



INSTALLATION INSTRUCTIONS



ASC-4

Automatic Sustainable Controller



1. General information

| | |
|---|----------|
| 1.1 Warnings, legal information and safety | 4 |
| 1.1.1 Symbols for hazard statements..... | 4 |
| 1.1.2 Symbols for general notes..... | 4 |
| 1.1.3 Legal information and disclaimer..... | 4 |
| 1.1.4 Safety during installation and operation..... | 5 |
| 1.1.5 Electrostatic discharge awareness..... | 5 |
| 1.1.6 Factory settings..... | 5 |
| 1.2 About the installation instructions | 5 |
| 1.2.1 General purpose..... | 5 |
| 1.2.2 Intended users..... | 5 |

2. Mounting

| | |
|--|----------|
| 2.1 ASC mounting and dimensions | 6 |
| 2.1.1 Mounting of the unit..... | 6 |
| 2.1.2 Unit dimensions..... | 6 |
| 2.1.3 Panel cutout..... | 6 |
| 2.1.4 Drilling template in mm (inches)..... | 7 |
| 2.1.5 Mounting instructions..... | 8 |
| 2.1.6 Tightening torques..... | 8 |

3. Hardware

| | |
|---|-----------|
| 3.1 Board slot positions | 9 |
| 3.2 Terminal overview | 9 |
| 3.3 Terminal strip overview | 11 |
| 3.4 Input/output lists | 13 |
| 3.4.1 Slot #1, power supply PCB..... | 13 |
| 3.4.2 Slot #2, serial communication (standard)..... | 14 |
| 3.4.3 Slot #2, 7 digital inputs (option M13.2)..... | 14 |
| 3.4.4 Slot #2, relay outputs (option M14.2)..... | 14 |
| 3.4.5 Slot #3, 13 digital inputs and 4 relay outputs (standard/M12)..... | 15 |
| 3.4.6 Slot #4, 7 digital inputs (option M13.4)..... | 16 |
| 3.4.7 Slot #4, relay outputs (option M14.4)..... | 16 |
| 3.4.8 Slot #4, analogue outputs for inverter control or transducer signals (option E2)..... | 16 |
| 3.4.9 Slot #5, AC measuring..... | 17 |
| 3.4.10 Slot #6, 7 digital inputs (option M13.6)..... | 17 |
| 3.4.11 Slot #6, 4 relay outputs (option M14.6)..... | 17 |
| 3.4.12 Slot #6, 4 analogue inputs (option M15.6)..... | 18 |
| 3.4.13 Slot #6, analogue outputs for transducer (option F1)..... | 18 |
| 3.4.14 Slot #7, I/O interface card (standard/M4)..... | 18 |
| 3.4.15 Slot #8, serial communication (option H2.8)..... | 20 |
| 3.4.16 Slot #8, 7 digital inputs (option M13.8)..... | 20 |
| 3.4.17 Slot #8, 4 relay outputs (option M14.8)..... | 20 |
| 3.4.18 Slot #8, 4 analogue inputs (option M15.8)..... | 21 |

4. Wiring

| | |
|--|-----------|
| 4.1 AC connections | 22 |
| 4.1.1 Neutral line (N)..... | 22 |
| 4.1.2 Current transformer grounding..... | 22 |
| 4.1.3 Fuses..... | 22 |
| 4.1.4 3-phase wiring..... | 22 |

| | |
|--|-----------|
| 4.2 DC connections | 24 |
| 4.2.1 Digital inputs..... | 24 |
| 4.2.2 Analogue inputs (option M15.X)..... | 24 |
| 4.2.3 External set points..... | 25 |
| 4.2.4 Multi-inputs (102, 105, 108)..... | 25 |
| 4.2.5 Transistor outputs (open collector outputs)..... | 26 |
| 4.3 Communication | 27 |
| 4.3.1 CAN bus..... | 27 |
| 4.3.2 Modbus (option H2)..... | 28 |
| 4.3.3 Display cable (option J)..... | 29 |

1. General information

1.1 Warnings, legal information and safety

1.1.1 Symbols for hazard statements



DANGER!



This highlights dangerous situations.

If the guidelines are not followed, these situations will result in death, serious personal injury, and equipment damage or destruction.



WARNING



This highlights potentially dangerous situations.

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



CAUTION



This highlights low level risk situation.

If the guidelines are not followed, these situations could result in minor or moderate injury.

NOTICE

This highlights an important notice

Make sure to read this information.

1.1.2 Symbols for general notes

NOTE This highlights general information.



More information

This highlights where you can find more information.



Example

This shows an example.



How to ...

This gives a link to a video for help and guidance.

1.1.3 Legal information and disclaimer

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

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

Disclaimer

DEIF A/S reserves the right to change any of the contents of this document without prior notice.

The English version of this document always contains the most recent and up-to-date information about the product. DEIF does not take responsibility for the accuracy of translations, and translations might not be updated at the same time as the English document. If there is a discrepancy, the English version prevails.

1.1.4 Safety during installation and operation

When you install and operate the equipment, you may have to work with dangerous currents and voltages. The installation must only be carried out by authorised personnel who understand the risks involved in working with electrical equipment.



DANGER!



Hazardous live currents and voltages

Do not touch any terminals, especially the AC measurement inputs and the relay terminals, as this could lead to injury or death.

1.1.5 Electrostatic discharge awareness

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

1.1.6 Factory settings

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

1.2 About the installation instructions

1.2.1 General purpose

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

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

NOTICE

Incorrect wiring

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

1.2.2 Intended users

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

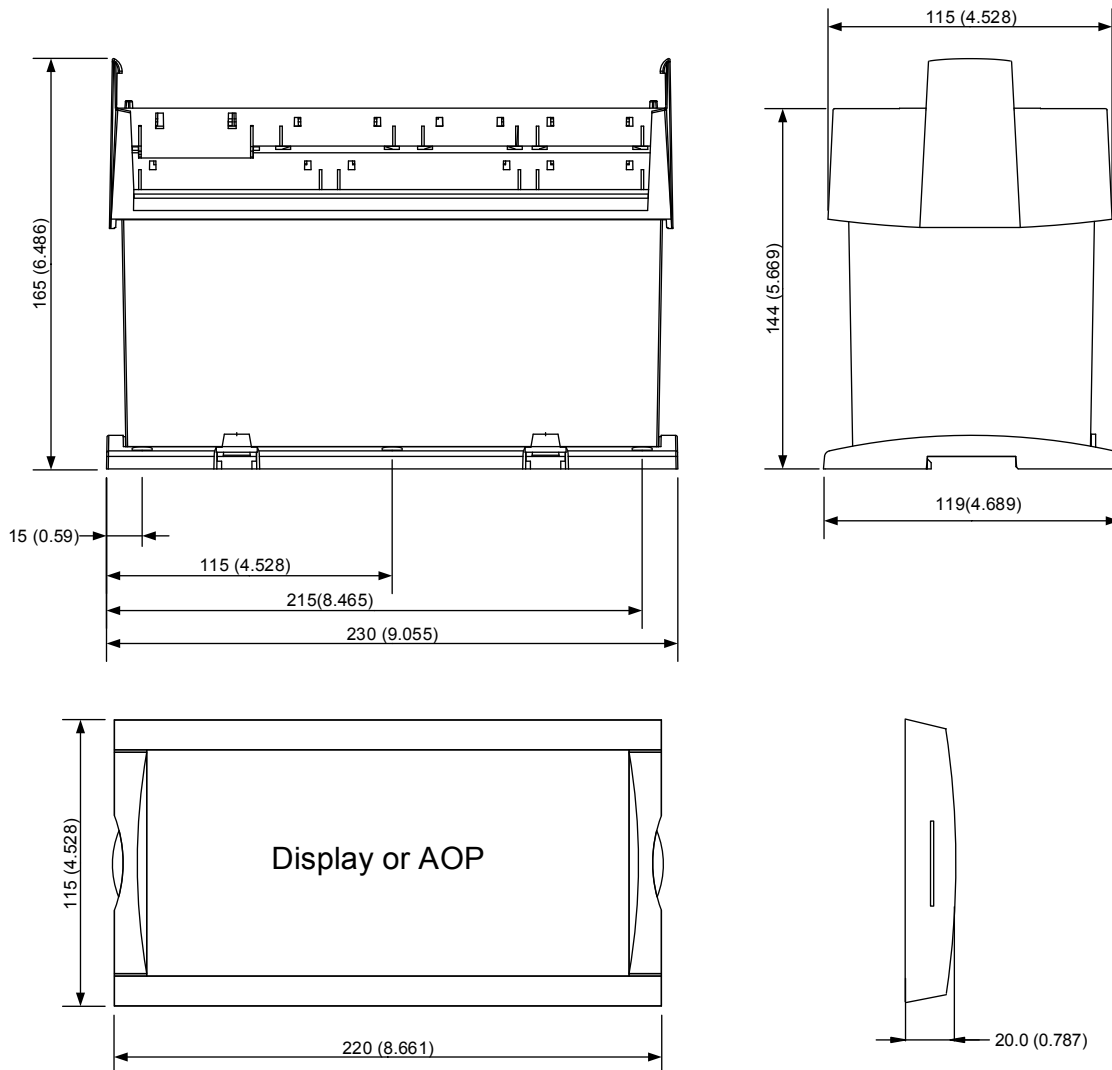
2. Mounting

2.1 ASC mounting and dimensions

2.1.1 Mounting of the equipment

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

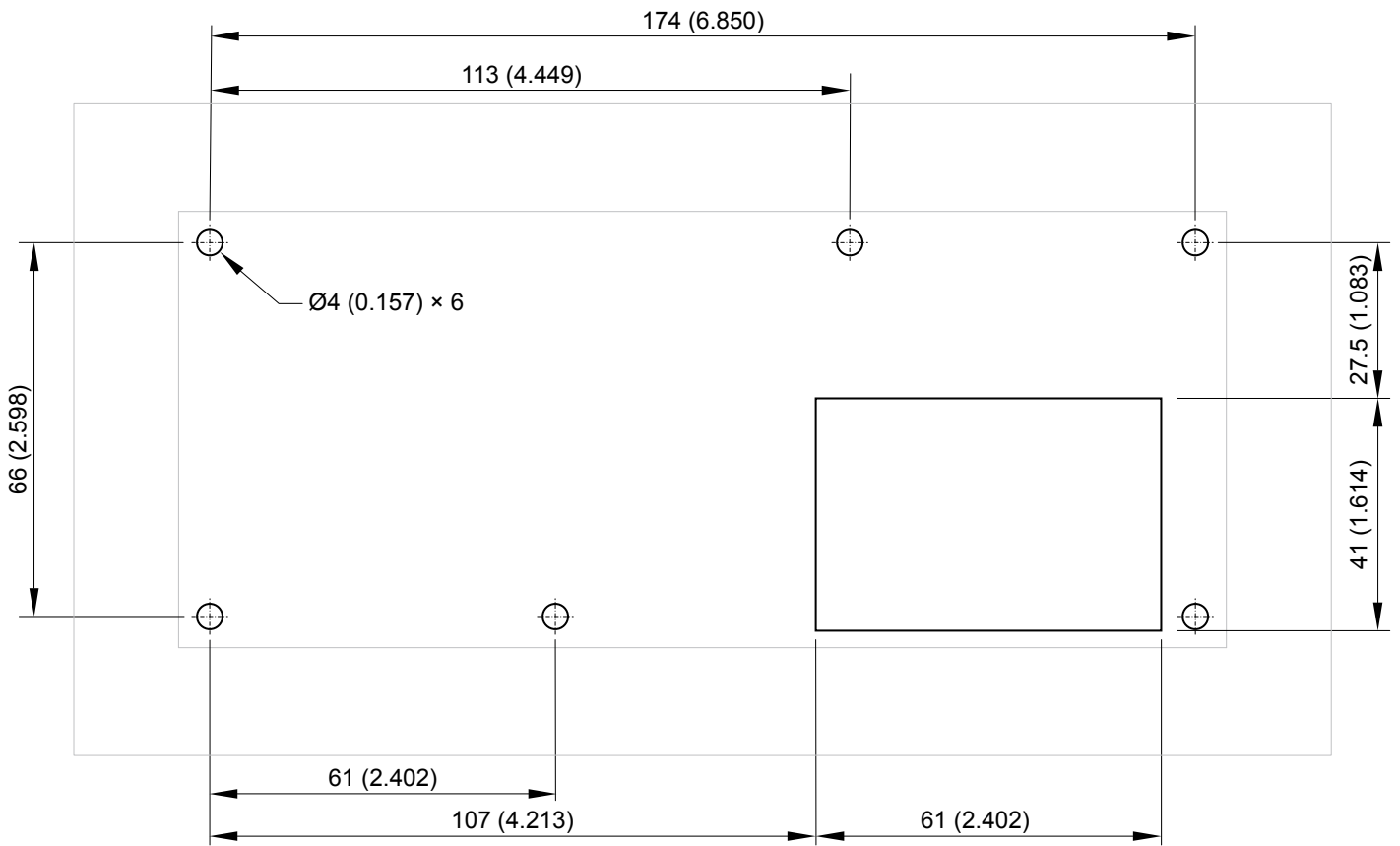
2.1.2 Dimensions



NOTE Dimensions are given in mm (inches).

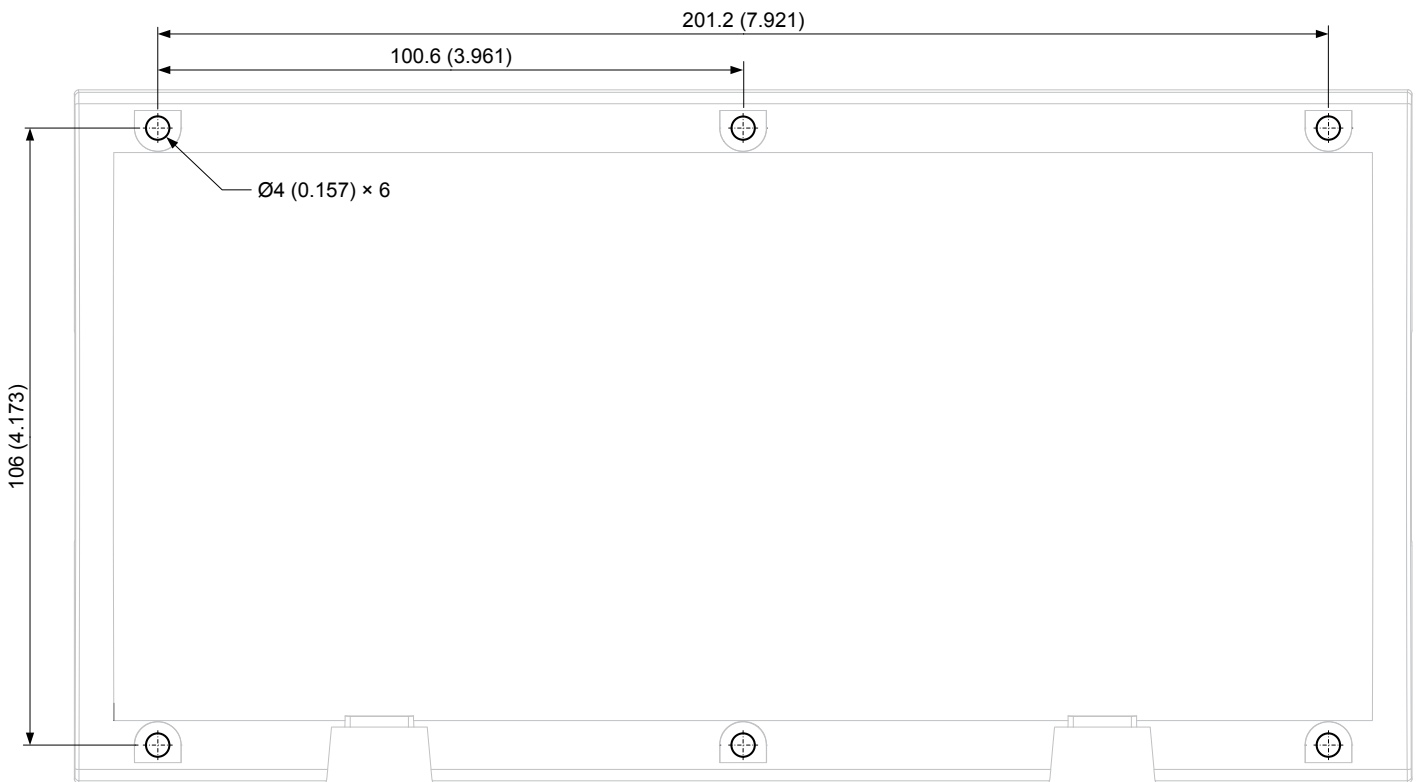
2.1.3 DU-2/AOP display panel cutout

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



NOTE Dimensions are in mm (inches).

2.1.4 Controller mounting drilling diagram



INFO
Measurements are in mm (inches).

2.1.5 Controller mounting

The controller can be mounted:

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

NOTE DEIF recommends using the screw hole fastening.

2.1.6 Tightening torques

Controller: 1.5 Nm for the six M4 screws (countersunk screws are not to be used)

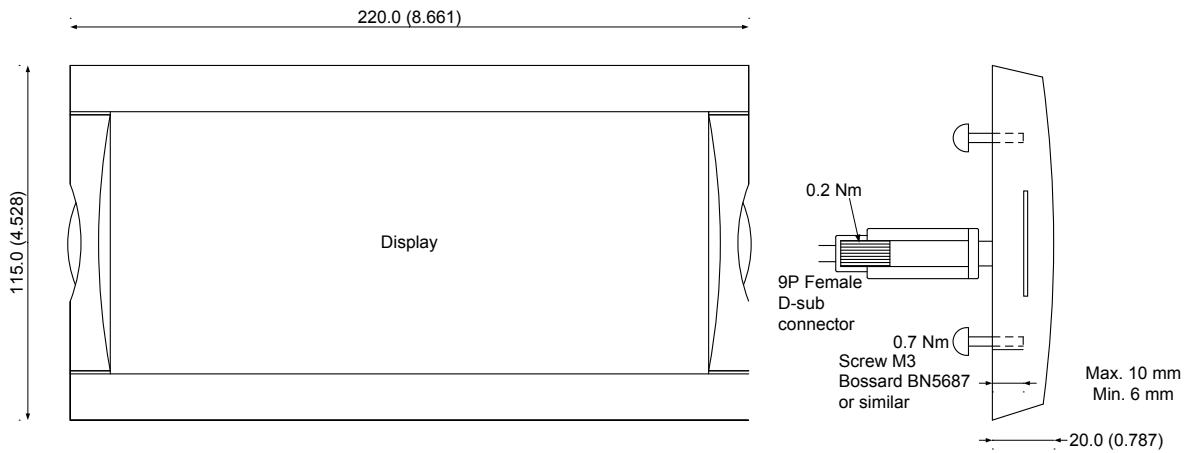
Plug connections (terminals): 0.5 Nm, 4.4 lb-in

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

Panel door mounting: 0.7 Nm, 6.2 lb-in

D-sub screw: 0.2 Nm, 1.8 lb-in

DC-DC converter terminals: 0.5 Nm, 4.4 lb-in



3. Hardware

3.1 Board slot positions

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

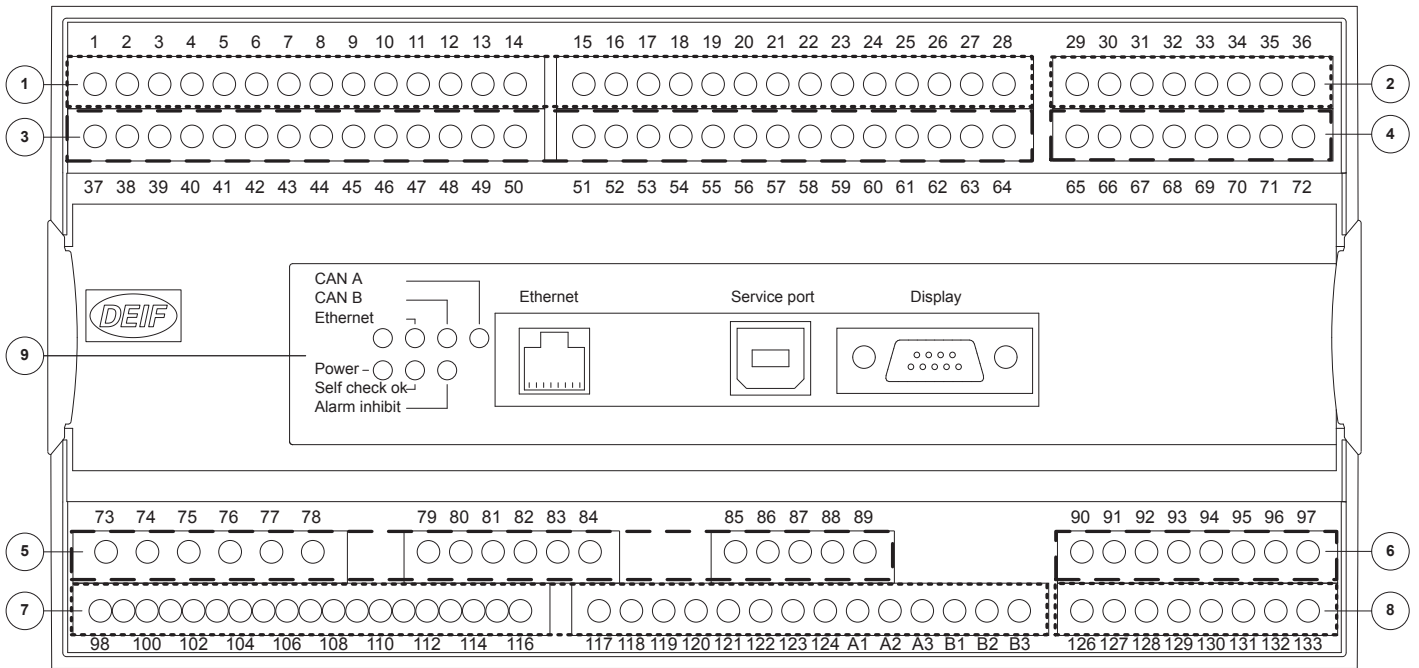
| Slot type | Option | Slot #1 | Slot #3 | Slot #5 | Slot #7 |
|------------------|--------------------------------|---------|----------|----------|-----------|
| Terminals | | 1 to 28 | 37 to 64 | 73 to 89 | 98 to 125 |
| Power supply | Standard | X | | | |
| AC measurements | Standard | | | X | |
| Interface | ASC PM: Standard ASC-4: M4 | | | | X |
| Power management | Standard | | | | X |
| I/O extension | ASC PM: Standard ASC-4: M12 | | X | | |

| Slot type | Option | Slot #2 | Slot #4 | Slot #6 | Slot #8 |
|-----------------------------|-----------------------|----------|----------|----------|------------|
| Terminals | | 29 to 34 | 65 to 72 | 90 to 97 | 126 to 133 |
| Analogue controller outputs | E2 | | X | | |
| Analogue transducer outputs | F1 | | | X | |
| Relay outputs | M14.4 | | X | | |
| Serial communication | H2.2 (standard) | X | | | |
| Serial communication | H2.8 | | | | X |
| I/O extension cards | M13.2/M14.2 | X | | | |
| I/O extension cards | M13.6/M14.6/ M15.6 | | | X | |
| I/O extension cards | M13.8/M14.8/ M15.8 | | | | X |

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

3.2 Terminal overview

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



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

| No. | Slot |
|-----|--|
| 1 | #1, terminal 1-28, power supply (standard) |
| 2 | #2, terminal 29-36, communication (standard) |
| 3 | #3, terminal 37-64, inputs/outputs (standard/M12) |
| 4 | #4, terminal 65-72, inputs/outputs |
| 5 | #5, terminal 73-89, AC measuring (standard) |
| 6 | #6, terminal 90-97, inputs/outputs |
| 7 | #7, terminal 98-125, inputs/outputs and PM CAN (standard/M4) |
| 8 | #8, terminal 126-133, communication and I/O extensions |
| 9 | LED I/F |

3.3 Terminal strip overview

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

| | | | | | | | |
|--|----|----------|---------|--|-----|--|-----------------------------------|
| Reserved for options, see <i>Data sheet</i> . | 72 | | | | 133 | Reserved for options, see <i>Data sheet</i> . | |
| | 71 | | | | 132 | | |
| | 70 | | | | 131 | | |
| | 69 | | | | 130 | | |
| | 68 | | | | 129 | | |
| | 67 | | | | 128 | | |
| | 66 | | | | 127 | | |
| | 65 | | | | 126 | | |
| | | Slot #4 | Slot #8 | | | | |
| | | Slot #3 | Slot #7 | | | | |
| Configurable | 64 | | | | B3 | CAN L | CAN bus Interface1B |
| | 63 | Relay 63 | | | B2 | GND | |
| Configurable | 62 | | | | B1 | CAN H | |
| | 61 | Relay 61 | | | A3 | CAN L | CAN bus Interface 1 |
| Configurable | 60 | | | | A2 | GND | |
| | 59 | Relay 59 | | | A1 | CAN H | |
| Configurable | 58 | | | | 124 | | Not used |
| | 57 | Relay 57 | | | 123 | | |
| Common for 43-55 | 56 | | | | 122 | | Not used |
| Configurable | 55 | | | | 121 | | |
| Configurable | 54 | | | | 120 | | Not used |
| Configurable | 53 | | | | 119 | | |
| Configurable | 52 | | | | 118 | | Not used |
| Configurable | 51 | | | | 117 | | |
| Configurable | 50 | | | | 116 | | Configurable |
| Configurable | 49 | | | | 115 | | |
| Configurable | 48 | | | | 114 | | Configurable |
| Configurable | 47 | | | | 113 | | |
| Configurable | 46 | | | | 112 | | Configurable |
| Configurable | 45 | | | | 111 | | |
| Configurable | 44 | | | | 110 | C | Multi-input 108 or DG reactive |
| Configurable | 43 | | | | 109 | B | |
| Ext. PF set point | 42 | | | | 108 | A | |
| Common for 40/42 | 41 | | | | 107 | C | Multi-input 105 or DG power |
| Ext. kW set point | 40 | | | | 106 | B | |
| Not used | 39 | | | | 105 | A | |
| Not used | 38 | | | | 104 | C | Multi-input 102 or MAINS power |
| Not used | 37 | | | | 103 | B | |
| | | | | | 102 | A | |
| | | | | | 101 | GND | Not used |
| | | | | | 100 | Input | |
| | | | | | 99 | (-) | Common for 118 8-36 V DC |
| | | | | | 98 | (+) | |

3.4 Input/output lists

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

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

3.4.1 Slot #1, power supply PCB

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

| Terminal | Function | Technical data | Description |
|----------|------------------|----------------|--|
| 26 | Digital input 26 | Optocoupler | PV breaker/ESS breaker open feedback |
| 27 | Digital input 27 | Optocoupler | PV breaker/ESS breaker closed feedback |
| 28 | Com. | Common | Common for terminals 23 to 27 |

3.4.2 Slot #2, serial communication (standard)

Modbus (option H2.2)

| Terminal | Function | Description |
|----------|------------|--|
| 29 | DATA + (A) | Modbus RTU, RS-485 This is the Modbus master output for inverter control, for example using Sunspec communication |
| 30 | GND | |
| 31 | DATA - (B) | |
| 32 | Not used | |
| 33 | DATA + (A) | |
| 34 | Not used | |
| 35 | DATA - (B) | |
| 36 | Not used | |

When the serial communication line exceeds 30 m, it 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.

NOTE Never connect the GND terminal 30 to earth. Only connect it to the shield in the communication cable.

3.4.3 Slot #2, 7 digital inputs (option M13.2)

| Terminal | Function | Technical data | Description |
|----------|------------------|----------------|-------------------------------|
| 29 | Digital input 29 | Optocoupler | Configurable |
| 30 | Digital input 30 | Optocoupler | Configurable |
| 31 | Digital input 31 | Optocoupler | Configurable |
| 32 | Digital input 32 | Optocoupler | Configurable |
| 33 | Digital input 33 | Optocoupler | Configurable |
| 34 | Digital input 34 | Optocoupler | Configurable |
| 35 | Digital input 35 | Optocoupler | Configurable |
| 36 | Com. | Optocoupler | Common for terminals 29 to 35 |

3.4.4 Slot #2, relay outputs (option M14.2)

| Terminal | Function | Technical data | Description |
|----------|----------|--------------------------|--------------|
| 29 | NE/ND | Relay 29 250 V AC/5 A | Configurable |
| 30 | Com. | | |

| Terminal | Function | Technical data | Description |
|----------|----------|----------------|--------------|
| 31 | NE/ND | Relay 31 | Configurable |
| 32 | Com. | 250 V AC/5 A | |
| 33 | NE/ND | Relay 33 | Configurable |
| 34 | Com. | 250 V AC/5 A | |
| 35 | NE/ND | Relay 35 | Configurable |
| 36 | Com. | 250 V AC/5 A | |

3.4.5 Slot #3, 13 digital inputs and 4 relay outputs (standard/M12)

| Terminal | Function | Technical data | Description |
|----------|-----------------|----------------|---------------------------------------|
| 37 | Not used | | |
| 38 | | | |
| 39 | | | |
| 40 | -10/+10 V DC | Analogue I/O | f/P set point |
| 41 | Com. | Common | Common |
| 42 | -10/+10 V DC | Analogue I/O | U/Q set point |
| 43 | Digital input | Optocoupler | Configurable/(diesel GB1 position ON) |
| 44 | Digital input | Optocoupler | Configurable/(diesel GB2 position ON) |
| 45 | Digital input | Optocoupler | Configurable/(diesel GB3 position ON) |
| 46 | Digital input | Optocoupler | Configurable/(diesel GB4 position ON) |
| 47 | Digital input | Optocoupler | Configurable/(diesel GB5 position ON) |
| 48 | Digital input | Optocoupler | Configurable/(diesel GB6 position ON) |
| 49 | Digital input | Optocoupler | Configurable |
| 50 | Digital input | Optocoupler | Configurable |
| 51 | Digital input | Optocoupler | Configurable |
| 52 | Digital input | Optocoupler | Configurable |
| 53 | Digital input | Optocoupler | Configurable |
| 54 | Digital input | Optocoupler | Configurable |
| 55 | Digital input | Optocoupler | Configurable |
| 56 | Com. | Common | Common for terminals 43 to 55 |
| 57 | NE/ND | Relay 57 | Configurable |
| 58 | Com. | 250 V AC/5 A | |
| 59 | NE/ND | Relay 59 | Configurable |
| 60 | Com. | 250 V AC/5 A | |

| Terminal | Function | Technical data | Description |
|----------|----------|----------------|--------------|
| 61 | NE/ND | Relay 61 | Configurable |
| 62 | Com. | 250 V AC/5 A | |
| 63 | NE/ND | Relay 63 | Configurable |
| 64 | Com. | 250 V AC/5 A | |

3.4.6 Slot #4, 7 digital inputs (option M13.4)

| Terminal | Function | Technical data | Description |
|----------|------------------|----------------|-------------------------------|
| 65 | Digital input 65 | Optocoupler | Configurable |
| 66 | Digital input 66 | Optocoupler | Configurable |
| 67 | Digital input 67 | Optocoupler | Configurable |
| 68 | Digital input 68 | Optocoupler | Configurable |
| 69 | Digital input 69 | Optocoupler | Configurable |
| 70 | Digital input 70 | Optocoupler | Configurable |
| 71 | Digital input 71 | Optocoupler | Configurable |
| 72 | Com. | Optocoupler | Common for terminals 65 to 71 |

3.4.7 Slot #4, relay outputs (option M14.4)

| Terminal | Function | Technical data | Description |
|----------|----------|----------------|--------------|
| 65 | NE/ND | Relay 65 | Configurable |
| 66 | Com. | 250 V AC/5 A | |
| 67 | NE/ND | Relay 67 | Configurable |
| 68 | Com. | 250 V AC/5 A | |
| 69 | Not used | Relay 69 | Configurable |
| 70 | Com. | 250 V AC/5 A | |
| 71 | Not used | Relay 71 | Configurable |
| 72 | Com. | 250 V AC/5 A | |

3.4.8 Slot #4, analogue outputs for inverter control or transducer signals (option E2)

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

3.4.9 Slot #5, AC measuring

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

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

| Terminal | Function | Technical data | Description |
|----------|------------------|----------------|-------------------------------|
| 90 | Com. | Common | Common for terminals 91 to 97 |
| 91 | Digital input 91 | Optocoupler | Configurable |
| 92 | Digital input 92 | Optocoupler | Configurable |
| 93 | Digital input 93 | Optocoupler | Configurable |
| 94 | Digital input 94 | Optocoupler | Configurable |
| 95 | Digital input 95 | Optocoupler | Configurable |
| 96 | Digital input 96 | Optocoupler | Configurable |
| 97 | Digital input 97 | Optocoupler | Configurable |

3.4.11 Slot #6, 4 relay outputs (option M14.6)

| Terminal | Function | Technical data | Description |
|----------|----------|----------------|--------------|
| 90 | NE/ND | Relay 90 | Configurable |
| 91 | Com. | 250 V AC/5 A | |

| Terminal | Function | Technical data | Description |
|----------|----------|----------------|--------------|
| 92 | NE/ND | Relay 92 | Configurable |
| 93 | Com. | 250 V AC/5 A | |
| 94 | NE/ND | Relay 94 | Configurable |
| 95 | Com. | 250 V AC/5 A | |
| 96 | NE/ND | Relay 96 | Configurable |
| 97 | Com. | 250 V AC/5 A | |

3.4.12 Slot #6, 4 analogue inputs (option M15.6)

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

3.4.13 Slot #6, analogue outputs for transducer (option F1)

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

NOTE Option F1 cannot be used for inverter control outputs.

3.4.14 Slot #7, I/O interface card (standard/M4)

| Terminal | Function | Technical data | Description |
|----------|-------------|-----------------------|-----------------|
| 98 | +12/24 V DC | 12/24 V DC +/-30 % | DC power supply |
| 99 | 0 V DC | | |
| 100 | NA | - | Not used |
| 101 | NA | | |

| Terminal | Function | Technical data | Description |
|----------|-------------------|---|---|
| 102 | A | 0(4) to 20 mA Digital Pt100 Pt1000 RMI 0 to 40 V DC | Multi-input 1 |
| 103 | B | | 4 to 20 mA signal from mains transducer (stand-alone application) |
| 104 | C | | |
| 105 | A | | Multi-input 2 |
| 106 | B | | 4 to 20 mA signal from genset bus total active power transducer (stand-alone application) |
| 107 | C | | |
| 108 | A | | Multi-input 3 |
| 109 | B | | 4 to 20 mA signal from genset bus total reactive power transducer (stand-alone application) |
| 110 | C | | |
| 111 | Com. | | Common |
| 112 | Digital input 112 | Optocoupler | Configurable |
| 113 | Digital input 113 | Optocoupler | Configurable |
| 114 | Digital input 114 | Optocoupler | Configurable |
| 115 | Digital input 115 | Optocoupler | Configurable |
| 116 | Digital input 116 | Optocoupler | Configurable |
| 117 | Digital input 117 | Optocoupler | Configurable |
| 118 | Digital input 118 | Optocoupler | Emergency stop and common for terminals 119 and 120 |
| 119 | NO | - | Not used |
| 120 | NO | - | Not used |
| 121 | Com. | - | Not used |
| 122 | NO | | |
| 123 | Com. | | |
| 124 | NO | | |
| A1 | CAN-H | | CAN bus interface A |
| A2 | GND | | |
| A3 | CAN-L | | |
| B1 | CAN-H | | CAN bus interface B |
| B2 | GND | | |
| B3 | CAN-L | | |

3.4.15 Slot #8, serial communication (option H2.8)

| Terminal | Function | Description |
|----------|------------|--|
| 133 | DATA + (A) | Modbus RTU, RS-485 This is the Modbus master output for power meter communication |
| 132 | GND | |
| 131 | DATA - (B) | |
| 130 | Not used | |
| 129 | DATA + (A) | |
| 128 | Not used | |
| 127 | DATA - (B) | |
| 126 | Not used | |

When the serial communication line exceeds 30 m, it should be terminated between DATA + and DATA - with a resistor equal to the cable impedance. The terminals 129/133 and 127/131 are internally connected.

NOTE Never connect the GND terminal 132 to earth. Only connect it to the shield in the communication cable.

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

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

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

| Terminal | Function | Technical data | Description |
|----------|----------|---------------------------|--------------|
| 126 | NE/ND | Relay 126 250 V AC/5 A | Configurable |
| 127 | Com. | | |
| 128 | NE/ND | Relay 128 250 V AC/5 A | Configurable |
| 129 | Com. | | |
| 130 | NE/ND | Relay 130 250 V AC/5 A | Configurable |
| 131 | Com. | | |
| 132 | NE/ND | Relay 132 250 V AC/5 A | Configurable |
| 133 | Com. | | |

3.4.18 Slot #8, 4 analogue inputs (option M15.8)

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

4. Wiring

4.1 AC connections

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



CAUTION



Incorrect wiring

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

4.1.1 Neutral line (N)

When 3-phase distribution systems are used, the neutral line (N) is only necessary if it is a 3-phase + neutral system. If the distribution system is a 3-phase system without neutral, then leave the terminals 84 and 88 empty.

4.1.2 Current transformer grounding

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

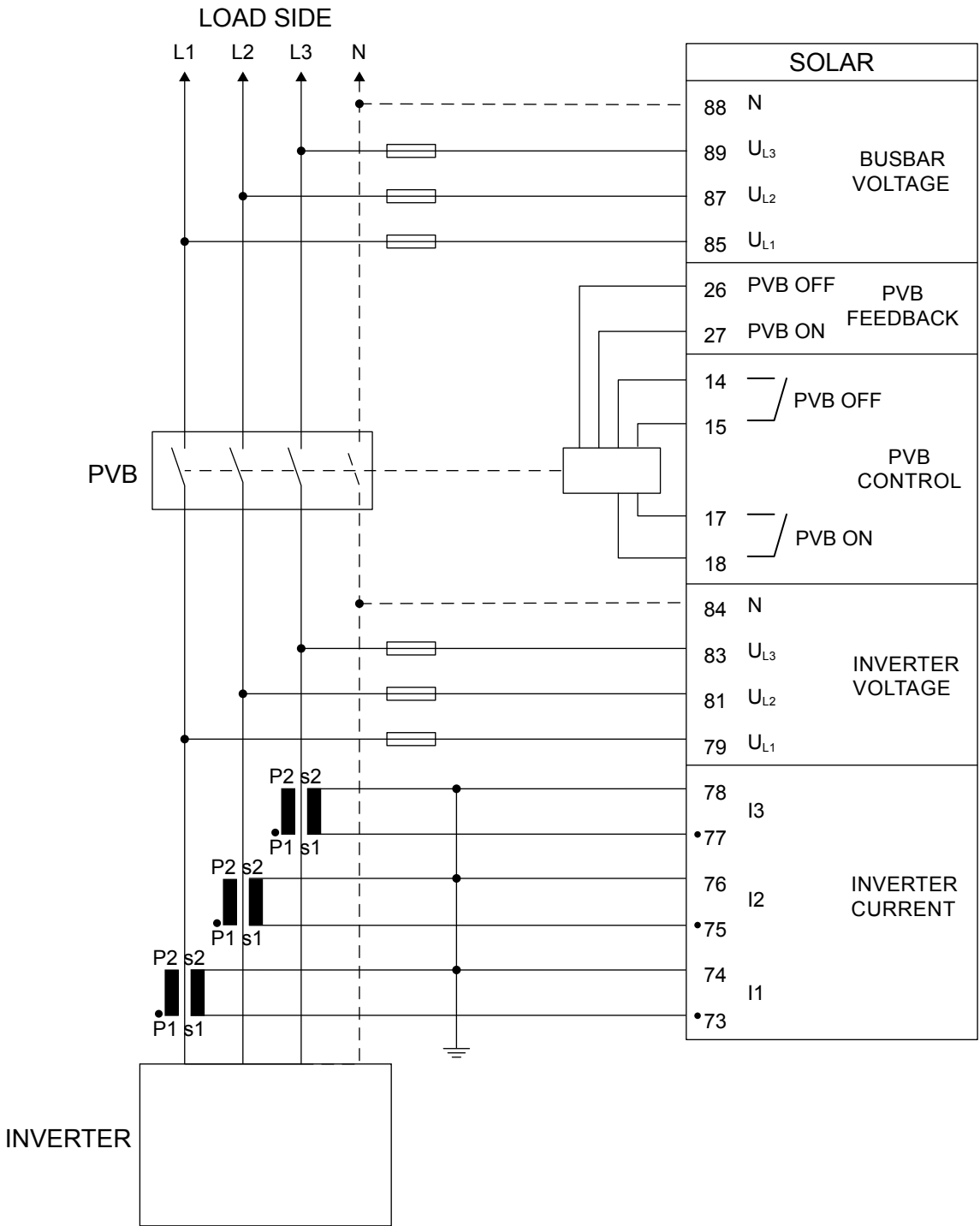
4.1.3 Fuses

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

4.1.4 3-phase wiring

The diagram shows the most important points to wire, and it shows the example where the PV breaker is installed, but this is optional.

General wiring arrangement

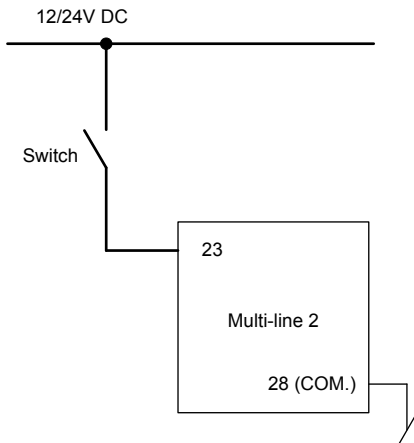


NOTE The 3-phase wiring for the ESS is similar to the PV example.

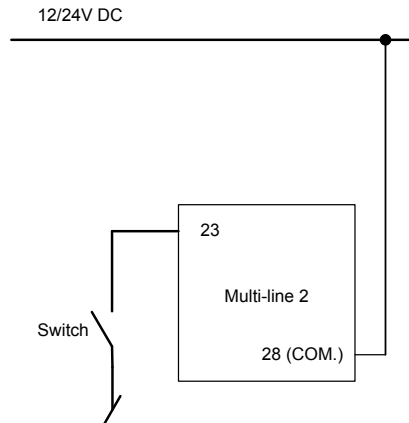
4.2 DC connections

4.2.1 Digital inputs

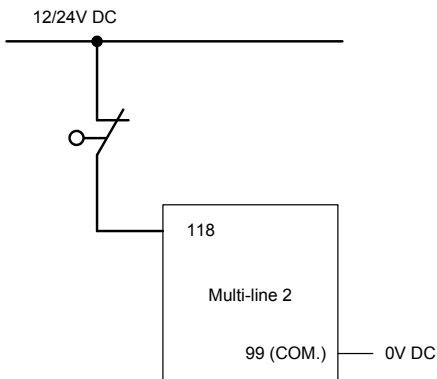
Battery positive to input



Battery negative to input

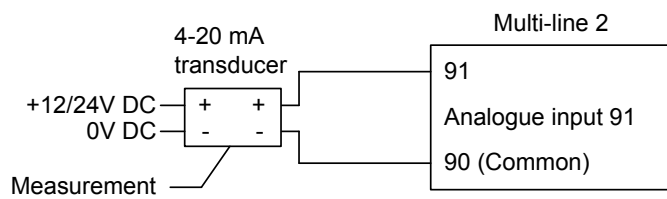


Emergency stop

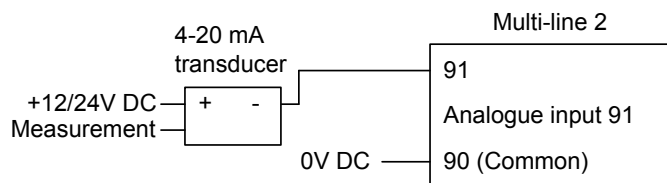


4.2.2 Analogue inputs (option M15.X)

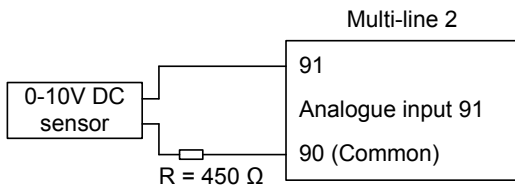
Active transducer (4 to 20 mA)



Passive transducer (4 to 20 mA)



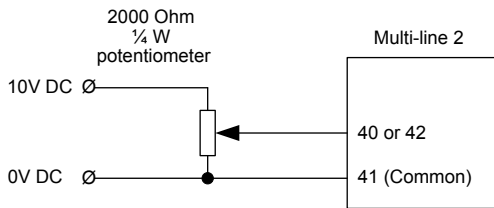
V DC sensor (4 to 20 mA)



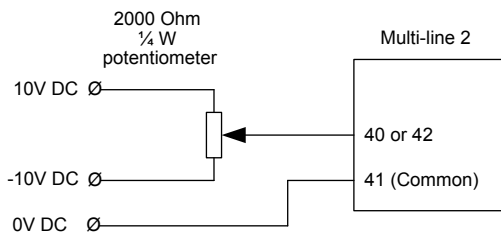
4.2.3 External set points

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

0 to 10 V DC input using potentiometer



+/-10 V DC input using potentiometer

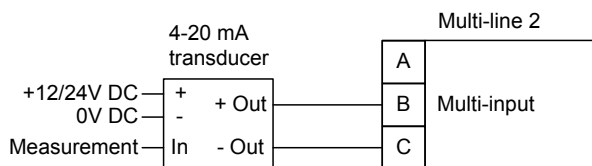


4.2.4 Multi-inputs (102, 105, 108)

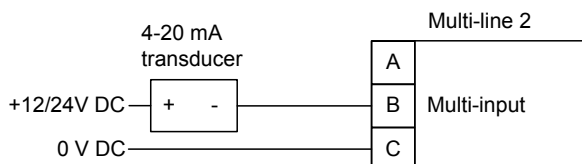
0(4) to 20 mA

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

Active transducer (0(4) to 20 mA)

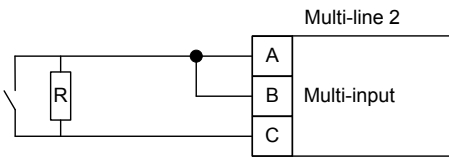


Passive transducer (0(4) to 20 mA)



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

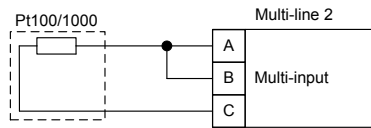
Digital inputs



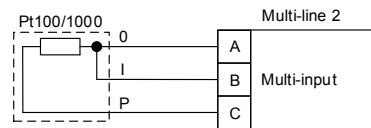
NOTE The resistor is only mounted if wire fail supervision is required. The value of the resistor should be $270 \Omega \pm 10\%$.

Pt100/Pt1000

2-wire

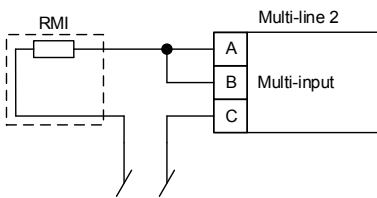


3-wire

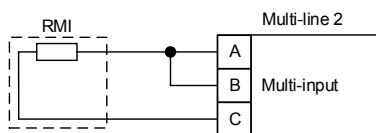


RMI

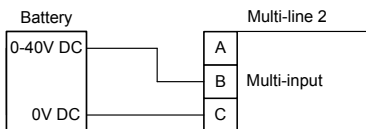
1-wire



2-wire



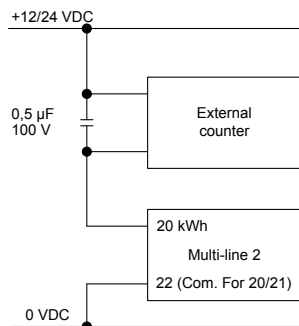
0 to 40 V DC



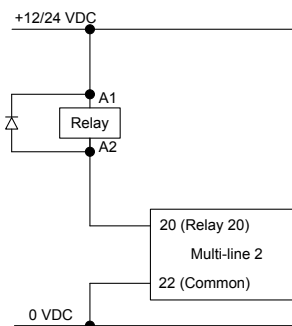
4.2.5 Transistor outputs (open collector outputs)

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

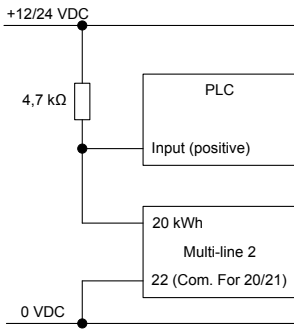
External counter



Relay outputs



Connection to PLC



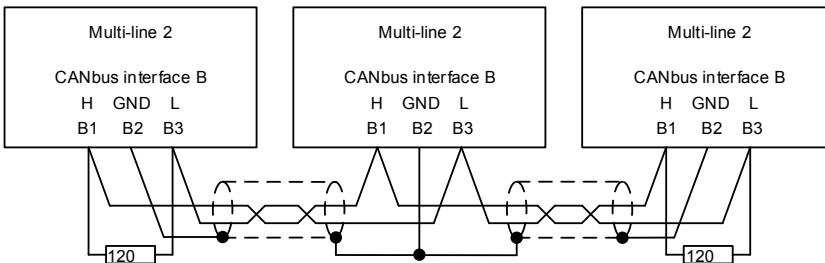
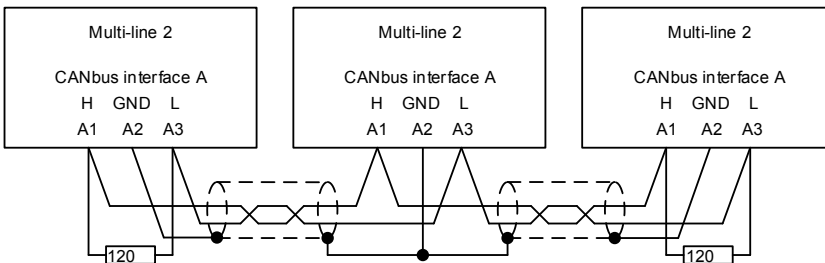
NOTE Remember to mount the freewheeling diode.

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

4.3 Communication

4.3.1 CAN bus

Examples with three controllers connected, for example one ASC and two generator AGC controllers.

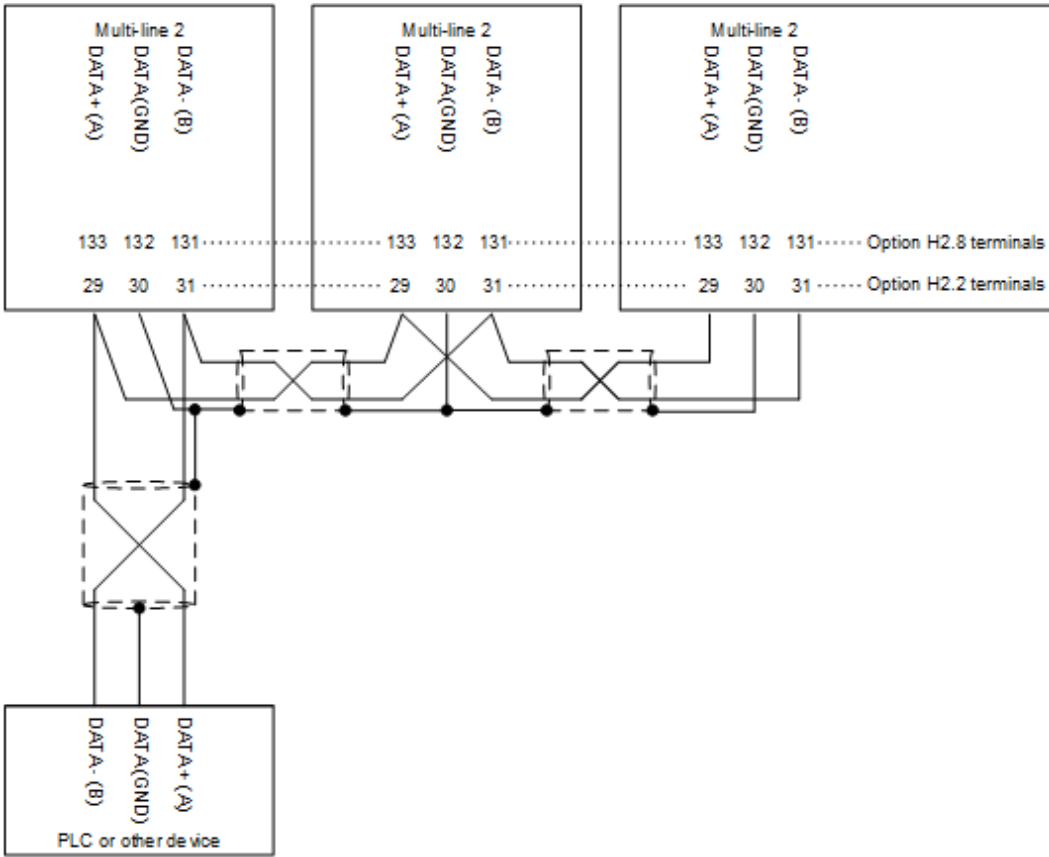


NOTE Use shielded twisted cable, Belden 3105A or similar.

NOTE End resistor R = 120 Ohm.

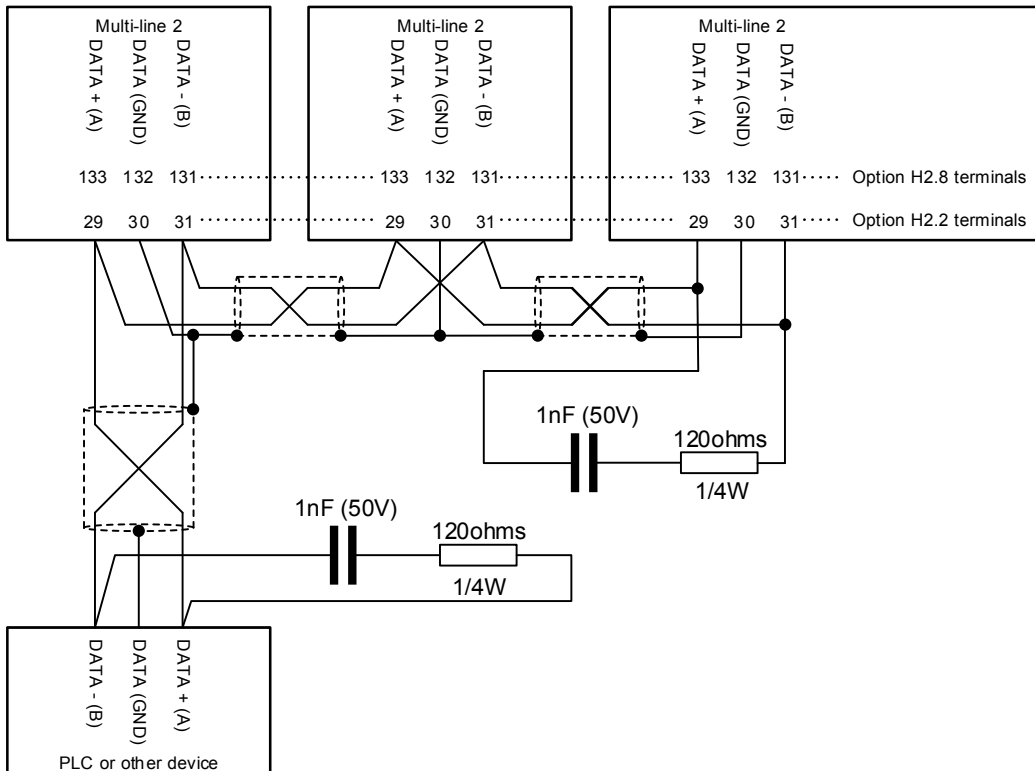
4.3.2 Modbus (option H2)

Connection with 2-wire screened cable



NOTE Use shielded twisted cable.

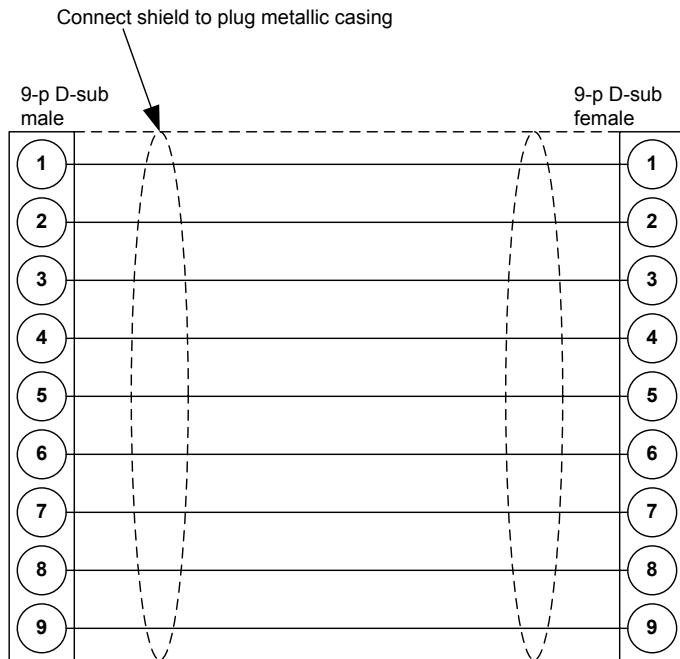
NOTE The RS-485 Modbus lines need end resistors (end terminators) when the bus length exceeds 30 m. If end resistors are needed, we recommend to install them like this:



NOTE Cable: Belden 3105 A or equivalent. 22 AWG (0.6 mm²) twisted pair, shielded, <40 mΩ/m, min. 95 % shield coverage.

4.3.3 Display cable (option J)

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



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

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

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