37527

LS-5 Series
Circuit Breaker Control

User Manual
Software Version 1.xxxx

Manual 37527

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	11-02-28	TE	Release

Content

Figures and Tables

Figures

Tables

Glossary And List Of Abbreviations

CB	Circuit Breaker
CL	Code Level
CT	Current Transformer
DI	Discrete Input
DO	Discrete (Relay) Output
ECU	Engine Control Unit
FMI	Failure Mode Indicator
GCB	Generator Circuit Breaker
I	Current
IOP	Isolated Operation in Parallel
LDSS	Load-Dependent Start/Stop operation
MCB	Mains Circuit Breaker
MOP	Mains Operation in Parallel
MPU	Magnetic Pickup Unit
N.C.	Normally Closed (break) contact
N.O.	Normally Open (make) contact
OC	Occurrence Count
P	Real power
P/N	Part Number
PF	Power Factor
PF	Power factor
PID	Proportional Integral Derivative controller
PLC	Programmable Logic Control
PT	Potential (Voltage) Transformer
Q	Reactive power
S	Apparent power
S/N	Serial Number
SPN	Suspect Parameter Number
V	Voltage

Chapter 1.
General Information

Document Overview

This manual describes the LS-5 Series circuit breaker control.

	Type		English	German
LS-5				
	LS-5 Series – User Manual	this manual ⇨	37527	-
	easYgen-3400/3500 – User Manual		37528	-

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 which can be found in the appendix or from ToolKit and the respective *.SID file.

Chapter 2.
Installation

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.*

Marine Usage (Pending)

CAUTION

The following notes are very important for marine usage of the LS-5 circuit breaker control and have to be followed.

Application

The LS-5 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.

Housing Types

The controls of the LS-5 Series are available with two different housing types.

LS-511 - Sheet metal housing. Back panel mounting.

LS-521 - Plastic housing with LCD display. Front panel mounting.

Plastic Housing

Panel Cutout

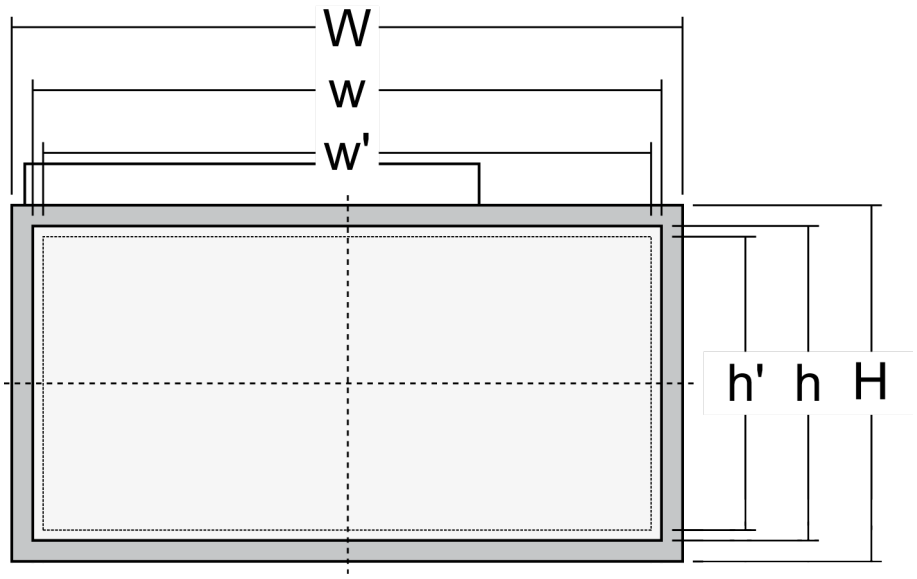


Figure 2-1: Housing - panel-board cutout

Measure	Description			Tolerance
H	Height	Total	171 mm	---
h		Panel cutout	138 mm	+ 1.0 mm
h'		Housing dimension	136 mm	
W	Width	Total	219 mm	---
w		Panel cutout	186 mm	+ 1.1 mm
w'		Housing dimension	184 mm	
	Depth	Total	61 mm	---

Table 2-1: Plastic housing - panel cutout

The maximum permissible corner radius is 3.5 mm.
Refer to Figure 2-3 on page 17 for a cutout drawing.

Dimensions

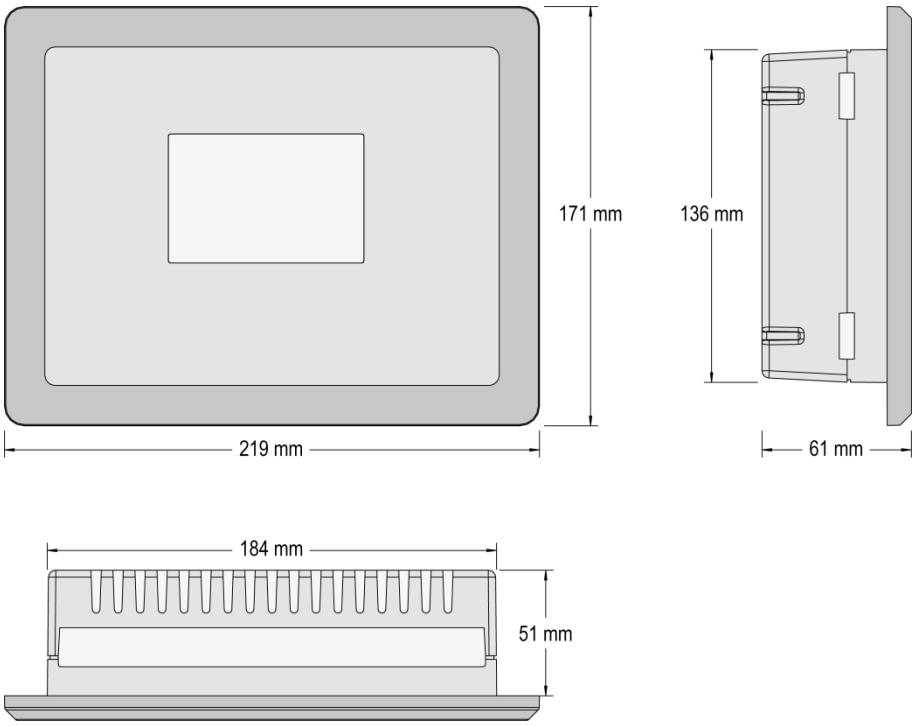


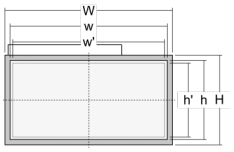
Figure 2-2: Plastic housing LS-521 – dimensions

Clamp Fastener Installation

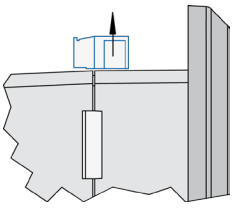
For installation into a panel door with the fastening clamps, please proceed as follows:

1. **Panel cutout**
   Cut out the panel according to the dimensions in Figure 2-1.

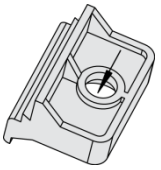
   Note: It is not necessary to drill the holes if the fastening clamps are used.



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

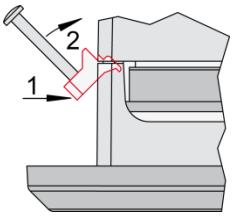


3. **Insert screws in clamps**
   Insert the four clamping screws into the clamp inserts from the shown side (opposite of the nut insert) until they are almost flush. Do not completely insert the screws into the clamp inserts.

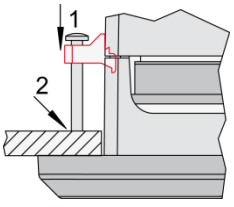


4. **Insert unit into cutout**
   Insert the unit into the panel cutout. Verify that the unit fits correctly in the cutout. If the panel cutout is not big enough, enlarge it accordingly.

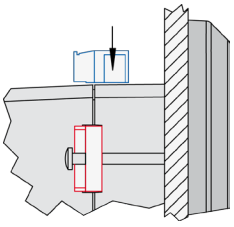
5. **Attach clamp inserts**
   Re-install the clamp inserts by tilting the insert to a 45° angle. (1) Insert the nose of the insert into the slot on the side of the housing. (2) Raise the clamp insert so that it is parallel to the control panel.



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 2-3.
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.

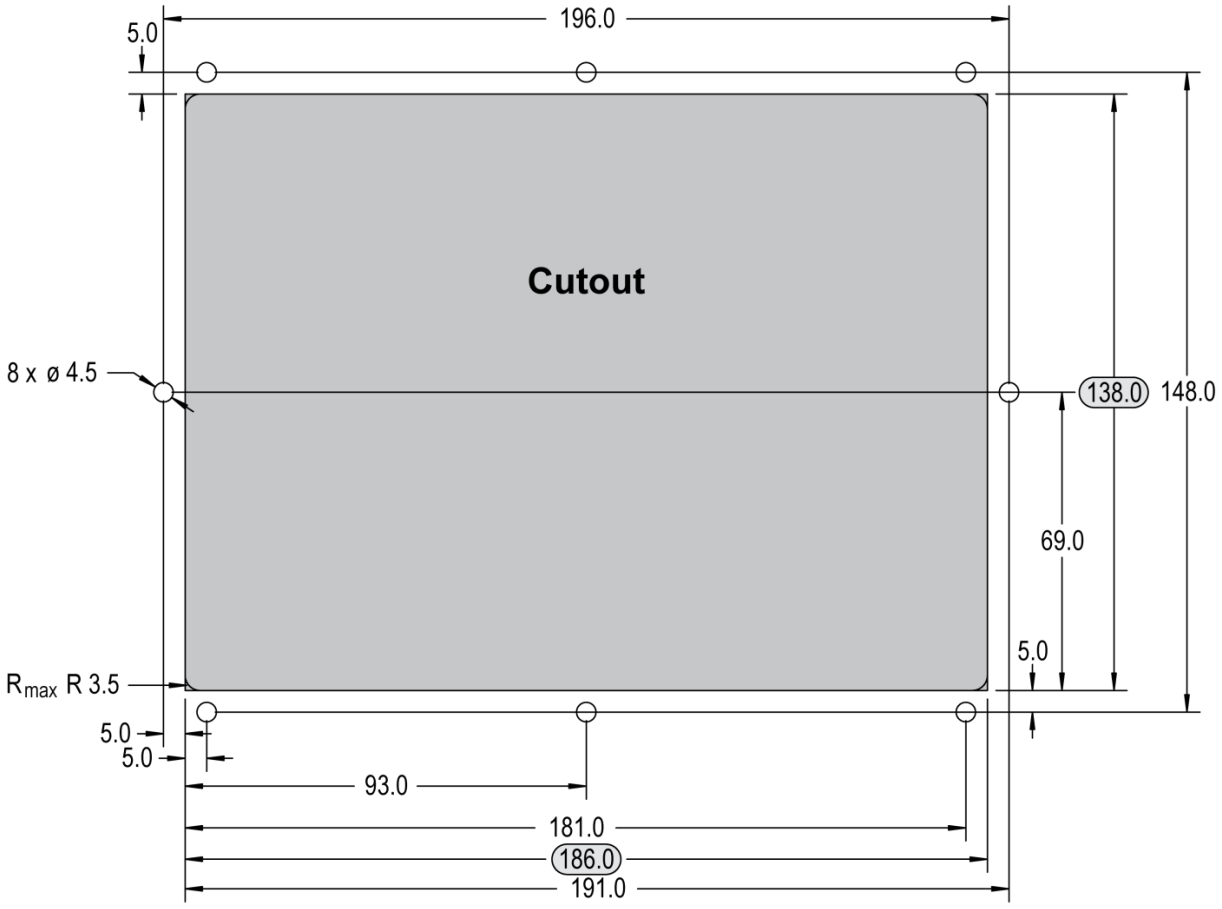


Figure 2-3: Plastic housing - drill plan

Sheet Metal Housing

Dimensions

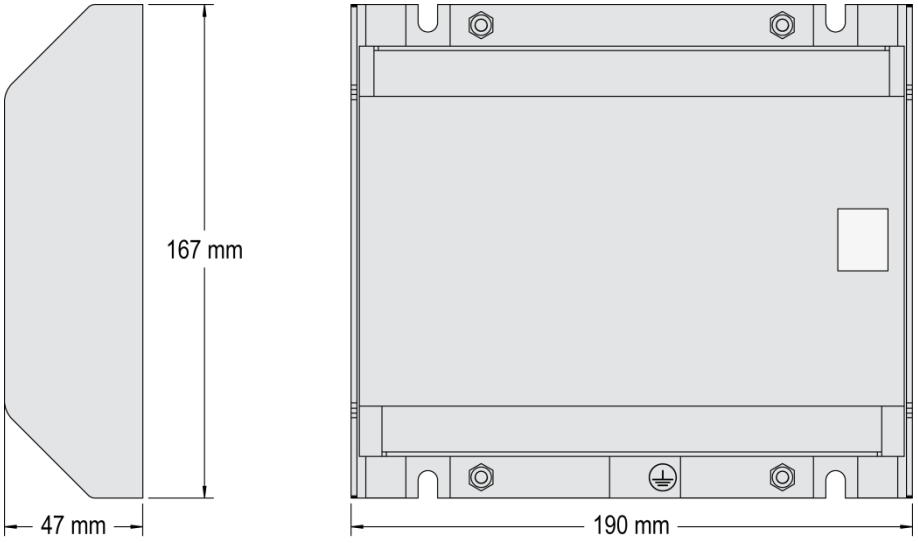


Figure 2-4: Sheet metal housing LS-511 – dimensions

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 2-5 (dimensions shown in mm).

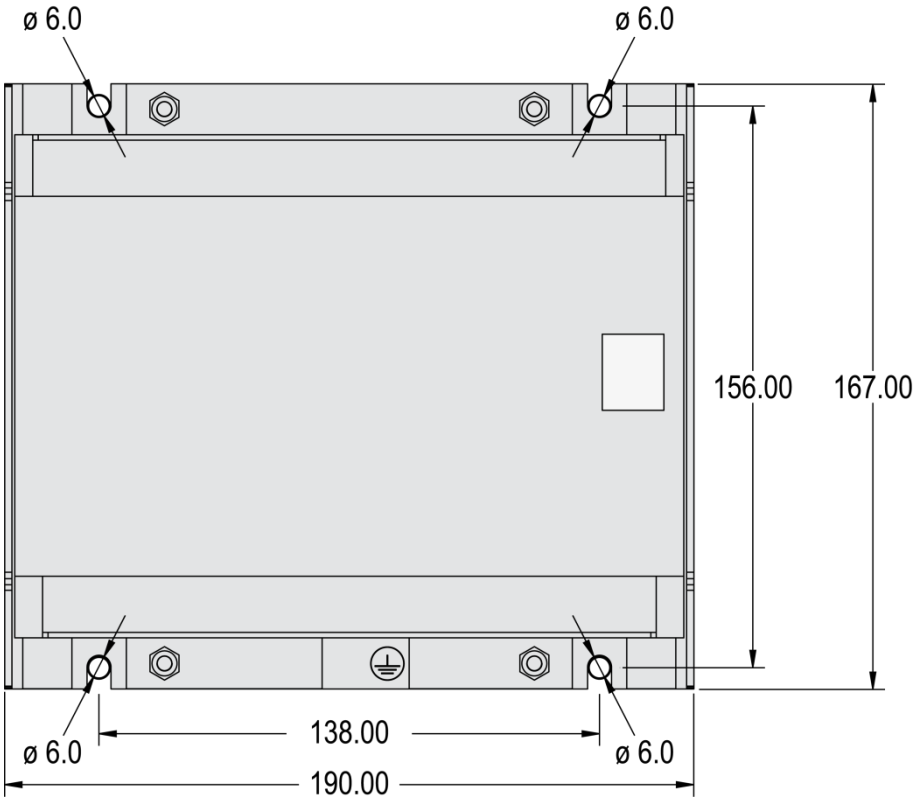


Figure 2-5: Sheet metal housing - drill plan

Wiring Diagrams

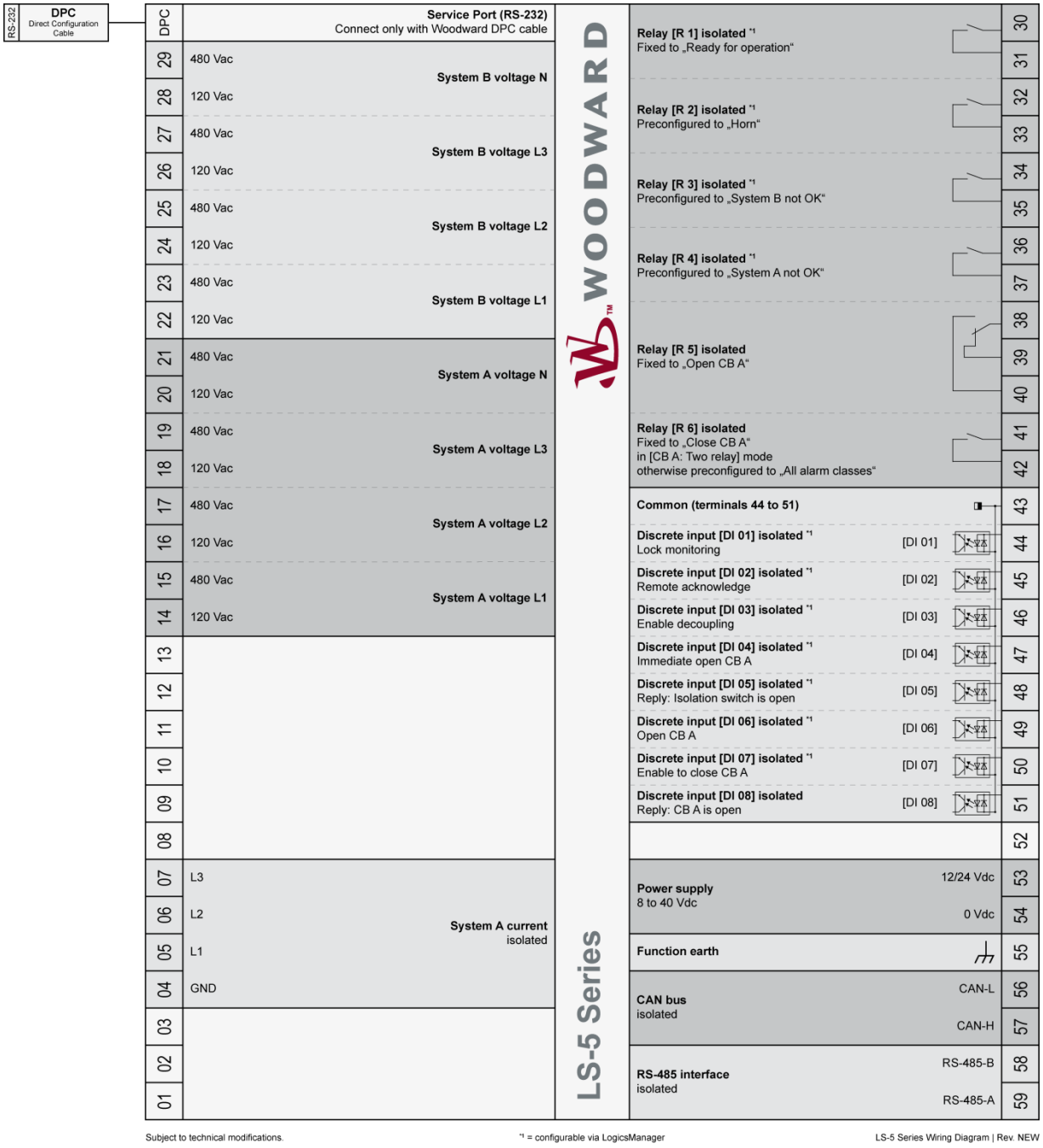


Figure 2-6: LS-5 Series – wiring diagram

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 187 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 2-2: Conversion chart - wire size

Power Supply

WARNING – Protective Earth / Function Earth

Protective Earth (PE) / Function Earth 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.

- **LS-52x: This function earth connection will be made using the screw-plug-terminal 55.**
- **LS-51x: The function earth terminal 55 is not connected on the LS-51x with sheet metal housing. The protective earth connection at the sheet metal housing must be used instead (refer to Figure 2-5 on page 18).**

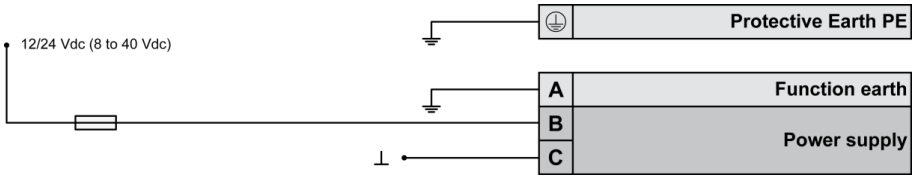


Figure 2-7: Power supply

Figure	Terminal	Description	A_{max}
A	55	Function earth (LS-52x models only)	2.5 mm²
B	53	12/24Vdc (8 to 40.0 Vdc)	2.5 mm²
C	54	0 Vdc	2.5 mm²

Table 2-3: Power supply - terminal assignment

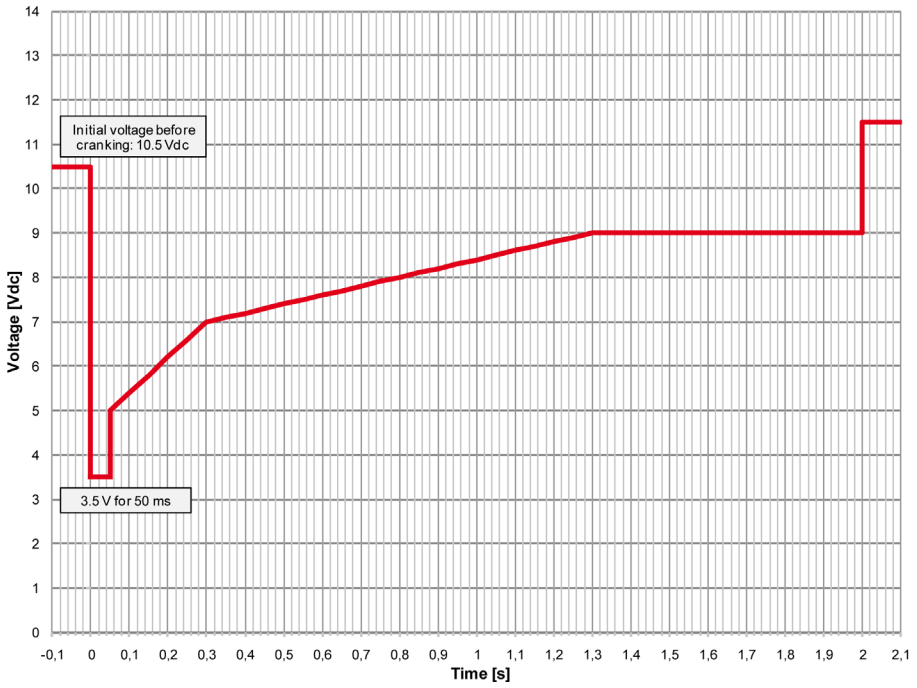


Figure 2-8: Power supply - crank waveform at maximum load

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)**

Voltage Measuring

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: System A

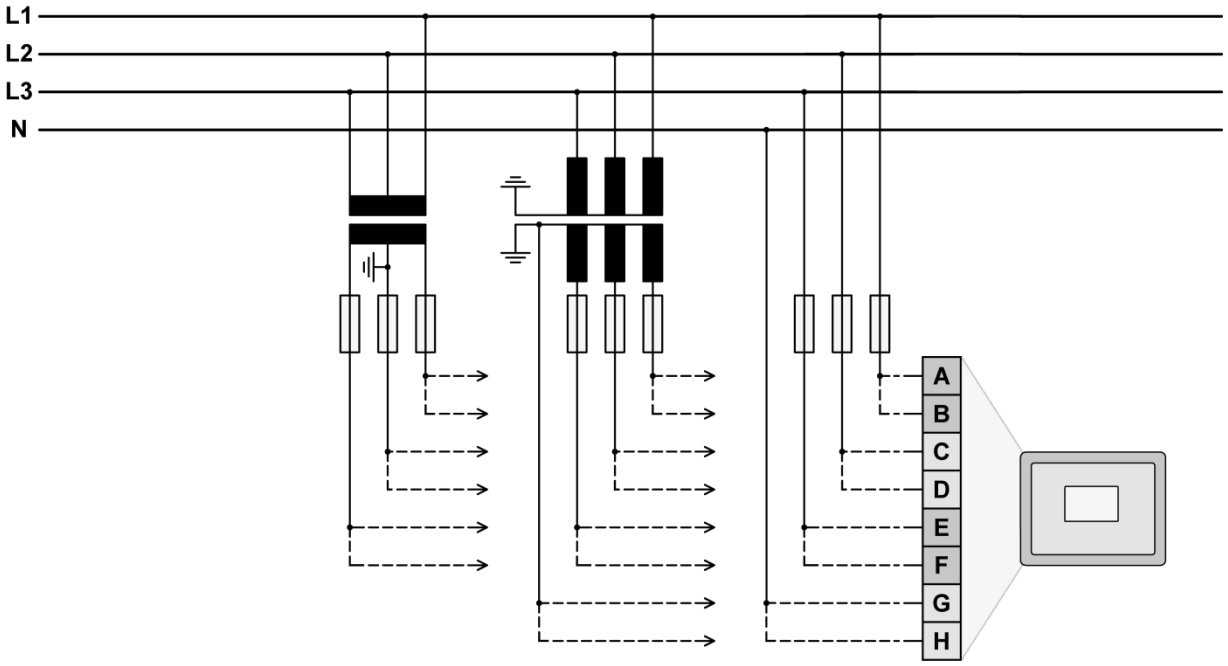


Figure 2-9: Voltage measuring – system A

Figure	Terminal	Description		A_{max}
A	14	System A Voltage L1	120 Vac	2.5 mm²
B	15		480 Vac	2.5 mm²
C	16	System A Voltage L2	120 Vac	2.5 mm²
D	17		480 Vac	2.5 mm²
E	18	System A Voltage L3	120 Vac	2.5 mm²
F	19		480 Vac	2.5 mm²
G	20	System A Voltage N	120 Vac	2.5 mm²
H	21		480 Vac	2.5 mm²

Table 2-4: Voltage measuring - terminal assignment – system A voltage

NOTE

If parameter 1800 ("SyA. PT sec. rated voltage", refer to Chapter 3: Configuration is configured with a value between 50 and 130 V, the 120 V input terminals must be used for proper measurement.

If parameter 1800 ("SyA. PT sec. rated voltage", refer to Chapter 3: Configuration is configured with a value between 131 and 480 V, the 480 V input terminals must be used for proper measurement.

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

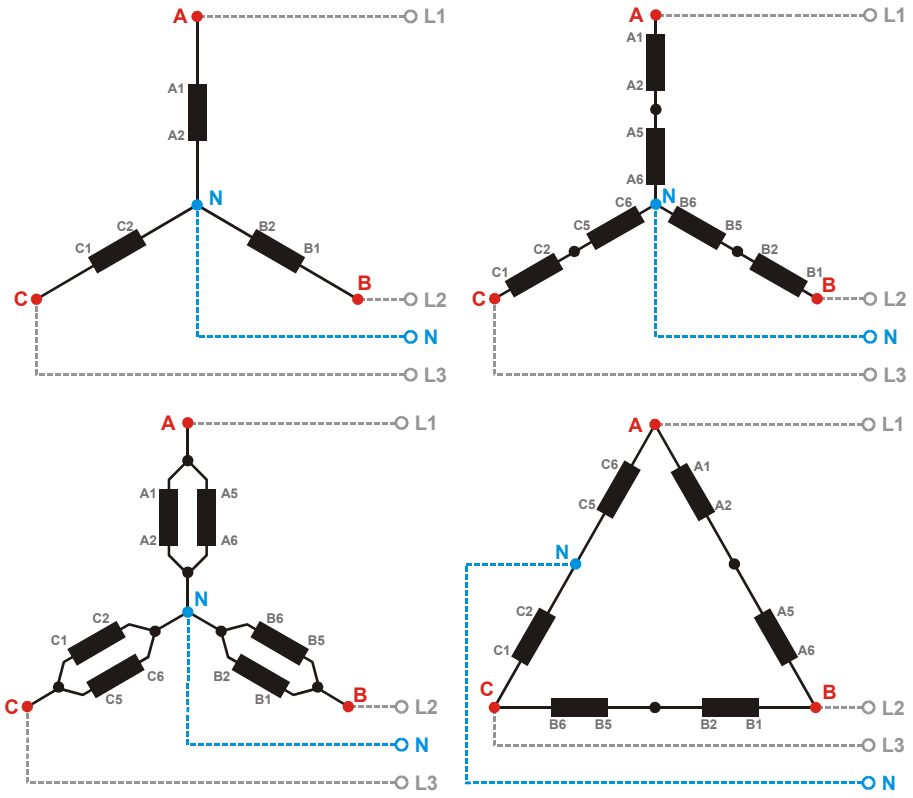


Figure 2-10: Voltage measuring – system A windings, 3Ph 4W

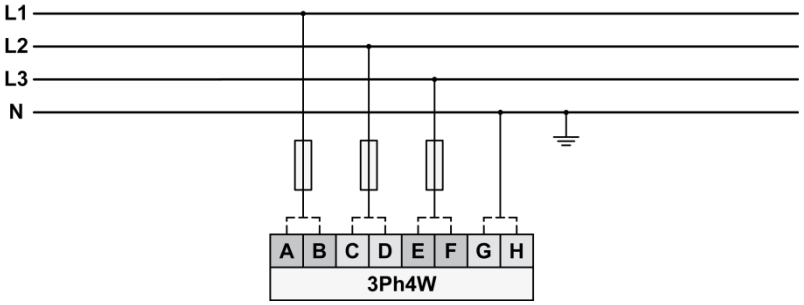


Figure 2-11: Voltage measuring – system A measuring inputs, 3Ph 4W

3Ph 4W	Wiring terminals								Note
Rated voltage (range)	[1] 120 V (50 to 130 $V_{eff.}$)				[5] 480 V (131 to 480 $V_{eff.}$)				1
Measuring range (max.)	[1] 0 to 150 Vac				[5] 0 to 600 Vac				
Figure	A	C	E	G	B	D	F	H	
Terminal	14	16	18	20	15	17	19	21	
Phase	L1	L2	L3	N	L1	L2	L3	N	

Table 2-5: Voltage measuring - terminal assignment – system A, 3Ph 4W

1 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: System A, Parameter Setting '3Ph 3W' (3-phase, 3-wire)

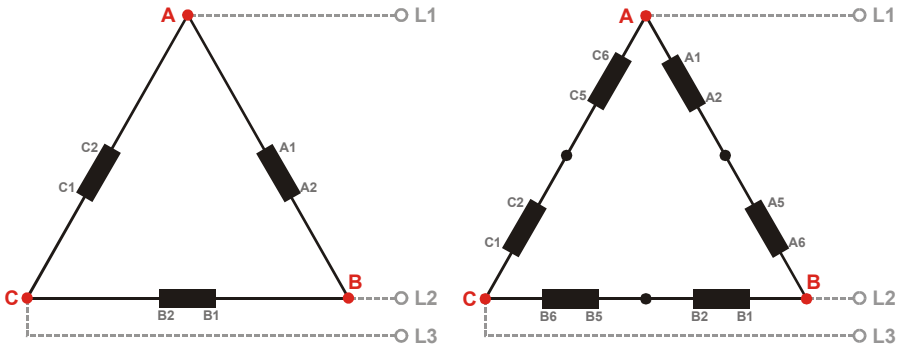


Figure 2-12: Voltage measuring – system A windings, 3Ph 3W

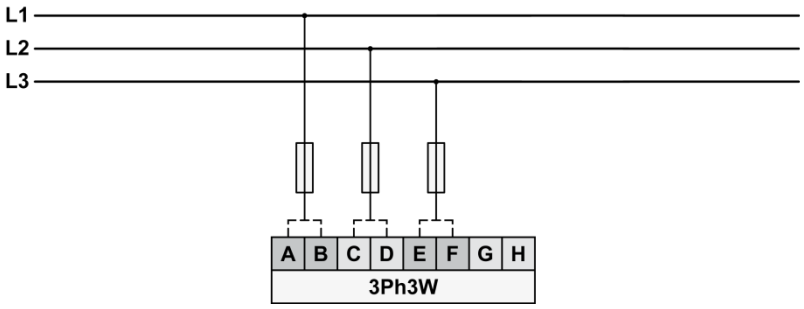


Figure 2-13: Voltage measuring – system A measuring inputs, 3Ph 3W

3Ph 3W	Wiring terminals								Note
Rated voltage (range)	[1] 120 V (50 to 130 $V_{eff.}$)				[5] 480 V (131 to 480 $V_{eff.}$)				2
Measuring range (max.)	[1] 0 to 150 Vac				[5] 0 to 600 Vac				
Figure	A	C	E	G	B	D	F	H	
Terminal	14	16	18	20	15	17	19	21	
Phase	L1	L2	L3	---	L1	L2	L3	---	

Table 2-6: Voltage measuring - terminal assignment – system A, 3Ph 3W

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

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

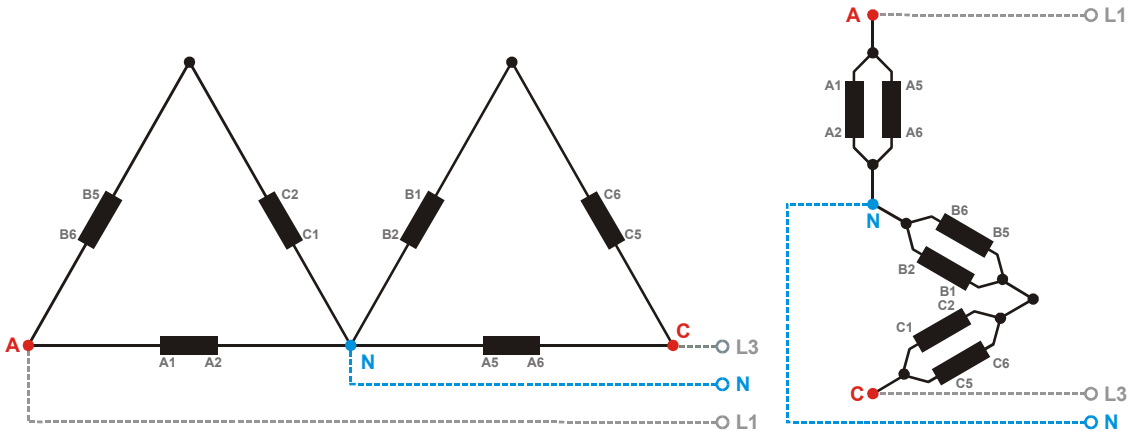


Figure 2-14: Voltage measuring – system A windings, 1Ph 3W

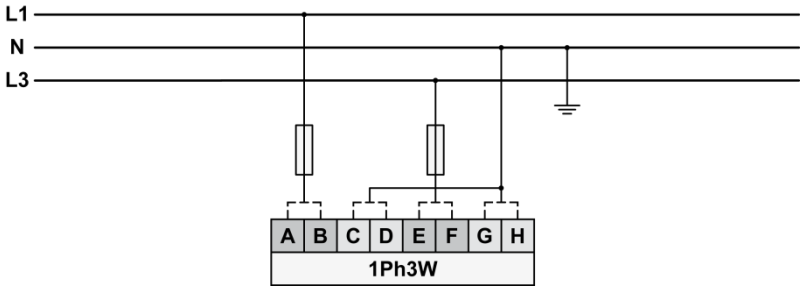


Figure 2-15: Voltage measuring – system A measuring inputs, 1Ph 3W

1Ph 3W	Wiring terminals								Note
Rated voltage (range)	[1] 120 V (50 to 130 $V_{eff.}$)				[5] 480 V (131 to 480 $V_{eff.}$)				3
Measuring range (max.)	[1] 0 to 150 Vac				[5] 0 to 600 Vac				
Figure	A	C	E	G	B	D	F	H	
Terminal	14	16	18	20	15	17	19	21	
Phase	L1	N	L3	N	L1	N	L3	N	

Table 2-7: Voltage measuring - terminal assignment – system A, 1Ph 3W

3 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: System A, 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 LS-5 consistently. Refer to the Chapter 3: Configuration for more information.

'1Ph 2W' Phase-Neutral Measuring

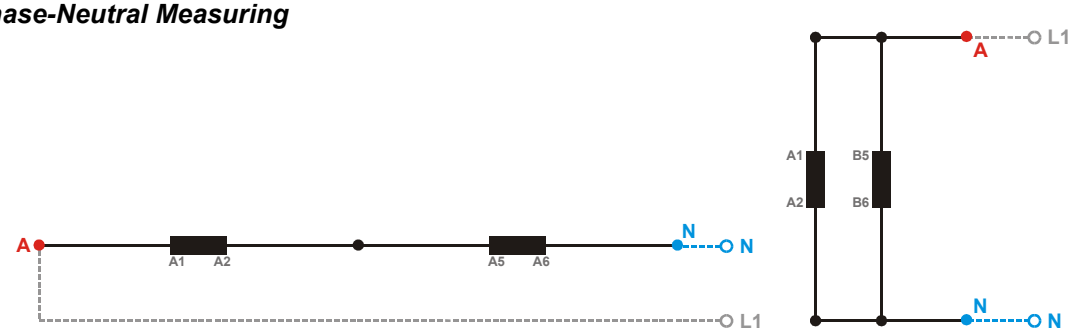


Figure 2-16: Voltage measuring – system A windings, 1Ph 2W (phase-neutral)

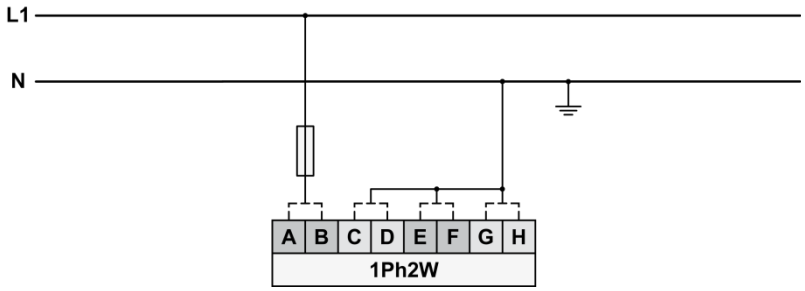


Figure 2-17: Voltage measuring – system A measuring inputs, 1Ph 2W (phase-neutral)

1Ph 2W	Wiring terminals								Note
Rated voltage (range)	[1] 120 V (50 to 130 $V_{eff.}$)				[5] 480 V (131 to 480 $V_{eff.}$)				4
Measuring range (max.)	[1] 0 to 150 Vac				[5] 0 to 600 Vac				
Figure	A	C	E	G	B	D	F	H	
Terminal	14	16	18	20	15	17	19	21	
Phase	L1	N	N	N	L1	N	N	N	

Table 2-8: Voltage measuring - terminal assignment – system A, 1Ph 2W (phase-neutral)

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.

'1Ph 2W' Phase-Phase Measuring

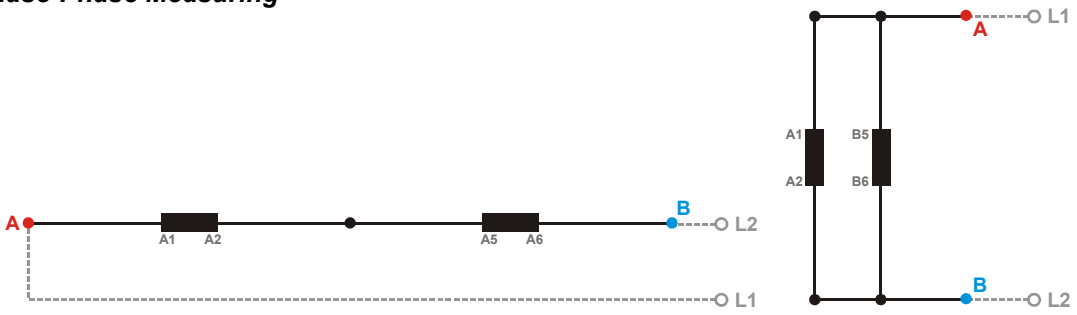


Figure 2-18: Voltage measuring – system A windings, 1Ph 2W (phase-phase)

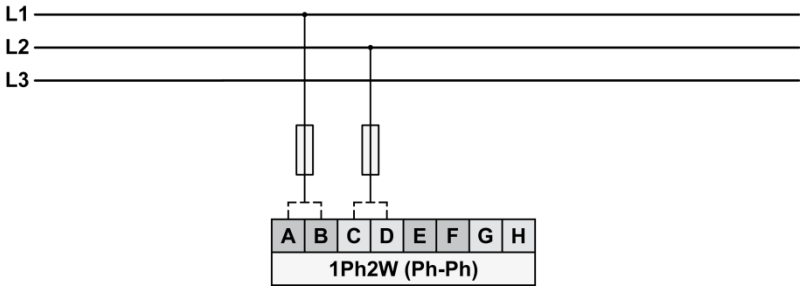


Figure 2-19: Voltage measuring – system A measuring inputs, 1Ph 2W (phase-phase)

1Ph 2W	Wiring terminals								Note
Rated voltage (range)	[1] 120 V (50 to 130 $V_{eff.}$)				[5] 480 V (131 to 480 $V_{eff.}$)				5
Measuring range (max.)	[1] 0 to 150 Vac				[5] 0 to 600 Vac				
Figure	A	C	E	G	B	D	F	H	
Terminal	14	16	18	20	15	17	19	21	
Phase	L1	L2	---	---	L1	L2	---	---	

Table 2-9: Voltage measuring - terminal assignment – system A, 1Ph 2W (phase-phase)

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.

Voltage Measuring: System B

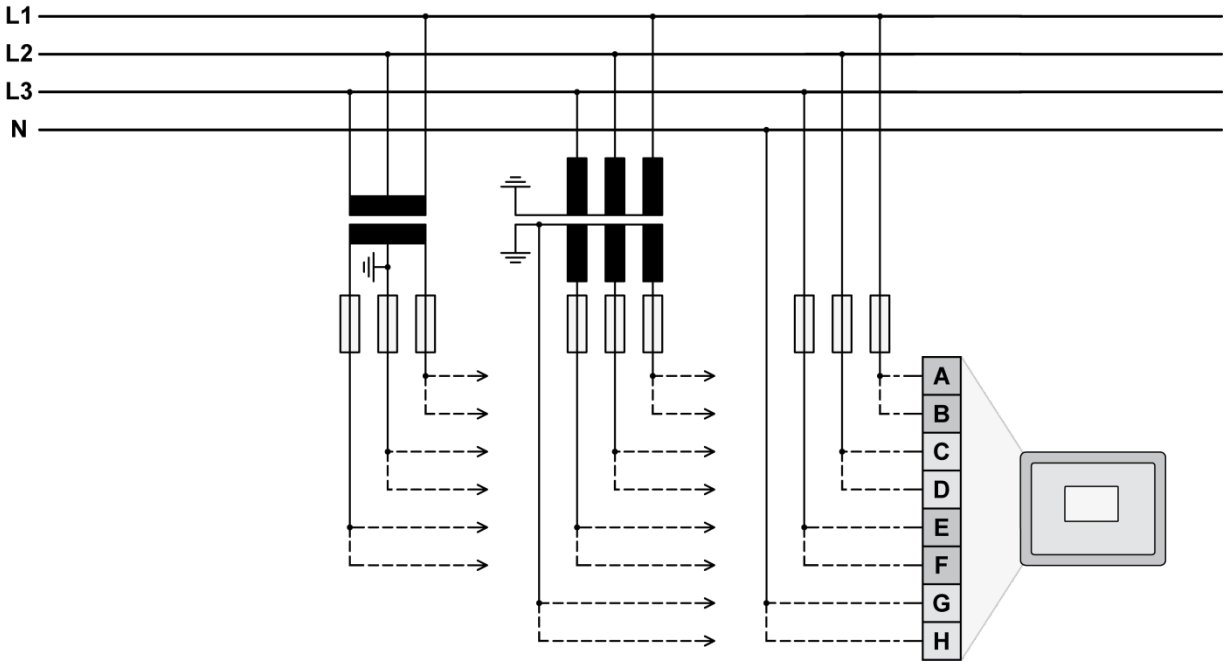


Figure 2-20: Voltage measuring – system B

Figure	Terminal	Description		A_{max}
A	22	System B Voltage L1	120 Vac	2.5 mm²
B	23		480 Vac	2.5 mm²
C	24	System B Voltage L2	120 Vac	2.5 mm²
D	25		480 Vac	2.5 mm²
E	26	System B Voltage L3	120 Vac	2.5 mm²
F	27		480 Vac	2.5 mm²
G	28	System B Voltage N	120 Vac	2.5 mm²
H	29		480 Vac	2.5 mm²

Table 2-10: Voltage measuring - terminal assignment – system B voltage

NOTE

If parameter 1803 ("SyB PT sec. rated voltage", refer to Chapter 3: Configuration) is configured with a value between 50 and 130 V, the 120 V input terminals must be used for proper measurement.

If parameter 1803 ("SyB PT sec. rated voltage", refer to Chapter 3: Configuration) is configured with a value between 131 and 480 V, the 480 V input terminals must be used for proper measurement.

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

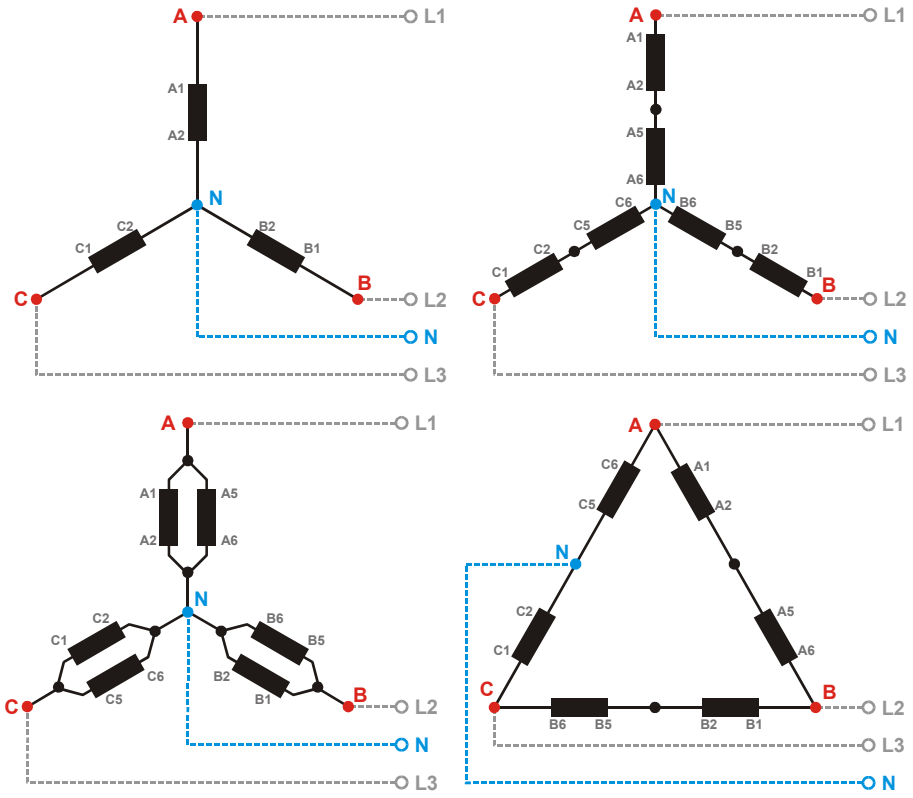


Figure 2-21: Voltage measuring – system B PT windings, 3Ph 4W

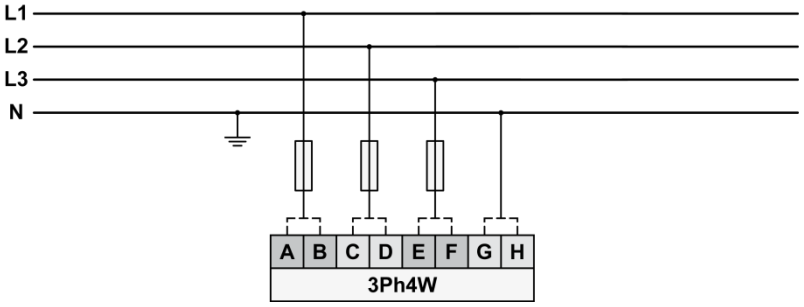


Figure 2-22: Voltage measuring – system B measuring inputs, 3Ph 4W

3Ph 4W	Wiring terminals								Note
Rated voltage (range)	[1] 120 V (50 to 130 $V_{eff.}$)				[5] 480 V (131 to 480 $V_{eff.}$)				6
Measuring range (max.)	[1] 0 to 150 Vac				[5] 0 to 600 Vac				
Figure	A	C	E	G	B	D	F	H	
Terminal	22	24	26	28	23	25	27	29	
Phase	L1	L2	L3	N	L1	L2	L3	N	

Table 2-11: Voltage measuring - terminal assignment – system B, 3Ph 4W

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: System B, Parameter Setting '3Ph 3W' (3-phase, 3-wire)

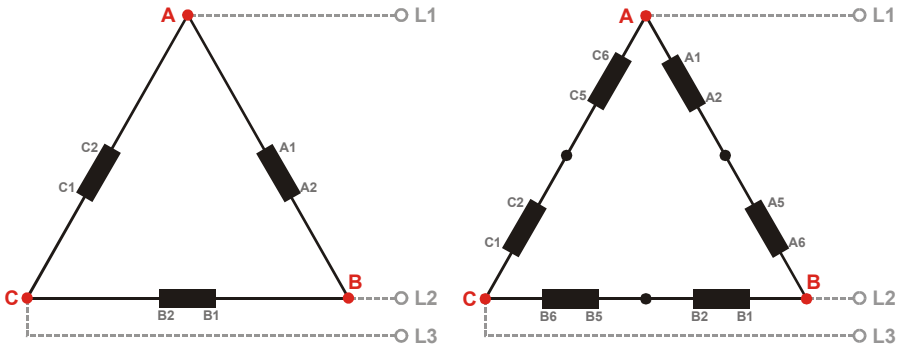


Figure 2-23: Voltage measuring – system B PT windings, 3Ph 3W

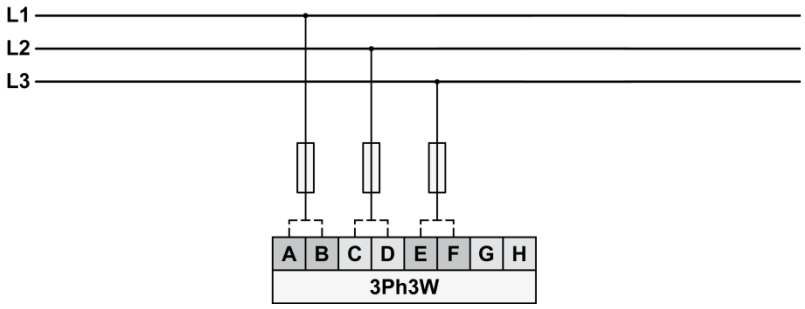


Figure 2-24: Voltage measuring – system B measuring inputs, 3Ph 3W

3Ph 3W	Wiring terminals								Note
Rated voltage (range)	[1] 120 V (50 to 130 $V_{eff.}$)				[5] 480 V (131 to 480 $V_{eff.}$)				7
Measuring range (max.)	[1] 0 to 150 Vac				[5] 0 to 600 Vac				
Figure	A	C	E	G	B	D	F	H	
Terminal	22	24	26	28	23	25	27	29	
Phase	L1	L2	L3	---	L1	L2	L3	---	

Table 2-12: Voltage measuring - terminal assignment – system B, 3Ph 3W

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

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

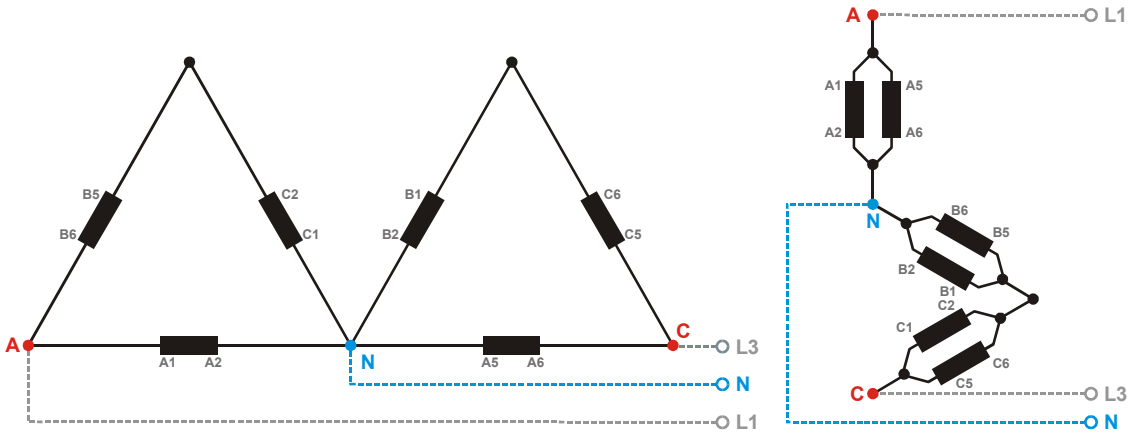


Figure 2-25: Voltage measuring – system B PT windings, 1Ph 3W

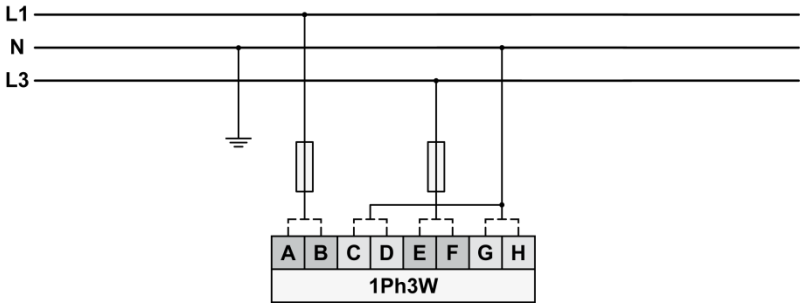


Figure 2-26: Voltage measuring - mains system B measuring inputs, 1Ph 3W

1Ph 3W	Wiring terminals								Note
Rated voltage (range)	[1] 120 V (50 to 130 $V_{eff.}$)				[5] 480 V (131 to 480 $V_{eff.}$)				8
Measuring range (max.)	[1] 0 to 150 Vac				[5] 0 to 600 Vac				
Figure	A	C	E	G	B	D	F	H	
Terminal	22	24	26	28	23	25	27	29	
Phase	L1	N	L3	N	L1	N	L3	N	

Table 2-13: Voltage measuring - terminal assignment – system B, 1Ph 3W

8 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: System B, 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 LS-5 consistently. Refer to the Chapter 3: Configuration for more information.

'1Ph 2W' Phase-Neutral Measuring

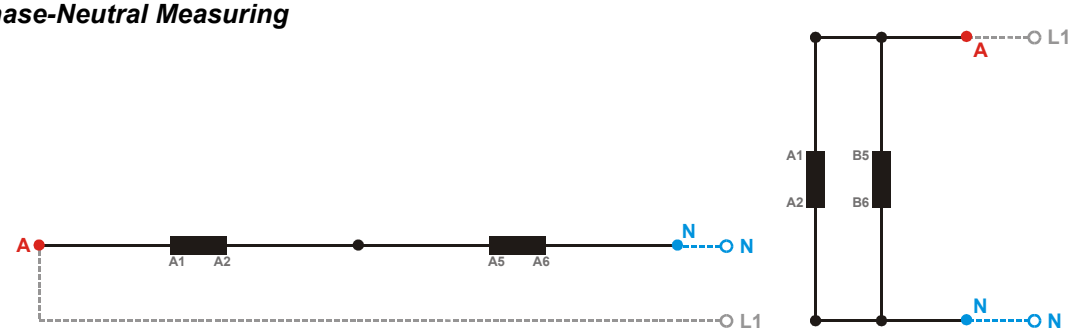


Figure 2-27: Voltage measuring – system B PT windings, 1Ph 2W (phase-neutral)

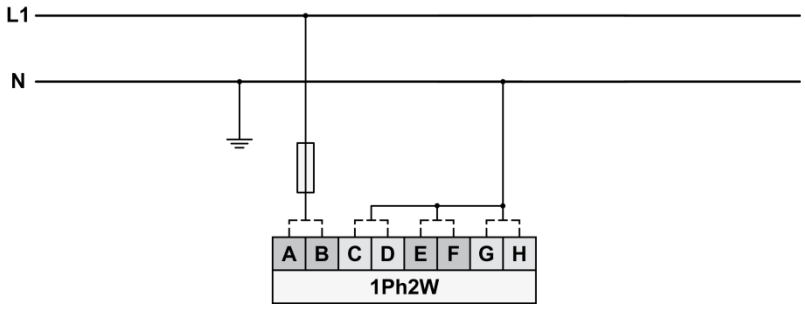


Figure 2-28: Voltage measuring – system B measuring inputs, 1Ph 2W (phase-neutral)

1Ph 2W	Wiring terminals								Note
Rated voltage (range)	[1] 120 V (50 to 130 $V_{eff.}$)				[5] 480 V (131 to 480 $V_{eff.}$)				9
Measuring range (max.)	[1] 0 to 150 Vac				[5] 0 to 600 Vac				
Figure	A	C	E	G	B	D	F	H	
Terminal	22	24	26	28	23	25	27	29	
Phase	L1	N	N	N	L1	N	N	N	

Table 2-14: Voltage measuring - terminal assignment – system B, 1Ph 2W (phase-neutral)

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.

'1Ph 2W' Phase-Phase Measuring

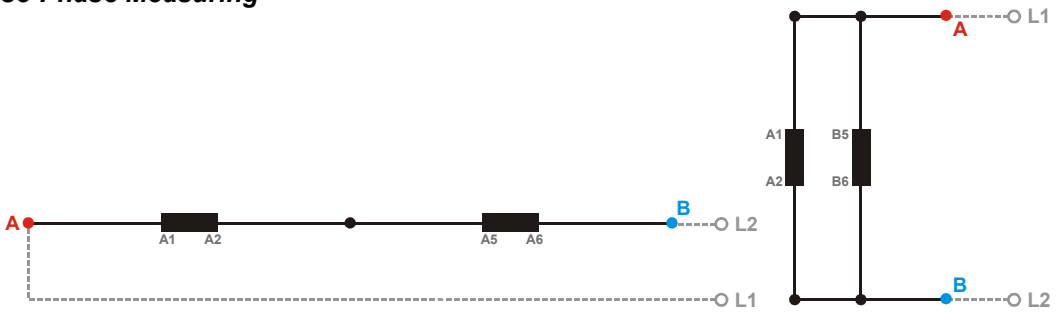


Figure 2-29: Voltage measuring – system B PT windings, 1Ph 2W (phase-phase)

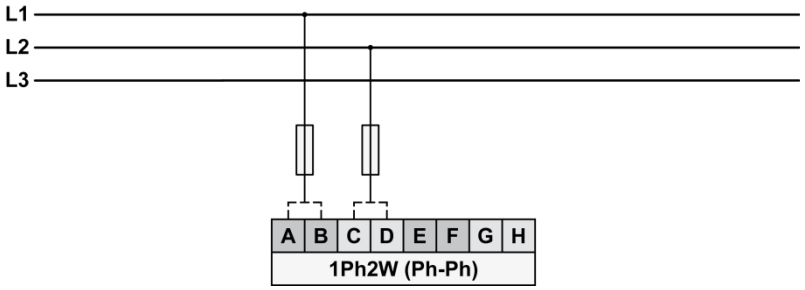


Figure 2-30: Voltage measuring – system B measuring inputs, 1Ph 2W (phase-phase)

1Ph 2W	Wiring terminals								Note
Rated voltage (range)	[1] 120 V (50 to 130 $V_{eff.}$)				[5] 480 V (131 to 480 $V_{eff.}$)				10
Measuring range (max.)	[1] 0 to 150 Vac				[5] 0 to 600 Vac				
Figure	A	C	E	G	B	D	F	H	
Terminal	22	24	26	28	23	25	27	29	
Phase	L1	L2	---	---	L1	L2	---	---	

Table 2-15: Voltage measuring - terminal assignment – system B, 1Ph 2W (phase-phase)

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.

Current Measuring

CAUTION

Before disconnecting the device, ensure that the current transformers/CT are short-circuited.

System A Current

NOTE

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

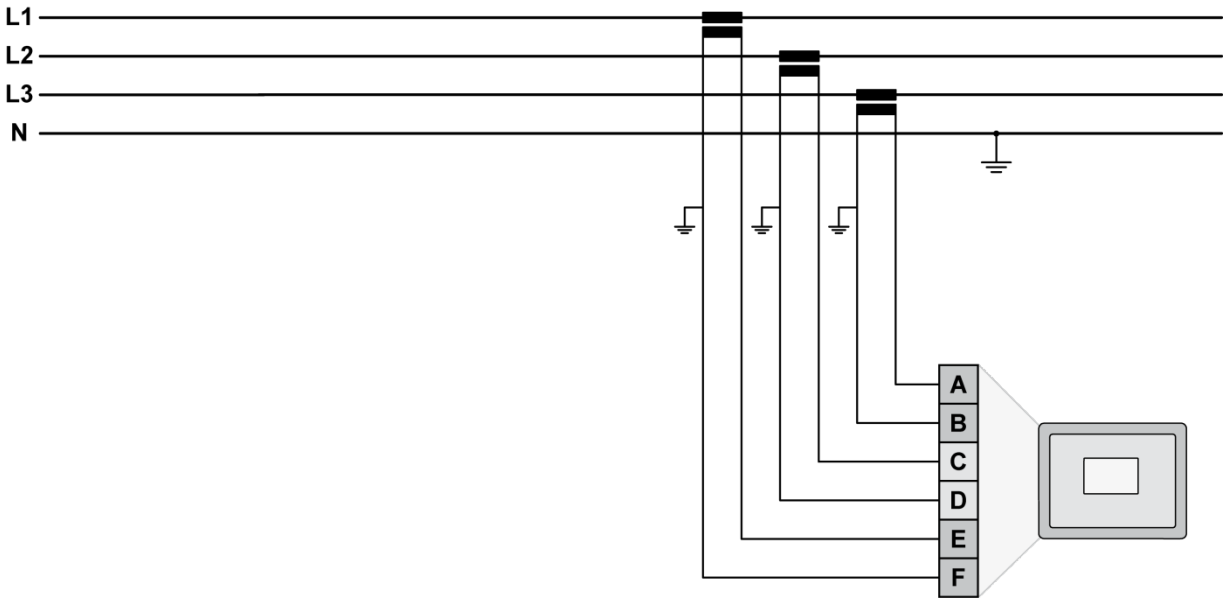


Figure 2-31: Current measuring – System A

Figure	Terminal	Description	A_{max}
A	7	System A Current L3	2.5 mm²
B	4	System A Current L3 (GND)	2.5 mm²
C	6	System A Current L2	2.5 mm²
D	4	System A Current L2 (GND)	2.5 mm²
E	5	System A Current L1	2.5 mm²
F	4	System A Current L1 (GND)	2.5 mm²

Table 2-16: Current measuring - terminal assignment – system A current

Current Measuring: System A, Parameter Setting 'L1 L2 L3'

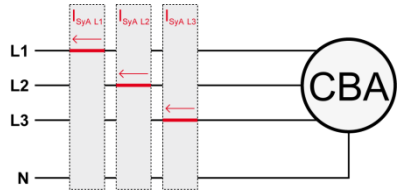


Figure 2-32: Current measuring – system A, L1 L2 L3

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

Table 2-17: Current measuring - terminal assignment – system A, L1 L2 L3

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

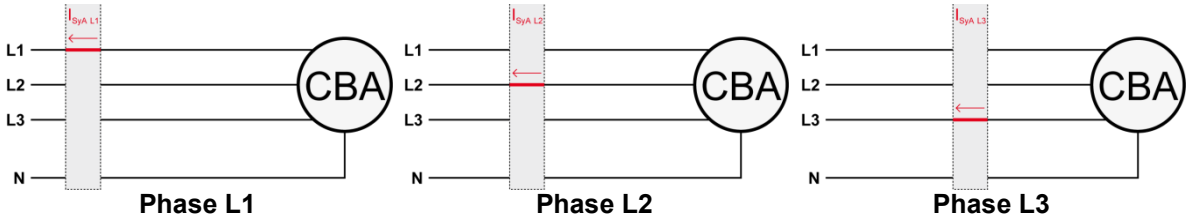


Figure 2-33: Current measuring – system A, phase Lx

	Wiring terminals						Notes
Phase L1							
Terminal	4	5	4	6	4	7	
Phase	s1 (k) L1	s2 (l) L1	---	---	---	---	
Phase L2							
Terminal	4	5	4	6	4	7	
Phase	---	---	s1 (k) L2	s2 (l) L2	---	---	
Phase L3							
Terminal	4	5	4	6	4	7	
Phase	---	---	---	---	s1 (k) L3	s2 (l) L3	
Phase L1 and L3							11
Terminal	4	5	4	6	4	7	
Phase	s1 (k) L1	s2 (l) L1	---	---	s1 (k) L3	s2 (l) L3	

Table 2-18: Current measuring - terminal assignment – system A, phase Lx

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

Power Measuring

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

Parameter	Description	Sign displayed
Positive real power	Power flow from System B to System A	+ Positive
Inductive (cos φ)	Inductive power flow from System B to System A	+ Positive

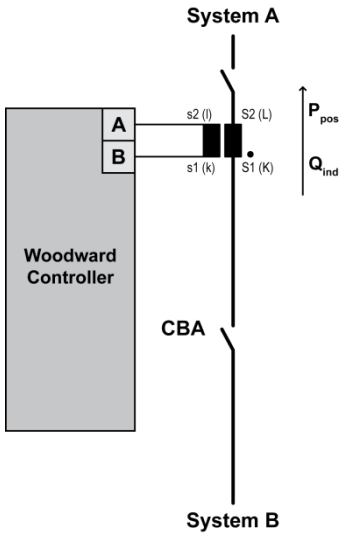


Figure 2-34: Power measuring - direction of power

Figure	Terminal	Description	A_{max}
A	5	System A Current L1	2.5 mm²
B	4	System A Current GND	2.5 mm²

Table 2-19: Power measuring - terminal assignment

Power Factor Definition

The phasor diagram is used from the System B 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)	c0.93 (capacitive)

lg.91 (lagging)	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

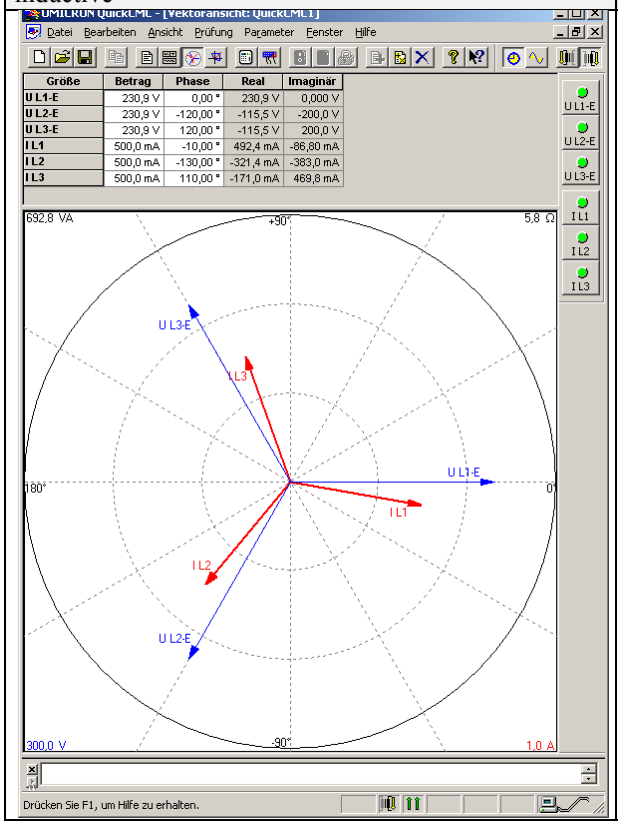
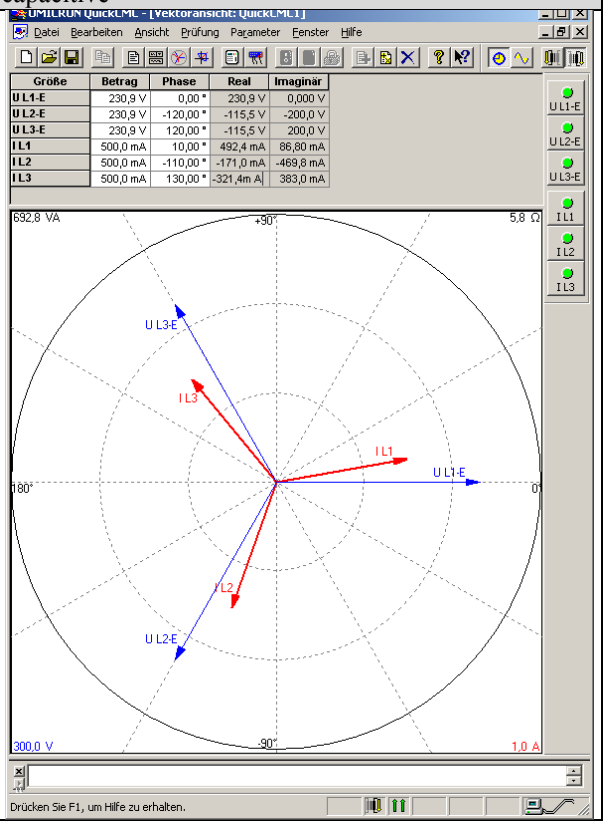
The generator is

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

Phasor diagram:

inductive	capacitive
	

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

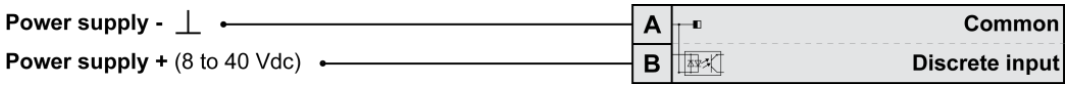


Figure 2-35: Discrete inputs - alarm/control input - positive signal

Discrete Inputs: Negative Polarity Signal

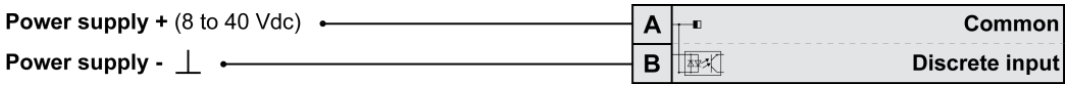


Figure 2-36: Discrete inputs - alarm/control input - negative signal

Terminal Com.	Terminal Term.	Description			A_{max}
A	B				
43 GND common ground	44	Discrete input [DI 01]	ALL	Lock monitoring *1	2.5 mm²
	45	Discrete input [DI 02]	ALL	Remote acknowledge *1	2.5 mm²
	46	Discrete input [DI 03]	ALL	Enable decoupling *1	2.5 mm²
	47	Discrete input [DI 04]	ALL	Immediate open CB A *1	2.5 mm²
	48	Discrete input [DI 05]	ALL	Reply: Isolation switch is open *1	2.5 mm²
	49	Discrete input [DI 06]	ALL	Open CB A (with unloading) *1	2.5 mm²
	50	Discrete input [DI 07]	ALL	Enable to close CB A *1	2.5 mm²
	51	Discrete input [DI 08]	ALL	Reply: CB A is open	2.5 mm²

Table 2-20: Discrete input - terminal assignment

*1 = default value / configurable via LogicsManager

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 38 for details.

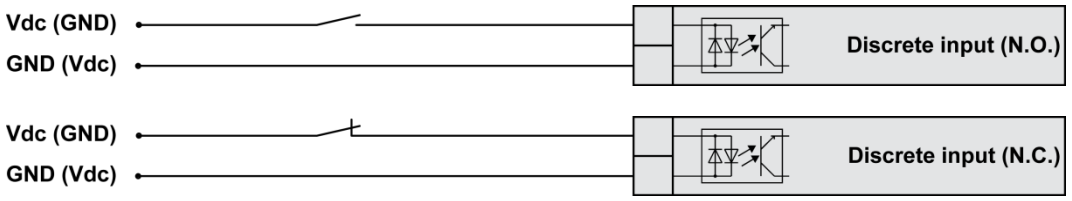


Figure 2-37: Discrete inputs - alarm/control inputs - operation logic

Relay Outputs (*LogicsManager*)

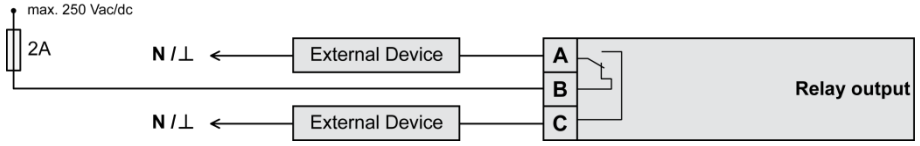


Figure 2-38: Relay outputs

Terminal		Description				A_{max}
A	C	Form A, N.O. make contact			Type ⇩	
30	31	Relay output [R 01]	ALL	Fixed to “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 “System B not OK”	SW	2.5 mm²
36	37	Relay output [R 04]	ALL	Preconfigured to “System A not OK”	SW	2.5 mm²

Terminal			Description				A_{max}
A	B	C	Form C, N.O. make contact, N.C.			Type ⇩	
38	39	40	Relay output [R 05]	ALL	Fixed to “Open CB A”	SW	2.5 mm²

Terminal		Description				A_{max}
A	C	Form A, N.O. make contact			Type ⇩	
41	42	Relay output [R 06]	ALL	Fixed to “Close CB A” in [CB A: Two relay] mode otherwise Preconfigured to “All alarm classes”	N.O.	2.5 mm²

LogicsManager.using the function ***LogicsManager*** it is possible to freely program the relays

ALL	All application modes
SW	Switchable via software
N.O.	Normally open (make) contact

Table 2-21: Relay outputs - terminal assignment

CAUTION

The discrete output "Ready for operation OFF" must be integrated into the alarm chain to make sure that if this relay falls off and an appropriate action can be taken.

NOTE

Refer to Appendix A: Connecting 24 V Relays on page 192 for interference suppressing circuits when connecting 24 V relays.

Interfaces

RS-485 Serial Interface

Terminal	Description	A_{max}
58	RS-485-B (TxD-)	2.5 mm²
59	RS-485-A (TxD+)	2.5 mm²

Table 2-22: RS-485 interface - pin assignment

RS-485 Half-Duplex

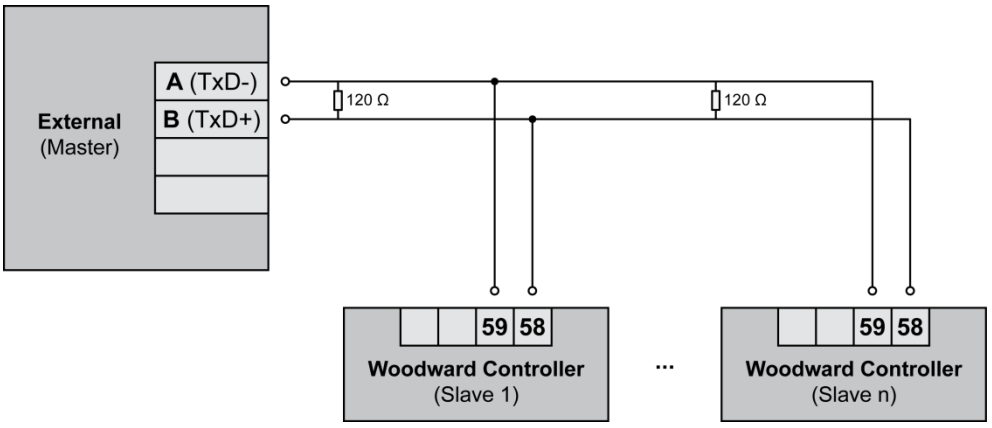


Figure 2-39: RS-485 - connection for half-duplex operation

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 LS-5 Series. (refer to “DPC - Direct Configuration Cable” on page 46)

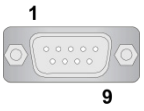


Figure 2-40: RS-232 interface - overview

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 2-23: RS-232 interface (DPC) - pin assignment

CAN Bus Interface

Terminal	Description	A_{max}
56	CAN-L	2.5 mm²
57	CAN-H	2.5 mm²

Table 2-24: CAN bus - pin assignment

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.

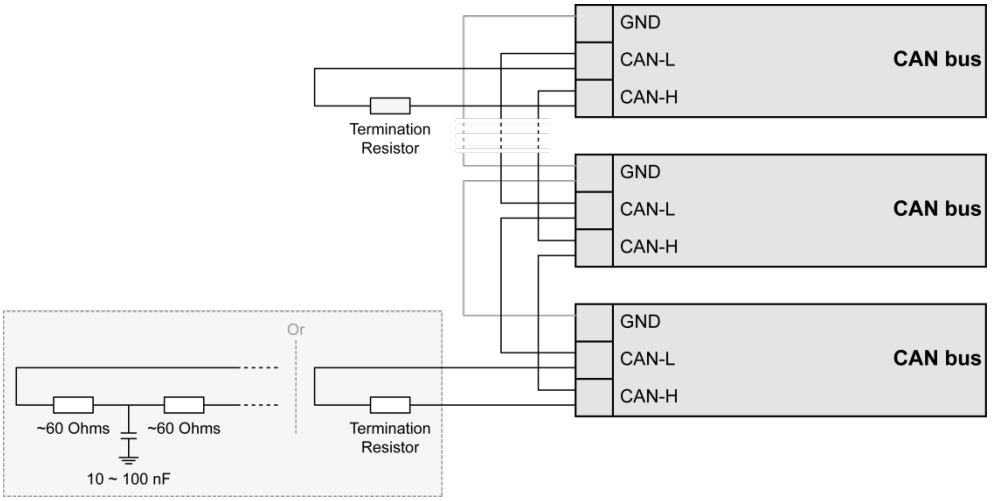


Figure 2-41: Interfaces - CAN bus - termination

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 2-25 for the maximum bus length (Source: CANopen; Holger Zeltwanger (Hrsg.); 2001 VDE VERLAG GMBH, Berlin und Offenbach; ISBN 3-8007-2448-0).

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

Table 2-25: Maximum CAN bus length

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

NOTE

When you are using 20 kbit/s or 50 kbit/s together with Toolkit, we recommend to set Parameter 9921 “Transfer rate 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
LS-5 Series	CAN bus	External RC element

Table 2-26: Bus shielding

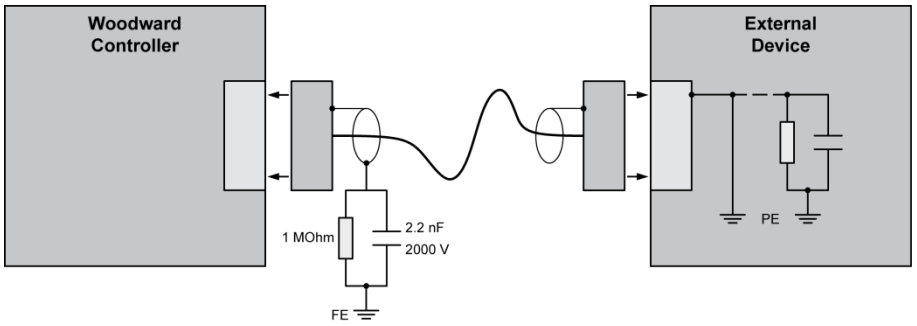


Figure 2-42: Interfaces – shielding (external RC element)

DPC - Direct Configuration Cable

The LS-5 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 LS-5 housing.

NOTE

The connection cable delivered with the DPC must be used between DPC and LS-5 to ensure proper functionality of the LS-5. An extension or utilization of different cable types for the connection between LS-5 and DPC may result a malfunction of the LS-5. 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 LS-5), 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 3.
Configuration

Configuration Via Front Panel

Operation of the unit via the front panel is explained in “Chapter 4: Operation”. This chapter will familiarize you with the unit, the meanings/functions of the buttons, and the display.

Configuration Via PC

Install ToolKit Configuration and Visualization Software

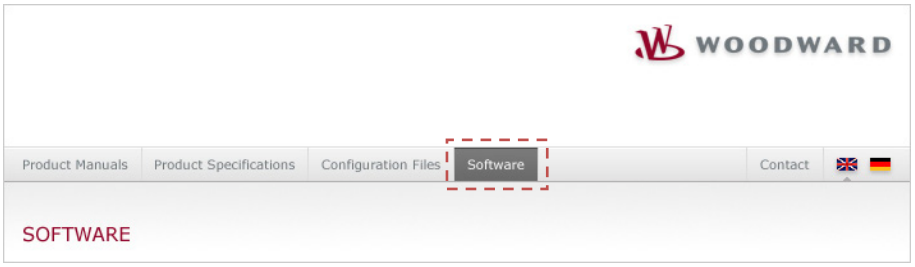
NOTE

Woodward's ToolKit software is required to configure the unit via PC.

ToolKit Version 3.5.3 or higher

Install ToolKit Software

1. Please insert the enclosed Product CD in the CD-ROM drive of your computer
2. The CD is going to start automatically (autostart function needs to be activated)
3. Please go to the section "Software" and follow the instructions described there



Alternatively ToolKit can be downloaded from our Website. Please proceed as follows:

1. Go to http://www.woodward.com/software
2. Select ToolKit in the list and click the "Go" button
3. Click "More Info" to get further information about ToolKit
4. Choose the preferred software version and click "Download"
5. Now you need to login with your e-mail address or register first
6. The download will start immediatly

Minimum system requirements for ToolKit:

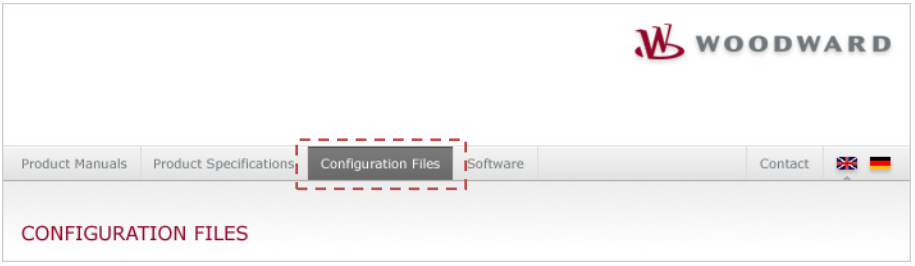
- Microsoft Windows® 7, Vista, XP (32- & 64-bit)
- Microsoft .NET Framework Ver. 3.5
- 600 MHz Pentium® CPU
- 96 MB of RAM
- Minimum 800 by 600 pixel screen with 256 colors
- Serial Port
- CD-ROM drive

NOTE

Microsoft .NET Framework 3.5 must be installed on your computer to be able to install ToolKit. If not already installed, Microsoft .NET Framework 3.5 will be installed automatically. You must be connected to the internet for this. Alternatively you can use the .NET Framework 3.5 installer which can be found on the Product CD.

Install ToolKit Configuration Files

1. *Please insert the enclosed Product CD in the CD-ROM drive of your computer*
2. *The CD is going to start automatically (autostart function needs to be activated)*
3. Please go to the section "Configuration Files" and follow the instructions described there



Alternatively ToolKit configuration files can be downloaded from our Website. Please proceed as follows:

1. Go to http://www.woodward.com/software/configfiles/
2. Please insert the part number (P/N) and revision of your device into the corresponding fields
3. Select ToolKit in the application type list
4. Click "Search"

NOTE

ToolKit is using the following files:

***.WTOOL**
File name composition: [P/N1]*[1]-[Revision]_[Language ID]_[P/N2]*[2]-[Revision]_[# of visualized gens].WTOOL
Example file name: 8440-1234-NEW_US_5418-1234-NEW.WTOOL
Content of the file: Display screens and pages for online configuration, which are associated with the respective *.SID file

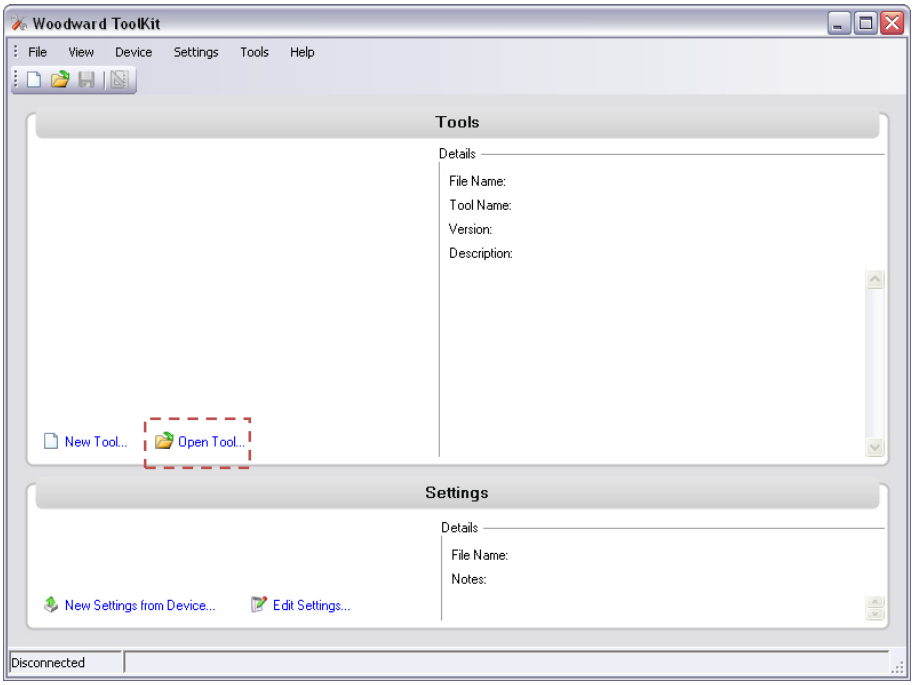
***.SID**
File name composition: [P/N2]*[2]-[Revision].SID
Example file name: 5418-1234-NEW.SID
Content of the file: All display and configuration parameters available in ToolKit

***.WSET**
File name composition: [user defined].WSET
Example file name: easYgen_settings.WSET
Content of the file: Default settings of the ToolKit configuration parameters provided by the SID file or user-defined settings read out of the unit.

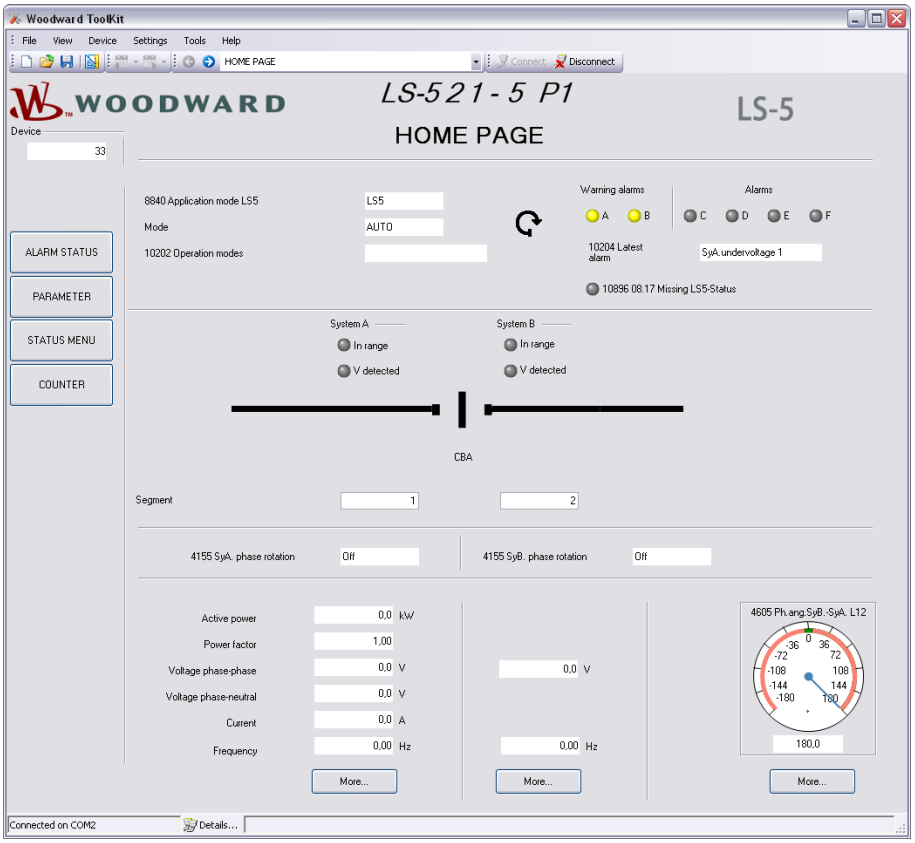
***[1] P/N1 = Part number of the unit**
***[2] P/N2 = Part number of the software in the unit**

Starting ToolKit Software

1. Start ToolKit via Windows Start menu -> Programs ->Woodward -> ToolKit 3.x
2. Please press the button “Open Tool”

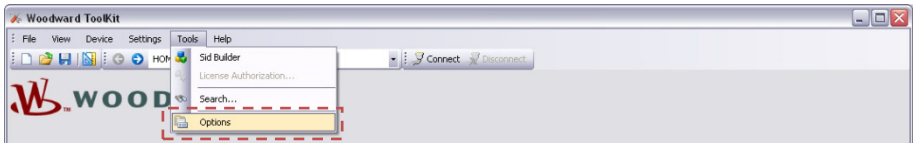


3. Go to the “Application” folder and open then the folder equal to the part number (P/N) of your device (e.g. 8440-1234). Select the wtool file (e.g. 8440-1234-NEW_US_5418-1234-NEW.wtool) and click “Open” to start the configuration file
4. Now the home page of the ToolKit configuration screen appears

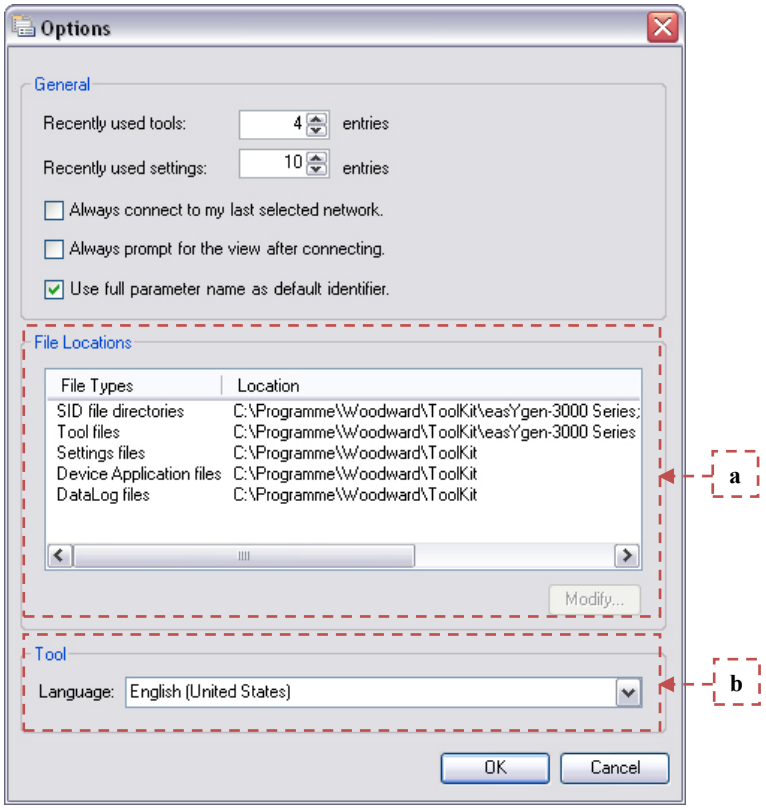


Configure ToolKit Software

1. Start the configuration by using the toolbar. Please go to Tools -> Options



2. The options window will be displayed



   a. Adjust the default locations of the configuration files
   b. The displayed language can be selected here
3. The changes become effective after clicking “OK”

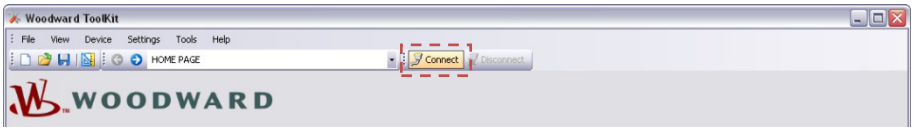
NOTE

Please use the ToolKit online help for further information.

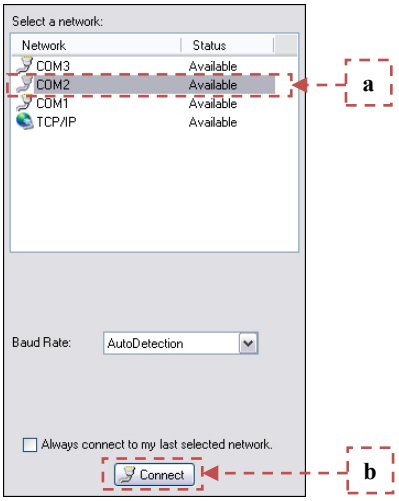
Connect ToolKit and the LS-5 Unit

For configuration of the unit via ToolKit please proceed as follows:

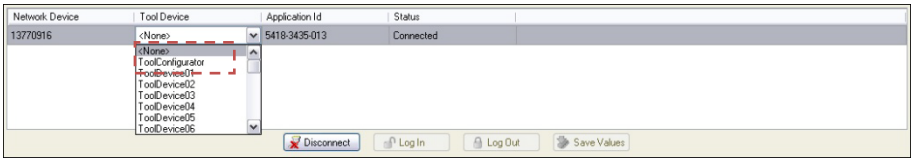
1. Connect the null modem communications cable between your laptop/PC and the DPC cable. Plug the null modem cable into the RS-232 serial port of the DPC cable and the other side to a serial COM port of the laptop/PC. If the laptop/PC does not have a serial port to connect the null modem cable to, use a USB to serial adapter. Now connect the DPC cable to the LS-5.
2. *Open ToolKit via Windows Start menu -> Programs -> Woodward -> ToolKit 3.x*
3. *From the main ToolKit window, click File then select "Open Tool"..., or click the Open Tool icon on the tool bar.*
4. *Locate and select the desired tool file (*.WTOOL) in the ToolKit data file directory and click Open.*
5. From the main ToolKit window, click Device then click "Connect", or select the Connect icon on the toolbar.



6. The connect dialog window will open if the option is enabled.



   a. Select the COM port that is connected to the communication cable.
   b. Click the "Connect" button.
7. The identifier of the device that ToolKit is connected to, will display in the status bar.
8. If the Communications window opens, select "ToolConfigurator" under Tool Device and close the Communications window.



9. If the device is security enabled, the Login dialog will appear.
10. Now you are able to edit the LS-5 parameters in the main window. Any changes made are written to the control memory automatically.

SID Files for Using ToolKit on the CAN Bus With Other CANopen Devices

If a PC with ToolKit is connected to the LS-5 via a CAN bus with other external CANopen devices (like a Phoenix Contact I/O expansion board, for example), it may happen that ToolKit cannot establish a connection with the LS-5 because it looks for a SID file for such an external device, which does not exist.
A special *.sid file can be created in this case. Contact Woodward for support or create a *.sid file with the following content:

```
<?xml version="1.0" encoding="utf-8"?>
<ServiceInterfaceDefinition xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" Identifier="[add the required device application name here]" Specification="EmptyFile">
</ServiceInterfaceDefinition>
```

The file name must be the same as the Identifier plus the extension *.sid. The file must be stored to the configured SID file directory.

NOTE

Depending on the computer used and the installed operation system, problems with the communication via an infrared connection may occur.

NOTE

If your computer is equipped with a Bluetooth interface please deactivate it temporarily in the Windows system control menu in the case that ToolKit is freezing building up a connection.

NOTE

It is also possible to connect to the unit via CAN bus. If a suitable CAN adapter is used, this may be selected in the Connect window. We recommend to use the IXXAT USB-to-CAN converter using the VCI V3 driver.

Be sure to configure the correct baud rate and timeout in the Properties dialog of the Connect window.

The Password for CAN Interface 1 (parameter 10402 on page 59) must be entered before being able to edit the parameters.

View LS-5 Data with ToolKit

The following figure shows an example visualization screen of ToolKit:

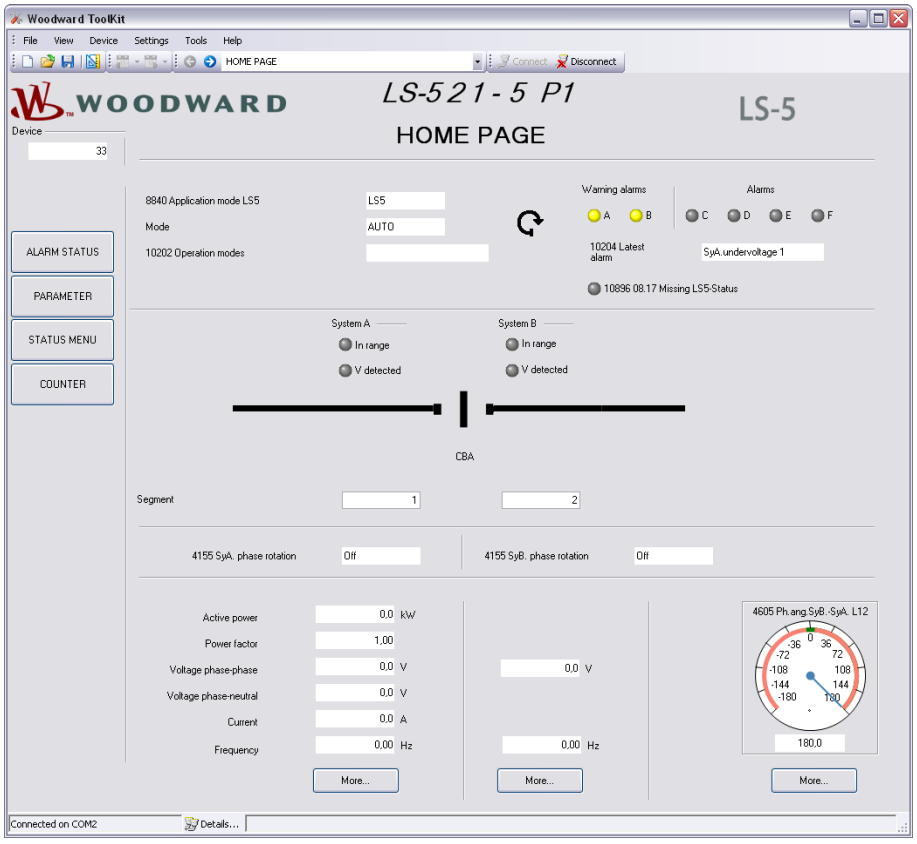


Figure 3-1: ToolKit - visualization screen

Navigation through the various visualization and configuration screens is performed by clicking on the and icons, by selecting a navigation button (e.g. STATUS MENU), or by selecting a screen from the drop-down list to the right of the arrow icons.
It is possible to view a trend chart of up to eight values with the trending tool utility of ToolKit. The following figure shows a trending screen of the measured battery voltage value:

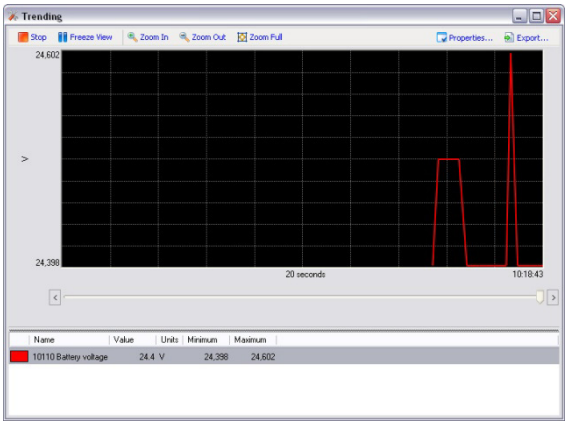


Figure 3-2: ToolKit - analog value trending screen

Each visualization screen provides for trending of monitored values by right-clicking on a value and selecting the "Add to trend" function. Trending is initiated by clicking on the Start button. Clicking the Export… button will save the trend data to a Comma Separated Values (CSV) file for viewing, editing or printing with office software, like Microsoft Excel, etc. The Properties… button is used to define high and low limits of the scale, sample rate, displayed time span and color of the graph.

Configure the LS-5 with ToolKit

The following figure shows an example configuration screen of ToolKit:

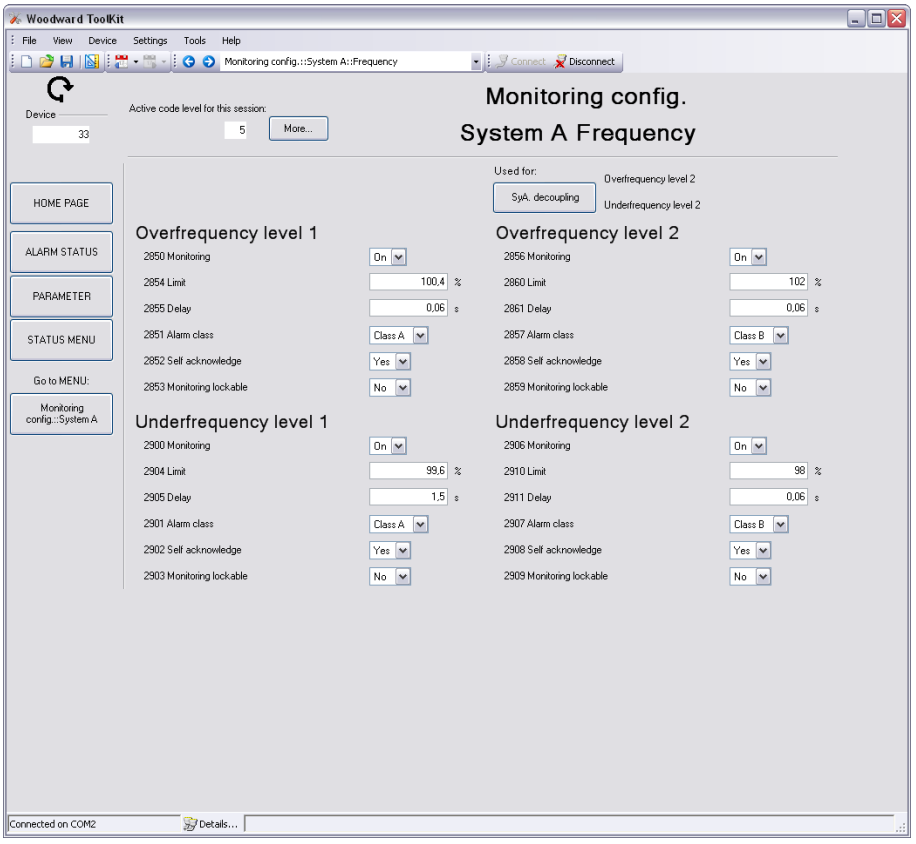


Figure 3-3: ToolKit - configuration screen

Entering a new value or selecting a value from a defined list will change the value in a field. The new value is written to the controller memory by changing to a new field or pressing the Enter key.

Navigation through the various configuration and visualization screens is performed by clicking on the and icons, by selecting a navigation button (e.g. STATUS MENU), or by selecting a screen from the drop-down list to the right of the arrow icons.

Parameters

To all parameters are assigned unique “Parameter Identification Numbers (ID)”. The parameter identification number may be used to reference individual parameters listed in this manual. This parameter identification number is also displayed in the ToolKit configuration screens next to the respective parameter.

Language / Clock Configuration

The following parameters are used to set the unit language, the current date and time, and the daylight saving time feature.

NOTE

If an Asian language is configured, some parameter screens may be displayed with an empty space at the bottom of the parameter list, which may be interpreted as an end of the list, although more parameters exist and are displayed when scrolling down.

ID	Parameter	CL	Setting range	Default	Description
1700	**Language**	0	Deutsch / English / Chinese / Português / Japanese / Russky / Türkçe / Español / Français / Italiano / Polski /	Englisch	The desired language for the unit display text is configured here.
1710	**Hour**	0	0 to 23 h	0	The hour of the clock time is set here. Example: **0:** 0th hour of the day (midnight). **23:** 23rd hour of the day (11 pm).
1709	**Minute**	0	0 to 59 min	-	The minute of the clock time is set here. Example: **0:** 0th minute of the hour. **59:** 59th minute of the hour.
1708	**Second**	0	0 to 59 s	-	The second of the clock time is set here. Example: **0:** 0th second of the minute. **59:** 59th second of the minute.
1698	**Transfer time to clock**	0	Yes / No	No	**Yes:** Adjusted time will be transfered to the unit. **No:** Adjusted time will be not transfered to the unit. ***NOTE:*** *This parameter may only be configured using ToolKit.*
1711	**Day**	0	1 to 31	-	The day of the date is set here. Example: **1:** 1st day of the month. **31:** 31st day of the month.
1712	**Month**	0	1 to 12	-	The month of the date is set here. Example: **1:** 1st month of the year. 1**2:** 12th month of the year.
1713	**Year**	0	0 to 99	-	The year of the date is set here. Example: **0:** Year 2000. **99:** Year 2099.
1699	**Transfer date to clock**	0	Yes / No	No	**Yes:** Adjusted date will be transfered to the unit. **No:** Adjusted date will be not transfered to the unit. ***NOTE:*** *This parameter may only be configured using ToolKit.*

The daylight saving time feature enables to automatically adjust the real-time clock to local daylight saving time (DST) provisions. If daylight saving time is enabled, the real-time clock will automatically be advanced by one hour when the configured DST begin date and time is reached and falls back again by one hour when the configured DST end date and time is reached. If the unit is used in the southern hemisphere, the DST function will be inverted automatically, if the DST begin month is later in the year than the DST end month.

NOTE

Do not change the time manually during the hour of the automatic time change if DST is enabled to avoid a wrong time setting.

Events or alarms, which occur during this hour might have a wrong time stamp.

NOTE

The following parameters will only be displayed, if Daylight saving time (parameter 4591) has been configured to "On" and the enter button has been pressed.

ID	Parameter	CL	Setting range	Default	Description
4591	**Daylight saving time**	2	On / Off	Off	Enables the daylight saving time. **On:** Daylight saving time is enabled. **Off:** Daylight saving time is disabled.
4594	**DST begin time**	2	0 to 23 h	2	The real-time clock will be advanced by one hour when this time is reached on the DST begin date. Example: **0:** 0th hour of the day (midnight). **23:** 23rd hour of the day (11 pm).
4598	**DST begin weekday**	2	Sunday / Monday / Tuesday / Wednesday / Thursday / Friday / Saturday	Sunday	The weekday for the DST begin date is configured here.
4592	**DST begin nth weekday**	2	1st / 2nd / 3rd / 4th / Last / LastButOne / LastButTwo / LastButThree	Last	The order number of the weekday for the DST begin date is configured here. Example: **1st:** DST starts on the 1st configured weekday of the DST begin month. **2nd:** DST starts on the 2nd configured weekday of the DST begin month. **3rd:** DST starts on the 3rd configured weekday of the DST begin month. **4th:** DST starts on the 4th configured weekday of the DST begin month. **Last:** DST starts on the last configured weekday of the DST begin month. **LastButOne:** DST starts on the last but one configured weekday of the DST begin month. **LastButTwo:** DST starts on the last but two configured weekday of the DST begin month. **LastButThree:** DST starts on the last but three configured weekday of the DST begin month.
4593	**DST begin month**	2	1 to 12	3	The month for the DST begin date is configured here. Example: **1:** 1st month of the year. **12:** 12th month of the year.
4597	**DST end time**	2	0 to 23	3	The real-time clock will fall back by one hour when this time is reached on the DST end date. Example: **0:** 0th hour of the day (midnight). **23:** 23rd hour of the day (11 pm).
4599	**DST end weekday**	2	Sunday / Monday / Tuesday / Wednesday / Thursday / Friday / Saturday	Sunday	The weekday for the DST end date is configured here.

ID	Parameter	CL	Setting range	Default	Description
4595	**DST end nth weekday**	2	1st / 2nd / 3rd / 4th / Last / LastButOne / LastButTwo / LastButThree	Last	The order number of the weekday for the DST end date is configured here. Example: **1st:** DST ends on the 1st configured weekday of the DST end month. **2nd:** DST ends on the 2nd configured weekday of the DST end month. **3rd:** DST ends on the 3rd configured weekday of the DST end month. **4th:** DST ends on the 4th configured weekday of the DST end month. **Last:** DST ends on the last configured weekday of the DST end month. **LastButOne:** DST ends on the last but one configured weekday of the DST end month. **LastButTwo:** DST ends on the last but two configured weekday of the DST end month. **LastButThree:** DST ends on the last but three configured weekday of the DST end month.
4596	**DST end month**	2	1 to 12	10	The month for the DST end date is configured here. Example: **1:** 1st month of the year. **12:** 12th month of the year.

Example:
If daylight saving time starts at 2:00 am on the 2nd Sunday in March and ends at 2:00 am on the 1st Sunday in November, the unit has to be configured like shown in Table 3-1 to enable an automatic change to daylight saving time and back to standard time.

ID	Parameter	Setting
4591	Daylight saving time	On
4594	DST begin time	2
4598	DST begin weekday	Sunday
4592	DST begin nth weekday	2nd
4593	DST begin month	3
4597	DST end time	2
4599	DST end weekday	Sunday
4595	DST end sunday	1st
4596	DST end month	11

Table 3-1: Daylight saving time - configuration example

	USA, Canada		European Union	
Year	DST Begins 2 a.m. (Second Sunday in March)	DST Ends 3 a.m. (First Sunday in November)	DST Begins 1 a.m. UTC=GMT (Last Sunday in March)	DST Ends 2 a.m. UTC=GMT (Last Sunday in October)
2008	March 9, 2008	November 2, 2008	March 30, 2008	October 26, 2008
2009	March 8, 2009	November 1, 2009	March 29, 2009	October 25, 2009
2010	March 14, 2010	November 7, 2010	March 28, 2010	October 31, 2010

Table 3-2: Daylight saving time - examplary dates

Display Configuration

The contrast of the display may be adjusted using this screen.

Enter Password

The LS-5 Series utilizes a password protected multi-level configuration access hierarchy. This permits varying degrees of access to the parameters being granted by assigning unique passwords to designated personnel. A distinction is made between the access levels as follows:

Code level CL0 ***(User Level)*** Standard password = none
This code level permits for monitoring of the system and limited access to the parameters. Configuration of the control is not permitted. Only the parameters for setting the language, the date, the time, and the horn reset time are accessible. The unit powers up in this code level.

Code level CL1 ***(Service Level)*** Standard password = "**0 0 0 1**"
This code level entitles the user to change selected non-critical parameters, such as setting the parameters accessible in CL0 plus Bar/PSI, °C/°F. The user may also change the password for level CL1. Access granted by this password expires two hours after the password has been entered and the user is returned to the CL0 level.

Code level CL2 ***(Temporary Commissioning Level)*** No standard password available
This code level grants temporary access to most of the parameters. The password is calculated from the random number generated when the password is initially accessed. It is designed to grant a user one-time access to a parameter without having to give him a reusable password. The user may also change the password for level CL1. Access granted by this password expires two hours after the password has been entered and the user is returned to the CL0 level. The password for the temporary commissioning level may be obtained from the vendor.

Code level CL3 ***(Commissioning Level)*** Standard password = "**0 0 0 3**"
This code level grants complete and total access to most of the parameters. In addition, the user may also change the passwords for levels CL1, CL2 and CL3. Access granted by this password expires two hours after the password has been entered and the user is returned to the CL0 level.

NOTE

Once the code level is entered, access to the configuration menus will be permitted for two hours or until another password is entered into the control. If a user needs to exit a code level then code level, CL0 should be entered. This will block unauthorized configuration of the control. A user may return to CL0 by allowing the entered password to expire after two hours or by changing any one digit on the random number generated on the password screen and entering it into the unit.

It is possible to disable expiration of the password by entering "0000" after the CL1 or CL3 password has been entered. Access to the entered code level will remain enabled until another password is entered. Otherwise, the code level would expire when loading the standard values (default 0000) via ToolKit.

ID	Parameter	CL	Setting range	Default	Description
10400	**Password display**	0	0 to 9999	Random number	The password for configuring the control via the front panel must be entered here.
10405	**Code level display**	0	Info	-	This value displays the code level, which is currently enabled for access via the front panel display.
10402	**Password CAN 1**	0	0000 to 9999	Random number	The password for configuring the control via the CAN interface #1 must be entered here.
10407	**Code level CAN 1**	0	Info	-	This value displays the code level, which is currently enabled for access via the CAN interface #1.
10401	**Password serial 1**	0	0000 to 9999	Random number	The password for configuring the control via RS-232 serial interface #1 must be entered here.
10406	**Code level serial 1**	0	Info	-	This value displays the code level, which is currently enabled for access via RS-232 serial interface #1.
10430	**Password serial 2**	0	0000 to 9999	Random number	The password for configuring the control via RS-485 serial interface #1 must be entered here.
10420	**Code level serial 2**	0	Info	-	This value displays the code level, which is currently enabled for access via RS-485 serial interface #1.

System Management

ID	Parameter	CL	Setting range	Default	Description
1702	**Device number**	2	33 to 64	33	A unique address is assigned to the control though this parameter. This unique address permits the controller to be correctly identified on the CAN bus. The address assigned to the controller may only be used once. All other bus addresses are calculated on the number entered in this parameter. ***NOTE:*** *No access in the application modes L-MCB* A03 *and L-GGB* A04*.* ***NOTE:*** *The unit must be restarted after changing the device number to ensure proper operation.*
4556	**Configure display backlight**	2	Key actv. / Off / On	Key actv.	**Key actv.:** The display backlight will be dimmed, if no soft key is pressed for the time configured in parameter ID 4557. **Off:** The display backlight is always disabled. **On:** The display backlight is always enabled.
4557	**Time until backlight shutdow**	2	1 to 999 min	120 min	If no soft key has been pressed for the time configured here, the display backlight will be dimmed. ***NOTE:*** *This parameter is only effective, if parameter ID 4556 is configured to* Key actv..
12978	**Lock keypad**	2	*LogicsManager*	FALSE	**Lock keypad** As long as the conditions of the *LogicsManager* have been fulfilled: **True:** • The buttons "MAN" and "AUTO" are locked. • The softkey "OPEN"/"CLOSE" are locked. • Acknowledge of alarms is blocked. • All parameters with the exception of display relevant parameters are not accessable. **False:** Full access depending on code level.
10417	**Factory default settings**	0	Yes / No	No	**Yes:** The following three parameters are visible and restoring the configured parameters to factory default values is enabled. **No:** The following three parameters are invisible and restoring the configured parameters to factory default values is not enabled. ***NOTE:*** *The following parameters will only be displayed, if* Factory default settings *(parameter ID 10417) has been configured to "Yes" and the enter button has been pressed.*
1701	**Set factory default values**	0	Yes / No	No	**Yes:** All parameters, which the enabled access code grants privileges to, will be restored to factory default values. **No:** All parameters will remain as currently configured.
10500	**Start bootloader**	2	23130 to 23130	42405	The bootloader is utilized for uploading application software only. The proper enable code must be entered while the control is in access code level CL3 or higher to perform this function. ***ATTENTION:*** *This function is used for uploading application software and may only be used by authorized Woodward technicians!*
1706	**Clear eventlog**	2	Yes / No	No	**Yes:** The event history will be cleared. **No:** The event history will not be cleared.

System Management: Password System

NOTE

The following passwords grant varying levels of access to the parameters. Each individual password can be used to access the appropriate configuration level through multiple access methods and communication protocols (via the front panel, via serial RS-232/485 interface, and via the CAN bus).

ID	Parameter	CL	Setting range	Default	Description
10415	**Basic code level**	1	0000 to 9999	-	**Password: Service Level (CL1)** The password for the code level "Service" is defined in this parameter. Refer to the Enter Password section on page 59 for default values.
10413	**Commissioning code level**	3	0000 to 9999	-	**Password: Commission (CL3)** The password for the code level "Commission" is defined in this parameter. Refer to the Enter Password section on page 59 for default values.
10414	**Temp. commissioning code level**	3	0000 to 9999	-	**Password: Temporary Commission (CL2)** The algorithm for calculating the password for the code level "Temporary Commissioning" is defined in this parameter.
10412	**Temp. supercomm. level code**	5	0000 to 9999	-	**Password: Temporary Supercommissioning (CL4)** The algorithm for calculating the password for the code level "Temporary Supercommissioning" is defined in this parameter.
10411	**Supercommissioning level code**	5	0000 to 9999	-	**Password: Supercommissioning" (CL5)** The password for the code level "Supercommissioning" is defined in this parameter. Refer to the Enter Password section on page 59 for default values.

Configuration

The configuration screen is accessed pressing the *Configuration* softkey in the parameter screen. The following sub-menus are available to configure the unit:

- Application configuration
- Monitoring configuration
- Measurement configuration
- Interfaces configuration
- *LogicsManager* configuration
- Counters configuration

NOTE

This controller is available in two different hardware version with either 1A [../1] or 5A [../5] current transformer inputs. Both versions are discussed in this manual. The setpoints for specific parameters will differ depending upon the hardware version.

NOTE

It is absolutely essential that correct rated values to be entered when configuring the controller, as many measurement and monitoring functions refer to these values.

Application Configuration

Application Mode LS-5 Configuration

<table>
<tr><th>ID</th><th>Parameter</th><th>CL</th><th>Setting range</th><th>Default</th><th>Description</th></tr>
<tr><td>8840</td><td>Application mode LS5</td><td>1</td><td>Single LS5 /
LS5 /
L-MCB /
L-GGB</td><td>LS5</td><td>The unit can be configured to four different application modes. Refer to the Chapter 4: Operation for additional information.

Single LS5 A01: In this application mode, there is only one single LS-5 unit.

LS5 A02: This is the application mode for multiple LS-5 units operation. In this mode a PLC can control the LS-5 units.

L-MCB A03: In this application mode, the easYgen is controlling the MCB via the LS-5. The operation mode is fixed to automatic.

L-GGB A04: In this application mode, the easYgen is controlling the GGB via the LS-5. The operation mode is fixed to automatic.

NOTE: In the application modes L-MCB A03 and L-GGB A04 some parameters are fixed to the corresponding parameters in the easYgen.

NOTE: In the L-MCB A03 and L-GGB A04 mode some parameters are preconfigured to fixed values. In this modes you can´t access these parameters via front panel or ToolKit. For this reason you have check thefollowing parameters if you change the application mode from L-MCB A03 or L-GGB A04 to LS5 A02 or Single LS5 A01 mode.

<table>
<tr><td>Device number (1702)</td><td>Variable system (8816)</td></tr>
<tr><td>Node-ID CAN bus 1 (8950)</td><td>Synchonization mode (5728)</td></tr>
<tr><td>Startup in mode (8827)</td><td>Mains power measurement (8813)</td></tr>
<tr><td>Isolation switch (8815)</td><td>Dead bus closure (8801)</td></tr>
<tr><td>Segment number System A (8810)</td><td>Connect A dead to B dead (8802)</td></tr>
<tr><td>Segment number System B (8811)</td><td>Connect A dead to B alive (8803)</td></tr>
<tr><td>Mains connection (8814)</td><td>Connect A alive to B dead (8804)</td></tr>
<tr><td>Open CBA in manual (8828)</td><td>Connect synchronous mains (8820)</td></tr>
<tr><td>Max. phase angle (8821)</td><td>Delay time phi max. (8822)</td></tr>
</table>

The following parameters (LogicsManager) are hidden and have no impact in the application modes L-MCB A03 and L-GGB A04.

<table>
<tr><td>LM: Enable close CBA (12945)</td><td>LM: Enable close CBA (24.34)</td></tr>
<tr><td>LM: Open CBA immediately (12944)</td><td>LM: Open CBA immediately (24.33)</td></tr>
<tr><td>LM: Open CBA unload (12943)</td><td>LM: Open CBA unload (24.32)</td></tr>
<tr><td>LM: Operation mode AUTO (12510)</td><td>LM: Operation mode MAN (12520)</td></tr>
<tr><td>LM: Open CBA in MAN (12957)</td><td>LM: Open CBA in MAN (24.46, 11435)</td></tr>
<tr><td>LM: Close CBA in MAN (12958)</td><td>LM: Close CBA in MAN (24.47, 11436)</td></tr>
</table>
</td></tr>
<tr><td>12950</td><td>Isol.sw open</td><td>2</td><td>LogicsManager</td><td>LM 24.39</td><td>Isolation switch is open
As long as the conditions of the LogicsManager have been fulfilled, the LS-5 assumes an open isolation switch (else a closed isolation switch).</td></tr>
</table>

NOTE

Please refer to chapter Application on page 136 for details.

Breakers Configuration

Configure CBA

ID	Parameter	CL	Setting range	Default	Description
8800	**CBA control**	2	1 Relay / 2 Relays	2 Relays	**1 Relay:** A MCB is operated and if necessary monitored. Relay [R5] (38/39/40) is used and fixed to this function. **2 Relays:** A MCB is operated and if necessary monitored. Relay [R5] (38/39/40) is used for the open function, relay [R6] (41/42) to close it. The opening and closing is carried out with the pulse method.
3417	**CBA time pulse**	2	0.10 to 0.50 s	0.50 s	**Pulse duration to close the CBA** The time of the pulse output may be adjusted to the breaker being utilized.
5715	**Closing time CBA**	2	40 to 300 ms	80 ms	**Inherent delay of CBA for synchronization** The inherent closing time of the CBA corresponds to the lead-time of the close command. The close command will be issued independent of the differential frequency at the entered time before the synchronous point.
3407	**CBA auto unlock**	2	Yes / No	No	**Switch unblocking CBA** This is used for special circuit breakers to put the breaker into a defined initial state or to enable closing at all. **Yes:** Before every close-pulse, an open-pulse is issued for e.g. 1 second (depends on settings of parameter 5718). A CB close pulse is enabled only after the open pulse is issued. **No:** The CB close pulse is enabled without being preceded by a CB open pulse.
5718	**CBA open time pulse**	2	0.10 to 9.90 s	1.00 s	**CBA open time pulse** This time defines the length of the CBA open time pulse, if the automatic switch unblocking CBA is activated.
8828	**Open CBA in manual**	2	Immediate / With unl.	Immediate	**Open CBA in manual** **Immediate:** If there is an open command in manual mode, the CBA will open immediately. **With unl.:** If there is an open command in manual mode, the CBA will open with unloading. If there is a further open command while unloading (via LM or button) the CBA opens immediately. ***NOTE:*** *With the exception of the application mode Single LS5* **A01***, unloading is skipped, if no closed GCB in the relevant segments is detected.* ***NOTE:*** *No access in the application modes L-MCB* **A03** *and L-GGB* **A04***.*
8820	**Connect synchronous mains**	2	Yes / No	No	**Connect synchronous mains** **No:** Closing the CBA in case of synchronous mains (System A and System B are mains connected) is not allowed. **Yes:** Closing the CBA in case of synchronous mains is possible if • System A and System B are detected as mains connected and • The angle is in the configuration window of parameter 8821 for at least the time configured in parameter 8822. ***NOTE:*** *If no closed GCB in the relevant segment is detected, unloading will be canceled and the breaker will be opend immediately (even if the command "Open CBA with unloading" is active).* ***NOTE:*** *No access in the application modes L-MCB* **A03** *and L-GGB* **A04***.*
8821	**Max phase angle**	2	0 to 20 °	20 °	Maximum admissible angle between both voltage systems in case of connecting synchronous mains. ***NOTE:*** *No access in the application modes L-MCB* **A03** *and L-GGB* **A04***.*

ID	Parameter	CL	Setting range	Default	Description
8822	**Delay time phi max**	2	0 to 99 s	1 s	Defines the time how long the phase angle (parameter 8821) between both voltage systems needs to be below the configured maximum permissible angle before connecting synchronous mains. ***NOTE:*** *No access in the application modes L-MCB* A03 *and L-GGB* A04*.*
12957	**Open CBA in MAN**	2	*LogicsManager*	-	**Open CBA in manual** Once the conditions of the *LogicsManager* have been fulfilled the LS-5 opens the CBA immediately or with unloading (according to parameter 8828), if no other LS-5 with higher priority likes to do the same. ***NOTE:*** *If a close or open command is active but is blocked by another device with higher priority the display shows "CBA request".* ***NOTE:*** *Only in operation mode MANUAL.* ***NOTE:*** *No access in the application modes L-MCB* A03 *and L-GGB* A04*.*
12958	**Close CBA in MAN**	2	*LogicsManager*	-	**Close CBA in manual** Once the conditions of the *LogicsManager* have been fulfilled the LS5 closes the CBA, if no other LS5 with higher priority likes to do the same. (Provided the conditions for dead bus closure or synchronization are true.) ***NOTE:*** *If a close or open command is active but is blocked by another device with higher priority the display shows "CBA request".* ***NOTE:*** *Only in operation mode MANUAL.* ***NOTE:*** *No access in the application modes L-MCB* A03 *and L-GGB* A04*.*
12943	**Open CBA unload**	2	*LogicsManager*	(09.06 & 1) &1	**Open CBA with unloading** Once the conditions of the *LogicsManager* have been fulfilled the LS-5 opens the CBA with unloading, if no other LS-5 with higher priority likes to do the same. ***NOTE:*** *If a close or open command is active but is blocked by another device with higher priority the display shows "CBA request".* ***NOTE:*** *Only in operation mode AUTOMATIC.* ***NOTE:*** *No access in the application modes L-MCB* A03 *and L-GGB* A04*.*
12944	**Open CBA immed.**	2	*LogicsManager*	(09.04 & 1) &1	**Open CBA immediately** Once the conditions of the *LogicsManager* have been fulfilled the LS-5 opens the CBA immediately. ***NOTE:*** *Only in operation mode AUTOMATIC.* ***NOTE:*** *No access in the application modes L-MCB* A03 *and L-GGB* A04*.*

ID	Parameter	CL	Setting range	Default	Description
12945	**Enable close CBA**	2	*LogicsManager*	(09.07 & !08.07) & !07.05	**Enable close CBA** Once the conditions of the *LogicsManager* have been fulfilled the LS-5 closes the CBA, if no other LS5 with higher priority likes to do the same. (Provided the conditions for dead bus closure or synchronization are true.) ***NOTE:*** *If a close or open command is active but is blocked by another device with higher priority the display shows "CBA request".* ***NOTE:*** *Only in operation mode AUTOMATIC.* ***NOTE:*** *No access in the application modes L-MCB* A03 *and L-GGB* A04*.*

Synchronization CBA

ID	Parameter	CL	Setting range	Default	Description
5730	**Synchronization CBA**	2	Slip freq / Ph. match	Slip freq	**Slip frequency:** The LS-5 instructs the frequency controller (e.g. easYgen) to adjust the frequency in a way, that the frequency of the variable system is marginal greater than the target. When the synchronizing conditions are reached, a close command will be issued. The slipping frequency is positive to avoid reverse power. **Phase matching:** The LS-5 instructs the frequency controller (e.g. easYgen) to adjust the phase angle of the variable system to that of the target, in view of turning the phase difference to zero.
5711	**Pos. freq. differential CBA**	2	0.02 to 0.49 Hz	0.18 Hz	**Positive frequency differential CBA** The prerequisite for a connect command being issued for the CBA is that the differential frequency is below the configured differential frequency. This value specifies the upper frequency (positive value corresponds to positive slip system B frequency is higher than the system A frequency).
5712	**Neg. freq. differential CBA**	2	-0.49 to 0.00 Hz	-0.18 Hz	**Negative frequency differential CBA** The prerequisite for a connect command being issued for the CBA is that the differential frequency is above the configured differential frequency. This value specifies the lower frequency limit (negative value corresponds to negative slip system B frequency is less than the system A frequency).
5710	**Voltage differential CBA**	2	0.50 to 20.00 %	5.00 %	The maximum permissible voltage differential for closing CBA is configured here. If the difference between system A and system B voltage does not exceed the value configured here and the system voltages are within the operating voltage windows (parameters 5800/5801/5810/5811 on page 90), the "Command: CBA close" may be issued.
8825	**Phase angle compensation**	2	On / Off	Off	**On:** If a transformer is located between systems A and B and if the transformer has a vector group with a phase angle deviation, then “On” should be configured in this parameter. **Off:** If a transformer is not located between systems A and B or if the transformer has a vector group without a phase angle deviation, then “Off” should be configured in this parameter. ***NOTE:*** *This parameter defines if the parameter 8824 is valid or not.* ***WARNING:*** *Ensure this parameter is configured correctly to prevent erroneous synchronization settings. Incorrect wiring of the system cannot be compensated for with this parameter.*
8824	**Phase angle compensation**	2	-180 to 180 °	0 °	This parameter compensates phase angle deviations, which can be caused by transformers (e.g. a delta to wye transformer) located within the electrical system. Ensure the following parameters are configured correctly to prevent erroneous synchronization settings. Incorrect wiring of the system cannot be compensated for with this parameter. **Please act as follows:** If a transformer is not located between systems A and B or if the transformer has a vector group without a phase angle deviation, then a phase angle deviation of 0° should be configured in this parameter. ***NOTE:*** *Further information can be found in chapter “Commissioning Note” on page 69.* ***WARNING:*** *Ensure this parameter is configured correctly to prevent erroneous synchronization settings. Incorrect wiring of the system cannot be compensated for with this parameter.*

Commissioning Note

a) Interconnection of the mains voltage possible

With a phase angle deviation of 0 ° and sytem B not energized and system A energized, close the CBA. This will result in system A and system B being at the same voltage potential. The phase angle deviation will now be displayed on the LS-5 screen (synchronization angle phi). Enter the displayed value into this parameter.

CAUTION

The correct setting must be validated in every control unit with a differential voltage measurement.

b) Interconnection of the mains voltage not possible but the vector group of the transformer is known

The vector group of the transformer is known and states the phase angle deviation in multiplies of 30°. Out of the vector group the phase angle deviation can be calculated as an angle from 0° to 360°. **For this value the voltage of the low voltage side is behind the voltage of the high voltage side ⇨ phase angle deviation α! When calculating the resulting value, the low voltage side of the transformer always lags behind the high voltage side (phase angle deviation α).**

The phase difference is to be calculated as follows:

	High voltage side = System [A]	High voltage side = System [B]
α < 180 °	α	-α
α > 180 °	-360 ° + α	360 ° - α

Table 3-3: Calculation of the phase angle deviation

Phase Matching

ID	Parameter	CL	Setting range	Default	Description
5713	**Max. positive phase angle CBA**	2	0.0 to 60.0 °	7.0 °	**Max. permissible positive phase angle CBA** The prerequisite for a connect command being issued for the CBA is that the leading phase angle between system B and system A is below the configured maximum permissible angle
5714	**Max. negative phase angle CBA**	2	-60.0 to 00.0 °	-7.0 °	**Max. permissible negative phase angle CBA** The prerequisite for a connect command being issued for the CBA is that the lagging phase angle between system B and system A is above the configured minimum permissible angle
5717	**Phase matching CBA dwell time**	2	0.0 to 60.0 s	3.0 s	**Phase matching dwell time of CBA** This is the minimum time that the system A/B voltage, frequency, and phase angle must be within the configured limits before the breaker will be closed.

Deadbus Closure CBA

ID	Parameter	CL	Setting range	Default	Description
8801	**Dead bus closure CBA**	2	On / Off	Off	**On:** Dead bus closure possible according to the conditions defined by parameters 8802, 8803, 8804 and 5820. **Off:** No dead bus closure possible. ***NOTE:*** *No access in the application modes L-MCB* A03 *and L-GGB* A04*.*
8802	**Connect A dead to B dead**	2	On / Off	Off	**On:** Dead bus closure of system A dead to system B dead is allowed. **Off:** Dead bus closure of system A dead to system B dead is not allowed. ***NOTE:*** *No access in the application modes L-MCB* A03 *and L-GGB* A04*.*
8803	**Connect A dead to B alive**	2	On / Off	Off	**On:** Dead bus closure of system A dead to system B alive is allowed. **Off:** Dead bus closure of system A dead to system B alive is not allowed. ***NOTE:*** *No access in the application modes L-MCB* A03 *and L-GGB* A04*.*
8804	**Connect A alive to B dead**	2	On / Off	Off	**On:** Dead bus closure of system A alive to system B dead is allowed. **Off:** Dead bus closure of system A alive to system B dead is not allowed. ***NOTE:*** *No access in the application modes L-MCB* A03 *and L-GGB* A04*.*
8805	**Dead bus closure delay time**	2	0.0 to 20.0 s	5.0 s	To detect a dead bus condition of a system, the system voltage must below the value defined by parameter 5820 for at least the time defined here.
5820	**Dead bus detection max. volt.**	2	0 to 30 %	10 %	If system A/B voltage falls below this percentage of system A/B rated voltage for the time defined by parameter 8805, a dead bus condition is detected.

CAUTION

A dead bus closure can also be performed in the case of a mains failure. If the deadbus bus closure should not be performed, the corresponding parameters must be switched "Off" (parameter 8802, 8803 or 8804).

Synchronization Configuration

ID	Parameter	CL	Setting range	Default	Description
5728	**Synchroniza-tion mode**	2	Off / Permissive / Check / Run / Ctrl by LM	Run	**Off:** The synchronization is disabled; the frequency and voltage adaptation for synchronization is not active. **Permissive:** The unit acts as a synch check device. The unit will not issue speed or voltage bias commands to achieve synchroni-zation, but if synchronization conditions are matched (frequency, phase, voltage and phase angle), the control will issue a breaker close command. **Check:** Used for checking a synchronizer prior to commissioning. The control actively synchronizes generator(s) by issuing speed and voltage bias commands, but does not issue a breaker closure command. **Run:** Normal operating mode. The control actively synchronizes and issues breaker closure commands. **Ctrl. by LM:** The synchronization mode is controlled by *Logics Manager* (12907, 12906 and 12908). If more than one *LogicsMa-nager* are true, PERMISSIVE has the highest priority, RUN has the lowest priority. ***NOTE:*** *No access in the application modes L-MCB* A03 *and L-GGB* A04*.*
12907	**Syn. mode PERM.**	2	*LogicsManager*	(0 & 1) & 1	**Synchronization mode PERMISSIVE** As long as the conditions of the *LogicsManager* have been ful-filled, the LS-5 works in synchronization mode “Permissive”. ***NOTE:*** *Only valid if parameter 5728 is set to “Ctrl by LM”.*
12906	**Syn. mode CHECK**	2	*LogicsManager*	(0 & 1) & 1	**Synchronization mode CHECK** As long as the conditions of the *LogicsManager* have been ful-filled, the LS-5 works in synchronization mode “Check”. ***NOTE:*** *Only valid if parameter 5728 is set to “Ctrl by LM”.*
12908	**Syn. mode RUN**	2	*LogicsManager*	(0 & 1) & 1	**Synchronization mode RUN** As long as the conditions of the *LogicsManager* have been ful-filled, the LS-5 works in synchronization mode “RUN”. ***NOTE:*** *Only valid if parameter 5728 is set to “Ctrl by LM”.*

Segment Configuration

ID	Parameter	CL	Setting range	Default	Description
8810	**Segment number Sy.A**	2	1 to 64	1	Segment number for system A. ***NOTE:*** *No access in the application modes L-MCB A03 and L-GGB A04.*
8811	**Segment number Sy.B**	2	1 to 64	1	Segment number for system B. ***NOTE:*** *No access in the application modes L-MCB A03 and L-GGB A04.*
8812	**Segment number isol. Switch**	2	1 to 64	1	Segment number isolation switch (if available).
8813	**Mains pow. measurem.**	2	Valid / Invalid	Invalid	**Valid:** The measured power is used for mains real power control. **Invalid:** The measured power is not used for power control. ***NOTE:*** *No access in the application modes L-MCB A03 and L-GGB A04.*
8814	**Mains connection**	2	None / System A / System B / Isol.swi.	None	**None:** No system is wired to mains directly. It can not be used for mains failure detection. **System A:** System A is wired to mains directly. **System B:** System B is wired to mains directly. **Isol. Switch:** The system of the isolation switch is wired to mains. ***NOTE:*** *No access in the application modes L-MCB A03 and L-GGB A04.*
8815	**Isol. switch**	2	None / System A / System B	None	**None:** No isolation switch at system A or system B. **System A:** Isolation switch is at system A. **System B:** Isolation switch is at system B. ***NOTE:*** *No access in the application modes L-MCB A03 and L-GGB A04.*
8816	**Variable system**	2	System A / System B	System A	One of the systems must be defined as a variable system. A variable system is defined as a system that can change in frequency and voltage due to the easYgen control unit. In normal applications this is the frequency/voltage that is situated opposite the mains voltage of the MCB. The opposite side of the CB is therefore either constant (mains voltage) or a controlled stable (bus coupler) system. **System A:** Variable system is system A. **System B:** Variable system is system B. ***NOTE:*** *No access in the application modes L-MCB A03 and L-GGB A04.*

Inputs / Outputs Configuration

Discrete Inputs Configuration

NOTE

Please refer to chapter Discrete Inputs on page 38 for details.

ID	Parameter	CL	Setting range	Default	Description
1400	**DI {x} Text**	T	*4 to 16 character text*	*See parameter list*	**Message text** If the discrete input is enabled with alarm class, this text is displayed on the control unit screen. The event history will store this text message as well. The text may have 4 through 16 characters. ***NOTE:*** *This parameter may only be configured using ToolKit.* ***NOTE:*** *If the DI is used as control input with the alarm class "Control", you may enter here its function (e.g. external acknowledgement) for a better overview within the configuration.*
1201	**DI {x} Operation**	2	N.O. / N.C.	N.O.	The discrete inputs may be operated by a normally open (N.O.) or normally closed (N.C.) contact. The idle circuit current input can be used to monitor for a wire break. A positive or negative voltage polarity referred to the reference point of the DI may be applied. **N.O.:** The discrete input is analyzed as "enabled" by energizing the input (normally open). **N.C.:** The discrete input is analyzed as "enabled" by de-energizing the input (normally closed).
1200	**DI {x} Delay**	2	0.08 to 650.00 s	DI 01/04 0.20 s Other DIs 0.50 s	A delay time in seconds can be assigned to each alarm or control input. The discrete input must be enabled without interruption for the delay time before the unit reacts. If the discrete input is used within the *LogicsManager* this delay is taken into account as well.
1202	**DI {x} Alarm class**	2	Class A / Class B / Class C / Class D / Class E / Class F / Control	Control	An alarm class may be assigned to the discrete input. The alarm class is executed when the discrete input is enabled. If "control" has been configured, there will be no entry in the event history and a function out of the *LogicsManager* (description at page 195) can be assigned to the discrete input. ***NOTE:*** *See chapter "Alarm Classes" on page 194.*
1203	**DI {x} Monitoring lockable**	2	Yes / No	No	**Yes:** Monitoring for fault conditions is only performed if Lock Monitoring Status 24.40 is false. **No:** Monitoring for this fault condition is continuously enabled regardless of Lock Monitoring Status 24.40.
1204	**DI {x} Self acknowledge**	2	Yes / No	No	**Yes:** The control automatically clears the alarm if the fault condition is no longer detected. **No:** The control does not automatically reset the alarm when the fault condition is no longer detected. The alarm must be acknowledged and reset by manually pressing the appropriate buttons or by activating the *LogicsManager* output "External acknowledgement" (via a discrete input or via an interface). If the DI is configured with the alarm class "Control", self acknowledgement is always active.

The preceding parameters are used to configure the discrete inputs 1 through 7. The parameter IDs refer to DI 1. Refer to Table 3-4 for the parameter IDs of the parameters DI 2 through DI 7.

	DI 2	DI 3	DI 4	DI 5	DI 6	DI 7
Text	1410	1420	1430	1440	1450	1460
Operation	1221	1241	1261	1281	1301	1321
Delay	1220	1240	1260	1280	1300	1320
Alarm class	1222	1242	1262	1282	1302	1322
Monitoring lockable	1223	1243	1263	1283	1303	1323
Self acknowledged	1224	1244	1264	1284	1304	1324

Table 3-4: Discrete inputs - parameter IDs

NOTE

DI 8 is always used for the circuit breaker replies and cannot be configured.

Discrete Outputs Configuration (*LogicsManager*)

The discrete outputs are controlled via the *LogicsManager*.

⇨ **Please note the description of the *LogicsManager* starting on page 195.**

Relay Number	Term.	
Internal relay outputs		
[R1]	30/31	*LogicsManager*; combinated with 'Ready for operation OFF'
[R2]	32/33	*LogicsManager*; pre-assigned with 'Centralized alarm (horn)'
[R3]	34/35	*LogicsManager*; pre-assigned with 'System B not OK'
[R4]	36/37	*LogicsManager*; pre-assigned with 'System A not OK'
[R5]	38/39/40	Fixed to 'Open CBA'
[R6]	41/42	Fixed to 'Close CBA' if CBA is controlled by 2 relays otherwise *LogicsManager* pre-assigned with 'All Alarm classes'

Table 3-5: Relay outputs - assignment

ID	Parameter	CL	Setting range	Default	Description
12580	**Ready for op. Off**	2	*LogicsManager*	-	The "Ready for operation OFF" relay is energized by default if the power supply exceeds 8 V. Once the conditions of the *LogicsManager* have been fulfilled, the relay will be de-energized. This *LogicsManager* output may be configured with additional conditions, which may signal a PLC an "out of operation" condition by de-energizing the relay on terminals 30/31, like "alarm D" or no "AUTO mode" present. The *LogicsManager* and its default settings are explained on page 195 in Appendix C: "LogicsManager". ***CAUTION:*** *The discrete output "Ready for operation OFF" must be wired in series with an emergency function. We recommend to signal this fault independently from the unit if the availability of the plant is important.*
12110	**Relay {x}**	2	*LogicsManager*	-	Once the conditions of the *LogicsManager* have been fulfilled, the relay will be energized. The *LogicsManager* and its default settings are explained on page 195 in Appendix C: "LogicsManager".

Above parameter ID 12110 refers to Relay 2. Refer to Table 3-6 for the parameter IDs of the parameters for Relay 3 to Relay 6.

	R 1	R 2	R 3	R 4	R 5	R 6
Parameter ID	12580	12110	12310	12320	12130	12140

Table 3-6: Discrete outputs - parameter IDs

Automatic Run Configuration

ID	Parameter	CL	Setting range	Default	Description
8827	**Startup in mode**	2	AUTO / MAN / Last	AUTO	If the controller is powered down, the unit will start in the following configured mode when it is powered up again. **AUTO:** The unit starts in the AUTOMATIC operating mode. **MAN**: The unit starts in the MANUAL operating mode. **Last:** The unit starts in the last operating mode the control was in prior to being de-energized. ***NOTE:*** *No access in the application modes L-MCB A03 and L-GGB A04.*
12510	**Operat. mode AUTO**	2	*LogicsManager*	-	Once the conditions of the *LogicsManager* have been fulfilled the unit will change into operating mode AUTOMATIC. If AUTOMATIC mode is selected via the *LogicsManager* it is not possible to change operating modes via the front panel. The *LogicsManager* and its default settings are explained on page 195 in Appendix C: "*LogicsManager*". ***NOTE:*** *No access in the application modes L-MCB A03 and L-GGB A04.*
12520	**Operat. mode MAN**	2	*LogicsManager*	-	Once the conditions of the *LogicsManager* have been fulfilled the unit will change into operating mode MANUAL. If MANUAL mode is selected via the *LogicsManager* it is not possible to change operating modes via the front panel. The *LogicsManager* and its default settings are explained on page 195 in Appendix C: "*LogicsManager*". ***NOTE:*** *No access in the application modes L-MCB A03 and L-GGB A04.*

Monitoring Configuration

System A

ID	Parameter	CL	Setting range	Default	Description
1771	**SyA. voltage monitoring**	2	Phase - phase / Phase - neutral	Phase - phase	The unit can either monitor the wye voltages (phase-neutral) or the delta voltages (phase-phase). The monitoring of the wye voltage is above all necessary to avoid earth-faults in a compensated or isolated network resulting in the tripping of the voltage protection. **Phase – phase:** The phase-phase voltage will be measured and all subsequent parameters concerning voltage monitoring "System A" are referred to this value (VL-L). **Phase – neutral:** The phase-neutral voltage will be measured and all subsequent parameters concerning voltage monitoring "System A" are referred to this value (VL-N). ***WARNING:*** *This parameter influences the protective functions.*
2801	**Mains settling time**	2	0 to 9999 s	20 s	To end the emergency operation, the monitored mains must be within the configured operating parameters without interruption for the minimum period of time set with this parameter without interruption. This parameter permits delaying the switching of the load from the generator to the mains. The display indicates "`Mains settling`" during this time.

Operating Voltage / Frequency

ID	Parameter	CL	Setting range	Default	Description
5810	**Upper voltage limit**	2	100 to 150 %	110 %	The maximum permissible positive deviation of the system A voltage from the system A rated voltage (parameter 1768 on page 99) is configured here. This value may be used as a voltage limit switch. The conditional state of this switch may be used as a command variable for the *LogicsManager* (02.09).
5814	**Hysteresis upper volt. limit**	2	0 to 50 %	2 %	If the system A voltage has exceeded the limit configured in parameter 5810, the voltage must fall below the limit and the value configured here, to be considered as being within the operating limits again.
5811	**Lower voltage limit**	2	50 to 100 %	90 %	The maximum permissible negative deviation of the system A voltage from the system A rated voltage (parameter 1768 on page 99) is configured here. This value may be used as a voltage limit switch. The conditional state of this switch may be used as a command variable for the *LogicsManager* (02.09).
5815	**Hysteresis lower volt. limit**	2	0 to 50 %	2 %	If the system A voltage has fallen below the limit configured in parameter 5811, the voltage must exceed the limit and the value configured here, to be considered as being within the operating limits again.
5812	**Upper frequency limit**	2	100 to 150 %	110 %	The maximum permissible positive deviation of the system A frequency from the rated system frequency (parameter 1750 on page 99) is configured here. This value may be used as a frequency limit switch. The conditional state of this switch may be used as a command variable for the *LogicsManager* (02.10).
5816	**Hysteresis upper freq. limit**	2	0 to 50 %	0.5 %	If the system A frequency has exceeded the limit configured in parameter 5812, the frequency must fall below the limit and the value configured here, to be considered as being within the operating limits again.
5813	**Lower frequency limit**	2	0 to 100 %	90 %	The maximum permissible negative deviation of the system A frequency from the rated system frequency (parameter 1750 on page 99) is configured here. This value may be used as a frequency limit switch. The conditional state of this switch may be used as a command variable for the *LogicsManager* (02.10).

ID	Parameter	CL	Setting range	Default	Description
5817	**Hysteresis lower freq. limit**	2	0 to 50 %	0.5 %	If the system A frequency has fallen below the limit configured in parameter 5813, the frequency must exceed the limit and the value configured here, to be considered as being within the operating limits again.

Example:
If the system A rated voltage is 400 V, the upper voltage limit is 110 % (of the system A rated voltage, i.e. 440 V), and the hysteresis for the upper voltage limit is 5 % (of the mains rated voltage, i.e. 20 V), the system A voltage will be considered as being out of the operating limits as soon as it exceeds 440 V and will be considered as being within the operating limits again as soon as it falls below 420 V (440 V – 20 V).
If the rated system frequency is 50 Hz, the lower frequency limit is 90 % (of the rated system frequency, i.e. 45 Hz), and the hysteresis for the lower frequency limit is 5 % (of the rated system frequency, i.e. 2.5 Hz), the mains frequency will be considered as being out of the operating limits as soon as it falls below 45 Hz and will be considered as being within the operating limits again as soon as it exceeds 47.5 Hz (45 Hz + 2.5 Hz).

NOTE

If system A is configured and wired for mains, the system A operating voltage/frequency parameters can be used to trigger mains failure conditions and activate an emergency run. The system A values must be within these ranges to synchronize the CBA. It is recommended to configure the operating limits within the monitoring limits.

System A (SyA.) Decoupling

The system A decoupling function is intended for use in a mains parallel operation and monitors a series of subordinate mains protection thresholds. If a threshold is exceeded, the LS5 initiates a breaker opening and separates the system B from the mains at the defined breaker.
The following thresholds are monitored:

- Overfrequency level 1 (refer to page 80 for detailed information)
- Overfrequency level 2 (refer to page 80 for detailed information)
- Underfrequency level 1 (refer to page 81 for detailed information)
- Underfrequency level 2 (refer to page 81 for detailed information)
- Overvoltage level 1 if parameterized for decoupling (refer to page 82 for detailed information)
- Overvoltage level 2 (refer to page 82 for detailed information)
- Undervoltage level 1 if parameterized (refer to page 83 for detailed information)
- Undervoltage level 2 (refer to page 83 for detailed information)
- Phase shift or df/dt (refer to page 84 for detailed information)
- Voltage increase if parameterized for decoupling

If one of these protective functions is triggered, the display indicates **"SyA. decoupling"** (the logical command variable "07.25" will be enabled) and the active level 2 alarm.

ID	Parameter	CL	Setting range	Default	Description
12942	**Enable SyA dec.**	2	*LogicsManager*	-	If *LogicsManager* 24.31 is true, decoupling is “On”.
3058	**Change of frequency**	2	Off / Ph. Shift / df/dt	Ph. shift	**Off:** Change of frequency is not monitored. **Ph. Shift:** Change of frequency is monitored on phase shift. **df/dt (ROCOF):** Change of frequency is monitored on df/dt.
3111	**Alarm class**	2	Class A / Class B / Class C / Class D / Class E / Class F	Class B	Each limit may be assigned an independent alarm class that specifies what action should be taken when the limit is surpassed. ***NOTE:*** *See chapter "Alarm Classes" on page 194.*
3112	**Self acknowledge**	2	Yes / No	No	**Yes:** The control automatically clears the alarm if the fault condition is no longer detected. **No:** The control does not automatically reset the alarm when the fault condition is no longer detected. The alarm must be acknowledged and reset by manually pressing the appropriate buttons or by activating the *LogicsManager* output "External acknowledgement" (via a discrete input or via an interface).

NOTE

The decoupling function is optimized on the relay output "CBA open". In case of using a free relay output in conjunction with the command variable 07.25 an additional delay time of up to 20ms is to consider.

Overfrequency (Levels 1 & 2) ANSI# 81O

There are two overfrequency alarm levels available in the control. Both alarms are definite time alarms and are illustrated in the figure below. The figure diagrams a frequency trend and the associated pickup times and length of the alarms. Monitoring of the frequency is accomplished in two steps.
If this protective function is triggered, the display indicates "**SyA. overfreq. 1**" or "**SyA. overfreq. 2**" and the logical command variable "07.06" or "07.07" will be enabled.

ID	Parameter	CL	Setting range	Default	Description
2850 2856	**Monitoring** (Limit 1 / Limit 2)	2	On / Off	On	**On:** Overfrequency monitoring is carried out according to the following parameters. Monitoring is performed at two levels. Both values may be configured independent from each other (prerequisite: limit 1 < Level 2 limit). **Off:** Monitoring is disabled for limit 1 and/or Level 2 limit.
2854 2860	**Limit** (Limit 1 / Limit 2)	2	100.0 to 140.0 %	100.4 % 102.0 %	The percentage values that are to be monitored for each threshold limit are defined here. If this value is reached or exceeded for at least the delay time without interruption, the action specified by the alarm class is initiated. ***NOTE:*** *This value refers to the System rated frequency (parameter 1750 on page 99).*
2855 2861	**Delay** (Limit 1 / Limit 2)	2	0.02 to 99.99 s	0.06 s	If the monitored system A frequency value exceeds the threshold value for the delay time configured here, an alarm will be issued. If the monitored mains frequency falls below the threshold (minus the hysteresis) before the delay expires the time will be reset.
2851 2857	**Alarm Class** (Limit 1 / Limit 2)	2	Class A / Class B / Class C / Class D / Class E / Class F	Class A Class B	Each limit may be assigned an independent alarm class that specifies what action should be taken when the limit is surpassed. ***NOTE:*** *See chapter "Alarm Classes" on page 194.*
2852 2858	**Self acknowledge** (Limit 1 / Limit 2)	2	Yes / No	Yes	**Yes:** The control automatically clears the alarm if the fault condition is no longer detected. **No:** The control does not automatically reset the alarm when the fault condition is no longer detected. The alarm must be acknowledged and reset by manually pressing the appropriate buttons or by activating the *LogicsManager* output "External acknowledgement" (via a discrete input or via an interface).
2853 2859	**Monitoring lockable** (Limit 1 / Limit 2)	2	Yes / No	No	**Yes:** Monitoring for fault conditions is only performed if Lock Monitoring Status 24.40 is false. **No:** Monitoring for this fault condition is continuously enabled regardless of Lock Monitoring Status 24.40.

NOTE

The system A overfrequency Level 2 limit configuration parameters are located below the SyA. decoupling function menu on the display.

Underfrequency (Levels 1 & 2) ANSI# 81U

There are two underfrequency alarm levels available in the control. Both alarms are definite time alarms and are illustrated in the figure below. The figure diagrams a frequency trend and the associated pickup times and length of the alarms. Monitoring of the frequency is performed in two steps.
If this protective function is triggered, the display indicates "**SyA. underfreq. 1**" or "**SyA. underfreq. 2**" and the logical command variable "07.08" or "07.09" will be enabled.

ID	Parameter	CL	Setting range	Default	Description
2900 2906	**Monitoring** (Limit 1 / Limit 2)	2	On / Off	On	**On:** Underfrequency monitoring is carried out according to the following parameters. Monitoring is performed at two levels. Both values may be configured independent from each other (prerequisite: Level 1 > Level 2). **Off:** Monitoring is disabled for limit 1 and/or Level 2 limit.
2904 2910	**Limit** (Limit 1 / Limit 2)	2	50.0 to 140.0 %	99.6 % 98.0 %	The percentage values that are to be monitored for each threshold limit are defined here. If this value is reached or exceeded for at least the delay time without interruption, the action specified by the alarm class is initiated. ***NOTE:*** *This value refers to the System rated frequency (parameter 1750 on page 99).*
2905 2911	**Delay** (Limit 1 / Limit 2)	2	0.02 to 99.99 s	1.50 s 0.06 s	If the monitored system A frequency value exceeds the threshold value for the delay time configured here, an alarm will be issued. If the monitored system A frequency falls below the threshold (minus the hysteresis) before the delay expires the time will be reset.
2901 2907	**Alarm Class** (Limit 1 / Limit 2)	2	Class A / Class B / Class C / Class D / Class E / Class F	Class A Class B	Each limit may be assigned an independent alarm class that specifies what action should be taken when the limit is surpassed. ***NOTE:*** *See chapter "Alarm Classes" on page 194.*
2902 2908	**Self acknowledge** (Limit 1 / Limit 2)	2	Yes / No	Yes	**Yes:** The control automatically clears the alarm if the fault condition is no longer detected. **No:** The control does not automatically reset the alarm when the fault condition is no longer detected. The alarm must be acknowledged and reset by manually pressing the appropriate buttons or by activating the *LogicsManager* output "External acknowledgement" (via a discrete input or via an interface).
2903 2909	**Monitoring lockable** (Limit 1 / Limit 2)	2	Yes / No	No	**Yes:** Monitoring for fault conditions is only performed if Lock Monitoring Status 24.40 is false. **No:** Monitoring for this fault condition is continuously enabled regardless of Lock Monitoring Status 24.40.

NOTE

The system A underfrequency Level 2 limit configuration parameters are located below the SyA. decoupling function menu on the display.

Overvoltage (Levels 1 & 2) ANSI# 59

Voltage is monitored depending on parameter "System A voltage measuring" (parameter 1851 on page 100). There are two overvoltage alarm levels available in the control. Both alarms are definite time alarms and are illustrated in the figure below. The figure diagrams a frequency trend and the associated pickup times and length of the alarms. Monitoring of the voltage is done in two steps.
If this protective function is triggered, the display indicates "**SyA. overvoltage 1**" or "**SyA. overvoltage 2**" and the logical command variable "07.10" or "07.11" will be enabled.

ID	Parameter	CL	Setting range	Default	Description
2950 2956	**Monitoring** (Limit 1 / Limit 2)	2	On / Off	On	**On:** Overvoltage monitoring is carried out according to the following parameters. Monitoring is performed at two levels. Both values may be configured independent from each other (prerequisite: limit 1 < Level 2 limit). **Off:** Monitoring is disabled for limit 1 and/or Level 2 limit.
2954 2960	**Limit** (Limit 1 / Limit 2)	2	50.0 to 130.0 %	108.0 % 110.0 %	The percentage values that are to be monitored for each threshold limit are defined here. If this value is reached or exceeded for at least the delay time without interruption, the action specified by the alarm class is initiated. ***NOTE:*** *This value refers to the System A rated voltage (parameter 1766 on page 99).*
2955 2961	**Delay** (Limit 1 / Limit 2)	2	0.02 to 99.99 s	1.50 s 0.06 s	If the monitored system A voltage exceeds the threshold value for the delay time configured here, an alarm will be issued. If the monitored mains voltage falls below the threshold (minus the hysteresis) before the delay expires the time will be reset.
2951 2957	**Alarm Class** (Limit 1 / Limit 2)	2	Class A / Class B / Class C / Class D / Class E / Class F	Class B	Each limit may be assigned an independent alarm class that specifies what action should be taken when the limit is surpassed. ***NOTE:*** *See chapter "Alarm Classes" on page 194.*
2952 2958	**Self acknowledge** (Limit 1 / Limit 2)	2	Yes / No	Yes	**Yes:** The control automatically clears the alarm if the fault condition is no longer detected. **No:** The control does not automatically reset the alarm when the fault condition is no longer detected. The alarm must be acknowledged and reset by manually pressing the appropriate buttons or by activating the *LogicsManager* output "External acknowledgement" (via a discrete input or via an interface).
2953 2959	**Monitoring lockable** (Limit 1 / Limit 2)	2	Yes / No	No	**Yes:** Monitoring for fault conditions is only performed if Lock Monitoring Status 24.40 is false. **No:** Monitoring for this fault condition is continuously enabled regardless of Lock Monitoring Status 24.40.
8845	**SyA. decoupling**	2	On / Off	Off	**System A decoupling by overvoltage level 1** **On:** Tripping of system A overvoltage level 1 causes decoupling **Off:** Tripping of system A overvoltage level 1 don't causes decoupling.

NOTE

The system A overvoltage Level 2 limit configuration parameters are located below the SyA. decoupling function menu on the display.

Undervoltage (Levels 1 & 2) ANSI# 27

Voltage is monitored depending on parameter "System A voltage measuring" (parameter 1851 on page 100). There are two undervoltage alarm levels available in the control. Both alarms are definite time alarms and are illustrated in the figure below. The figure diagrams a frequency trend and the associated pickup times and length of the alarms. Monitoring of the voltage is done in two steps.
If this protective function is triggered, the display indicates "**SyA. undervoltage 1**" or "**SyA. undervoltage 2**" and the logical command variable "07.12" or "07.13" will be enabled.

ID	Parameter	CL	Setting range	Default	Description
3000 3006	**Monitoring** (Limit 1 / Limit 2)	2	On / Off	On	**On:** Undervoltage monitoring is carried out according to the following parameters. Monitoring is performed at two levels. Both values may be con¬figured independent from each other (prerequisite: Level 1 limit < Level 2 limit). **Off:** Monitoring is disabled for Level 1 limit and/or Level 2 limit.
3004 3010	**Limit** (Limit 1 / Limit 2)	2	50.0 to 130.0 %	92.0 % 90.0 %	The percentage values that are to be monitored for each threshold limit are defined here. If this value is reached or fallen below for at least the delay time without interruption, the action specified by the alarm class is initiated. ***NOTE:*** *This value refers to the System A rated voltage (parameter 1766 on page 99).*
3005 3011	**Delay** (Limit 1 / Limit 2)	2	0.02 to 99.99 s	1.50 s 0.06 s	If the monitored system A voltage falls below the threshold value for the delay time configured here, an alarm will be issued. If the monitored mains voltage exceeds the threshold (plus the hysteresis) again before the delay expires the time will be reset.
3001 3007	**Alarm Class** (Limit 1 / Limit 2)	2	Class A / Class B / Class C / Class D / Class E / Class F	Class A Class B	Each limit may be assigned an independent alarm class that specifies what action should be taken when the limit is surpassed. ***NOTE:*** *See chapter "Alarm Classes" on page 194.*
3002 3008	**Self acknowledge** (Limit 1 / Limit 2)	2	Yes / No	Yes	**Yes:** The control automatically clears the alarm if the fault condition is no longer detected. **No:** The control does not automatically reset the alarm when the fault condition is no longer detected. The alarm must be acknowledged and reset by manually pressing the appropriate buttons or by activating the *LogicsManager* output "External acknowledgement" (via a discrete input or via an interface).
3003 3009	**Monitoring lockable** (Limit 1 / Limit 2)	2	Yes / No	No	**Yes:** Monitoring for fault conditions is only performed if Lock Monitoring Status 24.40 is false. **No:** Monitoring for this fault condition is continuously enabled regardless of Lock Monitoring Status 24.40.
8844	**SyA. decoupling**	2	On / Off	Off	**System A decoupling by undervoltage level 1** **On:** Tripping of system A undervoltage level 1 causes decoupling. **Off:** Tripping of system A undervoltage level 1 don't causes decoupling.

NOTE

The System A undervoltage Level 2 limit configuration parameters are located below the SyA. decoupling function menu on the display.

Phase Shift

A vector/phase shift is defined as the sudden variation of the voltage curve which may be caused by a major generator load change. It usually occurs, if the utility opens the MCB, which causes a load change for the genset.

The LS-5 measures the duration of a cycle, where a new measurement is started with each voltage passing through zero. The measured cycle duration will be compared with an internal quartz-calibrated reference time to determine the cycle duration difference of the voltage signal. A vector/phase shift as shown in Figure 3-4 causes a premature or delayed zero passage. The determined cycle duration difference corresponds with the occurring phase shift angle.

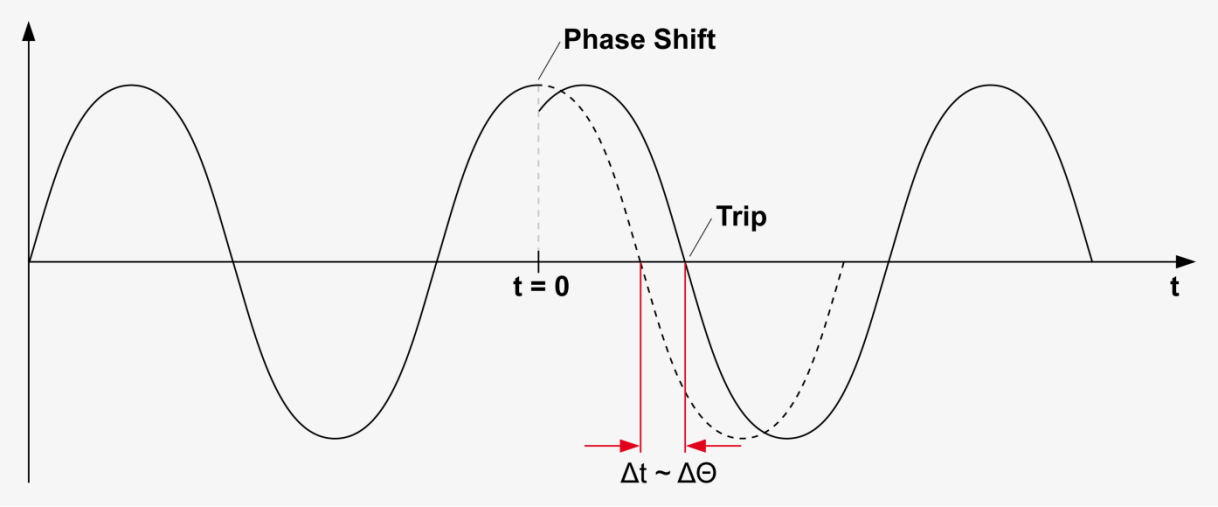


Figure 3-4: Monitoring - phase shift

The monitoring may be carried out three-phased or one/three-phased. Different limits may be configured for one-phase and three-phase monitoring. The vector/phase shift monitor can also be used as an additional method to decouple from the mains. Vector/phase shift monitoring is only enabled after the monitored voltage exceeds 50% of the PT secondary rated voltage.

Function: "Voltage cycle duration not within the permissible range" - The voltage cycle duration exceeds the configured limit value for the phase/vector shift. The result is, that the power circuit breaker that disconnects from the mains, is opened, the message "**`SyA. phase shift`**" is displayed, and the logical command variable "07.14" is enabled.

ID	Parameter	CL	Setting range	Default	Description
3053	**Monitoring**	2	1/3-phase / 3-phase	1/3-phase	**1/3-phase:** During single-phase voltage phase/vector shift monitoring, tripping occurs if the phase/vector shift exceeds the configured threshold value (parameter 3054) in at least one of the three phases. Note: If a phase/vector shift occurs in one or two phases, the single-phase threshold value (parameter 3054) is taken into consideration; if a phase/vector shift occurs in all three phases, the three-phase threshold value (parameter 3055) is taken into consideration. Single phase monitoring is very sensitive and may lead to nuisance tripping if the selected phase angle settings are too small. **3-phase:** During three-phase voltage phase/vector shift monitoring, tripping occurs only if the phase/vector shift exceeds the specified threshold value (parameter 3055) in all three phases within 2 cycles.
3054	**Limit 1-phase**	2	3 to 30 °	20 °	If the electrical angle of the system A voltage shifts more than this configured value in any single phase, an alarm with the class configured in parameter 3051 is initiated. The decoupling procedure will open the CBA.

ID	Parameter	CL	Setting range	Default	Description
3055	**Limit 3-phase**	2	3 to 30 °	8 °	If the electrical angle of the system A voltage shifts more than this configured value in all three phases, an alarm with the class configured in parameter 3051 is initiated. The decoupling procedure will open the CBA.
3051	**Alarm class**	2	Class A / Class B / Class C / Class D / Class E / Class F	Class B	Each limit may be assigned an independent alarm class that specifies what action should be taken when the limit is surpassed. ***NOTE:*** *See chapter "Alarm Classes" on page 194.*
3052	**Self acknowledge**	2	Yes / No	Yes	**Yes:** The control automatically clears the alarm if the fault condition is no longer detected. **No:** The control does not automatically reset the alarm when the fault condition is no longer detected. The alarm must be acknowledged and reset by manually pressing the appropriate buttons or by activating the *LogicsManager* output "External acknowledgement" (via a discrete input or via an interface).
3056	**Monitoring lockable**	2	Yes / No	No	**Yes:** Monitoring for fault conditions is only performed if Lock Monitoring Status 24.40 is false. **No:** Monitoring for this fault condition is continuously enabled regardless of Lock Monitoring Status 24.40.

NOTE

The system A. phase shift configuration parameters are located below the system A decoupling function menu on the display.

Df/Dt (ROCOF) ANSI# 81RL

Function: "df/dt (ROCOF = Rate Of Change Of Frequency) is not within permissible limits" df/dt (ROCOF) monitoring measures the stability of the frequency. The frequency of a source will vary due to changing loads and other effects. The rate of these frequency changes due to the load variances is relatively high compared to those of a large network. The control unit calculates the unit of measure per unit of time. The df/dt is measured over 4 sine waves to ensure that it is differentiated from a phase shift. This results in a minimum response time of approximately 100ms (at 50 Hz).

ID	Parameter	CL	Setting range	Default	Description
3104	**Limit**	2	0.1 to 9.9 Hz/s	2.6 Hz/s	The df/dt threshold is defined here. If this value is reached or exceeded for at least the delay time without interruption, an alarm with the class configured in parameter 3105 is initiated. The decoupling procedure will open the CBA.
3105	**Delay**	2	0.10 to 2.00 s	0.10 s	If the monitored rate of df/dt exceeds the threshold value for the delay time configured here, an alarm will be issued. If the monitored df/dt exceeds the threshold (plus the hysteresis) again before the delay expires the time will be reset.
3101	**Alarm class**	2	Class A / Class B / Class C / Class D / Class E / Class F	Class B	Each limit may be assigned an independent alarm class that specifies what action should be taken when the limit is surpassed. ***NOTE:*** *See chapter "Alarm Classes" on page 194.*
3102	**Self acknowledge**	2	Yes / No	No	**Yes:** The control automatically clears the alarm if the fault condition is no longer detected. **No:** The control does not automatically reset the alarm when the fault condition is no longer detected. The alarm must be acknowledged and reset by manually pressing the appropriate buttons or by activating the *LogicsManager* output "External acknowledgement" (via a discrete input or via an interface).
3103	**Monitoring lockable**	2	Yes / No	No	**Yes:** Monitoring for fault conditions is only performed if Lock Monitoring Status 24.40 is false. **No:** Monitoring for this fault condition is continuously enabled regardless of Lock Monitoring Status 24.40.

System A (SyA.) Phase Rotation

CAUTION

Please ensure during installation that all voltages applied to this unit are wired correctly to both sides of the circuit breaker. Failure to do so may result in damage to the control unit and/or generation equipment due to closing the breaker asynchronous or with mismatched phase rotations and phase rotation monitoring enabled at all connected components (generator, breakers, cable, busbars, etc.).

This function may block a connection of systems with wrong phases systems only under the following conditions:

- **The voltages being measured are wired correctly with respect to the phase rotation at the measuring points (i.e. the voltage transformer in front and behind the circuit breaker).**
- **The measuring voltages are wired without angular phase shift or interruption from the measuring point to the control unit.**
- **The measuring voltages are wired to the correct terminals of the control unit.**
- **The configured alarm class is of class C or D (breaker relevant alarm).**

Correct phase rotation of the phase voltages ensures that damage will not occur during a breaker closure. The voltage phase rotation alarm checks the phase rotation of the voltages and the configured phase rotation to ensure they are identical. The directions of rotation are differentiated as "clockwise" and "counter clockwise". With a clockwise field the direction of rotation is "L1-L2-L3"; with a counter clockwise field the direction of rotation is "L1-L3-L2". If the control is configured for a clockwise rotation and the voltages into the unit are calculated as counterclockwise the alarm will be initiated. The direction of configured rotation being monitored by the control unit is displayed on the screen.
If this protective function is triggered, the display indicates "**`SyA.phase rotation`**" and the logical command variable "07.05" will be enabled.

NOTE

This monitoring function is only enabled if system A voltage measuring (parameter 1853) is configured to "3Ph 4W" or "3Ph 3W" and the measured voltage exceeds 50 % of the rated voltage (parameter 1768) or if Mains voltage measuring (parameter 1853) is configured to "1Ph 2W" (in this case, the phase rotation is not evaluated, but defined by the 1Ph2W phase rotation (parameter 1859)).

ID	Parameter	CL	Setting range	Default	Description
3970	**Monitoring**	2	On / Off	On	**On:** Phase rotation monitoring is carried out according to the following parameters. **Off:** No monitoring is carried out.
3974	**SyA. Phase rotation**	2	CW / CCW	CW	**CW:** The three-phase measured mains voltage is rotating CW (clock-wise; that means the voltage rotates in L1-L2-L3 direction; standard setting). **CCW:** The three-phase measured mains voltage is rotating CCW (counter clock-wise; that means the voltage rotates in L1-L3-L2 direction).
3971	**Alarm class**	2	Class A / Class B / Class C / Class D / Class E / Class F	Class B	Each limit may be assigned an independent alarm class that specifies what action should be taken when the limit is surpassed. ***NOTE:*** *See chapter "Alarm Classes" on page 194.*
3972	**Self acknowledge**	2	Yes / No	No	**Yes:** The control automatically clears the alarm if the fault condition is no longer detected. **No:** The control does not automatically reset the alarm when the fault condition is no longer detected. The alarm must be acknowledged and reset by manually pressing the appropriate buttons or by activating the *LogicsManager* output "External acknowledgement" (via a discrete input or via an interface).
3973	**Monitoring lockable**	2	Yes / No	No	**Yes:** Monitoring for fault conditions is only performed if Lock Monitoring Status 24.40 is false. **No:** Monitoring for this fault condition is continuously enabled regardless of Lock Monitoring Status 24.40.

System A (SyA.) Voltage Asymmetry

Voltage asymmetry is determined by calculating the negative sequence component of a three phase system. This value is derived from the three delta voltages. The threshold is defined as the percentage of that value relative to the nominal delta voltage. The protective function is triggered if this percentage value is exceeded. If this protective function is triggered, the display indicates "**`SyA. volt. asymmetry`**" and the logical command variable "06.18" will be enabled.

NOTE

This monitoring function is only enabled if Generator voltage measuring (parameter 1851) is configured to "3Ph 4W" or "3Ph 3W".

ID	Parameter	CL	Setting range	Default	Description
3921	**Monitoring**	2	On / Off	On	**On:** Voltage asymmetry monitoring is carried out according to the following parameters. **Off:** No monitoring is carried out.
3924	**Limit**	2	0.5 to 99.9 %	10.0 %	The percentage values that are to be monitored for each threshold limit are defined here. If this value is reached or exceeded for at least the delay time without interruption, the action specified by the alarm class is initiated. ***NOTE:*** *This value refers to system A rated voltage (parameter 1766 on page 99).*
3925	**Delay**	2	00.02 to 99.99 s	05.00 s	If the monitored system A voltage asymmetry exceeds the threshold value for the delay time configured here, an alarm will be issued. If the monitored system A voltage asymmetry falls below the threshold (minus the hysteresis) before the delay expires the time will be reset.
3922	**Alarm class**	2	Class A / Class B / Class C / Class D / Class E / Class F / Control	Class B	Each limit may be assigned an independent alarm class that specifies what action should be taken when the limit is surpassed. ***NOTE:*** *See chapter "Alarm Classes" on page 194.*
3923	**Self acknowledge**	2	Yes / No	Yes	**Yes:** The control automatically clears the alarm if the fault condition is no longer detected. **No:** The control does not automatically reset the alarm when the fault condition is no longer detected. The alarm must be acknowledged and reset by manually pressing the appropriate buttons or by activating the *LogicsManager* output "External acknowledgement" (via a discrete input or via an interface).
3926	**Monitoring lockable**	2	On / Off	On	**Yes:** Monitoring for fault conditions is only performed if Lock Monitoring Status 24.40 is false. **No:** Monitoring for this fault condition is continuously enabled regardless of Lock Monitoring Status 24.40.

System A (SyA.) Voltage Increase

This function allows to monitor the quality of the voltage over a longer time period. It is realized as a filter. The function is only active if system A is in the operation window (voltage and frequency).

ID	Parameter	CL	Setting range	Default	Description
8806	**Monitoring**	2	On / Off	Off	**On:** Voltage increase monitoring is carried out according to the following parameters. **Off:** No monitoring is carried out.
8807	**Limit**	2	100 to 150 %	110 %	The percentage value (related to SyB rated voltage) that is to be monitored is defined here. If the voltage of at least one phase exceeds this value, an alarm “SyA. volt. Incr.” is tripped after a time T depending: • On the parameter Response Time (8839) and • The difference between this limit and the measured value. (the higher the difference, the faster the tripping.) ***NOTE:*** *This value refers to system A rated voltage (parameter 1766 on page 99).*
8808	**SyA decoupling volt. incr.**	2	Yes / No	No	**Yes:** Voltage increase monitoring does cause a decoupling. **No:** Voltage increase monitoring does not cause a decoupling.
8831	**Alarm class**	2	Class A / Class B / Class C / Class D / Class E / Class F / Control	Class B	Each limit may be assigned an independent alarm class that specifies what action should be taken when the limit is surpassed. ***NOTE:*** *See chapter "Alarm Classes" on page 194.*
8832	**Self acknowledge**	2	Yes / No	Yes	**Yes:** The control automatically clears the alarm if the fault condition is no longer detected. **No:** The control does not automatically reset the alarm when the fault condition is no longer detected. The alarm must be acknowledged and reset by manually pressing the appropriate buttons or by activating the *LogicsManager* output "External acknowledgement" (via a discrete input or via an interface).
8833	**Monitoring lockable**	2	Yes / No	No	**Yes:** Monitoring for fault conditions is only performed if Lock Monitoring Status 24.40 is false. **No:** Monitoring for this fault condition is continuously enabled regardless of Lock Monitoring Status 24.40.
8839	**Response time**	2	1 to 650 s	128 s	Configures the response time of the filter. The higher the time, the slower the tripping.

System B

ID	Parameter	CL	Setting range	Default	Description
1770	**SyB. Voltage monitoring**	2	Ph – Ph / Phase - N	Ph – Ph	The unit can either monitor the phase-neutral (wye) voltages or the phase-phase (delta) voltages. If the controller is used in a compensated or isolated network, voltage protection monitoring should be configured as phase-neutral to prevent earth-faults resulting in tripping of the voltage protections. **Ph – Ph (Phase – phase):** The phase-phase voltage will be measured and all subsequent parameters concerning voltage monitoring "generator" are referred to this value (V_{L-L}). **Phase – N (Phase – neutral):** The phase-neutral voltage will be measured and all subsequent parameters concerning voltage monitoring "System B" are referred to this value (V_{L-N}). ***WARNING:*** *This parameter defines how the protective functions operate.*

Operating Voltage / Frequency

ID	Parameter	CL	Setting range	Default	Description
5800	**Upper voltage limit**	2	100 to 150 %	110 %	The maximum permissible positive deviation of the system B voltage from the system B rated voltage (parameter 1768 on page 99) is configured here. This value may be used as a voltage limit switch. The conditional state of this switch may be used as a command variable for the *LogicsManager* (02.03).
5801	**Lower voltage limit**	2	50 to 100 %	90 %	The maximum permissible negative deviation of the system B voltage from the system B rated voltage (parameter 1768 on page 99) is configured here. This value may be used as a voltage limit switch. The conditional state of this switch may be used as a command variable for the *LogicsManager* (02.03).
5802	**Upper frequency limit**	2	100.0 to 150.0 %	105.0 %	The maximum permissible positive deviation of the system B frequency from the rated system frequency (parameter 1750 on page 99) is configured here. This value may be used as a frequency limit switch. The conditional state of this switch may be used as a command variable for the *LogicsManager* (02.04).
5803	**Lower frequency limit**	2	50.0 to 100.0 %	95.0 %	The maximum permissible negative deviation of the system B frequency from the rated system frequency (parameter 1750 on page 99) is configured here. This value may be used as a frequency limit switch. The conditional state of this switch may be used as a command variable for the *LogicsManager* (02.04).

NOTE

The operating voltage/frequency parameters are used to check if the values are in range when performing a dead bus closure and synchronization.

It is recommended to configure the operating limits within the monitoring limits.

System B (SyB.) Phase Rotation

CAUTION

Ensure that the control unit is properly connected to phase voltages on both sides of the circuit breaker(s) during installation. Failure to do so may result in damage to the control unit and/or generation equipment due to the breaker closing asynchronously or with mismatched phase rotations. Also ensure that phase rotation monitoring is enabled at all connected components (generator, breakers, cable, busbars, etc.).

This function will block a connection of systems with mismatched phases only under the following conditions:

- **The voltages being measured are wired correctly with respect to the phase rotation at the measuring points (i.e. the potential transformers in on both sides of the circuit breaker)**
- **The voltages being measured are wired so that angular phase shifts or any interruptions from the measuring point to the control unit do not exist**
- **The voltages being measured are wired to the correct terminals of the control.**
- **The configured alarm class is of class C or D (breaker relevant alarm).**

Correct phase rotation of the phase voltages ensures that damage will not occur during a breaker closure. The voltage phase rotation alarm checks the phase rotation of the measured voltages and the configured phase rotation to ensure they are identical. The directions of rotation are differentiated as "clockwise" and "counter clockwise". With a clockwise field the direction of rotation is "L1-L2-L3"; with a counter clockwise field the direction of rotation is "L1-L3-L2". If the control is configured for a clockwise rotation and the measured voltages are monitored as counterclockwise, the alarm will be initiated. The direction of configured rotation being monitored by the control unit is displayed on the screen.
If this protective function is triggered, the display indicates "**`SyB.phase rotation`**" and the logical command variable "06.21" will be enabled.

NOTE

This monitoring function is only enabled if system B voltage measuring (parameter 1851) is configured to "3Ph 4W" or "3Ph 3W" and the measured voltage exceeds 50 % of the rated voltage (parameter 1766) or if Generator voltage measuring (parameter 1851) is configured to "1Ph 2W" (in this case, the phase rotation is not evaluated, but defined by the 1Ph2W phase rotation (parameter 1859)).

ID	Parameter	CL	Setting range	Default	Description
3950	**Monitoring**	2	On / Off	Off	**On:** Phase rotation monitoring is carried out according to the following parameters. **Off:** No monitoring is carried out.
3954	**SyB phase rotation**	2	CW / CCW	CW	**CW:** The three-phase measured system B voltage is rotating CW (clock-wise; that means the voltage rotates in L1-L2-L3 direction; standard setting). **CCW:** The three-phase measured system B voltage is rotating CCW (counter clock-wise; that means the voltage rotates in L1-L3-L2 direction).
3951	**Alarm class**	2	Class A / Class B / Class C / Class D / Class E / Class F	Class F	Each limit may be assigned an independent alarm class that specifies what action should be taken when the limit is surpassed. ***NOTE:*** *See chapter "Alarm Classes" on page 194.*
3952	**Self acknowledge**	2	Yes / No	No	**Yes:** The control automatically clears the alarm if the fault condition is no longer detected. **No:** The control does not automatically reset the alarm when the fault condition is no longer detected. The alarm must be acknowledged and reset by manually pressing the appropriate buttons or by activating the *LogicsManager* output "External acknowledgement" (via a discrete input or via an interface).
3953	**Monitoring lockable**	2	Yes / No	No	**Yes:** Monitoring for fault conditions is only performed if Lock Monitoring Status 24.40 is false. **No:** Monitoring for this fault condition is continuously enabled regardless of Lock Monitoring Status 24.40.

Breakers

CBA

Circuit breaker monitoring contains two alarms: A breaker reclose alarm and a breaker open alarm.

Reclose Alarm: If the control initiates a close of the breaker and the breaker fails to close after the configured number of attempts the monitoring CBA alarm will be initiated.
(Refer to parameter "CBA maximum attempts of closure", parameter 3419 on page 92).
If this protective function is triggered, the display indicates "**`CBA fail to close`**" and the logical command variable "08.07" will be enabled.

Breaker Open Alarm: If the control is attempting to open the circuit breaker and it fails to see that the CBA is open within the configured time in seconds after issuing the breaker open command then the monitoring CBA alarm will be initiated.
(Refer to parameter "CBA open monitoring", parameter 3421 on page 92).
If this protective function is triggered, the display indicates "**`CBA fail to open`**" and the logical command variable "08.08" will be enabled.

ID	Parameter	CL	Setting range	Default	Description
2620	**CBA monitoring**	2	On / Off	On	**On:** Monitoring of the CBA is carried out according to the following parameters. **Off:** Monitoring is disabled.
2621	**CBA alarm class**	2	Class A / Class B	Class B	Each limit may be assigned an independent alarm class that specifies what action should be taken when the limit is surpassed. ***NOTE:*** *See chapter "Alarm Classes" on page 194.*
3419	**CBA maximum attempts of closure**	2	1 to 10	5	The maximum number of breaker closing attempts is configured in this parameter (relay output "Command: close CBA"). When the breaker reaches the configured number of attempts, an "`CBA fail to close`" alarm is issued. The counter for the closure attempts will be reset as soon as the "Reply CBA" is de-energized for at least 5 seconds to signal a closed CBA.
3421	**CBA open monitoring**	2	0.10 to 5.00 s	2.00 s	If the "Reply CBA" is not detected as energized once this timer expires, an "`CBA fail to open`" alarm is issued. This timer initiates as soon as the "open breaker" sequence begins. The alarm configured in parameter 2621 is issued.
2622	**CBA monitoring lockable**	2	Yes / No	No	**Yes:** Monitoring for fault conditions is only performed if Lock Monitoring Status 24.40 is false. **No:** Monitoring for this fault condition is continuously enabled regardless of Lock Monitoring Status 24.40.

Synchronization CBA

ID	Parameter	CL	Setting range	Default	Description
3070	**Monitoring**	2	On / Off	On	**On:** Monitoring of the CBA synchronization is carried out according to the following parameters. **Off:** Monitoring is disabled.
3073	**Delay**	2	3 to 999 s	60 s	If it was not possible to synchronize the CBA within the time configured here, an alarm will be issued. The message "`CBA syn. timeout`" is issued and the logical command variable "08.31" will be enabled.
3071	**Alarm class**	2	Class A / Class B / Class C / Class D / Class E / Class F	Class B	Each limit may be assigned an independent alarm class that specifies what action should be taken when the limit is surpassed. ***NOTE:*** *See chapter "Alarm Classes" on page 194.*
3072	**Self acknowledge**	2	Yes / No	No	**Yes:** The control automatically clears the alarm if the fault condition is no longer detected. **No:** The control does not automatically reset the alarm when the fault condition is no longer detected. The alarm must be acknowledged and reset by manually pressing the appropriate buttons or by activating the *LogicsManager* output "External acknowledgement" (via a discrete input or via an interface).
3075	**Monitoring lockable**	2	Yes / No	No	**Yes:** Monitoring for fault conditions is only performed if Lock Monitoring Status 24.40 is false. **No:** Monitoring for this fault condition is continuously enabled regardless of Lock Monitoring Status 24.40.

CBA Unload Mismatch

ID	Parameter	CL	Setting range	Default	Description
8819	**Unload trip level CBA**	2	0.5 to 99.9 %	3.0 %	This value refers to the System A rated active power (parameter 1752 on page 99. If the monitored power of system A falls below this value, a "CBA open" command will be issued.
8835	**Delay**	2	1 to 999 s	30 s	If the monitored System A power does not fall below the limit configured in parameter 8819 before the time configured here expires, a "CBA open" command will be issued together with an alarm “CBA unload mismatch” and the logical command variable "08.36" will be enabled.
8836	**Alarm class**	2	Class A / Class B / Class C / Class D / Class E / Class F / Control	Class B	Each limit may be assigned an independent alarm class that specifies what action should be taken when the limit is surpassed. ***NOTE:*** *See chapter "Alarm Classes" on page 194.*
8837	**Self acknowledge**	2	Yes / No	No	**Yes:** The control automatically clears the alarm if the fault condition is no longer detected. **No:** The control does not automatically reset the alarm when the fault condition is no longer detected. The alarm must be acknowledged and reset by manually pressing the appropriate buttons or by activating the *LogicsManager* output "External acknowledgement" (via a discrete input or via an interface).
8846	**Monitoring lockable**	2	Yes / No	No	**Yes:** Monitoring for fault conditions is only performed if Lock Monitoring Status 24.40 is false. **No:** Monitoring for this fault condition is continuously enabled regardless of Lock Monitoring Status 24.40.

System A (SyA.) / System B (SyB.) Phase Rotation

Correct phase rotation of the phase voltages ensures that damage will not occur during a breaker closure. The voltage phase rotation alarm checks, if the phase rotation of the measured voltage systems are identical. If the control detects different phase rotations of system A and system B, the alarm will be initiated and a breaker synchronization is inhibited. However, this alarm will not prevent a dead busbar closure, i.e. a dead bus start.
If this protective function is triggered, the display indicates "**`Ph.rotation mismatch`**" and the logical command variable "08.33" will be enabled.

NOTE

This monitoring function is only enabled if system A voltage measuring (parameter 1851) and system B voltage measuring (parameter 1853) are configured to "3Ph 4W" or "3Ph 3W" and the measured voltage exceeds 50 % of the rated voltage (parameter 1766) or if Generator voltage measuring (parameter 1851) and Mains voltage measuring (parameter 1853) are configured to "1Ph 2W" (in this case, the phase rotation is not evaluated, but defined by the 1Ph2W phase rotation (parameter 1859)).

ID	Parameter	CL	Setting range	Default	Description
2940	**Monitoring**	2	On / Off	On	**On:** Phase rotation monitoring is carried out according to the following parameters **Off:** No monitoring is carried out.
2941	**Alarm class**	2	Class A / Class B / Class C / Class D / Class E / Class F	Class B	Each limit may be assigned an independent alarm class that specifies what action should be taken when the limit is surpassed. ***NOTE:*** *See chapter "Alarm Classes" on page 194.*
2942	**Self acknowledge**	2	Yes / No	Yes	**Yes:** The control automatically clears the alarm if the fault condition is no longer detected. **No:** The control does not automatically reset the alarm when the fault condition is no longer detected. The alarm must be acknowledged and reset by manually pressing the appropriate buttons or by activating the *LogicsManager* output "External acknowledgement" (via a discrete input or via an interface).
2945	**Monitoring lockable**	2	Yes / No	No	**Yes:** Monitoring for fault conditions is only performed if Lock Monitoring Status 24.40 is false. **No:** Monitoring for this fault condition is continuously enabled regardless of Lock Monitoring Status 24.40.

Miscellaneous

ID	Parameter	CL	Setting range	Default	Description
1756	**Time until horn reset**	0	0 to 1,000 s	180 s	After each alarm of alarm class B through F occurs, the alarm LED flashes and the horn (command variable 01.12) is enabled. After the delay time 'time until horn reset' has expired, the flashing LED changes into a steady light and the horn (command variable 01.12) is disabled. The alarm LED flashes until the alarm has been acknowledged either via the push button, the *LogicsManager*, or the interface. ***NOTE:*** *If this parameter is configured to 0, the horn will remain active until it will be acknowledged.*
12490	**Ext. acknowledge**	2	*LogicsManager*	(DI 02 & 1) & 1	It is possible to acknowledge all alarms simultaneously from remote, e.g. with a discrete input. The logical output of the *LogicsManager* has to become TRUE twice. The first time is for acknowledging the horn, the second for all alarm messages. The On-delay time is the minimum time the input signals have to be "1". The Off-delay time is the time how long the input conditions have to be "0" before the next high signal is accepted. Once the conditions of the *LogicsManager* have been fulfilled the alarms will be acknowledged. ***NOTE:*** *The first high signal into the discrete input acknowledges the command variable 01.12 (horn). The second high signal acknowledges all inactive alarm messages.* The *LogicsManager* and its default settings are explained on page 195 in Appendix C: "*LogicsManager*".
12959	**Lock Monitoring**	2	*LogicsManager*	(DI 01 & 1) & 1	**Lock Monitoring** As long as the conditions of the *LogicsManager* have been fulfilled, all monitoring functions which are configured “Monitoring lockable” to “Yes” are locked.

CAN Interface 1 Configuration

The CANopen interface 1 is monitored. If the interface does not receive a Receive Process Data Object (RPDO) before the delay expires, an alarm will be initiated.
If this protective function is triggered, the display indicates "**`CANopen interface 1`**" and the logical command variable "08.18" will be enabled.

ID	Parameter	CL	Setting range	Default	Description
3150	**Monitoring**	2	On / Off	Off	**On:** CANopen interface 1 monitoring is carried out according to the following parameters. **Off:** Monitoring is disabled.
3154	**Delay**	2	0.01 to 650.00 s	0.20 s	The maximum receiving break is configured with this parameter. If the interface does not receive an RPDO within this time, the action specified by the alarm class is initiated. The delay timer is re-initialized after every message is received.
3151	**Alarm class**	2	Class A / Class B / Class C / Class D / Class E / Class F / Control	Class B	Each limit may be assigned an independent alarm class that specifies what action should be taken when the limit is surpassed. ***NOTE:*** *See chapter "Alarm Classes" on page 194.*
3152	**Self acknowledge**	2	Yes / No	Yes	**Yes:** The control automatically clears the alarm if the fault condition is no longer detected. **No:** The control does not automatically reset the alarm when the fault condition is no longer detected. The alarm must be acknowledged and reset by manually pressing the appropriate buttons or by activating the *LogicsManager* output "External acknowledgement" (via a discrete input or via an interface).

ID	Parameter	CL	Setting range	Default	Description
3153	**Monitoring lockable**	2	Yes / No	No	**Yes:** Monitoring for fault conditions is only performed if Lock Monitoring Status 24.40 is false. **No:** Monitoring for this fault condition is continuously enabled regardless of Lock Monitoring Status 24.40.

Battery Overvoltage (Levels 1 & 2)

There are two battery overvoltage alarm levels available in the control. Both alarms are definite time alarms and are illustrated in the figure below. The figure diagrams a frequency trend and the associated pickup times and length of the alarms. Monitoring of the voltage is done in two steps.
If this protective function is triggered, the display indicates "**`Bat. overvoltage 1`**" or "**`Bat. overvoltage 2`**" and the logical command variable "08.01" or "08.02" will be enabled.

ID	Parameter	CL	Setting range	Default	Description
3450 3456	**Monitoring** (Limit 1 / Limit 2)	2	On / Off	On	**On:** Overvoltage monitoring of the battery voltage is carried out according to the following parameters. Both values may be configured independent from each other (prerequisite: Level 1 > Level 2). **Off:** Monitoring is disabled for Level 1 limit and/or Level 2 limit.
3454 3460	**Limit** (Limit 1 / Limit 2)	2	8.0 to 42.0 V	32.0 V 35.0 V	The threshold values that are to be monitored are defined here. If the monitored battery voltage reaches or exceeds this value for at least the delay time without interruption, the action specified by the alarm class is initiated.
3455 3461	**Delay** (Limit 1 / Limit 2)	2	0.02 to 99.99 s	5.00 s 1.00 s	If the monitored battery voltage exceeds the threshold value for the delay time configured here, an alarm will be issued. If the monitored battery voltage falls below the threshold (minus the hysteresis) before the delay expires the time will be reset.
3451 3457	**Alarm Class** (Limit 1 / Limit 2)	2	Class A / Class B / Class C / Class D / Class E / Class F / Control	Class B	Each limit may be assigned an independent alarm class that specifies what action should be taken when the limit is surpassed. ***NOTE:*** *See chapter "Alarm Classes" on page 194.*
3452 3458	**Self acknowledge** (Limit 1 / Limit 2)	2	Yes / No	No	**Yes:** The control automatically clears the alarm if the fault condition is no longer detected. **No:** The control does not automatically reset the alarm when the fault condition is no longer detected. The alarm must be acknowledged and reset by manually pressing the appropriate buttons or by activating the *LogicsManager* output "External acknowledgement" (via a discrete input or via an interface).
3453 3459	**Monitoring lockable** (Limit 1 / Limit 2)	2	Yes / No	No	**Yes:** Monitoring for fault conditions is only performed if Lock Monitoring Status 24.40 is false. **No:** Monitoring for this fault condition is continuously enabled regardless of Lock Monitoring Status 24.40.

Battery Undervoltage (Levels 1 & 2)

There are two battery undervoltage alarm levels available in the control. Both alarms are definite time alarms and are illustrated in the figure below. The figure diagrams a frequency trend and the associated pickup times and length of the alarms. Monitoring of the voltage is done in two steps.
If this protective function is triggered, the display indicates "**`Bat. undervoltage 1`**" or "**`Bat. undervoltage 2`**" and the logical command variable "08.03" or "08.04" will be enabled.

ID	Parameter	CL	Setting range	Default	Description
3500 3506	**Monitoring** (Limit 1 / Limit 2)	2	On / Off	On	**On:** Undervoltage monitoring of the battery voltage is carried out according to the following parameters. Both values may be configured independent from each other (prerequisite: Level 1 > Level 2). **Off:** Monitoring is disabled for Level 1 limit and/or Level 2 limit.
3504 3510	**Limit** (Limit 1 / Limit 2)	2	8.0 to 42.0 V	24.0 V 20.0 V	The threshold values that are to be monitored are defined here. If the monitored battery voltage reaches or falls below this value for at least the delay time without interruption, the action specified by the alarm class is initiated. ***NOTE:*** *The default monitoring limit for battery undervoltage is 24 Vdc after 60 seconds. This is because in normal operation the terminal voltage is approximately 26 Vdc (alternator charged battery).*
3505 3511	**Delay** (Limit 1 / Limit 2)	2	0.02 to 99.99 s	60.00 s 10.00 s	If the battery voltage falls below the threshold value for the delay time configured here, an alarm will be issued. If the battery voltage exceeds the threshold (plus the hysteresis) again before the delay expires the time will be reset.
3501 3507	**Alarm Class** (Limit 1 / Limit 2)	2	Class A / Class B / Class C / Class D / Class E / Class F / Control	Class B	Each limit may be assigned an independent alarm class that specifies what action should be taken when the limit is surpassed. ***NOTE:*** *See cha*pter *"Alarm Classes"* o*n page 194.*
3502 3508	**Self acknowledge** (Limit 1 / Limit 2)	2	Yes / No	No	**Yes:** The control automatically clears the alarm if the fault condition is no longer detected. **No:** The control does not automatically reset the alarm when the fault condition is no longer detected. The alarm must be acknowledged and reset by manually pressing the appropriate buttons or by activating the *LogicsManager* output "External acknowledgement" (via a discrete input or via an interface).
3503 3509	**Monitoring lockable** (Limit 1 / Limit 2)	2	Yes / No	No	**Yes:** Monitoring for fault conditions is only performed if Lock Monitoring Status 24.40 is false. **No:** Monitoring for this fault condition is continuously enabled regardless of Lock Monitoring Status 24.40.

Multi-Unit Missing Members

The multi-unit missing members monitoring function checks whether all participating units are available (sending data on the CAN bus).
If the number of available units is less than the number of members configured in parameter 4063 for at least the delay time (refer to below note), the display indicates "**`Missing members`**" and the logical command variable "08.17" will be enabled.

NOTE

After energizing the unit, a delay is started, which allows a possible "Missing members" alarm to become active. This delay depends on the Node-ID of the unit (parameter 8950 on page 104) and the transfer rate of a load share / LS-5 fast message (parameter 9921 on page 104) and may last for approx. 140 seconds for a high Node-ID (e.g. 127). This delay serves for detecting the Master of a CAN bus connection. Approximately two minutes after energizing the unit, the alarm delay will be set to a fix time, which depends on the setting of parameter 9921 on page 104 (Transfer rate LS fast message) and is in the range between 3 to 9 seconds.

ID	Parameter	CL	Setting range	Default	Description
4060	**Monitoring**	2	On / Off	Off	**On:** Multi-unit missing members monitoring is carried out. **Off:** Monitoring is disabled. ***NOTE:*** *This parameter only applies to application mode* A02.
4063	**Number of LS5 communicating**	2	2 to 64	2	The number of participating LS-5 units is configured here.
4061	**Alarm class**	2	Class A / Class B / Class C / Class D / Class E / Class F	Class B	Each limit may be assigned an independent alarm class that specifies what action should be taken when the limit is surpassed. ***NOTE:*** *See chapter "Alarm Classes" on page 194.*
4062	**Self acknowledge**	2	Yes / No	No	**Yes:** The control automatically clears the alarm if the fault condition is no longer detected. **No:** The control does not automatically reset the alarm when the fault condition is no longer detected. The alarm must be acknowledged and reset by manually pressing the appropriate buttons or by activating the *LogicsManager* output "External acknowledgement" (via a discrete input or via an interface).

Measurement Configuration

ID	Parameter	CL	Setting range	Default	Description
1750	**System rated frequency**	2	50 Hz / 60 Hz	50 Hz	The rated frequency of the system is used as a reference figure for all frequency related functions, which use a percentage value, like frequency monitoring, breaker operation windows or the Analog Manager.
1766	**SyA. rated voltage**	2	50 to 650,000 V	400 V	The sytem A potential transformer primary voltage is entered in this parameter. The system A rated voltage is used as a reference figure for all system A voltage related functions, which use a percentage value, like sytem A voltage monitoring, breaker operation windows or the Analog Manager.
1768	**SyB. rated voltage**	2	50 to 650,000 V	400 V	The system A potential transformer primary voltage is entered in this parameter. The system A rated voltage is used as a reference figure for all system A voltage related functions, which use a percentage value, like system A voltage monitoring, breaker operation windows or the Analog Manager.
1752	**SyA. rated active power [kW]**	2	0.5 to 99,999.9	200.00	This value specifies the system A real power rating, which is used as a reference figure for related functions.
1758	**SyA. rated react. pwr. [kvar]**	2	0.5 to 99999.9	200.00	This value specifies the system A reactive power rating, which is used as a reference figure for related functions.
1754	**SyA. rated current**	2	1 to 32,000 A	300 A	This value specifies the system A rated current, which is used as a reference figure for related functions.
1858	**1Ph2W voltage measuring**	2	Phase - phase / Phase - neutral	Phase - phase	**Phase – phase**: The unit is configured for measuring phase-phase voltages if 1Ph 2W measuring is selected. **Phase – neutral**: The unit is configured for measuring phase-neutral voltages if 1Ph 2W measuring is selected. ***NOTE:*** *Please refer to the comments on measuring principles in the Chapter 1: Installation.*
1859	**1Ph2W phase rotation**	2	CW / CCW	CW	**CW:** A clockwise rotation field is supposed for 1Ph 2W measuring. **CCW:** A counter-clockwise rotation field is supposed for 1Ph 2W measuring. ***NOTE:*** *The measurement of phase rotation with 1Ph2W is not possible. For this reason montitoring phase rotation mismatch is working with this supposed phase rotation.* ***NOTE:*** *Please refer to the comments on measuring principles in the Chapter 1: Installation.*

ID	Parameter	CL	Setting range	Default	Description
1851	**SyA. voltage measuring**	2	3Ph 4W / 3Ph 3W / 1Ph 2W / 1Ph 3W / 3Ph 4W OD	3Ph 4W	**3Ph 4W:** Measurement is performed Line-Neutral (WYE connected system) and Line-Line (Delta connected system). The protection depends on the setting of parameter 1771 on page 77. Phase voltages and the neutral must be connected for proper calculation. Measurement, display and protection are adjusted according to the rules for WYE connected systems. Monitoring refers to the following voltages: • V_{L12}, V_{L23}, and V_{L31} (parameter 1771 configured to "Phase-phase") • V_{L1N}, V_{L2N}, and V_{L3N} (parameter 1771 configured to "Phase-neutral") **3Ph 3W:** Measurement is performed Line-Line (Delta connected system). Phase voltages must be connected for proper calculation. Measurement, display and protection are adjusted according to the rules for Delta connected systems. Monitoring refers to the following voltages: • V_{L12}, V_{L23}, V_{L31} **1Ph 2W:** Measurement is performed Line-Neutral (WYE connected system) if parameter 1858 is configured to "Phase - neutral" and Line-Line (Delta connected system) if parameter 1858 is configured to "Phase - phase". Measurement, display and protection are adjusted according to the rules for phase-phase systems. Monitoring refers to the following voltages: • V_{L1N}, V_{L12} **1Ph 3W:** Measurement is performed Line-Neutral (WYE connected system) and Line-Line (Delta connected system). The protection depends on the setting of parameter 1771 on page 77. Measurement, display, and protection are adjusted according to the rules for single-phase systems. Monitoring refers to the following voltages: • V_{L1N}, V_{L3N} (parameter 1771 configured to "Phase-phase") • V_{L13} (parameter 1771 configured to "Phase-neutral") ***NOTE:*** *If this parameter is configured to 1Ph 3W, the system A rated voltages (parameter 1766) must be entered as Line-Line (Delta).* ***NOTE:*** *Please refer to the comments on measuring principles in the Chapter 1: Installation.*
1850	**SyA. current measuring**		L1 L2 L3 / Phase L1 Phase L2 Phase L3	L1 L2 L3	**L1 L2 L3:** All three phases are monitored. Measurement, display and protection are adjusted according to the rules for 3-phase measurement. Monitoring refers to the following currents: • I_{L1}, I_{L2}, I_{L3} **Phase L{1/2/3}:** Only one phase is monitored. Measurement, display and protection are adjusted according to the rules for single-phase measurement. Monitoring refers to the selected phase.

ID	Parameter	CL	Setting range	Default	Description
1853	**SyB. voltage measuring**		3Ph 4W / 3Ph 3W / 1Ph 2W / 1Ph 3W	3Ph 4W	**3Ph 4W:** Measurement is performed Line-Neutral (WYE connected system) and Line-Line (Delta connected system). The protection depends on the setting of parameter 1770 on page 90. Phase voltages and the neutral must be connected for proper calculation. Measurement, display and protection are adjusted according to the rules for WYE connected systems. Monitoring refers to the following voltages: • V_{L12}, V_{L23}, and V_{L31} (parameter 1770 configured to "Phase-phase") • V_{L1N}, V_{L2N} and V_{L3N} (parameter 1770 configured to "Phase-neutral") **3Ph 3W:** Measurement is performed Line-Line (Delta connected system). Phase voltages must be connected for proper calculation. Measurement, display and protection are adjusted according to the rules for Delta connected systems. Monitoring refers to the following voltages: • V_{L12}, V_{L23}, V_{L31} **1Ph 2W:** Measurement is performed Line-Neutral (WYE connected system) if parameter 1858 is configured to "Phase - neutral" and Line-Line (Delta connected system) if parameter 1858 is configured to "Phase - phase". Measurement, display and protection are adjusted according to the rules for phase-phase systems. Monitoring refers to the following voltages: • V_{L1N}, V_{L12} **1Ph 3W:** Measurement is performed Line-Neutral (WYE connected system) and Line-Line (Delta connected system). The protection depends on the setting of parameter 1770 on page 90. Measurement, display, and protection are adjusted according to the rules for single-phase systems. Monitoring refers to the following voltages: • V_{L1N}, V_{L3N} (parameter 1770 configured to "Phase-phase") • V_{L13} (parameter 1770 configured to "Phase-neutral") ***NOTE:*** *If this parameter is configured to 1Ph 3W, the system B rated voltages (parameter 1768) must be entered as Line-Line (Delta).* ***NOTE:*** *Please refer to the comments on measuring principles in the Chapter 1: Installation.*

Transformer Configuration

NOTE

This controller is available in two different hardware version with either 1A [../1] or 5A [../5] current transformer inputs. Both versions are discussed in this manual. The setpoints for specific parameters will differ depending upon the hardware version, indicated on the data plate.

- **[1] LS-5xx-1 = Current transformer with ../1 A rated current**
- **[5] LS-5xx-5 = Current transformer with ../5 A rated current**

ID	Parameter	CL	Setting range	Default	Description
1801	**SyA. PT prim. rated voltage**	2	50 to 650,000 V	400 V	Some applications may require the use of potential transformers to facilitate measuring the voltages. The rating of the primary side of the potential transformer must be entered into this parameter. If the application does not require potential transformers at sytem A (i.e. the voltage is 480 V or less), then this voltage will be entered into this parameter.
1800	**SyA. PT sec. rated voltage**	2	50 to 480 V	400 V	Some applications may require the use of potential transformers to facilitate measuring the voltages. The rating of the secondary side of the potential transformer must be entered into this parameter. If the application does not require potential transformers at system A (i.e. the voltage is 480 V or less), then this voltage will be entered into this parameter. • Rated voltage: 100 Vac (this parameter configured between 50 and 130 V) - System A voltage: Terminals 14/16/18/20 • Rated voltage: 400 Vac (this parameter configured between 131 and 480 V) - System A voltage: Terminals 15/17/19/21 ***WARNING:*** *Only connect the measured voltage to either the 100 Vac or the 400 Vac inputs. Do not connect both sets of inputs to the measured system.* ***NOTE:*** *The control is equipped with dual voltage measuring inputs. The voltage range of these measurement inputs is dependent upon input terminals are used (see below). This value refers to the secondary voltages of the potential transformers, which are directly connected to the control.*
1806	**SyA. CT prim. rated current**	2	1 to 32,000 A/x	500 A/x	The input of the current transformer ratio is necessary for the indication and control of the actual monitored value. The current transformers ratio should be selected so that at least 60% of the secondary current rating can be measured when the monitored system is at 100% of operating capacity (i.e. at 100% of system capacity a 5 A CT should output 3 A). If the current transformers are sized so that the percentage of the output is lower, the loss of resolution may cause inaccuracies in the monitoring and control functions and affect the functionality of the control. ***NOTE:*** *This screen only applies to controls equipped with 5 A CT inputs. This will not be displayed in the controller screen of a unit equipped with 1 A CT inputs.*
1804	**SyB. PT prim. rated voltage**	2	50 to 650,000 V	400 V	Some applications may require the use of potential transformers to facilitate measuring the voltages to be monitored. The rating of the primary side of the potential transformer must be entered into this parameter. If the application does not require potential transformers (i.e. the measured voltage is 480 V or less), then this voltage will be entered into this parameter.

ID	Parameter	CL	Setting range	Default	Description
1803	**SyB. PT sec. rated voltage**	2	50 to 480 V	400 V	Some applications may require the use of potential transformers to facilitate measuring the mains voltages. The rating of the secondary side of the potential transformer must be entered into this parameter. If the application does not require potential transformers (i.e. the measured voltage is 480 V or less), then the this voltage will be entered into this parameter. • Rated voltage: 120 Vac (this parameter configured between 50 and 130 V) - System B voltage: Terminals 22/24/26/28 • Rated voltage: 480 Vac (this parameter configured between 131 and 480 V) - System B Voltage: Terminals 23/25/27/29 ***WARNING:*** *Only connect the measured voltage to either the 100 Vac or the 400 Vac inputs. Do not connect both sets of inputs to the measured system.* ***NOTE:*** *The control is equipped with dual voltage measuring inputs. The voltage range of these measurement inputs is dependent upon input terminals are used (see below). This value refers to the secondary voltages of the potential transformers, which are directly connected to the control.*

Interfaces Configuration

ID	Parameter	CL	Setting range	Default	Description
8051	**Toolkit interface**	2	Serial 1 / Serial 2	Serial 1	**Serial 1:** Toolkit is working at Serial #1 interface (RS-232) **Serial 2:** Toolkit is working at Serial #2 interface (RS-485)

CAN Interface Configuration

NOTE

The CAN bus is a field bus and subject to various disturbances. Therefore, it cannot be guaranteed that every request will be answered. We recommend to repeat a request, which is not answered within reasonable time.

ID	Parameter	CL	Setting range	Default	Description
9923	**Comm. LS5 <-> gen. device**	2	CAN #1 / Off	CAN #1	The interface, which is used for transmitting the LS-5 data and easYgen load share data is configured here.
9921	**Transfer rate fast message**	2	0.10 to 0.30 s	0.10 s	The transfer rate defines the time delay between two fast CAN messages. In case of CAN systems with a high bus load (e.g. long distance between the units with low baud rate), a shorter transfer rate (higher time setting) helps to reduce the bus load.
9920	**Comm. LS5 <-> gen. CAN-ID**	2	2xx Hex / 3xx Hex / 4xx Hex / 5xx Hex	5xx Hex	The first digit of the CAN ID or the range (i.e. 2xx means 200 through 2FF) is configured here. The last two digits will be assigned by the control with the settings from the device number (parameter 1702 on page 60).

CAN Interface 1 Configuration

ID	Parameter	CL	Setting range	Default	Description
3156	**Baudrate**	2	20 kBaud / 50 kBaud / 100 kBaud / 125 kBaud / 250 kBaud / 500 kBaud / 800 kBaud / 1,000 kBaud	250 kBaud	This parameter defines the used Baud rate. Please note, that all participants on the CAN bus must use the same Baud rate.
8950	**Node-ID CAN bus 1**	2	1 to 127 (dec)	33	A number that is unique to the control must be set in this parameter so that this control unit can be correctly identified on the CAN bus. This address number may only be used once on the CAN bus. All additional addresses are calculated based on this unique device number. ***NOTE:*** *We recommend to take the same number as the device number. If there are no easYgen´s at the bus, we recommend configuring the Node-IDs for units, which participate, as low as possible to facilitate establishing of communication.* ***NOTE:*** *No access in the application modes L-MCB* A03 *and L-GGB* A04*.*

<table>
<tr><th>ID</th><th>Parameter</th><th>CL</th><th>Setting range</th><th>Default</th><th>Description</th></tr>
<tr><td>8993</td><td>CANopen Master</td><td>2</td><td>Default Master / On / Off</td><td>Default Master</td><td>One bus participant must take over the network management and put the other participants into "operational" mode. The LS-5 is able to perform this task.

Default Master: The unit starts up in "operational" mode and sends a "Start_Remote_node" message after a short delay (the delay is the Node ID (parameter 8950) in seconds, i.e. if the Node ID is configured to 2, the message will be sent after 2 seconds). If more than one easYgen is configured to Default Master, the unit with the lower Node ID will take over control. Therefore, the CAN bus devices, which are intended to act as Default Master should be assigned a low Node ID. No other device on the CAN bus (except the easYgens) may operate as Master).
On: The unit is the CANopen Master and automatically changes into operational mode and transmits data.
Off: The unit is a CANopen Slave. An external Master must change into operational mode.

NOTE: If CANopen Master (parameter 8993) is configured to "Off", the Master controller (for example a PLC) must send a "Start_Remote_node" message to initiate the load share message transmission of the easYgen. If no "Start_Remote_node" message would be sent, the complete system would not be operational.</td></tr>
<tr><td>9120</td><td>Producer heartbeat time</td><td>2</td><td>0 to 65,500 ms</td><td>2,000 ms</td><td>Independent from the CANopen Master configuration, the unit transmits a heartbeat message with this configured heartbeat cycle time. If the producer heartbeat time is equal 0, the heartbeat will only be sent as response to a remote frame request. The time configured here will be rounded up to the next 20 ms step.</td></tr>
<tr><td>9100</td><td>COB-ID SYNC Message</td><td>2</td><td>1 to FFFFFFFF hex</td><td>80 hex</td><td>This parameter defines whether the unit generates the SYNC message or not.

Complies with CANopen specification: object 1005, subindex 0; defines the COB ID of the synchronization object (SYNC). The structure of this object is shown in the following tables:

<table>
<tr><th>UNSIGNED 32</th><th>MSB</th><th></th><th></th><th></th><th>LSB</th></tr>
<tr><td>Bits</td><td>31</td><td>30</td><td>29</td><td>28-11</td><td>10-0</td></tr>
<tr><td>11 bit ID</td><td>X</td><td>0/1</td><td>X</td><td>00000000000000000</td><td>11 bit Identifier</td></tr>
</table>

<table>
<tr><th>Bit number</th><th>Value</th><th>Meaning</th></tr>
<tr><td>31 (MSB)</td><td>X</td><td>N/A</td></tr>
<tr><td>30</td><td>0
1</td><td>Unit does not generate SYNC message
Unit generates SYNC message</td></tr>
<tr><td>29</td><td>X</td><td>N/A</td></tr>
<tr><td>28-11</td><td>0</td><td>Always</td></tr>
<tr><td>10-0 (LSB)</td><td>X</td><td>Bits 10-0 of SYNC COB ID</td></tr>
</table>
</td></tr>
<tr><td>8940</td><td>Producer SYNCMessage time</td><td>2</td><td>0 to 65,000 ms</td><td>20 ms</td><td>This is the cycle time of the SYNC message. If the unit is configured for this function (parameter 9100) it will send the SYNC message with this interval. The time configured here will be rounded up to the next 10 ms step.</td></tr>
<tr><td>9101</td><td>COB-ID TIME Message</td><td>2</td><td>1 to FFFFFFFF hex</td><td>C0000100 hex</td><td>This parameter defines whether the unit generates the TIME message or not.

Complies with CANopen specification: object 1012, subindex 0; defines the COB ID of the time object (TIME). The structure of this object is shown in the following tables:

<table>
<tr><th>UNSIGNED 32</th><th>MSB</th><th></th><th></th><th></th><th>LSB</th></tr>
<tr><td>Bits</td><td>31</td><td>30</td><td>29</td><td>28-11</td><td>10-0</td></tr>
<tr><td>11 bit ID</td><td>X</td><td>0/1</td><td>X</td><td>00000000000000000</td><td>11 bit Identifier</td></tr>
</table>

<table>
<tr><th>Bit number</th><th>Value</th><th>Meaning</th></tr>
<tr><td>31 (MSB)</td><td>X</td><td>N/A</td></tr>
<tr><td>30</td><td>0
1</td><td>Unit does not generate TIME message
Unit generates TIME message</td></tr>
<tr><td>29</td><td>X</td><td>N/A</td></tr>
<tr><td>28-11</td><td>0</td><td>Always</td></tr>
<tr><td>10-0 (LSB)</td><td>X</td><td>Bits 10-0 of SYNC COB ID</td></tr>
</table>
</td></tr>
</table>

Additional Server SDOs (Service Data Objects)

NOTE

The CAN bus is a field bus and subject to various disturbances. Therefore, it cannot be guaranteed that every request will be answered. We recommend to repeat a request, which is not answered within reasonable time.

NOTE

The first Node ID is the standard Node ID of CAN interface 1 (parameter 8950).

ID	Parameter	CL	Setting range	Default	Description
33040	**2. Node ID**	2	0 to 127 (dec)	0	In a multi-master application, each Master needs its own identifier (Node ID) from the unit in order to send remote signals (i.e. remote start, stop, or acknowledge) to the unit. The additional SDO channel will be made available by configuring this Node ID to a value different than zero. This is the additional CAN ID for the PLC.
33041	**3. Node ID**	2	0 to 127 (dec)	0	In a multi-master application, each Master needs its own identifier (Node ID) from the unit in order to send remote signals (i.e. remote start, stop, or acknowledge) to the unit. The additional SDO channel will be made available by configuring this Node ID to a value different than zero. This is the additional CAN ID for the PLC.
33042	**4. Node ID**	2	0 to 127 (dec)	0	In a multi-master application, each Master needs its own identifier (Node ID) from the unit in order to send remote signals (i.e. remote start, stop, or acknowledge) to the unit. The additional SDO channel will be made available by configuring this Node ID to a value different than zero. This is the additional CAN ID for the PLC.
33043	**5. Node ID**	2	0 to 127 (dec)	0	In a multi-master application, each Master needs its own identifier (Node ID) from the unit in order to send remote signals (i.e. remote start, stop, or acknowledge) to the unit. The additional SDO channel will be made available by configuring this Node ID to a value different than zero. This is the additional CAN ID for the PLC.

Receive PDO 1 (Process Data Object)

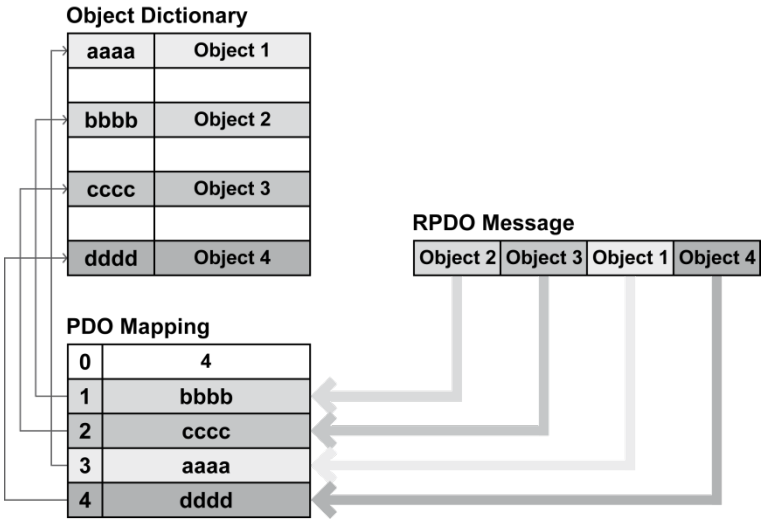


Figure 3-5: Interfaces - Principle of RPDO mapping

NOTE

Do not configure an RPDO or TPDO with a COB-ID higher than 580 (hex) or lower than 180 (hex). These IDs are reserved for internal purposes.

ID	Parameter	CL	Setting range	Default	Description
9300	**COB-ID**	2	1 to FFFFFFFF hex	80000000 hex	This parameter contains the communication parameters for the PDOs, the device is able to receive. *Complies with CANopen specification: object 1400 (for RPDO 1, 1401 for RPDO 2 and 1402 for TPDO 3), subindex 1. The structure of this object is shown in the following tables:* UNSIGNED 32 / MSB / LSB Bits: 31 | 30 | 29 | 28-11 | 10-0 11 bit ID: 0/1 | X | X | 00000000000000000 | 11 bit Identifier Bit number / Value / Meaning 31 (MSB): 0 = PDO exists / is valid; 1 = PDO does not exist / is not valid 30: X = N/A 29: X = N/A 28-11: 0 = Always 10-0 (LSB): X = Bits 10-0 of COB ID PDO valid / not valid allows selecting, which PDOs are used in the operational state.
9121	**Event timer**	2	0 to 65,500 ms	2,000 ms	This parameter configures the time, from which this PDO is marked as "not existing". The time configured here will be rounded up to the next 5 ms step. Received messages are processed by the control unit every 20 ms. Messages, which are sent faster, will be discarded. We recommend to configure ten times the cycle time of the received data here. *Complies with CANopen specification: object 1400 (for TPDO 1, 1401 for TPDO 2 and 1402 for TPDO 3), subindex 5*

Transmit PDO {x} (Process Data Objects)

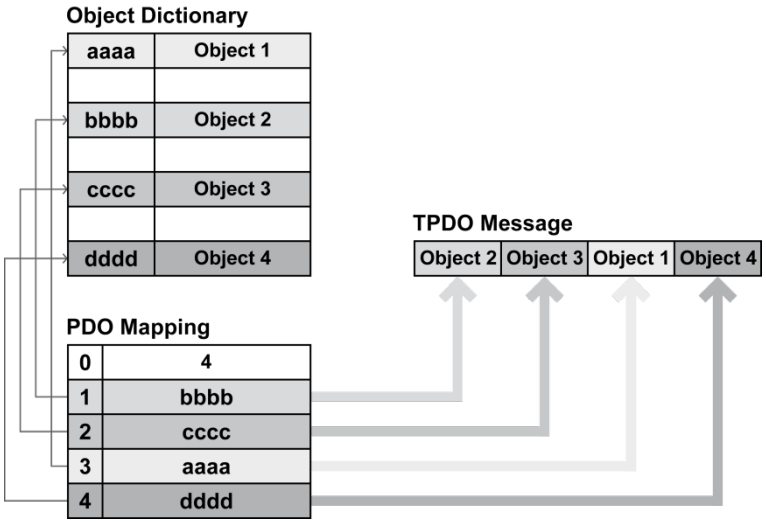


Figure 3-6: Interfaces - Principle of TPDO mapping

NOTE

Do not configure an RPDO or TPDO with a COB-ID higher than 580 (hex) or lower than 180 (hex). These IDs are reserved for internal purposes.

ID	Parameter	CL	Setting range	Default	Description
9600 9610 9620	**COB-ID**	2	1 to FFFFFFFF hex	181 hex 80000000 hex 80000000 hex	This parameter contains the communication parameters for the PDOs, the device is able to transmit. *Complies with CANopen specification: object 1400 (for RPDO 1, 1401 for RPDO 2 and 1402 for TPDO 3), subindex 1. The structure of this object is shown in the following tables:* UNSIGNED 32 / MSB / LSB Bits: 31 | 30 | 29 | 28-11 | 10-0 11 bit ID: 0/1 | X | X | 00000000000000000 | 11 bit Identifier Bit number / Value / Meaning 31 (MSB): 0 = PDO exists / is valid; 1 = PDO does not exist / is not valid 30: X = N/A 29: X = N/A 28-11: 0 = Always 10-0 (LSB): X = Bits 10-0 of COB ID PDO valid / not valid allows selecting, which PDOs are used in the operational state.
8962 8963 8964	**Selected data protocol**	2	0 to 65,535	5301 0 0	A data protocol may be selected by entering the data protocol ID here. If 0 is configured here, the message assembled by the mapping parameters is used. If an unknown data protocol ID is configured here, a failure is indicated by the CAN status bits. Possible data protocol IDs are: • 5301: Data telegram

<table>
<tr><th>ID</th><th>Parameter</th><th>CL</th><th>Setting range</th><th>Default</th><th>Description</th></tr>
<tr><td>9602
9612
9622</td><td>Transmis-sion type</td><td>2</td><td>0 to 255</td><td>255</td><td>This parameter contains the communication parameters for the PDOs the unit is able to transmit. It defines whether the unit broadcasts all data automatically (value 254 or 255) or only upon request with the configured address of the COB ID SYNC message (parameter 9100).

Complies with CANopen specification: object 1800 (for TPDO 1, 1801 for TPDO 2 and 1802 for TPDO 3), subindex 2. The description of the transmission type is shown in the following table:

<table>
<tr><th>Transmission type</th><th colspan="5">PDO Transmissions</th></tr>
<tr><th></th><th>Cyclic</th><th>Acyclic</th><th>Ayn-chronous</th><th>Asyn-chronous</th><th>RTR only</th></tr>
<tr><td>0</td><td colspan="5">Will not be sent</td></tr>
<tr><td>1-240</td><td>X</td><td>-</td><td>X</td><td>-</td><td>-</td></tr>
<tr><td>241-251</td><td colspan="5">Will not be sent</td></tr>
<tr><td>252</td><td colspan="5">Will not be sent</td></tr>
<tr><td>253</td><td colspan="5">Will not be sent</td></tr>
<tr><td>254</td><td>-</td><td>-</td><td>-</td><td>X</td><td>-</td></tr>
<tr><td>255</td><td>-</td><td>-</td><td>-</td><td>X</td><td>-</td></tr>
</table>
A value between 1 and 240 means that the PDO is transferred synchronously and cyclically. The transmission type indicating the number of SYNC, which are necessary to trigger PDO transmissions. Receive PDOs are always triggered by the following SYNC upon reception of data independent of the transmission types 0 to 240. For TPDOs, transmission type 254 and 255 means, the application event is the event timer.</td></tr>
<tr><td>9604
9614
9624</td><td>Event timer</td><td>2</td><td>0 to 65,500 ms</td><td>20 ms</td><td>This parameter contains the communication parameters for the PDOs the unit is able to transmit. The broadcast cycle for the transmitted data is configured here. The time configured here will be rounded up to the next 5 ms step.

Complies with CANopen specification: object 1800 (for TPDO 1, 1801 for TPDO 2 and 1802 for TPDO 3), subindex 5</td></tr>
<tr><td>9609
9619
9629</td><td>Number of mapped objects</td><td>2</td><td>0 to 4</td><td>0</td><td>This parameter contains the mapping for the PDOs the unit is able to transmit. This number is also the number of the application variables, which shall be transmitted with the corresponding PDO.

Complies with CANopen specification: object 1A00 (for TPDO 1, 1A01 for TPDO 2 and 1A02 for TPDO 3), subindex 0</td></tr>
<tr><td>9605
9615
9625</td><td>1. Mapped object</td><td>2</td><td>0 to 65535</td><td>0</td><td>This parameter contains the information about the mapped application variables. These entries describe the PDO contents by their index. The sub-index is always 1. The length is determined automatically.

Complies with CANopen specification: object 1A00 (for TPDO 1, 1A01 for TPDO 2 and 1A02 for TPDO 3), subindex 1</td></tr>
<tr><td>9606
9616
9626</td><td>2. Mapped object</td><td>2</td><td>0 to 65535</td><td>0</td><td>This parameter contains the information about the mapped application variables. These entries describe the PDO contents by their index. The sub-index is always 1. The length is determined automatically.

Complies with CANopen specification: object 1A00 (for TPDO 1, 1A01 for TPDO 2 and 1A02 for TPDO 3), subindex 2</td></tr>
<tr><td>9607
9617
9627</td><td>3. Mapped object</td><td>2</td><td>0 to 65535</td><td>0</td><td>This parameter contains the information about the mapped application variables. These entries describe the PDO contents by their index. The sub-index is always 1. The length is determined automatically.

Complies with CANopen specification: object 1A00 (for TPDO 1, 1A01 for TPDO 2 and 1A02 for TPDO 3), subindex 3</td></tr>
<tr><td>9608
9618
9628</td><td>4. Mapped object</td><td>2</td><td>0 to 65535</td><td>0</td><td>This parameter contains the information about the mapped application variables. These entries describe the PDO contents by their index. The sub-index is always 1. The length is determined automatically.

Complies with CANopen specification: object 1A00 (for TPDO 1, 1A01 for TPDO 2 and 1A02 for TPDO 3), subindex 4</td></tr>
</table>

NOTE

CANopen allows to send 8 byte of data with each Transmit PDO. These may be defined separately if no pre-defined data protocol is used.

All data protocol parameters with a parameter ID may be sent as an object with a CANopen Transmit PDO.

In this case, the data length will be taken from the data byte column (refer to the Data Protocols section in the Interface Manual 37430):

- **1,2 UNSIGNED16 or SIGNED16**
- **3,4 UNSIGNED16 or SIGNED16**
- **5,6 UNSIGNED16 or SIGNED16**
- **1,2,3,4 UNSIGNED32 or SIGNED32**
- **3,4,5,6 UNSIGNED32 or SIGNED32**
- **etc.**

The object ID is identical with the parameter ID when configuring via front panel or ToolKit.

RS-232 Interface Configuration (Serial 1)

ID	Parameter	CL	Setting range	Default	Description
3163	**Baudrate**	2	2.4 kBd / 4.8 kBd / 9.6 kBd / 14.4 kBd / 19.2 kBd / 38.4 kBd / 56 kBd / 115 kBd	19.2 kBd	This parameter defines the baud rate for communications. Please note, that all participants on the bus must use the same baud rate.
3161	**Parity**	2	No / Even / Odd	No	The used parity of the interface is set here.
3162	**Stop bits**	2	One / Two	One	The number of stop bits is set here.
3185	**Modbus slave ID**	2	0 to 255	33	The Modbus device address, which is used to identify the device via Modbus, is entered here. If "0" is configured here, the Modbus is disabled.
3186	**Reply delay time**	2	0.00 to 1.00 s	0.00 s	This is the minimum delay time between a request from the Modbus master and the sent response of the slave. This time is also required if an external interface converter to RS-485 is used for example.

RS-485 Interface Configuration (Serial 2)

ID	Parameter	CL	Setting range	Default	Description
3170	**Baudrate**	2	2.4 kBd / 4.8 kBd / 9.6 kBd / 14.4 kBd / 19.2 kBd / 38.4 kBd / 56 kBd / 115 kBd	19.2 kBd	This parameter defines the baud rate for communications. Please note, that all participants on the bus must use the same baud rate.
3171	**Parity**	2	No / Even / Odd	No	The used parity of the interface is set here.
3172	**Stop bits**	2	One / Two	One	The number of stop bits is set here.
3188	**Modbus slave ID**	2	0 to 255	33	The Modbus device address, which is used to identify the device via Modbus, is entered here. If "0" is configured here, the Modbus is disabled.
3189	**Reply delay time**	2	0.00 to 2.55 s	0.00 s	This is the minimum delay time between a request from the Modbus master and the sent response of the slave. This time is required in halfduplex mode.

Modbus Protocol 5300 Multiple

<table>
<tr><th>ID</th><th>Parameter</th><th>CL</th><th>Setting range</th><th>Default</th><th>Description</th></tr>
<tr><td>3181</td><td>Power [W] exponent 10^x</td><td>2</td><td>2 to 5</td><td>3</td><td>This setting adjusts the format of the 16 bit power values in the data telegram.

Example power measurement:
The measurement range is 0…250 kW
Momentarily measurement value = 198.5 kW (198.500 W)

<table>
<tr><th>Set-ting</th><th>Mean-ing</th><th>Calcula-tion</th><th>Transfer value (16Bit, max.32767)</th><th>Possible Display Format</th></tr>
<tr><td>2</td><td>10^2</td><td>———</td><td>1985</td><td>198.5 kW</td></tr>
<tr><td>3</td><td>10^3</td><td>———</td><td>198</td><td>198 k</td></tr>
<tr><td>4</td><td>10^4</td><td>———</td><td>□9</td><td>N/A</td></tr>
<tr><td>5</td><td>10^5</td><td>———</td><td>1</td><td>N□A</td></tr>
</table></td></tr>
<tr><td>3182</td><td>Voltage [V] exponent 10^x</td><td>2</td><td>-1 to 2</td><td>0</td><td>This setting adjusts the format of the 16 bit voltage values in the data telegram.

Example voltage measurement:
The measurement range is 0…480 V
Momentarily measurement value = 477.8 V

<table>
<tr><th>Set□i ng</th><th>Mean-ing</th><th>Calcula-tion</th><th>Transfer value (16Bit, max.32767)</th><th>Possible Display Format</th></tr>
<tr><td>-1</td><td>10^{-1}</td><td>———</td><td>4778</td><td>4□7.8 V</td></tr>
<tr><td>0</td><td>10^0</td><td>———</td><td>477</td><td>477 V</td></tr>
<tr><td>1</td><td>10^1</td><td>———</td><td>47</td><td>N/A</td></tr>
<tr><td></td><td>10^2</td><td>———</td><td>4</td><td>N/A</td></tr>
</table></td></tr>
<tr><td>3183</td><td>Current [A] exponent 10^x</td><td>2</td><td>-1 to 0</td><td>0</td><td>This setting adjusts the format of the 16 bit current values in the data telegram.

Example current measurement:
The measurement range is 0…500 A
Momentarily measurement value = 345.4 A

<table>
<tr><th>Set□i ng</th><th>Mean-ing</th><th>Calcula-tion</th><th>Transfer value (16Bit, max.32767)</th><th>Possible Display Format</th></tr>
<tr><td>-1</td><td>10^{-1}</td><td>———</td><td>3454</td><td>345.4 A</td></tr>
<tr><td>0</td><td>10^0</td><td>———</td><td>345</td><td>345□A</td></tr>
</table></td></tr>
</table>

LogicsManager Configuration

Internal Flags Configuration

Internal flags within the *LogicsManager* logical outputs may be programmed and used for multiple functions. For conditions and explanation of programming please refer to page 195 in chapter "LogicsManager").

ID	Parameter	CL	Setting range	Default	Description
yyyyy	**Flag {x}**	2	*LogicsManager*	(0 & 1) & 1	**Internal flags: Flag {x} [x = 1 to 16]** The flags may be used as auxiliary flags for complex combinations by using the logical output of these flags as command variable for other logical outputs.

Flag {x}	Flag 1	Flag 2	Flag 3	Flag 4	Flag 5	Flag 6	Flag 7	Flag 8
Parameter ID yyyyy	12230	12240	12250	12260	12270	12280	12290	12300
Flag {x}	**Flag 9**	**Flag 10**	**Flag 11**	**Flag 12**	**Flag 13**	**Flag 14**	**Flag 15**	**Flag 16**
Parameter ID yyyyy	12910	12911	12912	12913	12914	12915	12916	12917

Table 3-7: Internal flags - parameter IDs

LS5 Flags Configuration

Each LS-5 has five special flags (“Flag 1 LS5” to “Flag 5 LS5”) which can be defined via *LogicsManager*. They are transmitted via CAN bus. These flags (26.01 to 27.80) are received by the other LS-5 and easYgen devices and can be used as inputs for the *LogicsManager*.

ID	Parameter	CL	Setting range	Default	Description
xxxxx	**Flag {x} LS5**	2	*LogicsManager*	(0 & 1) & 1	**LS5 flags: Flag {x} LS5 [x = 1 to 5]** The flags may be used as auxiliary flags for complex combinations by using the logical output of these flags as command variable for other logical outputs.

Flag {x} LS5	Flag 1 LS5	Flag 2 LS5	Flag 3 LS5	Flag 4 LS5	Flag 5 LS5
Parameter ID xxxxx	12952	12953	12954	12955	12956

Table 3-8: LS5 flags - parameter IDs

LED Configuration

Each LS-5 has eight LED flags (“LED 1” to “LED 8”) which can be defined via *LogicsManager*. LED (internal) flags (24.51 to 24.58) within the *LogicsManager* logical outputs may be programmed and used for multiple functions. For conditions and explanation of programming please refer to page 195 in chapter "LogicsManager").

ID	Parameter	CL	Setting range	Default	Description
xxxxx	**LED{x}**	2	*LogicsManager*	-	**LED flags: LED {x} [x = 1 to 8]** **LS-51x** The flags are used to control the LED states. The default values are defined on the provided paper strip. **LS-52x** The flags may be used as auxiliary flags for complex combinations by using the logical output of these flags as command variable for other logical outputs.

LED {x}	LED 1	LED 2	LED 3	LED 4	LED 5	LED 6	LED 7	LED 8
Parameter ID xxxxx	12962	12963	12964	12965	12966	12967	12968	12969

Table 3-9: LED flags - parameter IDs

NOTE

The LED configuration is used in the LS-51x to control the LEDs. In the LS-52x version the LED flags can be used as additional internal flags.

Set Timers

Daily Time Setpoint

Utilizing the *LogicsManager* it is possible to establish specific times of the day that functions (i.e. generator exerciser) can be enabled. The two daily time setpoints are activated each day at the configured time. Using the *LogicsManager* these setpoints may be configured individually or combined to create a time range.

ID	Parameter	CL	Setting range	Default	Description
1652 1657	**Timer {x}: Hour**	2	0 to 23 h	8 h 17 h	**Timer: Daily time setpoint {x} [x = 1/2]: hour** Enter the hour of the daily time setpoint here. Example: **0:** 0th hour of the day (midnight). **23:** 23rd hour of the day (11pm).
1651 1656	**Timer {x}: Minute**	2	0 to 59 min	0 min	**Timer: Daily time setpoint {x} [x = 1/2]: minute** Enter the minute of the daily time setpoint here. Example: **0:** 0th minute of the hour. **59:** 59th minute of the hour.
1650 1655	**Timer {x}: Second**	2	0 to 59 s	0 s	**Timer: Daily time setpoint {x} [x = 1/2]: second** Enter the second of the daily time setpoint here. Example **0:** 0th second of the minute. **59:** 59th second of the minute.

Active Time Setpoint

Utilizing the *LogicsManager* it is possible to establish specific days (or hours, minutes, seconds) that functions (i.e. generator exerciser) can be enabled. The active switching point is activated only on a specified day (or hour, minute, second). The set points may be configured individually or combined via the *LogicsManager*. You may configure monthly, daily, hourly, minutely, or even secondly time setpoints depending on how you combine the setpoints in the *LogicsManager*.

ID	Parameter	CL	Setting range	Default	Description
1663	**Active day**	2	1 to 31	1	**Timer: Active time setpoint: day** Enter the day of the active switch point here. Example: **01:** 1st day of the month. **31:** 31st day of the month. The active time setpoint is enabled during the indicated day from 0:00:00 hours to 23:59:59 hours.
1662	**Active hour**	2	0 to 23 h	12 h	**Timer: Active time setpoint: hour** Enter the hour of the active switch point here. Example: **0:** 0th hour of the day. **23:** 23rd hour of the day. The active time setpoint is enabled every day during the indicated hour from minute 0 to minute 59.
1661	**Active minute**	2	0 to 59 min	0 min	**Timer: Active time setpoint: minute** Enter the minute of the active switch point here. Example: **0:** 0th minute of the hour. **59:** 59th minute of the hour. The active time setpoint is enabled every hour during the indicated minute from second 0 to second 59.
1660	**Active second**	2	0 to 59 s	0 s	**Timer: Active time setpoint: second** Enter the second of the active switch point here. Example: **0:** 0th second of the minute. **59:** 59th second the minute. The active time setpoint is enabled every minute during the indicated second.

Weekly Time Setpoint

Utilizing the *LogicsManager* it is possible to establish specific days of the week that functions (i.e. generator exerciser) can be enabled. The weekly time setpoint is enabled during the indicated day from 0:00:00 hours to 23:59:59 hours.

ID	Parameter	CL	Setting range	Default	Description
1670	**Monday active**	2	Yes / No	Yes	**Timer: Weekly time setpoints Monday: days** Please enter the days of the weekly workdays: **Yes:** The switch point is enabled every Monday **No:** The switch point is disabled every Monday
1671	**Tuesday active**	2	Yes / No	Yes	**Timer: Weekly time setpoints Tuesday: days** Please enter the days of the weekly workdays: **Yes:** The switch point is enabled every Tuesday **No:** The switch point is disabled every Tuesday
1672	**Wednesday active**	2	Yes / No	Yes	**Timer: Weekly time setpoints Wednesday: days** Please enter the days of the weekly workdays: **Yes:** The switch point is enabled every Wednesday **No:** The switch point is disabled every Wednesday
1673	**Thursday active**	2	Yes / No	Yes	**Timer: Weekly time setpoints Thursday: days** Please enter the days of the weekly workdays: **Yes:** The switch point is enabled every Thursday **No:** The switch point is disabled every Thursday
1674	**Friday active**	2	Yes / No	Yes	**Timer: Weekly time setpoints Friday: days** Please enter the days of the weekly workdays: **Yes:** The switch point is enabled every Friday **No:** The switch point is disabled every Friday
1675	**Saturday active**	2	Yes / No	No	**Timer: Weekly time setpoints Saturday: days** Please enter the days of the weekly workdays: **Yes:** The switch point is enabled every Saturday **No:** The switch point is disabled every Saturday
1676	**Sunday active**	2	Yes / No	No	**Timer: Weekly time setpoints Sunday: days** Please enter the days of the weekly workdays: **Yes:** The switch point is enabled every Sunday **No:** The switch point is disabled every Sunday

Counters Configuration

CB Close Counter

ID	Parameter	CL	Setting range	Default	Description
2541	**Counter value present**	2	0 to 65,535	0	**Setpoint value for CBA close counter** This parameter defines the number of times the control unit registers a CBA closure. The number entered here will overwrite the current displayed value after confirming with parameter 2542 on page 117.
2542	**CBA set number of closures**	2	Yes / No	No	**Set CBA close counter** **Yes:** The current value of the CBA close counter is overwritten with the value configured in "Set point value for start counter". After the counter has been (re)set, this parameter changes back to "No" automatically. **No:** The value of this counter is not changed.

Chapter 4.
Operation

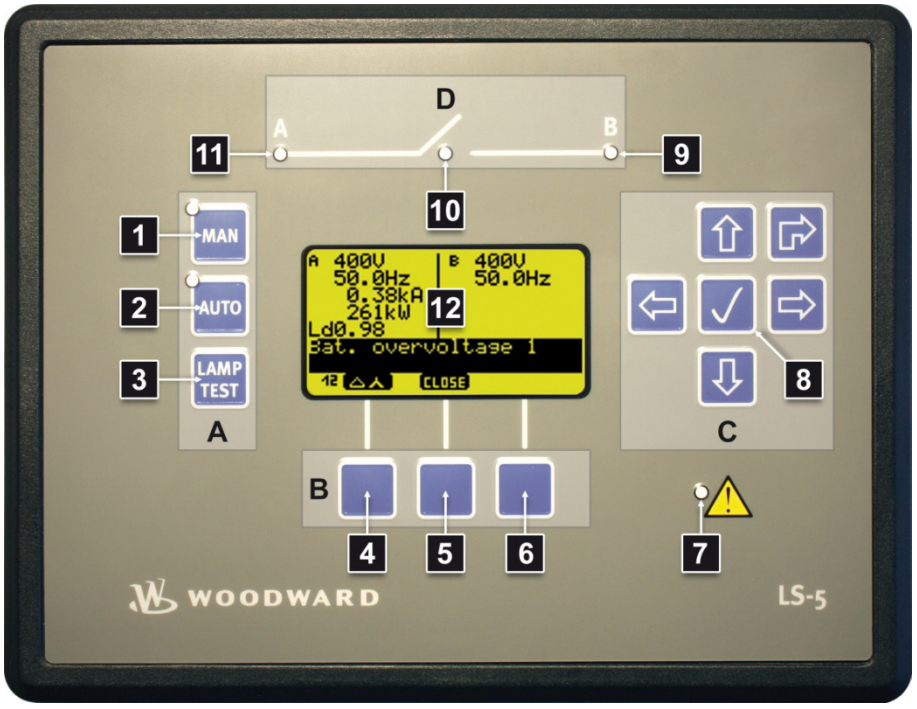


Figure 4-1: Front panel and display

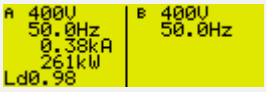
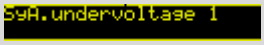
Figure 4-1 illustrates the front panel/display of the LS-52x with push buttons, LEDs and LCD display. A short description of the front panel is given below.

A			
No	**Button**	**Function Main Screen**	**Function Other Screens**
1	MAN	Change into MANUAL operating mode. The LED indicates that the operation mode is active. When MANUAL is selected, the breaker control is performed manually via the push button ■ (No. 5). If the controller is configured to operation mode L-MCB or L-GGB (parameter ID 8840) the button has no function.	
2	AUTO	Change into AUTOMATIC operating mode. The LED indicates that the operation mode is active. When AUTOMATIC is selected, the control unit manages all breaker control functions. These functions are performed in accordance with how the control is configured.	
3	LAMP TEST	Perform lamp test.	

B			
No	**Button**	**Function Main Screen**	**Function Other Screens**
4	■	Toggle between delta/wye voltage display. The index of the "**V**" symbol indicates whether delta or wye voltage is displayed and which phases are displayed. See table Table 4-1 on page 120	The push button has only a function if a graphic icon is assigened (No. 12).
5	■	AUTOMATIC operating mode – No function. MANUAL operating mode – CLOSE Open / Close Breaker.	The push button has only a function if a graphic icon is assigened (No. 12).
6	■	No function.	The push button has only a function if a graphic icon is assigened (No. 12).
7	⚠	The LED indicates that alarm messages are active / present in the control unit.	

C			
No	**Button**	**Function Main Screen**	**Function Other Screens**
8		Display the “Alarm list” screen.	Scroll up / Raise value
		Display the “Main menu” screen.	Scroll down / Lower value
		Display the “Parameter” screen.	Scroll right
		No function.	Scroll left / Enter menu (if graphic icon is assigned)
		Reset “Horn”.	Enter / Acknowledge
		No function.	Return to last screen

D			
No	**Button**	**Function Main Screen**	**Function Other Screens**
9		The LED indicates three states: **Off:** Voltage is below dead bus limit (parameter ID 5820). **Blinking:** Voltage higher than dead bus limit (parameter ID 5820) but voltage or frequency are not in range. **On:** Voltage / frequency in operation window.	
10		The LED indicates two states: **Off:** Breaker is opened. **On:** Breaker is closed.	
11		The LED indicates three states: **Off:** Voltage is below dead bus limit (parameter ID 5820). **Blinking:** Voltage higher than dead bus limit (parameter ID 5820) but voltage or frequency are not in range. **On:** Voltage / frequency in operation window.	

Main Screen		
No	**Display**	**Function**
12		**A:** Shows the System A values. **B:** Shows the System B values.
		This display section shows the “Status Messages” and “Alarm Messages”. A detailed list of the messages can be found in paragraph “Display Messages” on page 129.
		The voltage display softkey changes the type of voltage display. The amount of information available from the system depends on how the measuring is configured in the control. Table 4-1 on page 120 illustrates what values are available depending on the configured measurement type.
		This graphic icon is only displayed in the MANUAL operating mode.

NOTE

If the control unit has been configured for external operating mode selection, the AUTO and MAN operating push buttons have no function. The operating mode cannot be changed.

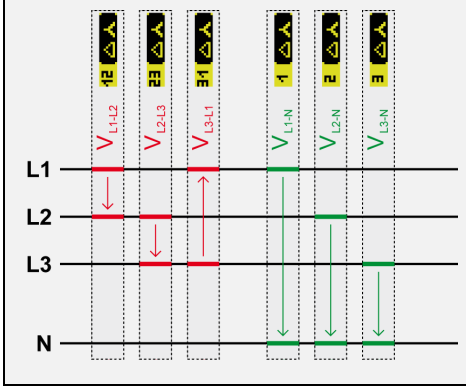
Measuring point	Scroll display		Symbol of' the displayed voltage			Displayed at parameter setting			
	Soft key	Press				3Ph 4W	3Ph 3W	1Ph 2W	1Ph 3W
System A / System B 		0× (6×)		Delta	L1-L2	yes	yes	Yes *1	---
		1×		Delta	L2-L3	yes	yes	---	---
		2×		Delta	L3-L1	yes	yes	---	yes
		3×		Wye	L1-N	yes	---	Yes *1	yes
		4×		Wye	L2-N	yes	---	---	---
		5×		Wye	L3-N	yes	---	---	yes

Table 4-1: Measuring values

*1 (depends on setting of parameter 1858)

Screen Structure

The following figure shows the screen structure of the LS-52x control device.

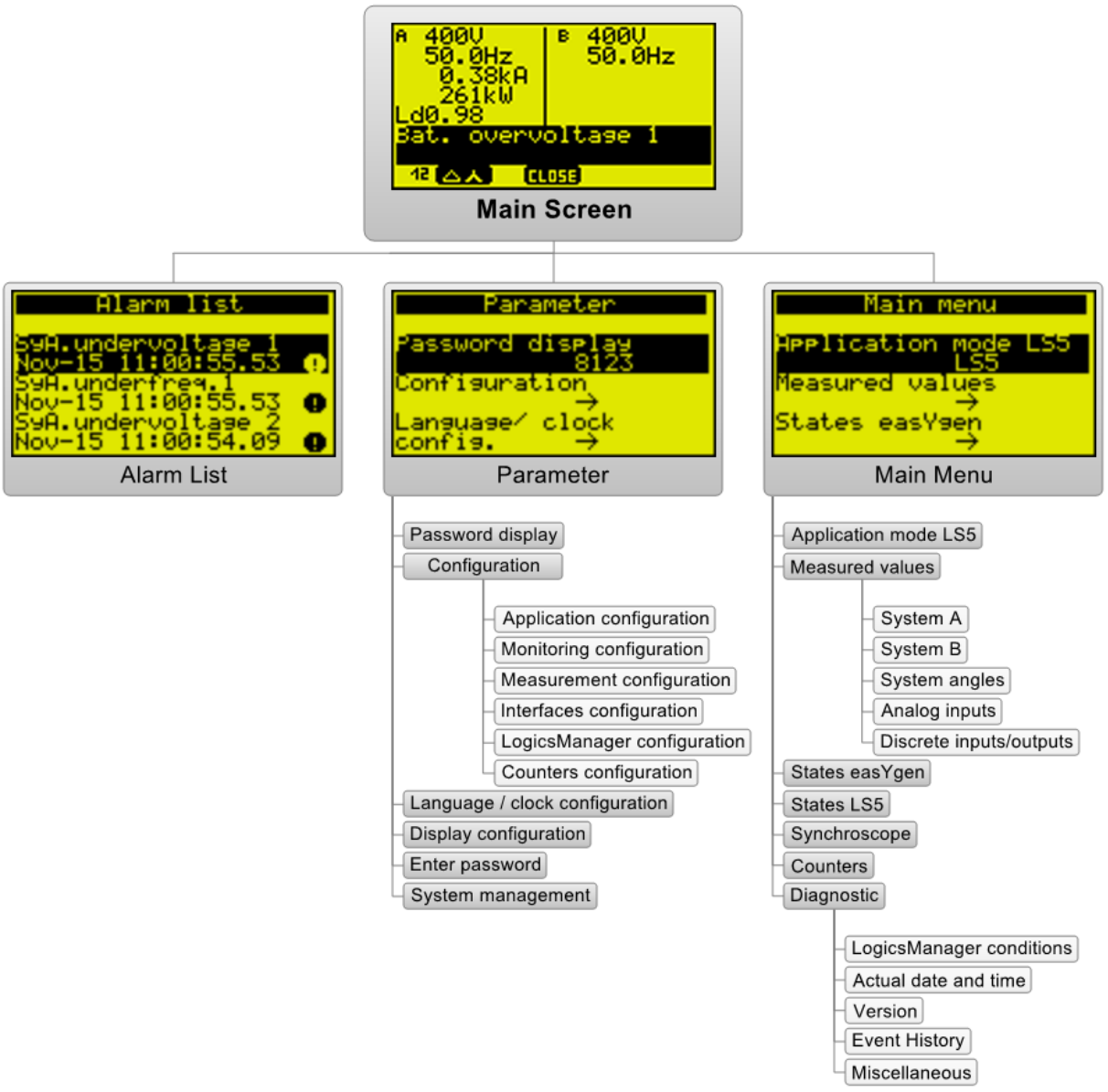


Figure 4-2: Screen structure

Navigation

Alarm List

Screen "Alarm list"

This screen appears after pressing the softkey in the main screen. All alarm messages, which have not been acknowledged and cleared, are displayed. Each alarm is displayed with the alarm message and the date and time of the alarm occurred in the format mon-dd hh:mm:ss.ss. Please note, that self-acknowledging alarm messages get a new timestamp when initializing the unit (switching on). The symbol indicates that this alarm condition is still present. A maximum of 16 alarm messages can be displayed. If 16 alarm messages are already displayed and further alarm messages occur, these will not be displayed before displayed alarm messages are acknowledged and thus deleted from the list.

Return to the main screen.

Scroll up to next alarm message.

Scroll down to next alarm message.

Acknowledge alarm. (can be only performed if alarm condition is not present)

Parameter

The following section shows only some selected screens which have special functions or operation features which extend the standard operation.

Screen "Parameter"

This screen appears after pressing the softkey in the main screen.

Return to the main screen.

Scroll up to next menu item.

Scroll down to next menu item.

Enter menu item.

Password display
Displays the code level.
Configuration
Display the configuration menu screen.
Language / clock configuration
Display the language / clock configuration.
Display configuration
Display the display configuration.
Enter password
Display the password entry screen.
System management
Display the system management configuration screen.

Screen "Display configuration"

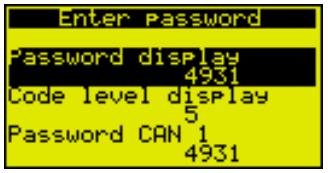
This screen appears after selecting the "Display configuration" menu in the "Parameter" screen. The contrast of the display may be configured here.

Return to the "Parameter" screen.

Increase contrast.

Decrease contrast.

Screen "Enter password"



This screen appears after selecting the "Enter password" menu in the "Parameter" screen. Only the password may be entered using this screen. The code levels are only displayed depending on the entered password.

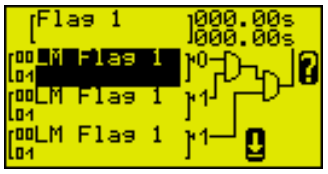
Return to the "Parameter" screen.

Scroll up one parameter.

Scroll down one parameter.

Select the parameter to be configured with this button. Change the parameter using the ⇧ ⇩ softkeys. Navigate in the screen using the ⇦ ⇨ softkeys. Confirm the change with the ✓ softkey or exit parameter configuration without any changes using the softkey.

Screen "LogicsManager configuration"



This screen appears after selecting "Configuration/LogicsManager configuration/Internal flags configuration/Flag 1" menu in the "Parameter" screen. Some parameters are configured via the LogicsManager (refer to Chapter: Configuration). A typical LogicsManager screen is shown in the following. You may configure a logical operation using various command variables, signs, logical operators, and delay times to achieve the desired logical output.

Return to the "Internal flags configuration" screen.

Scroll up one command variable within section.

Scroll down one command variable within section.

Navigate to next command variable section.

By pressing this softkey character you get to a help screen, which displays the logical operators of the *LogicsManager*.

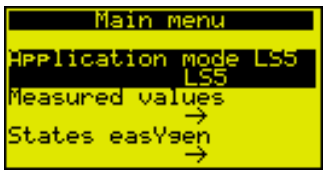
Toggle between the configurable elements.

Confirm the configured option of the selected *LogicsManager* parameter.

Main Menu

The following section shows only some selected screens which have special functions or operation features which extend the standard operation.

Screen "Main Menu"

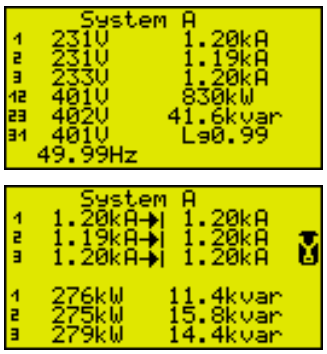


This screen appears after pressing the softkey in the main screen.

- Return to the main screen.
- Scroll up to next menu item.
- Scroll down to next menu item.
- Enter menu item.

Application mode LS5
Displays the current LS5 application mode.
Measured Values
Display the measured values screen.
States easYgen
Display the easYgen states screen.
States LS5
Display the LS5 states screen.
Synchroscope
Display the synchroscope screen.
Counters
Display the counters screen.
Diagnostic
Display the diagonstic screen.

Screen "System A"

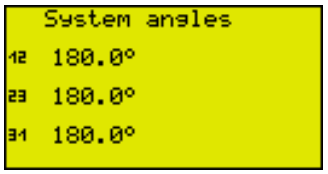


This screen appears after selecting the "System A" menu in the "Measured values" screen. All measured system A values are displayed in this screen.

- Return to "Measured values" screen.
- Scroll down display screen to additional system A values.
- Scroll up display screen to main system A values.
- Reset the maximum value display.

V ..... Voltage
A ..... Current
kW .... Real power
Kvar . Reactive power
Hz ..... Frequency
Lg ..... Lagging
Ld ..... Leading

Screen "System angles"

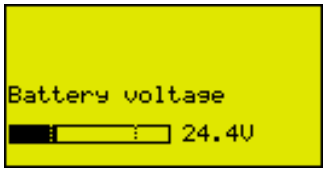


This screen appears after selecting the "System angles" menu in the "Measured values" screen. All measured system angle values are displayed in this screen.

NOTE: *The shown values are the real sytem angles between system A and system B without phase angle compensation (parameter ID 8824).*

Return to "Measured values" screen.

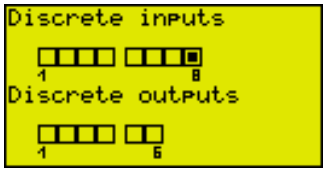
Screen "Analog inputs"



This screen appears after selecting the "Analog inputs" menu in the "Measured values" screen. All measured battery voltagr is displayed in this screen.

Return to "Measured values" screen.

Screen "Discrete inputs/outputs"



This screen appears after selecting the "Discrete inputs/outputs" menu in the "Measured values" screen. Discrete input and discrete output status are displayed.

Return to "Measured Values" screen.

Status display of the discrete inputs and discrete outputs. (Note: The configured logic for the discrete input "N.O./N.C." will determine how the LS-5 reacts to the state of the discrete input. If the respective DI is configured to N.O, the unit reacts on the energized state ( ); if it is configured to N.C., it reacts on the de-energized state ( ).

Discrete input: energized
de-energized

Discrete output: relay activated
relay de-activated

Screen "States easYgen"

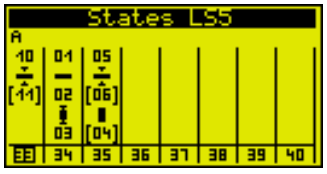
(Four screens – 32 easYgen states)

This screen appears after selecting the "States easYgen" menu in the "Main menu" screen. The states of the easYgen devices are displayed.

- Return to "Main menu" screen.
- Scroll up one screen.
- Scroll down one screen.

- STOP operating mode.
- MANUAL operating mode.
- AUTOMATIC operating mode.
- Breaker open (GCB).
- Breaker closed (GCB).
- Segment number.
- Device number.

Screen "States LS5"



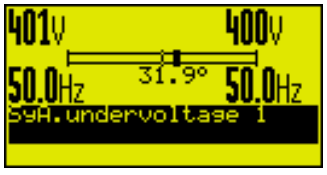
(Four screens – 32 LS-5 states)

This screen appears after selecting the "States LS5" menu in the "Main menu" screen. The states of the LS-5 devices are displayed.

- Return to "Main menu" screen.
- Scroll up one screen.
- Scroll down one screen.

- Segment numbers and Breaker switch: opened / closed.
- Segment numbers and Isolation switch: opened / closed.
- Indicates voltage and frequency are in range.
- Indicates voltage or frequency are not in range.
- Own LS-5 device number.
- Other LS-5 device numbers.

Screen "Synchroscope"

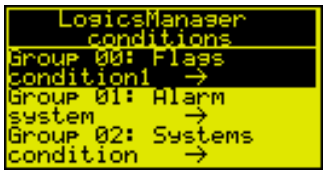


This screen appears after selecting the "Synchroscope" menu in the "Main menu" screen. The square symbol indicates the actual phase angle between system A and system B. A complete left position of the square symbol means -180° and complete right position means +180°. The frequency and voltage differences are indicated in the display.

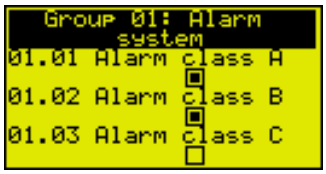
NOTE: *The shown value is not the real angle between system A and system B if the phase angle compensation (parameter ID 8824) is active. The configured phase angle compensation is added to the angle.*

- Return to "Main menu" screen.

Screen "LogicsManager conditions"



Command variables of group 1 (ex.):



This screen appears after selecting the "LogicsManager conditions" menu in the "Diagnostic" screen. You are able to display the conditions of all *LogicsManager* command variables, which are located in their respective groups.

Return to "Diagnostic" screen.

Scroll up one group / command variable.

Scroll down one group / command variable.

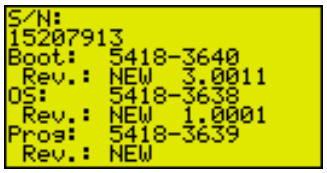
Select the highlighted command variable group and display the state of the command variables in this group.

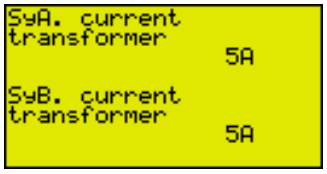
Status display of the command variables:

The command variables is TRUE

The command variables is FALSE

Screen "Version"





This screen appears after selecting the "Version" menu in the "Diagnostic" screen. This screen displays the serial number of the unit and the firm- and software P/N, version, and revision.

Return to "Diagnostic" screen.

Scroll down display screen.

Scroll up display screen.

Screen "Event History"

This screen appears after selecting the "Event History" menu in the "Diagnostic" screen. A date/time stamp is added to each entry. Additional characters (+ and -) indicate the state of the event. The "+" character indicates a condition that is still active. If the condition is no longer present anymore, it will be displayed again, but with a "-" indication.

Return to "Diagnostic" screen.

Scroll up one event.

Scroll down one event.

Screen "CAN interface 1 state"

CAN interface 1 state:

This screen appears after selecting "CAN interface 1 state" in the "Diagnostic/Miscellaneous" screen.

Return to "Miscellaneous" screen.

Status display of the respective bits:

The respective bit is enabled

The respective bit is disabled

Can bus 1 state:

- Bit 1 a TPDO has incorrect mapping parameters
- Bit 3 a TPDO has more than 8 bytes

CAN 1 monitoring (active state):

- Bit {x} RPDO{x} is not received at the moment

CAN 1 monitoring (latched state):

- Bit {x} RPDO{x} has not been received

Display Messages

Status Messages

Message text and ID	Meaning
Mains settling ID 13205	**Mains settling time is active** When the control unit detects that a mains (system A) fault is in range again the mains settling timer begins counting down. The mains (system A) is assumed as stable after the expiration of this timer. If the timer is running a synchronization of CBA is not possible.
CBA dead bus close ID 13210	**Dead bus closing of the CBA** The CBA is closing with at least on system is dead.
CBA open ID 13257	**The CBA is being opened** An CBA open command has been issued.
Synchronization CBA ID 13260	**The CBA will be synchronized** The control tries to synchronize the CBA.
Unloading SyA. ID 13264	**The CBA will open with unloading** The LS-5 wants to open the CBA with unloading and is waiting until the power reaches the value defined by parameter 8819.
Synch. PERMISSIVE ID 13265	**Synchronization mode Permissive (twinckling)** Synchronization mode is set to Permissive (parameter 5728)
Synch. CHECK ID 13266	**Synchronization mode Check (twinckling)** Synchronization mode is set to Check (parameter 5728)
Synch. OFF ID 13267	**Synchronization mode Off (twinckling)** Synchronization mode is set to Off (parameter 5728)
Syn. mains close CBA ID 13279	**Synchronous mains close CBA** The LS-5 has detected that System A and System B are connected to mains and is closing the CBA according to parameters 8820, 8821 and 8822.
CBA request ID 13280	**CBA request** There is a command to open or close the CBA, but the execution is already blocked by the priority of a breaker command off another LS-5/GCB or the LS-5 is still arbitrating the priority.

Alarm Messages

Message text and ID	Meaning
Bat. overvoltage 1 ID 10007	**Battery overvoltage, limit value 1** The battery voltage has exceeded the limit value 1 for battery overvoltage for at least the configured time and did not fall below the value of the hysteresis.
Bat. overvoltage 2 ID 10008	**Battery overvoltage, limit value 2** The battery voltage has exceeded the limit value 2 for battery overvoltage for at least the configured time and did not fall below the value of the hysteresis.
Bat. undervoltage 1 ID 10005	**Battery undervoltage, limit value 1** The battery voltage has fallen below the limit value 1 for battery undervoltage for at least the configured time and has not exceeded the value of the hysteresis.
Bat. undervoltage 2 ID 10006	**Battery undervoltage, limit value 2** The battery voltage has fallen below the limit value 2 for battery undervoltage for at least the configured time and has not exceeded the value of the hysteresis.
CANopen Interface 1 ID 10087	**Interface alarm CANopen on CAN bus 1** No Receive Process Data Object (RPDO) is received within the configured time.
EEPROM failure ID 1714	**The EEPROM checksum is corrupted** The EEPROM check at startup has resulted a defective EEPROM.
SyB. phase rotation ID 3955	**System B rotating field** The system A rotating field does not correspond with the configured direction.
SyA. decoupling ID 3114	**System A decoupling is initiated** One or more monitoring function(s) considered for the system A decoupling functionality has triggered.
SyA. overfreq. 1 ID 2862	**System A overfrequency, limit value 1** The system A frequency has exceeded the limit value 1 for system A overfrequency for at least the configured time and did not fall below the value of the hysteresis.
SyA. overfreq. 2 ID 2863	**System A overfrequency, limit value 2** The system A frequency has exceeded the limit value 2 for system A overfrequency for at least the configured time and did not fall below the value of the hysteresis. Triggering this monitoring function causes the mains decoupling function to trigger.
SyA. overvoltage 1 ID 2962	**System A overvoltage, limit value 1** The system A voltage has exceeded the limit value 1 for system A overvoltage for at least the configured time and did not fall below the value of the hysteresis.
SyA. overvoltage 2 ID 2963	**System A overvoltage, limit value 2** The system A voltage has exceeded the limit value 2 for system A overvoltage for at least the configured time and did not fall below the value of the hysteresis. Triggering this monitoring function causes the mains decoupling function to trigger.
SyA. phase shift ID 3057	**System A phase shift** A system A phase shift, which has exceeded the configured limit, has occurred. Triggering this monitoring function causes the system A decoupling function to trigger.
SyA. underfreq. 1 ID 2912	**System A underfrequency, limit value 1** The system A frequency has fallen below the limit value 1 for system A underfrequency for at least the configured time and has not exceeded the value of the hysteresis.
SyA underfreq. 2 ID 2913	**System A underfrequency, limit value 2** The system A frequency has fallen below the limit value 2 for system A underfrequency for at least the configured time and has not exceeded the value of the hysteresis. Triggering this monitoring function causes the mains decoupling function to trigger.
SyA. undervoltage 1 ID 3012	**System A undervoltage, limit value 1** The system A voltage has fallen below the limit value 1 for system A undervoltage for at least the configured time and has not exceeded the value of the hysteresis.
SyA. undervoltage 2 ID 3013	**System A undervoltage, limit value 2** The system A voltage has fallen below the limit value 2 for system A undervoltage for at least the configured time and has not exceeded the value of the hysteresis. Triggering this monitoring function causes the mains decoupling function to trigger.
CBA fail to close ID 2623	**CBA failed to close** The LS-5 has attempted to close the CBA the configured maximum number of attempts and failed. The LS-5 will continue to attempt to close the CBA as long as the conditions for closing the CBA are fulfilled.
CBA fail to open ID 2624	**Failed CBA open** The LS-5 is still receiving the reply CBA closed after the CBA open monitoring timer has expired.
CBA syn. timeout ID 3074	**CBA synchronization time exceeded** The LS-5 has failed to synchronize the CBA within the configured synchronization time.
Missing LS5 ID 4064	**Missing LS-5 members detected** The LS-5 has detected that the number of available units at CAN does not correspond with the configured application mode.
SyA. phase rotation ID 3975	**System A rotating field** The system A rotating field does not correspond with the configured direction.

Message text and ID	Meaning
Ph.rotation mismatch ID 2944	**System A/System B phase rotation different** System A or System B has different rotating fields. A CB closure is blocked.
SyA. df/dt ID 3106	**System A df/dt (ROCOF)** A system A df/dt, which has exceeded the configured limit, has occurred. Triggering this monitoring function causes the system A decoupling function to trigger.
SyA. volt. asymmetry ID 3928	**System A voltage asymmetry** For at least the delay time without interruption.
SyA. volt. incr. ID 8834	**System A voltage increase** The limit for voltage increase is reached or exceeded.
CBA unload mismatch ID 8838	**CBA unloading mismatch** While unloading CBA the defined limit of load is not reached in the defined time.

Discrete input #	1	2	3	4	5	6	7	8
Message ID	10600	10601	10602	10603	10604	10605	10607	10608

Table 4-2: Message IDs for discrete inputs

Restoring Language Setting

Due to the multilingual capability of the unit, it may happen that the display language of the LS-5 Series is set to a language, the operator is unable to read or understand, by mistake. In this case, the following proceeding helps to restore the desired language. The default setting is English.

Figure 4-3: Front panel and display

Figure 4-3 refers to the different softkeys, which appear in the configured language. In order to change the language setting, press the softkeys in the following order:

1. Press softkey until you return to the starting screen (as indicated above)
2. Press softkey once to access the "Parameter" screen
3. Press softkey twice to access the "Language / clock config." screen
4. Press softkey twice to edit the language setting
5. Press softkey to select the desired language
6. Press softkey once to commit the language setting

Now, the display language is restored to the desired language again.

LS-51x (ToolKit)

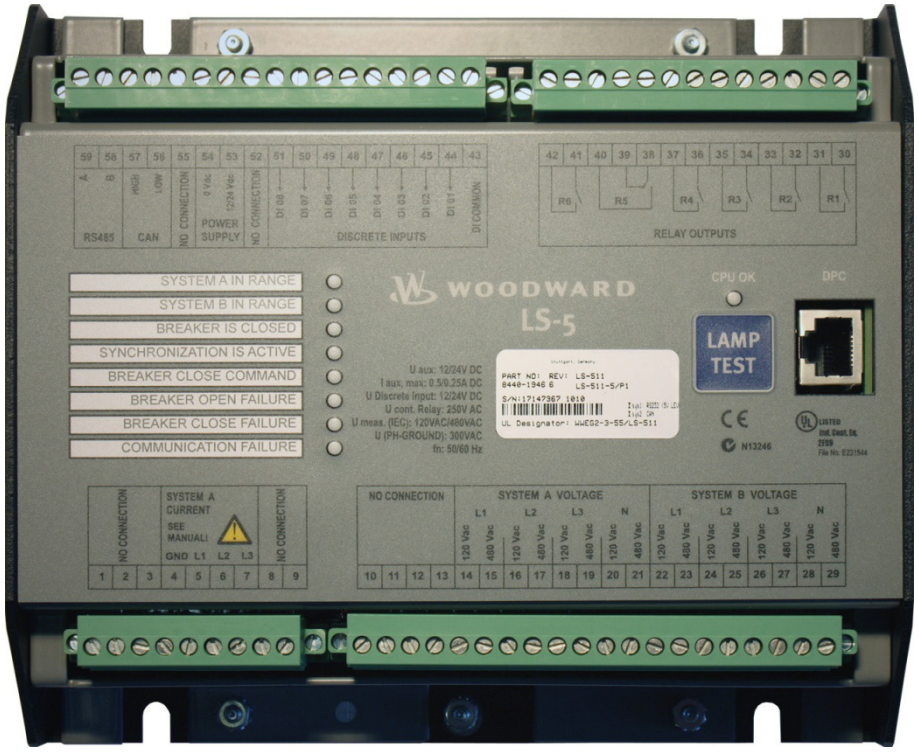


Figure 4-4: LS-51x – front panel

Figure 4-4 illustrates the front panel of the LS-51x with “Lamp Test” push button, LEDs and DPC connector. A short description of the back panel is given below.

Element	Function
	Perform lamp test.
	DPC connector for optional DPC cable.
	The LED indicates “CPU OK”.
	The LEDs 1 to 8 indicate the LogicManger states of parameter 12962 to 12969.

Special ToolKit Screens

States easYgen

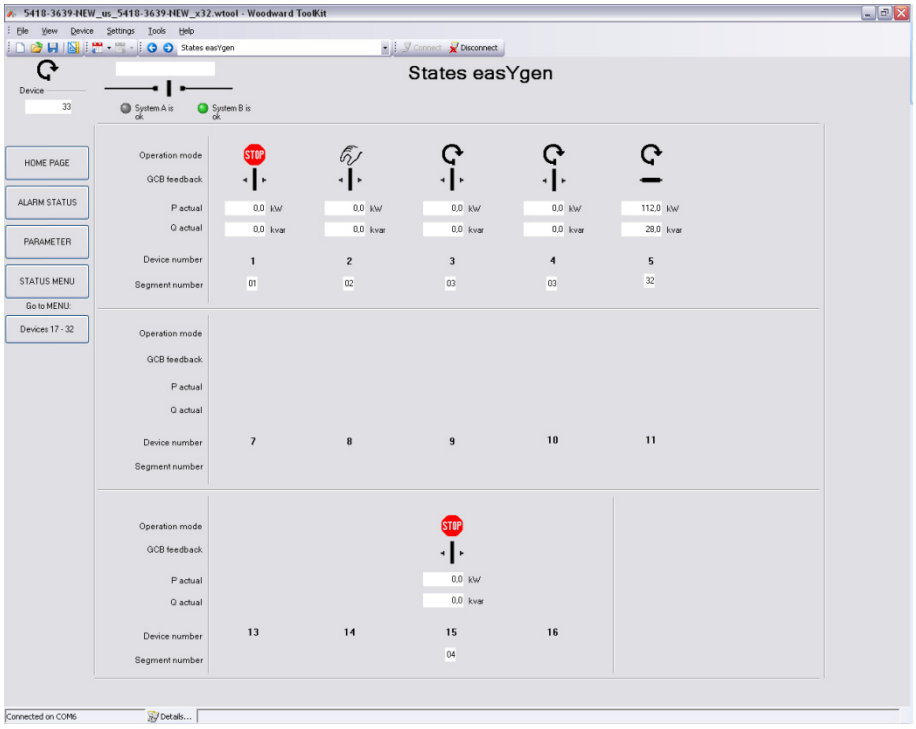


Figure 4-5: ToolKit screen – states easYgen

The states of the easYgen devices are displayed.

STOP	STOP operating mode.
	MANUAL operating mode.
	AUTOMATIC operating mode.
	Breaker open.
	Breaker closed.

Table 4-3: Icons – states easYgen

States LS-5

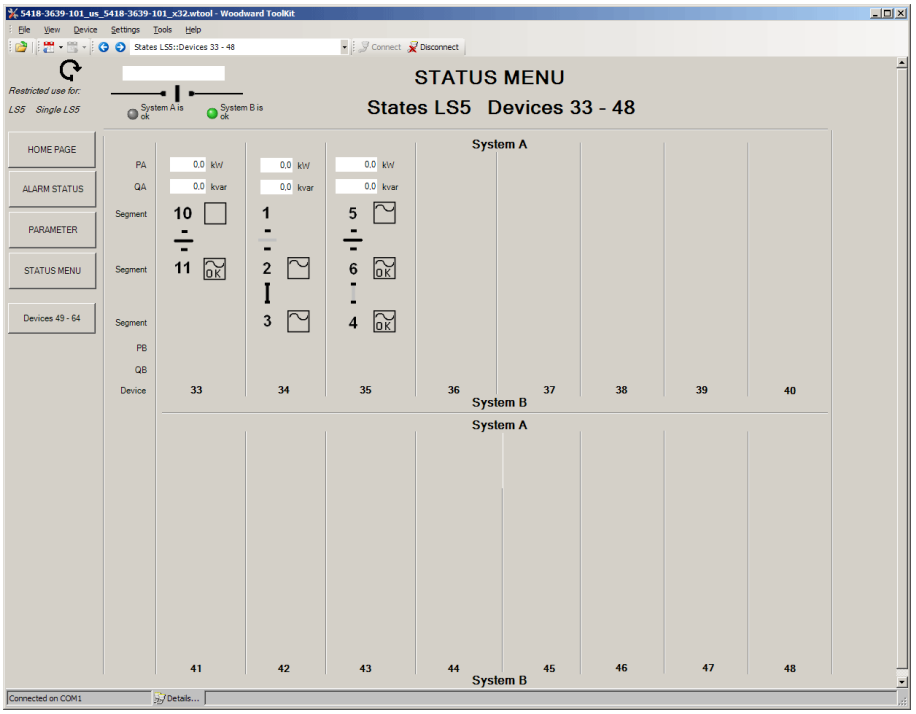


Figure 4-6: ToolKit screen – states LS-5

The states of the LS-5 devices are displayed.

	Voltage is below dead bus limit.
	Voltage higher than dead bus limit but not in range.
OK	Voltage and frequency in operation window.
	Breaker switch open
	Breaker switch closed
	Isolation switch open
	Isolation switch closed

Table 4-4: Icons – states LS-5

Chapter 5.
Application

Overview

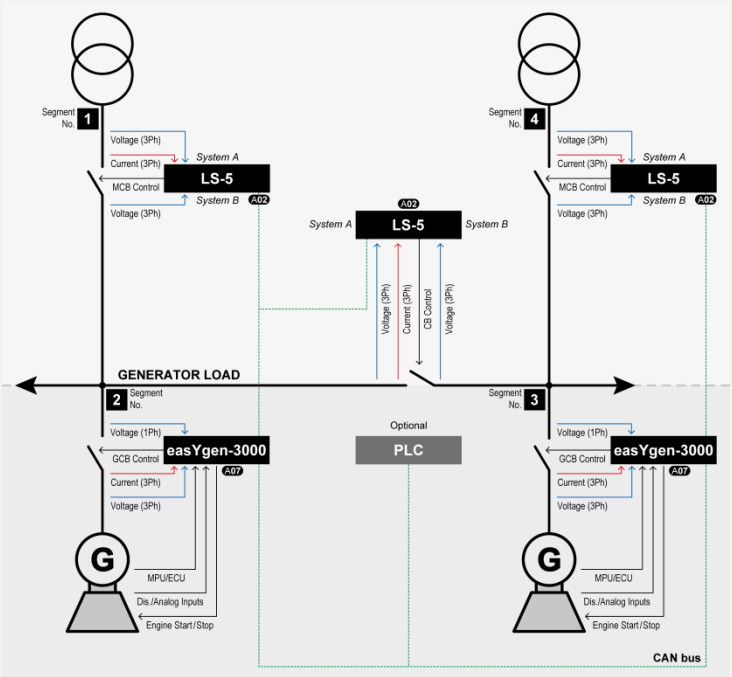
The LS-5 unit interacts together with the easYgen-3400/3500 in a system. This system allows establishing various applications. To make the handling for that wide range of applications easier, different preconfigured application modes in the LS-5 as well in the easYgen-3400/3500 are provided. These application modes are created because some preconfigurations are automatically fixed through the according application modes. The following chapter explains the differentiation of the application modes and there settings. Not all possible configurations can be explained in detail, but shall help to guide through the settings according to the mode.

Application Modes LS-5

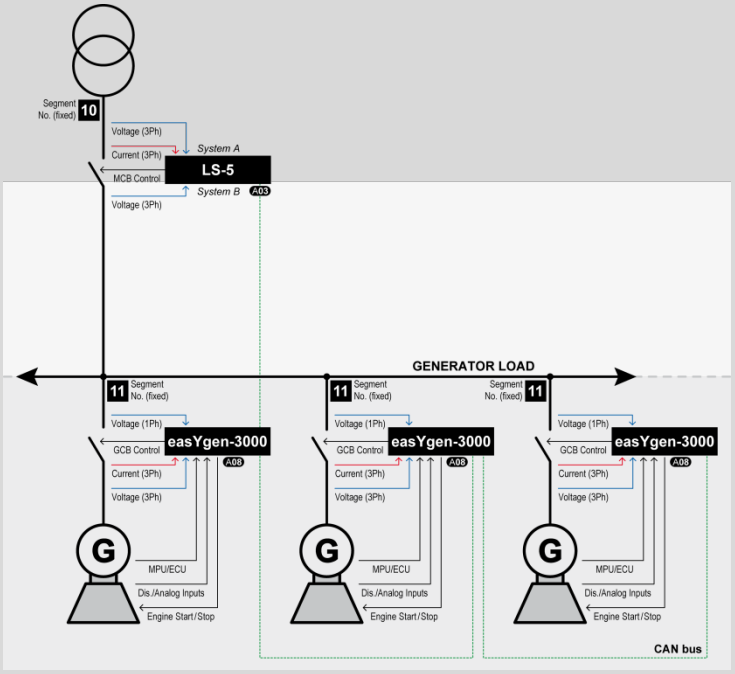
Application Mode LS-511/521	Application Symbol	Function
Single LS5	A01	Independent synch check relay mode. This application mode provides the following functions: • Handling of CBA (dead bus closure, synchronization, open) initiated by the corresponding command variables or by manual commands. • Measuring and monitoring of system A values (voltage, frequency, phase rotation, current). • Measuring of system B values (voltage, frequency, phase rotation). • Measuring of active and reactive power on system A. • Measuring of phase angle system A to system B. • No easYgen is expected on the CAN bus. • Interacting as an independent synchronizer for a PLC by communication interface (CANopen, Modbus RTU slave). ***NOTE:*** *The LS-5 acts as if there is no other LS-5 in the system.*
LS5	A02	Open LS-5 system, in conjunction with easYgen-3400/3500, individually configurable. This application mode provides the following functions: • Handling of CBA (dead bus closure, synchronization, open) initiated by the corresponding command variables or by manual commands. • Measuring and monitoring of system A values (voltage, frequency, phase rotation, current). • Measuring of system B values (voltage, frequency, phase rotation). • Measuring of active and reactive power on system A. • Measuring of phase angle system A to system B. • The system allows here up to 32 easYgen and up to 16 LS-5. • Recognition of segments within the easYgen / LS-5 system. • The decision for closing and opening the breaker comes from the LS-5 itself (LogicsManager). • Dead bus arbitration with other easYgen and LS-5. • Mains decoupling function in the LS-5 configurable, for LS-5 connected with system A at mains. • Complicated applications require an external close and open logic (PLC). ***NOTE:*** *The LS-5 is expecting at least one easYgen device in the system.*

L-MCB	**A03**	LS-5 as MCB control in conjunction with easYgen-3400/3500 in a fixed application. This application mode provides the following functions: • Handling of a MCB (dead bus closure, synchronization, open) initiated by the easYgen. • The operating mode MANUAL in the LS-5 is not supported. • Measuring and monitoring of system A values, (mains voltage, mains frequency, mains phase rotation, mains current), transferred to easYgen. • Measuring of system B values, (voltage, frequency, phase rotation), transferred to easYgen. • Measuring of mains active and mains reactive power on system A. • The decision for closing and opening the breaker comes exclusively from the easYgen-3400/3500 as MCB close and open command. • Mains decoupling function in the LS-5 configurable. • No PLC for close and open command required. • Automatic configuration of the relevant parameters. ***NOTE:*** *The LS-5 is expecting at least one easYgen device in the system.*
L-GGB	**A04**	LS-5 as GGB control in conjunction with easYgen-3400/3500 in a fixed application. This application mode provides the following functions: • Handling of a GGB (dead bus closure, synchronization, open) initiated by the easYgen. • The operating mode MANUAL in the LS-5 is not supported. • Measuring and monitoring of system A values (load voltage, load frequency, load phase rotation). • Measuring of system B values (generator busbar voltage, -frequency, -phase rotation). • The decision for closing and opening the breaker comes exclusively from the easYgen-3400/3500 as GGB close and open command. • No PLC for close and open command required. • Automatic configuration of the relevant parameters. ***NOTE:*** *The LS-5 is expecting at least one easYgen device in the system.*

Application Modes easYgen-3400/3500 Interacting With LS-5

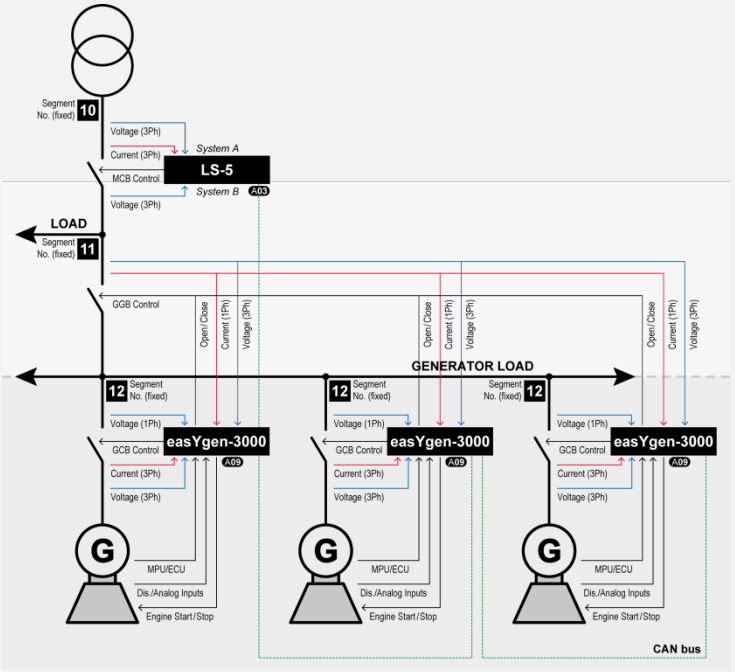
Application Mode easYgen-3400/3500	Application Symbol	Function
GCB/LS5	A07	One or more easYgen in conjunction with an open LS-5 system, individually configurable for different application. Multiple isolated and/or mains parallel operation. (max. 16 LS-5).  This application mode provides the following functions: • Handling of the GCB (dead bus closure, synchronization, open) intitiated by start command in AUTO or individually in MAN mode. • Measuring and monitoring of generator values (voltage, frequency, phase rotation, current and power). • Measuring of generator busbar values (voltage, frequency). • Indicating of mains values (voltage, frequency) sent from “Mains”-LS-5 with the smallest ID in the own segment (configurable by parameter 4103). • Indicating the sum of active and reactive power sent from all “Mains”-LS-5 in the own segment. • Regulating Import/Export power with the sum of active and reactive power sent from all “Mains”-LS-5 in the own segment. • The easYgen recognizes through the LS-5 system the active segment number. • Digital input 8 is occupied for feedback GCB. • Relay output 6 is occupied for close command GCB. • Connection to mains (MCB is closed) is recognized over the LS-5 system, if one or more “Mains”-LS-5 are available. • Minimum 1 LS-5 is expected on the CAN 3 bus. • The close and open commands for the single LS-5 breakers are usually not generated in the easYgen. • Run-up synchronization, acting on the GCB, is possible. • Mains voltage and current is usually not connected at the easYgen.

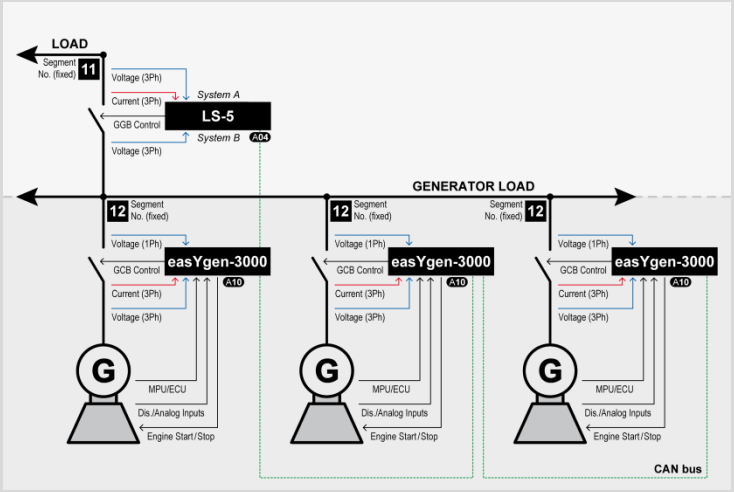
GCB/L-MCB	**A08**	One or more easYgen in conjunction with one LS-5 unit, acting on the MCB in a fixed application. Multiple isolated and/or mains parallel operation. The same handling as in the GCB/MCB mode, but the MCB is operated through the LS5.

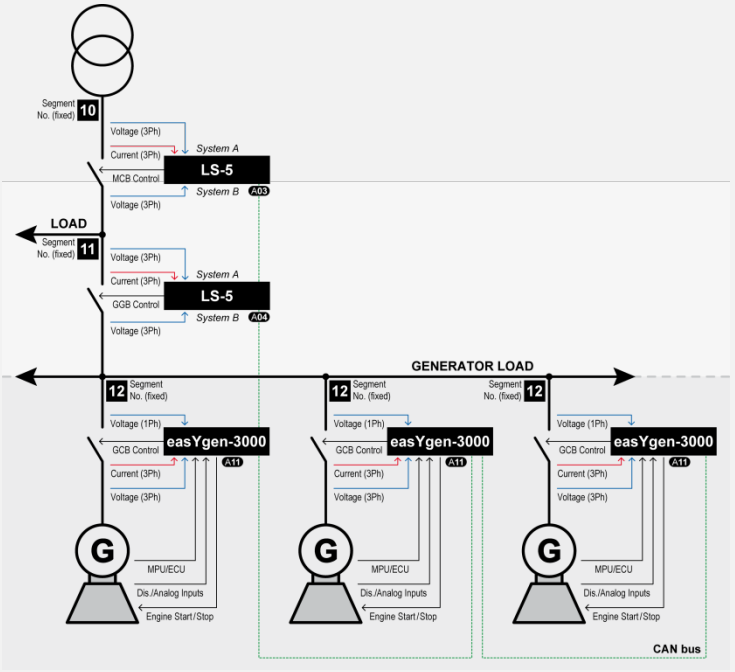


This application mode provides the following functions:

- LS5 is configured to “L-MCB” **A03** mode.
- Handling of the GCB (dead bus closure, synchronization, open) initiated by start command in AUTO or individually in MAN mode.
- Handling of the MCB (dead bus closure, synchronization, open) in AUTO and MANUAL according to the rules of the GCB/MCB mode.
- The Breaker Transition mode parameter 3411 is considered.
- Measuring and monitoring of generator values (voltage, frequency, phase rotation, current and power)
- Measuring of generator busbar values (voltage, frequency)
- Indicating of mains values (voltage, frequency, phase angle) sent from the LS5. (Configurable by parameter 4103)
- Indicating of active and reactive power at the interchange point sent from LS5.
- Regulating Import/Export power with active and reactive power sent from LS5.
- Discrete input 8 is occupied for feedback GCB
- Relay output 6 is occupied for close command GCB
- Connection to mains (MCB is closed) is recognized over the LS5.
- The LS5 is expected on the CAN3 bus.
- The close and open commands for the LS5 are generated in the easYgen.
- Run-up synchronization, acting on the GCB, is possible.
- Mains voltage and current is usually not connected at the easYgen.

GCB/GGB/L-MCB	A09	One or more easYgen, one generator group breaker (GGB) in conjunction with one LS-5 unit, acting on the MCB in a fixed application. Multiple isolated and/or mains parallel operation. The same handling as in the GCB/GGB/MCB mode, but the MCB is operated through the LS5.  This application mode provides the following functions: • LS-5 is configured to “L-MCB” A03 mode. • Handling of the GCB (dead bus closure, synchronization, open) initiated by start command in AUTO or individually in MAN mode. • Handling of the GGB (dead bus closure, synchronization, open) initiated by start command in AUTO or individually in MAN mode. • Handling of the MCB (dead bus closure, synchronization, open) in AUTO and MANUAL according to the rules of the GCB/GGB/MCB mode. • The Breaker Transition mode parameter 3411 is considered. • Measuring and monitoring of generator values (voltage, frequency, phase rotation, current and power). • Measuring of generator busbar values (voltage, frequency). • Measuring and monitoring of load busbar values (voltage, frequency, phase rotation, current and power) ***NOTE:*** *This measurement is executed with the easYgen own “mains” measurement connected at the load busbar.* • Indicating of mains values (voltage, frequency, phase angle) sent from the LS-5 (configurable by parameter 4103). • Indicating of active and reactive power at the interchange point sent from LS-5. • Regulating Import/Export power with active and reactive power sent from LS-5. • Discrete input 8 is occupied for feedback GCB. • Discrete input 9 is occupied for feedback GGB. • Relay output 6 is occupied for close command GCB. • Relay output 10 is occupied for close command GGB. • Relay output 11 is occupied for open command GGB. • Connection to mains (MCB is closed) is recognized over the LS-5. • The LS-5 is expected on the CAN 3 bus. • The close and open commands for the LS-5 are generated in the easYgen. • Run-up synchronization, acting on the GCB or GCB/GGB, is possible.

GCB/L-GGB	A10	One or more easYgen with one LS-5 unit, acting on the GGB in a fixed application. **Only isolated operation.** The same handling as in the GCB/GGB mode without mains parallel operation, but the GGB is operated through the LS5.  • LS-5 is configured to “L-GGB” A04 mode. • Handling of the GCB (dead bus closure, synchronization, open) initiated by start command in AUTO or individually in MAN mode. • Handling of the GGB (dead bus closure, synchronization, open) initiated by start command in AUTO or individually in MAN mode according to the rules of the GCB/GGB mode. • Measuring and monitoring of generator values (voltage, frequency, phase rotation, current and power). • Measuring of generator busbar values (voltage, frequency). • Discrete input 8 is occupied for feedback GCB. • Relay output 6 is occupied for close command GCB. • The LS-5 is expected on the CAN 3 bus. • The close and open commands for the LS-5 are generated in the easYgen. • Run-up synchronization, acting on the GCB or GCB/GGB, is possible.

GCB/L-GGB/L-MCB	**A11**	One or more easYgen with one LS-5 unit, acting on the GGB and another LS-5 unit, acting on the MCB in a fixed application. Multiple isolated and/or mains parallel operation. The same handling as in the GCB/GGB/MCB mode, but the GGB and MCB is operated through the LS-5.  This application mode provides the following functions: • One LS-5 is configured to “L-MCB” A03 mode. • Other LS-5 is configured to “L-GGB” A04 mode. • Handling of the GCB (dead bus closure, synchronization, open) initiated by start command in AUTO or individually in MAN mode. • Handling of the GGB (dead bus closure, synchronization, open) initiated by start command in AUTO or individually in MAN mode according to the rule of the GCB/GGB/MCB mode. • Handling of the MCB (dead bus closure, synchronization, open) in AUTO and MANUAL according to the rules of the GCB/GGB/MCB mode. • The Breaker Transition mode parameter 3411 is considered. • Measuring and monitoring of generator values (voltage, frequency, phase rotation, current and power). • Measuring of generator busbar values (voltage, frequency) • Indicating of mains values (voltage, frequency, phase angle) sent from the LS-5 (configurable by parameter 4103). • Indicating of active and reactive power at the interchange point sent from LS-5. • Regulating Import/Export power with active and reactive power sent from LS-5. • Discrete input 8 is occupied for feedback GCB. • Relay output 6 is occupied for close command GCB. • Connection to mains (MCB is closed) is recognized over the LS-5 system. • Both LS-5 are expected on the CAN 3 bus. • The close and open commands for the both LS-5 are generated in the easYgen. • Run-up synchronization, acting on the GCB or GCB/GGB, is possible.

Correlation Application Modes easYgen3500/3400 And LS-5

	Application Mode LS-511/521	Application Symbol	Application Mode easYgen-3400/3500	Application Symbol
LS-511/521	**Single LS5**	A01	n/a	n/a
LS-511/521 + easYgen-3400/3500	**LS5** (up to 16 unit)	A02	**GCB/LS5**	A07
	L-MCB (max. 1 unit)	A03	**GCB/L-MCB**	A08
			GCB/GGB/L-MCB	A09
	L-GGB (max. 1 unit)	A04	**GCB/L-GGB**	A10
	L-GGB (max. 1 unit)	A04	**GCB/L-GGB/L-MCB**	A11
	L-MCB (max. 1 unit)	A03		

LS-5 Standalone Application

Application Mode: Single LS5 | A01

The LS-5, configured as „Single LS5“, runs as an independent unit and does not expect any other unit on the CAN bus. The idea of this mode is to use the LS-5 as a simple sync check relay controlled by discrete inputs or to run it together with a PLC as a synchronizer. Therefore the PLC gets all information about all measurement values (voltages, current, power, phase angle) by communication interface to run a close loop synchronizing. Additionally the LS-5 can be taken as a measurement transformer for displaying and monitoring values. The decoupling functions (voltage, frequency, change of frequency) can also be used when a mains parallel situation exists.

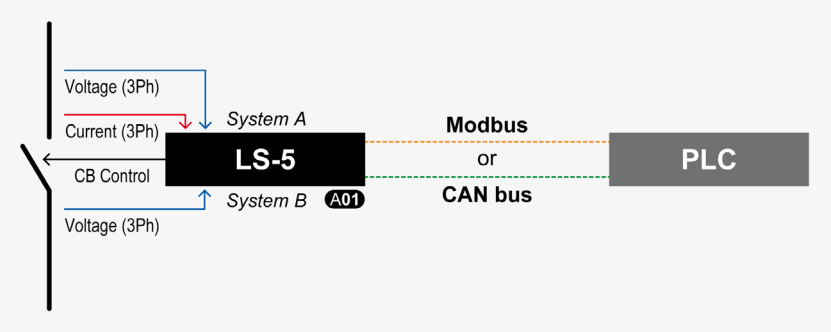


Figure 5-1: Application mode – Single LS5

Installation

1. If a mains decoupling function is desired, the system A measurement is to connect on the mains busbar.
2. The PLC acts as master and has to monitor the functionality of the communication interface.

Configuration

1. Configure the application mode (parameter 8840) of the LS-5 device to “Single LS5 | A01”.
2. For configure the measurement navigate to “Parameter>Configuration>Measurement config.” and enter your individually settings.
3. If a phase angle compensation is required, sometimes needed when tapping voltages over power transformer, navigate to “Configuration>Application config>Breakers config.>Configure CBA>Synchronization CBA>Phase angle compensation”. This setting must be executed very carefully and must be double checked by a voltmeter over the particular breaker.
4. If the control for close and open the breaker shall be done by discrete inputs, the default setting according to the wiring diagram is recommended.
5. If the control for close and open the breaker shall be done by communication interface, the register with the remote control bits is used. (LM Command variables 04.44 to 04.59, Bit1 to Bit 16). See chapter “Communication interface” for more information how to address the according data register.
6. The close command is released by the LM equation “Enable close CBA”. Navigate to “Configuration>Application config>Breakers config.>Configure CBA>Enable close CBA”. Enter here your arguments for closing the breaker.
7. The open command is activated by the LM equation “Open CBA immed.”. Enter here your arguments for opening the breaker. The open command executed through the LM equation “Open CBA unload” makes only sense, if the PLC can influence the unloading of the breaker.
8. In case of a required manual operation by push buttons acting on DI, the two LM “Open CBA in manual” and “Close CBA in manual” can be used for. The configuration “Open CBA in manual” (Immediate>With unl.) should be set to “Immediate”.
9. The LS-5 can be adjusted for different kind of breaker closure. Refer there for to “Configuration>Application config.>Configure CBA”. Whereby the configuration “Dead bus closure CBA” on/off is generally releasing any kind of dead busbar closure.

LS-5 Series & easYgen-3400/500 Applications

General

In comparison to the mode “Single LS5” are all following modes part of the overall system of LS-5 and easYgen-3400/3500 controls. The information between the units must be exchanged over CAN bus. The easYgen provides therefore the CAN 3 bus connection.

There are two types of LS-5 existing within the different application modes:

1. The LS-5 runs as a slave unit (Mode “L-MCB” A03; Mode “L-GGB” A04). In these modes the LS-5 is guided by the easYgen and takes over directly the close and open commands coming from the easYgen(s). In this case no external logic is needed to decide, when the breaker is to open or to close. The operating mode MANUAL in the LS-5 is not supported. The manual control is provided by the easYgen(s). The isolation switch input of the LS-5 is ignored. The LS-5 sends measuring values and flags to the CAN connected easYgen(s), which are needed for the according application mode. The application modes including LS-5 configured to L-MCB A03 and L-GGB A04 are fixed and can not be varied except from the amount of generators, feeding on the generator busbar (max. 32). Other tie-breakers are not allowed. The configuration for LS-5 and easYgen is restricted to make the configuration easier. The application mode determines the fixed segment numbers for system A and B.The LogicsManager for close and open commands are faded out.

2. The LS-5 runs as an independent unit (Mode “LS5” A02). The closing and opening of the breaker is controlled through the LogicsManager equation “Open CBA unload”; “Open CBA immed.” and “Enable close CBA“. The close and open commands are configured with LogicsManager command variables. This can be discrete inputs, remote control bits or CB control bits coming from the easYgen(s). In dependence on the complexity of the system according external program logics are required. The operating mode MANUAL in the LS-5 is supported and shall give the operator the possibility to force a close or open of the breaker by hand. The display model offers therefore an operating mode button and a softkey to close and open the breaker. The Mode “LS5” A02 opens a wide range of applications and requires more effort to configure the whole easYgen – LS-5 system. The configuration of segments is an important consumption that the system runs. This will be explained more in detail in the following chapters.

The LS-5 Runs As A Slave Unit (Mode “L-MCB” A03; Mode “L-GGB” A04)

The easYgen and LS-5 offers application modes, which allow an easier setup of the easYgen – LS-5 system. The applications are predefined and allow no variety, except the amount of easYgen-3000 driven generators (up to 32). Check your application, whether it adapts to the here introduced applications.

Predefined Application 1: Single Or Multiple easYgen With One External Operated MCB

- Application Mode easYgen-3400/3500: GCB/L-MCB | A08
- Application Mode LS-5: L-MCB | A03

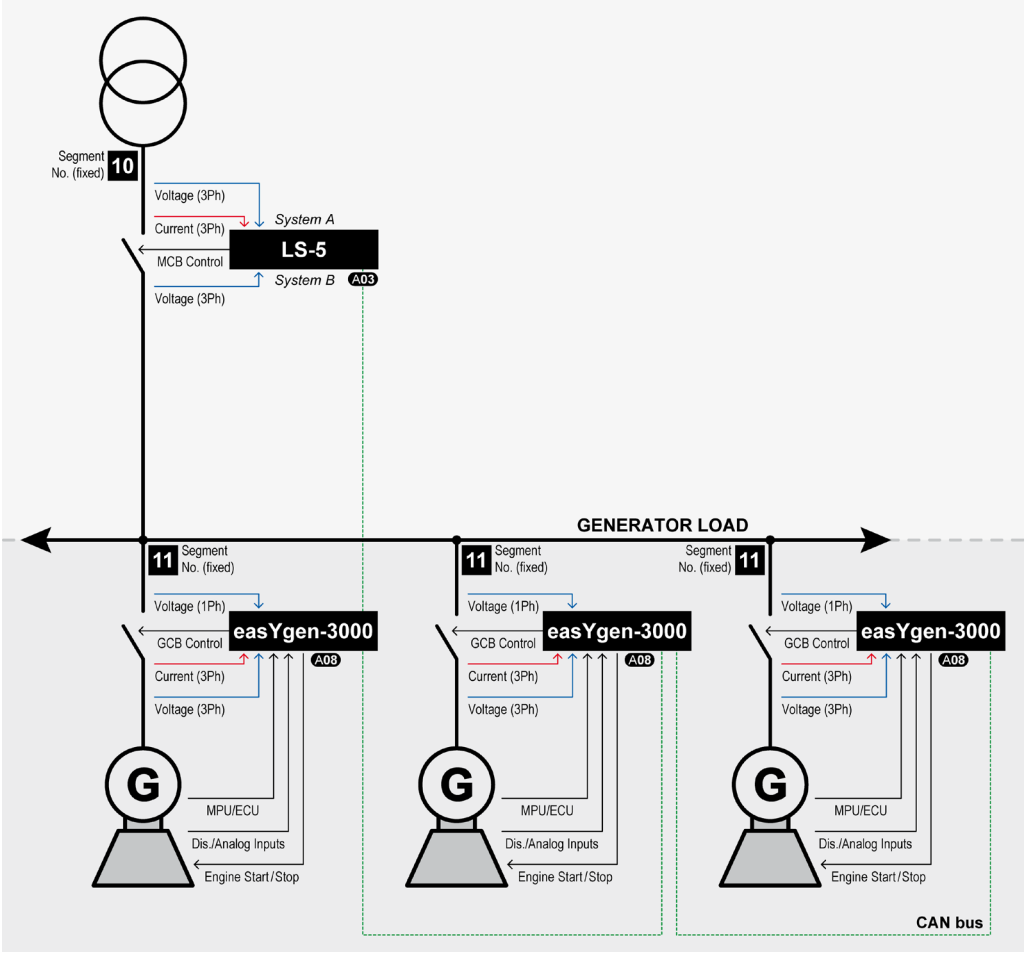


Figure 5-2: Single or multiple easYgen with one external operated MCB

Introduction

One or more gensets feed on a load busbar. The easYgen(s) close and open their own generator breaker. The LS-5 at the interchange point closes and opens the MCB. All breakers are connected to the same segment; the generator busbar is equal to the load busbar. The easYgen(s) running the same tasks as in the application mode GCB/MCB with the differentiation, that instead of a direct MCB handling now the LS-5 is taking over that part. The decision when to close or open the MCB is coming from the easYgen(s) via CAN bus. The manual control on the MCB is restricted on the easYgen(s). If a run-up synchronization is desired, only the mode “with GCB” is supported. In this arrangement the mains decoupling is provided by the LS-5. When the mains decoupling over GCB is desired, please refer to chapter “Mains Decoupling Function easYgen”.

Installation

LS-5:

1. The system A voltage and current measurement is connected to the mains.
2. The system B voltage measurement is connected to the busbar.
3. The MCB breaker feedback is connected to the LS-5 only.
4. The MCB breaker command(s) are connected to the LS-5 only.
5. The LS-5 CAN is connected to the CAN 3 of the easYgen(s).

easYgen:

1. The generator voltage and current measurement is connected to the generator.
2. The busbar voltage measurement is connected to the busbar.
3. The mains voltage measurement is not used.
4. The GCB breaker feedback is connected to the according easYgen.
5. The GCB breaker command(s) are connected to the the according easYgen.
6. The easYgen CAN 3 is connected to the CAN of the LS-5.

Configuration

LS-5:

1. Configure the application mode (parameter 8840) of the LS-5 device to "L-MCB | A03".
2. Configure the measurement system A and B.
3. If a phase angle compensation is required, sometimes needed when tapping voltages over power transformer, navigate to "Configuration>Application config>Breakers config.>Configure CBA>Synchronization CBA>Phase angle compensation". This setting must be executed very carefully and must be double checked by a voltmeter over the particular breaker.
4. Configure the breaker close and/or open relay(s) according to your MCB.
5. Check the synchronization setting, like phase angle, frequency window and voltage.

easYgen:

1. Configure the application mode (parameter 3444) of each easYgen device to "GCB/L-MCB | A03".
2. Configure the measurement for generator and busbar according to the chapter "Configuration" on page 47.
3. The mains measurement is not used in this application mode. A couple of settings should be configured as follows. **Switch off** the following parameters:
   - "Mains decoupling" (parameter 3110)
   - "Change of frequency" (parameter 3058)
   - "Overfrequency level 1" (parameter 2850)
   - "Underfrequency level 1" (parameter 2900)
   - "Overfrequency level 2" (parameter 2856)
   - "Underfrequency level 2" (parameter 2906)
   - "Overvoltage level 1" (parameter 2950)
   - "Undervoltage level 1" (parameter 3000)
   - "Overvoltage level 2" (parameter 2956)
   - "Undervoltage level 2" (parameter 3006)
   - "Mains voltage increase" (parameter 8806)
4. If a phase angle compensation over the GCB is required, sometimes needed when tapping voltages over power transformer, navigate to "Parameter>Configuration>Configure Application>Configure Breakers>Configure GCB>Phase angle compensation GCB "On/Off". This setting must be executed very carefully and must be double checked by a voltmeter over the particular breaker.
5. For displaying the mains values coming from LS-5 on the main screen, navigate to parameter "Show mains data" parameter 4103 and switch to "LS5".
6. Each easYgen device provides in this arrangement four control bits for sending information to the LS-5. Therefor navigate to "Parameter>Configuration>Configure LogicsManager>Configure LS5". These bits can be used as command variables in the LS-5. So it is imaginable to take the bit 3 for initiate alarms acknowledge in the LS-5 or to release the mains decoupling.

Predefined Application 2: Multiple easYgen with one GGB and one external operated MCB

- Application Mode easYgen-3400/3500: GCB/GGB/L-MCB | A09
- Application Mode LS-5: L-MCB | A03

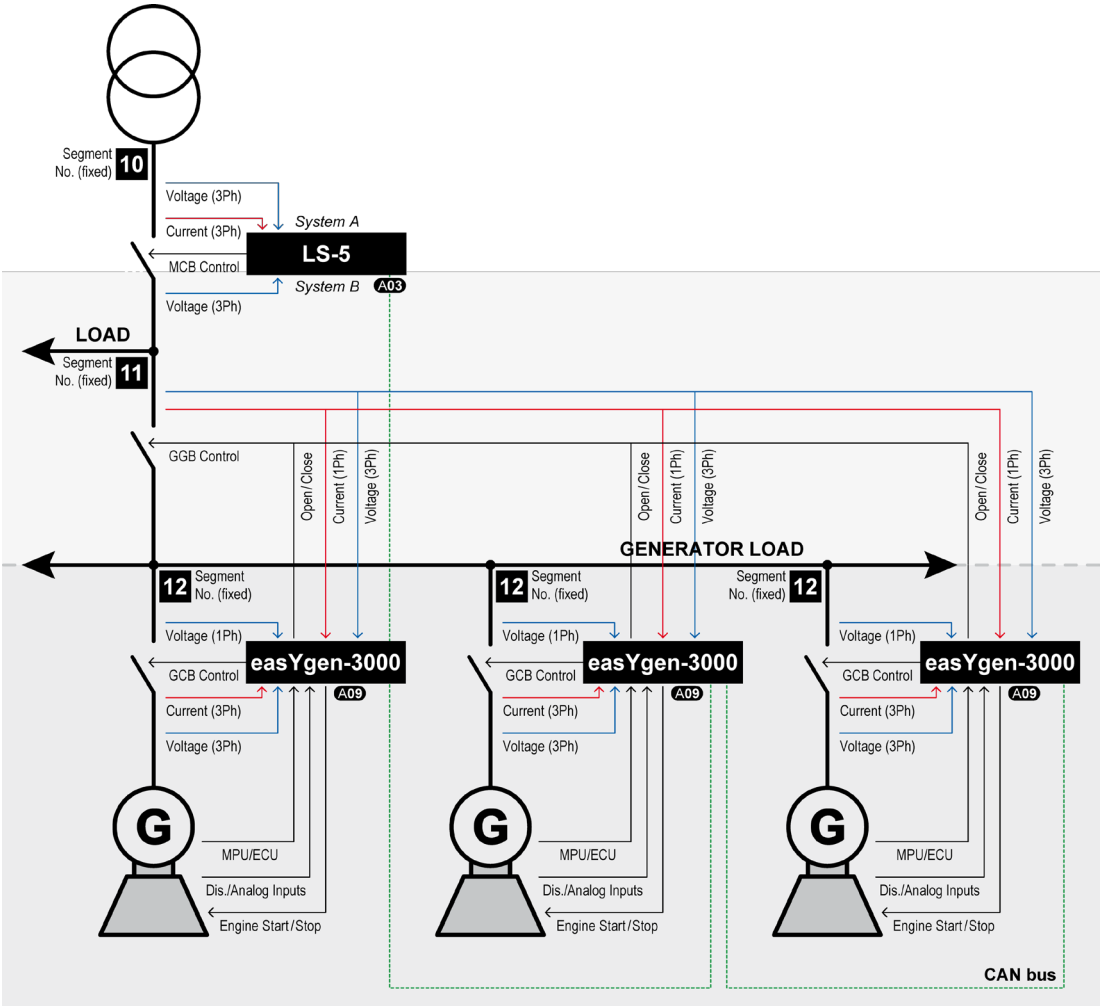


Figure 5-3: Multiple easYgen with one GGB and one external operated MCB

Introduction

One or more gensets feed on a generator busbar. The easYgen(s) close and open their own generator breaker. The easYgen(s) close and open the common generator group breaker (GGB). The LS-5 at the interchange point closes and opens the MCB. This application includes a generator busbar and a load busbar and one mains income. The easYgen(s) running the same tasks as in the application mode GCB/GGB/MCB with the differentiation, that instead of a direct MCB handling through the easYgen, the LS-5 controls the MCB. The decision when to close or open the MCB is coming from the easYgen(s) over the CAN bus. The manual control on the MCB is restricted on the easYgen(s). If a run-up synchronization is desired, the modes “withGCB” and “with GCB/GGB” are supported. In this arrangement the mains decoupling is provided by the LS-5. When the mains decoupling over GCB is desired, please refer to chapter “Mains Decoupling Function easYgen”.

NOTE

The mains measurement of the easYgen(s) are used for the load busbar measurement.

Installation

LS-5:

1. The system A voltage and current measurement is connected to the mains.
2. The system B voltage measurement is connected to the load busbar.
3. The MCB breaker feedback is connected to the LS-5 only.
4. The MCB breaker command(s) are connected to the LS-5 only.
5. The LS-5 CAN is connected to the CAN 3 of the easYgen(s).

easYgen:

1. The generator voltage and current measurement is connected to the generator.
2. The busbar voltage measurement is connected to the generator busbar.
3. The mains voltage measurement is connected to the load busbar.
4. The GGB breaker feedback is connected to all easYgens.
5. The GGB breaker command(s) are connected to all easYgens.
6. The GCB breaker feedback is connected to the according easYgen.
7. The GCB breaker command(s) are connected to the the according easYgen.
8. The easYgen CAN 3 is connected to the CAN of the LS-5.

Configuration

LS-5:

1. Configure the application mode (parameter 8840) of the LS-5 device to "L-MCB | A03".
2. Configure the measurement system A and B.
3. If a phase angle compensation is required, sometimes needed when tapping voltages over power transformer, navigate to "Configuration>Application config>Breakers config.>Configure CBA>Synchronization CBA>Phase angle compensation". This setting must be executed very carefully and must be double checked by a voltmeter over the particular breaker.
4. Configure the breaker close and/or open relay(s) according to your MCB.
5. Check the synchronization setting, like phase angle, frequency window and voltage.

easYgen:

1. Configure the application mode (parameter 3444) of each easYgen device to "GCB/GGB/L-MCB | A09".
2. Configure the measurement for generator and busbar according to chapter "Configuration" on page 47.
3. Configure the mains measurement of the easYgen according to chapter "Configuration" on page 47, but in relation to the load busbar voltage. The mains measurement of the easYgen is only taken for synchronization GGB, operating range consideration and phase rotation check. All other easYgen mains measurement functions are not used. A couple of settings should be configured as follows. **Switch off** the following parameters:
   - "Mains decoupling" (parameter 3110)
   - "Change of frequency" (parameter 3058)
   - "Overfrequency level 1" (parameter 2850)
   - "Underfrequency level 1" (parameter 2900)
   - "Overfrequency level 2" (parameter 2856)
   - "Underfrequency level 2" (parameter 2906)
   - "Overvoltage level 1" (parameter 2950)
   - "Undervoltage level 1" (parameter 3000)
   - "Overvoltage level 2" (parameter 2956)
   - "Undervoltage level 2" (parameter 3006)
   - "Mains voltage increase" (parameter 8806)
4. If a phase angle compensation over the GCB is required, sometimes needed when tapping voltages over power transformer, navigate to "Parameter>Configuration>Configure Application>Configure Breakers>Configure GCB>Phase angle compensation GCB ""On/Off". This setting must be executed very carefully and must be double checked by a voltmeter over the particular breaker.
5. If a phase angle compensation over the GGB is required, navigate to MCB phase angle compensation in ToolKit. This setting must be executed very carefully and must be double checked by a voltmeter over the particular breaker.
6. For displaying the mains values coming from LS-5 on the main screen, navigate to parameter "Show mains data" parameter 4103 and switch to "LS5".

7. Each easYgen device provides in this arrangement four control bits for sending information to the LS-5. Therefore navigate to “Parameter>Configuration>Configure LogicsManager>Configure LS5”. These bits can be used as command variables in the LS-5. So it is imaginable to take bit 3 to initiate an alarm acknowledge in the LS-5 or to release the mains decoupling.

Predefined Application 3: Multiple easYgen with one external operated GGB in isolated operation

- Application Mode easYgen-3400/3500: GCB/L-GGB | A10
- Application Mode LS-5: L-GGB | A04

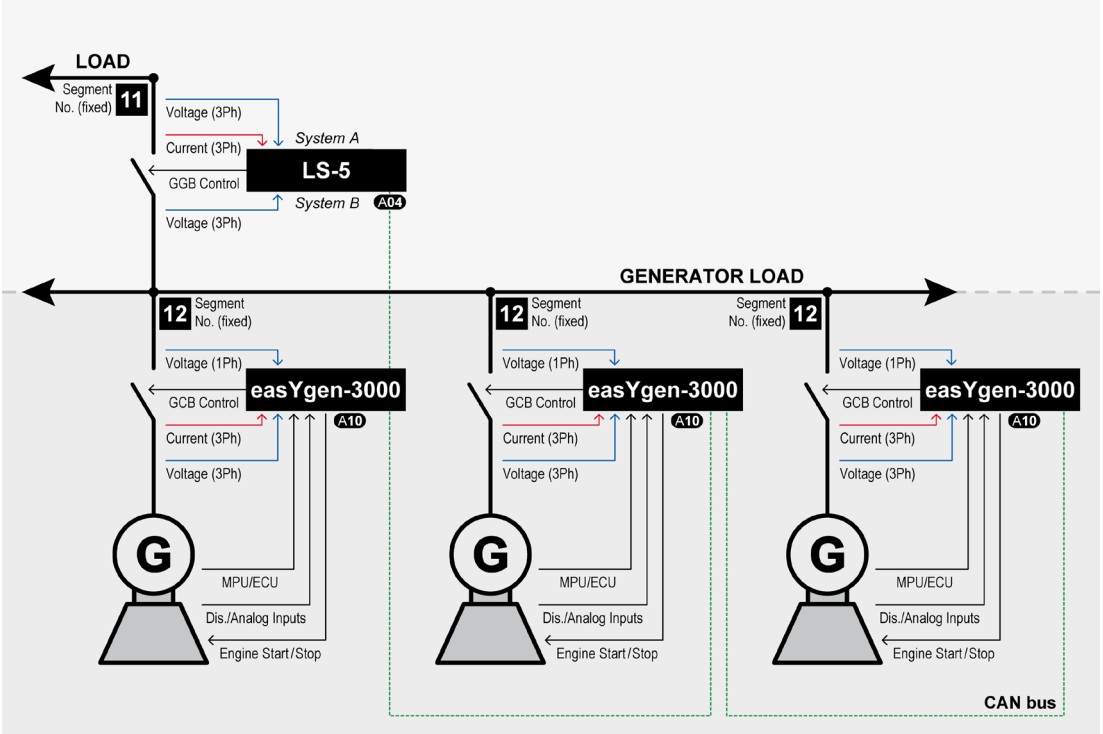


Figure 5-4: Multiple easYgen with one external operated GGB in isolated operation

Introduction

One or more gensets feed on a generator busbar. The easYgen(s) close and open their own generator breaker. The easYgens close and open the common generator group breaker (GGB). The LS-5 over the GGB closes and opens the GGB. This application includes a generator busbar and a load busbar. The mains is not present. The easYgen(s) running the same tasks as in the application mode GCB/GGB with the differentiation that only isolated operation is allowed and instead of a direct GGB handling through the easYgen, the LS-5 controls the GGB. The decision when to close or open the GGB is coming from the easYgen(s) over the CAN bus. The manual control on the GGB is restricted on the easYgen(s). If a run-up synchronization is desired, the modes “withGCB” and “with GCB/GGB” are supported.

NOTE

The mains measurement of the easYgen(s) are used for the load busbar measurement.

Installation

LS-5:

1. The system A voltage measurement is connected to the load busbar.
2. The system B voltage measurement is connected to the generator busbar.
3. The GGB breaker feedback is connected to the LS-5 only.
4. The GGB breaker command(s) are connected to the LS-5 only.
5. The LS-5 CAN is connected to the CAN 3 of the easYgen(s).

easYgen:

1. The generator voltage and current measurement is connected to the generator.
2. The busbar voltage measurement is connected to the busbar.
3. The mains voltage measurement is not used.
4. The GCB breaker feedback is connected to the according easYgen.
5. The GCB breaker command(s) are connected to the the according easYgen.
6. The easYgen CAN 3 is connected to the CAN of the LS-5.

Configuration

LS-5:

1. Configure the application mode (parameter 8840) of the LS-5 device to "L-GGB | A04".
2. Configure the measurement system A and B.
3. Configure the breaker close and/or open relay(s) according to your GGB.

easYgen:

1. Configure the application mode (parameter 3444) of each easYgen device to "GCB/L-GGB | A10".
2. Configure the measurement for generator and busbar according to chapter "Configuration" on page 47.
3. The mains measurement is not used in this application mode. A couple of settings should be configured as follows. **Switch off** the following parameters:
   - "Mains decoupling" (parameter 3110)
   - "Change of frequency" (parameter 3058)
   - "Overfrequency level 1" (parameter 2850)
   - "Underfrequency level 1" (parameter 2900)
   - "Overfrequency level 2" (parameter 2856)
   - "Underfrequency level 2" (parameter 2906)
   - "Overvoltage level 1" (parameter 2950)
   - "Undervoltage level 1" (parameter 3000)
   - "Overvoltage level 2" (parameter 2956)
   - "Undervoltage level 2" (parameter 3006)
   - "Mains voltage increase" (parameter 8806)
4. If a phase angle compensation over the GCB is required, sometimes needed when tapping voltages over power transformer, navigate to "Parameter>Configuration>Configure Application>Configure Breakers>Configure GCB>Phase angle compensation GCB" "On/Off". This setting must be executed very carefully and must be double checked by a voltmeter over the particular breaker.
5. For removing the mains values from the main screen, navigate to parameter "Show mains data" parameter 4103 and switch to "No".
6. Each easYgen device provides in this arrangement four control bits for sending information to the LS-5. Therefor navigate to "Parameter>Configuration>Configure LogicsManager>Configure LS5. These bits can be used as command variables in the LS-5, like alarm acknowledge in the LS-5 and more.

Predefined Application 4: Multiple easYgen with one external operated GGB and one external operated MCB

- Application Mode easYgen-3400/3500: GCB/L-GGB/L-MCB | A11
- Application Mode LS-5: L-MCB | A03
- Application Mode LS-5: L-GGB | A04

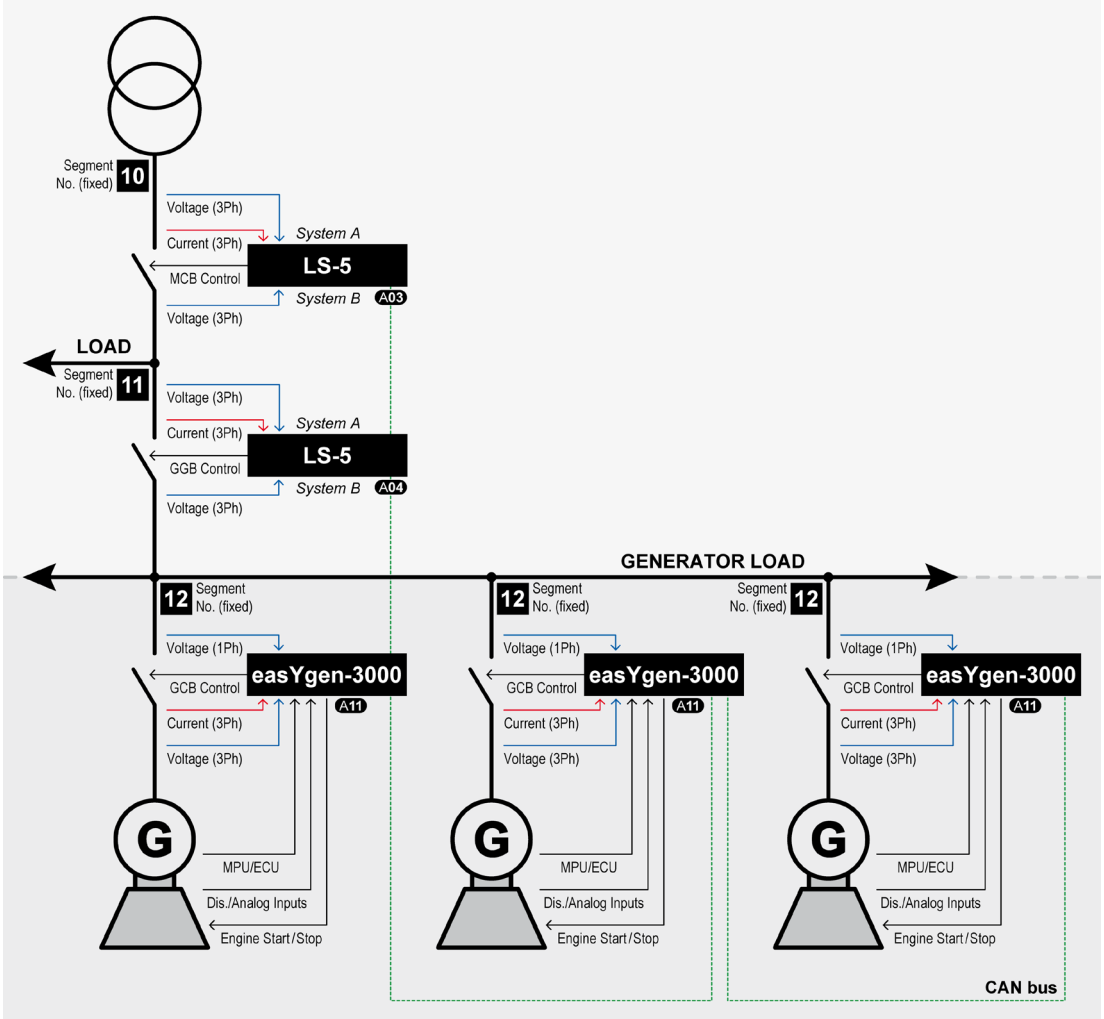


Figure 5-5: Multiple easYgen with one external operated GGB and one external operated MCB

Introduction

One or more gensets feed on a generator busbar. The easYgen(s) close and open their own generator breaker. The LS-5 between the generator busbar and load busbar close and open the common generator group breaker (GGB). The LS-5 at the interchange point to the mains closes and opens the MCB. This application includes a generator busbar, a load busbar and one mains income. The easYgen(s) running the same tasks as in the application mode GCB/GGB/MCB with the differentiation, that instead of a direct GGB and MCB handling through the easYgen, the both LS-5 devices take over that part. The decision when to close or open the MCB and GGB is coming from the easYgen(s) over the CAN bus. The manual control on the MCB and GGB is restricted on the easYgen(s). If a run-up synchronization is desired, the modes “withGCB” and “with GCB/GGB” are supported. In this arrangement the mains decoupling is provided by the LS-5 for the MCB. When the mains decoupling over GCB is desired, please refer to chapter “Mains Decoupling Function easYgen”.

Installation

LS-5 (MCB):

1. The system A voltage and current measurement is connected to the mains.
2. The system B voltage measurement is connected to the load busbar.
3. The MCB breaker feedback is connected to the LS-5 only.
4. The MCB breaker command(s) are connected to the LS-5 only.
5. The LS-5 CAN is connected to the CAN 3 of the easYgen(s).

LS-5 (GGB):

1. The system A voltage measurement is connected to the load busbar.
2. The system B voltage measurement is connected to the generator busbar.
3. The GGB breaker feedback is connected to the LS-5 only.
4. The GGB breaker command(s) are connected to the LS-5 only.
5. The LS-5 CAN is connected to the CAN 3 of the easYgen(s).

easYgen:

1. The generator voltage and current measurement is connected to the generator.
2. The busbar voltage measurement is connected to the generator busbar.
3. The mains voltage measurement is not used.
4. The GCB breaker feedback is connected to the according easYgen.
5. The GCB breaker command(s) are connected to the the according easYgen.
6. The easYgen CAN 3 is connected to the CAN of the LS-5.

Configuration

LS-5 (MCB):

1. Configure the application mode (parameter 8840) of the LS-5 device to “L-MCB | A03”.
2. Configure the measurement system A and B.
3. If a phase angle compensation over the MCB is required, sometimes needed when tapping voltages over power transformer, navigate to “Configuration>Application config>Breakers config.>Configure CBA>Synchronization CBA>Phase angle compensation”. This setting must be executed very carefully and must be double checked by a voltmeter over the particular breaker.
4. Configure the breaker close and/or open relay(s) according to your MCB.
5. Check the synchronization setting, like phase angle, frequency window and voltage.

LS-5 (GGB):

1. Configure the Application mode (parameter 8840) of the LS-5 device to “L-GGB | A04”.
2. Configure the measurement system A and B.
3. If a phase angle compensation over the GGB is required, sometimes needed when tapping voltages over power transformer, navigate to “Configuration>Application config>Breakers config.>Configure CBA>Synchronization CBA>Phase angle compensation”. This setting must be executed very carefully and must be double checked by a voltmeter over the particular breaker.
4. Configure the breaker close and/or open relay(s) according to your GGB.
5. Check the synchronization setting, like phase angle, frequency window and voltage.

easYgen:

1. Configure the application mode (parameter 3444) of each easYgen device to “GCB/L-GGB/L-MCB | A11”.
2. Configure the measurement for generator and busbar according to chapter “Configuration” on page 47.
3. The mains measurement is not used in this application mode. A couple of settings should be configured as follows. **Switch off** the following parameters:
   - “Mains decoupling” (parameter 3110)
   - “Change of frequency” (parameter 3058)
   - “Overfrequency level 1” (parameter 2850)
   - “Underfrequency level 1” (parameter 2900)
   - “Overfrequency level 2” (parameter 2856)
   - “Underfrequency level 2” (parameter 2906)
   - “Overvoltage level 1” (parameter 2950)
   - “Undervoltage level 1” (parameter 3000)
   - “Overvoltage level 2” (parameter 2956)
   - “Undervoltage level 2” (parameter 3006)
   - “Mains voltage increase” (parameter 8806)
4. If a phase angle compensation over the GCB is required, sometimes needed when tapping voltages over power transformer, navigate to “Parameter>Configuration>Configure Application>Configure Breakers>Configure GCB>Phase angle compensation GCB” “On/Off”. This setting must be executed very carefully and must be double checked by a voltmeter over the particular breaker.
5. For displaying the mains values coming from LS-5 on the main screen, navigate to parameter “Show mains data” parameter 4103 and switch to “LS5”.
6. Each easYgen device provides in this arrangement two control bits for sending information to the LS-5. Therefor navigate to “Parameter>Configuration>Configure LogicsManager>Configure LS5”. These bits can be used as command variables in the LS-5 to iniate i.e. an alarm acknowledge or to release the mains decoupling.

The LS-5 runs as independent unit (Mode "LS5" A02)

The easYgen and LS-5 offers an application mode (easYgen: "GCB/LS5 A07" and LS-5: "LS5 A02"), which allows a wide range of different applications. Unfortuately the setup of such an open easYgen – LS-5 system requires more knowledge. The free LS-5 arrangement allows up to 32 easYgen-3400/3500 and up to 16 LS-5 devices. The easYgen(s) are only operating their GCBs; the other breakers have to be operated by the LS-5. At next shall be clarified some expressions which will come up in the next introduced examples.

Introduction and Explanation of Terms

Segment Number (Control Number)

A segment is defined as a section of the bus, feeder or interconnection, which cannot electrically be isolated to a smaller section and is connected to a circuit breaker or an isolation switch which is operated or supervised by an LS-5. A transformer is not to be considered as a segment or a point of isolation. Each segment, feeder, or interconnection must be assigned a number that is unique to that segment.

Isolation Switch

In some applications are existing isolation switches. An isolation switch is usually taken to interrupt two bars from each. The breaker is usually controlled manually. The LS-5 unit in mode "LS5 A02" can handle max.1 isolation switch. The LS-5, located at the isolation switch, must be informed about the condition of that switch. The condition determines the segmenting.

Mains Breaker

The frequency and voltage are solid. A segment number is needed. The first breaker from mains side is the MCB. The LS-5 is always connected with measurement system A on the mains side. The setting "Mains connection" is always set on "System A". The system A measurement gets the mains segment number.

Tie Breaker

No direct mains connection neither on system A or system B. For both sides a segment number is needed. There is no clear rule for where system A or system B needs to be connected. Likely the location of the CT determines the measurement A B. The setting "Mains connection" is always set to "None".

Generator

The frequency and voltage are variable. A segment number is not needed.

Device Number (Control Number)

It is necessary to configure all connected controls with a unique device number (control number). Hence the units are clear defined in their function and location. The numbers 1 to 32 are reserved for the easYgen(s) (easYgen "Device number"), the numbers 33 to 64 are reserved for the LS-5 ("Device number" parameter 1702).

CAN Bus Node ID Number

To communicate via the CAN bus it is necessary to configure all connected controls with a unique CAN bus node ID number (parameter 8950). Usually the same number like the device ID number is taken.

Priority During Breaker Closure

In an emergency application the simultaneous closing of two circuit breakers is blocked via communications between the LS-5 and the easYgen. Once an easYgen is enabled for a dead bus connection, it has priority over all LS-5s (any CB controlled by an LS-5 cannot be closed). If multiple LS-5s are enabled to close a circuit breaker at the same time the LS-5 with the lowest CAN identification number receives the master status (all other LS-5s are inactive). When a closure failure occurs (see chapter "Breakers" on page 92), this LS-5 falls out of the dead bus closure consideration. The next prioritized LS-5 overtakes this part.

Mains Measurement with easYgen

The application mode "GCB/LS5 A07" does not need the mains measurement of the easYgen. This measurement is provided by the LS5 system. The only exception using mains measurement of the easYgen is the mains decoupling function acting on GCB. In this case refer to chapter "Mains Decoupling Function in the easYgen". For all other cases the measurement causes alarms. Therefore they need to be **switched off**:

- "Mains decoupling" parameter 3110
- "Change of frequency" parameter 3058
- "Overfrequency level 1" parameter 2850
- "Underfrequency level 1" parameter 2900
- "Overfrequency level 2" parameter 2856
- "Underfrequency level 2" parameter 2906
- "Overvoltage level 1" parameter 2950
- "Undervoltage level 1" parameter 3000
- "Overvoltage level 2" parameter 2956
- "Undervoltage level 2" parameter 3006
- "Mains voltage increase" parameter 8806

The mains current and power measurement is never used in the "GCB/LS5 A07" mode.

Mains Decoupling Function easYgen

To provide mains decoupling, acting on the GCB, the mains decoupling function of the easYgen must be used. This includes the mains measurement executed with the easYgen. The mains measurement is connected together with the busbar measurement on the generator busbar. Refer to the easYgen-3400/3500 Manual 37528 for details.

Mains Decoupling Function LS-5

In this arrangement the mains decoupling is provided by the LS-5 for the MCB. When the mains decoupling over GCB is desired, please refer to chapter "Mains Decoupling Function easYgen". The LS5(s) which are responsible for the mains breakers overtake the mains monitoring and execute the decoupling function. The mains monitoring is done with the measurement system A. The measurement system A is connected on the mains side.

Configuration

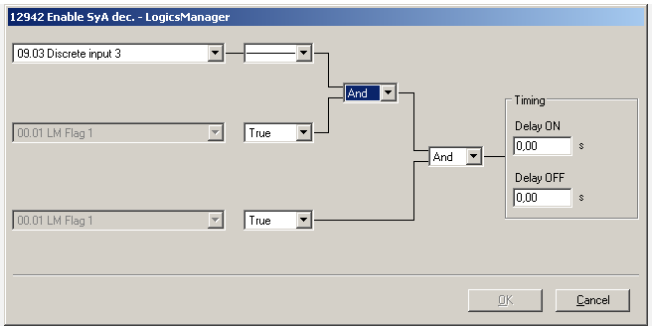
1. Navigate to "Configuration>Monitoring config.>System A".
2. Configure syA.voltage monitoring parameter 1771 to "Phase-Phase (Ph-Ph)" or "Phase-Neutral (Ph-N)".
3. Navigate to "Operating voltage" and "Operating frequency".
   - Configure the operating range for frequency.
   - Configure the operating range for voltage.

NOTE

Please make sure not configure these ranges smaller as the decoupling thresholds (see below).

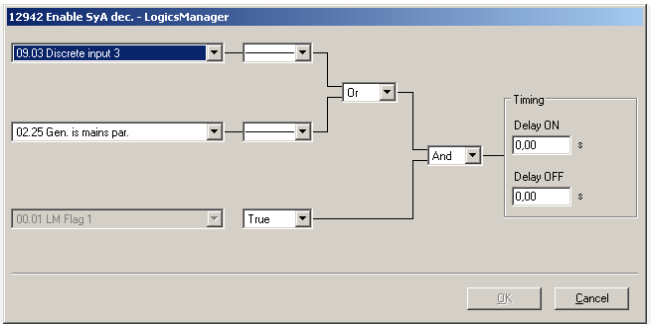
4. Configure the mains settling time (parameter 13205). The mains settling time determines for how long the mains must be stay continuously stable, before the MCB shall be closed back. Consider that there are several LS-5s on different mains incoming points which should have the same setting.
5. Navigate to "SyA. Decoupling".
6. Configure the LogicsManager equation "Enable SyA dec.". At next will follow two configuration examples, which are based on following arguments:

Example 1 (Default):



The mains decoupling function shall only be enabled, if an external release therefore is given (Discrete Input 3). In this case a PLC is required.

Example 2:



The mains decoupling function shall be explicitly enabled, when a "Test" key switch is activated. (This helps to make a mains decoupling test without any generator is running)
OR
The mains decoupling function shall be enabled, if any generator is running parallel to mains

7. Configure the according mains decoupling thresholds:
   - Overvoltage level 2
   - Undervoltage level 2
   - Overfrequency level 2
   - Underfrequency level 2
   - Change of frequency (Phase shift or df/dt)
8. Configure the alarm class (usually alarm A or B).
9. Configure self acknowledgment to "Yes" or "No".

Run-up Synchronization in the LS-5 mode

The LS-5 mode allows the run-up synchronization but only for the GCB. The mode GCB/GGB is not supported. The easYgen will only close its breaker in a run-up situation, if the LS-5 system detects no connection to mains for the according easYgen segment. Regarding run-up synchronization there is nothing to configure in the LS-5.

AMF Start in the LS-5 mode

The AMF start of the easYgen(s) is controlled by segments. The design engineer has to consider, which segments shall be monitored and shall cause an AMF start. The easYgen provides therefore a special setting. The procedure runs as follows:
The easYgen(s) monitors the configured segment(s) on being "black". If only one segment is recognized as not within operating range, the generator starts after the emergency run delay time. With successful start, the generator(s) close its breaker.

NOTE

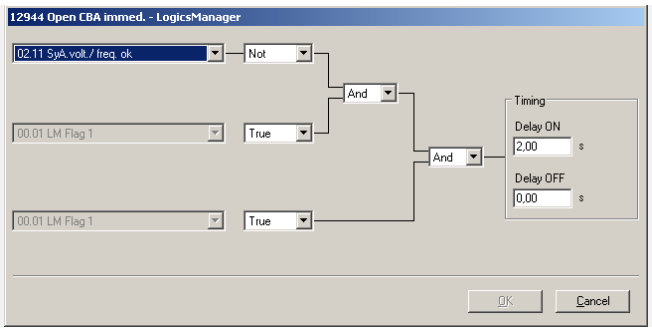
To avoid that the LS-5 of the MCB stays closed during emergency run, the according LS-5 has to open its own breaker. The example below shows a solution that the "System A Not-OK flag" opens the MCB automatically after the emergency delay time. The system A condition flags are generated out of the operating ranges for system A. see chapter "Mains Decoupling Function easYgen".

The easYgen feeds the own segment during emergency run. The AMF mode will only be stopped, if all monitored segments are OK for the mains settling time and have connection to mains again. The operating ranges and the main settling time are configured in the LS-5s.

Configuration

Configure the according LS-5 over the MCB:

1. Navigate to "Configuration>Monitoring config.>System A".
2. Navigate to "Operating voltage" and "Operating frequency".
   - Configure the operating range for frequency.
   - Configure the operating range for voltage.
3. Navigate to "Configuration>Application config.>Breakers config.>Configure CBA"
4. Configure "Open CBA immed." as follows:



LS-5 over the MCB:
The LS-5 issues an MCB open command, if the mains (system A) is not in operating range.

To avoid flicker trouble, the open command is delayed.

NOTE

There may other solutions exist to open the MCB. The LogicsManager system provides a wide range of flags and conditions to take from. So another example could be to incorporate a flag coming from easYgen, which signals successsful start.

Configure the easYgen(s):

1. Configure application mode to "GCB/LS5 A07".
2. Navigate to "Parameter>Configuration>Configure emergency run".
3. Configure "Mains fail delay time", "LM inhibit emerg.run", "Break emerg. in crital mode" according to your application.
4. Configure the emergency run segments in each easYgen. They can be different between easYgen(s) or easYgen groups.

The next example shows the segment configuration according to the chapter: " Predefined Application 1".

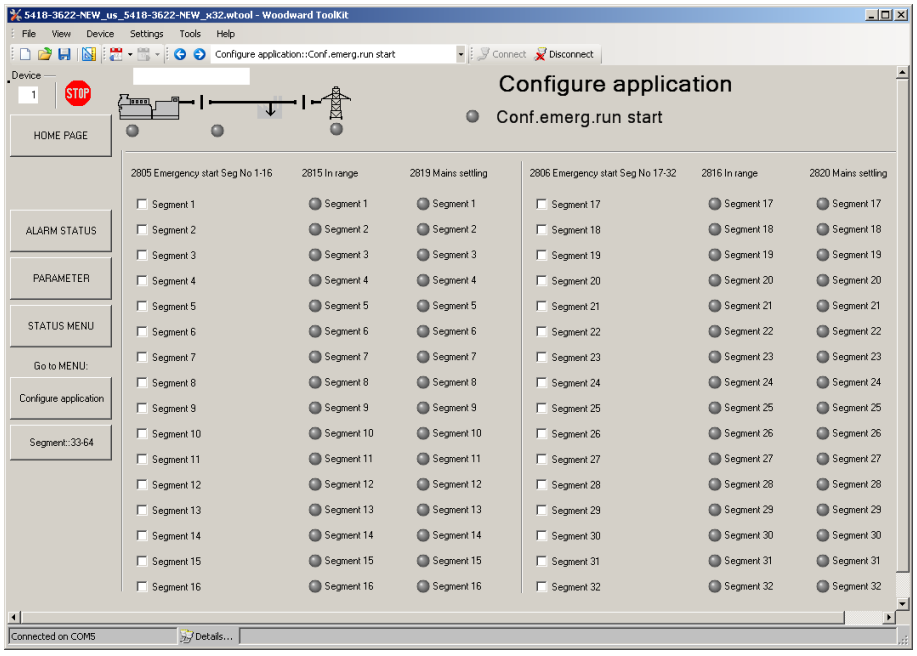


Figure 5-6: Example ToolKit: Configure AMF start segments by clicking on the segment number

Manual Control of Breaker in the LS-5 mode

The LS-5 mode provides manual closing and opening of the circuit breaker at the particular LS-5. This can be configured via LogicsManager equations. The display variant provides additionally soft keys in the display. The soft keys take part of the key lock function for security reasons or unintended operations. The easYgen(s) have no direct influence on the manual control of the LS-5(s).

LS-5 Command Bits from easYgen to LS-5

The easYgen provides in this application mode six LS-5 command bits. The command bits are transported via CAN interface to each LS-5. The design engineer can decide, if he wants to take the OR'ed LS-5 command flags

coming from all easYgens or if he likes to take the individual command flag coming from a special easYgen. In example an acknowledge alarm command could be general flag which would be taken from the OR'ed source. An special close command in the example could come from an explicit easYgen and must be therefore not taken from the OR'ed list.

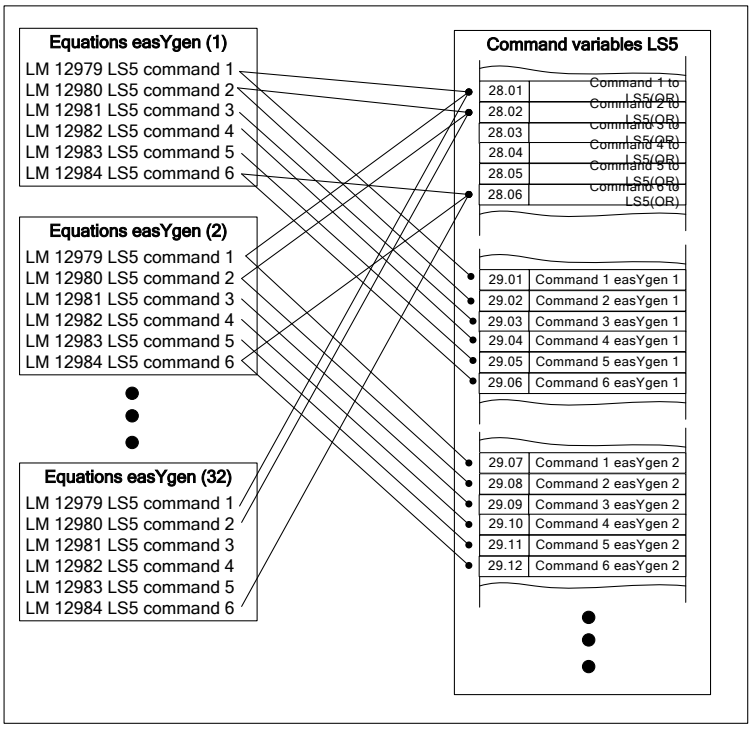


Figure 5-7: LogicsManager system - easYgen information transport to LS-5

LS-5 Flags from LS-5 to LS-5 and easYgen

The LS-5 flags generated in the LS-5 device with LogicsManager equations can be used from connected LS-5 and easYgen devives. Each LS-5 sends five flags over the CAN interface. The system allows to inform or to command something to other units. In example the acknowledge command can be sent to all other units to reset alarms. All bits are individual.

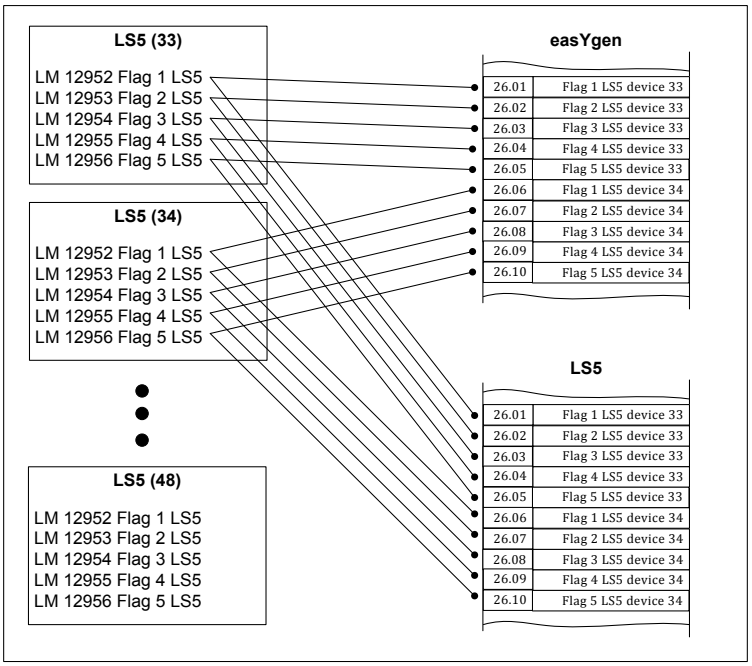


Figure 5-8: LogicsManager system – LS-5 information transport to LS-5 and easYgen

Preparation

Prepare the easYgen – LS-5 system for configuration as follows:

1. Draw a single line diagram that only contains essential equipment. The schematic should consist of a minimum: All used easYgens, all transformers, all breaker elements (such as circuit breakers and isolation switches), all elements to be controlled, and all LS-5s. Assign numbered addresses for each component of the system in accordance with the methods already described.
2. Number all easYgen control units from 1 to 32 (order is user-defined and depends on your application).
3. Number all system LS-5s from 33 to 48 (order is user-defined and depends on your application).
4. Number all CAN Node-IDs (usually the same like device number).
5. Number all **segments** according to the upper showed definitions. As long no other reason exists, count up the number continuously from left to right or opposite.
6. Draw into the single line diagram the measurement system A and B of the single LS-5 according to the definitions. As long no other reason exist, hold system A and B continuously on the same side. This makes the configuration easier. Maybe the location of a CT forces to leave this rule (this can be compensated in the configuration).

Predefined Application 1: H-Configuration with two easYgen and two incoming mains and tie-breaker

- Application Mode easYgen-3400/3500: GCB/LS5 | A07
- Application Mode LS-5: LS5 | A02

Introduction

One or more genset(s) feed on a generator/load busbar, here signed as segment no.2. One or more genset(s) feed on a generator/load busbar, here signed as segment no.3. A tie-breaker is located between the both generator/load busbars. Each generator/load busbar has its own incoming mains breaker. Here signed as segment no. 1 and segment no.4.
The easYgen(s) are started by a remote start signal or by AMF mode and operating their GCBs. The other breakers, handled from the LS-5, receiving their breaker open and close commands through orders coming from an external logic. The external logic could be a discrete input, a remote control bit, a monitor function, an easYgen command, etc.. In this example the decision when to close or open the breaker is managed by a PLC sending their orders over the CANopen protocol. Serial Modbus can also be taken to send orders or reading information from all members. Refer therefor to chapter “Interface”.
Amongst others, the breaker feedbacks of the single LS-5 are sent via the CAN interface and inform all other connected devices in the system, if they are interconnected or not. This determines the argument of the regulation for the easYgen (i.e. power control, frequency control, load sharing). It is very important that all units are well configured according to the subchapter “Definitions” beginning of this main chapter. This example does not contain any isolation switches, which could devide the segments.

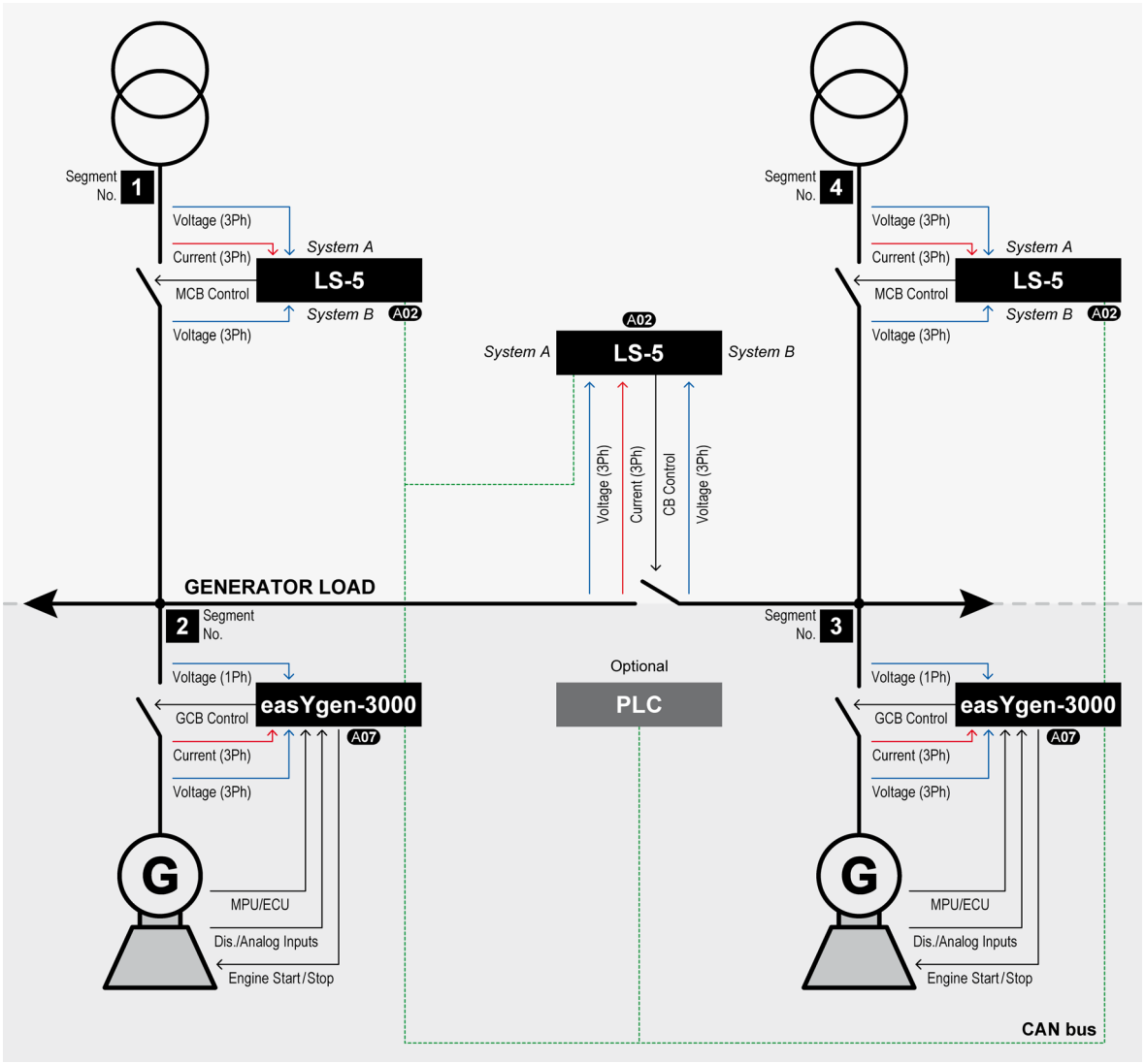


Figure 5-9: Application – H-Configuration with two easYgen and two incoming mains and tie-breaker

Preparation

1. As in the beginning of this chapter mentioned, it is recommended to draw a single line diagram of the application. In this case: two incoming mains with MCBs; two or more generators per generator segment; all breakers (tie-breaker, GCB, MCB).
2. Number all easYgen control units from 1 to 32.
3. Number all system LS-5s from 33 to 48.
4. Number all CAN Node-IDs (usually the same like device number).
5. Number all **segments** according to the upper showed definitions. As long no other reason exists, count up the number continuously from left to right or opposite.
6. Draw into the single line diagram the measurement system A and B of the single LS-5 according to the definitions. As long no other reason exist, hold system A and B continuously on the same side. This makes the configuration easier. Maybe the location of a CT forces to leave this rule (this can be compensated in the configuration).

Installation

LS-5 (incoming mains):

1. The system A voltage and current measurement is connected to the mains.
2. The system B voltage measurement is connected to the generator/load busbar.
3. The MCB breaker feedback is connected to the LS-5 only.
4. The MCB breaker command(s) are connected to the LS-5 only.
5. The LS-5 CAN is connected to the CAN 3 of the easYgen(s).

LS-5 (tie-breaker):

1. The system A voltage and current measurement is connected to the generator/load busbar segment no. 2.
2. The system B voltage measurement is connected to the generator/load busbar segment no. 3.
3. The tie-breaker feedback is connected to the LS-5 only.
4. The tie-breaker command(s) are connected to the LS-5 only.
5. The LS-5 CAN is connected to the CAN 3 of the easYgen(s).

easYgen:

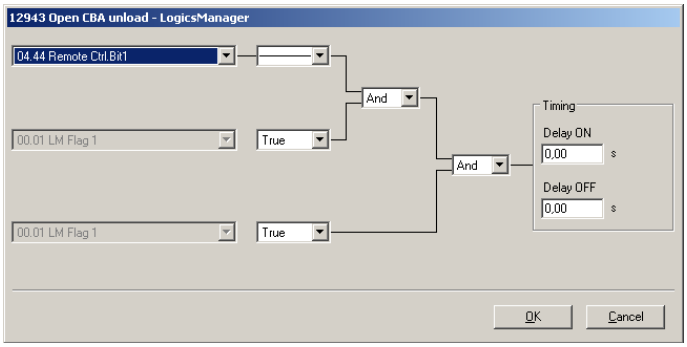
1. The generator voltage and current measurement is connected to the generator.
2. The busbar voltage measurement is connected to the generator/load busbar.
3. The mains voltage measurement is not used.
4. The GCB breaker feedback is connected to the according easYgen.
5. The GCB breaker command(s) are connected to the the according easYgen.
6. The easYgen CAN 3 is connected to the CAN of the LS-5.

Configuration

LS-5 (incoming mains):

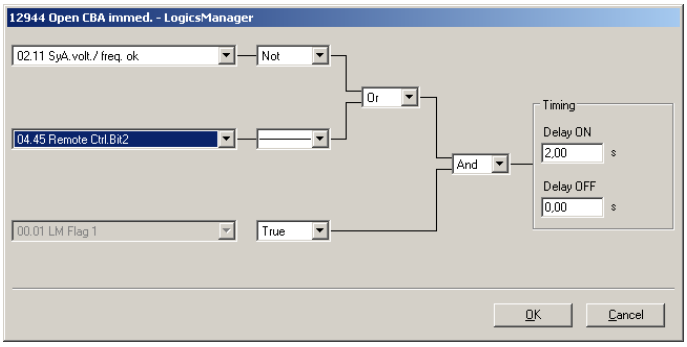
1. Configure the application mode (parameter 8840) of the LS-5 device to "LS5 | A02".
2. Enter the device ID 33 for the LS-5, incoming mains on the left side and ID 35 for the LS-5, incoming mains on the right.
3. Enter the Node IDs (usually the same like device ID).
4. Enter the basic segment numbers at the LS-5, navigate to "Configuration>Application config>Segment config.".
   - LS-5, ID 33, incoming mains on the left side
     - Segment No. Sy.A (parameter 8810) -> 1
     - Segment No. Sy.B (parameter 8811) -> 2
     - Segment No. isol. Switch (parameter 8812) -> not applicable
     - Mains pow. Measurement (parameter 8813) -> Valid
     - Mains connection (parameter 8814) -> System A
     - Isol. Switch Para (parameter 8815) -> None
     - Variable system (parameter 8816) -> System B
   - LS-5, ID 35, incoming mains on the right side
     - Segment No. Sy.A (parameter 8810) -> 4
     - Segment No. Sy.B (parameter 8811) -> 3
     - Segment No. isol. Switch (parameter 8812) -> not applicable
     - Mains pow. Measurement (parameter 8813) -> Valid
     - Mains connection (parameter 8814) -> System A
     - Isol. Switch Para (parameter 8815) -> None
     - Variable system (parameter 8816) -> System B
5. Configure the measurement system A and B.
6. If a phase angle compensation over the MCB is required, sometimes needed when tapping voltages over power transformer, navigate to "Configuration>Application config>Breakers config.>Configure CBA>Synchronization CBA>Phase angle compensation". This setting must be executed very carefully and must be double checked by a voltmeter over the particular breaker.
7. Configure the breaker close and/or open relay(s) according to your MCB.
8. Check the synchronization settings, like phase angle, frequency window and voltage.
9. Configure the dead bus closure, navigate to "Configuration>Application config>Breakers config.>Configure CBA>Dead bus closure CBA".
   - Dead bus closure CBA (parameter 8801) -> On
   - Connect A dead to B dead (parameter 8802) -> Off
   - Connect A dead to B alive (parameter 8803) -> Off
   - Connect A alive to B dead (parameter 8804) -> On
   - Dead bus closure delay time (parameter 8805)
   - Dead bus detection max. volt (parameter 5820)
10. Configure the connection of synchronous networks, navigate to "Configuration>Application config>Breakers config.>Configure CBA>Connect synchronous mains".
    - Connect synchronous mains (parameter 8820) -> Yes
    - Max. phase angle (parameter 8821) -> 20°
    - Delay time phi max. (parameter 8822) -> 01s

11. Configure the LogicsManager in regards to close and open command for the MCB, navigate to “Configuration>Application config>Breakers config.>Configure CBA”.
    - Open CBA unload (parameter 12943) -> LogicsManager equation



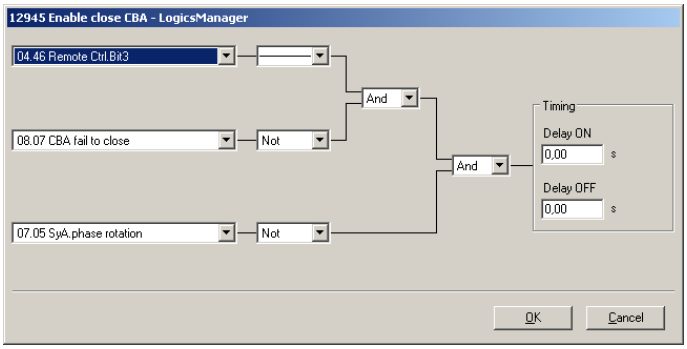
The LM equation opens the MCB with unloading, if the remote control bit 1 sent by the PLC.

- Open CBA immed. (parameter 12944) -> LogicsManager equation



The LM equation opens the MCB immediately, if the system A voltage / frequency is not within the configured operating ranges (refer to chapter “Operating Voltage / Frequency” on page 77)
or the remote control Bit 2 sent by the PLC.

- Enable close CBA (parameter 12945) -> LogicsManager equation



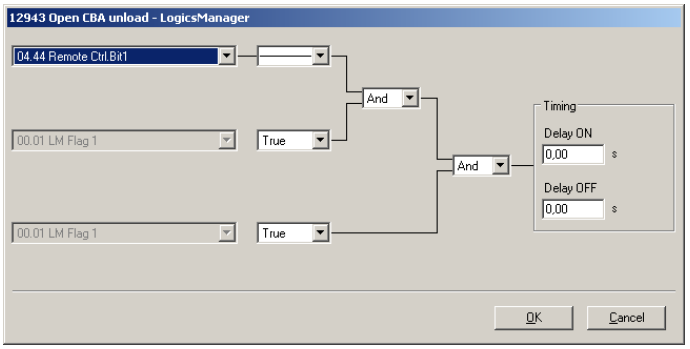
- The LM equation gives the release for close MCB, if
- The remote control bit 3 is sent by the PLC
- OR the CBA has a closure failure
- OR the system A measurement detects a phase rotation error.

NOTE

The same remote control bits can be used in the upper example, because each LS-5 receives its own control bits. The different device and Node-ID separates the control bits from eachother.

LS-5 (tie-breaker):

1. Configure the application mode (parameter 8840) of the LS-5 device to "LS5 | A02".
2. Enter the device ID 34 for the LS-5.
3. Enter the Node ID (usually the same like device ID).
4. Enter the basic segment numbers at the LS-5, navigate to "Configuration>Application config>Segment config.".
   - Segment No. Sy.A (parameter 8810) -> 2
   - Segment No. Sy.B (parameter 8811) -> 3
   - Segment No. isol. Switch (parameter 8812) -> not applicable
   - Mains pow. Measurement (parameter 8813) -> Invalid
   - Mains connection (parameter 8814) -> None
   - Isol. Switch Para (parameter 8815) -> None
   - Variable system (parameter 8816) -> System B
5. Configure the measurement System A and B.
6. If a phase angle compensation over the tie-breaker is required, navigate to "Configuration>Application config>Breakers config.>Configure CBA>Synchronization CBA>Phase angle compensation". This setting must be executed very carefully and must be double checked by a voltmeter over the particular breaker.
7. Configure the breaker close and/or open relay(s) according to your tie-breaker.
8. Check the synchronization settings, like phase angle, frequency window and voltage.
9. Configure the dead bus closure, navigate to "Configuration>Application config>Breakers config.>Configure CBA>Dead bus closure CBA".
   - Dead bus closure CBA (parameter 8801) -> On
   - Connect A dead to B dead (parameter 8802) -> On
   - Connect A dead to B alive (parameter 8803) -> On
   - Connect A alive to B dead (parameter 8804) -> On
   - Dead bus closure delay time (parameter 8805)
   - Dead bus detection max. volt (parameter 5820)
10. Configure the connection of synchronous networks, navigate to "Configuration>Application config>Breakers config.>Configure CBA>Connect synchronous mains".
    - Connect synchronous mains (parameter 8820) -> Yes
    - Max. phase angle (parameter 8821) -> 20°
    - Delay time phi max. (parameter 8822) -> 01s
11. Configure the LogicsManager in regards to close and open command for the tie-breaker, navigate to "Configuration>Application config>Breakers config.>Configure CBA".
    - Open CBA unload (parameter 12943) -> LogicsManager equation

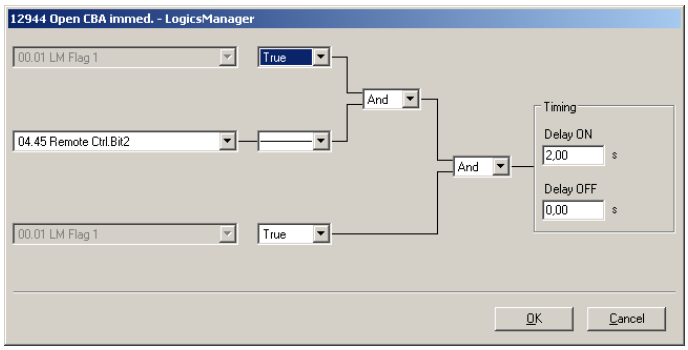


The LM equation opens the tie-breaker with unloading, if the remote control Bit 1 sent by the PLC.

NOTE

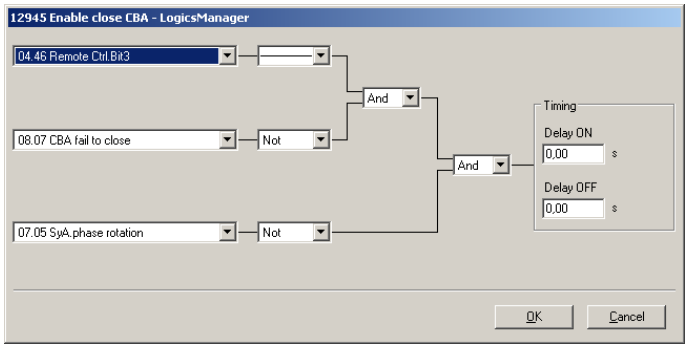
The unloading of the tie-breaker is only executed, if one side contains a variable system. Otherwise the open command is given without unloading.

- Open CBA immed. (parameter 12944) -> LogicsManager equation



The LM equation opens the tie-breaker immediately, if the remote control bit 2 sent by the PLC.

- Enable close CBA (parameter 12945) -> LogicsManager equation



- The LM equation gives the release for close CBA, if
- The remote control bit 3 is sent by the PLC
- OR the CBA has a closure failure
- OR the system A measurement detects a phase rotation error.

NOTE

The same remote control bits can be used in the upper example, because each LS-5 receives its own control bits. The different device and Node-ID separates the control bits from eachother.

easYgen(s):

1. Configure the application mode (parameter 3444) of each easYgen device to "GCB/LS5 | A02".
2. Enter the device ID 1 for the easYgen (usually from left to right).
3. Enter the Node IDs (usually the same like device ID).
4. Enter the basic segment numbers at the easYgen(s), navigate to "Parameter>Configuration>Configure Application>Configure Controller>Configure load share".
   - easYgen, ID 1, left side
     - Segment number (parameter 1723) -> 2
   - easYgen, ID 2, right side
     - Segment number (ID1723) -> 3
5. Configure the measurement for generator and busbar according to chapter "Configuration" on page 47.
6. The mains measurement is not used in this application mode.
7. If phase angle compensation over the GCB is required, navigate to "Parameter>Configuration>Configure Application>Configure Breakers>Configure GCB>Phase angle compensation GCB" "On/Off". This setting must be executed very carefully and must be double checked by a voltmeter over the particular breaker.
8. For displaying the mains values coming from LS-5 on the main screen, navigate to "Parameter>Configuration>Configure measurement", configure "Show mains data" parameter 4103 and switch to "LS5".
9. For the AMF mode the emergency run segments have to be configured. See there for chapter "AMF Start in the LS5 mode". Navigate to "Parameter>Configuration>Configure application>Configure emergency run". In this application are two examples considerable:
   1. Each generator group monitors its own generator/load busbar and mains income.
      - easYgen (left group) is configured to "segment 1" and "segment 2". The easYgen(s) on the left side starts, if one of these 2 segments running out of its operating ranges. On the other side the AMF mode stops, if these both segments are back alive and the mains incoming are closed.
      - easYgen (right group) is configured to "segment 3" and "segment 4". The easYgen(s) on the right side starts, if one of these 2 segments running out of its operating ranges. On the other side the AMF mode stops, if these both segments are back alive and the mains incoming are closed.
   2. All generators monitor both generator/load busbars and mains incomes.
      - All easYgen are configured to "segment 1"; "segment 2"; "segment 3" and "segment 4". All easYgen(s) start, if one of these 4 segments running out of its operating ranges. On the other side the AMF mode stops, if all segments are back alive and minimum one mains incoming in the own segment is closed.
10. Each easYgen device provides in this arrangement six control bits for sending information to the LS-5. Therefore navigate to "Parameter>Configuration>Configure LogicsManager>Configure LS5". These bits can be used as command variables in the LS-5 to iniate i.e. an alarm acknowledge or to release the mains decoupling.

Predefined Application 2: Multiple Mains/Generator with two easYgen and two incoming mains and different tie-breaker

- Application Mode easYgen-3400/3500: GCB/LS5 | A07
- Application Mode LS-5: LS5 | A02

Introduction

One or more genset feed on a generator/load Busbar, here signed as segment no.4. One or more genset feed on a generator/load busbar, here signed as segment no.5. A tie-breaker is located between the both generator/load busbars. Each generator/load busbar has its own generator group breaker with an isolated switch. The LS-5 over this tie-breaker handles 3 segments: no.2, no.3 and no.5. The LS-5 over the tie-breaker on the other side handles the segments: no.5, no.6 and no.7.
The both isolation switches between segment no.3 and no.4, respectively no.6 and no.5 are manual operated. The according LS-5s need the feedback of the isolation switch for their segment control. Between the generator/load busbars and the GGBs is located a step up transformer. The load on the higher level is also separated into two groups and is feeded by the according generator group or by mains. Each load group on the higher voltage level is equipped with an MCB two an own incoming mains. And the both loads on the higher voltage level can also be connected via a tie-breaker operated by a LS-5.

The easYgen(s) are started by a remote start signal or by AMF mode and operating their GCBs. The other breakers, handled by LS-5, receive their breaker open and close commands through orders coming from an external logic. The external logic could be a discrete input, a remote control bit, a monitor function, etc.. In this example the decision when to close or open the breaker is managed by a PLC sending their orders over the CANopen protocol. Serial Modbus can also be taken to send orders or reading information from all members. Refer therefore to chapter “Interface”.
Amongst others the breaker feedbacks of the single LS-5 are sent via CAN interface and inform all other connected devices in the system, if they are interconnected or not. This determines the argument of the regulation for the easYgen (i.e. power control, frequency control, load sharing). It is very important that all units are well configured according to the subchapter “Definitions” beginning of this main chapter. In this example the isolation switch condition takes also an important part for the segmenting.

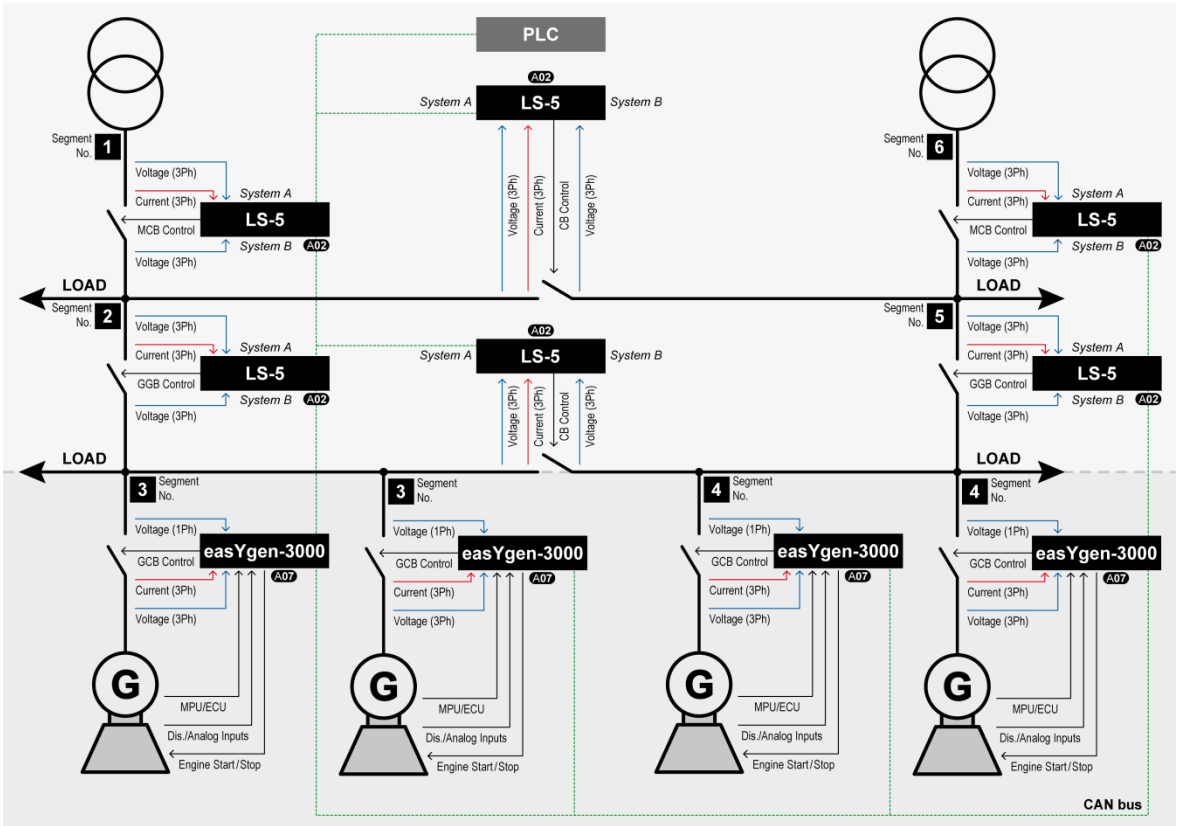


Figure 5-10: Application – Multiple Mains/Generator with two easYgen and two incoming mains and different tie-breaker

Preparation

1. As in the beginning of this chapter mentioned, it is recommended to draw a single line diagram to the application. In this case: two incoming mains with MCBs; two or more generator per generator/load busbar segment; all breakers (tie-breaker, GCB).
2. Number all easYgen control units from 1 to 32.
3. Number all system LS-5s from 33 to 48.
4. Number all CAN Node-IDs (usually the same like device number).
5. Number all **segments** according to the upper showed definitions. As long no other reason exists, count up the number continuously from left to right or opposite.
6. Draw into the single line diagram the measurement systems A and B of the single LS-5 according to the definitions. As long no other reason exists, hold system A and B continuously on the same side. This makes the configuration easier. Maybe the location of a CT forces to leave this rule (this can be compensated by configuration).

Installation

LS-5 (incoming mains):

1. The system A voltage and current measurement is connected to the mains. segment no.1.
2. The system B voltage measurement is connected to the high voltage load busbar.
3. The MCB breaker feedback is connected to the LS-5 only.
4. The MCB breaker command(s) are connected to the LS-5 only.
5. The LS-5 CAN is connected to the CAN 3 of the easYgen(s).

LS-5 (GGBs):

1. The system A voltage and current measurement is connected to the higher voltage busbar segment no.2. (7).
2. The system B voltage measurement is connected to the upper voltage side of the load busbar segment no.3. (6).
3. The GGB feedback is connected to the LS-5 only.
4. The GGB command(s) are connected to the LS-5 only.
5. The isolation switch feedback, located between generator/load busbar and transformer, is connected to the LS-5 only.
6. The LS-5 CAN is connected to the CAN 3 of the easYgen(s).

LS-5 (tie-breaker lower voltage level):

1. The system A voltage and current measurement is connected to the segment no.4.
2. The system B voltage measurement is connected to the segment no.5.
3. The tie-breaker feedback is connected to the LS-5 only.
4. The tie-breaker command(s) are connected to the LS-5 only.
5. The LS-5 CAN is connected to the CAN 3 of the easYgen(s).

LS-5 (tie-breaker higher voltage level):

1. The system A voltage and current measurement is connected to the segment no.2.
2. The system B voltage measurement is connected to the segment no.7.
3. The tie-breaker feedback is connected to the LS-5 only.
4. The tie-breaker command(s) are connected to the LS-5 only.
5. The LS-5 CAN is connected to the CAN 3 of the easYgen(s).

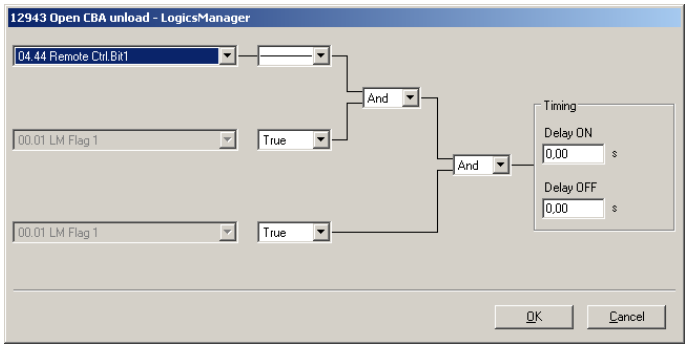
easYgen:

1. The generator voltage and current measurement is connected to the generator.
2. The busbar voltage measurement is connected to the generator/load busbar.
3. The mains voltage measurement is not used.
4. The GCB breaker feedback is connected to the according easYgen.
5. The GCB breaker command(s) are connected to the the according easYgen.
6. The easYgen CAN 3 is connected to the CAN of the LS-5.

Configuration

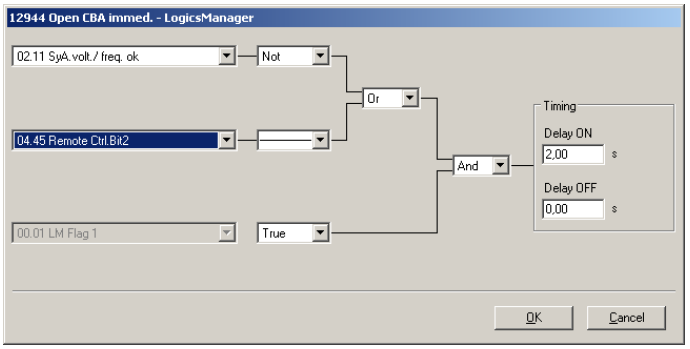
LS-5 (incoming mains):

1. Configure the application mode (parameter 8840) of the LS-5 device to "LS5 | A02".
2. Enter the device ID 33 for the LS-5, incoming mains on the left side and ID 37 for the LS-5, incoming mains on the right.
3. Enter the Node IDs (usually the same like device ID).
4. Enter the basic segment numbers at the LS-5, navigate to "Configuration>Application config>Segment config.".
   - LS-5, ID 33, incoming mains on the left side
     - Segment No. Sy.A (parameter 8810) -> 1
     - Segment No. Sy.B (parameter 8811) -> 2
     - Segment No. isol. Switch (parameter 8812) -> not applicable
     - Mains pow. Measurement (parameter 8813) -> Valid
     - Mains connection (parameter 8814) -> System A
     - Isol. Switch Para (parameter 8815) -> None
     - Variable system (parameter 8816) -> System B
   - LS-5, ID 37, incoming mains on the right side
     - Segment No. Sy.A (parameter 8810) -> 8
     - Segment No. Sy.B (parameter 8811) -> 7
     - Segment No. isol. Switch (parameter 8812) -> not applicable
     - Mains pow. Measurement (parameter 8813) -> Valid
     - Mains connection (parameter 8814) -> System A
     - Isol. Switch Para (parameter 8815) -> None
     - Variable system (parameter 8816) -> System B
5. Configure the measurement system A and B.
6. Configure the breaker close and/or open relay(s) according to your MCB.
7. Check the synchronization settings, like phase angle, frequency window and voltage.
8. Configure the dead bus closure, navigate to "Configuration>Application config>Breakers config.>Configure CBA>Dead bus closure CBA".
   - Dead bus closure CBA (parameter 8801) -> On
   - Connect A dead to B dead (parameter 8802) -> Off
   - Connect A dead to B alive (parameter 8803) -> Off
   - Connect A alive to B dead (parameter 8804) -> On
   - Dead bus closure delay time (parameter 8805)
   - Dead bus detection max. volt (parameter 5820)
9. Configure the connection of synchronous networks, navigate to "Configuration>Application config>Breakers config.>Configure CBA>Connect synchronous mains".
   - Connect synchronous mains (parameter 8820) -> Yes
   - Max. phase angle (parameter 8821) -> 20°
   - Delay time phi max. (parameter 8822) -> 01s
10. Configure the LogicsManager in regards to close and open command for the MCB, navigate to "Configuration>Application config>Breakers config.>Configure CBA".
    - Open CBA unload (parameter 12943) -> LogicsManager equation



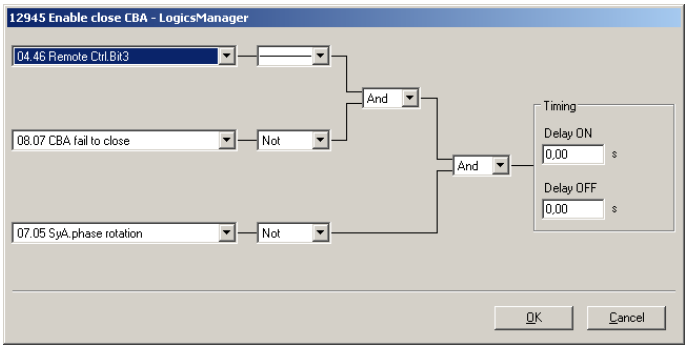
The LM equation opens the MCB with unloading, if the remote control bit 1 sent by the PLC

- Open CBA immed. (parameter 12944) -> LogicsManager equation



- The LM equation opens the MCB immediately, if the system A voltage / frequency is not within the configured operating ranges (refer to chapter “Operating Voltage / Frequency” on page 77)
- OR the remote control bit 2 sent by the PLC.

- Enable close CBA (parameter 12945) -> LogicsManager equation



- The LM equation gives the release for close MCB, if
- The remote control bit 3 is sent by the PLC
- OR the CBA has a closure failure
- OR the system A measurement detects a phase rotation error.

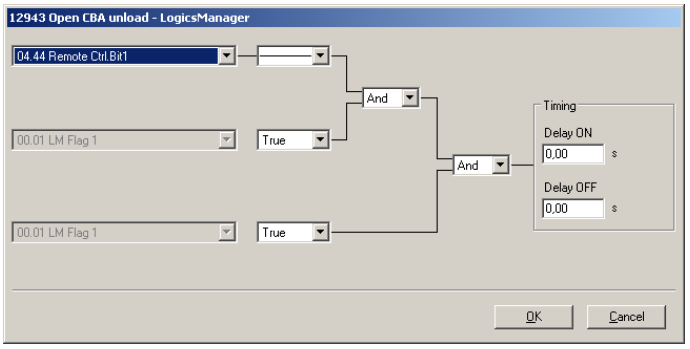
NOTE

The same remote control bits can be used in the upper example, because each LS-5 receives its own control bits. The different device and Node-ID separates the control bits from eachother.

LS-5 (GGB):

1. Configure the application mode (parameter 8840) of the LS-5 device to "LS5 | A02".
2. Enter the device ID 34 for the LS-5.
3. Enter the device ID 34 for the LS-5, being GGB on the left side and ID 36 for the LS-5, being GGB on the right.
4. Enter the Node ID (usually the same like device ID).
5. Enter the basic segment numbers at the LS-5, navigate to "Configuration>Application config>Segment config.".
   - LS-5, ID 34, GGB on the left side
     - Segment No. Sy.A (parameter 8810) -> 2
     - Segment No. Sy.B (parameter 8811) -> 3
     - Segment No. isol. Switch (parameter 8812) -> 4
     - Mains pow. Measurement (parameter 8813) -> Invalid
     - Mains connection (parameter 8814) -> None
     - Isol. Switch (parameter 8815) -> System B
     - Variable system (parameter 8816) -> System B
   - LS-5, ID 36, GGB on the right side
     - Segment No. Sy.A (parameter 8810) -> 7
     - Segment No. Sy.B (parameter 8811) -> 6
     - Segment No. isol. Switch (parameter 8812) -> 5
     - Mains pow. Measurement (parameter 8813) -> Invalid
     - Mains connection (parameter 8814) -> None
     - Isol. Switch (parameter 8815) -> System B
     - Variable system (parameter 8816) -> System B
6. Configure the isolation switch feedback "isol.sw open" for a discrete input, navigate to "Configuration>Application config>Breakers config.". (discrete input 5 is recommended).
7. Configure the measurement system A and B.
8. Configure the breaker close and/or open relay(s) according to your GGB.
9. Check the synchronization settings, like phase angle, frequency window and voltage.
10. Configure the dead bus closure, navigate to "Configuration>Application config>Breakers config.>Configure CBA>Dead bus closure CBA".
    - Dead bus closure CBA (parameter 8801) -> On
    - Connect A dead to B dead (parameter 8802) -> On
    - Connect A dead to B alive (parameter 8803) -> On
    - Connect A alive to B dead (parameter 8804) -> On
    - Dead bus closure delay time (parameter 8805)
    - Dead bus detection max. volt (parameter 5820)
11. Configure the connection of synchronous networks, navigate to "Configuration>Application config>Breakers config.>Configure CBA>Connect synchronous mains".
    - Connect synchronous mains (parameter 8820) -> Yes
    - Max. phase angle (parameter 8821) -> 20°
    - Delay time phi max. (parameter 8822) -> 01s

12. Configure the LogicsManager in regards to close and open command for the GGB, navigate to “Configuration>Application config>Breakers config.>Configure CBA”.
    - Open CBA unload (parameter 12943) -> LogicsManager equation.

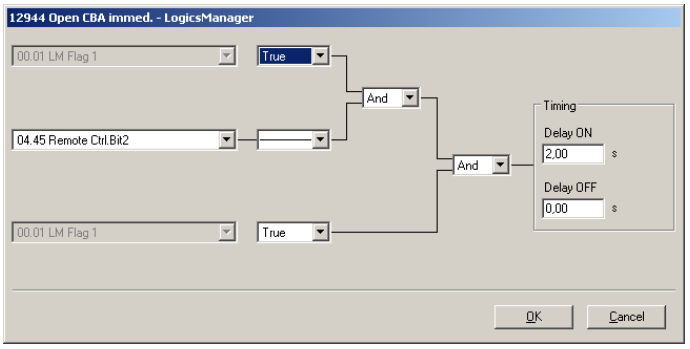


The LM equation opens the GGB with unloading, if the remote control bit 1 sent by the PLC.

NOTE

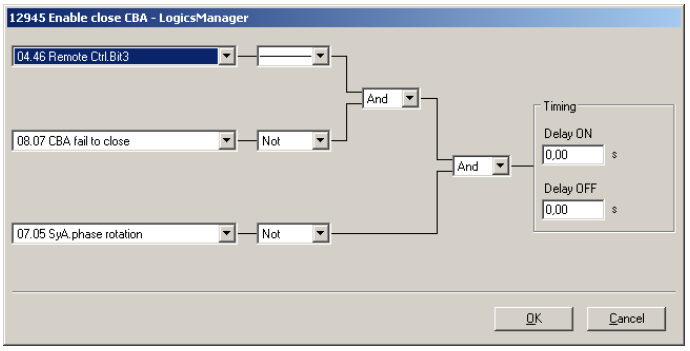
The unloading of the tie-breaker is only executed, if one side contains a variable system. Otherwise the open command is given without unloading.

- Open CBA immed. (parameter 12944) -> LogicsManager equation



The LM equation opens the GGB immediately, if the remote control bit 2 sent by the PLC.

- Enable close CBA (parameter 12945) -> LogicsManager equation



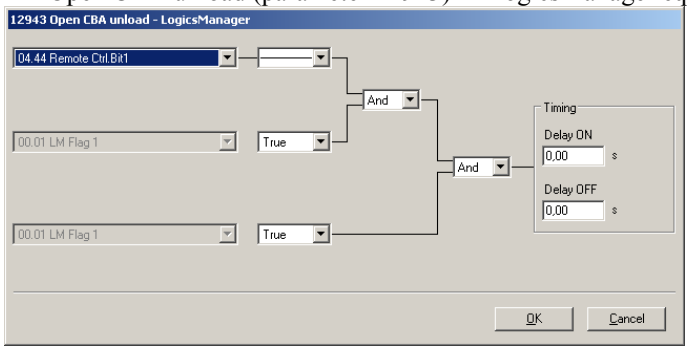
- The LM equation gives the release for close the GGB, if
- The remote control bit 3 is sent by the PLC
- OR the CBA (GGB) has a closure failure
- OR the system A measurement detects a phase rotation error.

NOTE

The same remote control bits can be used in the upper example, because each LS-5 receives its own control bits. The different device and Node-ID separates the control bits from eachother.

LS-5 (tie-breaker lower voltage level):

1. Configure the application mode (parameter 8840) of the LS-5 device to "LS5 | A02".
2. Enter the device ID 35 for the LS-5.
3. Enter the Node ID (usually the same like device ID).
4. Enter the basic segment numbers at the LS-5, navigate to "Configuration>Application config>Segment config.".
   - Segment No. Sy.A (parameter 8810) -> 4
   - Segment No. Sy.B (parameter 8811) -> 5
   - Segment No. isol. Switch (parameter 8812) -> not applicable
   - Mains pow. Measurement (parameter 8813) -> Invalid
   - Mains connection (parameter 8814) -> None
   - Isol. Switch Para (parameter 8815) -> None
   - Variable system (parameter 8816) -> System A
5. Configure the measurement system A and B.
6. Configure the breaker close and/or open relay(s) according to your tie-breaker.
7. Check the synchronization settings, like phase angle, frequency window and voltage.
8. Configure the dead bus closure, navigate to "Configuration>Application config>Breakers config.>Configure CBA>Dead bus closure CBA".
   - Dead bus closure CBA (parameter 8801) -> On
   - Connect A dead to B dead (parameter 8802) -> On
   - Connect A dead to B alive (parameter 8803) -> On
   - Connect A alive to B dead (parameter 8804) -> On
   - Dead bus closure delay time (parameter 8805)
   - Dead bus detection max. volt (parameter 5820)
9. Configure the connection of synchronous networks, navigate to "Configuration>Application config>Breakers config.>Configure CBA>Connect synchronous mains".
   - Connect synchronous mains (parameter 8820) -> Yes
   - Max. phase angle (parameter 8821) -> 20°
   - Delay time phi max. (parameter 8822) -> 01s
10. Configure the LogicsManager in regards to close and open command for the tie-breaker, navigate to "Configuration>Application config>Breakers config.>Configure CBA".
    - Open CBA unload (parameter 12943) -> LogicsManager equation

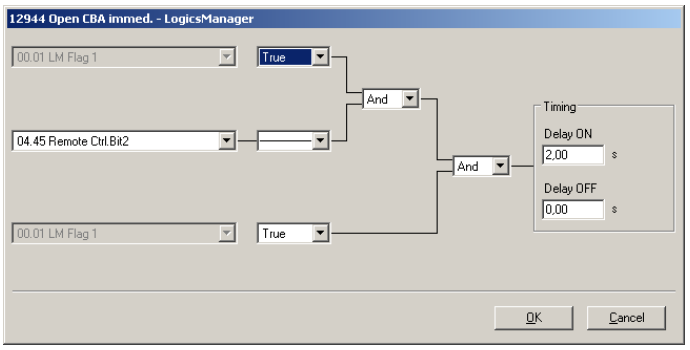


The LM equation opens the tie-breaker with unloading, if the remote control bit 1 sent by the PLC.

NOTE

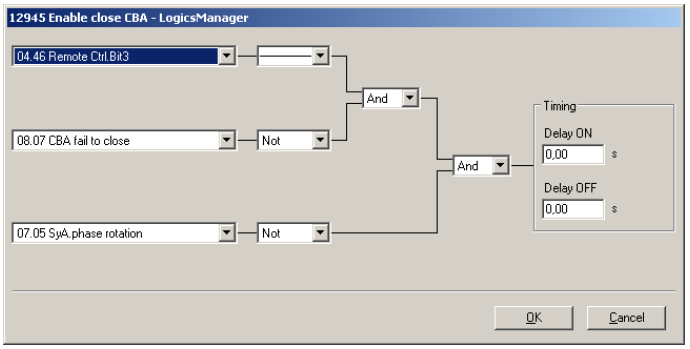
The unloading of the tie-breaker is only executed, if one side contains a variable system. Otherwise the open command is given without unloading.

- Open CBA immed. (parameter 12944) -> LogicsManager equation



The LM equation opens the tie-breaker immediately, if the remote control bit 2 sent by the PLC.

- Enable close CBA (parameter 12945) -> LogicsManager equation



- The LM equation gives the release for close CBA, if
- The remote control bit 3 is sent by the PLC
- OR the CBA has a closure failure
- OR the system A measurement detects a phase rotation error.

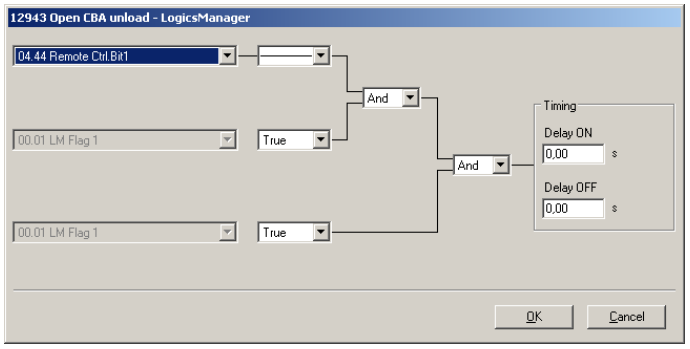
NOTE

The same remote control bits can be used in the upper example, because each LS-5 receives its own control bits. The different device and Node-ID separates the control bits from eachother.

LS-5 (tie-breaker high voltage level):

1. Configure the application mode (parameter 8840) of the LS-5 device to "LS5 | A02".
2. Enter the device ID 38 for the LS-5.
3. Enter the Node ID (usually the same like device ID).
4. Enter the basic segment numbers at the LS-5, navigate to "Configuration>Application config>Segment config.".
   - Segment No. Sy.A (parameter 8810) -> 2
   - Segment No. Sy.B (parameter 8811) -> 7
   - Segment No. isol. Switch (parameter 8812) -> not applicable
   - Mains pow. Measurement (parameter 8813) -> Invalid
   - Mains connection (parameter 8814) -> None
   - Isol. Switch Para (parameter 8815) -> None
   - Variable system (parameter 8816) -> System A
5. Configure the measurement system A and B.
6. Configure the breaker close and/or open relay(s) according to your tie-breaker.
7. Check the synchronization settings, like phase angle, frequency window and voltage.
8. Configure the dead bus closure, navigate to "Configuration>Application config>Breakers config.>Configure CBA>Dead bus closure CBA".
   - Dead bus closure CBA (parameter 8801) -> On
   - Connect A dead to B dead (parameter 8802) -> On
   - Connect A dead to B alive (parameter 8803) -> On
   - Connect A alive to B dead (parameter 8804) -> On
   - Dead bus closure delay time (parameter 8805)
   - Dead bus detection max. volt (parameter 5820)
9. Configure the connection of synchronous networks, navigate to "Configuration>Application config>Breakers config.>Configure CBA>Connect synchronous mains".
   - Connect synchronous mains (parameter 8820) -> Yes
   - Max. phase angle (parameter 8821) -> 20°
   - Delay time phi max. (parameter 8822) -> 01s
10. Configure the LogicsManager in regards to close and open command for the tie-breaker, navigate to "Configuration>Application config>Breakers config.>Configure CBA".

    - Open CBA unload (parameter 12943) -> LogicsManager equation

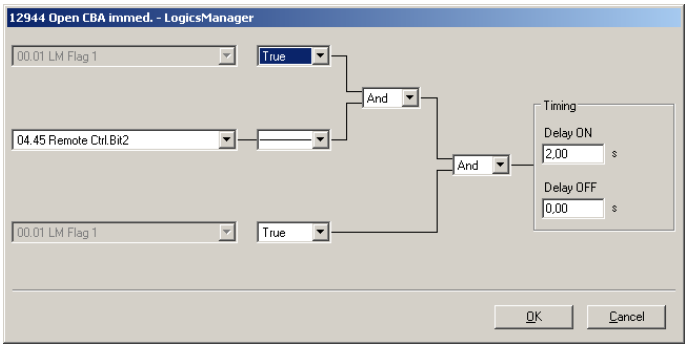


The LM equation opens the tie-breaker with unloading, if the remote control bit 1 sent by the PLC.

NOTE

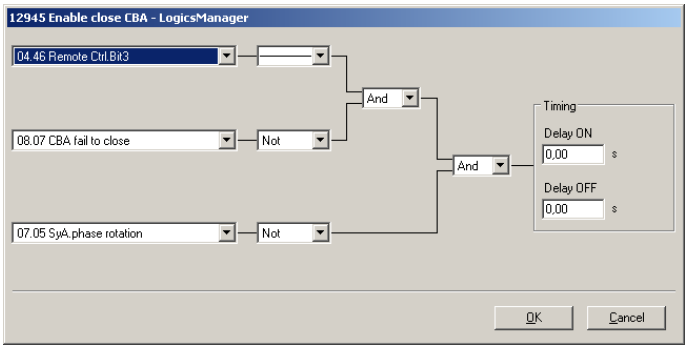
The unloading of the tie-breaker is only executed, if one side contains a variable system. Otherwise the open command is given without unloading.

- Open CBA immed. (parameter 12944) -> LogicsManager equation



The LM equation opens the tie-breaker immediately, if the remote control bit 2 sent by the PLC.

- Enable close CBA (parameter 12945) -> LogicsManager equation



- The LM equation gives the release for close CBA, if
- The Remote control bit 3 is sent by the PLC
- OR the CBA has a closure failure
- OR the system A measurement detects a phase rotation error.

NOTE

The same remote control bits can be used in the upper example, because each LS-5 receives its own control bits. The different device and Node-ID separates the control bits from eachother.

easYgen(s):

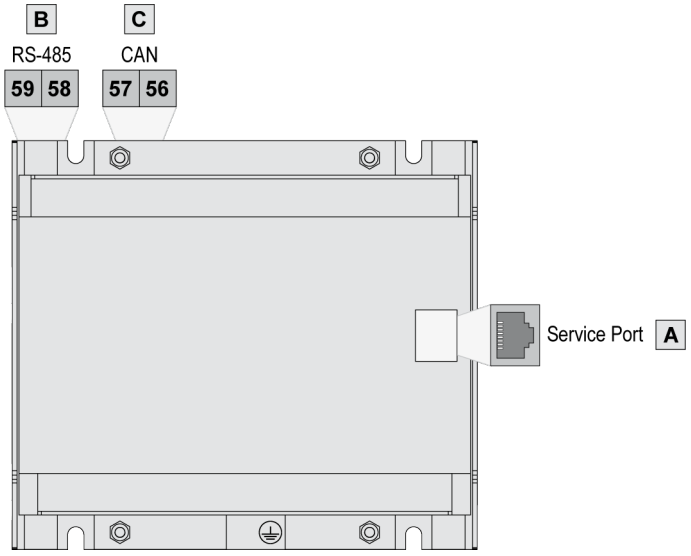
1. Configure the application mode (parameter 3444) of each easYgen device to "GCB/LS5 | A02".
2. Enter the device ID 1 for the easYgen (usually from left to right).
3. Enter the Node IDs (usually the same like device ID).
4. Enter the basic segment numbers at the easYgen(s), navigate to "Parameter>Configuration>Configure Application>Configure Controller>Configure load share".
   - easYgen, ID 1, left side
     - Segment number (parameter 1723) -> 2
   - easYgen, ID 2, right side
     - Segment number (parameter 1723) -> 3
5. Configure the measurement for generator and busbar according to chapter "Configuration" on page 47.
6. The mains measurement is not used in this application mode. A couple of settings should be configured as follows. **Switch off** the following parameters:
   - "Mains decoupling" (parameter 3110)
   - "Change of frequency" (parameter 3058)
   - "Overfrequency level 1" (parameter 2850)
   - "Underfrequency level 1" (parameter 2900)
   - "Overfrequency level 2" (parameter 2856)
   - "Underfrequency level 2" (parameter 2906)
   - "Overvoltage level 1" (parameter 2950)
   - "Undervoltage level 1" (parameter 3000)
   - "Overvoltage level 2" (parameter 2956)
   - "Undervoltage level 2" (parameter 3006)
   - "Mains voltage increase" (parameter 8806)
7. If a phase angle compensation over the GCB is required, navigate to "Parameter>Configuration>Configure Application>Configure Breakers>Configure GCB>Phase angle compensation GCB" "On/Off". This setting must be executed very carefully and must be double checked by a voltmeter over the particular breaker.
8. For displaying the mains values coming from LS-5 on the main screen, navigate to "Parameter>Configuration>Configure measurement", configure "Show mains data" parameter 4103 and switch to "LS5".
9. For the AMF mode the emergency run segments have to be configured. See there for chapter "AMF Start in the LS5 mode". Navigate to "Parameter>Configuration>Configure application>Configure emergency run". In this application are two examples considerable:
   1. Each generator group monitors its own generator/load busbar and mains income.
      - easYgen (left group) is configured to "segment 1" and "segment 2". The easYgen(s) on the left side starts, if one of these 2 segments running out of its operating ranges. On the other side the AMF mode stopps, if these both segments are back alive and the mains incoming are closed.
      - easYgen (right group) is configured to "segment 3" and "segment 4". The easYgen(s) on the right side starts, if one of these 2 segments running out of its operating ranges. On the other side the AMF mode stops, if these both segments are back alive and the mains incoming are closed.
   2. All generator monitors both generator/load busbars and mains incomes.
      - All easYgen are configured to "segment 1"; "segment 2"; "segment 3" and "segment 4". All easYgen(s) start, if one of these 4 segments running out of its operating ranges. On the other side the AMF mode stops, if all segments are back alive and minimum one mains incoming in the own segment is closed.
10. Each easYgen device provides in this arrangement six control bits for sending information to the LS-5. Therefore navigate to "Parameter>Configuration>Configure LogicsManager>Configure LS5". These bits can be used as command variables in the LS-5 to iniate i.e. an alarm acknowledge or to release the mains decoupling.

Chapter 6.
Interface

Interfaces Overview

The LS-511/521 provides the following interfaces which are supporting different protocols.

LS-511



LS-521

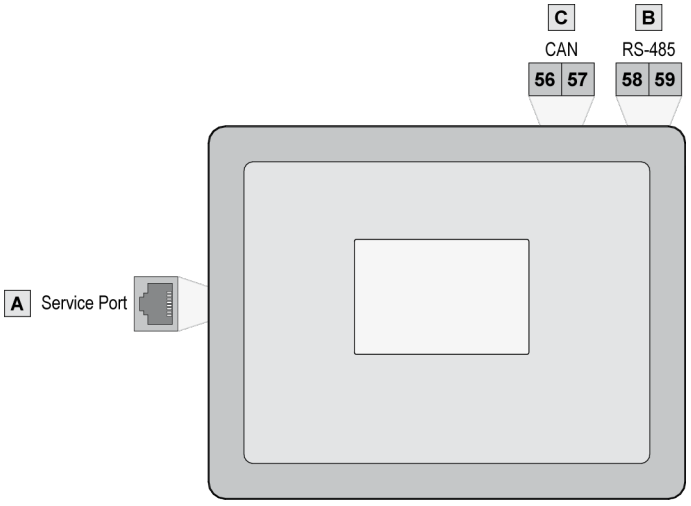


Figure 6-1: Interface ovierview

Figure	Interface	Protocol
A	Service Port (RS-232 – optional Woodward DPC cable required)	Modbus; ToolKit
B	RS-485	Modbus; ToolKit
C	CAN bus	CANopen

CAN Interface

CAN Interface 1 (Guidance level)

CAN interface 1 is a freely configurable CANopen interface with 2 RPDOs (receive boxes), 3 TPDOs (send boxes), and 4 additional Server SDOs.

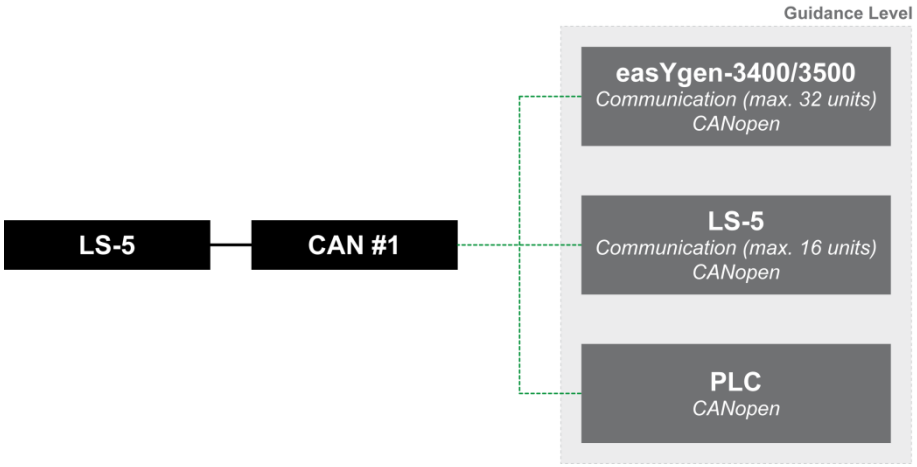


Figure 6-2: CAN interface 1

Serial Interfaces

RS-232 Interface (Serial Interface 1)

A freely configurable RS-232 interface is provided to serve as a local service interface for configuring the unit and visualize measured data. The serial interface 1 provides a Modbus as well as the Woodward ToolKit protocol.

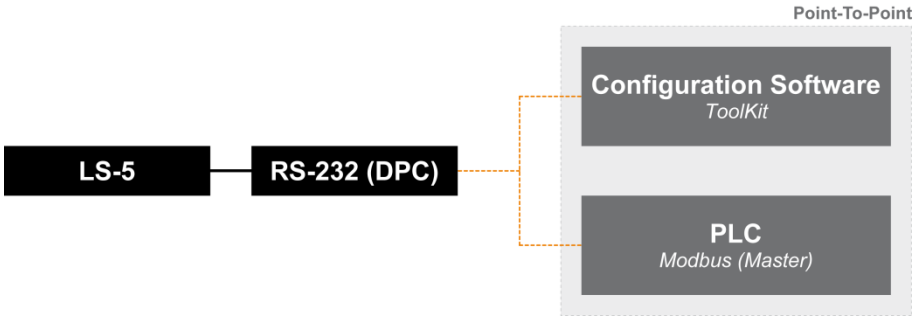


Figure 6-3: RS-232 interface

RS-485 Interface (Serial Interface 2)

A freely configurable RS-485 Modbus RTU Slave interface is provided to add PLC connectivity. It is also possible to configure the unit, visualize measured data and alarm messages, and control the unit remotely.

Figure 6-4: RS-485 interface

Protocols Overview

CANopen

CANopen is a communication protocol and device profile specification for embedded systems used in automation. The CANopen standard consists of an addressing scheme, several small communication protocols and an application layer defined by a device profile. The communication protocols have support for network management, device monitoring and communication between nodes, including a simple transport layer for message segmentation/desegmentation.

Protocol Description

If a data protocol is used, a CAN message looks like this:

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
MUX	Data byte	Data byte	Data byte	Data byte	Data byte	Data byte	Internal

The MUX byte is counted up, the meaning of the data byte changes according to the value of the MUX byte. In the protocol tables is listed which parameter at which MUX on which position is transmitted. The meaning of the parameter can be taken by means of the number of the parameter description ("CANopen Mapping parameter").

Example:

MUX	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
1	118				147		Internal

In MUX 1 (byte 1 has got value 1) the value of parameter 118 is included in the byte 2 up to byte 5 (mains voltage 1-2). In byte 6 up to byte 7 the value of parameter 147 is included (mains frequency). Byte 8 includes internal definitions and can be ignored.

Data Format

Unsigned Integer

UNSIGNED type data has positive integers as values. The range is between 0 and 2n-1. The data is shown by the bit sequence of length n.

- Bit sequence: $b = b_0$ to b_{n-1}
- shows the value: $UNSIGNEDn(b) = b_{n-1}*2^{n-1}+....+b_1*2^1+b_0*2^0$

NOTE

Please note that the bit sequence starts on the left with the least significant byte.

Example: Value 266 = 10A hex of type UNSIGNED16 is transmitted on the bus in two octets, first 0A hex and then 01 hex.

The following UNSIGNED data types are transmitted as follows:

Octet Number	1.	2.	3.	4.	5.	6.	7.	8.
UNSIGNED8	b_7 to b_0							
UNSIGNED16	b_7 to b_0	b_{15} to b_8						
UNSIGNED24	b_7 to b_0	b_{15} to b_8	b_{23} to b_{16}					
UNSIGNED32	b_7 to b_0	b_{15} to b_8	b_{23} to b_{16}	b_{31} to b_{24}				
UNSIGNED40	b_7 to b_0	b_{15} to b_8	b_{23} to b_{16}	b_{31} to b_{24}	b_{39} to b_{32}			
UNSIGNED48	b_7 to b_0	b_{15} to b_8	b_{23} to b_{16}	b_{31} to b_{24}	b_{39} to b_{32}	b_{47} to b_{40}		
UNSIGNED56	b_7 to b_0	b_{15} to b_8	b_{23} to b_{16}	b_{31} to b_{24}	b_{39} to b_{32}	b_{47} to b_{40}	b_{55} to b_{48}	
UNSIGNED64	b_7 to b_0	b_{15} to b_8	b_{23} to b_{16}	b_{31} to b_{24}	b_{39} to b_{32}	b_{47} to b_{40}	b_{55} to b_{48}	b_{63} to b_{56}

Table 6-1: Transfer syntax for data type UNSIGNEDn

Signed Integer

SIGNED type data has integers as values. The range is between 0 and 2^n-1. The data is shown by the bit sequence of length n.

- Bit sequence: $b = b_0$ to b_{n-1}
- shows the value: $SIGNEDn(b) = b_{n-2}*2^{n-2}+...+b_1*2^1+b_0*2^0$ if $b_{n-1} = 0$
- and with two's complement: $SIGNEDn(b) = SIGNEDn(\hat{}b)-1$ if $b_{n-1} = 1$

NOTE

Please note that the bit sequence starts on the left with the least significant byte.

Example: The value -266 = FEF6 hex of type SIGNED16 is transmitted in two octets, first F6 hex and then FE hex.

The following SIGNED data types are transmitted as follows:

Octet Number	1.	2.	3.	4.	5.	6.	7.	8.
SIGNED8	b_7 to b_0							
SIGNED16	b_7 to b_0	b_{15} to b_8						
SIGNED24	b_7 to b_0	b_{15} to b_8	b_{23} to b_{16}					
SIGNED32	b_7 to b_0	b_{15} to b_8	b_{23} to b_{16}	b_{31} to b_{24}				
SIGNED40	b_7 to b_0	b_{15} to b_8	b_{23} to b_{16}	b_{31} to b_{24}	b_{39} to b_{32}			
SIGNED48	b_7 to b_0	b_{15} to b_8	b_{23} to b_{16}	b_{31} to b_{24}	b_{39} to b_{32}	b_{47} to b_{40}		
SIGNED56	b_7 to b_0	b_{15} to b_8	b_{23} to b_{16}	b_{31} to b_{24}	b_{39} to b_{32}	b_{47} to b_{40}	b_{55} to b_{48}	
SIGNED64	b_7 to b_0	b_{15} to b_8	b_{23} to b_{16}	b_{31} to b_{24}	b_{39} to b_{32}	b_{47} to b_{40}	b_{55} to b_{48}	b_{63} to b_{56}

Table 6-2: Transfer syntax for data type INTEGERn

Modbus

Modbus is a serial communications protocol published by Modicon in 1979 for use with its programmable logic controllers (PLCs). It has become a de facto standard communications protocol in industry, and is now the most commonly available means of connecting industrial electronic devices. The Woodward controller supports a Modbus RTU Slave module. This means that a Master node needs to poll the controller slave node. Modbus RTU can also be multi-dropped, or in other words, multiple Slave devices can exist on one Modbus RTU network, assuming that the serial interface is a RS-485. Detailed Information about the Modbus protocol are available on the following website:
http://www.modbus.org/specs.php

There are also various tools available on the internet. We recommend using ModScan32 which is a Windows application designed to operate as a Modbus Master device for accessing data points in a connected Modbus Slave device. It is designed primarily as a testing device for verification of correct protocol operation in new or existing systems. It is possible to download a trial version from the following website:
http://www.win-tech.com/html/modscan32.htm

Address Range

The controller Modbus Slave module distinguishes between visualization data and configuration & remote control data. The different data is accessible over a split address range and can be read via the "Read Holding Register" function. Furthermore, controller parameters and remote control data can be written with the "Preset Single Registers" function or "Preset Multiple Registers" (refer to Table 3-6)

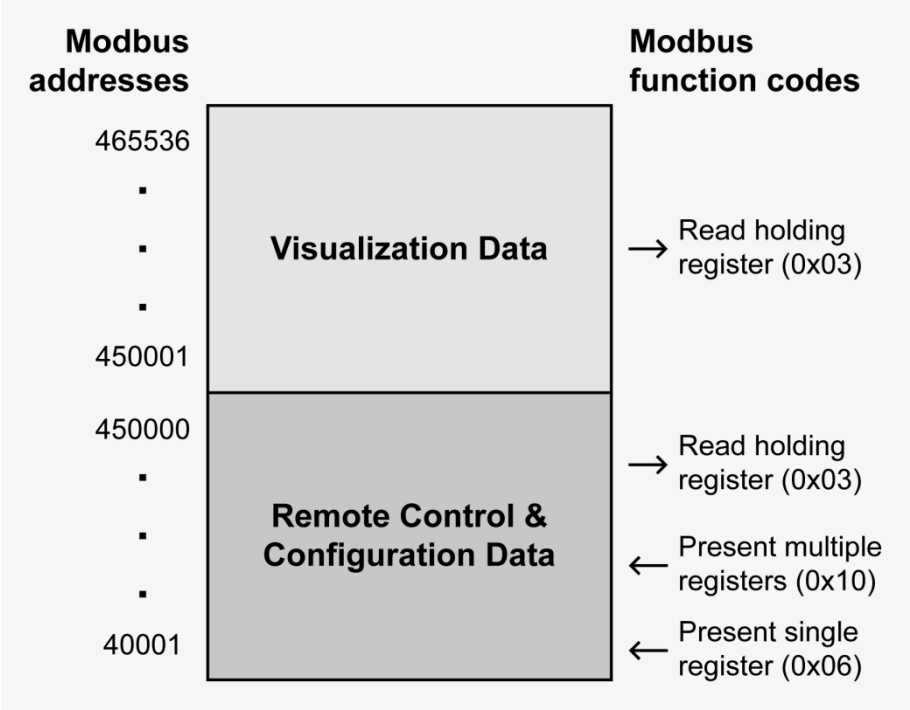


Table 6-3: Address range

NOTE

All addresses in this document comply with the Modicon address convention. Some PLCs or PC programs use different address conventions depending on their implementation. Then the address must be increased and the leading 4 may be omitted.

Please refer to your PLC or program manual for more information. This determines the address sent over the bus in the Modbus telegram. The Modbus starting address 450001 of the visualization data may become bus address 50000 for example.

Visualization

The visualization over Modbus is provided in a very fast data protocol where important system data like alarm states, AC measurement data, switch states and various other informations may be polled. According to the Modbus addressing range, the visualization protocol can be reached on addresses starting at 450001. On this address range it is possible to do block reads from 1 up to 128 Modbus registers at a time.

Modbus Read Addresses	Description	Multiplier	Units
450001	Protocol-ID, always 5300		--
450002	Scaling Power (16 bits) Exponent 10x W (5;4;3;2)		
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
450250	System B voltage L3-N	0.1	V

Table 6-4: Address range block read

NOTE

Table 6-4 is only an excerpt of the data protocol. It conforms to the data protocol 5300. Refer to Protocol 5300 (Basic Visualization) on page 218 for the complete protocol.

The following ModScan32 screenshot shows the configurations made to read the visualization protocol with a block read of 128 registers.

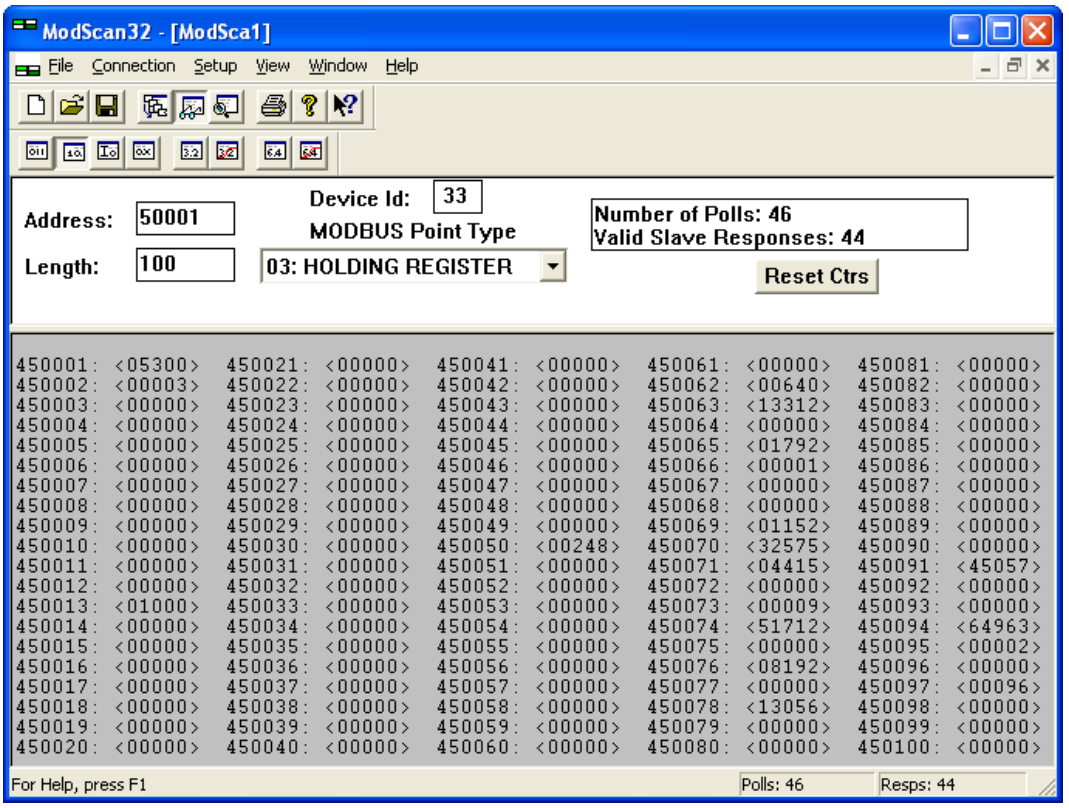


Figure 6-5: Visualization configurations

Configuration

The Modbus interface can be used to read/write parameters. According the Modbus addressing range for the configuration addresses, the range starts at 40001 and ends at 450000. You can always access only one parameter of the system in this address range. The Modbus address can be calculated depending on the parameter ID as illustrated below:

	Parameter ID < 10000	Parameter ID >= 10000
Modbus address =	40000 + (Par. ID+1)	400000 + (Par. ID+1)

Table 6-5: Address calculation

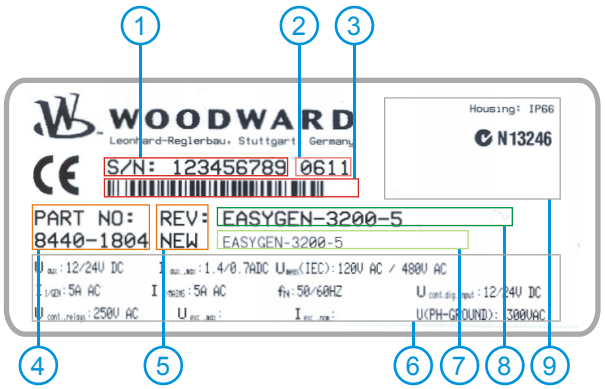
Block reads in this address range depend on the data type of the parameter. This makes it important to set the correct length in Modbus registers which depends on the data type (UNSIGNED 8, INTEGER 16, etc.). Refer to Table 3-9 for more information.

Types	Modbus registers
UNSIGNED 8	1
UNSIGNED 16	1
INTEGER 16	1
UNSIGNED 32	2
INTEGER 32	2
LOGMAN	7
TEXT/X	X/2

Table 6-6: Data types

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 System A ..... 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 ..... ~ 5 W (LS-511)
  ..... ~ 6 W (LS-521)
- 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

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; sheet metal ..... custom
- Dimensions (W × H × D): plastic ..... 219 × 171 × 61 mm; sheet metal ..... 190 × 167 × 47 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: plastic ..... approx. 850 g; sheet metal ..... approx. 840 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 / cUL, Ordinary locations, File No.: 231544
- ..... GOST-R
- Marine approval ..... Lloyds Register (LR) – Type Approval

Generic note ----------

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

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 ----------

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

Accuracy

Measuring value	Display	Accuracy	Measuring start	Notes
Frequency				
System A System B	40.0 to 85.0 Hz	0.1 % (of 85 Hz)	5 % (of PT secondary voltage setting) [1]	
Voltage				
Wye system A / system A	0 to 650 kV	1 % (of 120/480 V) [2]	1.5 % (of PT secondary voltage setting) [1]	
Delta system A / system B			2 % (of PT secondary voltage setting) [1]	
Current				
System A Max. value	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				
Battery voltage	8 to 40 V	1 % (of 24 V)		
Phase angle	-180 to 180 °		1.25 % (of PT secondary volt. setting)	180 ° is displayed for measuring values below measuring start

[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

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 7-1 shows the exemplary connection of a diode as an interference suppressing circuit.

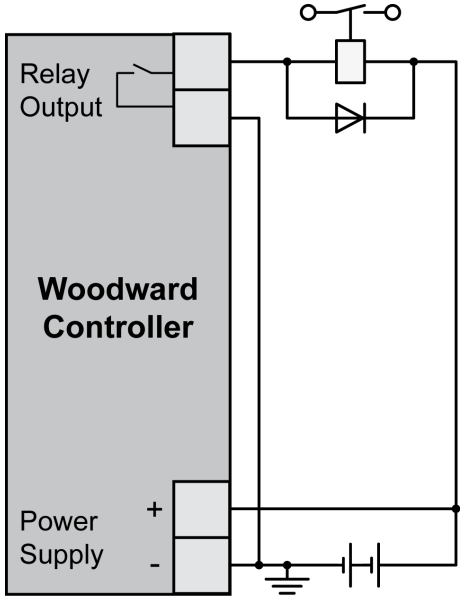


Figure 7-1: Interference suppressing circuit - connection

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

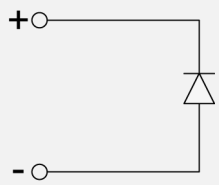
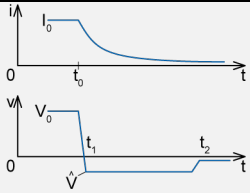
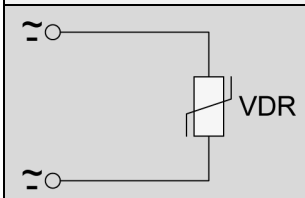
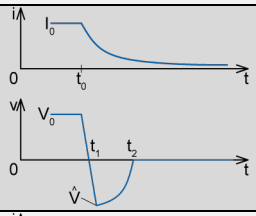
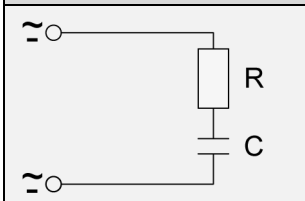
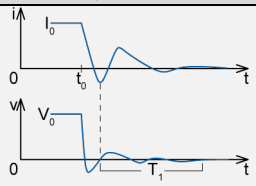
Connection diagram	Load current / voltage curve	Advantages	Disadvantages
		• Uncritical dimensioning • Lowest possible induced voltage • Very simple and reliable	• High release delay
		• Uncritical dimensioning • High energy absorption • Very simple setup • Suitable for AC voltage • Reverse polarity 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 7-1: Interference suppressing circuit for relays

Appendix B. Miscellaneous

Alarm Classes

The control functions are structured in the following alarm classes:

Alarm class	Visible in the display	LED "Alarm" & horn	Relay "Command: open CBA"
A	**yes**	**no**	**no**
	Warning Alarm This alarm does not open a breaker. A message output without a centralized alarm occurs: ⇨ Alarm text.		
B	**yes**	**yes**	**no**
	Warning Alarm This alarm does not open a breaker. An output of the centralized alarm occurs and the command variable 3.05 (horn) is issued. ⇨ Alarm text + flashing LED "Alarm" + Relay centralized alarm (horn).		
C	**yes**	**yes**	**with unloading**
	Shutdown Alarm With this alarm the CBA is opened with unloading. . ⇨ Alarm text + flashing LED "Alarm" + Relay centralized alarm (horn) + CBA open with unloading .		
D	**yes**	**yes**	**immediately**
	Shutdown Alarm With this alarm the CBA is opened immediately. ⇨ Alarm text + flashing LED "Alarm" + Relay centralized alarm (horn) + CBA open immediately.		
E	**yes**	**yes**	**immediately**
	Shutdown Alarm With this alarm the CBA is opened with unloading. ⇨ Alarm text + flashing LED "Alarm" + Relay centralized alarm (horn)+ CBA open immediately.		
F	**yes**	**yes**	**immediately**
	Shutdown Alarm With this alarm the CBA is opened immediately. ⇨ Alarm text + flashing LED "Alarm" + Relay centralized alarm (horn)+ CBA open immediately.		
Control	**no**	**no**	**no**
	Control Signal This signal issues a control command only. It may be assigned to a discrete input for example to get a control signal, which may be used in the *LogicsManager*. No alarm message and no entry in the alarm list or the event history will be issued. This signal is always self-acknowledging, but considers a delay time and may also be configured with “Monitoring lockable”.		

Appendix C. LogicsManager

The *LogicsManager* is used to customize the sequence of events in the control **unit** such as the start command of the engine or the operation of control unit relay outputs. For example, the start routine may be programmed so that it requires the closing of a discrete input or a preset time of day. Depending on the application mode of the unit, the number of available relays that may be programmed with the *LogicsManager* will vary. Two independent time delays are provided for the configured action to take place and be reset.

Structure and Description of the *LogicsManager*

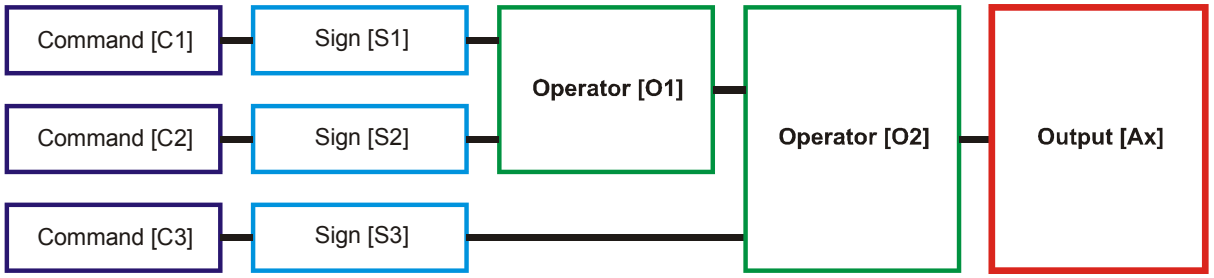


Figure 7-2: *LogicsManager* - function overview

- **Command (variable)** - A list of parameters and functions is provided for the command inputs. Examples of the parameters that may be configured into these commands are generator undervoltage thresholds 1 and 2, start fail, and cool down. These command variables are used to control the output function or relay. Refer to Logical Command Variables starting on page 200 for a complete list of all command variables.
- **Sign** - The sign field can be used to invert the state of the command or to fix its output to a logical true or false if the command is not needed. Setting the sign to the NOT state, changes the output of the command variable from true to false or vice versa.
- **Operator** - A logical device such as AND or OR.
- **(Logical) output** - The action or control sequence that occurs when all parameters set into the *LogicsManager* are met.

[Cx] - Command {x}	[Sx] - Sign {x}	[Ox] - Operator {x}	[Ax] - Output {x}
The description and the tables of all values, flags, and internal functions that are able to combine via the *LogicsManager* can be found in the Logical Command Variables section starting on page 200.	**Value {[Cx]}** The value [Cx] is passed 1:1. **NOT Value {[Cx]}** The opposite of the value [Cx] is passed. **0 [False; always "0"]** The value [Cx] is ignored and this logic path will always be FALSE. **1 [True; always "1"]** The value [Cx] is ignored and this logic path will always be TRUE.	**AND** Logical AND **NAND** Logical negated AND **OR** Logical OR **NOR** Logical negated OR **XOR** Exclusive OR **NXOR** Exclusive negated OR (See Table 7-3 for symbols)	The description and the tables of all logical outputs, flags, and functions that are able to combine via the *LogicsManager* can be found in the Logical Outputs section starting on page 197.

Table 7-2: *LogicsManager* - command overview

Configuration of the Command Chain

Using the values specified in the above table, the chain of commands of the *LogicsManager* (for example: operating the relays, setting the flags, specification of the automatic functions) is configured as follows:

[Ax] = (([C1] & [S1]) & [O1] & ([C2] & [S2])) & [O2] & ([C3] & [S3])

Programming example for the *LogicsManager*:
Relay [R2] shall energize, whenever "Discrete input [D2]" is energized "AND" the control does "NOT" have a fault that is "Alarm class C" "AND" does "NOT" have a fault that is "Alarm class D" ⇨

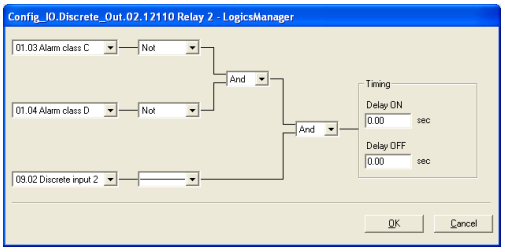


Figure 7-3: *LogicsManager* - display in ToolKit

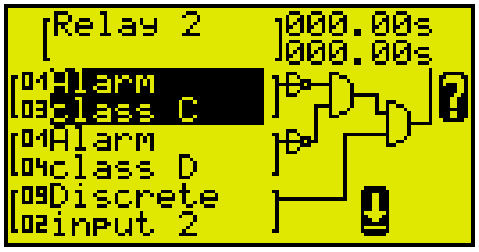


Figure 7-4: *LogicsManager* - display on LCD screen

Logical Symbols

The following symbols are used for the graphical programming of the *LogicsManager*. The LS-5 displays symbols according to the DIN 40 700 standard.

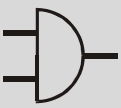
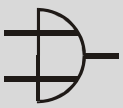
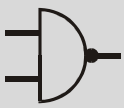
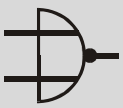
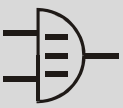
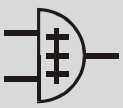
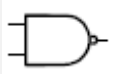
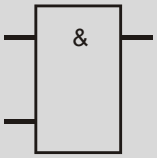
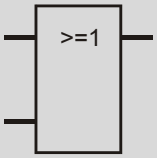
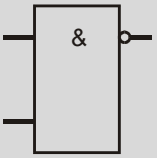
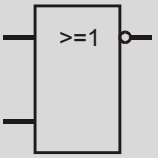
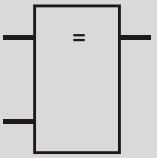
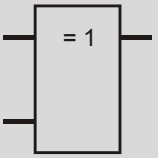
ToolKit	AND			OR			NAND			NOR			NXOR			XOR		
DIN 40 700 (LS-5)																		
ASA US MIL																		
IEC617-12																		
Truth table	x1	x2	y	x1	x2	y	x1	x2	y	x1	x2	y	x1	x2	y	x1	x2	y
	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	0
	0	1	0	0	1	1	0	1	1	0	1	0	0	1	0	0	1	1
	1	0	0	1	0	1	1	0	1	1	0	0	1	0	0	1	0	1
	1	1	1	1	1	1	1	1	0	1	1	0	1	1	1	1	1	0

Table 7-3: *LogicsManager* - logical symbols

Logical Outputs

The logical outputs or combinations may be grouped into three categories:

- Internal logical flags
- Internal functions
- Relay outputs

NOTE

The numbers of the logical outputs in the third column may again be used as input variable for other outputs in the *LogicsManager*.

Logical Outputs: Internal Flags

16 internal logical flags may be programmed to activate/deactivate functions. This permits more than 3 commands to be included in a logical function. They may be used like "auxiliary flags".

Name	Function	Number
Flag 1	Internal flag 1	00.01
Flag 2	Internal flag 2	00.02
Flag 3	Internal flag 3	00.03
Flag 4	Internal flag 4	00.04
Flag 5	Internal flag 5	00.05
Flag 6	Internal flag 6	00.06
Flag 7	Internal flag 7	00.07
Flag 8	Internal flag 8	00.08
Flag 9	Internal flag 9	00.30
Flag 10	Internal flag 10	00.31
Flag 11	Internal flag 11	00.32
Flag 12	Internal flag 12	00.33
Flag 13	Internal flag 13	00.34
Flag 14	Internal flag 14	00.35
Flag 15	Internal flag 15	00.36
Flag 16	Internal flag 16	00.37

Logical Outputs: LS-5 Flags

5 internal logical LS-5 flags may be programmed to activate/deactivate functions. This permits more than 3 commands to be included in a logical function. They may be used like "auxiliary flags". These flags are transmitted on the CAN bus. The flags of all LS-5 are received (as 26.01 to 27.80) by the LS-5 and the easYgen. They can be used as inputs for the *LogicsManager*.

Name	Function	Number
Flag 1 LS5	LS5 flag 1	24.41
Flag 2 LS5	LS5 flag 2	24.42
Flag 3 LS5	LS5 flag 3	24.43
Flag 4 LS5	LS5 flag 4	24.44
Flag 5 LS5	LS5 flag 5	24.45

Logical Outputs: Internal Functions

The following logical functions may be used to activate/deactivate functions.

Name	Function	Number
External acknowledge	The alarm acknowledgement is performed from an external source (parameter 12490 on page 95)	00.15
Operation mode AUTO	Activation of the AUTOMATIC operating mode (parameter 12510 on page 76)	00.16
Operation mode MAN	Activation of the MANUAL operating mode (parameter 12520 on page 76)	00.17
Synchronization mode CHECK	Used for checking a synchronizer prior to commissioning. The system actively synchronizes generator(s) by issuing speed and voltage bias commands, but **does not issue a breaker closure command**. (parameter 5728 onpage 71)	00.38
Synchronization mode PERMISSIVE	The system acts in a synch check mode. The system will not issue speed or voltage bias commands to achieve synchronization, but if synchronization conditions are matched (frequency, phase, voltage and phase angle), the control will issue a breaker close command. (parameter 5728 on page 71)	00.39
Synchronization mode RUN	Normal operating mode. The system actively synchronizes and issues breaker closure commands. (parameter 5728 on page 71)	00.40
Lock keypad	Activation of lock keypad (parameter 12978 on page 60)	00.95

Logical Outputs: Relay Outputs

All relays may be controlled directly by the *LogicsManager* depending on the respective application mode.

Name	Function	Number
Relay 1 (Ready for operation OFF)	If this logical output becomes true, the relay output 1 will be activated	00.41
Relay 2	If this logical output becomes true, the relay output 2 will be activated	00.42
Relay 3	If this logical output becomes true, the relay output 3 will be activated	00.43
Relay 4	If this logical output becomes true, the relay output 4 will be activated	00.44
Relay 5	Fixed to 'Open CBA'	---
Relay 6	If this logical output becomes true, the relay output 6 will be activated	00.46

Relay Number	Term.	
Internal relay outputs		
[R1]	30/31	*LogicsManager*; combinated with 'Ready for operation OFF'
[R2]	32/33	*LogicsManager*; pre-assigned with 'Centralized alarm (horn)'
[R3]	34/35	*LogicsManager*; pre-assigned with 'System B not OK'
[R4]	36/37	*LogicsManager*; pre-assigned with 'System A not OK'
[R5]	38/39/40	Fixed to 'Open CBA'
[R6]	41/42	Fixed to 'Close CBA' if CBA is controlled by 2 relays otherwise *LogicsManager* pre-assigned with 'All Alarm classes'

Table 7-4: Relay outputs - terminal assignment

Logical Command Variables

The logical command variables are grouped into different categories:

- Group 00: Flags condition 1
- Group 01: Alarm system
- Group 02: Systems condition
- Group 04: Applications condition
- Group 05: Device related alarms
- Group 06: System B (SyB.) related alarms
- Group 07: System A (SyA.) related alarms
- Group 08: System related alarms
- Group 09: Discrete inputs
- Group 11: Clock and timer
- Group 13: Discrete outputs
- Group 24: Flags condition 2
- Group 26: Logic flags from LS5 (33 to 48)
- Group 27: Logic flags from LS5 (49 to 64)
- Group 28: LS5 system conditions
- Group 29: Commands of EG (1 to 16)
- Group 29: Commands of EG (17 to 32)

Logical Command Variables: Group 00: Flags Condition 1

Flags condition 1, Logic command variables 00.01-00.95

Internal Flags are the result of the output of the logic ladders from Flag 1 to 16. Flags are internal logic that can be sent to other flags or Command variables.

No.	ID	Name	Function	Note
00.01	1	LM: Flag 1	Internal flag 1	Internal calculation; descr. page 197
00.02	2	LM: Flag 2	Internal flag 2	Internal calculation; descr. page 197
00.03	3	LM: Flag 3	Internal flag 3	Internal calculation; descr. page 197
00.04	4	LM: Flag 4	Internal flag 4	Internal calculation; descr. page 197
00.05	5	LM: Flag 5	Internal flag 5	Internal calculation; descr. page 197
00.06	6	LM: Flag 6	Internal flag 6	Internal calculation; descr. page 197
00.07	7	LM: Flag 7	Internal flag 7	Internal calculation; descr. page 197
00.08	8	LM: Flag 8	Internal flag 8	Internal calculation; descr. page 197
00.15	15	LM: External acknowledge	The alarm acknowledgement is performed from an external source	
00.16	16	LM: Operation mode AUTO	Activation of the AUTOMATIC operating mode	
00.17	17	LM: Operation mode MAN	Activation of the MANUAL op. mode	
00.30	30	LM: Flag 9	Internal flag 9	Internal calculation; descr. page 197
00.31	31	LM: Flag 10	Internal flag 10	Internal calculation; descr. page 197
00.32	32	LM: Flag 11	Internal flag 11	Internal calculation; descr. page 197
00.33	33	LM: Flag 12	Internal flag 12	Internal calculation; descr. page 197
00.34	34	LM: Flag 13	Internal flag 13	Internal calculation; descr. page 197
00.35	35	LM: Flag 14	Internal flag 14	Internal calculation; descr. page 197
00.36	36	LM: Flag 15	Internal flag 15	Internal calculation; descr. page 197
00.37	37	LM: Flag 16	Internal flag 16	Internal calculation; descr. page 197
00.38	38	LM: Syn. Mode CHECK	Synchronisation mode check is active	
00.39	39	LM: Syn. Mode PERM	Synchronisation mode permissive is active	
00.40	40	LM: Syn. Mode RUN	Synchronisation mode run is active	
00.41	41	LM: Relay 1		TRUE, if the *LogicsManager* condition driving this relay is fulfilled
00.42	42	LM: Relay 2		
00.43	43	LM: Relay 3		
00.44	44	LM: Relay 4		
00.45	45	Reserved		
00.46	46	LM: Relay 6		
00.95	95	LM: Lock Keypad	Lock keypad is active	

Logical Command Variables: Group 01: Alarm System

Alarm system, Logic command variables 01.01-01.12

Alarm classes may be configured as command variables for all logical outputs in the *LogicsManager*. Refer to page 194 for a description of the alarm classes.

No.	ID	Name / Function	Note
01.01	101	Alarm class A	TRUE as long as an alarm of this alarm class is active or latched (triggered)
01.02	102	Alarm class B	TRUE as long as an alarm of this alarm class is active or latched (triggered)
01.03	103	Alarm class C	TRUE as long as an alarm of this alarm class is active or latched (triggered)
01.04	104	Alarm class D	TRUE as long as an alarm of this alarm class is active or latched (triggered)
01.05	105	Alarm class E	TRUE as long as an alarm of this alarm class is active or latched (triggered)
01.06	106	Alarm class F	TRUE as long as an alarm of this alarm class is active or latched (triggered)
01.07	107	All alarm classes	TRUE as long as at least one alarm of the alarm classes A/B/C/D/E/F is active or latched (triggered)
01.08	108	Warning alarm	TRUE as long as at least one alarm of the alarm classes A/B is active or latched (triggered)
01.09	109	Shutdown alarm	TRUE as long as at least one alarm of the alarm classes C/D/E/F is active or latched (triggered)
01.10	110	Centralized alarm	TRUE as long as at least one alarm of the alarm classes B/C/D/E/F is active or latched (triggered)
01.11	111	New alarm triggered	TRUE if any alarm has been triggered until it is acknowledged
01.12	112	Horn	True if a new alarm is triggered and time (parameter 1756) for horn reset has not exceeded.

Logical Command Variables: Group 02: Systems Condition

Systems condition, Logic command variables 02.03-02.25

The status of the system may be used as command variable in a logical output to set parameters for customized operations.

No.	ID	Name	Function	Note
02.03	203	SyB. voltage ok	SyB. voltage within operating window	TRUE as long as the SyB. voltage is within the operating window
02.04	204	SyB. frequency ok	SyB. frequency within operating window	TRUE as long as the SyB. frequency is within the operating window
02.05	205	SyB. voltage / frequency ok	SyB. voltage and frequency within operating windows	TRUE as long as the SyB. voltage and frequency are within the operating windows (02.03. and 02.04 are TRUE)
02.09	209	SyA. voltage ok	SyA. voltage within operating window	TRUE as long as the SyA. voltage is within the operating window
02.10	210	SyA. frequency ok	SyA. frequency within operating window	TRUE as long as the SyA. frequency is within the operating window
02.11	211	SyA. voltage / frequency ok	SyA. voltage and frequency within operating windows	TRUE as long as the SyA. voltage and frequency are within the operating windows (02.09. and 02.10 are TRUE)
02.12	212	SyA. rotation CCW	SyA. voltage: rotating direction CCW	TRUE as long as the respective rotation field is detected in case of a three-phase voltage measurement at the respective measuring location
02.13	213	SyA. rotation CW	SyA. voltage: rotating direction CW	
02.14	214	SyB. rotation CCW	SyB. voltage: rotating direction CCW	
02.15	215	SyB. rotation CW	SyB. voltage: rotating direction CW	
02.23	223	System A is dead	System A is dead	TRUE as long as system A voltage is below the level defined by parameter 5820.
02.24	224	System B is dead	System B is dead	TRUE as long as system B voltage is below the level defined by parameter 5820.
02.25	225	Gen. is mains par.	Indicates generator is in mains parallel operation	TRUE if system A (B) is mains connected and system B (A) is variable and CBA is closed and at least one GCB (easYgen) at a relevant segment is closed. (It can be used to enable mains decoupling.)

Logical Command Variables: Group 04: Applications Condition

Applications condition, Logic command variables 4.01-04.62

These operating statuses may be used as command variable in a logical output to set parameters for customized operations.

No.	ID	Name	Function	Note
04.01	401	Auto mode	AUTOMATIC operating mode active	TRUE in AUTOMATIC operating mode
04.03	403	Manual mode	MANUAL operating mode active	TRUE in MANUAL operating mode
04.04	404	Lamp test	A lamp test is being performed	TRUE if the lamp test is active
04.05	405	Acknowledge	"Acknowledge" push button has been pressed or an external acknowledgment via *LogicsManager*	This condition is TRUE for approx. 40 ms and must be extended utilizing a delay time
04.07	407	CBA is closed	CBA is closed only	TRUE if DI 8 (Reply CBA) is de-energized
04.11	411	Mains settling	Mains settling time active	TRUE in LS5 or single LS5 mode while mains settling time is running.
04.21	421	Syn. CBA is active	Synchronization CBA is active	TRUE if the CBA shall be synchronized until the CBA is closed
04.22	422	Opening CBA active	Opening CBA is active	TRUE if an CBA open command is issued until DI 8 (Reply CBA) is energized
04.23	423	Closing CBA active	Closing CBA is active	TRUE if an CBA close command is issued; same function as relay 5 or 6 (cf. parameter 8800)
04.29	429	CBA unloading	CBA unloading sequence is active	TRUE if CBA open with unloading is active.
04.44	444	Remote control Bit 1	Free control bit 1 is activated	Refer to Chapter 6: Interface
04.45	445	Remote control Bit 2	Free control bit 2 is activated	
04.46	446	Remote control Bit 3	Free control bit 3 is activated	
04.47	447	Remote control Bit 4	Free control bit 4 is activated	
04.48	448	Remote control Bit 5	Free control bit 5 is activated	
04.49	449	Remote control Bit 6	Free control bit 6 is activated	
04.50	450	Remote control Bit 7	Free control bit 7 is activated	
04.51	451	Remote control Bit 8	Free control bit 8 is activated	
04.52	452	Remote control Bit 9	Free control bit 9 is activated	
04.53	453	Remote control Bit 10	Free control bit 10 is activated	
04.54	454	Remote control Bit 11	Free control bit 11 is activated	
04.55	455	Remote control Bit 12	Free control bit 12 is activated	
04.56	456	Remote control Bit 13	Free control bit 13 is activated	
04.57	457	Remote control Bit 14	Free control bit 14 is activated	
04.58	458	Remote control Bit 15	Free control bit 15 is activated	
04.59	459	Remote control Bit 16	Free control bit 16 is activated	
04.61	461	Syn. Mains close active	Synchronous Mains closure procedure is active.	TRUE if - System A detected as mains connected and - System B detected as mains connected and - Angle is in range (paramter 8821, 8822) and - Parameter “Connect synchr. mains (8820) is “On” and - CBA is enabled and - System A is ok and - System B is ok.
04.62	462	Dead bus close active	Dead bus closure procedure is active.	TRUE if - Dead bus closure is allowed (parameter 8801 to 8804) and - Dead bus conditions are true (parameter 8801 to 8805, 5820) and - CBA is enabled

Logical Command Variables: Group 05: Device Related Alarms

Device related alarms, Logic command variables 05.15
These device alarms may be used as command variable in a logical output to set parameters for customized operations.

No.	ID	Name / Function	Note
05.15	515	EEprom failure	TRUE = alarm latched (triggered) FALSE = alarm acknowledged

Logical Command Variables: Group 06: System B Related Alarms

System B related alarms, Logic command variables 06.21
These system B alarms may be used as command variable in a logical output to set parameters for customized operations.

No.	ID	Name / Function	Note
06.21	621	SyB. phase rotation	TRUE = alarm latched (triggered) FALSE = alarm acknowledged

Logical Command Variables: Group 07: System A Related Alarms

System A related alarms, Logic command variables 07.05-07.27
These system A alarms may be used as command variable in a logical output to set parameters for customized operations.

No.	ID	Function	Note
07.05	705	SyA. phase rotation	TRUE = alarm latched (triggered) FALSE = alarm acknowledged
07.06	706	SyA. overfrequency (limit) 1	
07.07	707	SyA. overfrequency (limit) 2	
07.08	708	SyA. underfrequency (limit) 1	
07.09	709	SyA. underfrequency (limit) 2	
07.10	710	SyA. overvoltage (limit) 1	
07.11	711	SyA. overvoltage (limit) 2	
07.12	712	SyA. undervoltage (limit) 1	
07.13	713	SyA. undervoltage (limit) 2	
07.14	714	SyA. phase shift	
07.15	715	SyA. df/dt	
07.25	725	SyA. decoupling	
07.26	726	SyA. voltage asymmetry	
07.27	727	SyA. Voltage. increase.	

Logical Command Variables: Group 08: System Related Alarms

System related alarms, Logic command variables 08.01-08.36
These system alarms may be used as command variable in a logical output n to set parameters for customized operations.

No.	ID	Function	Note
08.01	801	Battery overvoltage (limit) 1	TRUE = alarm latched (triggered) FALSE = alarm acknowledged
08.02	802	Battery overvoltage (limit) 2	
08.03	803	Battery undervoltage (limit) 1	
08.04	804	Battery undervoltage (limit) 2	
08.07	807	CBA fail to close	
08.08	808	CBA fail to open	
08.17	817	Missing LS5	
08.18	818	CANopen Interface 1	
08.31	831	Synchronization time CBA	
08.33	833	Phase rotation mismatch	
08.36	836	CBA unload mismatch	

Logical Command Variables: Group 09: Discrete Inputs

Discrete inputs, Logic command variables 09.01-09.08
The discrete inputs may be used as command variable in a logical output to set parameters for customized operations.

No.	ID	Function	Note
09.01	901	DI 1 (Discrete input [DI 01])	TRUE = logical "1" (delay times and NO/NC parameters are ignored) FALSE = logical "0" (alarm has been acknowledged or immediately after TRUE condition is not present anymore, if Control is configured as alarm class)
09.02	902	DI 2 (Discrete input [DI 02])	
09.03	903	DI 3 (Discrete input [DI 03])	
09.04	904	DI 4 (Discrete input [DI 04])	
09.05	905	DI 5 (Discrete input [DI 05])	
09.06	906	DI 6 (Discrete input [DI 06])	
09.07	907	DI 7 (Discrete input [DI 07])	
09.08	908	DI 8 (Discrete input [DI 08])	

Logical Command Variables: Group 11: Clock and Timer

Clock and timer, Logic command variables 11.01-11.07
Time functions may be used as command variable in a logical output.

No.	ID	Name / Function	Note
11.01	1101	Timer 1 (exceeded)	see page 115**Fehler! Textmarke nicht definiert.**
11.02	1102	Timer 2 (exceeded)	see page 115
11.03	1103	Active weekday (equal to setting)	see page 115
11.04	1104	Active day (equal to setting)	see page 115
11.05	1105	Active hour (equal to setting)	see page 115
11.06	1106	Active minute (equal to setting)	see page 115
11.07	1107	Active second (equal to setting)	see page 115

Logical Command Variables: Group 13: Discrete Outputs

Discrete outputs, Logic command variables 13.01-13.12
The discrete outputs may be used as command variable in a logical output.

No.	ID	Name / Function	Note
13.01	1301	Discrete output DO1 [R01]	TRUE = logical "1" (this condition indicates the logical status of the internal relays) FALSE = logical "0" (this condition indicates the logical status of the internal relays)
13.02	1302	Discrete output DO2 [R02]	
13.03	1303	Discrete output DO3 [R03]	
13.04	1304	Discrete output DO4 [R04]	
13.05	1305	Discrete output DO5 [R05]	
13.06	1306	Discrete output DO6 [R06]	

Logical Command Variables: Group 24: Flags condition 2

Flags condition 2, Logic command variables 24.31-24.58

The discrete outputs may be used as command variable in a logical output.

No.	ID	Name / Function	Note
24.31	2131	LM: Enable SyA dec.	
24.32	2132	LM: Open CBA	
24.33	2133	LM: Immediate open CBA	
24.34	2134	LM: Enable to close CBA	
24.39	2139	LM: Isol. swi. open	
24.40	2140	LM: Lock Monitoring	
24.41	2141	LM: Flag 1 LS5	
24.42	2142	LM: Flag 2 LS5	
24.43	2143	LM: Flag 3 LS5	
24.44	2144	LM: Flag 4 LS5	
24.45	2145	LM: Flag 5 LS5	
24.46	2146	LM: Open CBA in MAN	
24.47	2147	LM: Close CBA in MAN	
24.51	2151	LM: LED 1 (System A in range)	These command variables and the coresponding equations are available in the display version in ToolKit and the HMI, even if the LEDs are not available. In the display version the variables can be used as additional internal flags and are located there.
24.52	2152	LM: LED 2 (System B in range)	
24.53	2153	LM: LED 3 (Breaker is closed)	
24.54	2154	LM: LED 4 (Synchronization is active)	
24.55	2155	LM: LED 5 (Breaker close command)	
24.56	2156	LM: LED 6 (Breaker open failure)	
24.57	2157	LM: LED 7 (Breaker close failure)	
24.58	2158	LM: LED 8 (Communication failure)	

Logical Command Variables: Group 26: Flags of LS5 (33 to 48)

Flags of LS5 (33 to 48), Logic command variables 26.01-26.80

No.	ID	Name / Function	Note
26.01	2201	Flag 1 LS5 device 33	TRUE if LogicsManager 12952 in LS-5 device no. {x} is activated [x = 33 to 48]
26.02	2202	Flag 2 LS5 device 33	TRUE if LogicsManager 12953 in LS-5 device no. {x} is activated [x = 33 to 48]
26.03	2203	Flag 3 LS5 device 33	TRUE if LogicsManager 12954 in LS-5 device no. {x} is activated [x = 33 to 48]
26.04	2204	Flag 4 LS5 device 33	TRUE if LogicsManager 12955 in LS-5 device no. {x} is activated [x = 33 to 48]
26.05	2205	Flag 5 LS5 device 33	TRUE if LogicsManager 12956 in LS-5 device no. {x} is activated [x = 33 to 48]
26.06	2206	Flag 1 LS5 device 34	
26.07	2207	Flag 2 LS5 device 34	
26.08	2208	Flag 3 LS5 device 34	
26.09	2209	Flag 4 LS5 device 34	
26.10	2210	Flag 5 LS5 device 34	
26.11	2211	Flag 1 LS5 device 35	
26.12	2212	Flag 2 LS5 device 35	
26.13	2213	Flag 3 LS5 device 35	
26.14	2214	Flag 4 LS5 device 35	
26.15	2215	Flag 5 LS5 device 35	
26.16	2216	Flag 1 LS5 device 36	
26.17	2217	Flag 2 LS5 device 36	
26.18	2218	Flag 3 LS5 device 36	
26.19	2219	Flag 4 LS5 device 36	
26.20	2220	Flag 5 LS5 device 36	
26.21	2221	Flag 1 LS5 device 37	
26.22	2222	Flag 2 LS5 device 37	
26.23	2223	Flag 3 LS5 device 37	
26.24	2224	Flag 4 LS5 device 37	
26.25	2225	Flag 5 LS5 device 37	
26.26	2226	Flag 1 LS5 device 38	

26.27	2227	Flag 2 LS5 device 38	
26.28	2228	Flag 3 LS5 device 38	
26.29	2229	Flag 4 LS5 device 38	
26.30	2230	Flag 5 LS5 device 38	
26.31	2231	Flag 1 LS5 device 39	
26.32	2232	Flag 2 LS5 device 39	
26.33	2233	Flag 3 LS5 device 39	
26.34	2234	Flag 4 LS5 device 39	
26.35	2235	Flag 5 LS5 device 39	
26.36	2236	Flag 1 LS5 device 40	
26.37	2237	Flag 2 LS5 device 40	
26.38	2238	Flag 3 LS5 device 40	
26.39	2239	Flag 4 LS5 device 40	
26.40	2240	Flag 5 LS5 device 40	
26.41	2241	Flag 1 LS5 device 41	
26.42	2242	Flag 2 LS5 device 41	
26.43	2243	Flag 3 LS5 device 41	
26.44	2244	Flag 4 LS5 device 41	
26.45	2245	Flag 5 LS5 device 41	
26.46	2246	Flag 1 LS5 device 42	
26.47	2247	Flag 2 LS5 device 42	
26.48	2248	Flag 3 LS5 device 42	
26.49	2249	Flag 4 LS5 device 42	
26.50	2250	Flag 5 LS5 device 42	
26.51	2251	Flag 1 LS5 device 43	
26.52	2252	Flag 2 LS5 device 43	
26.53	2253	Flag 3 LS5 device 43	
26.54	2254	Flag 4 LS5 device 43	
26.55	2255	Flag 5 LS5 device 43	
26.56	2256	Flag 1 LS5 device 44	
26.57	2257	Flag 2 LS5 device 44	
26.58	2258	Flag 3 LS5 device 44	
26.59	2259	Flag 4 LS5 device 44	
26.60	2260	Flag 5 LS5 device 44	
26.61	2261	Flag 1 LS5 device 45	
26.62	2262	Flag 2 LS5 device 45	
26.63	2263	Flag 3 LS5 device 45	
26.64	2264	Flag 4 LS5 device 45	
26.65	2265	Flag 5 LS5 device 45	
26.66	2266	Flag 1 LS5 device 46	
26.67	2267	Flag 2 LS5 device 46	
26.68	2268	Flag 3 LS5 device 46	
26.69	2269	Flag 4 LS5 device 46	
26.70	2270	Flag 5 LS5 device 46	
26.71	2271	Flag 1 LS5 device 47	
26.72	2272	Flag 2 LS5 device 47	
26.73	2273	Flag 3 LS5 device 47	
26.74	2274	Flag 4 LS5 device 47	
26.75	2275	Flag 5 LS5 device 47	
26.76	2276	Flag 1 LS5 device 48	
26.77	2277	Flag 2 LS5 device 48	
26.78	2278	Flag 3 LS5 device 48	
26.79	2279	Flag 4 LS5 device 48	
26.80	2280	Flag 5 LS5 device 48	

Logical Command Variables: Group 27: Flags of LS5 (49 to 64)

Flags of LS5 (49 to 64), Logic command variables 27.01-27.80

No.	ID	Name / Function	Note
27.01	2301	Flag 1 LS5 device 49	TRUE if LogicsManager 12952 in LS-5 device no. {x} is activated [x = 49 to 64]
27.02	2302	Flag 2 LS5 device 49	TRUE if LogicsManager 12953 in LS-5 device no. {x} is activated [x = 49 to 64]
27.03	2303	Flag 3 LS5 device 49	TRUE if LogicsManager 12954 in LS-5 device no. {x} is activated [x = 49 to 64]
27.04	2304	Flag 4 LS5 device 49	TRUE if LogicsManager 12955 in LS-5 device no. {x} is activated [x = 49 to 64]
27.05	2305	Flag 5 LS5 device 49	TRUE if LogicsManager 12956 in LS-5 device no. {x} is activated [x = 49 to 64]
27.06	2306	Flag 1 LS5 device 50	
27.07	2307	Flag 2 LS5 device 50	
27.08	2308	Flag 3 LS5 device 50	
27.09	2309	Flag 4 LS5 device 50	
27.10	2310	Flag 5 LS5 device 50	
27.11	2311	Flag 1 LS5 device 51	
27.12	2312	Flag 2 LS5 device 51	
27.13	2313	Flag 3 LS5 device 51	
27.14	2314	Flag 4 LS5 device 51	
27.15	2315	Flag 5 LS5 device 51	
27.16	2316	Flag 1 LS5 device 52	
27.17	2317	Flag 2 LS5 device 52	
27.18	2318	Flag 3 LS5 device 52	
27.19	2319	Flag 4 LS5 device 52	
27.20	2320	Flag 5 LS5 device 52	
27.21	2321	Flag 1 LS5 device 53	
27.22	2322	Flag 2 LS5 device 53	
27.23	2323	Flag 3 LS5 device 53	
27.24	2324	Flag 4 LS5 device 53	
27.25	2325	Flag 5 LS5 device 53	
27.26	2326	Flag 1 LS5 device 54	
27.27	2327	Flag 2 LS5 device 54	
27.28	2328	Flag 3 LS5 device 54	
27.29	2329	Flag 4 LS5 device 54	
27.30	2330	Flag 5 LS5 device 54	
27.31	2331	Flag 1 LS5 device 55	
27.32	2332	Flag 2 LS5 device 55	
27.33	2333	Flag 3 LS5 device 55	
27.34	2334	Flag 4 LS5 device 55	
27.35	2335	Flag 5 LS5 device 55	
27.36	2336	Flag 1 LS5 device 56	
27.37	2337	Flag 2 LS5 device 56	
27.38	2338	Flag 3 LS5 device 56	
27.39	2339	Flag 4 LS5 device 56	
27.40	2340	Flag 5 LS5 device 56	
27.41	2341	Flag 1 LS5 device 57	
27.42	2342	Flag 2 LS5 device 57	
27.43	2343	Flag 3 LS5 device 57	
27.44	2344	Flag 4 LS5 device 57	
27.45	2345	Flag 5 LS5 device 57	
27.46	2346	Flag 1 LS5 device 58	
27.47	2347	Flag 2 LS5 device 58	
27.48	2348	Flag 3 LS5 device 58	
27.49	2349	Flag 4 LS5 device 58	
27.50	2350	Flag 5 LS5 device 58	
27.51	2351	Flag 1 LS5 device 59	
27.52	2352	Flag 2 LS5 device 59	
27.53	2353	Flag 3 LS5 device 59	
27.54	2354	Flag 4 LS5 device 59	
27.55	2355	Flag 5 LS5 device 59	
27.56	2356	Flag 1 LS5 device 60	

27.57	2357	Flag 2 LS5 device 60	
27.58	2358	Flag 3 LS5 device 60	
27.59	2359	Flag 4 LS5 device 60	
27.60	2360	Flag 5 LS5 device 60	
27.61	2361	Flag 1 LS5 device 61	
27.62	2362	Flag 2 LS5 device 61	
27.63	2363	Flag 3 LS5 device 61	
27.64	2364	Flag 4 LS5 device 61	
27.65	2365	Flag 5 LS5 device 61	
27.66	2366	Flag 1 LS5 device 62	
27.67	2367	Flag 2 LS5 device 62	
27.68	2368	Flag 3 LS5 device 62	
27.69	2369	Flag 4 LS5 device 62	
27.70	2370	Flag 5 LS5 device 62	
27.71	2371	Flag 1 LS5 device 63	
27.72	2372	Flag 2 LS5 device 63	
27.73	2373	Flag 3 LS5 device 63	
27.74	2374	Flag 4 LS5 device 63	
27.75	2375	Flag 5 LS5 device 63	
27.76	2376	Flag 1 LS5 device 64	
27.77	2377	Flag 2 LS5 device 64	
27.78	2378	Flag 3 LS5 device 64	
27.79	2379	Flag 4 LS5 device 64	
27.80	2380	Flag 5 LS5 device 64	

Logical Command Variables: Group 28: LS5 system conditions

LS5 system conditions, Logic command variables 28.01-28.06

No.	ID	Name / Function	Note
28.01	2401	Command 1 to LS5 easYgen (OR)	TRUE if at least one easYgen sets the command variable to TRUE (OR operation)
28.02	2402	Command 2 to LS5 easYgen (OR)	
28.03	2403	Command 3 to LS5 easYgen (OR)	
28.04	2404	Command 4 to LS5 easYgen (OR)	
28.05	2405	Command 5 to LS5 easYgen (OR)	
28.06	2406	Command 6 to LS5 easYgen (OR)	

Logical Command Variables: Group 29: Commands of EG (1 to 16)

Commands of EG (1 to 16), Logic command variables 29.01-29.96

No.	ID	Name / Function	Note
29.01	2501	Command 1 easYgen 1	
29.02	2502	Command 2 easYgen 1	
29.03	2503	Command 3 easYgen 1	
29.04	2504	Command 4 easYgen 1	
29.05	2505	Command 5 easYgen 1	
29.06	2506	Command 6 easYgen 1	
29.07	2507	Command 1 easYgen 2	
29.08	2508	Command 2 easYgen 2	
29.09	2509	Command 3 easYgen 2	
29.10	2510	Command 4 easYgen 2	
29.11	2511	Command 5 easYgen 2	
29.12	2512	Command 6 easYgen 2	
29.13	2513	Command 1 easYgen 3	
29.14	2514	Command 2 easYgen 3	
29.15	2515	Command 3 easYgen 3	
29.16	2516	Command 4 easYgen 3	
29.17	2517	Command 5 easYgen 3	
29.18	2518	Command 6 easYgen 3	
29.19	2519	Command 1 easYgen 4	
29.20	2520	Command 2 easYgen 4	
29.21	2521	Command 3 easYgen 4	
29.22	2522	Command 4 easYgen 4	
29.23	2523	Command 5 easYgen 4	
29.24	2524	Command 6 easYgen 4	
29.25	2525	Command 1 easYgen 5	
29.26	2526	Command 2 easYgen 5	
29.27	2527	Command 3 easYgen 5	
29.28	2528	Command 4 easYgen 5	

29.29	2529	Command 5 easYgen 5	
29.30	2530	Command 6 easYgen 5	
29.31	2531	Command 1 easYgen 6	
29.32	2532	Command 2 easYgen 6	
29.33	2533	Command 3 easYgen 6	
29.34	2534	Command 4 easYgen 6	
29.35	2535	Command 5 easYgen 6	
29.36	2536	Command 6 easYgen 6	
29.37	2537	Command 1 easYgen 7	
29.38	2538	Command 2 easYgen 7	
29.39	2539	Command 3 easYgen 7	
29.40	2540	Command 4 easYgen 7	
29.41	2541	Command 5 easYgen 7	
29.42	2542	Command 6 easYgen 7	
29.43	2543	Command 1 easYgen 8	
29.44	2544	Command 2 easYgen 8	
29.45	2545	Command 3 easYgen 8	
29.46	2546	Command 4 easYgen 8	
29.47	2547	Command 5 easYgen 8	
29.48	2548	Command 6 easYgen 8	
29.49	2549	Command 1 easYgen 9	
29.50	2550	Command 2 easYgen 9	
29.51	2551	Command 3 easYgen 9	
29.52	2552	Command 4 easYgen 9	
29.53	2553	Command 5 easYgen 9	
29.54	2554	Command 6 easYgen 9	
29.55	2555	Command 1 easYgen 10	
29.56	2556	Command 2 easYgen 10	
29.57	2557	Command 3 easYgen 10	
29.58	2558	Command 4 easYgen 10	
29.59	2559	Command 5 easYgen 10	
29.60	2560	Command 6 easYgen 10	
29.61	2561	Command 1 easYgen 11	
29.62	2562	Command 2 easYgen 11	
29.63	2563	Command 3 easYgen 11	
29.64	2564	Command 4 easYgen 11	
29.65	2565	Command 5 easYgen 11	
29.66	2566	Command 6 easYgen 11	
29.67	2567	Command 1 easYgen 12	
29.68	2568	Command 2 easYgen 12	
29.69	2569	Command 3 easYgen 12	
29.70	2570	Command 4 easYgen 12	
29.71	2571	Command 5 easYgen 12	
29.72	2572	Command 6 easYgen 12	
29.73	2573	Command 1 easYgen 13	
29.74	2574	Command 2 easYgen 13	
29.75	2575	Command 3 easYgen 13	
29.76	2576	Command 4 easYgen 13	
29.77	2577	Command 5 easYgen 13	
29.78	2578	Command 6 easYgen 13	
29.79	2579	Command 1 easYgen 14	
29.80	2580	Command 2 easYgen 14	
29.81	2581	Command 3 easYgen 14	
29.82	2582	Command 4 easYgen 14	
29.83	2583	Command 5 easYgen 14	
29.84	2584	Command 6 easYgen 14	
29.85	2585	Command 1 easYgen 15	
29.86	2586	Command 2 easYgen 15	
29.87	2587	Command 3 easYgen 15	
29.88	2588	Command 4 easYgen 15	
29.89	2589	Command 5 easYgen 15	
29.90	2590	Command 6 easYgen 15	
29.91	2591	Command 1 easYgen 16	
29.92	2592	Command 2 easYgen 16	
29.93	2593	Command 3 easYgen 16	
29.94	2594	Command 4 easYgen 16	
29.95	2595	Command 5 easYgen 16	
29.96	2596	Command 6 easYgen 16	

Logical Command Variables: Group 30: Commands of EG (17 to 32)

Commands of EG (17 to 32), Logic command variables 30.01-30.96

No.	ID	Name / Function	Note
30.01	2601	Command 1 easYgen 17	
30.02	2602	Command 2 easYgen 17	
30.03	2603	Command 3 easYgen 17	
30.04	2604	Command 4 easYgen 17	
30.05	2605	Command 5 easYgen 17	
30.06	2606	Command 6 easYgen 17	
30.07	2607	Command 1 easYgen 18	
30.08	2608	Command 2 easYgen 18	
30.09	2609	Command 3 easYgen 18	
30.10	2610	Command 4 easYgen 18	
30.11	2611	Command 5 easYgen 18	
30.12	2612	Command 6 easYgen 18	
30.13	2613	Command 1 easYgen 19	
30.14	2614	Command 2 easYgen 19	
30.15	2615	Command 3 easYgen 19	
30.16	2616	Command 4 easYgen 19	
30.17	2617	Command 5 easYgen 19	
30.18	2618	Command 6 easYgen 19	
30.19	2619	Command 1 easYgen 20	
30.20	2620	Command 2 easYgen 20	
30.21	2621	Command 3 easYgen 20	
30.22	2622	Command 4 easYgen 20	
30.23	2623	Command 5 easYgen 20	
30.24	2624	Command 6 easYgen 20	
30.25	2625	Command 1 easYgen 21	
30.26	2626	Command 2 easYgen 21	
30.27	2627	Command 3 easYgen 21	
30.28	2628	Command 4 easYgen 21	
30.29	2629	Command 5 easYgen 21	
30.30	2630	Command 6 easYgen 21	
30.31	2631	Command 1 easYgen 22	
30.32	2632	Command 2 easYgen 22	
30.33	2633	Command 3 easYgen 22	
30.34	2634	Command 4 easYgen 22	
30.35	2635	Command 5 easYgen 22	
30.36	2636	Command 6 easYgen 22	
30.37	2637	Command 1 easYgen 23	
30.38	2638	Command 2 easYgen 23	
30.39	2639	Command 3 easYgen 23	
30.40	2640	Command 4 easYgen 23	
30.41	2641	Command 5 easYgen 23	
30.42	2642	Command 6 easYgen 23	
30.43	2643	Command 1 easYgen 24	
30.44	2644	Command 2 easYgen 24	
30.45	2645	Command 3 easYgen 24	
30.46	2646	Command 4 easYgen 24	
30.47	2647	Command 5 easYgen 24	
30.48	2648	Command 6 easYgen 24	
30.49	2649	Command 1 easYgen 25	
30.50	2650	Command 2 easYgen 25	
30.51	2651	Command 3 easYgen 25	
30.52	2652	Command 4 easYgen 25	
30.53	2653	Command 5 easYgen 25	
30.54	2654	Command 6 easYgen 25	
30.55	2655	Command 1 easYgen 26	
30.56	2656	Command 2 easYgen 26	
30.57	2657	Command 3 easYgen 26	
30.58	2658	Command 4 easYgen 26	
30.59	2659	Command 5 easYgen 26	
30.60	2660	Command 6 easYgen 26	
30.61	2661	Command 1 easYgen 27	
30.62	2662	Command 2 easYgen 27	
30.63	2663	Command 3 easYgen 27	
30.64	2664	Command 4 easYgen 27	
30.65	2665	Command 5 easYgen 27	
30.66	2666	Command 6 easYgen 27	

30.67	2667	Command 1 easYgen 28	
30.68	2668	Command 2 easYgen 28	
30.69	2669	Command 3 easYgen 28	
30.70	2670	Command 4 easYgen 28	
30.71	2671	Command 5 easYgen 28	
30.72	2672	Command 6 easYgen 28	
30.73	2673	Command 1 easYgen 29	
30.74	2674	Command 2 easYgen 29	
30.75	2675	Command 3 easYgen 29	
30.76	2676	Command 4 easYgen 29	
30.77	2677	Command 5 easYgen 29	
30.78	2678	Command 6 easYgen 29	
30.79	2679	Command 1 easYgen 30	
30.80	2680	Command 2 easYgen 30	
30.81	2681	Command 3 easYgen 30	
30.82	2682	Command 4 easYgen 30	
30.83	2683	Command 5 easYgen 30	
30.84	2684	Command 6 easYgen 30	
30.85	2685	Command 1 easYgen 31	
30.86	2686	Command 2 easYgen 31	
30.87	2687	Command 3 easYgen 31	
30.88	2688	Command 4 easYgen 31	
30.89	2689	Command 5 easYgen 31	
30.90	2690	Command 6 easYgen 31	
30.91	2691	Command 1 easYgen 32	
30.92	2692	Command 2 easYgen 32	
30.93	2693	Command 3 easYgen 32	
30.94	2694	Command 4 easYgen 32	
30.95	2695	Command 5 easYgen 32	
30.96	2696	Command 6 easYgen 32	

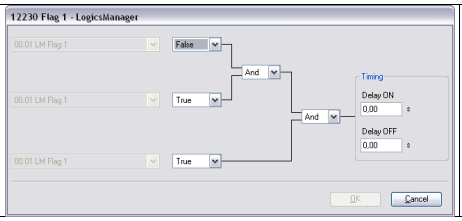
Factory Setting

The inputs, outputs, and internal flags, which may be programmed via the *LogicsManager* have the following factory default settings when delivered:

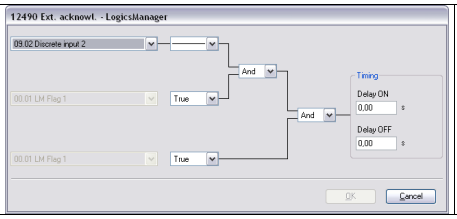
simple (function)	extended (configuration)	result

Factory Setting: Functions

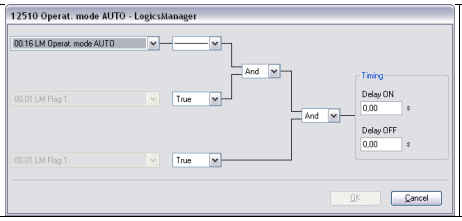
[00.0x] Flag {x}; {x} = 1 to 8

A01	✓	If TRUE, flag {x} becomes TRUE. Deactivated by default		FALSE
A02	✓			
A03	✓			
A04	✓			
AUTO	✓			
MAN	✓			

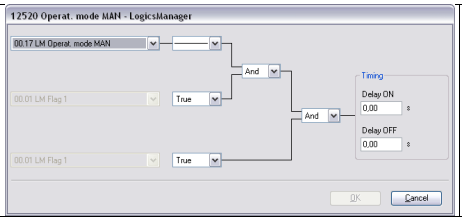
[00.15] External acknowledgment

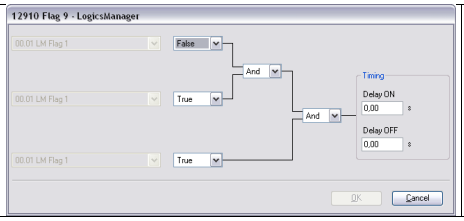
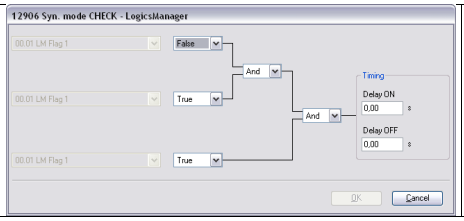
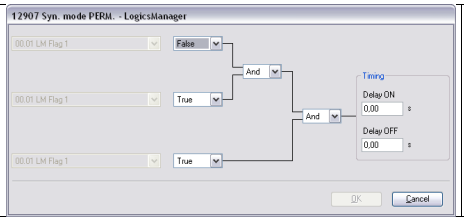
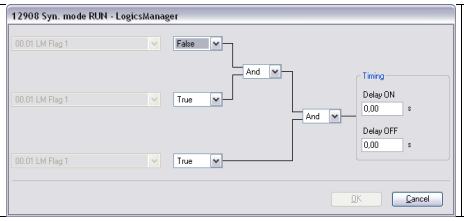
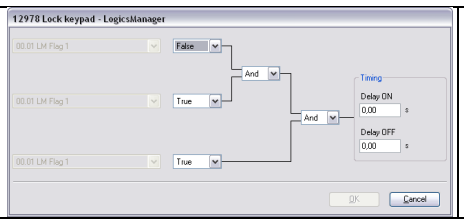
A01	✓	If TRUE, all alarms are acknowledged from an external source. TRUE once discrete input [DI 2] is energized.		dependent on discrete input [DI 2]
A02	✓			
A03	✓			
A04	✓			
AUTO	✓			
MAN	✓			

[00.16] Operation mode AUTOMATIC

A01	✓	If TRUE the unit changes into AUTOMATIC operating mode. Deactivated by default		FALSE
A02	✓			
A03	---			
A04	---			
AUTO	---			
MAN	✓			

[00.17] Operation mode MANUAL

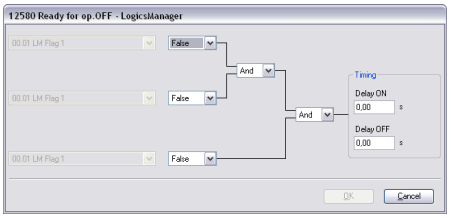
A01	✓	If TRUE the unit changes into MANUAL operating mode. Deactivated by default		FALSE
A02	✓			
A03	---			
A04	---			
AUTO	✓			
MAN	---			

		simple (function)	extended (configuration)	result
[00.3x] Flag {y}; {x} = 0 to 7, {y} = 9 to 16				
A01	✓	If TRUE, flag {y} becomes TRUE. Deactivated by default		FALSE
A02	✓			
A03	✓			
A04	✓			
AUTO	✓			
MAN	✓			
[00.38] Synchronization Mode CHECK				
A01	✓	If TRUE, synchronization mode CHECK is enabled. Deactivated by default		FALSE
A02	✓			
A03	---			
A04	---			
AUTO	✓			
MAN	✓			
[00.39] Synchronization Mode PERM				
A01	✓	If TRUE, synchronization mode PERMISSIVE is enabled. Deactivated by default		FALSE
A02	✓			
A03	---			
A04	---			
AUTO	✓			
MAN	✓			
[00.40] Synchronization Mode RUN				
A01	✓	If TRUE, synchronization mode RUN is enabled. Deactivated by default		FALSE
A02	✓			
A03	---			
A04	---			
AUTO	✓			
MAN	✓			
[00.95] Lock keypad				
A01	✓	If TRUE, the Lock keypad function is activated. Deactivated by default		FALSE
A02	✓			
A03	✓			
A04	✓			
AUTO	✓			
MAN	✓			

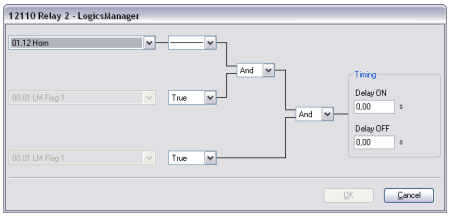
simple (function)	extended (configuration)	result

Factory Setting: Relay Outputs

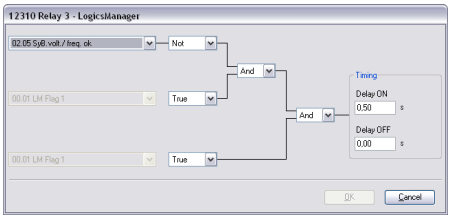
[00.41] Relay 1 [R01] - Ready for operation OFF

A01	✓	Relay will be de-energized if unit is not ready for operation or the logics manager output is TRUE. LM output is deactivated by default **Note:** This LM function is preconfigured and may be activated by passing through the command variables [01.09] Shutdown alarm or [04.01] Operating mode AUTO or [00.01] LM: Flag 1 ('—' instead of '0'). The unit is only ready for operation after an start-up delay following the power supply connection.		**FALSE**
A02	✓			
A03	✓			
A04	✓			
AUTO	✓			
MAN	✓			

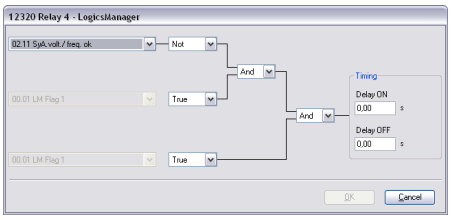
[00.42] Relay 2 [R02] - Horn / freely configurable

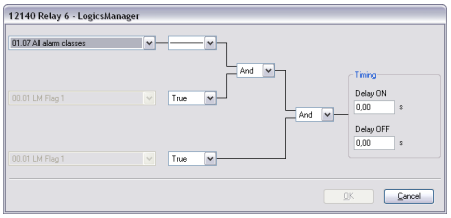
A01	✓	Relay energizes if the internal condition "Horn" is TRUE		dependent on Logics Command Variable [01.12]
A02	✓			
A03	✓			
A04	✓			
AUTO	✓			
MAN	✓			

[00.43] Relay 3 [R03] -System B voltage/frequency not OK / freely configurable

A01	✓	Relay energizes if the internal condition "SyB volt/freq. ok" is FALSE		dependent on Logics Command Variable [02.05]
A02	✓			
A03	✓			
A04	✓			
AUTO	✓			
MAN	✓			

[00.44] Relay 4 [R04] - System A voltage/frequency not OK / freely configurable

A01	✓	Relay energizes if the internal condition "SyA volt/freq. ok" is FALSE		dependent on Logics Command Variable [02.11]
A02	✓			
A03	✓			
A04	✓			
AUTO	✓			
MAN	✓			

		simple (function)	extended (configuration)	result
[00.45] Relay 5 [R05] - Open CBA				
A01	✓	Fixed function to open CBA	Not configurable	
A02	✓			
A03	✓			
A04	✓			
AUTO	✓			
MAN	✓			
[00.46] Relay 6 [R06] – Close CBA (in CBA: two relay mode) / All alarm classes				
A01	✓	In two relay mode fixed to “close CBA”. Otherwise the relay energizes if “All alarm classes” is TRUE		FALSE
A02	✓			
A03	✓			
A04	✓			
AUTO	✓			
MAN	✓			

Appendix D.
Data Protocols

Modbus

Protocol 5300 (Basic Visualization)

Modicon start addr.	Start addr. (*1)	Parameter ID	Description	Multiplier	Units
450001	450000		Protocoll-ID, always 5300		--
450002	450001	3181	Scaling Power (16 bits) Exponent 10^x W (5;4;3;2)		
450003	450002	3182	Scaling Volts (16 bits) Exponent 10^x V (2;1;0;-1)		
450004	450003	3183	Scaling Amps (16 bits) Exponent 10^x A (0;-1)		
450005	450004		0 (reserve)		
450006	450005		0 (reserve)		
450007	450006		0 (reserve)		
450008	450007		0 (reserve)		
450009	450008		0 (reserve)		
AC System A values (16 bits)					
450010	450009	144	System A frequency	0.01	Hz
450011	450010	246	Total system A power	scaled defined by index 3181 (modicon Adress 450002)	W
450012	450011	247	Total system A reactive power	scaled defined by index 3181 (modicon Adress 450002)	var
450013	450012	160	System A power factor	0.001	
450014	450013	248	System A voltage L1-L2	scaled defined by index 3182 (modicon Adress 450003)	V
450015	450014	249	System A voltage L2-L3	scaled defined by index 3182 (modicon Adress 450003)	V
450016	450015	250	System A voltage L3-L1	scaled defined by index 3182 (modicon Adress 450003)	V
450017	450016	251	System A voltage L1-N	scaled defined by index 3182 (modicon Adress 450003)	V
450018	450017	252	System A voltage L2-N	scaled defined by index 3182 (modicon Adress 450003)	V
450019	450018	253	System A voltage L3-N	scaled defined by index 3182 (modicon Adress 450003)	V

Modicon start addr.	Start addr. (*1)	Parameter ID	Description	Multiplier	Units
450020	450019	255	System A current 1	scaled defined by index 3183 (modicon Adress 450004)	A
450021	450020	256	System A current 2	scaled defined by index 3183 (modicon Adress 450004)	A
450022	450021	257	System A current 3	scaled defined by index 3183 (modicon Adress 450004)	A
450023	450022		0 (reserve)		
450024	450023		0 (reserve)		
450025	450024		0 (reserve)		
450026	450025		0 (reserve)		
450027	450026		0 (reserve)		
450028	450027		0 (reserve)		
450029	450028		0 (reserve)		
AC System B values (16 bits)					
450030	450029	147	System B frequency	0.01	Hz
450031	450030	258	Total system B power	scaled defined by index 3181 (modicon Adress 450002)	W
450032	450031	259	Total system B reactive power	scaled defined by index 3181 (modicon Adress 450002)	var
450033	450032	208	System B power factor	0.001	
450034	450033	260	System B voltage L1-L2	scaled defined by index 3182 (modicon Adress 450003)	V
450035	450034	261	System B voltage L2-L3	scaled defined by index 3182 (modicon Adress 450003)	V
450036	450035	262	System B voltage L3-L1	scaled defined by index 3182 (modicon Adress 450003)	V
450037	450036	263	System B voltage L1-N	scaled defined by index 3182 (modicon Adress 450003)	V
450038	450037	264	System B voltage L2-N	scaled defined by index 3182 (modicon Adress 450003)	V
450039	450038	265	System B voltage L3-N	scaled defined by index 3182 (modicon Adress 450003)	V
450040	450039		0 (reserve)		
450041	450040		0 (reserve)		
450042	450041		0 (reserve)		
450043	450042		0 (reserve)		
450044	450043		0 (reserve)		
AC System values (16 bits)					
450045	450044		0 (reserve)		

Modicon start addr.	Start addr. (*1)	Parameter ID	Description	Multiplier	Units
450046	450045		0 (reserve)		
450047	450046		0 (reserve)		
450048	450047		0 (reserve)		
450049	450048		0 (reserve)		
DC Analogue Values (16 bits)					
450050	450049	10110	Battery voltage	0.1	V
450051	450050		0 (reserve)		
450052	450051		0 (reserve)		
450053	450052		0 (reserve)		
450054	450053		0 (reserve)		
450055	450054		0 (reserve)		
450056	450055		0 (reserve)		
450057	450056		0 (reserve)		
450058	450057		0 (reserve)		
450059	450058		0 (reserve)		
Control and Status (16 bits)					
450060	450059	10202	State Display	Id discription see operation manual status messages	(enum.)
450061	450060	8018	Visualisation Remote and CB-Control		
			intern	Mask: 0001h	
			intern	Mask: 0002h	
			intern	Mask: 0004h	
			intern	Mask: 0008h	
			intern	Mask: 0010h	
			intern	Mask: 0020h	
			intern	Mask: 0040h	
			intern	Mask: 0080h	
			28.01 Command to CB-control 1 (OR'ed)	Mask: 0100h	
			28.02 Command to CB-control 2 (OR'ed)	Mask: 0200h	
			28.03 Command to CB-control 3 (OR'ed)	Mask: 0400h	
			28.04 Command to CB-control 4 (OR'ed)	Mask: 0800h	
			28.05 Command to CB-control 5 (OR'ed)	Mask: 1000h	
			28.06 Command to CB-control 6 (OR'ed)	Mask: 2000h	
			intern		
			intern		
450062	450061	10146	LogicManagerBits		
			11.10 running hours 100h over (toggles every 100 running hours)	Mask: 0001h	
			11.09 running hours 10h over (toggles every 10 running hours)	Mask: 0002h	
			11.08 running hours 1h over (toggles every running hour)	Mask: 0004h	
			11.07 Active second	Mask: 0008h	
			11.06 Active minute	Mask: 0010h	
			11.05 Active hour	Mask: 0020h	
			11.04 Active day in month	Mask: 0040h	
			11.03 Active weekday	Mask: 0080h	
			11.02 Time 2 overrun	Mask: 0100h	
			11.01 Time 1 overrun	Mask: 0200h	
			intern	Mask: 0400h	
			04.05 Acknowledge was executed	Mask: 0800h	

Modicon start addr.	Start addr. (*1)	Parameter ID	Description	Multiplier	Units
			01.09 Shutdown alarm are active (alarm class C-F)	Mask: 1000h	
			intern	Mask: 2000h	
			intern	Mask: 4000h	
			intern	Mask: 8000h	
			LogicManagerBits1		
			intern	Mask: 0001h	
			intern	Mask: 0002h	
			intern	Mask: 0004h	
			intern	Mask: 0008h	
			intern	Mask: 0010h	
			intern	Mask: 0020h	
			intern	Mask: 0040h	
450063	450062	10147	intern	Mask: 0080h	
			intern	Mask: 0100h	
			intern	Mask: 0200h	
			00.46 LM Relay 6	Mask: 0400h	
			intern	Mask: 0800h	
			00.44 LM Relay 4	Mask: 1000h	
			00.43 LM Relay 3	Mask: 2000h	
			00.42 LM Relay 2	Mask: 4000h	
			00.41 LM Relay 1	Mask: 8000h	
			LogicManagerBits2		
			intern	Mask: 0001h	
			00.17 LM Operation mode MANUAL	Mask: 0002h	
			00.16 LM Operation mode AUTOMATIC	Mask: 0004h	
			intern	Mask: 0008h	
			00.15 LM External acknowledge	Mask: 0010h	
			intern	Mask: 0020h	
			intern	Mask: 0040h	
450064	450063	10140	intern	Mask: 0080h	
			00.08 LM Internal flag 8	Mask: 0100h	
			00.07 LM Internal flag 7	Mask: 0200h	
			00.06 LM Internal flag 6	Mask: 0400h	
			00.05 LM Internal flag 5	Mask: 0800h	
			00.04 LM Internal flag 4	Mask: 1000h	
			00.03 LM Internal flag 3	Mask: 2000h	
			00.02 LM Internal flag 2	Mask: 4000h	
			00.01 LM Internal flag 1	Mask: 8000h	
			LogicManagerBits3		
			intern	Mask: 0001h	
			intern	Mask: 0002h	
			intern	Mask: 0004h	
			intern	Mask: 0008h	
450065	450064	10148	intern	Mask: 0010h	
			intern	Mask: 0020h	
			intern	Mask: 0040h	
			intern	Mask: 0080h	
			01.08 Warning alarms are active (alarm class A, B)	Mask: 0100h	
			01.07 All alarm classes are active	Mask: 0200h	

Modicon start addr.	Start addr. (*1)	Parameter ID	Description	Multiplier	Units
			01.10 Centralized alarms are active (alarm class B-F)	Mask: 0400h	
			04.04 Lamp test	Mask: 0800h	
			intern	Mask: 1000h	
			intern	Mask: 2000h	
			intern	Mask: 4000h	
			intern	Mask: 8000h	
			LogicManagerBits4		
			intern	Mask: 0001h	
			intern	Mask: 0002h	
			00.37 LM Internal flag 16	Mask: 0004h	
			00.36 LM Internal flag 15	Mask: 0008h	
			00.35 LM Internal flag 14	Mask: 0010h	
			00.34 LM Internal flag 13	Mask: 0020h	
			00.33 LM Internal flag 12	Mask: 0040h	
450066	450065	10150	00.32 LM Internal flag 11	Mask: 0080h	
			00.31 LM Internal flag 10	Mask: 0100h	
			00.30 LM Internal flag 9	Mask: 0200h	
			intern	Mask: 0400h	
			intern	Mask: 0800h	
			intern	Mask: 1000h	
			intern	Mask: 2000h	
			intern	Mask: 4000h	
			intern	Mask: 8000h	
			LogicManagerBits6		
			00.40 LM Synchronization mode RUN	Mask: 0001h	
			00.39 LM Synchronization mode PERMISSIVE	Mask: 0002h	
			00.38 LM Synchronization mode CHECK	Mask: 0004h	
			intern	Mask: 0008h	
			intern	Mask: 0010h	
			intern	Mask: 0020h	
			intern	Mask: 0040h	
450067	450066	10162	intern	Mask: 0080h	
			intern	Mask: 0100h	
			intern	Mask: 0200h	
			intern	Mask: 0400h	
			intern	Mask: 0800h	
			intern	Mask: 1000h	
			intern	Mask: 2000h	
			intern	Mask: 4000h	
			intern	Mask: 8000h	
			ANIN_Mon		
			08.03 Battery under voltage threshold 1	Mask: 0001h	
			08.01 Battery over voltage threshold 1	Mask: 0002h	
			08.04 Battery under voltage threshold 2	Mask: 0004h	
450068	450067	10136	08.02 Battery over voltage threshold 2	Mask: 0008h	
			intern	Mask: 0010h	
			intern	Mask: 0020h	
			intern	Mask: 0040h	
			intern	Mask: 0080h	

Modicon start addr.	Start addr. (*1)	Parameter ID	Description	Multiplier	Units
			intern	Mask: 0100h	
			intern	Mask: 0200h	
			intern	Mask: 0400h	
			intern	Mask: 0800h	
			intern	Mask: 1000h	
			intern	Mask: 2000h	
			intern	Mask: 4000h	
			intern	Mask: 8000h	
450069	450068	4139	SysConFlags0_Debounced		
			intern	Mask: 0001h	
			intern	Mask: 0002h	
			intern	Mask: 0004h	
			intern	Mask: 0008h	
			intern	Mask: 0010h	
			intern	Mask: 0020h	
			02.11 System A voltage and frequency in range (ready for operation, 02.09 AND 02.10 are TRUE)	Mask: 0040h	
			intern	Mask: 0080h	
			intern	Mask: 0100h	
			02.10 System A frequency in range (based on System B frequency window)	Mask: 0200h	
			intern	Mask: 0400h	
			intern	Mask: 0800h	
			02.09 Sytem A voltage in range (based on System B voltage window)	Mask: 1000h	
			02.05 System B voltage and frequency in range (ready for operation, 02.03 AND 02.04 are TRUE)	Mask: 2000h	
			02.04 System B frequency in range (based on System A Operating frequency window)	Mask: 4000h	
			02.03 System B voltage in range (based on System A Operating voltage window)	Mask: 8000h	
450070	450069	1791	GenSyst		
			intern	Mask: 0001h	
			intern	Mask: 0002h	
			intern	Mask: 0004h	
			intern	Mask: 0008h	
			intern	Mask: 0010h	
			intern	Mask: 0020h	
			02.13 System A phase rotation: Clock Wise (CW, forward, right turn)	Mask: 0040h	
			02.12 System A phase rotation: Counter Clock Wise (CCW, reverse, left turn)	Mask: 0080h	
			intern	Mask: 0100h	
			intern	Mask: 0200h	
			intern	Mask: 0400h	
			intern	Mask: 0800h	
			intern	Mask: 1000h	
			intern	Mask: 2000h	
			intern	Mask: 4000h	
			intern	Mask: 8000h	
450071	450070	1792	MainsSyst		
			intern	Mask: 0001h	
			intern	Mask: 0002h	
			intern	Mask: 0004h	
			intern	Mask: 0008h	

Modicon start addr.	Start addr. (*1)	Parameter ID	Description	Multiplier	Units
			intern	Mask: 0010h	
			intern	Mask: 0020h	
			02.15 System B phase rotation: Clock Wise (CW, forward, right turn)	Mask: 0040h	
			02.14 System B phase rotation: Counter Clock Wise (CCW, reverse, left turn)	Mask: 0080h	
			intern	Mask: 0100h	
			intern	Mask: 0200h	
			intern	Mask: 0400h	
			intern	Mask: 0800h	
			intern	Mask: 1000h	
			intern	Mask: 2000h	
			intern	Mask: 4000h	
			intern	Mask: 8000h	
450072	450071		0 (reserve)		
			GAPControlBits1		
			04.01 Operating Mode Automatic	Mask: 0001h	
			04.03 Operating Mode Manual	Mask: 0002h	
			04.04 Lamp test request	Mask: 0004h	
			04.07 CB A is closed	Mask: 0008h	
			24.39 Isolation Switch is open (LS510)	Mask: 0010h	
			04.11 Mains settling is active	Mask: 0020h	
			04.18 Synchronisation CB A procedure is active	Mask: 0040h	
450073	450072	4153	04.19 Open command CB A is active	Mask: 0080h	
			04.20 Close command CB A is active	Mask: 0100h	
			04.21 Synchronisation CB B procedure is active	Mask: 0200h	
			04.22 Open command CB B is active	Mask: 0400h	
			04.23 Close command CB B is active	Mask: 0800h	
			04.28 Unloading CB A is active	Mask: 1000h	
			04.29 Unloading CB B is active	Mask: 2000h	
			04.41 Breaker Transition Mode Alternative 1	Mask: 4000h	
			04.42 Breaker Transition Mode Alternative 2	Mask: 8000h	
			GAPControlBits2		
450074	450073	4154		Mask: 0001h	
				Mask: 0002h	

Modicon start addr.	Start addr. (*1)	Parameter ID	Description	Multiplier	Units
				Mask: 0004h	
				Mask: 0008h	
				Mask: 0010h	
				Mask: 0020h	
				Mask: 0040h	
				Mask: 0080h	
				Mask: 0100h	
				Mask: 0200h	
				Mask: 0400h	
				Mask: 0800h	
				Mask: 1000h	
				Mask: 2000h	
				Mask: 4000h	
				Mask: 8000h	
450075	450074	4155	GAPControlBits3		
				Mask: 0001h	
				Mask: 0002h	
				Mask: 0004h	
				Mask: 0008h	
				Mask: 0010h	
				Mask: 0020h	
				Mask: 0040h	
				Mask: 0080h	
				Mask: 0100h	
				Mask: 0200h	
				Mask: 0400h	
				Mask: 0800h	
				Mask: 1000h	
				Mask: 2000h	
				Mask: 4000h	
				Mask: 8000h	
450076	450075	10191	LogicManagerBits10		
			24.31, enable mains decoupling	Mask: 0001h	
			24.32, open CBA	Mask: 0002h	
			24.33, immediate open cba	Mask: 0004h	
			24.34, enable to close CBA	Mask: 0008h	
			24.35, open cbb	Mask: 0010h	
			24.36, immediate open cbb	Mask: 0020h	
			24.37, load transfer to system A	Mask: 0040h	
			24.38, load transfer to system B	Mask: 0080h	
			24.41, Flag 1 LS 5	Mask: 0100h	
			24.42, Flag 2 LS 5	Mask: 0200h	
			24.43, Flag 3 LS 5	Mask: 0400h	
			24.44, Flag 4 LS 5	Mask: 0800h	
			24.45, Flag 5 LS 5	Mask: 1000h	
			intern	Mask: 2000h	
			intern	Mask: 4000h	
			intern	Mask: 8000h	
450077	450076	10138	Gen1_Mon		

Modicon start addr.	Start addr. (*1)	Parameter ID	Description	Multiplier	Units
			intern	Mask: 0001h	
			intern	Mask: 0002h	
			intern	Mask: 0004h	
			intern	Mask: 0008h	
			intern	Mask: 0010h	
			intern	Mask: 0020h	
			intern	Mask: 0040h	
			intern	Mask: 0080h	
			intern	Mask: 0100h	
			intern	Mask: 0200h	
			06.21 System B Phase Rotation mismatch	Mask: 0400h	
			intern	Mask: 0800h	
			intern	Mask: 1000h	
			intern	Mask: 2000h	
			intern	Mask: 4000h	
			intern	Mask: 8000h	
450078	450077	10135	Mains_Mon		
			intern	Mask: 0001h	
			intern	Mask: 0002h	
			07.05 System A phase rotation mismatch	Mask: 0004h	
			07.26 System A voltage asymmetry (with negative sequence)	Mask: 0008h	
			intern	Mask: 0010h	
			intern	Mask: 0020h	
			07.25 System A decoupling	Mask: 0040h	
			07.14 System A Phase shift	Mask: 0080h	
			07.13 System A under voltage threshold 2	Mask: 0100h	
			07.12 System A under voltage threshold 1	Mask: 0200h	
			07.11 System A over voltage threshold 2	Mask: 0400h	
			07.10 System A over voltage threshold 1	Mask: 0800h	
			07.09 System A under frequency threshold 2	Mask: 1000h	
			07.08 System A under frequency threshold 1	Mask: 2000h	
			07.07 System A over frequency threshold 2	Mask: 4000h	
			07.06 System A over frequency threshold 1	Mask: 8000h	
450079	450078	4138	Mains1_Mon		
			intern	Mask: 0001h	
			intern	Mask: 0002h	
			intern	Mask: 0004h	
			intern	Mask: 0008h	
			intern	Mask: 0010h	
			intern	Mask: 0020h	
			intern	Mask: 0040h	
			07.15 System A df/dt	Mask: 0080h	
			intern	Mask: 0100h	
			intern	Mask: 0200h	
			intern	Mask: 0400h	
			intern	Mask: 0800h	
			intern	Mask: 1000h	
			intern	Mask: 2000h	
			intern	Mask: 4000h	

Modicon start addr.	Start addr. (*1)	Parameter ID	Description	Multiplier	Units
			intern	Mask: 8000h	
			Visualisation Remote and CB-Control with CAN-Input.		
			04.44 Remote Control Bit 1	Mask: 0001h	
			04.45 Remote Control Bit 2	Mask: 0002h	
			04.46 Remote Control Bit 3	Mask: 0004h	
			04.47 Remote Control Bit 4	Mask: 0008h	
			04.48 Remote Control Bit 5	Mask: 0010h	
			04.49 Remote Control Bit 6	Mask: 0020h	
			04.50 Remote Control Bit 7	Mask: 0040h	
450080	450079		04.51 Remote Control Bit 8	Mask: 0080h	
			04.52 Remote Control Bit 9	Mask: 0100h	
			04.53 Remote Control Bit 10	Mask: 0200h	
			04.54 Remote Control Bit 11	Mask: 0400h	
			04.55 Remote Control Bit 12	Mask: 0800h	
			04.56 Remote Control Bit 13	Mask: 1000h	
			04.57 Remote Control Bit 14	Mask: 2000h	
			04.58 Remote Control Bit 15	Mask: 4000h	
			04.59 Remote Control Bit 16	Mask: 8000h	
450081	450080		0 (reserve)		
450082	450081		0 (reserve)		
450083	450082		0 (reserve)		
450084	450083		0 (reserve)		
450085	450084		0 (reserve)		
450086	450085		0 (reserve)		
450087	450086		0 (reserve)		
450088	450087		0 (reserve)		
450089	450088		0 (reserve)		
450090	450089		0 (reserve)		
			Relay Outputs 1		
			Relay-Output 1 (inverted)	Mask: 8000h	Bit
			Relay-Output 2	Mask: 4000h	Bit
			Relay-Output 3	Mask: 2000h	Bit
			Relay-Output 4	Mask: 1000h	Bit
			Relay-Output 5	Mask: 0800h	Bit
			Relay-Output 6	Mask: 0400h	Bit
			internal	Mask: 0200h	Bit
450091	450090	10107	internal	Mask: 0100h	Bit
			internal	Mask: 0080h	Bit
			internal	Mask: 0040h	Bit
			internal	Mask: 0020h	Bit
			internal	Mask: 0010h	Bit
			internal	Mask: 0008h	Bit
			internal	Mask: 0004h	Bit
			internal	Mask: 0002h	Bit
			internal	Mask: 0001h	Bit
450092	450091		0 (reserve)		
450093	450092		0 (reserve)		
450094	450093	10131	Alarm Class Latched		

Modicon start addr.	Start addr. (*1)	Parameter ID	Description	Multiplier	Units
			internal	Mask: 8000h	Bit
			internal	Mask: 4000h	Bit
			internal	Mask: 2000h	Bit
			internal	Mask: 1000h	Bit
			internal	Mask: 0800h	Bit
			internal	Mask: 0400h	Bit
			internal	Mask: 0200h	Bit
			internal	Mask: 0100h	Bit
			internal	Mask: 0080h	Bit
			internal	Mask: 0040h	Bit
			Alarm class F latched	Mask: 0020h	Bit
			Alarm class E latched	Mask: 0010h	Bit
			Alarm class D latched	Mask: 0008h	Bit
			Alarm class C latched	Mask: 0004h	Bit
			Alarm class B latched	Mask: 0002h	Bit
			Alarm class A latched	Mask: 0001h	Bit
			LogicManagerBits5		
			internal	Mask: 8000h	Bit
			internal	Mask: 4000h	Bit
			internal	Mask: 2000h	Bit
			internal	Mask: 1000h	Bit
			internal	Mask: 0800h	Bit
			internal	Mask: 0400h	Bit
			internal	Mask: 0200h	Bit
450095	450094	10160	internal	Mask: 0100h	Bit
			internal	Mask: 0080h	Bit
			internal	Mask: 0040h	Bit
			internal	Mask: 0020h	Bit
			internal	Mask: 0010h	Bit
			internal	Mask: 0008h	Bit
			internal	Mask: 0004h	Bit
			01.11 New Alarm triggered	Mask: 0002h	Bit
			internal	Mask: 0001h	Bit
		10149	Alarm2		
			08.30 Timeout Synchronisation CB B	Mask: 8000h	Bit
			08.31 Timeout Synchronisation CB A	Mask: 4000h	Bit
			internal	Mask: 2000h	Bit
			internal	Mask: 1000h	Bit
			08.33 System A / System B phase rotation different	Mask: 0800h	Bit
			08.20 CAN bus overload	Mask: 0400h	Bit
			internal	Mask: 0200h	Bit
450096	450095		internal	Mask: 0100h	Bit
			internal	Mask: 0080h	Bit
			internal	Mask: 0040h	Bit
			internal	Mask: 0020h	Bit
			internal	Mask: 0010h	Bit
			08.17 Number of member mismatch	Mask: 0008h	Bit
			05.15 EEPROM corrupted	Mask: 0004h	Bit
			internal	Mask: 0002h	Bit
			internal	Mask: 0001h	Bit
450097	450096	10133	Alarm1		
			internal	Mask: 8000h	Bit

Modicon start addr.	Start addr. (*1)	Parameter ID	Description	Multiplier	Units
			internal	Mask: 4000h	Bit
			internal	Mask: 2000h	Bit
			internal	Mask: 1000h	Bit
			internal	Mask: 0800h	Bit
			internal	Mask: 0400h	Bit
			internal	Mask: 0200h	Bit
			08.05 CB B close not successful	Mask: 0100h	Bit
			08.06 CB B open not successful	Mask: 0080h	Bit
			08.07 CB A close not successful	Mask: 0040h	Bit
			08.08 CB A open not successful	Mask: 0020h	Bit
			internal	Mask: 0010h	Bit
			internal	Mask: 0008h	Bit
			internal	Mask: 0004h	Bit
			internal	Mask: 0002h	Bit
			08.18 CANopen error interface 1	Mask: 0001h	Bit
450098	450097		0 (reserve)		
450099	450098		0 (reserve)		
450100	450099		0 (reserve)		
450101	450100		0 (reserve)		
450102	450101		0 (reserve)		
450103	450102		0 (reserve)		
450104	450103		0 (reserve)		
450105	450104		0 (reserve)		
450106	450105		0 (reserve)		
450107	450106		0 (reserve)		
450108	450107		0 (reserve)		
System A (16 bits)					
450109	450108		0 (reserve)		
450110	450109		0 (reserve)		
System B (16 bits)					
450111	450110		0 (reserve)		
450112	450111		0 (reserve)		
Digital Inputs (16 bits)					
		10132	Alarms Digital Inputs 1 latched (unacknowledged)		
		10608	State Digital Input 8	Mask: 8000h	Bit
		10607	State Digital Input 7	Mask: 4000h	Bit
		10605	State Digital Input 6	Mask: 2000h	Bit
		10604	State Digital Input 5	Mask: 1000h	Bit
		10603	State Digital Input 4	Mask: 0800h	Bit
		10602	State Digital Input 3	Mask: 0400h	Bit
		10601	State Digital Input 2	Mask: 0200h	Bit
450113	450112	10600	State Digital Input 1	Mask: 0100h	Bit
			internal	Mask: 0080h	Bit
			internal	Mask: 0040h	Bit
			internal	Mask: 0020h	Bit
			internal	Mask: 0010h	Bit
			internal	Mask: 0008h	Bit
			internal	Mask: 0004h	Bit
			internal	Mask: 0002h	Bit
			internal	Mask: 0001h	Bit
450114	450113		0 (reserve)		

Modicon start addr.	Start addr. (*1)	Parameter ID	Description	Multiplier	Units
450115	450114		0 (reserve)		
DC Analogue Values Wirebreak (16 bits)					
		10137	Alarms Analog Inputs Wire Break latched (unacknowledged)		
			internal	Mask: 0001h	Bit
			internal	Mask: 0002h	Bit
			internal	Mask: 0004h	Bit
			internal	Mask: 0008h	Bit
			internal	Mask: 0010h	Bit
			internal	Mask: 0020h	Bit
			internal	Mask: 0040h	Bit
450116	450115		internal	Mask: 0080h	Bit
			internal	Mask: 0100h	Bit
			internal	Mask: 0200h	Bit
			internal	Mask: 0400h	Bit
			internal	Mask: 0800h	Bit
			internal	Mask: 1000h	Bit
			internal	Mask: 2000h	Bit
			internal	Mask: 4000h	Bit
			internal	Mask: 8000h	Bit
450117	450116		0 (reserve)		
450118	450117		0 (reserve)		
EG3000 Controls (16 bits)					
			Status from Device 1		
			Generator Voltage and Frequency ok		
			Busbar Voltage and Frequency ok		
			Mains Voltage and Frequency ok		
			4th System Voltage and Frequency ok		
			Busbar1 Dead Busbar Detection		
			Busbar2 Dead Busbar Detection		
		no ID. staLoadshare[0]. stData.stMedium1. usControl	intern		
450119	450118		intern		
			29.01 command to CB-control 1		
			29.02 command to CB-control 2		
			29.03 command to CB-control 3		
			29.04 command to CB-control 4		
			29.05 command to CB-control 5		
			29.06 command to CB-control 6		
			intern		
			intern		
			Status from Device 2		
			Generator Voltage and Frequency ok		
			Busbar Voltage and Frequency ok		
			Mains Voltage and Frequency ok		
			4th System Voltage and Frequency ok		
		no ID. staLoadshare[1]. stData.stMedium1. usControl	Busbar1 Dead Busbar Detection		
450120	450119		Busbar2 Dead Busbar Detection		
			intern		
			intern		
			29.01 command to CB-control 1		
			29.02 command to CB-control 2		
			29.03 command to CB-control 3		

Modicon start addr.	Start addr. (*1)	Parameter ID	Description	Multiplier	Units
			29.04 command to CB-control 4		
			29.05 command to CB-control 5		
			29.06 command to CB-control 6		
			intern		
			intern		
450121	450120	no ID. staLoadshare[2]. stData.stMedium1. usControl	Status from Device 3		
			Generator Voltage and Frequency ok		
			Busbar Voltage and Frequency ok		
			Mains Voltage and Frequency ok		
			4th System Voltage and Frequency ok		
			Busbar1 Dead Busbar Detection		
			Busbar2 Dead Busbar Detection		
			intern		
			intern		
			29.01 command to CB-control 1		
			29.02 command to CB-control 2		
			29.03 command to CB-control 3		
			29.04 command to CB-control 4		
			29.05 command to CB-control 5		
			29.06 command to CB-control 6		
			intern		
			intern		
450122	450121	no ID. staLoadshare[3]. stData.stMedium1. usControl	Status from Device 4		
			Generator Voltage and Frequency ok		
			Busbar Voltage and Frequency ok		
			Mains Voltage and Frequency ok		
			4th System Voltage and Frequency ok		
			Busbar1 Dead Busbar Detection		
			Busbar2 Dead Busbar Detection		
			intern		
			intern		
			29.01 command to CB-control 1		
			29.02 command to CB-control 2		
			29.03 command to CB-control 3		
			29.04 command to CB-control 4		
			29.05 command to CB-control 5		
			29.06 command to CB-control 6		
			intern		
			intern		
450123	450122	no ID. staLoadshare[4]. stData.stMedium1. usControl	Status from Device 5		
			Generator Voltage and Frequency ok		
			Busbar Voltage and Frequency ok		
			Mains Voltage and Frequency ok		
			4th System Voltage and Frequency ok		
			Busbar1 Dead Busbar Detection		
			Busbar2 Dead Busbar Detection		
			intern		
			intern		
			29.01 command to CB-control 1		
			29.02 command to CB-control 2		
			29.03 command to CB-control 3		
			29.04 command to CB-control 4		

Modicon start addr.	Start addr. (*1)	Parameter ID	Description	Multiplier	Units
			29.05 command to CB-control 5		
			29.06 command to CB-control 6		
			intern		
			intern		
450124	450123	no ID. staLoadshare[5]. stData.stMedium1. usControl	Status from Device 6		
			Generator Voltage and Frequency ok		
			Busbar Voltage and Frequency ok		
			Mains Voltage and Frequency ok		
			4th System Voltage and Frequency ok		
			Busbar1 Dead Busbar Detection		
			Busbar2 Dead Busbar Detection		
			intern		
			intern		
			29.01 command to CB-control 1		
			29.02 command to CB-control 2		
			29.03 command to CB-control 3		
			29.04 command to CB-control 4		
			29.05 command to CB-control 5		
			29.06 command to CB-control 6		
			intern		
			intern		
450125	450124	no ID. staLoadshare[6]. stData.stMedium1. usControl	Status from Device 7		
			Generator Voltage and Frequency ok		
			Busbar Voltage and Frequency ok		
			Mains Voltage and Frequency ok		
			4th System Voltage and Frequency ok		
			Busbar1 Dead Busbar Detection		
			Busbar2 Dead Busbar Detection		
			intern		
			intern		
			29.01 command to CB-control 1		
			29.02 command to CB-control 2		
			29.03 command to CB-control 3		
			29.04 command to CB-control 4		
			29.05 command to CB-control 5		
			29.06 command to CB-control 6		
			intern		
			intern		
450126	450125	no ID. staLoadshare[7]. stData.stMedium1. usControl	Status from Device 8		
			Generator Voltage and Frequency ok		
			Busbar Voltage and Frequency ok		
			Mains Voltage and Frequency ok		
			4th System Voltage and Frequency ok		
			Busbar1 Dead Busbar Detection		
			Busbar2 Dead Busbar Detection		
			intern		
			intern		
			29.01 command to CB-control 1		
			29.02 command to CB-control 2		
			29.03 command to CB-control 3		
			29.04 command to CB-control 4		
			29.05 command to CB-control 5		

Modicon start addr.	Start addr. (*1)	Parameter ID	Description	Multiplier	Units
			29.06 command to CB-control 6		
			intern		
			intern		
450127	450126	no ID. staLoadshare[8]. stData.stMedium1. usControl	Status from Device 9		
			Generator Voltage and Frequency ok		
			Busbar Voltage and Frequency ok		
			Mains Voltage and Frequency ok		
			4th System Voltage and Frequency ok		
			Busbar1 Dead Busbar Detection		
			Busbar2 Dead Busbar Detection		
			intern		
			intern		
			29.01 command to CB-control 1		
			29.02 command to CB-control 2		
			29.03 command to CB-control 3		
			29.04 command to CB-control 4		
			29.05 command to CB-control 5		
			29.06 command to CB-control 6		
			intern		
			intern		
450128	450127	no ID. staLoadshare[9]. stData.stMedium1. usControl	Status from Device 10		
			Generator Voltage and Frequency ok		
			Busbar Voltage and Frequency ok		
			Mains Voltage and Frequency ok		
			4th System Voltage and Frequency ok		
			Busbar1 Dead Busbar Detection		
			Busbar2 Dead Busbar Detection		
			intern		
			intern		
			29.01 command to CB-control 1		
			29.02 command to CB-control 2		
			29.03 command to CB-control 3		
			29.04 command to CB-control 4		
			29.05 command to CB-control 5		
			29.06 command to CB-control 6		
			intern		
			intern		
450129	450128	no ID. staLoadshare[10]. stData.stMedium1. usControl	Status from Device 11		
			Generator Voltage and Frequency ok		
			Busbar Voltage and Frequency ok		
			Mains Voltage and Frequency ok		
			4th System Voltage and Frequency ok		
			Busbar1 Dead Busbar Detection		
			Busbar2 Dead Busbar Detection		
			intern		
			intern		
			29.01 command to CB-control 1		
			29.02 command to CB-control 2		
			29.03 command to CB-control 3		
			29.04 command to CB-control 4		
			29.05 command to CB-control 5		
			29.06 command to CB-control 6		

Modicon start addr.	Start addr. (*1)	Parameter ID	Description	Multiplier	Units
			intern		
			intern		
450130	450129	no ID. staLoadshare[11]. stData.stMedium1. usControl	Status from Device 12		
			Generator Voltage and Frequency ok		
			Busbar Voltage and Frequency ok		
			Mains Voltage and Frequency ok		
			4th System Voltage and Frequency ok		
			Busbar1 Dead Busbar Detection		
			Busbar2 Dead Busbar Detection		
			intern		
			intern		
			29.01 command to CB-control 1		
			29.02 command to CB-control 2		
			29.03 command to CB-control 3		
			29.04 command to CB-control 4		
			29.05 command to CB-control 5		
			29.06 command to CB-control 6		
			intern		
			intern		
450131	450130	no ID. staLoadshare[12]. stData.stMedium1. usControl	Status from Device 13		
			Generator Voltage and Frequency ok		
			Busbar Voltage and Frequency ok		
			Mains Voltage and Frequency ok		
			4th System Voltage and Frequency ok		
			Busbar1 Dead Busbar Detection		
			Busbar2 Dead Busbar Detection		
			intern		
			intern		
			29.01 command to CB-control 1		
			29.02 command to CB-control 2		
			29.03 command to CB-control 3		
			29.04 command to CB-control 4		
			29.05 command to CB-control 5		
			29.06 command to CB-control 6		
			intern		
			intern		
450132	450131	no ID. staLoadshare[13]. stData.stMedium1. usControl	Status from Device 14		
			Generator Voltage and Frequency ok		
			Busbar Voltage and Frequency ok		
			Mains Voltage and Frequency ok		
			4th System Voltage and Frequency ok		
			Busbar1 Dead Busbar Detection		
			Busbar2 Dead Busbar Detection		
			intern		
			intern		
			29.01 command to CB-control 1		
			29.02 command to CB-control 2		
			29.03 command to CB-control 3		
			29.04 command to CB-control 4		
			29.05 command to CB-control 5		
			29.06 command to CB-control 6		
			intern		

Modicon start addr.	Start addr. (*1)	Parameter ID	Description	Multiplier	Units
			intern		
450133	450132	no ID. staLoadshare[14]. stData.stMedium1. usControl	Status from Device 15		
			Generator Voltage and Frequency ok		
			Busbar Voltage and Frequency ok		
			Mains Voltage and Frequency ok		
			4th System Voltage and Frequency ok		
			Busbar1 Dead Busbar Detection		
			Busbar2 Dead Busbar Detection		
			intern		
			intern		
			29.01 command to CB-control 1		
			29.02 command to CB-control 2		
			29.03 command to CB-control 3		
			29.04 command to CB-control 4		
			29.05 command to CB-control 5		
			29.06 command to CB-control 6		
			intern		
			intern		
450134	450133	no ID. staLoadshare[15]. stData.stMedium1. usControl	Status from Device 16		
			Generator Voltage and Frequency ok		
			Busbar Voltage and Frequency ok		
			Mains Voltage and Frequency ok		
			4th System Voltage and Frequency ok		
			Busbar1 Dead Busbar Detection		
			Busbar2 Dead Busbar Detection		
			intern		
			intern		
			29.01 command to CB-control 1		
			29.02 command to CB-control 2		
			29.03 command to CB-control 3		
			29.04 command to CB-control 4		
			29.05 command to CB-control 5		
			29.06 command to CB-control 6		
			intern		
			intern		
450135	450134	no ID. staLoadshare[16]. stData.stMedium1. usControl	Status from Device 17		
			Generator Voltage and Frequency ok		
			Busbar Voltage and Frequency ok		
			Mains Voltage and Frequency ok		
			4th System Voltage and Frequency ok		
			Busbar1 Dead Busbar Detection		
			Busbar2 Dead Busbar Detection		
			intern		
			intern		
			29.01 command to CB-control 1		
			29.02 command to CB-control 2		
			29.03 command to CB-control 3		
			29.04 command to CB-control 4		
			29.05 command to CB-control 5		
			29.06 command to CB-control 6		
			intern		
			intern		

Modicon start addr.	Start addr. (*1)	Parameter ID	Description	Multiplier	Units
450136	450135	no ID. staLoadshare[17]. stData.stMedium1. usControl	Status from Device 18		
			Generator Voltage and Frequency ok		
			Busbar Voltage and Frequency ok		
			Mains Voltage and Frequency ok		
			4th System Voltage and Frequency ok		
			Busbar1 Dead Busbar Detection		
			Busbar2 Dead Busbar Detection		
			intern		
			intern		
			29.01 command to CB-control 1		
			29.02 command to CB-control 2		
			29.03 command to CB-control 3		
			29.04 command to CB-control 4		
			29.05 command to CB-control 5		
			29.06 command to CB-control 6		
			intern		
			intern		
450137	450136	no ID. staLoadshare[18]. stData.stMedium1. usControl	Status from Device 19		
			Generator Voltage and Frequency ok		
			Busbar Voltage and Frequency ok		
			Mains Voltage and Frequency ok		
			4th System Voltage and Frequency ok		
			Busbar1 Dead Busbar Detection		
			Busbar2 Dead Busbar Detection		
			intern		
			intern		
			29.01 command to CB-control 1		
			29.02 command to CB-control 2		
			29.03 command to CB-control 3		
			29.04 command to CB-control 4		
			29.05 command to CB-control 5		
			29.06 command to CB-control 6		
			intern		
			intern		
450138	450137	no ID. staLoadshare[19]. stData.stMedium1. usControl	Status from Device 20		
			Generator Voltage and Frequency ok		
			Busbar Voltage and Frequency ok		
			Mains Voltage and Frequency ok		
			4th System Voltage and Frequency ok		
			Busbar1 Dead Busbar Detection		
			Busbar2 Dead Busbar Detection		
			intern		
			intern		
			29.01 command to CB-control 1		
			29.02 command to CB-control 2		
			29.03 command to CB-control 3		
			29.04 command to CB-control 4		
			29.05 command to CB-control 5		
			29.06 command to CB-control 6		
			intern		
			intern		
450139	450138	no ID.	Status from Device 21		

Modicon start addr.	Start addr. (*1)	Parameter ID	Description	Multiplier	Units
		staLoadshare[20]. stData.stMedium1. usControl	Generator Voltage and Frequency ok		
			Busbar Voltage and Frequency ok		
			Mains Voltage and Frequency ok		
			4th System Voltage and Frequency ok		
			Busbar1 Dead Busbar Detection		
			Busbar2 Dead Busbar Detection		
			intern		
			intern		
			29.01 command to CB-control 1		
			29.02 command to CB-control 2		
			29.03 command to CB-control 3		
			29.04 command to CB-control 4		
			29.05 command to CB-control 5		
			29.06 command to CB-control 6		
			intern		
			intern		
450140	450139	no ID. staLoadshare[21]. stData.stMedium1. usControl	Status from Device 22		
			Generator Voltage and Frequency ok		
			Busbar Voltage and Frequency ok		
			Mains Voltage and Frequency ok		
			4th System Voltage and Frequency ok		
			Busbar1 Dead Busbar Detection		
			Busbar2 Dead Busbar Detection		
			intern		
			intern		
			29.01 command to CB-control 1		
			29.02 command to CB-control 2		
			29.03 command to CB-control 3		
			29.04 command to CB-control 4		
			29.05 command to CB-control 5		
			29.06 command to CB-control 6		
			intern		
			intern		
450141	450140	no ID. staLoadshare[22]. stData.stMedium1. usControl	Status from Device 23		
			Generator Voltage and Frequency ok		
			Busbar Voltage and Frequency ok		
			Mains Voltage and Frequency ok		
			4th System Voltage and Frequency ok		
			Busbar1 Dead Busbar Detection		
			Busbar2 Dead Busbar Detection		
			intern		
			intern		
			29.01 command to CB-control 1		
			29.02 command to CB-control 2		
			29.03 command to CB-control 3		
			29.04 command to CB-control 4		
			29.05 command to CB-control 5		
			29.06 command to CB-control 6		
			intern		
			intern		
450142	450141	no ID. staLoadshare[23].	Status from Device 24		
			Generator Voltage and Frequency ok		

Modicon start addr.	Start addr. (*1)	Parameter ID	Description	Multiplier	Units
		stData.stMedium1. usControl	Busbar Voltage and Frequency ok		
			Mains Voltage and Frequency ok		
			4th System Voltage and Frequency ok		
			Busbar1 Dead Busbar Detection		
			Busbar2 Dead Busbar Detection		
			intern		
			intern		
			29.01 command to CB-control 1		
			29.02 command to CB-control 2		
			29.03 command to CB-control 3		
			29.04 command to CB-control 4		
			29.05 command to CB-control 5		
			29.06 command to CB-control 6		
			intern		
			intern		
450143	450142	no ID. staLoadshare[24]. stData.stMedium1. usControl	Status from Device 25		
			Generator Voltage and Frequency ok		
			Busbar Voltage and Frequency ok		
			Mains Voltage and Frequency ok		
			4th System Voltage and Frequency ok		
			Busbar1 Dead Busbar Detection		
			Busbar2 Dead Busbar Detection		
			intern		
			intern		
			29.01 command to CB-control 1		
			29.02 command to CB-control 2		
			29.03 command to CB-control 3		
			29.04 command to CB-control 4		
			29.05 command to CB-control 5		
			29.06 command to CB-control 6		
			intern		
			intern		
450144	450143	no ID. staLoadshare[25]. stData.stMedium1. usControl	Status from Device 26		
			Generator Voltage and Frequency ok		
			Busbar Voltage and Frequency ok		
			Mains Voltage and Frequency ok		
			4th System Voltage and Frequency ok		
			Busbar1 Dead Busbar Detection		
			Busbar2 Dead Busbar Detection		
			intern		
			intern		
			29.01 command to CB-control 1		
			29.02 command to CB-control 2		
			29.03 command to CB-control 3		
			29.04 command to CB-control 4		
			29.05 command to CB-control 5		
			29.06 command to CB-control 6		
			intern		
			intern		
450145	450144	no ID. staLoadshare[26]. stData.stMedium1. usControl	Status from Device 27		
			Generator Voltage and Frequency ok		
			Busbar Voltage and Frequency ok		

Modicon start addr.	Start addr. (*1)	Parameter ID	Description	Multiplier	Units
			Mains Voltage and Frequency ok		
			4th System Voltage and Frequency ok		
			Busbar1 Dead Busbar Detection		
			Busbar2 Dead Busbar Detection		
			intern		
			intern		
			29.01 command to CB-control 1		
			29.02 command to CB-control 2		
			29.03 command to CB-control 3		
			29.04 command to CB-control 4		
			29.05 command to CB-control 5		
			29.06 command to CB-control 6		
			intern		
			intern		
450146	450145	no ID. staLoadshare[27]. stData.stMedium1. usControl	Status from Device 28		
			Generator Voltage and Frequency ok		
			Busbar Voltage and Frequency ok		
			Mains Voltage and Frequency ok		
			4th System Voltage and Frequency ok		
			Busbar1 Dead Busbar Detection		
			Busbar2 Dead Busbar Detection		
			intern		
			intern		
			29.01 command to CB-control 1		
			29.02 command to CB-control 2		
			29.03 command to CB-control 3		
			29.04 command to CB-control 4		
			29.05 command to CB-control 5		
			29.06 command to CB-control 6		
			intern		
			intern		
450147	450146	no ID. staLoadshare[28]. stData.stMedium1. usControl	Status from Device 29		
			Generator Voltage and Frequency ok		
			Busbar Voltage and Frequency ok		
			Mains Voltage and Frequency ok		
			4th System Voltage and Frequency ok		
			Busbar1 Dead Busbar Detection		
			Busbar2 Dead Busbar Detection		
			intern		
			intern		
			29.01 command to CB-control 1		
			29.02 command to CB-control 2		
			29.03 command to CB-control 3		
			29.04 command to CB-control 4		
			29.05 command to CB-control 5		
			29.06 command to CB-control 6		
			intern		
			intern		
450148	450147	no ID. staLoadshare[29]. stData.stMedium1. usControl	Status from Device 30		
			Generator Voltage and Frequency ok		
			Busbar Voltage and Frequency ok		
			Mains Voltage and Frequency ok		

Modicon start addr.	Start addr. (*1)	Parameter ID	Description	Multiplier	Units
			4th System Voltage and Frequency ok		
			Busbar1 Dead Busbar Detection		
			Busbar2 Dead Busbar Detection		
			intern		
			intern		
			29.01 command to CB-control 1		
			29.02 command to CB-control 2		
			29.03 command to CB-control 3		
			29.04 command to CB-control 4		
			29.05 command to CB-control 5		
			29.06 command to CB-control 6		
			intern		
			intern		
450149	450148	no ID. staLoadshare[30]. stData.stMedium1. usControl	Status from Device 31		
			Generator Voltage and Frequency ok		
			Busbar Voltage and Frequency ok		
			Mains Voltage and Frequency ok		
			4th System Voltage and Frequency ok		
			Busbar1 Dead Busbar Detection		
			Busbar2 Dead Busbar Detection		
			intern		
			intern		
			29.01 command to CB-control 1		
			29.02 command to CB-control 2		
			29.03 command to CB-control 3		
			29.04 command to CB-control 4		
			29.05 command to CB-control 5		
			29.06 command to CB-control 6		
			intern		
			intern		
450150	450149	no ID. staLoadshare[31]. stData.stMedium1. usControl	Status from Device 32		
			Generator Voltage and Frequency ok		
			Busbar Voltage and Frequency ok		
			Mains Voltage and Frequency ok		
			4th System Voltage and Frequency ok		
			Busbar1 Dead Busbar Detection		
			Busbar2 Dead Busbar Detection		
			intern		
			intern		
			29.01 command to CB-control 1		
			29.02 command to CB-control 2		
			29.03 command to CB-control 3		
			29.04 command to CB-control 4		
			29.05 command to CB-control 5		
			29.06 command to CB-control 6		
			intern		
			intern		
450151	450150		0 (reserve)		
450152	450151		0 (reserve)		
450153	450152		0 (reserve)		
450154	450153		0 (reserve)		
450155	450154		0 (reserve)		

Modicon start addr.	Start addr. (*1)	Parameter ID	Description	Multiplier	Units
450156	450155		0 (reserve)		
450157	450156		0 (reserve)		
450158	450157		0 (reserve)		
450159	450158		0 (reserve)		
450160	450159		0 (reserve)		
450161	450160		0 (reserve)		
450162	450161		0 (reserve)		
450163	450162		0 (reserve)		
450164	450163		0 (reserve)		
450165	450164		0 (reserve)		
450166	450165		0 (reserve)		
450167	450166		0 (reserve)		
450168	450167		0 (reserve)		
450169	450168		0 (reserve)		
450170	450169		0 (reserve)		
450171	450170		0 (reserve)		
450172	450171		0 (reserve)		
450173	450172		0 (reserve)		
450174	450173		0 (reserve)		
450175	450174		0 (reserve)		
450176	450175		0 (reserve)		
450177	450176		0 (reserve)		
450178	450177		0 (reserve)		
450179	450178		0 (reserve)		
450180	450179		0 (reserve)		
450181	450180		0 (reserve)		
450182	450181		0 (reserve)		
AC System A (32 bits)					
450183	450182	135	Total system A power	1	W
450185	450184	136	Total system A reactive power	1	var
450187	450186	137	Total system A apparent power	1	VA
450189	450188	170	Av. system A Wye-Voltage	0.1	V
450191	450190	171	Av. system A Delta-Voltage	0.1	V
450193	450192	185	Av. system A Current	0.001	A
450195	450194	111	System A current 1	0.001	A
450197	450196	112	System A current 2	0.001	A
450199	450198	113	System A current 3	0.001	A
450201	450200	108	System A voltage L1-L2	0.1	V
450203	450202	109	System A voltage L2-L3	0.1	V
450205	450204	110	System A voltage L3-L1	0.1	V
450207	450206	114	System A voltage L1-N	0.1	V
450209	450208	115	System A voltage L2-N	0.1	V
450211	450210	116	System A voltage L3-N	0.1	V
450213	450212	125	System A active power 1-N	1	W
450215	450214	126	System A active power 2-N	1	W
450217	450216	127	System A active power 3-N	1	W
450219	450218		0 (reserve)		
450221	450220		0 (reserve)		
450223	450222		0 (reserve)		

Modicon start addr.	Start addr. (*1)	Parameter ID	Description	Multiplier	Units
450225	450224		0 (reserve)		
450227	450226		0 (reserve)		
AC System B (32 bits)					
450229	450228	140	Total system B power	1	W
450231	450230	150	Total system B reactive power	1	var
450233	450232	173	Av. system B Wye-Voltage	0.1	V
450235	450234	174	Av. system B Delta-Voltage	0.1	V
450237	450236	207	Av. system B Current	0.001	A
450239	450238	134	0 (prepared system B current L1)	0.001	A
450241	450240	118	System B voltage L1-L2	0.1	V
450243	450242	119	System B voltage L2-L3	0.1	V
450245	450244	120	System B voltage L3-L1	0.1	V
450247	450246	121	System B voltage L1-N	0.1	V
450249	450248	122	System B voltage L2-N	0.1	V
450251	450250	123	System B voltage L3-N	0.1	V
450253	450252		0 (reserve)		
450255	450254		0 (reserve)		
AC System values (32 bits)					
450257	450256		0 (reserve)		
450259	450258		0 (reserve)		
450261	450260		0 (reserve)		
450263	450262		0 (reserve)		
450265	450264		0 (reserve)		
450267	450266		0 (reserve)		

CAN Bus

Protocol 5301 (Basic Visualization)

Daten Byte 0 (Mux)	Daten Byte	Parameter ID	Description	Multiplier	Units
0	0		Mux Identifier		
	1..2		Protocol-Identifier (always 5301)		
	3..6	136	System A total reactive power	1	Var
Mux 1					
1	0		Mux Identifier		
	1,2	160	System A power factor (cos.phi)	0.001	
	3...6	170	System A average wye voltage	0.1	V
Mux 2					
2	0		Mux Identifier		
	1,2	144	System A frequency	0.01	Hz
	3...6	171	System A average delta voltage	0.1	V
Mux 3					
3	0		Mux Identifier		
	1,2	10202	Operation modes 13280 = CB A request 13264 = Unloading CB A 13210 = CB A Dead bus closure 13260 = Synchronization CB A 13205 = Mains settling time running 13257 = Open CB A 13279 = Synchron. Network close CB A 13265 = Synchronization Permissive 13266 = Synchronization Check 13267 = Synchronization OFF		
	3...6	135	System A total active power	1	W

Daten Byte 0 (Mux)	Daten Byte	Parameter ID	Description	Multiplier	Units
Mux 4					
4	0		Mux Identifier		
	1,2	10107	Digital outputs 1 to 6		
			Relay-Output 1 (inverted)	Mask: 8000h	
			Relay-Output 2	Mask: 4000h	
			Relay-Output 3	Mask: 2000h	
			Relay-Output 4	Mask: 1000h	
			Relay-Output 5	Mask: 0800h	
			Relay-Output 6	Mask: 0400h	
			internal	Mask: 0200h	
			internal	Mask: 0100h	
			internal	Mask: 0080h	
			internal	Mask: 0040h	
			internal	Mask: 0020h	
			internal	Mask: 0010h	
			internal	Mask: 0008h	
			internal	Mask: 0004h	
			internal	Mask: 0002h	
			internal	Mask: 0001h	
	3...6	185	System A current average	0.001	A
Mux 5					
5	0		Mux Identifier		
	1,2	8018	Digital information		
			internal	Mask: 0001h	
			internal	Mask: 0002h	
			internal	Mask: 0004h	
			internal	Mask: 0008h	
			internal	Mask: 0010h	
			internal	Mask: 0020h	
			internal	Mask: 0040h	
			internal	Mask: 0080h	
			28.01 Command to CB-control 1 (OR'ed)	Mask: 0100h	
			28.02 Command to CB-control 2 (OR'ed)	Mask: 0200h	
			28.03 Command to CB-control 3 (OR'ed)	Mask: 0400h	
			28.04 Command to CB-control 4 (OR'ed)	Mask: 0800h	
			28.05 Command to CB-control 5 (OR'ed)	Mask: 1000h	
			28.06 Command to CB-control 6 (OR'ed)	Mask: 2000h	
			internal	Mask: 4000h	
			internal	Mask: 8000h	
	3...6	111	System A current 1	0.001	A
Mux 6					
6	0		Mux Identifier		
		10110	Battery voltage	0.1	V
		112	System A current 2	0.001	A
Mux 7					
7	0		Mux Identifier		
	1,2	10146	Digital information		
			internal	Mask: 0001h	
			internal	Mask: 0002h	
			internal	Mask: 0004h	
			11.07 Active second	Mask: 0008h	
			11.06 Active minute	Mask: 0010h	
			11.05 Active hour	Mask: 0020h	
			11.04 Active day in month	Mask: 0040h	
			11.03 Active weekday	Mask: 0080h	
			11.02 Time 2 overrun	Mask: 0100h	
			11.01 Time 1 overrun	Mask: 0200h	
			internal	Mask: 0400h	
			04.05 Acknowledge was executed	Mask: 0800h	
			01.09 Shutdown alarm active (alarm C-F)	Mask: 1000h	
			internal	Mask: 2000h	
			internal	Mask: 4000h	
			internal	Mask: 8000h	
	3...6	113	System A current 3	0.001	A
Mux 8					
8	0		Mux Identifier		
	1,2	10107	Digital information		
			00.41 LM Relay 1	Mask: 8000h	

Daten Byte 0 (Mux)	Daten Byte	Parameter ID	Description	Multiplier	Units
			00.42 LM Relay 2	Mask: 4000h	
			00.43 LM Relay 3	Mask: 2000h	
			00.44 LM Relay 4	Mask: 1000h	
			00.45 LM Relay 5	Mask: 0800h	
			00.46 LM Relay 6	Mask: 0400h	
			internal	Mask: 0200h	
			internal	Mask: 0100h	
			internal	Mask: 0080h	
			internal	Mask: 0040h	
			internal	Mask: 0020h	
			internal	Mask: 0010h	
			internal	Mask: 0008h	
			internal	Mask: 0004h	
			internal	Mask: 0002h	
			internal	Mask: 0001h	
	3...6	108	System A voltage 1-2	0.1	V
Mux 9					
9	0		Mux Identifier		
	1,2	10140	Digital information		
			00.01 LM Internal flag 1	Mask: 8000h	
			00.02 LM Internal flag 2	Mask: 4000h	
			00.03 LM Internal flag 3	Mask: 2000h	
			00.04 LM Internal flag 4	Mask: 1000h	
			00.05 LM Internal flag 5	Mask: 0800h	
			00.06 LM Internal flag 6	Mask: 0400h	
			00.07 LM Internal flag 7	Mask: 0200h	
			00.08 LM Internal flag 8	Mask: 0100h	
			internal	Mask: 0080h	
			internal	Mask: 0040h	
			internal	Mask: 0020h	
			00.15 LM External acknowledge	Mask: 0010h	
			internal	Mask: 0008h	
			00.16 LM Operation mode AUTOMATIC	Mask: 0004h	
			00.17 LM Operation mode MANUAL	Mask: 0002h	
			internal	Mask: 0001h	
	3...6	114	System A voltage 1-N	0.1	V
Mux 10					
10	0		Mux Identifier		
	1,2	10148	Digital information		
			internal	Mask: 8000h	
			internal	Mask: 4000h	
			internal	Mask: 2000h	
			internal	Mask: 1000h	
			04.04 Lamp test	Mask: 0800h	
			01.10 Centralized alarms active (alarm B-F)	Mask: 0400h	
			01.07 All alarm classes are active	Mask: 0200h	
			01.08 Warning alarms active (alarm A, B)	Mask: 0100h	
			internal	Mask: 0080h	
			internal	Mask: 0040h	
			internal	Mask: 0020h	
			internal	Mask: 0010h	
			internal	Mask: 0008h	
			internal	Mask: 0004h	
			internal	Mask: 0002h	
			internal	Mask: 0001h	
	3...6	109	System A voltage 2-3	0.1	V
Mux 11					
11	0		Mux Identifier		
	1,2	10150	Digital information		
			internal	Mask: 8000h	
			internal	Mask: 4000h	
			internal	Mask: 2000h	
			internal	Mask: 1000h	
			internal	Mask: 0800h	
			internal	Mask: 0400h	
			00.30 LM Internal flag 9	Mask: 0200h	
			00.31 LM Internal flag 10	Mask: 0100h	
			00.32 LM Internal flag 11	Mask: 0080h	

Daten Byte 0 (Mux)	Daten Byte	Parameter ID	Description	Multiplier	Units
			00.33 LM Internal flag 12	Mask: 0040h	
			00.34 LM Internal flag 13	Mask: 0020h	
			00.35 LM Internal flag 14	Mask: 0010h	
			00.36 LM Internal flag 15	Mask: 0008h	
			00.37 LM Internal flag 16	Mask: 0004h	
			internal	Mask: 0002h	
			internal	Mask: 0001h	
	3...6	115	System A voltage 2-N	0.1	V
Mux 12					
12	0		Mux Identifier		
	1,2	10160	Digital information		
			internal	Mask: 8000h	
			internal	Mask: 4000h	
			internal	Mask: 2000h	
			internal	Mask: 1000h	
			internal	Mask: 0800h	
			internal	Mask: 0400h	
			internal	Mask: 0200h	
			internal	Mask: 0100h	
			internal	Mask: 0080h	
			internal	Mask: 0040h	
			internal	Mask: 0020h	
			internal	Mask: 0010h	
			internal	Mask: 0008h	
			internal	Mask: 0004h	
			01.11 New Alarm triggered	Mask: 0002h	
			internal	Mask: 0001h	
	3...6	110	System A voltage 3-1	0.1	V
Mux 13					
13	0		Mux Identifier		
	1,2	10162	Digital information		
			internal	Mask: 8000h	
			internal	Mask: 4000h	
			internal	Mask: 2000h	
			internal	Mask: 1000h	
			internal	Mask: 0800h	
			internal	Mask: 0400h	
			internal	Mask: 0200h	
			internal	Mask: 0100h	
			internal	Mask: 0080h	
			internal	Mask: 0040h	
			internal	Mask: 0020h	
			internal	Mask: 0010h	
			internal	Mask: 0008h	
			00.38 LM Synchronization mode CHECK	Mask: 0004h	
			00.39 LM Synchronization mode PERMISSIVE	Mask: 0002h	
			00.40 LM Synchronization mode RUN	Mask: 0001h	
	3...6	116	System A voltage 3-N	0.1	V
Mux 14					
14	0		Mux Identifier		
	1,2	10131	Digital information		
			internal	Mask: 8000h	
			internal	Mask: 4000h	
			internal	Mask: 2000h	
			internal	Mask: 1000h	
			internal	Mask: 0800h	
			internal	Mask: 0400h	
			internal	Mask: 0200h	
			internal	Mask: 0100h	
			internal	Mask: 0080h	
			internal	Mask: 0040h	
			Alarm class F latched	Mask: 0020h	
			Alarm class E latched	Mask: 0010h	
			Alarm class D latched	Mask: 0008h	
			Alarm class C latched	Mask: 0004h	
			Alarm class B latched	Mask: 0002h	
			Alarm class A latched	Mask: 0001h	
	3...6	-	reserved for System A positive active energy	-	-

Daten Byte 0 (Mux)	Daten Byte	Parameter ID	Description	Multiplier	Units
Mux 15					
15	0		Mux Identifier		
	1,2	10132	Digital information		
			State Digital Input 8 latched	Mask: 8000h	
			State Digital Input 7 latched	Mask: 4000h	
			State Digital Input 6 latched	Mask: 2000h	
			State Digital Input 5 latched	Mask: 1000h	
			State Digital Input 4 latched	Mask: 0800h	
			State Digital Input 3 latched	Mask: 0400h	
			State Digital Input 2 latched	Mask: 0200h	
			State Digital Input 1 latched	Mask: 0100h	
			internal	Mask: 0080h	
			internal	Mask: 0040h	
			internal	Mask: 0020h	
			internal	Mask: 0010h	
			internal	Mask: 0008h	
			internal	Mask: 0004h	
			internal	Mask: 0002h	
			internal	Mask: 0001h	
	3...6	173	System B average wye voltage	0.1	V
Mux 16					
16	0		Mux Identifier		
	1,2	147	System B frequency	0.01	Hz
	3...6	174	System B average delta voltage	0.1	V
Mux 17					
17	0		Mux Identifier		
	1,2	10111	AI 1 Input		
	3...6	-	reserved for System B current average	-	-
Mux 18					
18	0		Mux Identifier		
	1,2	-	reserved for System B power factor (cos.phi)	-	-
	3...6	-	reserved for System B total reactive power	-	-
Mux 19					
19	0		Mux Identifier		
	1,2	10132	Digital information		
			internal	Mask: 8000h	
			internal	Mask: 4000h	
			internal	Mask: 2000h	
			internal	Mask: 1000h	
			internal	Mask: 0800h	
			internal	Mask: 0400h	
			internal	Mask: 0200h	
			internal	Mask: 0100h	
			internal	Mask: 0080h	
			internal	Mask: 0040h	
			internal	Mask: 0020h	
			internal	Mask: 0010h	
			internal	Mask: 0008h	
			internal	Mask: 0004h	
			reserved for 10.01 AI 1 out of range	Mask: 0002h	
			internal	Mask: 0001h	
	3...6	-	reserved for System B total reactive power	-	-
Mux 20					
20	0		Mux Identifier		
	1,2	534	Digital information		
			04.59 [extended group] Interface control 16	Mask: 8000h	
			04.58 [extended group] Interface control 15	Mask: 4000h	
			04.57 [extended group] Interface control 14	Mask: 2000h	
			04.56 [extended group] Interface control 13	Mask: 1000h	
			04.55 [extended group] Interface control 12	Mask: 0800h	
			04.54 [extended group] Interface control 11	Mask: 0400h	
			04.53 [extended group] Interface control 10	Mask: 0200h	
			04.52 [extended group] Interface control 9	Mask: 0100h	
			04.51 [extended group] Interface control 8	Mask: 0080h	
			04.50 [extended group] Interface control 7	Mask: 0040h	
			04.49 [extended group] Interface control 6	Mask: 0020h	
			04.48 [extended group] Interface control 5	Mask: 0010h	
			04.47 [extended group] Interface control 4	Mask: 0008h	

Daten Byte 0 (Mux)	Daten Byte	Parameter ID	Description	Multiplier	Units
			04.46 [extended group] Interface control 3	Mask: 0004h	
			04.45 [extended group] Interface control 2	Mask: 0002h	
			04.44 [extended group] Interface control 1	Mask: 0001h	
	3...6	-	reserved for System B current 1	-	-
Mux 21					
21	0		Mux Identifier		
	1,2	10136	Digital information		
			internal	Mask: 8000h	
			internal	Mask: 4000h	
			internal	Mask: 2000h	
			internal	Mask: 1000h	
			internal	Mask: 0800h	
			internal	Mask: 0400h	
			internal	Mask: 0200h	
			internal	Mask: 0100h	
			internal	Mask: 0080h	
			internal	Mask: 0040h	
			internal	Mask: 0020h	
			internal	Mask: 0010h	
			08.02 Battery over voltage threshold 2	Mask: 0008h	
			08.04 Battery under voltage threshold 2	Mask: 0004h	
			08.01 Battery over voltage threshold 1	Mask: 0002h	
			08.03 Battery under voltage threshold 1	Mask: 0001h	
	3...6	118	System B voltage 1-2	0.1	V
Mux 22					
22	0		Mux Identifier		
	1,2	4139	Digital information		
			02.03 System B voltage in range (based on System B Operating voltage window)	Mask: 8000h	
			02.04 System B frequency in range (based on System B Operating frequency window)	Mask: 4000h	
			02.05 System B voltage and frequency in range (ready for operation, 02.03 AND 02.04 are TRUE)	Mask: 2000h	
			02.09 Sytem A voltage in range (based on System A voltage window)	Mask: 1000h	
			internal	Mask: 0800h	
			internal	Mask: 0400h	
			02.10 System A frequency in range (based on System A frequency window)	Mask: 0200h	
			internal	Mask: 0100h	
			internal	Mask: 0080h	
			02.11 System A voltage and frequency in range (ready for operation, 02.09 AND 02.10 are TRUE)	Mask: 0040h	
			internal	Mask: 0020h	
			internal	Mask: 0010h	
			internal	Mask: 0008h	
			internal	Mask: 0004h	
			internal	Mask: 0002h	
			internal	Mask: 0001h	
	3...6	121	System B voltage 1-N	0.1	V
Mux 23					
23	0		Mux Identifier		
	1,2	1791	Digital information		
			internal	Mask: 8000h	
			internal	Mask: 4000h	
			internal	Mask: 2000h	
			internal	Mask: 1000h	
			internal	Mask: 0800h	
			internal	Mask: 0400h	
			internal	Mask: 0200h	
			internal	Mask: 0100h	
			02.12 System A phase rotation: Counter Clock Wise (CCW, reverse, left turn)	Mask: 0080h	
			02.13 System A phase rotation: Clock Wise (CW, forward, right turn)	Mask: 0040h	
			internal	Mask: 0020h	
			internal	Mask: 0010h	
			internal	Mask: 0008h	

Daten Byte 0 (Mux)	Daten Byte	Parameter ID	Description	Multiplier	Units
			internal	Mask: 0004h	
			internal	Mask: 0002h	
			internal	Mask: 0001h	
	3...6	119	System B voltage 2-3	0.1	V
Mux 24					
24	0		Mux Identifier		
	1,2	1792	Digital information		
			internal	Mask: 8000h	
			internal	Mask: 4000h	
			internal	Mask: 2000h	
			internal	Mask: 1000h	
			internal	Mask: 0800h	
			internal	Mask: 0400h	
			internal	Mask: 0200h	
			internal	Mask: 0100h	
			02.14 System B phase rotation: Counter Clock Wise (CCW, reverse, left turn)	Mask: 0080h	
			02.15 System B phase rotation: Clock Wise (CW, forward, right turn)	Mask: 0040h	
			internal	Mask: 0020h	
			internal	Mask: 0010h	
			internal	Mask: 0008h	
			internal	Mask: 0004h	
			internal	Mask: 0002h	
			internal	Mask: 0001h	
	3...6	122	System B voltage 2-N	0.1	V
Mux 25					
25	0		Mux Identifier		
	1,2		internal		
	3...6	120	System B voltage 3-1	0.1	V
Mux 26					
26	0		Mux Identifier		
	1,2	10149	Digital information		
			08.30 reserved for Timeout Synchronisation CB B (LS5X2)	Mask: 8000h	
			08.31 Timeout Synchronisation CB A	Mask: 4000h	
			internal	Mask: 2000h	
			internal	Mask: 1000h	
			08.33 System A / System B phase rotation different	Mask: 0800h	
			08.20 reserved for CAN bus overload	Mask: 0400h	
			internal	Mask: 0200h	
			internal	Mask: 0100h	
			internal	Mask: 0080h	
			internal	Mask: 0040h	
			internal	Mask: 0020h	
			internal	Mask: 0010h	
			08.17 Number of member mismatch	Mask: 0008h	
			05.15 EEPROM corrupted	Mask: 0004h	
			internal	Mask: 0002h	
			internal	Mask: 0001h	
	3...6	123	System B voltage 3-N	0.1	V
Mux 27					
27	0		Mux Identifier		
	1,2	4153	Digital information		
			internal	Mask: 8000h	
			internal	Mask: 4000h	
			04.29 Unloading CB B is active (LS5X2)	Mask: 2000h	
			04.28 Unloading CB A is active	Mask: 1000h	
			04.23 reserved for Close command CB B is active (LS5X2)	Mask: 0800h	
			04.22 reserved for Open command CB B is active (LS5X2)	Mask: 0400h	
			04.21 Synchronisation CB B procedure is active (LS5X2)	Mask: 0200h	
			04.20 Close command CB A is active	Mask: 0100h	
			04.19 Open command CB A is active	Mask: 0080h	
			04.18 Synchronisation CB A procedure is active	Mask: 0040h	
			04.11 Mains settling is active	Mask: 0020h	
			24.37 Isolation Switch is open (LS5X1) or 04.06 CB B is closed (LS5X2)	Mask: 0010h	
			04.07 CB A is closed	Mask: 0008h	
			04.04 Lamp test request	Mask: 0004h	

Daten Byte 0 (Mux)	Daten Byte	Parameter ID	Description	Multiplier	Units
			04.03 Operating Mode Manual	Mask: 0002h	
			04.01 Operating Mode Automatic	Mask: 0001h	
	3,4	4154	Digital information		
			02.23 System A is dead	Mask: 8000h	
			02.24 System B is dead	Mask: 4000h	
			02.25 Mains parallel operation	Mask: 2000h	
			System B Mains connected	Mask: 1000h	
			System A Mains connected	Mask: 0800h	
			Mains at "right" position (directly or isolation switch) for Tookit grid indication	Mask: 0400h	
			Mains at "left" position (directly or isolation switch) for Tookit grid indication	Mask: 0200h	
			28.06 Command 6 to LS5 (OR'ed)	Mask: 0100h	
			28.05 Command 5 to LS5 (OR'ed)	Mask: 0080h	
			28.04 Command 4 to LS5 (OR'ed)	Mask: 0040h	
			28.03 Command 3 to LS5 (OR'ed)	Mask: 0020h	
			28.02 Command 2 to LS5 (OR'ed)	Mask: 0010h	
			28.01 Command 1 to LS5 (OR'ed)	Mask: 0008h	
			04.61 Synchronous Mains Closure Procedure is active	Mask: 0004h	
			04.62 Dead Bus Closure Procedure is active	Mask: 0002h	
			Increment Close Counter CBA	Mask: 0001h	
	5,6	4155	Digital information		
			Syst. B Phase rotation CCW (for ToolKit)	Mask: 8000h	
			Syst. B Phase rotation CW (for ToolKit)	Mask: 4000h	
			Syst. A Phase rotation CCW (for ToolKit)	Mask: 2000h	
			Syst. A Phase rotation CW (for ToolKit)	Mask: 1000h	
			internal	Mask: 0800h	
			internal	Mask: 0400h	
			internal	Mask: 0200h	
			internal	Mask: 0100h	
			internal	Mask: 0080h	
			internal	Mask: 0040h	
			internal	Mask: 0020h	
			internal	Mask: 0010h	
			Syst. A Phase rotation CW (for ToolKit)	Mask: 0008h	
			Syst. A Phase rotation CCW (for ToolKit)	Mask: 0004h	
			Syst. B Phase rotation CW (for ToolKit)	Mask: 0002h	
			Syst. B Phase rotation CCW (for ToolKit)	Mask: 0001h	
Mux 28					
28	0		Mux Identifier		
	1,2	10133	Digital information		
			internal	Mask: 8000h	
			internal	Mask: 4000h	
			internal	Mask: 2000h	
			internal	Mask: 1000h	
			internal	Mask: 0800h	
			internal	Mask: 0400h	
			internal	Mask: 0200h	
			08.05 CB B close not successful (LS5X2)	Mask: 0100h	
			08.06 CB B open not successful (LS5X2)	Mask: 0080h	
			08.07 CB A close not successful	Mask: 0040h	
			08.08 CB A open not successful	Mask: 0020h	
			internal	Mask: 0010h	
			internal	Mask: 0008h	
			internal	Mask: 0004h	
			internal	Mask: 0002h	
			08.18 CANopen error interface 1	Mask: 0001h	
	3,4	10191	Digital information		
			internal	Mask: 8000h	
			internal	Mask: 4000h	
			internal	Mask: 2000h	
			24.45, Flag 5 LS 5	Mask: 1000h	
			24.44, Flag 4 LS 5	Mask: 0800h	
			24.43, Flag 3 LS 5	Mask: 0400h	
			24.42, Flag 2 LS 5	Mask: 0200h	
			24.41, Flag 1 LS 5	Mask: 0100h	
			24.38, load transfer to system B	Mask: 0080h	
			24.37, load transfer to system A	Mask: 0040h	

Daten Byte 0 (Mux)	Daten Byte	Parameter ID	Description	Multiplier	Units
			24.36, immediate open CB B (LS5X2)	Mask: 0020h	
			24.35, open CB B (LS5X2)	Mask: 0010h	
			24.34, enable to close CBA	Mask: 0008h	
			24.33, immediate open CB A	Mask: 0004h	
			24.32, open CBA	Mask: 0002h	
			24.31, enable mains decoupling	Mask: 0001h	
	5,6	10138	Digital information		
			internal	Mask: 8000h	
			internal	Mask: 4000h	
			internal	Mask: 2000h	
			internal	Mask: 1000h	
			internal	Mask: 0800h	
			06.21 System B Phase Rotation mismatch	Mask: 0400h	
			internal	Mask: 0200h	
			internal	Mask: 0100h	
			internal	Mask: 0080h	
			internal	Mask: 0040h	
			internal	Mask: 0020h	
			internal	Mask: 0010h	
			internal	Mask: 0008h	
			internal	Mask: 0004h	
			internal	Mask: 0002h	
			internal	Mask: 0001h	
Mux 29					
29	0		Mux Identifier		
	1,2	10135	Digital information		
			07.06 System A over frequency threshold 1	Mask: 8000h	
			07.07 System A over frequency threshold 2	Mask: 4000h	
			07.08 System A under frequency threshold 1	Mask: 2000h	
			07.09 System A under frequency threshold 2	Mask: 1000h	
			07.10 System A over voltage threshold 1	Mask: 0800h	
			07.11 System A over voltage threshold 2	Mask: 0400h	
			07.12 System A under voltage threshold 1	Mask: 0200h	
			07.13 System A under voltage threshold 2	Mask: 0100h	
			07.14 System A Phase shift	Mask: 0080h	
			07.25 System A decoupling	Mask: 0040h	
			internal	Mask: 0020h	
			internal	Mask: 0010h	
			07.26 System A voltage asymmetry (with negative sequence)	Mask: 0008h	
			07.05 System A phase rotation mismatch	Mask: 0004h	
			internal	Mask: 0002h	
			internal	Mask: 0001h	
	3,4	4138	Digital information		
			internal	Mask: 8000h	
			internal	Mask: 4000h	
			internal	Mask: 2000h	
			internal	Mask: 1000h	
			internal	Mask: 0800h	
			internal	Mask: 0400h	
			internal	Mask: 0200h	
			internal	Mask: 0100h	
			07.15 System A df/dt	Mask: 0080h	
			internal	Mask: 0040h	
			internal	Mask: 0020h	
			internal	Mask: 0010h	
			internal	Mask: 0008h	
			internal	Mask: 0004h	
			internal	Mask: 0002h	
			internal	Mask: 0001h	
	5,6	-	Digital information		
			internal	Mask: 8000h	
			internal	Mask: 4000h	
			internal	Mask: 2000h	
			internal	Mask: 1000h	
			internal	Mask: 0800h	
			internal	Mask: 0400h	
			internal	Mask: 0200h	

Daten Byte 0 (Mux)	Daten Byte	Parameter ID	Description	Multiplier	Units
			internal	Mask: 0100h	
			internal	Mask: 0080h	
			internal	Mask: 0040h	
			internal	Mask: 0020h	
			internal	Mask: 0010h	
			internal	Mask: 0008h	
			internal	Mask: 0004h	
			internal	Mask: 0002h	
			internal	Mask: 0001h	

Protocol 6003 (LS-5 Communication)

General

The LS-5 communication message contains all data, which is required to operate the LS-5 system. This communication protocol works parallel to the load share communication.

In order to lower the bus load, the messages are divided into "fast", "normal", and "slow" refreshed data. The mux is identified accordingly with "F", "N", and "S" (refer to the following tables). The load share message contains one fast, two normal, and four slow messages, which are made up as shown in Table 7-5.

Timing

The time interval between two fast messages (T_{Fast} , i.e. the time for refreshing a fast message) is configured with the parameter "Transfer rate LS fast message" (parameter 9921). The time intervals between refreshing a normal or slow messages depend on this parameter as well according to the following sequence:

S0 – F – N0 – F – N1 – F – S1 – F – N0 – F – N1 – F – S2 – F – N0 – F – N1 – F – S3 – F – N0 – F – N1 – F

T_{Fast} = time interval between refreshing the fast message
T_{Normal} = time interval between refreshing a normal message = 3 x T_{Fast}
T_{Slow} = time interval between refreshing a slow message = 12 x T_{Fast}

Example:
The parameter "Transfer rate LS fast message" (parameter 9921) is configured to "0.10 s".
The sequence of the sent messages for T_{Fast} = 100 ms (i.e. 0.10 s) is shown in Table 7-5. This means that a new message is sent every 50 ms.

Time [ms]	0	50	100	150	200	250	300	350	400	450	500	550
Sent message	S0	F	N0	F	N1	F	S1	F	N0	F	N1	F
Mux #	0	3	1	3	2	3	4	3	1	3	2	3
Time [ms]	600	650	700	750	800	850	900	950	1000	1050	1100	1150
Sent message	S2	F	N0	F	N1	F	S3	F	N0	F	N1	F
Mux #	5	3	1	3	2	3	6	3	1	3	2	3

Table 7-5: Load share message - example

The maximum length of the CAN bus load share line depends on this parameter as well. The values in Table 7-6 are valid for 32 participants and a bus load of approx. 40 %. *1

T_{Fast} [ms]	T_{Normal} [ms]	T_{Slow} [ms]	Baud rate	Distance
100	300	1200	250 kBaud	250 m
200	600	2400	125 kBaud	500 m
300	900	3800	50 kBaud	1000 m

Table 7-6: Load share line - max. length (32 participants)

The maximum length of the CAN bus load share line depends on this parameter as well. The values in Table 7-7 are valid for 48 participants and a bus load of approx. 40 %. *1

T_{Fast} [ms]	T_{Normal} [ms]	T_{Slow} [ms]	Baud rate	Distance
100	300	1200	250 kBaud	250 m
200	600	2400	125 kBaud	500 m

Table 7-7: Load share line - max. length (48 participants)

*1 = This approach incorporates two transmit PDO (remote control bits) by a PLC on CAN interface 3 with a refresh time same as the configured T_{Fast} - setting in the easYgen / LS-5.

Correlation Of Protocols:
The easYgen handles parallel to the load share message protocol also the LS-5 communication protocol.

	easYgen	LS-5
Load Share Message (protocol 6000)	Transmit / Receive	Receive
LS-5 Communication (protocol 6003)	Receive	Transmit / Receive

Load share bus communication - "fast" refreshed data				
Mux	**Byte**	**Bit**	**Function**	**Remark**
F	0		3	Mux identifier
	1		Frequency of connected mains or frequency to which is to synchronize	Frequency in 00.00 Hz
	2			
	3		Phase angle between system A and B	Phase angle [1/10°] Phase angle compensation is incorporated
	4			
	5	0	System A in range	
		1	System B in range	
		2	System A is black	
		3	System B is black	
		4	Breaker 1 closed	
		5	Isolation switch or breaker 2 closed	
		6	Synchronous networks detected	Between system A an B
		7	Not used	
	6	1	Wish to open the breaker	
		2	Wish to close the breaker	
		3	Wish is for breaker 0 = Breaker 1 1 = Breaker 2	
		4	Execution of wish	
		5	Variable system 0 = System A 1 = System B	
		6	Synchronizing mode 0 = Slip frequency 1 = Phase matching	
		7	Not used	
	7		Not used	

Load share bus communication - "normal" refreshed data				
Mux	**Byte**	**Bit**	**Function**	**Remark**
N0	0		1	Mux identifier
	1		Voltage setpoint	Voltage of the fixed system in the percentage format (000.00 %) of the 2 rated voltage setting
	2			
	3		Active power system A	Long [W]
	4			
	5			
	6			
	7		Not used	

Load share bus communication - "normal" refreshed data				
Mux	**Byte**	**Bit**	**Function**	**Remark**
N1	0		2	Mux identifier
	1		Not used	
	2	0	Logic bit 1	
		1	Logic bit 2	
		2	Logic bit 3	
		3	Logic bit 4	
		4	Logic bit 5	
		5	Mains settling active	
		6-7	Not used	
	3		Reactive power system A	Long [var]
	4			
	5			
	6			
	7		Not used	

Load share bus communication - "slow" refreshed data				
Mux	**Byte**	**Bit**	**Function**	**Remark**
S0	0		0	Mux identifier
	1		Protocol-Identifier	6003
	2			
	3		Not used	
	4			
	5			
	6			
	7		Not used	
S1	0		4	Mux identifier
	1	0-1	Mains wiring 0 = No mains wiring 1 = Mains wiring at system A 2 = Mains wiring at system B 3 = Mains wiring at isolation switch	
		2-3	0 = Off 1 = System A 2 = System B 3 = Not used	
		4-6	Visualization message definition 0 = No valid information 1 = Average delta voltage of mains (visualization message 1) and average wye voltage of mains (visualization message 2)	
		7	Mains power measurement valid	This means the power of system A is used for mains import/export control
	2	0-4	Segment number isolation switch	Max. 32 nodes possible
		5	Extended bit for segment number isolation switch	Max. 64 nodes possible
		6-7	Not used	
	3		Not used	
	4			
	5			
	6			
	7			
S2	0		5	Mux identifier
	1	0-4	Segment number system A	1 to 32
		5	Extended bit for segment number system A	Max. 64 nodes possible
		6-7	Not used	
	2	0-4	Segment number system B	Max. 32 nodes possible
		5	Extended bit for segment number system B	Max. 64 nodes possible
		6-7	Not used	
	3		Visualization message 1	Dependent on visualization message defined in mux "S1"
	4			
	5			
	6			
	7		Not used	
S3	0		6	Mux identifier
	1		Not used	
	2		Not used	
	3		Visualization message 2	Dependent of visualization message defined in "Slow 1"
	4			
	5			
	6			
	7		Not used	

Appendix E.
Event History

The event history is a 300-entry FIFO (First In/First Out) memory for logging alarm events and operation states of the unit. As new event messages are entered into the history, the oldest messages are deleted once 300 events have occurred. Refer to Chapter 4: Operation for additional information about the event history.

Resetting the Event History

NOTE

Be sure to be in the appropriate code level to reset the event history. If you have not entered the correct password for the required code level, the parameters for resetting the event history are not available (refer to the System Management section on page 60 for more information).

The event history can be reset using the parameter "Clear event log" via the front panel.

Resetting the Event History Using the Front Panel

Make sure that you are in code level CL2 or higher (refer to the Enter Password section on page 59).
Set the parameter "Clear event log" to Yes (refer to the System Management section on page 60).
The complete event history is now being cleared.

Event List

Index	Event text	Description
14353	AUTO mode	Auto mode became active
14355	MAN mode	Manual mode became active
14700	Feedback CBA open	Reply CBA open became active
14701	Feedback CBA close	CBA close (reply CBA open became)
14724	System A is ok	System A became ok (Voltage and frequency in range)
14727	System B is ok	System B became ok (Voltage and frequency in range)
14730	Close command CBA	CBA close command became active
14731	Open command CBA	CBA open command became active
14778	Start up power	Power up cycle happened

Table 7-8: Event history - event list

Alarm List

Index	Event text	Description
1714	EEPROM failure	Internal error. EEPROM checksum corrupted
2623	CBA fail to close	Alarm failed to close CBA
2624	CBA fail to open	Alarm failed to open CBA
2862	SyA. overfreq.1	Alarm system A overfrequency threshold 1 (for system A decoupling)
2863	SyA. overfreq.2	Alarm system A overfrequency threshold 2 (for system A decoupling)
2912	SyA.underfreq.1	Alarm system A underfrequency threshold 1 (for system A decoupling)
2913	SyA.underfreq.2	Alarm system A underfrequency threshold 2 (for system A decoupling)
2944	Phase rot. mismatch	Alarm phase rotation mismatch
2962	SyA. overvoltage 1	Alarm system A overvoltage threshold 1 (for system A decoupling)
2963	SyA. overvoltage 2	Alarm system A overvoltage threshold 2 (for system A decoupling)
3012	SyA.undervoltage 1	Alarm system A undervoltage threshold 1 (for system A decoupling)
3013	SyA.undervoltage 2	Alarm system A undervoltage threshold 2 (for system A decoupling)
3057	SyA. phase shift	Alarm system A phase shift for system A decoupling
3074	CBA syn. timeout	Alarm timeout synchronization CBA
3106	SyA. df/dt	Alarm system A change of rate of frequency (df/dt (ROCOF))
3114	SyA. decoupling	Alarm system A decoupling triggered. The system A decoupling function has recognized a system A failure and tripped the breaker
3928	SyA. volt. asymmetry	Alarm system A voltage deviation in different phases.
3955	SyB.phase rotation	Alarm system B phase rotation miswired
3975	SyA.phase rotation	Alarm system A phase rotation miswired
4064	Missing LS5	Number of load share participants does not match
8834	SyA. volt. incr.	Alarm system A slow voltage increase.
8838	CBA unload mismatch	Alarm system A power does not fall below the configured unload limit.

Index	Event text	Description
10005	Bat.undervoltage 1	Alarm battery undervoltage level 1
10006	Bat.undervoltage 2	Alarm battery undervoltage level 2
10007	Bat. overvoltage 1	Alarm battery overvoltage level 1
10008	Bat. overvoltage 2	Alarm battery overvoltage level 2
10087	CANopen Interface1	No data received on CAN bus 1
10600	Discrete input 1	Alarm DI1 (configurable)
10601	Discrete input 2	Alarm DI2 (configurable)
10602	Discrete input 3	Alarm DI3 (configurable)
10603	Discrete input 4	Alarm DI4 (configurable)
10604	Discrete input 5	Alarm DI5 (configurable)
10605	Discrete input 6	Alarm DI6 (configurable)
10607	Discrete input 7	Alarm DI7 (configurable)
10608	Discrete input 8	Alarm DI8

Appendix F.
Parameter List

Introduction

Parameter List Columns

The parameter list consists of the following columns, which provide important information for each parameter:

NamespaceX

The namespaces 1, 2, and 3 are used to combine all parameters within functional groups. All parameters, which concern the critical mode operation for example, are grouped using Namespace1 (Config_Application), Namespace2 (Automatic_Run), and Namespace3 (Critical_Mode) into one functional group in ToolKit.

Parameter ID

The parameter ID is a unique identifier for each individual parameter. It is mentioned besides each parameter in ToolKit and also required when configuring the unit via interface.

Parameter Text

The parameter text describes the parameter and appears on the configuration screens of the unit and ToolKit.

Setting Range

The setting range describes the range for possible parameter settings and may either be a range (e.g. 0 to 9), or a selection of different options (e.g. Yes or No). If the respective parameter allows configuring different options, the number behind each option is the number, which needs to be transmitted via interface to select this option.

Default Value

The default value is the parameter setting at delivery of the unit or after resetting the unit to factory settings. If the parameter allows configuring different options, the default value describes the number of the respective option. If the parameter is a *LogicsManager* function, the default value describes the seven words, which are transmitted for a configuration of a *LogicsManager* parameter. If the parameter is an Analog Manager function, the default value describes the ID of the selected Analog Manager data source .

Data Type

The data type indicates the data type of the respective parameter. The following data types are possible:

- UNSIGNED8 unsigned 8 bit integer
- UNSIGNED16 unsigned 16 bit integer
- UNSIGNED32 unsigned 32 bit integer
- SIGNED32 signed 32 bit integer
- INTEGER16 16 bit integer
- Analogman Analog Manager parameter
- Logman *LogicsManager* parameter
- Text/8 8 character text
- Text/16 16 character text

Code Level (CL)

This is the minimum code level, which is required to access the respective parameter.

ID + 2000h

The CANopen address of the respective parameter is composed of the parameter ID + 2000 (hex).

Device

Shows the device type in which the parameter is present.

Parameter

Namespace1	Namespace2	Namespace3	ID	Parameter Text	Setting Range	Default value	Data type	CL	Par. ID + 2000h
-	-	-	521	Lamp test	No ; 0 Yes ; 1	0	UNSIGNED 16	0	2209h
Config_IO	Discrete_In	1	1201	Operation	N.O. ; 0 N.C. ; 1	0	UNSIGNED 16	2	24B1h
Config_IO	Discrete_In	1	1202	Alarm class	Class A ; 0 Class B ; 1 Class C ; 2 Class D ; 3 Class E ; 4 Class F ; 5 Control ; 6	6	UNSIGNED 16	2	24B2h
Config_IO	Discrete_In	1	1203	Monitoring lockable	No ; 0 Yes ; 1	0	UNSIGNED 16	2	24B3h
Config_IO	Discrete_In	1	1204	Self acknowledge	No ; 0 Yes ; 1	0	UNSIGNED 16	2	24B4h
Config_IO	Discrete_In	2	1221	Operation	N.O. ; 0 N.C. ; 1	0	UNSIGNED 16	2	24C5h
Config_IO	Discrete_In	2	1222	Alarm class	Class A ; 0 Class B ; 1 Class C ; 2 Class D ; 3 Class E ; 4 Class F ; 5 Control ; 6	6	UNSIGNED 16	2	24C6h
Config_IO	Discrete_In	2	1223	Monitoring lockable	No ; 0 Yes ; 1	0	UNSIGNED 16	2	24C7h
Config_IO	Discrete_In	2	1224	Self acknowledge	No ; 0 Yes ; 1	0	UNSIGNED 16	2	24C8h
Config_IO	Discrete_In	3	1241	Operation	N.O. ; 0 N.C. ; 1	0	UNSIGNED 16	2	24D9h
Config_IO	Discrete_In	3	1242	Alarm class	Class A ; 0 Class B ; 1 Class C ; 2 Class D ; 3 Class E ; 4 Class F ; 5 Control ; 6	6	UNSIGNED 16	2	24DAh
Config_IO	Discrete_In	3	1243	Monitoring lockable	No ; 0 Yes ; 1	0	UNSIGNED 16	2	24DBh
Config_IO	Discrete_In	3	1244	Self acknowledge	No ; 0 Yes ; 1	0	UNSIGNED 16	2	24DCh
Config_IO	Discrete_In	4	1261	Operation	N.O. ; 0 N.C. ; 1	0	UNSIGNED 16	2	24EDh
Config_IO	Discrete_In	4	1262	Alarm class	Class A ; 0 Class B ; 1 Class C ; 2 Class D ; 3 Class E ; 4 Class F ; 5 Control ; 6	6	UNSIGNED 16	2	24EEh
Config_IO	Discrete_In	4	1263	Monitoring lockable	No ; 0 Yes ; 1	0	UNSIGNED 16	2	24EFh
Config_IO	Discrete_In	4	1264	Self acknowledge	No ; 0 Yes ; 1	0	UNSIGNED 16	2	24F0h
Config_IO	Discrete_In	5	1281	Operation	N.O. ; 0 N.C. ; 1	0	UNSIGNED 16	2	2501h
Config_IO	Discrete_In	5	1282	Alarm class	Class A ; 0 Class B ; 1 Class C ; 2 Class D ; 3 Class E ; 4 Class F ; 5 Control ; 6	6	UNSIGNED 16	2	2502h
Config_IO	Discrete_In	5	1283	Monitoring lockable	No ; 0 Yes ; 1	0	UNSIGNED 16	2	2503h
Config_IO	Discrete_In	5	1284	Self acknowledge	No ; 0 Yes ; 1	0	UNSIGNED 16	2	2504h
Config_IO	Discrete_In	6	1301	Operation	N.O. ; 0 N.C. ; 1	0	UNSIGNED 16	2	2515h

Namespace1	Namespace2	Namespace3	ID	Parameter Text	Setting Range	Default value	Data type	CL	Par. ID + 2000h
Config_IO	Discrete_In	6	1302	Alarm class	Class A ; 0 Class B ; 1 Class C ; 2 Class D ; 3 Class E ; 4 Class F ; 5 Control ; 6	6	UNSIGNED 16	2	2516h
Config_IO	Discrete_In	6	1303	Monitoring lockable	No ; 0 Yes ; 1	0	UNSIGNED 16	2	2517h
Config_IO	Discrete_In	6	1304	Self acknowledge	No ; 0 Yes ; 1	0	UNSIGNED 16	2	2518h
Config_IO	Discrete_In	7	1321	Operation	N.O. ; 0 N.C. ; 1	0	UNSIGNED 16	2	2529h
Config_IO	Discrete_In	7	1322	Alarm class	Class A ; 0 Class B ; 1 Class C ; 2 Class D ; 3 Class E ; 4 Class F ; 5 Control ; 6	6	UNSIGNED 16	2	252Ah
Config_IO	Discrete_In	7	1323	Monitoring lockable	No ; 0 Yes ; 1	0	UNSIGNED 16	2	252Bh
Config_IO	Discrete_In	7	1324	Self acknowledge	No ; 0 Yes ; 1	0	UNSIGNED 16	2	252Ch
Config_LogicsManager	Timers	-	1670	Monday active	No ; 0 Yes ; 1	1	UNSIGNED 16	2	2686h
Config_LogicsManager	Timers	-	1671	Tuesday active	No ; 0 Yes ; 1	1	UNSIGNED 16	2	2687h
Config_LogicsManager	Timers	-	1672	Wednesday active	No ; 0 Yes ; 1	1	UNSIGNED 16	2	2688h
Config_LogicsManager	Timers	-	1673	Thursday active	No ; 0 Yes ; 1	1	UNSIGNED 16	2	2689h
Config_LogicsManager	Timers	-	1674	Friday active	No ; 0 Yes ; 1	1	UNSIGNED 16	2	268Ah
Config_LogicsManager	Timers	-	1675	Saturday active	No ; 0 Yes ; 1	0	UNSIGNED 16	2	268Bh
Config_LogicsManager	Timers	-	1676	Sunday active	No ; 0 Yes ; 1	0	UNSIGNED 16	2	268Ch
Config_Admin	Clock	-	1698	Transfer time to clock	No ; 0 Yes ; 1	0	UNSIGNED 16	0	26A2h
Config_Admin	Clock	-	1699	Transfer date to clock	No ; 0 Yes ; 1	0	UNSIGNED 16	0	26A3h
Config_Admin	-	-	1700	Language	Deutsch ; 0 English ; 1 日本語 ; 2 Português ; 3 中文 ; 4 Russky ; 5 Türkçe ; 6 Español ; 7 Français ; 8 Italiano ; 9 Polski ; 10	1	UNSIGNED 16	0	26A4h
Config_Admin	-	-	1701	Set factory default values	No ; 0 Yes ; 1	0	UNSIGNED 16	0	26A5h
Config_Measurement	-	-	1750	System rated frequency	50Hz ; 0 60Hz ; 1	0	UNSIGNED 16	2	26D6h
Config_Monitoring	System_B	-	1770	SyB. voltage monitoring	Ph - Ph ; 0 Phase - N ; 1	0	UNSIGNED 16	2	26EAh
Config_Monitoring	System_A	-	1771	SyA. voltage monitoring	Ph - Ph ; 0 Phase - N ; 1	0	UNSIGNED 16	2	26EBh
Config_Measurement	-	-	1850	SyA. current measuring	L1 L2 L3 ; 0 Phase L1 ; 1 Phase L2 ; 2 Phase L3 ; 3	0	UNSIGNED 16	2	273Ah
Config_Measurement	-	-	1851	SyA. voltage measuring	3Ph 4W ; 0 3Ph 3W ; 1 1Ph 2W ; 2 1Ph 3W ; 3 3Ph 4W OD ; 4	0	UNSIGNED 16	2	273Bh
Config_Measurement	-	-	1853	SyB. voltage measuring	3Ph 4W ; 0 3Ph 3W ; 1 1Ph 2W ; 2 1Ph 3W ; 3	0	UNSIGNED 16	2	273Dh
Config_Measurement	-	-	1858	1Ph2W voltage measuring	Phase - N ; 0 Ph - Ph ; 1	1	UNSIGNED 16	2	2742h
Config_Measurement	-	-	1859	1Ph2W phase rotation	CW ; 0 CCW ; 1	0	UNSIGNED 16	2	2743h
Config_Admin	Counters	-	2510	SyA. active power 0.00MWh	No ; 0 Yes ; 1	0	UNSIGNED 16	2	29CEh
Config_Admin	Counters	-	2542	CBA Set number of closures	No ; 0 Yes ; 1	0	UNSIGNED 16	2	29EEh
Config_Monitoring	Breaker	CBA	2620	CBA monitoring	Off ; 0 On ; 1	1	UNSIGNED 16	2	2A3Ch
Config_Monitoring	Breaker	CBA	2621	CBA alarm class	Class A ; 0 Class B ; 1	1	UNSIGNED 16	2	2A3Dh
Config_Monitoring	Breaker	CBA	2622	CBA monitoring lockable	No ; 0 Yes ; 1	0	UNSIGNED 16	2	2A3Eh
Config_Monitoring	System_A	Overfrequency level 1	2850	Monitoring	Off ; 0 On ; 1	1	UNSIGNED 16	2	2B22h

Namespace1	Namespace2	Namespace3	ID	Parameter Text	Setting Range	Default value	Data type	CL	Par. ID + 2000h
Config_Monitoring	System_A	Overfrequency level 1	2851	Alarm class	Class A ; 0 Class B ; 1 Class C ; 2 Class D ; 3 Class E ; 4 Class F ; 5	0	UNSIGNED 16	2	2B23h
Config_Monitoring	System_A	Overfrequency level 1	2852	Self acknowledge	No ; 0 Yes ; 1	1	UNSIGNED 16	2	2B24h
Config_Monitoring	System_A	Overfrequency level 1	2853	Monitoring lockable	No ; 0 Yes ; 1	0	UNSIGNED 16	4	2B25h
Config_Monitoring	System_A	Overfrequency level 2	2856	Monitoring	Off ; 0 On ; 1	1	UNSIGNED 16	2	2B28h
Config_Monitoring	System_A	Overfrequency level 2	2857	Alarm class	Class A ; 0 Class B ; 1 Class C ; 2 Class D ; 3 Class E ; 4 Class F ; 5	1	UNSIGNED 16	2	2B29h
Config_Monitoring	System_A	Overfrequency level 2	2858	Self acknowledge	No ; 0 Yes ; 1	1	UNSIGNED 16	2	2B2Ah
Config_Monitoring	System_A	Overfrequency level 2	2859	Monitoring lockable	No ; 0 Yes ; 1	0	UNSIGNED 16	4	2B2Bh
Config_Monitoring	System_A	Underfrequency level 1	2900	Monitoring	Off ; 0 On ; 1	1	UNSIGNED 16	2	2B54h
Config_Monitoring	System_A	Underfrequency level 1	2901	Alarm class	Class A ; 0 Class B ; 1 Class C ; 2 Class D ; 3 Class E ; 4 Class F ; 5	0	UNSIGNED 16	2	2B55h
Config_Monitoring	System_A	Underfrequency level 1	2902	Self acknowledge	No ; 0 Yes ; 1	1	UNSIGNED 16	2	2B56h
Config_Monitoring	System_A	Underfrequency level 1	2903	Monitoring lockable	No ; 0 Yes ; 1	0	UNSIGNED 16	4	2B57h
Config_Monitoring	System_A	Underfrequency level 2	2906	Monitoring	Off ; 0 On ; 1	1	UNSIGNED 16	2	2B5Ah
Config_Monitoring	System_A	Underfrequency level 2	2907	Alarm class	Class A ; 0 Class B ; 1 Class C ; 2 Class D ; 3 Class E ; 4 Class F ; 5	1	UNSIGNED 16	2	2B5Bh
Config_Monitoring	System_A	Underfrequency level 2	2908	Self acknowledge	No ; 0 Yes ; 1	1	UNSIGNED 16	2	2B5Ch
Config_Monitoring	System_A	Underfrequency level 2	2909	Monitoring lockable	No ; 0 Yes ; 1	0	UNSIGNED 16	4	2B5Dh
Config_Monitoring	Breaker	SyA. / SyB. phase rotation	2940	Monitoring	Off ; 0 On ; 1	1	UNSIGNED 16	2	2B7Ch
Config_Monitoring	Breaker	SyA. / SyB. phase rotation	2941	Alarm class	Class A ; 0 Class B ; 1 Class C ; 2 Class D ; 3 Class E ; 4 Class F ; 5	1	UNSIGNED 16	2	2B7Dh
Config_Monitoring	Breaker	SyA. / SyB. phase rotation	2942	Self acknowledge	No ; 0 Yes ; 1	1	UNSIGNED 16	2	2B7Eh
Config_Monitoring	Breaker	SyA. / SyB. phase rotation	2945	Monitoring lockable	No ; 0 Yes ; 1	0	UNSIGNED 16	2	2B81h
Config_Monitoring	System_A	Overvoltage level 1	2950	Monitoring	Off ; 0 On ; 1	1	UNSIGNED 16	2	2B86h
Config_Monitoring	System_A	Overvoltage level 1	2951	Alarm class	Class A ; 0 Class B ; 1 Class C ; 2 Class D ; 3 Class E ; 4 Class F ; 5	0	UNSIGNED 16	2	2B87h
Config_Monitoring	System_A	Overvoltage level 1	2952	Self acknowledge	No ; 0 Yes ; 1	1	UNSIGNED 16	2	2B88h
Config_Monitoring	System_A	Overvoltage level 1	2953	Monitoring lockable	No ; 0 Yes ; 1	0	UNSIGNED 16	4	2B89h
Config_Monitoring	System_A	Overvoltage level 2	2956	Monitoring	Off ; 0 On ; 1	1	UNSIGNED 16	2	2B8Ch
Config_Monitoring	System_A	Overvoltage level 2	2957	Alarm class	Class A ; 0 Class B ; 1 Class C ; 2 Class D ; 3 Class E ; 4 Class F ; 5	1	UNSIGNED 16	2	2B8Dh
Config_Monitoring	System_A	Overvoltage level 2	2958	Self acknowledge	No ; 0 Yes ; 1	1	UNSIGNED 16	2	2B8Eh
Config_Monitoring	System_A	Overvoltage level 2	2959	Monitoring lockable	No ; 0 Yes ; 1	0	UNSIGNED 16	4	2B8Fh
Config_Monitoring	System_A	Undervoltage level 1	3000	Monitoring	Off ; 0 On ; 1	1	UNSIGNED 16	2	2BB8h
Config_Monitoring	System_A	Undervoltage level 1	3001	Alarm class	Class A ; 0 Class B ; 1 Class C ; 2 Class D ; 3 Class E ; 4 Class F ; 5	0	UNSIGNED 16	2	2BB9h
Config_Monitoring	System_A	Undervoltage level 1	3002	Self acknowledge	No ; 0 Yes ; 1	1	UNSIGNED 16	2	2BBAh
Config_Monitoring	System_A	Undervoltage level 1	3003	Monitoring lockable	No ; 0 Yes ; 1	0	UNSIGNED 16	4	2BBBh

Namespace1	Namespace2	Namespace3	ID	Parameter Text	Setting Range	Default value	Data type	CL	Par. ID + 2000h
Config_Monitoring	System_A	Undervoltage level 2	3006	Monitoring	Off ; 0 On ; 1	1	UNSIGNED 16	2	2BBEh
Config_Monitoring	System_A	Undervoltage level 2	3007	Alarm class	Class A ; 0 Class B ; 1 Class C ; 2 Class D ; 3 Class E ; 4 Class F ; 5	1	UNSIGNED 16	2	2BBFh
Config_Monitoring	System_A	Undervoltage level 2	3008	Self acknowledge	No ; 0 Yes ; 1	1	UNSIGNED 16	2	2BC0h
Config_Monitoring	System_A	Undervoltage level 2	3009	Monitoring lockable	No ; 0 Yes ; 1	0	UNSIGNED 16	4	2BC1h
Config_Monitoring	System_A	Phase shift	3050	Monitoring	Off ; 0 On ; 1	1	UNSIGNED 16	2	2BEAh
Config_Monitoring	System_A	Phase shift	3051	Alarm class	Class A ; 0 Class B ; 1 Class C ; 2 Class D ; 3 Class E ; 4 Class F ; 5	1	UNSIGNED 16	2	2BEBh
Config_Monitoring	System_A	Phase shift	3052	Self acknowledge	No ; 0 Yes ; 1	1	UNSIGNED 16	2	2BECh
Config_Monitoring	System_A	Phase shift	3053	Monitoring	3-phase ; 0 1/3-phase ; 1	1	UNSIGNED 16	2	2BEDh
Config_Monitoring	System_A	Phase shift	3056	Monitoring lockable	No ; 0 Yes ; 1	0	UNSIGNED 16	4	2BF0h
Config_Monitoring	Mains	SyA. decoupling	3058	Change of frequency	Off ; 0 Ph. shift ; 1 df/dt ; 2	1	UNSIGNED 16	2	2BF2h
Config_Monitoring	Breaker	Synchro_CBA	3070	Monitoring	Off ; 0 On ; 1	1	UNSIGNED 16	2	2BFEh
Config_Monitoring	Breaker	Synchro_CBA	3071	Alarm class	Class A ; 0 Class B ; 1 Class C ; 2 Class D ; 3 Class E ; 4 Class F ; 5	1	UNSIGNED 16	2	2BFFh
Config_Monitoring	Breaker	Synchro_CBA	3072	Self acknowledge	No ; 0 Yes ; 1	0	UNSIGNED 16	2	2C00h
Config_Monitoring	Breaker	Synchro_CBA	3075	Monitoring lockable	No ; 0 Yes ; 1	0	UNSIGNED 16	2	2C03h
Config_Monitoring	System_A	df/dt	3100	Monitoring	Off ; 0 On ; 1	0	UNSIGNED 16	2	2C1Ch
Config_Monitoring	System_A	df/dt	3101	Alarm class	Class A ; 0 Class B ; 1 Class C ; 2 Class D ; 3 Class E ; 4 Class F ; 5	1	UNSIGNED 16	2	2C1Dh
Config_Monitoring	System_A	df/dt	3102	Self acknowledge	No ; 0 Yes ; 1	0	UNSIGNED 16	2	2C1Eh
Config_Monitoring	System_A	df/dt	3103	Monitoring lockable	No ; 0 Yes ; 1	0	UNSIGNED 16	4	2C1Fh
Config_Monitoring	System_A	SyA. decoupling	3111	Alarm class	Class A ; 0 Class B ; 1 Class C ; 2 Class D ; 3 Class E ; 4 Class F ; 5	1	UNSIGNED 16	2	2C27h
Config_Monitoring	System_A	SyA. decoupling	3112	Self acknowledge	No ; 0 Yes ; 1	0	UNSIGNED 16	2	2C28h
Config_Monitoring	CAN 1	-	3150	Monitoring	Off ; 0 On ; 1	0	UNSIGNED 16	2	2C4Eh
Config_Monitoring	CAN 1	-	3151	Alarm class	Class A ; 0 Class B ; 1 Class C ; 2 Class D ; 3 Class E ; 4 Class F ; 5 Control ; 6	1	UNSIGNED 16	2	2C4Fh
Config_Monitoring	CAN 1	-	3152	Self acknowledge	No ; 0 Yes ; 1	1	UNSIGNED 16	2	2C50h
Config_Monitoring	CAN 1	-	3153	Monitoring lockable	No ; 0 Yes ; 1	0	UNSIGNED 16	2	2C51h
Config_CAN1	-	-	3156	Baudrate	20 kBd ; 0 50 kBd ; 1 100 kBd ; 2 125 kBd ; 3 250 kBd ; 4 500 kBd ; 5 800 kBd ; 6 1000 kBd ; 7	4	UNSIGNED 16	2	2C54h
Config_Serial1	-	-	3161	Parity	No ; 0 Even ; 1 Odd ; 2	0	UNSIGNED 16	2	2C59h
Config_Serial1	-	-	3162	Stop bits	One ; 0 Two ; 1	0	UNSIGNED 16	2	2C5Ah
Config_Serial1	-	-	3163	Baudrate	2400 Bd ; 0 4800 Bd ; 1 9600 Bd ; 2 14.4 kBd ; 3 19.2 kBd ; 4 38.4 kBd ; 5 56 kBd ; 6 115 kBd ; 7	4	UNSIGNED 16	2	2C5Bh

Namespace1	Namespace2	Namespace3	ID	Parameter Text	Setting Range	Default value	Data type	CL	Par. ID + 2000h
Config_Serial2	-	-	3170	Baudrate	2400 Bd ; 0 4800 Bd ; 1 9600 Bd ; 2 14.4 kBd ; 3 19.2 kBd ; 4 38.4 kBd ; 5 56 kBd ; 6 115 kBd ; 7	4	UNSIGNED 16	2	2C62h
Config_Serial2	-	-	3171	Parity	No ; 0 Even ; 1 Odd ; 2	0	UNSIGNED 16	2	2C63h
Config_Serial2	-	-	3172	Stop bits	One ; 0 Two ; 1	0	UNSIGNED 16	2	2C64h
Config_Application	Breaker	CBA	3407	CBA auto unlock	No ; 0 Yes ; 1	0	UNSIGNED 16	2	2D4Fh
Config_Monitoring	Battery voltage	Overvoltage level 1	3450	Monitoring	Off ; 0 On ; 1	1	UNSIGNED 16	2	2D7Ah
Config_Monitoring	Battery voltage	Overvoltage level 1	3451	Alarm class	Class A ; 0 Class B ; 1 Class C ; 2 Class D ; 3 Class E ; 4 Class F ; 5 Control ; 6	1	UNSIGNED 16	2	2D7Bh
Config_Monitoring	Battery voltage	Overvoltage level 1	3452	Self acknowledge	No ; 0 Yes ; 1	0	UNSIGNED 16	2	2D7Ch
Config_Monitoring	Battery voltage	Overvoltage level 1	3453	Monitoring lockable	No ; 0 Yes ; 1	0	UNSIGNED 16	2	2D7Dh
Config_Monitoring	Battery voltage	Overvoltage level 2	3456	Monitoring	Off ; 0 On ; 1	1	UNSIGNED 16	2	2D80h
Config_Monitoring	Battery voltage	Overvoltage level 2	3457	Alarm class	Class A ; 0 Class B ; 1 Class C ; 2 Class D ; 3 Class E ; 4 Class F ; 5 Control ; 6	1	UNSIGNED 16	2	2D81h
Config_Monitoring	Battery voltage	Overvoltage level 2	3458	Self acknowledge	No ; 0 Yes ; 1	0	UNSIGNED 16	4	2D82h
Config_Monitoring	Battery voltage	Overvoltage level 2	3459	Monitoring lockable	No ; 0 Yes ; 1	0	UNSIGNED 16	4	2D83h
Config_Monitoring	Battery voltage	Undervoltage level 1	3500	Monitoring	Off ; 0 On ; 1	1	UNSIGNED 16	2	2DACh
Config_Monitoring	Battery voltage	Undervoltage level 1	3501	Alarm class	Class A ; 0 Class B ; 1 Class C ; 2 Class D ; 3 Class E ; 4 Class F ; 5 Control ; 6	1	UNSIGNED 16	2	2DADh
Config_Monitoring	Battery voltage	Undervoltage level 1	3502	Self acknowledge	No ; 0 Yes ; 1	0	UNSIGNED 16	2	2DAEh
Config_Monitoring	Battery voltage	Undervoltage level 1	3503	Monitoring lockable	No ; 0 Yes ; 1	0	UNSIGNED 16	2	2DAFh
Config_Monitoring	Battery voltage	Undervoltage level 2	3506	Monitoring	Off ; 0 On ; 1	1	UNSIGNED 16	2	2DB2h
Config_Monitoring	Battery voltage	Undervoltage level 2	3507	Alarm class	Class A ; 0 Class B ; 1 Class C ; 2 Class D ; 3 Class E ; 4 Class F ; 5 Control ; 6	1	UNSIGNED 16	2	2DB3h
Config_Monitoring	Battery voltage	Undervoltage level 2	3508	Self acknowledge	No ; 0 Yes ; 1	0	UNSIGNED 16	4	2DB4h
Config_Monitoring	Battery voltage	Undervoltage level 2	3509	Monitoring lockable	No ; 0 Yes ; 1	0	UNSIGNED 16	4	2DB5h
Config_Monitoring	System_A	SyA. voltage asymmetry	3921	Monitoring	Off ; 0 On ; 1	1	UNSIGNED 16	2	2F51h
Config_Monitoring	System_A	SyA. voltage asymmetry	3922	Alarm class	Class A ; 0 Class B ; 1 Class C ; 2 Class D ; 3 Class E ; 4 Class F ; 5 Control ; 6	1	UNSIGNED 16	2	2F52h
Config_Monitoring	System_A	SyA. voltage asymmetry	3923	Self acknowledge	No ; 0 Yes ; 1	1	UNSIGNED 16	4	2F53h
Config_Monitoring	System_A	SyA. voltage asymmetry	3926	Monitoring lockable	No ; 0 Yes ; 1	0	UNSIGNED 16	2	2F56h
Config_Monitoring	System_B	SyB. phase rotation	3950	Monitoring	Off ; 0 On ; 1	1	UNSIGNED 16	2	2F6Eh
Config_Monitoring	System_B	SyB. phase rotation	3951	Alarm class	Class A ; 0 Class B ; 1 Class C ; 2 Class D ; 3 Class E ; 4 Class F ; 5	5	UNSIGNED 16	2	2F6Fh
Config_Monitoring	System_B	SyB. phase rotation	3952	Self acknowledge	No ; 0 Yes ; 1	0	UNSIGNED 16	4	2F70h
Config_Monitoring	System_B	SyB. phase rotation	3953	Monitoring lockable	No ; 0 Yes ; 1	0	UNSIGNED 16	2	2F71h
Config_Monitoring	System_B	SyB. phase rotation	3954	SyB. phase rotation	CW ; 0 CCW ; 1	0	UNSIGNED 16	2	2F72h

Namespace1	Namespace2	Namespace3	ID	Parameter Text	Setting Range	Default value	Data type	CL	Par. ID + 2000h
Config_Monitoring	System_A	SyA. phase rotation	3970	Monitoring	Off ; 0 On ; 1	1	UNSIGNED 16	2	2F82h
Config_Monitoring	System_A	SyA. phase rotation	3971	Alarm class	Class A ; 0 Class B ; 1 Class C ; 2 Class D ; 3 Class E ; 4 Class F ; 5	1	UNSIGNED 16	2	2F83h
Config_Monitoring	System_A	SyA. phase rotation	3972	Self acknowledge	No ; 0 Yes ; 1	0	UNSIGNED 16	2	2F84h
Config_Monitoring	System_A	SyA. phase rotation	3973	Monitoring lockable	No ; 0 Yes ; 1	0	UNSIGNED 16	2	2F85h
Config_Monitoring	System_A	SyA. phase rotation	3974	SyA. phase rotation	CW ; 0 CCW ; 1	0	UNSIGNED 16	2	2F86h
Config_Monitoring	Load_Share	-	4060	Monitoring	Off ; 0 On ; 1	0	UNSIGNED 16	2	2FDCh
Config_Monitoring	Load_Share	-	4061	Alarm class	Class A ; 0 Class B ; 1 Class C ; 2 Class D ; 3 Class E ; 4 Class F ; 5 Control ; 6	1	UNSIGNED 16	2	2FDDh
Config_Monitoring	Load_Share	-	4062	Self acknowledge	No ; 0 Yes ; 1	0	UNSIGNED 16	2	2FDEh
Config_Admin	Backlight	-	4556	Configure display backlight	On ; 0 Off ; 1 Key actv. ; 2	2	UNSIGNED 16	2	31CCh
Config_Admin	Clock	-	4591	Daylight saving time	Off ; 0 On ; 1	0	UNSIGNED 16	2	31EFh
Config_Admin	Clock	-	4592	DST begin nth. weekday	1st ; 0 2nd ; 1 3rd ; 2 4th ; 3 Last ; 4 LastBut1 ; 5 LastBut2 ; 6 LastBut3 ; 7	4	UNSIGNED 16	2	31F0h
Config_Admin	Clock	-	4595	DST end nth. weekday	1st ; 0 2nd ; 1 3rd ; 2 4th ; 3 Last ; 4 LastBut1 ; 5 LastBut2 ; 6 LastBut3 ; 7	4	UNSIGNED 16	2	31F3h
Config_Admin	Clock	-	4598	DST begin weekday	Sunday ; 0 Monday ; 1 Tuesday ; 2 Wednesday ; 3 Thursday ; 4 Friday ; 5 Saturday ; 6	0	UNSIGNED 16	2	31F6h
Config_Admin	Clock	-	4599	DST end weekday	Sunday ; 0 Monday ; 1 Tuesday ; 2 Wednesday ; 3 Thursday ; 4 Friday ; 5 Saturday ; 6	0	UNSIGNED 16	2	31F7h
Config_Application	Breaker	Synchronization	5728	Synchronization mode	Off ; 0 PERMISS. ; 1 CHECK ; 2 RUN ; 3 Ctrl byLM ; 4	3	UNSIGNED 16	2	3660h
Config_Application	Breaker	CBA	5730	Synchronization CBA	Slip freq ; 0 Ph.match. ; 1	0	UNSIGNED 16	2	3662h
Config_Interfaces	-	-	8051	Toolkit Interface	Serial 1 ; 0 Serial 2 ; 1	0	UNSIGNED 16	2	3F73h
Config_Application	Breaker	CBA	8800	CBA control	1 Relay ; 0 2 Relays ; 1	1	UNSIGNED 16	2	4260h
Config_Application	Breaker	CBA	8801	Dead bus closure CBA	Off ; 0 On ; 1	0	UNSIGNED 16	2	4261h
Config_Application	Breaker	CBA	8802	Connect A dead to B dead	Off ; 0 On ; 1	0	UNSIGNED 16	2	4262h
Config_Application	Breaker	CBA	8803	Connect A dead to B alive	Off ; 0 On ; 1	0	UNSIGNED 16	2	4263h
Config_Application	Breaker	CBA	8804	Connect A alive to B dead	Off ; 0 On ; 1	0	UNSIGNED 16	2	4264h
Config_Monitoring	System_A	SyA. voltage increase	8806	Monitoring	Off ; 0 On ; 1	0	UNSIGNED 16	2	4266h
Config_Monitoring	System_A	SyA. voltage increase	8808	SyA decoupling volt.incr.	No ; 0 Yes ; 1	0	UNSIGNED 16	2	4268h
Config_Application	Segment config.	-	8813	Mains pow. measurem.	Valid ; 0 Invalid ; 1	1	UNSIGNED 16	2	426Dh
Config_Application	Segment config.	-	8814	Mains connection	None ; 0 System A ; 1 System B ; 2 Isol.swi. ; 3	0	UNSIGNED 16	2	426Eh
Config_Application	Segment config.	-	8815	Isol. switch	None ; 0 System A ; 1 System B ; 2	0	UNSIGNED 16	2	426Fh
Config_Application	Segment config.	-	8816	Variable system	System A ; 0 System B ; 1	0	UNSIGNED 16	2	4270h

Namespace1	Namespace2	Namespace3	ID	Parameter Text	Setting Range	Default value	Data type	CL	Par. ID + 2000h
Config_Application	Breaker	CBA	8820	Connect synchronous mains	No ; 0 Yes ; 1	0	UNSIGNED 16	2	4274h
Config_Application	Breaker	CBA	8825	Phase angle compensation	Off ; 0 On ; 1	0	UNSIGNED 16	2	4279h
Config_Application	Automatic_Run	-	8827	Startup in mode	AUTO ; 0 MAN ; 1 Last ; 2	0	UNSIGNED 16	2	427Bh
Config_Application	Breaker	CBA	8828	Open CBA in manual	With unl. ; 0 Immediate ; 1	1	UNSIGNED 16	2	427Ch
Config_Monitoring	System_A	SyA. voltage increase	8831	Alarm class	Class A ; 0 Class B ; 1 Class C ; 2 Class D ; 3 Class E ; 4 Class F ; 5 Control ; 6	1	UNSIGNED 16	2	427Fh
Config_Monitoring	System_A	SyA. voltage increase	8832	Self acknowledge	No ; 0 Yes ; 1	1	UNSIGNED 16	4	4280h
Config_Monitoring	System_A	SyA. voltage increase	8833	Monitoring lockable	No ; 0 Yes ; 1	0	UNSIGNED 16	2	4281h
Config_Monitoring	Breaker	CBA	8836	Alarm class	Class A ; 0 Class B ; 1 Class C ; 2 Class D ; 3 Class E ; 4 Class F ; 5 Control ; 6	1	UNSIGNED 16	2	4284h
Config_Monitoring	Breaker	CBA	8837	Self acknowledge	No ; 0 Yes ; 1	0	UNSIGNED 16	2	4285h
Config_Application	-	-	8840	Application mode LS5	LS5 ; 0 L-MCB ; 1 L-GGB ; 2 Single LS5 ; 3	0	UNSIGNED 16	2	4288h
Config_Monitoring	System_A	-	8844	SyA. decoupling	Off ; 0 On ; 1	0	UNSIGNED 16	2	428Ch
Config_Monitoring	System_A	-	8845	SyA. decoupling	Off ; 0 On ; 1	0	UNSIGNED 16	2	428Dh
Config_Monitoring	Breaker	CBA	8846	Monitoring lockable	No ; 0 Yes ; 1	0	UNSIGNED 16	2	428Eh
Config_CAN1	-	-	8993	CANopen Master	Off ; 0 On ; 1 Def.Mstr ; 2	2	UNSIGNED 16	2	4321h
Config_Interfaces	-	-	9920	Comm. LS5 <-> gen. CAN-ID	2xx Hex ; 0 3xx Hex ; 1 4xx Hex ; 2 5xx Hex ; 3	3	UNSIGNED 16	2	46C0h
Config_Interfaces	-	-	9923	Comm. LS5 <-> gen. device	Off ; 0 CAN #1 ; 1	1	UNSIGNED 16	2	46C3h
Config_Admin	-	-	10417	Factory default settings	No ; 0 Yes ; 1	0	UNSIGNED 16	0	48B1h
Config_IO	Discrete_In	1	1200	Delay	000.08 to 650.00 s	000.20 s	UNSIGNED 16	2	24B0h
Config_IO	Discrete_In	2	1220	Delay	000.08 to 650.00 s	000.50 s	UNSIGNED 16	2	24C4h
Config_IO	Discrete_In	3	1240	Delay	000.08 to 650.00 s	000.50 s	UNSIGNED 16	2	24D8h
Config_IO	Discrete_In	4	1260	Delay	000.08 to 650.00 s	000.20 s	UNSIGNED 16	2	24ECh
Config_IO	Discrete_In	5	1280	Delay	000.08 to 650.00 s	000.50 s	UNSIGNED 16	2	2500h
Config_IO	Discrete_In	6	1300	Delay	000.08 to 650.00 s	000.50 s	UNSIGNED 16	2	2514h
Config_IO	Discrete_In	7	1320	Delay	000.08 to 650.00 s	000.50 s	UNSIGNED 16	2	2528h
Config_LogicsManager	Timers	-	1650	Timer 1: Second	00 to 59 s	00 s	UNSIGNED 8	2	2672h
Config_LogicsManager	Timers	-	1651	Timer 1: Minute	00 to 59 min	00 min	UNSIGNED 8	2	2673h
Config_LogicsManager	Timers	-	1652	Timer 1: Hour	00 to 23 h	08 h	UNSIGNED 8	2	2674h
Config_LogicsManager	Timers	-	1655	Timer 2: Second	00 to 59 s	00 s	UNSIGNED 8	2	2677h
Config_LogicsManager	Timers	-	1656	Timer 2: Minute	00 to 59 min	00 min	UNSIGNED 8	2	2678h
Config_LogicsManager	Timers	-	1657	Timer 2: Hour	00 to 23 h	17 h	UNSIGNED 8	2	2679h
Config_LogicsManager	Timers	-	1660	Active second	00 to 59 s	00 s	UNSIGNED 8	2	267Ch
Config_LogicsManager	Timers	-	1661	Active minute	00 to 59 min	00 min	UNSIGNED 8	2	267Dh
Config_LogicsManager	Timers	-	1662	Active hour	00 to 23 h	12 h	UNSIGNED 8	2	267Eh
Config_LogicsManager	Timers	-	1663	Active day	01 to 31	1	UNSIGNED 8	2	267Fh
Config_Admin	-	-	1702	Device number	033 to 064	33	UNSIGNED 16	2	26A6h
Config_Admin	Clock	-	1708	Second	00 to 59 s	00 s	UNSIGNED 8	0	26ACh
Config_Admin	Clock	-	1709	Minute	00 to 59 min	00 min	UNSIGNED 8	0	26ADh
Config_Admin	Clock	-	1710	Hour	00 to 23 h	00 h	UNSIGNED 8	0	26AEh
Config_Admin	Clock	-	1711	Day	01 to 31	0	UNSIGNED 8	0	26AFh
Config_Admin	Clock	-	1712	Month	01 to 12	0	UNSIGNED 8	0	26B0h
Config_Admin	Clock	-	1713	Year	00 to 99	0	UNSIGNED 8	0	26B1h
Config_Measurement	-	-	1752	SyA. rated active power [kW]	00000.5 to 99999.9	00200.0	UNSIGNED 32	2	26D8h
Config_Measurement	-	-	1754	SyA. rated current	00001 to 32000 A	00300 A	UNSIGNED 16	2	26DAh
Config_Monitoring	-	-	1756	Time until horn reset	0000 to 1000 s	0180 s	UNSIGNED 16	0	26DCh
Config_Measurement	-	-	1758	SyA. rated react. pwr.[kvar]	00000.5 to 99999.9	00200.0	UNSIGNED 32	2	26DEh
Display_Misc	Clock	-	1760	Second	00 to 59 s	00 s	UNSIGNED 8	0	26E0h

Namespace1	Namespace2	Namespace3	ID	Parameter Text	Setting Range	Default value	Data type	CL	Par. ID + 2000h
Display_Misc	Clock	-	1761	Minute	00 to 59 min	00 min	UNSIGNED 8	0	26E1h
Display_Misc	Clock	-	1762	Hour	00 to 23 h	00 h	UNSIGNED 8	0	26E2h
Display_Misc	Clock	-	1763	Day	01 to 31	0	UNSIGNED 8	0	26E3h
Display_Misc	Clock	-	1764	Month	01 to 12	0	UNSIGNED 8	0	26E4h
Display_Misc	Clock	-	1765	Year	00 to 99	0	UNSIGNED 8	0	26E5h
Config_Measurement	-	-	1766	SyA. rated voltage	000050 to 650000 V	000400 V	UNSIGNED 32	2	26E6h
Config_Measurement	-	-	1768	SyB. rated voltage	000050 to 650000 V	000400 V	UNSIGNED 32	2	26E8h
Config_Measurement	Transformer	-	1800	SyA. PT sec. rated voltage	050 to 480 V	400 V	UNSIGNED 16	2	2708h
Config_Measurement	Transformer	-	1801	SyA. PT prim. rated voltage	000050 to 650000 V	000400 V	UNSIGNED 32	2	2709h
Config_Measurement	Transformer	-	1803	SyB. PT sec. rated voltage	050 to 480 V	400 V	UNSIGNED 16	2	270Bh
Config_Measurement	Transformer	-	1804	SyB. PT prim. rated voltage	000050 to 650000 V	000400 V	UNSIGNED 32	2	270Ch
Config_Measurement	Transformer	-	1806	SyA. CT prim. rated current	00001 to 32000 A/x	00500 A/x	UNSIGNED 16	2	270Eh
Config_Admin	Counters	-	2515	Counter value preset	00000000 towrong format	0	UNSIGNED 32	2	29D3h
Config_Admin	Counters	-	2541	Counter value preset	00000 to 65535	0	UNSIGNED 16	2	29EDh
Config_Monitoring	System_B	-	2801	Mains settling time	0000 to 9999 s	0020 s	UNSIGNED 16	2	2AF1h
Config_Monitoring	System_A	Overfrequency level 1	2854	Limit	100.0 to 140.0 %	100.4 %	UNSIGNED 16	2	2B26h
Config_Monitoring	System_A	Overfrequency level 1	2855	Delay	00.02 to 99.99 s	00.06 s	UNSIGNED 16	2	2B27h
Config_Monitoring	System_A	Overfrequency level 2	2860	Limit	100.0 to 140.0 %	102.0 %	UNSIGNED 16	2	2B2Ch
Config_Monitoring	System_A	Overfrequency level 2	2861	Delay	00.02 to 99.99 s	00.06 s	UNSIGNED 16	2	2B2Dh
Config_Monitoring	System_A	Underfrequency level 1	2904	Limit	066.6 to 140.0 %	099.6 %	UNSIGNED 16	2	2B58h
Config_Monitoring	System_A	Underfrequency level 1	2905	Delay	00.02 to 99.99 s	01.50 s	UNSIGNED 16	2	2B59h
Config_Monitoring	System_A	Underfrequency level 2	2910	Limit	066.6 to 140.0 %	098.0 %	UNSIGNED 16	2	2B5Eh
Config_Monitoring	System_A	Underfrequency level 2	2911	Delay	00.02 to 99.99 s	00.06 s	UNSIGNED 16	2	2B5Fh
Config_Monitoring	System_A	Overvoltage level 1	2954	Limit	050.0 to 130.0 %	108.0 %	UNSIGNED 16	2	2B8Ah
Config_Monitoring	System_A	Overvoltage level 1	2955	Delay	00.02 to 99.99 s	01.50 s	UNSIGNED 16	2	2B8Bh
Config_Monitoring	System_A	Overvoltage level 2	2960	Limit	050.0 to 130.0 %	110.0 %	UNSIGNED 16	2	2B90h
Config_Monitoring	System_A	Overvoltage level 2	2961	Delay	00.02 to 99.99 s	00.06 s	UNSIGNED 16	2	2B91h
Config_Monitoring	System_A	Undervoltage level 1	3004	Limit	050.0 to 130.0 %	092.0 %	UNSIGNED 16	2	2BBCh
Config_Monitoring	System_A	Undervoltage level 1	3005	Delay	00.02 to 99.99 s	01.50 s	UNSIGNED 16	2	2BBDh
Config_Monitoring	System_A	Undervoltage level 2	3010	Limit	050.0 to 130.0 %	090.0 %	UNSIGNED 16	2	2BC2h
Config_Monitoring	System_A	Undervoltage level 2	3011	Delay	00.02 to 99.99 s	00.06 s	UNSIGNED 16	2	2BC3h
Config_Monitoring	System_A	Phase shift	3054	Limit 1-phase	03 to 30 °	20 °	UNSIGNED 16	2	2BEEh
Config_Monitoring	System_A	Phase shift	3055	Limit 3-phase	03 to 30 °	08 °	UNSIGNED 16	2	2BEFh
Config_Monitoring	Breaker	Synchro_CBA	3073	Delay	003 to 999 s	060 s	UNSIGNED 16	2	2C01h
Config_Monitoring	System_A	df/dt	3104	Limit	0.1 to 9.9 Hz/s	2.6 Hz/s	UNSIGNED 16	2	2C20h
Config_Monitoring	System_A	df/dt	3105	Delay	0.10 to 2.00 s	0.10 s	UNSIGNED 16	2	2C21h
Config_Monitoring	CAN 1	-	3154	Delay	000.01 to 650.00 s	000.20 s	UNSIGNED 16	2	2C52h
Modbus	-	-	3181	Power [W] exponent 10^x	02 to 05	3	INTEGER 16	2	2C6Dh
Modbus	-	-	3182	Voltage [V] exponent 10^x	-01 to 02	0	INTEGER 16	2	2C6Eh
Modbus	-	-	3183	Current [A] exponent 10^x	-01 to 00	0	INTEGER 16	2	2C6Fh
Config_Serial1	Modbus	-	3185	Modbus slave ID	000 to 255	33	UNSIGNED 16	2	2C71h
Config_Serial1	Modbus	-	3186	Reply delay time	0.00 to 1.00 s	0.00 s	UNSIGNED 16	2	2C72h
Config_Serial2	Modbus	-	3188	Modbus slave ID	000 to 255	33	UNSIGNED 16	2	2C74h
Config_Serial2	Modbus	-	3189	Reply delay time	0.00 to 2.55 s	0.00 s	UNSIGNED 16	2	2C75h
Config_Application	Breaker	CBA	3417	CBA time pulse	0.10 to 0.50 s	0.50 s	UNSIGNED 16	2	2D59h
Config_Monitoring	Breaker	CBA	3419	CBA maximum attempts of closure	01 to 10	5	UNSIGNED 16	2	2D5Bh
Config_Monitoring	Breaker	CBA	3421	CBA open monitoring	0.10 to 5.00 s	2.00 s	UNSIGNED 16	2	2D5Dh
Config_Monitoring	Battery voltage	Overvoltage level 1	3454	Limit	08.0 to 42.0 V	32.0 V	UNSIGNED 16	2	2D7Eh
Config_Monitoring	Battery voltage	Overvoltage level 1	3455	Delay	00.02 to 99.99 s	05.00 s	UNSIGNED 16	2	2D7Fh
Config_Monitoring	Battery voltage	Overvoltage level 2	3460	Limit	08.0 to 42.0 V	35.0 V	UNSIGNED 16	2	2D84h
Config_Monitoring	Battery voltage	Overvoltage level 2	3461	Delay	00.02 to 99.99 s	01.00 s	UNSIGNED 16	2	2D85h
Config_Monitoring	Battery voltage	Undervoltage level 1	3504	Limit	08.0 to 42.0 V	24.0 V	UNSIGNED 16	2	2DB0h
Config_Monitoring	Battery voltage	Undervoltage level 1	3505	Delay	00.02 to 99.99 s	60.00 s	UNSIGNED 16	2	2DB1h
Config_Monitoring	Battery voltage	Undervoltage level 2	3510	Limit	08.0 to 42.0 V	20.0 V	UNSIGNED 16	2	2DB6h

Namespace1	Namespace2	Namespace3	ID	Parameter Text	Setting Range	Default value	Data type	CL	Par. ID + 2000h
Config_Monitoring	Battery voltage	Undervoltage level 2	3511	Delay	00.02 to 99.99 s	10.00 s	UNSIGNED 16	2	2DB7h
Config_Monitoring	System_A	SyA. voltage asymmetry	3924	Limit	00.5 to 99.9 %	10.0 %	UNSIGNED 16	2	2F54h
Config_Monitoring	System_A	SyA. voltage asymmetry	3925	Delay	00.02 to 99.99 s	05.00 s	UNSIGNED 16	2	2F55h
Config_Monitoring	Load_Share	-	4063	Number of LS5 communicating	02 to 64	2	UNSIGNED 16	2	2FDFh
Config_Admin	Backlight	-	4557	Time until backlight shutdown	001 to 999 min	120 min	UNSIGNED 16	2	31CDh
Config_Admin	Clock	-	4593	DST begin month	01 to 12	3	UNSIGNED 8	2	31F1h
Config_Admin	Clock	-	4594	DST begin time	00 to 23 h	02 h	UNSIGNED 8	2	31F2h
Config_Admin	Clock	-	4596	DST end month	01 to 12	10	UNSIGNED 8	2	31F4h
Config_Admin	Clock	-	4597	DST end time	00 to 23 h	03 h	UNSIGNED 8	2	31F5h
Config_Application	Breaker	CBA	5710	Voltage differential CBA	00.50 to 20.00 %	05.00 %	UNSIGNED 16	2	364Eh
Config_Application	Breaker	CBA	5711	Pos. freq. differential CBA	00.02 to 00.49 Hz	00.18 Hz	INTEGER 16	2	364Fh
Config_Application	Breaker	CBA	5712	Neg. freq. differential CBA	-00.49 to 00.00 Hz	-00.18 Hz	INTEGER 16	2	3650h
Config_Application	Breaker	CBA	5713	Max. positive phase angle CBA	000.0 to 060.0 °	007.0 °	INTEGER 16	2	3651h
Config_Application	Breaker	CBA	5714	Max. negative phase angle CBA	-060.0 to 000.0 °	-007.0 °	INTEGER 16	2	3652h
Config_Application	Breaker	CBA	5715	Closing time CBA	040 to 300 ms	080 ms	UNSIGNED 16	2	3653h
Config_Application	Breaker	CBA	5717	Phase matching CBA dwell time	00.0 to 60.0 s	03.0 s	UNSIGNED 16	2	3655h
Config_Application	Breaker	CBA	5718	CBA open time pulse	0.10 to 9.90 s	1.00 s	UNSIGNED 16	2	3656h
Config_Monitoring	System_B	Operating voltage / frequency	5800	Upper voltage limit	100 to 150 %	110%	UNSIGNED 16	2	36A8h
Config_Monitoring	System_B	Operating voltage / frequency	5801	Lower voltage limit	050 to 100 %	90%	UNSIGNED 16	2	36A9h
Config_Monitoring	System_B	Operating voltage / frequency	5802	Upper frequency limit	100.0 to 150.0 %	105.0 %	UNSIGNED 16	2	36AAh
Config_Monitoring	System_B	Operating voltage / frequency	5803	Lower frequency limit	066.6 to 100.0 %	095.0 %	UNSIGNED 16	2	36ABh
Config_Monitoring	System_A	Operating voltage / frequency	5810	Upper voltage limit	100 to 150 %	110%	UNSIGNED 16	2	36B2h
Config_Monitoring	System_A	Operating voltage / frequency	5811	Lower voltage limit	050 to 100 %	90%	UNSIGNED 16	2	36B3h
Config_Monitoring	System_A	Operating voltage / frequency	5812	Upper frequency limit	100.0 to 150.0 %	110.0 %	UNSIGNED 16	2	36B4h
Config_Monitoring	System_A	Operating voltage / frequency	5813	Lower frequency limit	066.6 to 100.0 %	090.0 %	UNSIGNED 16	2	36B5h
Config_Monitoring	System_A	Operating voltage / frequency	5814	Hysteresis upper volt.limit	000 to 050 %	2%	UNSIGNED 16	2	36B6h
Config_Monitoring	System_A	Operating voltage / frequency	5815	Hysteresis lower volt.limit	000 to 050 %	2%	UNSIGNED 16	2	36B7h
Config_Monitoring	System_A	Operating voltage / frequency	5816	Hysteresis upper freq.limit	00.0 to 50.0 %	00.5 %	UNSIGNED 16	2	36B8h
Config_Monitoring	System_A	Operating voltage / frequency	5817	Hysteresis lower freq.limit	00.0 to 50.0 %	00.5 %	UNSIGNED 16	2	36B9h
Config_Application	Breaker	-	5820	Dead bus detection max. volt.	000 to 030 %	10%	UNSIGNED 16	2	36BCh
Config_Application	Breaker	CBA	8805	Dead bus closure delay time	00.0 to 20.0 s	05.0 s	UNSIGNED 16	2	4265h
Config_Monitoring	System_A	SyA. voltage increase	8807	Limit	100 to 150 %	110%	UNSIGNED 16	2	4267h
Config_Application	Segment config.	-	8810	Segment number Sy.A	01 to 64	1	UNSIGNED 16	2	426Ah
Config_Application	Segment config.	-	8811	Segment number Sy.B	01 to 64	2	UNSIGNED 16	2	426Bh
Config_Application	Segment config.	-	8812	Segment number isol. switch	01 to 64	1	UNSIGNED 16	2	426Ch
Config_Monitoring	Breaker	CBA	8819	Unload trip level CBA	00.5 to 99.9 %	03.0 %	UNSIGNED 16	2	4273h
Config_Application	Breaker	CBA	8821	Max. phase angle	00 to 20 °	20 °	UNSIGNED 16	2	4275h
Config_Application	Breaker	CBA	8822	Delay time phi max.	00 to 99 s	01 s	UNSIGNED 16	2	4276h
Config_Application	Breaker	CBA	8824	Phase angle	-0180 to 0180 °	0000 °	INTEGER 16	2	4278h
Config_Monitoring	Breaker	CBA	8835	Delay	001 to 999 s	030 s	UNSIGNED 16	2	4283h
Config_Monitoring	System_A	SyA. voltage increase	8839	Response time	001 to 650 s	128 s	UNSIGNED 16	2	4287h
Config_CAN1	-	-	8940	Producer SYNCMessage time	00000 to 65000 ms	00020 ms	UNSIGNED 16	2	42ECh
Config_CAN1	-	-	8950	Node-ID CAN bus 1	001 to 127	33	UNSIGNED 16	2	42F6h
Config_CAN1	CANopen	Transmit PDO 1	8962	Selected Data Protocol	00000 to 65535	5301	UNSIGNED 16	2	4302h

Namespace1	Namespace2	Namespace3	ID	Parameter Text	Setting Range	Default value	Data type	CL	Par. ID + 2000h
Config_CAN1	CANopen	Transmit PDO 2	8963	Selected Data Protocol	00000 to 65535	0	UNSIGNED 16	2	4303h
Config_CAN1	CANopen	Transmit PDO 3	8964	Selected Data Protocol	00000 to 65535	0	UNSIGNED 16	2	4304h
Config_CAN1	CANopen	Receive PDO 1	8970	Selected Data Protocol			UNSIGNED 16	2	430Ah
Config_CAN1	CANopen	Receive PDO 2	8971	Selected Data Protocol			UNSIGNED 16	2	430Bh
Config_CAN1	CANopen	Receive PDO 3	8972	Selected Data Protocol			UNSIGNED 16	2	430Ch
Config_CAN1	-	-	9100	COB-ID SYNC Message	00000001 to 4294967296 <no Unit: Hex>	00000000 <no Unit: Hex>	UNSIGNED 32	2	438Ch
Config_CAN1	-	-	9101	COB-ID TIME Message	00000001 to 4294967296 <no Unit: Hex>	00000000 <no Unit: Hex>	UNSIGNED 32	2	438Dh
Config_CAN1	-	-	9120	Producer heartbeat time	00000 to 65500 ms	02000 ms	UNSIGNED 16	2	43A0h
Config_CAN1	CANopen	Receive PDO 1	9121	Event timer	00000 to 65500 ms	02000 ms	UNSIGNED 16	2	43A1h
Config_CAN1	CANopen	Receive PDO 2	9122	Event timer	00000 to 65500 ms	02000 ms	UNSIGNED 16	2	43A2h
Config_CAN1	CANopen	Receive PDO 3	9123	Event timer			UNSIGNED 16	2	43A3h
Config_CAN1	CANopen	Receive PDO 1	9300	COB-ID	00000001 to 4294967296 <no Unit: Hex>	00000000 <no Unit: Hex>	UNSIGNED 32	2	4454h
Config_CAN1	CANopen	Receive PDO 2	9310	COB-ID	00000001 to 4294967296 <no Unit: Hex>	00000000 <no Unit: Hex>	UNSIGNED 32	2	445Eh
Config_CAN1	CANopen	Receive PDO 3	9320	COB-ID			UNSIGNED 32	2	4468h
Config_CAN1	CANopen	Transmit PDO 1	9600	COB-ID	00000001 to 4294967296 <no Unit: Hex>	00000000 <no Unit: Hex>	UNSIGNED 32	2	4580h
Config_CAN1	CANopen	Transmit PDO 1	9602	Transmission type	000 to 255	255	UNSIGNED 8	2	4582h
Config_CAN1	CANopen	Transmit PDO 1	9604	Event timer	00000 to 65500 ms	00020 ms	UNSIGNED 16	2	4584h
Config_CAN1	CANopen	Transmit PDO 1	9605	1. Mapped Object	00000 to 65535	0	UNSIGNED 16	2	4585h
Config_CAN1	CANopen	Transmit PDO 1	9606	2. Mapped Object	00000 to 65535	0	UNSIGNED 16	2	4586h
Config_CAN1	CANopen	Transmit PDO 1	9607	3. Mapped Object	00000 to 65535	0	UNSIGNED 16	2	4587h
Config_CAN1	CANopen	Transmit PDO 1	9608	4. Mapped Object	00000 to 65535	0	UNSIGNED 16	2	4588h
Config_CAN1	CANopen	Transmit PDO 1	9609	Number of Mapped Objects	0 to 4	0	UNSIGNED 8	2	4589h
Config_CAN1	CANopen	Transmit PDO 2	9610	COB-ID	00000001 to 4294967296 <no Unit: Hex>	00000000 <no Unit: Hex>	UNSIGNED 32	2	458Ah
Config_CAN1	CANopen	Transmit PDO 2	9612	Transmission type	000 to 255	255	UNSIGNED 8	2	458Ch
Config_CAN1	CANopen	Transmit PDO 2	9614	Event timer	00000 to 65500 ms	00020 ms	UNSIGNED 16	2	458Eh
Config_CAN1	CANopen	Transmit PDO 2	9615	1. Mapped Object	00000 to 65535	0	UNSIGNED 16	2	458Fh
Config_CAN1	CANopen	Transmit PDO 2	9616	2. Mapped Object	00000 to 65535	0	UNSIGNED 16	2	4590h
Config_CAN1	CANopen	Transmit PDO 2	9617	3. Mapped Object	00000 to 65535	0	UNSIGNED 16	2	4591h
Config_CAN1	CANopen	Transmit PDO 2	9618	4. Mapped Object	00000 to 65535	0	UNSIGNED 16	2	4592h
Config_CAN1	CANopen	Transmit PDO 2	9619	Number of Mapped Objects	0 to 4	0	UNSIGNED 8	2	4593h
Config_CAN1	CANopen	Transmit PDO 3	9620	COB-ID	00000001 to 4294967296 <no Unit: Hex>	00000000 <no Unit: Hex>	UNSIGNED 32	2	4594h
Config_CAN1	CANopen	Transmit PDO 3	9622	Transmission type	000 to 255	255	UNSIGNED 8	2	4596h
Config_CAN1	CANopen	Transmit PDO 3	9624	Event timer	00000 to 65500 ms	00020 ms	UNSIGNED 16	2	4598h
Config_CAN1	CANopen	Transmit PDO 3	9625	1. Mapped Object	00000 to 65535	0	UNSIGNED 16	2	4599h
Config_CAN1	CANopen	Transmit PDO 3	9626	2. Mapped Object	00000 to 65535	0	UNSIGNED 16	2	459Ah
Config_CAN1	CANopen	Transmit PDO 3	9627	3. Mapped Object	00000 to 65535	0	UNSIGNED 16	2	459Bh
Config_CAN1	CANopen	Transmit PDO 3	9628	4. Mapped Object	00000 to 65535	0	UNSIGNED 16	2	459Ch
Config_CAN1	CANopen	Transmit PDO 3	9629	Number of Mapped Objects	0 to 4	0	UNSIGNED 8	2	459Dh
Config_CAN1	CANopen	Receive PDO 3	9905	Number of Mapped Objects			UNSIGNED 8	2	46B1h
Config_CAN1	CANopen	Receive PDO 3	9906	1. Mapped Object			UNSIGNED 16	2	46B2h
Config_CAN1	CANopen	Receive PDO 3	9907	2. Mapped Object			UNSIGNED 16	2	46B3h
Config_CAN1	CANopen	Receive PDO 3	9908	3. Mapped Object			UNSIGNED 16	2	46B4h
Config_CAN1	CANopen	Receive PDO 3	9909	4. Mapped Object			UNSIGNED 16	2	46B5h
Config_CAN1	CANopen	Receive PDO 1	9910	Number of Mapped Objects			UNSIGNED 8	2	46B6h
Config_CAN1	CANopen	Receive PDO 1	9911	1. Mapped Object			UNSIGNED 16	2	46B7h
Config_CAN1	CANopen	Receive PDO 1	9912	2. Mapped Object			UNSIGNED 16	2	46B8h
Config_CAN1	CANopen	Receive PDO 1	9913	3. Mapped Object			UNSIGNED 16	2	46B9h
Config_CAN1	CANopen	Receive PDO 1	9914	4. Mapped Object			UNSIGNED 16	2	46BAh
Config_CAN1	CANopen	Receive PDO 2	9915	Number of Mapped Objects			UNSIGNED 8	2	46BBh
Config_CAN1	CANopen	Receive PDO 2	9916	1. Mapped Object			UNSIGNED 16	2	46BCh
Config_CAN1	CANopen	Receive PDO 2	9917	2. Mapped Object			UNSIGNED 16	2	46BDh
Config_CAN1	CANopen	Receive PDO 2	9918	3. Mapped Object			UNSIGNED 16	2	46BEh
Config_CAN1	CANopen	Receive PDO 2	9919	4. Mapped Object			UNSIGNED 16	2	46BFh
Config_Interfaces	-	-	9921	Transfer rate fast message	0.10 to 0.30 s	0.10 s	UNSIGNED 16	2	46C1h
Config_Admin	Access	-	10401	Password serial 1	0000 to 9999	1805	UNSIGNED 16	0	48A1h
Config_Admin	Access	-	10402	Password CAN 1	0000 to 9999	1805	UNSIGNED 16	0	48A2h
Config_Admin	Access	-	10404	Password for re-mote config.	0000 to 9999	1805	UNSIGNED 16	0	48A4h
Config_Admin	Access	Password sys-tem	10411	Supercommissioni ng level code	0000 to 9999		UNSIGNED 16	5	48ABh

Namespace1	Namespace2	Namespace3	ID	Parameter Text	Setting Range	Default value	Data type	CL	Par. ID + 2000h
Config_Admin	Access	Password sys-tem	10412	Temp. supercomm. level code	0000 to 9999		UNSIGNED 16	5	48ACh
Config_Admin	Access	Password sys-tem	10413	Commissioning code level	0000 to 9999		UNSIGNED 16	3	48ADh
Config_Admin	Access	Password sys-tem	10414	Temp. commissioning code level	0000 to 9999		UNSIGNED 16	3	48AEh
Config_Admin	Access	Password sys-tem	10415	Basic code level	0000 to 9999		UNSIGNED 16	1	48AFh
Config_Admin	Access	-	10430	Password serial 2	0000 to 9999	1805	UNSIGNED 16	0	48BEh
Config_CAN1	CANopen	Additional Server SDOs	33040	2. Node ID	000 to 127	0	UNSIGNED 8	2	A110h
Config_CAN1	CANopen	Additional Server SDOs	33041	3. Node ID	000 to 127	0	UNSIGNED 8	2	A111h
Config_CAN1	CANopen	Additional Server SDOs	33042	4. Node ID	000 to 127	0	UNSIGNED 8	2	A112h
Config_CAN1	CANopen	Additional Server SDOs	33043	5. Node ID	000 to 127	0	UNSIGNED 8	2	A113h
Config_IO	Discrete_Out	2	12110	Relay 2		"0,0,0x2010,020,112,1,1"	Logman	2	4F4Eh
Config_IO	Discrete_Out	6	12140	Relay 6		"0,0,0x2010,020,107,1,1"	Logman	2	4F6Ch
Config_LogicsManager	Flags	1	12230	Flag 1		"0,0,0x2030,020,1,1,1"	Logman	2	4FC6h
Config_LogicsManager	Flags	2	12240	Flag 2		"0,0,0x2030,020,1,1,1"	Logman	2	4FD0h
Config_LogicsManager	Flags	3	12250	Flag 3		"0,0,0x2030,020,1,1,1"	Logman	2	4FDAh
Config_LogicsManager	Flags	4	12260	Flag 4		"0,0,0x2030,020,1,1,1"	Logman	2	4FE4h
Config_LogicsManager	Flags	5	12270	Flag 5		"0,0,0x2030,020,1,1,1"	Logman	2	4FEEh
Config_LogicsManager	Flags	6	12280	Flag 6		"0,0,0x2030,020,1,1,1"	Logman	2	4FF8h
Config_LogicsManager	Flags	7	12290	Flag 7		"0,0,0x2030,020,1,1,1"	Logman	2	5002h
Config_LogicsManager	Flags	8	12300	Flag 8		"0,0,0x2030,020,1,1,1"	Logman	2	500Ch
Config_IO	Discrete_Out	3	12310	Relay 3		"50,0,0x2000,020,205,1,1"	Logman	2	5016h
Config_IO	Discrete_Out	4	12320	Relay 4		"0,0,0x2000,020,211,1,1"	Logman	2	5020h
Config_Monitoring	-	-	12490	Ext. acknowl.		"0,0,0x2010,020,902,1,1"	Logman	2	50CAh
Config_Application	Automatic_Run	-	12510	Operat. mode AUTO		"0,0,0x2010,020,16,1,1"	Logman	2	50DEh
Config_Application	Automatic_Run	-	12520	Operat. mode MAN		"0,0,0x2010,020,17,1,1"	Logman	2	50E8h
Config_IO	Discrete_Out	1	12580	Ready for op.OFF		"0,0,0x3030,030,1,1,1"	Logman	2	5124h
Config_Application	Breaker	Synchronization	12906	Syn. mode CHECK		"0,0,0x2030,020,1,1,1"	Logman	2	526Ah
Config_Application	Breaker	Synchronization	12907	Syn. mode PERM.		"0,0,0x2030,020,1,1,1"	Logman	2	526Bh
Config_Application	Breaker	Synchronization	12908	Syn. mode RUN		"0,0,0x2030,020,1,1,1"	Logman	2	526Ch
Config_LogicsManager	Flags	9	12910	Flag 9		"0,0,0x2030,020,1,1,1"	Logman	2	526Eh
Config_LogicsManager	Flags	10	12911	Flag 10		"0,0,0x2030,020,1,1,1"	Logman	2	526Fh
Config_LogicsManager	Flags	11	12912	Flag 11		"0,0,0x2030,020,1,1,1"	Logman	2	5270h
Config_LogicsManager	Flags	12	12913	Flag 12		"0,0,0x2030,020,1,1,1"	Logman	2	5271h
Config_LogicsManager	Flags	13	12914	Flag 13		"0,0,0x2030,020,1,1,1"	Logman	2	5272h
Config_LogicsManager	Flags	14	12915	Flag 14		"0,0,0x2030,020,1,1,1"	Logman	2	5273h
Config_LogicsManager	Flags	15	12916	Flag 15		"0,0,0x2030,020,1,1,1"	Logman	2	5274h
Config_LogicsManager	Flags	16	12917	Flag 16		"0,0,0x2030,020,1,1,1"	Logman	2	5275h
Config_Monitoring	System_A	SyA. decoupling	12942	Enable SyA dec.		"0,0,0x2010,020,903,1,1"	Logman	2	528Eh
Config_Application	Breaker	CBA	12943	Open CBA unload		"0,0,0x2010,020,906,1,1"	Logman	2	528Fh
Config_Application	Breaker	CBA	12944	Open CBA immed.		"0,0,0x2010,020,904,1,1"	Logman	2	5290h
Config_Application	Breaker	CBA	12945	Enable close CBA		"0,0,010,000,907,807,705"	Logman	2	5291h
Config_Application	Breaker	-	12950	Isol.sw open		"0,0,0x2010,020,905,1,1"	Logman	2	5296h
Config_LogicsManager	LS5 System Conditions	1	12952	Flag 1 LS5		"0,0,0x2030,020,1,1,1"	Logman	2	5298h
Config_LogicsManager	LS5 System Conditions	2	12953	Flag 2 LS5		"0,0,0x2030,020,1,1,1"	Logman	2	5299h
Config_LogicsManager	LS5 System Conditions	3	12954	Flag 3 LS5		"0,0,0x2030,020,1,1,1"	Logman	2	529Ah
Config_LogicsManager	LS5 System Conditions	4	12955	Flag 4 LS5		"0,0,0x2030,020,1,1,1"	Logman	2	529Bh
Config_LogicsManager	LS5 System Conditions	5	12956	Flag 5 LS5		"0,0,0x2030,020,1,1,1"	Logman	2	529Ch

Namespace1	Namespace2	Namespace3	ID	Parameter Text	Setting Range	Default value	Data type	CL	Par. ID + 2000h
Config_Application	Breaker	CBA	12957	Open CBA in MAN		"0,0,0x2030,020,1,1,1"	Logman	2	529Dh
Config_Application	Breaker	CBA	12958	Close CBA in MAN		"0,0,0x2030,020,1,1,1"	Logman	2	529Eh
Config_Monitoring	-	-	12959	Lock Monitoring		"0,0,0x2010,020,901,1,1"	Logman	2	529Fh
Config_IO	LEDs	1	12962	LED 1		"0,0,0x2010,020,211,1,1"	Logman	2	52A2h
Config_IO	LEDs	2	12963	LED 2		"0,0,0x2010,020,205,1,1"	Logman	2	52A3h
Config_IO	LEDs	3	12964	LED 3		"0,0,0x2010,020,407,1,1"	Logman	2	52A4h
Config_IO	LEDs	4	12965	LED 4		"0,0,0x2010,020,421,1,1"	Logman	2	52A5h
Config_IO	LEDs	5	12966	LED 5		"0,0,0x2010,020,423,1,1"	Logman	2	52A6h
Config_IO	LEDs	6	12967	LED 6		"0,0,0x2010,020,808,1,1"	Logman	2	52A7h
Config_IO	LEDs	7	12968	LED 7		"0,0,0x2010,020,807,1,1"	Logman	2	52A8h
Config_IO	LEDs	8	12969	LED 8		"0,0,0x2010,020,817,1,1"	Logman	2	52A9h
Config_LogicsManager	Lock keypad	1	12978	Lock keypad		"0,0,0x2030,020,1,1,1"	Logman	2	52B2h
Config_IO	Discrete_In	1	1400	Description	user-defined	Lock monitoring	Text/16	2	2578h
Config_IO	Discrete_In	2	1410	Description	user-defined	External Ackn.	Text/16	2	2582h
Config_IO	Discrete_In	3	1420	Description	user-defined	Enable decoupling	Text/16	2	258Ch
Config_IO	Discrete_In	4	1430	Description	user-defined	Immed. open CBA	Text/16	2	2596h
Config_IO	Discrete_In	5	1440	Description	user-defined	Repl. Iso. open	Text/16	2	25A0h
Config_IO	Discrete_In	6	1450	Description	user-defined	Open CBA	Text/16	2	25AAh
Config_IO	Discrete_In	7	1460	Description	user-defined	En. close CBA	Text/16	2	25B4h

Appendix G.
Service Options

Product Service Options

The following factory options are available for servicing Woodward equipment, based on the standard Woodward Product and Service Warranty (5-01-1205) that is in effect at the time the product is purchased from Woodward or the service is performed. If you are experiencing problems with installation or unsatisfactory performance of an installed system, the following options are available:

- Consult the troubleshooting guide in the manual.
- Contact Woodward technical assistance (see "How to Contact Woodward" later in this chapter) and discuss your problem. In most cases, your problem can be resolved over the phone. If not, you can select which course of action you wish to pursue based on the available services listed in this section.

Returning Equipment For Repair

If a control (or any part of an electronic control) is to be returned to Woodward for repair, please contact Woodward in advance to obtain a Return Authorization Number. When shipping the unit(s), attach a tag with the following information:

- name and location where the control is installed;
- name and phone number of contact person;
- complete Woodward part numbers (P/N) and serial number (S/N);
- description of the problem;
- instructions describing the desired type of repair.

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.*

Packing A Control

Use the following materials when returning a complete control:

- protective caps on any connectors;
- antistatic protective bags on all electronic modules;
- packing materials that will not damage the surface of the unit;
- at least 100 mm (4 inches) of tightly packed, industry-approved packing material;
- a packing carton with double walls;
- a strong tape around the outside of the carton for increased strength.

Return Authorization Number RAN

When returning equipment to Woodward, please telephone and ask for the Customer Service Department in Stuttgart [+49 (0) 711 789 54-0]. They will help expedite the processing of your order through our distributors or local service facility. To expedite the repair process, contact Woodward in advance to obtain a Return Authorization Number, and arrange for issue of a purchase order for the unit(s) to be repaired. No work can be started until a purchase order is received.

NOTE

We highly recommend that you make arrangement in advance for return shipments. Contact a Woodward customer service representative at +49 (0) 711 789 54-0 for instructions and for a Return Authorization Number.

Replacement Parts

When ordering replacement parts for controls, include the following information:

- the part numbers P/N (XXXX-XXX) that is on the enclosure nameplate;
- the unit serial number S/N, which is also on the nameplate.

How To Contact Woodward

Please contact following address if you have questions or if you want to send a product for repair:

Woodward GmbH
Handwerkstrasse 29
70565 Stuttgart - Germany

Phone: +49 (0) 711 789 54-0 (8.00 - 16.30 German time)
Fax: +49 (0) 711 789 54-100
e-mail: stgt-info@woodward.com

For assistance outside Germany, call one of the following international Woodward facilities to obtain the address and phone number of the facility nearest your location where you will be able to get information and service.

Facility	Phone number
USA	+1 (970) 482 5811
India	+91 (129) 409 7100
Brazil	+55 (19) 3708 4800
Japan	+81 (476) 93 4661
The Netherlands	+31 (23) 566 1111

You can also contact the Woodward Customer Service Department or consult our worldwide directory on Woodward's website (**www.woodward.com**) for the name of your nearest Woodward distributor or service facility. [For worldwide directory information, go to **www.woodward.com/ic/locations**.]

Engineering Services

Woodward Industrial Controls Engineering Services offers the following after-sales support for Woodward products. For these services, you can contact us by telephone, by e-mail, or through the Woodward website.

- Technical support
- Product training
- Field service during commissioning

Technical Support is available through our many worldwide locations, through our authorized distributors, or through GE Global Controls Services, depending on the product. This service can assist you with technical questions or problem solving during normal business hours. Emergency assistance is also available during non-business hours by phoning our toll-free number and stating the urgency of your problem. For technical engineering support, please contact us via our toll-free or local phone numbers, e-mail us, or use our website and reference technical support.

Product Training is available on-site from several of our worldwide facilities, at your location, or from GE Global Controls Services, depending on the product. This training, conducted by experienced personnel, will assure that you will be able to maintain system reliability and availability. For information concerning training, please contact us via our toll-free or local phone numbers, e-mail us, or use our website and reference ***customer training***.

Field Service engineering on-site support is available, depending on the product and location, from our facility in Colorado, or from one of many worldwide Woodward offices or authorized distributors. Field engineers are experienced on both Woodward products as well as on much of the non-Woodward equipment with which our products interface. For field service engineering assistance, please contact us via our toll-free or local phone numbers, e-mail us, or use our website and reference ***field service***.

Technical Assistance

If you need to telephone for technical assistance, you will need to provide the following information. Please write it down here before phoning:

Contact

Your company _____

Your name _____

Phone number _____

Fax number _____

Control (see name plate)

Unit no. and revision: P/N: _____ REV: _____

Unit type LS-_____

Serial number S/N _____

Description of your problem

_____

_____

_____

_____

_____

_____

Please be sure you have a list of all parameters available. You can print this using ToolKit. Additionally you can save the complete set of parameters (standard values) and send them to our Service department via e-mail.

We appreciate your comments about the content of our publications.

Please send comments to: stgt-documentation@woodward.com

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

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Homepage

http://www.woodward.com

Woodward has company-owned plants, subsidiaries, and branches, as well as authorized distributors and other authorized service and sales facilities throughout the world.

Complete address/phone/fax/e-mail information for all locations is available on our website (www.woodward.com).

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