37426B

easYgen-2000 Series
Genset Control

Installation
Software Version 1.xxxx

EASYGEN 2000

Manual 37426B

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	09-06-09	TE	Release
A	09-10-09	TE	Minor changes
B	10-01-14	TE	Minor changes

Content

Figures and Tables

Figures

Tables

Chapter 1.
General Information

Document Overview

Type		English	German
easYgen-2000 Series			
easYgen-2000 Series - Installation	this manual ⇨	37426	DE37426
easYgen-2000 Series - Configuration		37427	DE37427
easYgen-2000 Series - Operation		37428	DE37428
easYgen-2000 Series - Application		37429	-
easYgen-2000 Series - Interfaces		37430	-
easYgen-2000 Series - Parameter List		37431	DE37431
easYgen-2000 Series - Brief Operation Information		37432	DE37432

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.

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 37431 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.*

Chapter 3.
Marine Usage (Pending)

CAUTION

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

Application

The easYgen-2000 Series has no internally isolated power supply.

For marine applications an EMI filter (i.e. SCHAFFNER - FN 2070-3-06) must be connected ahead of the power supply input.

To meet the functional safety requirements of the application, the rules of marine classification independent protective devices must be applied.

Chapter 4.
Housing

Panel Cutout

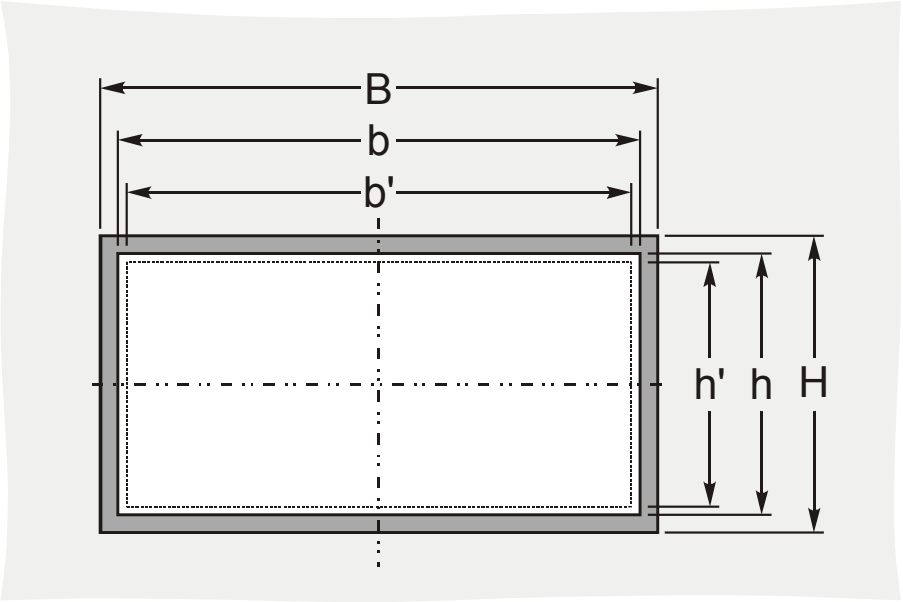


Figure 4-1: Housing - panel-board cutout

Measure	Description			Tolerance
H	Height	Total	171 mm	---
h		Panel cutout	138 mm	+ 1.0 mm
h'		Housing dimension	136 mm	
B	Width	Total	219 mm	---
b		Panel cutout	186 mm	+ 1.1 mm
b'		Housing dimension	184 mm	
	Depth	Total	61 / 98[1] mm	---

Table 4-1: Plastic housing - panel cutout

The maximum permissible corner radius is 3.5 mm.
Refer to Figure 4-4 on page 14 for a cutout drawing.

[1] 61 mm (easYgen-2200) / 98 mm (easYgen-2500)

Dimensions

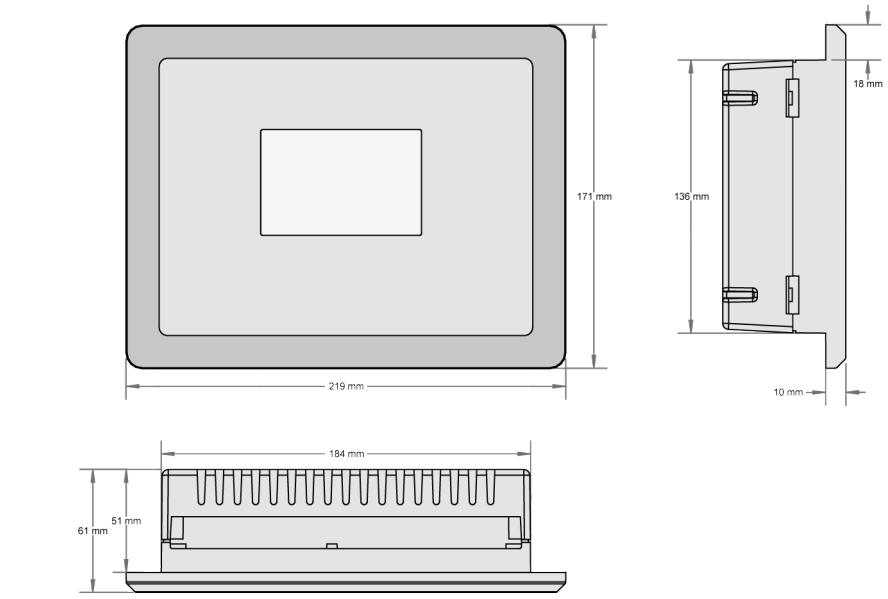


Figure 4-2: Plastic housing easYgen-2200 – dimensions

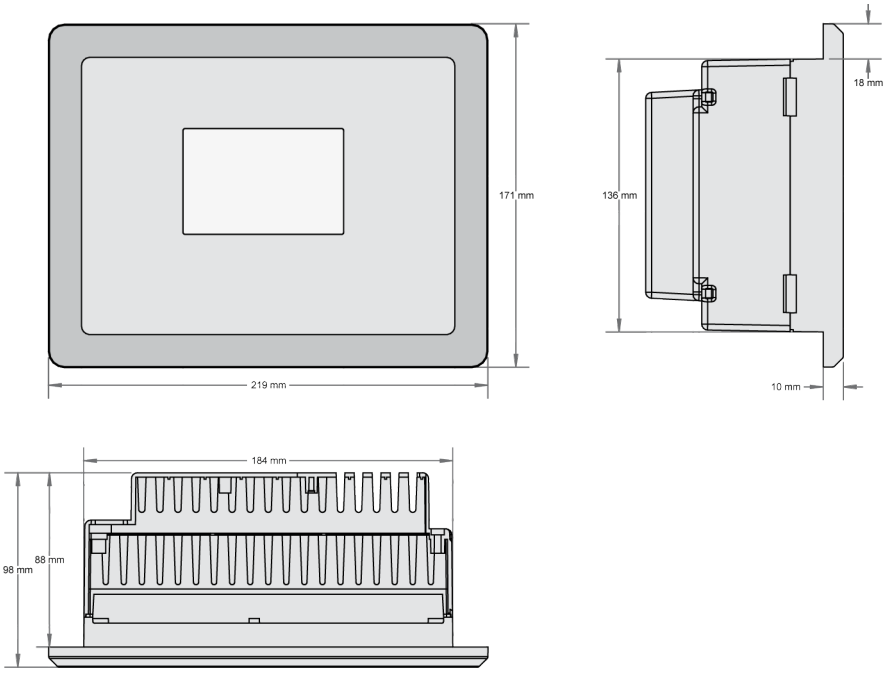


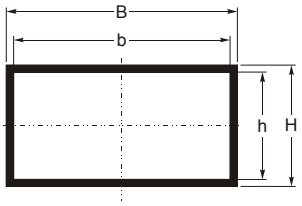
Figure 4-3: Plastic housing easYgen-2500 – dimensions

Clamp Fastener Installation

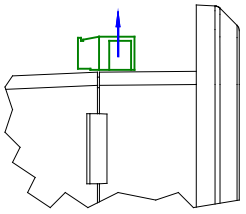
For installation into a panel door with the fastening clamps, please proceed as follows:

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

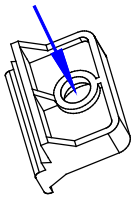
   Note: It is not necessary to drill the holes if the fastening clamps are used.



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

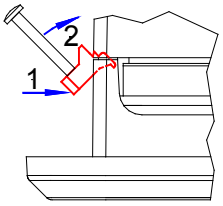


3. **Insert screws in clamps**
   Insert the four clamping screws into the clamp inserts from the shown side (opposite of the nut insert) until they are almost flush. Do not completely insert the screws into the clamp inserts.

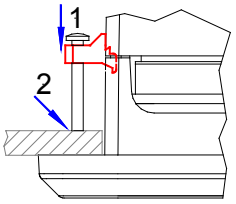


4. **Insert unit into cutout**
   Insert the unit into the panel cutout. Verify that the unit fits correctly in the cutout. If the panel cutout is not big enough, enlarge it accordingly.

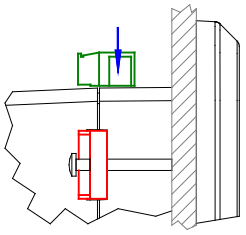
5. **Attach clamp inserts**
   Re-install the clamp inserts by tilting the insert to a 45° angle. (1) Insert the nose of the insert into the slot on the side of the housing. (2) Raise the clamp insert so that it is parallel to the control panel.



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 (0.9 pound-force inches).



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



Screw Kit Installation

In order to enhance the protection of the front to IP 65, 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 4-4.
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 cross-wise 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.

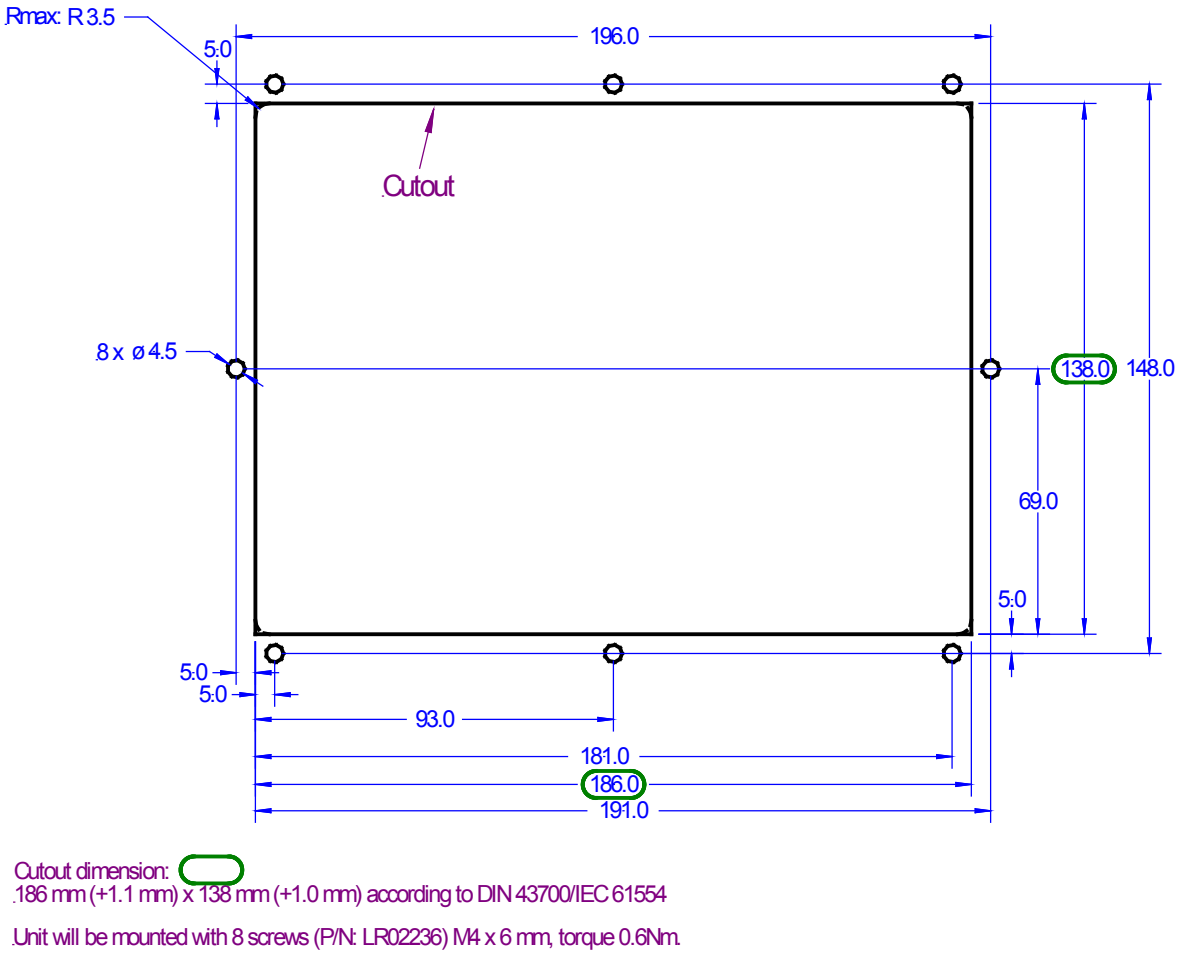


Figure 4-4: Housing - drill plan

Terminal Arrangement

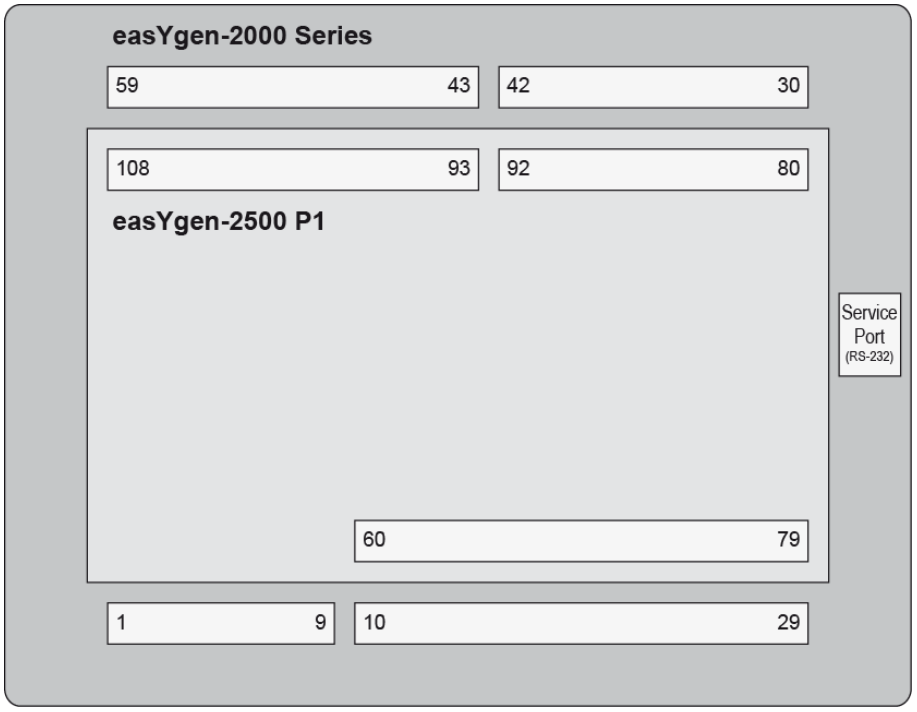


Figure 4-5: easYgen-2000 Series - terminal arrangement - rear view

Chapter 5.
Wiring Diagrams

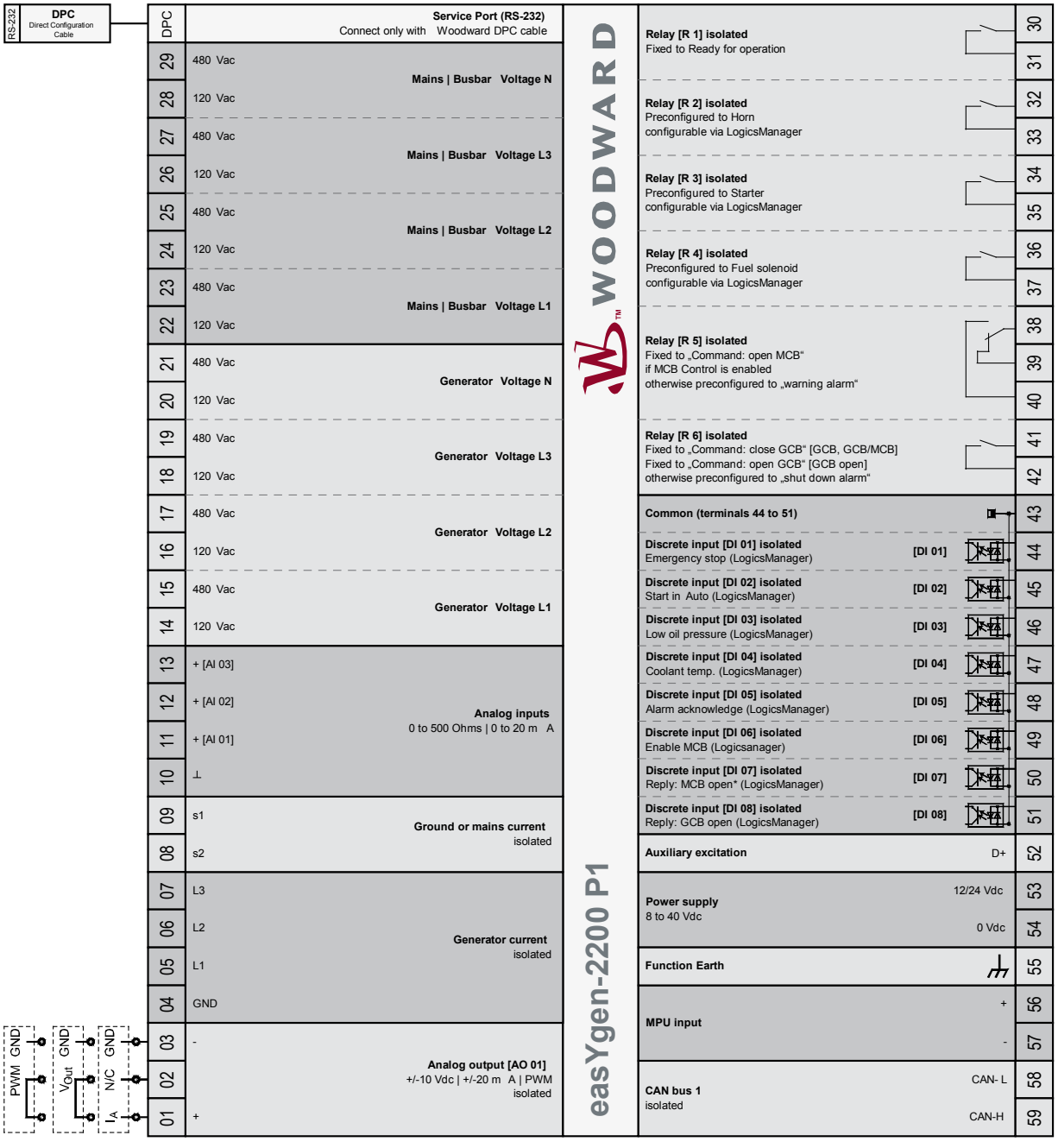


Figure 5-1: easYgen-2200 P1 – wiring diagram

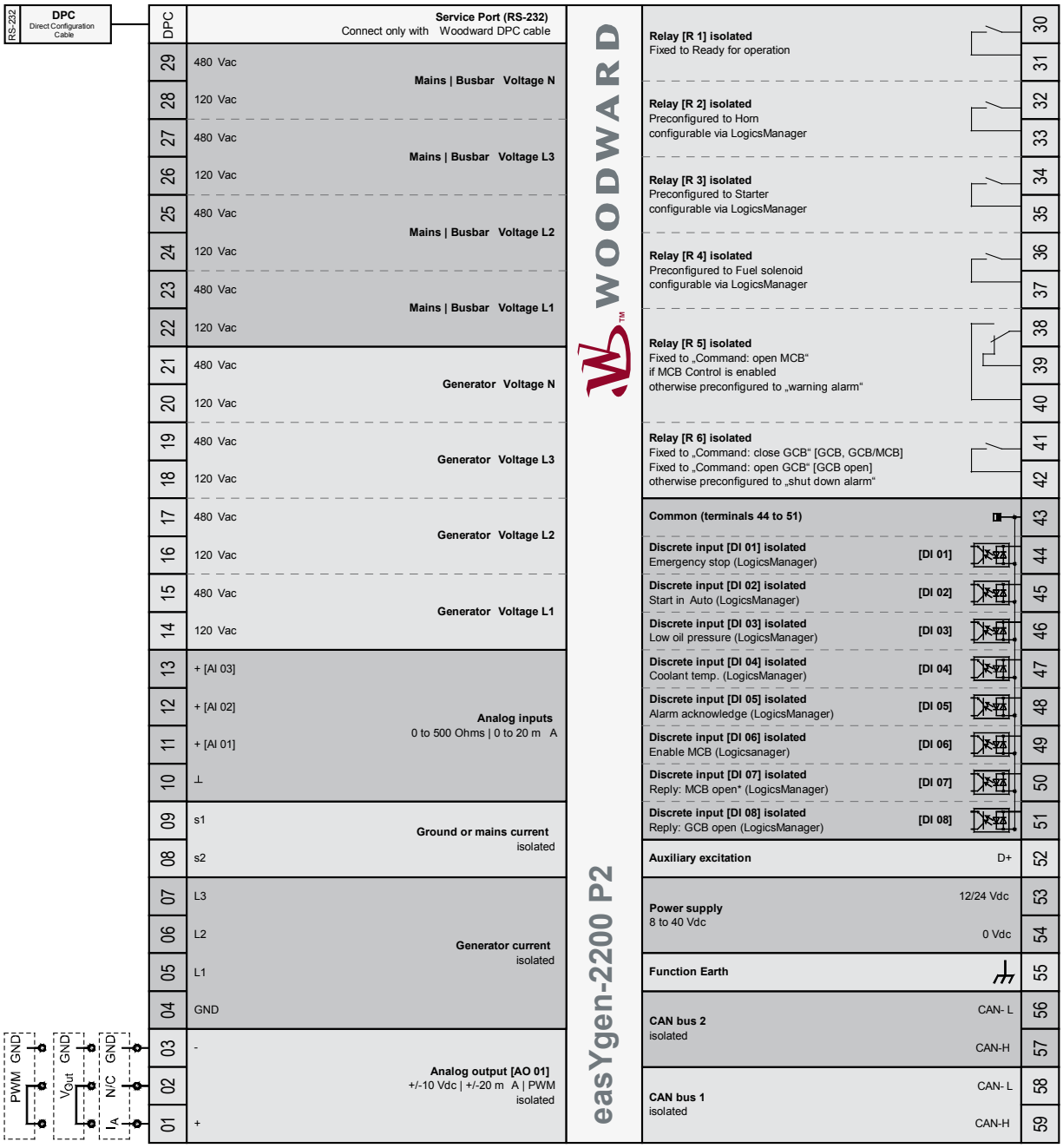


Figure 5-2: easYgen-2200 P2 – wiring diagram

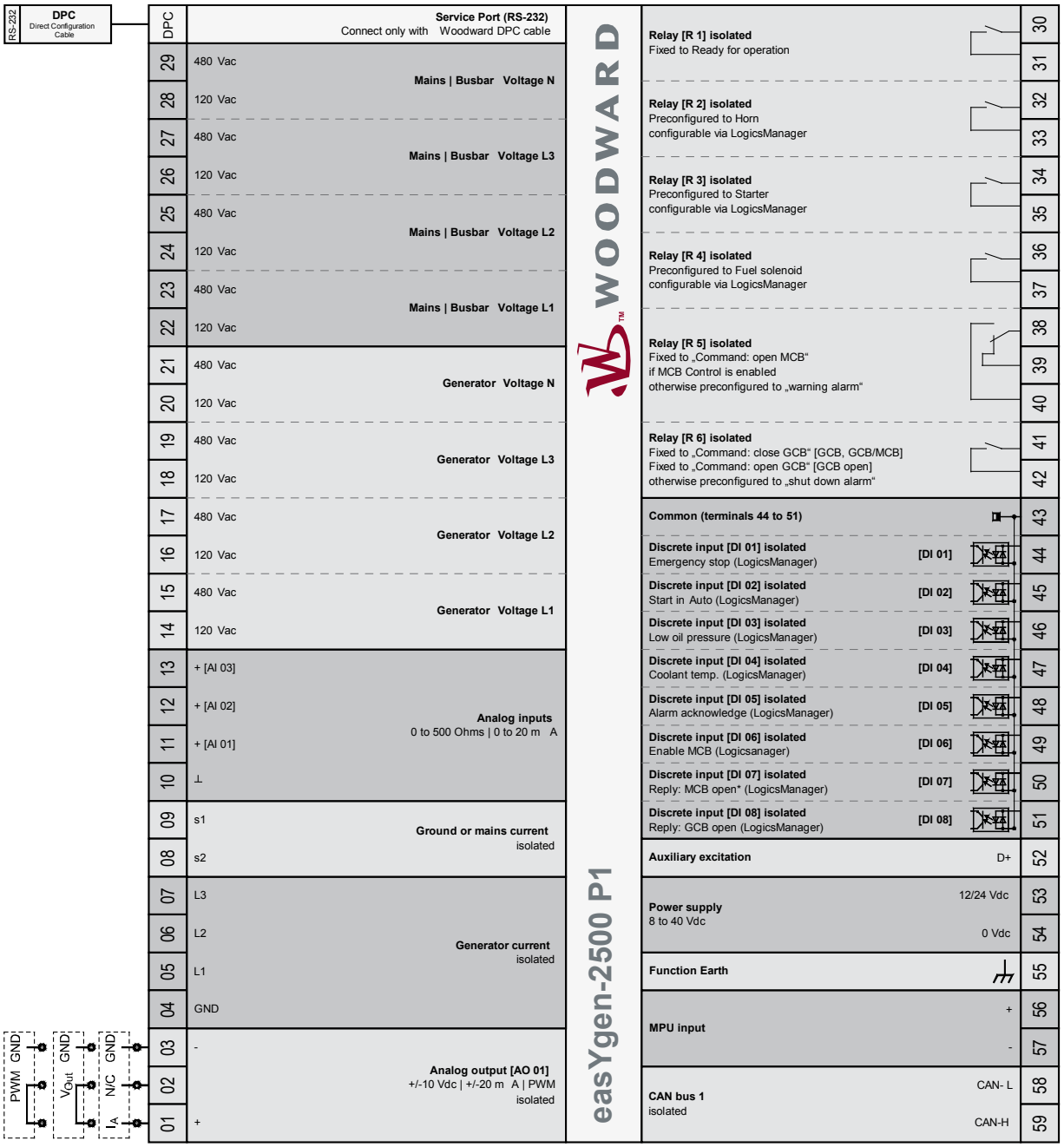


Figure 5-3: easYgen-2500 P1 – wiring diagram 1/2

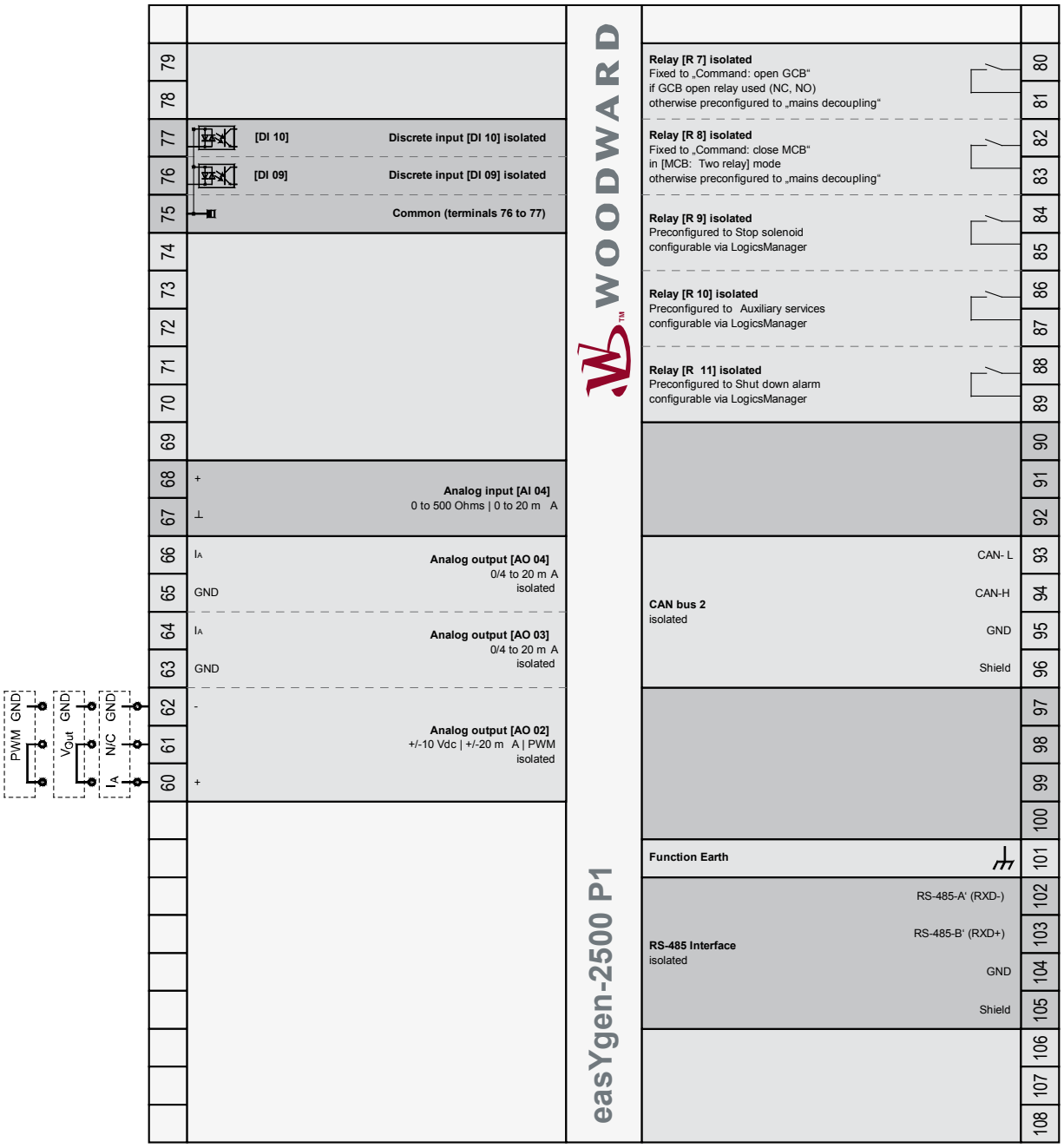


Figure 5-4: easYgen-2500 P1 – wiring diagram 2/2

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 64 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

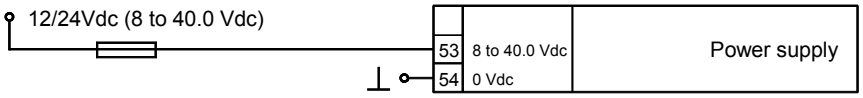


Figure 6-1: Power supply

Terminal	Description	A_{max}
53	12/24Vdc (8 to 40.0 Vdc)	2.5 mm²
54	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 53:

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

or

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

Charging Alternator

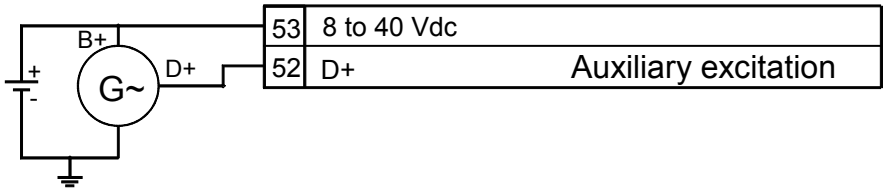


Figure 6-3: Charging alternator input/output

Terminal	Description	A_{max}
53	8 to 40Vdc	2.5 mm²
52	Auxiliary excitation input/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 120 V and 480 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

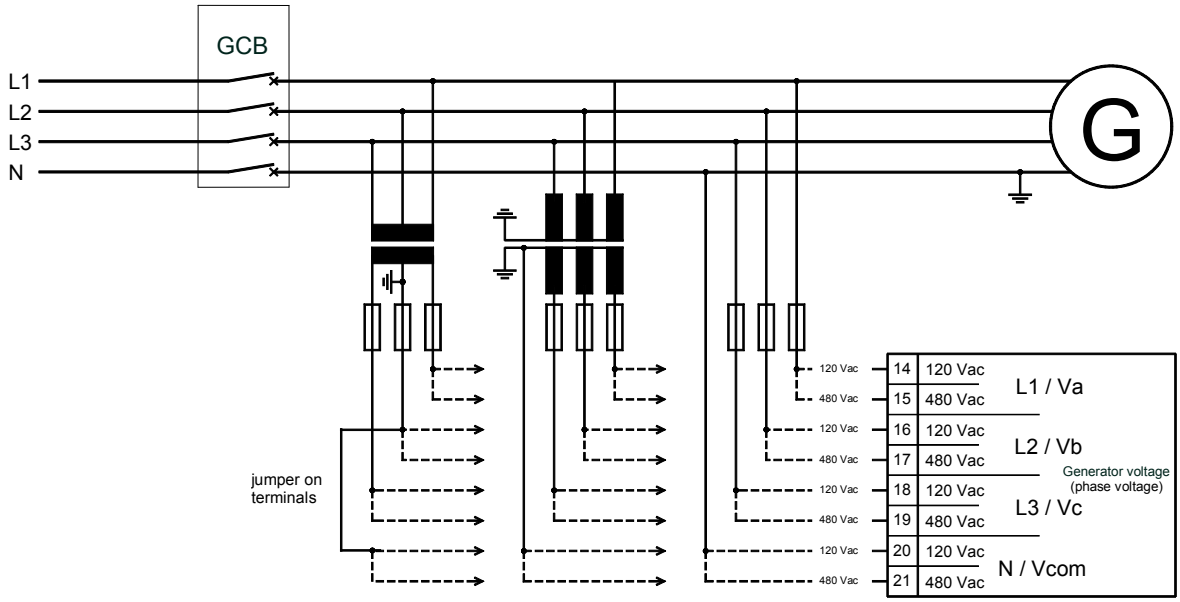


Figure 6-4: Voltage measuring - generator

Terminal	Description		A_{max}
14	Generator voltage - phase L1 / Va	120 Vac	2.5 mm²
15		480 Vac	2.5 mm²
16	Generator voltage - phase L2 / Vb	120 Vac	2.5 mm²
17		480 Vac	2.5 mm²
18	Generator voltage - phase L3 / Vc	120 Vac	2.5 mm²
19		480 Vac	2.5 mm²
20	Generator voltage - phase N / Vcom	120 Vac	2.5 mm²
21		480 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 37427) is configured with a value between 50 and 130 V, the 120 V input terminals must be used for proper measurement.

If parameter 1800 ("Gen. PT secondary rated volt.", refer to Configuration Manual 37427) is configured with a value between 131 and 480 V, the 480 V input terminals must be used for proper measurement.

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

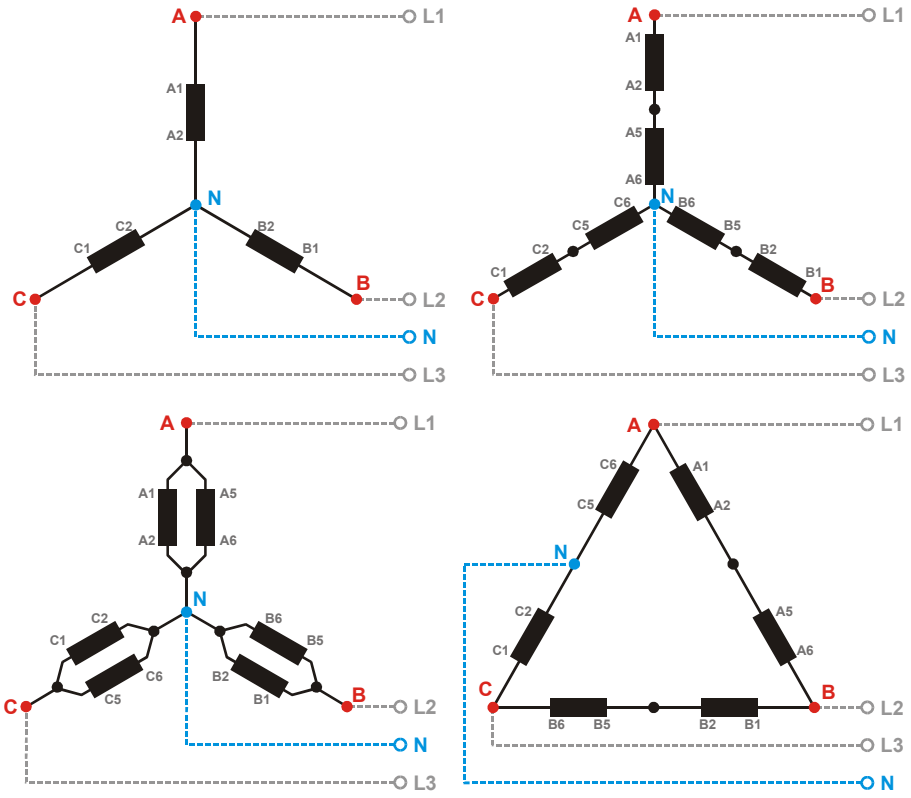


Figure 6-5: Voltage measuring - generator windings, 3Ph 4W

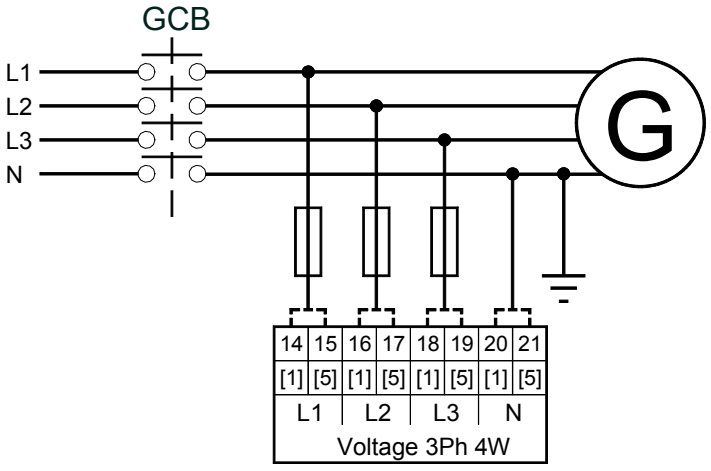


Figure 6-6: Voltage measuring - generator measuring inputs, 3Ph 4W

3Ph 4W	Wiring terminals								Note
Rated voltage (range)	[1] 120 V (50 to 130 V_{eff})				[5] 480 V (131 to 480 V_{eff})				2
Measuring range (max.)	[1] 0 to 150 Vac				[5] 0 to 600 Vac				
easYgen terminal	14	16	18	20	15	17	19	21	
Phase	L1	L2	L3	N	L1	L2	L3	N	

Table 6-5: 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)

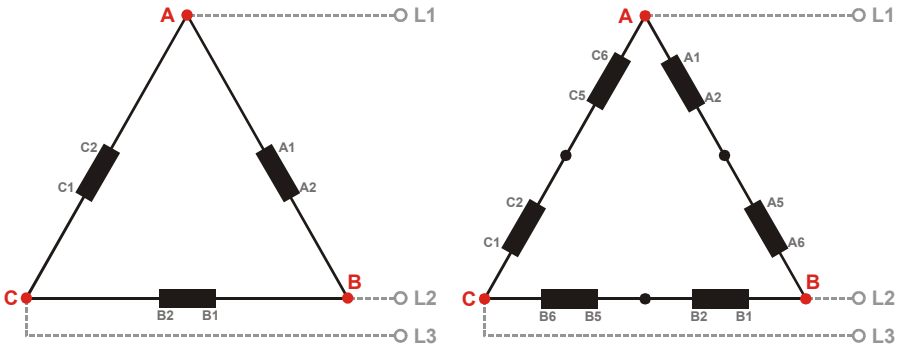


Figure 6-7: Voltage measuring - generator windings, 3Ph 3W

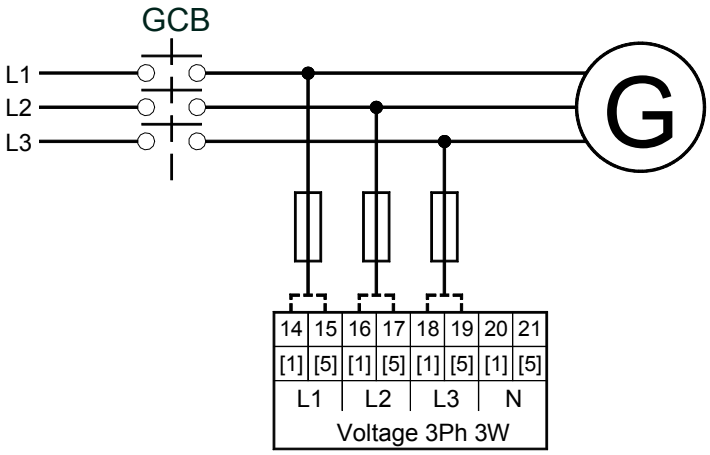


Figure 6-8: Voltage measuring - generator measuring inputs, 3Ph 3W

3Ph 3W	Wiring terminals								Note
Rated voltage (range)	[1] 120 V (50 to 130 $V_{eff.}$)				[5] 480 V (131 to 480 $V_{eff.}$)				3
Measuring range (max.)	[1] 0 to 150 Vac				[5] 0 to 600 Vac				
easYgen terminal	14	16	18	20	15	17	19	21	
Phase	L1	L2	L3	---	L1	L2	L3	---	

Table 6-6: 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)

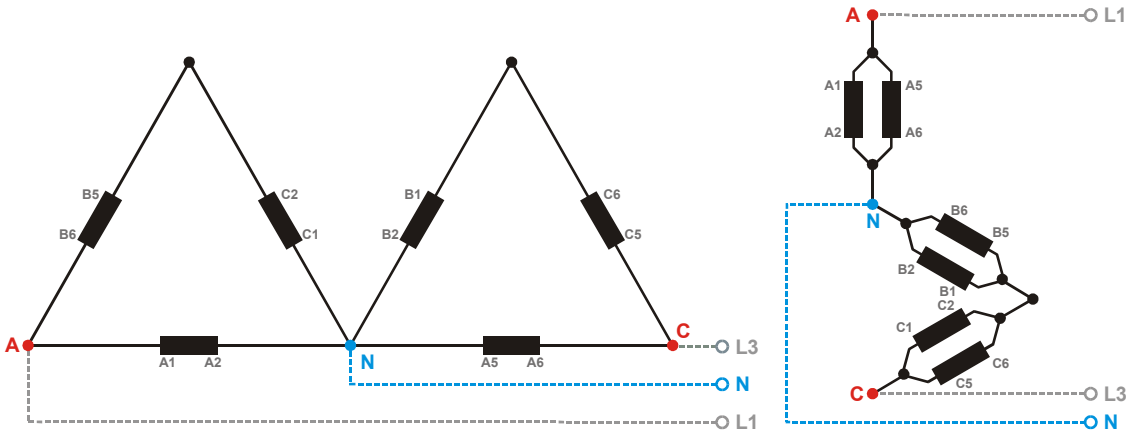


Figure 6-9: Voltage measuring - generator windings, 1Ph 3W

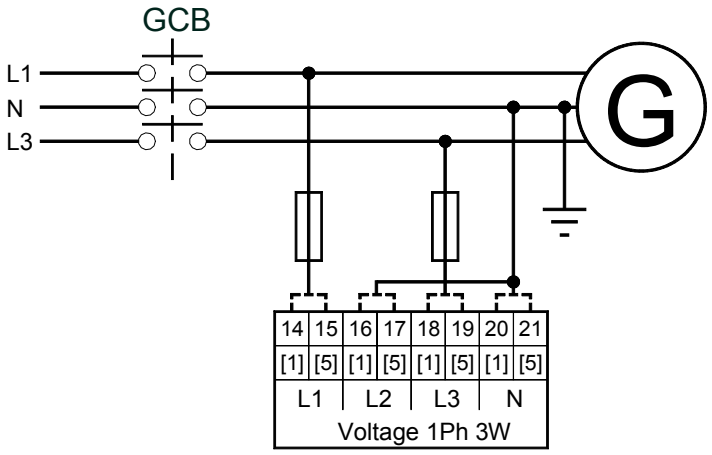


Figure 6-10: Voltage measuring - generator measuring inputs, 1Ph 3W

1Ph 3W	Wiring terminals								Note
Rated voltage (range)	[1] 120 V (50 to 130 V_{eff})				[5] 480 V (131 to 480 V_{eff})				4
Measuring range (max.)	[1] 0 to 150 Vac				[5] 0 to 600 Vac				
easYgen terminal	14	16	18	20	15	17	19	21	
Phase	L1	N	L3	N	L1	N	L3	N	

Table 6-7: 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 37427 for more information.

'1Ph 2W' Phase-Neutral Measuring

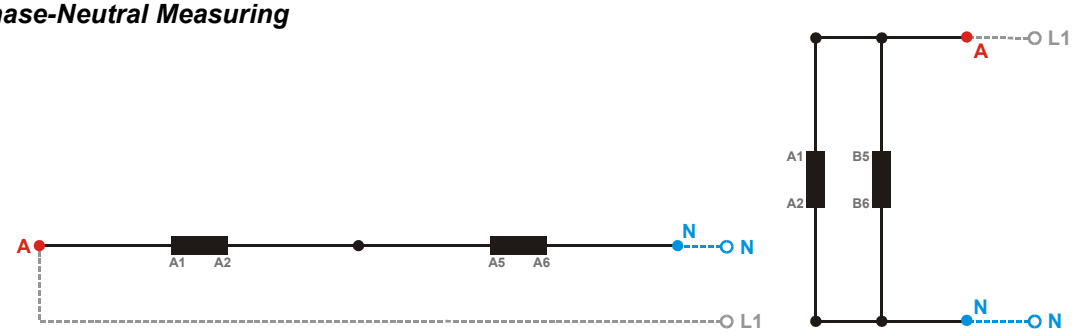


Figure 6-11: Voltage measuring - generator windings, 1Ph 2W (phase-neutral)

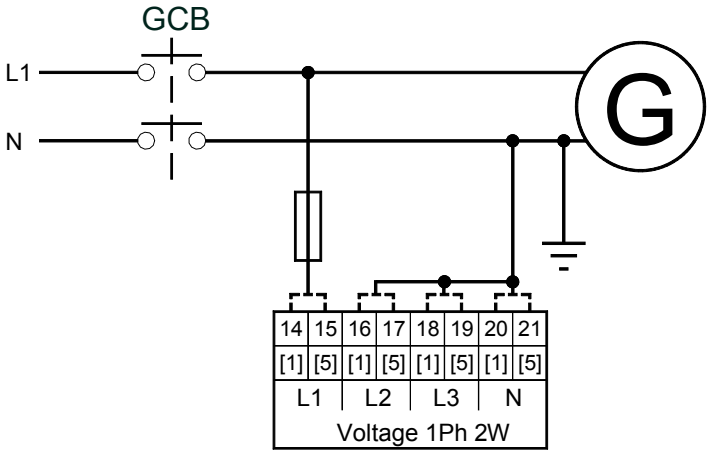


Figure 6-12: Voltage measuring - generator measuring inputs, 1Ph 2W (phase-neutral)

1Ph 2W	Wiring terminals								Note
Rated voltage (range)	[1] 120 V (50 to 130 $V_{eff.}$)				[5] 480 V (131 to 480 $V_{eff.}$)				5
Measuring range (max.)	[1] 0 to 150 Vac				[5] 0 to 600 Vac				
easYgen terminal	14	16	18	20	15	17	19	21	
Phase	L1	N	N	N	L1	N	N	N	

Table 6-8: Voltage measuring - terminal assignment - generator, 1Ph 2W (phase-neutral)

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

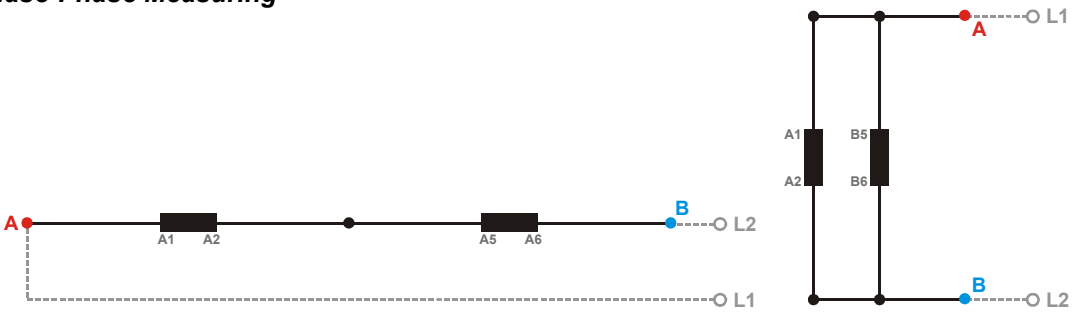


Figure 6-13: Voltage measuring - generator windings, 1Ph 2W (phase-phase)

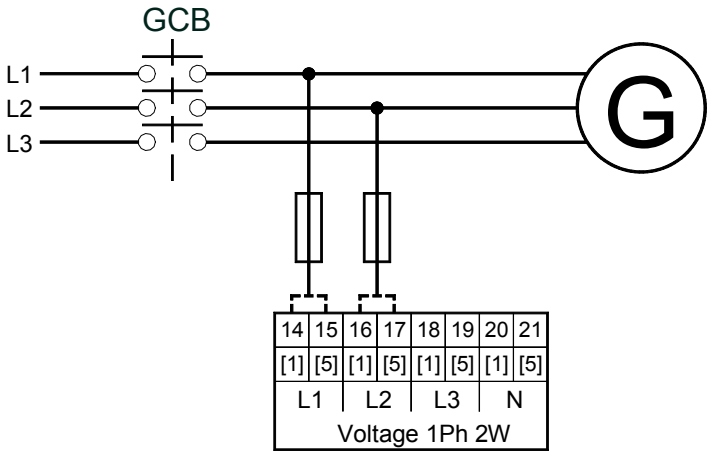


Figure 6-14: Voltage measuring - generator measuring inputs, 1Ph 2W (phase-phase)

1Ph 2W	Wiring terminals								Note
Rated voltage (range)	[1] 120 V (50 to 130 V_{eff})				[5] 480 V (131 to 480 V_{eff})				6
Measuring range (max.)	[1] 0 to 150 Vac				[5] 0 to 600 Vac				
easYgen terminal	14	16	18	20	15	17	19	21	
Phase	L1	L2	---	---	L1	L2	---	---	

Table 6-9: 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 (Busbar)

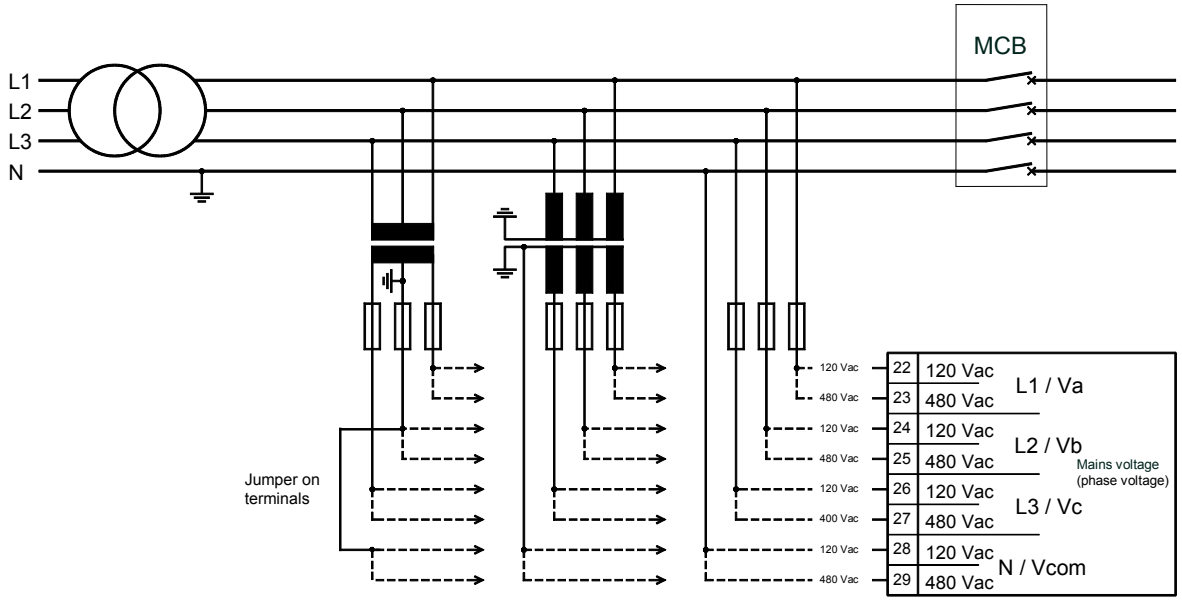


Figure 6-15: Voltage measuring – mains (busbar)

Terminal	Description		A_{max}
22	Mains (Busbar) voltage - phase L1 / Va	120 Vac	2.5 mm²
23		480 Vac	2.5 mm²
24	Mains (Busbar) voltage - phase L2 / Vb	120 Vac	2.5 mm²
25		480 Vac	2.5 mm²
26	Mains (Busbar) voltage - phase L3 / Vc	120 Vac	2.5 mm²
27		480 Vac	2.5 mm²
28	Mains (Busbar) voltage - phase N / Vcom	120 Vac	2.5 mm²
29		480 Vac	2.5 mm²

Table 6-10: Voltage measuring - terminal assignment - mains (busbar) voltage

NOTE

If parameter 1803 ("Mains PT secondary rated volt.", refer to Configuration Manual 37427) is configured with a value between 50 and 130 V, the 120 V input terminals must be used for proper measurement.

If parameter 1803 ("Mains PT secondary rated volt.", refer to Configuration Manual 37427) is configured with a value between 131 and 480 V, the 480 V input terminals must be used for proper measurement.

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

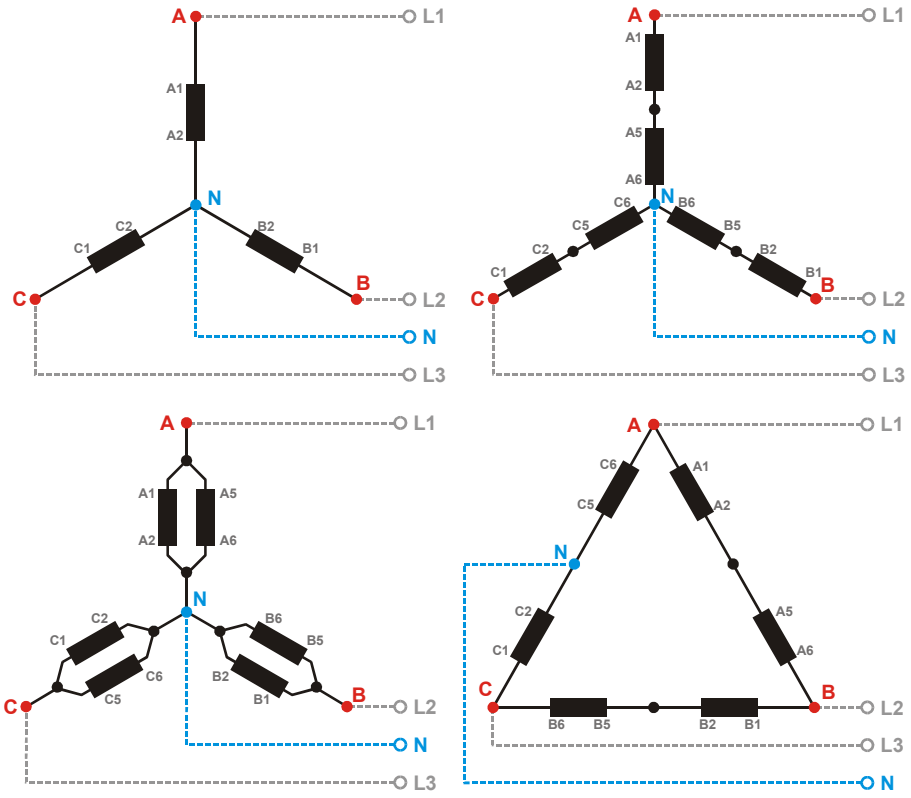


Figure 6-16: Voltage measuring - mains (busbar) PT windings, 3Ph 4W

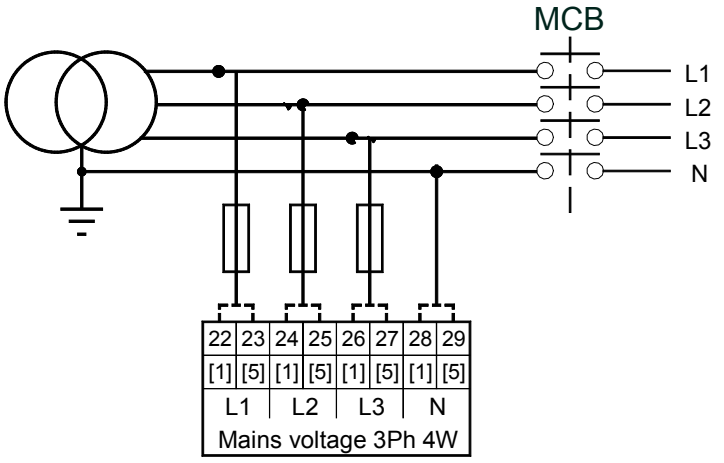


Figure 6-17: Voltage measuring - mains (busbar) measuring inputs, 3Ph 4W

3Ph 4W	Wiring terminals								Note
Rated voltage (range)	[1] 120 V (50 to 130 V_{eff})				[5] 480 V (131 to 480 V_{eff})				7
Measuring range (max.)	[1] 0 to 150 Vac				[5] 0 to 600 Vac				
easYgen terminal	22	24	26	28	23	25	27	29	
Phase	L1	L2	L3	N	L1	L2	L3	N	

Table 6-11: Voltage measuring - terminal assignment – mains (busbar), 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 (Busbar), Parameter Setting '3Ph 3W' (3-phase, 3-wire)

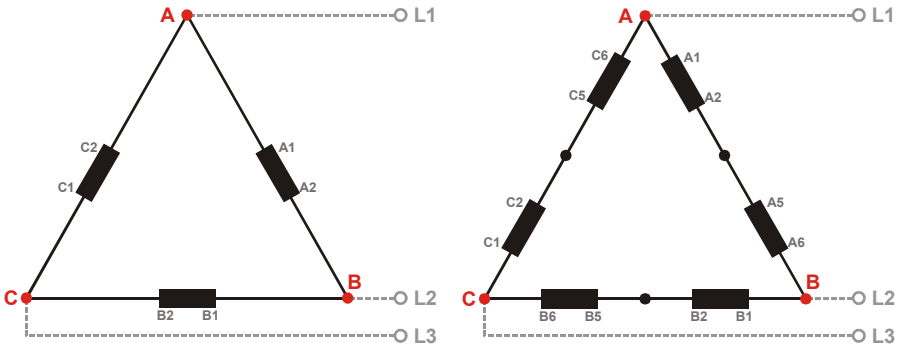


Figure 6-18: Voltage measuring - mains (busbar) PT windings, 3Ph 3W

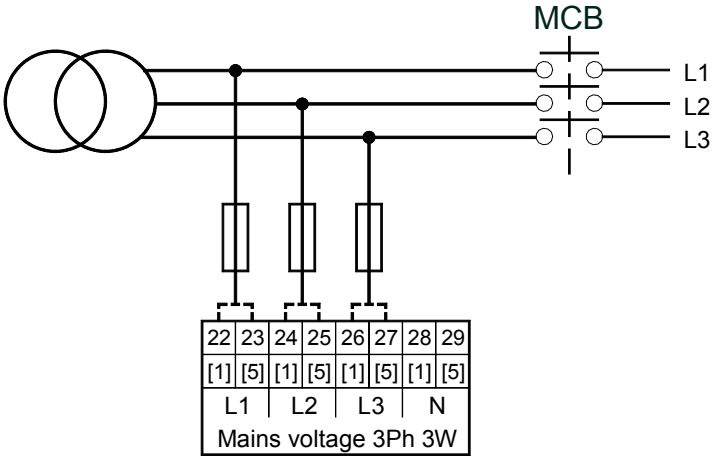


Figure 6-19: Voltage measuring - mains (busbar) measuring inputs, 3Ph 3W

3Ph 3W	Wiring terminals								Note
Rated voltage (range)	[1] 120 V (50 to 130 $V_{eff.}$)				[5] 480 V (131 to 480 $V_{eff.}$)				8
Measuring range (max.)	[1] 0 to 150 Vac				[5] 0 to 600 Vac				
easYgen terminal	22	24	26	28	23	25	27	29	
Phase	L1	L2	L3	---	L1	L2	L3	---	

Table 6-12: Voltage measuring - terminal assignment - mains (busbar), 3Ph 3W

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

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

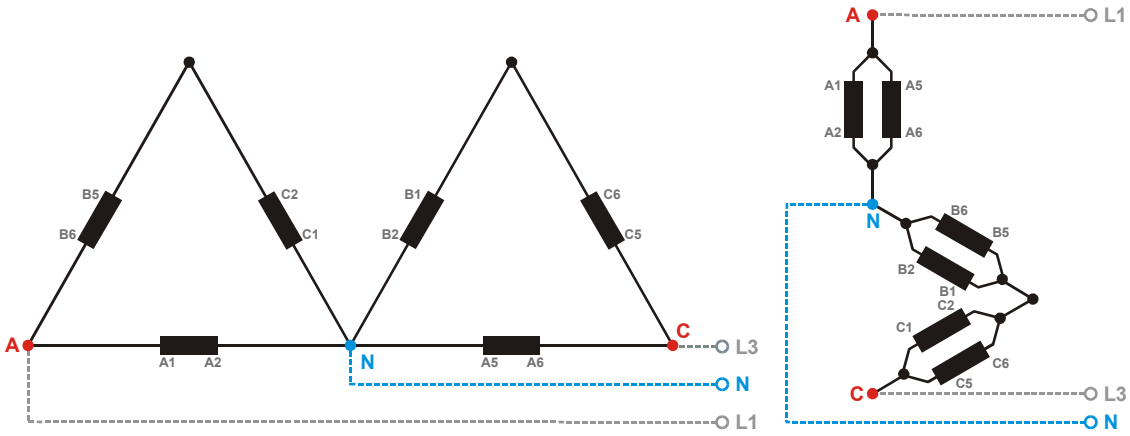


Figure 6-20: Voltage measuring - mains (busbar) PT windings, 1Ph 3W

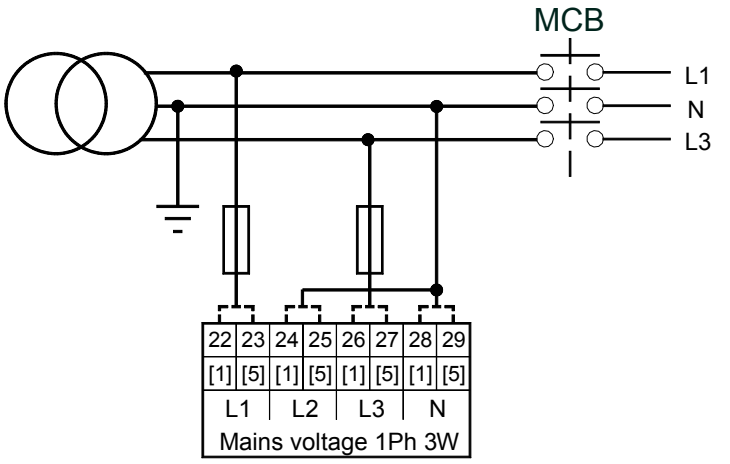


Figure 6-21: Voltage measuring - mains (busbar) measuring inputs, 1Ph 3W

1Ph 3W	Wiring terminals								Note
Rated voltage (range)	[1] 120 V (50 to 130 $V_{eff.}$)				[5] 480 V (131 to 480 $V_{eff.}$)				9
Measuring range (max.)	[1] 0 to 150 Vac				[5] 0 to 600 Vac				
easYgen terminal	22	24	26	28	23	25	27	29	
Phase	L1	N	L3	N	L1	N	L3	N	

Table 6-13: Voltage measuring - terminal assignment – mains (busbar), 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 (Busbar), 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 37427 for more information.

'1Ph 2W' Phase-Neutral Measuring

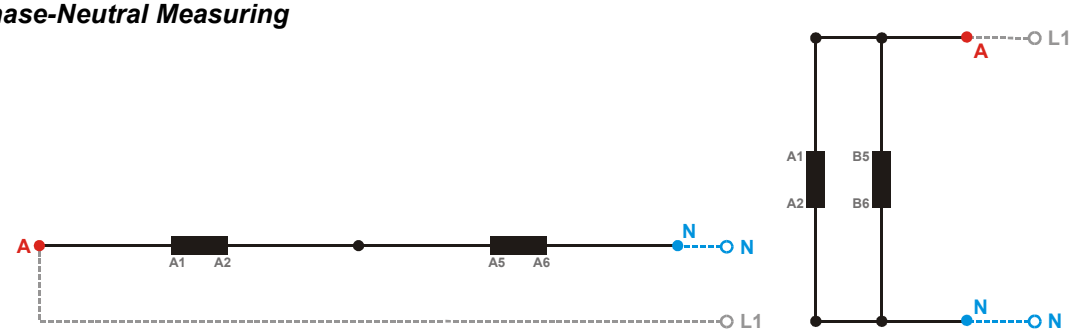


Figure 6-22: Voltage measuring - mains (busbar) PT windings, 1Ph 2W (phase-neutral)

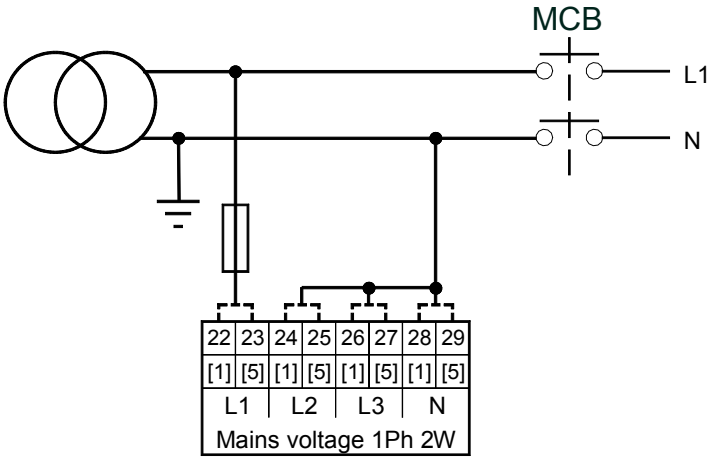


Figure 6-23: Voltage measuring - mains (busbar) measuring inputs, 1Ph 2W (phase-neutral)

1Ph 2W	Wiring terminals								Note
Rated voltage (range)	[1] 120 V (50 to 130 V_{eff})				[5] 480 V (131 to 480 V_{eff})				10
Measuring range (max.)	[1] 0 to 150 Vac				[5] 0 to 600 Vac				
easYgen terminal	22	24	26	28	23	25	27	29	
Phase	L1	N	N	N	L1	N	N	N	

Table 6-14: Voltage measuring - terminal assignment – mains (busbar), 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

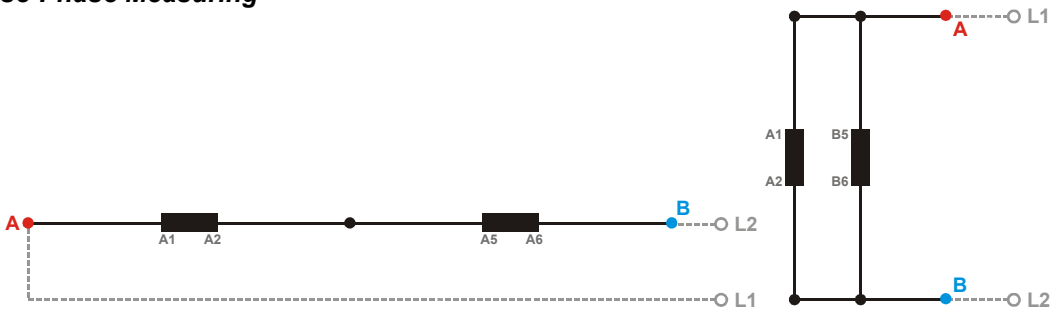


Figure 6-24: Voltage measuring - mains (busbar) PT windings, 1Ph 2W (phase-phase)

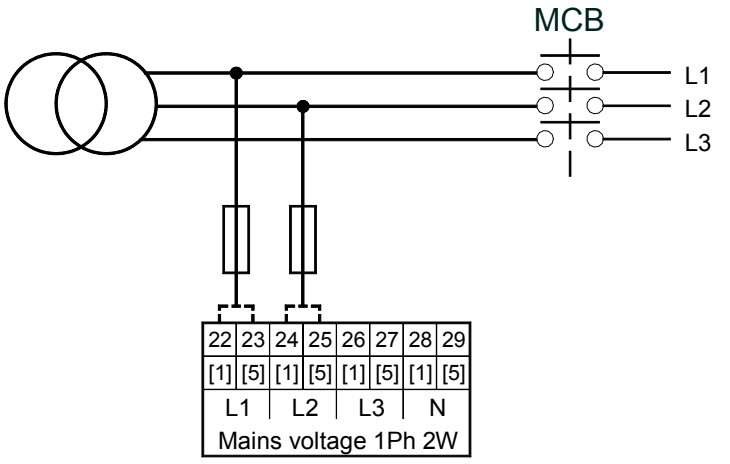


Figure 6-25: Voltage measuring - mains (busbar) measuring inputs, 1Ph 2W (phase-phase)

1Ph 2W	Wiring terminals								Note
Rated voltage (range)	[1] 120 V (50 to 130 V_{eff})				[5] 480 V (131 to 480 V_{eff})				11
Measuring range (max.)	[1] 0 to 150 Vac				[5] 0 to 600 Vac				
easYgen terminal	22	24	26	28	23	25	27	29	
Phase	L1	L2	---	---	L1	L2	---	---	

Table 6-15: Voltage measuring - terminal assignment – mains (busbar), 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 (Mains)

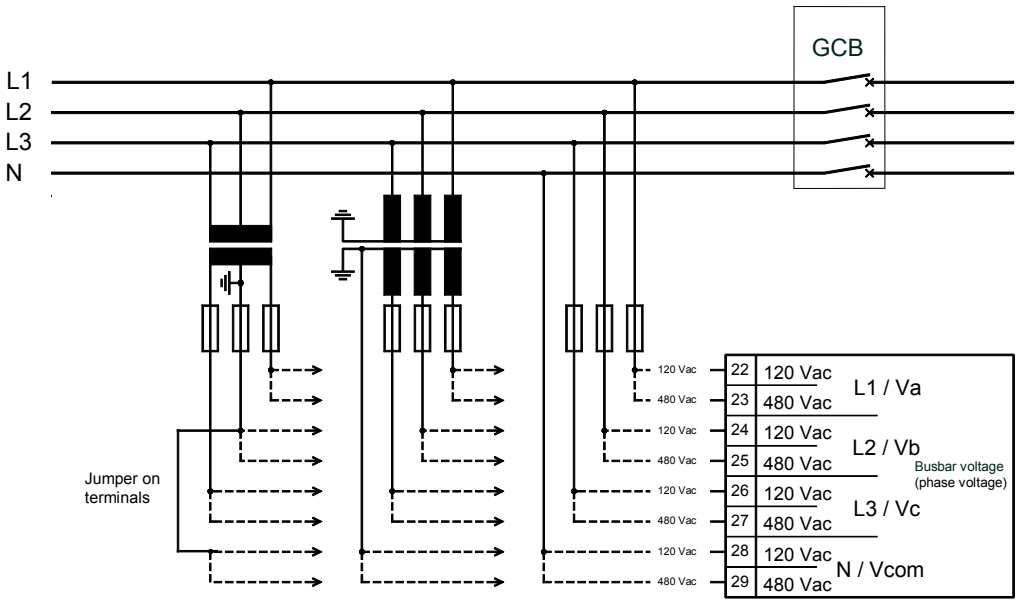


Figure 6-26: Voltage measuring – busbar (mains)

Terminal	Description		A_{max}
22	Busbar (Mains) voltage - phase L1 / Va	120 Vac	2.5 mm²
23		480 Vac	2.5 mm²
24	Busbar (Mains) voltage - phase L2 / Vb	120 Vac	2.5 mm²
25		480 Vac	2.5 mm²
26	Busbar (Mains) voltage - phase L3 / Vc	120 Vac	2.5 mm²
27		480 Vac	2.5 mm²
28	Busbar (Mains) voltage - phase N / Vcom	120 Vac	2.5 mm²
29		480 Vac	2.5 mm²

Table 6-16: Voltage measuring - terminal assignment – busbar (mains) voltage

NOTE

If parameter 1803 ("Mains PT secondary rated volt.", refer to Configuration Manual 37427) is configured with a value between 50 and 130 V, the 120 V input terminals must be used for proper measurement.

If parameter 1803 ("Mains PT secondary rated volt.", refer to Configuration Manual 37427) is configured with a value between 131 and 480 V, the 480 V input terminals must be used for proper measurement.

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

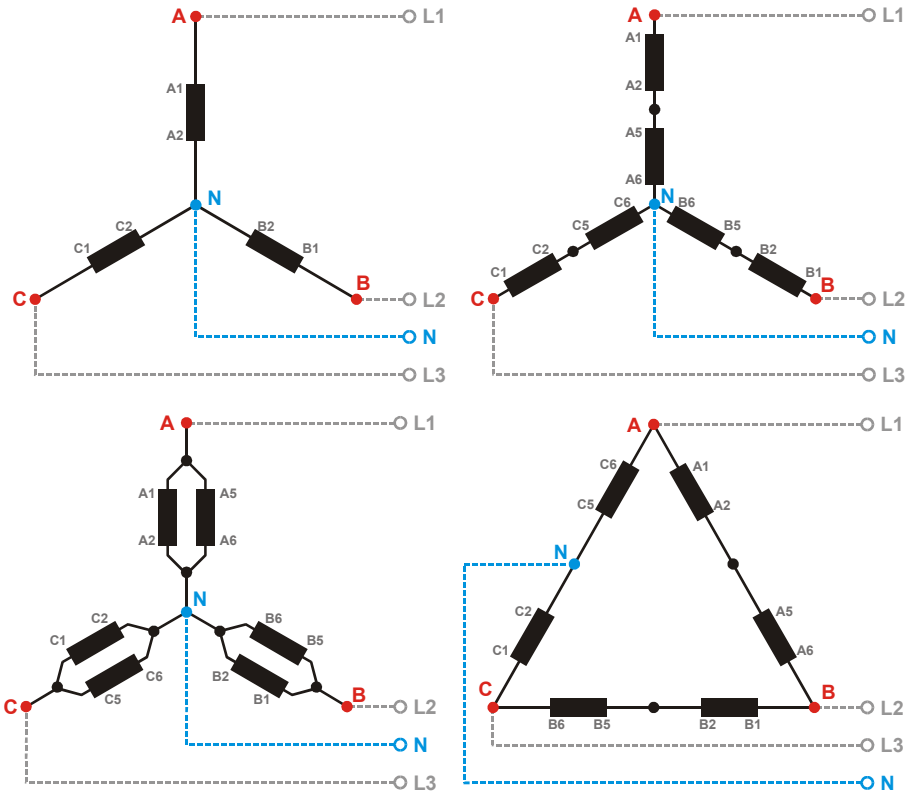


Figure 6-27: Voltage measuring – busbar (mains) PT windings, 3Ph 4W

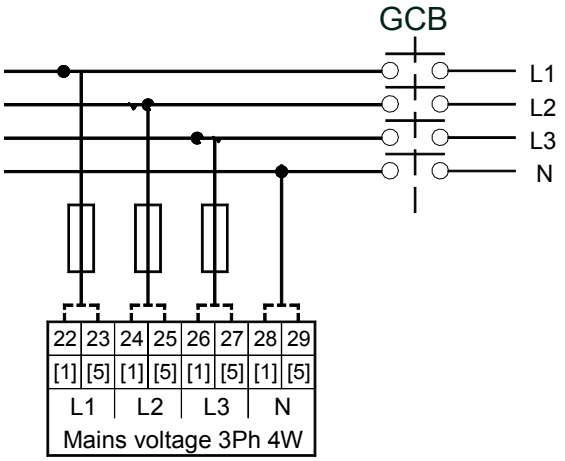


Figure 6-28: Voltage measuring – busbar (mains) measuring inputs, 3Ph 4W

3Ph 4W	Wiring terminals								Note
Rated voltage (range)	[1] 120 V (50 to 130 V_{eff})				[5] 480 V (131 to 480 V_{eff})				12
Measuring range (max.)	[1] 0 to 150 Vac				[5] 0 to 600 Vac				
easYgen terminal	22	24	26	28	23	25	27	29	
Phase	L1	L2	L3	N	L1	L2	L3	N	

Table 6-17: Voltage measuring - terminal assignment – busbar (mains), 3Ph 4W

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.

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

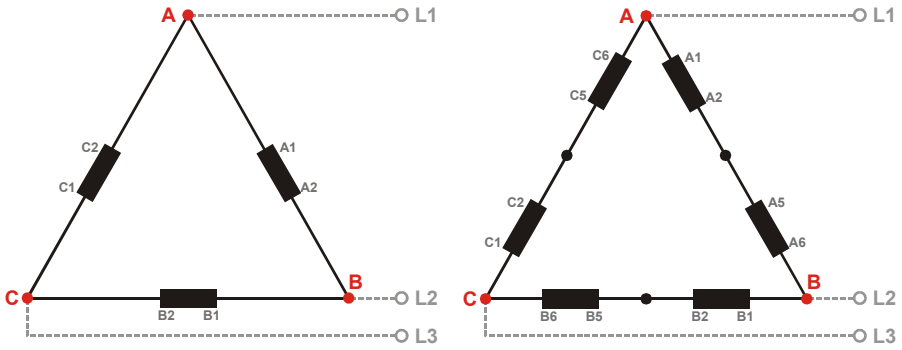


Figure 6-29: Voltage measuring – busbar (mains) PT windings, 3Ph 3W

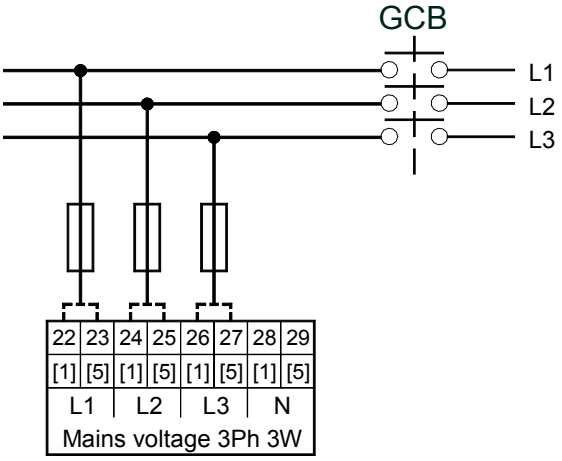


Figure 6-30: Voltage measuring – busbar (mains) measuring inputs, 3Ph 3W

3Ph 3W	Wiring terminals								Note
Rated voltage (range)	[1] 120 V (50 to 130 $V_{eff.}$)				[5] 480 V (131 to 480 $V_{eff.}$)				13
Measuring range (max.)	[1] 0 to 150 Vac				[5] 0 to 600 Vac				
easYgen terminal	22	24	26	28	23	25	27	29	
Phase	L1	L2	L3	---	L1	L2	L3	---	

Table 6-18: Voltage measuring - terminal assignment – busbar (mains), 3Ph 3W

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

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

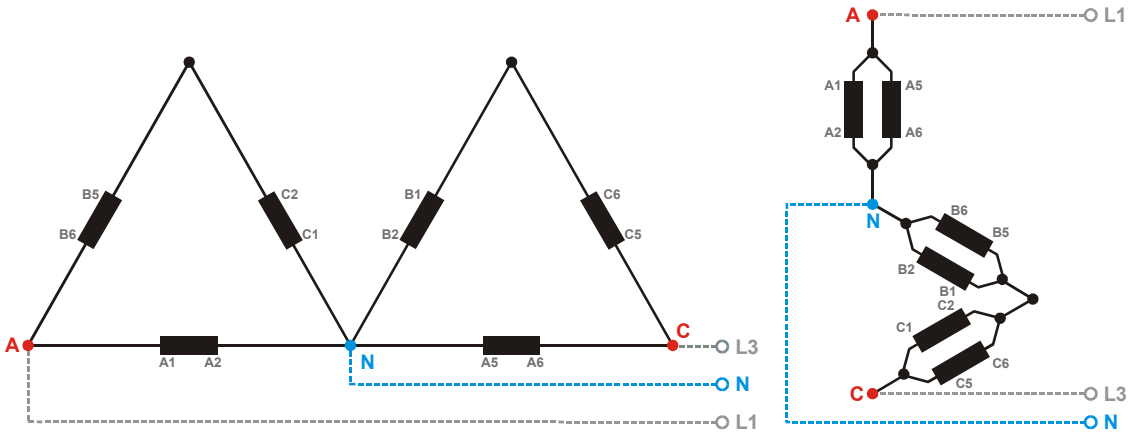


Figure 6-31: Voltage measuring – busbar (mains) PT windings, 1Ph 3W

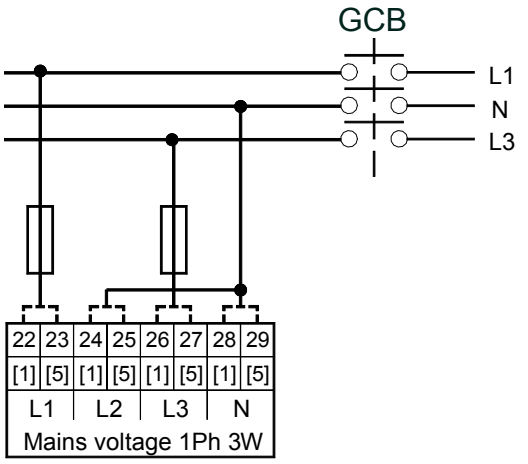


Figure 6-32: Voltage measuring – busbar (mains) measuring inputs, 1Ph 3W

1Ph 3W	Wiring terminals								Note
Rated voltage (range)	[1] 120 V (50 to 130 $V_{eff.}$)				[5] 480 V (131 to 480 $V_{eff.}$)				14
Measuring range (max.)	[1] 0 to 150 Vac				[5] 0 to 600 Vac				
easYgen terminal	22	24	26	28	23	25	27	29	
Phase	L1	N	L3	N	L1	N	L3	N	

Table 6-19: Voltage measuring - terminal assignment – busbar (mains), 1Ph 3W

14 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 (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 37427 for more information.

'1Ph 2W' Phase-Neutral Measuring

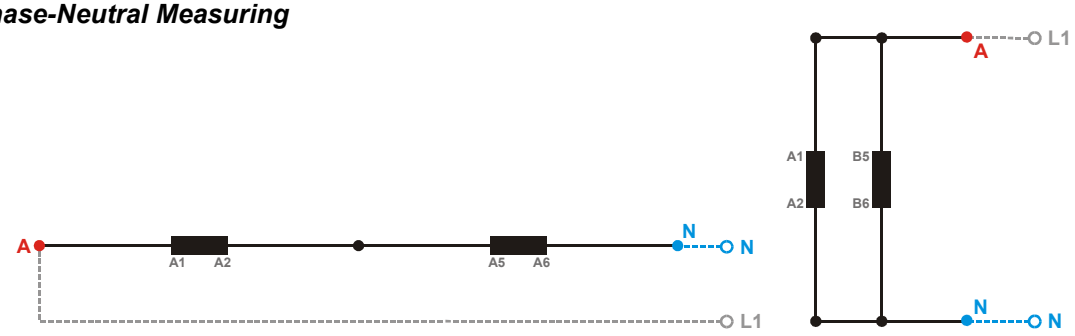


Figure 6-33: Voltage measuring – busbar (mains) PT windings, 1Ph 2W (phase-neutral)

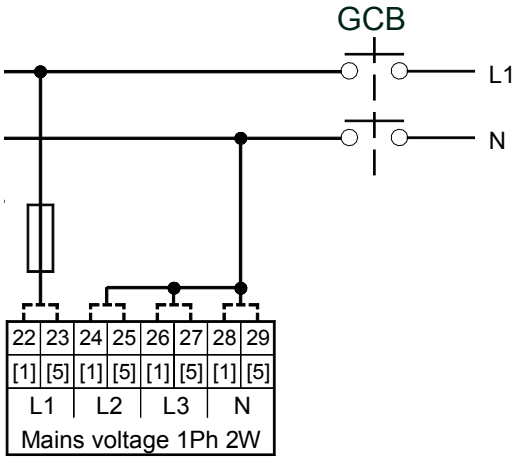


Figure 6-34: Voltage measuring – busbar (mains) measuring inputs, 1Ph 2W (phase-neutral)

1Ph 2W	Wiring terminals								Note
Rated voltage (range)	[1] 120 V (50 to 130 $V_{eff.}$)				[5] 480 V (131 to 480 $V_{eff.}$)				15
Measuring range (max.)	[1] 0 to 150 Vac				[5] 0 to 600 Vac				
easYgen terminal	22	24	26	28	23	25	27	29	
Phase	L1	N	N	N	L1	N	N	N	

Table 6-20: Voltage measuring - terminal assignment – busbar (mains), 1Ph 2W (phase-neutral)

15 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

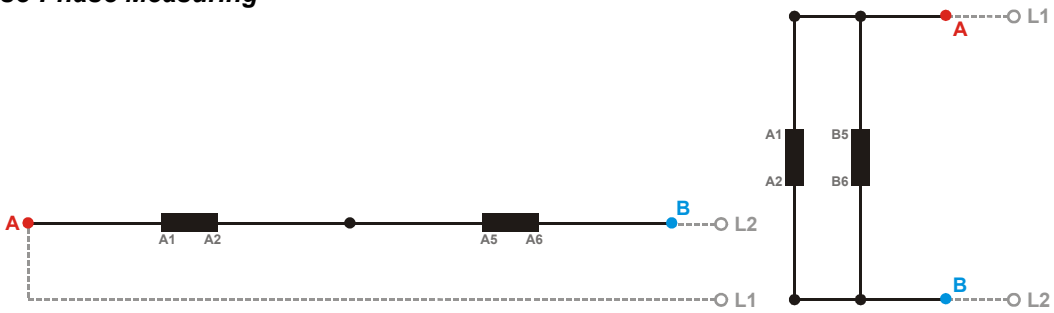


Figure 6-35: Voltage measuring – busbar (mains) PT windings, 1Ph 2W (phase-phase)

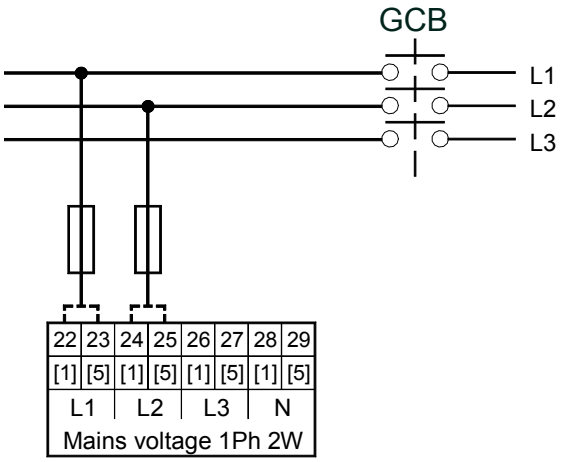


Figure 6-36: Voltage measuring – busbar (mains) measuring inputs, 1Ph 2W (phase-phase)

1Ph 2W	Wiring terminals								Note
Rated voltage (range)	[1] 120 V (50 to 130 V_{eff})				[5] 480 V (131 to 480 V_{eff})				16
Measuring range (max.)	[1] 0 to 150 Vac				[5] 0 to 600 Vac				
easYgen terminal	22	24	26	28	23	25	27	29	
Phase	L1	L2	---	---	L1	L2	---	---	

Table 6-21: Voltage measuring - terminal assignment – busbar (mains), 1Ph 2W (phase-phase)

16 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.

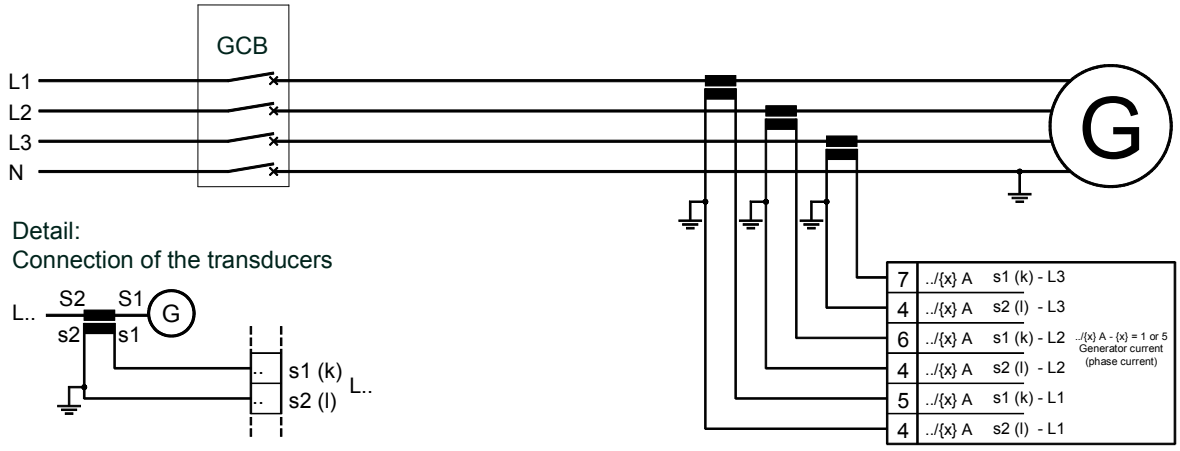


Figure 6-37: Current measuring - generator

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

Table 6-22: Current measuring - terminal assignment - generator current

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

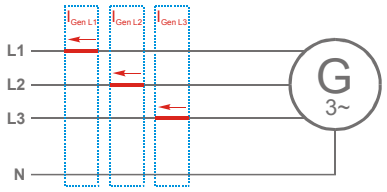


Figure 6-38: Current measuring - generator, L1 L2 L3

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

Table 6-23: Current measuring - terminal assignment - generator, L1 L2 L3

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

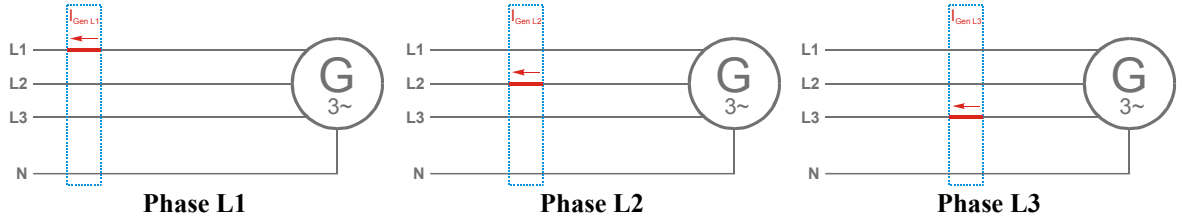


Figure 6-39: Current measuring - generator, phase Lx

	Wiring terminals						Notes
Phase L1							
easYgen terminal	4	5	4	6	4	7	
Phase	s2 (k) L1	s1 (l) L1	---	---	---	---	
Phase L2							
easYgen terminal	4	5	4	6	4	7	
Phase	---	---	s2 (k) L2	s1 (l) L2	---	---	
Phase L3							
easYgen terminal	4	5	4	6	4	7	
Phase	---	---	---	---	s2 (k) L3	s1 (l) L3	
Phase L1 and L3							17
easYgen terminal	4	5	4	6	4	7	
Phase	s2 (k) L1	s1 (l) L1	---	---	s2 (k) L3	s1 (l) L3	

Table 6-24: Current measuring - terminal assignment - generator, phase Lx

17 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.

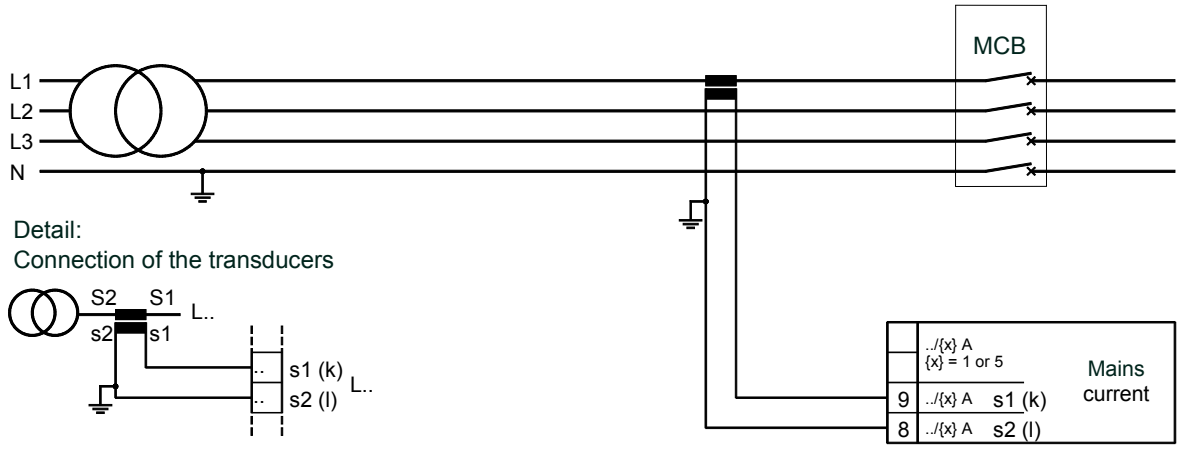


Figure 6-40: Current measuring - mains current

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

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

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

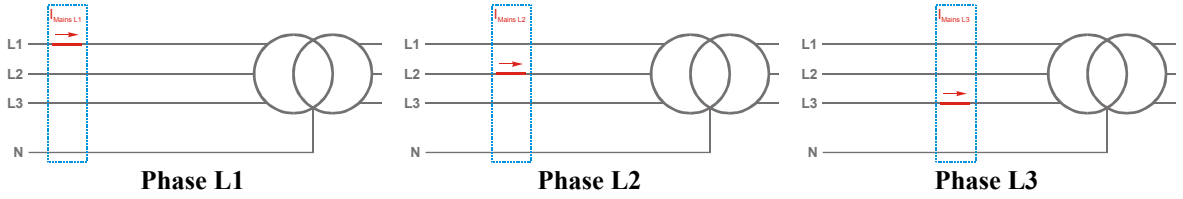


Figure 6-41: Current measuring - mains, phase Lx

	Wiring terminals		Notes
Phase L1			
easYgen terminal	8	9	
Phase	s2 (l) - L1	s1 (k) - L1	
Phase L2			
easYgen terminal	8	9	
Phase	s2 (l) - L2	s1 (k) - L2	
Phase L3			
easYgen terminal	8	9	
Phase	s2 (l) - L3	s1 (k) - L3	

Table 6-26: 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 37427 for more information.

NOTE

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

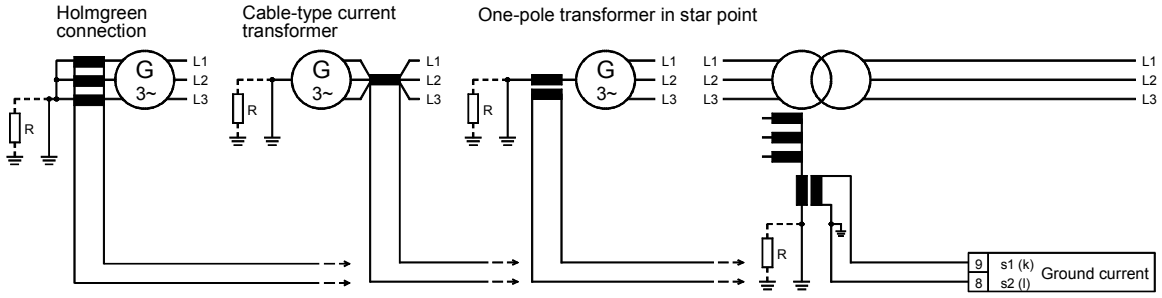


Figure 6-42: Current measuring - ground current

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

Table 6-27: 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

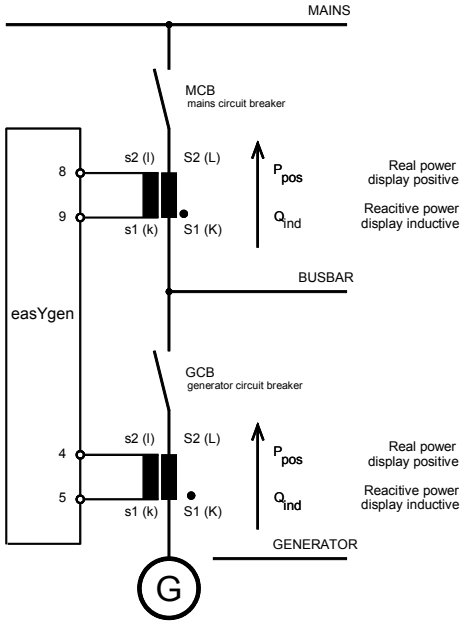


Figure 6-43: Power measuring - direction of power

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

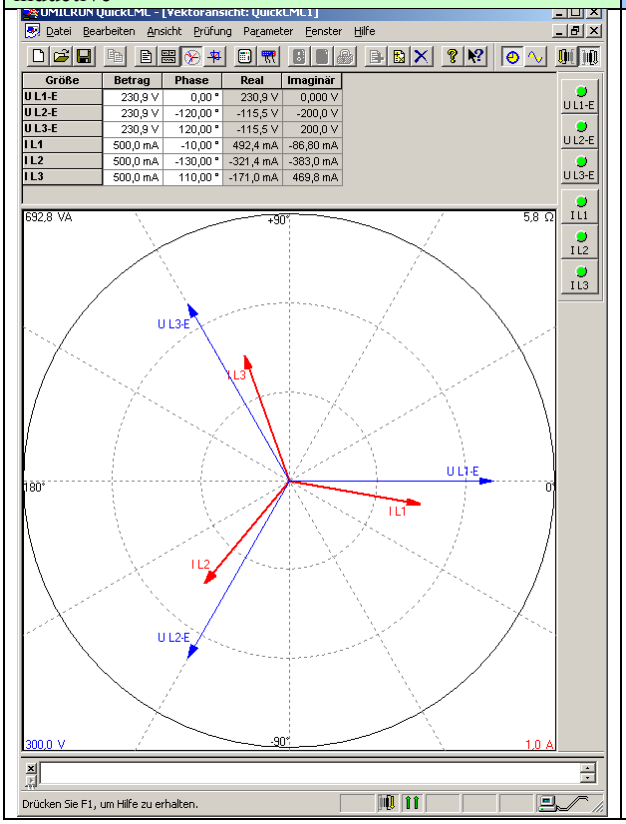
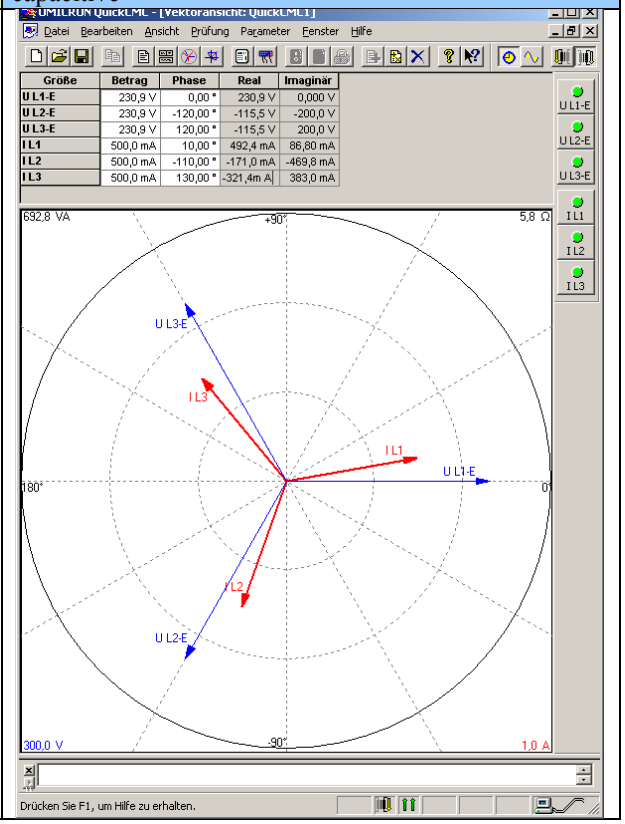
The generator is

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)

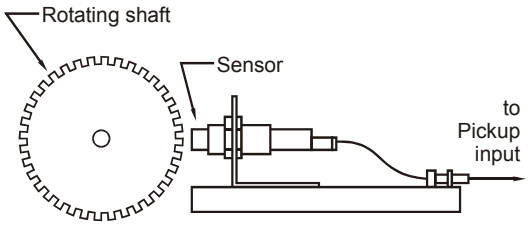


Figure 6-44: MPU - principle overview

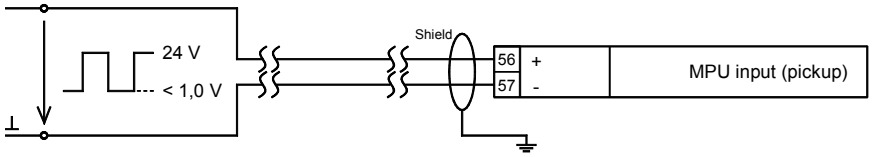


Figure 6-45: MPU input

Terminal	Description	A_{max}
56	MPU input - inductive/switching	2.5 mm²
57	MPU input - GND	2.5 mm²

Table 6-28: MPU - terminal assignment (easYgen-2200 P1 & easYgen-2500 P1 only)

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.

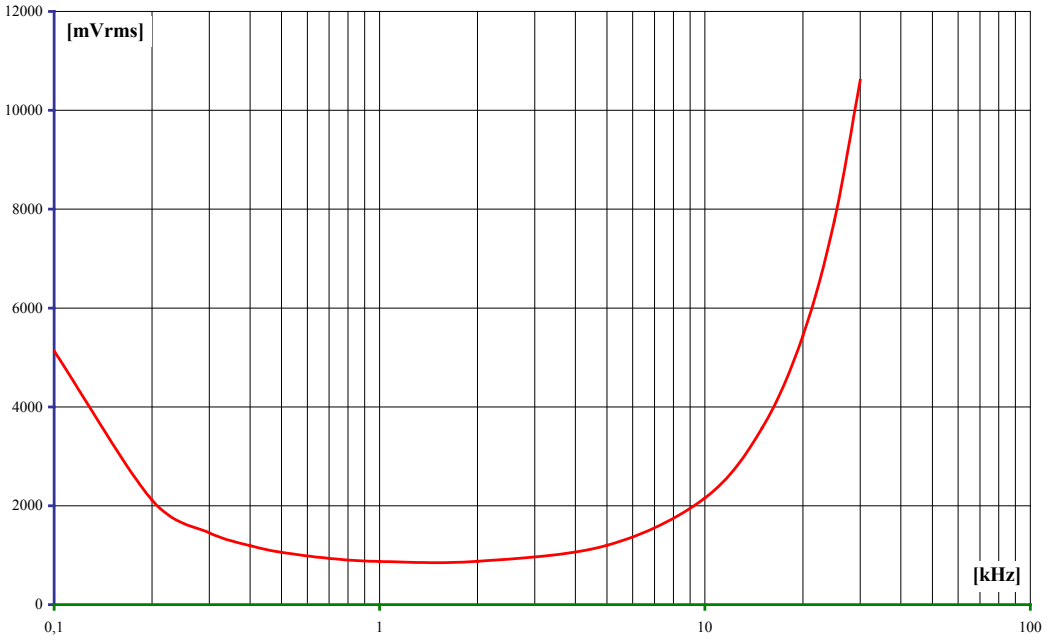


Figure 6-46: Minimal necessary input voltage depending on frequency

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

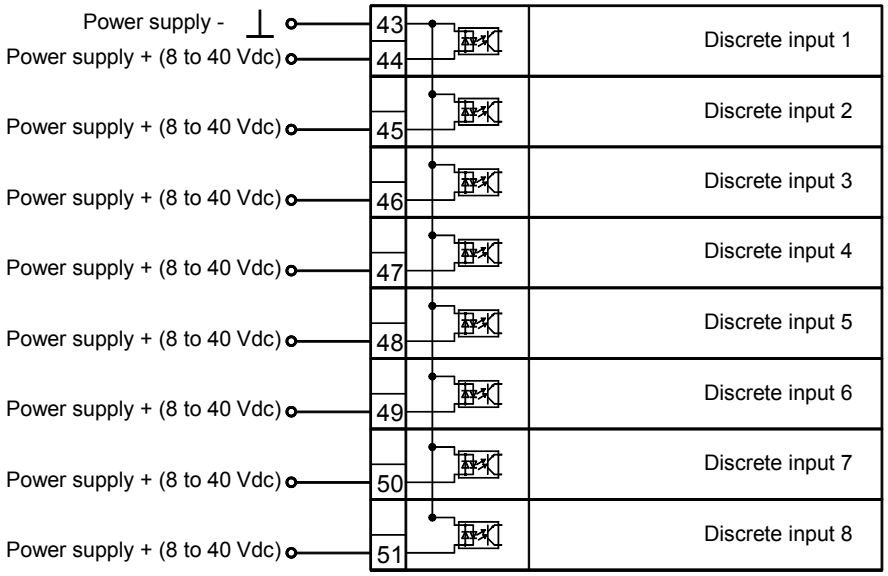


Figure 6-47: Discrete inputs - alarm/control input - positive signal (easYgen-2000 Series)

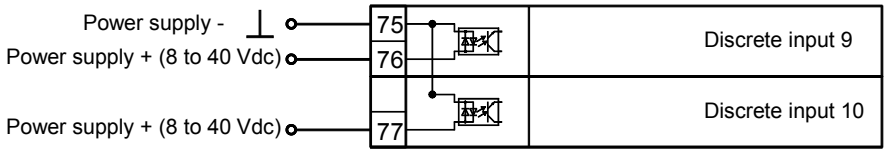


Figure 6-48: Discrete inputs - alarm/control input - positive signal (easYgen-2500 P1 only)

Discrete Inputs: Negative Polarity Signal

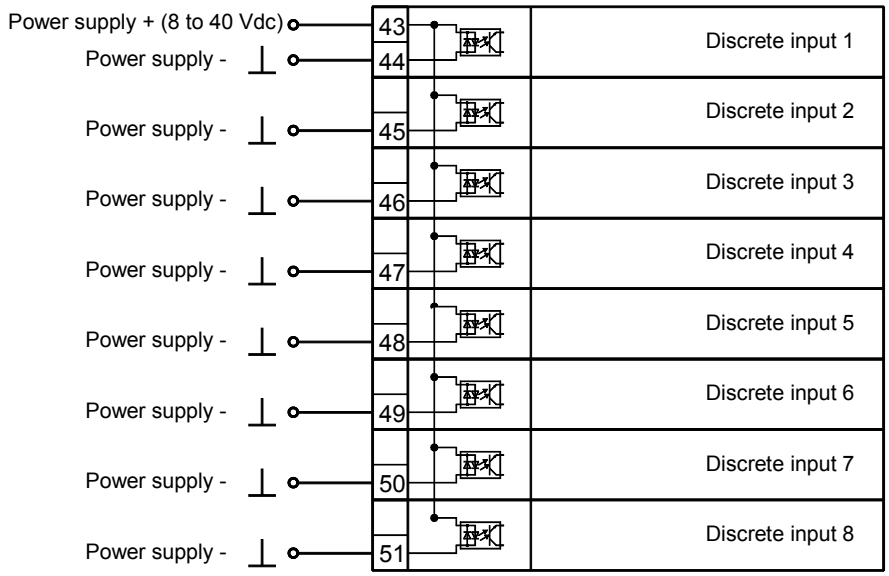


Figure 6-49: Discrete inputs - alarm/control input - negative signal (easYgen-2000 Series)

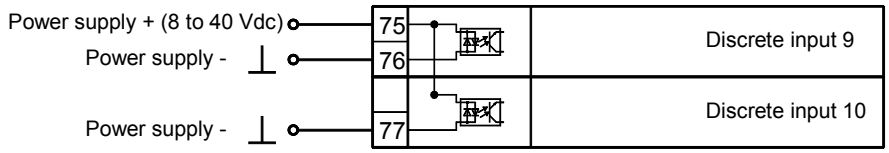


Figure 6-50: Discrete inputs - alarm/control input - negative signal (easYgen-2500 P1 only)

Terminal	Description	A_{max}
43	Discrete inputs - GND (common ground)	2.5 mm²
44	Discrete input [DI 01]; pre-assigned to 'Emergency stop'	2.5 mm²
45	Discrete input [DI 02]; pre-assigned to 'Start in AUTO'	2.5 mm²
46	Discrete input [DI 03]; pre-assigned to 'Low oil pressure'	2.5 mm²
47	Discrete input [DI 04]; pre-assigned to 'Coolant temperature'	2.5 mm²
48	Discrete input [DI 05]; pre-assigned to 'External alarm acknowledgement'	2.5 mm²
49	Discrete input [DI 06]; pre-assigned to 'Enable MCB'	2.5 mm²
50	Discrete input [DI 07]; fixed to 'Reply MCB open'	2.5 mm²
51	Discrete input [DI 08]; fixed to 'Reply GCB open'	2.5 mm²

Table 6-29: Discrete input - terminal assignment (easYgen-2000 Series)

Terminal	Description	A_{max}
75	Discrete inputs - GND (common ground)	2.5 mm²
76	Discrete input [DI 09]	2.5 mm²
77	Discrete input [DI 10]	2.5 mm²

Table 6-30: Discrete input - terminal assignment (easYgen-2500 P1 only)

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 48 for details.

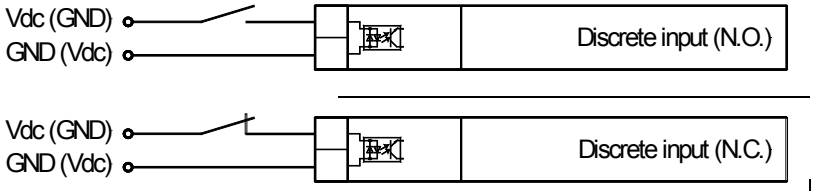


Figure 6-51: Discrete inputs - alarm/control inputs - operation logic

Relay Outputs (*LogicsManager*)

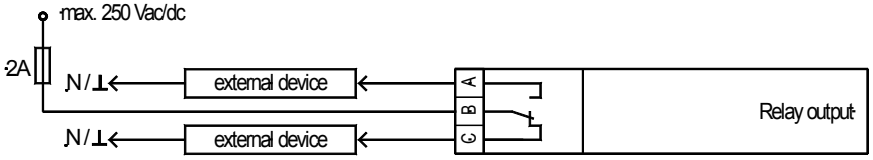


Figure 6-52: Relay outputs

Terminal Term.	Com.	Description				A_{max}
A	**B**	**Form A, N.O. make contact**			Type ⇩	
30	31	Relay output [R 01]	{all}	Ready for operation	N.O.	2.5 mm²
32	33	Relay output [R 02]	{all}	Preconfigured to Horn	SW	2.5 mm²
34	35	Relay output [R 03]	{all}	Preconfigured to Starter	SW	2.5 mm²
36	37	Relay output [R 04]	{all}	Preconfigured to Fuel solenoid / gas valve	SW	2.5 mm²

Terminal Term.	Com.		Description				A_{max}
A	**B**	**C**	**Form C, N.O. make contact, N.C.**			Type ⇩	
38	39	40	Relay output [R 05]	{2oc}	"Command Open MCB" or *LogicsManager*	SW	2.5 mm²

Terminal Term.	Com.	Description				A_{max}
A	**B**	**Form A, N.O. make contact**			Type ⇩	
41	42	Relay output [R 06]	{1o} {1oc} {2oc}	"Command Close GCB" or *LogicsManager*	N.O.	2.5 mm²

Terminal Term.	Com.	Description				A_{max}
A	**B**	**Form A, N.O. make contact**			Type ⇩	
80	81	Relay output [R 07]	{1o} {1oc} {2oc}	"Command close MCB" or *LogicsManager*	N.O.	2.5 mm²
82	83	Relay output [R 08]	{1o} {1oc} {2oc}	"Command open GCB" or *LogicsManager*	N.O.	2.5 mm²
84	85	Relay output [R 09]	{all}	*LogicsManager*	N.O.	2.5 mm²
86	87	Relay output [R 10]	{all}	*LogicsManager*	N.O.	2.5 mm²
88	89	Relay output [R 11]	{all}	*LogicsManager*	N.O.	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 6-31: 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 70 for interference suppressing circuits when connecting 24 V relays.

Analog Inputs (*FlexIn*)

NOTE

There is a mixed operation of resistor senders and 0/4 to 20 mA senders possible. Please consider the following application references.

Wiring Resistor Senders

Wiring Two-Pole Senders

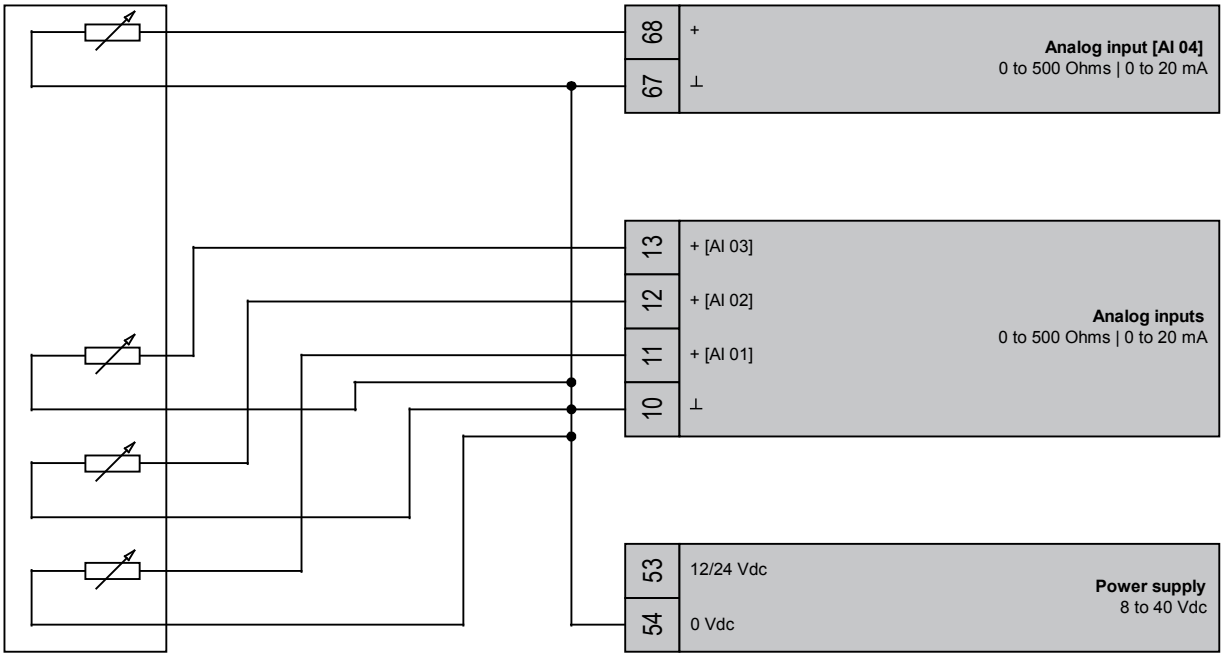


Figure 6-53: Analog inputs (resistors) - wiring two-pole senders

Terminal	Description	A_{max}
10	Analog input ground [AI 01, AI 02, AI 03], connected with 0 VDC	2.5 mm²
11	Analog input [AI 01]	2.5 mm²
12	Analog input [AI 02]	2.5 mm²
13	Analog input [AI 03]	2.5 mm²

Table 6-32: Analog inputs - terminal assignment - wiring single- and two-pole senders

Terminal	Description	A_{max}
67	Analog input ground [AI 04], connected with 0 VDC	2.5 mm²
68	Analog input [AI 04]	2.5 mm²

Table 6-33: Analog inputs - terminal assignment - wiring two-pole senders (easYgen-2500 P1 only)

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.

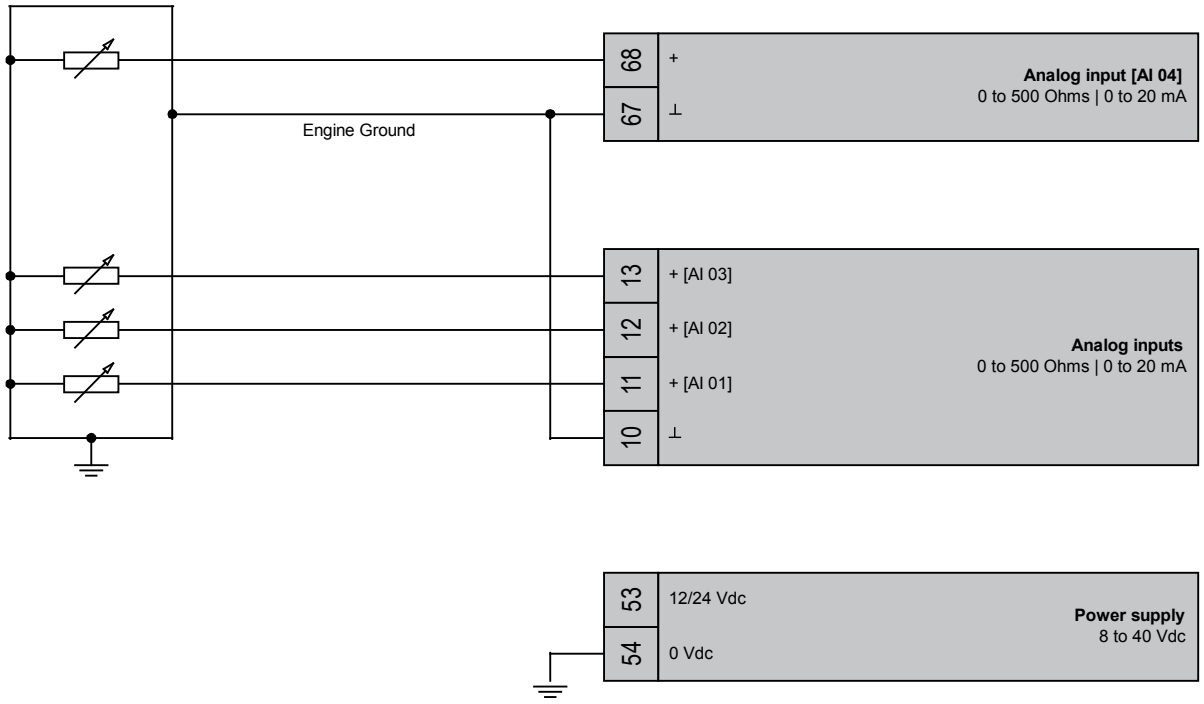


Figure 6-54: Analog inputs (resistors) - wiring single-pole senders

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

Table 6-34: Analog inputs - terminal assignment - wiring single- and two-pole senders

Terminal	Description	A_{max}
67	Analog input ground [AI 04], connected with AI ground (term.10)	2.5 mm²
68	Analog input [AI 04]	2.5 mm²

Table 6-35: Analog inputs - terminal assignment - wiring single-pole senders (easYgen-2500 P1 only)

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.

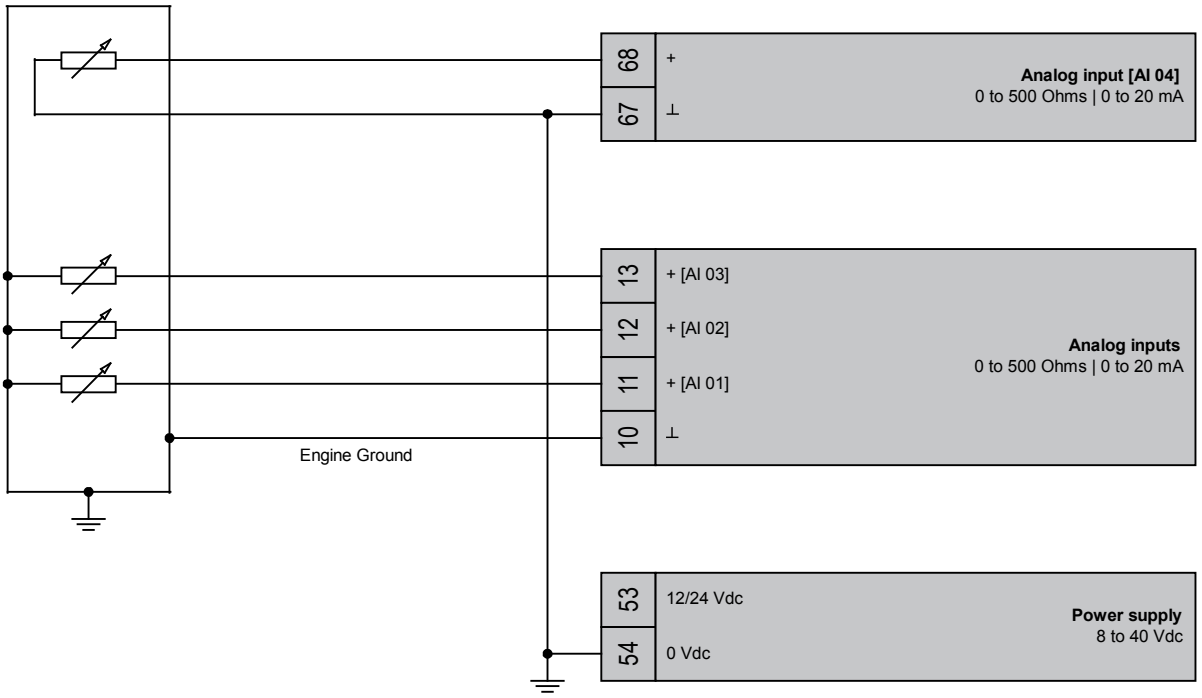


Figure 6-55: Analog inputs (resistors) - wiring single- and two-pole senders

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

Table 6-36: Analog inputs - terminal assignment - wiring single- and two-pole senders

Terminal	Description	A_{max}
67	Analog input ground [AI 04], connected with 0VDC (term.54)	2.5 mm²
68	Analog input [AI 04]	2.5 mm²

Table 6-37: Analog inputs - terminal assignment - wiring single- and two-pole senders (easYgen-2500 P1 only)

Wiring 0/4 to 20 mA Senders

The 0/4 to 20 mA inputs can be used for one or two pole senders.

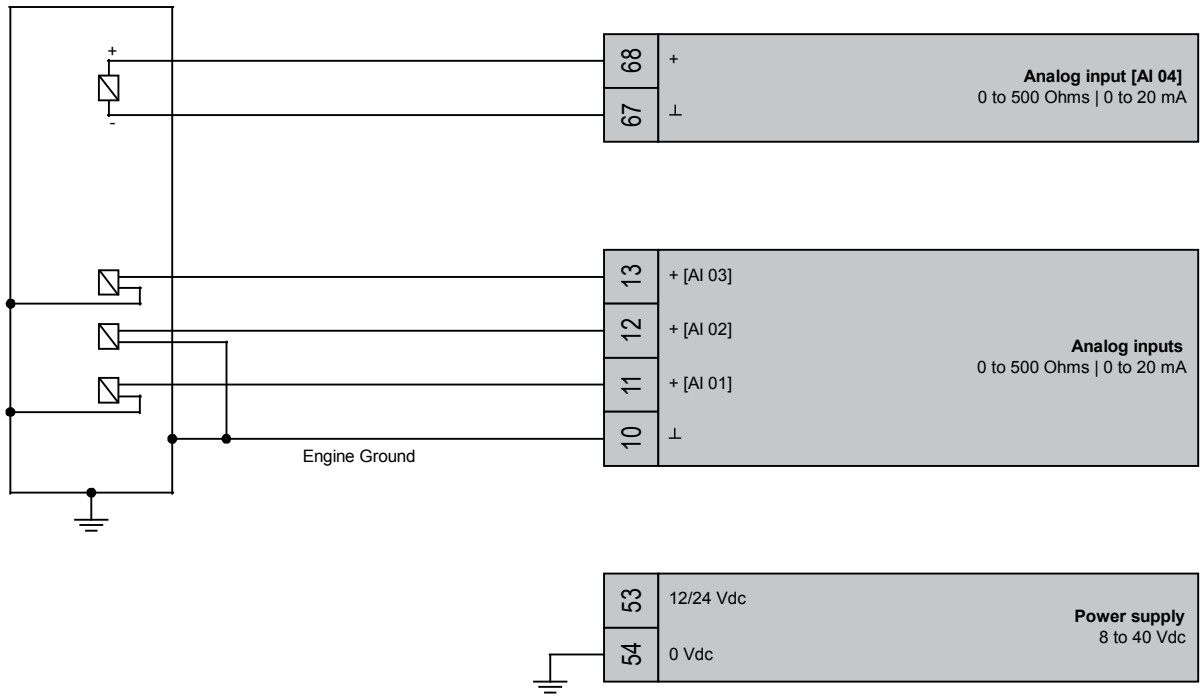


Figure 6-56: Analog inputs (0/4 to 20 mA) - wiring single- and two-pole senders

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

Table 6-38: Analog inputs - terminal assignment - wiring single- and two-pole senders

Terminal	Description	A_{max}
67	Analog input ground [AI 04]	2.5 mm²
68	Analog input [AI 04]	2.5 mm²

Table 6-39: Analog inputs - terminal assignment - wiring single- and two-pole senders (easYgen-2500 P1 only)

Analog Outputs

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

Controller Wiring

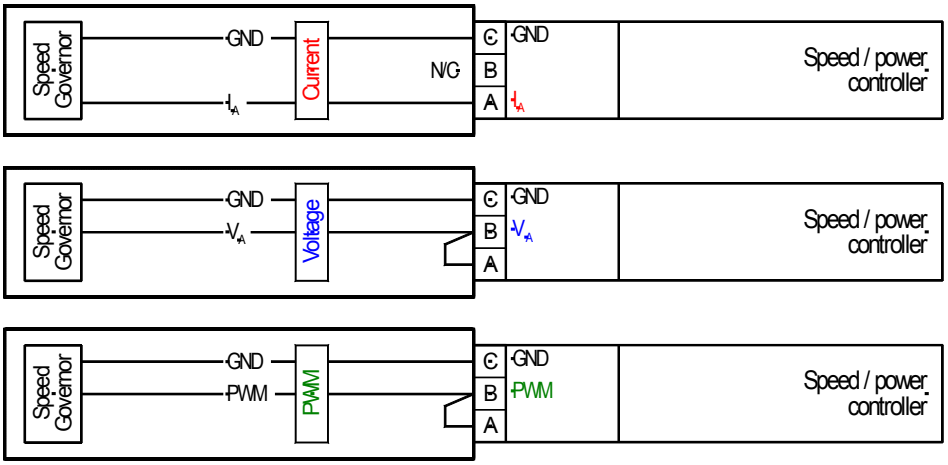


Figure 6-57: Analog controller output 1/2 - Wiring and external jumper setting

Type	Terminal			Description	A_{max}
I Current	A	1	I_A	Analog output AO 01 (easYgen 2000 Series)	2.5 mm²
	B	2			2.5 mm²
	C	3	GND		2.5 mm²
V Voltage	A	1			2.5 mm²
	B	2	V_A		2.5 mm²
	C	3	GND		2.5 mm²
PWM	A	1			2.5 mm²
	B	2	PWM		2.5 mm²
	C	3	GND		2.5 mm²
I Current	A	60	I_A	Analog output AO 02 (easYgen 2500 P1 only)	2.5 mm²
	B	61			2.5 mm²
	C	62	GND		2.5 mm²
V Voltage	A	60			2.5 mm²
	B	61	V_A		2.5 mm²
	C	62	GND		2.5 mm²
PWM	A	60			2.5 mm²
	B	61	PWM		2.5 mm²
	C	62	GND		2.5 mm²

Table 6-40: Bias signal outputs 1/2 - analog or PWM

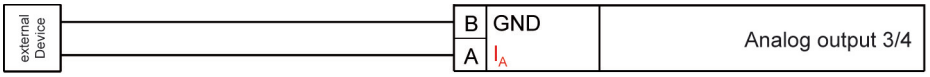


Figure 6-58: Analog controller output 3/4 - Wiring and external jumper setting

Type	Terminal			Description	A_{max}
I Current	A	64	I_A	Analog output AO 03 (easYgen 2500 P1 only)	2.5 mm²
	B	63	GND		2.5 mm²
I Current	A	66	I_A	Analog output AO 04 (easYgen 2500 P1 only)	2.5 mm²
	B	65	GND		2.5 mm²

Table 6-41: Bias signal outputs 3/4 - analog

Interfaces

RS-485 Serial Interfaces

RS-485 Serial Interface (easYgen-2500 P1 only)

Terminal	Description	A_{max}
102	RS-485-B (TxD-)	N/A
103	RS-485-A (TxD+)	N/A
104	GND	N/A
105	Shield	N/A

Table 6-42: RS-485 interface - pin assignment (easYgen-2500 P1 only)

Half-Duplex with Modbus on RS-485

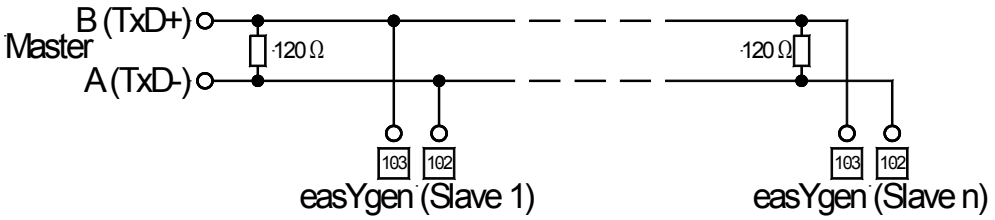


Figure 6-59: RS-485 Modbus - connection for half-duplex operation

Service Port (RS-232)

The optional Woodward Direct Configuration Cable (DPC) must be connected to the Service Port. The DPC adapter has a single RS-232 interface which is used for the configuration setup of the easYgen-2000 Series.

Figure 6-60: 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 6-43: RS-232 interface (DPC) - pin assignment

CAN Bus Interfaces (*FlexCAN*)

CAN Bus 1 (easYgen-2000 Series)

Terminal	Description	A_{max}
58	CAN-L	N/A
59	CAN-H	N/A

Table 6-44: CAN bus 1 - pin assignment (easYgen-2000 Series)

CAN Bus 2 (easYgen-2200 P2 only)

Terminal	Description	A_{max}
56	CAN-L	N/A
57	CAN-H	N/A

Table 6-45: CAN bus 2 - pin assignment (easYgen-2200 P2 only)

CAN Bus 2 (easYgen-2500 P1 only)

Terminal	Description	A_{max}
93	CAN-L	N/A
94	CAN-H	N/A
95	GND	N/A
96	Shield	N/A

Table 6-46: CAN bus 2 - pin assignment (easYgen-2500 P1 only)

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.

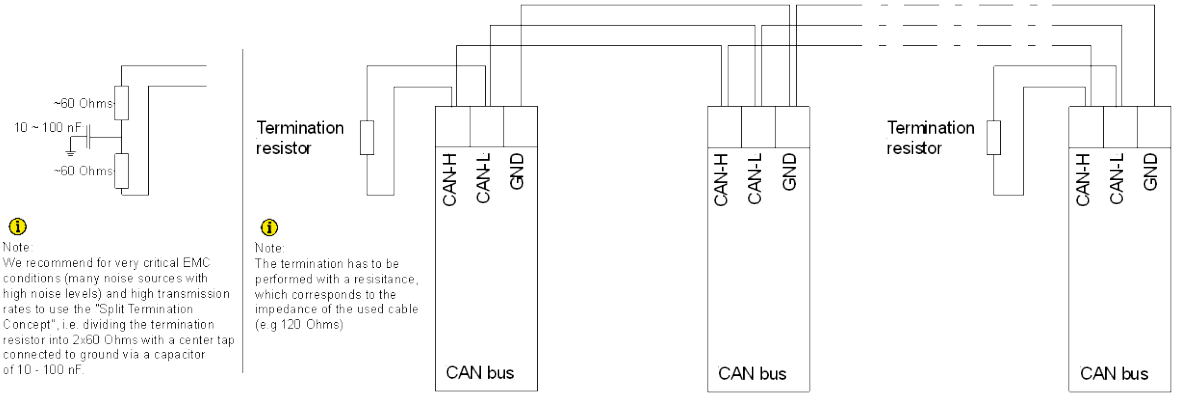


Figure 6-61: Interfaces - CAN bus - termination

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) missing
- The configured baud rate is too high for bus 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 6-47 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 6-47: 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.

NOTE

When you are using 20 kbit/s or 50 kbit/s together with Toolkit, we recommend to set Parameter 9921

"Transfer rate LS fast message" to 0,30 s.

Bus Shielding

The table below gives a detailed overview how the different interfaces needs to be shielded.

Device	Interface	Shielding
easYgen-2200 P1	CAN 1	External RC element
easYgen-2200 P2	CAN 1 CAN 2	External RC element External RC element
easYgen-2500 P1	CAN 1 CAN 2 RS-485	External RC element Internal RC element Internal RC element

Table 6-48: Bus shielding

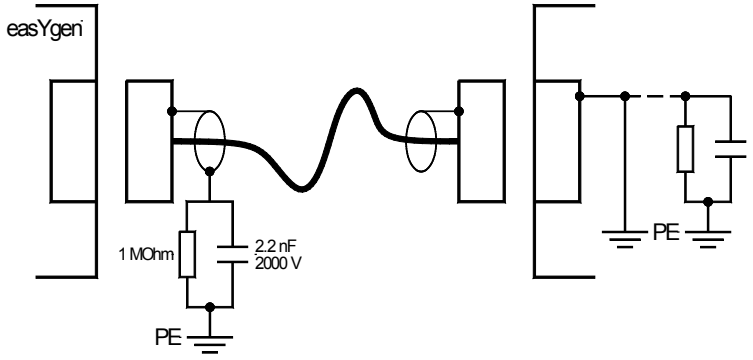


Figure 6-62: Interfaces – shielding (external RC element)

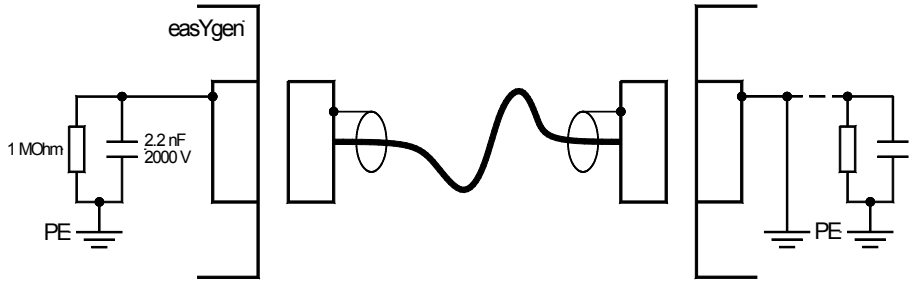


Figure 6-63: Interface – shielding (internal RC element)

DPC - Direct Configuration Cable

The easYgen provides a Service Port for connecting a computer via the DPC (direct configuration cable). The configuration interface is the RJ45 socket on the side of the easYgen housing.

NOTE

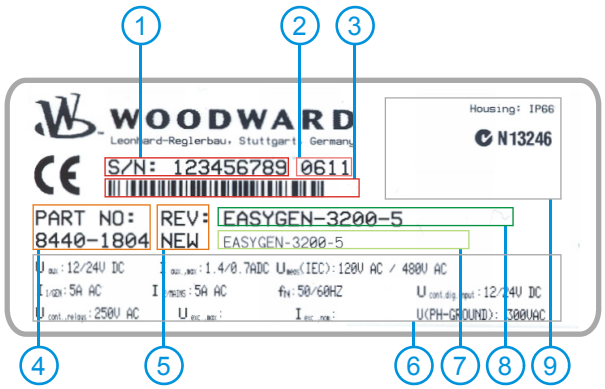
The connection cable delivered with the DPC must be used between DPC and easYgen to ensure proper functionality of the easYgen. An extension or utilization of different cable types for the connection between easYgen and DPC may result a malfunction of the easYgen. This may possibly result in damage to components of the system. If an extension of the data connection line is required, only the serial cable (RS-232) between DPC and laptop/PC may be extended. It is recommended to use an industry standard cable for this.

NOTE

For a continuous operation with the direct configuration cable DPC (e.g. remote control of the easYgen), it is required to use at least revision F (P/N 5417-557 Rev. F) of the DPC. When using a DPC of an earlier revision, problems may occur in continuous operation. It is recommended to use an industry standard serial (RS-232) cable to connect the DPC with the laptop/PC for continuous operation. The shield connector (6.3mm tab connector) at the DPC of revision F (P/N 5417-557 Rev. F) and above must be connected to ground.

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

120 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

480 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 **120 V** .....0.498 MΩ
  480 V ..... 2.0 MΩ
- Maximum power consumption per path..... < 0.15 W

Measuring values, currents ----------galvanically 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 .....~ 8 W (easYgen-2200)
  .....~ 12 W (easYgen-2500)
- Degree of pollution 2
- Maximum elevation ..... 2000 m ASL

Discrete inputs ----------galvanically 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 (none isolated)----------freely scaleable
- 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%
  - single-pole senders ..... ≤ 1%
- Accuracy 0 to 500 Ω input
  - only two-pole senders ..... ≤ 1%
  - single-pole senders ..... ≤ 2.5%

Analog outputs (isolated)----------galvanically isolated
- at rated output..... freely scalable
- Insulation voltage (continuously) ..... 100 Vac
- Insulation test voltage (≤ 5s)..... 1000 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 6-46

Interface ----------

Service Port (RS-232) ..... **galvanically not isolated**
- Version RS-232
- Signal level 5V

RS-485 interface ..... **galvanically isolated**
- Insulation voltage (continuously) ..... 100 Vac
- Insulation test voltage (≤ 5s) ..... 1000 Vac
- Version ..... RS-485 Standard
- Operation ..... Half Duplex

CAN bus interface ..... **galvanically isolated**
- Insulation voltage (continuously) ..... 100 Vac
- Insulation test voltage (≤ 5s) ..... 1000 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
- Dimensions (W × H × D) — easYgen-2200 ..... 219 × 171 × 61 mm
- Dimensions (W × H × D) — easYgen-2500 ..... 219 × 171 × 98 mm
- Front cutout (plastic housing) (W × H) ..... 186 [+1.1] × 138 [+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 — easYgen-2200 ..... approx. 800 g
  easYgen-2500 ..... approx. 1,100 g

Protection ----------
- Protection system — plastic ..... IP54 from front with clamp fasteners
  IP65 from front with screw kit
  IP20 from back
- 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
- Marine approval ..... LR (Lloyds Register) (Pending)

Chapter 8.
Environmental Data

Vibration----------

- Frequency Range – Sine Sweep ..... 5Hz to 100Hz
  - Acceleration 4G
- Standards .....
  EN 60255-21-1 (EN 60068-2-6, Fc)
  Lloyd's Register, Vibration Test2
  SAEJ1455 Chassis Data
- Frequency Range - Random ..... 10Hz to 500Hz
  - Power Intensity..... 0.015G²/Hz
  - RMS Value..... 1.04 Grms
- Standards .....
  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
  MILSTD -810D, M501.2 Induced, M502.2 Cold
  LR Dry Heat, Cold, Envt 2,4, DNV Dry heat, Cold Class A,C

Humidity----------

- Humidity..... 95%, non condensing, max.85% @ ≥ 40°C / 104°F
- Standards ..... MIL-STD 810D, M507.2, PII

Marine Environmental Categories (Pending) ----------

- 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	0.1 % (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 120/480 V) [2]	1.5 % (of PT secondary voltage setting) [1]	
Delta generator / mains / busbar			2 % (of PT secondary voltage setting) [1]	
Current				
Generator Max. value Mains/ground current	0 to 32,000 A	1 % (of 1/5 A) [3]	1 % (of 1/5 A) [3]	
Real power				
Actual total real power value	-2 to 2 GW	2 % (of 120/480 V * 1/5 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 120/480 V * 1/5 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 1/5 A) [3]	1.00 is displayed for measuring values below the measuring start
Miscellaneous				
Real energy	0 to 4,200 GWh		0.36 % (of 1/5 A) [3]	not calibrated
Operating hours	4×10^9 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 % / 2.5 % [4] (of 20 mA)		

[1] Setting of the parameter for the PT secondary rated voltage
[2] depending on the used measuring inputs (120/480 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

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 9-1 shows the exemplary connection of a diode as an interference suppressing circuit.

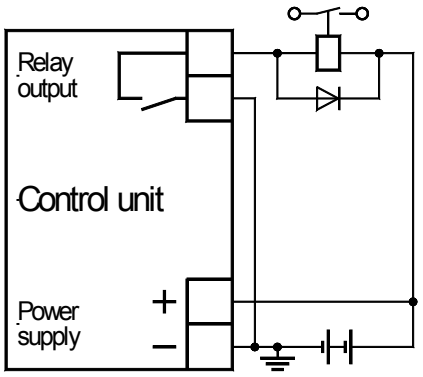


Figure 9-1: Interference suppressing circuit - connection

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

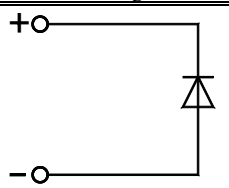
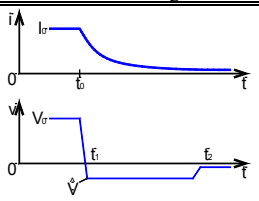
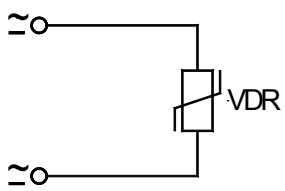
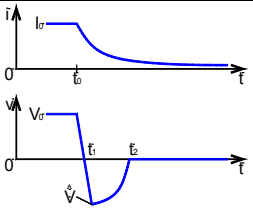
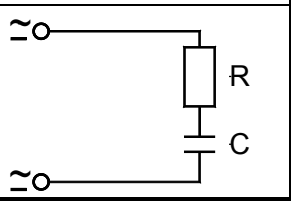
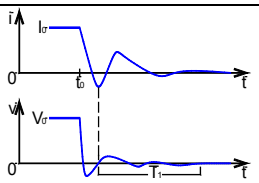
Connection diagram	Load current / voltage curve	Advantages	Disadvantages
		• Uncritical dimensioning • Lowest possible induced voltage • Very simple and reliable	• High release delay
		• Uncritical dimensioning • High energy absorption • Very simple setup • Suitable for AC voltage • Reverse polarity 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 9-1: 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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