.2.3 Drawings

Refer to www.deif.com for the most recent 3D-files, drawings, E-drawings and E-plans.

2. Mounting

2.1 Dimensions



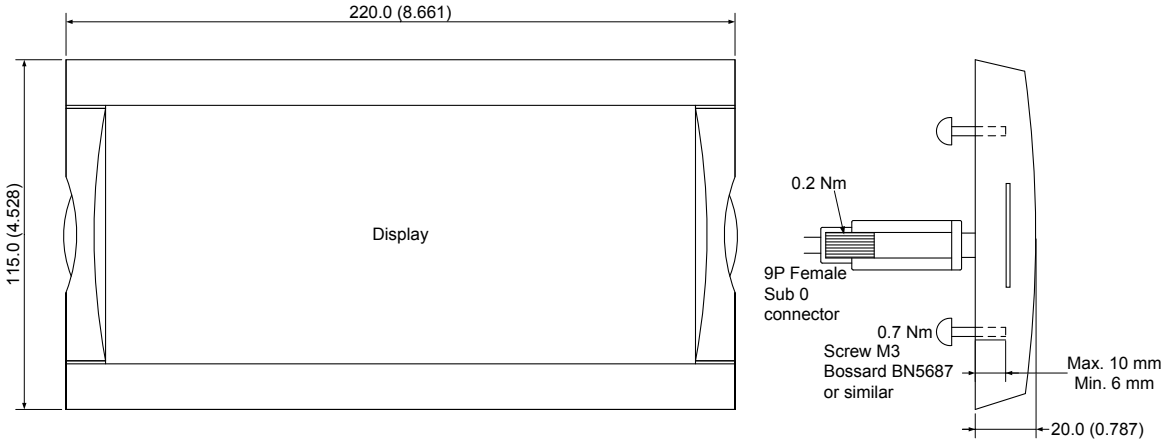
INFO
Dimensions are given in mm (inches).

2.2 Tightening torques

Controller:	1.5 Nm for the six M4 screws (countersunk screws are not to be used)
Plug connections (terminals):	0.5 Nm, 4.4 lb-in

DU-2/AOP-1/AOP-2 (see diagram below)

Panel door mounting:	0.7 Nm, 6.2 lb-in
D-sub screw:	0.2 Nm, 1.8 lb-in
DC-DC converter terminals:	0.5 Nm, 4.4 lb-in



2.3 Mounting of the equipment

The controller is designed for mounting inside the panel. The DU-2 display can be installed on the panel door and connected to the controller with a display cable.

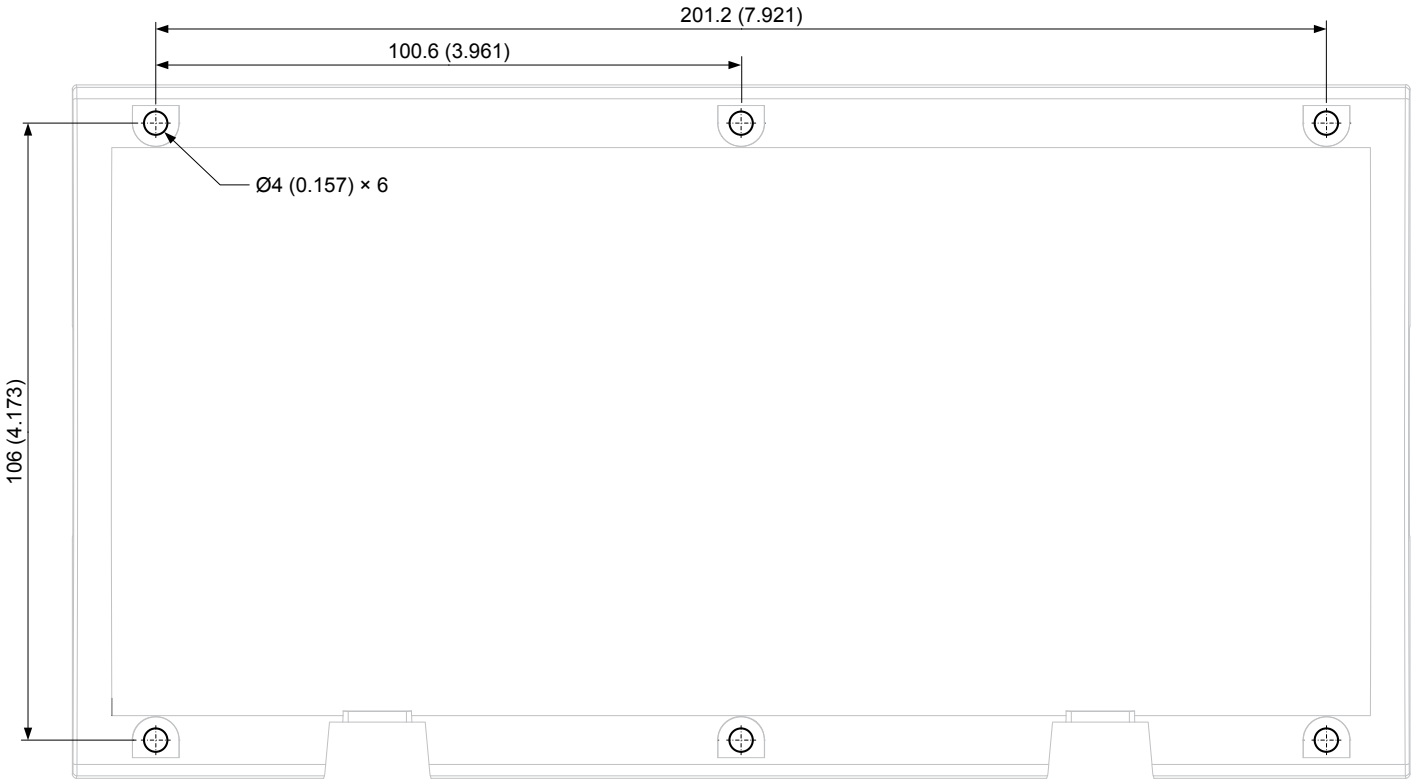
2.3.1 Controller mounting

The controller can be mounted:

1. With screws to the rear side of the cabinet. Six screw holes are available for this.
2. Directly on a DIN rail.

INFO
DEIF recommends using the screw hole fastening.

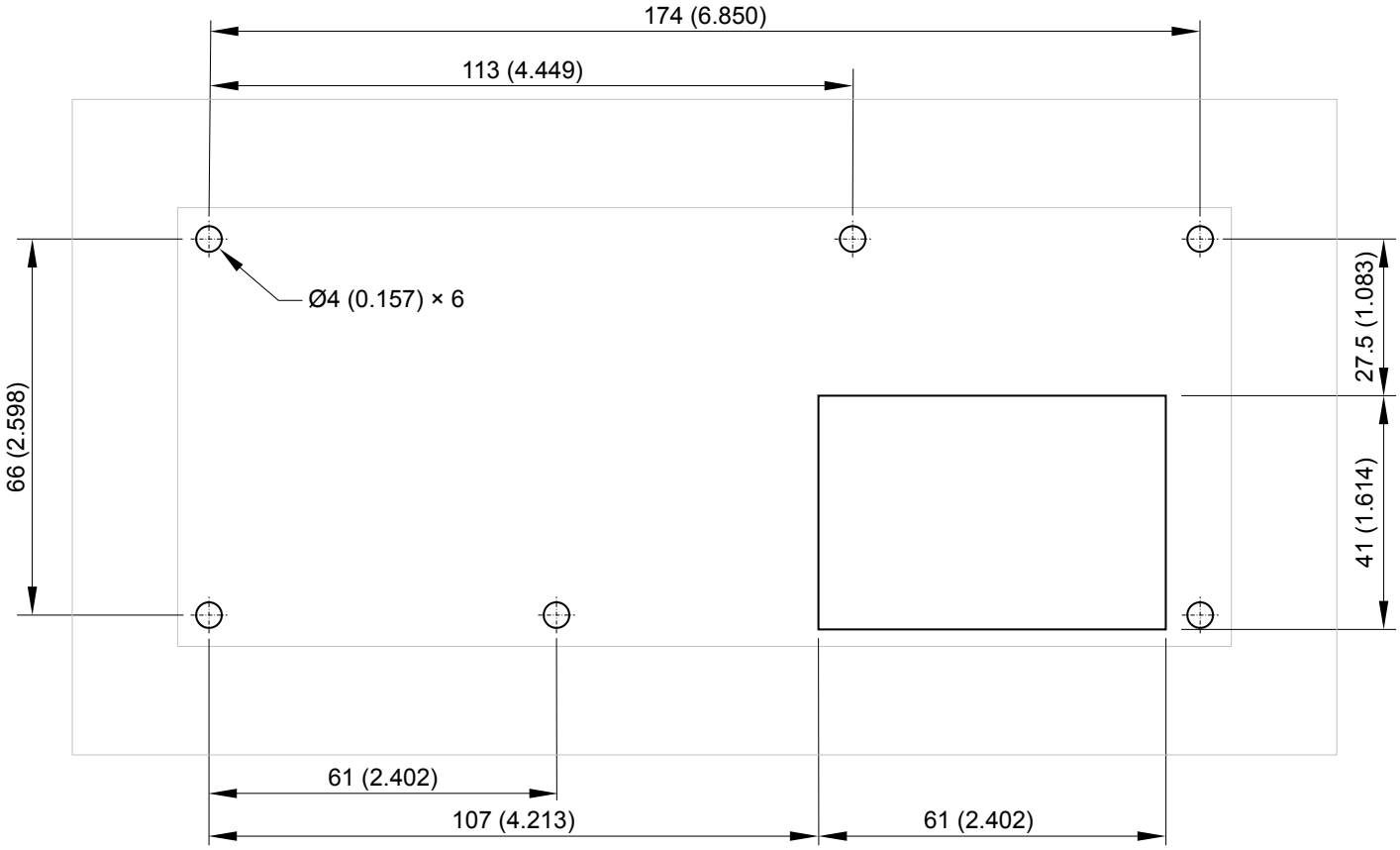
2.3.2 Controller mounting drilling diagram



INFO
Measurements are in mm (inches).

2.3.3 DU-2/AOP display panel cutout

Cut and drill the panel door for the DU-2/AOP according to the diagram below.

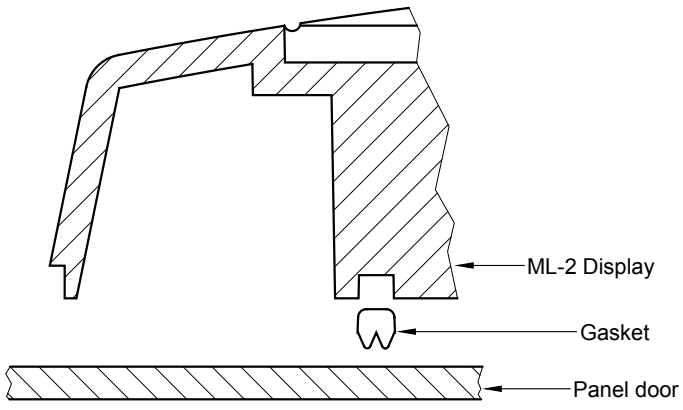


INFO
Dimensions are in mm (inches).

2.3.4 Mounting of DU-2/AOP gasket (option L1)

It is important to mount the gasket correctly to have an IP65 seal. You must use all six DU-2 or AOP screws to ensure IP65.

Mount the gasket as shown below.



3. Hardware

3.1 Board slot positions

The unit housing is divided into board slot positions. This means that the unit consists of a number of printed circuit boards (PCB) mounted in numbered slots. The green terminal blocks are then mounted in the PCBs. Some of these board slots are standard and some are intended for options. The board slot positions are arranged as illustrated below.

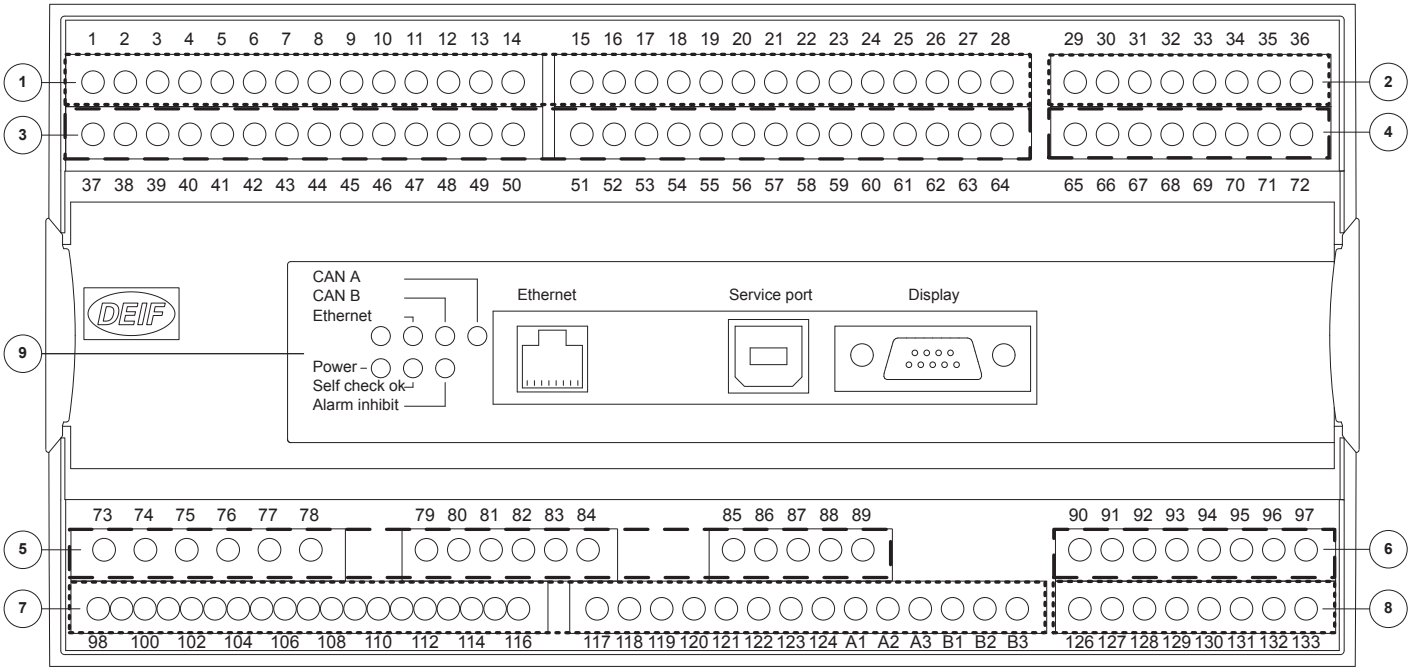
Slot type	Option	Slot #1	Slot #3	Slot #5	Slot #7
Terminals		1-28	37-64	73-89	98-125
Power supply	Standard	X			
AC measurements	Standard			X	
Engine interface	Standard/M4				X
Load sharing	G3		X		
Power management	G4/G5/G8				X
Engine communication	H7				X
I/O extension	M12		X		

Slot type	Option	Slot #2	Slot #4	Slot #6	Slot #8
Terminals		29-34	65-72	90-97	126-133
Analogue controller outputs	E1/E2		X		
Analogue transducer outputs	F1			X	
Combination outputs	EF2/EF4/EF5/EF6		X		
Serial communication	H2/H3/H9	X			
Engine communication	H5/H6/H13				X
Engine communication and external I/O	H12.2/H12.8	X			X
I/O extension cards	H8.2/M13.2/M14.2	X			
I/O extension cards	M13.6/M14.6/M15.6/M16.6			X	
I/O extension cards	H8.8/M13.8/M14.8/M15.8/M16.8				X

INFO
Only hardware options, which will affect the hardware of the unit, are represented in the table. The software options will be seen through the PC utility software. The software options that are not represented in the above table can be found in the data sheet.

3.2 Controller top side overview

An overview of the terminals is presented below. The slot positions are as follows:

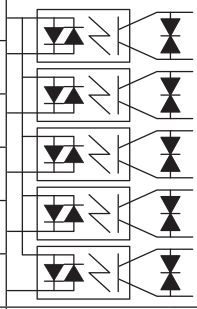
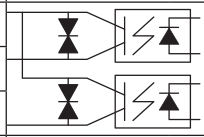
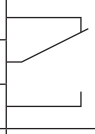
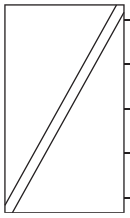
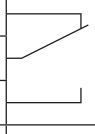
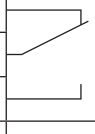
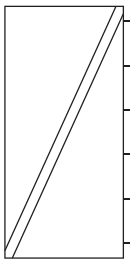
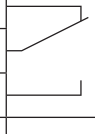
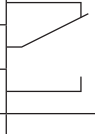
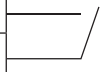
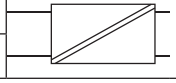


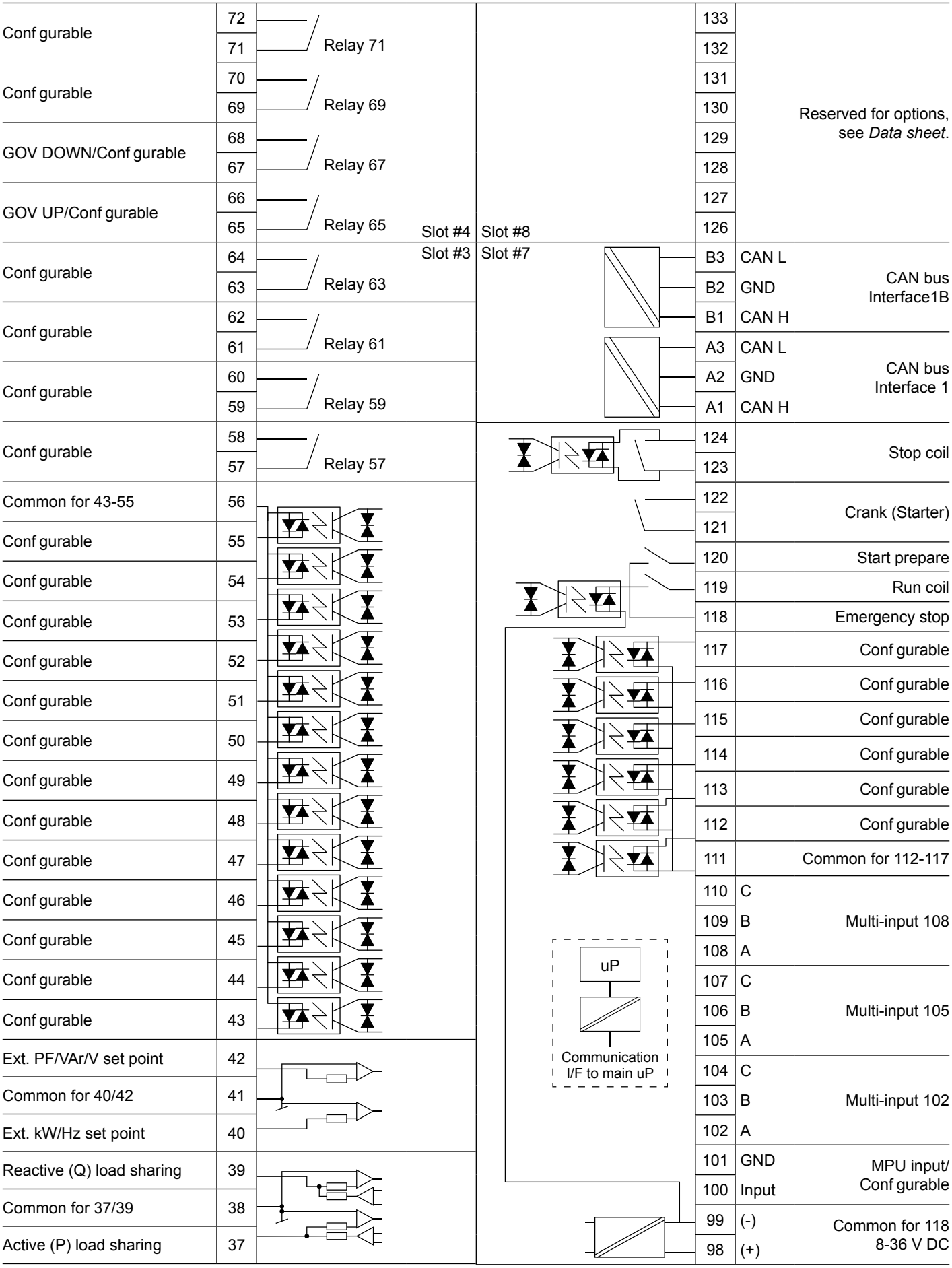
(1): The numbers in the drawing above refer to the slot numbers indicated in the table below.

Slot	Terminals	Function
1	1-28	Power supply (standard)
2	29-36	Communication and I/O extensions
3	37-64	In-/outputs/load sharing
4	65-72	Governor, AVR, in-/outputs (standard)
5	73-89	AC measuring (standard)
6	90-97	In-/outputs
7	98-125	Engine I/F (standard)
8	126-133	Engine communication, in-/outputs
9	-	Interfaces and LEDs

3.3 Terminal strip overviews

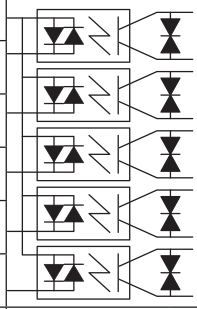
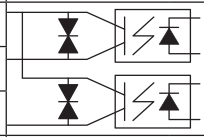
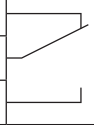
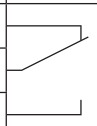
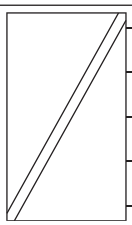
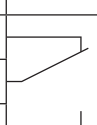
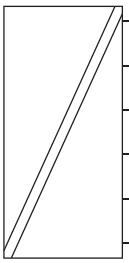
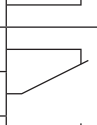
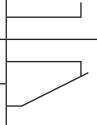
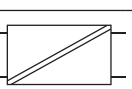
3.3.1 Genset controller

Reserved for options, see *Data sheet*.	36				97	Reserved for options, see *Data sheet*.	
	35				96		
	34				95		
	33				94		
	32				93		
	31				92		
	30				91		
	29		Slot #2	Slot #6	90		
Common for 23-27	28		Slot #1	Slot #5			
GB Closed	27						
GB Open	26						
MB Closed/Conf gurable	25						
MB Open/Conf gurable	24						
Conf gurable	23						
Common for 20/21	22						
kVArh pulse/Relay 21	21						
kWh pulse/Relay 20	20						
Close Generator Breaker (sync.)	19		Relay 17				
	18						
	17						
					89	L3	GENERATOR BUSBAR VOLTAGE
					88	Neutral	
Open Generator Breaker	16		Relay 14				
	15				87	L2	
	14				86		
					85	L1	
Close Mains Breaker/ Conf gurable	13		Relay 11		84	Neutral	GENERATOR VOLTAGE
	12				83	L3	
	11				82		
Open Mains Breaker/ Conf gurable	10		Relay 08		81	L2	
	9				80		
	8				79	L1	
Alarm horn/ Conf gurable	7		Relay 05		78	S2 (l)	L3 AC current
	6				77	S1 (k)	L3 AC current
	5						
Status relay	4		Status relay		76	S2 (l)	L2 AC current
	3				75	S1 (k)	L2 AC current
DC power supply (-)	2				74	S2 (l)	L1 AC current
8-36 V DC (+)	1				73	S1 (k)	L1 AC current

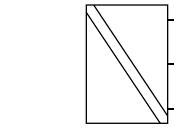
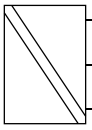
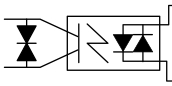
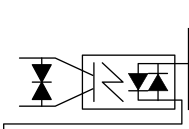
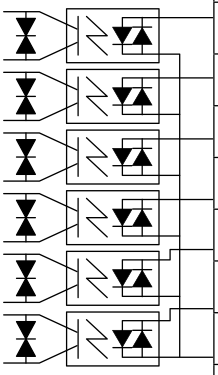
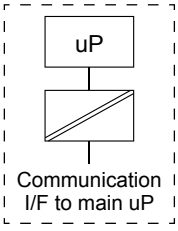

Conf gurable
72
71
Relay 71
Conf gurable
70
69
Relay 69
GOV DOWN/Conf gurable
68
67
Relay 67
GOV UP/Conf gurable
66
65
Relay 65
Slot #4
Slot #3
Slot #8
Slot #7
Conf gurable
64
63
Relay 63
Conf gurable
62
61
Relay 61
Conf gurable
60
59
Relay 59
Conf gurable
58
57
Relay 57
Common for 43-55
56
Conf gurable
55
Conf gurable
54
Conf gurable
53
Conf gurable
52
Conf gurable
51
Conf gurable
50
Conf gurable
49
Conf gurable
48
Conf gurable
47
Conf gurable
46
Conf gurable
45
Conf gurable
44
Conf gurable
43
Ext. PF/VAr/V set point
42
Common for 40/42
41
Ext. kW/Hz set point
40
Reactive (Q) load sharing
39
Common for 37/39
38
Active (P) load sharing
37
uP
Communication
I/F to main uP
133
132
131
130
129
128
127
126
Reserved for options,
see Data sheet.
B3
B2
B1
CAN L
GND
CAN H
CAN bus
Interface1B
A3
A2
A1
CAN L
GND
CAN H
CAN bus
Interface 1
124
123
Stop coil
122
121
Crank (Starter)
120
Start prepare
119
Run coil
118
Emergency stop
117
Conf gurable
116
Conf gurable
115
Conf gurable
114
Conf gurable
113
Conf gurable
112
Conf gurable
111
Common for 112-117
110
109
108
C
B
A
Multi-input 108
107
106
105
C
B
A
Multi-input 105
104
103
102
C
B
A
Multi-input 102
101
100
GND
Input
MPU input/
Conf gurable
99
98
(-)
(+)
Common for 118
8-36 V DC

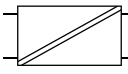
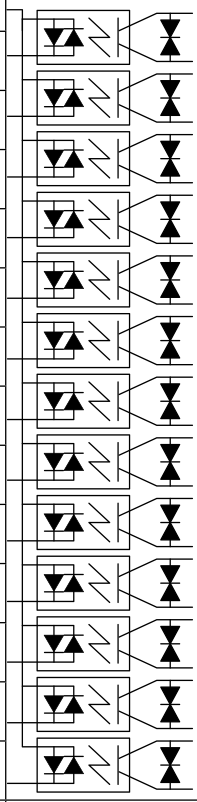
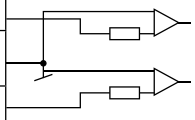
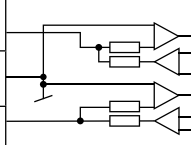
INFO
The hardware shown in slot #3 is option M12 and G3. For details, see the option manuals.

3.3.2 Mains controller

Reserved for options, see *Data sheet*.	36				97	Reserved for options, see *Data sheet*.	
	35				96		
	34				95		
	33				94		
	32				93		
	31				92		
	30				91		
	29		Slot #2	Slot #6	90		
Common for 23-27	28		Slot #1	Slot #5			
Conf gurable	27						
Conf gurable	26						
MB Closed	25						
MB Open	24						
Conf gurable	23						
Common for 20/21	22						
kVArh pulse/Relay 21	21						
kWh pulse/Relay 20	20						
Conf gurable	19		Relay 17				
	18						
	17				89	L3	
Conf gurable	16		Relay 14		88	Neutral	GROUP BUSBAR VOLTAGE
	15				87	L2	
	14				86		
Close Mains Breaker (sync.)	13		Relay 11		85	L1	
	12				84	Neutral	
	11				83	L3	
Open Mains Breaker	10		Relay 08		82		MAINS VOLTAGE
	9				81	L2	
	8				80		
Alarm horn/ Conf gurable	7		Relay 05		79	L1	
	6				78	S2 (I)	L3 AC current
	5				77	S1 (k)	L3 AC current
Status relay	4		Status relay		76	S2 (I)	L2 AC current
	3				75	S1 (k)	L2 AC current
DC power supply (-)	2				74	S2 (I)	L1 AC current
8-36 V DC (+)	1				73	S1 (k)	L1 AC current

Reserved for options, see *Data sheet*.	72			133	Reserved for options, see *Data sheet*.
	71			132	
	70			131	
	69			130	
	68			129	
	67			128	
	66			127	
	65	Slot #4	Slot #8	126	
Conf gurable	64	Slot #3	Slot #7	B3	CAN L
	63	Relay 63		B2	GND
				B1	CAN H
Conf gurable	62			A3	CAN L
	61	Relay 61		A2	GND
				A1	CAN H
Conf gurable	60				
	59	Relay 59			
Conf gurable	58			124	Not used
	57	Relay 57		123	
Common for 43-55	56			122	Not used
Conf gurable	55			121	
Conf gurable	54			120	Not used
Conf gurable	53			119	Not used
Conf gurable	52			118	Not used
Conf gurable	51			117	Conf gurable
Conf gurable	50			116	Conf gurable
Conf gurable	49			115	Conf gurable
Conf gurable	48			114	Conf gurable
Conf gurable	47			113	Conf gurable
Conf gurable	46			112	Conf gurable
Conf gurable	45			111	Common for 112-117
Conf gurable	44			110	C
Conf gurable	43			109	B
				108	A
Ext. PF set point	42			107	C
Common for 40/42	41			106	B
Ext. kW set point	40			105	A
				104	C
				103	B
				102	A
Not used	39			101	Not used
Not used	38			100	
Not used	37			99	(-)
				98	(+)

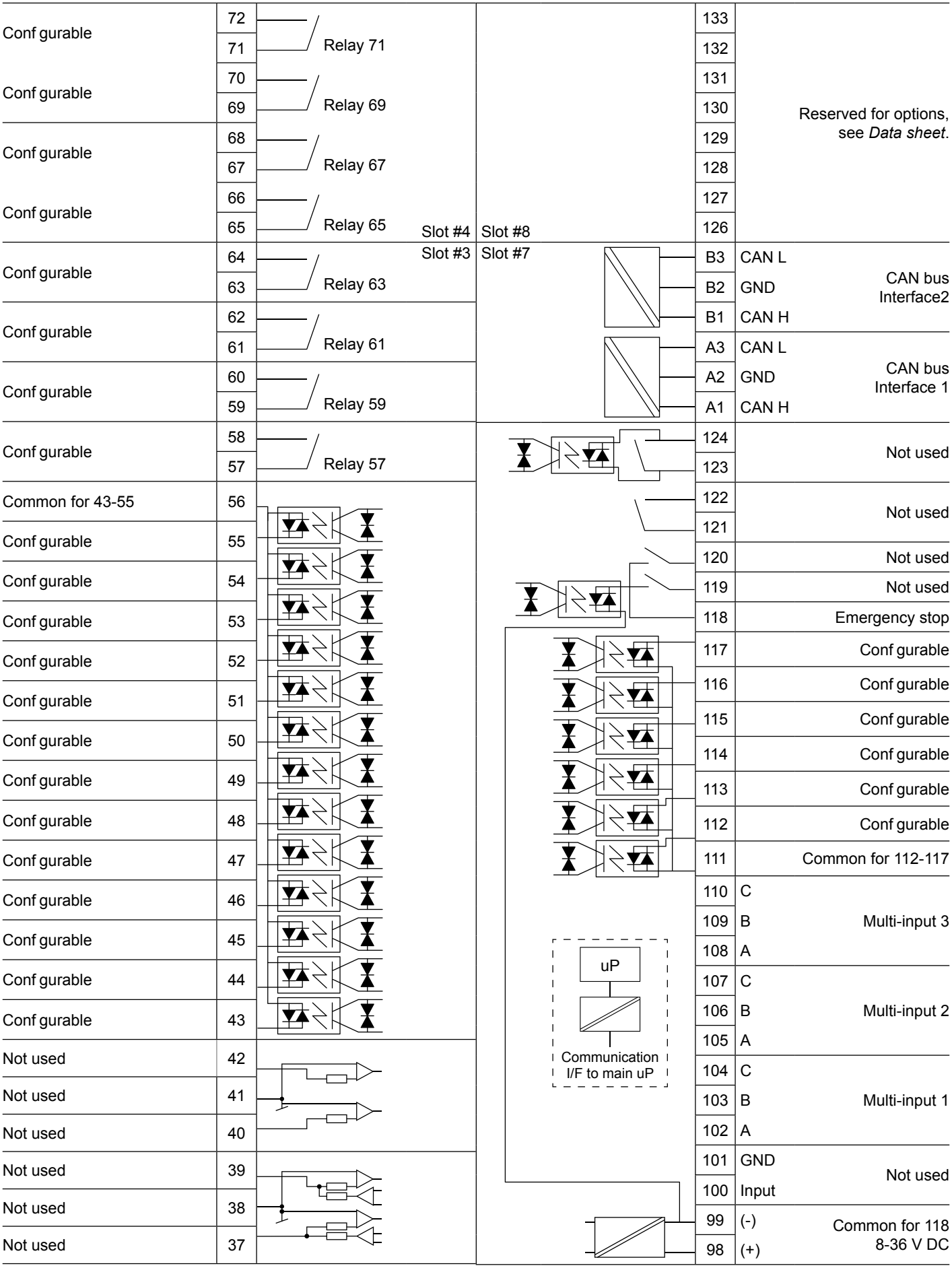







INFO
The hardware shown in slot #3 is option M12 and G3. For details, see the option manuals.

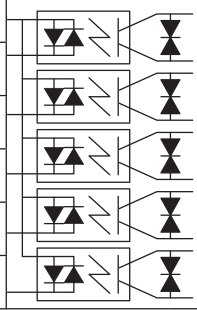
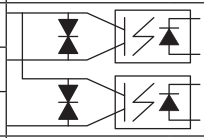
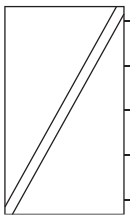
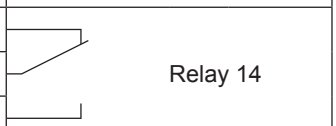
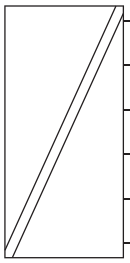
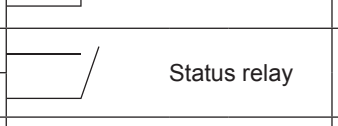
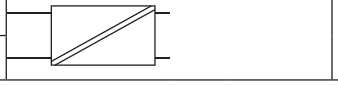
3.3.3 BTB controller

Reserved for options, see *Data sheet*.		36			97	Reserved for options, see *Data sheet*.	
		35			96		
		34			95		
		33			94		
		32			93		
		31			92		
		30			91		
		29	Slot #2	Slot #6	90		
Common for 23-27		28	Slot #1	Slot #5			
BTB Closed/Conf gurable		27					
BTB Open/Conf gurable		26					
Conf gurable		25					
Conf gurable		24					
Conf gurable		23					
Common for 20/21		22					
kVArh pulse/Relay 21		21					
kWh pulse/Relay 20		20					
Close Bus Tie Breaker/ Conf gurable		19	Relay 17				
		18					
		17			89	L3	BUSBAR B VOLTAGE
Open Bus Tie Breaker/ Conf gurable		16	Relay 14		88	Neutral	
		15			87	L2	
		14			86		
Conf gurable		13	Relay 11		85	L1	
		12			84	Neutral	BUSBAR A VOLTAGE
		11			83	L3	
Conf gurable		10	Relay 08		82		
		9			81	L2	
		8			80		
Alarm horn/ Conf gurable		7	Relay 05		79	L1	
		6			78	S2 (I)	L3 AC current
		5			77	S1 (k)	L3 AC current
Status relay		4	Status relay		76	S2 (I)	L2 AC current
		3			75	S1 (k)	L2 AC current
DC power supply 8-36 V DC	(-)	2			74	S2 (I)	L1 AC current
	(+)	1			73	S1 (k)	L1 AC current

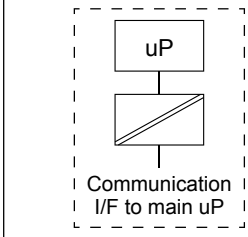

Conf gurable
72
71
Relay 71
Conf gurable
70
69
Relay 69
Conf gurable
68
67
Relay 67
Conf gurable
66
65
Relay 65
Slot #4
Slot #3
Conf gurable
64
63
Relay 63
Conf gurable
62
61
Relay 61
Conf gurable
60
59
Relay 59
Conf gurable
58
57
Relay 57
Common for 43-55
56
Conf gurable
55
Conf gurable
54
Conf gurable
53
Conf gurable
52
Conf gurable
51
Conf gurable
50
Conf gurable
49
Conf gurable
48
Conf gurable
47
Conf gurable
46
Conf gurable
45
Conf gurable
44
Conf gurable
43
Not used
42
Not used
41
Not used
40
Not used
39
Not used
38
Not used
37
Slot #8
Slot #7
uP
Communication
I/F to main uP
133
132
131
130
129
128
127
126
Reserved for options,
see Data sheet.
B3
B2
B1
CAN L
GND
CAN H
CAN bus
Interface2
A3
A2
A1
CAN L
GND
CAN H
CAN bus
Interface 1
124
123
Not used
122
121
Not used
120
Not used
119
Not used
118
Emergency stop
117
Conf gurable
116
Conf gurable
115
Conf gurable
114
Conf gurable
113
Conf gurable
112
Conf gurable
111
Common for 112-117
110
109
108
C
B
A
Multi-input 3
107
106
105
C
B
A
Multi-input 2
104
103
102
C
B
A
Multi-input 1
101
100
GND
Input
Not used
99
98
(-)
(+)
Common for 118
8-36 V DC

INFO
The hardware shown in slot #3 is option M12. For details, see the option manual.

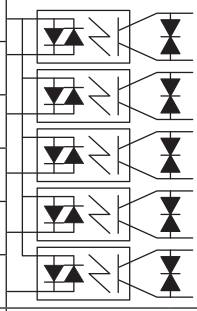
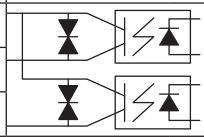
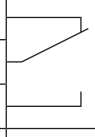
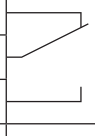
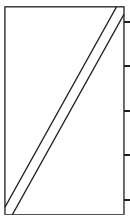
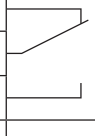
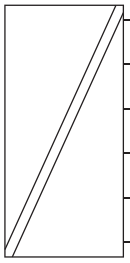
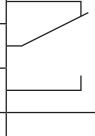
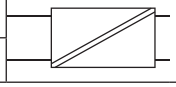
3.3.4 Group controller

3-level application communication to Group/Plant	Not used	36			97	Reserved for options, see *Data sheet*.	
	Not used	35			96		
	CAN L	34			95		
	GND	33			94		
	CAN H	32			93		
	CAN L	31			92		
	GND	30			91		
	CAN H	29	Slot #2	Slot #6	90		
Common for 23-27		28	Slot #1	Slot #5			
TB Closed		27					
TB Open		26					
Conf gurable		25					
Conf gurable		24					
Conf gurable		23					
Common for 20/21		22					
kVArh pulse/Relay 21		21					
kWh pulse/Relay 20		20					
Close Tie Breaker (sync.)		19	 Relay 17				
		18					
		17			89	L3	GENERATOR BUSBAR VOLTAGE
Open Tie Breaker		16	 Relay 14		88	Neutral	
		15			87	L2	
		14			86		
Conf gurable		13	 Relay 11		85	L1	
		12			84	Neutral	
		11			83	L3	
Conf gurable		10	 Relay 08		82		GROUP BUSBAR VOLTAGE
		9			81	L2	
		8			80		
Alarm horn/ Conf gurable		7	 Relay 05		79	L1	
		6			78	S2 (I)	L3 AC current
		5			77	S1 (k)	L3 AC current
Status relay		4	 Status relay		76	S2 (I)	L2 AC current
		3			75	S1 (k)	L2 AC current
DC power supply 8-36 V DC	(-)	2			74	S2 (I)	L1 AC current
	(+)	1			73	S1 (k)	L1 AC current

Reserved for options, see *Data sheet*.	72			133	Reserved for options, see *Data sheet*.
	71			132	
	70			131	
	69			130	
	68			129	
	67			128	
	66			127	
	65	Slot #4	Slot #8	126	
Conf gurable	64	Slot #3	Slot #7	B3	CAN L
	63	Relay 63		B2	GND — CAN bus Interface B
Conf gurable	62			B1	CAN H
	61	Relay 61		A3	CAN L
Conf gurable	60			A2	GND — CAN bus Interface A
	59	Relay 59		A1	CAN H
Conf gurable	58			124	Not used
	57	Relay 57		123	
Common for 43-55	56			122	Not used
Conf gurable	55			121	
Conf gurable	54			120	Not used
Conf gurable	53			119	Not used
Conf gurable	52			118	Not used
Conf gurable	51			117	Conf gurable
Conf gurable	50			116	Conf gurable
Conf gurable	49			115	Conf gurable
Conf gurable	48			114	Conf gurable
Conf gurable	47			113	Conf gurable
Conf gurable	46			112	Conf gurable
Conf gurable	45			111	Common for 112-117
Conf gurable	44			110	C
Conf gurable	43			109	B — Multi-input 108
Ext. PF set point	42			108	A
Common for 40/42	41			107	C
Ext. kW set point	40			106	B — Multi-input 105
Not used	39			105	A
Not used	38			104	C
Not used	37			103	B — Multi-input 102
				102	A
				101	Not used
				100	
				99	(-) — Common for 118 8-36 V DC
				98	(+)



3.3.5 Plant controller

Reserved for options, see *Data sheet*.	36				97	Reserved for options, see *Data sheet*.	
	35				96		
	34				95		
	33				94		
	32				93		
	31				92		
	30				91		
	29		Slot #2	Slot #6	90		
Common for 23-27	28		Slot #1	Slot #5			
Conf gurable	27						
Conf gurable	26						
MB Closed	25						
MB Open	24						
Conf gurable	23						
Common for 20/21	22						
kVArh pulse/Relay 21	21						
kWh pulse/Relay 20	20						
Conf gurable	19		Relay 17				
	18						
	17				89	L3	GROUP BUSBAR VOLTAGE
Conf gurable	16		Relay 14		88	Neutral	
	15				87	L2	
	14				86		
Close Mains Breaker (sync.)	13		Relay 11		85	L1	
	12				84	Neutral	MAINS VOLTAGE
	11				83	L3	
Open Mains Breaker	10		Relay 08		82		
	9				81	L2	
	8				80		
Alarm horn/ Conf gurable	7		Relay 05		79	L1	
	6				78	S2 (l)	L3 AC current
	5				77	S1 (k)	L3 AC current
Status relay	4		Status relay		76	S2 (l)	L2 AC current
	3				75	S1 (k)	L2 AC current
DC power supply 8-36 V DC (-)	2				74	S2 (l)	L1 AC current
(+)	1				73	S1 (k)	L1 AC current

Reserved for options, see *Data sheet*.	72			133	Reserved for options, see *Data sheet*.
	71			132	
	70			131	
	69			130	
	68			129	
	67			128	
	66			127	
	65	Slot #4	Slot #8	126	
Conf gurable	64	Slot #3	Slot #7	B3	CAN L
	63	Relay 63		B2	GND — CAN bus Interface B
Conf gurable	62			B1	CAN H
	61	Relay 61		A3	CAN L
Conf gurable	60			A2	GND — CAN bus Interface A
	59	Relay 59		A1	CAN H
Conf gurable	58			124	Not used
	57	Relay 57		123	
Common for 43-55	56			122	Not used
Conf gurable	55			121	
Conf gurable	54			120	Not used
Conf gurable	53			119	Not used
Conf gurable	52			118	Not used
Conf gurable	51			117	Conf gurable
Conf gurable	50			116	Conf gurable
Conf gurable	49			115	Conf gurable
Conf gurable	48			114	Conf gurable
Conf gurable	47			113	Conf gurable
Conf gurable	46			112	Conf gurable
Conf gurable	45			111	Common for 112-117
Conf gurable	44			110	C
Conf gurable	43			109	B — Multi-input 108
				108	A
				107	C
				106	B — Multi-input 105
				105	A
Ext. PF set point	42			104	C
Common for 40/42	41			103	B — Multi-input 102
Ext. kW set point	40			102	A
Not used	39			101	Not used
Not used	38			100	
Not used	37			99	(-) — Common for 118
				98	(+) — 8-36 V DC

3.4 Input/output lists

The I/O lists use these abbreviations for the relay outputs:

NO: Normally Open
NC: Normally Closed
NE: Normally Energised
ND: Normally De-energised
Com.: Common terminal

3.5 Slot 1

3.5.1 Power supply - Genset controller

Term.	Function	Technical data	Description
1	+12/24 V DC	12/24 V DC +/-30 %	Power supply
2	0 V DC		
3	NO	Status relay 24 V DC/1 A	Normally open relay, processor/power supply status supervision
4	Com.		
5	NO	Relay 05 250 V AC/8 A	Central alarm HORN/configurable
6	Com.		
7	NC		
8	NO	Relay 08 250 V AC/8 A	Open mains breaker/configurable
9	Com.		
10	NC		
11	NO	Relay 11 250 V AC/8 A	Close mains breaker (synchronising)/configurable
12	Com.		
13	NC		
14	NO	Relay 250 V AC/8 A	Open generator breaker
15	Com.		
16	NC		
17	NO	Relay 250 V AC/8 A	Close generator breaker (synchronising)
18	Com.		
19	NC		
20	Open collector 1	Transistor output/Relay 20	Pulse output 1, kWh counter/configurable
21	Open collector 2	Transistor output/Relay 21	Pulse output 2, kvarh counter/configurable
22	Com.	Common	Common terminal for terminals 20 and 21
23	Digital input 23	Optocoupler	Configurable
24	Digital input 24	Optocoupler	Mains breaker open/configurable
25	Digital input 25	Optocoupler	Mains breaker closed/configurable
26	Digital input 26	Optocoupler	Generator breaker open
27	Digital input 27	Optocoupler	Generator breaker closed
28	Com.	Common	Common for terminals 23 to 27

3.5.2 Power supply - Mains controller

Term.	Function	Technical data	Description
1	+12/24 V DC	12/24 V DC +/-30 %	Power supply
2	0 V DC		
3	NO	Status relay 24 V DC/1 A	Normally open relay, processor/power supply status supervision
4	Com.		

Term.	Function	Technical data	Description
5	NO	Relay 05 250 V AC/8 A	Central alarm HORN/configurable
6	Com.		
7	NC		
8	NO	Relay 08 250V AC/8 A	Open mains breaker/configurable
9	Com.		
10	NC		
11	NO	Relay 11 250 V AC/8 A	Close mains breaker (synchronising)/configurable
12	Com.		
13	NC		
14	NO	Relay 14 250 V AC/8 A	Open tie breaker/configurable
15	Com.		
16	NC		
17	NO	Relay 17 250 V AC/8 A	Close tie breaker (synchronising)/configurable
18	Com.		
19	NC		
20	Open collector 1	Transistor output/Relay 20	Pulse output 1, kWh counter/configurable
21	Open collector 2	Transistor output/Relay 21	Pulse output 2, kvarh counter/configurable
22	Com.	Common	Common terminal for terminals 20 and 21
23	Digital input 23	Optocoupler	Configurable
24	Digital input 24	Optocoupler	Mains breaker open/configurable
25	Digital input 25	Optocoupler	Mains breaker closed/configurable
26	Digital input 26	Optocoupler	Tie breaker open/configurable
27	Digital input 27	Optocoupler	Tie breaker closed/configurable
28	Com.	Common	Common for terminals 23 to 27

3.5.3 Power supply - BTB controller

Term.	Function	Technical data	Description
1	+12/24 V DC	12/24 V DC +/-30 %	Power supply
2	0 V DC		
3	NO	Status relay 24 V DC/1 A	Normally open relay, processor/power supply status supervision
4	Com.		
5	NO	Relay 05 250 V AC/8 A	Central alarm HORN/configurable
6	Com.		
7	NC		
8	NO	Relay 08 250 V AC/8 A	Configurable
9	Com.		
10	NC		

Term.	Function	Technical data	Description
11	NO	Relay 11 250 V AC/8 A	Configurable
12	Com.		
13	NC		
14	NO	Relay 250 V AC/8 A	Open bus tie breaker
15	Com.		
16	NC		
17	NO	Relay 250 V AC/8 A	Close bus tie breaker (synchronising)
18	Com.		
19	NC		
20	Open collector 1	Transistor output/Relay 20	Configurable
21	Open collector 2	Transistor output/Relay 21	Configurable
22	Com.	Common	Common terminal for terminals 20 and 21
23	Digital input 23	Optocoupler	Configurable
24	Digital input 24	Optocoupler	Configurable
25	Digital input 25	Optocoupler	Configurable
26	Digital input 26	Optocoupler	Configurable
27	Digital input 27	Optocoupler	Configurable
28	Com.	Common	Common for terminals 23 to 27

3.5.4 Power supply - Group controller

Term.	Function	Technical data	Description
1	+12/24 V DC	12/24 V DC +/-30 %	Power supply
2	0 V DC		
3	NO	Status relay 24 V DC/1 A	Normally open relay, processor/power supply status supervision
4	Com.		
5	NO	Relay 05 250 V AC/8 A	Central alarm HORN/configurable
6	Com.		
7	NC		
8	NO	Relay 08 250 V AC/8 A	Configurable
9	Com.		
10	NC		
11	NO	Relay 11 250 V AC/8 A	Configurable
12	Com.		
13	NC		
14	NO	Relay 250 V AC/8 A	Open tie breaker
15	Com.		
16	NC		

Term.	Function	Technical data	Description
17	NO	Relay 250 V AC/8 A	Close tie breaker (synchronising)
18	Com.		
19	NC		
20	Open collector 1	Transistor output/Relay 20	Configurable
21	Open collector 2	Transistor output/Relay 21	Configurable
22	Com.	Common	Common terminal for terminals 20 and 21
23	Digital input 23	Optocoupler	Configurable
24	Digital input 24	Optocoupler	Configurable
25	Digital input 25	Optocoupler	Configurable
26	Digital input 26	Optocoupler	Tie breaker open
27	Digital input 27	Optocoupler	Tie breaker closed/configurable
28	Com.	Common	Common for terminals 23 to 27

3.5.5 Power supply - Plant controller

Term.	Function	Technical data	Description
1	+12/24 V DC	12/24 V DC +/-30 %	Power supply
2	0 V DC		
3	NO	Status relay 24 V DC/1 A	Normally open relay, processor/power supply status supervision
4	Com.		
5	NO	Relay 05 250 V AC/8 A	Central alarm HORN/configurable
6	Com.		
7	NC		
8	NO	Relay 08 250 V AC/8 A	Open mains breaker/configurable
9	Com.		
10	NC		
11	NO	Relay 11 250 V AC/8 A	Close mains breaker (synchronising)/configurable
12	Com.		
13	NC		
14	NO	Relay 250 V AC/8 A	Configurable
15	Com.		
16	NC		
17	NO	Relay 250 V AC/8 A	Configurable
18	Com.		
19	NC		
20	Open collector 1	Transistor output/Relay 20	Pulse output 1, kWh counter/configurable
21	Open collector 2	Transistor output/Relay 21	Pulse output 2, kvarh counter/configurable
22	Com.	Common	Common terminal for terminals 20 and 21
23	Digital input 23	Optocoupler	Configurable
24	Digital input 24	Optocoupler	Mains breaker open/Configurable

Term.	Function	Technical data	Description
25	Digital input 25	Optocoupler	Mains breaker closed/configurable
26	Digital input 26	Optocoupler	Configurable
27	Digital input 27	Optocoupler	Configurable
28	Com.	Common	Common for terminals 23 to 27

3.6 Slot 2

3.6.1 Serial communication (option H)

Modbus RTU, RS-485 (option H2)

Term.	Function	Description
29	DATA + (A)	Modbus RTU, RS-485
30	GND	
31	DATA - (B)	
32	Not used	
33	DATA + (A)	
34	Not used	
35	DATA - (B)	
36	Not used	

The serial communication line should be terminated between DATA + and DATA - with a resistor equal to the cable impedance. The terminals 29/33 and 31/35 are internally connected.

INFO
Never connect the GND terminal 30 to earth. Only connect it to a third wire in the communication cable!

Modbus RTU, RS-232 (option H9)

Term.	Function	Description
29	Not used	Modbus RTU, RS-232
30	GND	
31	Not used	
32	TxD	
33	Not used	
34	RxD	
35	Not used	
36	Not used	

INFO
Never connect the GND terminal 30 to earth. Only connect it to a third wire in the communication cable!

Profibus (option H3)

Term.	Function	Description
29	DATA + (B)	Pin 3 on 9-pole D-sub connector Pin 5 on 9-pole D-sub connector Pin 8 on 9-pole D-sub connector
30	GND	
31	DATA - (A)	
32	DATA + (B)	
33	GND	
34	DATA - (A)	
35	Not used	
36	Not used	

INFO
Never connect the GND terminal 30 to earth. Only connect it to a third wire in the communication cable!

3.6.2 External I/O module (option H8.2)

Term.	Function	Description
29	CAN-H	CAN bus card option H8.2
30	CAN-GND	
31	CAN-L	
32	CAN-H	
33	CAN-GND	
34	CAN-L	
35	Not used	
36	Not used	

INFO
Terminals 29 and 32 are internally connected. Terminals 31 and 34 are internally connected.

3.6.3 Dual CAN (option H12.2)

Term.	Function	Description
29	CAN-H	H12 dual CAN bus card includes the following options: Option H5 (engine interface communication) Option H8 (external I/O module) It is configurable which terminals that are used Terminals 29-31: CAN C Terminals 32-34: CAN D
30	CAN-GND	
31	CAN-L	
32	CAN-H	
33	CAN-GND	
34	CAN-L	
35	Not used	
36	Not used	

3.6.4 7 digital inputs (option M13.2)

Term.	Function	Technical data	Description
29	Binary input 29	Optocoupler	Configurable
30	Binary input 30	Optocoupler	Configurable
31	Binary input 31	Optocoupler	Configurable
32	Binary input 32	Optocoupler	Configurable
33	Binary input 33	Optocoupler	Configurable
34	Binary input 34	Optocoupler	Configurable
35	Binary input 35	Optocoupler	Configurable
36	Com.	Optocoupler	Common for terminals 29 to 35

3.6.5 Relay outputs (option M14.2)

Term.	Function	Technical data	Description
29	NE/ND	Relay 29 250 V AC/5 A	Configurable
30	Com.		
31	NE/ND	Relay 31 250 V AC/5 A	Configurable
32	Com.		
33	NE/ND	Relay 33 250 V AC/5 A	Configurable
34	Com.		
35	NE/ND	Relay 35 250 V AC/5 A	Configurable
36	Com.		

3.7 Slot 3

3.7.1 Load sharing control (option G3)

Term.	Function	Technical data	Description
37	-5 to 0 to 5 V DC	Analogue I/O	Active load sharing line
38	Com.	Common	Common for load sharing lines
39	-5 to 0 to 5 V DC	Analogue I/O	Reactive load sharing
40	-10 to 0 to 10 V DC	Analogue I/O	f/P set point (passive)
41	Com.	Common	Common for 40/42
42	-10 to 0 to 10 V DC	Analogue I/O	U/Q set point (passive)
43	**Not used**		
44			
45			
46			
47			
48			
49			
50			
51			
52			
53			
54			
55			
56			
57			
58			
59			
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62			
63			
64			

3.7.2 13 binary inputs and 4 relay outputs (option M12)

Term.	Function	Technical data	Description
37	**Not used**		
38			
39			
40	-10/+10 V DC	Analogue I/O	f/P set point
41	Com.	Common	Common

Term.	Function	Technical data	Description
42	-10/+10 V DC	Analogue I/O	U/Q set point
43	Binary input	Optocoupler	Configurable
44	Binary input	Optocoupler	Configurable
45	Binary input	Optocoupler	Configurable
46	Binary input	Optocoupler	Configurable
47	Binary input	Optocoupler	Configurable
48	Binary input	Optocoupler	Configurable
49	Binary input	Optocoupler	Configurable
50	Binary input	Optocoupler	Configurable
51	Binary input	Optocoupler	Configurable
52	Binary input	Optocoupler	Configurable
53	Binary input	Optocoupler	Configurable
54	Binary input	Optocoupler	Configurable
55	Binary input	Optocoupler	Configurable
56	Com.	Common	Common for terminals 43 to 55
57	NE/ND	Relay 57 250 V AC/5 A	Configurable
58	Com.		
59	NE/ND	Relay 59 250 V AC/5 A	Configurable
60	Com.		
61	NE/ND	Relay 61 250 V AC/5 A	Configurable
62	Com.		
63	NE/ND	Relay 63 250 V AC/5 A	Configurable
64	Com.		

3.8 Slot 4

3.8.1 Relay outputs (option M14.4, standard)

Term.	Function	Technical data	Description
65	NE/ND	Relay 65 250 V AC/5 A	Generator GOV: Increase frequency/configurable
66	Com.		
67	NE/ND	Relay 67 250 V AC/5 A	Generator GOV: Decrease frequency/configurable
68	Com.		
69	Not used	Relay 69 250 V AC/5 A	Configurable
70	Com.		
71	Not used	Relay 71 250 V AC/5 A	Configurable
72	Com.		

3.8.2 Analogue outputs for GOV/AVR or transducer (option E1)

Term.	Function	Description
65	Not used	
66	+/-25 mA	Configurable
67	0	
68	Not used	
69	Not used	
70	+/-25 mA	Configurable
71	0	
72	Not used	

INFO
AVR control requires option D1.

3.8.3 Analogue outputs for GOV/AVR or transducer (option EF2)

Term.	Function	Description
65	Not used	
66	+/-25 mA	Configurable
67	0	
68	Not used	
69	Not used	
70	0(4)-20 mA out	Configurable
71	0	
72	Not used	

INFO
AVR control requires option D1.

3.8.4 Combination outputs for GOV/AVR or transducer (option EF4)

Term.	Function	Description
65	+/-25 mA	Configurable
66	0	
67	Not used	
68	Not used	
69	Relay	Relay 69
70	Relay	
71	Relay	Relay 71
72	Relay	

INFO
AVR control requires option D1.

3.8.5 PWM, relay and analogue outputs for GOV/AVR (option EF5)

Term.	Function	Description
65	+/-25 mA	AVR set point output
66	0	
67	PWM +	PWM speed governor signal
68	PWM -	
69	NO	Relay output for AVR. Raise voltage
70	Com.	
71	NO	Relay output for AVR. Lower voltage
72	Com.	

INFO
AVR control requires option D1.

3.8.6 PWM and analogue outputs for GOV/AVR (option EF6)

Term.	Function	Description
65	Not used	
66	Not used	
67	0	Speed governor, AVR or transducer output 68
68	+/-25 mA	
69	PWM -	PWM speed governor signal
70	PWM +	
71	0	Speed governor, AVR or transducer output 72
72	+/-25 mA	

INFO
Connect PWM - to the engine battery negative and PWM + to the engine control system S-SPD (speed) input (called RATED SPEED on the ADEM controller and PRIMARY THROTTLE on the PEEC controller).

INFO
AVR control requires option D1.

3.8.7 Analogue outputs for GOV/AVR or transducer (option E2)

Term.	Function	Description
65	Not used	
66	0(4) to 20 mA out	Configurable
67	0	
68	Not used	
69	Not used	
70	0(4) to 20 mA out	Configurable
71	0	
72	Not used	

INFO
AVR control requires option D1.

3.9 Slot 5

3.9.1 AC measuring - Genset controller

Term.	Function	Technical data	Description
73	I L1, s1	Generator current L1	x/1 A or x/5 A input
74	I L1, s2		
75	I L2, s1	Generator current L2	x/1 A or x/5 A input
76	I L2, s2		
77	I L3, s1	Generator current L3	x/1 A or x/5 A input
78	I L3, s2		
79	U L1	Generator voltage L1	Max. 690 V AC phase-phase value
80		Not used	
81	U L2	Generator voltage L2	Max. 690 V AC phase-phase value
82		Not used	
83	U L3	Generator voltage L3	Max. 690 V AC phase-phase value
84	$U_{NEUTRAL}$	Generator voltage neutral	
85	U L1	Mains/bus voltage L1	Max. 690 V AC phase-phase value
86		Not used	
87	U L2	Mains/bus voltage L2	Max. 690 V AC phase-phase value
88	$U_{NEUTRAL}$	Mains/bus voltage neutral	
89	U L3	Mains/bus voltage L3	Max. 690 V AC phase-phase value

3.9.2 AC measuring - Mains controller

Term.	Function	Technical data	Description
73	I L1, s1	Mains current L1	x/1 A or x/5 A input
74	I L1, s2		
75	I L2, s1	Mains current L2	x/1 A or x/5 A input
76	I L2, s2		
77	I L3, s1	Mains current L3	x/1 A or x/5 A input
78	I L3, s2		
79	U L1	Mains voltage L1	Max. 690 V AC phase-phase value
80		Not used	
81	U L2	Mains voltage L2	Max. 690 V AC phase-phase value
82		Not used	
83	U L3	Mains voltage L3	Max. 690 V AC phase-phase value
84	$U_{NEUTRAL}$	Mains voltage neutral	
85	U L1	Bus voltage L1	Max. 690 V AC phase-phase value
86		Not used	
87	U L2	Bus voltage L2	Max. 690 V AC phase-phase value

Term.	Function	Technical data	Description
88	$U_{NEUTRAL}$	Bus voltage neutral	
89	U L3	Bus voltage L3	Max. 690 V AC phase-phase value

3.9.3 AC measuring - BTB controller

Term.	Function	Technical data	Description
73	I L1, s1	Bus A current L1	x/1 A or x/5 A input
74	I L1, s2		
75	I L2, s1	Bus A current L2	x/1 A or x/5 A input
76	I L2, s2		
77	I L3, s1	Bus A current L3	x/1 A or x/5 A input
78	I L3, s2		
79	U L1	Bus A voltage L1	Max. 690 V AC phase-phase value
80		Not used	
81	U L2	Bus A voltage L2	Max. 690 V AC phase-phase value
82		Not used	
83	U L3	Bus A voltage L3	Max. 690 V AC phase-phase value
84	$U_{NEUTRAL}$	Bus A voltage neutral	
85	U L1	Bus B voltage L1	Max. 690 V AC phase-phase value
86		Not used	
87	U L2	Bus B voltage L2	Max. 690 V AC phase-phase value
88	$U_{NEUTRAL}$	Bus B voltage neutral	
89	U L3	Bus B voltage L3	Max. 690 V AC phase-phase value

3.9.4 AC measuring - Group controller

Term.	Function	Technical data	Description
73	I L1, s1	Generator current L1	x/1 A or x/5 A input
74	I L1, s2		
75	I L2, s1	Generator current L2	x/1 A or x/5 A input
76	I L2, s2		
77	I L3, s1	Generator current L3	x/1 A or x/5 A input
78	I L3, s2		
79	U L1	Generator voltage L1	Max. 690 V AC phase-phase value
80		Not used	
81	U L2	Generator voltage L2	Max. 690 V AC phase-phase value
82		Not used	
83	U L3	Generator voltage L3	Max. 690 V AC phase-phase value
84	$U_{NEUTRAL}$	Generator voltage neutral	
85	U L1	BB voltage L1	Max. 690 V AC phase-phase value
86		Not used	

Term.	Function	Technical data	Description
87	U L2	BB voltage L2	Max. 690 V AC phase-phase value
88	$U_{NEUTRAL}$	BB voltage neutral	
89	U L3	BB voltage L3	Max. 690 V AC phase-phase value

3.9.5 AC measuring - Plant controller

Term.	Function	Technical data	Description
73	I L1, s1	Mains current L1	x/1 A or x/5 A input
74	I L1, s2		
75	I L2, s1	Mains current L2	x/1 A or x/5 A input
76	I L2, s2		
77	I L3, s1	Mains current L3	x/1 A or x/5 A input
78	I L3, s2		
79	U L1	Mains voltage L1	Max. 690 V AC phase-phase value
80		Not used	
81	U L2	Mains voltage L2	Max. 690 V AC phase-phase value
82		Not used	
83	U L3	Mains voltage L3	Max. 690 V AC phase-phase value
84	$U_{NEUTRAL}$	Mains voltage neutral	
85	U L1	BB voltage L1	Max. 690 V AC phase-phase value
86		Not used	
87	U L2	BB voltage L2	Max. 690 V AC phase-phase value
88	$U_{NEUTRAL}$	BB voltage neutral	
89	U L3	BB voltage L3	Max. 690 V AC phase-phase value

3.10 Slot 6

3.10.1 7 digital inputs (option M13.6)

Term.	Function	Technical data	Description
90	Com.	Common	Common for terminals 90 to 97
91	Binary input 91	Optocoupler	Configurable
92	Binary input 92	Optocoupler	Configurable
93	Binary input 93	Optocoupler	Configurable
94	Binary input 94	Optocoupler	Configurable
95	Binary input 95	Optocoupler	Configurable
96	Binary input 96	Optocoupler	Configurable
97	Binary input 97	Optocoupler	Configurable

3.10.2 4 relay outputs (option M14.6)

Term.	Function	Technical data	Description
90	NE/ND	Relay 90 250 V AC 5 A	Configurable
91	Com.		
92	NE/ND	Relay 92 250 V AC 5 A	Configurable
93	Com.		
94	NE/ND	Relay 94 250 V AC 5 A	Configurable
95	Com.		
96	NE/ND	Relay 96 250 V AC 5 A	Configurable
97	Com.		

3.10.3 4 analogue inputs (option M15.6)

Term.	Function	Technical data	Description
90	Analogue input 91 -	Common	Configurable
91	Analogue input 91 +	4 to 20 mA in	
92	Analogue input 93 -	Common	Configurable
93	Analogue input 93 +	4 to 20 mA in	
94	Analogue input 95 -	Common	Configurable
95	Analogue input 95 +	4 to 20 mA in	
96	Analogue input 97 -	Common	Configurable
97	Analogue input 97 +	4 to 20 mA in	

3.10.4 4 multi-inputs (option M16.6)

Term.	Function	Technical data	Description
90	Multi-input 91	Common	Configurable: 4 to 20 mA/0 to 5 V/Pt100
91	Multi-input 91	Analogue in	

Term.	Function	Technical data	Description
92	Multi-input 93	Common	Configurable: 4 to 20 mA/0 to 5 V/Pt100
93	Multi-input 93	Analogue in	
94	Multi-input 95	Common	Configurable: 4 to 20 mA/0 to 5 V/Pt100
95	Multi-input 95	Analogue in	
96	Multi-input 97	Common	Configurable: 4 to 20 mA/0 to 5 V/Pt100
97	Multi-input 97	Analogue in	

3.10.5 Analogue outputs for transducer (option F1)

Term.	Function	Description
90	Not used	
91	0	Transducer output
92	0(4) to 20 mA out	
93	Not used	
94	Not used	
95	0	Transducer output
96	0(4) to 20 mA out	
97	Not used	

INFO
The option F1 cannot be used for GOV/AVR outputs.

3.11 Slot 7

3.11.1 Engine interface card - Genset controller

Term.	Function	Technical data	Description
98	+12/24 V DC	12/24 V DC +/-30 %	DC power supply
99	0 V DC		
100	MPU input	0.5 to 70 V AC/ 10 to 10,000 Hz	Magnetic pickup with wire break
101	MPU GND		
102	A	0(4) to 20 mA Digital Pt100 Pt1000 RMI 0 to 40 V DC	Multi-input 1
103	B		
104	C		
105	A		Multi-input 2
106	B		
107	C		
108	A		Multi-input 3
109	B		
110	C		
111	Com.	Common	Common for terminals 112 to 117
112	Digital input 112	Optocoupler	Configurable
113	Digital input 113	Optocoupler	Configurable
114	Digital input 114	Optocoupler	Configurable
115	Digital input 115	Optocoupler	Configurable
116	Digital input 116	Optocoupler	Configurable
117	Digital input 117	Optocoupler	Configurable
118	Digital input 118	Optocoupler	Emergency stop and common for 119 and 120
119	NO	Relay 24 V DC/5 A	Run coil
120	NO	Relay 24 V DC/5 A	Start prepare
121	Com.	Relay 250 V AC/5 A	Crank (starter)
122	NO		
123	Com.	Relay 24 V DC/5 A	Stop coil w/wire failure detection
124	NO		
A1	CAN-H		CAN bus interface A (option G4, G5, G8 or H7)
A2	GND		
A3	CAN-L		
B1	CAN-H		CAN bus interface B (option G4 or G5, G8)
B2	GND		
B3	CAN-L		

3.11.2 Engine interface card - Mains/BTB/Group/Plant controller

Term.	Function	Technical data	Description
98	+12/24 V DC	12/24 V DC +/-30 %	DC power supply
99	0 V DC		
100	MPU input	0.5 to 70 V AC/ 10 to 10,000 Hz	Magnetic pickup
101	MPU GND		
102	A	0(4) to 20 mA Digital Pt100 Pt1000 RMI 0 to 40 V DC	Multi-input 1
103	B		
104	C		
105	A		Multi-input 2
106	B		
107	C		
108	A		Multi-input 3
109	B		
110	C		
111	Com.	Common	Common for terminals 112-117
112	Digital input 112	Optocoupler	Configurable
113	Digital input 113	Optocoupler	Configurable
114	Digital input 114	Optocoupler	Configurable
115	Digital input 115	Optocoupler	Configurable
116	Digital input 116	Optocoupler	Configurable
117	Digital input 117	Optocoupler	Configurable
118	Digital input 118	Optocoupler	Emergency stop and common for 119 and 120
119	NO	Relay 24 V DC/5 A	Not used
120	NO	Relay 24 V DC/5 A	Not used
121	Com.	Relay 250 V AC/5 A	Not used
122	NO		
123	Com.	Relay 24 V DC/5 A	Not used
124	NO		
A1	CAN-H		CAN bus interface A (option G4 or G5)
A2	GND		
A3	CAN-L		
B1	CAN-H		CAN bus interface B (option G4 or G5)
B2	GND		
B3	CAN-L		

3.12 Slot 8

3.12.1 Engine interface communication (option H5)

Term.	Function	Description
126	Not used	CAN bus-based engine interface communication
127	Not used	
128	CAN-L	
129	GND	
130	CAN-H	
131	CAN-L	
132	GND	
133	CAN-H	

3.12.2 Cummins engine interface communication (option H6)

Term.	Function	Description
126	Not used	Modbus RTU (RS-485)
127	DATA - (B)	
128	Not used	
129	DATA + (A)	
130	Not used	
131	DATA - (B)	
132	GND	
133	DATA + (A)	

3.12.3 7 digital inputs (option M13.8)

Term.	Function	Technical data	Description
126	Com.	Common	Common for terminals 127 to 133
127	Digital input 127	Optocoupler	Configurable
128	Digital input 128	Optocoupler	Configurable
129	Digital input 129	Optocoupler	Configurable
130	Digital input 130	Optocoupler	Configurable
131	Digital input 131	Optocoupler	Configurable
132	Digital input 132	Optocoupler	Configurable
133	Digital input 133	Optocoupler	Configurable

3.12.4 4 relay outputs (option M14.8)

Term.	Function	Technical data	Description
126	NE/ND	Relay 126 250 V AC/5 A	Configurable
127	Com.		

Term.	Function	Technical data	Description
128	NE/ND	Relay 128 250 V AC/5 A	Configurable
129	Com.		
130	NE/ND	Relay 130 250 V AC/5 A	Configurable
131	Com.		
132	NE/ND	Relay 132 250 V AC/5 A	Configurable
133	Com.		

3.12.5 4 analogue inputs (option M15.8)

Term.	Function	Technical data	Description
126	Analogue input 127 -	Common	Configurable
127	Analogue input 127 +	4 to 20 mA in	
128	Analogue input 129 -	Common	Configurable
129	Analogue input 129 +	4 to 20 mA in	
130	Analogue input 131 -	Common	Configurable
131	Analogue input 131 +	4 to 20 mA in	
132	Analogue input 133 -	Common	Configurable
133	Analogue input 133 +	4 to 20 mA in	

3.12.6 4 multi-inputs (option M16.8)

Term.	Function	Technical data	Description
126	Multi-input 127	Common	Configurable: 4 to 20 mA/0 to 5 V/Pt100
127	Multi-input 127	Analogue in	
128	Multi-input 129	Common	Configurable: 4 to 20 mA/0 to 5 V/Pt100
129	Multi-input 129	Analogue in	
130	Multi-input 131	Common	Configurable: 4 to 20 mA/0 to 5 V/Pt100
131	Multi-input 131	Analogue in	
132	Multi-input 133	Common	Configurable: 4 to 20 mA/0 to 5 V/Pt100
133	Multi-input 133	Analogue in	

3.12.7 External I/O module (option H8.8)

Term.	Function	Description
126	Not used	CAN bus card option H8.8
127	Not used	
128	CAN-L	
129	GND	
130	CAN-H	
131	CAN-L	
132	GND	
133	CAN-H	

INFO
Terminals 133 and 130 are internally connected. Terminals 131 and 128 are internally connected.

3.12.8 Dual CAN (option H12.8)

Term.	Function	Description
126	Not used	Dual CAN bus card includes the following options: Option H5 (engine interface communication) Option H8 (external I/O module) It is configurable which terminals that are used Terminals 128-130: CAN E Terminals 131-133: CAN F
127	Not used	
128	CAN-L	
129	GND	
130	CAN-H	
131	CAN-L	
132	GND	
133	CAN-H	

4. Wiring

4.1 AC connections

The controller can be wired up in a 1-phase, 2-phase or 3-phase configuration. 3-phase examples are included for each controller type.

INFO
Contact the switchboard manufacturer for accurate information about required wiring for the specific application.

Neutral line (N)

For three phases systems, the neutral line (N) is only required if the system is a three-phase + neutral system. If the distribution system is a three-phase system without neutral, do not connect terminals 84 and 88.

Current transformer grounding

The current transformers can be grounded using the s1 or s2 connections.

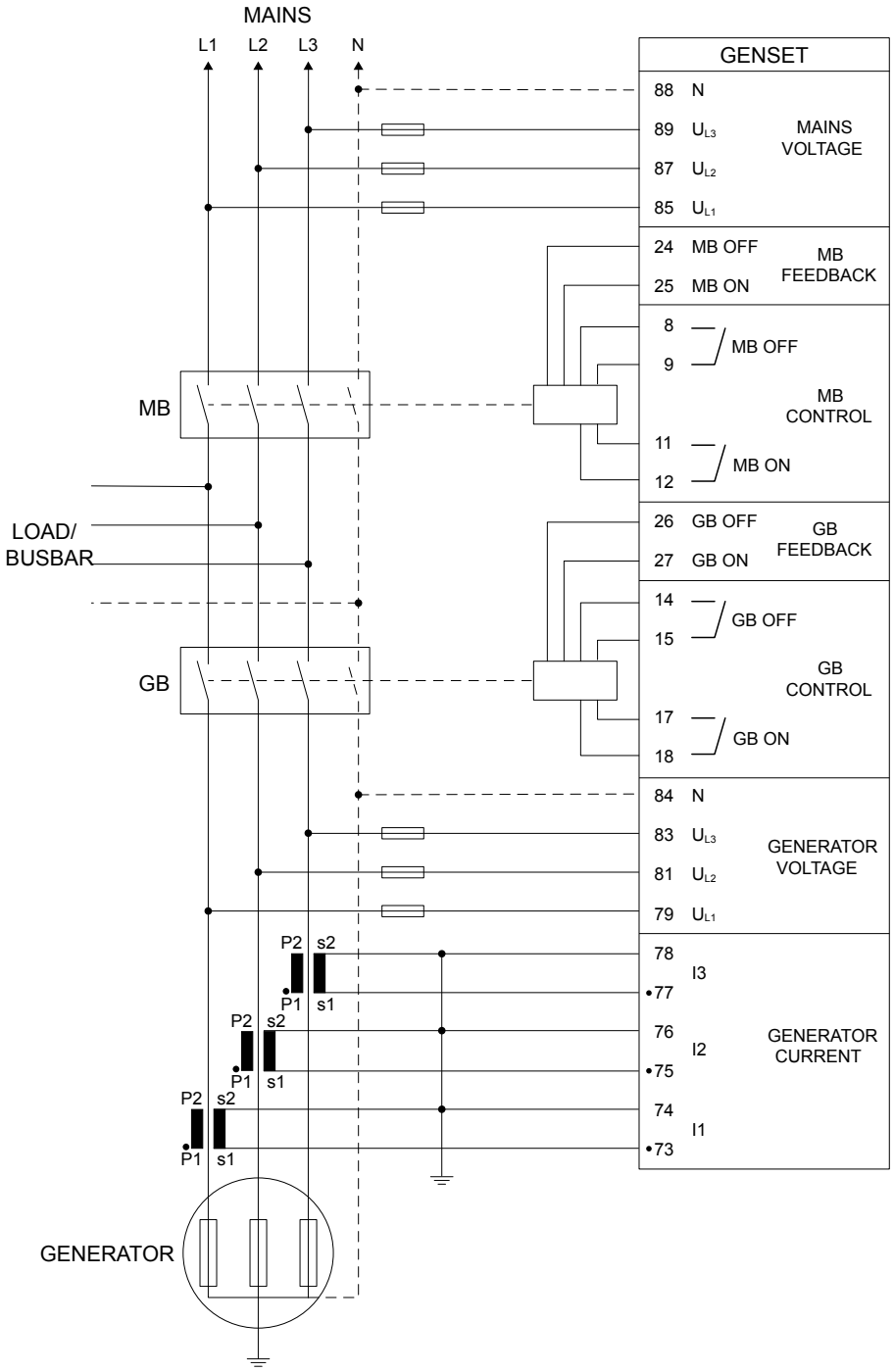
Fuses

Protect the AC voltage measurement cables with 2 A, slow blow fuses.

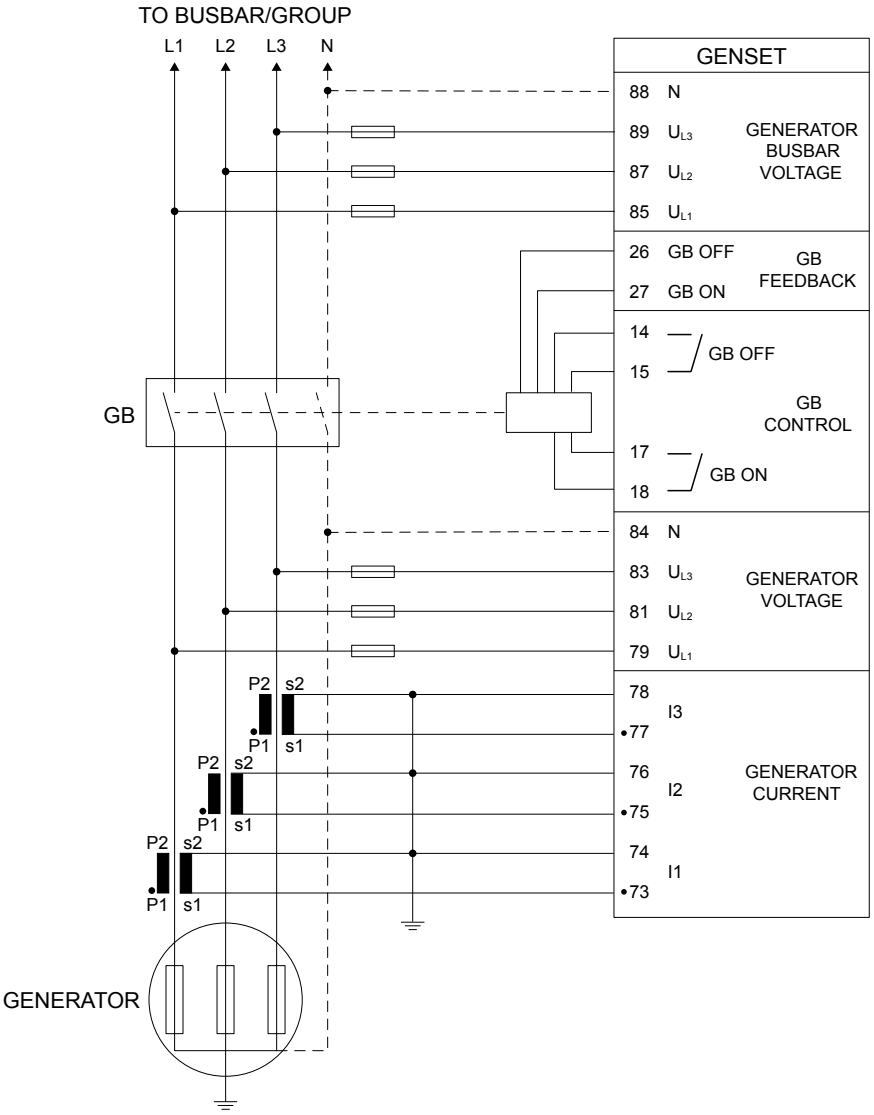
Breaker wiring

The examples are for pulse breakers. Breaker open/off wiring is not required for a continuous breaker.

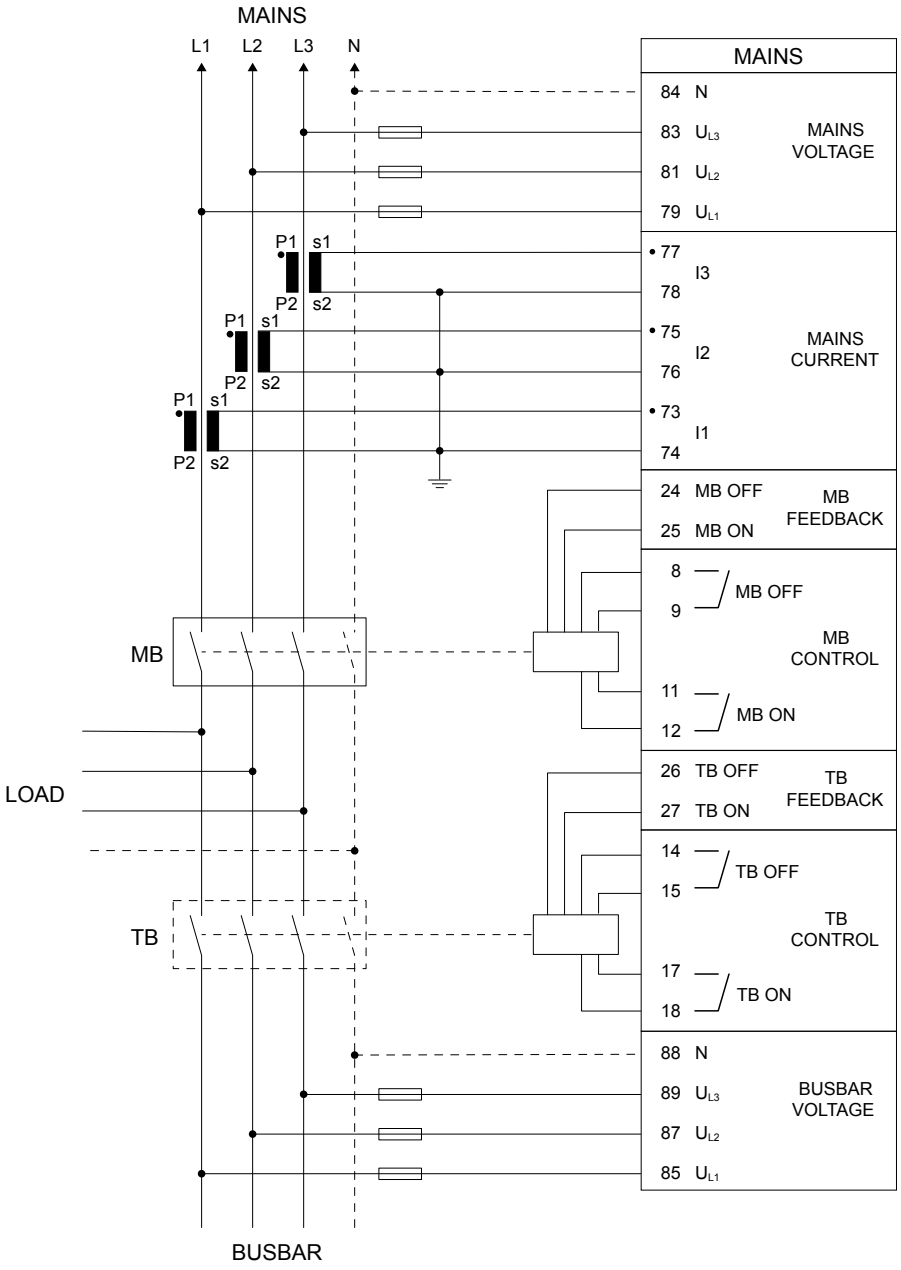
4.1.1 Genset controller (stand-alone)



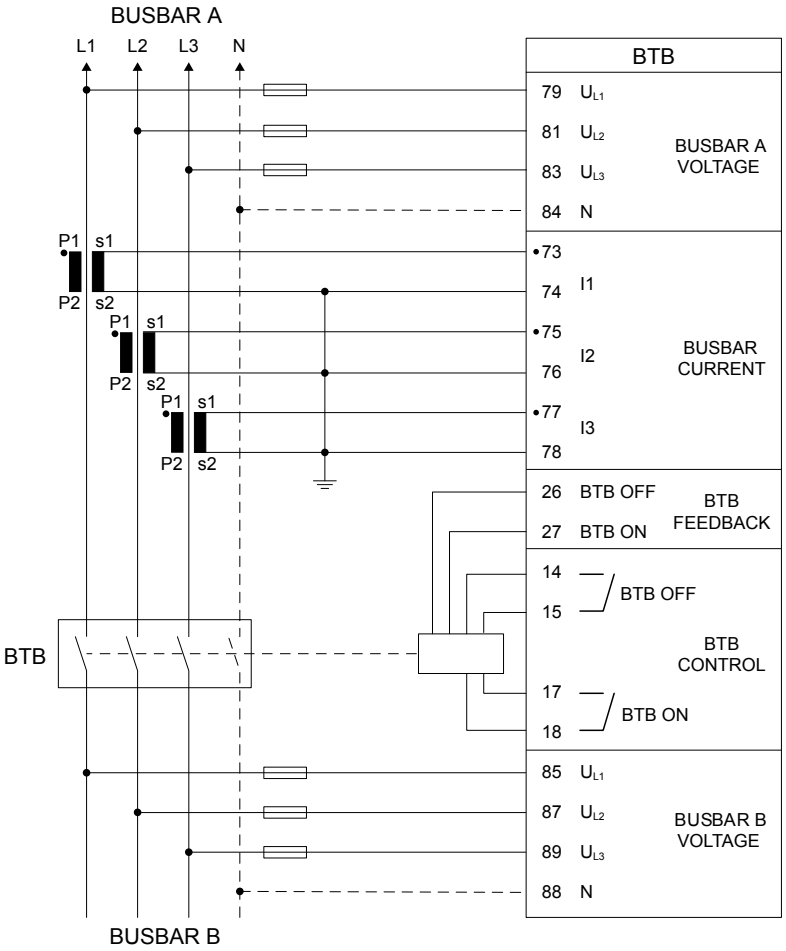
4.1.2 Genset controller (power management/island)



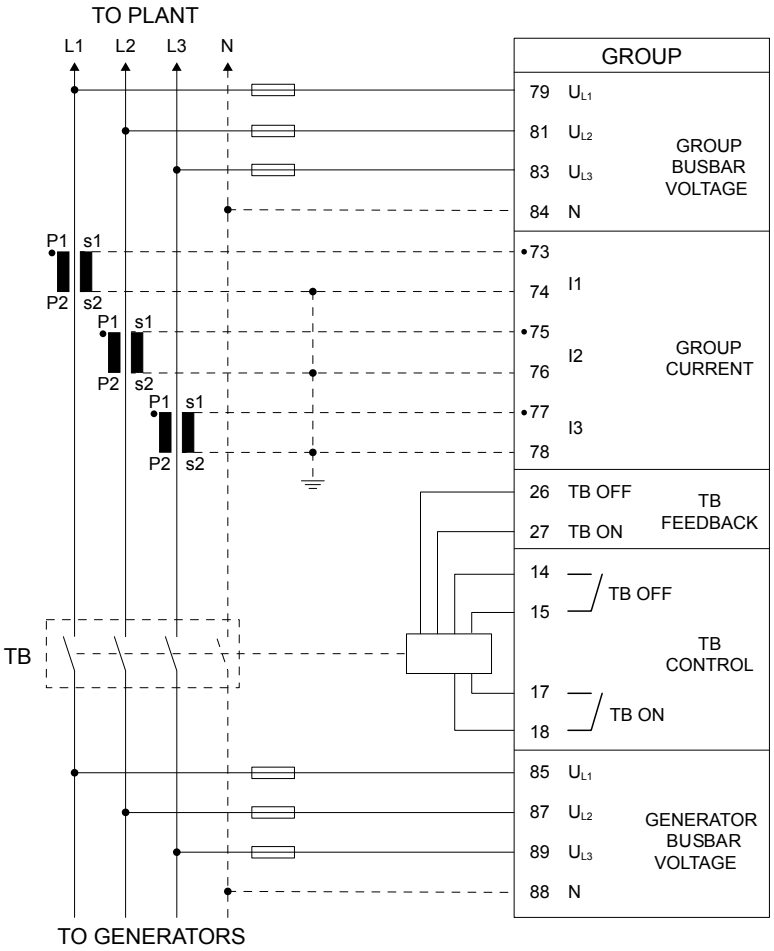
4.1.3 Mains controller



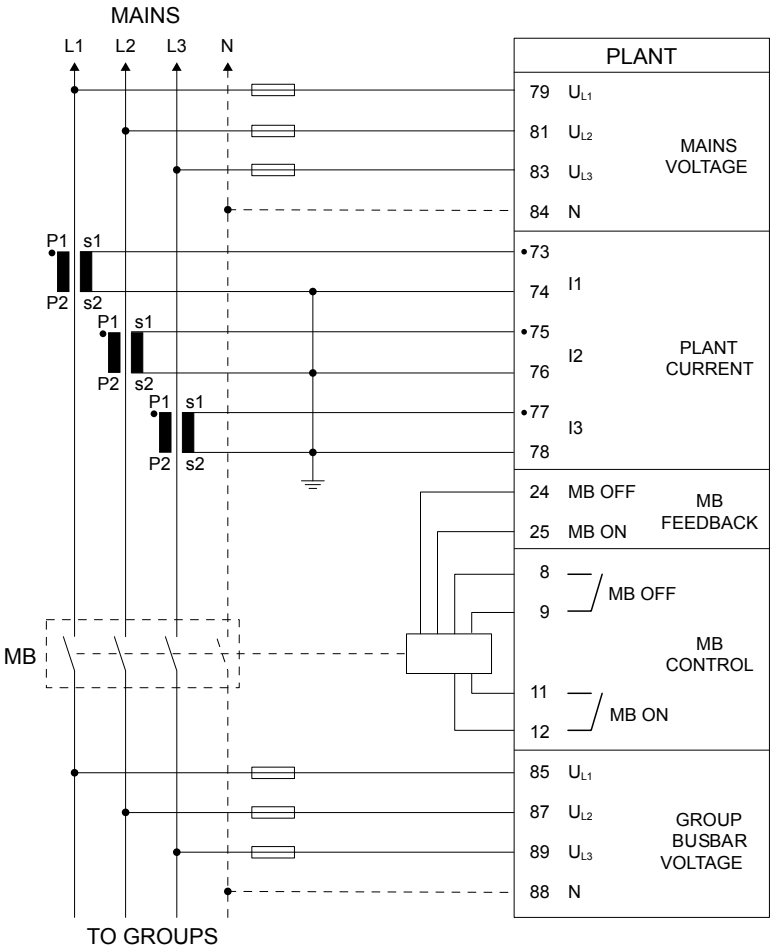
4.1.4 BTB controller



4.1.5 Group controller

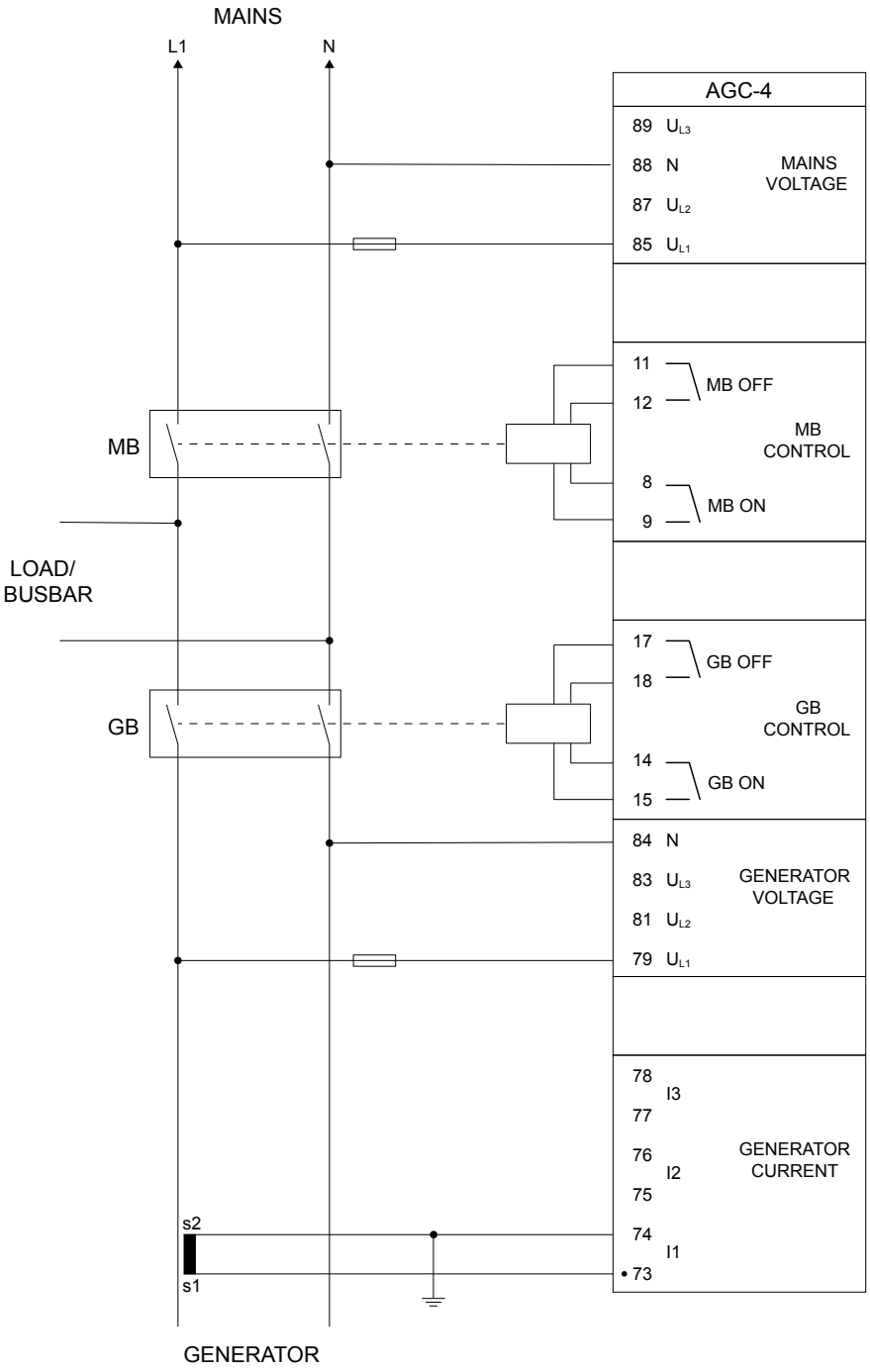


4.1.6 Plant controller

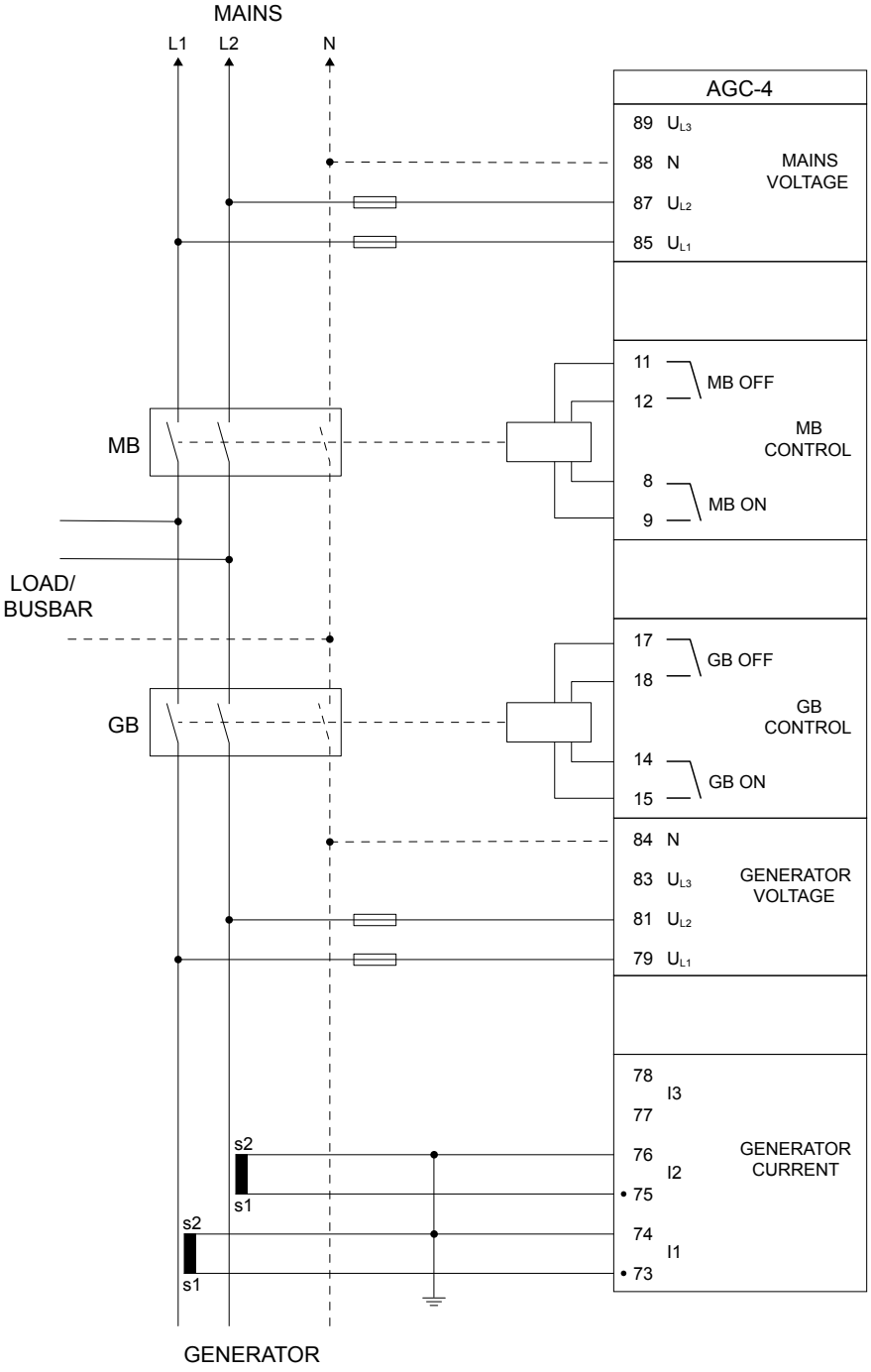


4.1.7 Single-phase and 2-phase AC wiring

Single-phase (stand-alone genset controller)

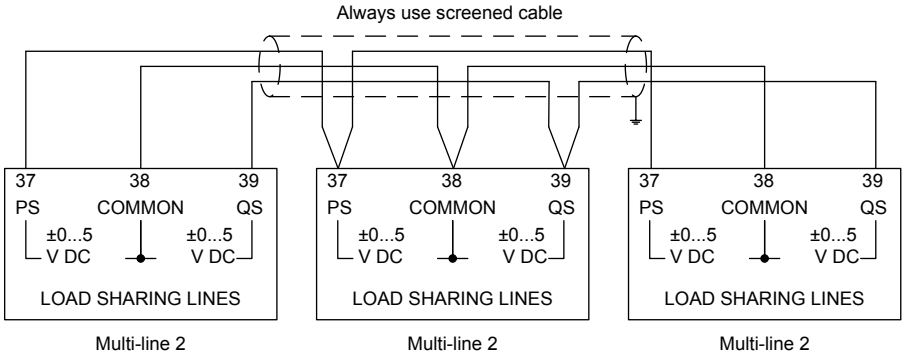


2-phase L1L2 split-phase (stand-alone genset controller)



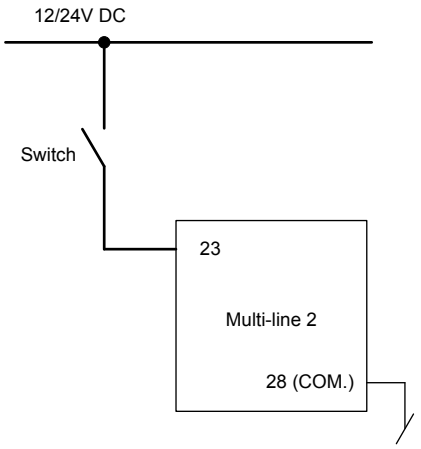
4.2 DC connections

4.2.1 Load sharing lines (option G3)

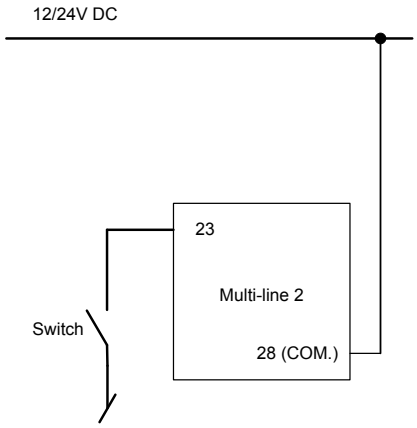


4.2.2 Digital inputs

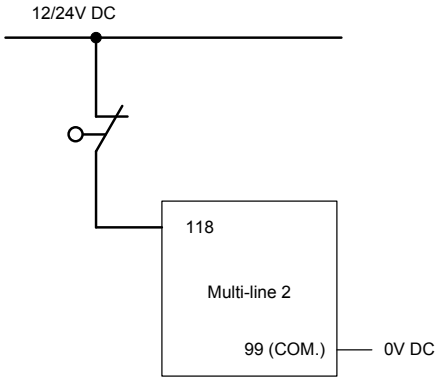
Battery positive to input:



Battery negative to input:

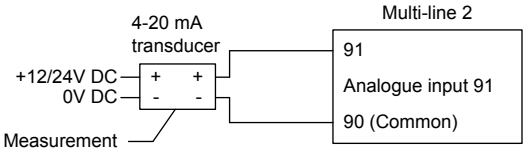


Emergency stop:

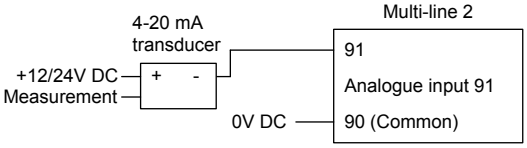


4.2.3 Analogue inputs (option M15.X)

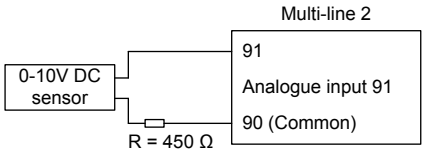
4 to 20 mA - Active transducer



4 to 20 mA - Passive transducer

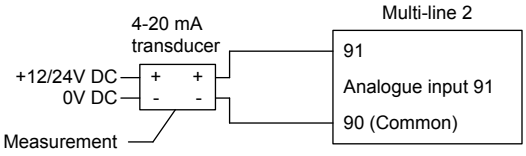


V DC sensor

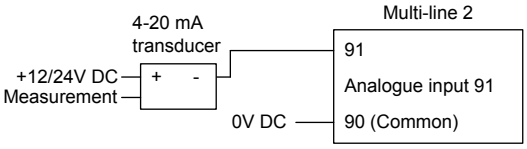


4.2.4 Multi-inputs (option M16.X)

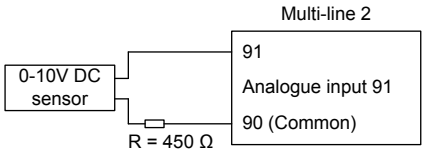
4 to 20 mA - Active transducer



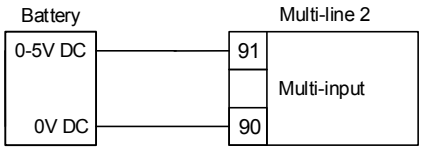
4 to 20 mA - Passive transducer



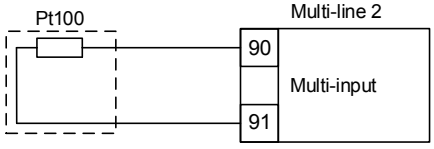
V DC sensor



0 to 5 V DC



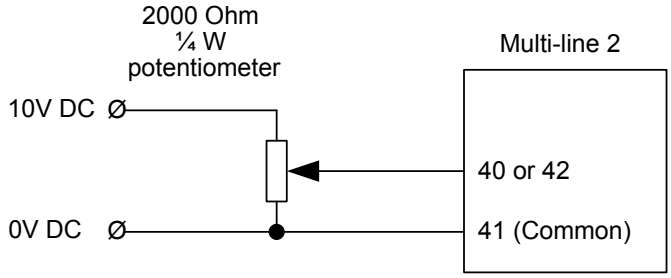
Pt100



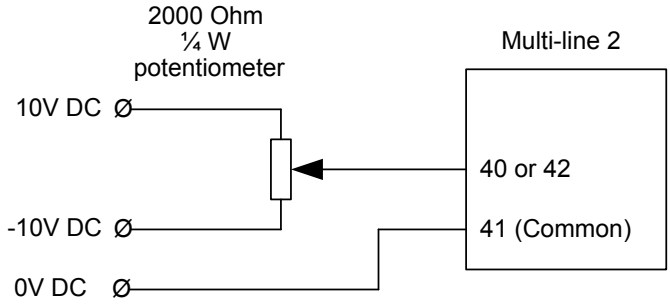
4.2.5 External set points (option G3/M12)

The set point inputs are passive, that is, an external power source is needed. This can be an active output from, for example, a PLC, or a potentiometer can be used.

0 to 10 V DC input using potentiometer



+/-10 V DC input using potentiometer

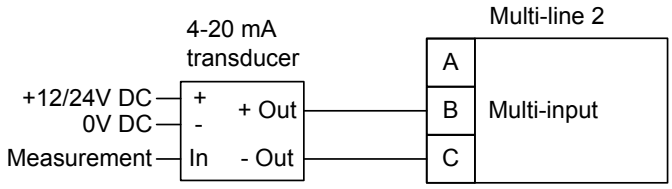


4.2.6 Multi-inputs (102, 105, 108)

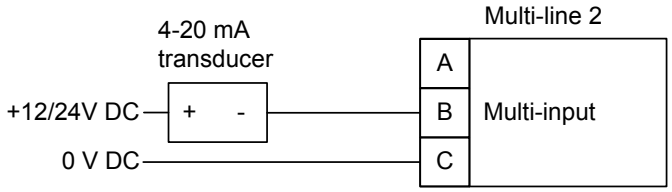
0(4) to 20 mA

The multi-inputs are placed in slot #7. The terminal numbers for the individual multi-inputs can be seen under Slot #7.

Active transducer

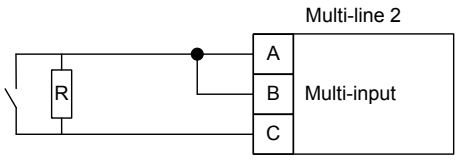


Passive transducer



INFO
If the passive sensor has its own battery supply, the voltage must not exceed 30 V DC.

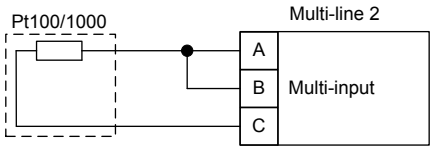
Digital inputs



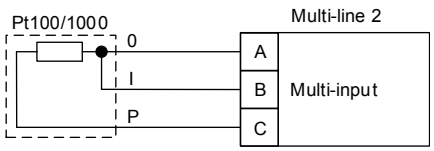
INFO
The resistor is only mounted if wire fail supervision is required. The value of the resistor should be 270 Ω +/-10 %.

Pt100/Pt1000

2-wire

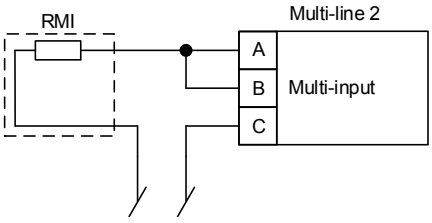


3-wire

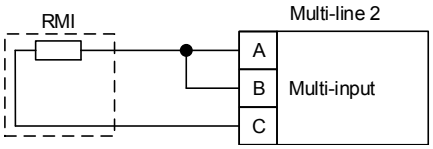


RMI

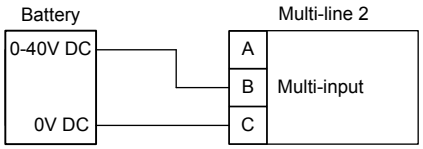
1-wire



2-wire

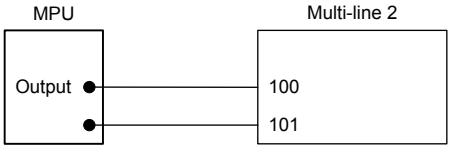


0 to 40 V DC

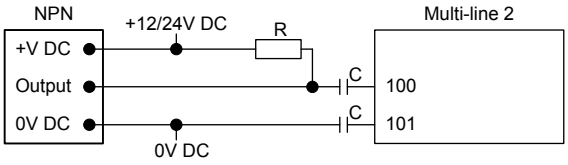


4.2.7 RPM input

Magnetic pickup (MPU)



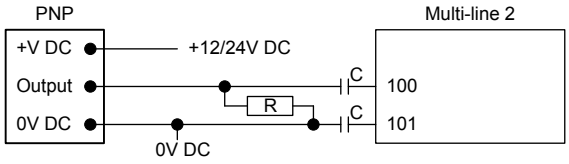
NPN sensor



C = 22 nF, 100 V foil type

R = 1200 Ω @ 24 V DC, 600 Ω @ 12 V DC

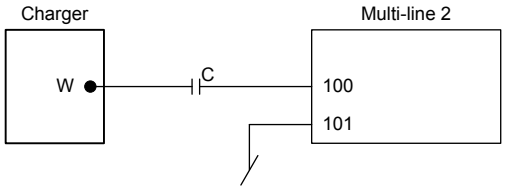
PNP sensor



C = 22 nF, 100 V foil type

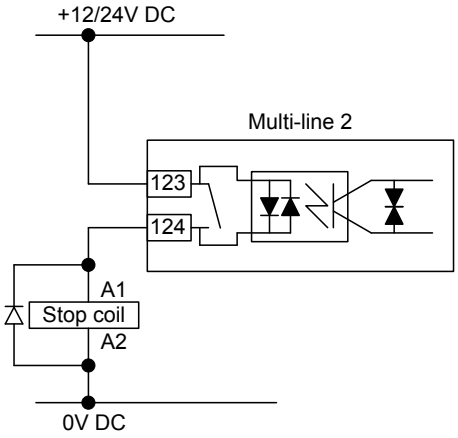
R = 1200 Ω @ 24 V DC, 600 Ω @ 12 V DC

Charger, W output



C = 22 nF, 100 V foil type

4.2.8 Stop coil

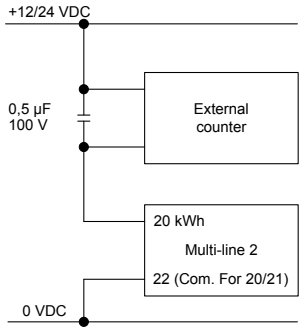


INFO
Remember to mount the freewheeling diode.

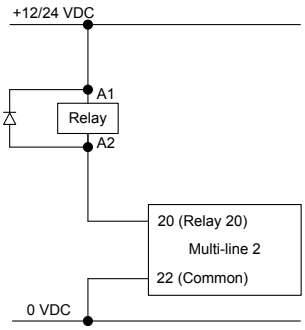
4.2.9 Transistor outputs (open collector outputs)

The open collector outputs can be used as kWh and kvarh counter outputs or as relay outputs. The outputs are low power outputs. For that reason, one of the following circuits must be applied.

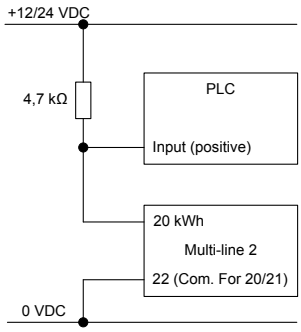
External counter:



Relay outputs:



Connection to PLC:



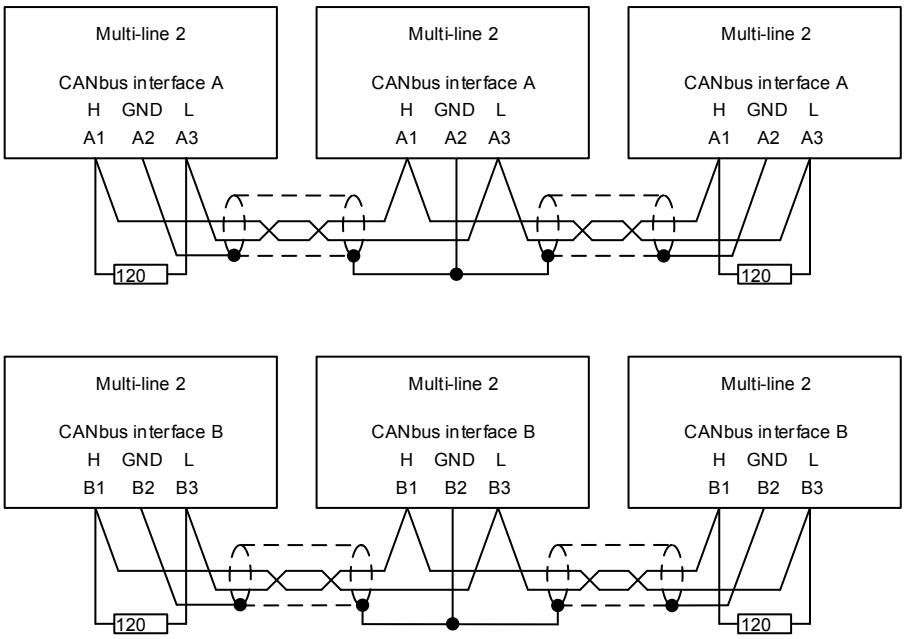
INFO
Remember to mount the freewheeling diode.

INFO
Maximum load on the open collector outputs is 10 mA at 24 V DC.

4.3 Communication

4.3.1 CAN bus (option G4/G5/G8)

Examples with three controllers connected (for example, one mains controller and two genset controllers).



INFO
Use shielded twisted cable.

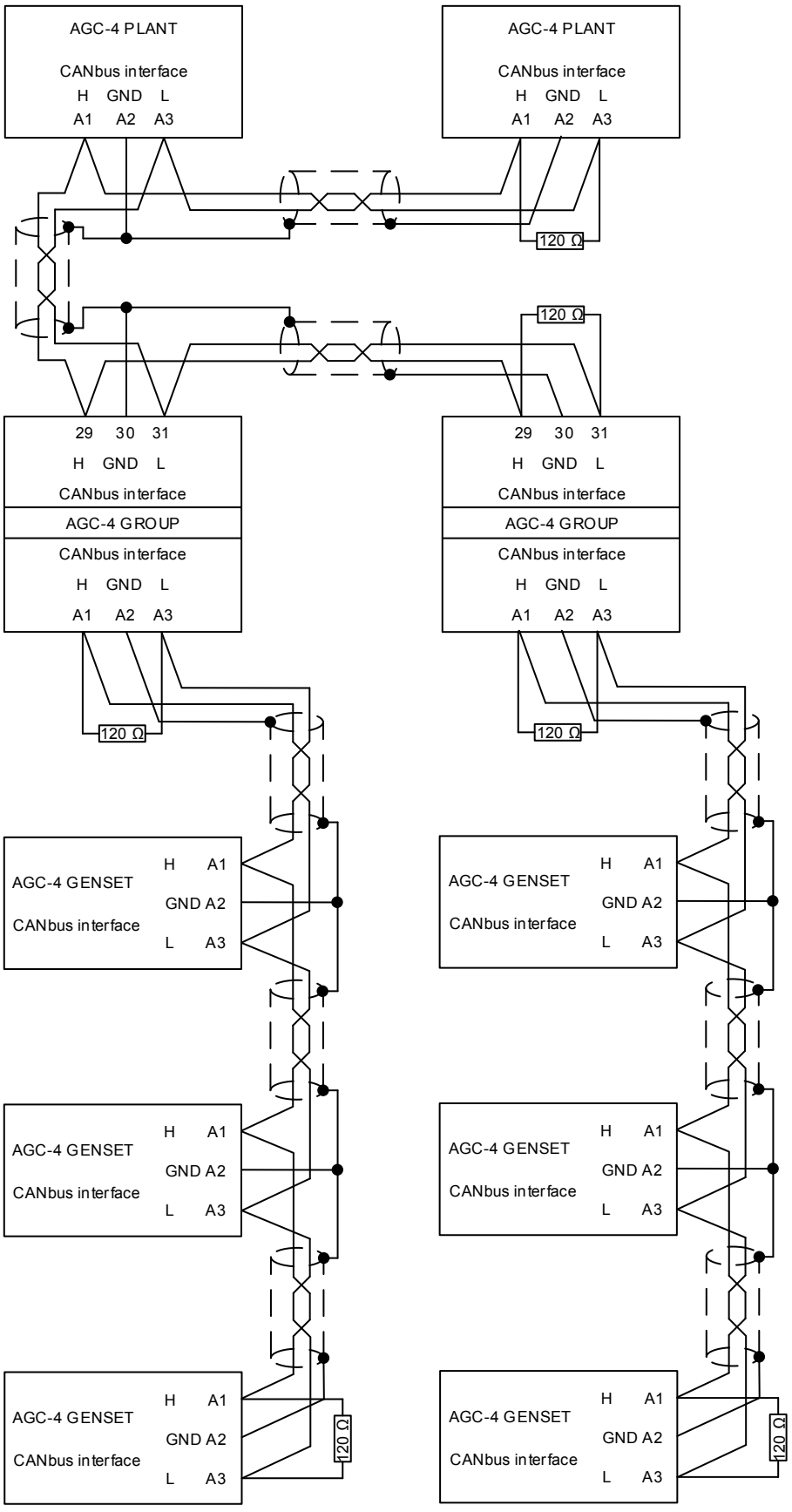
INFO
End resistor R = 120 Ohm.

4.3.2 CAN bus (3-level application, option G7)

The CAN bus communication and the controllers must be wired as two separate systems.

The first CAN bus is wired between the plant controllers and the group controller.

The other CAN bus line is wired from one group controller and down to the gensets in the specific genset group. This must be wired from these terminals:



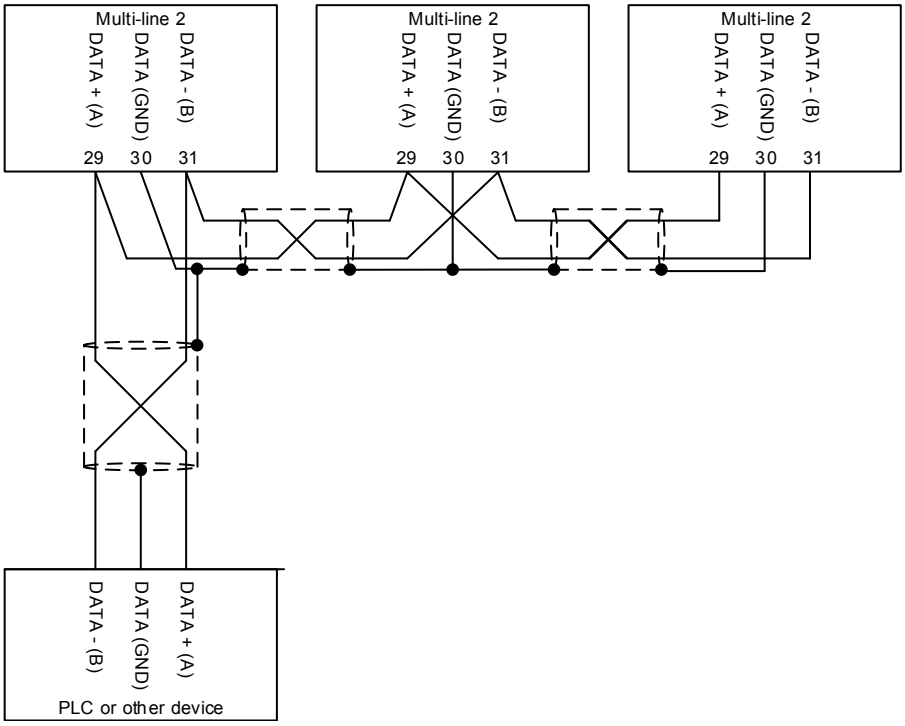
INFO
Connect shield to earth at one end only. Shield ends must be insulated with tape or insulation tubing.

INFO
Use shielded twisted cable.

INFO
End resistor R = 120 ohm.

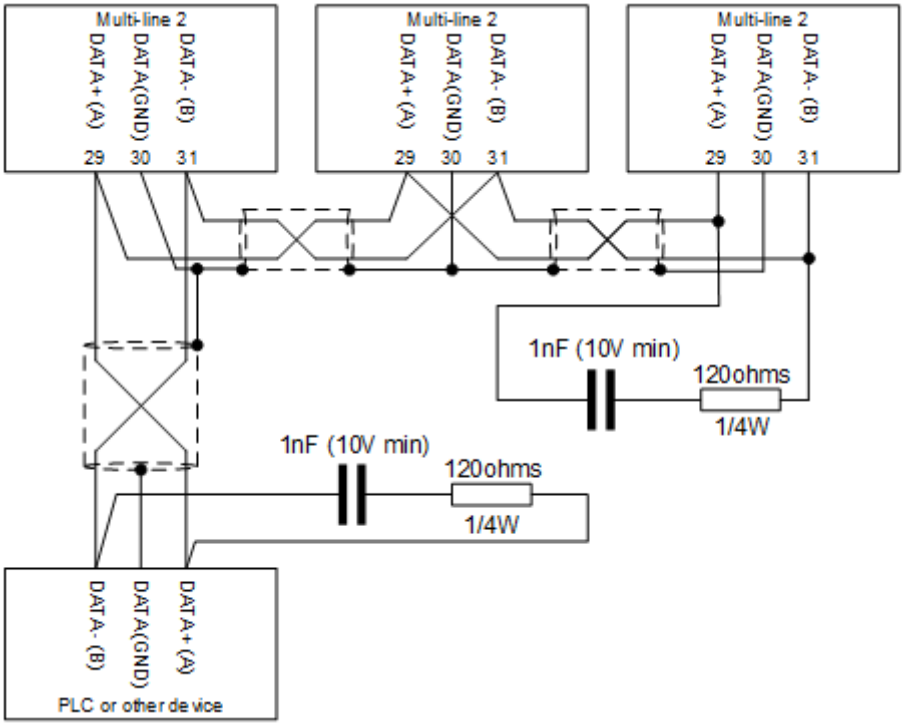
4.3.3 Modbus RS-485 (option H2)

Example with three controllers connected.



INFO
Use shielded twisted cable.

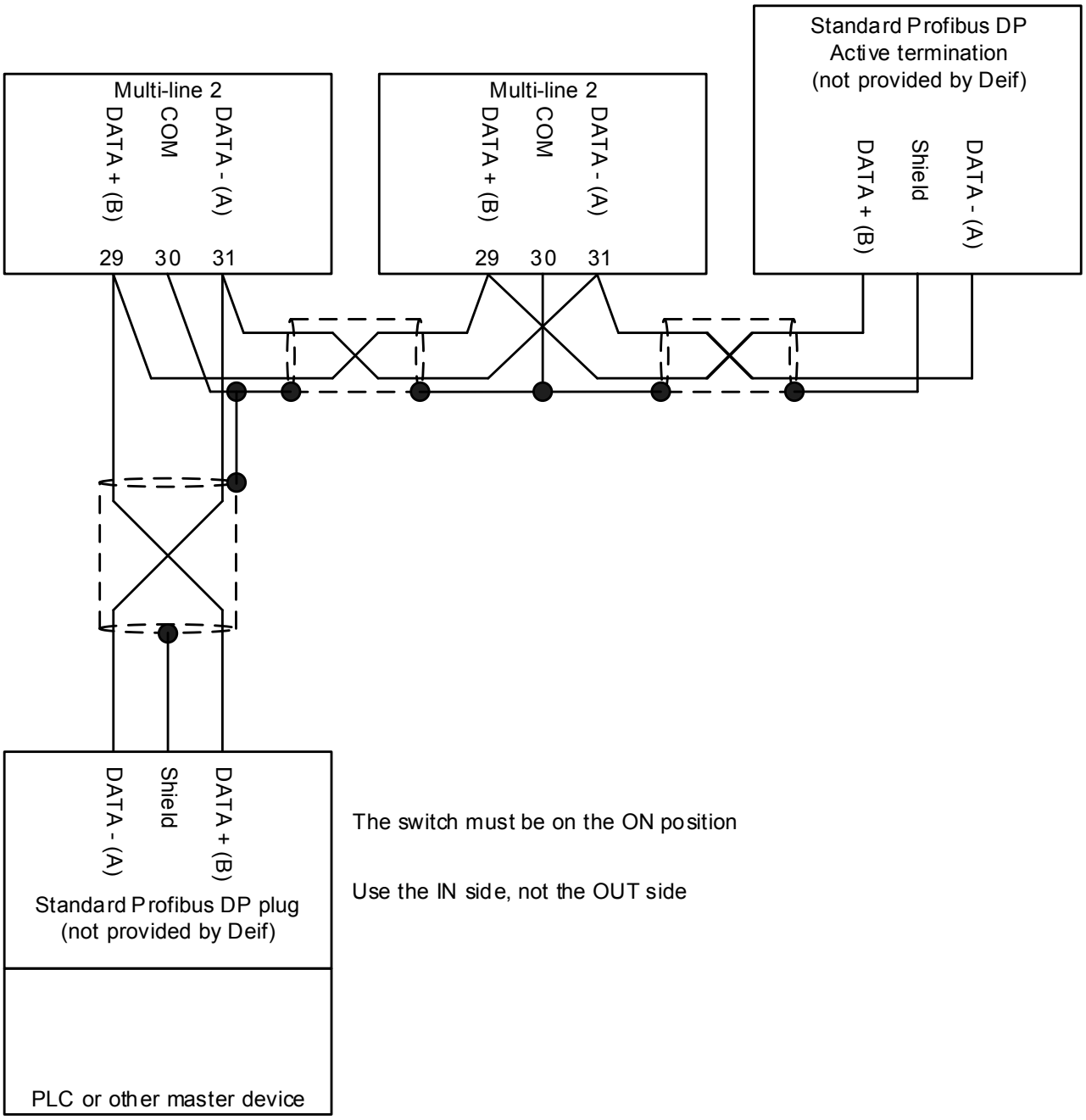
INFO
The RS-485 Modbus lines need end resistors (end terminators) when the bus length exceeds 30 m. If end resistors are needed, we recommend to install them like this:



INFO
Cable: Belden 3105A or equivalent. 22 AWG (0.6 mm^2) twisted pair, shielded, <40 mΩ/m, min. 95 % shield coverage.

4.3.4 Profibus DP (option H3)

Example with two controllers connected.

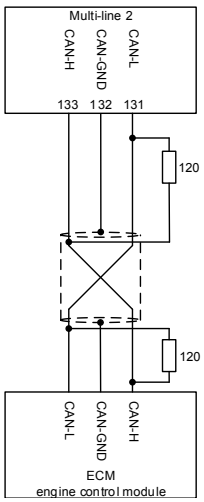


The switch must be on the ON position

Use the IN side, not the OUT side

INFO
Use shielded twisted cable.

4.3.5 CAN bus engine communication (option H5)

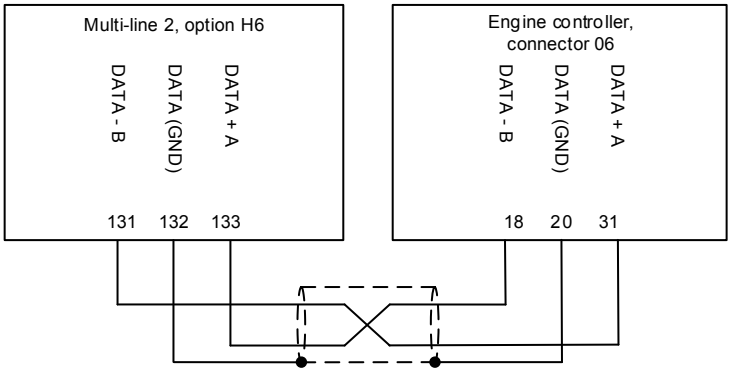


INFO
Use shielded twisted cable.

INFO
End resistor R = 120 Ohm.

INFO
The terminating resistor at the engine side might not be needed, see the engine manufacturer's literature.

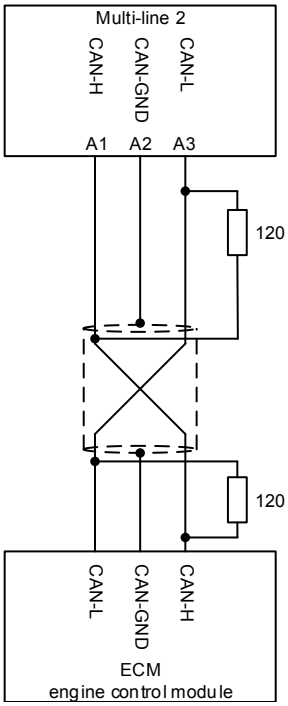
4.3.6 Cummins GCS (option H6)



INFO
Use shielded twisted cable.

INFO
Cable: Belden 3105A or equivalent. 22 AWG (0.6 mm^2) twisted pair, shielded, <40 mΩ/m, min. 95 % shield coverage.

4.3.7 CAN bus engine communication (option H7)

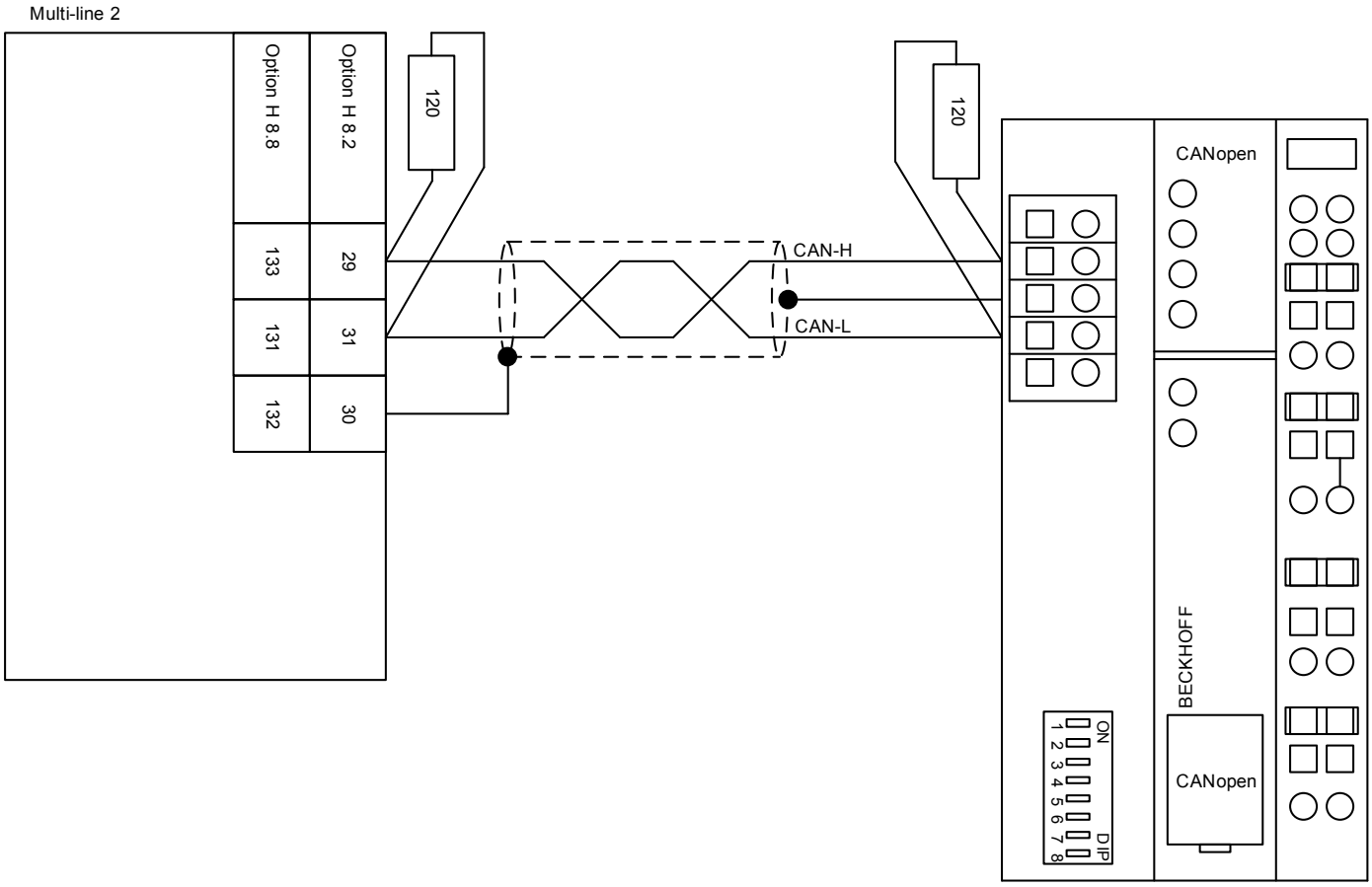


INFO
Use shielded twisted cable.

INFO
End resistor R = 120 Ohm.

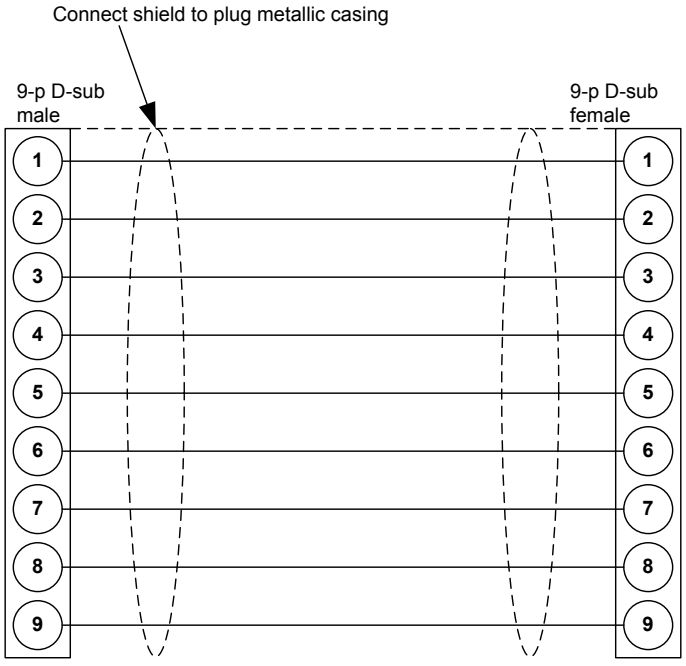
INFO
The terminating resistor at the engine side might not be needed, see the engine manufacturer’s literature.

4.3.8 External I/O module (option H8)



4.3.9 Display cable (option J)

A standard computer extension cable can be used (9-pole D-sub male/female plugs) or a cable can be tailored.



Wires min. 0.22 mm^2, max. cable length 6 m.

Cable types: Belden 9540, BICC H8146, Brand Rex BE57540 or equivalent.

INFO
Do not use tools or brute force when tightening the finger-screws on the display cable.

5. Technical specifications

Accuracy	Class 1.0 -25 to 15 to 30 to 70 °C Temperature coefficient: +/-0.2 % of full scale per 10 °C Class 0.5 with option Q1 Averaged frequency: +/-10 mHz, 15 to 30 °C, 45 to 65 Hz Positive, negative and zero sequence alarms: Class 1 within 5 % voltage unbalance Class 1.0 for negative sequence current Fast over-current: 3 % of 350 %*In Analogue outputs: Class 1.0 according to total range Option EF4/EF5: Class 4.0 according to total range To IEC/EN60688
Operating temperature	-25 to 70 °C (-13 to 158 °F) -25 to 60 °C (-13 to 140 °F) if Modbus TCP/IP (option N) is available in the controller. (UL/cUL Listed: Max. surrounding air temperature: 55 °C/131 °F)
Storage temperature	-40 to 70 °C (-40 to 158 °F)
Climate	97 % RH to IEC 60068-2-30
Operating altitude	0 to 4000 m above sea level Derating 2001 to 4000 m above sea level: Max. 480 V AC phase-phase 3W4 measuring voltage Max. 690 V AC phase-phase 3W3 measuring voltage
Measuring voltage	100 to 690 V AC +/-20 % (UL/cUL Listed: 600 V AC phase-phase) Consumption: Max. 0.25 VA/phase
Measuring current	-/1 or -/5 A AC (UL/cUL Listed: from CTs 1-5 A) Consumption: Max. 0.3 VA/phase
Current overload	4 x I_n continuously 20 x I_n, 10 sec. (max. 75 A) 80 x I_n, 1 sec. (max. 300 A)
Measuring frequency	30 to 70 Hz
Aux. supply	Terminals 1 and 2: 12/24 V DC nominal (8 to 36 V DC operational). Max. 11 W consumption Battery voltage measurement accuracy: ±0.8 V within 8 to 32 V DC, ±0.5 V within 8 to 32 V DC @ 20 °C Terminals 98 and 99: 12/24 V DC nominal (8 to 36 V DC operational). Max. 5 W consumption 0 V DC for max. 10 ms when coming from at least 24 V DC (cranking dropout) The aux. supply inputs are to be protected by a 2 A slow blow fuse. (UL/cUL Listed: AWG 24)
Digital inputs	Optocoupler, bi-directional ON: 8 to 36 V DC Impedance: 4.7 kΩ OFF: <2 V DC
Analogue inputs	-10 to +10 V DC: Not galvanically separated. Impedance: 100 kΩ (analogue load sharing lines) 0(4) to 20 mA: impedance 50 Ω. Not galvanically separated (M15.X)
RPM	RPM (MPU): 2 to 70 V AC, 10 to 10000 Hz, max. 50 kΩ
Multi-inputs Engine interface board slot #7	0(4) to 20 mA: 0 to 20 mA, +/-1 %. Not galvanically separated Digital: Max. resistance for ON detection: 100 Ω. Not galvanically separated Pt100/1000: -40 to 250 °C, +/-1 %. Not galvanically separated. To IEC/EN60751 RMI: 0 to 1700 Ω, +/-2 %. Not galvanically separated V DC: 0 to 40 V DC, +/-1 %. Not galvanically separated
Multi-inputs (M16.X)	0(4) to 20 mA: 0 to 20 mA, +/-2 %. Not galvanically separated Pt100: -40 to 250 °C, +/-2 %. Not galvanically separated. To IEC/EN60751

	V DC: 0 to 5 V DC, +/-2 %. Not galvanically separated
Relay outputs	Electrical rating: 250 V AC/30 V DC, 5 A. (UL/cUL Listed: 250 V AC/24 V DC, 2 A resistive load) Thermal rating @ 50 °C: 2 A: Continuously. 4 A: t_{on}= 5 sec., t_{off} = 15 sec. (Controller status output: 1 A)
Open collector outputs	Supply: 8 to 36 V DC, max. 10 mA (terminal 20, 21, 22 (com))
Analogue outputs	0(4) to 20 mA and +/-25 mA. Galvanically separated. Active output (internal supply). Load max. 500 Ω. (UL/cUL Listed: Max. 20 mA output) Update rate: transducer output: 250 ms. Regulator output: 100 ms
Load sharing lines	-5 to 0 to +5 V DC. Impedance: 23.5 kΩ
Galvanic separation	Between AC voltage and other I/Os: 3250 V, 50 Hz, 1 min. Between AC current and other I/Os: 2200 V, 50 Hz, 1 min. Between analogue outputs and other I/Os: 550 V, 50 Hz, 1 min. Between digital input groups and other I/Os: 550 V, 50 Hz, 1 min.
Response times (delay set to minimum)	**Busbar:** Over-/under-voltage: <50 ms Over-/under-frequency: <50 ms Voltage unbalance: <250 ms **Generator:** Reverse power: <250 ms Over-current: <250 ms Fast over-current: <40 ms Directional over-current: <150 ms Over-/under-voltage: <250 ms Over-/under-frequency: <350 ms Overload: <250 ms Current unbalance: <250 ms Voltage unbalance: <250 ms Reactive power import: <250 ms Reactive power export: <250 ms Voltage-dependent I>: <250 ms Negative sequence I: <500 ms Negative sequence U: <500 ms Zero sequence I: <500 ms Zero sequence U: <500 ms Overspeed: <500 ms Digital inputs: <250 ms Emergency stop: <200 ms Multi-inputs: 800 ms Wire failure: <600 ms **Mains:** df/dt (ROCOF): <130 ms (4 periods) Vector jump: <40 ms Positive sequence: <60 ms Time-dependent under-voltage, U_t<: <50 ms Time-dependent over-voltage, U_t>: <50 ms Under-voltage and reactive power low, U_Q<: <250 ms
Mounting	DIN-rail mount or base mount with six screws Tightening torque: 1.5 N·m
Safety	To EN 61010-1, installation category (over-voltage category) III, 600 V, pollution degree 2 To UL 508 and CSA 22.2 no. 14-05, over-voltage category III, 600 V, pollution degree 2
EMC/CE	To EN 61000-6-2, EN 61000-6-4, IEC 60255-26.
Vibration	3 to 13.2 Hz: 2 mm_{pp}. 13.2 to 100 Hz: 0.7 g. To IEC 60068-2-6 & IACS UR E10 10 to 58.1 Hz: 0.15 mm_{pp}. 58.1 to 150 Hz: 1 g. To IEC 60255-21-1 Response (class 2)

	10 to 150 Hz: 2 g. To IEC 60255-21-1 Endurance (class 2) 3 to 8.15 Hz: 15 mm_{pp}. 8.15 - 35 Hz 2g. To IEC 60255-21-3 Seismic (class 2)
Shock (base mount)	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 Endurance (class 2) 50 g, 11 ms, half sine. To IEC 60068-2-27
Bump	20 g, 16 ms, half sine. To IEC 60255-21-2 (class 2)
Material	All plastic materials are self-extinguishing according to UL94 (V1)
Plug connections	**Controller** AC current: 0.2 to 4.0 mm^2 stranded wire. (UL/cUL Listed: AWG 18) AC voltage: 0.2 to 2.5 mm^2 stranded wire. (UL/cUL Listed: AWG 20) Relays: (UL/cUL Listed: AWG 22) Terminals 98-116: 0.2 to 1.5 mm^2 stranded wire. (UL/cUL Listed: AWG 24) Other: 0.2 to 2.5 mm^2 stranded wire. (UL/cUL Listed: AWG 24) Tightening torque: 0.5 N·m (5-7 lb-in) Service port: USB A-B **DU-2 display** 9-pole D-sub female Tightening torque: 0.2 N·m
Protection	Controller: IP20. Display: IP40 (IP54 with gasket: Option L). (UL/cUL Listed: Type Complete Device, Open Type). To IEC/EN 60529
Governors and AVRs	Multi-line 2 interfaces to all governors and AVRs using analogue, relay control or CAN-based J1939 communication See interfacing guide at www.deif.com
Approvals	UL/cUL Listed to UL508 Applies to VDE-AR-N 4105 See www.deif.com for the most recent approvals.
UL markings	Wiring: Use 60/75 °C copper conductors only Mounting: For use on a flat surface of type 1 enclosure Installation: To be installed in accordance with the NEC (US) or the CEC (Canada) **AOP-2** Maximum ambient temperature: 60 °C Wiring: Use 60/75 °C copper conductors only Mounting: For use on a flat surface of type 3 (IP54) enclosure. Main disconnect must be provided by installer Installation: To be installed in accordance with the NEC (US) or the CEC (Canada) **DC/DC converter for AOP-2** Tightening torque: 0.5 Nm (4.4 lb-in) Wire size: AWG 22-14 Tightening torque: Panel door mounting 0.7 N·m, D-sub screw 0.2 N·m
Weight	Controller: 1.6 kg (3.5 lbs.) Option J1/J4/J6/J7: 0.2 kg (0.4 lbs.) Option J2: 0.4 kg (0.9 lbs.) Option J8: 0.3 kg (0.58 lbs.) DU-2 display: 0.4 kg (0.9 lbs.)

For the TDU 107 technical specifications, see the **TDU 107 Data sheet**. For more information, see www.deif.com/products/tdu-107