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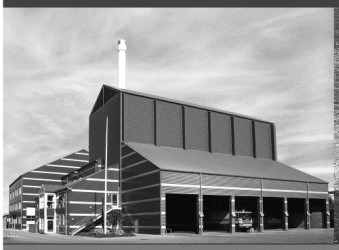
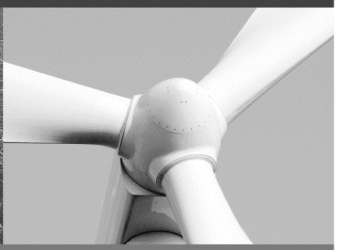
INSTALLATION INSTRUCTIONS





Generator Paralleling Controller, GPC-3, and variants
Generator Protection Unit, GPU-3, and variants
Paralleling and Protection Unit, PPU-3

- Mounting
- Board slot positions
- I/O lists
- Wiring

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SW version 3.06.x or later

This document is valid for the following products:

GPC	Software version 3.06.x
GPC Gas	Software version 3.06.x
GPC Hydro	Software version 3.06.x
GPU	Software version 3.06.x
GPU Gas	Software version 3.06.x
GPU Hydro	Software version 3.06.x
PPU	Software version 3.06.x

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1. About this document

General purpose

This document is the Installation Instructions for DEIF's GPC-3, GPU-3 and PPU-3. The document mainly includes general hardware description, I/O lists and wiring descriptions.

The general purpose of these installation instructions is to give the user important information to be used in the installation of the controllers.

Please make sure that you read this manual before starting to work with the controllers. Failure to do this could result in damaging the equipment or, even worse, injury of personnel.

Intended users

These installation instructions are mainly intended for the panel builder designer in charge. On the basis of this document, the panel builder designer will give the electrician the information he needs in order to install the controllers, e.g. detailed electrical drawings. In some cases the electrician may use these installation instructions himself.

Contents/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.

Definitions

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

Notes

The notes provide general information which will be helpful for the reader to bear in mind.

Warnings

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

2. Warnings and legal information

Legal information and responsibility

DEIF takes no responsibility for installation or operation of the generator sets. If there is any doubt about how to install or operate the generator sets controlled by the controllers, the company responsible for the installation or the operation of the sets must be contacted.

The controllers are not to be opened by unauthorised personnel. If opened anyway, the warranty will be lost.

Electrostatic discharge awareness

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

Safety issues

Installing the controllers implies 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.

3. Mounting

Mounting of the unit

The unit is designed for mounting inside the switchboard. The display can be installed on the switchboard door and connected to the main unit with a display cable. The technical specifications in chapter 8 include detailed information about:

- Unit dimensions
- Panel cutout
- Screw hole positions and dimensions

Panel cutout

In order to ensure optimum mounting, the switchboard door must be cut out according to the *panel cutout* illustration presented in chapter 8.

Mounting instructions

For land applications the units can be either DIN-rail or base mounted.

For marine applications the units have to be mounted 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.

4. General hardware description

Hardware

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.

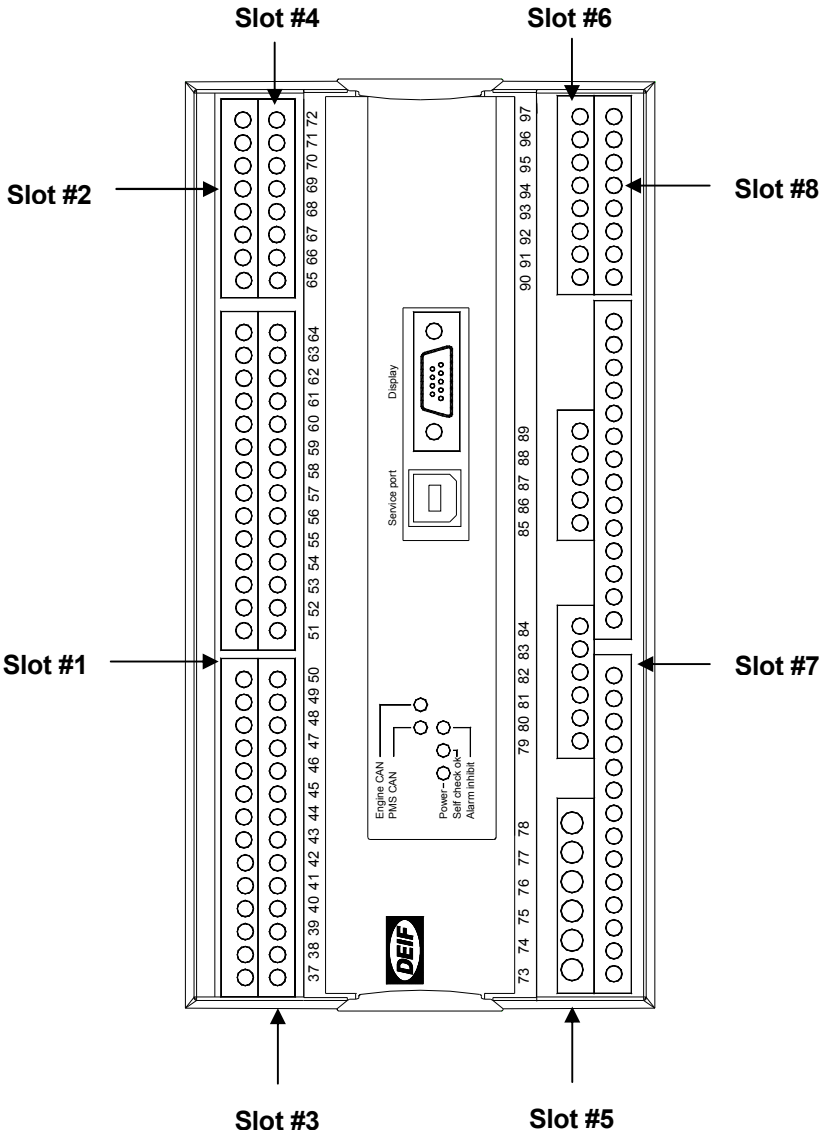
Slot	Term.	GPU/GPU Hydro	GPC/PPU	Description
Slot #1	1-28	*Standard*	*Standard*	Power supply board
Slot #2	29-36	Option	Option	Option: H2 (Modbus RS485) H3 (Profibus) H8.2 (Beckhoff ext. I/Os) H9.2 (Modbus RS232) M14.2 (4 x relay outputs)
Slot #3	37-64	Option M12	Standard	GPC/PPU: Load sharing and I/O board GPU/GPU Hydro: I/O extension
Slot #4	65-72	Option	Standard (4 x relay outputs)	Option: E1 (2 x +/-25 mA output) E2 (2 x 0(4)...20 mA output) EF2 (1 x +/-25 mA, 1 x 0(4)...20 mA) EF4 (1 x +/-25 mA, 2 x relay outputs) EF5 (1 x PWM, +/-25 mA, 2 x relay outputs) EF6 (1 x PWM, 2 x +/-25 mA outputs) M14.4 (4 x relay outputs)
Slot #5	73-89	Standard	Standard	AC measuring
Slot #6	90-97	Option	Option	Option: F1 (2 x analogue outputs) M13.6 (7 x binary inputs) M14.6 (4 x relay outputs) M15.6 (4 x analogue inputs)
Slot #7	98-B3	Option	Option	M4 (engine interface board or I/O extension) - CAN I/F A (H7 - J1939) - CAN I/F B (reserved)

Slot	Term.	GPU/GPU Hydro	GPC/PPU	Description
Slot #8	126-133	Option	Option	Option: G9 (CANbus load sharing) M13.8 (7 x binary inputs) M14.8 (4 x relay outputs) M15.8 (4 x analogue inputs) H5, H6 (engine comm.) H8.8 (Beckhoff ext. I/Os)

Only hardware options which will affect the hardware of the unit are represented in the table. The software options can be seen through the PC utility software. The software options are described in the data sheet.

Unit top side overview

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



5. GPU/GPU Hydro I/O list

Terminal strip description

Slot #1, power supply and binary I/O

For the relay outputs the following terms will be used:

NO means **N**ormally **O**pen
NC means **N**ormally **C**losed
Com. means common terminal for the relay in question

Term.	Function	Technical data	Description
1	+12/24V DC	8-36V DC	Power supply
2	0V DC		
3	NC	Status relay	Normally closed relay, processor/power supply status supervision
4	Com.	24 V/1 A	
5	NO	Relay 5	Alarm horn/configurable
6	Com.	250V AC/8 A	
7	NC		
8	NO	Relay 8	Configurable
9	Com.	250V AC/8 A	
10	NC		
11	NO	Relay 11	Configurable
12	Com.	250V AC/8 A	
13	NC		
14	NO	Relay 14	Open GB
15	Com.	250V AC/8 A	
16	NC		
17	NO	Relay 17	Configurable
18	Com.	250V AC/8 A	
19	NC		
20	Open collector 1	Transistor out (relay 20)	Configurable as standard relay output
21	Open collector 2	Transistor out (relay 21)	Configurable as standard relay output
22	Com.	Common	Common terminal for terminals 20 and 21
23	Binary input	Optocoupler	Alarm inhibit 1/configurable

24	Binary input	Optocoupler	Remote alarm acknowledge/ configurable
25	Binary input	Optocoupler	Configurable
26	Binary input	Optocoupler	Configurable
27	Binary input	Optocoupler	Configurable
28	Com.	Common	Common for terminals 23-27

The power supply must be protected with a 2 A slow-blow fuse.

Slot #2, external communication (optional)

Option H2 (Modbus RS485)

Term.	Function	Description
29	DATA + (A)	Modbus RTU/ASCII, RS485
30	Not used	
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.

Option H3 (Profibus DP)

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

Option H8.2

CANbus interface for external I/O modules.

Term.	Function	Description
29	Not used	CANbus communication for Beckhoff external I/O modules
30	Not used	
31	CAN-L	
32	Not used	
33	CAN-H	
34	CAN-L	
35	Not used	
36	CAN-H	

Option H9.2 (Modbus RS232)

Term.	Function	Description
29		Modbus RTU/ASCII, RS232
30	DATA GND	
31		
32	TxD	
33		
34	RxD	
35		
36		

Slot #3, digital I/Os (option M12)

Term.	Function	Technical data	Description
37			Not available
38			Not available
39			Not available
40			Not available
41			Not available
42			Not available
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 43-55
57	NO	Relay 57 6	GOV/AVR control or configurable
58	Com.	250V AC 8 A	
59	NO	Relay 59 7	GOV/AVR control or configurable
60	Com.	250V AC 8 A	
61	NO	Relay 61 8	GOV/AVR control or configurable
62	Com.	250V AC 8 A	
63	NO	Relay 63 9	GOV/AVR control or configurable
64	Com.	250V AC 8 A	

GOV control requires option G2.

AVR control requires options G2 and D1.

Slot #4, GOV/AVR (optional)

GOV control requires option G2.
AVR control requires options G2 and D1.

Option M14.4

GOV/AVR or configurable relay output card.

Term.	Function	Description
65	Relay 65	GOV/AVR or configurable
66	250V AC, 8 A	
67	Relay 67	GOV/AVR or configurable
68	250V AC, 8 A	
69	Relay 69	GOV/AVR or configurable
70	250V AC, 8 A	
71	Relay 71	GOV/AVR or configurable
72	250V AC, 8 A	

Option E1

GOV/AVR or transducer output card.

Term.	Function	Description
65	Not used	
66	+/-20 mA out	Speed governor/AVR setpoint output or transducer (Analogue output 66)
67	0	
68	Not used	
69	Not used	
70	+/-20 mA out	Speed governor/AVR voltage setpoint output or transducer (Analogue output 70)
71	0	
72	Not used	

Option E2

GOV/AVR or transducer output card.

Term.	Function	Description
65	Not used	
66	0-20 mA out	Speed governor/AVR setpoint output or transducer (Analogue output 66)
67	0	
68	Not used	
69	Not used	
70	0-20 mA out	Speed governor/AVR voltage setpoint output or transducer (Analogue output 70)
71	0	
72	Not used	

Option EF2

GOV/AVR or transducer output card.

Term.	Function	Description
65	Not used	
66	+/-20 mA	Speed governor/AVR setpoint output or transducer (Analogue output 66)
67	0	
68	Not used	
69	Not used	
70	0(4)-20 mA out	Speed governor/AVR setpoint output or transducer (Analogue output 70)
71	0	
72	Not used	

Option EF4

GOV/AVR or transducer combination output card.

Term.	Function	Description
65	ANA +	Speed governor/AVR setpoint output or transducer (Analogue output 66)
66	ANA -	
67	Not used	
68	Not used	
69	Relay 69	GOV/AVR control or configurable
70	250V AC, 8 A	
71	Relay 71	GOV/AVR control or configurable
72	250V AC, 8 A	

Option EF5

PWM GOV and AVR combination output card.

Term.	Function	Description
65	+/-25 mA out	AVR setpoint output
66	0	
67	PWM +	PWM speed governor signal
68	PWM -	
69	Relay 69	GOV/AVR control or configurable
70	250V AC, 8 A	
71	Relay 71	GOV/AVR control or configurable
72	250V AC, 8 A	

Slot #5, AC measuring

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

Current inputs are galvanically separated. Max. 0.3 VA per phase. Voltage measurements are available (phase to phase) from 100V AC to 690V AC.

Slot #6, I/O extension (optional)

Option F1

Transducer output card.

Term.	Function	Description
90	Not used	
91	0	Analogue output 91, selectable
92	0(4)-20 mA out	
93	Not used	
94	Not used	
95	0	Analogue output 95, selectable
96	0(4)-20 mA out	
97	Not used	

Option M13.6

7 x binary inputs.

Term.	Function	Description
90	Common	Common
91	Digital input 91	Configurable
92	Digital input 92	Configurable
93	Digital input 93	Configurable
94	Digital input 94	Configurable
95	Digital input 95	Configurable
96	Digital input 96	Configurable
97	Digital input 97	Configurable

Option M14.6

4 x relay outputs.

Term.	Function	Description
90 91	Relay 90 250V AC, 8 A max.	Configurable
92 93	Relay 92 250V AC, 8 A max.	Configurable
94 95	Relay 94 250V AC, 8 A max.	Configurable
96 97	Relay 96 250V AC, 8 A max.	Configurable

Option M15.6

4 x analogue 4-20 mA inputs.

Term.	Function	Description
90	Input 90 common	Common
91	Analogue input 91+	4-20 mA in
92	Input 92 common	Common
93	Analogue input 93+	4-20 mA in
94	Input 94 common	Common
95	Analogue input 95+	4-20 mA in
96	Input 96 common	Common
97	Analogue input 97+	4-20 mA in

Slot #7, engine interface board (option M4)

Term.	Function	Technical data	Description/preconfiguration
98	+12/24V DC	8-36V DC	DC power supply
99	0V DC		
100	MPU input	0.5-70V AC/ 10-10000 Hz	Magnetic pick-up (RPM)
101	MPU GND		
102	A	0(4)-20 mA Digital w/wire break Pt100 Pt1000 RMI 0-40V DC	Multi-input 1 Preselected to digital input with wire break detection
103	B		
104	C		
105	A		Multi-input 2 Preselected to digital input with wire break detection
106	B		
107	C		
108	A		Multi-input 3 Preselected to digital input with wire break detection
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	Shutdown override/configurable
115	Digital input 115	Optocoupler	Configurable
116	Digital input 116	Optocoupler	Running feedback/configurable
117	Digital input 117	Optocoupler	Configurable
118	Digital input 118	Optocoupler	Emergency stop and common for 119 and 120
119	NO	Relay 24V DC/5 A	Run coil/configurable
120	NO	Relay 24V DC/5 A	Start prepare/configurable
121	Com.	Relay 24V DC/5 A	Crank (starter)/configurable
122	NO		
123	Com.	Relay 24V DC/5 A	Stop coil w/wire break/configurable
124	NO		
A1	CAN-H	CANbus	CANbus J1939 engine interface (option H7)
A2	CAN GND		
A3	CAN-L		

Slot #8, communication and I/O (optional)

Option H5

CANbus engine interface card.

Term.	Function	Description
126	Not used	CANbus communication for engine interface J1939 or MTU MDEC/MTU ADEC
127	Not used	
128	CAN-L	
129	Not used	
130	CAN-H	
131	CAN-L	
132	Not used	
133	CAN-H	

Option H8.8

CANbus interface for external I/O modules.

Term.	Function	Description
126	Not used	CANbus communication for Beckhoff external I/O modules
127	Not used	
128	CAN-L	
129	Not used	
130	CAN-H	
131	CAN-L	
132	Not used	
133	CAN-H	

Option M13.8

7 x binary inputs.

Term.	Function	Description
126	Common	Common
127	Digital input 127	Configurable
128	Digital input 128	Configurable
129	Digital input 129	Configurable
130	Digital input 130	Configurable
131	Digital input 131	Configurable
132	Digital input 132	Configurable
133	Digital input 133	Configurable

Option M14.8

4 x relay outputs.

Term.	Function	Description
126 127	Relay 126 250V AC, 8 A max.	Configurable
128 129	Relay 128 250V AC, 8 A max.	Configurable
130 131	Relay 130 250V AC, 8 A max.	Configurable
132 133	Relay 132 250V AC, 8 A max.	Configurable

Option M15.8

4 x analogue 4-20 mA inputs.

Term.	Function	Description
126	Input 127 common	Common
127	Analogue input 127+	4-20 mA in
128	Input 129 common	Common
129	Analogue input 129+	4-20 mA in
130	Input 131 common	Common
131	Analogue input 131+	4-20 mA in
132	Input 133 common	Common
133	Analogue input 133+	4-20 mA in

Digital inputs

Term.	Name	Function
23	Alarm inhibit 1/ configurable	External input for inhibit of selected alarms
24	Remote alarm acknow-ledge/configurable	
25	Configurable/start sync./ control (option G2)	Option G2: Activates synchronisation. The Deload function is used to open the breaker
26	Configurable/GB open (option G2)	Option G2: Breaker feedback signal. The connection breaker is in position OFF
27	Configurable/GB closed (option G2)	Option G2: Breaker feedback signal. The connection breaker is in position ON

Relay outputs

Term.	Name	Function
3 4	Status relay	The status relay on the power supply board is a normally closed relay with the purpose of processor and power supply supervision
5 6 7	Alarm horn relay/ configurable	The relay is activated on any alarm that appears. The output can be normally open (terminal 5-6) or normally closed (terminal 6-7)
8 9 10	Configurable	
11 12 13	Configurable	
14 15 16	Open GB	Generator breaker OFF signal. The output can be selected to be normally open (NO, terminal 14-15) or normally closed (NC, terminal 15-16)
17 18 19	Configurable/close GB	Option G2: Generator breaker ON signal. The output can be selected to be normally open (NO, terminal 17-18) or normally closed (NC, terminal 18-19)
20	Configurable	Configurable digital output (transistor output type)
21	Configurable	Configurable digital output (transistor output type)

6. GPC/PPU I/O list

Terminal strip description

Slot #1, power supply and binary I/O

For the relay outputs the following terms will be used:

NO means **N**ormally **O**pen
NC means **N**ormally **C**losed
Com. means common terminal for the relay in question

Term.	Function	Technical data	Description
1	+12/24V DC	8-36V DC	Power supply
2	0V DC		
3	NC	Status relay	Normally closed relay, processor/power supply status supervision
4	Com.	24 V/1 A	
5	NO	Relay 5	Alarm horn/configurable
6	Com.	250V AC/8 A	
7	NC		
8	NO	Relay 8	Configurable
9	Com.	250V AC/8 A	
10	NC		
11	NO	Relay 11	Configurable
12	Com.	250V AC/8 A	
13	NC		
14	NO	Relay 14	Open GB
15	Com.	250V AC/8 A	
16	NC		
17	NO	Relay 17	Close GB
18	Com.	250V AC/8 A	
19	NC		
20	Open collector 1	Transistor out (relay 20)	Configurable as standard relay output
21	Open collector 2	Transistor out (relay 21)	Configurable as standard relay output
22	Com.	Common	Common terminal for terminals 20 and 21
23	Binary input	Optocoupler	Alarm inhibit 1/configurable

24	Binary input	Optocoupler	Remote alarm acknowledge/ configurable
25	Binary input	Optocoupler	Start sync./control/configurable
26	Binary input	Optocoupler	GB open
27	Binary input	Optocoupler	GB closed
28	Com.	Common	Common for terminals 23-27

The power supply must be protected with a 2 A slow-blow fuse.

Slot #2, external communication (optional)

Option H2

Modbus RS485

Term.	Function	Description
29	DATA + (A)	Modbus RTU/ASCII, RS485
30	Not used	
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.

Option H3

Profibus

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

Option H8.2

CANbus interface for external I/O modules.

Term.	Function	Description
29	Not used	CANbus communication for Beckhoff external I/O modules
30	Not used	
31	CAN-L	
32	Not used	
33	CAN-H	
34	CAN-L	
35	Not used	
36	CAN-H	

Option H9.2

Modbus RS232

Term.	Function	Description
29		Modbus RTU/ASCII, RS232
30	DATA GND	
31		
32	TxD	
33		
34	RxD	
35		
36		

Option M14.2

4 x relay outputs

Term.	Function	Description
29	Relay 29	Configurable
30	250V AC, 8 A	
31	Relay 31	Configurable
32	250V AC, 8 A	
33	Relay 33	Configurable
34	250V AC, 8 A	
35	Relay 35	Configurable
36	250V AC, 8 A	

Slot #3, digital I/O

Term.	Function	Technical data	Description
37	-5…0…5V DC	Analogue I/O	Active load sharing line
38	Com.	Common	Common for load sharing lines
39	-5…0…5V DC	Analogue I/O	Reactive load sharing
40	-10…0…10V DC	Analogue input	f/P setpoint (passive)
41	Com.	Common	Common for 40/42
42	-10…0…10V DC	Analogue input	U/Q setpoint (passive)
43	Binary input	Optocoupler	Deload/configurable
44	Binary input	Optocoupler	Man. GOV UP/configurable
45	Binary input	Optocoupler	Man. GOV DOWN/configurable
46	Binary input	Optocoupler	Man. AVR UP/configurable
47	Binary input	Optocoupler	Man. AVR DOWN/configurable
48	Binary input	Optocoupler	Fixed frequency/configurable
49	Binary input	Optocoupler	P load sharing/configurable
50	Binary input	Optocoupler	Ext. GOV setpoint/configurable
51	Binary input	Optocoupler	Fixed voltage/configurable
52	Binary input	Optocoupler	Q load sharing/configurable
53	Binary input	Optocoupler	Ext. AVR setpoint/configurable
54	Binary input	Optocoupler	Configurable
55	Binary input	Optocoupler	Configurable
56	Com.	Common	Common for terminals 43-55
57	NO	Relay 57 6	GOV/AVR control or configurable
58	Com.	250V AC 8 A	
59	NO	Relay 59 7	GOV/AVR control or configurable
60	Com.	250V AC 8 A	
61	NO	Relay 61 8	GOV/AVR control or configurable
62	Com.	250V AC 8 A	
63	NO	Relay 63 9	GOV/AVR control or configurable
64	Com.	250V AC 8 A	

AVR control requires option D1.

Slot #4, GOV/AVR

AVR control requires option D1.

Standard

GOV/AVR or configurable relay output card.

Term.	Function	Description
65	Relay 65	GOV/AVR or configurable
66	250V AC, 8 A	
67	Relay 67	GOV/AVR or configurable
68	250V AC, 8 A	
69	Relay 69	GOV/AVR or configurable
70	250V AC, 8 A	
71	Relay 71	GOV/AVR or configurable
72	250V AC, 8 A	

Option E1

GOV/AVR or transducer output card.

Term.	Function	Description
65	Not used	
66	+/-20 mA out	Speed governor/AVR setpoint output or transducer (Analogue output 66)
67	0	
68	Not used	
69	Not used	
70	+/-20 mA out	Speed governor/AVR voltage setpoint output or transducer (Analogue output 70)
71	0	
72	Not used	

Option E2

GOV/AVR or transducer output card.

Term.	Function	Description
65	Not used	
66	0-20 mA out	Speed governor/AVR setpoint output or transducer (Analogue output 66)
67	0	
68	Not used	
69	Not used	
70	0-20 mA out	Speed governor/AVR voltage setpoint output or transducer (Analogue output 70)
71	0	
72	Not used	

Option EF2

GOV/AVR or transducer output card.

Term.	Function	Description
65	Not used	
66	+/-20 mA	Speed governor/AVR setpoint output or transducer (Analogue output 66)
67	0	
68	Not used	
69	Not used	
70	0(4)-20 mA out	Speed governor/AVR setpoint output or transducer (Analogue output 70)
71	0	
72	Not used	

Option EF4

GOV/AVR or transducer combination output card.

Term.	Function	Description
65	ANA +	Speed governor/AVR setpoint output or transducer (Analogue output 66)
66	ANA -	
67	Not used	
68	Not used	
69	Relay 69	GOV/AVR control or configurable
70	250V AC, 8 A	
71	Relay 71	GOV/AVR control or configurable
72	250V AC, 8 A	

Option EF5

PWM GOV and AVR combination output card.

Term.	Function	Description
65	+/-25 mA out	AVR setpoint output
66	0	
67	PWM +	PWM speed governor signal
68	PWM -	
69	Relay 69	GOV/AVR control or configurable
70	250V AC, 8 A	
71	Relay 71	GOV/AVR control or configurable
72	250V AC, 8 A	

Option EF6

PWM GOV and AVR combination output card.

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

Option EF6 is not available for PPU.

Slot #5, AC measuring

Term.	Function	Technical data	Description
73	I L1 s1	Generator current L1	1/5 A AC input
74	I L1 s2		
75	I L2 s1	Generator current L2	1/5 A AC input
76	I L2 s2		
77	I L3 s1	Generator current L3	1/5 A AC input
78	I L3 s2		
79	U L1	Generator voltage L1	Max. 690V AC phase-phase value
80	*Not used*		
81	U L2	Generator voltage L2	Max. 690V AC phase-phase value
82	*Not used*		
83	U L3	Generator voltage L3	Max. 690V AC phase-phase value
84	U neutral	Generator voltage neutral	For land-based applications only
85	U L1	Mains bus voltage L1	Max. 690V AC phase-phase value
86	*Not used*		
87	U L2	Mains bus voltage L2	Max. 690V AC phase-phase value
88	U neutral	Mains bus voltage neutral	For land-based applications only
89	U L3	Mains bus voltage L3	Max. 690V AC phase-phase value

Current inputs are galvanically separated. Max. 0.3 VA per phase. Voltage measurements are available (phase to phase) from 100V AC to 690V AC.

Slot #6, I/O extension (optional)

Option F1

Transducer output card.

Term.	Function	Description
90	Not used	
91	0	Analogue output 91, selectable
92	0(4)-20 mA out	
93	Not used	
94	Not used	
95	0	Analogue output 95, selectable
96	0(4)-20 mA out	
97	Not used	

Option M13.6

7 x binary inputs.

Term.	Function	Description
90	Common	Common
91	Digital input 91	Configurable
92	Digital input 92	Configurable
93	Digital input 93	Configurable
94	Digital input 94	Configurable
95	Digital input 95	Configurable
96	Digital input 96	Configurable
97	Digital input 97	Configurable

Option M14.6

4 x relay outputs.

Term.	Function	Description
90 91	Relay output 90 250V AC, 8 A max.	Configurable
92 93	Relay output 92 250V AC, 8 A max.	Configurable
94 95	Relay output 94 250V AC, 8 A max.	Configurable
96 97	Relay output 96 250V AC, 8 A max.	Configurable

Option M15.6

4 x analogue 4-20 mA inputs.

Term.	Function	Description
90	Input 90 common	Common
91	Analogue input 91+	4-20 mA in
92	Input 92 common	Common
93	Analogue input 93+	4-20 mA in
94	Input 94 common	Common
95	Analogue input 95+	4-20 mA in
96	Input 96 common	Common
97	Analogue input 97+	4-20 mA in

Slot #7, engine interface board (option M4)

Term.	Function	Technical data	Description/preconfiguration
98	+12/24V DC	8-36V DC	DC power supply
99	0V DC		
100	MPU input	0.5-70V AC/ 10-10000 Hz	Magnetic pick-up
101	MPU GND		
102	A	0(4)-20 mA Digital w/wire break Pt100 Pt1000 RMI 0-40V DC	Multi-input 1 Preselected to digital input with wire break detection
103	B		
104	C		
105	A		Multi-input 2 Preselected to digital input with wire break detection
106	B		
107	C		
108	A		Multi-input 3 Preselected to digital input with wire break detection
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	Shutdown override/configurable
115	Digital input 115	Optocoupler	Configurable
116	Digital input 116	Optocoupler	Running feedback/configurable
117	Digital input 117	Optocoupler	Configurable
118	Digital input 118	Optocoupler	Emergency stop and common for 119 and 120
119	NO	Relay 24V DC/5 A	Run coil/configurable
120	NO	Relay 24V DC/5 A	Start prepare/configurable
121	Com.	Relay 24V DC/5 A	Crank (starter)/configurable
122	NO		
123	Com.	Relay 24V DC/5 A	Stop coil w/wire break/configurable
124	NO		
A1	CAN-H	CANbus	CANbus J1939 engine interface (option H7)
A2	CAN GND		
A3	CAN-L		

Slot #8, communication and I/O (optional)

Option H5

CANbus engine interface card.

Term.	Function	Description
126	Not used	CANbus communication for engine interface J1939 or MTU MDEC/MTU ADEC
127	Not used	
128	CAN-L	
129	Not used	
130	CAN-H	
131	CAN-L	
132	Not used	
133	CAN-H	

Option H8.8

CANbus interface for external I/O modules.

Term.	Function	Description
126	Not used	CANbus communication for Beckhoff external I/O modules
127	Not used	
128	CAN-L	
129	Not used	
130	CAN-H	
131	CAN-L	
132	Not used	
133	CAN-H	

Option M13.8

7 x digital inputs.

Term.	Function	Description
126	Common	Common
127	Digital input 127	Configurable
128	Digital input 128	Configurable
129	Digital input 129	Configurable
130	Digital input 130	Configurable
131	Digital input 131	Configurable
132	Digital input 132	Configurable
133	Digital input 133	Configurable

Option M14.8

4 x relay outputs.

Term.	Function	Description
126 127	Relay output 126 250V AC, 8 A max.	Configurable
128 129	Relay output 128 250V AC, 8 A max.	Configurable
130 131	Relay output 130 250V AC, 8 A max.	Configurable
132 133	Relay output 132 250V AC, 8 A max.	Configurable

Option M15.8

4 x analogue 4-20 mA inputs.

Term.	Function	Description
126	Input 127 common	Common
127	Analogue input 127+	4-20 mA in
128	Input 129 common	Common
129	Analogue input 129+	4-20 mA in
130	Input 131 common	Common
131	Analogue input 131+	4-20 mA in
132	Input 133 common	Common
133	Analogue input 133+	4-20 mA in

Digital inputs

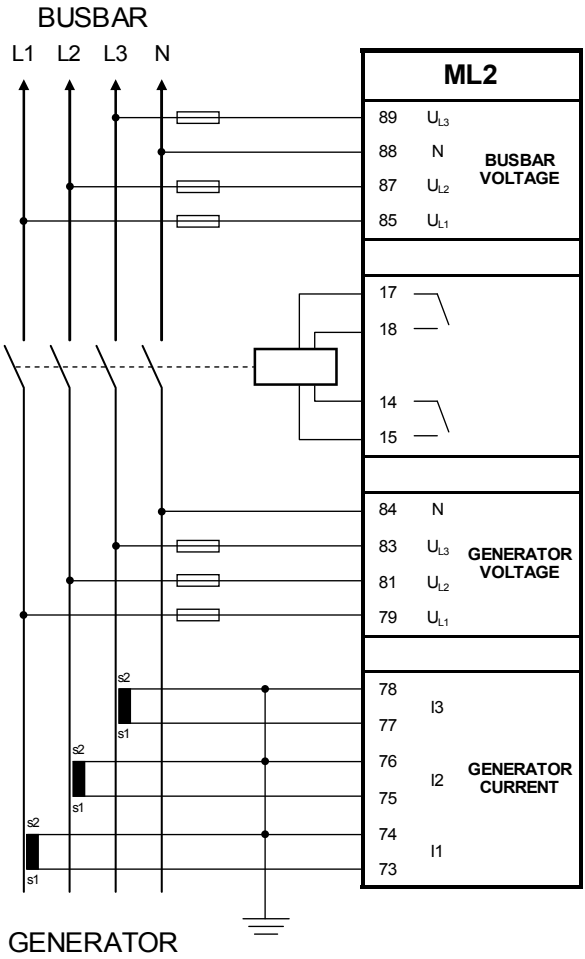
Term.	Name	Function
23	Alarm inhibit 1/configurable	External input for inhibit of selected alarms
24	Remote alarm acknowledge/ configurable	Remote alarm acknowledge
25	Start sync./control/ configurable	Activates the regulation and synchronisation. Works together with 'Deload' (43)
26	GB open	Breaker feedback signal. The connection breaker is in position OFF
27	GB closed	Breaker feedback signal. The connection breaker is in position ON
43	Deload/configurable	Activates the deload sequence. Works together with start sync./control (25)
44	Manual GOV UP/ configurable	Increase engine speed
45	Manual GOV DOWN/ configurable	Decrease engine speed
46	Manual AVR UP/ configurable	Option D1: Increase generator voltage
47	Manual AVR DOWN/ configurable	Option D1: Decrease generator voltage
48	Fixed frequency/configurable	Activates frequency controller
49	P load sharing/configurable	Activates load sharing controller
50	Ext. GOV setpoint/ configurable	The nominal frequency setpoint will be controlled from the analogue inputs terminal 40/41. The internal setpoint will not be used
51	Fixed voltage/configurable	Activates voltage controller
52	Q load sharing/configurable	Activates Q load sharing controller
53	Ext. AVR setpoint/ configurable	The nominal voltage setpoint will be controlled from the analogue inputs terminal 41/42. The internal setpoint will not be used
54	Configurable	
55	Configurable	

Relay outputs

Term.	Name	Function
3 4	Status relay	The status relay on the power supply board is a normally closed relay with the purpose of processor and power supply supervision
5 6 7	Alarm horn relay/ configurable	The relay is activated on any alarm that appears. The output can be normally open (terminal 5-6) or normally closed (terminal 6-7)
8 9 10	Configurable	
11 12 13	Configurable	
14 15 16	Open GB	Generator breaker OFF signal. The output can be selected to be normally open (NO, terminal 14-15) or normally closed (NC, terminal 15-16)
17 18 19	Close GB	Generator breaker ON signal. The output can be selected to be normally open (NO, terminal 17-18) or normally closed (NC, terminal 18-19)
20	Configurable	Configurable digital output (transistor output type)
21	Configurable	Configurable digital output (transistor output type)
65 66	Configurable	GOV/AVR control or configurable
67 68	Configurable	GOV/AVR control or configurable
69 70	Configurable	GOV/AVR control or configurable
71 72	Configurable	GOV/AVR control or configurable

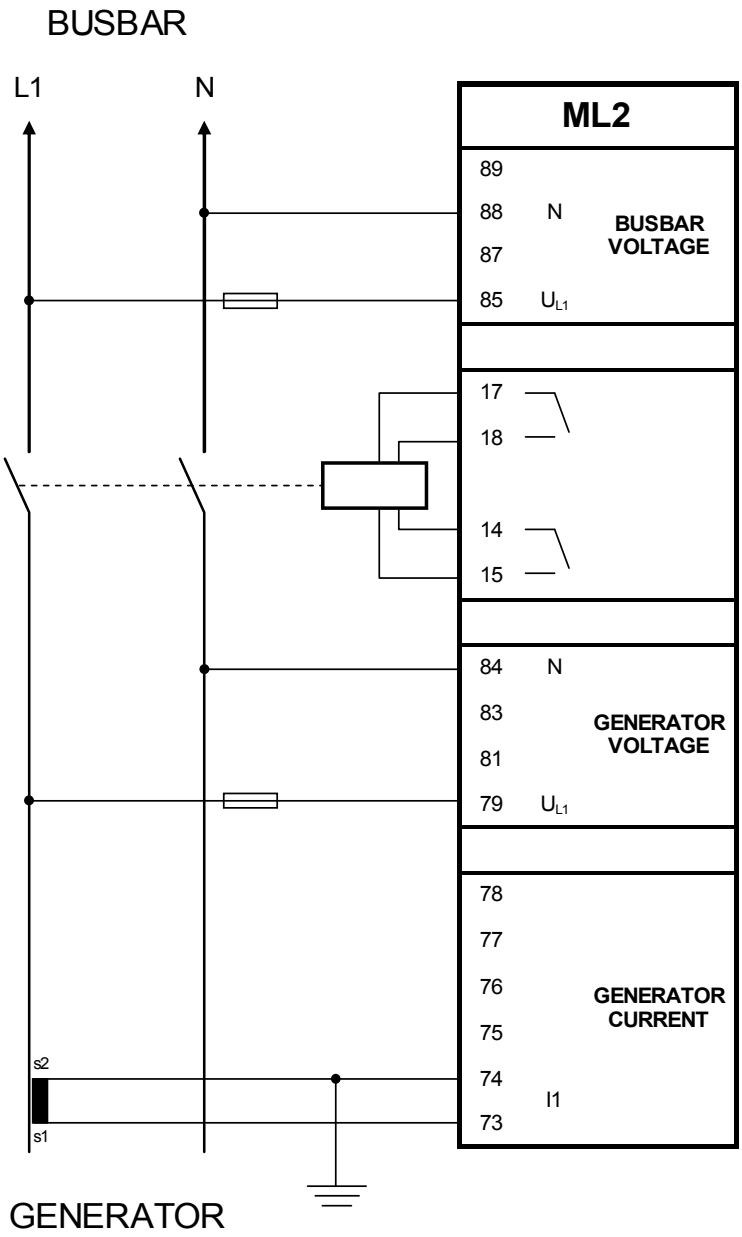
7. Wirings

AC connections (3-phase)

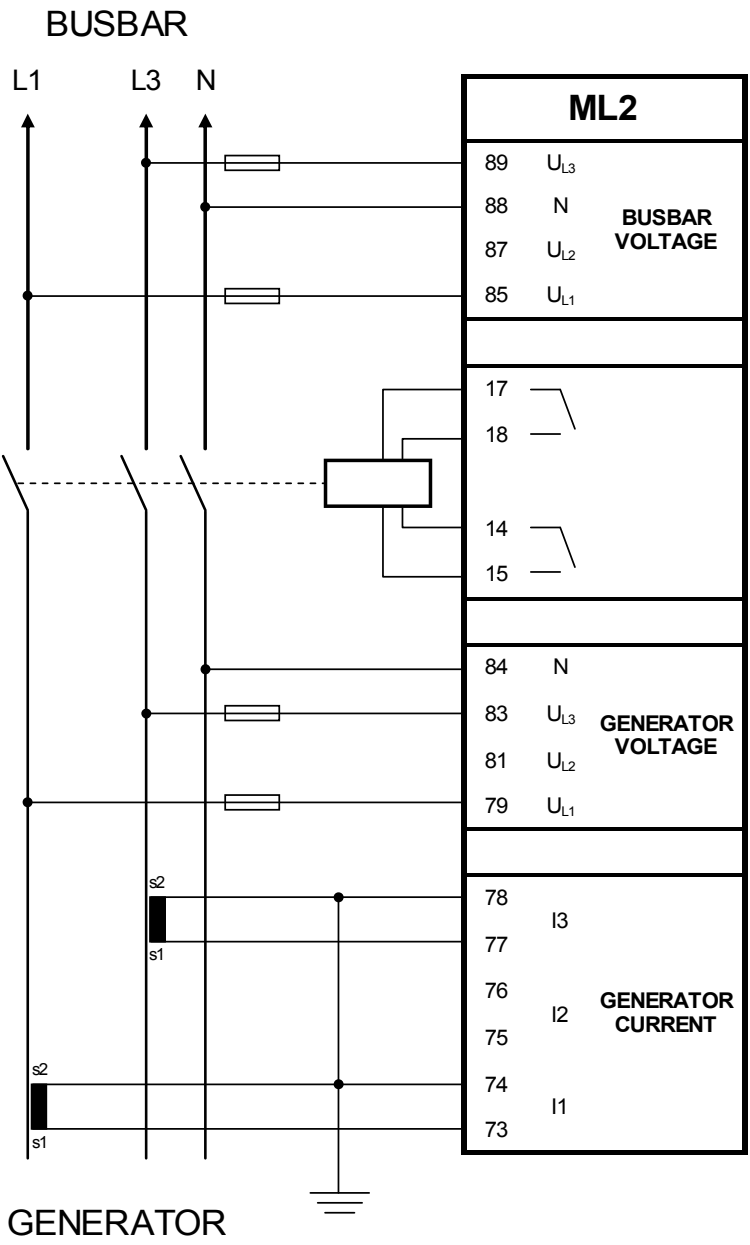


The neutral line (N) connection is not necessary for correct measurement. 3-phase without neutral is also possible. The current transformer ground connection can be on the s1 or s2 connection, whichever is preferred. Fuses: 2 A slow-blow.

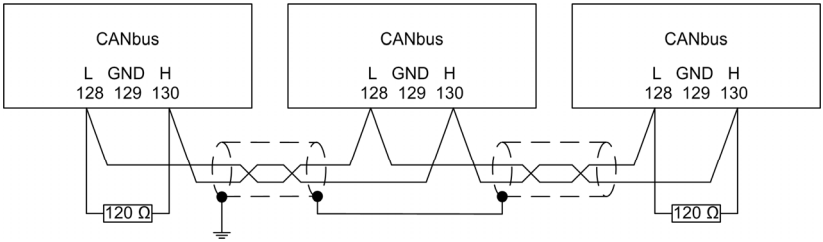
AC connections (1-phase)



AC connections (2-phase)



CANbus load sharing (option G9)

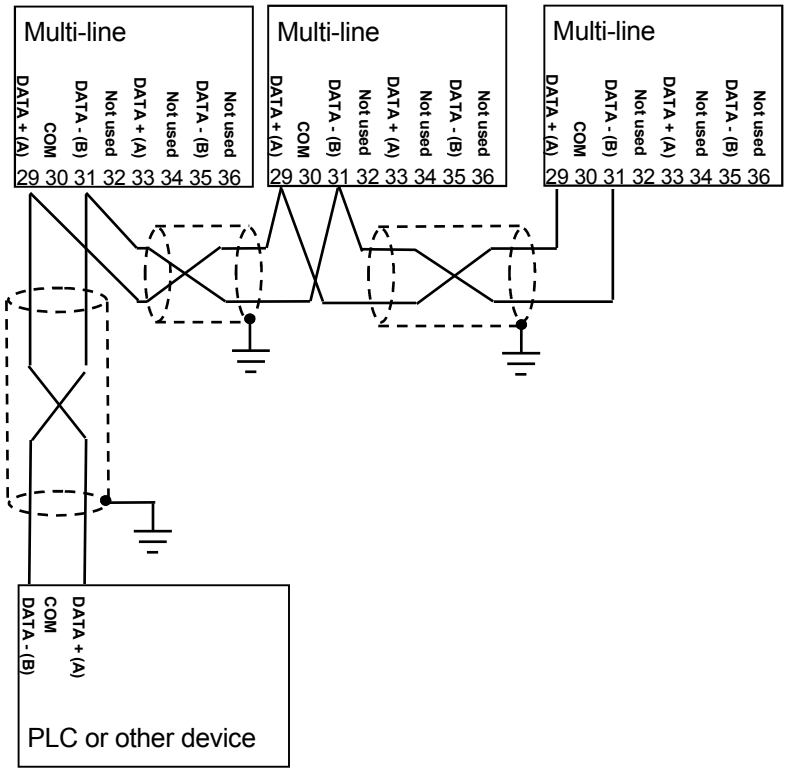


Use shielded twisted cable.

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

Modbus, RS485 (option H2)

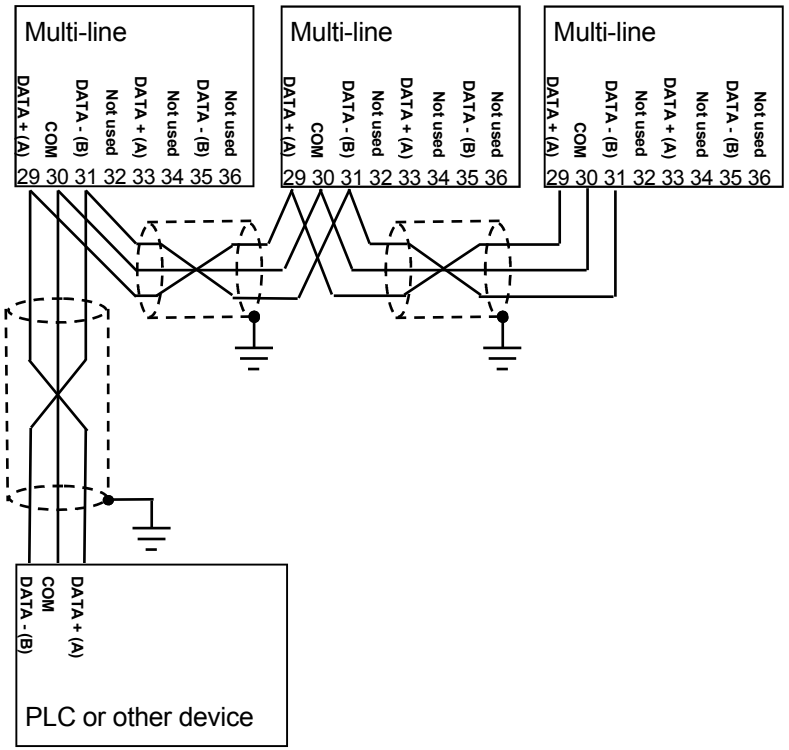
Connection with 2-wire screened cable (recommended):



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

Use shielded twisted cable.

Connection with 3-wire shielded cable:



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

Use shielded twisted cable.

This solution is only feasible if the COM line is insulated.
Check PLC/other device before connecting.
A non-insulated COM line may result in damage to the equipment.

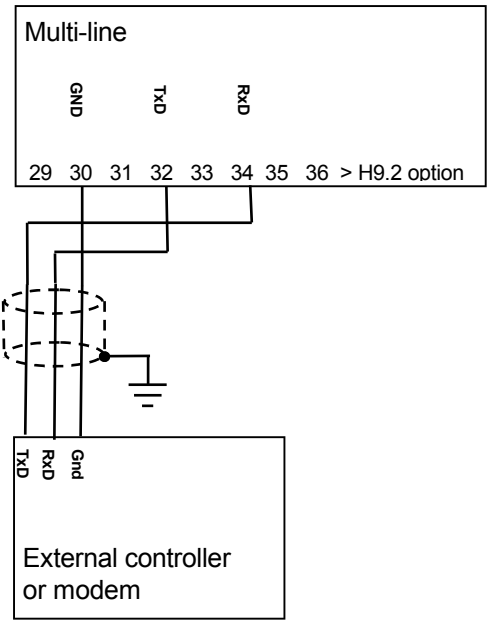
Normally, the Modbus does not need bias resistors (end terminators). These are only needed in case of very long lines and/or many nodes (>32) on the Modbus network. If bias resistors are needed, the calculation should be based on the following data:

- **A line internal pull-up bias resistor: 22 kΩ**
- **B line internal pull-down bias resistor: 22 kΩ**
- **Receiver input sensitivity: +/-200 mV**
- **Receiver input impedance: 12 kΩ**

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

Modbus, RS232 (option H9.2)

Connection to an external controller (PLC, PC, etc.) or a modem (GSM or RTC):



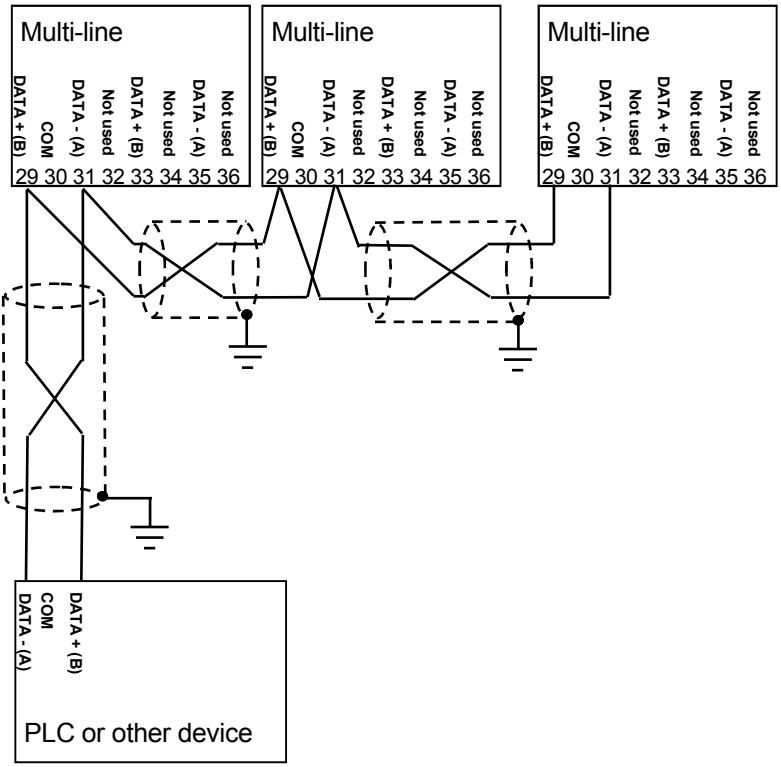
Connect shield to earth at one end only. Shield ends must be insulated with tape or insulation tubing.

This solution is only feasible if the COM line is insulated.
Check PLC/other device before connecting.
A non-insulated COM line may result in damage to the equipment.

Cable: Belden 3106 A or equivalent. 22 AWG (0.6 mm^2) shielded, <40 mΩ/m, min. 95% shield coverage.

Profibus DP (option H3)

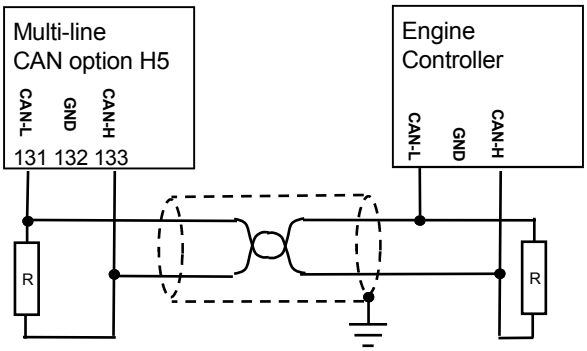
Connection with 2-wire screened cable (recommended):



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

Use shielded twisted cable.

CANbus engine communication (option H5)



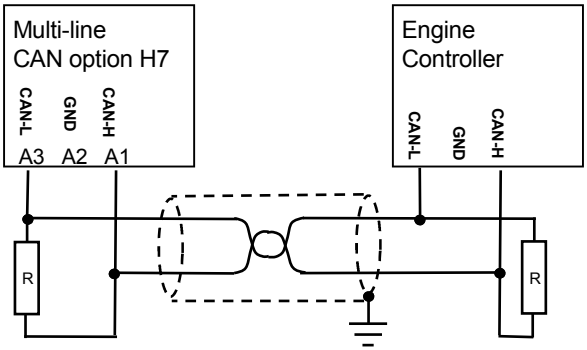
Connect shield to ground at one end only. Shield ends must be insulated with tape or insulation tubing.

Use shielded twisted cable.

End resistor R = 120 Ohm.

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

CANbus engine communication (option H7)



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

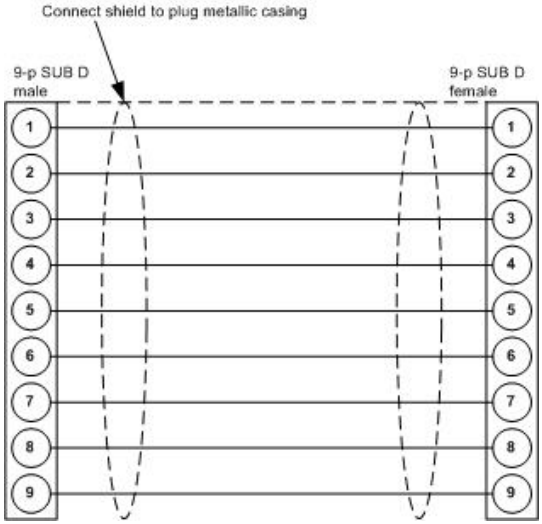
Use shielded twisted cable.

End resistor R = 120 Ohm.

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

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.



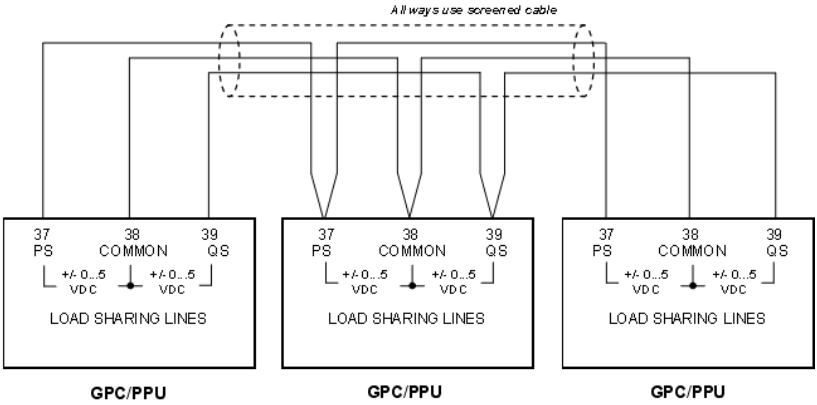
Wires min. 0.22 mm2, max. cable length 6 m.

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.

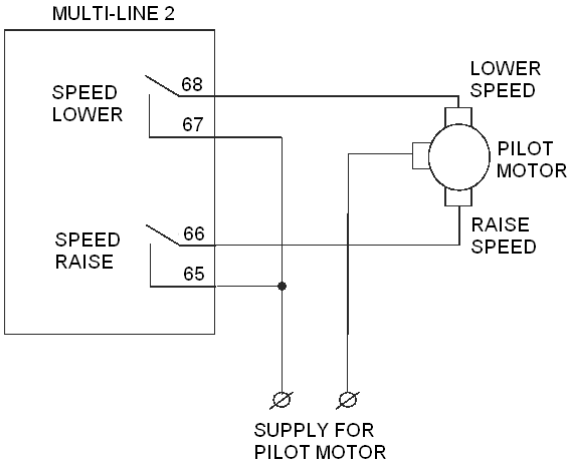
Load sharing lines

Screened, twisted cable is recommended to prevent disturbances on the load sharing lines.



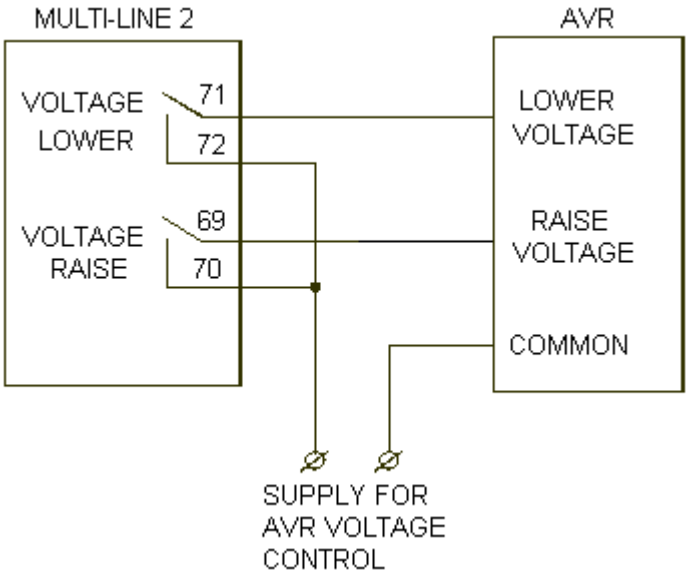
Mechanical speed governor

The illustration below shows the necessary connections to carry out speed control using relay outputs.

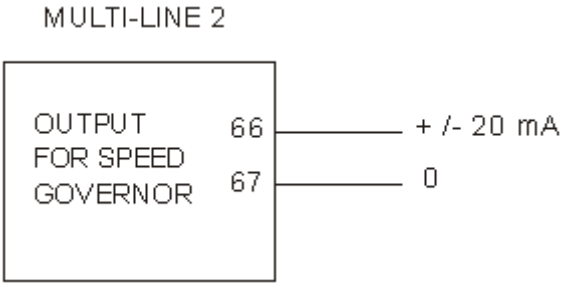


In order to extend the lifetime of the internal relays and prevent unwanted switching noise, it is recommended to use free wheel diodes (1N4007) if a DC voltage is used for the regulation. If an AC voltage is used for the regulation, it is recommended to use a varistor. The diode/varistor must be placed across the terminals of the pilot motor/external regulation relay coil.

AVR with relay outputs



Electronic speed governor

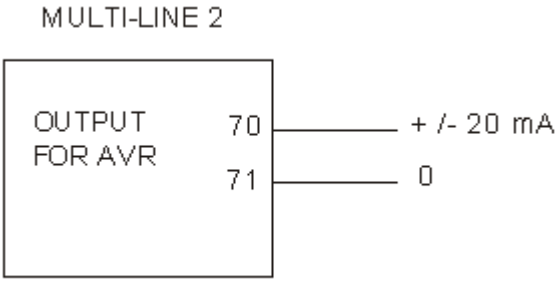


If necessary, the current outputs can be converted to voltage using a resistor across the terminals (250 Ω will convert the +/-20 mA into +/-5V DC).

For further information on how to connect the analogue output to the most common speed governors, please refer to:

Application Notes, Interfacing DEIF equipment to governors and AVRs, document number 4189340670 at www.deif.com.

AVR with analogue outputs



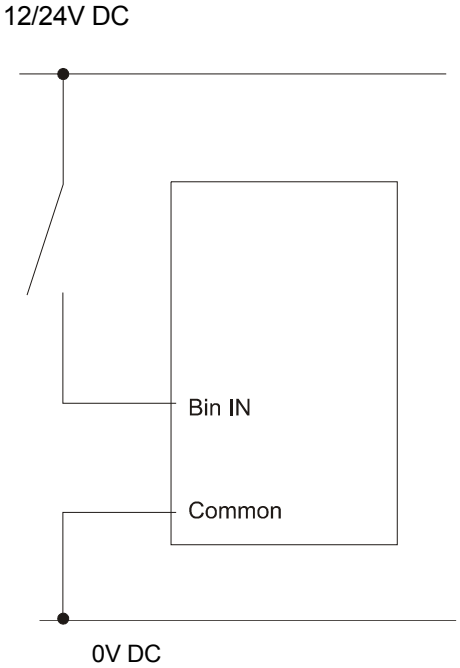
If necessary, the current outputs can be converted to voltage using a resistor across the terminals (250 Ω will convert the +/-20 mA into +/-5V DC).

For further information on how to connect the analogue output to the most common AVRs, please refer to:

Application Notes, Interfacing DEIF equipment to governors and AVRs, document number 4189340670 at www.deif.com.

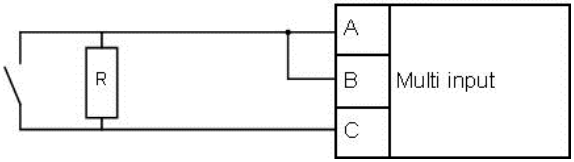
Digital inputs

All digital inputs are 12/24V DC bi-directional optocoupler. Typical input is:



Digital inputs with wire break supervision (option M4)

The digital inputs with wire break supervision only need potential free contacts.



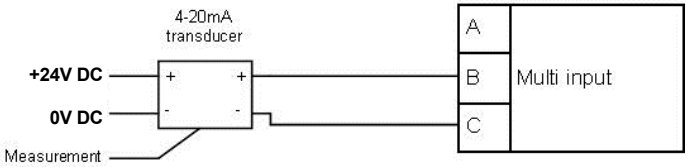
The resistor value should be 270 Ω +/-10%.

Multi-functional inputs (option M4)

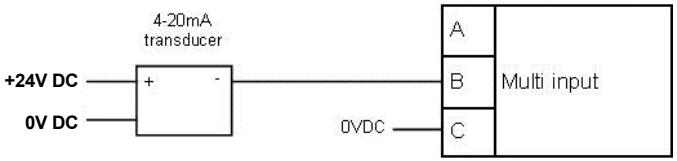
If the predefined binary inputs with cable supervision are not used, they can be used for the following.

0(4)-20 mA

Active transducer



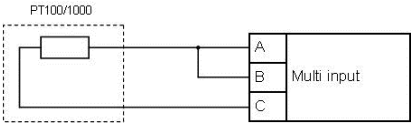
Passive transducer



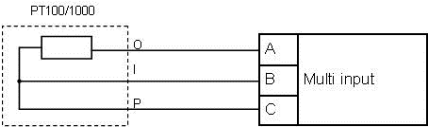
If the passive sensor has its own battery supply, the voltage must not exceed 30V DC.

Pt100/Pt1000

2-wire

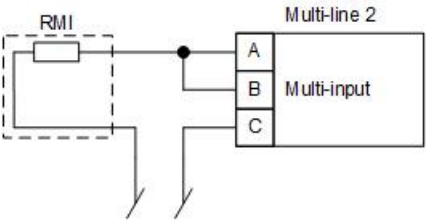


3-wire

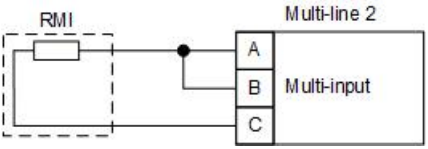


RMI

1-wire

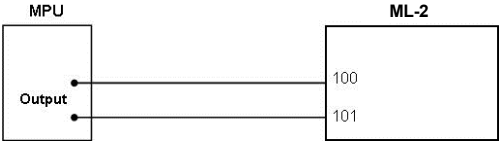


2-wire

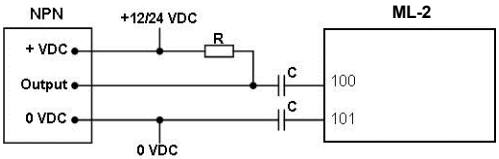


Magnetic pick-up (MPU) input (option M4)

Magnetic pick-up (MPU)

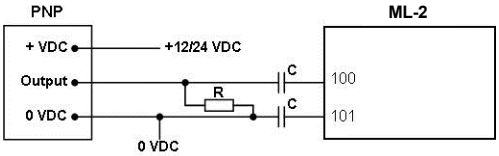


NPN sensor



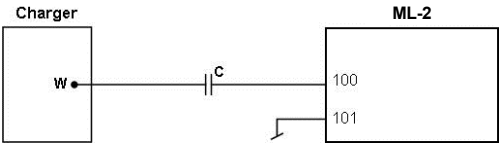
C = 22 nF, 100 V foil type
R = 1200Ω@24V DC, 600Ω@12V DC

PNP sensor



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

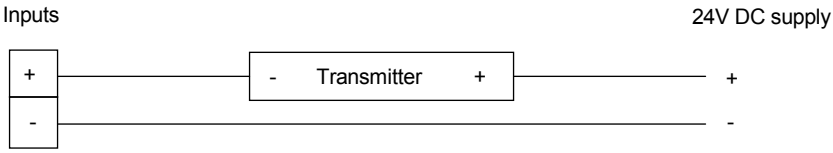
Charger, W output



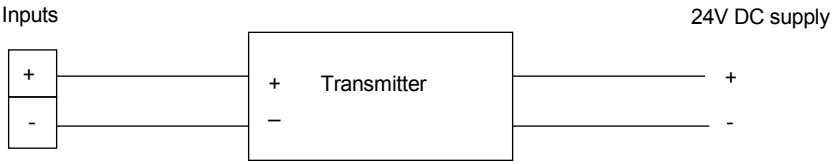
C = 22 nF, 100 V foil type

Analogue inputs (option M15.x)

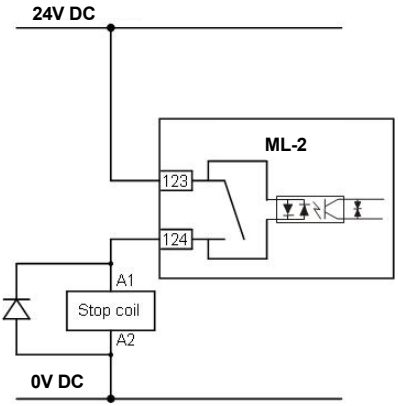
The analogue 0(4)...20 mA inputs are passive and require an external power supply:



or:



Stop coil with wire break detection (option M4)



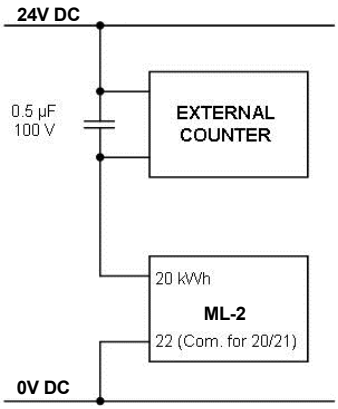
To avoid faulty activation of the stop coil caused by the wire break circuit, use a stop coil with the following specifications:
24V DC: I_{ON}>10 mA/R_{COIL}<1650 Ω
12V DC: I_{ON}>10 mA/R_{COIL}<800 Ω

Remember to mount the free wheel diode.

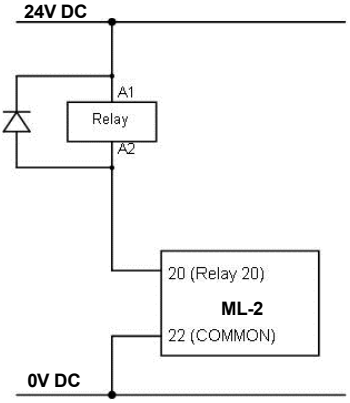
Transistor outputs

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.

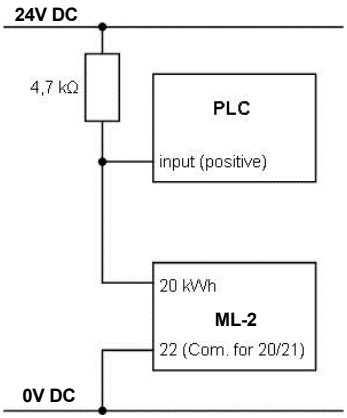
External counter:



Relay outputs:



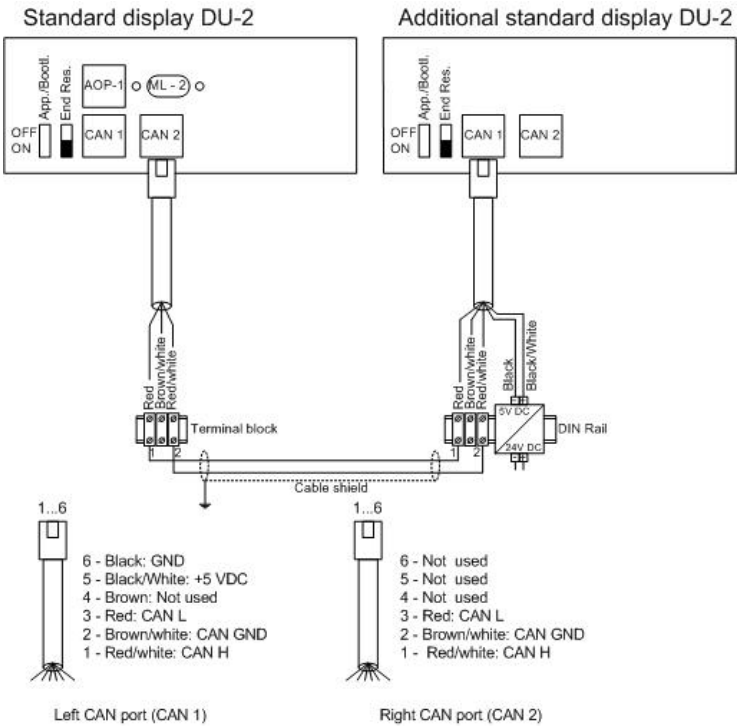
Connection to PLC:



Remember to mount the free wheel diode.

Max. load: 10 mA.

Additional display unit, DU-2 (option X2)



End resistor:

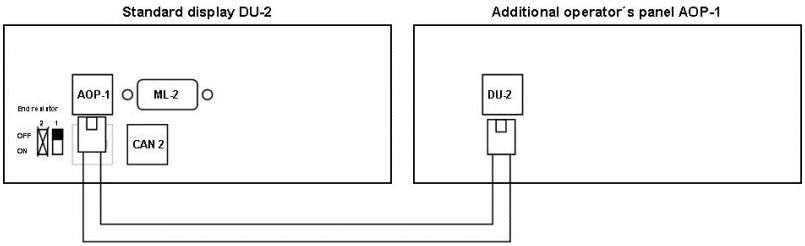
2 units connected: Dip switch no. 1 has to be set to ON on both units.

3 units connected: Dip switch no. 1 has to be set to ON on unit 1 and unit 3.

The maximum length of the CANbus line is 200 m.

A DC/DC converter for the DC supply voltage and 2 x 1 m cable with an RJ45 plug in one end and stripped wires in the other end are included in the DU-2 (option X2) delivery.

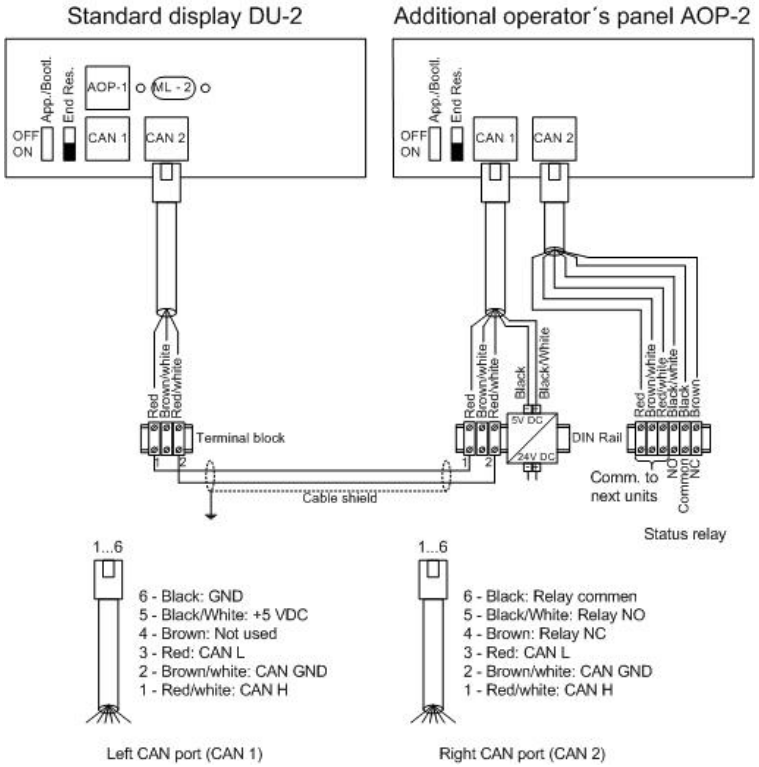
Additional operator's panel, AOP-1 (option X3)



The maximum distance between the DU-2 and the AOP-1 is 0.5 m.

The cable for connection between the AOP-1 and the DU-2 is included in the AOP-1 delivery.

Additional operator's panel, AOP-2 (option X4)



It is recommended to keep a fair distance to power cables.

A DC/DC converter for the DC supply voltage and 2 x 1 m cable with an RJ12 plug in one end and stripped wires in the other end are included in the AOP-2 delivery.

The cable between the terminal blocks should be shielded twisted pair.

The maximum length of the CANbus line is 200 m.

8. General data

Technical specifications

Accuracy: Class 1.0

-25…15…30…70°C
Temperature coefficient: +/-0.2% of full scale per 10°C

Positive, negative and zero sequence alarms:
Class 1 within 5% voltage unbalance

Class 1.0 for negative sequence current

Fast overcurrent:
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/EN 60688

Operating temp.: -25…70°C (-13...158°F)
(UL/cUL Listed: Max. surrounding air temp.: 55°C/131°F)

-25…60°C (-13…140°F) for the option N

Storage temp.: -40…70°C (-40...158°F)

Climate: 97% RH to IEC 60068-2-30

Operating altitude: 0-4000 m above sea level

Derating 2001-4000 m above sea level:

Max. 480V AC phase-phase 3W4 meas. voltage
Max. 690V AC phase-phase 3W3 meas. voltage

Meas. voltage: 100-690V AC +/-20%
(UL/cUL Listed: 600V AC phase-phase)

Consumption: Max. 0.25 VA/phase

Meas. 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)

Meas. frequency: 30…70 Hz

Aux. supply: Terminals 1 and 2:
12/24V DC (8...36 V continuously, 6 V 1 sec.)
Max. 11 W consumption

Terminals 98 and 99:
12/24V DC (8...36 V continuously, 6 V 1 sec.)
Max. 5 W consumption

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…36V DC
Impedance: 4.7 kΩ
OFF: <2V DC

Analogue inputs: 0(4)…20 mA

Impedance: 50 Ω
Not galvanically separated

RPM (MPU): 2…70V AC, 10…10000 Hz,
max 50 kΩ

Multi-inputs:

0(4)…20 mA:
0-20 mA, +/-1%
Not galvanically separated

Digital:
Max. resistance for ON detection: 100 Ω
Not galvanically separated

Pt100/1000:
-40…250°C, +/-1%
Not galvanically separated
To IEC/EN 60751

RMI:
0…1700 Ω, +/-2%
Not galvanically separated

V DC:
0…40V DC, +/-1%
Not galvanically separated

Relay outputs:

Electrical rating:
250V AC/30V DC, 5 A
(UL/cUL Listed: 250V AC/24V 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…36V DC, max. 10 mA

Analogue outputs:

0(4)...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

Analogue load sharing lines: -5…0…+5V DC,
Impedance: 23.5 kΩ

Galv. 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 minimum)

Busbar:

Over-/undervoltage:	<50 ms
Over-/underfrequency:	<50 ms
Voltage unbalance:	<200 ms

Generator:

Reverse power:	<200 ms
Overcurrent:	<200 ms
Fast overcurrent:	<40 ms
Over-/undervoltage:	<200 ms
Over-/underfrequency:	<300 ms
Overload:	<200 ms
Current unbalance:	<200 ms
Voltage unbalance:	<200 ms
React. power import:	<200 ms
React. power export:	<200 ms
Overspeed:	<400 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 undervoltage, U_t<	< 50 ms
Undervoltage and reactive power low, U_Q<	<250 ms

Mounting: DIN rail mount or base mount with 6 screws

Safety: To EN 61010-1, installation category (overvoltage category) III, 600 V, pollution degree 2
To UL 508 and CSA 22.2 no. 14-05, overvoltage category III, 600 V, pollution degree 2

EMC/CE:

GPC-3 and GPU-3:
To EN 61000-6-2, EN 61000-6-4, IEC 60255-26

PPU-3:
To EN 61000-6-2, EN 61000-6-4, IEC 60255-26,
IEC 60533 Power distribution zone,
IACS UR E10 Power distribution zone

Vibration:

3…13.2 Hz: 2 mm_{pp}
13.2…100 Hz: 0.7 g
To IEC 60068-2-6 & IACS UR E10

10…60 Hz: 0.15 mm_{pp}
60…150 Hz: 1 g
To IEC 60255-21-1 Response (class 2)

10…150 Hz: 2 g
To IEC 60255-21-1 Endurance (class 2)

Shock (base mount):

10 g, 11 msec, half sine
To IEC 60255-21-2 Response (class 2)

30 g, 11 msec, half sine
To IEC 60255-21-2 Endurance (class 2)

50 g, 11 msec, half sine
To IEC 60068-2-27

Bump:

20 g, 16 msec, half sine
To IEC 60255-21-2 (class 2)

Material:

All plastic materials are self-extinguishing according to UL94 (V1)

Plug connections:

AC current:
0.2-4.0 mm^2 stranded wire
(UL/cUL Listed: AWG 18)

AC voltage:
0.2-2.5 mm^2 stranded wire
(UL/cUL Listed: AWG 20)

Relays:
(UL/cUL Listed: AWG 22)

Terminals 98-116:
0.2-1.5 mm^2 stranded wire
(UL/cUL Listed: AWG 24)

Other:
0.2-2.5 mm^2 stranded wire
(UL/cUL Listed: AWG 24)

Display:
9-pole Sub-D female

Service port:
USB A-B

Protection:

Unit: IP20
Display: IP52 (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:

Marine approved by all major classification societies
UL/cUL Listed to UL508
UL/cUL Recognized to UL2200

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:

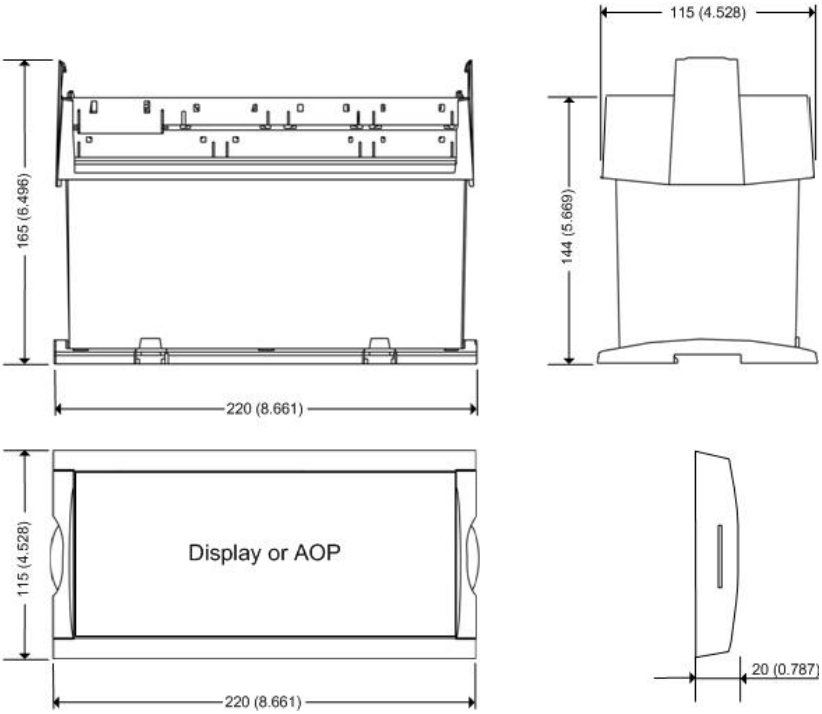
Tightening torque:	0.5 Nm (4.4 lb-in)
Wire size:	AWG 22-14

Weight:

Base unit:	1.6 kg (3.5 lbs.)
Option J1/J3/J6:	0.2 kg (0.4 lbs.)
Option J2:	0.4 kg (0.9 lbs.)
Display:	0.4 kg (0.9 lbs.)

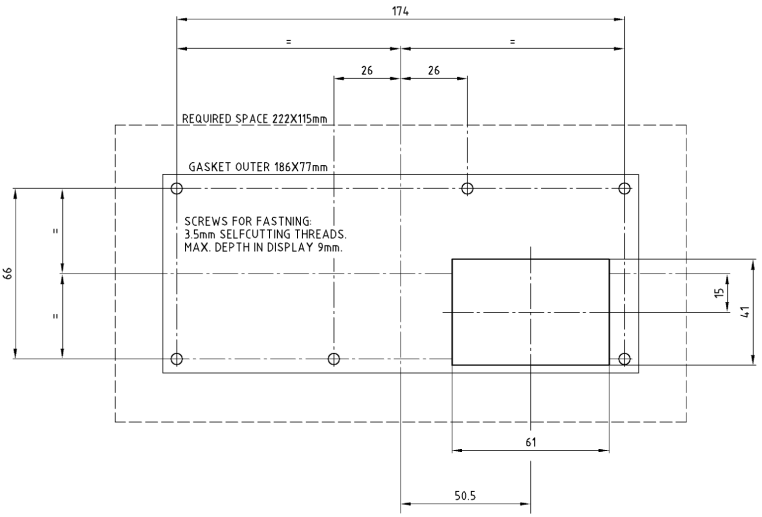
Dimensions

Unit

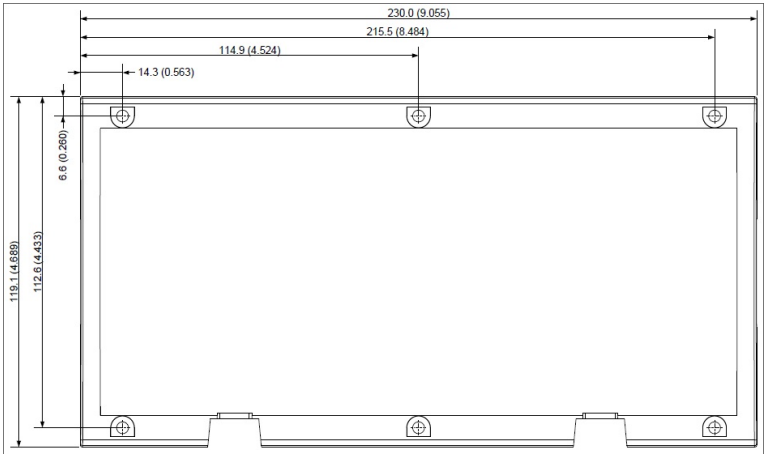


Dimensions are given in mm (inches).

Panel cutout



Drilling template



Dimensions are given in mm (inches).

DEIF A/S reserves the right to change any of the above.