37468

easYgen-3000 Series
Genset Control

Installation

Software Version: 1.15xx or higher

Manual 37468

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.

Revision History

Rev.	Date	Editor	Changes
NEW	10-05-05	TE	Release based on 37414B

Content

Figures and Tables

Figures

Tables

Chapter 1.
General Information

Document Overview

Type		English	German
easYgen-3000 Series			
easYgen-3000 Series - Installation	this manual ⇨	37468	DE37468
easYgen-3000 Series - Configuration		37469	DE37469
easYgen-3000 Series - Operation		37470	DE37470
easYgen-3000 Series - Application		37471	-
easYgen-3000 Series - Interfaces		37472	-
easYgen-3000 Series - Parameter List		37473	DE37473
easYgen-3200 - Brief Operation Information		37399	GR37399
easYgen-3100 - Brief Operation Information		37474	-
RP-3000 Remote Panel		37413	-

Table 1-1: Manual - overview

Intended Use The unit must only be operated in the manner described by 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.

What are the differences between the easYgen-3000 Series Package P1 & Package P2?

easYgen-3000 Series	Package P1	Package P2
Freely configurable PID controllers	-	3
External discrete inputs / outputs via CANopen (maximum)	16 / 16	32 / 32
External analog inputs / outputs via CANopen (maximum)	-	16 / 4

NOTE

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

The present manual has been prepared to enable the installation and commissioning of the unit. 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 may be taken from the Parameter List 37473 or from ToolKit and the respective *.SID file.

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 easily as synthetics.

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

4. **Opening the control cover may void the unit 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:

   - Ensure that the device is completely voltage-free (all connectors have to be disconnected).
   - 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 cabinet, place it in the antistatic protective bag.

CAUTION

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.*

NOTE

The unit is capable to withstand an electrostatic powder coating process with a voltage of up to 85 kV and a current of up to 40 µA.

Chapter 3.
Marine Usage

CAUTION

The following notes are very important for marine usage of the easYgen genset control and have to be followed.

NOTE

The specified marine approvals are only valid for metal housing units. They are only valid for plastic housing units, if they are installed using the screw kit (refer to Screw Kit Installation on page 14). In this case, all 12 screws must be used and tightened accordingly.

Application

The easYgen-3000 Series has an internally isolated power supply.

If the easYgen is to be used on bridge and deck zones, an EMI filter (i.e. TIMONTA FSS2-65-4/3) must be used for the power supply inputs.

Some additional, independent safety and protection devices are necessary to meet safety requirements of Rules and Regulations of marine Classification Societies.
The easYgen is type approved by LR Lloyd's Register.
Please consider for final functional arrangements to comply with appropriate Lloyd's Register Rules as subject of the Plan Approval process.

Chapter 4. Housing

The controls of the easYgen-3000 Series are available with two different housings. Refer to the applicable section for detailed information about installation and technical data of the respective housing type.

- Plastic housing for front panel flush mounting with graphical LC display (easYgen-3200)

Figure 4-1: easYgen-3200 - plastic housing

- Sheet metal housing for switch cabinet back mounting without display (easYgen-3100)

Figure 4-2: easYgen-3100 - sheet metal housing

Plastic Housing

Panel Cutout

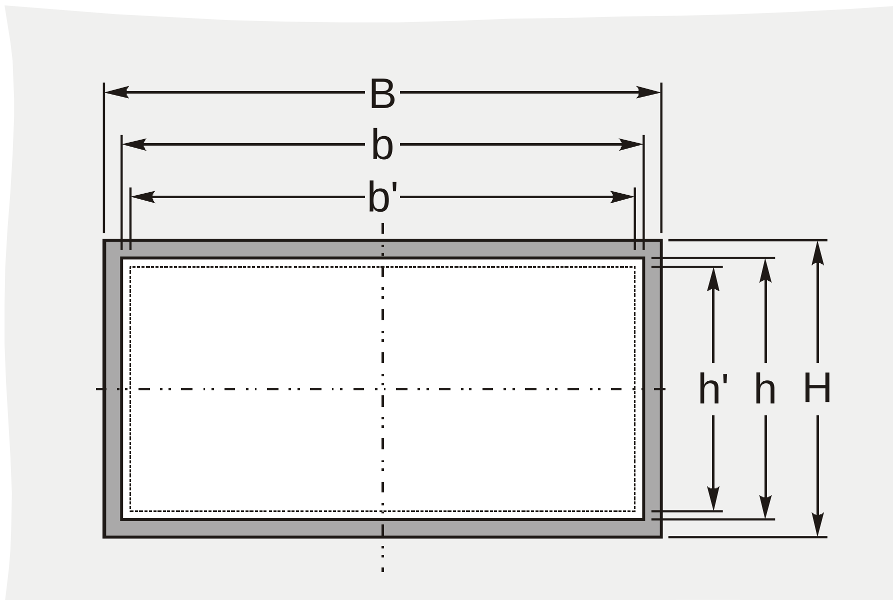


Figure 4-3: Plastic housing - panel-board cutout

Measure	Description			Tolerance
H	Height	Total	217 mm	---
h		Panel cutout	183 mm	+ 1.0 mm
h'		Housing dimension	181 mm	
B	Width	Total	282 mm	---
b		Panel cutout	249 mm	+ 1.1 mm
b'		Housing dimension	247 mm	
	Depth	Total	99 mm	---

Table 4-1: Plastic housing - panel cutout

The maximum permissible corner radius is 4 mm.
Refer to Figure 4-5 on page 14 for a cutout drawing.

Dimensions

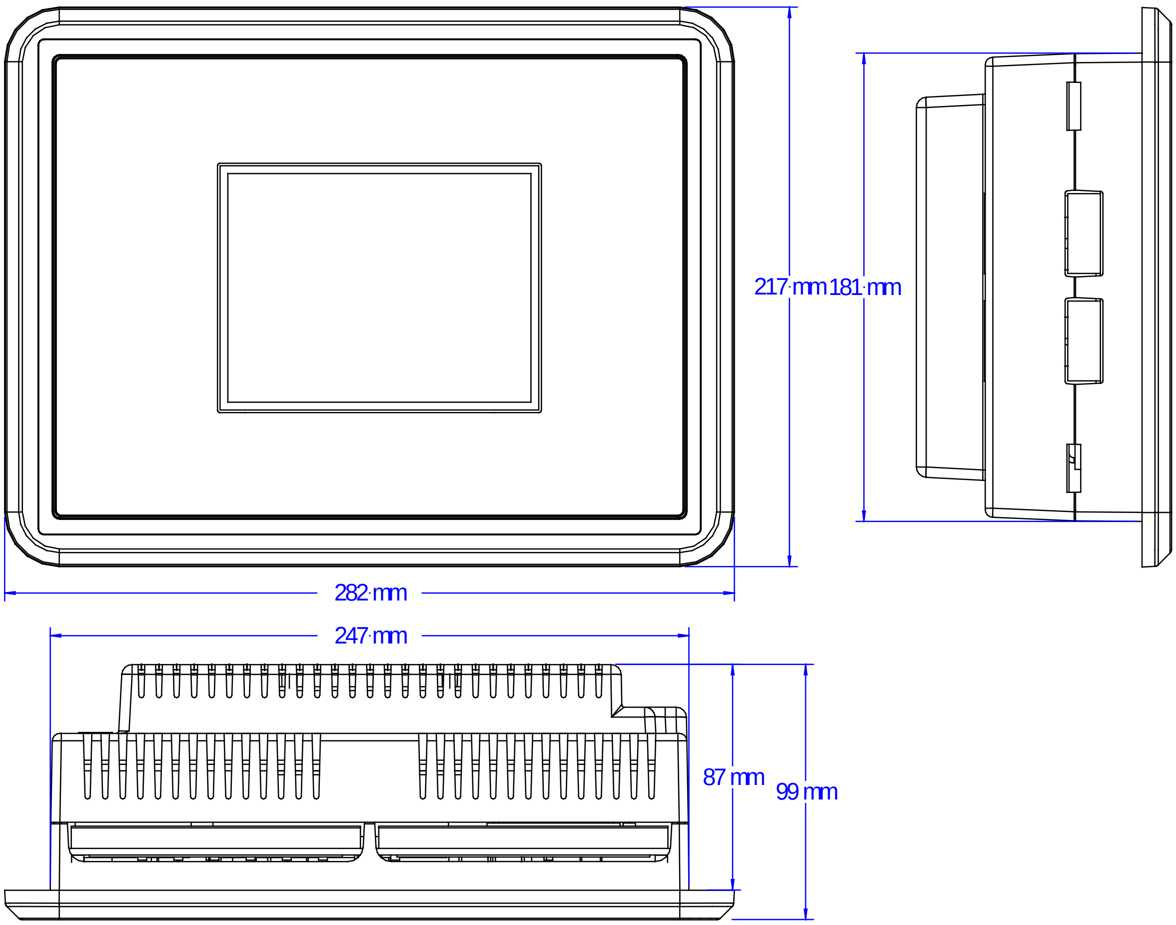


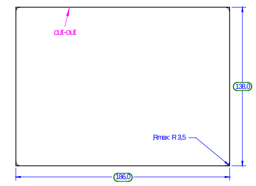
Figure 4-4: Plastic housing easYgen-3200 - dimensions

Clamp Fastener Installation

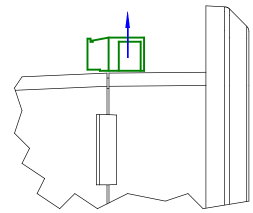
For installation into a door panel with the fastening clamps, proceed as follows:

1. **Panel cutout**
   Cut out the panel according to the dimensions in Table 4-1.

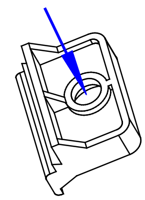
   Note:
   Don't drill the holes if you want to use the clamp fasteners. If the holes are drilled into the panel, the clamp fasteners cannot be used anymore!



2. **Remove terminals**
   Loosen the wire connection terminal screws on the back of the unit and remove the wire connection terminal strip if required.

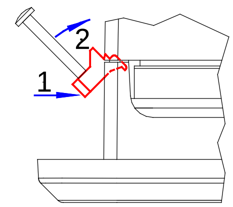


3. **Insert screws in clamps**
   Insert the four clamping screws into the clamp inserts from the shown side (opposite of the nut insert) until they are almost flush. Do not completely insert the screws into the clamp inserts.

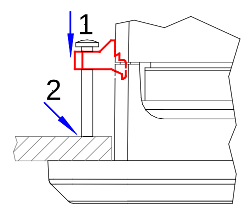


4. **Insert unit into cutout**
   Insert the unit into the panel cutout. Verify that the unit fits correctly in the cutout. If the panel cutout is not big enough, enlarge it accordingly.

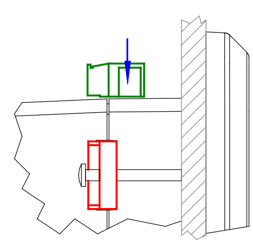
5. **Attach clamp inserts**
   Re-install the clamp inserts by tilting the insert to a 45° angle. (1) Insert the nose of the insert into the slot on the side of the housing. (2) Raise the clamp insert so that it is parallel to the control panel.



6. **Tighten clamping screws**
   Tighten the clamping screws (1) until the control unit is secured to the control panel (2). Over tightening of these screws may result in the clamp inserts or the housing breaking. Do not exceed the recommended tightening torque of 0.1 Nm.



7. **Reattach terminals**
   Reattach the wire connection terminal strip (1) and secure them with the side screws.



Screw Kit Installation

NOTE

Don't drill the holes if you want to use the clamp fasteners. If the holes are drilled into the panel, the clamp fasteners cannot be used anymore!

NOTE

The housing is equipped with 12 nut inserts (refer to Figure 4-5 for their position), which must all be tightened properly to achieve the required degree of protection.

Some versions of the plastic housing are not equipped with nut inserts and may not be fastened with the screw kit.

In order to enhance the protection to IP 66, it is possible to fasten the unit with a screw kit instead of the clamp fastener hardware.

Proceed as follows to install the unit using the screw kit:

1. Cut out the panel and drill the holes according to the dimensions in Figure 4-5 (dimensions shown in mm).
2. Insert the unit into the panel cutout. Verify that the unit fits correctly in the cutout. If the panel cutout is not big enough, enlarge it accordingly.
3. Insert the screws and tighten to 0.6 Nm (5.3 pound inches) of torque. Tighten the screws with a crosswise pattern to ensure even pressure distribution.

NOTE

If the thickness of the panel sheet exceeds 2.5 mm, be sure to use screws with a length of the panel sheet thickness + 4 mm.

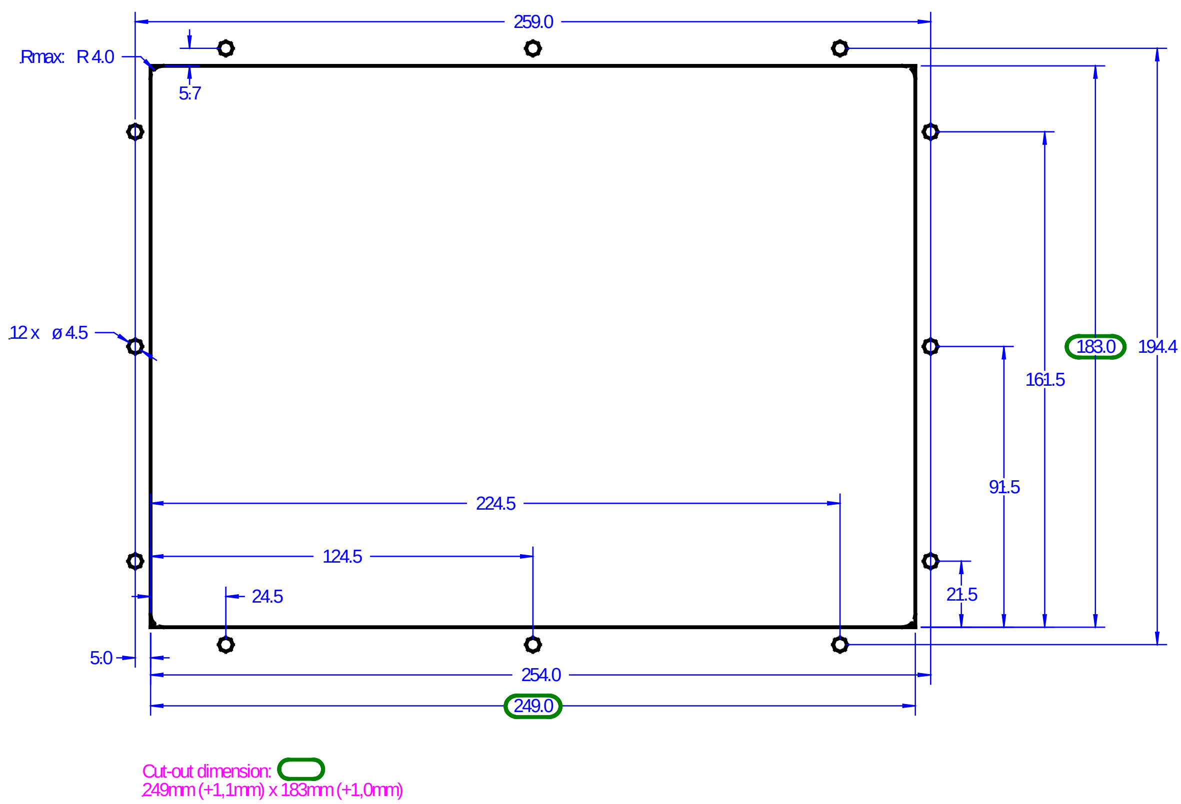


Figure 4-5: Plastic housing - drill plan

Sheet Metal Housing

Dimensions

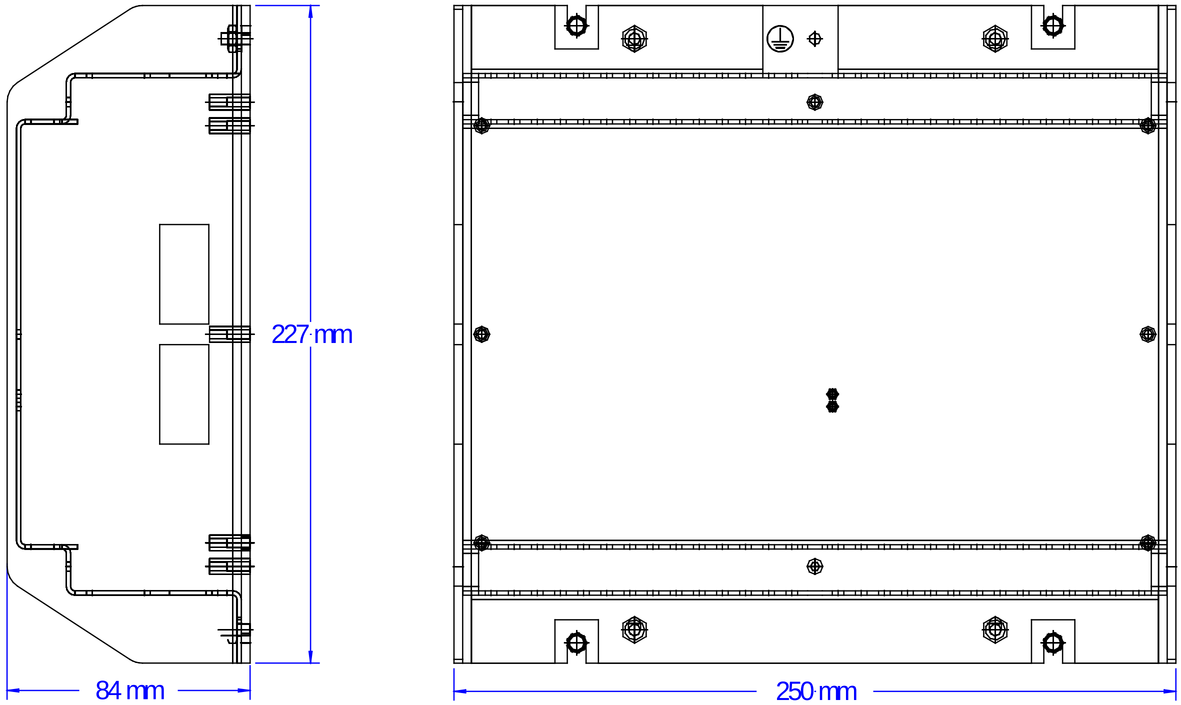


Figure 4-6: Sheet metal housing easYgen-3100 - dimensions

Installation

The unit is to be mounted to the switch cabinet back using four screws with a maximum diameter of 6 mm. Drill the holes according to the dimensions in Figure 4-7 (dimensions shown in mm).

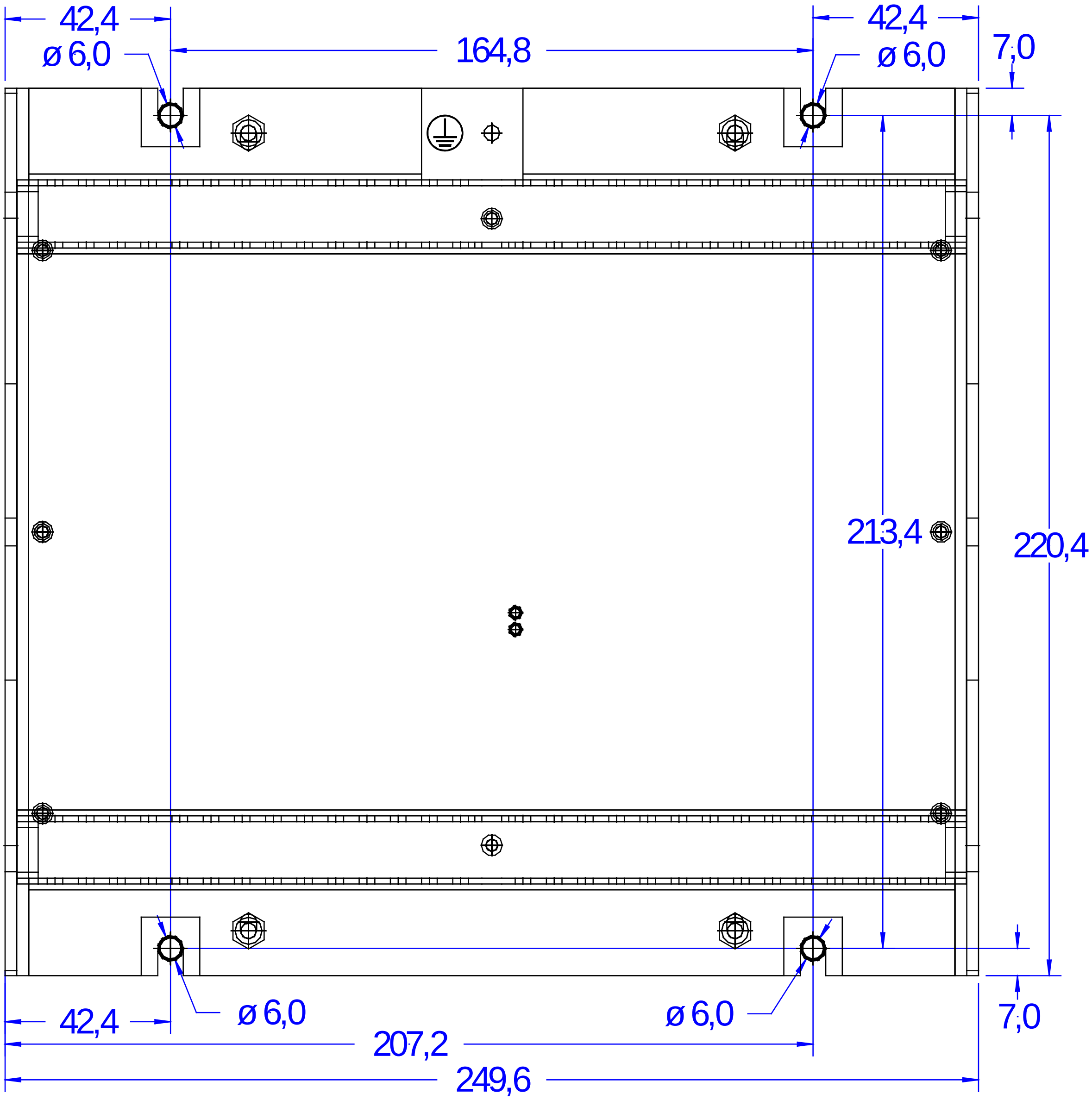


Figure 4-7: Sheet metal housing - drill plan

Terminal Arrangement

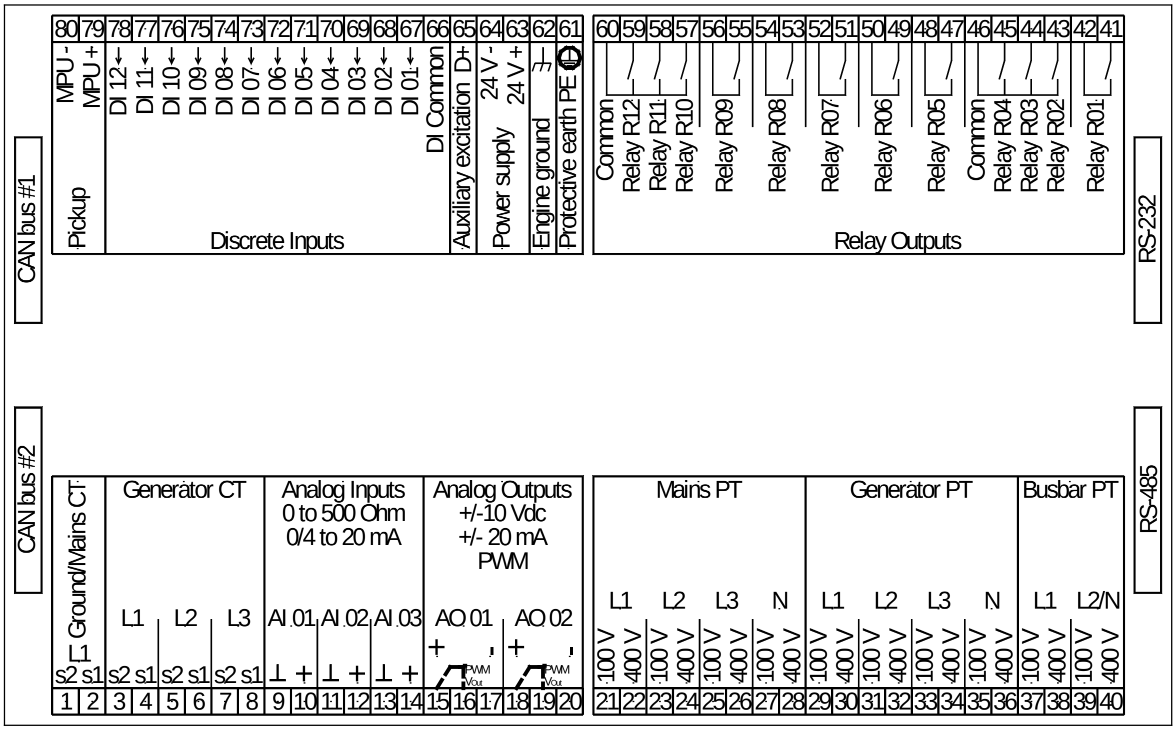


Figure 4-8: easYgen-3200 - terminal arrangement - rear view

NOTE

The Protective Earth terminal 61 is not connected on the easYgen-3100 with sheet metal housing. The protective earth connection at the sheet metal housing must be used instead (refer to Figure 4-9).

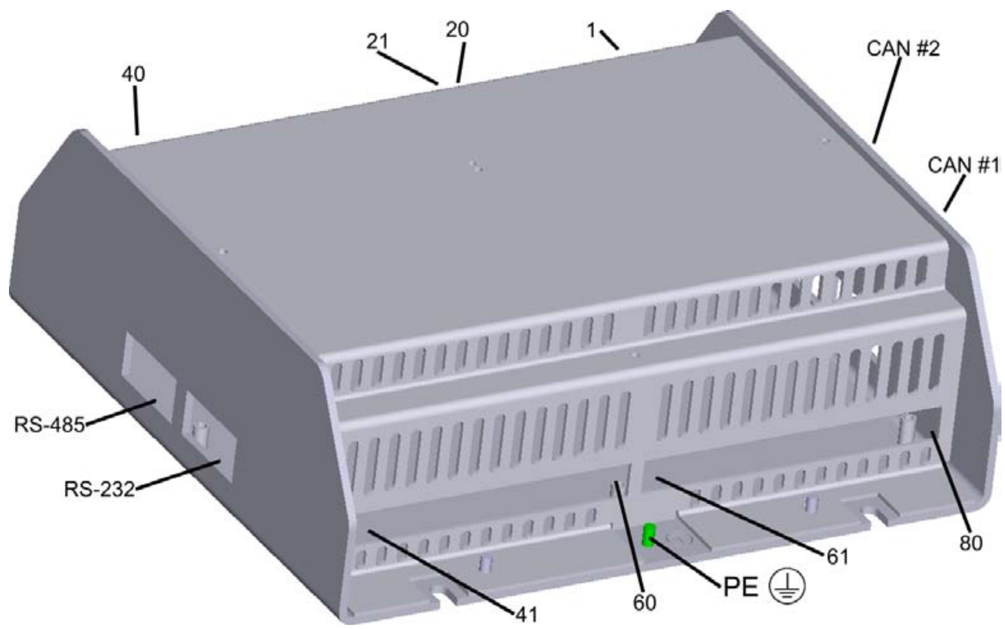


Figure 4-9: easYgen-3100 - terminal arrangement

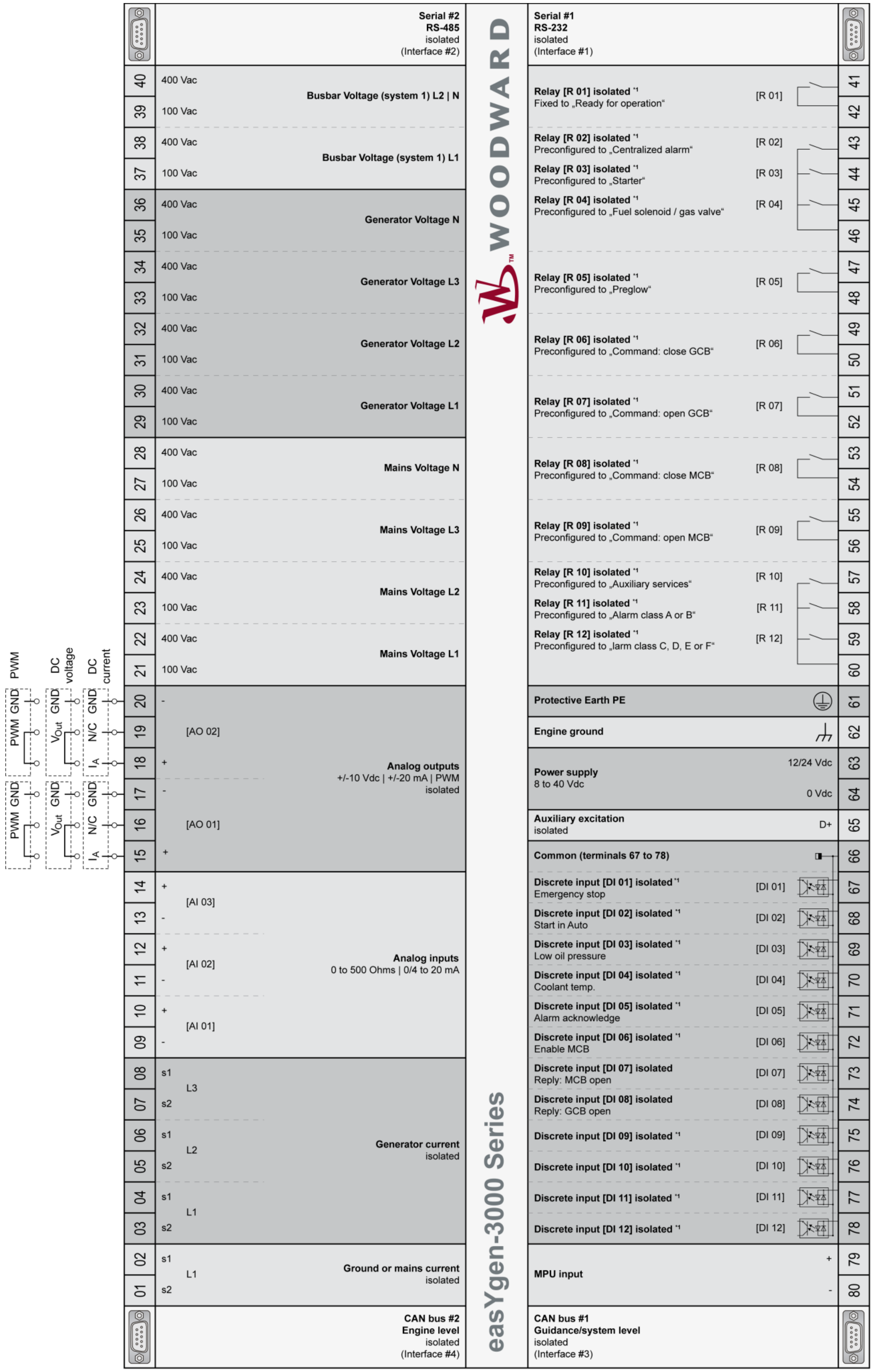
Chapter 5.
Wiring Diagrams

[refer to next page for wiring diagram]

Figure 5-1: Wiring diagram – overview

NOTE

The Protective Earth terminal 61 is not connected on the easYgen-3100 with sheet metal housing. The protective earth connection at the sheet metal housing must be used instead (refer to Figure 4-9 on page 17).



Subject to technical modifications.

*1 = configurable via LogicsManager

easYgen-3000 Series Wiring Diagram | Rev. C

Chapter 6. Connections

WARNING

All technical data and ratings indicated in this chapter are not definite! Only the values indicated in Chapter 7: Technical Data on page 58 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 6-1: Conversion chart - wire size

Power Supply

WARNING – Protective Earth

Protective Earth (PE) must be connected to the unit to avoid the risk of electric shock. The conductor providing the connection must have a wire larger than or equal to 2.5 mm² (14 AWG). The connection must be performed properly.

- **easYgen-3200: This connection will be made using the screw-plug-terminal 61.**
- **easYgen-3100: The protective earth terminal 61 is not connected on the easYgen-3100 with sheet metal housing. The protective earth connection at the sheet metal housing must be used instead (refer to Figure 4-9 on page 17).**

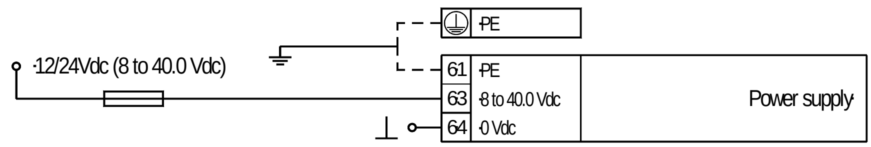


Figure 6-1: Power supply

Terminal	Description	A_{max}
61	PE (protective earth) - easYgen-3200 ONLY	2.5 mm²
63	12/24Vdc (8 to 40.0 Vdc)	2.5 mm²
64	0 Vdc	2.5 mm²

Table 6-2: Power supply - terminal assignment

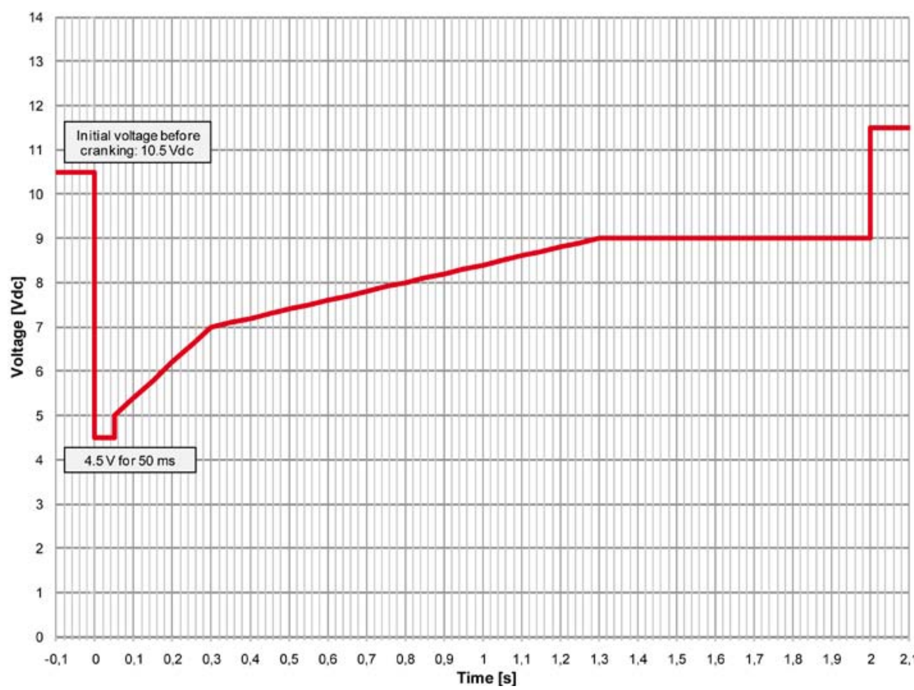


Figure 6-2: Power supply - crank waveform at maximum load

NOTE

Woodward recommends to use one of the following slow-acting protective devices in the supply line to terminal 63:

- **Fuse NEOZED D01 6A or equivalent**

or

- **Miniature Circuit Breaker 6A / Type C (for example: ABB type: S271C6 or equivalent)**

Charging Alternator

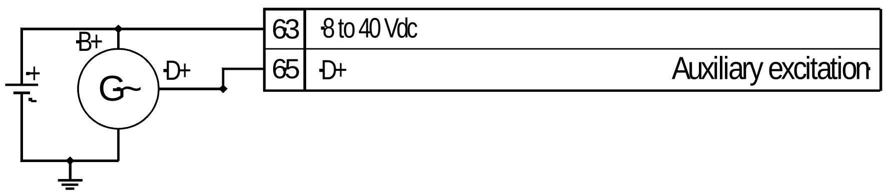


Figure 6-3: Charging alternator input/output

Terminal	Description	A_{max}
63	Battery B+	2.5 mm²
65	Auxiliary excitation output D+	2.5 mm²

Table 6-3: Charging alternator input/output - terminal assignment

NOTE

The charging alternator D+ acts as an output for pre-exciting the charging alternator during engine start-up only. During regular operation, it acts as an input for monitoring the charging voltage.

Voltage Measuring (*FlexRange*)

NOTE

DO NOT use both sets of voltage measuring inputs. The control unit will not measure voltage correctly if the 100 V and 400 V inputs are utilized simultaneously.

NOTE

Woodward recommends protecting the voltage measuring inputs with slow-acting fuses rated for 2 to 6 A.

Voltage Measuring: Generator

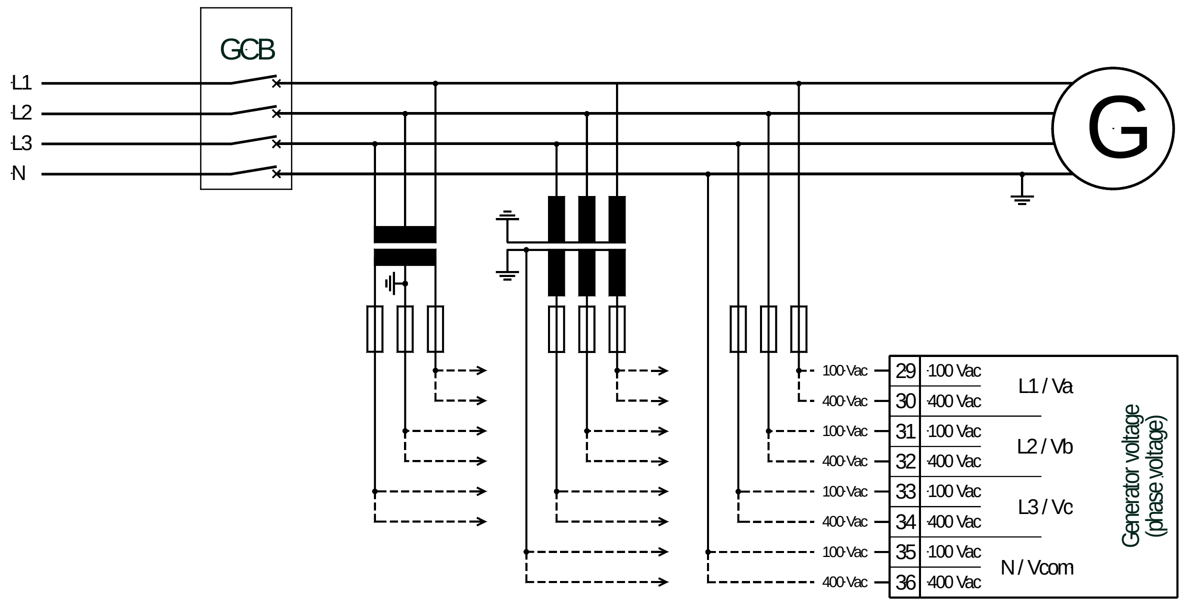


Figure 6-4: Voltage measuring - generator

Terminal	Description		A_{max}
29	Generator voltage - phase L1 / Va	100 Vac	2.5 mm²
30		400 Vac	2.5 mm²
31	Generator voltage - phase L2 / Vb	100 Vac	2.5 mm²
32		400 Vac	2.5 mm²
33	Generator voltage - phase L3 / Vc	100 Vac	2.5 mm²
34		400 Vac	2.5 mm²
35	Generator voltage - phase N / Vcom	100 Vac	2.5 mm²
36		400 Vac	2.5 mm²

Table 6-4: Voltage measuring - terminal assignment - generator voltage

NOTE

If parameter 1800 ("Gen. PT secondary rated volt.", refer to Configuration Manual 37469) is configured with a value between 50 and 130 V, the 100 V input terminals must be used for proper measurement.

If parameter 1800 ("Gen. PT secondary rated volt.", refer to Configuration Manual 37469) is configured with a value between 131 and 480 V, the 400 V input terminals must be used for proper measurement.

Voltage Measuring: Generator, Parameter Setting '3Ph 4W OD' (3-phase, 4-wire, Open delta)

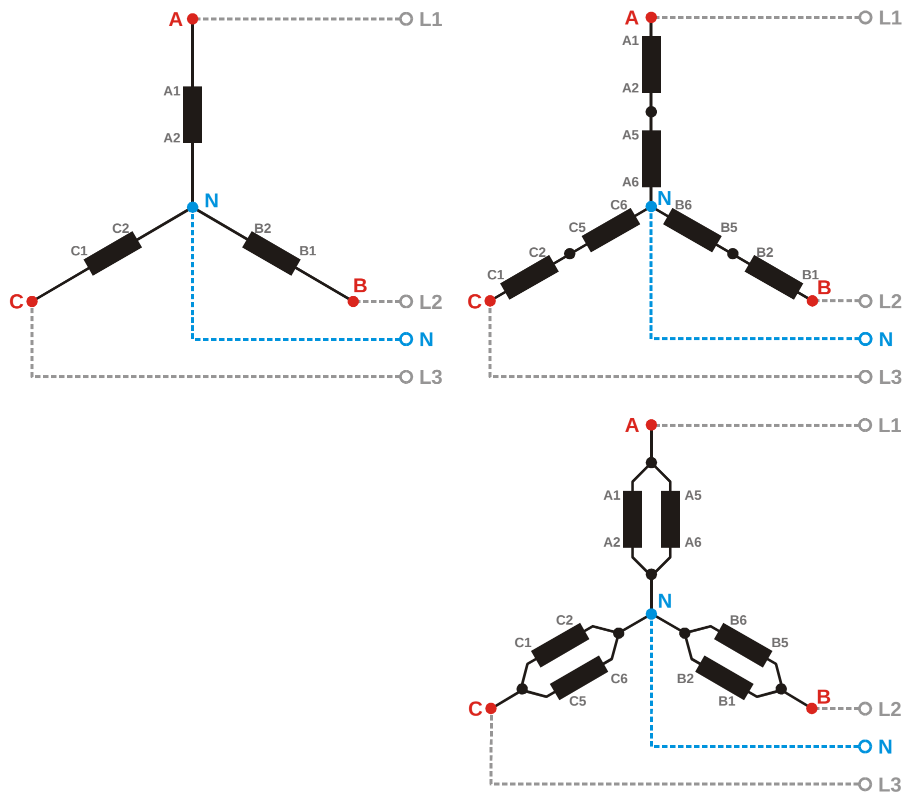


Figure 6-5: Voltage measuring - generator windings, 3Ph 4W OD

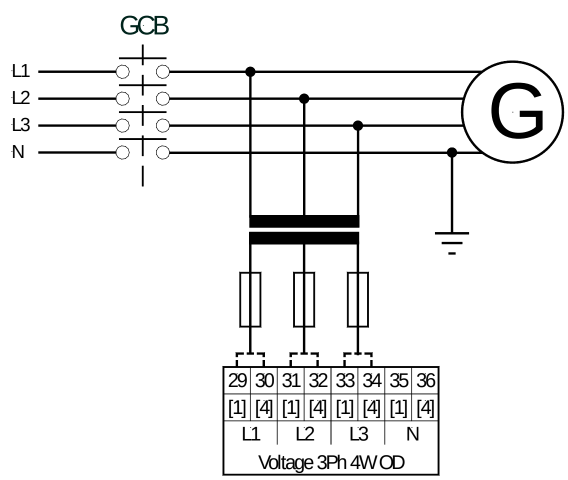


Figure 6-6: Voltage measuring - generator measuring inputs, 3Ph 4W OD

3Ph 4W OD	Wiring terminals								Note
Rated voltage (range)	[1] 100 V (50 to 130 $V_{eff.}$)				[4] 400 V (131 to 480 $V_{eff.}$)				1
Measuring range (max.)	[1] 0 to 150 Vac				[4] 0 to 600 Vac				
easYgen terminal	29	31	33	35	30	32	34	36	
Phase	L1	L2	L3	---	L1	L2	L3	---	

Table 6-5: Voltage measuring - terminal assignment - generator, 3Ph 4W OD

1 For different voltage systems, different wiring terminals have to be used.

Voltage Measuring: Generator, Parameter Setting '3Ph 4W' (3-phase, 4-wire)

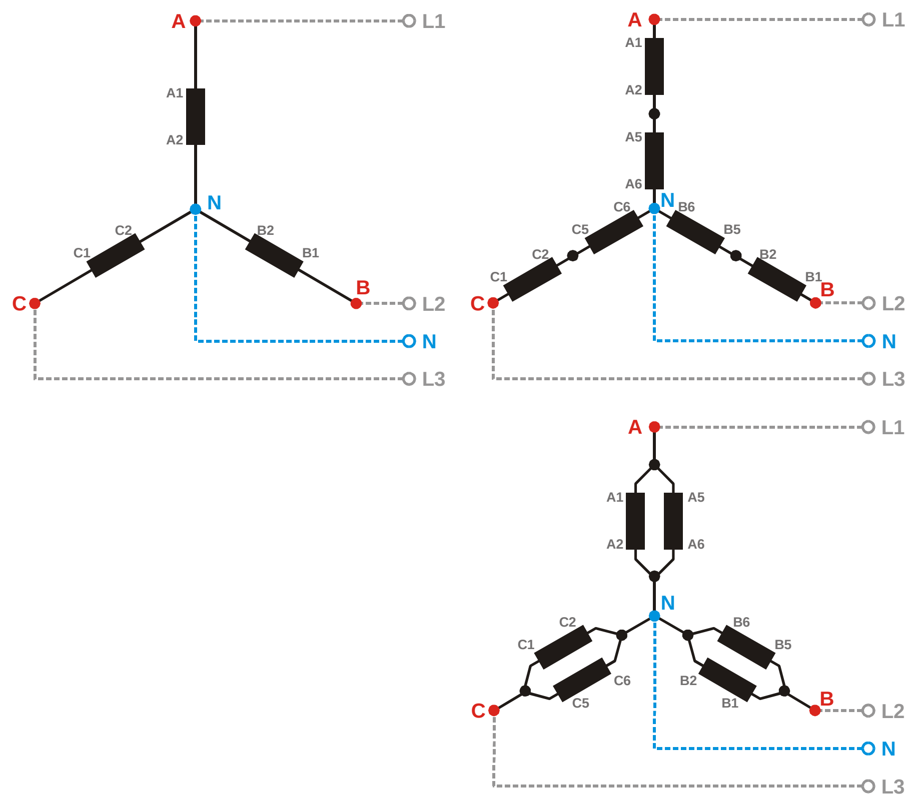


Figure 6-7: Voltage measuring - generator windings, 3Ph 4W

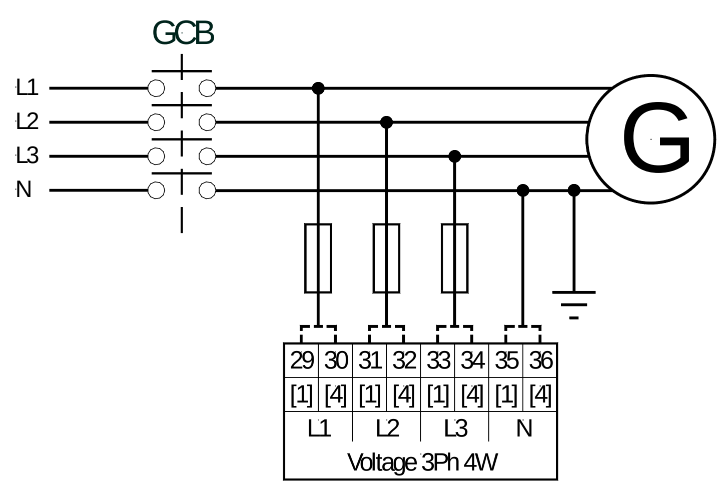


Figure 6-8: Voltage measuring - generator measuring inputs, 3Ph 4W

3Ph 4W	Wiring terminals								Note
Rated voltage (range)	[1] 100 V (50 to 130 $V_{eff.}$)				[4] 400 V (131 to 480 $V_{eff.}$)				2
Measuring range (max.)	[1] 0 to 150 Vac				[4] 0 to 600 Vac				
easYgen terminal	29	31	33	35	30	32	34	36	
Phase	L1	L2	L3	N	L1	L2	L3	N	

Table 6-6: Voltage measuring - terminal assignment - generator, 3Ph 4W

2 For different voltage systems, different wiring terminals have to be used. Incorrect measurements are possible if both voltage systems use the same N terminal.

Voltage Measuring: Generator, Parameter Setting '3Ph 3W' (3-phase, 3-wire)

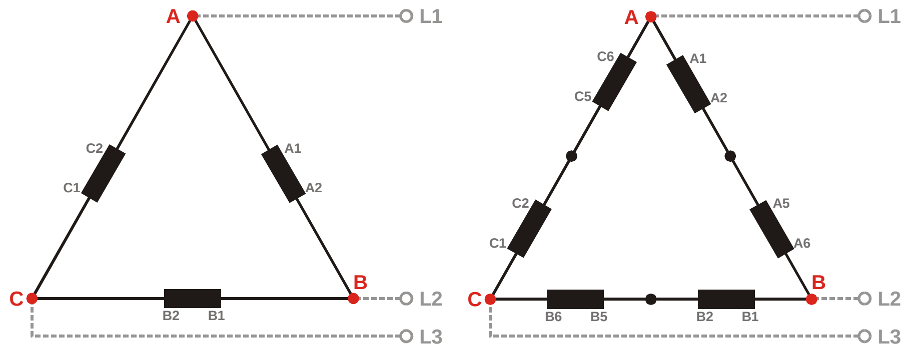


Figure 6-9: Voltage measuring - generator windings, 3Ph 3W

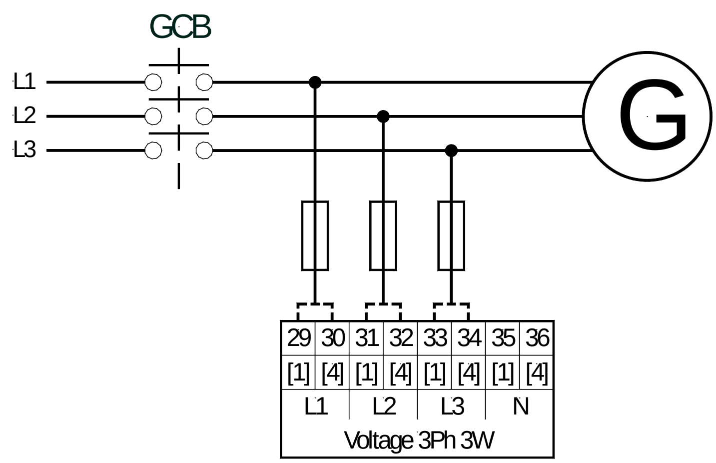


Figure 6-10: Voltage measuring - generator measuring inputs, 3Ph 3W

3Ph 3W	Wiring terminals								Note
Rated voltage (range)	[1] 100 V (50 to 130 $V_{eff.}$)				[4] 400 V (131 to 480 $V_{eff.}$)				3
Measuring range (max.)	[1] 0 to 150 Vac				[4] 0 to 600 Vac				
easYgen terminal	29	31	33	35	30	32	34	36	
Phase	L1	L2	L3	---	L1	L2	L3	---	

Table 6-7: Voltage measuring - terminal assignment - generator, 3Ph 3W

NOTE

If L1,L2 or L3 are connected to PE or N the single reactive powers VL1-I1, VL2-I2 and VL3-I3 cannot be calculated correctly. So the overall reactive power does not fit. The apparent power is calculated out of the reactive power and cannot be correct too.

The at all active power and the single currents are calculated all the time correct.

3 For different voltage systems, different wiring terminals have to be used.

Voltage Measuring: Generator, Parameter Setting '1Ph 3W' (1-phase, 3-wire)

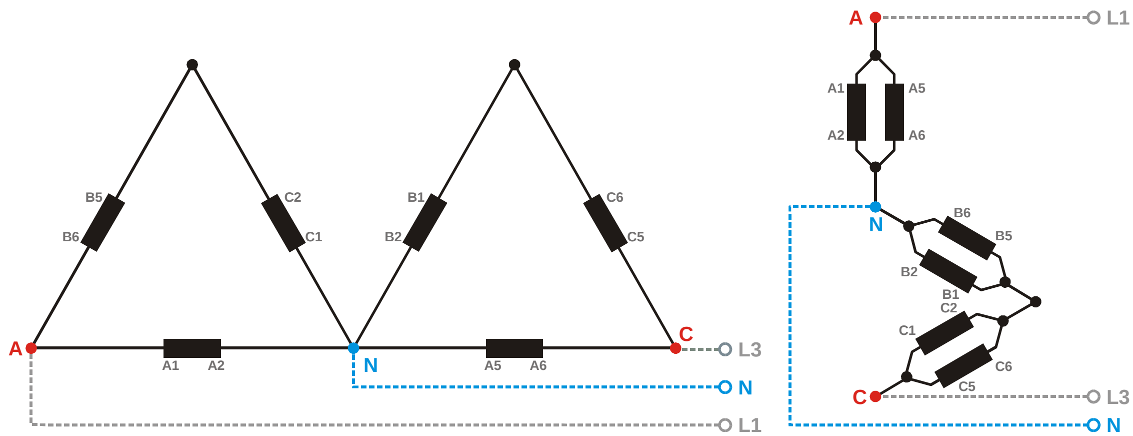


Figure 6-11: Voltage measuring - generator windings, 1Ph 3W

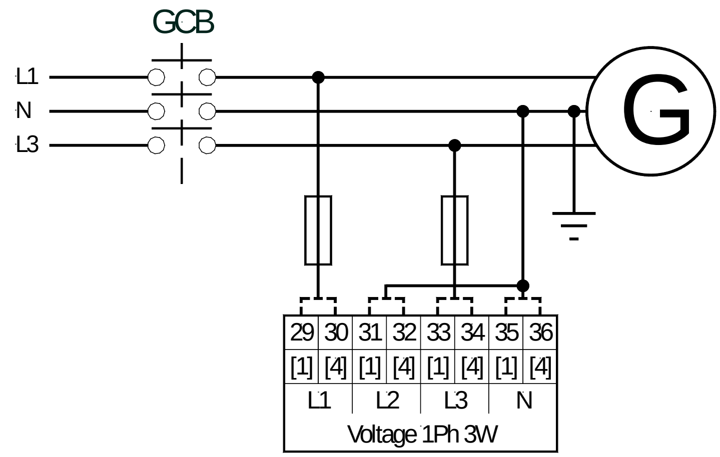


Figure 6-12: Voltage measuring - generator measuring inputs, 1Ph 3W

1Ph 3W	Wiring terminals								Note
Rated voltage (range)	[1] 100 V (50 to 130 $V_{eff.}$)				[4] 400 V (131 to 480 $V_{eff.}$)				4
Measuring range (max.)	[1] 0 to 150 Vac				[4] 0 to 600 Vac				
easYgen terminal	29	31	33	35	30	32	34	36	
Phase	L1	N	L3	N	L1	N	L3	N	

Table 6-8: Voltage measuring - terminal assignment - generator, 1Ph 3W

4 For different voltage systems, different wiring terminals have to be used. Incorrect measurements are possible if both voltage systems use the same N terminal.

Voltage Measuring: Generator, Parameter Setting '1Ph 2W' (1-phase, 2-wire)

NOTE

The 1-phase, 2-wire measurement may be performed phase-neutral or phase-phase. Please note to configure and wire the easYgen consistently. Refer to the Configuration Manual 37469 for more information.

'1Ph 2W' Phase-Neutral Measuring

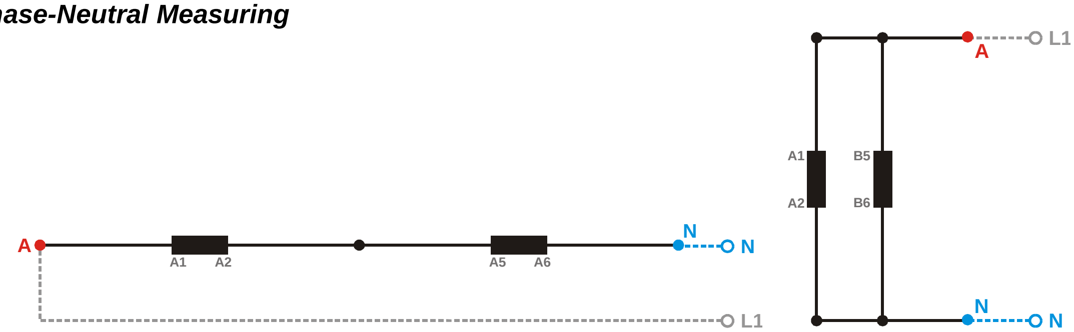


Figure 6-13: Voltage measuring - generator windings, 1Ph 2W (phase-neutral)

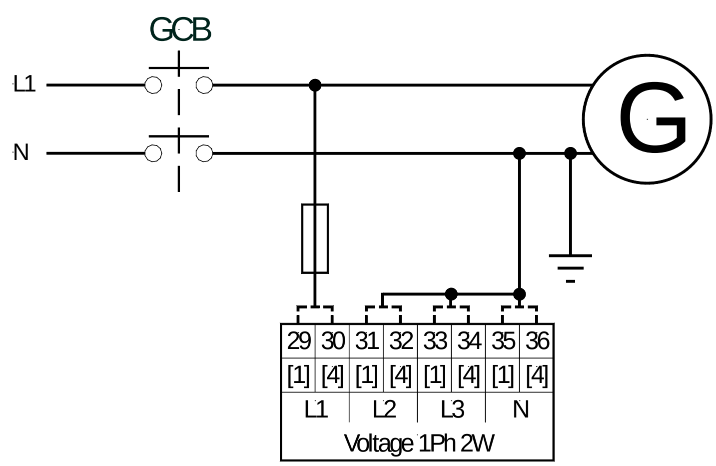


Figure 6-14: Voltage measuring - generator measuring inputs, 1Ph 2W (phase-neutral)

1Ph 2W	Wiring terminals								Note
Rated voltage (range)	[1] 100 V (50 to 130 $V_{eff.}$)				[4] 400 V (131 to 480 $V_{eff.}$)				5
Measuring range (max.)	[1] 0 to 150 Vac				[4] 0 to 600 Vac				
easYgen terminal	29	31	33	35	30	32	34	36	
Phase	L1	N	N	N	L1	N	N	N	

Table 6-9: Voltage measuring - terminal assignment - generator, 1Ph 2W (phase-neutral)

NOTE

Do never configure the busbar measurement for phase-neutral, if the other systems like mains and generator are configured as 3ph 3W or 4ph 4W without being the neutral in the middle of the triangle. The phase angle for synchronization would be not correct!

5 For different voltage systems, different wiring terminals have to be used. Incorrect measurements are possible if both voltage systems use the same N terminal.

'1Ph 2W' Phase-Phase Measuring

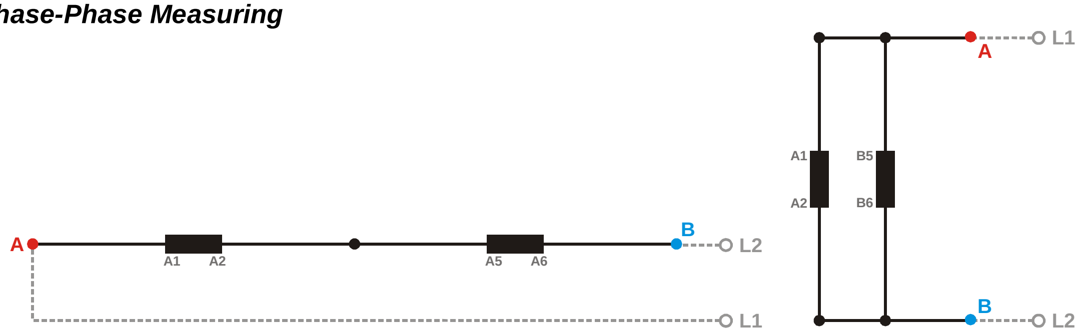


Figure 6-15: Voltage measuring - generator windings, 1Ph 2W (phase-phase)

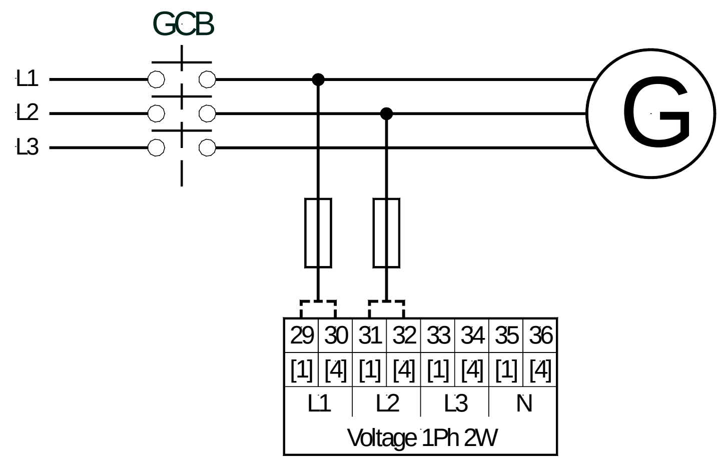


Figure 6-16: Voltage measuring - generator measuring inputs, 1Ph 2W (phase-phase)

1Ph 2W	Wiring terminals								Note
Rated voltage (range)	[1] 100 V (50 to 130 $V_{eff.}$)				[4] 400 V (131 to 480 $V_{eff.}$)				6
Measuring range (max.)	[1] 0 to 150 Vac				[4] 0 to 600 Vac				
easYgen terminal	29	31	33	35	30	32	34	36	
Phase	L1	L2	---	---	L1	L2	---	---	

Table 6-10: Voltage measuring - terminal assignment - generator, 1Ph 2W (phase-phase)

6 For different voltage systems, different wiring terminals have to be used. Incorrect measurements are possible if both voltage systems use the same N terminal.

Voltage Measuring: Mains

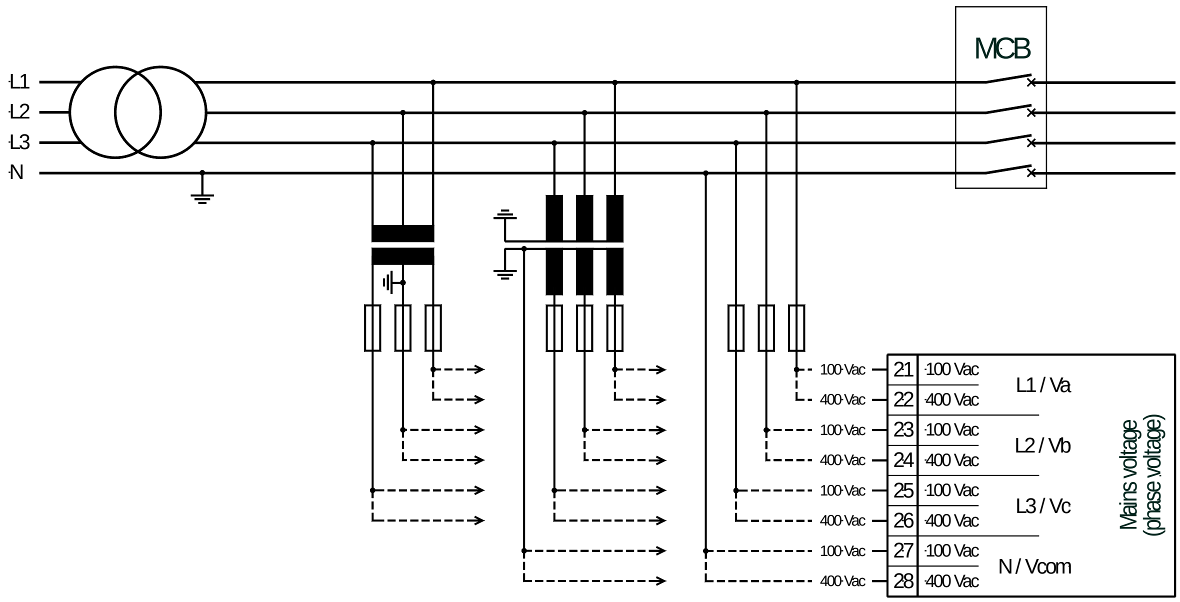


Figure 6-17: Voltage measuring - mains

Terminal	Description		A_{max}
21	Mains voltage - phase L1 / Va	100 Vac	2.5 mm²
22		400 Vac	2.5 mm²
23	Mains voltage - phase L2 / Vb	100 Vac	2.5 mm²
24		400 Vac	2.5 mm²
25	Mains voltage - phase L3 / Vc	100 Vac	2.5 mm²
26		400 Vac	2.5 mm²
27	Mains voltage - phase N / Vcom	100 Vac	2.5 mm²
28		400 Vac	2.5 mm²

Table 6-11: Voltage measuring - terminal assignment - mains voltage

NOTE

If parameter 1803 ("Mains PT secondary rated volt.", refer to Configuration Manual 37469) is configured with a value between 50 and 130 V, the 100 V input terminals must be used for proper measurement.

If parameter 1803 ("Mains PT secondary rated volt.", refer to Configuration Manual 37469) is configured with a value between 131 and 480 V, the 400 V input terminals must be used for proper measurement.

NOTE

If the easYgen is intended to be operated in parallel with the mains, the mains voltage measuring inputs must be connected. If an external mains decoupling is performed, jumpers between busbar and mains voltage measuring inputs may be installed.

Voltage Measuring: Mains, Parameter Setting '3Ph 4W' (3-phase, 4-wire)

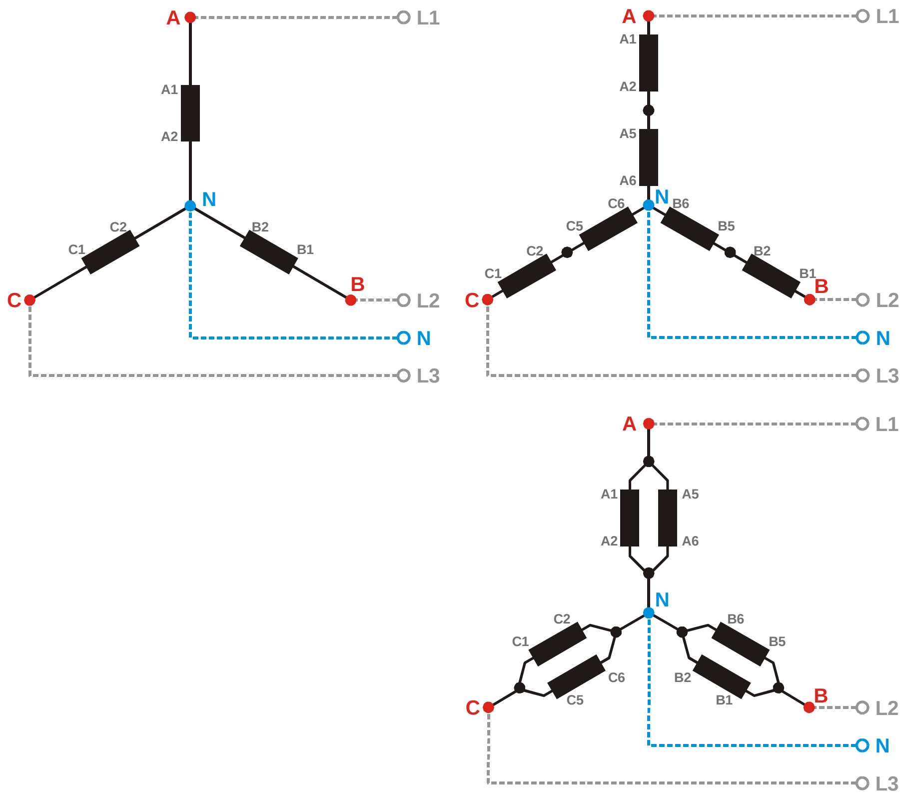


Figure 6-18: Voltage measuring - mains PT windings, 3Ph 4W

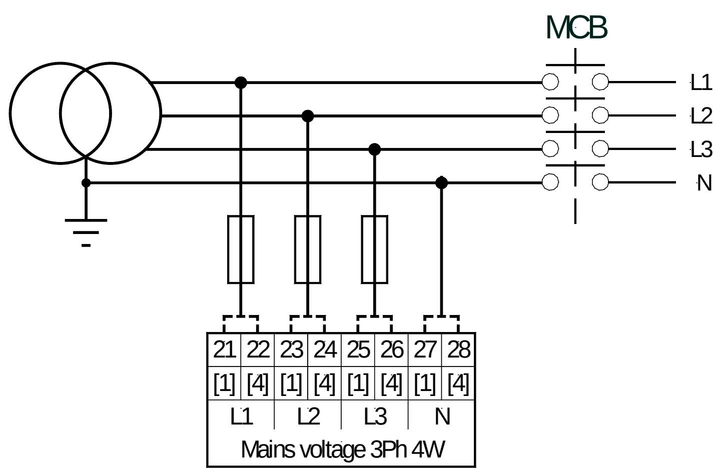


Figure 6-19: Voltage measuring - mains measuring inputs, 3Ph 4W

3Ph 4W	Wiring terminals								Note
Rated voltage (range)	[1] 100 V (50 to 130 $V_{eff.}$)				[4] 400 V (131 to 480 $V_{eff.}$)				7
Measuring range (max.)	[1] 0 to 150 Vac				[4] 0 to 600 Vac				
easYgen terminal	21	23	25	27	22	24	26	28	
Phase	L1	L2	L3	N	L1	L2	L3	N	

Table 6-12: Voltage measuring - terminal assignment - mains, 3Ph 4W

7 For different voltage systems, different wiring terminals have to be used. Incorrect measurements are possible if both voltage systems use the same N terminal.

Voltage Measuring: Mains, Parameter Setting '3Ph 3W' (3-phase, 3-wire)

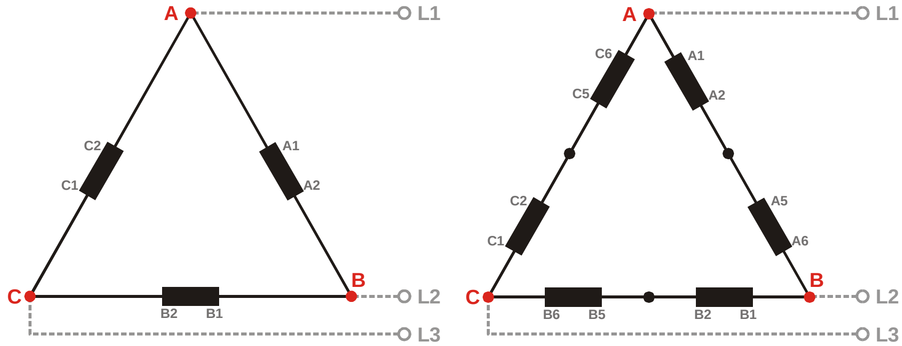


Figure 6-20: Voltage measuring - mains PT windings, 3Ph 3W

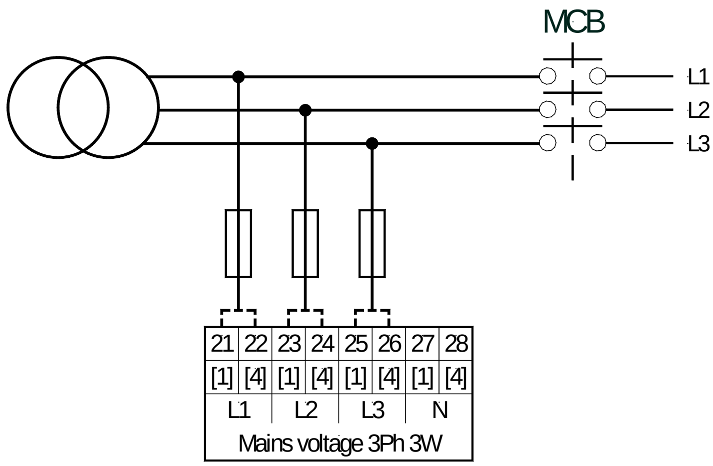


Figure 6-21: Voltage measuring - mains measuring inputs, 3Ph 3W

3Ph 3W	Wiring terminals								Note
Rated voltage (range)	[1] 100 V (50 to 130 $V_{eff.}$)				[4] 400 V (131 to 480 $V_{eff.}$)				8
Measuring range (max.)	[1] 0 to 150 Vac				[4] 0 to 600 Vac				
easYgen terminal	21	23	25	27	22	24	26	28	
Phase	L1	L2	L3	---	L1	L2	L3	---	

Table 6-13: Voltage measuring - terminal assignment - mains, 3Ph 3W

8 For different voltage systems, different wiring terminals have to be used.

Voltage Measuring: Mains, Parameter Setting '1Ph 3W' (1-phase, 3-wire)

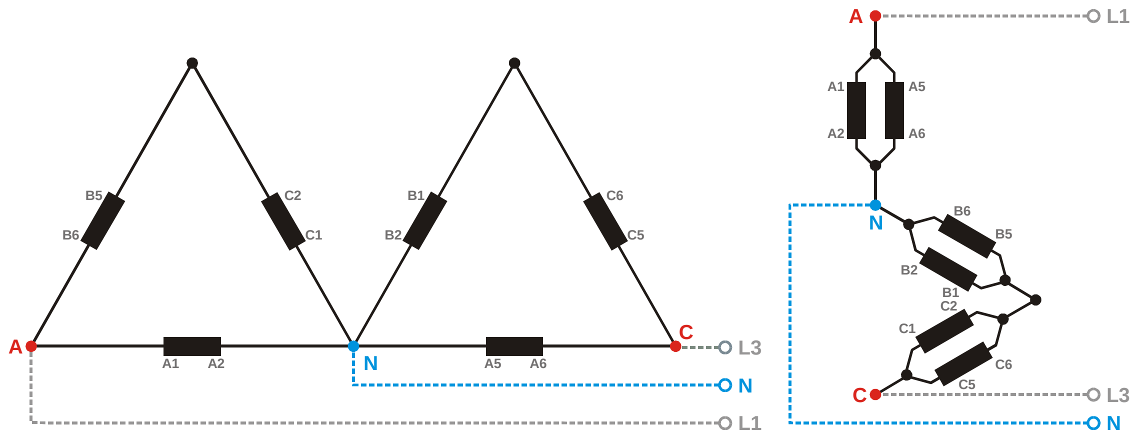


Figure 6-22: Voltage measuring - mains PT windings, 1Ph 3W

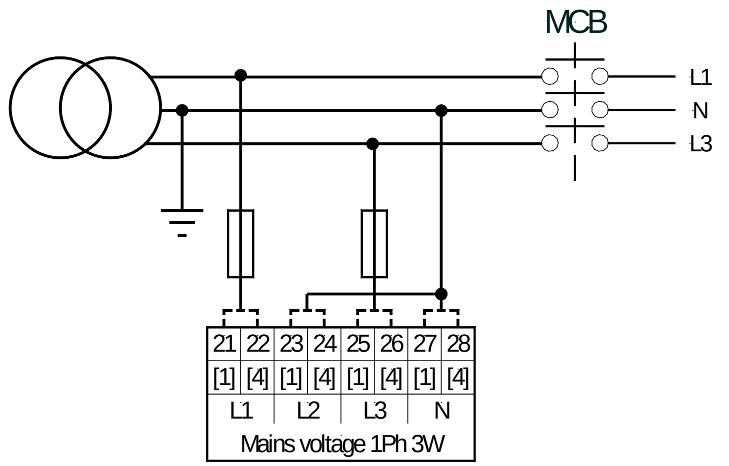


Figure 6-23: Voltage measuring - mains measuring inputs, 1Ph 3W

1Ph 3W	Wiring terminals								Note
Rated voltage (range)	[1] 100 V (50 to 130 $V_{eff.}$)				[4] 400 V (131 to 480 $V_{eff.}$)				9
Measuring range (max.)	[1] 0 to 150 Vac				[4] 0 to 600 Vac				
easYgen terminal	21	23	25	27	22	24	26	28	
Phase	L1	N	L3	N	L1	N	L3	N	

Table 6-14: Voltage measuring - terminal assignment - mains, 1Ph 3W

9 For different voltage systems, different wiring terminals have to be used. Incorrect measurements are possible if both voltage systems use the same N terminal.

Voltage Measuring: Mains, Parameter Setting '1Ph 2W' (1-phase, 2-wire)

NOTE

The 1-phase, 2-wire measurement may be performed phase-neutral or phase-phase. Please note to configure and wire the easYgen consistently. Refer to the Configuration Manual 37469 for more information.

'1Ph 2W' Phase-Neutral Measuring

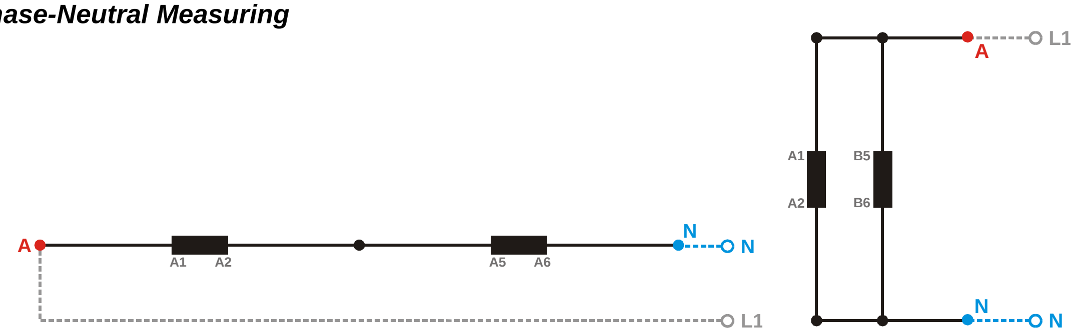


Figure 6-24: Voltage measuring - mains PT windings, 1Ph 2W (phase-neutral)

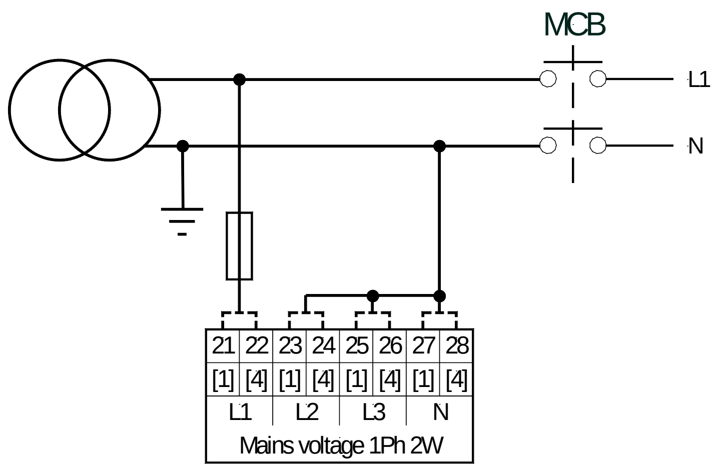


Figure 6-25: Voltage measuring - mains measuring inputs, 1Ph 2W (phase-neutral)

1Ph 2W	Wiring terminals								Note
Rated voltage (range)	[1] 100 V (50 to 130 $V_{eff.}$)				[4] 400 V (131 to 480 $V_{eff.}$)				10
Measuring range (max.)	[1] 0 to 150 Vac				[4] 0 to 600 Vac				
easYgen terminal	21	23	25	27	22	24	26	28	
Phase	L1	N	N	N	L1	N	N	N	

Table 6-15: Voltage measuring - terminal assignment - mains, 1Ph 2W (phase-neutral)

10 For different voltage systems, different wiring terminals have to be used. Incorrect measurements are possible if both voltage systems use the same N terminal.

'1Ph 2W' Phase-Phase Measuring

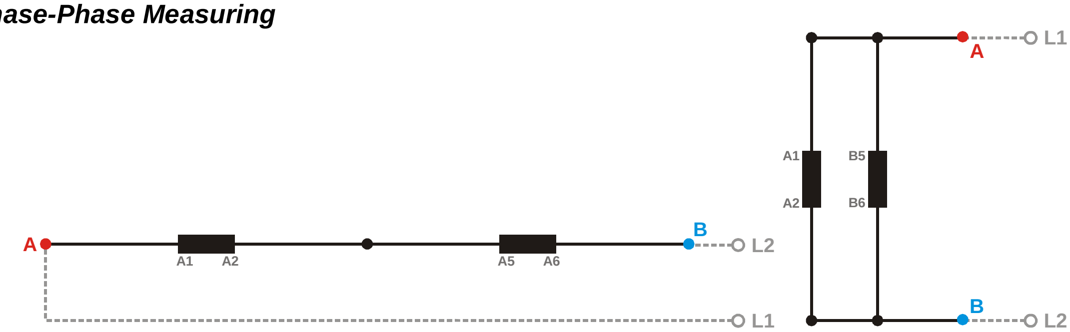


Figure 6-26: Voltage measuring - mains PT windings, 1Ph 2W (phase-phase)

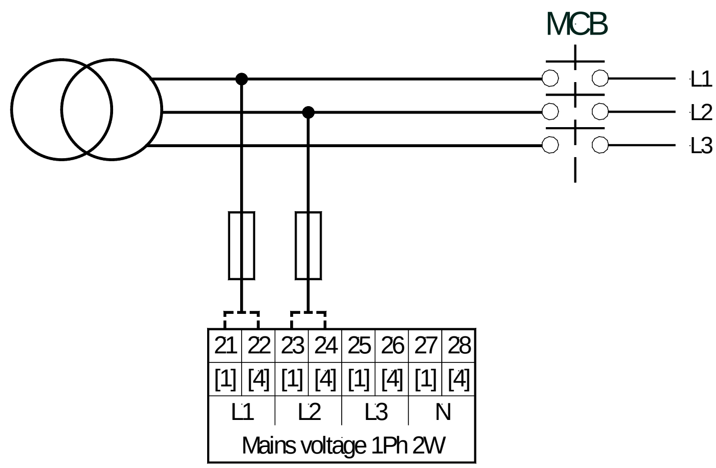


Figure 6-27: Voltage measuring - mains measuring inputs, 1Ph 2W (phase-phase)

1Ph 2W	Wiring terminals								Note
Rated voltage (range)	[1] 100 V (50 to 130 $V_{eff.}$)				[4] 400 V (131 to 480 $V_{eff.}$)				11
Measuring range (max.)	[1] 0 to 150 Vac				[4] 0 to 600 Vac				
easYgen terminal	21	23	25	27	22	24	26	28	
Phase	L1	L2	---	---	L1	L2	---	---	

Table 6-16: Voltage measuring - terminal assignment - mains, 1Ph 2W (phase-phase)

11 For different voltage systems, different wiring terminals have to be used. Incorrect measurements are possible if both voltage systems use the same N terminal.

Voltage Measuring: Busbar (System 1) 1Ph 2W

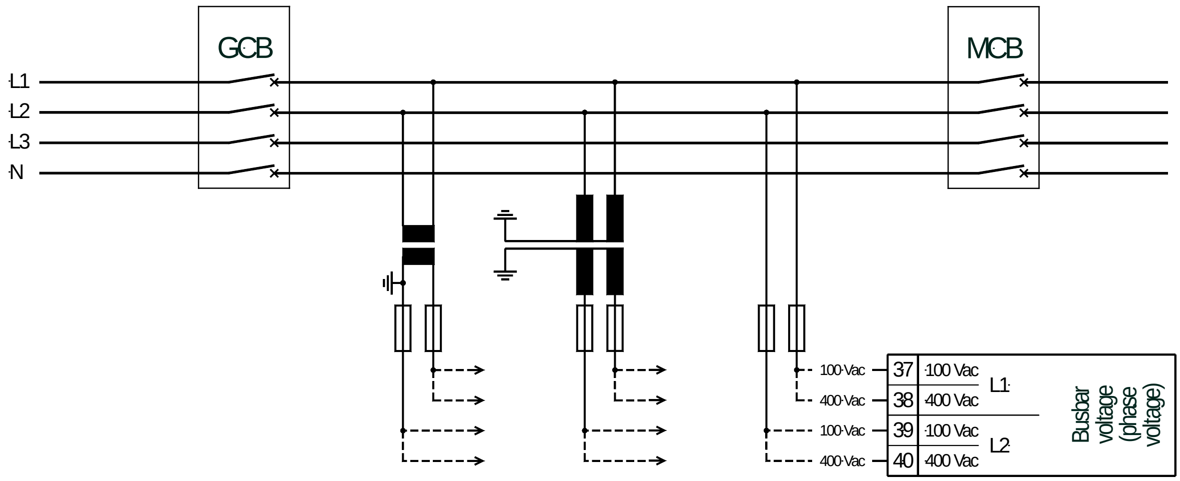


Figure 6-28: Voltage measuring - busbar (system 1) 1Ph 2W (phase-phase)

Terminal	Description		A_{max}
37	Busbar voltage (system 1) - phase L1	100 Vac	2.5 mm²
38		400 Vac	2.5 mm²
39	Busbar voltage (system 1) - phase L2 / N	100 Vac	2.5 mm²
40		400 Vac	2.5 mm²

Table 6-17: Voltage measuring - terminal assignment - busbar (system 1) 1Ph 2W (phase-phase)

NOTE

If parameter 1812 ("Busb1 PT secondary rated volt.", refer to Configuration Manual 37469) is configured with a value between 50 and 130 V, the 100 V input terminals must be used for proper measurement.

If parameter 1812 ("Busb1 PT secondary rated volt.", refer to Configuration Manual 37469) is configured with a value between 131 and 480 V, the 400 V input terminals must be used for proper measurement.

Voltage Measuring: Busbar (System 1), Parameter Setting '1Ph 2W' (1-phase, 2-wire)

NOTE

The 1-phase, 2-wire measurement may be performed phase-neutral or phase-phase. Please note to configure and wire the easYgen consistently. Refer to the Configuration Manual 37469 for more information.

'1Ph 2W' Phase-Neutral Measuring

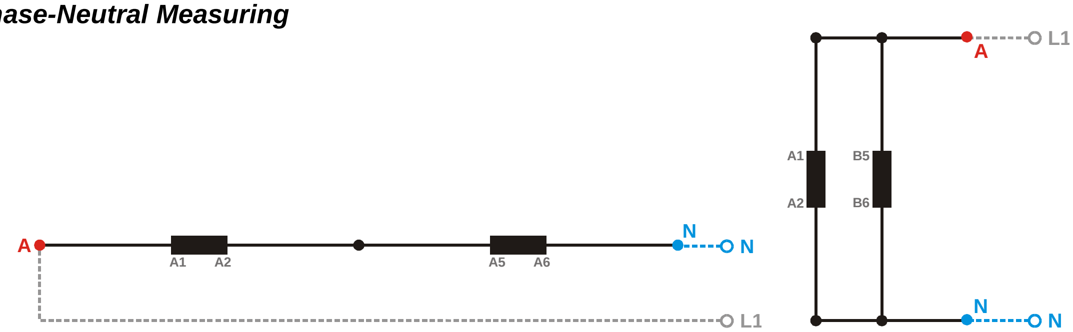


Figure 6-29: Voltage measuring - busbar PT windings, 1Ph 2W (phase-neutral)

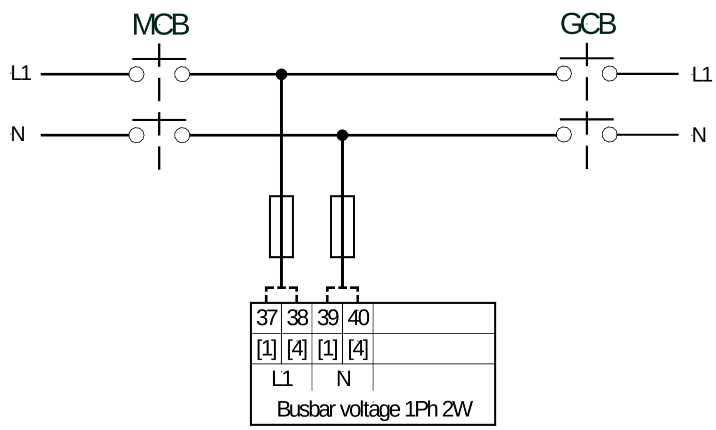


Figure 6-30: Voltage measuring - busbar measuring inputs, 1Ph 2W (phase-neutral)

1Ph 2W	Wiring terminals								Note
Rated voltage (range)	[1] 100 V (50 to 130 $V_{eff.}$)				[4] 400 V (131 to 480 $V_{eff.}$)				12
Measuring range (max.)	[1] 0 to 150 Vac				[4] 0 to 600 Vac				
easYgen terminal	37	39	---	---	38	40	---	---	
Phase	L1	N	---	---	L1	N	---	---	

Table 6-18: Voltage measuring - terminal assignment - busbar, 1Ph 2W (phase-neutral)

12 For different voltage systems, different wiring terminals have to be used. Incorrect measurements are possible if both voltage systems use the same N terminal.

'1Ph 2W' Phase-Phase Measuring

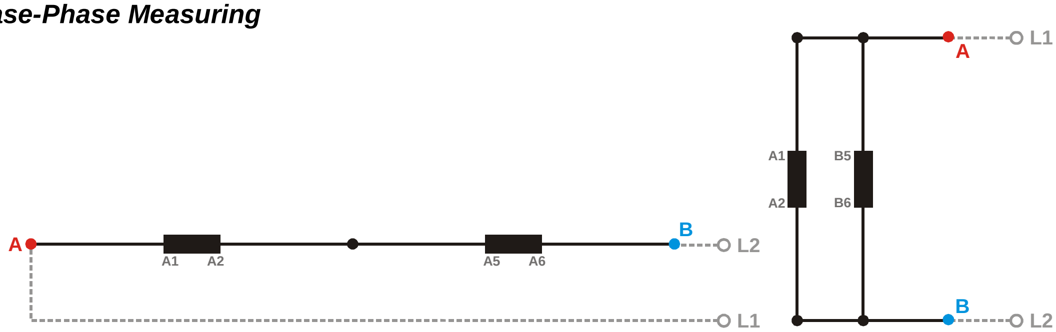


Figure 6-31: Voltage measuring - busbar PT windings, 1Ph 2W (phase-phase)

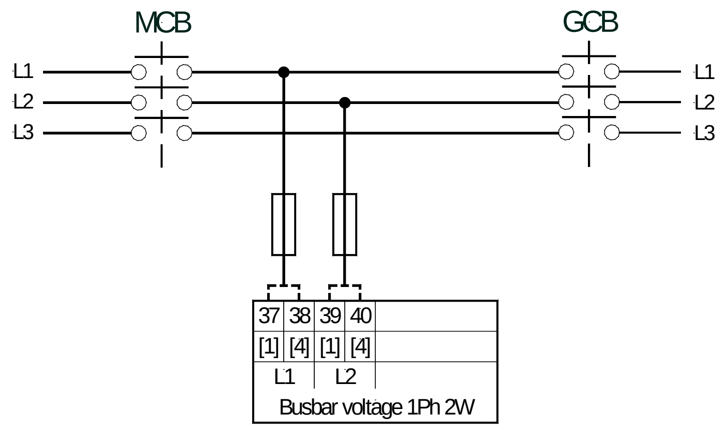


Figure 6-32: Voltage measuring - busbar measuring inputs, 1Ph 2W (phase-phase)

1Ph 2W	Wiring terminals								Note
Rated voltage (range)	[1] 100 V (50 to 130 $V_{eff.}$)				[4] 400 V (131 to 480 $V_{eff.}$)				13
Measuring range (max.)	[1] 0 to 150 Vac				[4] 0 to 600 Vac				
easYgen terminal	37	39	---	---	38	40	---	---	
Phase	L1	L2	---	---	L1	L2	---	---	

Table 6-19: Voltage measuring - terminal assignment - busbar, 1Ph 2W (phase-phase)

13 For different voltage systems, different wiring terminals have to be used. Incorrect measurements are possible if both voltage systems use the same N terminal.

Current Measuring

CAUTION

Before disconnecting the device, ensure that the current transformer/CT is short-circuited.

Generator Current

NOTE

Generally, one line of the current transformers secondary is to be grounded close to the CT.

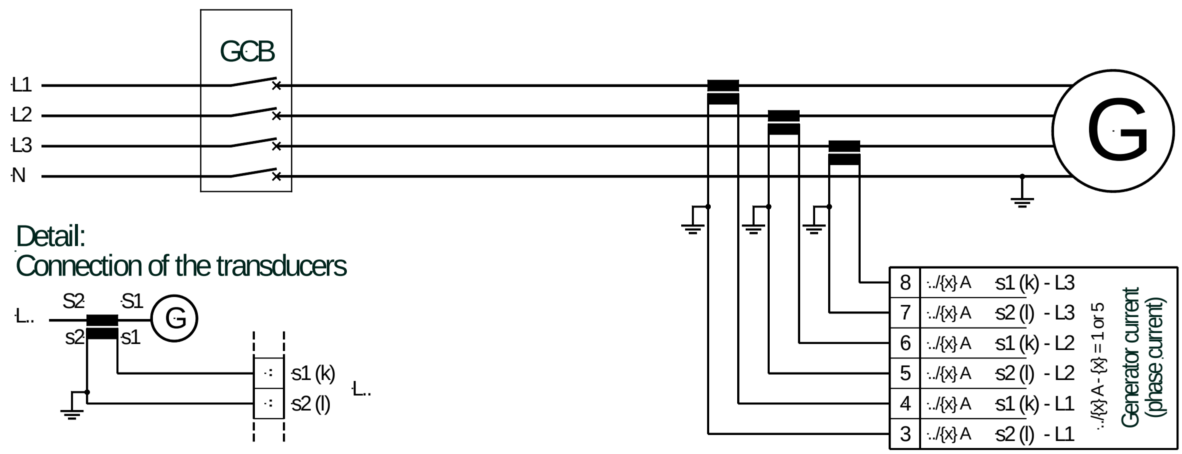


Figure 6-33: Current measuring - generator

Terminal	Description	A_{max}
8	Generator current - phase L3 - transformer terminal s1 (k)	2.5 mm²
7	Generator current - phase L3 - transformer terminal s2 (l)	2.5 mm²
6	Generator current - phase L2 - transformer terminal s1 (k)	2.5 mm²
5	Generator current - phase L2 - transformer terminal s2 (l)	2.5 mm²
4	Generator current - phase L1 - transformer terminal s1 (k)	2.5 mm²
3	Generator current - phase L1 - transformer terminal s2 (l)	2.5 mm²

Table 6-20: Current measuring - terminal assignment - generator current

Current Measuring: Generator, Parameter Setting 'L1 L2 L3'

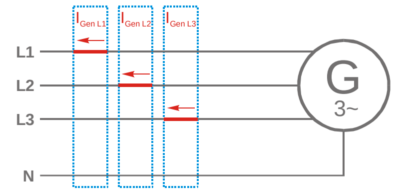


Figure 6-34: Current measuring - generator, L1 L2 L3

L1 L2 L3	Wiring terminals						Notes
easYgen terminal	3	4	5	6	7	8	
Phase	s2 (k) L1	s1 (l) L1	s2 (k) L2	s1 (l) L2	s2 (k) L3	s1 (l) L3	

Table 6-21: Current measuring - terminal assignment - generator, L1 L2 L3

Current Measuring: Generator, Parameter Setting 'Phase L1', 'Phase L2' & 'Phase L3'

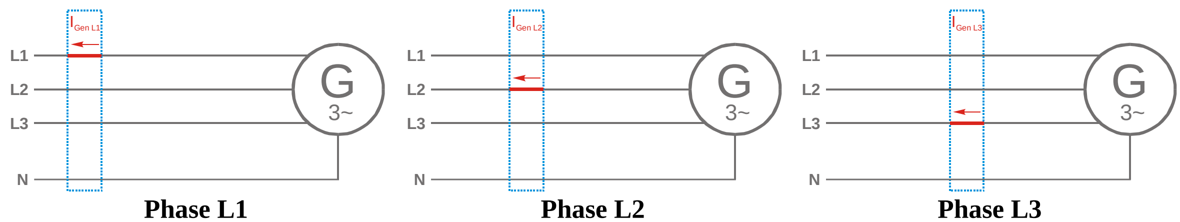


Figure 6-35: Current measuring - generator, phase Lx

	Wiring terminals						Notes
Phase L1							
easYgen terminal	3	4	5	6	7	8	
Phase	s2 (k) L1	s1 (l) L1	---	---	---	---	
Phase L2							
easYgen terminal	3	4	5	6	7	8	
Phase	---	---	s2 (k) L2	s1 (l) L2	---	---	
Phase L3							
easYgen terminal	3	4	5	6	7	8	
Phase	---	---	---	---	s2 (k) L3	s1 (l) L3	
Phase L1 and L3							14
easYgen terminal	3	4	5	6	7	8	
Phase	s2 (k) L1	s1 (l) L1	---	---	s2 (k) L3	s1 (l) L3	

Table 6-22: Current measuring - terminal assignment - generator, phase Lx

14 This is valid if the generator voltage measurement is configured to 1Ph 3W (refer to Voltage Measuring: Generator, Parameter Setting '1Ph 3W' (1-phase, 3-wire) on page 20).

Mains Current 1-Phase

NOTE

Generally, one line of the current transformers secondary is to be grounded close to the CT.

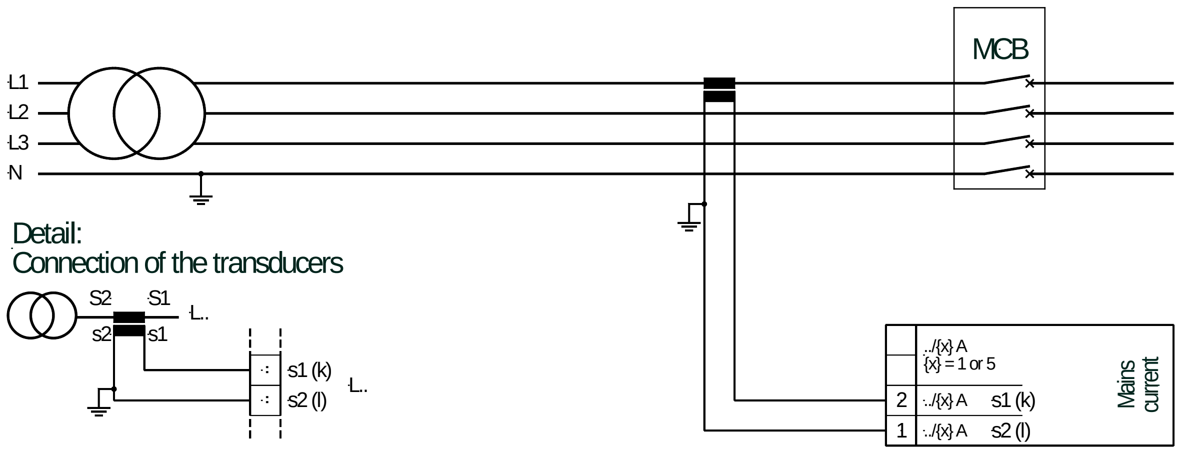


Figure 6-36: Current measuring - mains current

Terminal	Description	A_{max}
2	Mains current - transformer terminal s1 (k)	2.5 mm²
1	Mains current - transformer terminal s2 (l)	2.5 mm²

Table 6-23: Current measuring - terminal assignment - mains current

Current Measuring: Mains, Parameter Setting 'Phase L1', 'Phase L2' & 'Phase L3'

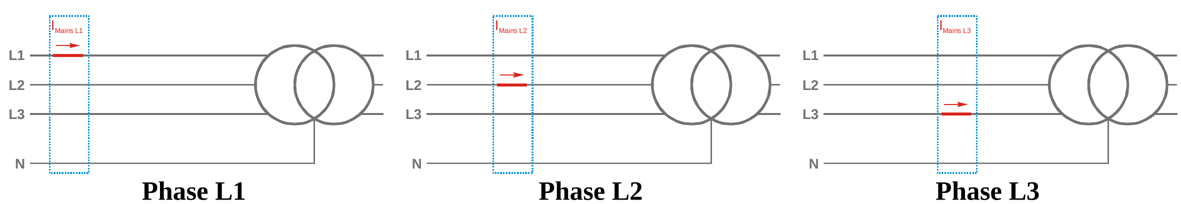


Figure 6-37: Current measuring - mains, phase Lx

	Wiring terminals		Notes
Phase L1			
easYgen terminal	1	2	
Phase	s2 (l) - L1	s1 (k) - L1	
Phase L2			
easYgen terminal	1	2	
Phase	s2 (l) - L2	s1 (k) - L2	
Phase L3			
easYgen terminal	1	2	
Phase	s2 (l) - L3	s1 (k) - L3	

Table 6-24: current measuring - terminal assignment - mains, phase Lx

Ground Current

The mains current input can be configured to measure the mains current or ground current. Depending on how Parameter 'Input mains current as' is configured will determine if this input will measure the mains current (default) or the ground current. Refer to configuration manual 37469 for more information.

NOTE

Generally, one line of the current transformers secondary is to be grounded close to the CT.

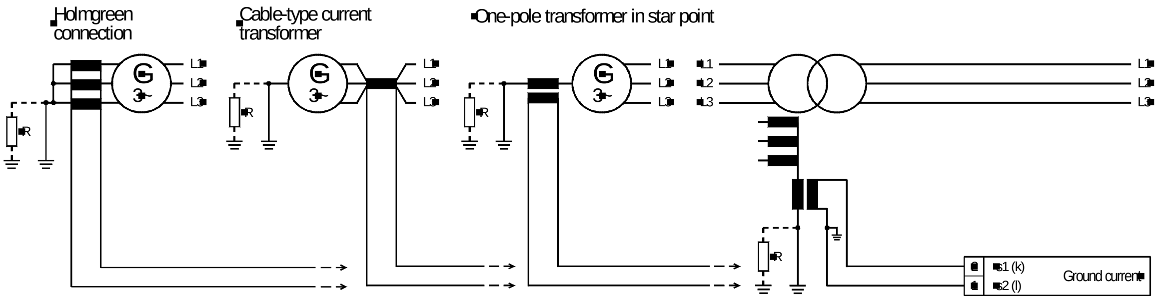


Figure 6-38: Current measuring - ground current

Terminal	Description	A_{max}
2	Ground current - transformer terminal s1 (k)	2.5 mm²
1	Ground current - transformer terminal s2 (l)	2.5 mm²

Table 6-25: Current measuring - terminal assignment - ground current

Power Measuring

If the unit's current transformers are wired according to the diagram shown, the following values are displayed.

Parameter	Description	Sign displayed
Generator real power	Genset generating kW	+ Positive
Generator real power	Genset in reverse power	- Negative
Generator power factor (cos φ)	Inductive / lagging	+ Positive
Generator power factor (cos φ)	Capacitive / leading	- Negative
Mains real power	Plant exporting kW +	+ Positive
Mains real power	Plant importing kW -	- Negative
Mains power factor (cos φ)	Inductive / lagging	+ Positive
Mains power factor (cos φ)	Capacitive / leading	- Negative

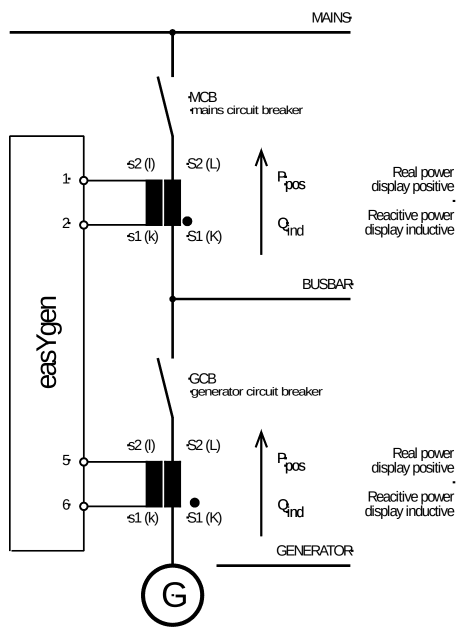


Figure 6-39: Power measuring - direction of power

Power Factor Definition

The phasor diagram is used from the generator's view. Power factor is defined as follows.

Power Factor is defined as a ratio of the real power to apparent power. In a purely resistive circuit, the voltage and current waveforms are instep resulting in a ratio or power factor of 1.00 (often referred to as unity). In an inductive circuit the current lags behind the voltage waveform resulting in usable power (real power) and unusable power (reactive power). This results in a positive ratio or lagging power factor (i.e. 0.85lagging). In a capacitive circuit the current waveform leads the voltage waveform resulting in usable power (real power) and unusable power (reactive power). This results in a negative ratio or a leading power factor (i.e. 0.85leading).

Inductive: Electrical load whose current waveform lags the voltage waveform thus having a lagging power factor. Some inductive loads such as electric motors have a large startup current requirement resulting in lagging power factors.	Capacitive: Electrical load whose current waveform leads the voltage waveform thus having a leading power factor. Some capacitive loads such as capacitor banks or buried cable result in leading power factors.

Different power factor displays at the unit:

i0.91 (inductive) lg.91 (lagging)	c0.93 (capacitive) ld.93 (leading)

Reactive power display at the unit:

70 kvar (positive)	-60 kvar (negative)

Output at the interface:

+ (positive)	- (negative)

In relation to the voltage, the current is

lagging	leading

The generator is

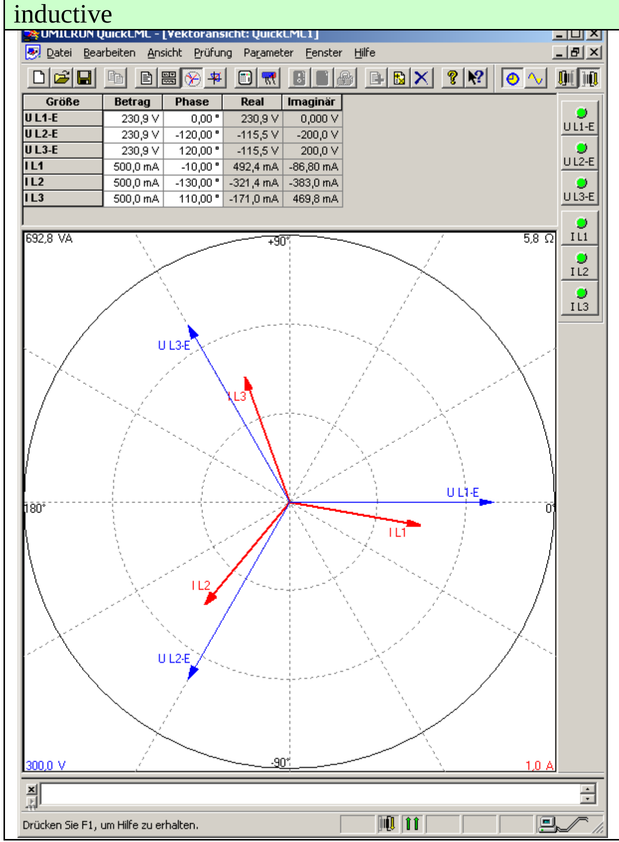
over excited	under excited

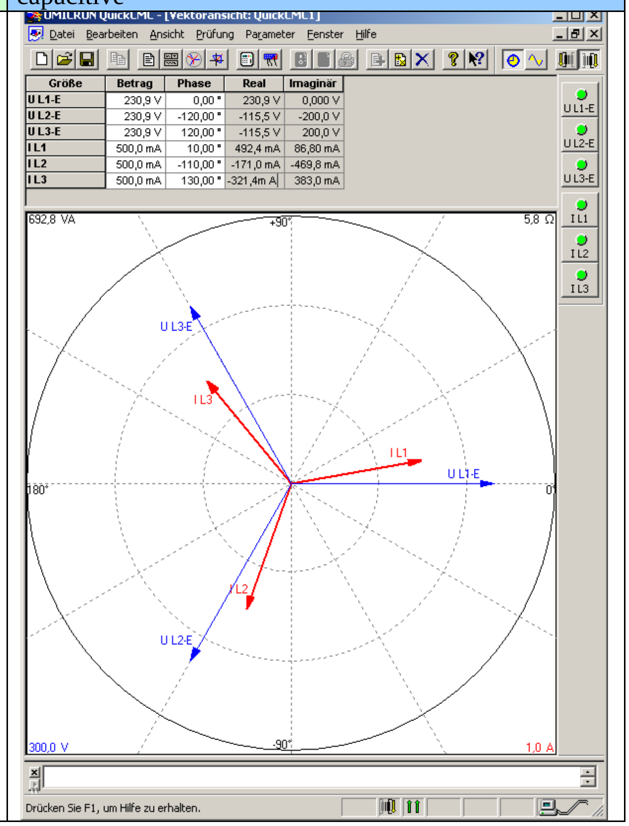
Control: If the control unit is equipped with a power factor controller while in parallel with the utility:

A voltage lower "-" signal is output as long as the measured value is "more inductive" than the reference set point Example: measured = i0.91; set point = i0.95	A voltage raise "+" signal is output as long as the measured value is "more capacitive" than the reference set point Example: measured = c0.91; set point = c0.95

Phasor diagram:

inductive	capacitive





MPU (Pickup)

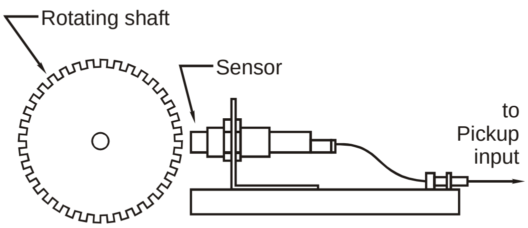


Figure 6-40: MPU - principle overview

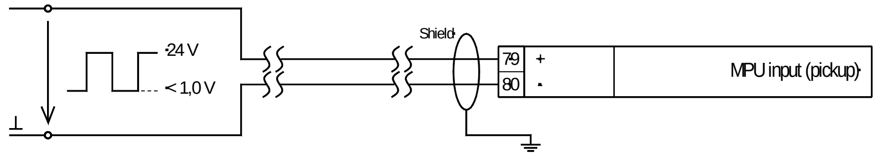


Figure 6-41: MPU input

Terminal	Description	A_{max}
79	MPU input - inductive/switching	2.5 mm²
80	MPU input - GND	2.5 mm²

Table 6-26: MPU - terminal assignment

NOTE

The shield of the MPU (Magnetic Pickup Unit) connection cable must be connected to a single point ground terminal near the easYgen. The shield must not be connected at the MPU side of the cable.

NOTE

The number of teeth on the flywheel reference gear and the flywheel speed must be configured so that the magnetic pickup input frequency does not exceed 14kHz.

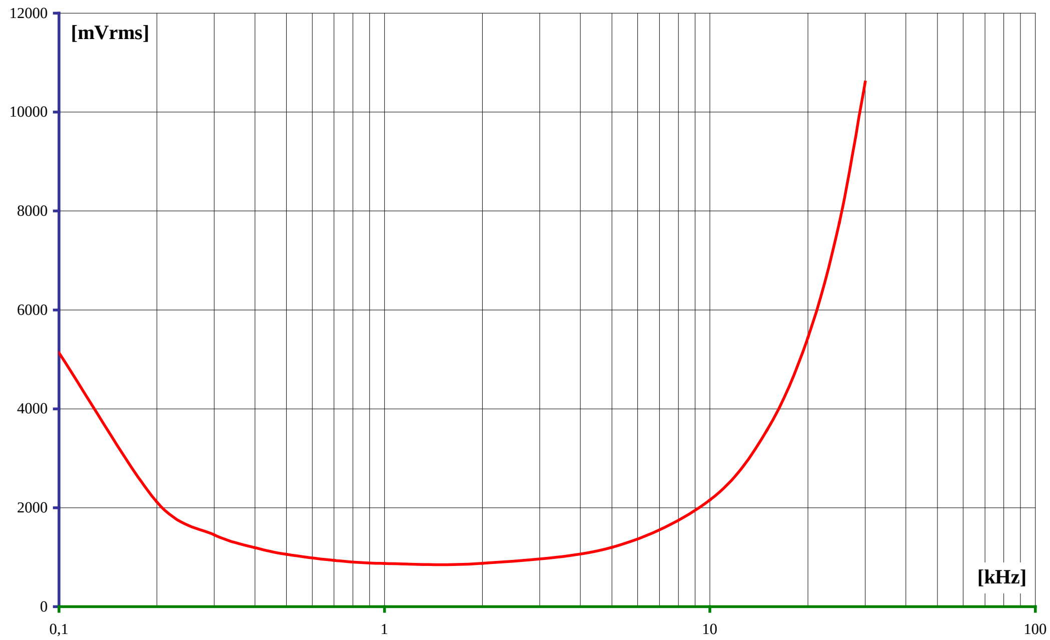


Figure 6-42: Minimal necessary input voltage depending on frequency

Discrete Inputs

Discrete Inputs: Signal Polarity

The discrete inputs are electrically isolated which permits the polarity of the connections to be either positive or negative.

NOTE

All discrete inputs must use the same polarity, either positive or negative signals, due to the common ground.

Discrete Inputs: Positive Polarity Signal

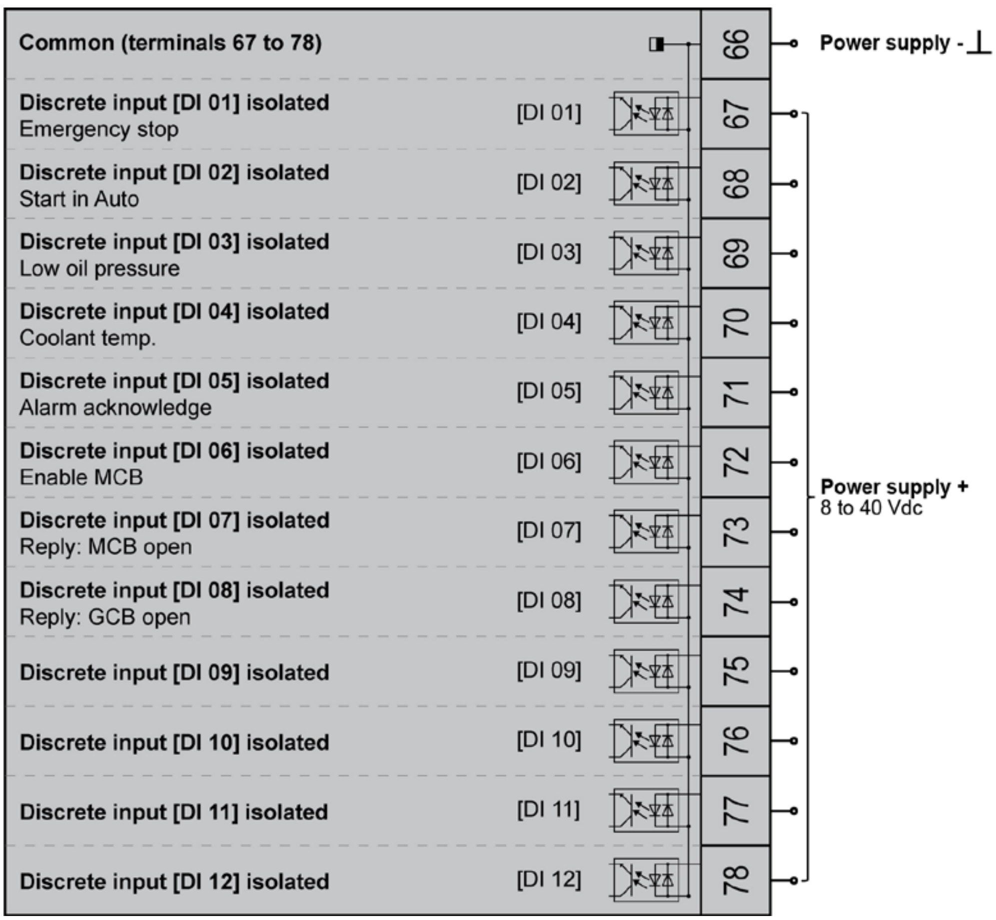


Figure 6-43: Discrete inputs - alarm/control input - positive signal

Discrete Inputs: Negative Polarity Signal

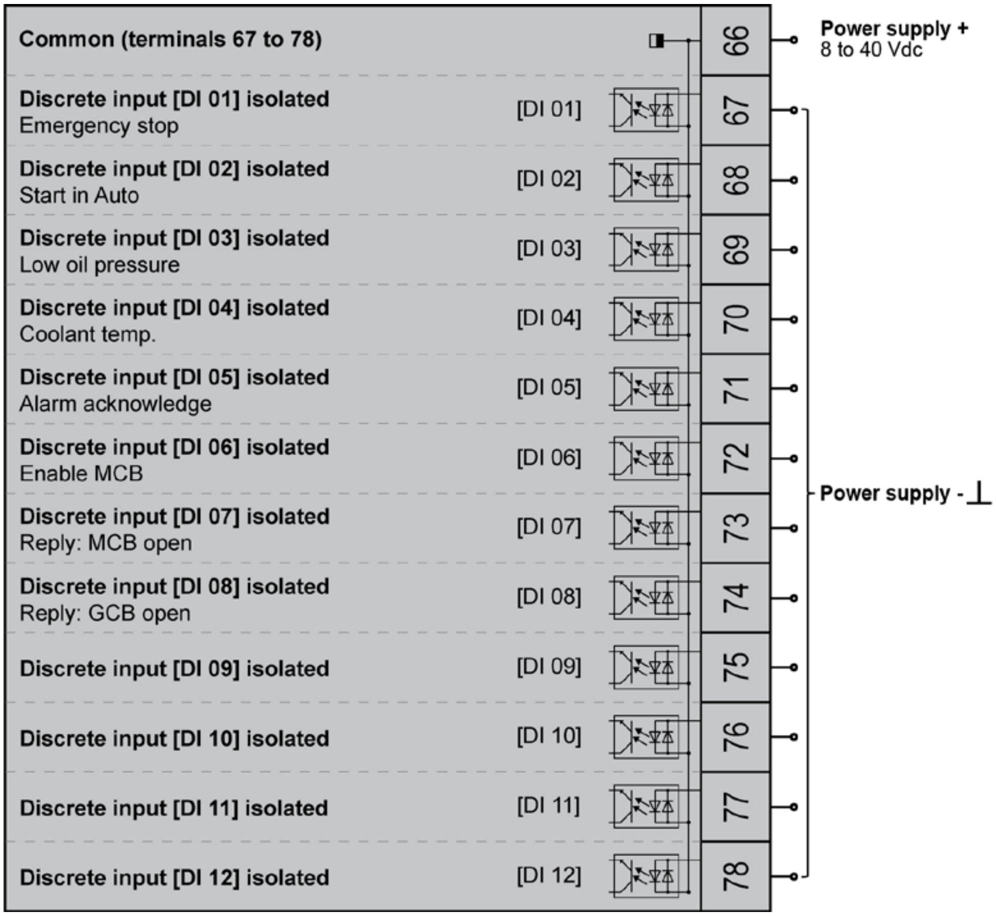


Figure 6-44: Discrete inputs - alarm/control input - negative signal

Terminal	Description	A_{max}
66	Discrete inputs - GND (common ground)	2.5 mm²
67	Discrete input [DI 01]; pre-assigned to 'Emergency stop'	2.5 mm²
68	Discrete input [DI 02]; pre-assigned to 'Start in AUTO'	2.5 mm²
69	Discrete input [DI 03]; pre-assigned to 'Low oil pressure'	2.5 mm²
70	Discrete input [DI 04]; pre-assigned to 'Coolant temperature'	2.5 mm²
71	Discrete input [DI 05]; pre-assigned to 'External alarm acknowledgement'	2.5 mm²
72	Discrete input [DI 06]; pre-assigned to 'Enable MCB'	2.5 mm²
73	Discrete input [DI 07]; fixed to 'Reply MCB' / Isolated operation	2.5 mm²
74	Discrete input [DI 08]; fixed to 'Reply GCB'	2.5 mm²
75	Discrete input [DI 09]	2.5 mm²
76	Discrete input [DI 10]	2.5 mm²
77	Discrete input [DI 11]	2.5 mm²
78	Discrete input [DI 12]	2.5 mm²

Table 6-27: Discrete input - terminal assignment

WARNING

Discrete Input DI01 "Emergency Stop" is only a signaling input. This input may only be used to signal that an external emergency stop button has been actuated. According to EN 60204, this input is not approved to be used as the emergency stop function. The emergency stop function must be implemented external to the control and cannot rely on the control to function properly.

Discrete Inputs: Operation Logic

Discrete inputs may be configured to normally open (N.O.) or normally closed (N.C.) states. In the state N.O., no potential is present during normal operation; if an alarm is issued or control operation is performed, the input is energized. In the state N.C., a potential is continuously present during normal operation; if an alarm is issued or control operation is performed, the input is de-energized.

The N.O. or N.C. contacts may be connected to the signal terminal as well as to the ground terminal of the discrete input. See previous chapter Discrete Inputs: Signal on page 46 for details.

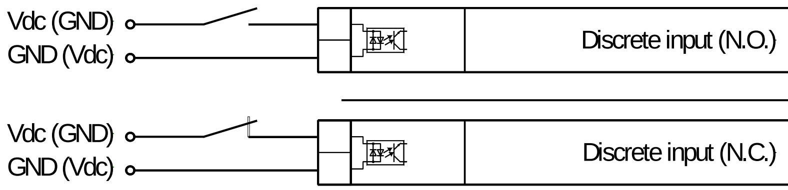


Figure 6-45: Discrete inputs - alarm/control inputs - operation logic

Relay Outputs
(*LogicsManager*)

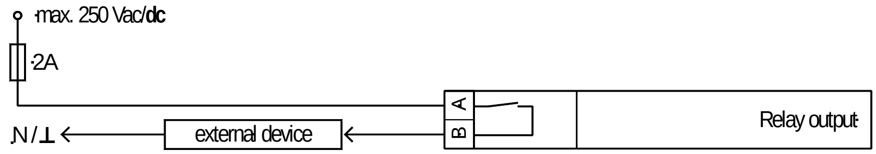


Figure 6-46: Relay outputs

Terminal Term. A	Terminal Com. B	Description		Form A, N.O. make contact	Type	A_{max}
42	41	Relay output [R 01]	{all}	Ready for operation & *LogicsManager*	N.O.	2.5 mm²
43	46	Relay output [R 02]	{all}	Centralized alarm or *LogicsManager*	SW	2.5 mm²
44	46	Relay output [R 03]	{all}	Starter or *LogicsManager*	SW	2.5 mm²
45	46	Relay output [R 04]	{all}	Fuel solenoid / gas valve or *LogicsManager*	SW	2.5 mm²
48	47	Relay output [R 05]	{all}	Preglow or *LogicsManager*	SW	2.5 mm²
50	49	Relay output [R 06]	{0} {1o}	*LogicsManager*	SW	2.5 mm²
			{1oc} {2oc}	Command: close GCB	N.O.	
52	51	Relay output [R 07]	{0}	*LogicsManager*	SW	2.5 mm²
			{1o} {1oc} {2oc}	Command: open GCB	N.O.	
54	53	Relay output [R 08]	{0} {1o} {1oc}	*LogicsManager*	SW	2.5 mm²
			{2oc}	Command: close MCB	N.O.	
56	55	Relay output [R 09]	{0} {1o} {1oc}	*LogicsManager*	SW	2.5 mm²
			{2oc}	Command: open MCB	N.O.	
57	60	Relay output [R 10]	{all}	Auxiliary services or *LogicsManager*	SW	2.5 mm²
58	60	Relay output [R 11]	{all}	Alarm class A and B or *LogicsManager*	SW	2.5 mm²
59	60	Relay output [R 12]	{all}	Alarm class C, D, E, F or *LogicsManager*	SW	2.5 mm²

LogicsManager..using the function ***LogicsManager*** it is possible to freely program the relays
{all}-all appliction modes
{0}-no breaker mode; {1o}-GCB open; {1oc}-GCB open/close; {1oc}-GCB/MCB open/close
SW-switchable via the software; N.O.-normally open (make) contact

Table 6-28: Relay outputs - terminal assignment

CAUTION

The discrete output "Ready for operation OFF" must be wired in series with an emergency stop function. This means that it must be ensured that the generator circuit breaker is opened and the engine is stopped if this discrete output is de-energized. We recommend to signal this fault independently from the unit if the availability of the plant is important.

NOTE

Refer to Appendix A: Connecting 24 V Relays on page 66 for interference suppressing circuits when connecting 24 V relays.

Analog Inputs (*FlexIn*)

It is recommended to use two-pole analog senders. This ensures an accuracy of ≤ 1% for 0 to 500 Ohm inputs and ≤ 1.2% for 0 to 20 mA inputs.

NOTE

The return wires (GND) should be connected to PE (terminal 61; for two-pole senders) or engine ground (terminal 62; for single-pole senders) as close to the easYgen terminals as possible.

The following senders may be used for the analog inputs:

- 0/4 to 20 mA
- resistive (0 to 500 Ohm)
- VDO, 0 to 180 Ohm; 0 to 5 bar, Index "III"; 0 to 10 bar, Index "IV"
- VDO, 0 to 380 Ohm; 40 to 120 °, Index "92-027-004; 50 to 125 °, Index "92-027-006

You may download a catalog of all available VDO sensors at the VDO homepage (http://www.vdo.com)

Wiring Two-Pole Senders

NOTE

To ensure accurate system measurements, all VDO sending units must utilize insulated wires that are connected to the easYgen analog input ground (terminals 9/11/13). Terminals 9/11/13 must have jumper wires connected to the PE connection (terminal 61). The Protective Earth terminal 61 is not connected on the easYgen-3100 with sheet metal housing. The protective earth connection at the sheet metal housing must be used instead.

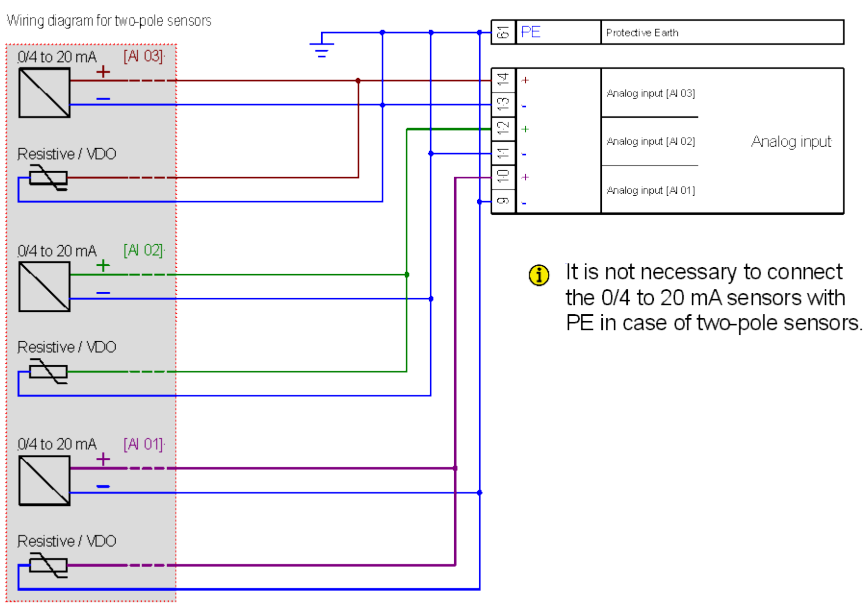


Figure 6-47: Analog inputs - wiring two-pole senders

Terminal	Description	A_{max}
9	Analog input [AI 01] ground, connected with PE	2.5 mm²
10	Analog input [AI 01]	2.5 mm²
11	Analog input [AI 02] ground, connected with PE	2.5 mm²
12	Analog input [AI 02]	2.5 mm²
13	Analog input [AI 03] ground, connected with PE	2.5 mm²
14	Analog input [AI 03]	2.5 mm²

Table 6-29: Analog inputs - terminal assignment - wiring two-pole senders

Wiring Single-Pole Senders

An accuracy of ≤ 2.5% may be achieved when using single-pole senders. The specified accuracy of ≤ 2.5% for single-pole sensors can only be achieved if the differential voltage between the genset chassis ground and PE does not exceed +/- 2.5V.

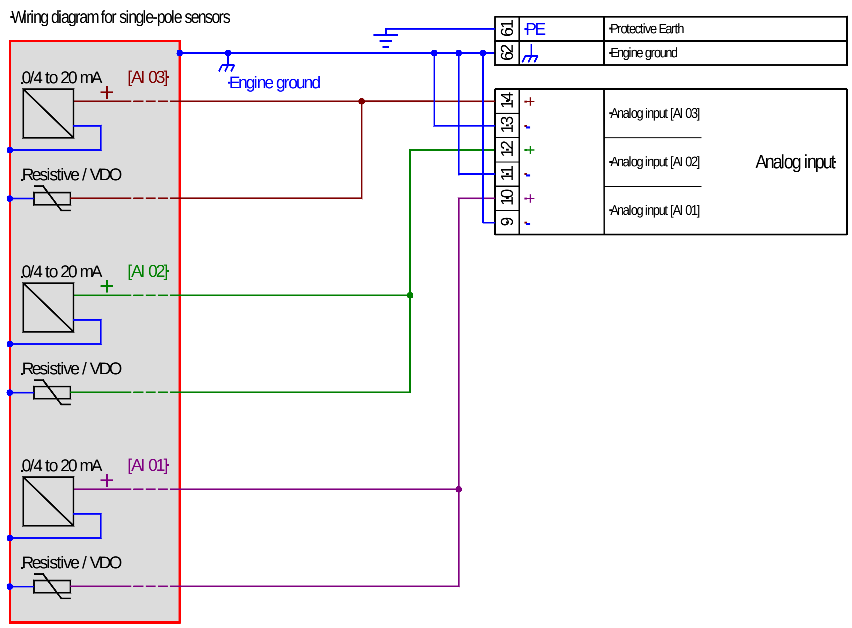


Figure 6-48: Analog inputs - wiring single-pole senders

Terminal	Description	A_{max}
9	Analog input [AI 01] ground, connected with engine ground	2.5 mm²
10	Analog input [AI 01]	2.5 mm²
11	Analog input [AI 02] ground, connected with engine ground	2.5 mm²
12	Analog input [AI 02]	2.5 mm²
13	Analog input [AI 03] ground, connected with engine ground	2.5 mm²
14	Analog input [AI 03]	2.5 mm²

Table 6-30: Analog inputs - terminal assignment - wiring single-pole senders

NOTE

The Protective Earth terminal 61 is not connected on the easYgen-3100 with sheet metal housing. The protective earth connection at the sheet metal housing must be used instead.

Wiring Single and Two-Pole Senders Simultaneously

An accuracy of ≤ 2.5% may be achieved when using single-pole senders. It is possible to combine single- and two-pole senders. The specified accuracy of ≤ 2.5% for single-pole sensors can only be achieved if the differential voltage between the genset chassis ground and PE does not exceed +/- 2.5V.

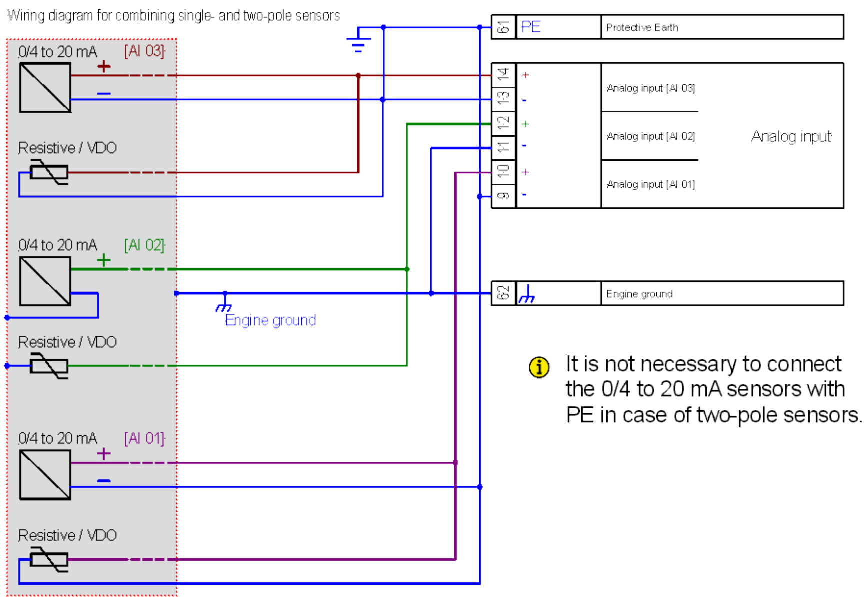


Figure 6-49: Analog inputs - wiring single- and two-pole senders

Terminal	Description	A_{max}
9	Analog input [AI 01] ground, connected with PE / engine ground	2.5 mm²
10	Analog input [AI 01]	2.5 mm²
11	Analog input [AI 02] ground, connected with PE / engine ground	2.5 mm²
12	Analog input [AI 02]	2.5 mm²
13	Analog input [AI 03] ground, connected with PE / engine ground	2.5 mm²
14	Analog input [AI 03]	2.5 mm²

Table 6-31: Analog inputs - terminal assignment - wiring single- and two-pole senders

NOTE

The Protective Earth terminal 61 is not connected on the easYgen-3100 with sheet metal housing. The protective earth connection at the sheet metal housing must be used instead.

Analog Outputs

Controller configuration and an external jumper can change the multifunction controller bias output signals. The analog outputs are galvanically isolated.

Controller Wiring

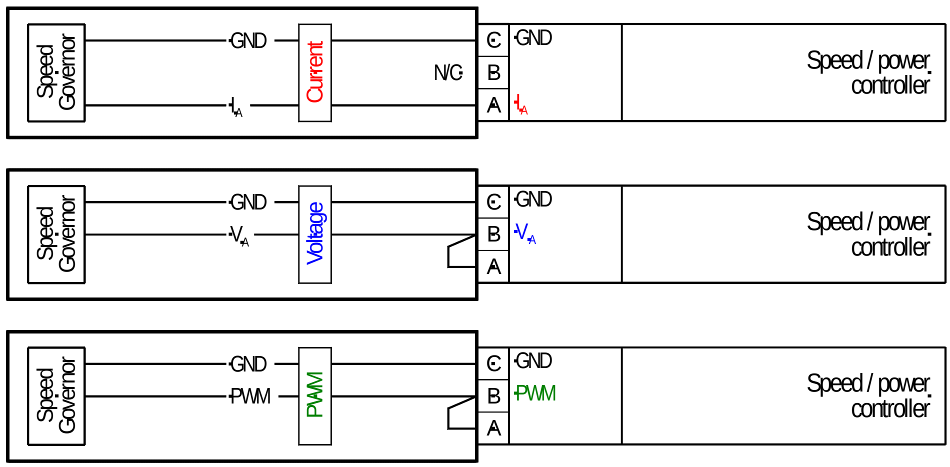


Figure 6-50: Analog controller output - Wiring and external jumper setting

Type	Terminal			Description	A_{max}
I Current	A	15	I_A	Analog output AO 01	2.5 mm²
	B	16			2.5 mm²
	C	17	GND		2.5 mm²
V Voltage	A	15			2.5 mm²
	B	16	V_A		2.5 mm²
	C	17	GND		2.5 mm²
PWM	A	15			2.5 mm²
	B	16	PWM		2.5 mm²
	C	17	GND		2.5 mm²
I Current	A	18	I_A	Analog output AO 02	2.5 mm²
	B	19			2.5 mm²
	C	20	GND		2.5 mm²
V Voltage	A	18			2.5 mm²
	B	19	V_A		2.5 mm²
	C	20	GND		2.5 mm²
PWM	A	18			2.5 mm²
	B	19	PWM		2.5 mm²
	C	20	GND		2.5 mm²

Table 6-32: Bias signal outputs - analog or PWM

Interfaces

RS-485 Serial Interfaces

RS-485 Serial Interface #1 (Serial Interface #2, Interface #2)

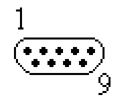


Figure 6-51: RS-485 interface #1 - overview

Terminal	Description	A_{max}
1	not connected	N/A
2	B (TxD+)	N/A
3	not connected	N/A
4	B' (RxD+)	N/A
5	not connected	N/A
6	not connected	N/A
7	A (TxD-)	N/A
8	not connected	N/A
9	A' (RxD-)	N/A

Table 6-33: RS-485 interface #1 - pin assignment

Half-Duplex with Modbus on RS-485

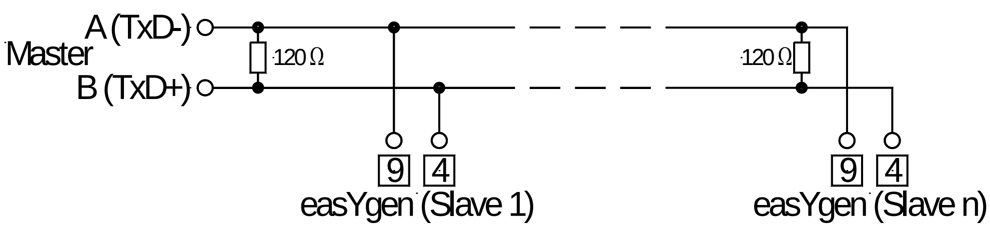


Figure 6-52: RS-485 Modbus - connection for half-duplex operation

Full-Duplex with Modbus on RS-485

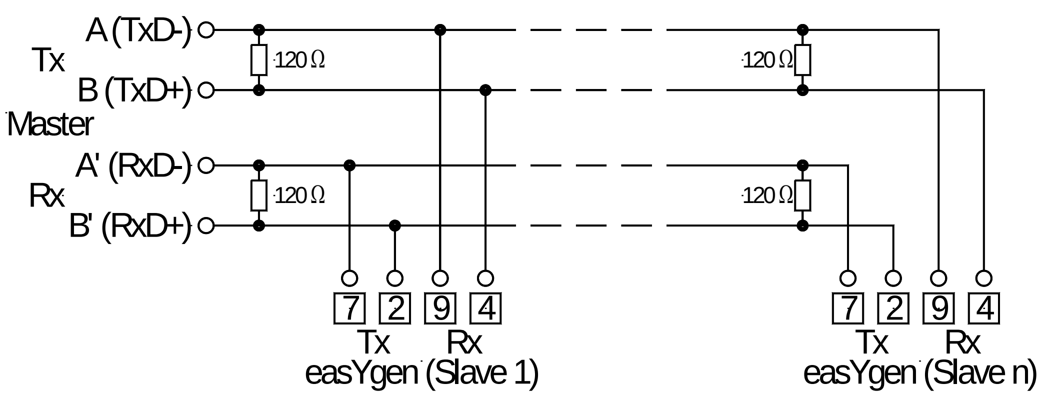


Figure 6-53: RS-485 Modbus - connection for full-duplex operation

NOTE

Please note that the easYgen must be configured for half- or full-duplex configuration (refer to parameter 3173 in the Configuration Manual 37469).

RS-232 Serial Interface (Serial Interface #1, Interface #1)

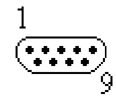


Figure 6-54: RS-232 interface - overview

Terminal	Description	A_{max}
1	not connected	N/A
2	RxD (receive data)	N/A
3	TxD (transmit data)	N/A
4	not connected	N/A
5	GND (system ground)	N/A
6	not connected	N/A
7	RTS (request to send)	N/A
8	CTS (clear to send)	N/A
9	not connected	N/A

Table 6-34: RS-232 interface - pin assignment

CAN Bus Interfaces (*FlexCAN*)

CAN Bus #1 (Interface #3)

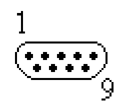


Figure 6-55: CAN bus #1 - overview

Terminal	Description	A_{max}
1	not connected	N/A
2	CAN-L	N/A
3	GND	N/A
4	not connected	N/A
5	not connected	N/A
6	not connected	N/A
7	CAN-H	N/A
8	not connected	N/A
9	not connected	N/A

Table 6-35: CAN bus #1 - pin assignment

CAN Bus #2 (Interface #4)

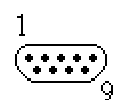


Figure 6-56: CAN bus #2 - overview

Terminal	Description	A_{max}
1	not connected	N/A
2	CAN-L	N/A
3	GND	N/A
4	not connected	N/A
5	not connected	N/A
6	not connected	N/A
7	CAN-H	N/A
8	not connected	N/A
9	not connected	N/A

Table 6-36: CAN bus #2 - pin assignment

NOTE

Refer to Appendix A: CAN Bus Pin Assignments of Third-Party Units on page 64 for general information about CAN bus pin assignments.

CAN Bus Topology

NOTE

Please note that the CAN bus must be terminated with a resistor, which corresponds to the impedance of the cable (e.g. 120 Ohms, 1/4 W) at both ends. The termination resistor is connected between CAN-H and CAN-L.

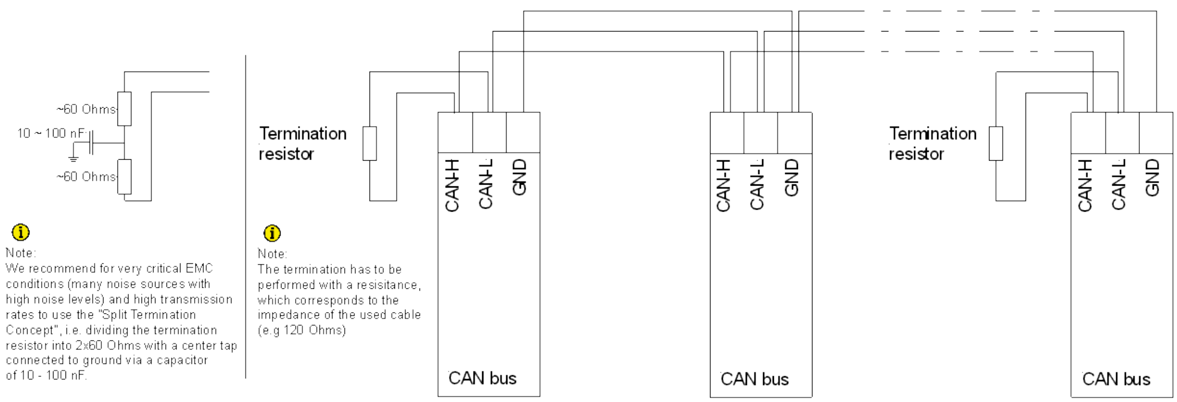


Figure 6-57: Interfaces - CAN bus - termination

Troubleshooting Possible CAN Bus Problems

If data is not transmitting on the CAN bus, check the following for common CAN bus communication problems:

- A T-structure bus is utilized
- CAN-L and CAN-H are interchanged
- Not all devices on the bus are using identical Baud rates
- Terminating resistor(s) are missing
- The configured baud rate is too high for wiring length
- The CAN bus cable is routed in close proximity with power cables

Woodward recommends the use of shielded, 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 6-37 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
250 kbit/s	250 m
125 kbit/s	500 m
50 kbit/s	1000 m
20 kbit/s	2500 m

Table 6-37: 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.

Bus Shielding

All bus connections of the easYgen are internally grounded via an RC element. Therefore, they may either be grounded directly (recommended) or also via an RC element on the opposite bus connection.

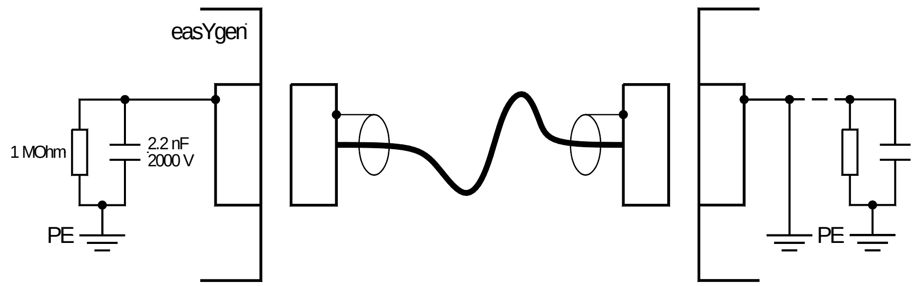
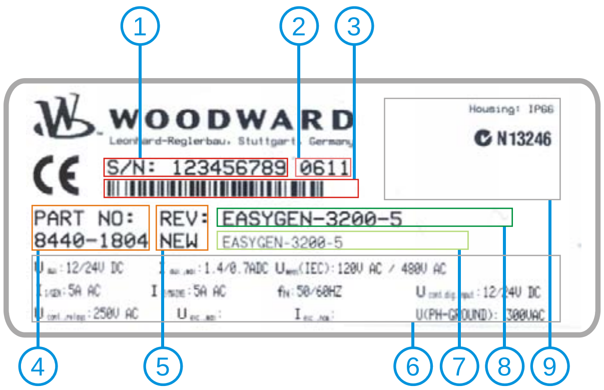


Figure 6-58: Interfaces - shielding

Chapter 7. 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	Approval	Approvals

Measuring values, voltages -- ⅄/Δ

- Measuring voltages

  100 V
  Rated value (V_{rated}).......................................69/120 Vac
  Maximum value (V_{max})........................max. 86/150 Vac
  Rated voltage phase – ground............................150 Vac
  Rated surge voltage... 2.5 kV

  400 V
  Rated value (V_{rated}).....................................277/480 Vac
  Maximum value (V_{max})......................max. 346/600 Vac
  Rated voltage phase – ground............................300 Vac
  Rated surge voltage... 4.0 kV

- Linear measuring range...1.25 × V_{rated}
- Measuring frequency.. 50/60 Hz (40.0 to 85.0 Hz)
- Accuracy .... Class 1
- Input resistance per path **100 V** ....0.498 MΩ
  400 V .... 2.0 MΩ
- Maximum power consumption per path.. < 0.15 W

Measuring values, currents ---isolated

- Measuring current
  [1] Rated value (I_{rated}) ..../1 A
  [5] Rated value (I_{rated}) ..../5 A

- Accuracy .... Class 1
- Linear measuring range Generator .... 3.0 × I_{rated}
  Mains/ground current......................... approx. 1.5 × I_{rated}
- Maximum power consumption per path.. < 0.15 VA
- Rated short-time current (1 s) **[1]** .... 50.0 × I_{rated}
  [5] .... 10.0 × I_{rated}

Ambient variables --

- Power supply .... 12/24 Vdc (8 to 40.0 Vdc)
- Intrinsic consumption .... max. 17 W
- Degree of pollution 2
- Maximum elevation .... 2,000 m ASL
- Insulation voltage (continuously) .... 40 Vdc
- Insulation test voltage (1s) .... 100 Vdc
- Overvoltage (≤ 2 min) .... 80 Vdc
- Reserve voltage protection .... Fully supply range
- Input capacitance .... 4,300 uF
- Supply voltage can be isolated .... negative potential or positive potential grounded

Discrete inputs -- **isolated**

- Input range ($V_{cont.\ dig.\ input}$) .... Rated voltage 12/24 Vdc (8 to 40.0 Vdc)
- Input resistance .... approx. 20 kΩ

Discrete outputs -- **potential free**

- Contact material .... AgCdO
- General purpose (GP) ($V_{cont,\ relays}$)
  - 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) ($V_{cont,\ relays}$)
  - AC B300
  - DC .... 1.00 Adc@24 Vdc
    0.22 Adc@125 Vdc
    0.10 Adc@250 Vdc

Analog inputs -- **freely scaleable**

- Maximum permissible voltage against PE (Ground) .... 9 V
- Resolution .... 11 Bit
- 0 to 20 mA input .... internal load 50 Ω
- 0 to 500 Ω input .... load current ≤ 2.3 mA
- Accuracy 0 to 20 mA input
  - only two-pole senders .... ≤ 1.2%
  - single-pole senders .... ≤ 2.5%
- Accuracy 0 to 500 Ω input
  - only two-pole senders .... ≤ 1%
  - single-pole senders .... ≤ 2.5%

Analog outputs -- **isolated**

- at rated output .... freely scalable,
- Insulation voltage (continuously) .... 100 Vac
- Insulation test voltage (1s) .... 500 Vac
- Versions .... ±10 Vdc, ±20 mA, PWM
- Resolution
  - ± 20 mA outputs, configured to ±20 mA .... 12 bit
  - ± 20 mA outputs, configured to 0 to 20 mA .... 11 bit
- 0 to 20 mA output .... maximum load 500 Ω
- ±10 V output .... internal resistance approx. 500 Ω

Magnetic Pickup Input -- **capacitively isolated**

- Input impedance .... min. approx. 17 kΩ
- Input voltage .... refer to Figure 6-42

Interface --

RS-232 interface .... **isolated**
- Insulation voltage (continuously) .... 100 Vac
- Insulation test voltage (1s) .... 500 Vac
- Version .... RS-232 Standard

RS-485 interface .... **isolated**
- Insulation voltage (continuously) .... 100 Vac
- Insulation test voltage (1s) .... 500 Vac
- Version .... RS-485 Standard

CAN bus interface .... **isolated**
- Insulation voltage (continuously) .... 100 Vac
- Insulation test voltage (1s) .... 500 Vac
- Version .... CAN bus
- Internal line termination .... Not available

Battery --
- Type .... Lithium
- Life span (operation without power supply) .... approx. 5 years
- Battery field replacement .... not allowed

Housing --
- Type plastic .... easYpack
  sheet metal .... custom
- Dimensions (W × H × D) plastic .... 282 × 217 × 99 mm
  sheet metal .... 249.6 × 227.4 × 84.1 mm
- Front cutout (plastic housing) (W × H) .... 249 [+1.1] × 183 [+1.0] mm
- Wiring .... screw-plug-terminals 2.5 mm²
- Recommended locked torque .... 4 inch pounds / 0.5 Nm
  use 60/75 °C copper wire only
  use class 1 wire only or equivalent
- Weight plastic .... approx. 1,850 g
  sheet metal .... approx. 1,750 g

Protection --
- Protection system plastic .... IP54 from front with clamp fasteners
  IP66 from front with screw kit
  IP20 from back
  sheet metal IP20
- Front folio (plastic housing) .... insulating surface
- EMC test (CE) .... tested according to applicable EN guidelines
- Listings .... CE marking; UL listing for ordinary locations
- Type approval .... UL, Ordinary Locations, File No.: 231544
  cUL (easYgen-3100 only)
- Marine .... Type approval: Lloyds Register (LR)
  Design Assessment: American Bureau of Shipping (ABS)

Generic note --
- Accuracy .... is referred to full scale value

Chapter 8.
Environmental Data

Vibration--
- Frequency Range – Sine Sweep .... 5Hz to 100Hz
  - Acceleration 4G
- Frequency Range - Random .... 10Hz to 500Hz
  - Power Intensity...0.015G²/Hz
  - RMS Value..1.04 Grms
- Standards ....

  EN 60255-21-1 (EN 60068-2-6, Fc)
  EN 60255-21-3
  Lloyd's Register, Vibration Test2
  SAEJ1455 Chassis Data
  MIL-STD 810F, M514.5A, Cat.4,
  Truck/Trailer tracked-restrained
  cargo, Fig. 514.5-C1

Shock ---
- Shock ....40G, Saw tooth pulse, 11ms
- Standards ....

  EN 60255-21-2
  MIL-STD 810F, M516.5, Procedure 1

Temperature ---
- Cold, Dry Heat (storage) ....-30°C (-22°F) / 80°C (176°F)
- Cold, Dry Heat (operating)...-20°C (-4°F) / 70 °C (158°F)
- Standards ....

  IEC 60068-2-2, Test Bb and Bd
  IEC 60068-2-1, Test Ab and Ad

Humidity--
- Humidity.. 60°C, 95% RH, 5 days
- Standards ....

  IEC 60068-2-30, Test Db

Marine Environmental Categories ---
- Lloyd's Register of Shipping (LRS)................................ ENV1, ENV2, ENV3 and ENV4

Chapter 9. Accuracy

Measuring value	Display	Accuracy	Measuring start	Notes
Frequency				
Generator	15.0 to 85.0 Hz	1 % (of 85 Hz)	5 % (of PT secondary voltage setting) [1]	
Mains	40.0 to 85.0 Hz			
Voltage				
Wye generator / mains / busbar	0 to 650 kV	1 % (of 150/600 V) [2]	1.5 % (of PT secondary voltage setting) [1]	
Delta generator / mains / busbar			2 % (of PT secondary voltage setting) [1]	
Current				
Generator	0 to 32,000 A	1 % (of 1.3/6.5 A) [3]	1 % (of 1.3/6.5 A) [3]	
Max. value				
Mains/ground current				
Real power				
Actual total real power value	-2 to 2 GW	2 % (of 150/600 V * 1.3/6.5 A) [2/3]	starts with detecting the zero passage of current/voltage	
Reactive power				
Actual value in L1, L2, L3	-2 to 2 Gvar	2 % (of 150/600 V * 1.3/6.5 A) [2/3]	starts with detecting the zero passage of current/voltage	
Power factor				
Actual value power factor L1	lagging 0.00 to 1.00 to leading 0.00	2 %	2 % (of 1.3/6.5 A) [3]	1.00 is displayed for measuring values below the measuring start
Miscellaneous				
Real energy	0 to 4,200 GWh		0.36 % (of 1.3/6.5 A) [3]	not calibrated
Operating hours	Max. 1×10^6 h			
Maintenance call hours	0 to 9,999 h			
Maintenance call days	0 to 999 d			
Start counter	0 to 65,535			
Battery voltage	8 to 40 V	1 % (of 24 V)		
Pickup speed	f_{rated} +/- 40 %			
Phase angle	-180 to 180 °		1.25 % (of PT secondary volt. setting)	180 ° is displayed for measuring values below measuring start
Analog inputs				
0 to 180 Ohms	freely scaleable	1 % / 2.5 % [4] (of 500 Ohms)		for VDO sensors
0 to 360 Ohms	freely scaleable			for VDO sensors
0 to 500 Ohms	freely scaleable			for resistive sensors
0 to 20 mA	freely scaleable	1.2 % / 2.5 % [4] (of 20 mA)		

1 Setting of the parameter for the PT secondary rated voltage
2 depending on the used measuring inputs (100/400 V)
3 depending on the CT input hardware (1/5 A) of the respective unit
4 for two-pole senders only / for single-pole senders and a combination of single- and two-pole sensors

Reference conditions (for measuring 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

Appendix A.
Useful Information

Suitable D-SUB Connector Housings

Some housings for D-Sub connectors are too wide to plug them into the unit properly. If your serial or CAN bus cable is equipped with a housing, which does not fit into the easYgen socket, you may replace the housing with one of the following housings:

Manufacturer: FCT (www.fctgroup.com)
Type/Order No.: FKH1
FKC1G

Manufacturer: Wuerth Electronic (www.we-online.de)
Type/Order No.: 618009214622
260809
41800927911

CAN Bus Pin Assignments of Third-Party Units

D-SUB DE9 Connector

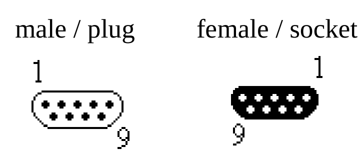


Figure 9-1: CAN bus pin assignment - D-SUB DE9 connector

Terminal	Signal	Description
1	-	Reserved
2	CAN_L	CAN Bus Signal (dominant low)
3	CAN_GND	CAN ground
4	-	Reserved
5	(CAN_SHLD)	Optional shield
6	(GND)	Optional CAN ground
7	CAN_H	CAN Bus Signal (dominant high)
8	-	Reserved
9	(CAN_V+)	Optional external voltage supply Vcc

according to CiA DS 102

Table 9-1: CAN bus pin assignment - D-SUB DE9 connector

RJ45/8P8C Connector

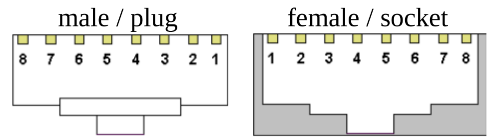


Figure 9-2: CAN bus pin assignment - RJ45/8P8C connector

Terminal	Signal	Description
1	CAN_H	CAN bus line (dominant high)
2	CAN_L	CAN bus line (dominant low)
3	CAN_GND	Ground / 0 V / V-
4	-	Reserved
5	-	Reserved
6	(CAN_SHLD)	Optional CAN Shield
7	CAN_GND	Ground / 0 V / V-
9	(CAN_V+)	Optional external voltage supply Vcc

according to CiA DRP 303-1

Table 9-2: CAN bus pin assignment - RJ45/8P8C connector

IDC / Header Connector

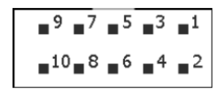


Figure 9-3: CAN bus pin assignment - IDC / Header

Terminal	Signal	Description
1	-	Reserved
2	(GND)	Optional CAN ground
3	CAN_L	CAN bus line (dominant low)
4	CAN_H	CAN bus line (dominant high)
5	CAN_GND	CAN ground
6	-	Reserved
7	-	Reserved
8	(CAN_V+)	Optional external voltage supply Vcc
9	(CAN_SHLD)	Optional shield
10	-	Not connected

Table 9-3: CAN bus pin assignment - IDC / Header

Connecting 24 V Relays

Interferences in the interaction of all components may affect the function of electronic devices.
One interference factor is disabling inductive loads, like coils of electromagnetic switching devices. When disabling such a device, high switch-off induces voltages may occur, which might destroy adjacent electronic devices or result interference voltage pulses, which lead to functional faults, by capacitive coupling mechanisms.
Since an interference-free switch-off is not possible without additional equipment, the relay coil is connected with an interference suppressing circuit.

If 24 V (coupling) relays are used in an application, it is required to connect a protection circuit to avoid interferences. Figure 9-4 shows the exemplary connection of a diode as an interference suppressing circuit.

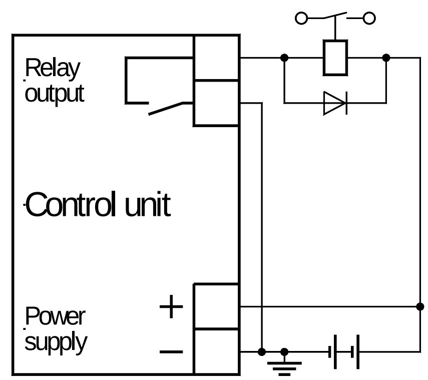


Figure 9-4: Interference suppressing circuit - connection

Advantages and disadvantages of different interference suppressing circuits are described in the following.

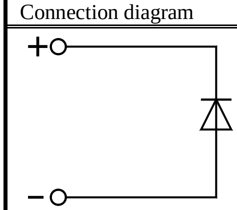
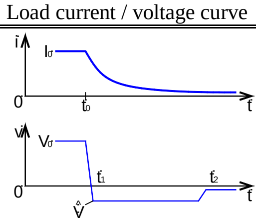
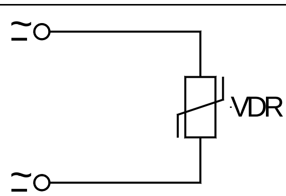
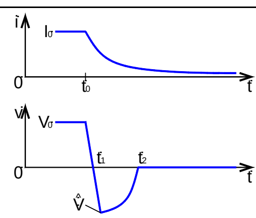
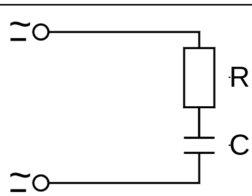
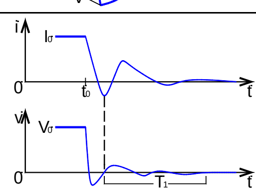
Connection diagram	Load current / voltage curve	Advantages	Disadvantages
		• Uncritical dimensioning • Lowest possible induced voltage • Very simple and reliable	• High release delay
		• Uncritical dimensioning • High energy absorption • Very simple setup • Suitable for AC voltage • Reverse polarity protected	• No attenuation below V_{VDR}
		• HF attenuation by energy storage • Immediate shut-off limiting • Attenuation below limiting voltage • Very suitable for AC voltage • Reverse polarity protected	• Exact dimensioning required

Table 9-4: Interference suppressing circuit for relays

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Please include the manual number from the front cover of this publication.

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