DEIF

-power in control

CE

INSTALLATION INSTRUCTIONS

Automatic Genset Controller, AGC-3

- Mounting
- Board slot positions
- Terminal strip overview
- I/O lists
- Wiring

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1. General information

2. General product information

3. Mounting

4. 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

Warnings indicate a potentially dangerous situation, which could result in death, personal injury or damaged equipment, if certain guidelines are not followed.

Notes

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. If there is any doubt about how to install or operate the engine/generator controlled by the Multi-line 2 unit, the company responsible for the installation or the operation of the set must be contacted.

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.

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 Electrostatic discharge awareness

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

1.1.5 Factory settings

The Multi-line 2 unit is delivered from factory with certain factory settings. These are based on average values and are not necessarily the correct settings for matching the engine/generator set in question. Precautions must be taken to check the settings before running the engine/generator set.

1.2 About the Installation Instructions

1.2.1 General purpose

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

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

Please make sure to 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 Contents and overall structure

This document is divided into chapters, and in order to make the structure simple and easy to use, each chapter will begin from the top of a new page.

2. General product information

2.1 AGC-3 product information

2.1.1 Introduction

The AGC is part of the DEIF Multi-line 2 product family. Multi-line 2 is a complete range of multi-function generator protection and control products integrating all the functions you need into one compact and attractive solution.

The concept of the AGC is to offer a cost-effective solution to genset builders, who need a flexible generator protection and control unit for medium to large genset applications. Being part of the Multi-line product family, the standard functions can be supplemented with a variety of optional functions.

2.1.2 Type of product

The Automatic Genset Controller is a micro-processor based control unit containing all necessary functions for protection and control of a genset.

It contains all necessary 3-phase measuring circuits, and all values and alarms are presented on the LCD display.

2.1.3 Options

The Multi-line 2 product range consists of different basic versions, which can be supplemented with the flexible options needed to provide the optimum solution. For example, the options cover various protections for generator, busbar and mains, voltage/var/PF control, various outputs, power management, serial communication, additional operator display, and so on.

2.2 Standard functions

2.2.1 Operation modes

- Automatic Mains Failure
- Island operation
- Fixed power/base load
- Peak shaving
- Load takeover
- Mains power export
- Remote Maintenance

2.2.2 Engine control

- Start/stop sequences
- Run and stop coil
- Relay outputs for governor control

2.2.3 Generator protection (ANSI)

- 2 × reverse power (32)
- 5 × overload (32)
- 6 × over-current (50/51)
- 2 × over-voltage (59)
- 3 × under-voltage (27)
- 3 × over-/under-frequency (81)
- Voltage-dependent over-current (51V)

- Current/voltage unbalance (60)
- Loss of excitation/overexcitation (40/32RV)
- Non-essential load/load shedding, 3 levels (I, Hz, P>, P>>)
- Multi-inputs (digital, 4 to 20 mA, 0 to 40 V DC, Pt100, Pt1000 or RMI)
- Digital inputs

2.2.4 Busbar protection (ANSI)

- 3 × over-voltage (59)
- 4 × under-voltage (27)
- 3 × over-frequency (81)
- 4 × under-frequency (81)
- Voltage unbalance (60)

2.2.5 Display

- Prepared for remote mounting
- Push-buttons for start and stop
- Push-buttons for breaker operations
- Status texts

2.2.6 M-Logic

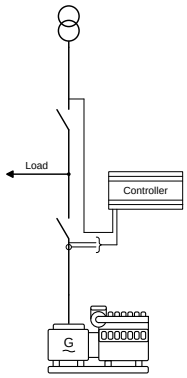
- Simple logic configuration tool
- Selectable input events
- Selectable output commands

2.3 Standard and optional applications

In the following sections, the standard and optional applications of the AGC will be presented. In addition, the correct application configuration for the different applications is listed. It is only possible to use the unit for one of the purposes, for example AMF (Automatic Mains Failure). The selection must be made on site.

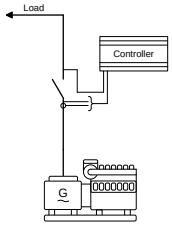
All units are supplied with AMF as factory setting.

2.3.1 Automatic Mains Failure, AMF



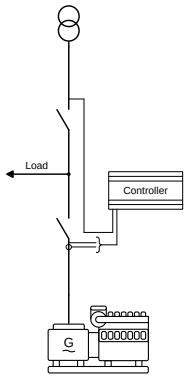
No.	Setting		Setting
6071	Genset mode	AMF	AMF

2.3.2 Island operation



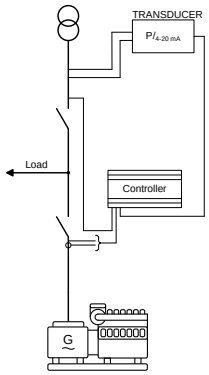
No.	Setting		Setting
6071	Genset mode	Island operation	Island operation

2.3.3 Fixed power/base load



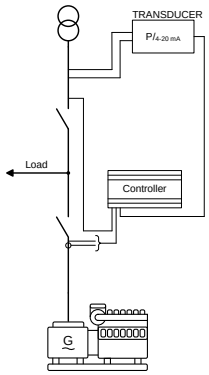
No.	Setting		Setting
6071	Genset mode	Fixed power	Fixed power

2.3.4 Peak shaving



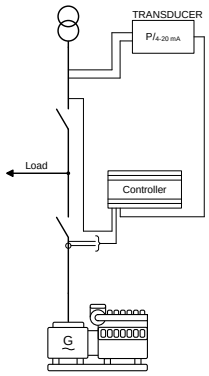
No.	Setting		Setting
6071	Genset mode	Peak shaving	Peak shaving

2.3.5 Load takeover



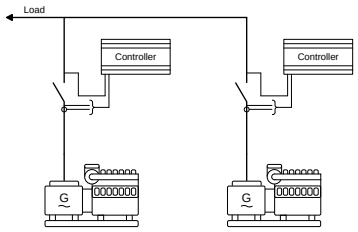
No.	Setting		Setting
6071	Genset mode	Load takeover	Load takeover

2.3.6 Mains power export (fixed power to mains)



No.	Setting		Setting
6071	Genset mode	Mains power export	Mains power export

2.3.7 Multiple gensets, load sharing



No.	Setting		Setting
6071	Genset mode	Island operation	Island operation

2.3.8 Multiple gensets, power management

For information about the power management application, refer to "Description of Option G4, G5 and G8".

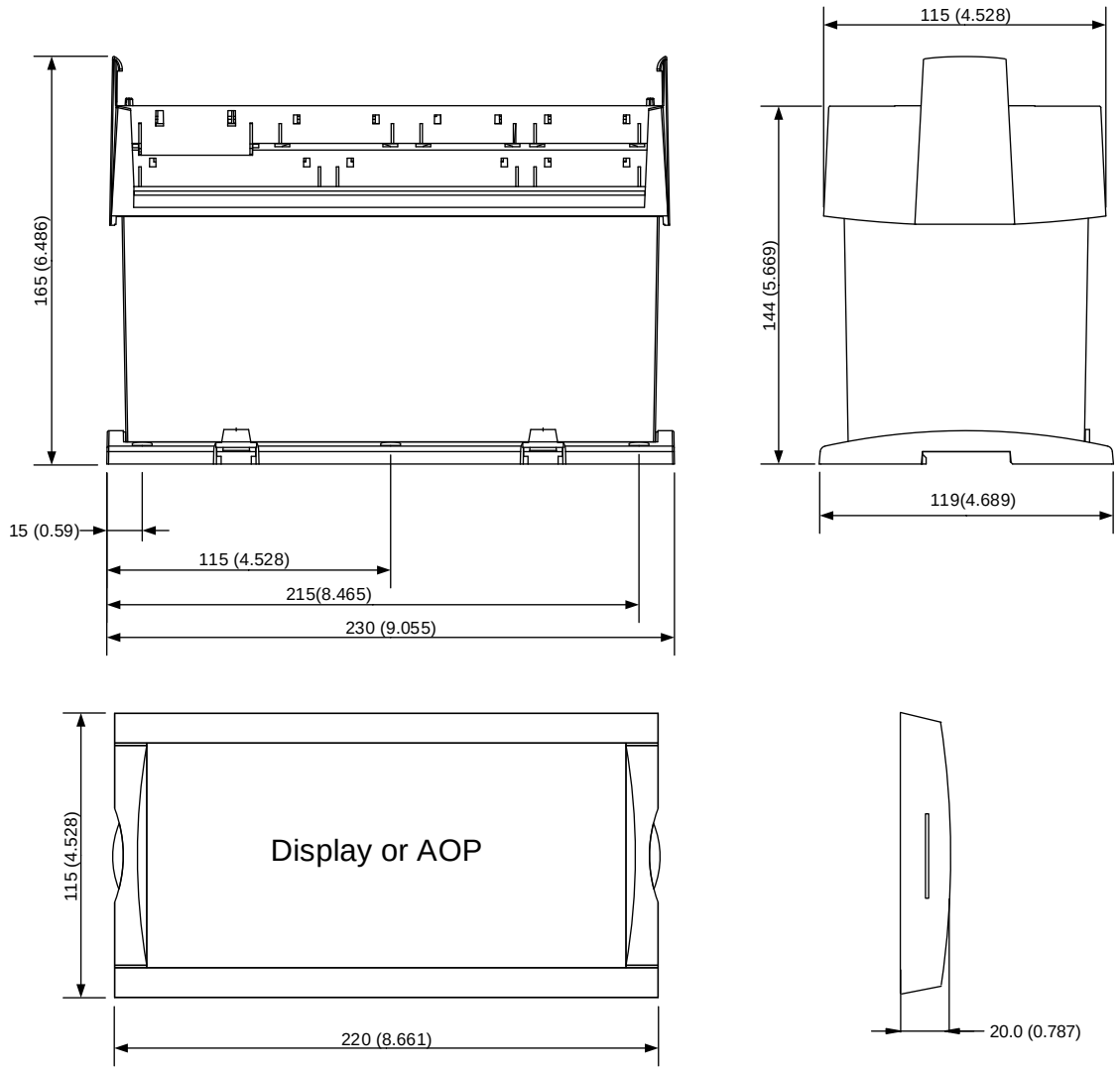
3. Mounting

3.1 AGC-3 mounting and dimensions

3.1.1 Mounting of the unit

The unit is designed for mounting inside the panel. The display can be installed on the panel door and connected to the main unit with a display cable.

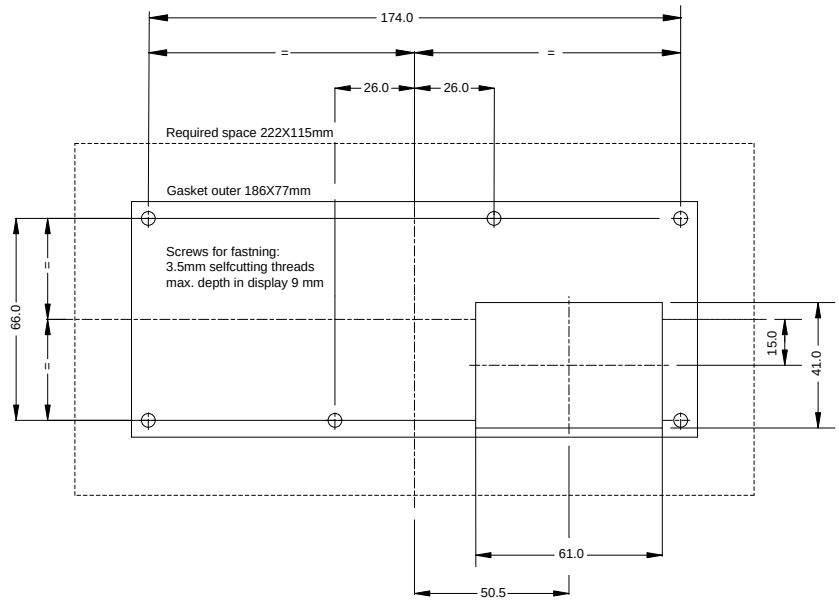
3.1.2 Unit dimensions



Dimensions are given in mm (inches).

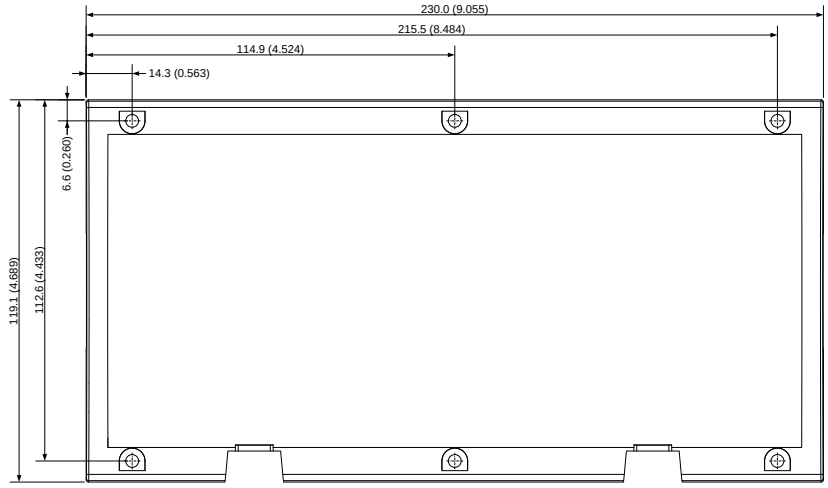
3.1.3 Panel cutout

In order to ensure optimum mounting, the panel door must be cut out according to the panel cutout illustration in the chapter Technical information.



Dimensions are given in mm.

3.1.4 Drilling template in mm (inches)



3.1.5 Mounting instructions

The unit can be mounted in two different ways:

1. Directly mounted on a DIN rail.
2. Fastened with screws to the rear side of the cabinet. Six screw holes are available for this mounting method.

DEIF recommends using the screw hole fastening.

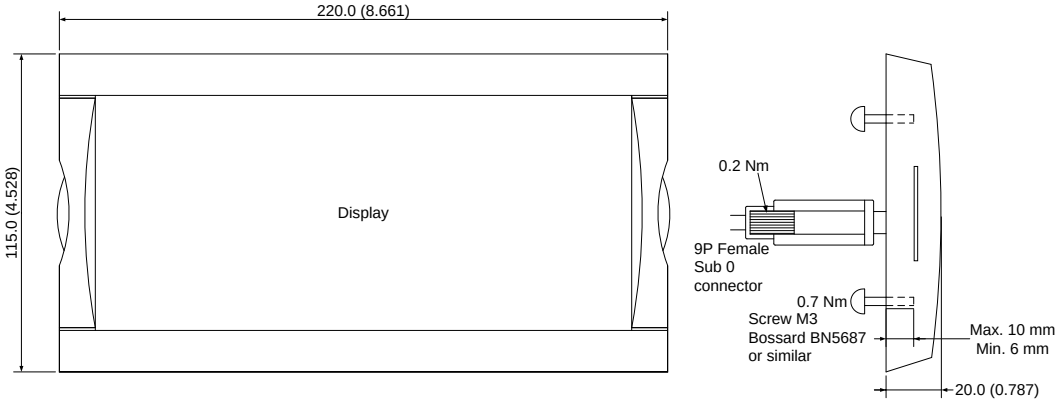
Warning in use of chemicals!
Do NOT use chemicals or oils (cutting oil, lubricating oil/grease) on or near by the surfaces of the controller housing or display panel. These may cause serious damage to the plastic parts and void the warranty.

3.1.6 Tightening torques

Unit panel door mounting:	0.3 Nm, 2.7 lb-in (see diagram in "Unit dimensions")
Plug connections (terminals):	0.5 Nm, 4.4 lb-in

Display, DU-2, AOP-1 and AOP-2 (see diagram below)

Panel door mounting:	0.7 Nm, 6.2 lb-in
Sub-D screw:	0.2 Nm, 1.8 lb-in



4. Hardware

4.1 Board slot positions

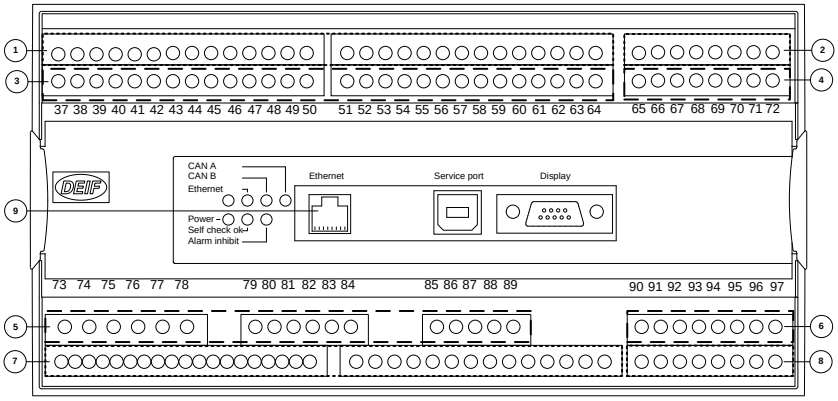
The unit housing is divided into board slot positions. This means that the unit consists of a number of printed circuit boards (PCBs) mounted in numbered slots. The green terminal blocks are then mounted in the PCBs. Some of these board slots are standard and some are intended for options. The board 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				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/H8.2	X			
Engine communication	H5/H6				X
I/O extension cards	M13.2	X			
I/O extension cards	M13.6/M14.6/M15			X	
I/O extension cards	M13.8/M14.8/H8.8				X
Plant management	G7				X

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.

4.1.1 Unit top side overview

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

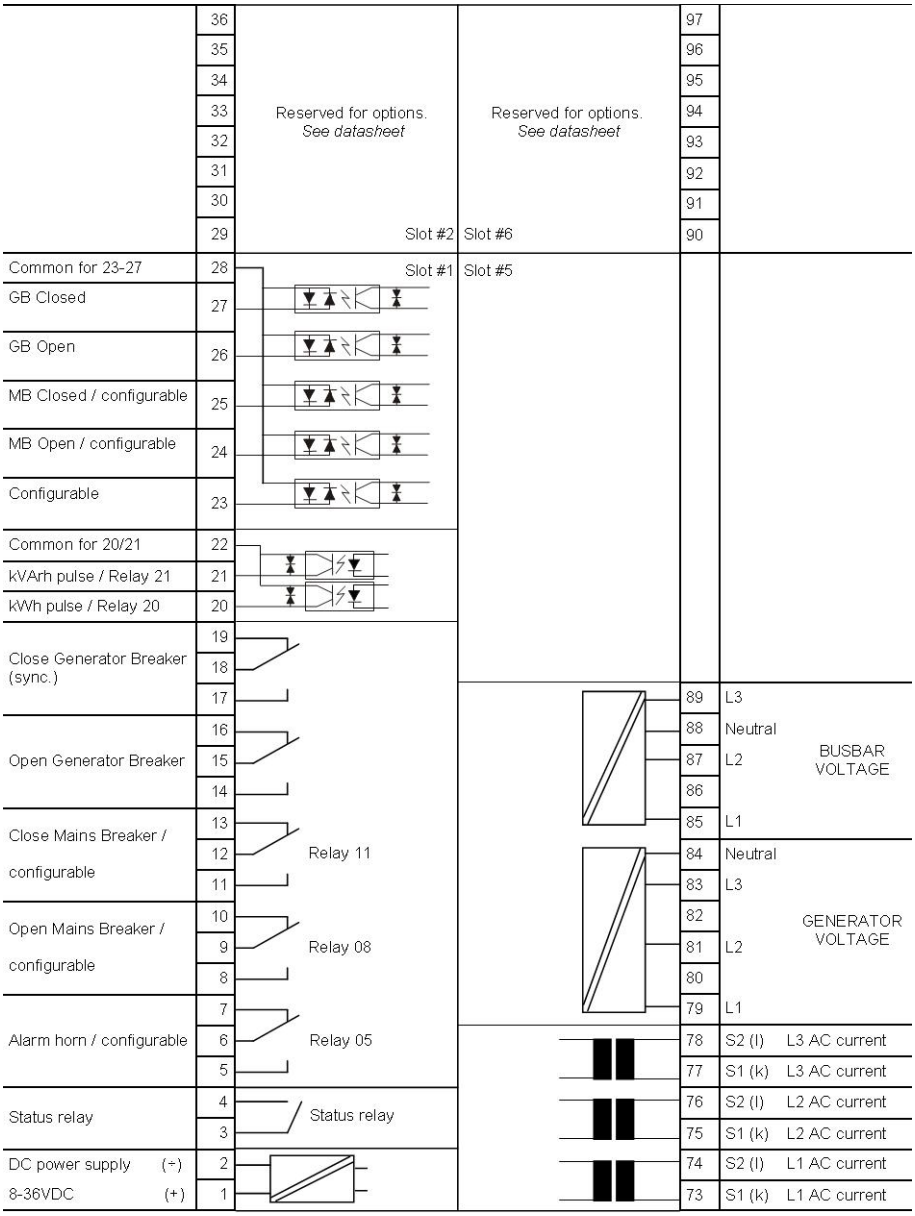


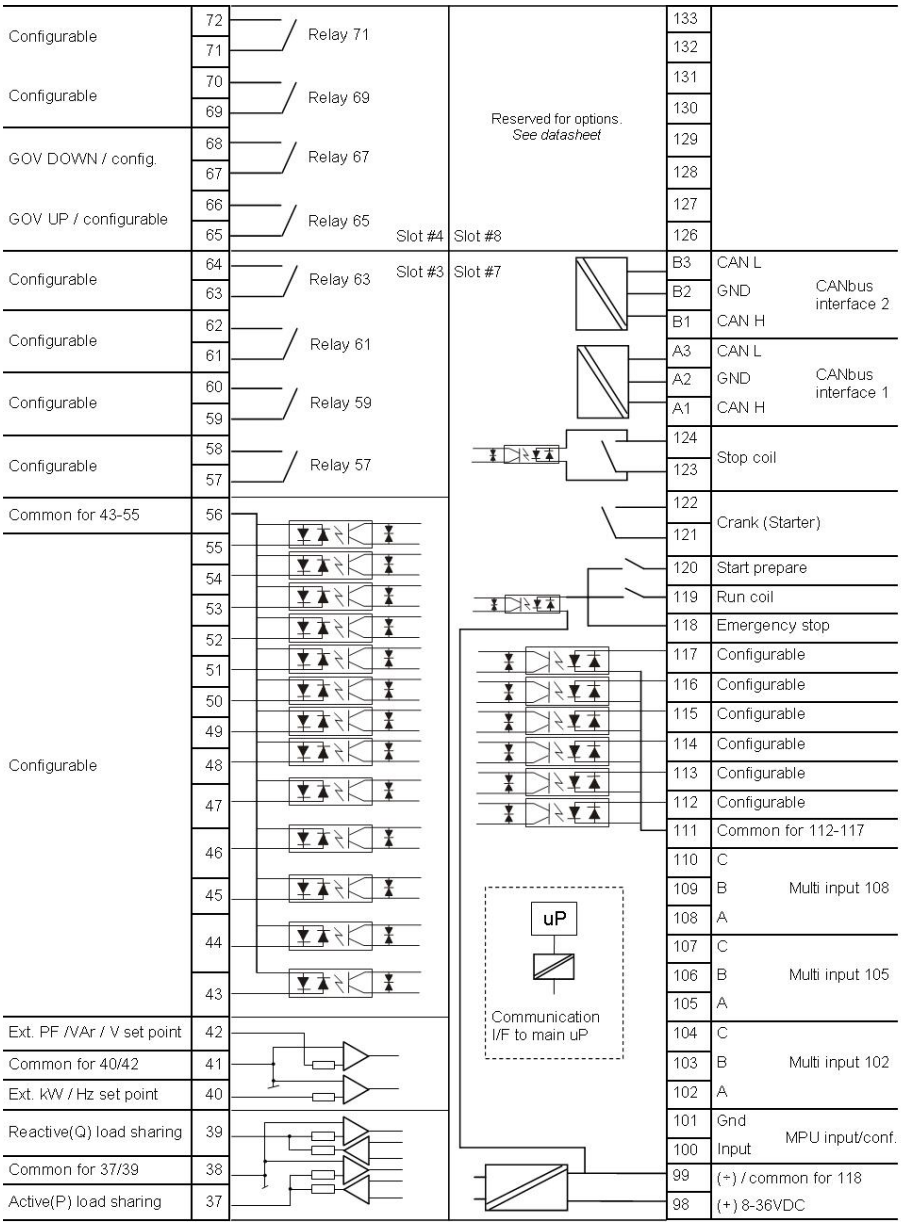
(1): The numbers in the drawing above refer to the slot numbers indicated in the table below.

No.	Slot
1	#1, terminal 1-28, power supply (standard)
2	#2, terminal 29-36, communication
3	#3, terminal 37-64, inputs/outputs/load sharing
4	#4, terminal 65-72, governor, AVR, inputs/outputs (standard)
5	#5, terminal 73-89, AC measuring (standard)
6	#6, terminal 90-97, inputs/outputs
7	#7, terminal 98-125, engine I/F (standard)
8	#8, terminal 126-133, engine communication, inputs/outputs
9	LED I/F

4.1.2 Terminal strip overviews

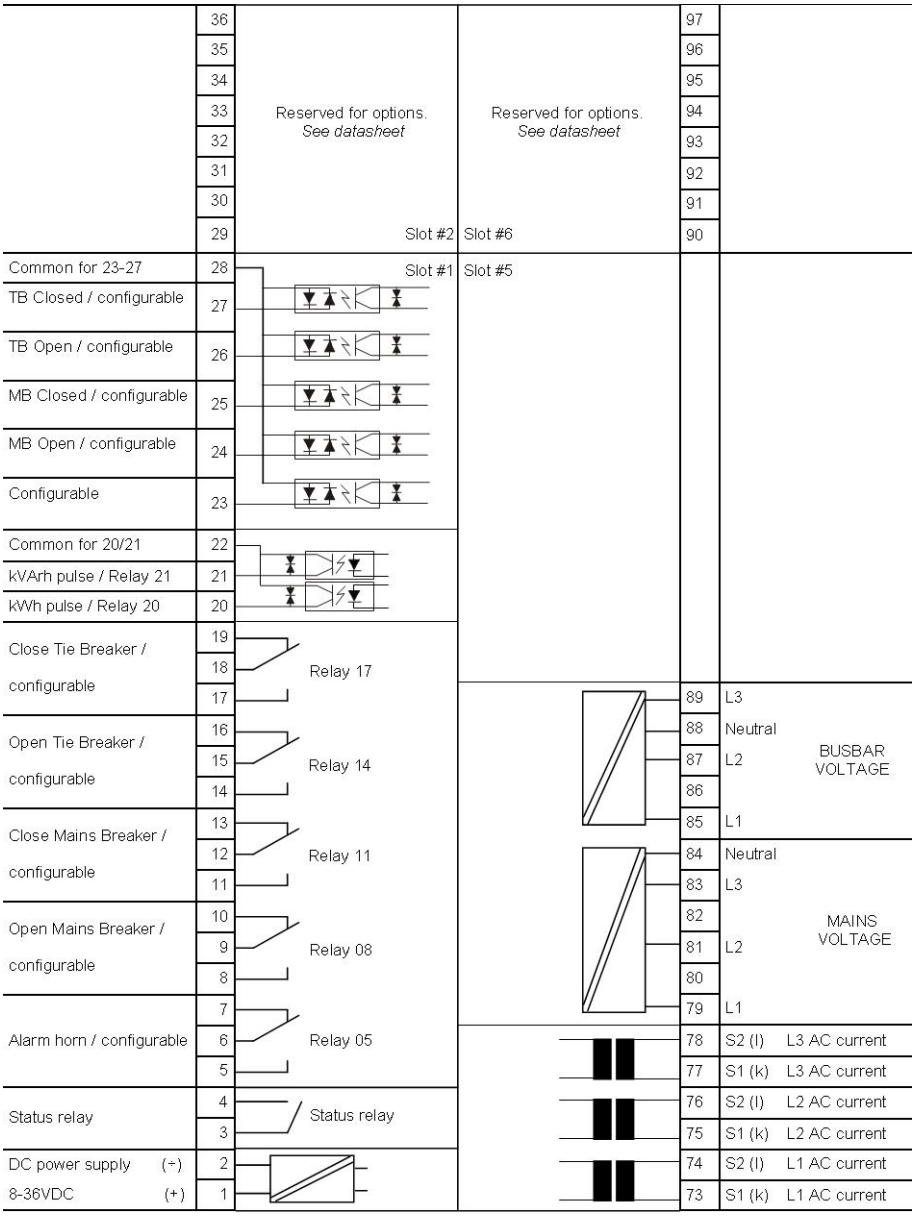
Standard unit

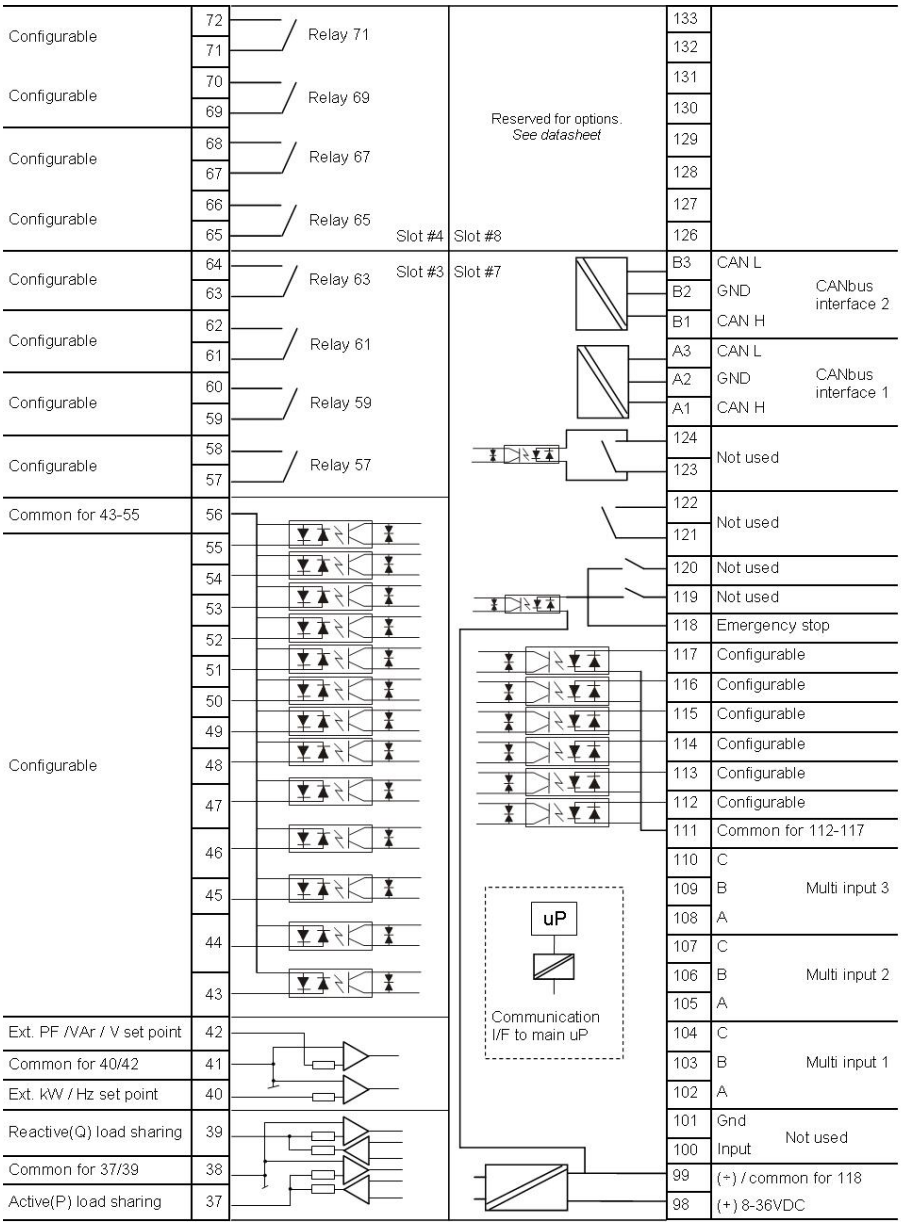




The hardware shown in slot #3 is option M12 and G3. For a detailed description of these options, refer to the option manuals.

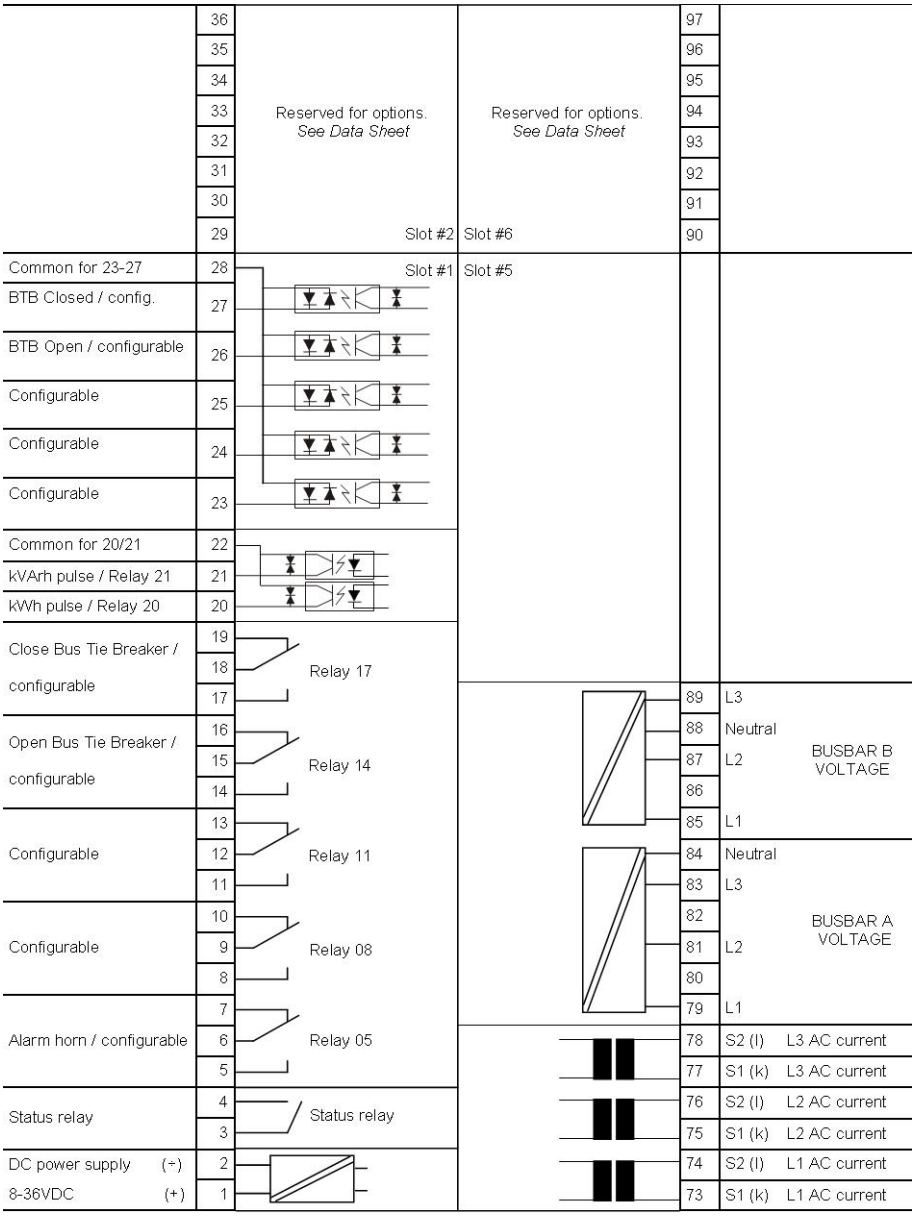
Mains unit

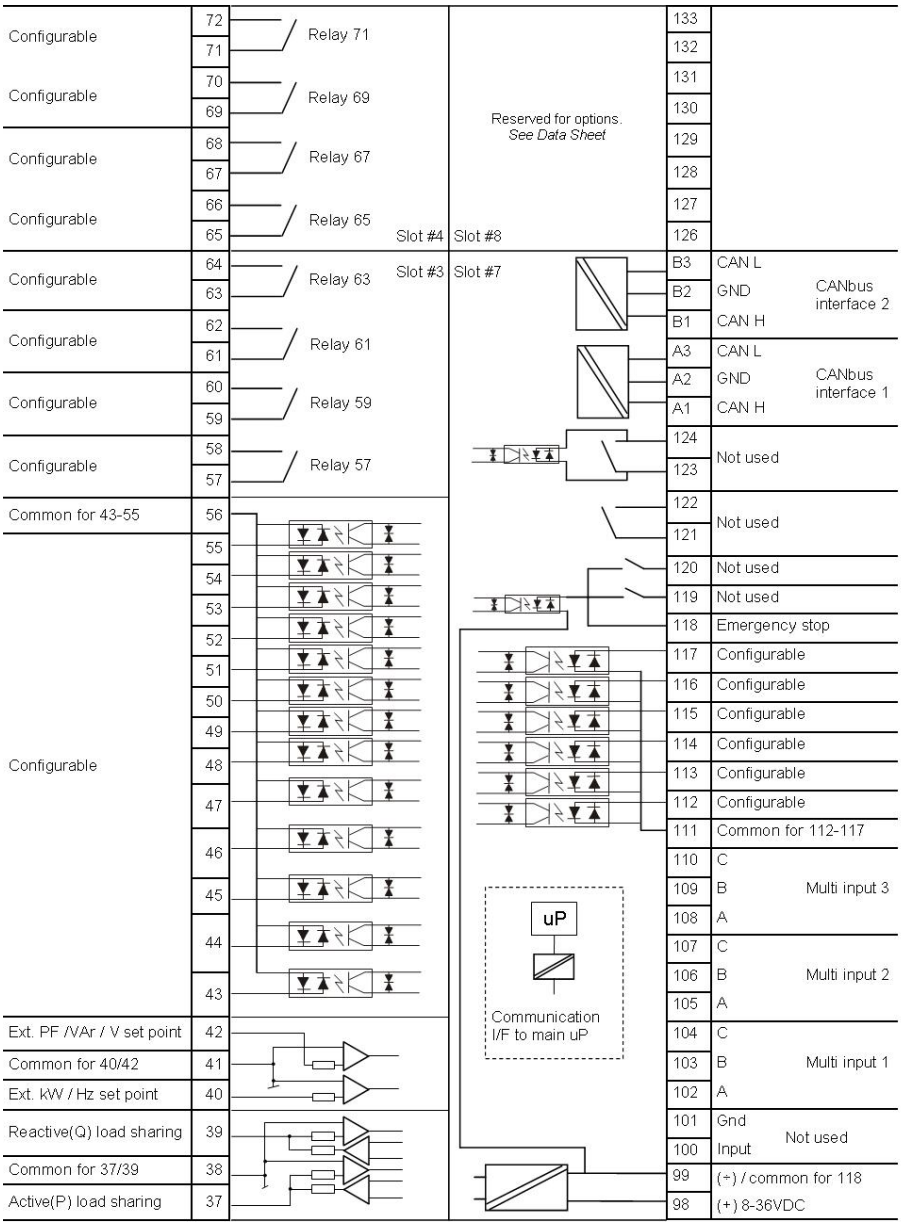

36
35
34
33
32
31
30
29
Reserved for options.
See datasheet
Slot #2
Reserved for options.
See datasheet
Slot #6
97
96
95
94
93
92
91
90
Common for 23-27
28
Slot #1
Slot #5
TB Closed / configurable
27
TB Open / configurable
26
MB Closed / configurable
25
MB Open / configurable
24
Configurable
23
Common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



The hardware shown in slot #3 is option M12 and G3. For a detailed description of these options, refer to the option manuals.

BTB unit


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



The hardware shown in slot #3 is option M12 and G3. For a detailed description of these options, refer to the option manuals.

4.1.3 Input/output lists

In the I/O lists, the following terms will be used in connection with the relay outputs:

NO means Normally Open
NC means Normally Closed
NE means Normally Energised
ND means Normally Deenergised
Com. means common terminal

4.1.4 Slot #1, power supply PCB

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

4.1.5 Slot #1, power supply PCB - AGC mains unit

The I/O list below is for the AGC mains unit.

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 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/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

4.1.6 Slot #2, serial communication (option H)

Modbus (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.

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

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

4.1.7 Slot #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	

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

4.1.8 Slot #3, 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		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			
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56			
57			
58			
59			
60			
61			
62			
63			
64			

4.1.9 Slot #3, 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
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.		

4.1.10 Slot #4, 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.		

4.1.11 Slot #4, 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	

4.1.12 Slot #4, 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) to 20 mA	Configurable
71	0	
72	Not used	

4.1.13 Slot #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	NO	Relay 69
70	Com.	
71	NO	Relay 71
72	Com.	

4.1.14 Slot #4, PWM output for GOV and combination output for 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.	

4.1.15 Slot #4, PWM output for GOV and combination output for 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	

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).

AVR control requires the D1 option.

4.1.16 Slot #4, analogue outputs for GOV/AVR or transducer (option E2)

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

4.1.17 Slot #5, AC measuring

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

4.1.18 Slot #5, AC measuring - AGC mains unit

The I/O list below is for the AGC mains unit.

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

4.1.19 Slot #5, AC measuring - AGC BTB unit

The I/O list below is for the AGC BTB unit.

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

4.1.20 Slot #6, 7 digital inputs (option M13.6)

Term.	Function	Technical data	Description
90	Com.	Common	Common for terminals 90-97
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

4.1.21 Slot #6, 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.		

4.1.22 Slot #6, 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	

4.1.23 Slot #6, analogue outputs for GOV/AVR or transducer (option F1)

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

4.1.24 Slot #7, engine interface card (standard)

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	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 or H7)
A2	GND		
A3	CAN-L		
B1	CAN-H		CAN bus interface B (option G4 or G5)
B2	GND		
B3	CAN-L		

4.1.25 Slot #7, engine interface card (standard) AGC mains/BTB

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		

4.1.26 Slot #8, 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	

4.1.27 Slot #8, 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)	

4.1.28 Slot #8, 7 digital inputs (option M13.8)

Term.	Function	Technical data	Description
126	Com.	Common	Common for terminals 127-133
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

4.1.29 Slot #8, 4 relay outputs (option M14.8)

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

4.1.30 Slot #8, 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	

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

5. Wirings

5.1 AC connections

The Multi-line 2 unit can be wired up in 1-phase, 2-phase or 3-phase configuration.

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

5.1.1 Neutral line (N)

When three-phase distribution systems are used, the neutral line (N) is only necessary if it is a three-phase + neutral system. If the distribution system is a three-phase system without neutral, then leave the terminals 84 and 88 empty.

5.1.2 Current transformer grounding

The current transformer ground connection can be made on s1 or s2 connection, whichever is preferred.

5.1.3 Fuses

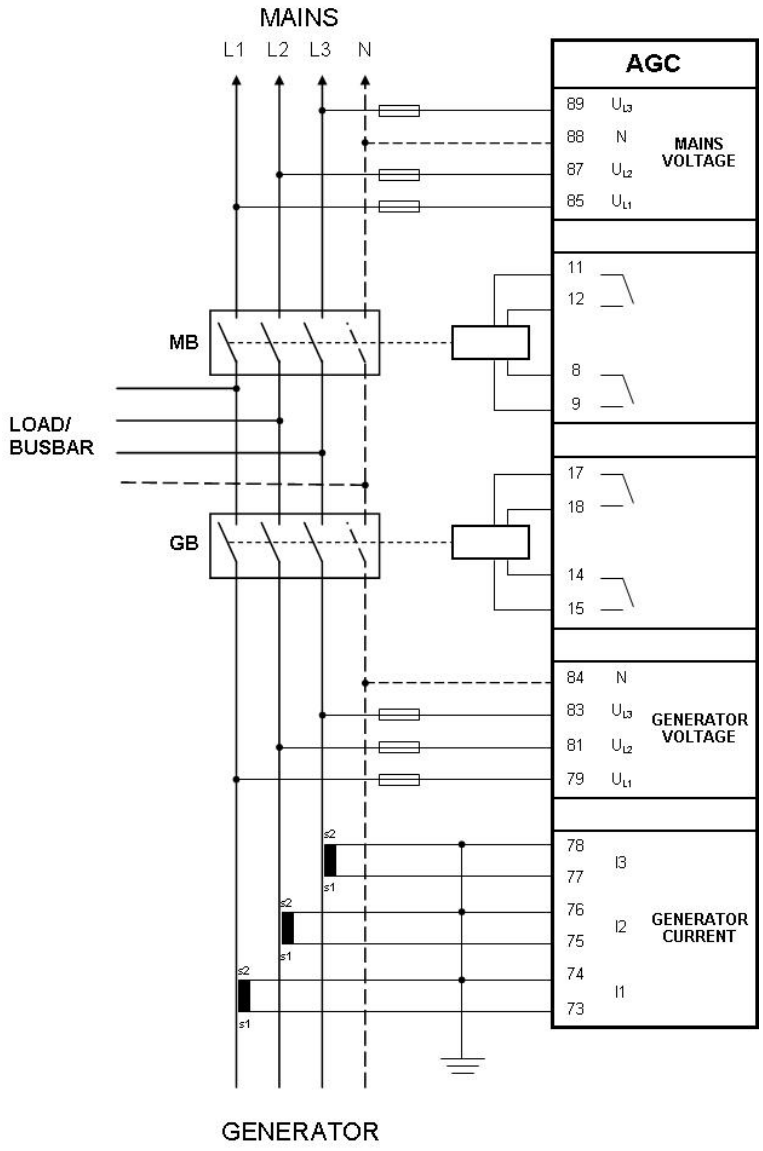
If the cables are protected with fuses, then use 2 A, slow blow.

5.1.4 Breaker wiring

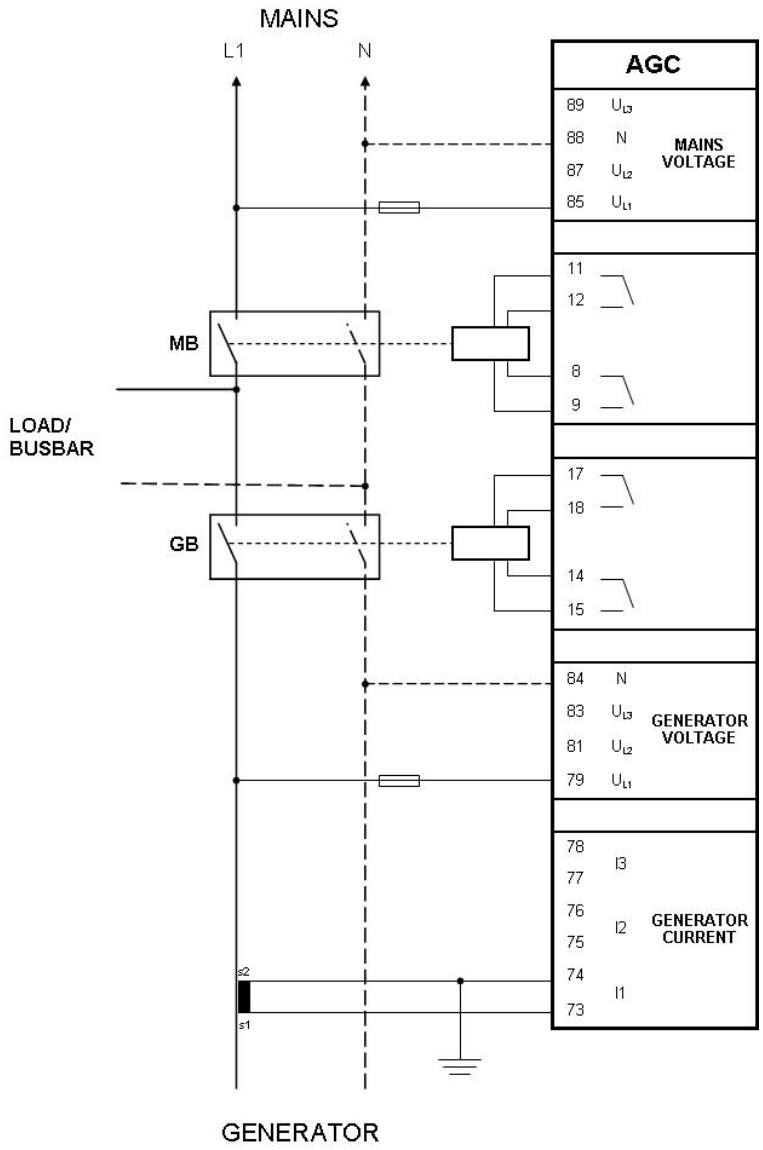
The breaker off wiring is an example only.

5.1.5 3-phase

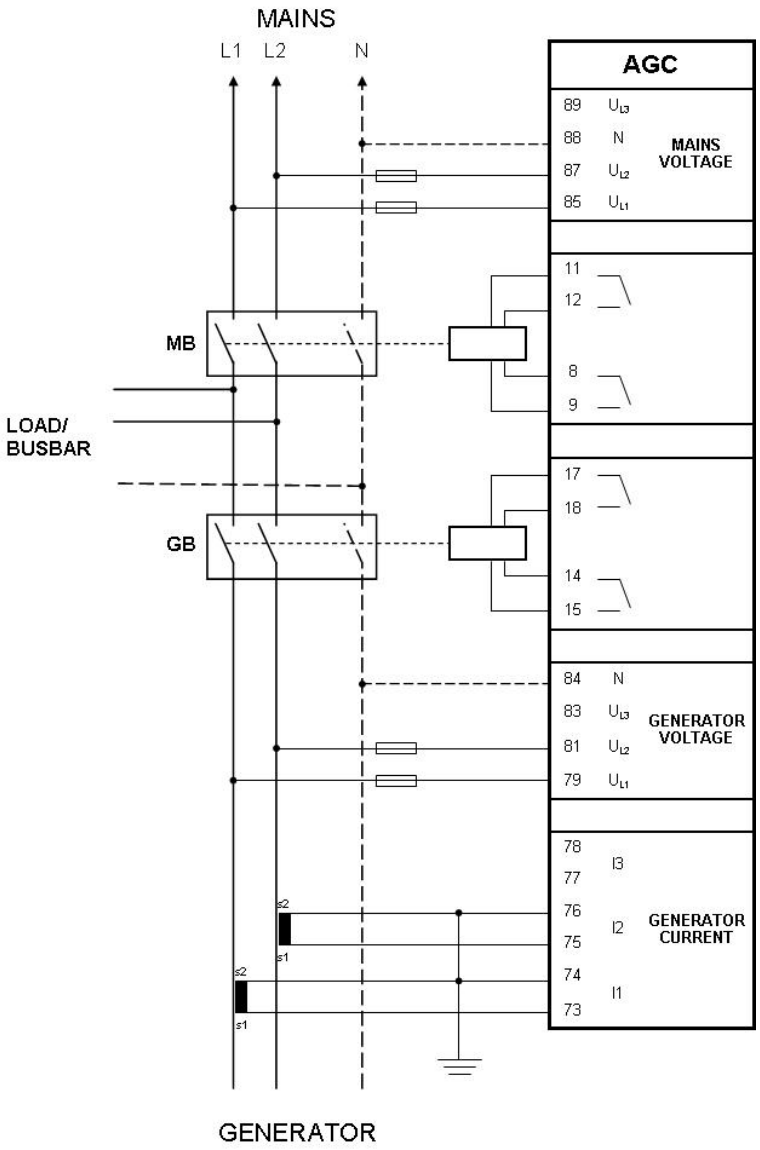
AMF, fixed power, peak shaving, load takeover, mains power export.



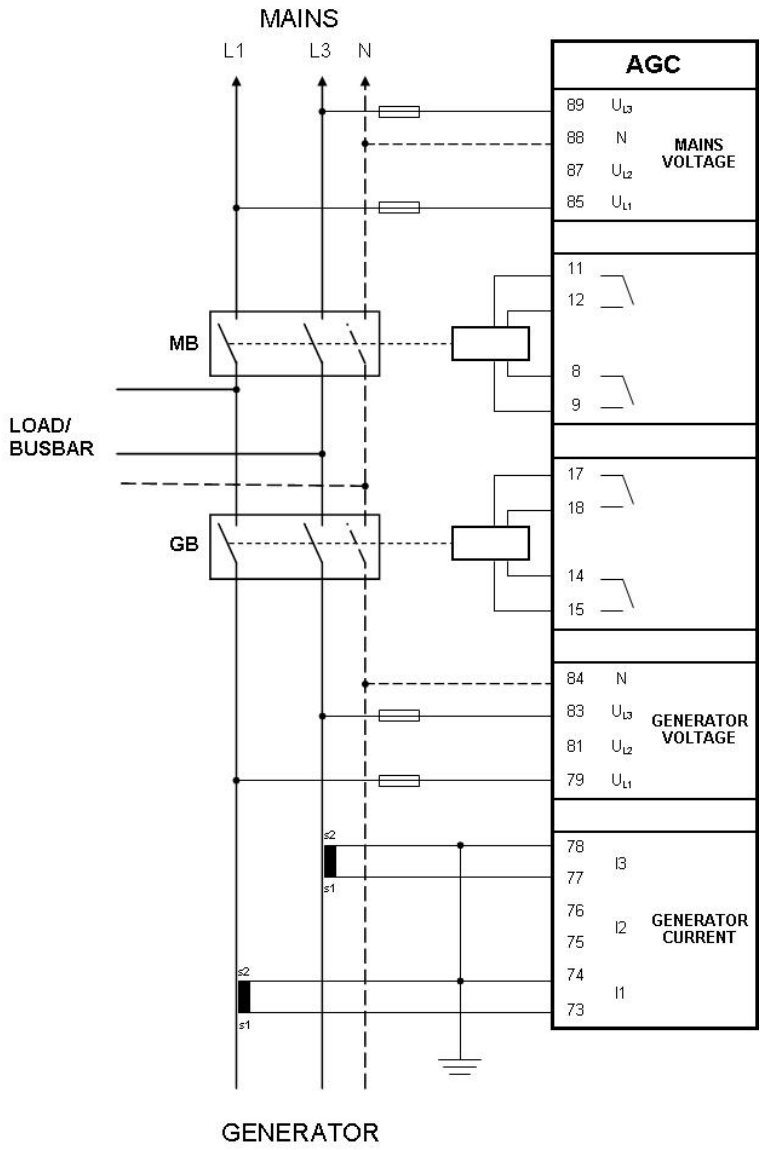
5.1.6 Single phase



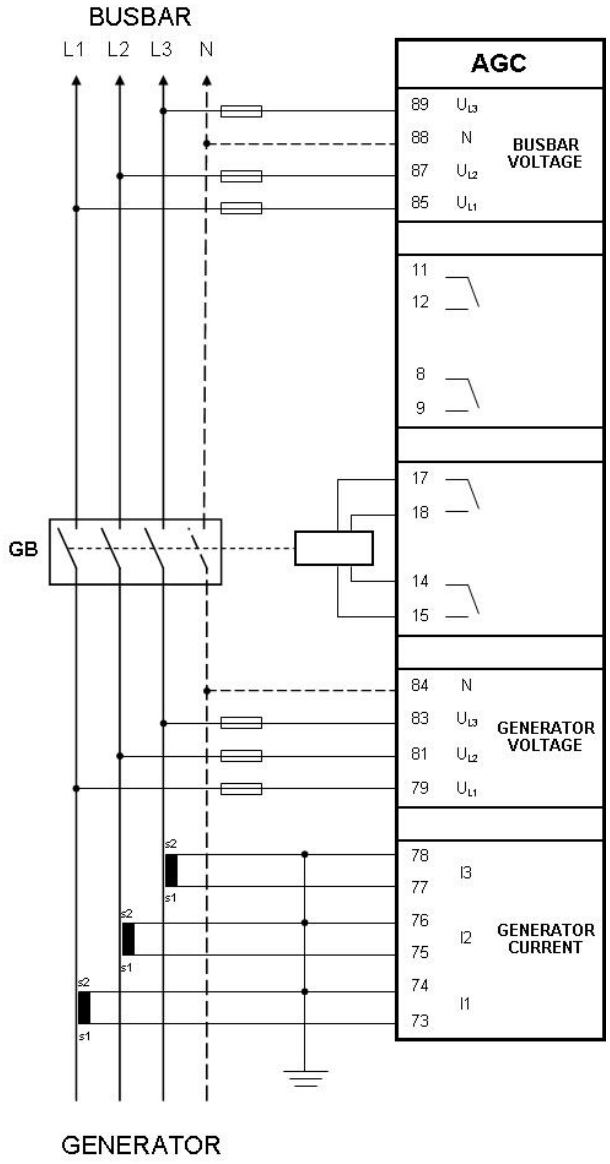
5.1.7 2-phase L1L2



5.1.8 2-phase L1L3 (split phase)

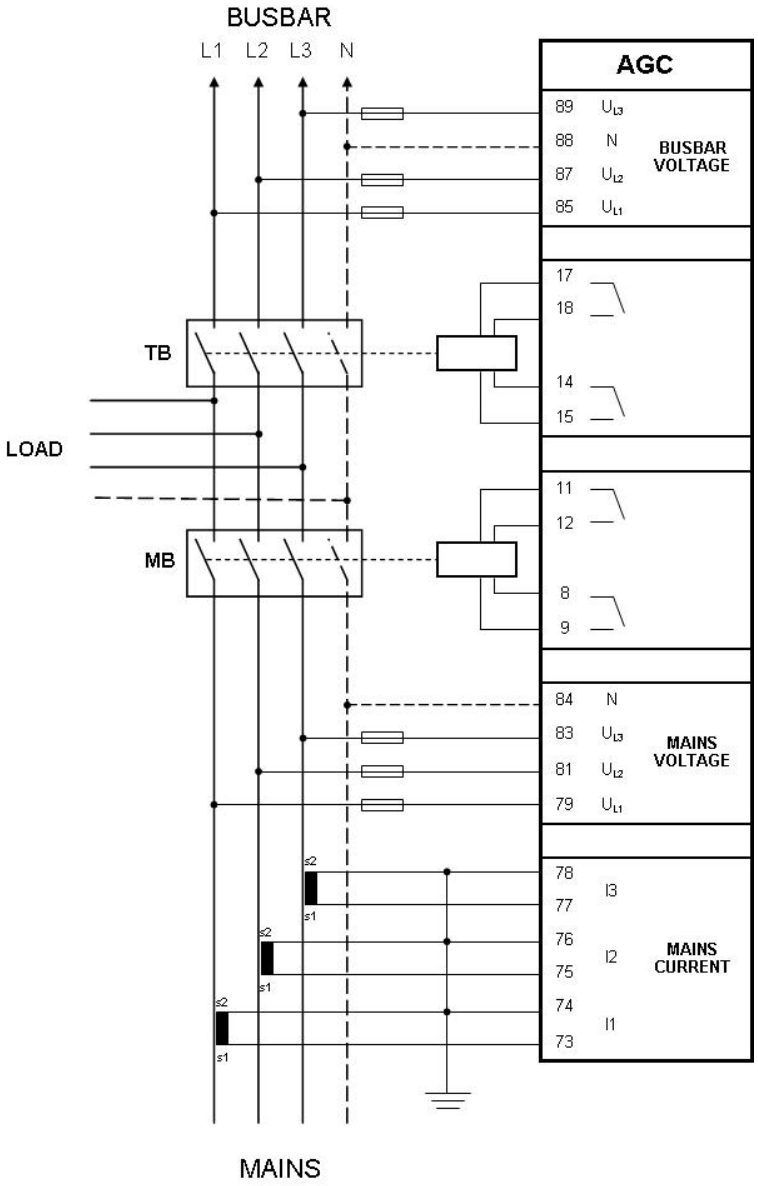


5.1.9 Island mode and power management (option G4/G5/G8)



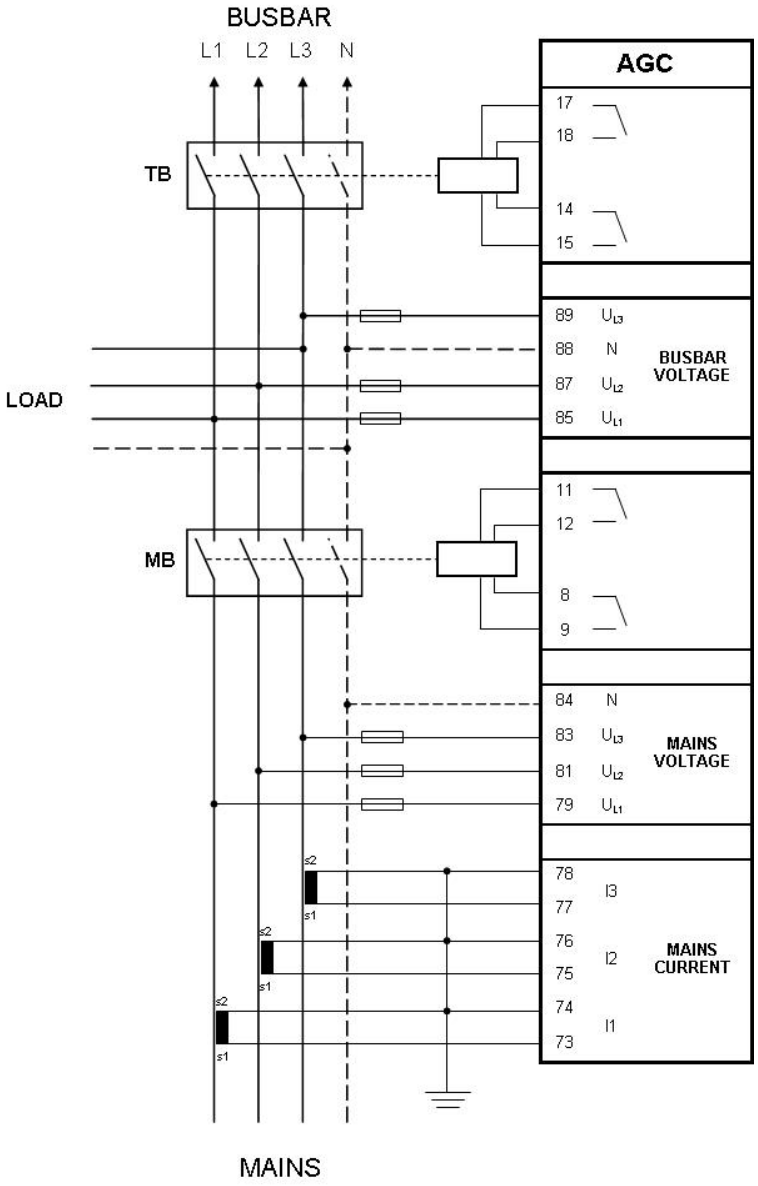
1-phase and 2-phase systems also supported.

5.1.10 Power management (option G5), AGC mains



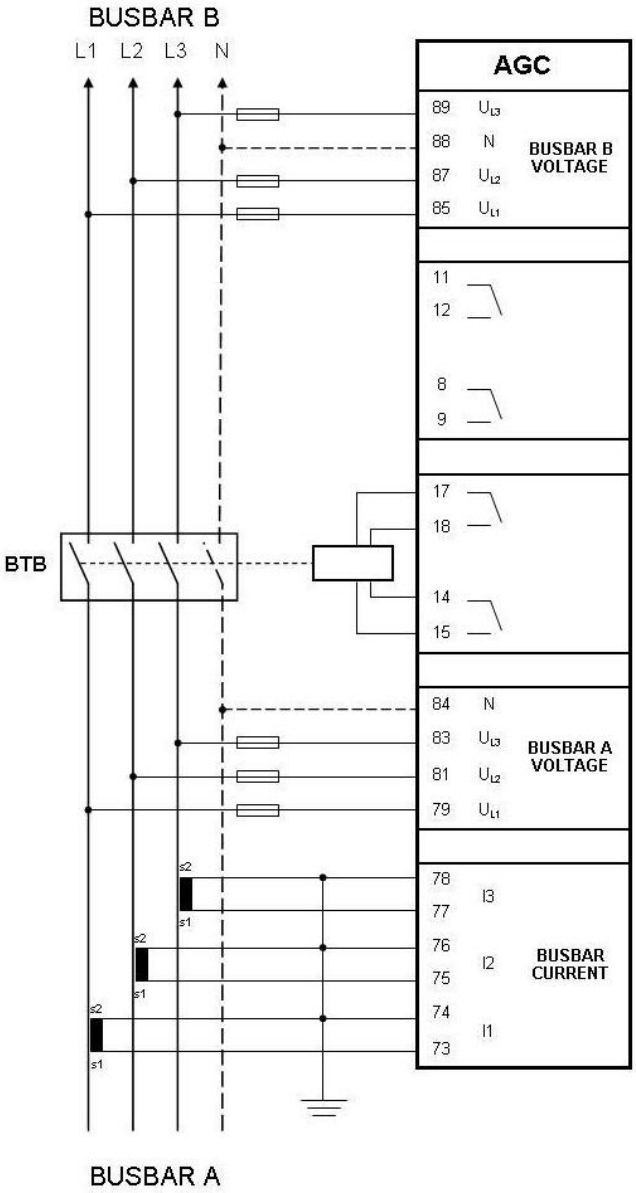
1-phase and 2-phase systems also supported.

5.1.11 Power management (option G5), dual mains - AGC mains



1-phase and 2-phase systems also supported.

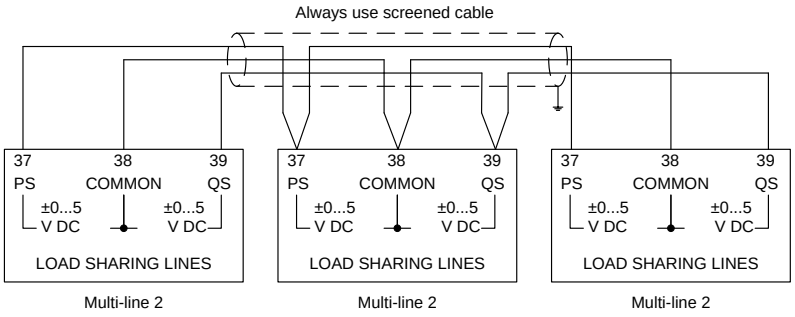
5.1.12 Power management (option G5), AGC BTB



1-phase and 2-phase systems also supported.

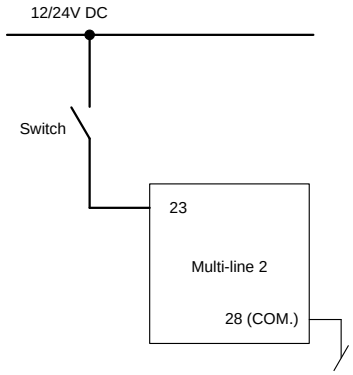
5.2 DC connections

5.2.1 Load sharing lines (option G3)

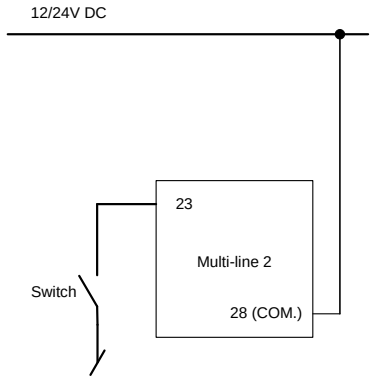


5.2.2 Digital inputs

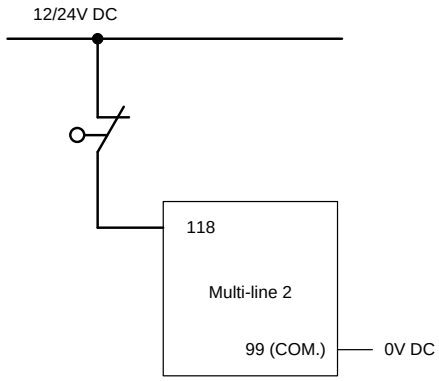
Battery positive to input:



Battery negative to input:



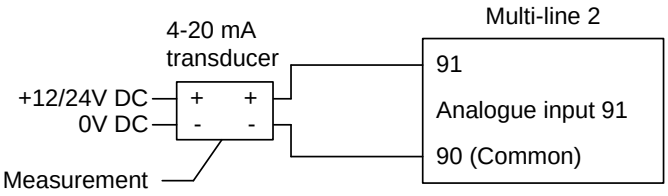
Emergency stop:



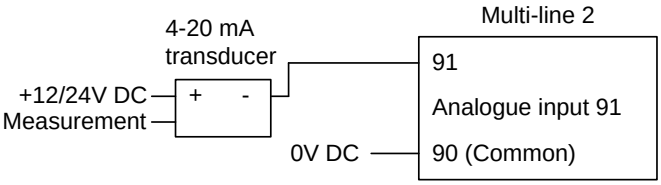
5.2.3 Analogue inputs

4 to 20 mA (option M15)

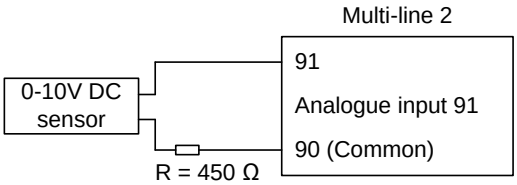
Active transducer



Passive transducer

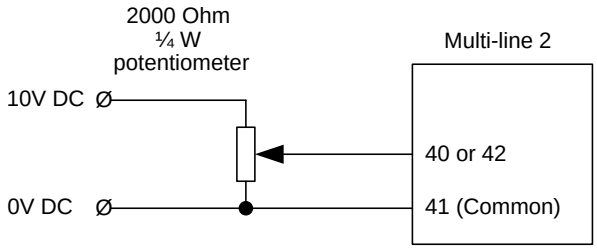


V DC sensor

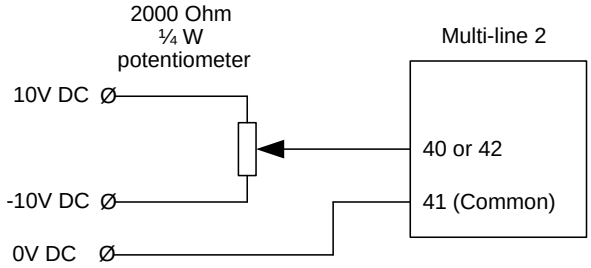


External set points (option G3)
The set point inputs are passive, in other words, an external power source is needed. This can be an active output, for example from a PLC, or a potentiometer can be used.

0 to 10 V DC input using potentiometer



+/-10 V DC input using potentiometer

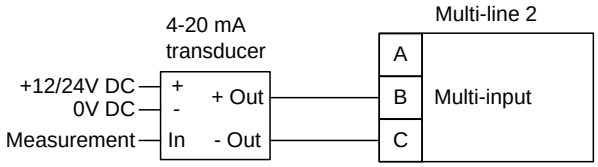


5.2.4 Multi-inputs

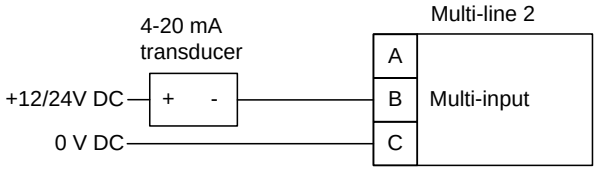
The multi-inputs are placed in slot #7, the terminal numbers for the individual multi-inputs can be seen in the "Input/output list".

0(4) to 20 mA

Active transducer

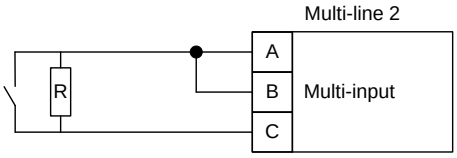


Passive transducer



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

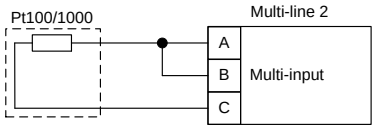
5.2.5 Digital inputs



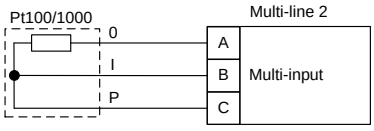
The resistor is only mounted if wire fail supervision is required. The value of the resistor should be 270 Ω +/-10 %.

5.2.6 Pt100/Pt1000

2-wire

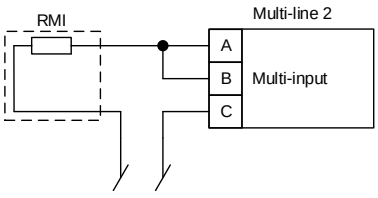


3-wire

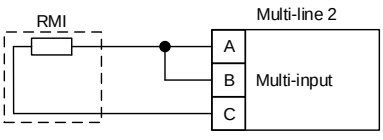


5.2.7 RMI

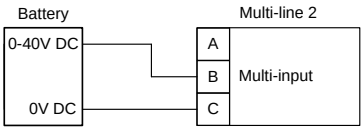
1-wire



2-wire

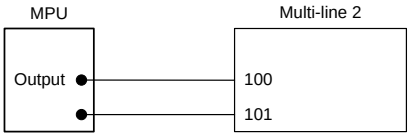


5.2.8 0 to 40 V DC

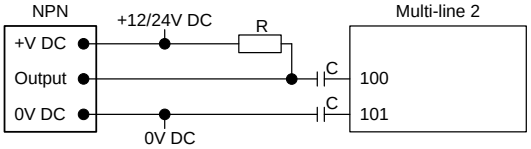


5.2.9 RPM input

Magnetic pickup (MPU)

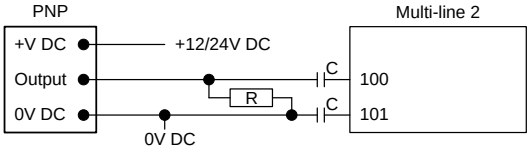


NPN sensor



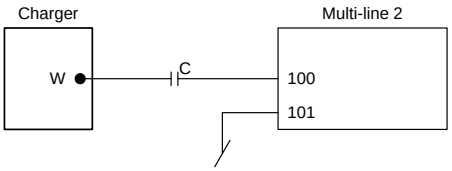
C = 22 nF, 100 V foil type
R = 1200 Ω @ 24 V DC, 600 Ω @ 12 V DC

PNP sensor



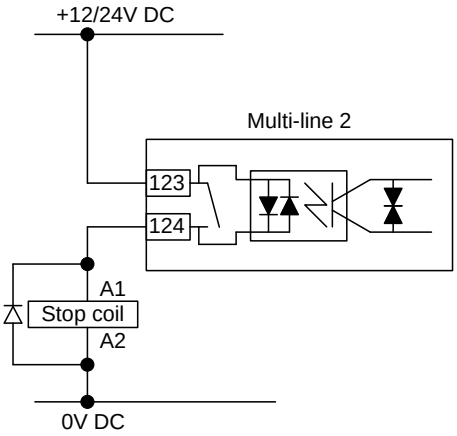
C = 22 nF, 100 V foil type
R = 1200 Ω @ 24 V DC, 600 Ω @ 12 V DC

Charger, W output



C = 22 nF, 100 V foil type

5.2.10 Stop coil

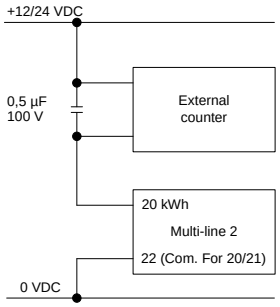


Remember to mount the freewheeling diode.

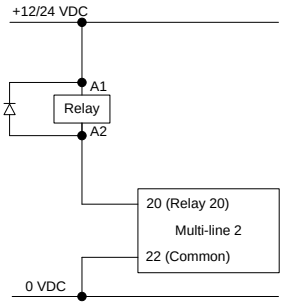
5.2.11 Transistor outputs (open collector outputs)

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.

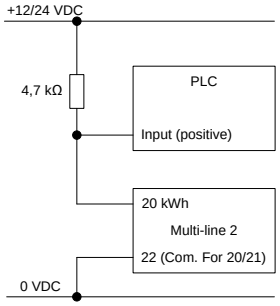
External counter:



Relay outputs:



Connection to PLC:



Remember to mount the freewheeling diode.

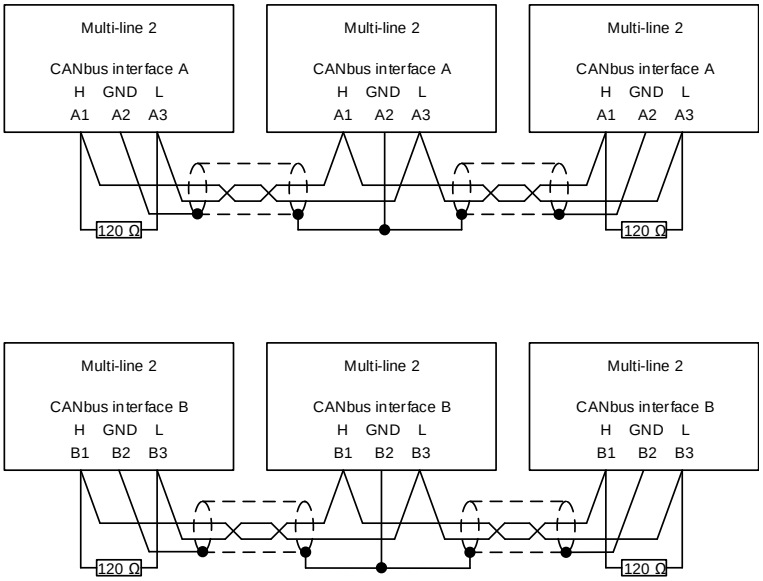
Maximum load on the open collector outputs is 10 mA at 24 V DC.

5.3 Communication

5.3.1 CAN bus (option G4/G5/G8)

Examples with three AGC units connected, for example one AGC mains and two generator AGC units.

It is not possible to mix CAN bus interface A and B.

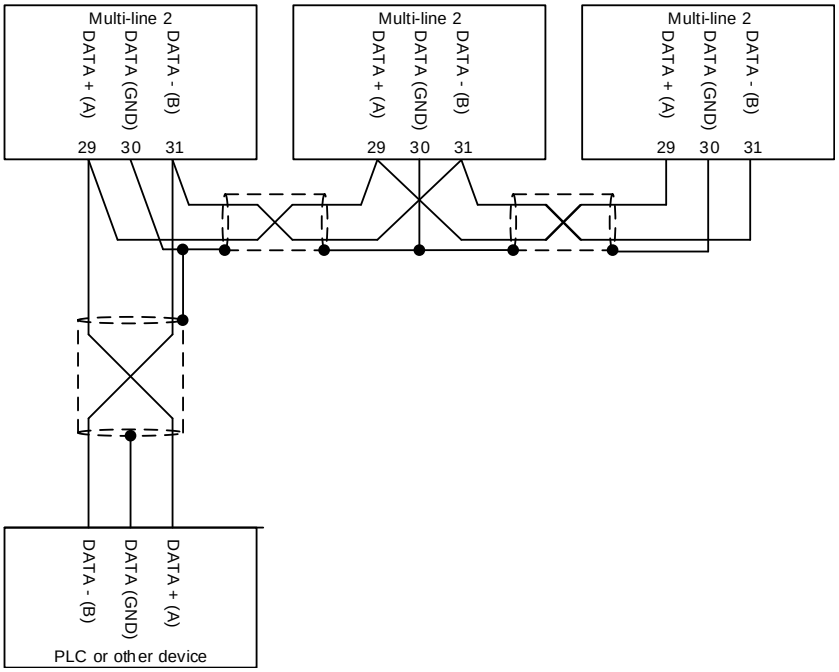


Use shielded twisted cable.

End resistor R = 120 Ohm.

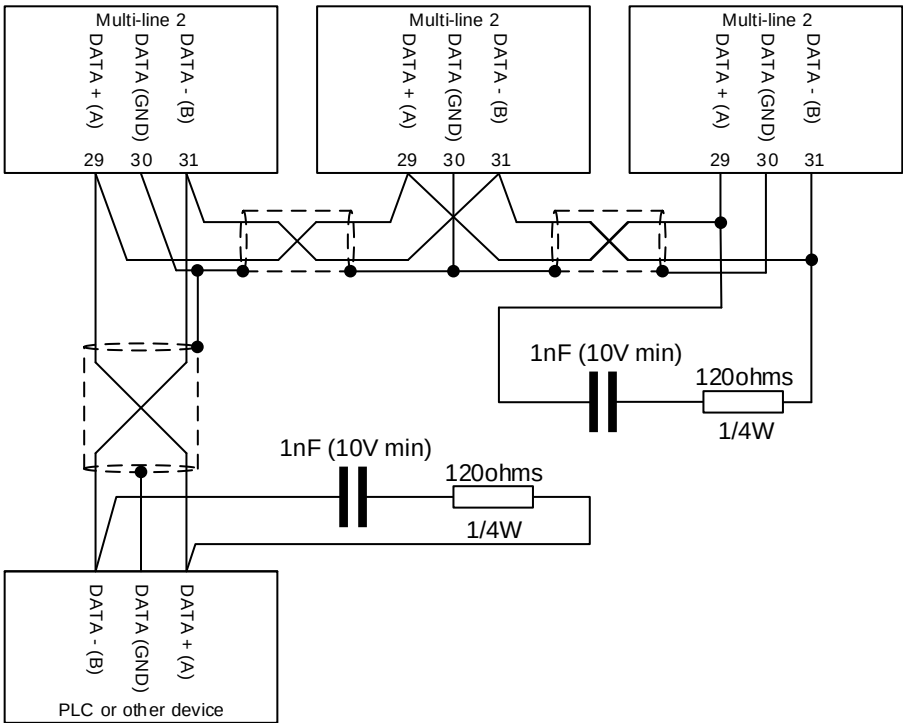
5.3.2 Modbus (option H2)

Connection with 2-wire screened cable:



Use shielded twisted cable.

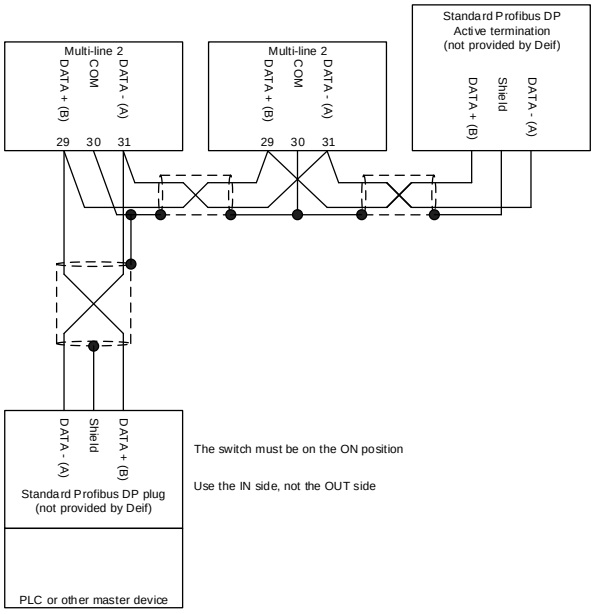
The RS-485 Modbus lines need end resistors (end terminators) when the bus length exceeds 30 m. If end resistors are needed, we recommend to install them like this:



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

5.3.3 Profibus DP (option H3)

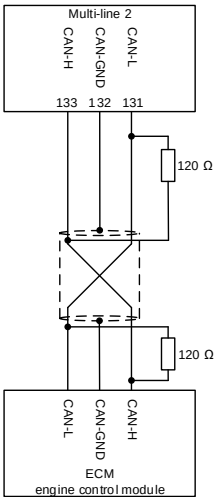
Connection with 2-wire screened cable:



Use shielded twisted cable.

5.3.4 CAN bus engine communication (option H5)

Connection with 2-wire screened cable:

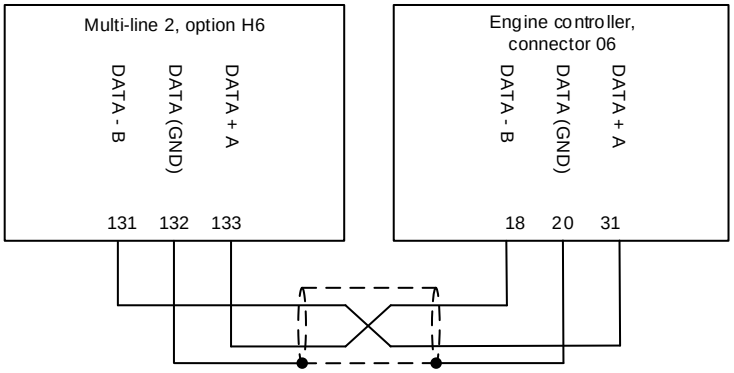


Use shielded twisted cable.

End resistor R = 120 Ohm.

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

5.3.5 Cummins GCS (option H6)

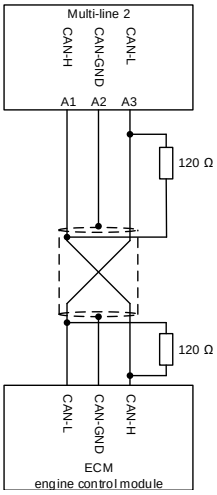


Use shielded twisted cable.

The RS-485 Modbus lines need end resistors (end terminators) when the bus length exceeds 30 m. However, that is not the case here, as this communication line never exceeds 30 m.

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

5.3.6 CAN bus engine communication (option H7)

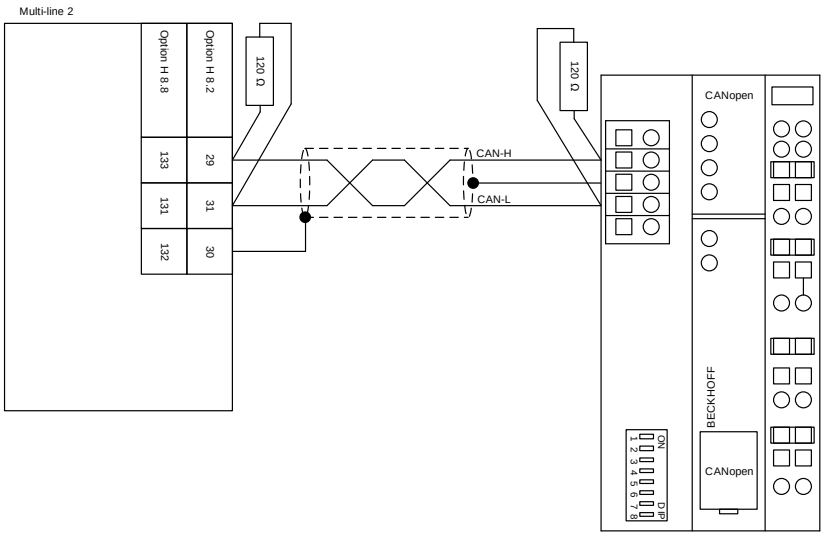


Use shielded twisted cable.

End resistor R = 120 Ohm.

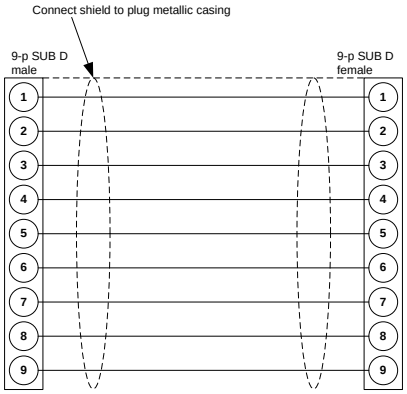
The terminating resistor at the engine side might not be needed, refer to the engine manufacturer's literature.

5.3.7 External I/O module (option H8)



5.3.8 Display cable (option J)

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



Wires min. 0.22 m^2, max. cable length 6 m.
Cable types: Belden 9540, BICC H8146, Brand Rex BE57540 or equivalent.

No use of tools or brute force when tightening finger-screws on display cable.

6. Technical information

6.1 Technical information, AGC-3

6.1.1 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 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 × I_n continuously 20 × I_n, 10 sec. (max. 75 A) 80 × 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 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)

Binary 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 0(4) to 20 mA: Impedance 50 Ω. Not galvanically separated RPM (MPU): 2 to 70 V AC, 10 to 10000 Hz, max. 50 kΩ
Multi-inputs	0(4) to 20 mA: 0 to 20 mA, +/-1 %. Not galvanically separated Binary: 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
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. (Unit status output: 1 A)
Open collector outputs	Supply: 8 to 36 V DC, max. 10 mA
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 binary input groups and other I/Os: 550 V, 50 Hz, 1 min.

Response times (delay set to min.)	**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 Under-voltage and reactive power low, U_Q<: <250 ms
Mounting	DIN-rail mount or base mount with six screws
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 60 Hz: 0.15mm_{pp}. 60 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)
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 Tightening torque	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) Display: 9-pole Sub-D female Service port: USB A-B For further information, refer to the "Installation Instructions"
Protection	Unit: IP20. Display: IP40 (IP54 with gasket: Option L). (UL/cUL Listed: Type Complete Device, Open Type). To IEC/EN 60529
Governors	Multi-line 2 interfaces to all governors, including GAC, Barber-Colman, Woodward and Cummins See interfacing guide at www.deif.com
Approvals	UL/cUL Listed to UL508. UL/cUL Recognized to UL2200
UL markings Tightening torque	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 For further information, refer to the "Installation Instructions"
Weight	Base unit: 1.6 kg (3.5 lbs.) Option J1/J3/J4/J6/J7: 0.2 kg (0.4 lbs.) Option J2: 0.4 kg (0.9 lbs.) Display: 0.4 kg (0.9 lbs.)