Installation instructions
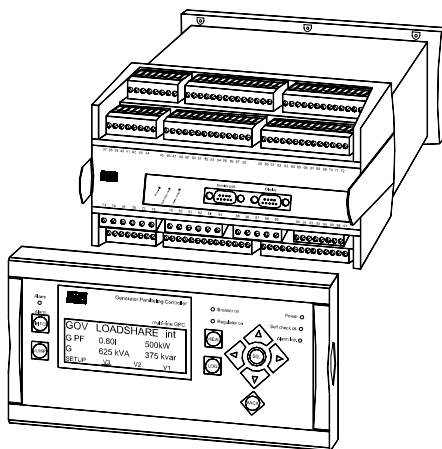
DEIF

-power in control

Multi-line 2/version 2-GS
4189340290K (UK)
SW version 2.4X.X

- *General product information*

- *Mounting*

- *Hardware*

- *Wirings*

- *Technical information*

DEIF A/S

CE

Table of contents

This manual is valid for standard Multi-line 2 units with firmware version 2.40.0 or later.

1. About this document

General purpose

This document is the Installation Instructions for DEIF's Multi-line 2 controllers, GPU, GPC and PPU. The document mainly includes general product information, mounting instructions, terminal strip overviews, 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 unit.

> ⚠️ **Please make sure that you read this manual before starting to work with the Multi-line 2 controller and the gen-set to be controlled. Failure to do this could result in damage to 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 Multi-line 2, 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.

Notes

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

Note symbol

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

Warning symbol

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

Use shielded twisted cable

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.

Safety issues

Installing the unit implies work with dangerous currents and voltages. Therefore, the installation of the Multi-line 2 should only be carried out by authorised personnel who understand the risks involved in the 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. General product information

Introduction

The GPU, GPC and PPU are 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 Multi-line 2 is to offer a cost-effective solution to gen-set builders, who need a flexible generator protection and control unit for medium to large gen-set applications. Being part of the Multi-line product family, the standard functions can be supplemented with a variety of optional functions.

Type of product

The Multi-line 2 is a micro-processor-based control unit containing all necessary functions for protection and control of a gen-set.

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

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. The options cover e.g. various protections for generator, busbar and mains, voltage/VAr/PF control, various outputs, power management, serial communication, additional operator display, etc.

Standard functions, GPC/PPU

In the following paragraphs, the standard functions of the GPC/PPU are listed.

Applications
- Stand-alone
- Parallel with other gen-sets
- Parallel with the mains

Control functions
- Synchronising
- Power and frequency controls

Operation modes
- Fixed frequency
- Fixed power (base load)
- Droop
- Load sharing

Protections (ANSI)
- Reverse power (32)
- Overcurrent, 2 levels (51)
- Overcurrent, 1 level (51)

Display
- Separate mounting
- Status texts
- Easy readable
- Programming

Measuring system
- 3-phase true RMS
- Galvanically isolated voltage and current inputs

GSM communication
- SMS messages at all alarms
- Dial up from PC utility software to control unit

Standard functions, GPU

In the following paragraphs, the standard functions of the GPU are listed.

Applications
- Generator protection

Protections (ANSI)
- Reverse power (32)
- Overcurrent, 2 levels (51)
- Overcurrent, 1 level (51)

Display
- Separate mounting
- Easy readable
- Password-protected setup
- Configurable views
- Alarm list
- Event log (150 events)

GSM communication
- SMS messages at all alarms
- Dial up from PC utility software to control unit

Functions
- 2 sets of alarm setpoints
- Alarm inhibit, automatic
- Horn relay
- Language selection
- kWh/kVArh outputs

Measuring system
- 3-phase true RMS
- Galvanically isolated voltage and current inputs
- -/1 or -/5A AC
- 100–25000V AC

Approvals
- Major Marine societies
- Netmanagement
- TÜV Nord
- GOST-R
- UL

4. 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 on p. 70 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 on p. 76.

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 base mounting method.

DEIF recommends using the base mounting.

Base mounting with six screws is required in marine applications.

5. Hardware

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.

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 not mentioned here can be found in the data sheet.

Table 1, GPC/PPU

Slot type	Option	Slot #1	Slot #2	Slot #3	Slot #4	Slot #5	Slot #6	Slot #7	Slot #8
Terminals		1-28	29-34	37-64	65-72	73-89	90-97	98-125	126-133
Power supply	Standard	X							
Measuring	Standard					X			
Load sharing	Standard			X					
Regulation outputs (relays)	Standard				X				
Voltage/var/PF control	D1				X				
Analogue controller outputs	E1				X				
Combination outputs	EF2/EF4				X				
PWM output (speed+droop)	EF3				X		X		
PWM output (speed)	EF5				X				
Analogue trans-ducer outputs	F1						X		
Serial communication	H1/H2/H3		X						
Engine communication	H4/H5/H6								X
Engine interface	M1							X	
Engine interface	M2							X	
I/O extension cards	M13/M14/M15								X

Table 2, GPU

Slot type	Option	Slot #1	Slot #2	Slot #3	Slot #4	Slot #5	Slot #6	Slot #7	Slot #8
Terminals		1-28	29-34	37-64	65-72	73-89	90-97	98-125	126-133
Power supply	Standard	X							
Measuring	Standard					X			
Synchronising w/relay outputs	G2			X	X				
Voltage matching	G2+D2			X	X				
Analogue trans-ducer outputs	F1						X		
Analogue trans-ducer outputs	F2				X		X		
Serial communication	H1/H2/H3		X						
Engine communication	H4/H5/H6								X
Engine interface	M1							X	
Engine interface	M2							X	
I/O extension cards	M13/M14/M15								X

Unit top side overview

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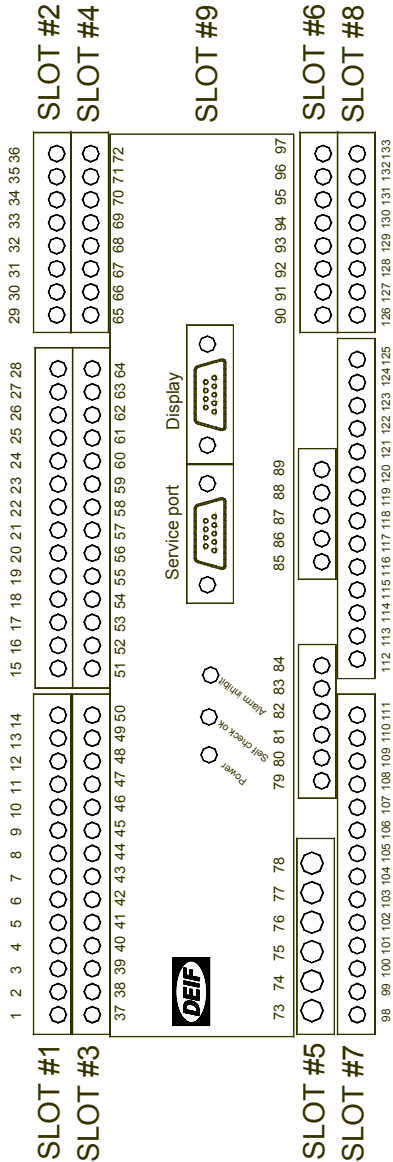
Terminal strip overview

The terminal strip overview of the standard GPC/PPU with option D1 is shown on the next two pages.

> **The terminal strip overview shows I/Os for selectable standard and optional hardware.**
>
> **Please refer to the data sheet for accurate information about possible configurations of the Multi-line 2.**
>
> **Please refer to the input/output lists in this installation instructions for detailed information about the I/Os of the specific options and Multi-line 2 type.**

The terminal strip overview of the standard GPU is shown on page 18.

Slots #1, #2, #5 and #6

This is the terminal strip overview for the GPC, **generator paralleling controller**.

	36	Reserved for options. *See datasheet*	Reserved for options. *See datasheet*	97	
	35			96	
	34			95	
	33			94	
	32			93	
	31			92	
	30			91	
	29	Slot #2	Slot #6	90	
Common for 23-27	28	Slot #1	Slot #5		
Block df/dt + vector jump Configurable	27				
External communication Configurable	26				
Start sync./control Configurable	25				
Alarm acknowledge Configurable	24				
Alarm inhibit Configurable	23				
Common for 20/21	22				
kVArh pulse	21				
kWh pulse	20				
Close breaker (sync.)	19	Sync relay			
	18				
	17			89	L3
Configurable	16	Relay 4		88	Neutral
(Open breaker)	15		BUSBAR VOLTAGE	87	L2
	14			86	
Configurable	13	Relay 3		85	L1
	12			84	Neutral
	11			83	L3
Configurable	10	Relay 2	GENERATOR VOLTAGE	82	L2
	9			81	L2
	8			80	
Configurable	7	Relay 1		79	L1
	6			78	S2 (l) L3 AC current
	5			77	S1 (k) L3 AC current
Status relay	4	Status relay		76	S2 (l) L2 AC current
	3			75	S1 (k) L2 AC current
DC power supply (÷)	2			74	S2 (l) L1 AC current
(+)	1			73	S1 (k) L1 AC current

Slots #3, #4, #7 and #8

This is the terminal strip overview for the GPC, **generator paralleling controller**.

AVR DOWN	72			133	
	71			132	
AVR control (Option D1)	70			131	
AVR UP	69		Reserved for options. *See datasheet*	130	
GOV DOWN	68			129	
	67			128	
GOV control	66			127	
GOV UP	65	Slot #4 / Slot #8		126	
Configurable	64	Slot #3 / Slot #7		125	
	63	Relay 8		124	
Configurable	62	Relay 7		123	
	61			122	
Configurable	60	Relay 6		121	
	59			120	
Configurable	58	Relay 5		119	
	57			118	
Common for 43-55	56			117	
CB closed	55			116	
CB open	54			115	
Mode 6 / Configurable	53			114	
Mode 5 / Configurable	52			113	
Mode 4 / Configurable	51			112	
Mode 3 / Configurable	50			111	
Mode 2 / Configurable	49			110	
Mode 1 / Configurable	48		Reserved for options. *See datasheet*	109	
Manual AVR down Configurable	47			108	
Manual AVR up Configurable	46			107	
Manual GOV down Configurable	45			106	
Manual GOV up Configurable	44			105	
Deload Configurable	43			104	
Ext. PF / var / V set point	42			103	
Common	41			102	
Ext. kW / Hz set point	40			101	
Reactive (Q) load sharing	39			100	
Common	38			99	
Active (P) load sharing	37			98	

Slots #1, #2, #5 and #6

This is the terminal strip overview for the standard GPU, **generator protection unit.**

	36			97	
	35			96	
	34			95	
	33	Reserved for options. *See datasheet*	Reserved for options. *See datasheet*	94	
	32			93	
	31			92	
	30			91	
	29	Slot #2	Slot #6	90	
Common for 23-27	28	Slot #1	Slot #5		
Block df/dt + vector jump Configurable	27				
External comm. (G2) Configurable	26				
Start sync./control (G2) Configurable	25				
Alarm acknowledge Configurable	24				
Alarm inhibit Configurable	23				
Common for 20/21	22				
kVArh pulse	21				
kWh pulse	20				
Close breaker (sync.) (option G2)	19	Sync relay			
	18				
	17			89	L3
Configurable (Open breaker)	16	Relay 4		88	Neutral
	15			87	L2 BUSBAR VOLTAGE
	14			86	
Configurable	13	Relay 3		85	L1
	12			84	Neutral
	11			83	L3
Configurable	10	Relay 2		82	GENERATOR VOLTAGE
	9			81	L2
	8			80	
Configurable	7	Relay 1		79	L1
	6			78	S2 (l) L3 AC current
	5			77	S1 (k) L3 AC current
Status relay	4	Status relay		76	S2 (l) L2 AC current
	3			75	S1 (k) L2 AC current
DC power supply (+)	2			74	S2 (l) L1 AC current
(+)	1			73	S1 (k) L1 AC current

Input/outputs lists, GPC and PPU

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

NO means Normally Open
NC means Normally Closed
Com. means Common terminal

Slot #1, power supply PCB

Term.	Function	Technical data	Description
1	+12/24V DC	12/24V DC -25/+30%	Power supply
2	0V DC		
3	NC	Status relay 24V/1A	Normally closed relay, processor/power supply status supervision
4	Com.		
5	NO	Relay 1 250V AC/8A	Configurable
6	Com.		
7	NC		
8	NO	Relay 2 250V AC/8A	Configurable
9	Com.		
10	NC		
11	NO	Relay 3 250V AC/8A	Configurable
12	Com.		
13	NC		
14	NO	Relay 4 250V AC/8A	Open breaker (deload) Can be configured for tripping also
15	Com.		
16	NC		
17	NO	Relay sync. 250V AC/8A	Close breaker (synchronising)
18	Com.		
19	NC		
20	Open collector 1	Transistor out	Pulse output 1, kWh counter
21	Open collector 2	Transistor out	Pulse output 2, kVArh counter
22	Com.	Common	Common for terminals 20 and 21
23	Binary input	Optocoupler	Remote alarm inhibit/ configurable

Term.	Function	Technical data	Description
24	Binary input	Optocoupler	Remote alarm acknowledge/ configurable
25	Binary input	Optocoupler	Start sync./control functions/ configurable
26	Binary input	Optocoupler	Bus communication control (H options)/configurable
27	Binary input	Optocoupler	Block vector jump and df/dt (ROCOF) (option A)/configurable
28	Com.	Common	Common for terminals 23-27

Slot #2, serial communication (option H)

CANopen (option H1)

Term.	Function	Description
29	CAN-H	The CAN is based on CANopen
30	GND	
31	CAN-L	
32	CAN-H	
33	GND	
34	CAN-L	
35	Not used	
36	Not used	

Terminals 29 and 32 are internally connected.
Terminals 31 and 34 are internally connected.
Terminals 30 and 33 are internally connected.

Modbus (option H2)

Term.	Function	Description
29	DATA + (A)	Modbus RTU, RS485
30	GND	
31	DATA - (B)	
32	Not used	
33	DATA + (A)	
34	Not used	
35	DATA - (B)	
36	Not used	

Terminals 29 and 33 are internally connected.
Terminals 31 and 35 are internally connected

Profibus (option H3)

Term.	Description	Remark
29	DATA + (B)	9-pin sub-D pin 3
30	GND	9-pin sub-D pin 5
31	DATA - (A)	9-pin sub-D pin 8
32	DATA + (B)	
33	GND	
34	DATA - (A)	
35	Not used	
36	Not used	

Terminals 29 and 32 are internally connected.
Terminals 30 and 33 are internally connected.
Terminals 31 and 34 are internally connected.

Slot #3, load sharing and input/output PCB

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	Frequency/active load setpoint. Passive (requires external power supply)
41	Com.	Common	Common for terminals 40 and 42
42	-10…0…10V DC	Analogue input	Voltage/VAr/power factor/ reactive load setpoint. Passive (requires external power supply)
43	Binary input	Optocoupler	Deload and open breaker/ configurable
44	Binary input	Optocoupler	Manual raise speed/ configurable
45	Binary input	Optocoupler	Manual lower speed/ configurable
46	Binary input	Optocoupler	Manual raise voltage/ configurable
47	Binary input	Optocoupler	Manual lower voltage/ configurable
48	Binary input	Optocoupler	Mode 1/configurable
49	Binary input	Optocoupler	Mode 2/configurable
50	Binary input	Optocoupler	Mode 3/configurable
51	Binary input	Optocoupler	Mode 4/configurable
52	Binary input	Optocoupler	Mode 5/configurable
53	Binary input	Optocoupler	Mode 6/configurable
54	Binary input	Optocoupler	Generator breaker open
55	Binary input	Optocoupler	Generator breaker closed
56	Com.	Common	Common for terminals 43-55
57	NO	Relay 5	Configurable

Term.	Function	Technical data	Description
58	Com.	250V AC 8A	
59	NO	Relay 6	Configurable
60	Com.	250V AC 8A	
61	NO	Relay 7	Configurable
62	Com.	250V AC 8A	
63	NO	Relay 8	Configurable
64	Com.	250V AC 8A	

Slot #4, relay for outputs

Term.	Function	Technical data	Description
65	NO	Relay	Generator GOV: Increase
66	Com.	250V AC/8A	frequency
67	NO	Relay	Generator GOV: Decrease
68	Com.	250V AC/8A	frequency
69	Not used	Relay	Generator AVR: Increase
70	Com.	250V AC/8A	voltage (option D1)
71	Not used	Relay	Generator AVR: Decrease
72	Com.	250V AC/8A	voltage (option D1)

Slot #4, analogue outputs (option E1)

Term.	Function	Description
65	Not used	
66	+/-20mA out	Speed governor setpoint output
67	0	
68	Not used	
69	Not used	
70	+/-20mA out	AVR voltage setpoint output (option
71	0	D1)
72	Not used	

Slot #4, PWM output (option EF3 or EF5 and option D)

Term.	Function	Description
65	ANA +	Analogue +/-20mA for AVR
66	ANA -	
67	PWM +	PWM speed governor signal
68	PWM -	
69	Relay	Relay output for AVR. Raise voltage
70	Relay	(option D1)
71	Relay	Relay output for AVR. Lower voltage
72	Relay	(option D1)

The PWM droop output is placed in slot #6. (This is only used with option EF3 – not option EF5).

Slot #4, PWM output (option EF3 and not option D)

Term.	Function	Description
65	Not used	
66	Not used	
67	PWM +	PWM speed governor signal
68	PWM -	
69	Not used	
70	Not used	
71	Not used	
72	Not used	

The PWM droop output is placed in slot #6. (This is only used with option EF3 – not option EF5).

Slot #4, combination outputs (option EF4)

Term.	Function	Description
65	ANA +	Analogue +/-20mA for GOV
66	ANA -	
67	Not used	
68	Not used	
69	Relay	Relay output for AVR. Raise voltage (option D1)
70	Relay	
71	Relay	Relay output for AVR. Lower voltage (option D1)
72	Relay	

Term.	Function	Description
65	ANA +	Analogue +/-20mA for AVR
66	ANA -	
67	Not used	
68	Not used	
69	Relay	Relay output for GOV. Increase frequency
70	Relay	
71	Relay	Relay output for GOV. Decrease frequency
72	Relay	

Slot #4, combination outputs (option EF2), GPC/PPU

Term.	Function	Description
65	Not used	
66	+/-20mA out	Speed governor setpoint output
67	0	
68	Not used	
69	Not used	
70	0(4)-20mA out	Analogue output 3, selectable
71	0	
72	Not used	

The option EF2 can be combined with option F1 (analogue output 1 and 2) to have 3 analogue transducer outputs in total.

Slot #5, AC measuring

Term.	Function	Technical data	Description
73	I L1 s1	Generator current L1	1/5A AC input
74	I L1 s2		
75	I L2 s1	Generator current L2	1/5A AC input
76	I L2 s2		
77	I L3 s1	Generator current L3	1/5A 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	N	Neutral	Generator 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	N	Neutral	Busbar neutral
89	U L3	Bus voltage L3	Max. 690V AC phase-phase value

Slot #6, analogue transducer outputs (option F1)

Term.	Function	Description
90	Not used	
91	0	Analogue output 1, selectable
92	0(4)-20mA out	
93	Not used	
94	Not used	
95	0	Analogue output 2, selectable
96	0(4)-20mA out	
97	Not used	

Slot #6, PWM droop output (option EF3)

Term.	Function	Description
90	Not used	
91	Not used	
92	PWM +	PWM speed governor signal
93	PWM -	
94	Not used	
95	Not used	
96	Not used	
97	Not used	

The PWM speed output is placed in slot #4.

Slot #7, engine control card (option M1)

| Term.	Function	Technical data	Description/ Preconfiguration
98	Analogue input 1 +	+4…20mA in	4…20mA input,
99	Analogue input 1 -	GND	configurable
100	Analogue input 2 +	+4…20mA in	4…20mA input,
101	Analogue input 2 -	GND	configurable
102	Analogue input 3 +	+4…20mA in	4…20mA input,
103	Analogue input 3 -	GND	configurable
104	Analogue input 4 +	+4…20mA in	4…20mA input,
105	Analogue input 4 -	GND	configurable
106	Pt100 input 1 P		3-wire Pt100 input,
107	Pt100 input 1 I		configurable
108	Pt100 input 1 O		-40…+250°C According to EN 60751 and IEC 751
109	Pt100 input 2 P		3-wire Pt100 input,
110	Pt100 input 2 I		configurable
111	Pt100 input 2 O		-40…+250°C According to EN 60751 and IEC 751
112	Tacho input	0.5…70V AC	RPM/magnetic pick-up/
113	Tacho input	10…10.000Hz	overspeed
114	Binary input	Optocoupler	Configurable
115	Binary input	Optocoupler	Start enable, configurable
116	Binary input	Optocoupler	Running feedback, configurable
117	Binary input	Optocoupler	Engine failure, configurable
118	Binary input	Optocoupler	Emergency stop, configurable
119	Com.	Common	Common for terminals 114-118
120	NO	Relay	Crank
121	Com.	250V AC/8A	
122	NO	Relay 9	Stop coil/running coil
123	Com.	250V AC/8A	(selectable)
124	NO	Relay	Start prepare
125	Com.	250V AC/8A	

Slot #7, engine control card (option M2)

| Term.	Function	Technical data	Description/ Preconfiguration
98	Analogue input 1 +	+4…20mA in	4…20mA input,
99	Analogue input 1 -	GND	configurable
100	Analogue input 2 +	+4…20mA in	4…20mA input,
101	Analogue input 2 -	GND	configurable
102	Analogue input 3 +	+4…20mA in	4…20mA input,
103	Analogue input 3 -	GND	configurable
104	VDO 1		Configurable (oil pressure)
105	VDO 2		Configurable (water temperature)
106	VDO 3		Configurable (fuel tank level)
107	Common		Com., term. 104-106
108	Tacho input	0.5…70V AC	RPM/magnetic pick-
109	Tacho input	10…10.000Hz	up/overspeed
110	Binary input	Optocoupler	Configurable
111	Binary input	Optocoupler	Configurable
112	Binary input	Optocoupler	Configurable
113	Binary input	Optocoupler	Configurable
114	Binary input	Optocoupler	Configurable
115	Binary input	Optocoupler	Start enable, configurable
116	Binary input	Optocoupler	Running feedback, configurable
117	Binary input	Optocoupler	External engine failure, configurable
118	Binary input	Optocoupler	Emergency stop, configurable
119	Com.	Common	Common for terminals 110-118
120	NO	Relay	Crank
121	Com.	250V AC/8A	
122	NO	Relay 9	Stop coil/running coil
123	Com.	250V AC/8A	(selectable)
124	NO	Relay	Start prepare
125	Com.	250V AC/8A	

Slot #8, seven binary inputs (option M13)

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

Slot #8, four relay outputs (option M14)

Term.	Function	Technical data	Description
126		Relay 10	Configurable
127		250V AC/8A	
128		Relay 11	Configurable
129		250V AC/8A	
130		Relay 12	Configurable
131		250V AC/8A	
132		Relay 13	Configurable
133		250V AC/8A	

Slot #8, four analogue inputs (option M15)

Term.	Function	Technical data	Description
126	Analogue input 5 -	Common	4...20mA input, configurable
127	Analogue input 5 +	4...20mA in	
128	Analogue input 6 -	Common	4...20mA input, configurable
129	Analogue input 6 +	4...20mA in	
130	Analogue input 7 -	Common	4...20mA input, configurable
131	Analogue input 7 +	4...20mA in	
132	Analogue input 8 -	Common	4...20mA input, configurable
133	Analogue input 8 +	4...20mA in	

Slot #8, engine communication, Caterpillar® CCM (option H4)

Term.	Function	Description
126	Not used	
127	Not used	
128	RxD	RS232 receive data from other unit
129	Not used	
130	TxD	RS232 transmit data to other unit
131	Not used	
132	GND	Ground
133	Not used	

Slot #8, engine communication, MTU and J1939 (option H5)

Term.	Function	Description
133	CAN-H	CANbus card option H5,
132	Ground	Engine Interface Communication
131	CAN-L	
130	CAN-H	
129	Ground	
128	CAN-L	
127	Not used	
126	Not used	

Slot #8, engine communication, Cummins ECM (option H6)

Term.	Function	Description
133	DATA + (A)	Modbus RTU, RS485 option H6,
132	GND	Cummins Engine Interface
131	DATA - (B)	Communication
130	Not used	
129	DATA + (A)	
128	Not used	
127	DATA - (B)	
126	Not used	

Input/outputs lists, GPU

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

NO means Normally Open
NC means Normally Closed
Com. means Common terminal

Slot #1, power supply PCB

Term.	Function	Technical data	Description
1	+12/24V DC	12/24V DC	Power supply
2	0V DC	-25/+30%	
3	NC	Status relay	Normally closed relay,
4	Com.	24V/1A	processor/power supply status supervision
5	NO	Relay 1	Configurable
6	Com.	250V AC/8A	
7	NC		
8	NO	Relay 2	Configurable
9	Com.	250V AC/8A	
10	NC		
11	NO	Relay 3	Configurable
12	Com.	250V AC/8A	
13	NC		
14	NO	Relay 4	Configurable
15	Com.	250V AC/8A	
16	NC		
17			Not used
18			Not used
19			Not used
20	Open collector 1	Transistor out	Pulse output 1, kWh counter
21	Open collector 2	Transistor out	Pulse output 2, kVArh counter
22	Com.	Common	Common for terminals 20 and 21
23	Binary input	Optocoupler	Remote alarm inhibit/ configurable

Term.	Function	Technical data	Description
24	Binary input	Optocoupler	Remote alarm acknowledge/ configurable
25	Binary input	Optocoupler	Configurable
26	Binary input	Optocoupler	Configurable
27	Binary input	Optocoupler	Block vector jump and df/dt (ROCOF) (option A)/configurable
28	Com.	Common	Common for terminals 23-27

Slot #2, serial communication (option H)

CANopen (option H1)

Term.	Function	Description
29	CAN-H	The CAN is based on CANopen
30	GND	
31	CAN-L	
32	CAN-H	
33	GND	
34	CAN-L	
35	Not used	
36	Not used	

Terminals 29 and 32 are internally connected.
Terminals 31 and 34 are internally connected.
Terminals 30 and 33 are internally connected.

Modbus (option H2)

Term.	Function	Description
29	DATA + (A)	Modbus RTU, RS485
30	GND	
31	DATA - (B)	
32	Not used	
33	DATA + (A)	
34	Not used	
35	DATA - (B)	
36	Not used	

Terminals 29 and 33 are internally connected.
Terminals 31 and 35 are internally connected

Profibus (option H3)

Term.	Description	Remark
29	DATA + (B)	9-pin sub-D pin 3
30	GND	9-pin sub-D pin 5
31	DATA - (A)	9-pin sub-D pin 8
32	DATA + (B)	
33	GND	
34	DATA - (A)	
35	Not used	
36	Not used	

Terminals 29 and 32 are internally connected.
Terminals 30 and 33 are internally connected.
Terminals 31 and 34 are internally connected.

Slot #3, synchronising control and input/output PCB, GPU

(i)   **Only installed when option G2 is available in the unit.**

Term.	Function	Technical data	Description
37	Not used		
38	Not used		
39	Not used		
40	Not used		
41	Not used		
42	Not used		
43	Binary input	Optocoupler	Configurable
44	Binary input	Optocoupler	Manual raise speed/ configurable
45	Binary input	Optocoupler	Manual lower speed/ configurable
46	Binary input	Optocoupler	Manual raise voltage/ configurable
47	Binary input	Optocoupler	Manual lower voltage/ 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	Generator breaker open
55	Binary input	Optocoupler	Generator breaker closed
56	Com.	Common	Common for terminals 43-55
57	NO	Relay 5	Configurable
58	Com.	250V AC 8A	
59	NO	Relay 6	Configurable
60	Com.	250V AC 8A	
61	NO	Relay 7	Configurable
62	Com.	250V AC 8A	

Term.	Function	Technical data	Description
63	NO	Relay 8	Configurable
64	Com.	250V AC 8A	

Slot #4, relay for outputs

Term.	Function	Technical data	Description
65	NO	Relay	Generator GOV: Increase
66	Com.	250V AC/8A	frequency
67	NO	Relay	Generator GOV: Decrease
68	Com.	250V AC/8A	frequency
69	Not used	Relay	Generator AVR: Increase
70	Com.	250V AC/8A	voltage (option D1)
71	Not used	Relay	Generator AVR: Decrease
72	Com.	250V AC/8A	voltage (option D1)

Slot #4, analogue transducer outputs (option F2), GPU

Term.	Function	Description
65	Not used	
66	0(4)-20mA out	Analogue output 4, selectable
67	0	
68	Not used	
69	Not used	
70	0(4)-20mA out	Analogue output 3, selectable
71	0	
72	Not used	

Slot #5, AC measuring

Term.	Function	Technical data	Description
73	I L1 s1	Generator current L1	1/5A AC input
74	I L1 s2		
75	I L2 s1	Generator current L2	1/5A AC input
76	I L2 s2		
77	I L3 s1	Generator current L3	1/5A 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	N	Neutral	Generator 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	N	Neutral	Busbar neutral
89	U L3	Bus voltage L3	Max. 690V AC phase-phase value

Slot #6, analogue transducer outputs (option F1)

Term.	Function	Description
90	Not used	
91	0	Analogue output 1, selectable
92	0(4)-20mA out	
93	Not used	
94	Not used	
95	0	Analogue output 2, selectable
96	0(4)-20mA out	
97	Not used	

Slot #7, engine control card (option M1)

Term.	Function	Technical data	Description/ Preconfiguration
98	Analogue input 1 +	+4…20mA in	4…20mA input, configurable
99	Analogue input 1 -	GND	
100	Analogue input 2 +	+4…20mA in	4…20mA input, configurable
101	Analogue input 2 -	GND	
102	Analogue input 3 +	+4…20mA in	4…20mA input, configurable
103	Analogue input 3 -	GND	
104	Analogue input 4 +	+4…20mA in	4…20mA input, configurable
105	Analogue input 4 -	GND	
106	Pt100 input 1 P		3-wire Pt100 input, configurable -40…+250°C According to EN 60751 and IEC 751
107	Pt100 input 1 I		
108	Pt100 input 1 O		
109	Pt100 input 2 P		3-wire Pt100 input, configurable -40…+250°C According to EN 60751 and IEC 751
110	Pt100 input 2 I		
111	Pt100 input 2 O		
112	Tacho input	0.5…70V AC 10…10,000Hz	RPM/magnetic pick-up/overspeed
113	Tacho input		
114	Binary input	Optocoupler	Configurable
115	Binary input	Optocoupler	Start enable, configurable
116	Binary input	Optocoupler	Running feedback, configurable
117	Binary input	Optocoupler	Engine failure, configurable
118	Binary input	Optocoupler	Emergency stop, configurable
119	Com.	Common	Common for terminals 114-118
120	NO	Relay 250V AC/8A	Crank
121	Com.		
122	NO	Relay 9 250V AC/8A	Stop coil/running coil (selectable)
123	Com.		

Term.	Function	Technical data	Description/ Preconfiguration
124	NO	Relay 250V AC/8A	Start prepare
125	Com.		

Slot #7, engine control card (option M2)

Term.	Function	Technical data	Description/ Preconfiguration
98	Analogue input 1 +	+4…20mA in	4…20mA input, configurable
99	Analogue input 1 -	GND	
100	Analogue input 2 +	+4…20mA in	4…20mA input, configurable
101	Analogue input 2 -	GND	
102	Analogue input 3 +	+4…20mA in	4…20mA input, configurable
103	Analogue input 3 -	GND	
104	VDO 1		Configurable (oil pressure)
105	VDO 2		Configurable (water temperature)
106	VDO 3		Configurable (fuel tank level)
107	Common		Com., term. 104-106
108	Tacho input	0.5…70V AC	RPM/magnetic pick-up/overspeed
109	Tacho input	10…10,000Hz	
110	Binary input	Optocoupler	Configurable
111	Binary input	Optocoupler	Configurable
112	Binary input	Optocoupler	Configurable
113	Binary input	Optocoupler	Configurable
114	Binary input	Optocoupler	Configurable
115	Binary input	Optocoupler	Start enable, configurable
116	Binary input	Optocoupler	Running feedback, configurable
117	Binary input	Optocoupler	External engine failure, configurable
118	Binary input	Optocoupler	Emergency stop, configurable
119	Com.	Common	Common for terminals 110-118
120	NO	Relay 250V AC/8A	Crank
121	Com.		
122	NO	Relay 9 250V AC/8A	Stop coil/running coil (selectable)
123	Com.		
124	NO	Relay	Start prepare

Term.	Function	Technical data	Description/ Preconfiguration
125	Com.	250V AC/8A	

Slot #8, seven binary inputs (option M13)

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

Slot #8, four relay outputs (option M14)

Term.	Function	Technical data	Description
126	⎯ /	Relay 10	Configurable
127		250V AC/8A	
128	⎯ /	Relay 11	Configurable
129		250V AC/8A	
130	⎯ /	Relay 12	Configurable
131		250V AC/8A	
132	⎯ /	Relay 13	Configurable
133		250V AC/8A	

Slot #8, four analogue inputs (option M15)

Term.	Function	Technical data	Description
126	Analogue input 5 -	Common	4...20mA input, configurable
127	Analogue input 5 +	4...20mA in	
128	Analogue input 6 -	Common	4...20mA input, configurable
129	Analogue input 6 +	4...20mA in	
130	Analogue input 7 -	Common	4...20mA input, configurable
131	Analogue input 7 +	4...20mA in	
132	Analogue input 8 -	Common	4...20mA input, configurable
133	Analogue input 8 +	4...20mA in	

Slot #8, engine communication, Caterpillar® CCM (option H4)

Term.	Function	Description
126	Not used	
127	Not used	
128	RxD	RS232 receive data from other unit
129	Not used	
130	TxD	RS232 transmit data to other unit
131	Not used	
132	GND	Ground
133	Not used	

Slot #8, engine communication, MTU and J1939 (option H5)

Term.	Function	Description
133	CAN-H	CANbus card option H5,
132	Ground	Engine Interface Communication
131	CAN-L	
130	CAN-H	
129	Ground	
128	CAN-L	
127	Not used	
126	Not used	

Slot #8, engine communication, Cummins ECM (option H6)

Term.	Function	Description
133	DATA + (A)	Modbus RTU, RS485 option H6,
132	GND	Cummins Engine Interface Communi-
131	DATA - (B)	cation
130	Not used	
129	DATA + (A)	
128	Not used	
127	DATA - (B)	
126	Not used	

Slot #8, load dependent start and stop relay, GPU

Term.	Function	Technical data	Description
126	NO	Relay 10	Start next generator (high load)
127	Com.	250V AC, 8A	
128	NO	Relay 11	Stop next generator (low load)
129	Com.	250V AC, 8A	
130	NO	Relay 12	Relay output, configurable
131	Com.	250V AC, 8A	
132	NO	Relay 13	Relay output, configurable
133	Com.	250V AC, 8A	

6.   Wirings

AC connections

The Multi-line 2 can be wired up in three-phase, single phase or split phase configuration.

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

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, leave terminals 84 and 88 empty.

Current transformer ground

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

Fuses

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

> ⚠️ **If the function 'Sync. blackout' (menu 2040) is enabled, the use of automatic fuses with an auxiliary contact is recommended to enable deactivation of the automatic breaker closing (term. 25 = OFF) if the busbar fuses are damaged. This is to avoid a false breaker closing.**

Breaker wiring
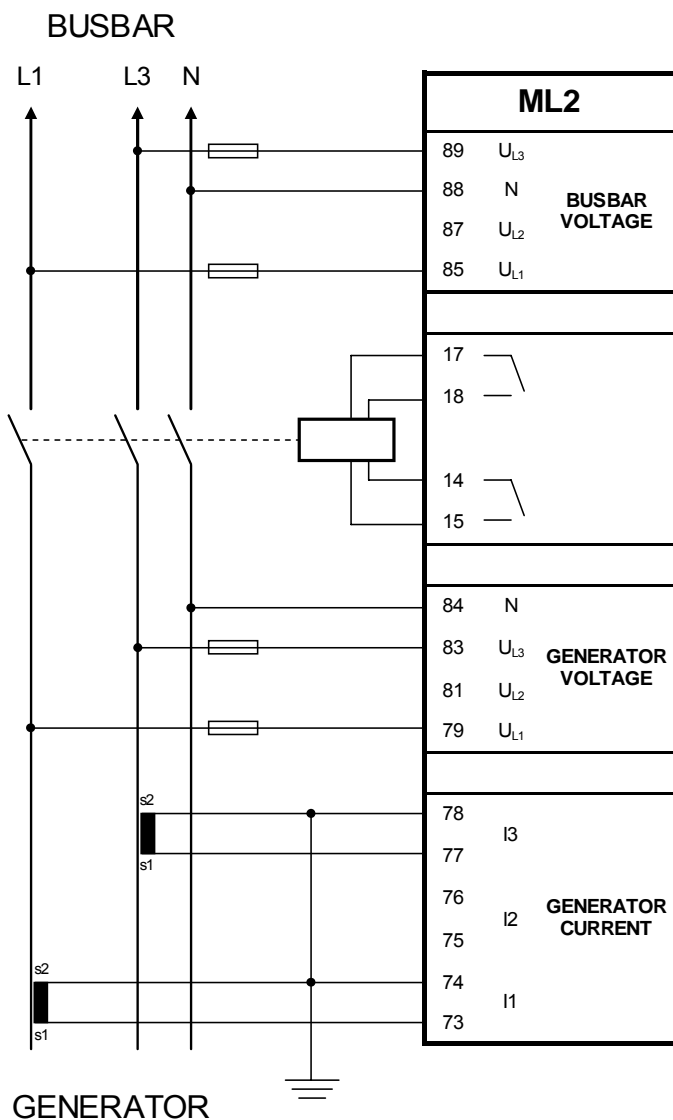
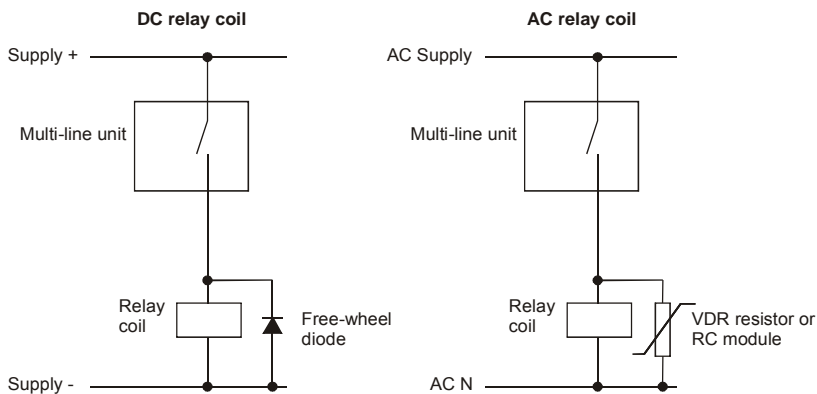The breaker off wiring is an example only.

3-phase AC connections

BUSBAR

L1 L2 L3 N

ML2	
89	U_{L3}
88	N	**BUSBAR VOLTAGE**
87	U_{L2}
85	U_{L1}
17	
18	
14	
15	
84	N
83	U_{L3}	**GENERATOR VOLTAGE**
81	U_{L2}
79	U_{L1}
78	
77	I3
76	
75	I2	**GENERATOR CURRENT**
74	
73	I1

s2 s1 (I3)
s2 s1 (I2)
s2 s1 (I1)

GENERATOR
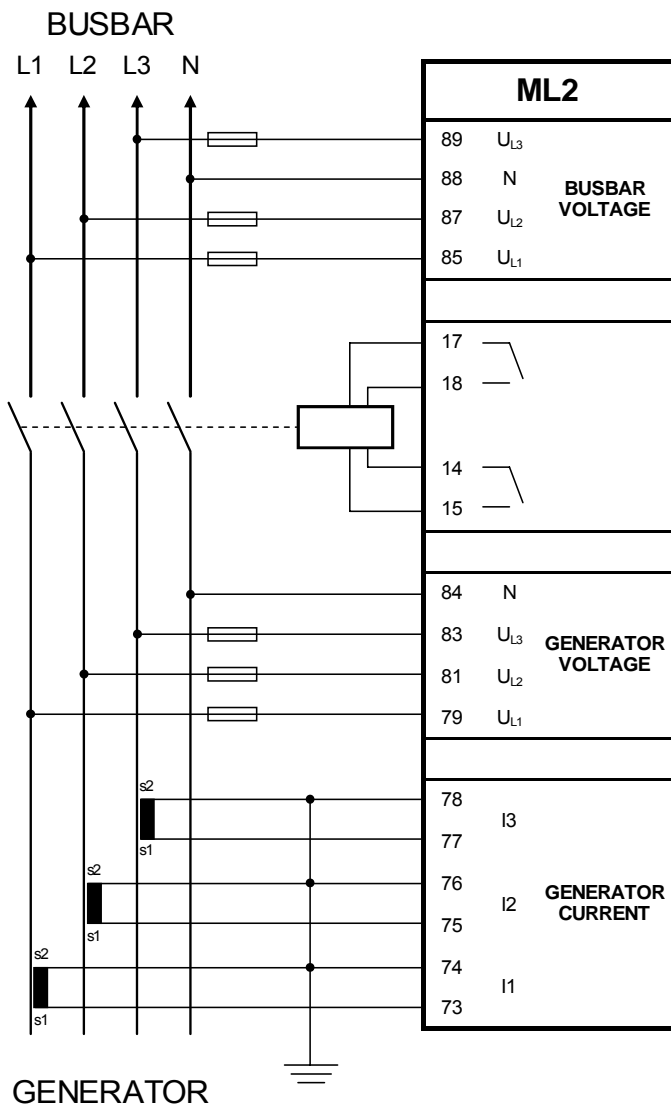
Single phase AC connections

BUSBAR

```
L1          N              ┌─────────────────────────┐
│           │              │           ML2           │
↑           ↑              ├─────────────────────────┤
│           │              │ 89                      │
│           ●──────────────┤ 88    N      BUSBAR     │
│           │              │ 87          VOLTAGE     │
●───────[fuse]─────────────┤ 85    U_L1              │
│           │              ├─────────────────────────┤
│           │              │ 17  �573                │
│           │         ┌────┤ 18   ⎯                  │
│   ╱   ╱   │  ┌──┐   │    │                         │
│  ╱   ╱ ───┼──┤  ├───┤    │ 14  ⎯73                 │
│           │  └──┘   └────┤ 15   ⎯                  │
│           │              ├─────────────────────────┤
│           ●──────────────┤ 84    N                 │
│           │              │ 83        GENERATOR      │
│           │              │ 81         VOLTAGE       │
●───────[fuse]─────────────┤ 79    U_L1              │
│           │              ├─────────────────────────┤
│           │              │ 78                      │
│           │              │ 77                      │
│           │              │ 76        GENERATOR      │
│           │              │ 75         CURRENT       │
s2 ●────────┼──────●───────┤ 74                      │
│■          │      │       │       I1                │
s1          │      │       │ 73                      │
│           │      ⏚       └─────────────────────────┘
```

GENERATOR

Split phase AC connections

BUSBAR

L1   L3   N

	ML2
89	U_{L3}
88	N
87	U_{L2}
85	U_{L1}

BUSBAR VOLTAGE

| 17 |
| 18 |
| 14 |
| 15 |

84	N
83	U_{L3}
81	U_{L2}
79	U_{L1}

GENERATOR VOLTAGE

78	
77	I3
76	
75	I2
74	
73	I1

GENERATOR CURRENT

s2

s1

s2

s1

GENERATOR
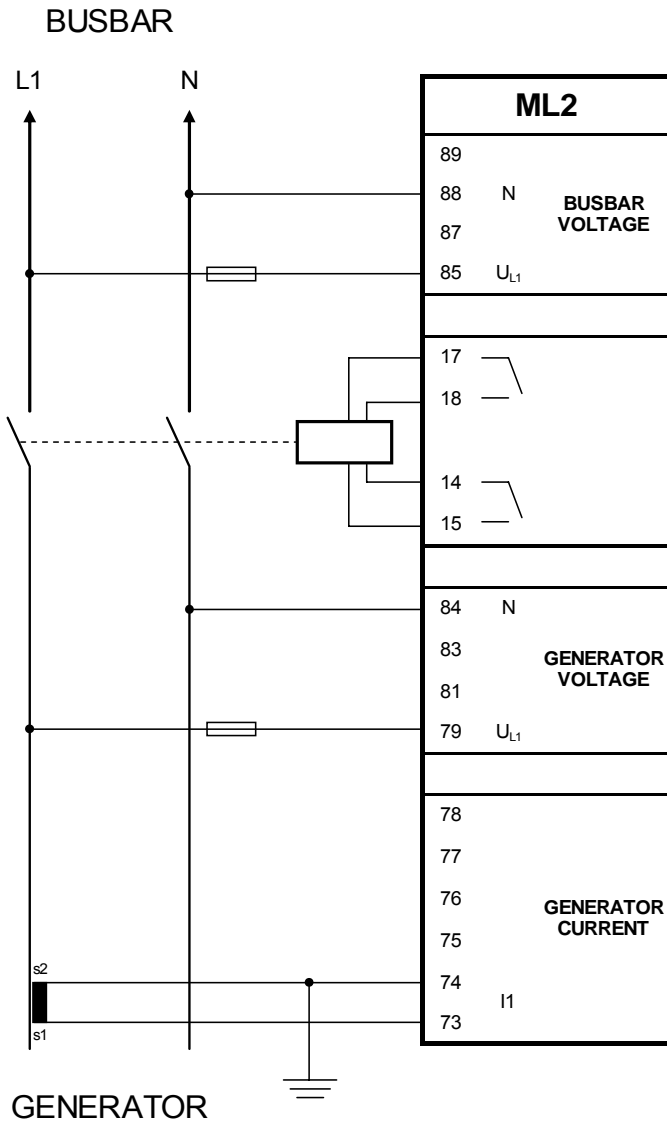
Relay outputs

Even though relay outputs are robust, noise suppression is still needed when using relays or other inductive loads:

DC relay coil   **AC relay coil**

Supply +   AC Supply

Multi-line unit   Multi-line unit

Relay coil   Free-wheel diode   Relay coil   VDR resistor or RC module

Supply -   AC N

If no noise suppression is mounted, unwanted resets may occur.

DC connections

Load sharing lines

Always use screened cable

37 PS	38 COMMON	39 QS
+/- 0...5 VDC	+/- 0...5 VDC	
	LOAD SHARING LINES	

GPC/PPU
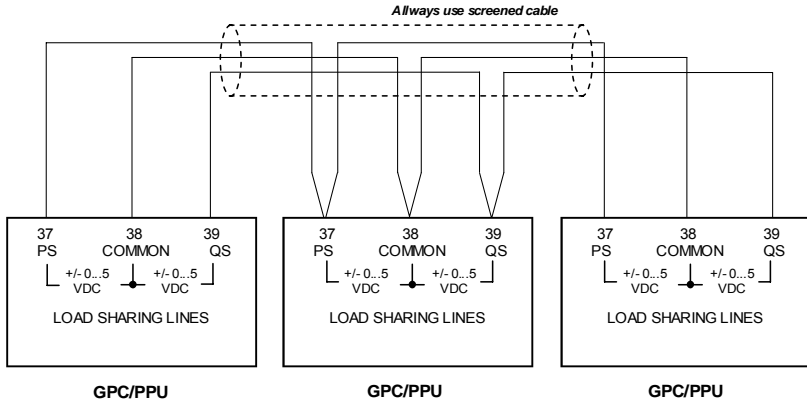
ⓘ **Always use a screened cable.**

Binary inputs

All binary inputs are 12/24V DC bi-directional optocouplers. A typical input is:

Battery positive to input
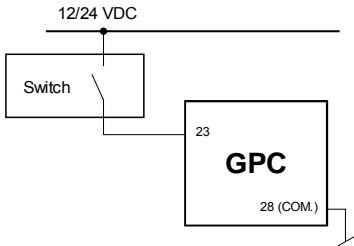
Battery negative to input

12/24 VDC

12/24 VDC

Switch

23

GPC

28 (COM.)

Switch

23

GPC

28 (COM.)
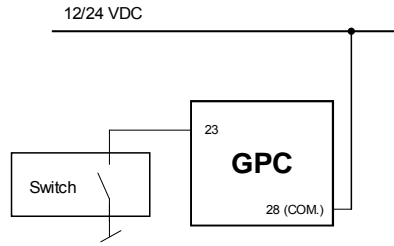
Analogue inputs (external setpoints)

The setpoint inputs are passive, i.e. an external power source is needed. This can be an active output from e.g. a PLC, or a potentiometer can be used.

0…10V DC input using potentiometer
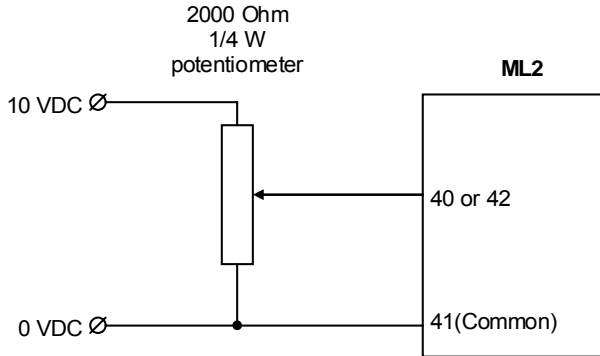
+/-10V input using potentiometer
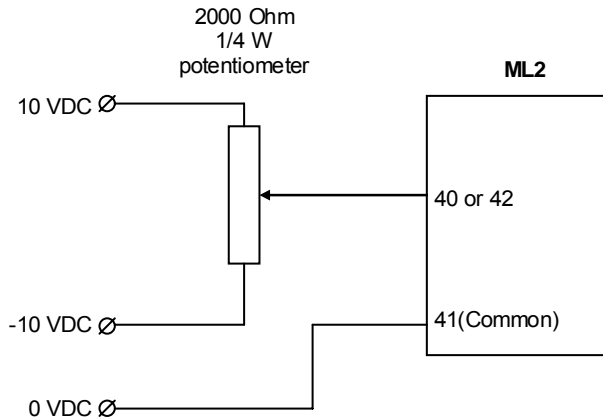
Optocoupler outputs for external counter

The kWh counter (terminals 20-22) and kVArh counter (terminals 21-22) outputs are low-power outputs (the maximum burden is 10mA). For that reason the following circuit must be applied:
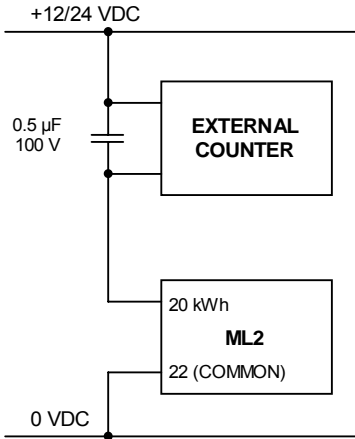
Communication

Display cable (option J1/J2)

A standard computer extension cable can be used (9-pole SUB-D male/female plugs) or a cable can be tailored:
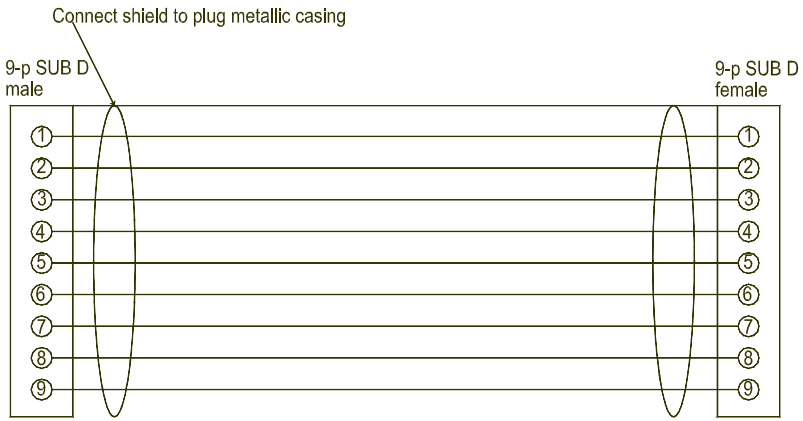
Wires min. $0.22m^2$, max. cable length 6m.
Cable types: Belden 9540, BICC H8146, Brand Rex BE57540 or equivalent.

Serial cable for PC with utility software (option J3)

A standard computer null-modem cable can be used (9-pole SUB-D female/female plugs), or a cable can be tailored:

Connect shield to plug metallic casing. If non-metalleic casing is used, leave shield un-connected.

9-p SUB D
female
multiline 2

9-p SUB D
female
PC

① ①
② ②
③ ③
④ ④
⑤ ⑤
⑥ ⑥
⑦ ⑦
⑧ ⑧
⑨ ⑨
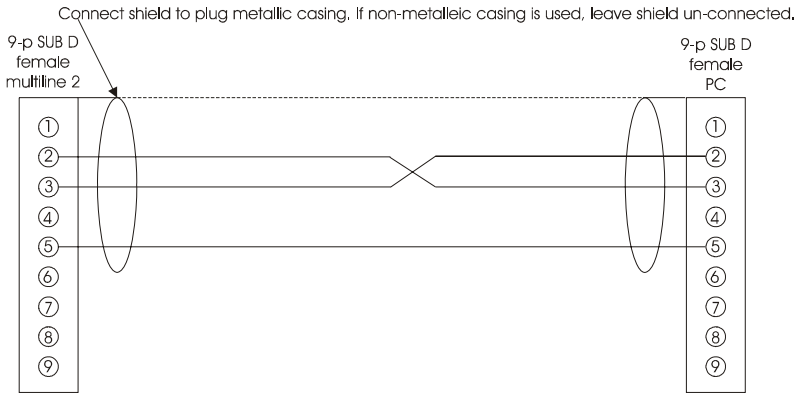
NULL-MODEM CABLE.

CANopen (option H1)
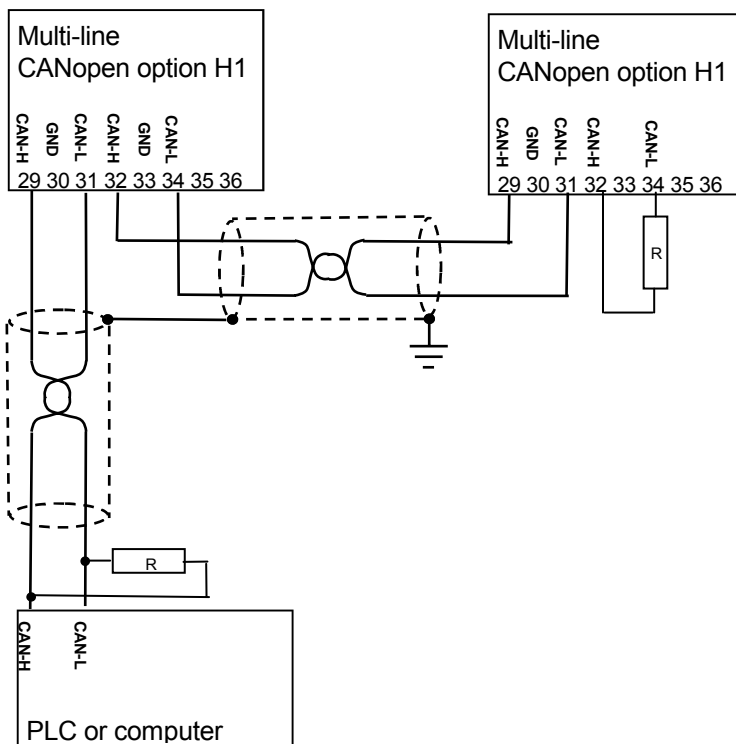
ML-2 terminals 29 and 32 are internally connected.
ML-2 terminals 31 and 34 are internally connected.

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.

Modbus (option H2)

Connection with 2-wire screened cable (recommended):
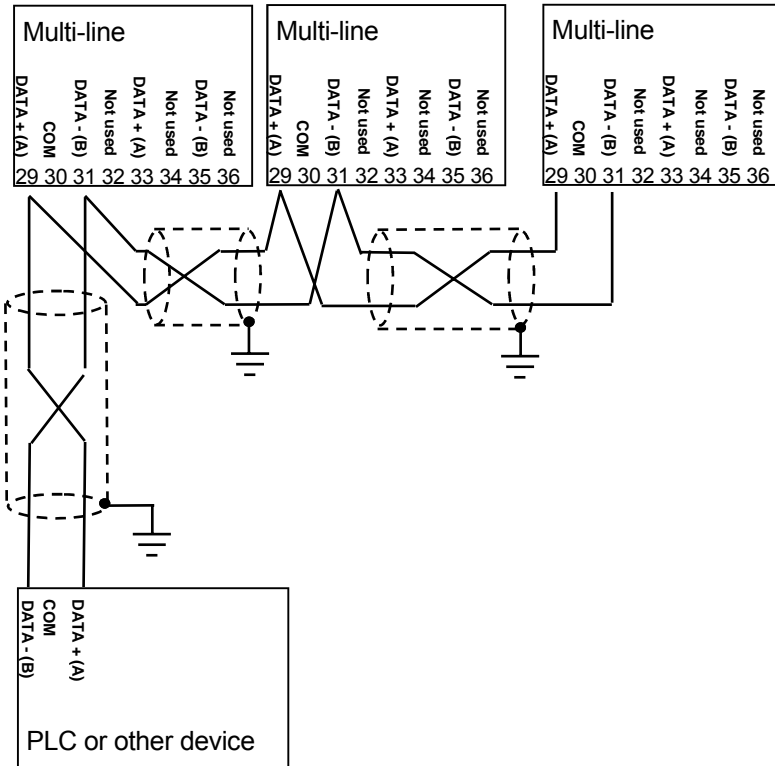
> **Connect shield to ground at one end only. Shield ends must be insulated with tape or insulation tubing.**

> **Use shielded twisted cable.**

Connection with 3-wire shielded cable:
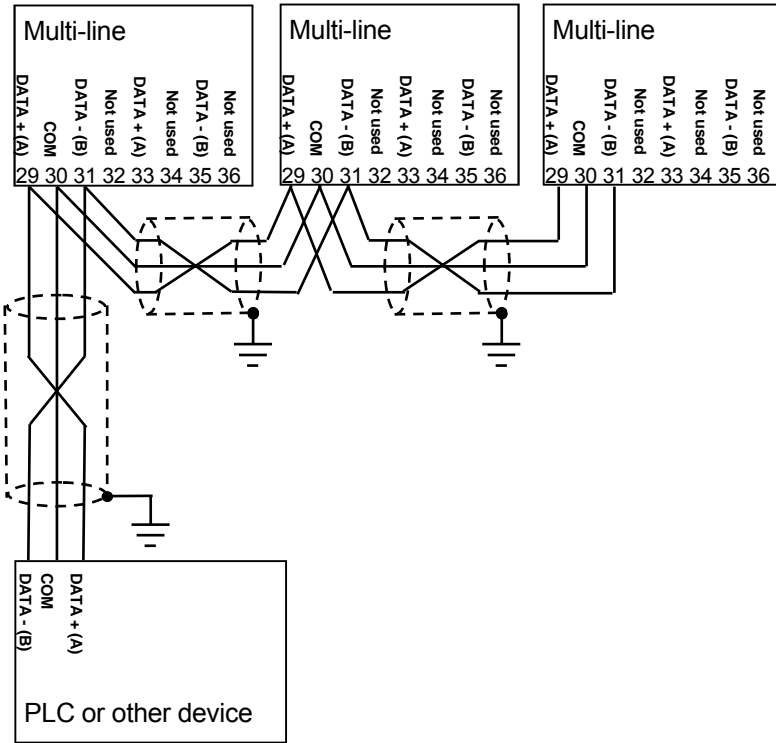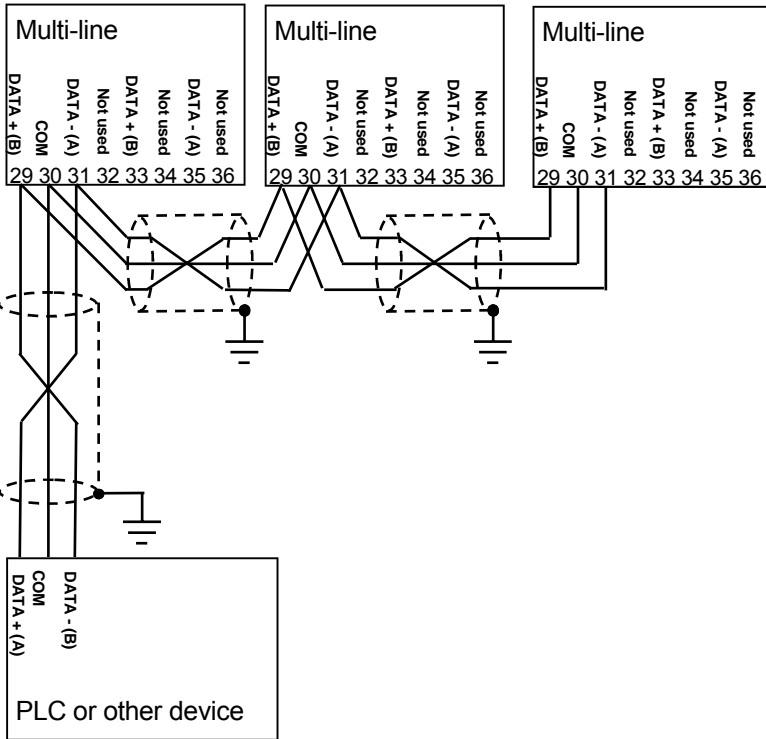

Connect shield to ground at one end only. Shield ends must be insulated with tape or insulation tubing.

Use shielded twisted cable

This solution is only feasible if the COM line is insulated. Check PLC/other device before connecting.

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

Profibus (option H3)

Connection with 2-wire screened cable (recommended):
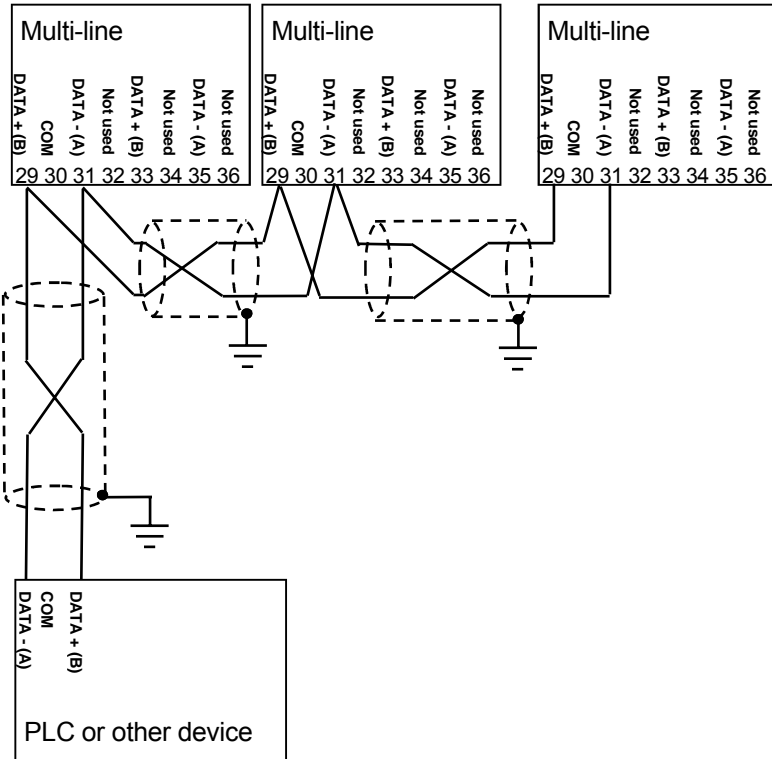
![info icon] **Connect shield to ground at one end only. Shield ends must be insulated with tape or insulation tubing.**

![info icon] **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.**
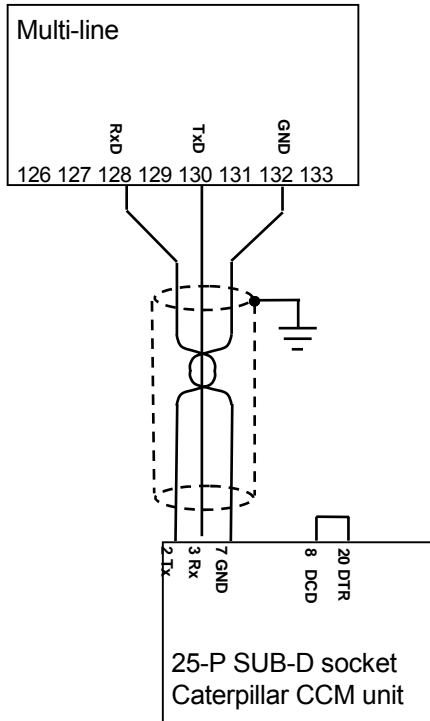
ⓘ **Use shielded twisted cable.**

⚠ **This solution is only feasible if the COM line is insulated. Check PLC/other device before connecting.**

Non-insulated COM line may result in damage to the equipment.

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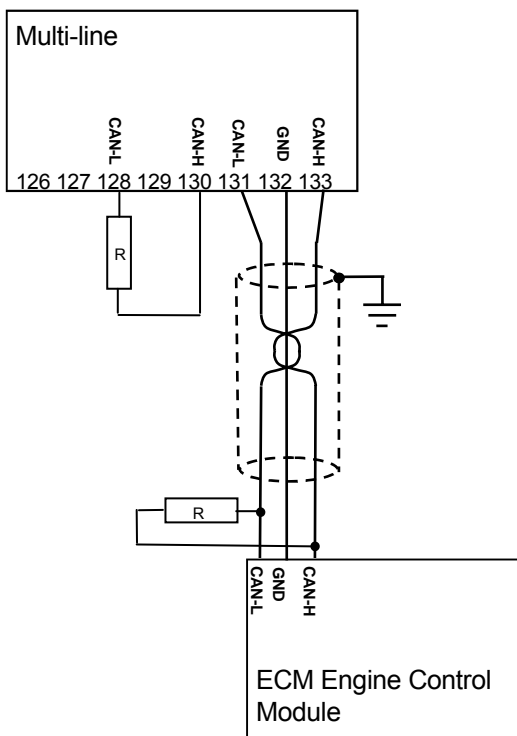

Option H4, Caterpillar CCM

Multi-line

RxD   TxD   GND
126 127 128 129 130 131 132 133

2 Tx 3 Rx 7 GND   8 DCD 20 DTR

25-P SUB-D socket
Caterpillar CCM unit

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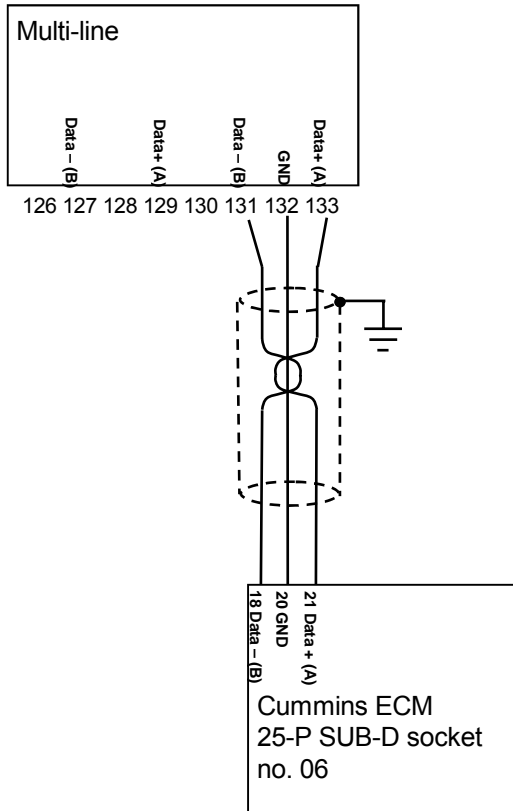
Use shielded twisted cable

Option H5, J1939 and MTU MDEC

ML-2 terminals 128 and 131 are internally connected.
ML-2 terminals 130 and 133 are internally connected.

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.

Option H6, Cummins engine communication

Multi-line

Data – (B)	Data+ (A)	Data – (B)	GND / Data+ (A)
126 127	128 129	130 131	132 133

Cummins ECM
25-P SUB-D socket
no. 06

18 Data – (B)   20 GND   21 Data + (A)

ML-2 terminals 127 and 131 are internally connected.
ML-2 terminals 129 and 133 are internally connected.

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

Use shielded twisted cable.

Normally the communication does not need bias resistors (end terminators). These are only needed in case of very long lines between the 2 modules If bias resistors are needed, the calculation should be based on the following data:

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

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

7. Technical information

Technical specifications

Accuracy: Class 1.0
                           Class 2.0 for neg. seq. current

                           To IEC/EN 60688

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

Storage temp.:   -40…70°C (-40...158°F)

Galv. separation: Between AC voltage, AC current and other I/Os:
                           3250V AC, 50Hz, 1 min.

                           Between analogue outputs and other I/Os:
                           500V DC, 1 min.

                           Between binary input groups and other I/Os:
                           500V DC, 1 min.

Meas. voltage: 100-690V AC +/-20%
                           (UL/cUL Listed: 110-480V AC phase-phase)

Consumption: Max. 0.25VA/phase

Meas. current: -/1 or -/5A AC
                           (UL/cUL Listed: From CTs 1-5A)

Consumption: Max. 0.3VA/phase

Current overload: 4 x I_n continuously
                           20 x I_n, 10 sec. (max. 75A)
                           80 x I_n, 1 sec. (max. 300A)

Meas. frequency: 30…70Hz

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

                        The aux. supply inputs are to be protected by a
                        2A slow blow fuse

                        Recommended power supply is DEIF's DCP-2

                        (UL/cUL Listed: AWG 24)

Binary inputs: Optocoupler, bi-directional
                        ON: Input voltage 8…36V DC
                        Impedance typically 4.7kΩ
                        OFF: <2V DC

Relay outputs: 250V AC/24V DC, 5A
                        (Unit status output: 1A)
                        (UL/cUL Listed: 250V AC/24V DC, 2A resistive
                        load)

Analogue inputs: -10/+10V DC
                        Not galvanically separated
                        Impedance 100kΩ

                        4-20mA
                        Impedance max. 50Ω
                        Not galvanically separated

                        Pt100
                        According to IEC/EN 60751

                        VDO
                        Resistor inputs, internal supply max. 480Ω

Mounting: DIN-rail mount or base mount with 6 screws
                        (Base mounting in marine applications)

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

Load sharing lines: -5/+5V DC, impedance 23.5kΩ

Analogue outputs: 0(4)...20mA
Galvanically separated
Active output (internal supply)
Load max. 500Ω
(UL/cUL Listed: Max. 20mA output)

Safety: To EN 61010-1, installation category (over-voltage category) III, 600V, pollution degree 2

To UL 508 and CSA 22.2 no. 14-05, overvoltage category III, 300V pollution degree 2

Protection: Unit: IP20
Display: IP52 (IP54 with gasket: Option L)
(UL/cUL Listed: Type Complete Device, Open Type)

To IEC/EN 60529

EMC/CE: To EN 61000-6-1/2/3/4
IEC 60255-26
IEC 60533 power distr. zone
IACS UR E10 power distr. zone

Vibration: 3…13.2Hz: 2mmpp
13.2…100Hz: 0.7g
To IEC 60068-2-6 & IACS UR E10

10…60Hz: 0.15mmpp
60…150Hz: 1g
To IEC 60255-21-1 Response (class2)

10…150Hz: 2g
To IEC 60255-21-1 Endurance (class2)

Shock (base mount): 10g, 11msec, half sine
To IEC 60255-21-2 Response (class2)

30g, 11msec, half sine
To IEC 60255-21-2 Endurance (class2)

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

Bump:		20g, 16msec, half sine To IEC 60255-21-2 (class2)
Material:		All plastic materials are self-extinguishing according to UL94 (V1)
Plug connections:	AC current:	4.0mm^2 multi stranded (UL/cUL Listed: AWG28-10) Tightening torque: 0.5-0.6 Nm (4.4-5.3 lb-in)
	Other:	2.5mm^2 multi stranded (UL/cUL Listed: AWG28-12) Tightening torque: 0.5-0.6 Nm (4.4-5.3 lb-in) (UL/cUL Listed: AWG20)
	Display:	9-pole Sub-D female
	PC:	9-pole Sub-D male
Governors:		Multi-line 2 interfaces to all governors, including GAC, Barber-Colman, Woodward and Cummins
		See interfacing guide at www.deif.com
Open collector outputs:		Supply 8-36V DC, max. 10mA
Weight:		Main unit: 1.6 kg (3.5 lbs.) Option J1/J3: 0.2 kg (0.4 lbs.) Option J2: 0.4 kg (0.9 lbs.)
Approval:		The GPU and PPU are approved by the major classification societies. Contact DEIF for details
		UL/cUL Listed to UL508

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)

Response times: *Busbar 1 and 2:*

Over-/undervoltage	<50ms
Over-/underfrequency	<50ms

      Generator:

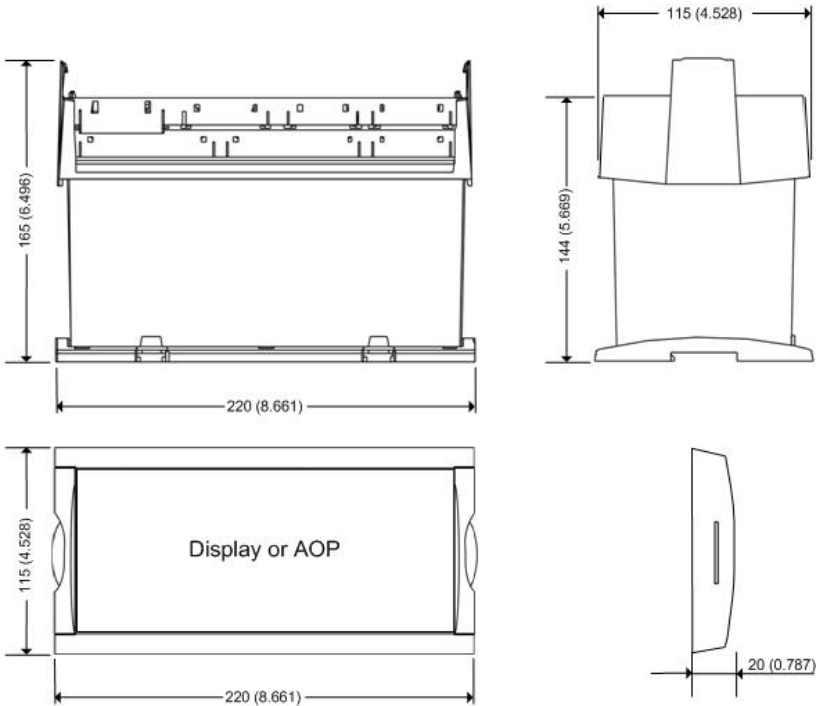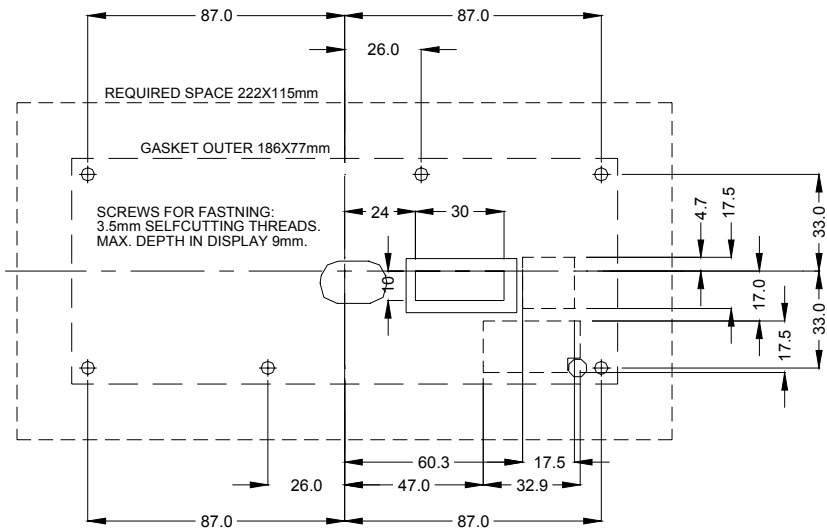|	
Over-/undervoltage	70-300ms
Over-/underfrequency	70-300ms
Current	100-300ms
Rocof	100ms (4 periods)
Vector jump	30ms
Fast overcurrent	<42ms

Unit dimensions

Dimensions are given in mm (inches).

Panel cutout (mm)

Panel cutout:

H x W = 10 (0.393") x 30 (1.181")

Display size:

H x W = 115 (4.528") x 220 (8.661")

REQUIRED SPACE 222X115mm

GASKET OUTER 186X77mm

SCREWS FOR FASTNING:
3.5mm SELFCUTTING THREADS.
MAX. DEPTH IN DISPLAY 9mm.

87.0   87.0   26.0   24   30   4.7   17.5   33.0   17.0   33.0   17.5   60.3   17.5   26.0   47.0   32.9   87.0   87.0

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