37366A

GCP-30 Series
Rental Package Genset Control

Installation
Software Version from V4.3046

Manual 37366A

WARNING

Read this entire manual and all other publications pertaining to the work to be performed before installing, operating, or servicing this equipment. Practice all plant and safety instructions and precautions. Failure to follow instructions can cause personal injury and/or property damage.

The engine, turbine, or other type of prime mover should be equipped with an overspeed (overtemperature, or overpressure, where applicable) shutdown device(s), that operates totally independently of the prime mover control device(s) to protect against runaway or damage to the engine, turbine, or other type of prime mover with possible personal injury or loss of life should the mechanical-hydraulic governor(s) or electric control(s), the actuator(s), fuel control(s), the driving mechanism(s), the linkage(s), or the controlled device(s) fail.

Any unauthorized modifications to or use of this equipment outside its specified mechanical, electrical, or other operating limits may cause personal injury and/or property damage, including damage to the equipment. Any such unauthorized modifications: (i) constitute "misuse" and/or "negligence" within the meaning of the product warranty thereby excluding warranty coverage for any resulting damage, and (ii) invalidate product certifications or listings.

CAUTION

To prevent damage to a control system that uses an alternator or battery-charging device, make sure the charging device is turned off before disconnecting the battery from the system.

Electronic controls contain static-sensitive parts. Observe the following precautions to prevent damage to these parts.

- **Discharge body static before handling the control (with power to the control turned off, contact a grounded surface and maintain contact while handling the control).**
- **Avoid all plastic, vinyl, and Styrofoam (except antistatic versions) around printed circuit boards.**
- **Do not touch the components or conductors on a printed circuit board with your hands or with conductive devices.**

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Important definitions

WARNING

Indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.

CAUTION

Indicates a potentially hazardous situation that, if not avoided, could result in damage to equipment.

NOTE

Provides other helpful information that does not fall under the warning or caution categories.

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Revision History

Rev.	Date	Editor	Changes
NEW	06-01-11	TP	Release
A	07-02-07	TP	Technical Data and CAN bus section updated; minor corrections

Contents

Illustrations and Tables

Illustrations

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Tables

Chapter 1.
General Information

Type		English	German
GCP-31/32 Series			
GCP-31/RPQ - Installation	this manual ⇨	37366	GR37366
GCP-31/RPQ - Configuration		37367	GR37367
GCP-31/32 - Function/Operation		37238	GR37238
GCP-31/32 - Application		37240	GR37240
GCP-31/32 Packages - Installation		37364	GR37364
GCP-31/32 Packages - Configuration		37365	GR37365
Option SC09/SC10 - CAN bus coupling		37382	GR37382
Additional Manuals			
SYNCONpanel - Manual		37187	-
Transportable remote synchronizing panel that transfers a local measured difference between two voltage systems via CAN bus to the rental package genset control.			
LeoPC1 - Manual		37146	GR37146
PC program for visualization, configuration, remote control, data logging, language upload, alarm and user management and management of the event recorder. This manual describes the use of the program.			
LeoPC1 - Manual		37164	GR37164
PC program for visualization, configuration, remote control, data logging, language upload, alarm and user management and management of the event recorder. This manual describes the programming of the program.			
IKD 1 - Manual		37135	GR37135
Discrete expansion board with 8 discrete inputs and 8 relay outputs that can be coupled via the CAN bus to the control unit. Assessment of the discrete inputs as well as control of the relay outputs is done via the control unit.			
GW 4 - Manual		37133	GR37133
Gateway for transferring the CAN bus to any other interface or bus.			

Table 1-1: Manual - Overview

Intended Use: This control is intended to be operated according to the guidelines described in this manual. The prerequisite for a proper and safe operation of the product is correct transportation, storage, and installation as well as careful operation and maintenance.

NOTE

This manual has been developed for a control fitted with all available options. Inputs/outputs, functions, configuration screens and other details described, which do not exist on your control may be ignored.

The present manual has been prepared to enable the installation and commissioning of the control. Due to the large variety of parameter settings, it is not possible to cover every combination. The manual is therefore only a guide. In case of incorrect entries or a total loss of functions, the default settings can be taken from the list of parameters located in the appendix of the Configuration manual.

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Chapter 2.
Electrostatic Discharge Awareness

All electronic equipment is static-sensitive, some components more than others. To protect these components from static damage, you must take special precautions to minimize or eliminate electrostatic discharges.

Follow these precautions when working with or near the control.

1. Before doing maintenance on the electronic control, discharge the static electricity on your body to ground by touching and holding a grounded metal object (pipes, cabinets, equipment, etc.).

2. Avoid the build-up of static electricity on your body by not wearing clothing made of synthetic materials. Wear cotton or cotton-blend materials as much as possible because these do not store static electric charges as much as synthetics.

3. Keep plastic, vinyl, and Styrofoam materials (such as plastic or Styrofoam cups, cup holders, cigarette packages, cellophane wrappers, vinyl books or folders, plastic bottles, and plastic ash trays) away from the control, the modules, and the work area as much as possible.

4. **Opening the Control unit will void the warranty!**
   Do not remove the printed circuit board (PCB) from the control cabinet unless absolutely necessary. If you must remove the PCB from the control cabinet, follow these precautions:

   - Make sure that the unit is completely de-energized (all connectors have to be pulled off).
   - Do not touch any part of the PCB except the edges.
   - Do not touch the electrical conductors, connectors, or components with conductive devices or with bare hands.
   - When replacing a PCB, keep the new PCB in the plastic antistatic protective bag it comes in until you are ready to install it. Immediately after removing the old PCB from the control unit, place it in the antistatic protective bag.

WARNING

To prevent damage to electronic components caused by improper handling, read and observe the precautions in Woodward manual 82715, *Guide for Handling and Protection of Electronic Controls, Printed Circuit Boards, and Modules.*

Chapter 3.
Housing

Dimensions

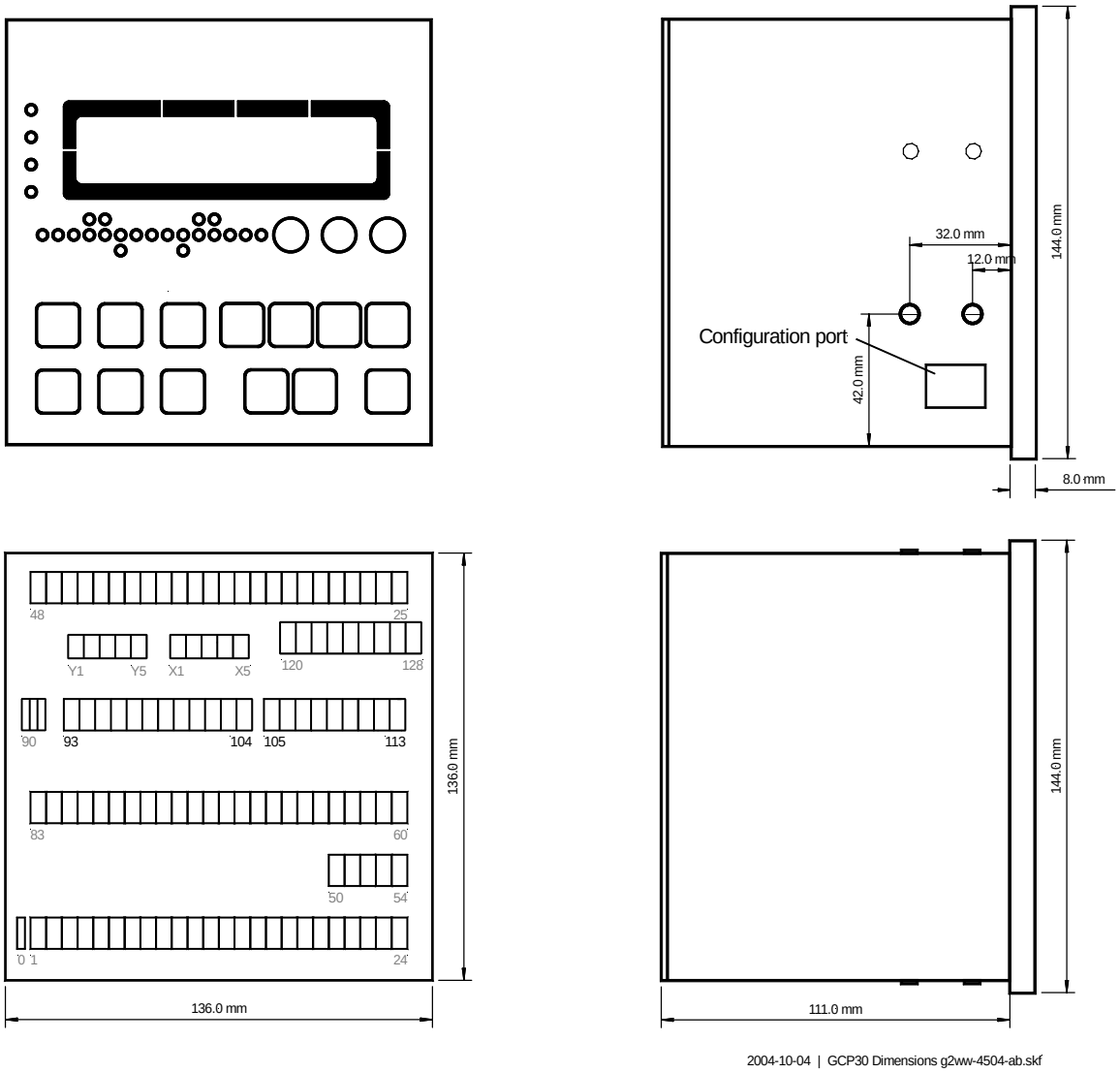

Figure 3-1: Housing - Dimensions

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Panel Cut-Out

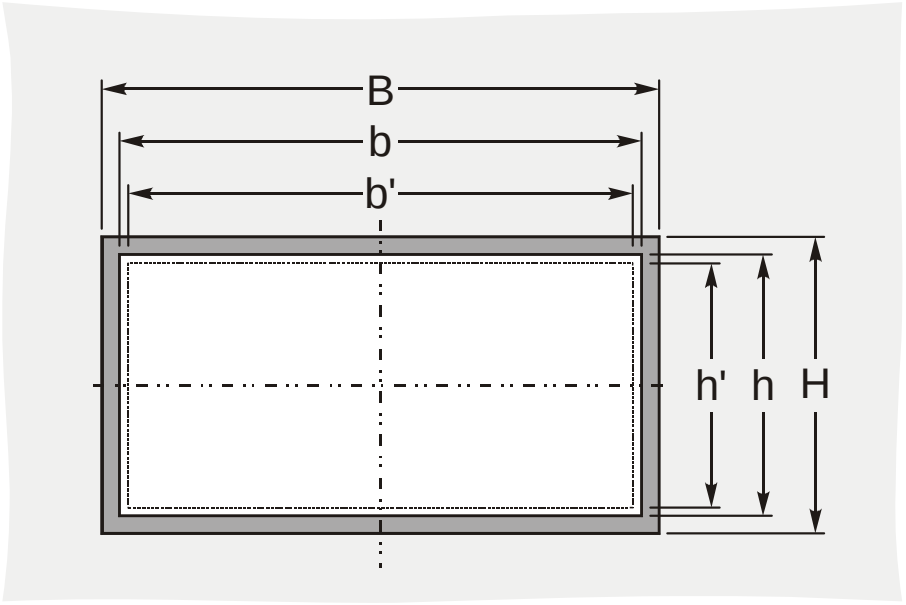

Figure 3-2: Housing - Control panel cut-out

Measure	Description			Tolerance
H	Height	Total	144 mm	---
h		Panel cut-out	138 mm	+ 1.0 mm
h'		Housing dimension	136 mm	
B	Width	Total	144 mm	---
b		Panel cut-out	138 mm	+ 1.0 mm
b'		Housing dimension	136 mm	
	Depth	Total	118	---

Table 3-1: Housing - panel cut-out

Side view

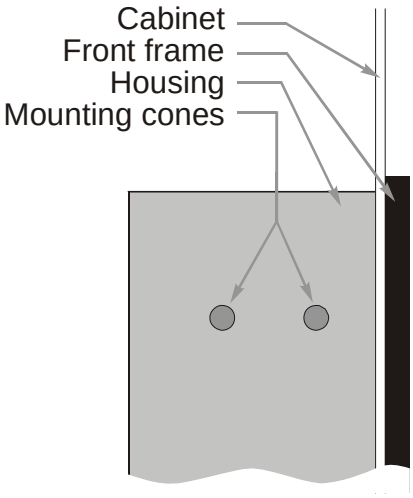

Figure 3-3: Side view - without clamps

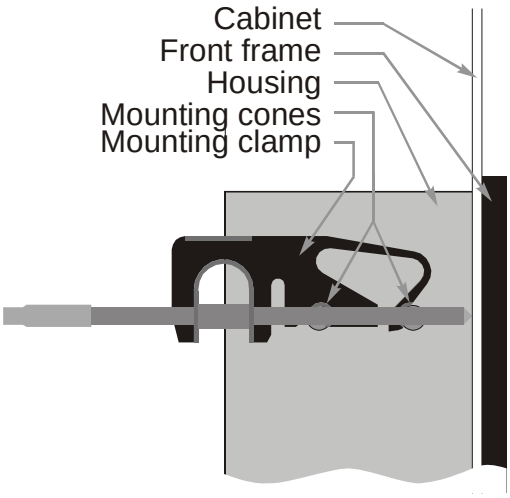

Figure 3-4: Side view - with clamps

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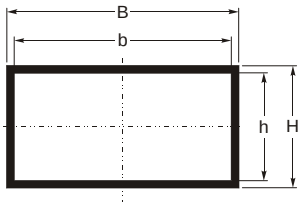
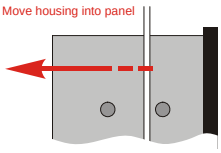
Installation

For installation into a door panel proceed as follows:

1. **Panel cut-out**
   Cut out the panel according to the dimensions in Figure 3-1.



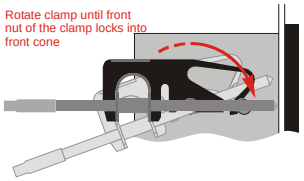
2. **Insert control into cut-out**
   Insert the control into the panel cut-out. Verify that the control fits correctly in the cut-out. If the panel cut-out is not big enough, enlarge it accordingly.



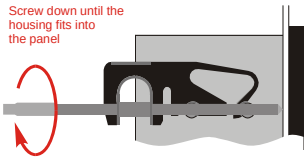
3. **Attach mounting clamps**
   Rotate clamps according to the picture on the right until they snap into the mounting cones.

a)

b)



4. **Screw clamps**
   Tighten the screw clamps until the housing is pressed and fixed against the panel. Be careful not to over tighten the clamps, which can unsnap the front frame from the housing. If this happens remove the control from the panel and reattach the frame by pressing firmly against the housing.



Note: Using the gasket kit (P/N 8923-1043) increases the IP protection from IP42 to IP54 from front. Mounting of the gasket is described in the manual supplied with the gasket kit.

Chapter 4.
Wiring Diagrams - Overview

WARNING

A circuit breaker must be located near to the control and in a position easily accessible to the operator. This must also bear a sign identifying it as an isolating switch for the control.

NOTE

Connected inductances (e.g. operating current coils, undervoltage tripping devices, auxiliary contactors, and/or power contactors) must be wired with an appropriate interference protection.

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GCP-31/RPQ+SC09 Rental Package

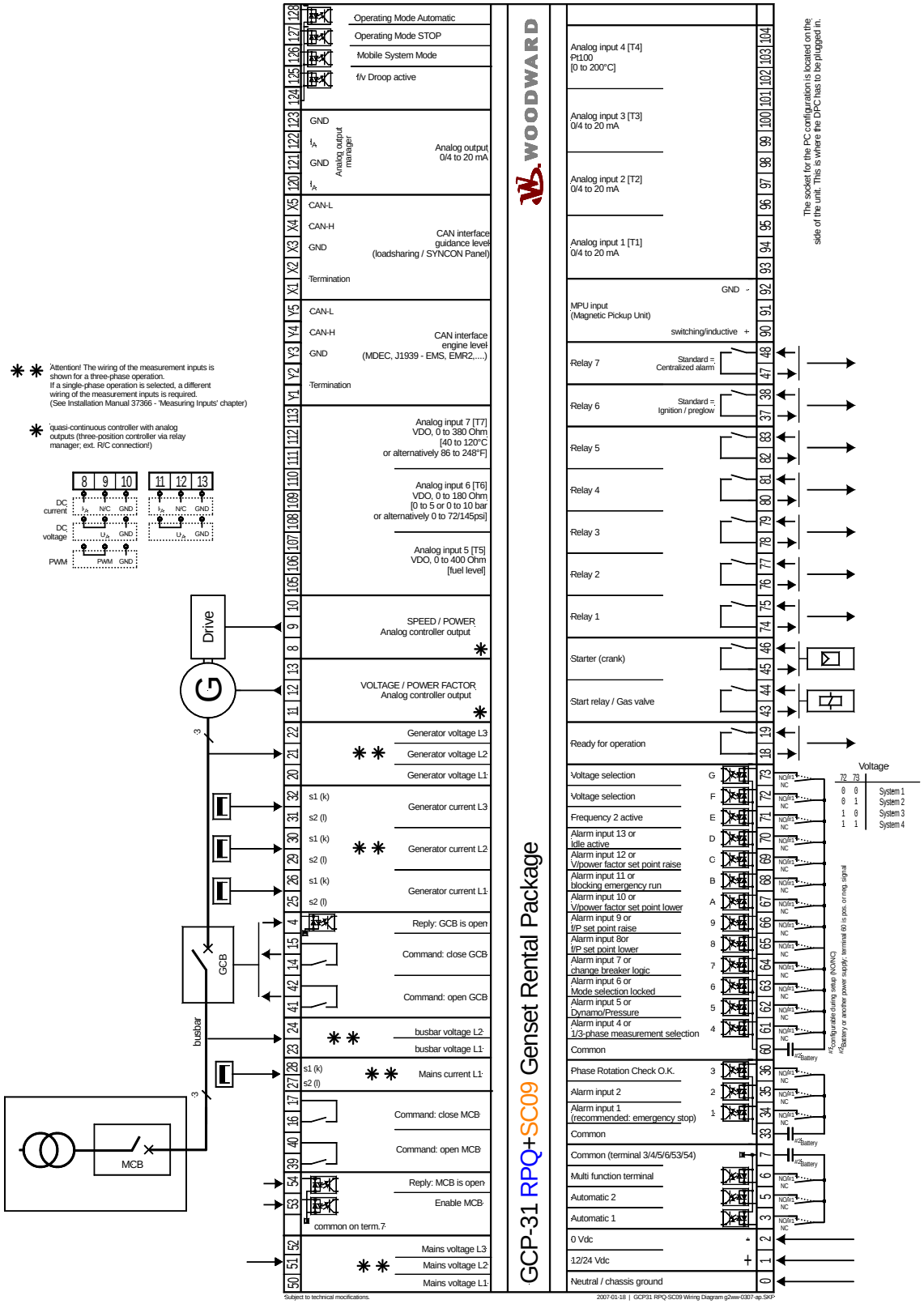

Figure 4-1: Wiring diagram GCP-31/RPQ+SC09 Rental Package

Chapter 5.
Connectors - Details

WARNING

All technical data and ratings indicated in this chapter are not definite! Only the values indicated in Technical Data on page 37 are valid!

The following chart may be used to convert square millimeters [mm²] to AWG and vice versa:

AWG	mm²	AWG	mm²	AWG	mm²	AWG	mm²	AWG	mm²	AWG	mm²
30	0.05	21	0.38	14	2.5	4	25	3/0	95	600MCM	300
28	0.08	20	0.5	12	4	2	35	4/0	120	750MCM	400
26	0.14	18	0.75	10	6	1	50	300MCM	150	1000MCM	500
24	0.25	17	1.0	8	10	1/0	55	350MCM	185		
22	0.34	16	1.5	6	16	2/0	70	500MCM	240		

Table 5-1: Conversion chart - wire size

Power Supply

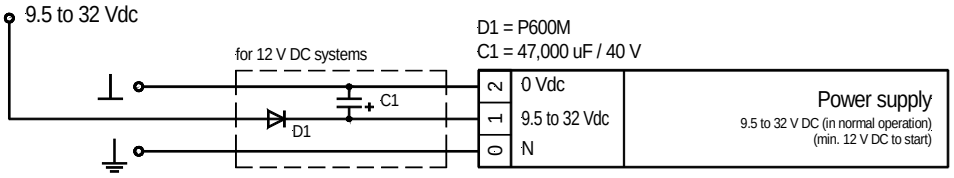

Figure 5-1: Power supply

Terminal	Description	A_{max}
0	Neutral point of the three-phase wye system or neutral terminal of the voltage transformer (Measuring reference point)	2.5 mm²
1	9.5 to 32 Vdc, 15 W	2.5 mm²
2	0 Vdc reference point	2.5 mm²

Table 5-2: Terminal assignment - power supply

NOTE

Please note the above description in an application with 12 Vdc power supply.

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Measuring Inputs

CAUTION

The usage of the voltage and current measuring inputs for three-phase or single-phase measuring depends on the configuration of the parameter "Single phase" (refer to configuration manual 37367, Parameter chapter, Measuring section).

It must be observed that the voltage and current measuring inputs must be wired differently when changing between three- and single-phase operation.

NOTE

If a three-wire system is connected, terminal 0 must remain disconnected. If terminal 0 is connected, the control may monitor a voltage that exceeds the permissible limits.

Voltage Three-Phase

Generator

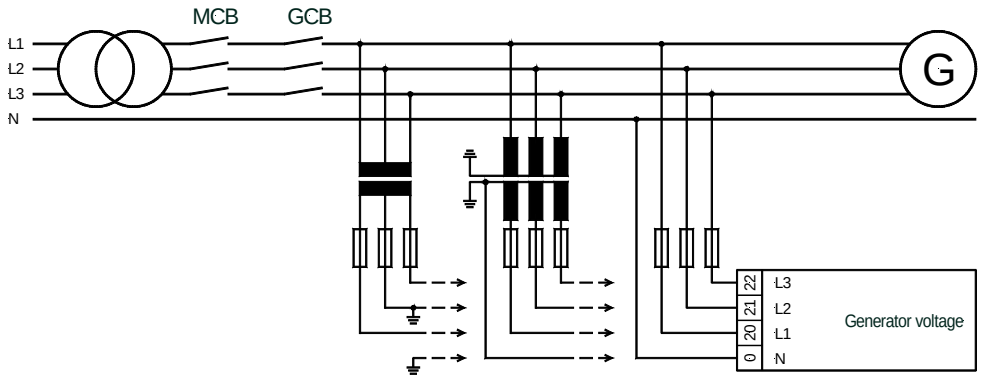

Figure 5-2: Measuring inputs - Voltage - Generator three-phase

Terminal	Measurement	Description	A_{max}
20	400 Vac or ../100 Vac	Generator voltage L1	2.5 mm²
21		Generator voltage L2	2.5 mm²
22		Generator voltage L3	2.5 mm²
0		Neutral point of the 3-phase wye system/transformer	2.5 mm²

Table 5-3: Terminal assignment - generator voltage measuring three-phase

NOTE

A GCP-30 controller with 400V PT inputs and potential transformers with 100V secondary outputs must be used for 480V delta applications. The GCP-30 will not properly protect the generator or system from overvoltage fault conditions if a GCP-30 with 100V PT inputs is used with 100V potential transformers or a 400V PT input unit is directly connected to a 480V system. The 100V model inputs are limited to measuring voltage up to 125V and an overvoltage fault would exceed this range. The 400V model of the GCP-30 is also unable to monitor for overvoltage faults if potential transformers are not utilized due to the overvoltage fault exceeding the voltage monitoring range of maximum 500V as well.

NOTE

The GCP-31/RPQ+SC09 Rental Package is only designed for low voltage systems with neutral earthing. The measuring voltage may be up to a maximum of 480 V. There are no settings for the potential transformers.

Busbar

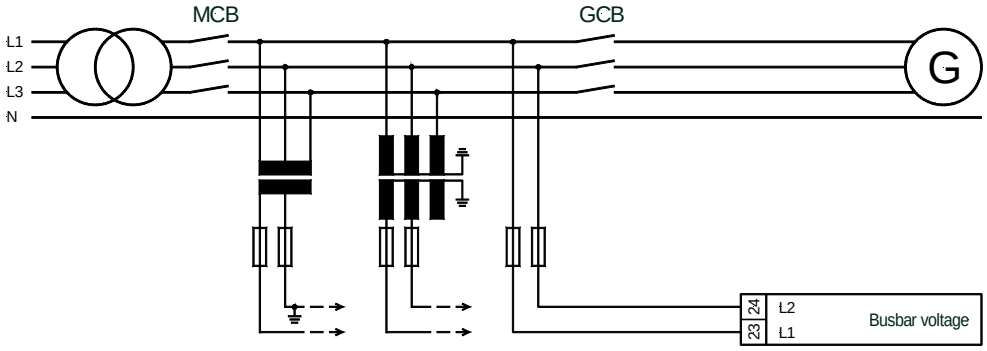

Figure 5-3: Measuring inputs - Voltage - Busbar three-phase

Terminal	Measurement	Description	A_{max}
23	400 Vac or ../100 Vac	Busbar voltage L1	2.5 mm²
24		Busbar voltage L2	2.5 mm²

Table 5-4: Terminal assignment - busbar voltage measuring three-phase

NOTE

The GCP-31 RPQ+SC09 Rental Package expects a "Phase rotation check O.K." signal on terminal 36 for the busbar voltage. If this signal is not present when busbar voltage is detected, the message "Phase sequence" is displayed and closing the CBs is blocked.

If the phase rotation shall not be monitored, the input at terminal 36 must be enrgized.

Mains

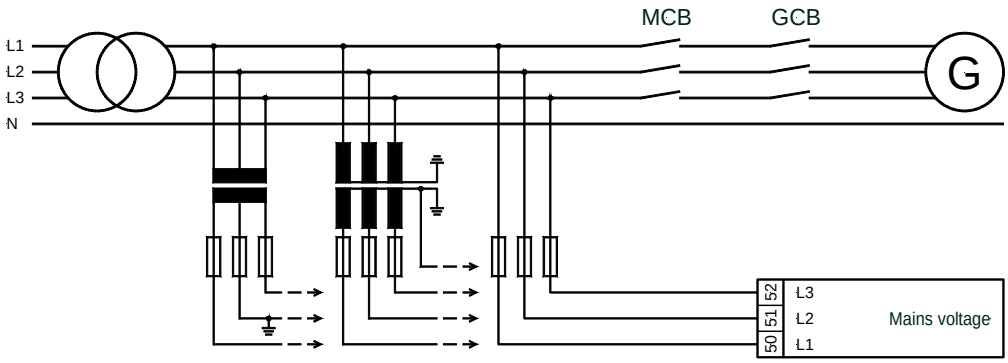

Figure 5-4: Measuring inputs - Voltage - Mains three-phase

Terminal	Measurement	Description	A_{max}
50	400 Vac or ../100 Vac	Mains voltage L1	2.5 mm²
51		Mains voltage L2	2.5 mm²
52		Mains voltage L3	2.5 mm²
0		Neutral point of the 3-phase system / transformer	2.5 mm²

Table 5-5: Terminal assignment - mains voltage measuring three-phase

NOTE

The mains voltage measuring inputs must be connected if the unit is used in mains parallel operation.

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Current Three-Phase

WARNING

Before disconnecting the secondary terminals of the current transformer or the connections of the current transformer at the control, ensure that the transformer is short-circuited.

NOTE

Current transformers are generally to be grounded on one side of the secondary.

Generator

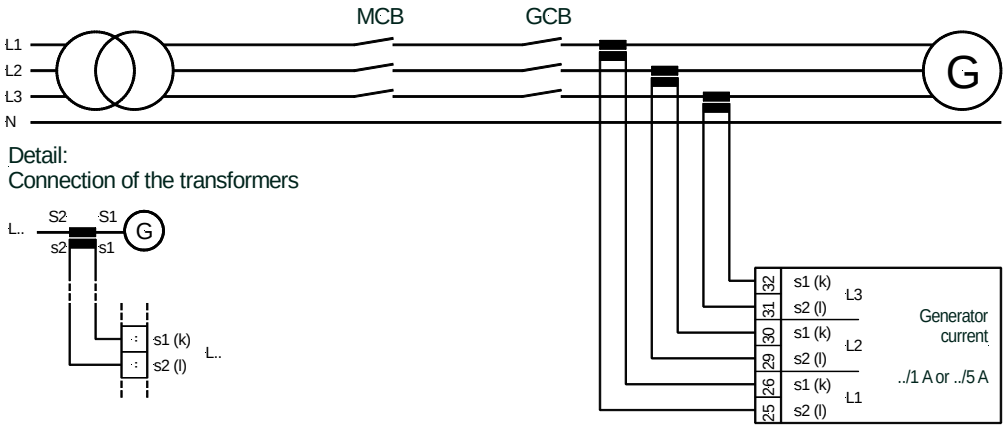

Figure 5-5: Measuring inputs - Current - Generator three-phase

Terminal	Measurement	Description	A_{max}
25	Transformer ../1 A or ../5 A	Generator current L1, transformer terminal s2 (l)	2.5 mm²
26		Generator current L1, transformer terminal s1 (k)	2.5 mm²
29		Generator current L2, transformer terminal s2 (l)	2.5 mm²
30		Generator current L2, transformer terminal s1 (k)	2.5 mm²
31		Generator current L3, transformer terminal s2 (l)	2.5 mm²
32		Generator current L3, transformer terminal s1 (k)	2.5 mm²

Table 5-6: Terminal assignment - generator current measuring three-phase

Mains (Mains Current Measuring Via Transformer)

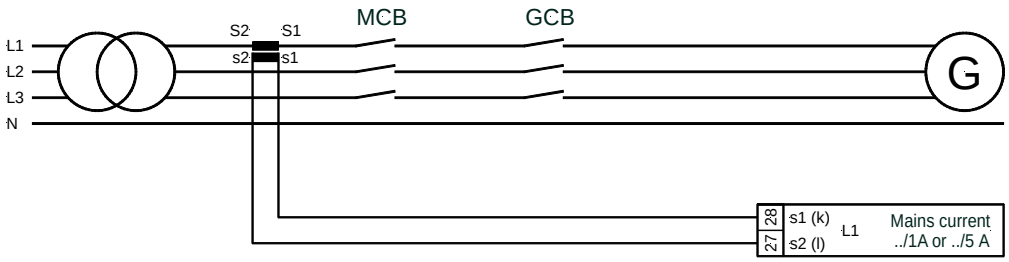

Figure 5-6: Measuring inputs - Current - Mains - via transformer

Terminal	Measurement	Description	A_{max}
27	Transformer ../1A or ../5A	Mains current L1, transformer terminal s2 (l)	2.5 mm²
28		Mains current L1, transformer terminal s1 (k)	2.5 mm²

Table 5-7: Terminal assignment - mains current measuring

Mains (Mains Interchange Import/Export Real Power Actual Value Via Measuring Transducer)

NOTE

During configuration the free configurable 20 mA inputs can be enabled with the following functions:

- **Mains interchange (import/export) real power actual value**
- **Real power set point value**
- **Alarm input**

Please note the details in the configuration manual 37367.

NOTE

If several controls are interconnected, the 20 mA measuring signal must not be looped through all controls. At each control, a 0/4 to 20 mA buffer amplifier must be connected to the mains interchange (import/export) real power measurement output signal. When selecting the external measuring transducer, please note that this must transmit both positive and negative ranges when transmitting the supply and reference power values.

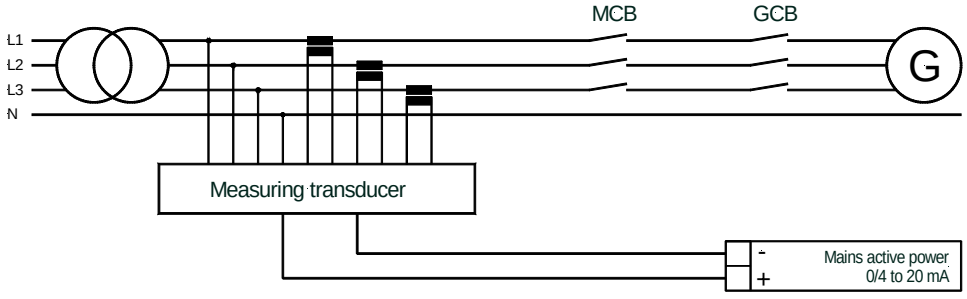

Figure 5-7: Measuring inputs - Real power - Mains - via measuring transducer three-phase

Terminal	Measurement	Description	A_{max}
configurable see page 28	0/4 to 20 mA	Mains interchange (import/export) real power measured value via 0/4 to 20 mA signal of an external measuring transducer (e.g. UMT 1)	1.5 mm²

Table 5-8: Terminal assignment - mains real power measuring three-phase

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Voltage Single-Phase

Generator

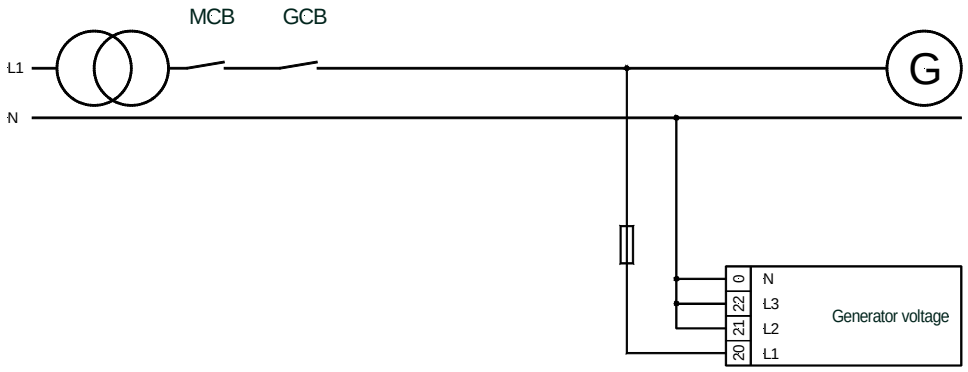

Figure 5-8: Measuring inputs - Voltage - Generator single-phase

Terminal	Measurement	Description	A_{max}
20	400 Vac	Generator voltage L1	2.5 mm²
21		Generator voltage L2 (connected with neutral)	2.5 mm²
22		Generator voltage L3 (connected with neutral)	2.5 mm²
0		Neutral	2.5 mm²

Table 5-9: Terminal assignment - generator voltage measuring single-phase

Busbar

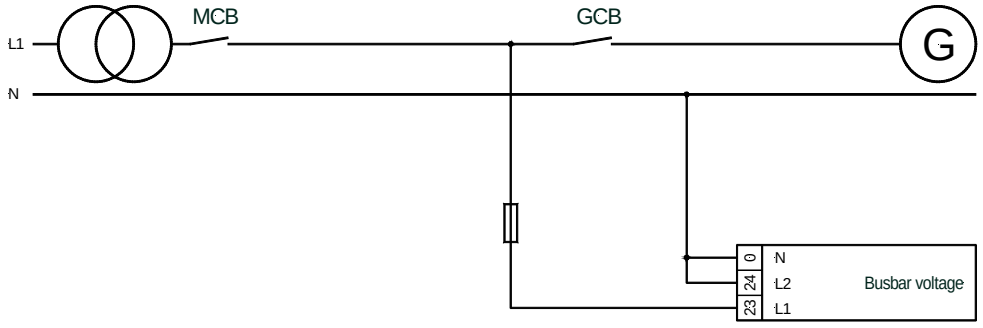

Figure 5-9: Measuring inputs - Voltage - Busbar single-phase

Terminal	Measurement	Description	A_{max}
23	400 Vac	Busbar voltage L1	2.5 mm²
24		Neutral	2.5 mm²

Table 5-10: Terminal assignment - busbar voltage measuring single-phase

Mains

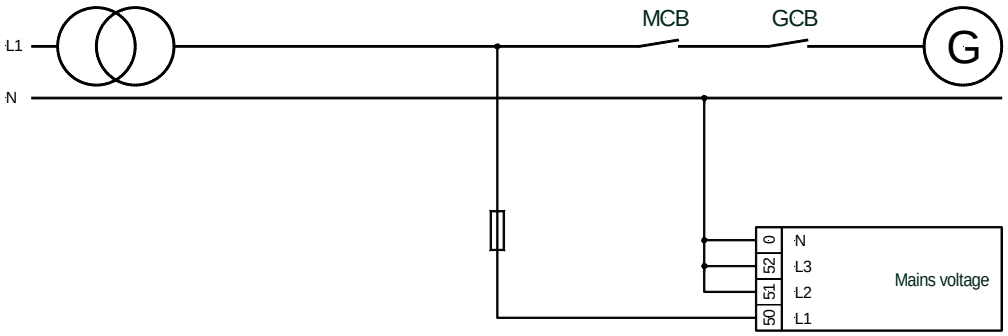

Figure 5-10: Measuring inputs - Voltage - Mains single-phase

Terminal	Measurement	Description	A_{max}
50	400 Vac	Mains voltage L1	2.5 mm²
51		Mains voltage L2 (connected with neutral)	2.5 mm²
52		Mains voltage L3 (connected with neutral)	2.5 mm²
0		Neutral	2.5 mm²

Table 5-11: Terminal assignment - mains voltage measuring single-phase

Current Single-Phase

WARNING

Before disconnecting the secondary terminals of the current transformer or the connections of the current transformer at the control, ensure that the transformer is short-circuited.

NOTE

Current transducers are generally to be grounded on the secondary and one side.

Generator

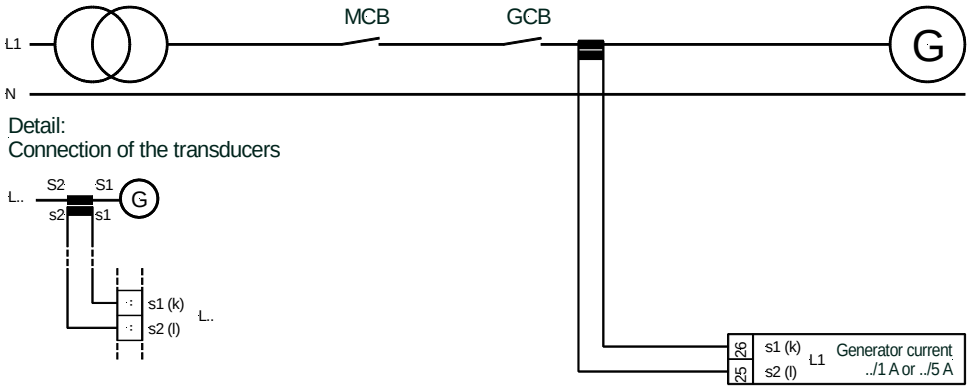

Figure 5-11: Measuring inputs - Current - Generator single-phase

Terminal	Measurement	Description	A_{max}
25	Transformer ../1 A, ../5 A	Generator current L1, transformer terminal s2 (l)	2.5 mm²
26		Generator current L1, transformer terminal s1 (k)	2.5 mm²
29, 30, 31, 32		**Do not connect for single-phase current measuring!**	2.5 mm²

Table 5-12: Terminal assignment - generator current measuring single-phase

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Mains (Mains Current Measuring Via Transformer)

Figure 5-12: Measuring inputs - Current - Mains - via transformer single-phase

Terminal	Measurement	Description	A_{max}
27	Transformer	Mains current L1, transformer terminal s2 (l)	2.5 mm²
28	../1A o. ../5A	Mains current L1, transformer terminal s1 (k)	2.5 mm²

Table 5-13: Terminal assignment - mains current measuring single-phase

Mains (Mains Interchange Import/Export Real Power Actual Value Via Measuring Transducer)

NOTE

During configuration the free configurable 20 mA inputs can be enabled with the following functions:

- **Mains interchange (import/export) real power actual value**
- **Real power set point value**
- **Alarm input**

Please notice the details in the configuration manual.

NOTE

If several controls are connected to form an interconnection, the 20 mA measuring signal must not be looped through all controls. At each control, a 0/4 to 20 mA buffer amplifier must be connected to the mains interchange (import/export) real power actual value measurement. When selecting the external measuring transformer, please note that this must transmit negative ranges on transmission of supply and reference power.

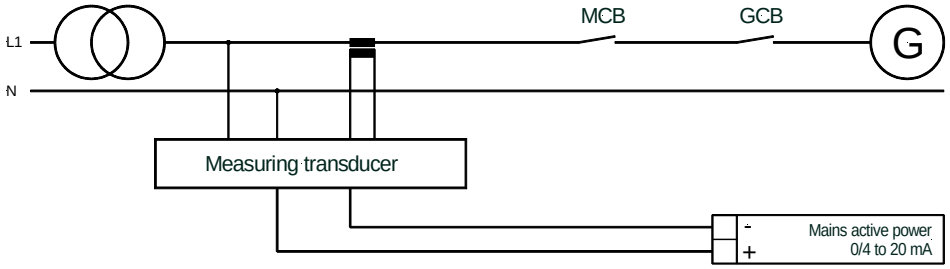

Figure 5-13: Measuring inputs - Real power - Mains - via measuring transducer single-phase

Terminal	Measurement	Description	A_{max}
configurable see page 28	0/4 to 20 mA	Mains interchange (import/export) real power actual value via 0/4 to 20 mA signal of an external measuring transducer (e.g. UMT 1)	1.5 mm²

Table 5-14: Terminal assignment - mains real power measuring single-phase

Discrete Inputs

CAUTION

Please note that the operating voltages recommended for the discrete inputs range from 4 to 40Vdc. The voltage potential may be applied with either a positive or negative polarity without causing damage. Voltages higher than the recommended range may result in damage or destruction of the hardware!

Terminal	Associated common	Description (according to DIN 40 719 Part 3, 5.8.3)	A_{max}
3	7	Automatic 1	2.5 mm²
4		Reply: GCB is open	2.5 mm²
5		Automatic 2	2.5 mm²
6		Multi function (selectable in configuration): • Engine enable • External acknowledgement • Engine stop • Operating mode STOP • Start without CB	2.5 mm²
53		Enable MCB	2.5 mm²
54		Status: isolated operation (busbar is not connected with mains)	2.5 mm²
34	33	Digital input [D01] - Alarm input (Emergency Stop recommended)	2.5 mm²
35		Digital input [D02] - Alarm input	2.5 mm²
36		Digital input [D03] "Phase rotation check O.K.": This control input is evaluated if the busbar is energized. In case of a failure, the message "Phase sequence" is displayed and closing the circuit breakers is blocked. If the busbar phase rotation shall not be monitored, this input must be energized permanently.	2.5 mm²

NOTE

Phase rotation monitoring is strongly recommended for the Rental Package. Otherwise, the input may always be energized if it shall not be evaluated.

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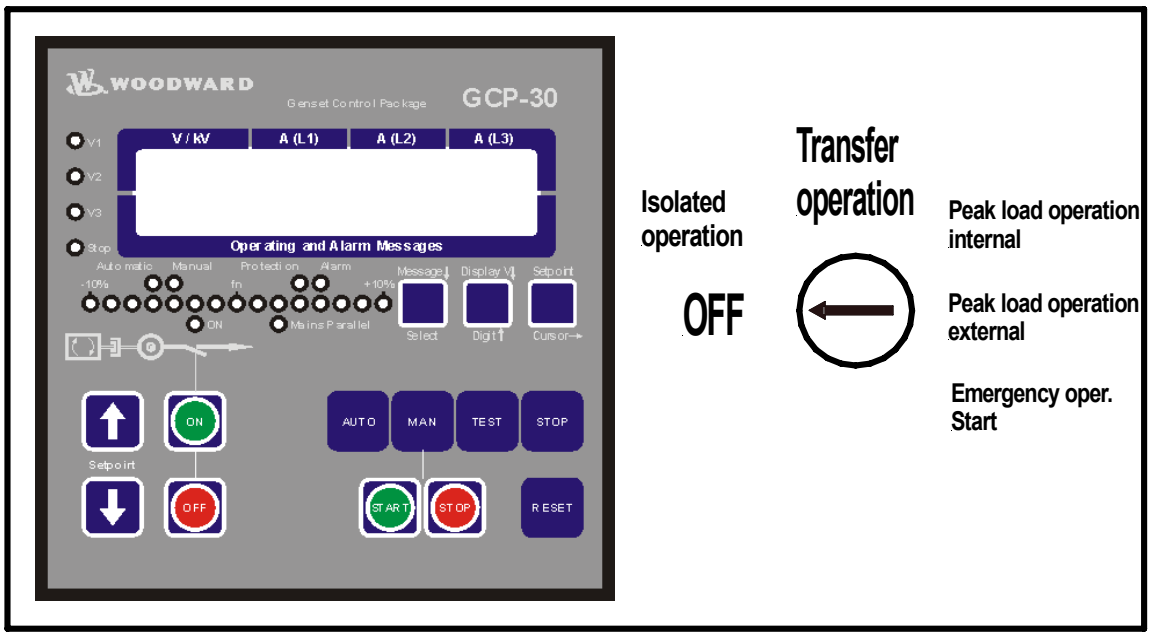
Terminal	Associated common	Description (according to DIN 40 719 Part 3, 5.8.3)	A_{max}
61	60	Digital input [D04] - Alarm input	2.5 mm²
62		Digital input [D05] - Alarm input or - Firing speed reached ("alternator", "oil pressure")	2.5 mm²
63		Discrete input [D06] - Alarm input or - Operation mode selector blocked	2.5 mm²
64		Discrete input [D07] - Alarm input or - Change breaker logic	2.5 mm²
65		Digital input [D08] - A Alarm input or - Frequency/power set point lower	2.5 mm²
66		Digital input [D09] - Alarm input or - Frequency/power set point raise	2.5 mm²
67		Digital input [D10] - Alarm input or - Voltage/power factor set point lower	2.5 mm²
68		Digital input [D11] - Alarm input or - Inhibit emergency run	2.5 mm²
69		Digital input [D12] - Alarm input or - Voltage/power factor set point raise	2.5 mm²
70		Digital input [D13] - Alarm input or - Idle mode	2.5 mm²
71		Frequency system 2 active. This control input allows to change between 2 speed systems. (usually 50/60Hz) The following parameters are considered: • Rated frequency • Set point frequency • Rated speed	2.5 mm²
72,73		Change voltage system 1,2,3,4. The following parameters are considered: • Rated voltage • Set point voltage generator • Current transformer generator • Set point current generator • Rated power generator Terminal 72 73 Result 0 0 System 1 0 1 System 2 1 0 System 3 1 1 System 4	2.5 mm²
125	124	Control input [term. 125] - Frequency/voltage droop ON	2.5 mm²
126		Control input [term. 126] - Mobile Systems Mode ON	2.5 mm²
127		Control input [term. 127] - **STOP** operating mode	2.5 mm²
128		Control input [term. 128] - **AUTOMATIC** operating mode	2.5 mm²

NOTE

The operating mode selection via DI is only possible if the digital input 6 (terminal 63, block operation mode selector) is energized. For detailed information, refer to the Configuration Manual (37367) under "Block operation mode selector switch via terminal 63".

Operating Modes of the Rental Package RPQ+SC09

The operating modes of the Rental Package RPQ+SC09 are usually selected via an external selector switch and the digital inputs. A typical connection of the selector switch and a description of the operating modes belonging to it may be found in the following.



For this, the signals are to be connected as follows:

Signals to be connected Operating mode	Terminal 54 Reply MCB OFF	Terminal 126 Mobile Systems	Terminal 53 Enable MCB	Terminal 68 Inhibit emergency run **	Terminal 3 Automatic 1	Terminal 5 Automatic 2
OFF (de-energized)	irrelevant	irrelevant	irrelevant	irrelevant	irrelevant	irrelevant
Isolated operation	1	0	0	1	remote control	0
Transfer operation	1	1	0 (Syncon Panel) remote control *	1	remote control	irrelevant
Peak load operation internal	0	0	1	1	remote control	0
Peak load operation external	0	0	1	1	0	remote control
Emergency operation Start	reply must be connected	0	1	0	0	0

*) If a synchronization between mains and generator busbar voltage is to be performed without SYNCON Panel, this DI must initiate the synchronization.

**) If no emergency power operation is required, the parameter "Emergency run" may be disabled. This allows to use terminal 68 as free alarm input.

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Switch Position OFF

The GCP will be de-energized in this operating mode. No actions are initiated by the unit anymore. If you switch to position OFF while the genset is running, the GCB opens and the genset stops immediately (it is assumed that this is provided by the customer).

Switch Position Isolated Operation

The GCP operating modes are enabled:

STOP: Genset stops with cool down or remains stopped. If necessary, the load will be taken off of the genset and the GCB will be opened.
MANUAL: Genset may be started and stopped manually. The generator breaker may be closed and opened using the manual keys. Frequency and voltage are controlled isochronous.
AUTOMATIC: The genset will be started and the GCB will be closed if remote control has been activated.
TEST: The genset will be started. The GCB may be closed and opened using the MANUAL keys.

The set points for frequency and voltage may either be modified using the arrow keys at the unit or via the digital inputs.

Switch Position Transfer Operation

(Function enable station and return to the mains)
The GCP operating modes may be freely available or fixed to **MANUAL** operating mode. The parameter "Interchange mode in Manual", which is responsible for this, is in the parameter group Automatic (refer to Configuration Manual 37367).

The following is valid in general:
Only the GCB will be synchronized. It is not possible to connect to a de-energized generator busbar.
If the GCB is closed, the generator monitoring is loaded with the trigger times mains monitoring, the phase shift monitoring is not active.
The automatic mains connection detection*) will be activated.
If no mains connection is detected, a frequency and voltage control with droop will be performed.
If a mains connection is detected, real and reactive power control will be performed.
A phase relation zero control with the mains may be restarted via the DI at terminal 53 (Enable MCB) or the SYNCON Panel. This will be disabled automatically if a mains connection is detected.
It is principally possible to open the GCB with the Operation mode STOP key for security reasons.

) Automatic mains connection detection:
The GCP detects automatically via phase L1 whether the generator is in parallel with the mains.
If the phase relation between mains and generator busbar is recognized as "fixed", the message "Mains connected" will be displayed. This is the case if the angle of L1 between mains and busbar remains below a certain angle limit for a certain time. Angle and time may be configured with the parameter "Detection mains coupling" under phase controller within the parameter group breaker (refer to Configuration Manual 37367).
This automatic detection is used to decide whether real and reactive power or frequency and voltage control is to be performed.

The following is valid for free operating mode selection at the GCP:

STOP: Genset stops with cool down or remains stopped. If necessary, the load will be taken off of the genset and the GCB will be opened.
MANUAL: Genset may be started and stopped manually. The generator breaker may be closed and opened using the manual keys.
AUTOMATIC: The genset will be started and the GCB will be closed if remote control has been activated.
TEST: Not possible; if transfer operation is selected during TEST operation, an automatic change to MANUAL operating mode will be performed.

The set points for frequency and voltage or real power and power factor may either be modified using the arrow keys at the unit, via the digital inputs, or using the SYNCON Panel.
Only the set points, the control of which is currently active, may be modified via the Dis.

Switch Position Peak Load Operation "Internal"

The GCP operating modes are enabled:

STOP: Genset stops with cool down or remains stopped. If necessary, the load will be taken off of the genset and the GCB will be opened.
MANUAL: Genset may be started and stopped manually.
The generator breaker may be closed and opened using the manual keys. After closing the GCB, real and reactive power are controlled.
AUTOMATIC: The genset will be started and the GCB will be synchronized if remote control has been activated. After closing the GCB, real and reactive power are controlled. The set real power 1 and the power factor are stored **"internally"**.
TEST: The genset will be started. The generator breaker may be closed and opened using the manual keys.

The set points for real power and power factor may either be modified using the arrow keys at the unit or via the digital inputs.

Switch Position Peak Load Operation "External"

The functions correspond with the switch position peak load operation "internal" except the difference that the real power set point is controlled by a 0/4 to 20mA signal or transmitted via an interface.

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Switch Position Emergency Power Start

The GCP operating modes are enabled:

STOP: Genset stops with cool down or remains stopped. If necessary, the load will be taken off of the genset and the GCB will be opened.

MANUAL: Genset may be started and stopped manually.
The generator breaker may be closed and opened using the manual keys.
No automatic change-over to emergency power is activated.

AUTOMATIC: If mains fail (measurement via terminals 50, 51, 52) the genset will be started, the MCB will be opened and the GCB will be closed. If mains return, the MCB will be synchronized back after the mains settling time has expired. Then the load will be taken off of the genset and the genset will be stopped.

TEST: The genset will be started. The generator breaker may be closed and opened using the manual keys. An automatic change-over to emergency power will be performed if necessary.

The set points for frequency and voltage may either be modified using the arrow keys at the unit or via the digital inputs.

NOTE

It is required for the emergency power start function that the MCB reply is connected. The start and stop commands from the GCP must also be wired to the MCB to enable an automatic change-over.

Phase Rotation Monitoring Busbar

If the generator busbar is energized, a phase rotation relay is evaluated via DI3 at terminal 36. If the phase rotation relay indicates a failure, this will be indicated by the GCP display and closing the GCB will be blocked.
If no phase rotation relay is used, the DI3 at terminal 36 must be energized to close the GCB. In this case, it must be observed that **no phase rotation protection** exists anymore. It is possible to close the GCB even if the phase rotation is wrong!

Analog Inputs

WARNING

The analog inputs of the GCP are not isolated. When utilizing an isolation monitor, use of two-pole, isolated transmitters is recommended.

The analog inputs for active transmitters (0 to 20 mA, 0 to 10V) should only be operated with two-pole, isolated transmitters.

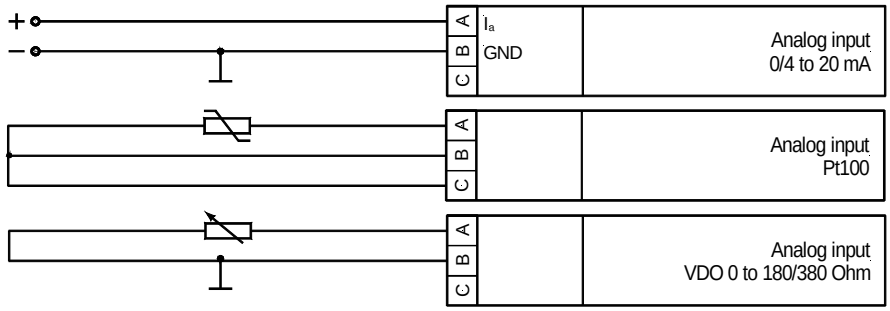

Figure 5-14: Analog inputs

Terminal A	Terminal B	Terminal C	Description (according to DIN 40 719 Part 3, 5.8.3)	A_{max}
93	94	95	Analog input 1 [T1] **0/4 to 20 mA**, configurable function: - Alarm input / Set value input / Actual value input	1.5 mm²
96	97	98	Analog input 2 [T2] **0/4 to 20 mA**, configurable function: - Alarm input / Set value input / Actual value input	1.5 mm²
99	100	101	Analog input 3 [T3] **0/4 to 20 mA**, configurable function: - Alarm input / Set value input / Actual value input	1.5 mm²
102	103	104	Analog input 4 [T4] **Pt100**, configurable function: - Alarm input / Actual value input	1.5 mm²
105	106	-	Analog input 5 [T5] **VDO 0 to 400 Ω fuel level freely scaleable**, configurable function: - Alarm input / Actual value input	1.5 mm²
108	109	-	Analog input 6 [T6] **VDO pressure 0 to 180 Ω (0 to 5/10 bar or 0 to 72.5/145 psi)**, configurable function: - Alarm input / Actual value input	1.5 mm²
111	112	-	Analog input 7 [T7] **VDO temperature 0 to 380 Ω (30 to 120°C or 86 to 248°F)**, configurable function: - Alarm input / Actual value input	1.5 mm²

Table 5-15: Analog inputs - terminal assignment

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MPU

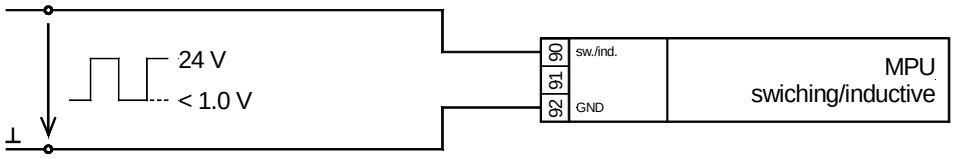

Figure 5-15: MPU

Terminal	Description		A_{max}
90	MPU (Magnetic Pickup Unit)	switching/inductive	2.5 mm²
91			2.5 mm²
92		GND	2.5 mm²

Table 5-16: MPU - terminal assignment

Specification of the input circuit for inductive speed sensors
Ambient temperature: 25 °C

Signal shape	Sinusoidal
Minimum input voltage in the range of 200 to 10,000 Hz	< 0.5 V_{eff}
Minimum input voltage in the range of 300 to 5,000 Hz	< 0.3 V_{eff}
Maximum input voltage in the range of 0 to 1,500 Hz	30 V_{eff}
Maximum input voltage in the range of 1,500 to 10,000 Hz	30 to 60 V_{eff} (linear increasing)

Table 5-17: MPU - input voltage

Note: As the ambient temperature increases, the minimum input voltage increases at a rate of approximately 0.3 V/°C.

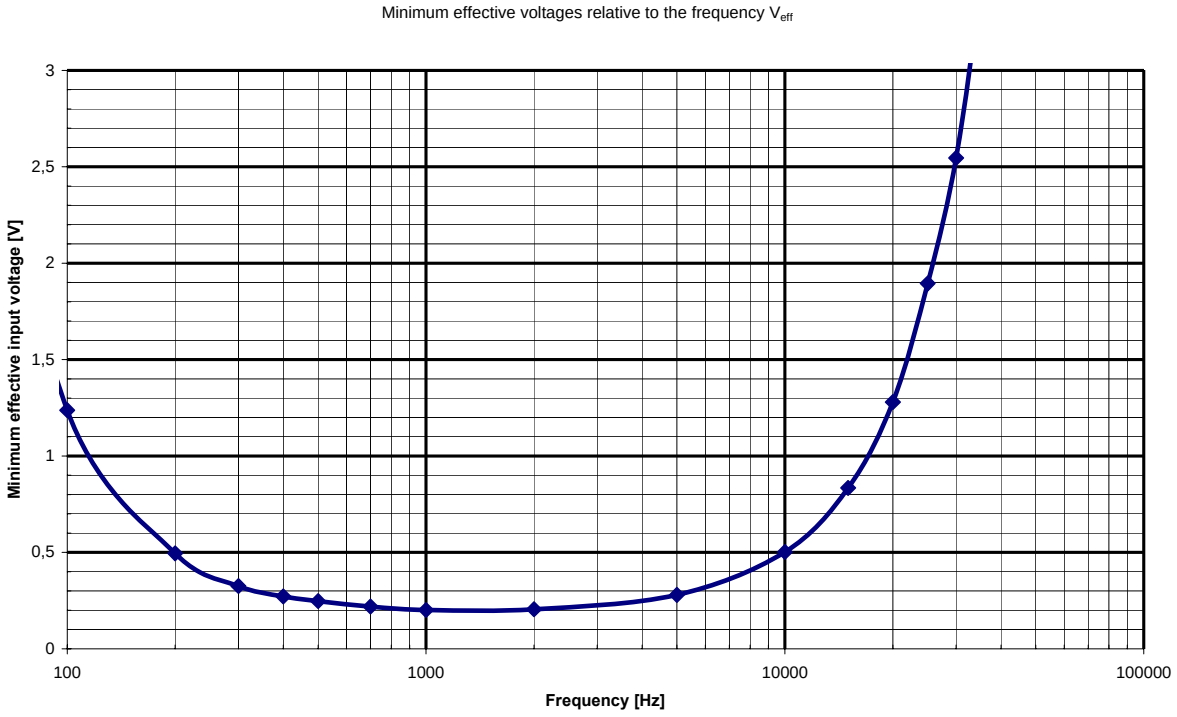

Figure 5-16: MPU - Typical behavior of the input voltage sensitivity

Relay Outputs

Controller Outputs

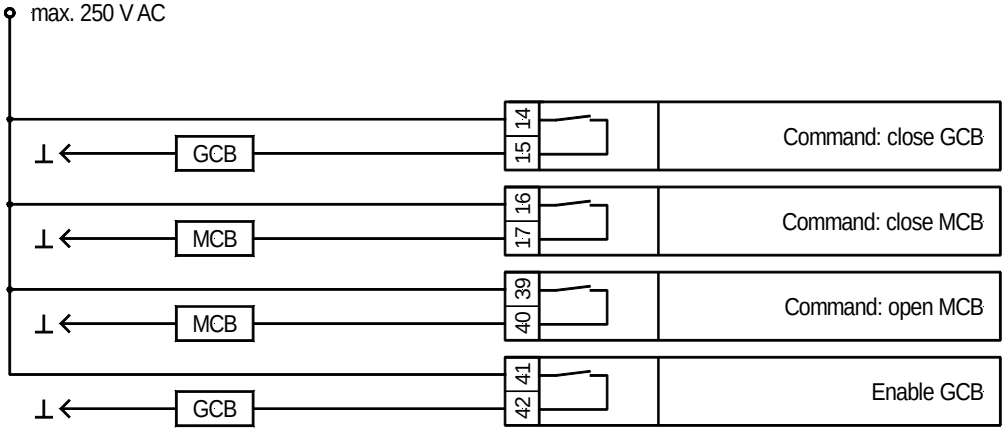

Figure 5-17: Relay outputs - Controller outputs - CB activation

Make cont.	Description	A_{max}
14/15	Command: close GCB	2.5 mm²
16/17	Command: close MCB	2.5 mm²
39/40	Command: open MCB	2.5 mm²
41/42	Command: open GCB	2.5 mm²

Table 5-18: Relay outputs - terminal assignment

Relay Manager

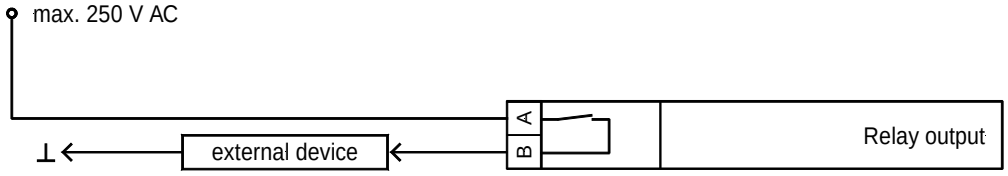

Figure 5-18: Relay outputs - Relay manager

Make cont.	Description	A_{max}
18/19	Readiness for operation	2.5 mm²
43/44	Fuel solenoid relay/gas valve	2.5 mm²
45/46	Starter	2.5 mm²
74/75	Relay [R1] (Relay manager)	2.5 mm²
76/77	Relay [R2] (Relay manager)	2.5 mm²
78/79	Relay [R3] (Relay manager)	2.5 mm²
80/81	Relay [R4] (Relay manager)	2.5 mm²
82/83	Relay [R5] (Relay manager)	2.5 mm²
37/38	Relay [R6] (Relay manager; pre-assigned: Preheat/Ignition ON)	2.5 mm²
47/48	Relay [R7] (Relay manager; pre-assigned: Centralized alarm horn)	2.5 mm²

Table 5-19: Relay manager - terminal assignment

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Analog Outputs

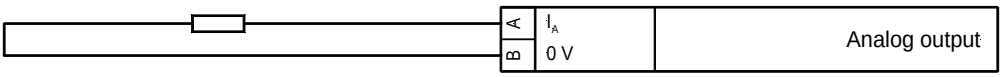

Figure 5-19: Analog outputs

Ia ***A***	GND ***B***	Description	A_{max}
120	121	Analog output [A1] - 0/4 to 20 mA	1.5 mm²
122	123	Analog output [A2] - 0/4 to 20 mA	1.5 mm²

Table 5-20: Analog outputs - terminal assignment

Controller Outputs

Multi Functional Controller Outputs

Configuration and an external jumper can change the multifunction controller outputs.

Versions

- **Three-position controller** via relay manager
  - Control of n/f/P: Parameter "**F/P contr.type**" = THREESTEP
    n+/f+/P+ = relay manger parameter 114
    n-/f-/P- = relay manager parameter 115
  - Control of V/Q: Parameter "**V/Q contr.output**" = THREESTEP
    V+/Q+ = relay manager parameter 116
    V-/Q- = relay manager parameter 117

- **Analog controller** output
  - Control of n/f/P: Parameter "**F/P contr.type**" = ANALOG
    Current output (mA) = no jumpers necessary
    Voltage output (V) = jumpers between 8/9
    Connect speed control to terminals 9/10
  - Control of V/Q: Parameter "**V/Q contr.output**" = ANALOG
    Current output (mA) = no jumpers necessary
    Voltage output (V) = jumpers between 11/12
    Connect voltage regulator to terminals 12/13

- **PWM controller** output
  - Control of n/f/P: Parameter "**F/P contr.type**" = PWM
    PWM output = jumpers between 8/9
    Connect speed control to terminals 9/10

Wiring Of Controller

- Setting: THREE-POSITION (Three-position controller)

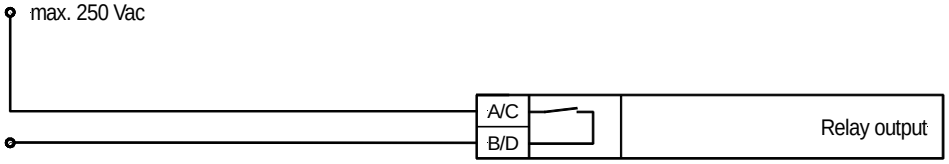

Figure 5-20: Three-position controller

Terminal		Description	A_{max}
A	raise	Speed / Frequency / Real power	2.5 mm²
B		(RelayManager: "raise" = 114, "lower" = 115) or	2.5 mm²
C	lower	Voltage / Reactive power	2.5 mm²
D		(RelayManager: "raise" = 116, "lower" = 117)	2.5 mm²

The selection and programming occurs via the relay manager (RM).

Table 5-21: Controller outputs - three-position

CAUTION

Refer to Technical Data on page 37 for information about current limits. Use an interposing relay if necessary. Currents higher than those specified destroy the hardware!

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- Setting: ANALOG or PWM (Analog controller) - Frequency-/Power controller

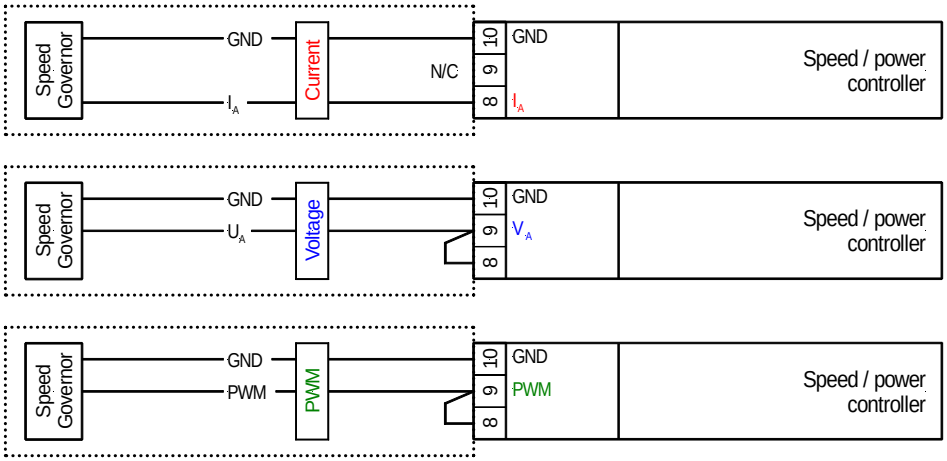

Figure 5-21: Analog controller output n/f/P - Wiring and external jumper setting

Type	Terminal		Description	A_{max}
I Current	8	I_A	Speed controller / Frequency controller / Real power controller	2.5 mm²
	9			2.5 mm²
	10	GND		2.5 mm²
V Voltage	8			2.5 mm²
	9	V_A		2.5 mm²
	10	GND		2.5 mm²
PWM	8			2.5 mm²
	9	PWM		2.5 mm²
	10	GND		2.5 mm²

Table 5-22: Controller outputs - analog or PWM

- Setting: ANALOG (Analog controller) - Voltage-/Reactive power controller

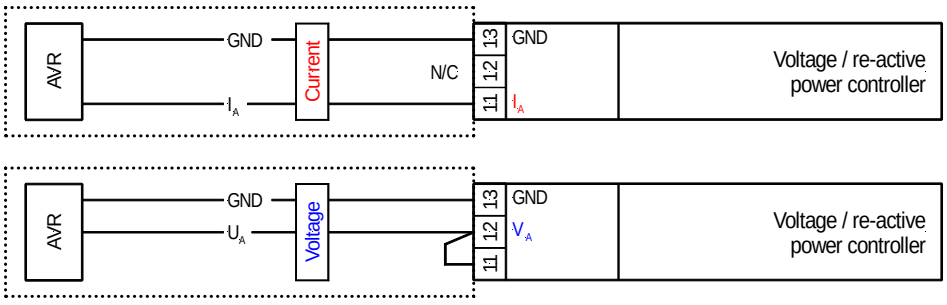

Figure 5-22: Analog controller output V/Q - Wiring and jumper setting

Type	Terminal		Description	A_{max}
I Current	11	I_A	Voltage controller / Reactive power controller	2.5 mm²
	12			2.5 mm²
	13	GND		2.5 mm²
V Voltage	11			2.5 mm²
	12	V_A		2.5 mm²
	13	GND		2.5 mm²

Table 5-23: Controller outputs - analog

Interface

Interface Wiring

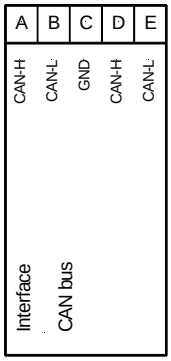

Figure 5-23: Interface - Terminals

Terminal					Description
A	B	C	D	E	
X1* CAN-H	X2* CAN-L	X3 GND	X4* CAN-H	X5* CAN-L	CAN bus guidance level
Y1* CAN-H	Y2* CAN-L	Y3 GND	Y4* CAN-H	Y5* CAN-L	CAN bus machine level

* may be used to connect to the CAN bus and/or to connect the termination resistor.

Table 5-24: Interface - terminal assignment

CAN Bus Shielding

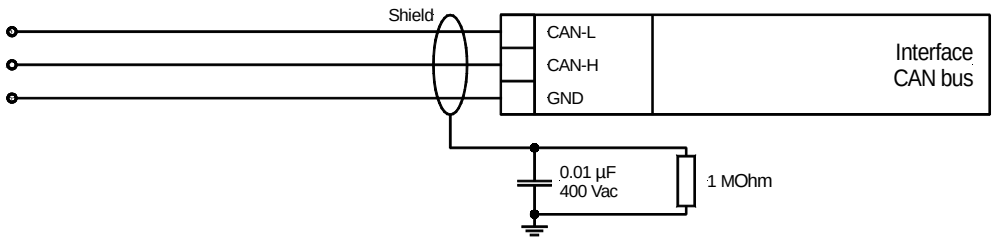

Figure 5-24: Interface - CAN bus shielding

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CAN Bus Topology

NOTE

Please note that the CAN bus must be terminated with an impedance which corresponds to the wave impedance of the cable (e.g. 120 Ω). The CAN bus is terminated between CAN-H and CAN-L.

The two CAN-H and CAN-L terminals in the unit are hard-wired internally and can be used to feed the CAN bus through. However, if you want to avoid a break of the bus when a unit is unplugged, you may connect the incoming and outgoing bus line in the same terminal.

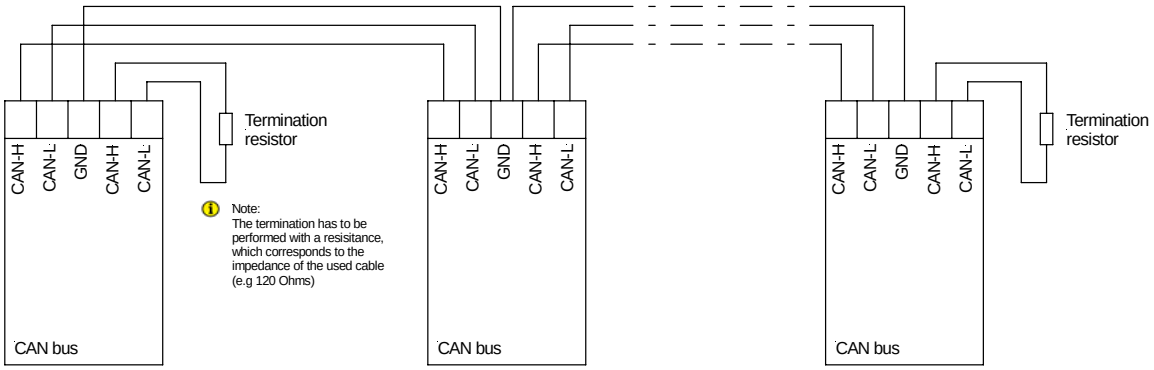

Figure 5-25: Interfaces - CAN bus topology

Possible CAN Bus Problems

If no data is transmitted on the CAN bus, check the following for common CAN bus communication problems:

- T structure bus is utilized (stub-end feeders or branch lines are not recommended)
- CAN-L and CAN-H are interchanged
- Not all devices on the bus are using identical Baud rates
- Correct terminating resistor(s) is/are missing
- Incorrect baud rate (too high) for length of CAN bus
- The CAN bus cable is co-routed with power cables

Woodward recommends the use of twisted-pair cables for the CAN bus (i.e.: Lappkabel Unitronic LIYCY (TP) 2×2×0.25, UNITRONIC-Bus LD 2×2×0.22).

Maximum CAN Bus Length

The maximum length of the communication bus wiring is dependent on the configured Baud rate. Refer to Table 5-25 for the maximum bus length (Source: CANopen; Holger Zeltwanger (Hrsg.); 2001 VDE VERLAG GMBH, Berlin und Offenbach; ISBN 3-8007-2448-0).

Baud rate	Max. length
1000 kbit/s	25 m
800 kbit/s	50 m
500 kbit/s	100 m
125 kbit/s	250 m
50 kbits/s	1000 m
20 kbit/s	2500 m

Table 5-25: Maximum CAN bus length

The maximum specified length for the communication bus wiring might not be achieved if poor quality wire is utilized, there is high contact resistance, or other conditions exist. Reducing the baud rate may overcome these issues.

DPC - Direct Configuration Interface

NOTE

To configure via the configuration interface (direct configuration), you need the configuration cable (part number 5417-557), the program LeoPC1 (delivered with the cable), and the corresponding configuration files. Please consult the online help installed when the program is installed for a description of the LeoPC1 program and its setup.

If the parameter "Direct para." is enabled on the control, communication via the CAN bus interface on terminals X1/X5 is disabled.

If the control unit detects that the engine is running (ignition speed exceeded), the direct configuration port is disabled.

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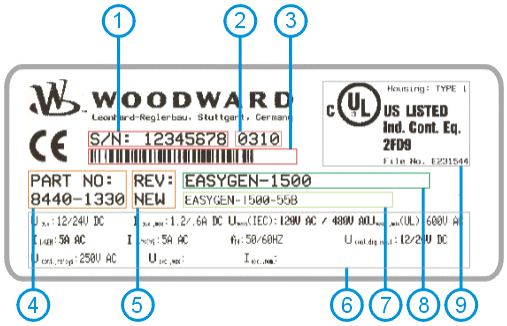
Chapter 6.
Technical Data

Nameplate



1	S/N	Serial number (numerical)
2	S/N	Date of production (YYMM)
3	S/N	Serial number (Barcode)
4	P/N	Item number
5	REV	Item revision number
6	Details	Technical data
7	Type	Description (long)
8	Type	Description (short)
9	UL	UL sign

Measuring values, voltages

- Measuring voltage
  - Standard (V_{rated}) ⅄/Δ ..... 230/400 Vac
  - Maximum value V_{Ph-Ph} (UL/cUL) ..... max.300 Vac
  - Rated voltage $V_{Ph-ground}$ ..... 300 Vac
  - Rated surge voltage ..... 4.0 kV
- Setting range (prim) ..... 0.050 to 65.000 kVac
- Linear measuring range ..... 1.3 × V_{rated}
- Measuring frequency ..... 50/60 Hz (40.0 to 70.0 Hz)
- Accuracy ..... Class 1
- Input resistance per path ..... [1] 0.21 MΩ
  [4] 0.7 MΩ
- Maximum power consumption per path ..... < 0.15 W

Measuring values, currents ----- isolated

Measuring current — Rated value (I_{rated}) ..../5 A

- Accuracy ..... Class 1
- Linear measuring range
  - Generator ..... 3.0 × I_{rated}
  - Mains/ground current ..... 1.5 × I_{rated}
- Maximum power consumption per path ..... < 0.15 VA

Rated short-time current (1 s) ..... 10.0 × I_{rated}

Ambient variables

- Power supply ..... 12/24 Vdc (9.5 to 32.0 Vdc)
- Intrinsic consumption ..... max. 20 W
- Ambient temperature
  - Storage ..... -40 to 80 °C / -40 to 176 °F
  - Operation ..... -20 to 70 °C / -4 to 158 °F
- Ambient humidity ..... 95 %, non-condensing

Discrete inputs ---------- isolated

- Input range ($V_{Cont, digital input}$) ..... Rated voltage 12/24 Vdc (6 to 32 Vdc)
- Input resistance ..... approx. 6.8 kΩ

Relay outputs ---------- potential free

- Contact material ..... AgCdO
- General purpose (GP) ($V_{Cont, relay output}$)

  AC ..... 2.00 Aac@250 Vac
  DC ..... 2.00 Adc@24 Vdc
  0.36 Adc@125 Vdc
  0.18 Adc@250 Vdc
- Pilot duty (PD) ($V_{Cont, relay output}$)

  DC ..... 1.00 Adc@24 Vdc
  0.22 Adc@125 Vdc
  0.10 Adc@250 Vdc

Analog inputs ---------- freely scaleable

- Resolution ..... 10 Bit
- 0/4 to 20 mA input ..... Difference measurement, load 150 Ω
- 0 to 5/10 Vdc input ..... Difference measurement, input resistance approx. 16.5 kΩ
- Pt100/Pt1000 input ..... for measuring resistances according to IEC 751

  [Pt100] ..... 2/3-conductor measurement, 0 to 200 °C
  [Pt1000] ..... 2-conductor measurement, -30 to 200 °C
- 0 to 180/380 Ω input ..... difference measurement, sensor current ≤1.9 mA

Analog outputs ---------- isolated

- at rated output ..... freely scalable,
- Insulation voltage ..... 3,000 Vdc
- Versions ..... 0 to 5 Vdc, +/-5 Vdc, 0 to 10 Vdc, 0 to 20 mA
- Resolution PWM ..... 8/12 Bit (depending on model)
- 0/4 to 20 mA output ..... maximum load 500 Ω
- 0 to 10 V/+/-5 V output ..... internal resistance ≤1 kΩ

Pickup input ---------- isolated

- Input impedance ..... min. approx. 17 kΩ
- Input voltage ..... (see Table 5-17: MPU - input voltage)

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Interface ----------

Service interface

- Version RS-232
- Signal level .....5 V

Level conversion and insulation by using DPC (P/N 5417-557)

CAN bus interface **isolated**

- Insulation voltage .....1,500 Vdc
- Version .....CAN bus
- Internal line termination ..... Not available

Battery ----------

- Type.....NiCd
- Durability (at operation without power supply) ..... approx. 5 years
- Battery field replacement..... not possible

Housing ----------

- Type.....APRANORM DIN 43 700
- Dimensions (W × H × D) .....144 × 144 × 118 mm
- Front cutout (W × H)..... 138 [+1.0] × 138 [+1.0] mm
- Wiring.....screw-plug-terminals 1.5 mm² or 2.5 mm²
- Recommended tightening torque.....0.5 Nm

use 60/75 °C copper wire only
use class 1 wire only or equivalent

- Weight ..... approx. 1,000 g

Protection----------

- Protection system.....IP42 from front for proper installation

IP54 from front with gasket (gasket: P/N 8923-1043)
IP21 from back

- Front folio..... insulating surface
- EMC test (CE) ..... tested according to applicable EN guidelines
- Listings ..... CE marking; UL listing for ordinary locations
- Type approval..... UL/cUL listed, Ordinary Locations, File No.: 231544

Chapter 7.
Accuracy

Measuring values		Display and ranges	Accuracy	Notes
Frequency				
Generator	f_{L1N}, f_{L2N}, f_{L3N}	15.0 to 85.0 Hz	1 %	-
Busbar	f_{L12}	15.0 to 85.0 Hz	1 %	-
Mains	f_{L1N}, f_{L2N}, f_{L3N}	40.0 to 85.0 Hz	1 %	-
Voltage				
Generator	V_{L1N}, V_{L2N}, V_{L3N}	0 to 400 V	1 %	Transformer ratio adjustable
	V_{L12}, V_{L23}, V_{L31}	0 to 400 V	1 %	
Busbar	V_{L12}	0 to 400 V	1 %	Transformer ratio adjustable
Mains	V_{L1N}, V_{L2N}, V_{L3N}	0 to 400 V	1 %	Transformer ratio adjustable
	V_{L12}, V_{L23}, V_{L31}	0 to 400 V	1 %	
Current				
Generator	I_{L1}, I_{L2}, I_{L3}	0 to 9,999 A	1 %	-
Max. value	I_{L1}, I_{L2}, I_{L3}	0 to 9,999 A	1 %	Slave pointer
Mains	I_{L1}	0 to 9,999 A	1 %	-
Real power				
Current total real power value		-32.0 to 32.0 MW	2 %	-
Reactive power				
Current value in L1, L2, L3		-32.0 to 32.0 Mvar	2 %	-
Power Factor (cos φ)				
Current value power factor (cos φ) L1		i0.00 to 1.00 to c0.00	2 %	-
Miscellaneous				
Real energy		0 to 4,200 GWh	2 %	not calibrated
Operating hours		0 to 65,000 h		-
Maintenance call		0 to 9,999 h		-
Start counter		0 to 32,750		-
Battery voltage		10 to 30 V	1 %	-
Pickup speed		f_N +/- 40 %		-
Analog inputs				
0/4 to 20 mA		freely scaleable		-
Pt100		0 to 250 °C		not calibrated
0 to 180 Ω		freely scaleable		for VDO sensors
0 to 360 Ω		freely scaleable		for VDO sensors

Reference conditions (to measure the accuracy):

- Input voltage ..... sinusoidal rated voltage
- Input current..... sinusoidal rated current
- Frequency..... rated frequency +/- 2 %
- Power supply..... rated voltage +/- 2 %
- Power factor (cos φ)..... 1.00
- Ambient temperature..... 23 °C +/- 2 K
- Warm-up period..... 20 minutes

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2007/2/Stuttgart