



-power in control



INSTALLATION INSTRUCTIONS



Advanced Genset Controller, AGC 200

- Mounting
- Terminal strip overview
- I/O lists
- Wiring



DEIF A/S · Frisenborgvej 33 · DK-7800 Skive
Tel.: +45 9614 9614 · Fax: +45 9614 9615
info@deif.com · www.deif.com

Document no.: 4189340610I
SW version: 4.52.x or later

1. General information

| | |
|--|---|
| 1.1. Warnings, legal information and safety..... | 4 |
| 1.1.1. Warnings and notes | 4 |
| 1.1.2. Legal information and disclaimer | 4 |
| 1.1.3. Safety issues | 4 |
| 1.1.4. Electrostatic discharge awareness | 4 |
| 1.1.5. Factory settings | 5 |
| 1.1.6. UL applications | 5 |
| 1.2. About the installation instructions..... | 5 |
| 1.2.1. General purpose | 5 |
| 1.2.2. Intended users | 5 |
| 1.2.3. Contents and overall structure | 5 |

2. General product information

| | |
|---|----|
| 2.1. AGC 200 product information..... | 6 |
| 2.1.1. Introduction..... | 6 |
| 2.1.2. Type of product..... | 6 |
| 2.1.3. Options..... | 6 |
| 2.1.4. Variants..... | 6 |
| 2.1.5. Available CAN ports..... | 7 |
| 2.2. Standard functions..... | 7 |
| 2.2.1. Operation modes..... | 7 |
| 2.2.2. Engine control (AGC 212/213/222/232/242/243) | 8 |
| 2.2.3. Generator control (AGC 212/213/222/232/242/243) | 8 |
| 2.2.4. Protection | 8 |
| 2.2.5. Display..... | 8 |
| 2.2.6. M-Logic..... | 8 |
| 2.2.7. General | 8 |
| 2.3. Standard and optional applications..... | 8 |
| 2.3.1. Standard and optional applications | 8 |
| 2.3.2. Automatic Mains Failure, AMF | 9 |
| 2.3.3. Island operation..... | 10 |
| 2.3.4. Fixed power/base load..... | 11 |
| 2.3.5. Peak shaving..... | 12 |
| 2.3.6. Load takeover..... | 13 |
| 2.3.7. Mains power export (fixed power to mains) | 14 |
| 2.3.8. Multiple gensets, CANshare..... | 14 |
| 2.3.9. Multiple gensets, load sharing (power management)..... | 15 |
| 2.3.10. Multiple gensets, power management (AGC 24x and 222 only) | 16 |

3. Mounting

| | |
|---|----|
| 3.1. AGC 200 mounting and dimensions..... | 17 |
| 3.1.1. Mounting of the unit | 17 |
| 3.1.2. Unit dimensions | 17 |
| 3.1.3. Panel cutout | 18 |
| 3.1.4. Mounting instructions | 18 |
| 3.1.5. Mounting of gasket (option L1) | 18 |
| 3.1.6. Tightening torques..... | 19 |

4. Hardware

| | |
|--|----|
| 4.1. AGC 200 hardware..... | 20 |
| 4.1.1. Unit rear side overview..... | 20 |
| 4.1.2. Terminal strip overview, AGC 21x, 222, 232, 233, 242, 243 | 21 |
| 4.1.3. Terminal strip overview, AGC 244/245/246..... | 28 |

5. Wirings

| | |
|-----------------------------|----|
| 5.1. AC connections..... | 34 |
| 5.1.1. AC connections | 34 |

| | |
|--|----|
| 5.1.2. Neutral line (N) | 34 |
| 5.1.3. Current transformer ground | 34 |
| 5.1.4. Voltage measurement fuses | 34 |
| 5.1.5. Breaker wiring | 34 |
| 5.1.6. 3-phase AGC 213/233/243 | 35 |
| 5.1.7. Single phase AGC 213/233/243 | 37 |
| 5.1.8. 2-phase L1L2 AGC 213/233/243 | 39 |
| 5.1.9. 2-phase L1L3 (split phase) | 41 |
| 5.1.10. Island mode and power management (AGC 212/222/232/242/243) | 43 |
| 5.1.11. Power management mains breaker (AGC 245) | 45 |
| 5.1.12. Power management mains and tie breaker (AGC 246) | 47 |
| 5.1.13. Power management AGC 244 BTB | 49 |
| 5.2. DC connections..... | 50 |
| 5.2.1. Digital inputs | 50 |
| 5.2.2. Multi-inputs | 50 |
| 5.2.3. Active transmitter | 51 |
| 5.2.4. 2-wire transmitter | 51 |
| 5.2.5. Digital inputs | 52 |
| 5.2.6. Pt100 | 52 |
| 5.2.7. RMI | 53 |
| 5.2.8. Magnetic pickup (MPU) | 53 |
| 5.2.9. NPN sensor | 53 |
| 5.2.10. PNP sensor | 54 |
| 5.2.11. Charger generator, W input | 54 |
| 5.2.12. D+ connection, terminal 93 | 55 |
| 5.2.13. Stop coil | 56 |
| 5.3. Communication..... | 57 |
| 5.3.1. CAN bus | 57 |
| 5.3.2. Modbus (option H2) | 58 |
| 5.3.3. CAN bus engine communication | 59 |
| 5.3.4. External I/O module (option H8) | 59 |
| 5.3.5. Additional operator panel AOP-2 (option X4) | 60 |
| 6. Technical information | |
| 6.1. Technical specifications..... | 62 |

1. General information

1.1 Warnings, legal information and safety

1.1.1 Warnings and notes

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

Warnings



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

Notes



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

1.1.2 Legal information and disclaimer

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



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

Disclaimer

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

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

1.1.3 Safety issues

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



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

1.1.4 Electrostatic discharge awareness

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

1.1.5 Factory settings

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

1.1.6 UL applications

These flat surface panel-mounted controllers are intended to be used in Listed Generator Assemblies where the suitability of the combination has been determined by Underwriters Laboratories.

These devices have been evaluated for fire and shock only. The accuracy and/or reliability of the voltage regulating function have not been evaluated. Metering, monitoring, protection and signaling functions have not been evaluated.

1.2 About the installation instructions

1.2.1 General purpose

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

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



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

1.2.2 Intended users

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

1.2.3 Contents and overall structure

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

2. General product information

2.1 AGC 200 product information

2.1.1 Introduction

The AGC 200 is a part of the DEIF Multi-line 2 product family. AGC 200 is a complete range of multi-function generator protection and control products, integrating all the functions you need into one compact and attractive solution.

The concept of the AGC 200 is to offer a cost-effective solution to genset builders, who need a flexible generator protection and control unit for small to large genset applications. Being part of the Multi-line product family, the standard functions can be supplemented with a variety of optional functions.

2.1.2 Type of product

The AGC 200 is a micro-processor based control unit containing all necessary functions for protection and control of a genset.

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

2.1.3 Options

The AGC 200 product range consists of different basic versions, which can be supplemented with the flexible options needed to provide the optimum solution. For example, the options cover various protections for generator, busbar and mains, serial communication, additional operator panels, and so on.

2.1.4 Variants

The following variants of the AGC 200 are available:

With engine communication (CAN bus) as standard:

AGC 212: Single generator, island operation

AGC 213: Single generator, mains failure (mains and generator breaker control)

With engine communication (CAN bus) and one extra CAN bus connection as standard:

AGC 222: Generator controller with power management

With engine communication (CAN bus) and two extra CAN bus connections as standard:

AGC 232: Generator controller with digital load sharing for island operation

AGC 233: Single generator, mains failure (mains and generator breaker control)

AGC 242: Generator controller with digital load sharing and power management

AGC 243: Generator controller with digital load sharing, power management and mains failure

AGC 244: Bus tie breaker controller with power management

AGC 245: Mains breaker controller with power management

AGC 246: Mains and tie breaker controller with power management

2.1.5 Available CAN ports

The table below shows available CAN ports and how each can be configured:

| | CAN A | CAN B | CAN C |
|--------------|---|---|---|
| AGC 212, 213 | Not available | Not available | OFF External I/O H5 EIC AOP2 |
| AGC 222 | Not available | OFF External I/O PM Secondary CANshare AOP2 PM Primary | OFF External I/O H5 EIC CANshare AOP2 |
| AGC 232, 233 | OFF External I/O CANshare AOP2 | OFF External I/O CANshare AOP2 | OFF External I/O H5 EIC CANshare AOP2 |
| AGC 242, 243 | OFF External I/O PM Primary CANshare AOP2 PM Secondary | OFF External I/O PM Secondary CANshare AOP2 PM Primary | OFF External I/O H5 EIC CANshare AOP2 |
| AGC 245, 246 | OFF External I/O PM Primary AOP2 PM Secondary | OFF External I/O PM Secondary AOP2 PM Primary | OFF External I/O H5 EIC AOP2 |

2.2 Standard functions

2.2.1 Operation modes

| Operation modes | Variant | | | | |
|-------------------------|-------------|---------|---------|-----|---------|
| | 212/222/232 | 213/233 | 242/243 | 244 | 245/246 |
| Automatic Mains Failure | | X | X | X* | X |
| Island operation | X | X | X | X* | |
| Fixed power/base load | | X | X | X* | X |
| Peak shaving | | X | X | X* | X |
| Load takeover | | X | X | X* | X |
| Mains power export | | X | X | X* | X |



* AGC 244 is always in power management mode and is working in all the above operation modes.

2.2.2 Engine control (AGC 212/213/222/232/242/243)

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

2.2.3 Generator control (AGC 212/213/222/232/242/243)

- Relay outputs for AVR control

2.2.4 Protection

- Over-current, 6 levels
- Reverse power, 2 levels
- Voltage-dependent over-current
- Over-voltage, 2 levels
- Under-voltage, 3 levels
- Over-frequency, 3 levels
- Under-frequency, 3 levels
- Overload, 5 levels
- Unbalanced current
- Unbalanced voltage
- Loss of excitation/Q<
- Over-excitation/Q>
- Multi-inputs, 3 configurable
- Digital inputs

2.2.5 Display

- Push-buttons for start and stop
- Push-buttons for breaker operations
- Status texts
- Alarm indication

2.2.6 M-Logic

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

2.2.7 General

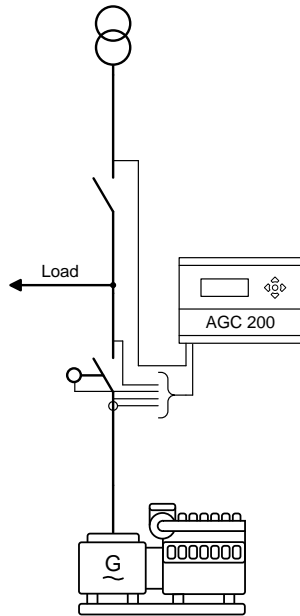
- USB interface to PC
- Free PC utility software for commissioning
- Additional functions available

2.3 Standard and optional applications

2.3.1 Standard and optional applications

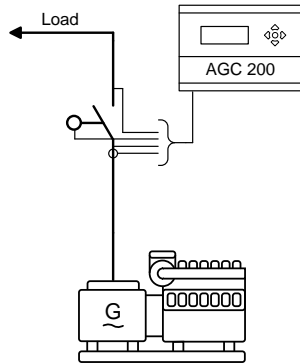
In the following sections, the standard and optional applications of the AGC 200 will be presented. In addition, the correct application configuration for the different applications is listed. It is only possible to use the unit for one of the purposes, for example AMF (Automatic Mains Failure). The selection must be made on site.

2.3.2 Automatic Mains Failure, AMF



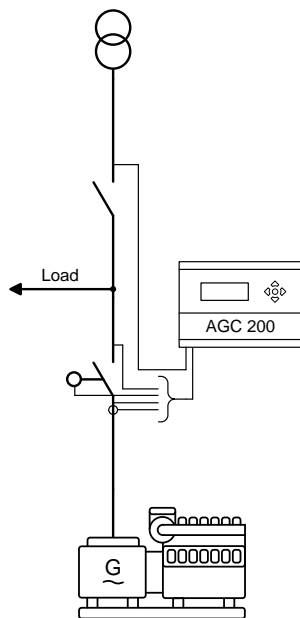
| No. | Setting |
|------|-----------------|
| 6070 | Genset mode AMF |

2.3.3 Island operation



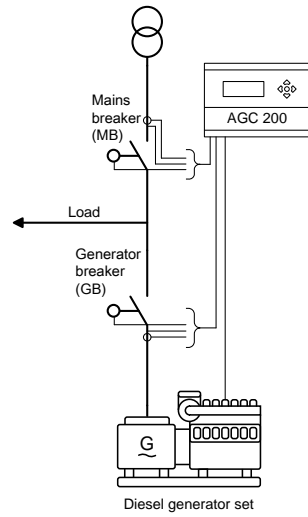
| No. | Setting | |
|------|-------------|------------------|
| 6070 | Genset mode | Island operation |

2.3.4 Fixed power/base load



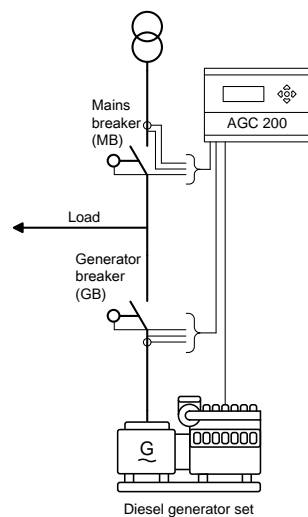
| No. | Setting | |
|------|-------------|-------------|
| 6070 | Genset mode | Fixed power |

2.3.5 Peak shaving



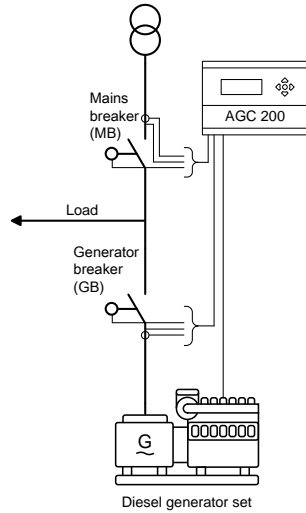
| No. | Setting | |
|------|-------------|--------------|
| 6070 | Genset mode | Peak shaving |

2.3.6 Load takeover



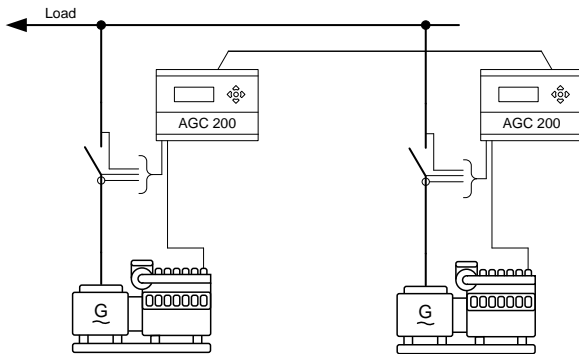
| No. | Setting | |
|------|-------------|---------------|
| 6070 | Genset mode | Load takeover |

2.3.7 Mains power export (fixed power to mains)



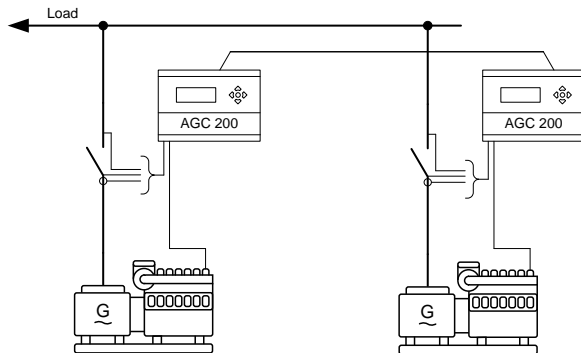
| No. | Setting | |
|------|-------------|--------------------|
| 6070 | Genset mode | Mains power export |

2.3.8 Multiple gensets, CANshare



| No. | Setting | |
|------|-------------|------------------|
| 6070 | Genset mode | Island operation |

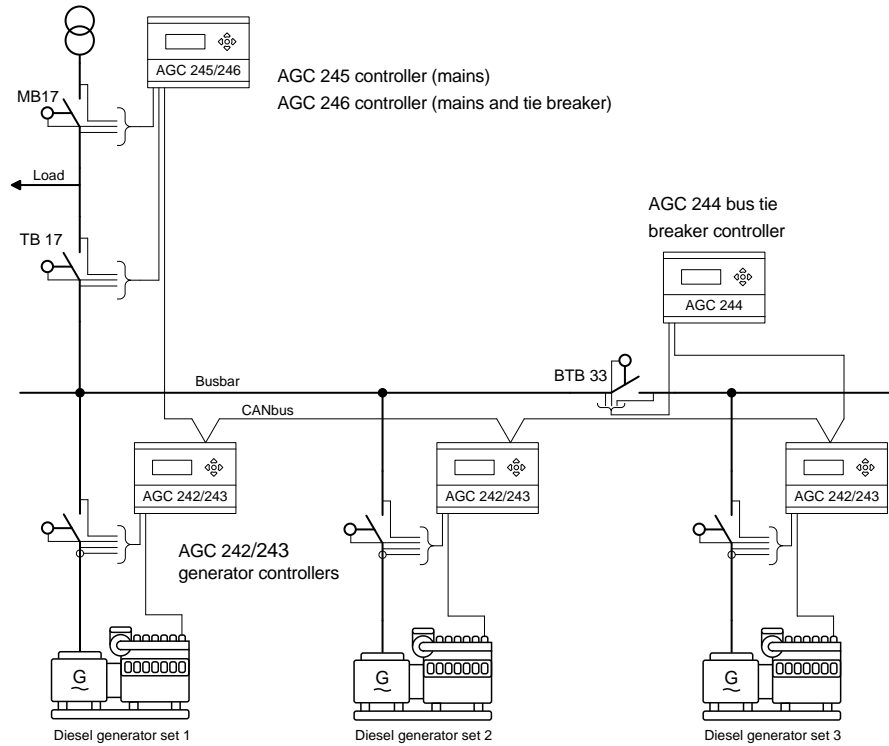
2.3.9 Multiple gensets, load sharing (power management)



| No. | Setting | |
|------|-------------|------------------|
| 6070 | Genset mode | Power management |

i If no mains is configured in a power management system, the genset will automatically be in "island mode", so channel 6071 must be "power management".

2.3.10 Multiple gensets, power management (AGC 24x and 222 only)



| No. | Setting | |
|------|-------------|------------------|
| 6070 | Genset mode | Power management |

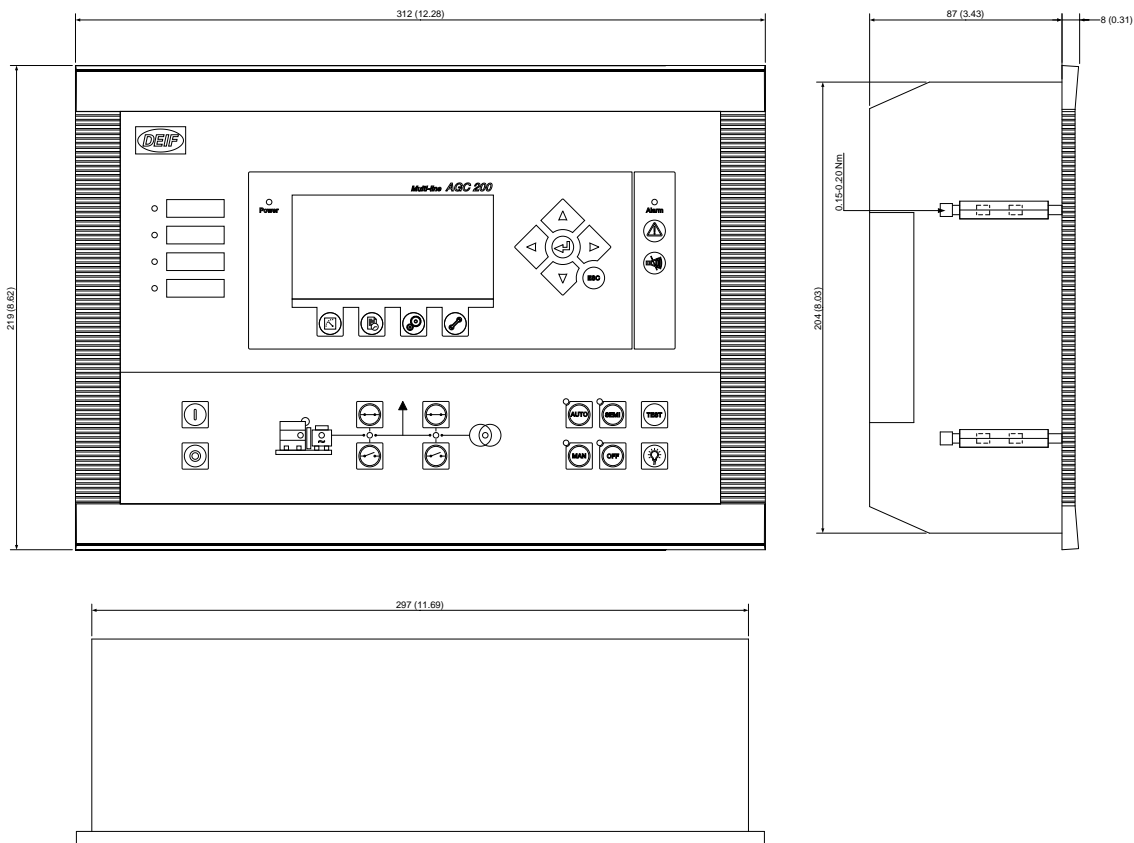
3. Mounting

3.1 AGC 200 mounting and dimensions

3.1.1 Mounting of the unit

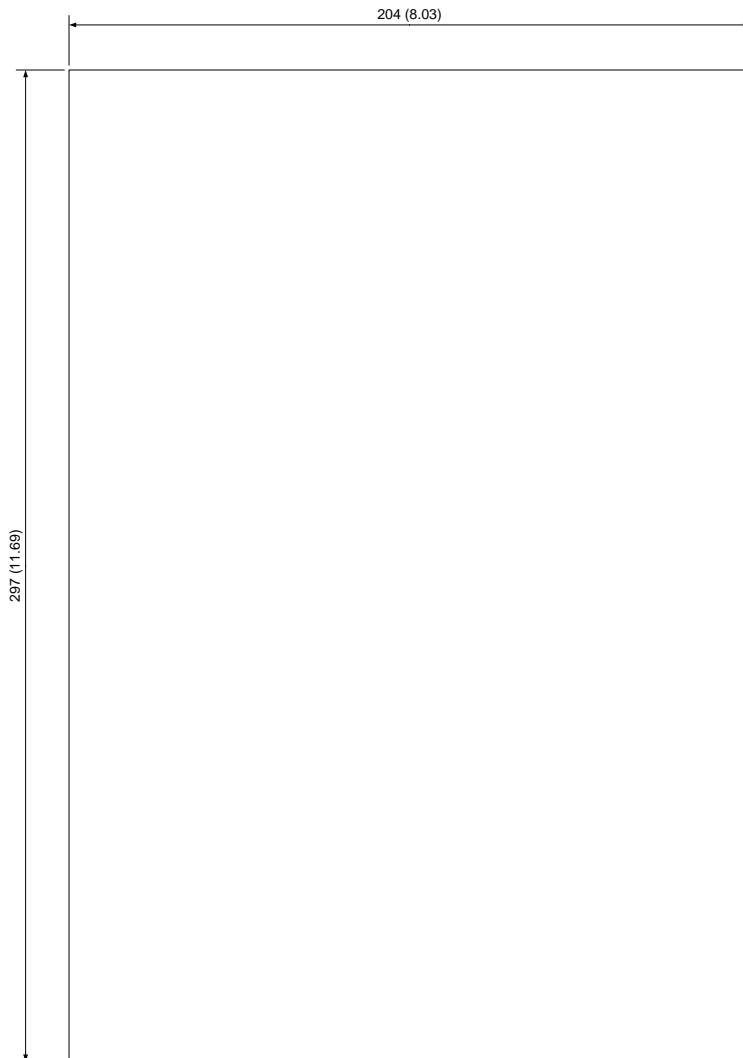
The unit is designed for mounting in the panel front.


3.1.2 Unit dimensions



Dimensions are given in mm (inches).

3.1.3 Panel cutout



 Dimensions are given in mm (inches).

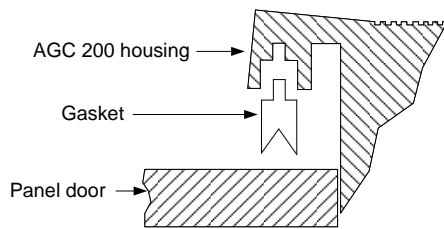
3.1.4 Mounting instructions

Fasten the unit with the screw clamps supplied with the unit. These are to be tightened 0.15-0.20 Nm - see diagram in the chapter Unit dimensions.

3.1.5 Mounting of gasket (option L1)

It is important that the gasket is mounted correctly; otherwise the IP65 tightness will not be obtained.

Mount the gasket as shown in the illustration below.



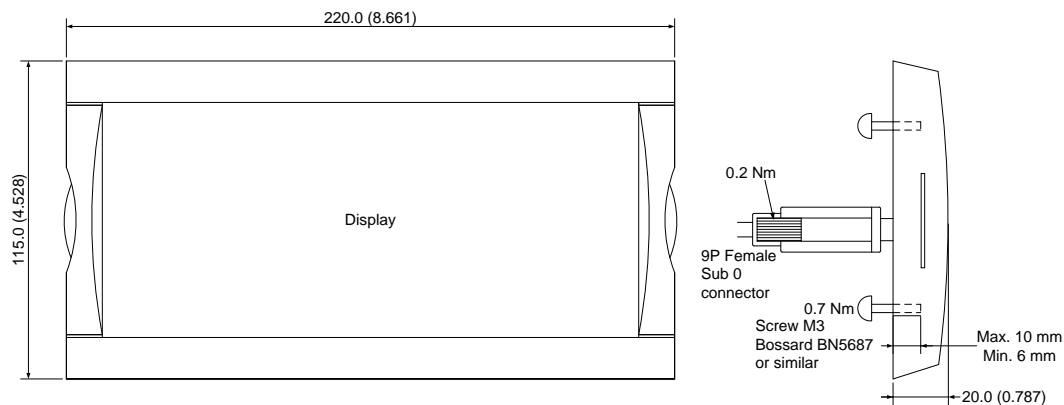
Furthermore, it is necessary to use all 12 screw clamps to ensure IP65 tightness.

3.1.6 Tightening torques

| | |
|-------------------------------|-----------------------------|
| Unit panel door mounting: | 0.15-0.20 Nm, 1.4-1.8 lb-in |
| Plug connections (terminals): | 0.5 Nm, 4.4 lb-in |

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

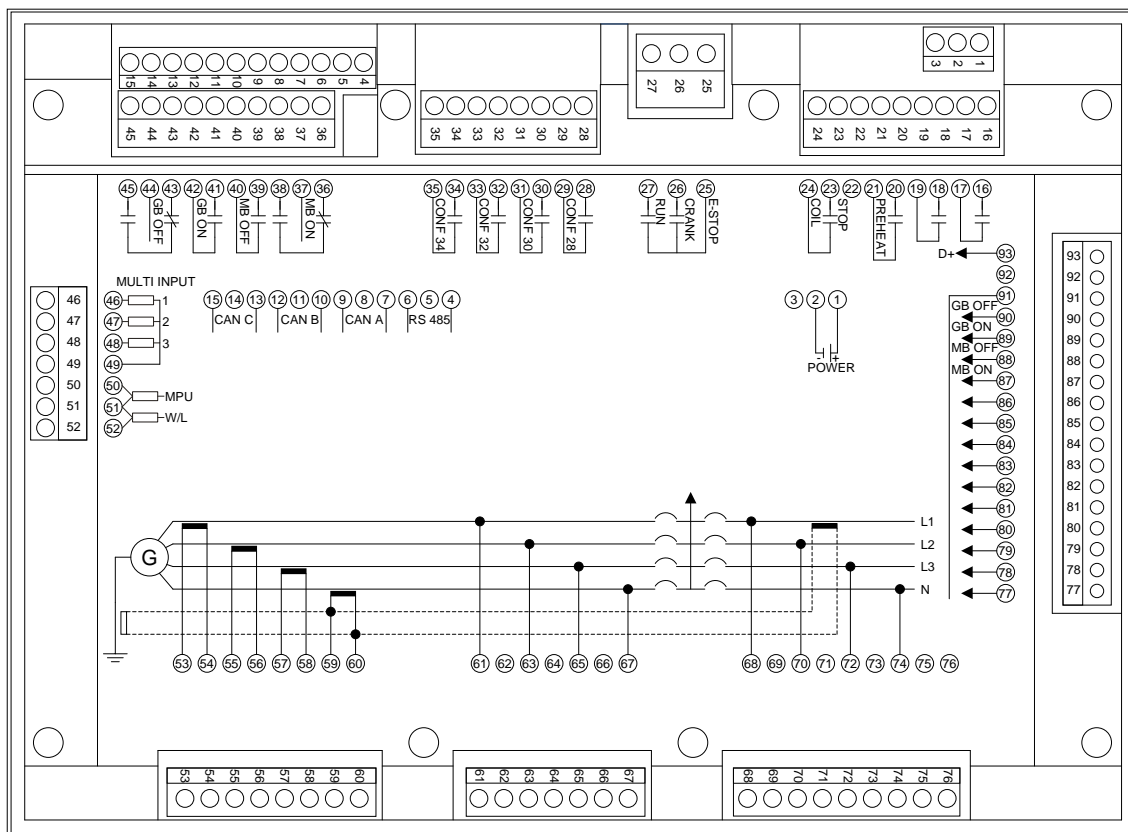
| | |
|----------------------------|-------------------|
| Panel door mounting: | 0.7 Nm, 6.2 lb-in |
| Sub-D screw: | 0.2 Nm, 1.8 lb-in |
| DC-DC converter terminals: | 0.5 Nm, 4.4 lb-in |



4. Hardware

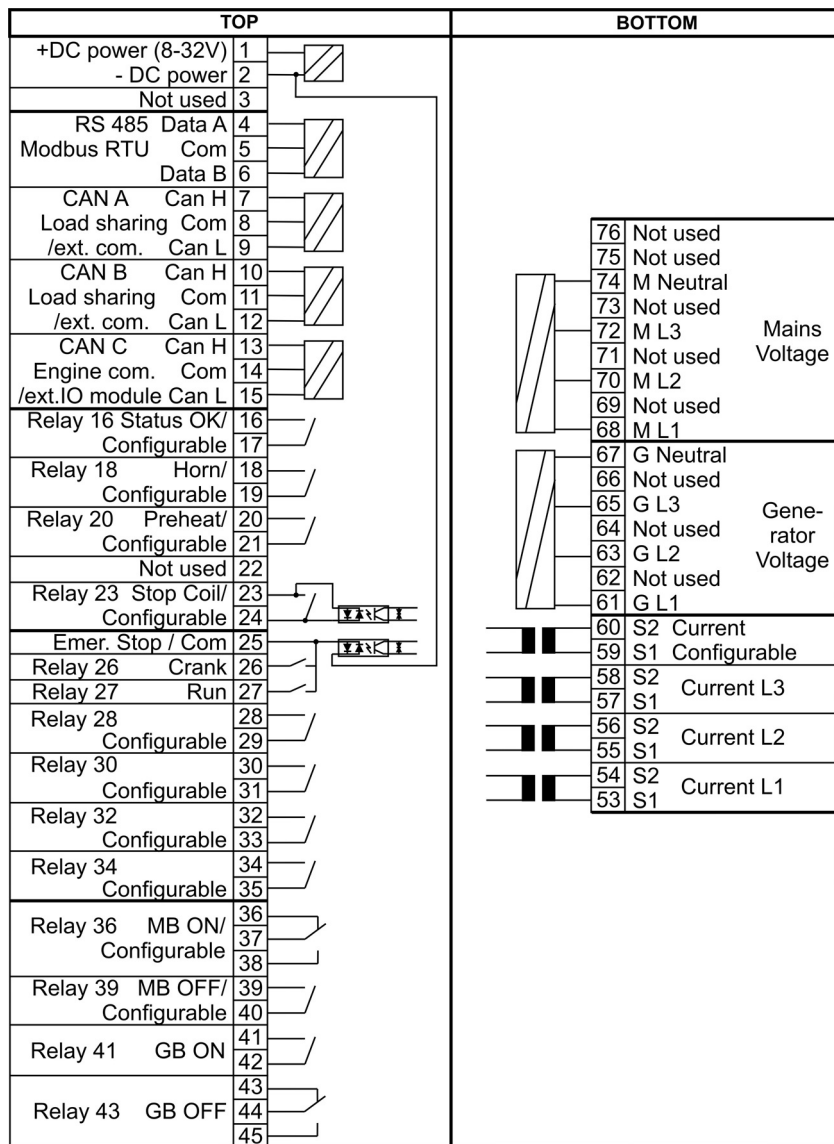
4.1 AGC 200 hardware

4.1.1 Unit rear side overview



Notice that not all connections are available in all versions; see the terminal strip for details.

4.1.2 Terminal strip overview, AGC 21x, 222, 232, 233, 242, 243



AGC 21x: CAN C only.
AGC 222: CAN B and C.
AGC 23x/24x: CAN A, B and C.
AGC 21x, 22x: Terminals 28 to 35 and 22 to 24 are not available.

| LEFT | | | RIGHT | | |
|-----------------|----|--|-------|----|--------------------|
| Multi-in 1 | 46 | | | 77 | Di 77 Configurable |
| Multi-in 2 | 47 | | | 78 | Di 78 Configurable |
| Multi-in 3 | 48 | | | 79 | Di 79 Configurable |
| Multi-in common | 49 | | | 80 | Di 80 Configurable |
| RPM MPU/tacho | 50 | | | 81 | Di 81 Configurable |
| RPM common | 51 | | | 82 | Di 82 Configurable |
| RPM W/NPN/PNP | 52 | | | 83 | Di 83 Configurable |
| | | | | 84 | Di 84 Configurable |
| | | | | 85 | Di 85 Configurable |
| | | | | 86 | Di 86 Configurable |
| | | | | 87 | MB ON / Di 87 |
| | | | | 88 | MB OFF / Di 88 |
| | | | | 89 | GB ON |
| | | | | 90 | GB OFF |
| | | | | 91 | Common |
| | | | | 92 | Not used |
| | | | | 93 | D+ (charger gen.) |

- Terminal 93 (D+) has two purposes. See chapter 6 for details.
- The placement of terminals (top, bottom, left, right) is seen from the rear side of the unit.
- Terminals 77 to 81 are not available in AGC 21x and 22x.

Input/output lists

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

Plug #1, power supply

| Term. | Function | Technical data | Description |
|-------|-------------|--------------------|--------------|
| 1 | +12/24 V DC | 12/24 V DC +/-30 % | Power supply |
| 2 | 0 V DC | | |
| 3 | | Not used | |

Plug #2, communication

| Term. | Function | Technical data | Description |
|-------|-----------|----------------------------------|--|
| 4 | Data+ (A) | RS-485 | Modbus RTU, max. 115 kBps |
| 5 | | | |
| 6 | Data+ (B) | | |
| 7 | CAN A H | CAN port A (not 21x, 22x series) | CANshare, power management, AOP-2 and external I/O modules |
| 8 | | | |
| 9 | CAN A L | | |
| 10 | CAN B H | CAN port B (not 21x series) | CANshare, power management, AOP-2 and external I/O modules |
| 11 | | | |
| 12 | CAN B L | | |
| 13 | CAN C H | CAN port C | J1939 governor and AVR analogue regulation |
| 14 | | | |
| 15 | CAN C L | | |

Plug #3, relay group 1

| Term. | Function | Technical data | Description |
|-------|----------|------------------------------------|--|
| 16 | Relay 16 | 8 A, 30 V DC/250 V AC | Status OK/configurable |
| 17 | | | |
| 18 | Relay 18 | 8 A, 30 V DC/250 V AC | Horn/configurable |
| 19 | | | |
| 20 | Relay 20 | 8 A, 30 V DC/250 V AC | Preheat/configurable |
| 21 | | | |
| 22 | Not used | | Not used |
| 23 | Relay 24 | 8 A, 36 V DC (not 21x, 22x series) | Stop coil/configurable With wire break monitoring |
| 24 | | | |

Plug #4, E-stop and start

| Term. | Function | Technical data | Description |
|-------|------------------------|----------------|---|
| 25 | +12/24 V DC Digital in | Optocoupler | Emergency stop and common for relay outputs 26 and 27 |
| 26 | Relay 26 | 16 A, 36 V DC | Crank (starter) |
| 27 | Relay 27 | 16 A, 36 V DC | RUN coil |

Plug #5, relay group 2



Not available for AGC 21x/22x.

| Term. | Function | Technical data | Description |
|-------|----------|-----------------------|--------------|
| 28 | Relay 28 | 8 A, 30 V DC/250 V AC | Configurable |
| 29 | | | |
| 30 | Relay 30 | 8 A, 30 V DC/250 V AC | Configurable |
| 31 | | | |
| 32 | Relay 32 | 8 A, 30 V DC/250 V AC | Configurable |
| 33 | | | |
| 34 | Relay 34 | 8 A, 30 V DC/250 V AC | Configurable |
| 35 | | | |

Plug #6, GB and MB relays

| Term. | Function | Technical data | Description |
|-------|--------------------------|-----------------------|--------------------------------|
| 36 | NC Relay Com 36 NO | 8 A, 30 V DC/250 V AC | Mains breaker ON/configurable |
| 37 | | | |
| 38 | | | |
| 39 | Relay 39 | 8 A, 30 V DC/250 V AC | Mains breaker OFF/configurable |
| 40 | | | |
| 41 | Relay 41 | 8 A, 30 V DC/250 V AC | Generator breaker ON |
| 42 | | | |
| 43 | NC Relay Com 43 NO | 8 A, 30 V DC/250 V AC | Generator breaker OFF |
| 44 | | | |
| 45 | | | |

Plug #7, multi-inputs and RPM pickup

| Term. | Function | Technical data | Description |
|-------|------------|----------------|---------------------------------|
| 46 | Multi-in 1 | Input | RMI/4 to 20 mA/Pt100/binary |
| 47 | Multi-in 2 | Input | RMI/4 to 20 mA/Pt100/binary |
| 48 | Multi-in 3 | Input | RMI/4 to 20 mA/Pt100/binary |
| 49 | Common | Input | Com. for inputs 46, 47 and 48 |
| 50 | MPU | RPM input | Magnetic pickup/tacho generator |
| 51 | Com | Common | Com. for inputs 50 and 52 |
| 52 | W | RPM input | Charge gen. W NPN/PNP pickup |

Plug #8, AC current inputs



CT on terminals 59-60: Not available for AGC 21x/22x.

| Term. | Function | Technical data | Description |
|-------|----------|----------------|--|
| 53 | L1 s1 | 1 or 5 A AC | Current phase L1 |
| 54 | L1 s2 | | |
| 55 | L2 s1 | 1 or 5 A AC | Current phase L2 |
| 56 | L2 s2 | | |
| 57 | L3 s1 | 1 or 5 A AC | Current phase L3 |
| 58 | L3 s2 | | |
| 59 | L4 s1 | 1 or 5 A AC | Configurable: Differential current, neutral current, ground current or mains current |
| 60 | L4 s2 | | |

Plug #9, generator AC voltage inputs

| Term. | Function | Technical data | Description |
|-------|----------|-----------------|-------------------|
| 61 | L 1 | 100 to 690 V AC | Generator line 1 |
| 62 | | Not used | |
| 63 | L 2 | 100 to 690 V AC | Generator line 2 |
| 64 | | Not used | |
| 65 | L 3 | 100 to 690 V AC | Generator line 3 |
| 66 | | Not used | |
| 67 | N | | Generator neutral |



All AC voltage inputs are galvanically separated from the rest of the unit. Voltages are indicated in phase-phase values.

Plug #10, mains AC voltage inputs

| Term. | Function | Technical data | Description |
|-------|----------|-----------------|---------------|
| 68 | L 1 | 100 to 690 V AC | Mains line 1 |
| 69 | | Not used | |
| 70 | L 2 | 100 to 690 V AC | Mains line 2 |
| 71 | | Not used | |
| 72 | L 3 | 100 to 690 V AC | Mains line 3 |
| 73 | | Not used | |
| 74 | N | | Mains neutral |
| 75 | | Not used | |
| 76 | | Not used | |



All AC voltage inputs are galvanically separated from the rest of the unit. Voltages are indicated in phase-phase values.

Plug #11, digital inputs and breaker positions

| Term. | Function | Technical data | Description |
|-------|-----------|----------------|--|
| 77 | Di 77 | Optocoupler | Configurable |
| 78 | Di 78 | Optocoupler | Configurable |
| 79 | Di 79 | Optocoupler | Configurable |
| 80 | Di 80 | Optocoupler | Configurable |
| 81 | Di 81 | Optocoupler | Configurable |
| 82 | Di 82 | Optocoupler | Configurable |
| 83 | Di 83 | Optocoupler | Configurable |
| 84 | Di 84 | Optocoupler | Configurable |
| 85 | Di 85 | Optocoupler | Configurable |
| 86 | Di 86 | Optocoupler | Configurable |
| 87 | Di 87 | Optocoupler | MB ON/configurable |
| 88 | Di 88 | Optocoupler | MB OFF/configurable |
| 89 | Di GB ON | Optocoupler | Gen. breaker ON feedback |
| 90 | Di GB OFF | Optocoupler | Gen. breaker OFF feedback |
| 91 | Com | Common | Common for inputs 77 to 90 |
| 92 | | Not used | |
| 93 | Di | D+ | Charger generator D+ running feedback and digital running feedback |



The digital inputs 77 to 90 are bi-directional, meaning that common can be - or +, whichever is preferred.



Terminals 77 to 81 are not available in AGC 21x and 22x.

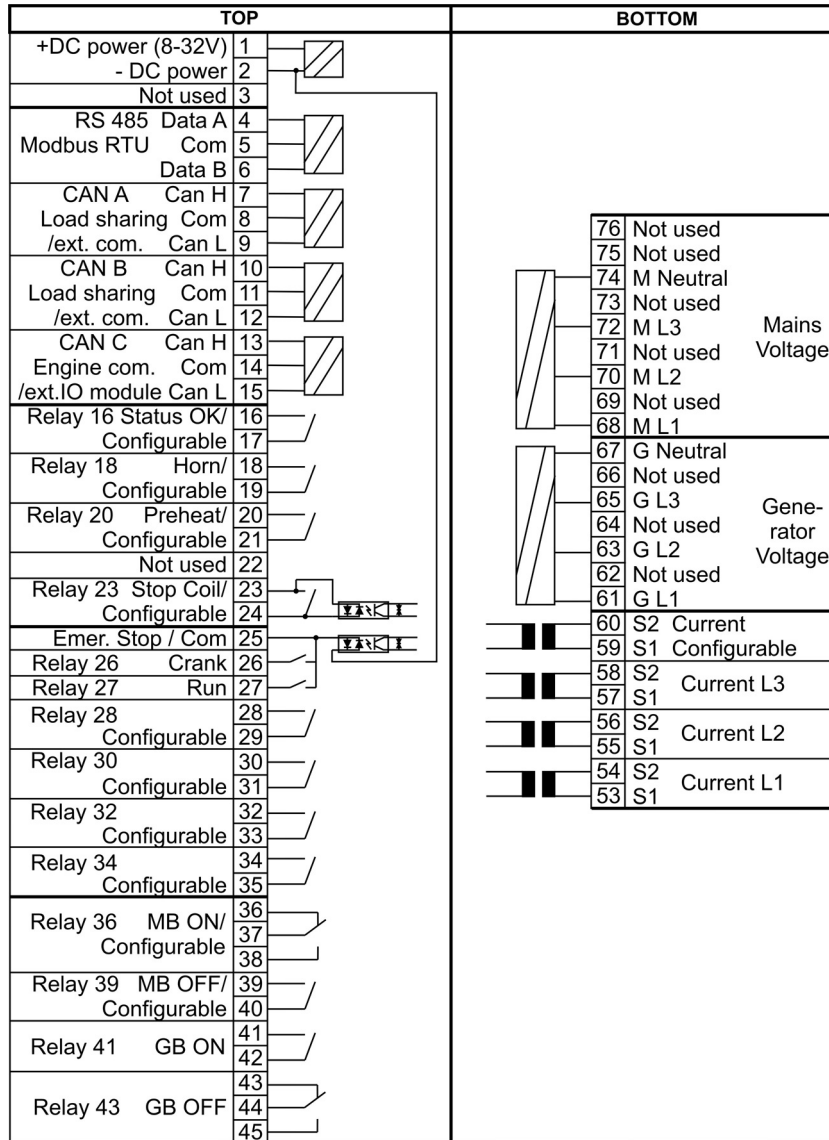


Terminals 87 to 90 are configurable in AGC 222.


Socket connections

| Term. | Function | Technical data | Description |
|--------------|-----------------|-----------------------|--|
| SD | Memory | SD memory | Additional memory space for lifetime logging of data |
| USB | PC conn | USB B | Connection for PC programming |
| RJ45 | TCP/IP | Ethernet | Modbus TCP/IP connection |

4.1.3 Terminal strip overview, AGC 244/245/246



 Relays 41 and 43 are not available in AGC 245.

 Relays 36 and 39 are configurable in AGC 244.

| LEFT | | RIGHT | |
|-----------------|----|-------|-----------------------|
| Multi-in 1 | 46 | | 77 Di 77 Configurable |
| Multi-in 2 | 47 | | 78 Di 78 Configurable |
| Multi-in 3 | 48 | | 79 Di 79 Configurable |
| Multi-in common | 49 | | 80 Di 80 Configurable |
| RPM MPU/tacho | 50 | | 81 Di 81 Configurable |
| RPM common | 51 | | 82 Di 82 Configurable |
| RPM W/NPN/PNP | 52 | | 83 Di 83 Configurable |
| | | | 84 Di 84 Configurable |
| | | | 85 Di 85 Configurable |
| | | | 86 Di 86 Configurable |
| | | | 87 MB ON / Di 87 |
| | | | 88 MB OFF / Di 88 |
| | | | 89 GB ON |
| | | | 90 GB OFF |
| | | | 91 Common |
| | | | 92 Not used |
| | | | 93 D+ (charger gen.) |

Inputs 87 and 88 are configurable in AGC 244.

The placement of terminals (top, bottom, left, right) is seen from the rear side of the unit.

Input/output lists

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

Plug #1, power supply

| Term. | Function | Technical data | Description |
|-------|-------------|--------------------|--------------|
| 1 | +12/24 V DC | 12/24 V DC +/-30 % | Power supply |
| 2 | 0 V DC | | |
| 3 | | Not used | |

Plug #2, communication

| Term. | Function | Technical data | Description |
|-------|-----------|----------------|--|
| 4 | Data+ (A) | RS-485 | Modbus RTU, max. 115 kBps |
| 5 | | | |
| 6 | Data+ (B) | | |
| 7 | CAN A H | CAN port A | Power management, AOP-2 and external I/O modules |
| 8 | | | |
| 9 | CAN A L | | |
| 10 | CAN B H | CAN port B | Power management, AOP-2 and external I/O modules |
| 11 | | | |
| 12 | CAN B L | | |
| 13 | CAN C H | CAN port C | Not used |
| 14 | | | |
| 15 | CAN C L | | |

Plug #3, relay group 1

| Term. | Function | Technical data | Description |
|-------|----------|-----------------------|--|
| 16 | Relay 16 | 8 A, 30 V DC/250 V AC | Status OK/configurable |
| 17 | | | |
| 18 | Relay 18 | 8 A, 30 V DC/250 V AC | Horn/configurable |
| 19 | | | |
| 20 | Relay 20 | 8 A, 30 V DC/250 V AC | Configurable |
| 21 | | | |
| 22 | Not used | | Not used |
| 23 | Relay 23 | 8 A, 36 V DC | Configurable With wire break monitoring |
| 24 | | | |

Plug #4, E-stop and start

| Term. | Function | Technical data | Description |
|-------|------------------------|----------------|----------------|
| 25 | +12/24 V DC Digital in | Optocoupler | Emergency stop |
| 26 | Relay 26 | 16 A, 36 V DC | Not used |
| 27 | Relay 27 | 16 A, 36 V DC | Not used |

Plug #5, relay group 2

| Term. | Function | Technical data | Description |
|-------|----------|-----------------------|--------------|
| 28 | Relay 28 | 8 A, 30 V DC/250 V AC | Configurable |
| 29 | | | |
| 30 | Relay 30 | 8 A, 30 V DC/250 V AC | Configurable |
| 31 | | | |
| 32 | Relay 32 | 8 A, 30 V DC/250 V AC | Configurable |
| 33 | | | |
| 34 | Relay 34 | 8 A, 30 V DC/250 V AC | Configurable |
| 35 | | | |

Plug #6, MB and (B)TB relays

| Term. | Function | Technical data | Description |
|-------|--------------------------|-----------------------|--------------------------------|
| 36 | NC relay Com 36 NO | 8 A, 30 V DC/250 V AC | Mains breaker ON/configurable |
| 37 | | | |
| 38 | | | |
| 39 | Relay 39 | 8 A, 30 V DC/250 V AC | Mains breaker OFF/configurable |
| 40 | | | |
| 41 | Relay 41 | 8 A, 30 V DC/250 V AC | (Bus) tie breaker ON |
| 42 | | | |
| 43 | NC relay Com 43 NO | 8 A, 30 V DC/250 V AC | (Bus) tie breaker OFF |
| 44 | | | |
| 45 | | | |

Plug #7, multi-inputs

| Term. | Function | Technical data | Description |
|-------|------------|----------------|-------------------------------|
| 46 | Multi-in 1 | Input | RMI/4 to 20 mA/Pt100/binary |
| 47 | Multi-in 2 | Input | RMI/4 to 20 mA/Pt100/binary |
| 48 | Multi-in 3 | Input | RMI/4 to 20 mA/Pt100/binary |
| 49 | Common | Input | Com. for inputs 46, 47 and 48 |
| 50 | Not used | | |
| 51 | Not used | | |
| 52 | Not used | | |

Plug #8, AC current inputs

| Term. | Function | Technical data | Description |
|-------|----------|----------------|------------------|
| 53 | L1 s1 | 1 or 5 A AC | Current phase L1 |
| 54 | L1 s2 | | |
| 55 | L2 s1 | 1 or 5 A AC | Current phase L2 |
| 56 | L2 s2 | | |
| 57 | L3 s1 | 1 or 5 A AC | Current phase L3 |
| 58 | L3 s2 | | |
| 59 | | Not used | |
| 60 | | | |

Plug #9, mains/busbar A AC voltage inputs

| Term. | Function | Technical data | Description |
|-------|----------|-----------------|------------------------------|
| 61 | L 1 | 100 to 690 V AC | Mains line 1 (AGC 244: BB A) |
| 62 | | Not used | |
| 63 | L 2 | 100 to 690 V AC | Mains line 2 (AGC 244: BB A) |
| 64 | | Not used | |
| 65 | L 3 | 100 to 690 V AC | Mains line 3 (AGC 244: BB A) |
| 66 | | Not used | |
| 67 | N | | Neutral |



All AC voltage inputs are galvanically separated from the rest of the unit. Voltages are indicated in phase-phase values.

Plug #10, busbar/busbar B AC voltage inputs

| Term. | Function | Technical data | Description |
|-------|----------|-----------------|-------------------------------|
| 68 | L 1 | 100 to 690 V AC | Busbar line 1 (AGC 244: BB A) |
| 69 | | Not used | |
| 70 | L 2 | 100 to 690 V AC | Busbar line 2 (AGC 244: BB A) |
| 71 | | Not used | |
| 72 | L 3 | 100 to 690 V AC | Busbar line 3 (AGC 244: BB A) |
| 73 | | Not used | |
| 74 | N | | Neutral |
| 75 | | Not used | |
| 76 | | Not used | |



All AC voltage inputs are galvanically separated from the rest of the unit. Voltages are indicated in phase-phase values.

Plug #11, digital inputs and breaker positions

| Term. | Function | Technical data | Description |
|-------|--------------|----------------|----------------------------|
| 77 | Di 77 | Optocoupler | Configurable |
| 78 | Di 78 | Optocoupler | Configurable |
| 79 | Di 79 | Optocoupler | Configurable |
| 80 | Di 80 | Optocoupler | Configurable |
| 81 | Di 81 | Optocoupler | Configurable |
| 82 | Di 82 | Optocoupler | Configurable |
| 83 | Di 83 | Optocoupler | Configurable |
| 84 | Di 84 | Optocoupler | Configurable |
| 85 | Di 85 | Optocoupler | Configurable |
| 86 | Di 86 | Optocoupler | Configurable |
| 87 | Di 87 | Optocoupler | MB ON/configurable |
| 88 | Di 88 | Optocoupler | MB OFF/configurable |
| 89 | Di (B)TB ON | Optocoupler | (B)TB ON feedback |
| 90 | Di (B)TB OFF | Optocoupler | (B)TB OFF feedback |
| 91 | Com | Common | Common for inputs 77 to 90 |
| 92 | | Not used | |
| 93 | | Not used | |



The digital inputs 77 to 90 are bi-directional, meaning that common can be - or +, whichever is preferred.

Socket connections

| Term. | Function | Technical data | Description |
|-------|----------|----------------|--|
| SD | Memory | SD memory | Additional memory space for lifetime logging of data |
| USB | PC conn | USB B | Connection for PC programming |
| RJ45 | TCP/IP | Ethernet | Modbus TCP/IP connection |

5. Wirings

5.1 AC connections

5.1.1 AC connections

The AGC 200 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.

5.1.2 Neutral line (N)

When three-phase distribution systems are used, the neutral line (N) is only necessary if it is a three-phase + neutral system. If the distribution system is a three-phase system without neutral, then leave the terminals 67 and 74 empty.

5.1.3 Current transformer ground

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

5.1.4 Voltage measurement fuses

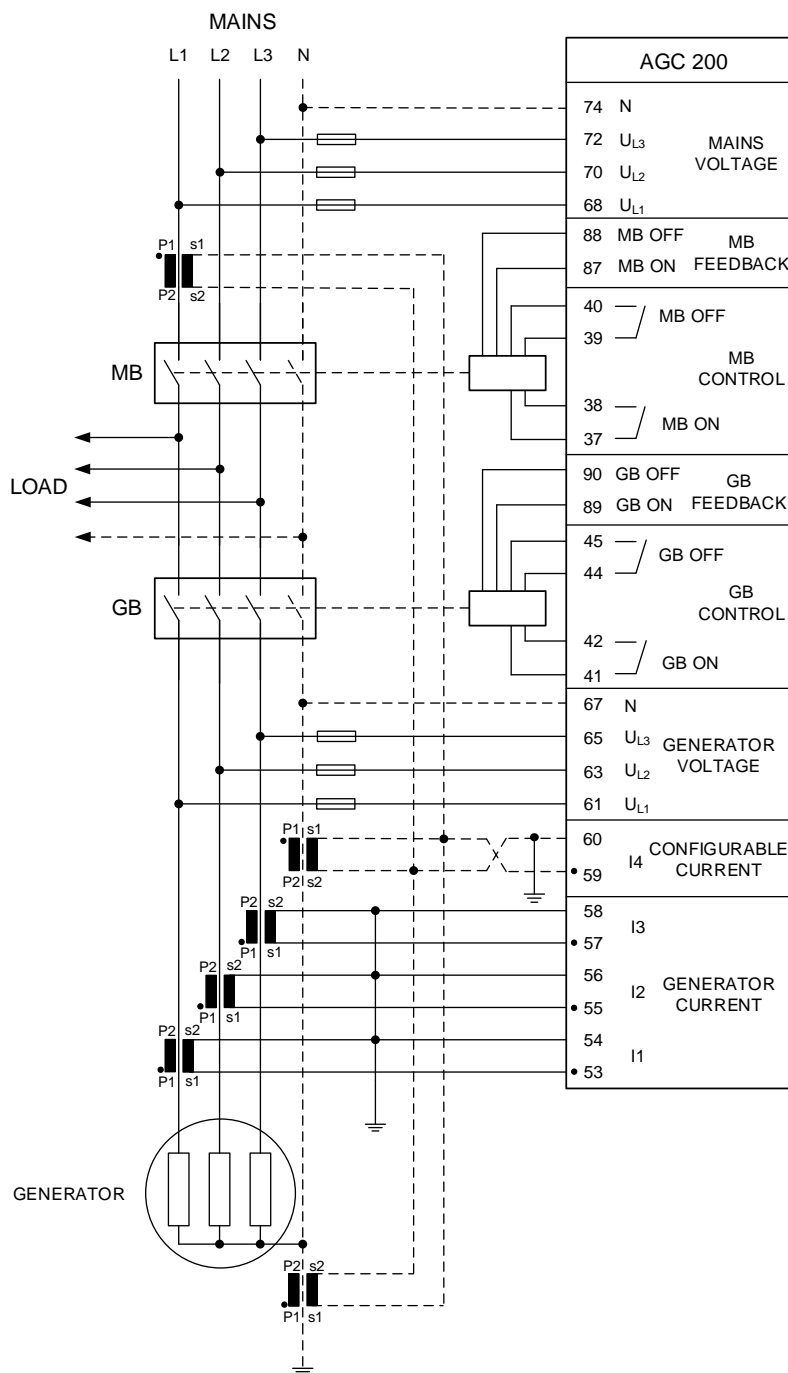
If the wires/cables are protected with fuses, use 2 A slow blow or higher, dependent on the wires/cables being protected.






5.1.5 Breaker wiring

The breaker wiring is an example only.

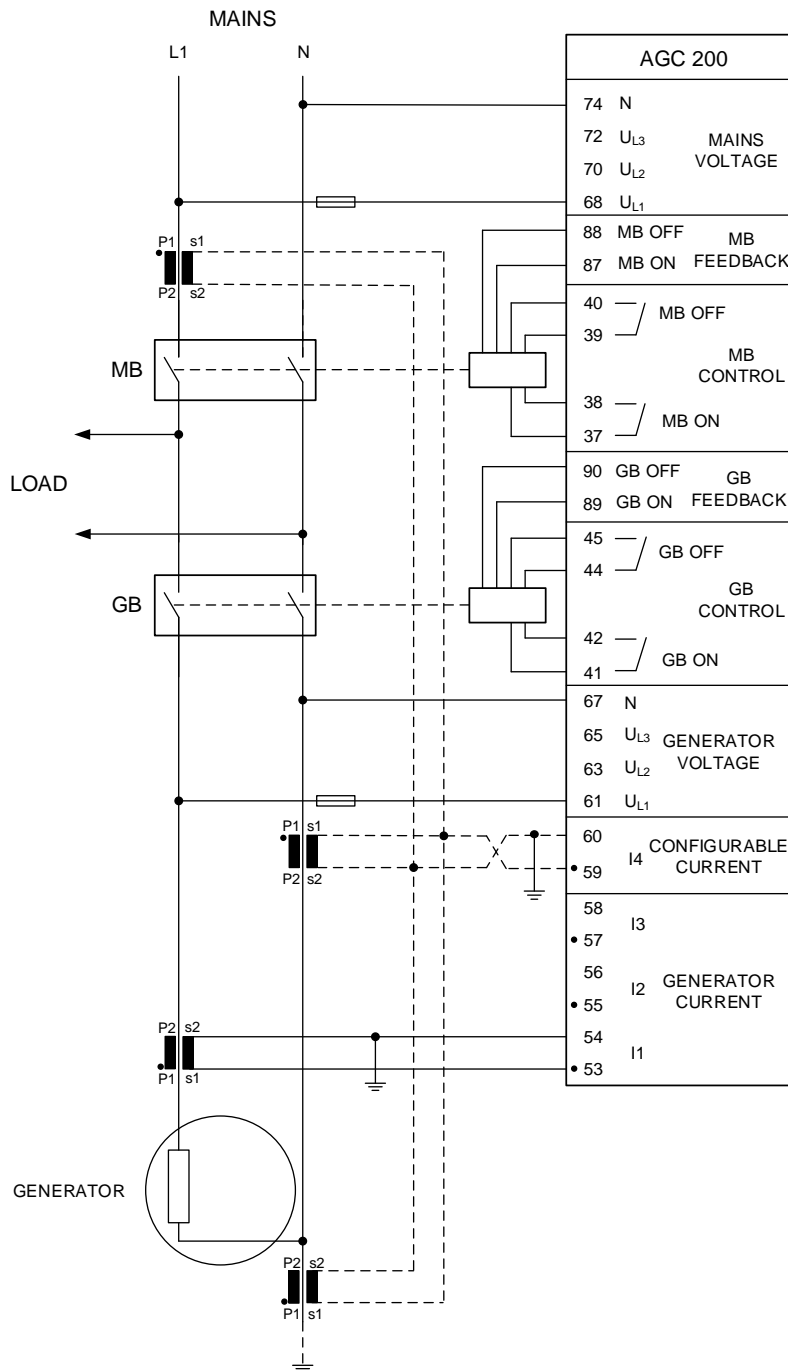
5.1.6 3-phase AGC 213/233/243

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



-  **Wiring indicated with dashed line is optional.**
-  **For peak shaving, load takeover and mains power export, the configurable current input can be used to measure phase L1 current.**
-  **The application shown is for pulse breakers.**
-  **Terminals 59 and 60 are not available on AGC 21x and AGC 22x.**
-  **Be aware that the inputs for feedbacks shown above also need a common wire on terminal 91. (Terminal 91 is common for 77 to 90).**

5.1.7 Single phase AGC 213/233/243





Wiring indicated with dashed line is optional.



The application shown is for pulse breakers.

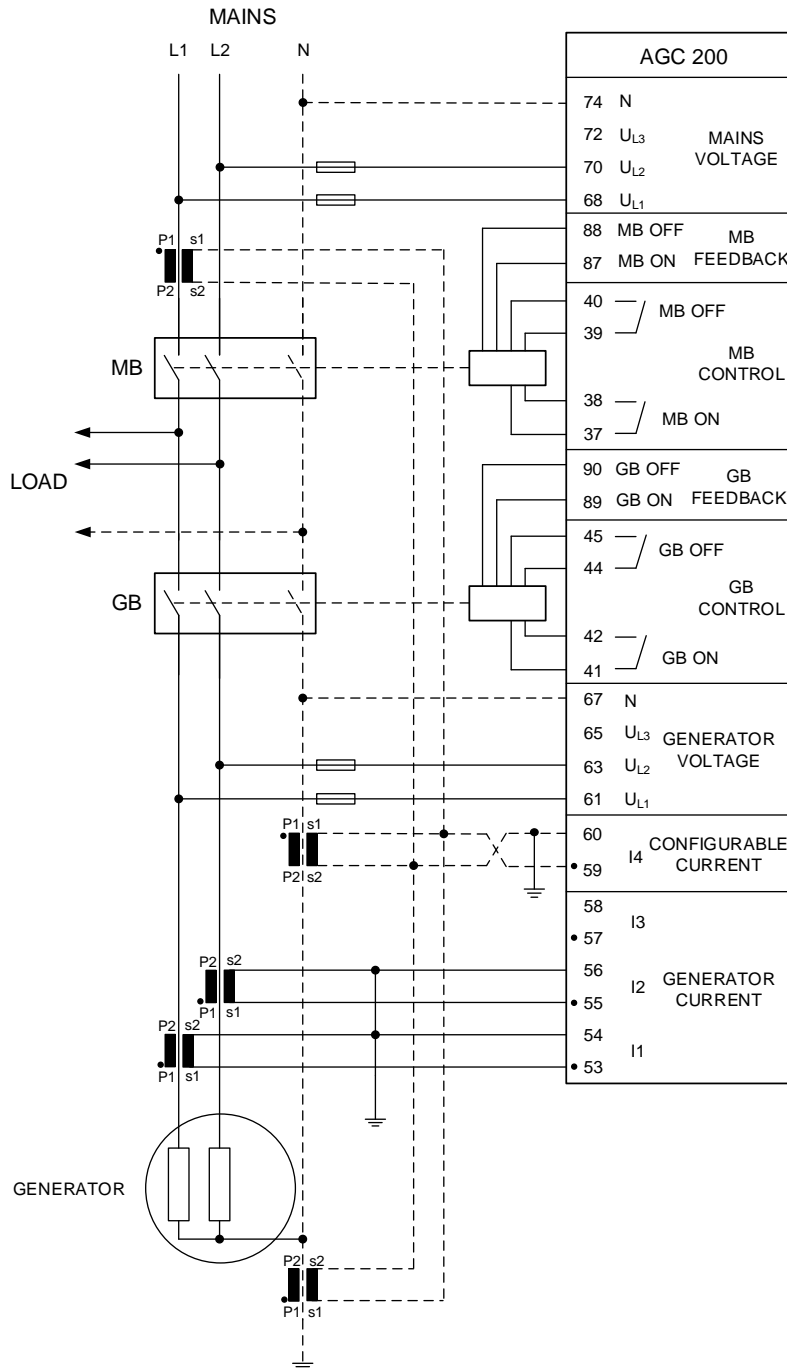


Terminals 59 and 60 are not available on AGC 21x and AGC 22x.



**Be aware that the inputs for feedbacks shown above also need a common wire on terminal 91.
(Terminal 91 is common for 77 to 90).**

5.1.8 2-phase L1L2 AGC 213/233/243





Wiring indicated with dashed line is optional.



The application shown is for pulse breakers.

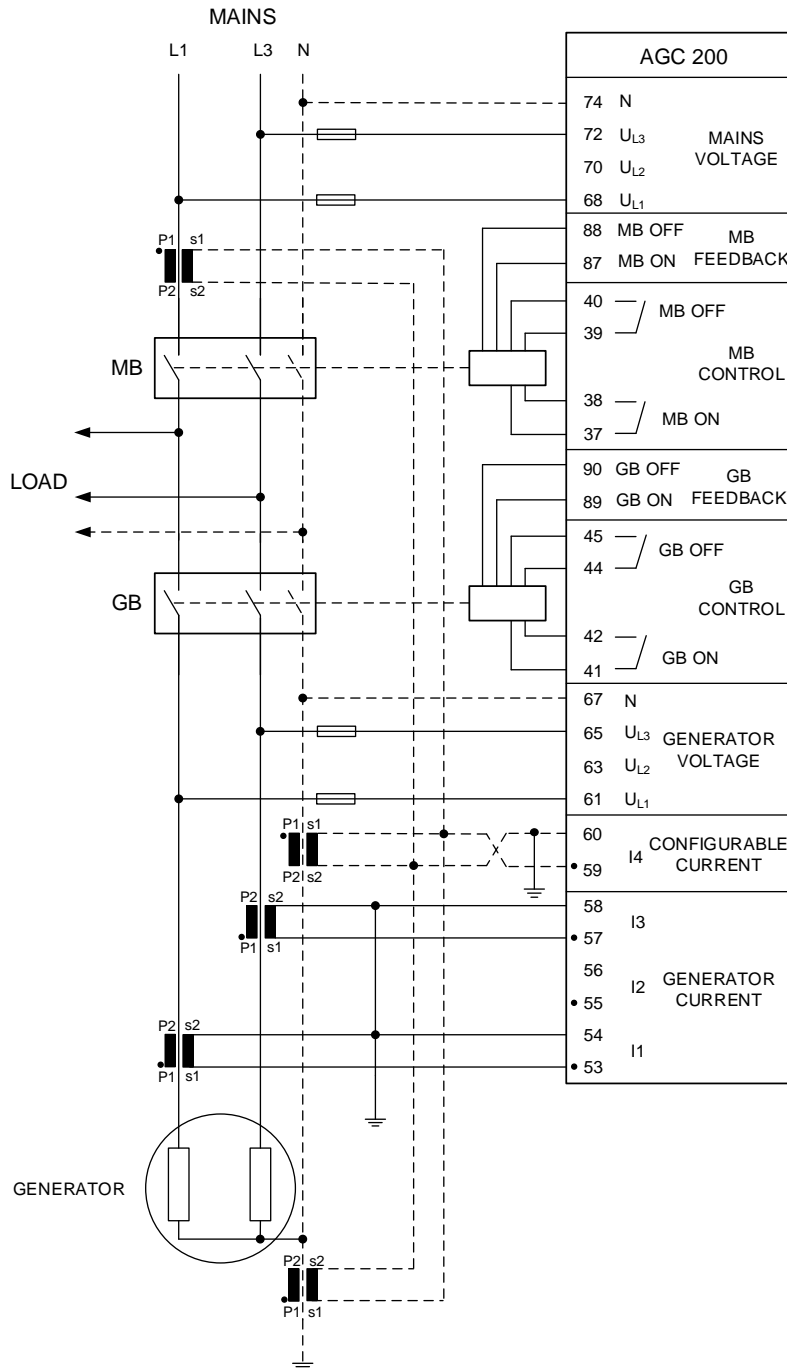







Terminals 59 and 60 are not available on AGC 21x and AGC 22x.



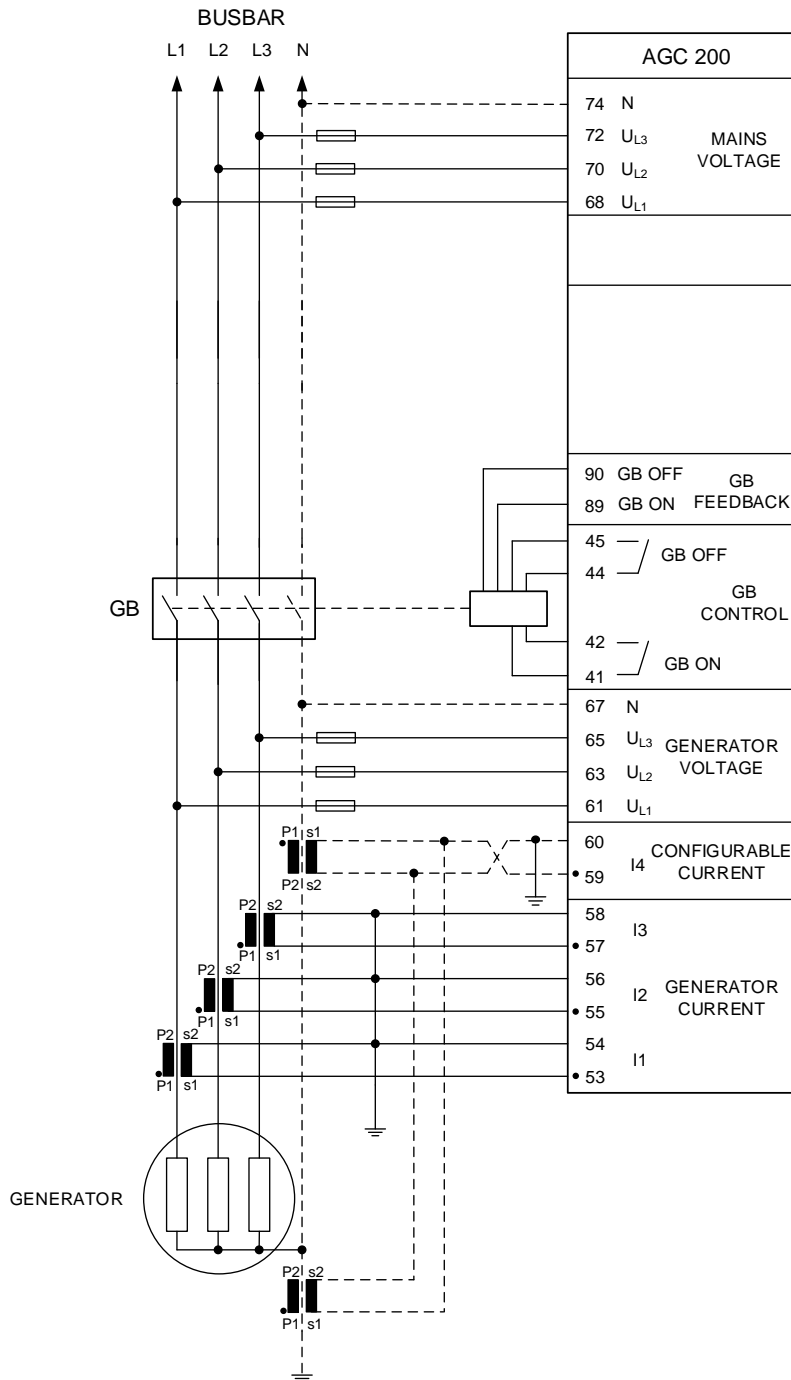
**Be aware that the inputs for feedbacks shown above also need a common wire on terminal 91.
(Terminal 91 is common for 77 to 90).**






5.1.9 2-phase L1L3 (split phase)



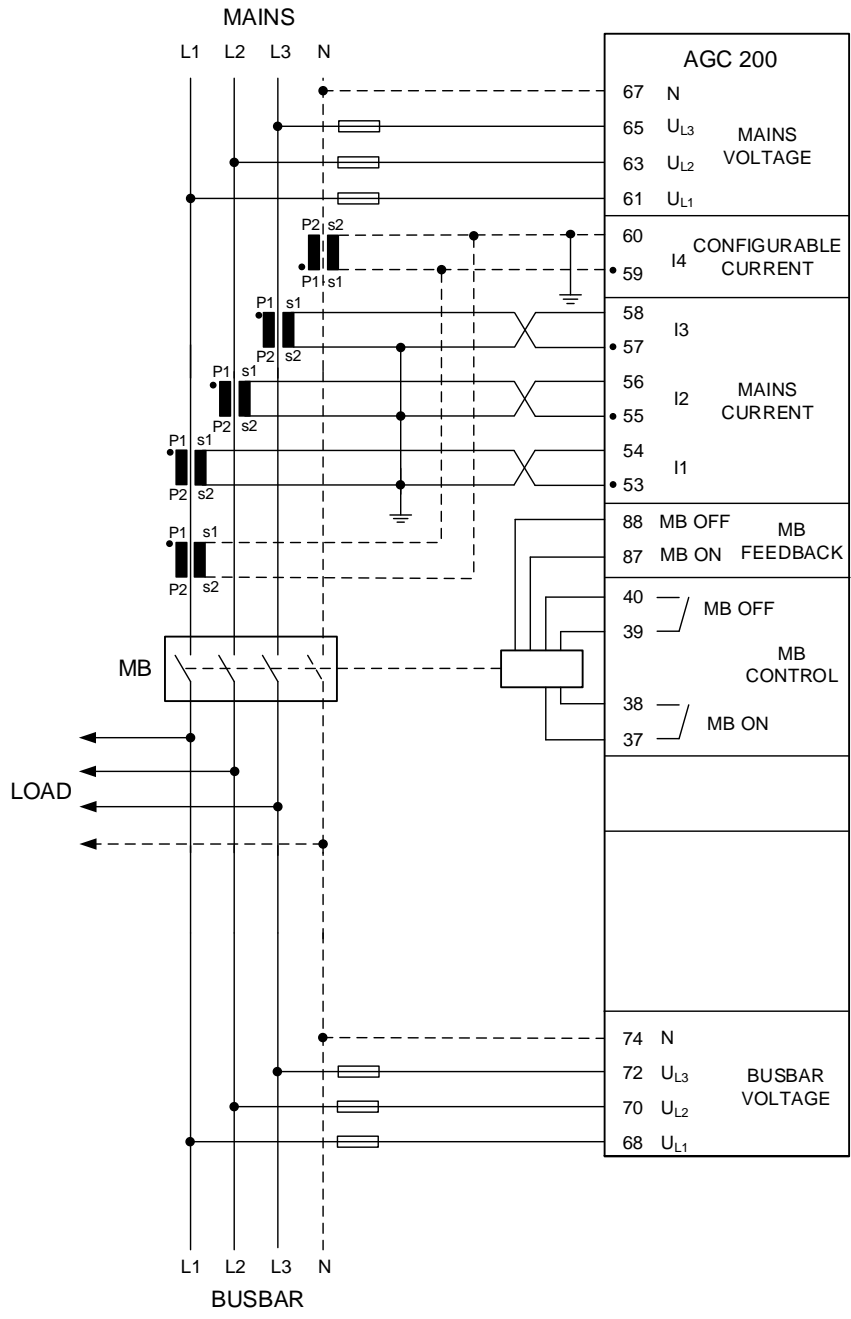
-  **Wiring indicated with dashed line is optional.**
-  **The phase angle between L1 and L3 voltages is 180°.**
-  **The application shown is for pulse breakers.**
-  **Terminals 59 and 60 are not available on AGC 21x and AGC 22x.**
-  **Be aware that the inputs for feedbacks shown above also need a common wire on terminal 91.
(Terminal 91 is common for 77 to 90).**

5.1.10 Island mode and power management (AGC 212/222/232/242/243)



-  **Wiring indicated with dashed line is optional.**
-  **1-phase and 2-phase systems are also supported.**
-  **The application shown is for pulse breakers.**
-  **Terminals 59 and 60 are not available on AGC 21x and AGC 22x.**
-  **Be aware that the inputs for feedbacks shown above also need a common wire on terminal 91.
(Terminal 91 is common for 77 to 90).**

5.1.11 Power management mains breaker (AGC 245)



 Wiring indicated with dashed line is optional.



1-phase and 2-phase systems are also supported.

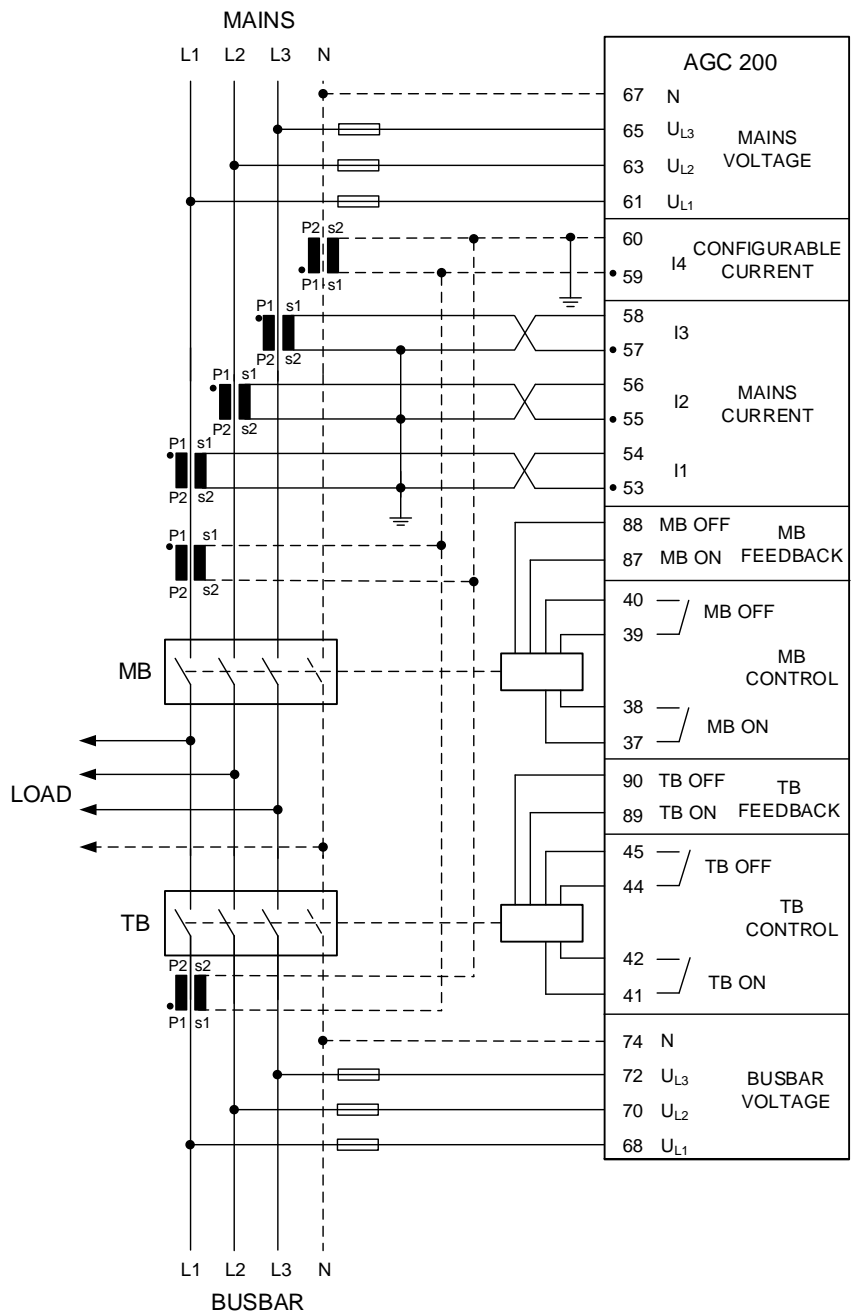


The application shown is for pulse breakers.



**Be aware that the inputs for feedbacks shown above also need a common wire on terminal 91.
(Terminal 91 is common for 77 to 90).**

5.1.12 Power management mains and tie breaker (AGC 246)



 Wiring indicated with dashed line is optional.



1-phase and 2-phase systems are also supported.

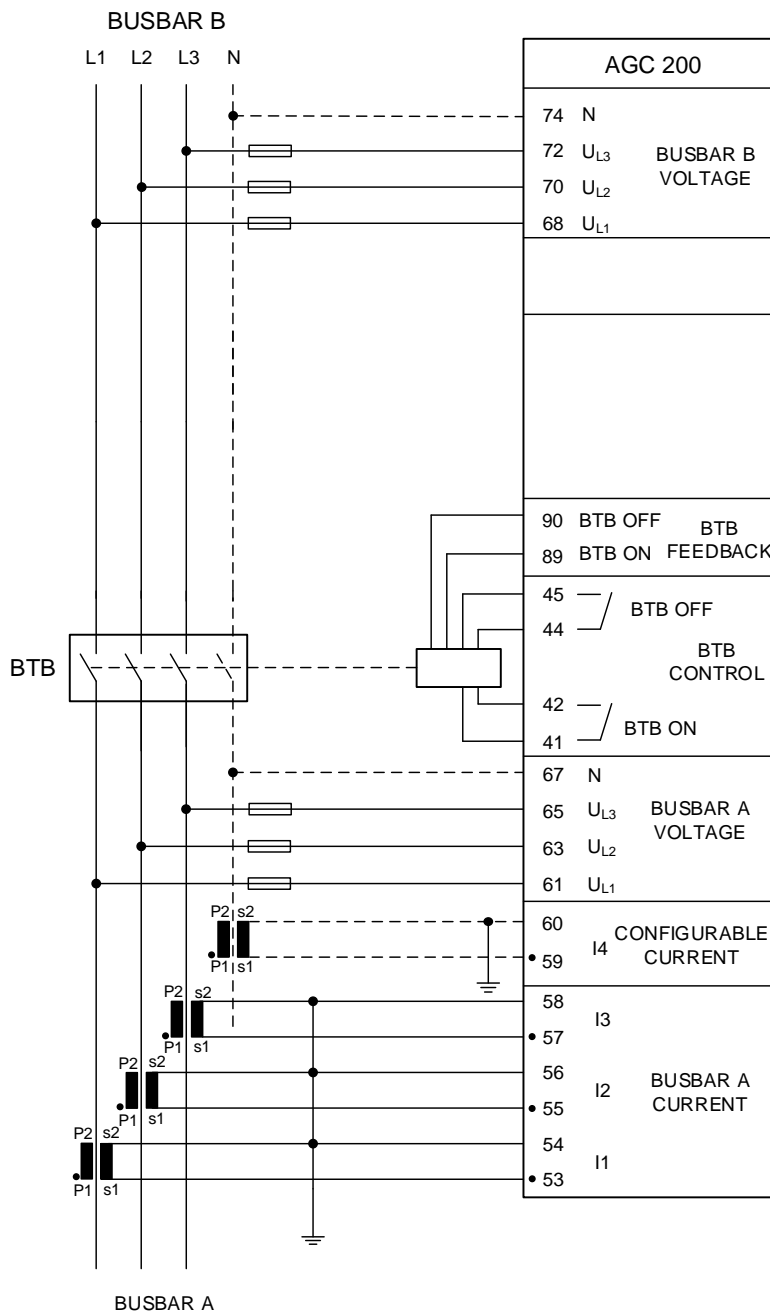


The application shown is for pulse breakers.






**Be aware that the inputs for feedbacks shown above also need a common wire on terminal 91.
(Terminal 91 is common for 77 to 90).**

5.1.13 Power management AGC 244 BTB

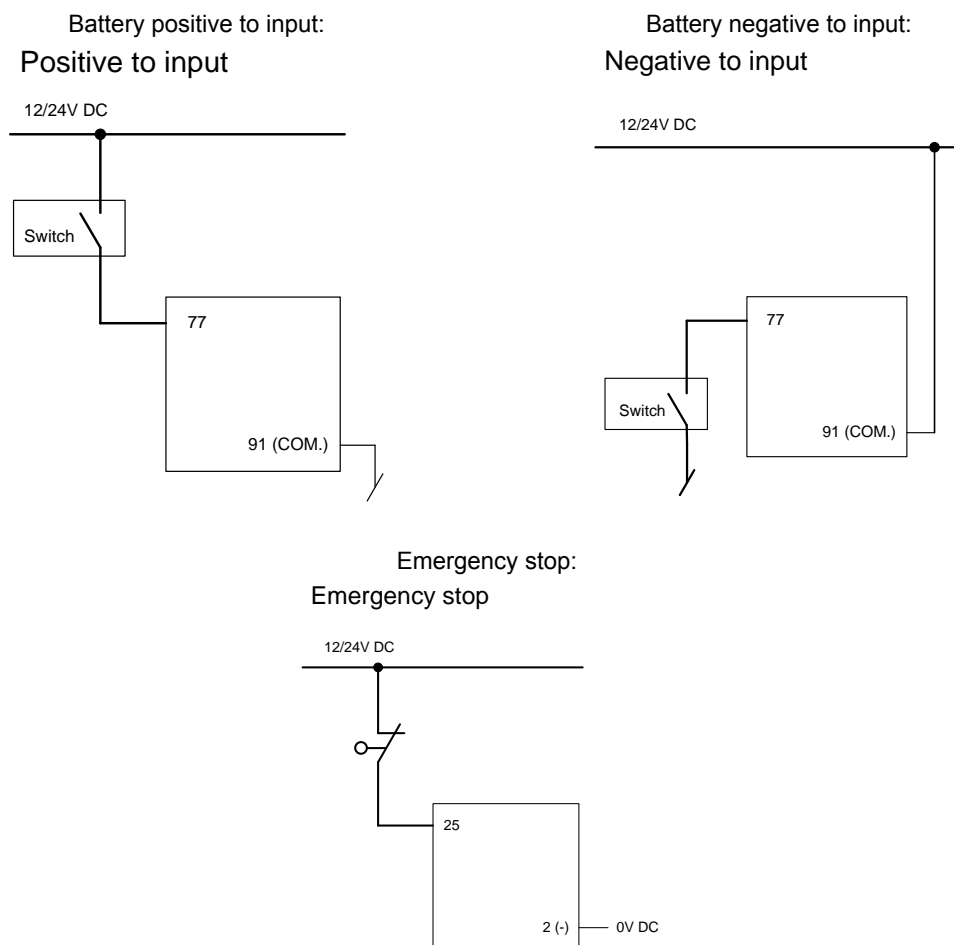


 Wiring indicated with dashed line is optional.

-  1-phase and 2-phase systems are also supported.
-  The application shown is for pulse breakers.
-  Be aware that the inputs for feedbacks shown above also need a common wire on terminal 91. (Terminal 91 is common for 77 to 90).

5.2 DC connections

5.2.1 Digital inputs



5.2.2 Multi-inputs

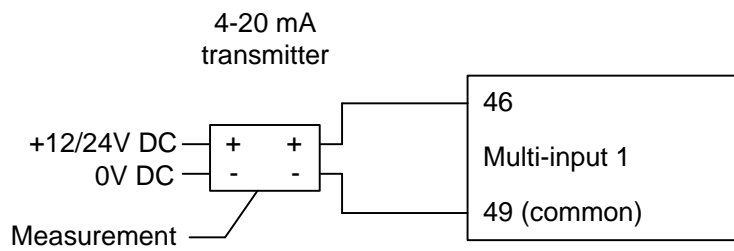
The AGC 200 unit has three multi-inputs, which can be configured to be used as the following input types:

1. 4 to 20 mA
2. Pt100

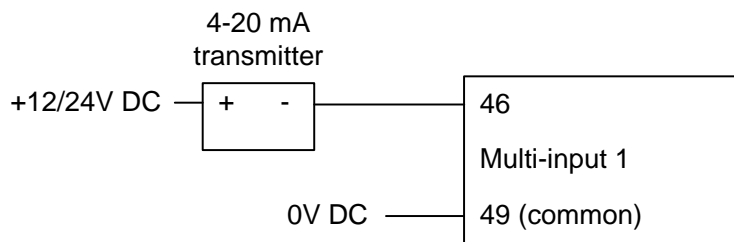
3. RMI oil
4. RMI water
5. RMI fuel
6. Digital

See the following sub-chapters for installation instructions for these input types. For further information regarding multi-inputs, see the "Designer's Reference Handbook".

5.2.3 Active transmitter

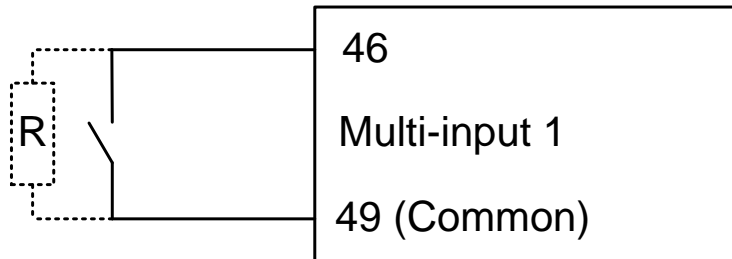


5.2.4 2-wire transmitter



If the 2-wire transmitter has its own battery supply, the voltage must not exceed 30 V DC.

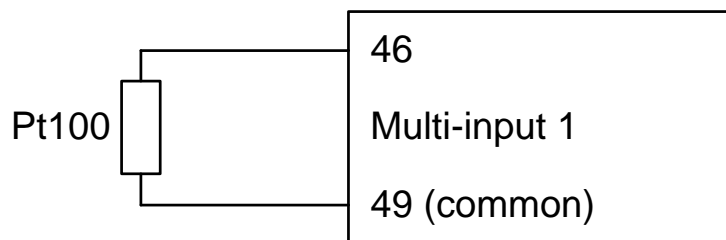
5.2.5 Digital inputs



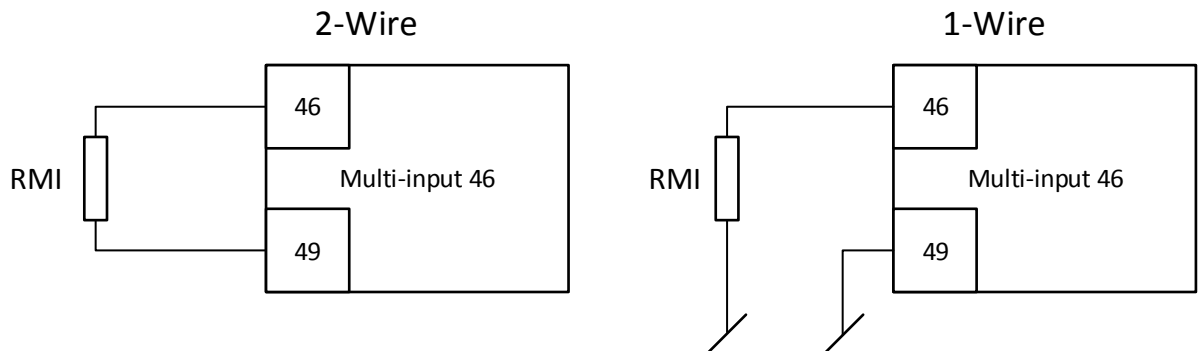
i Wire break monitoring resistor (if needed): $R = 240 \Omega$.

5.2.6 Pt100

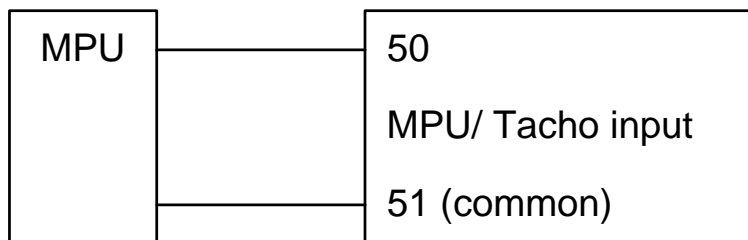
2-wire connections



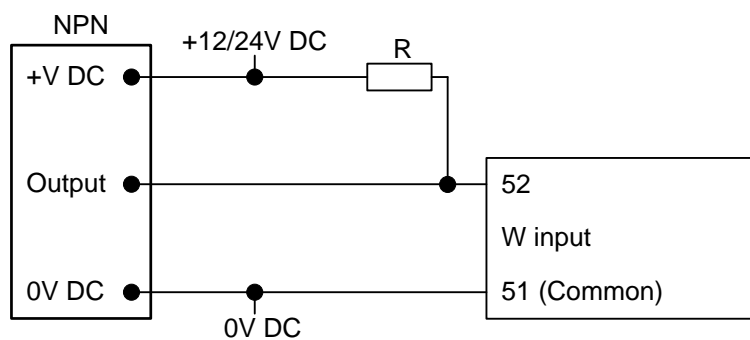
5.2.7 RMI



5.2.8 Magnetic pickup (MPU)

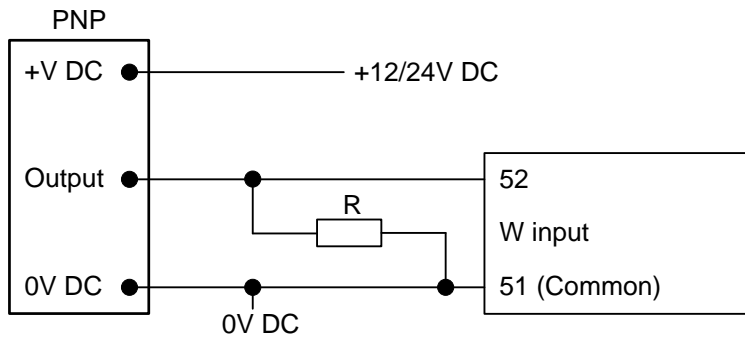


5.2.9 NPN sensor



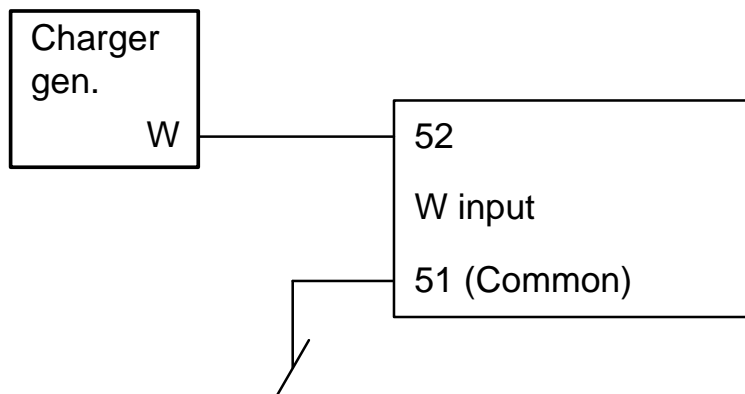
R = 1200Ω@24 V DC, 600Ω@12 V DC

5.2.10 PNP sensor

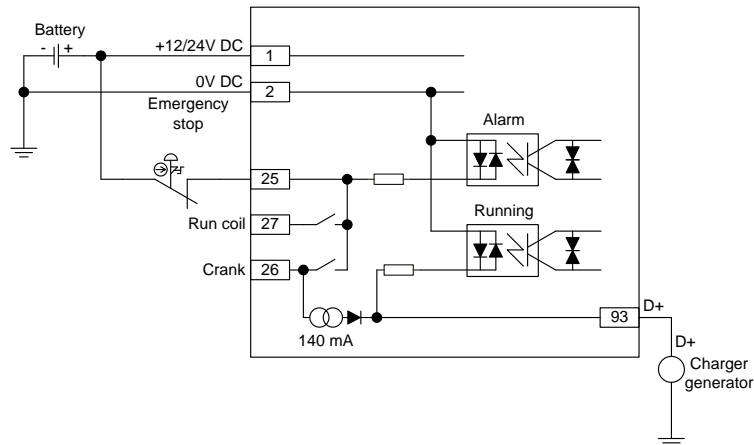


R = 1200Ω@24 V DC, 600Ω@12 V DC

5.2.11 Charger generator, W input



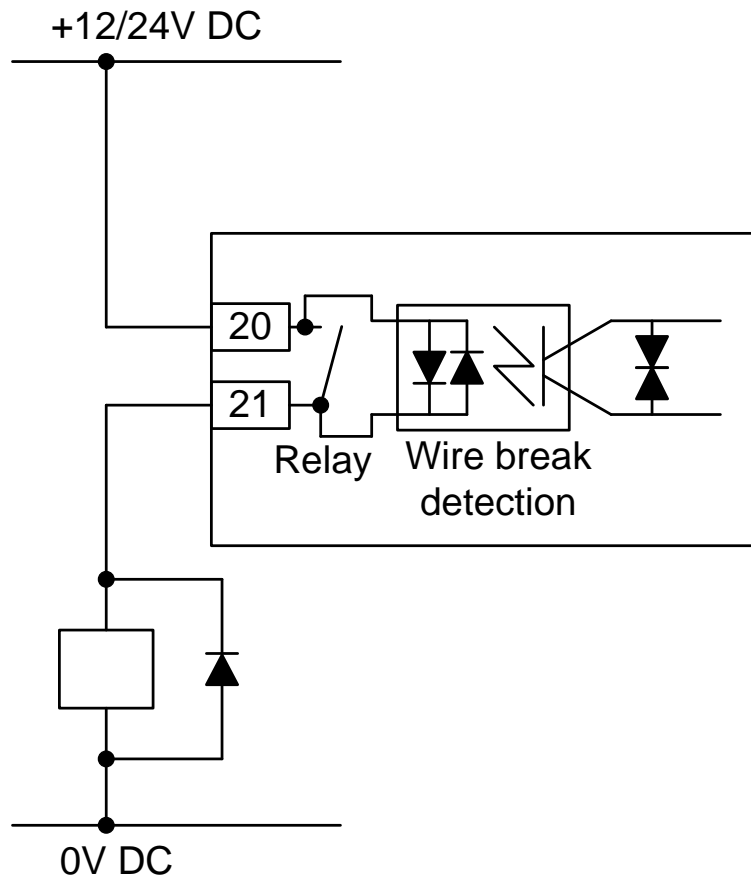
5.2.12 D+ connection, terminal 93



The D+ connection is used for two purposes:

- 1: Detection of engine running (in case the RPM input is not used).
This is done by detection of the 12/24 V DC build-up of the charger generator. When voltage comes up, the engine is running.
- 2: Helping the charger generator build up voltage.
When the crank relay output activates, it is fed 12/24 V from the emergency stop input (normally closed). At the same time, a 140 mA DC constant current generator will feed current into the terminal 93 (D+) connection. This will help excite the charger generator.

5.2.13 Stop coil



Remember to mount the freewheeling diode.



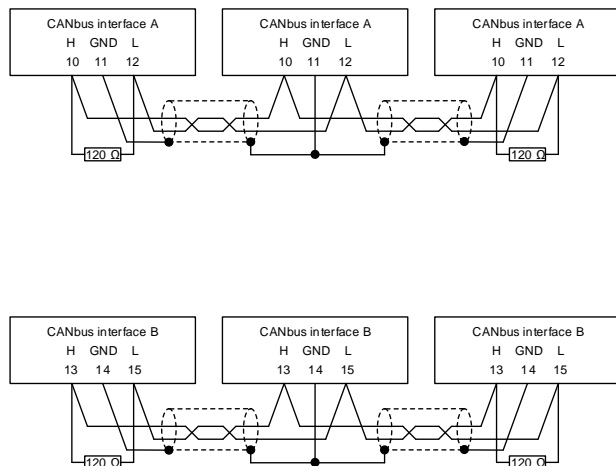
The wire break detection is only active when the output is OFF.

5.3 Communication

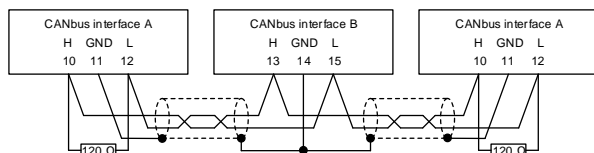
5.3.1 CAN bus

Examples with three AGC 242 units connected.

Until SW version 4.5x.x it is not possible to mix CAN bus wiring interface A and B. It has to be wired separately, as illustrated below.



From SW version 4.5x.x it is possible to mix the CAN wiring between A and B interfaces, if the interfaces that are wired together are configured to use matching protocols (channel 7840). For more information about available configuration of the CAN ports, see chapter "Available CAN ports". Below is an example of mixed CAN A and B.



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

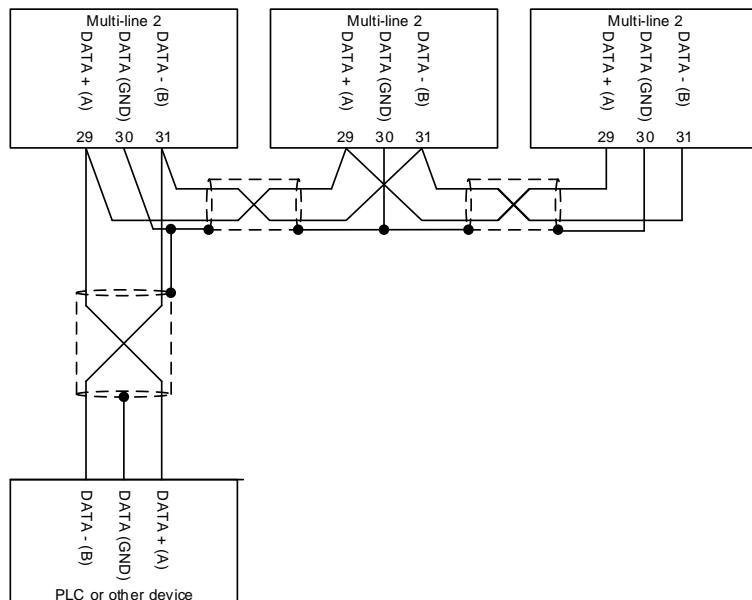







Use shielded twisted cable.



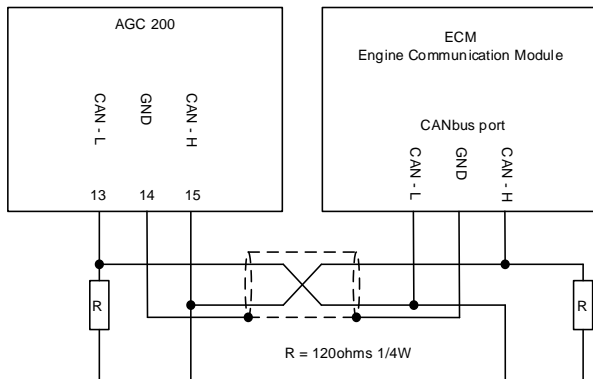
End resistor R = 120 Ohm.




5.3.2 Modbus (option H2)



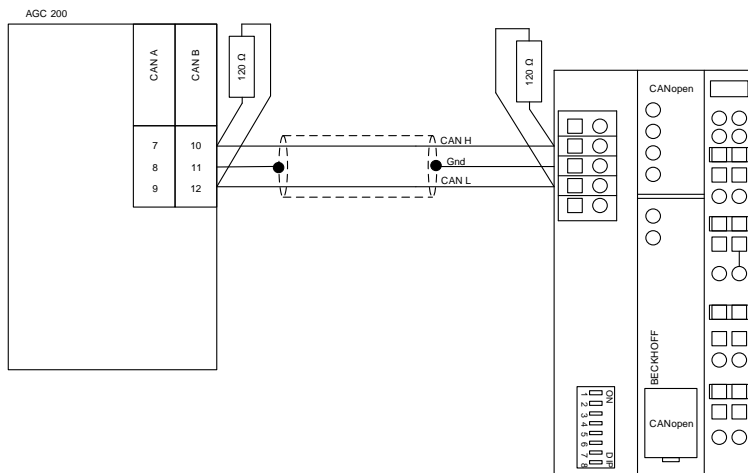
-  Connect AGC GND to AGC GND only via cable screen. Shield ends must be insulated with tape or insulation tubing.
-  The AGC GND terminal connection to cable screen must NOT be connected to 3rd party equipment unless the RS-485 gateway of this equipment is galvanically isolated from the rest. Do not connect cable screen to ground.
-  Normally, the Modbus does not need end terminating resistors. These are only needed in case of very long lines. If required, use $2 \times 120 \Omega$ 1/4 W resistors; place one resistor at each end of the RS-485 bus.
-  Cable: Belden 3105A or equivalent. 22 AWG (0.6 mm^2) twisted pair, shielded, $<40 \text{ m}\Omega/\text{m}$, min. 95 % shield coverage.
-  The AGC 200 has a fail-safe biasing function. It has internal 750Ω pull-up and pull-down resistors. Only one set of pull-up and pull-down resistors should be used at a time. Enable in one unit only. The biasing is selected in setting 7513.

5.3.3 CAN bus engine communication



-  Shield ends must be insulated with tape or insulation tubing.
-  Use shielded twisted cable.
-  The terminating resistor at the engine side may not be needed if it is incorporated in the engine controller. See the engine manufacturer's literature.

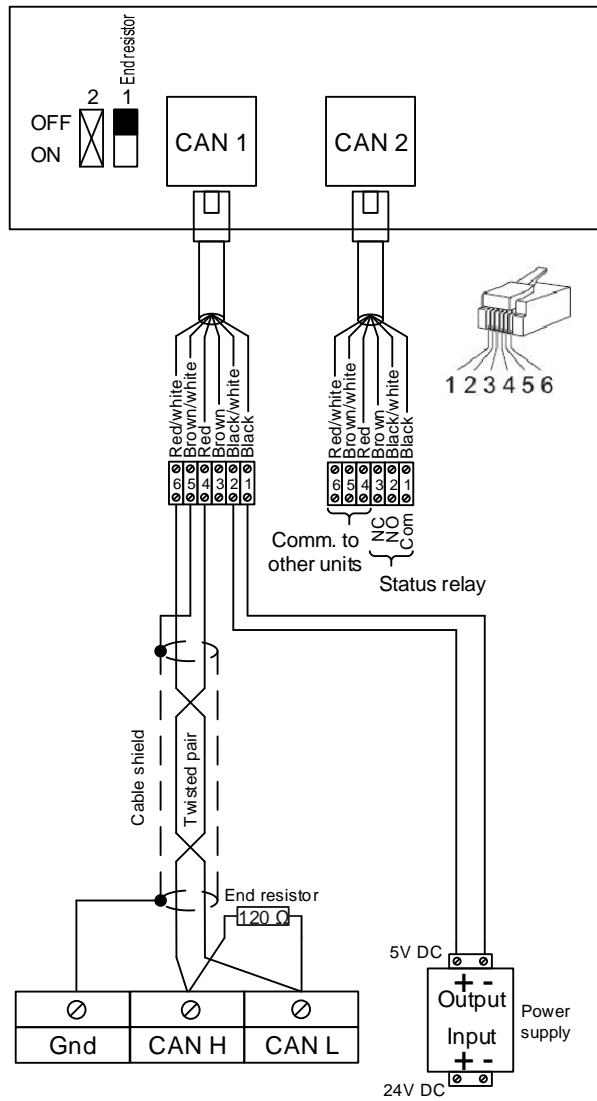
5.3.4 External I/O module (option H8)

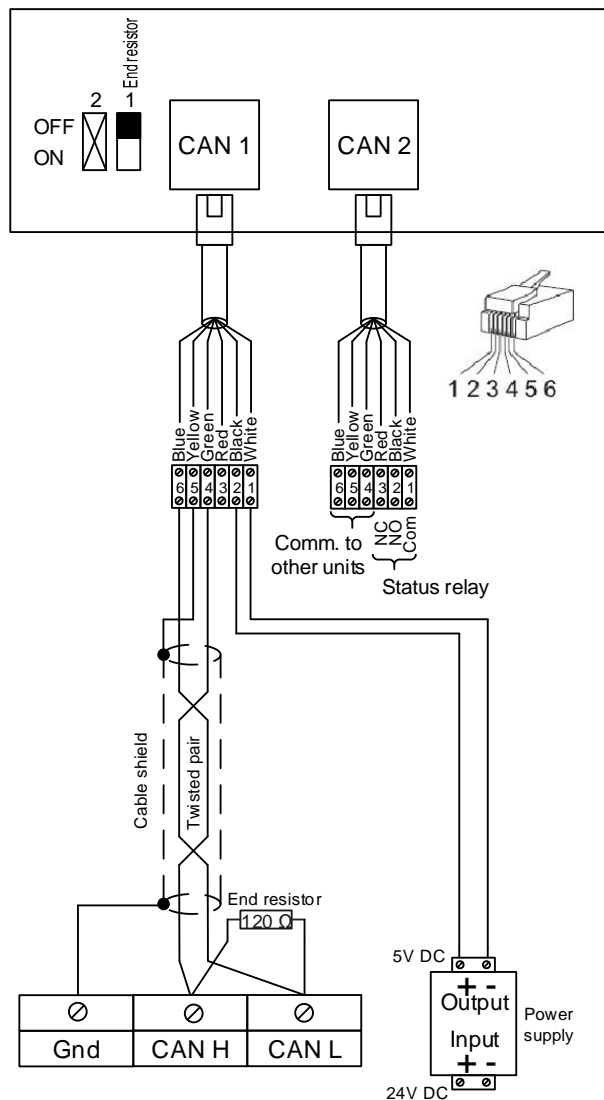


5.3.5 Additional operator panel AOP-2 (option X4)

More information on option X4 can be found in "Option X4 Additional Operator Panel AOP-2", document no. 4189340484.

ⓘ Be aware that two cables can be chosen, and that there is a difference in the colours of the wires. The diagrams below show how to wire up both cable types.





- i** If option H8 is used together with AOP-2, the total end resistance of the AOP-2 and the external I/O controller must be 120 Ω.
- i** A DC/DC converter for the DC supply voltage and 2 × 1 m cable with an RJ12 plug in one end and stripped wires in the other end are included in the AOP-2 delivery.

6. Technical information

6.1 Technical specifications

| | |
|------------------------------|---|
| Accuracy | <p>Class 1.0</p> <p>-40 to <u>15 to 30</u> to 70 °C</p> <p>Temperature coefficient: +/-0.2 % of full scale per 10 °C</p> <p>Short circuit: 5 % of 3.5*nominal current</p> <p>Earth current: 2 % of 1 A or 5 A To IEC/EN 60688</p> |
| Operating temperature | <p>-25 to 70 °C (-13 to 158 °F)</p> <p>UL/cUL Listed: Max. ambient temp. 50 °C/122 °F</p> <p>With option L2: -40 to 70 °C (-40 to 158 °F)</p> |
| Storage temperature | -40 to 70 °C (-40 to 158 °F) |
| Climate | 97 % RH to IEC 60068-2-30 |
| Operating altitude | Up to 3000 m above sea level |
| Measuring voltage | <p>100 to 690 V AC (+20 %)</p> <p>UL/cUL Listed: 100 to 600 V AC</p> <p>Phase to phase</p> <p>Load: 1.5 MΩ</p> |
| Frequency | 30 to 70 Hz |
| Measuring current | <p>1 A or 5 A AC from current transformer</p> <p>Consumption max.: 0.3 VA/phase</p> <p>UL/cUL Listed: Use listed or R/C (XODW2.8) current transformers</p> |
| Current overload | <p>The unit has been tested with the following currents:</p> <p>I_n 20 A: 60 s</p> <p>I_n 100 A: 10 s</p> <p>I_n 300 A: 1 s</p> |

| | |
|-------------------------------------|---|
| Magnetic pick-up input | <p>Voltage: 2 to 70 V peak</p> <p>Frequency: 10 to 10000 Hz</p> <p>Resistance: 250 to 3000 Ω</p> |
| Aux. supply | <p>6 to 36 V DC continuously</p> <p>UL/cUL Listed: 9 to 32.5 V DC</p> <p>0 V DC for 50 ms when coming from at least 12 V DC (cranking dropout)</p> <p>Reverse protection: -36 V continuously</p> <p>Battery voltage measurement accuracy: ±0.8 V within 8 to 30 V DC at -25 °C to 70 °C ±0.5 V within 8 to 30 V DC at 20 °C</p> <p>Max. 25 W consumption</p> <p>With option L2 -40 °C (-40 °F) Max. 45 W consumption</p> <p>The aux. supply inputs are to be protected by a 12 A slow-blow fuse</p> |
| Passive binary input voltage | <p>Bi-directional optocoupler</p> <p>ON: 8 to 36 V DC <2 V: OFF</p> <p>Impedance: 4.7 kΩ</p> |
| Emergency stop input voltage | <p>ON: +8 to 36 V DC (term. 25)</p> <p><2 V: OFF</p> <p>Impedance: 4.7 kΩ</p> |
| Multi-functional inputs | <p>Current input: 0(4) to 20 mA From active transmitter: 0 to 20 mA, +/-1 % Impedance: 50 Ω</p> <p>Binary input: Dry contact inputs 3 V DC internal supply, with cable supervision Max. resistance for ON detection: 100 Ω</p> <p>Pt100: -40 to 250 °C (-40 to 482 °F) +/-1 % To IEC/EN 60751</p> <p>RMI: 0 to 2500 Ω, +/-1 %</p> |

| | |
|---|--|
| Relay outputs, electrical rating | <p>Relays 16 to 20 and 28 to 43: 250 V AC/30 V DC 8 A UL/cUL Listed: 250 V AC/30 V DC 6 A General use B300 Pilot duty</p> <p>Relay 23: 36 V DC 8 A UL/cUL Listed: 24 V DC 8 A General use</p> <p>Relay 26 and 27: 36 V DC 16 A UL/cUL Listed: 24 V DC 16 A General use</p> |
| Galvanic separation AGC 222, 232 AGC 242, 243 AGC 244 AGC 245, 246 AGC 212, 213 | <p>Between AC voltage and other I/Os: 3250 V AC, 50 Hz, 1 minute Between AC current and other I/Os: 2200 V AC, 50 Hz, 1 minute Between relay outputs and other I/Os: 2200 V AC, 50 Hz, 1 minute Between aux. supply and other I/Os: 550 V AC, 50 Hz, 1 minute. Between binary input groups and other I/Os: 550 V AC, 50 Hz, 1 minute Between analogue input groups and other I/Os: 550 V AC, 50 Hz, 1 minute The same as above, but with no galvanic separation on analogue input groups</p> |
| Mounting | Panel-mounted |
| Front size | 312 × 219 mm (122.8 × 86.2 in) |
| Panel cutout | 297 × 204 mm (11.69 × 8.03 in) Tolerance: +0.4/-0 mm |
| Display | 240 × 128 pixel backlight STN |
| Safety | <p>To EN 61010-1, installation category (over-voltage category) III, 600 V, pollution degree 2</p> <p>To UL508 and CSA22.2 No. 14-05 Installation category (over-voltage category) III, 600 V, pollution degree 2</p> |
| Protection | <p>Front: IP52/NEMA type 1 (IP66/NEMA type 1 with gasket, option L1) Terminals: IP20/NEMA type 1 To IEC/EN 60529</p> |
| EMC/CE | <p>To EN 61000-6-1/2/3/4 IEC 60255-26 IEC 60533 power distr. zone IACS UR E10 power distr. zone</p> |
| Vibration | <p>3 to 13.2 Hz: 2 mm_{pp}. 13.2 to 100 Hz: 0.7 g. To IEC 60068-2-6 and IACS UR E10 10 to 60 Hz: 0.15mm_{pp}. 60 to 150 Hz: 1 g. To IEC 60255-21-1 Response (class 2) 10 to 150 Hz: 2 g. To IEC 60255-21-1 Endurance (class 2)</p> |
| Shock | <p>10 g, 11 ms, half sine. To IEC 60255-21-2 Response (class 2) 30 g, 11 ms, half sine. To IEC 60255-21-2 Endurance (class 2) 50 g, 11 ms, half sine. To IEC 60068-2-27</p> |
| Bump | 20 g, 16 ms, half sine. To IEC 60255-21-2 (class 2) |
| Material | All plastic materials are self-extinguishing according to UL94 (V1) |

| | |
|-------------------------|--|
| Plug connections | AC voltage/current inputs: 3.5 mm ² (13 AWG) multi-stranded Other: 1.5 mm ² (16 AWG) multi-stranded Service port: USB A-B TCP/IP: RJ 45 |
| Tightening torque | For further information, see chapter 3 "Mounting" |
| Approvals | UL/cUL Listed to UL508 UL/cUL Recognized to UL2200 |
| Weight | AGC 200: 1.6 kg (3.5 lbs) Option J6: 0.2 kg (0.4 lbs) AOP-2: 0.4 kg (0.9 lbs) |

| | |
|---|---|
| Response times (Delay set to minimum) | Busbar: Over-/under-voltage: < 50 ms Over-/under-frequency: < 50 ms Generator: Reverse power: <200 ms Over-current: <200 ms Short circuit: < 40 ms Directional over-current: <100 ms Over-/under-voltage: <200 ms Over-/under-frequency: <300 ms Overload: <200 ms Current unbalance: <200 ms Voltage unbalance: <200 ms React. power import: <200 ms React. power export: <200 ms Negative sequence I: <400 ms Negative sequence U: <400 ms Zero sequence I: <400 ms Zero sequence U: <400 ms Overspeed: <400 ms Digital inputs: <250 ms Analogue input: <250 ms Emergency stop: <200 ms Earth current: <100 ms Mains: df/dt (ROCOF): <130 ms (4 periods) Vector jump: < 40 ms |
|---|---|

| | |
|--------------------|---|
| | <p>Positive sequence: < 60 ms</p> <p>Time-dependent under-voltage, $U_t < 50$ ms</p> <p>Under-voltage and reactive power low, $U_Q < 250$ ms</p> |
| UL markings | <p>Wiring: Use 60/75 °C copper conductors only</p> <p>Wire size: AWG 30-12</p> <p>Terminal tightening torque: 5-7 lb-in</p> <p>Mounting: For use on a flat surface of a type 1 enclosure</p> <p>Installation: To be installed in accordance with the NEC (US) or the CEC (Canada)</p> |