SIEMENS

Medium-Voltage AC Converters

SINAMICS GL150 Commissioning Manual

Commissioning Manual

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Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠ DANGER

indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠ WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠ CAUTION

indicates that minor personal injury can result if proper precautions are not taken.

NOTICE

indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

⚠ WARNING

Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

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Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Introduction 1

1.1 Purpose of this document

This documentation facilitates the safe handling of the SINAMICS GL150 medium-voltage converter and contains comprehensive information on the commissioning and operating utilization phases and the tools available for them.

- This Commissioning Manual is valid for:
  - Software version SINAMICS V2.6.XX
  - STARTER version 4.1.XX

Table 1-1 Overview

Usage phase	Document/tool
Commissioning	Parameterization and Startup Tool STARTER List Manual GL150

Connectivity of the SINAMICS software and STARTER version

Table 1-2 Connectivity of the SINAMICS software and STARTER version

SINAMICS software	STARTER version	
	4.1.2	4.1.2 HF1
V 2.5 SP1	X	X
V 2.6 SP1	-	X
V 2.6 SP1 HF4	-	X

Documentation scope

In the interests of clarity, this documentation does not contain all the detailed information for all product types and cannot take into account every possible aspect of installation, operation, or maintenance.

Target group

This documentation is geared toward machine manufacturers, commissioning personnel and service personnel who put the SINAMICS GL150 medium-voltage converter into operation and operate it.

Note

The converter may only be commissioned by experienced commissioning personal who have the relevant expertise in LCI medium-voltage converters and SINAMICS operation. This installation guide cannot replace this experience.

Safety information 2

2.1 Observing the five safety rules

For your personal safety and in order to prevent material damage it is essential that you follow the safety instructions given below and all safety-related instructions in your product documentation. In particular pay attention to the safety-related instructions on the product itself and always read the section headed "Safety Instructions" in each document.

⚠ DANGER

Danger due to high voltages

High voltages cause death or serious injury if the safety instructions are not observed or if the equipment is handled incorrectly.

Potentially fatal voltages occur when this equipment is in operation which can remain present even after the converter is switched off.

Ensure that only qualified and trained personnel carry out work on the equipment.
Follow the five rules at all times and during each stage of the work.

The five safety rules:

1. **Disconnect the system.**
2. **Protect against reconnection.**
3. **Make sure that the equipment is de-energized.**
4. **Ground and short-circuit.**
5. **Cover or enclose adjacent components that are still live**

2.2 ESD-sensitive components

Guidelines for Handling Electrostatic Sensitive Devices (ESD)

NOTICE

Electrostatic discharge

Electronic modules contain components that can be destroyed by electrostatic discharge.

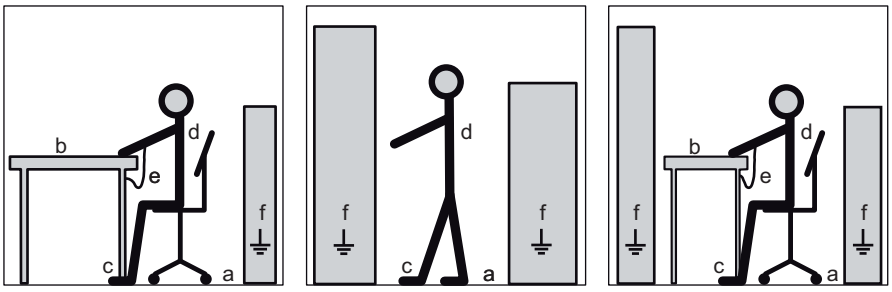
These modules can be easily destroyed by improper handling.

To protect your equipment against damage, follow the instructions given below.

- Never touch electronic modules unless absolutely necessary in the course of maintenance and repair procedures.
- If the modules have to be touched, the body of the person concerned must be electrostatically discharged immediately beforehand and be grounded.
- Electronic modules should not be brought into contact with electrically insulating materials such as plastic foil, plastic parts, insulating table supports or clothing made of synthetic fibers.
- Always place electrostatic endangered assemblies on conductive bases.
- Always store and transport electronic modules or components in conductive packaging (e.g. metallized plastic or metal containers).

NOTICE
Use conductive packaging material Electronic modules must be stored, transported and dispatched in conductive packaging. Electronic modules which are not correctly stored, transported or dispatched can be damaged. Pack electronic modules in appropriate conductive packaging (e.g. foam rubber or aluminum foil).

The necessary ESD protective measures for electrostatically sensitive devices are illustrated once again in the following drawings:



(1) (2) (3)

(1) Sitting

(2) Standing

(3) Standing/sitting

ESD protective measures

a = conductive floor

b = ESD table

c = ESD footwear

d = ESD coat

e = ESD wrist strap

f = cubicle ground connection

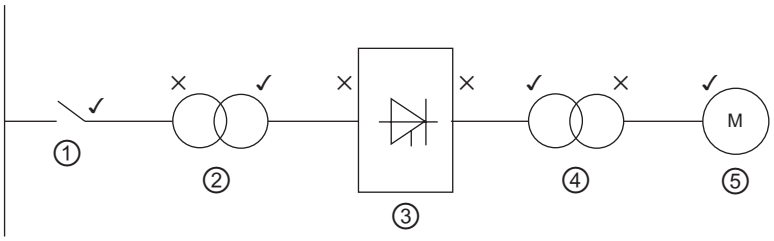
Figure 2-1 ESD protective measures

[ID 6006.02]

Commissioning (hardware) 3

The following requirements must be met:

- The system must be set up as described in the operating instructions and connected according to the circuit diagram.
- The CompactFlash Card must be inserted in the CU320.
- The shields must be connected as shown in the diagram. Please note that the shields must not be connected to the converter.



①	Circuit breaker	✓	Connect shield
②	Line-side transformer	X	Do not connect shield
③	Converter		
④	Load-side transformer		
⑤	Motor		

Figure 3-1 Shield connection

- The converter must be clean. If necessary, clean the converter. Make sure that there are no dust deposits / dirt inside the converter.
- The power cable must be correctly connected.

Note

Grounding concept

Generally, it is assumed that the 24 V DC supply in the system is grounded. If the 24 V DC supply provided by the customer is equipped with a ground fault monitoring device, incoming DC/DC converters must be used.

3.1 Checklist for commissioning the hardware

Introduction

We recommend working through the steps and checks listed in the checklist before commissioning.

This checklist does not purport to be exhaustive. Depending on the system, it may be necessary to perform further steps or checks.

Checklist

Note

Tool

The tool required for commissioning depends on the particular system.

For high voltages, appropriate equipment must be used for isolated measured value acquisition.

- Required tools
  - Oscilloscope
  - Multimeter
  - Phase frequency meter
  - CompactFlash card reader
  - Battery compartment
  - High-voltage probe
  - Rogowski coil
  - Laptop
  - Insulation tester
- Insulation test with insulation tester
  - Disconnect the ground fault detection in front of the resistors ①.
  - Then perform an insulation test, for example, with an Isometer.

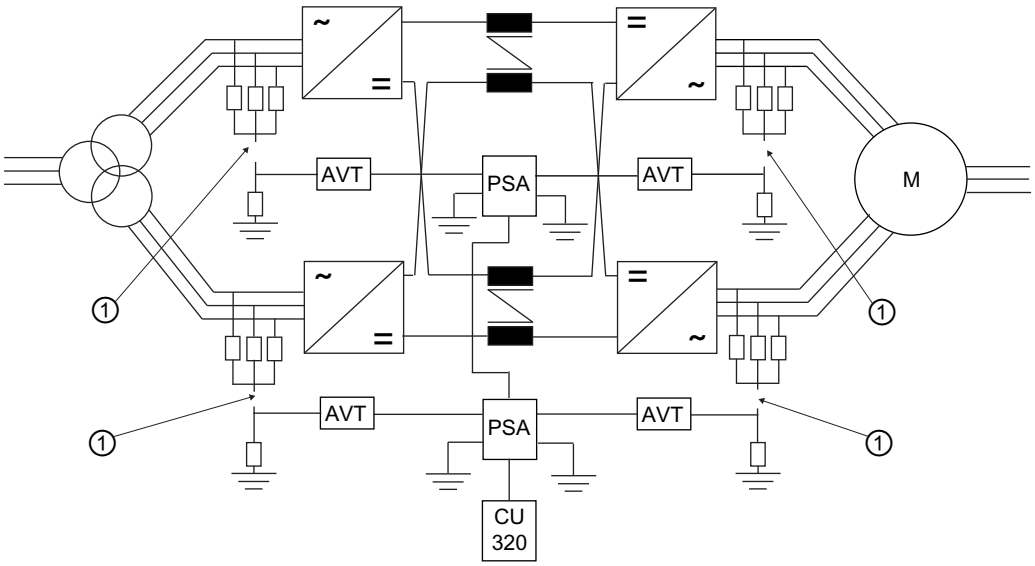


Figure 3-2 Example: Insulation test

- Make a back-up copy of the CompactFlash card.
- Apply the auxiliary voltage and gradually add the power supply.
  - Check whether the correct voltages are applied.
- After system start-up, check whether the firmware has been automatically updated.
- Check the ACX file on the CompactFlash card.
  - The CF card contains the file "Auftragsnummer_ Auftragsname.pdf" in which the ACX data are stated in plain text in directory ADDON\SINAMICS\DATA\HW_DESC\014. The GUID given in this file must match the r6545 parameter.
- Rectify the errors indicated.

- Rename the DRIVE-CliQ components according to the circuit diagram.
  - Check the DRIVE-CLiQ topology, for example using the flashing LED "RDY" on the components affected.
  - In OFFLINE mode, rename the components according to the circuit diagram and download the changes to the target device.
  - Save the changes from RAM to ROM. That is essential because the changes would otherwise be lost when the converter was switched off.
- Check the door limit switch.
- Check the electromagnetic door interlocking system (if installed).

⚠ WARNING

Dangerous high voltages

High voltages can cause death or serious injury if safety rules are not observed or if equipment is handled improperly.

Even when door interlocking is released, dangerous voltages could still be present on the auxiliary circuits (fans, anti-condensation heating, closed-loop control, etc.).

Check the function of the door limit switch on each door.

- Check the secure position and FO assignment if there are two or more transport units.
- Check the actual-value channels (U_m sensing, ground-fault detection, actual-current sensing).
  - Input voltage of the AVT combination module ≤ 3 V.
- Check the "emergency stop" function.
  - The converter goes into the fault state.
- Check connection with the higher-level controller (S7): Transformer and motor signals.
- Check the auxiliaries:
  - DMU
  - Switch
  - Disconnector, excitation
  - Fans.

Parameterizing/addressing 4

4.1 Important parameters

Introduction

This chapter contains the most important parameters for commissioning the converter.

You will find detailed information in the relevant section of chapter "Commissioning", in the List Manual on the CD supplied with the converter, and in the Help under the parameter in question

Important parameters for the test mode of the sequential control

Table 4-1 Important parameters for the test mode of the sequential control

Parameters	Description
p0840	Setting of the signal source for control word 1 bit 0 (ON/OFF1)
p1055	Setting of the signal source for inching 1
p1056	Setting of the signal source for inching 2
p1300	Setting the open-loop and closed-loop control mode of a drive
p1501	Setting of the signal source for switchover between speed and torque control
p6650	Setting for activation / deactivation of the test mode
p6651	Setting of the signal source for switching the test on/off
p6674	Setting of the checkback timeout on closing the circuit breaker
p6675	Setting of the checkback timeout on opening the circuit breaker
p6676	Setting the maximum permissible break-time of the circuit breaker
p6677	Setting of the signal type for the close command of the circuit breaker
p6678	Setting of the signal type for the open command of the circuit breaker
p6679	Setting of the pulse type for closing the circuit breaker
p6680	Setting of the pulse type for opening the circuit breaker
p6681	Setting of the pulse time for the open/close commands of the circuit breaker. Setting of the pulse time for the open/close commands of the circuit breaker
p6682	Setting of the blocking time for the circuit breaker
p6683	Setting of the bounce time of the circuit breaker used

Important parameters for the test mode of the auxiliaries

Table 4-2 Important parameters for the test mode of the auxiliaries

Parameters	Description
p6060	Setting of the signal source for the external command "Switch on fan"
p6577	Setting of the signal sources for the circuit monitoring functions

Parameters	Description
p6794	Setting of the monitoring time for switching on the fans
p6797	Setting of the switch-off delay after switching off the fans

Important parameters for the test mode of the outgoing disconnectors

Table 4-3 Important parameters for the test mode of the outgoing disconnectors

Parameters	Description
p6021	Setting of the signal source for switch-on enables 2 and 3 of the internal outgoing disconnector

Important parameters for testing communication with the excitation unit

Table 4-4 Important parameters for testing communication with the excitation unit

Parameters	Description
p2051	Selection of the PCD (actual values) with word format to be transmitted to the PROFIBUS master
p2061	Selection of the PCD (actual values) with double-word format to be transmitted to the PROFIBUS master

Important parameters for the test mode of demagnetization of the output transformer

Table 4-5 Important parameters for the test mode of demagnetization of the output transformer

Parameters	Description
p6000	Setting of the signal source for the ON command of the demagnetization equipment of the output transformer
p6001	Setting of the signal source for the ON checkback of the demagnetization equipment of the output transformer
p6002	Setting of the signal source for the checkback "demagnetization completed" of the demagnetization equipment of the output transformer
p6003	Setting of the signal source for the checkback "disconnector open" of the demagnetization equipment of the output transformer
p6004	Setting of the signal source for the checkback "fault" of the demagnetization equipment of the output transformer
r6005	Display of the status word of the demagnetization equipment of the output transformer
p6006	Setting of the timeout for the demagnetization equipment of the output transformer
p6008	Setting for enabling/disabling the demagnetization equipment of the output transformer
p6015	Execute and display BICO interconnections for existing options

Important parameters for the test mode of the motor sequential control

Table 4-6 Important parameters for the test mode of the motor sequential control

Parameters	Description
Test mode of the motor sequential control	
p6265	Setting of the mode for test mode for the motor sequential control

Important parameters for test mode for determination of line offset angle

Table 4-7 Important parameters for test mode for determination of line offset angle

Parameters	Description
p0971	Saving the parameters of each drive object in the non-volatile memory (CompactFlash Card)
p6067	Setting of the offset angle of the input transformer
r6068	Display of the offset angle

Important parameters for test mode for location

Table 4-8 Important parameters for test mode for location

Parameters	Description
p6240	Setting of the number of location cycles

Important parameters for test mode of current-control operation

Table 4-9 Important parameters for test mode of current-control operation

Parameters	Description
p6270	Setting of the minimum frequency of the motor control
p6285	Setting of the frequency of the load-side converter in test mode
p6350	Setting of the mode for manual operation
p6351	Setting of the standby generating frequency for mode "controlled operation without line voltage"
p6352	Setting of the delay angle for mode "controlled operation with/without line voltage"
p6353	Setting of the current setpoint for mode "current-controlled operation"

Fault history

You can call the fault history with parameter p0949.

4.2 Setting the motor parameters

4.2.1 Motor data sheet and equivalent circuit diagram

General information

Problem-free operation of the motor requires the data in the motor data sheet and in the equivalent circuit diagram.

Motor data sheet

The following figure shows an example of a motor data sheet:

Three - Phase Synchronous Motor with Solid Cylindrical Rotor					Order No. 1176595 Order Date 01.03.06 Manuf. No. D06318042 01-02
Type	1DX1559-8BS01-Z	Coding System	IC81W	Mounting	IM1001
Unit	2	Coolin Unit	sec.	prim	Endosure IP55
Duty		Cool Medium	Water	air	EX-Protection II2GEExpII T3
Drive for	Turbo-Compressor	Coolant Flow	40 m3/h	8,5 m3/s	Ex-Standard EN50016
		Inlet Temp	55° C	65° C	Insul. System Mic alastic
Standard	IEC60034	Outlet Temp.	°C	100°C	Thermal Class F
Rotation	ccw	Pressure Drop		250N/m2	Sevice Altitude <= 1000 m
Excitation	brushless	Losses to be dissipated		320 kw	
Type Exc. Mach		Ventilation System		4-end	OverSpeed 4320 min -1
		Type of Fan		axial	Motor Inertia tm2
Converter Simovert S 2 * 6 - pulse 2 Systems, 30° Electr. Displaced Over-Speed, Skip-Band-Width and Technical Endurance acc. to Mechanical Design Office				Load Curve	Part1: 0.98 - 1.00 * NN: m = const Part2: 1.00 - 1.01 * NN: m = n

Operating Data			Rated Point			
Output	kw/HP		17 000			
Voltage	V		2 * 4200			
Frequency	Hz		60			
Current	A		2 * 1283			
Speed	min-1		3600			
Power Factor			0.93			
Exc. Voltage	MM (130 °C)	V	105			
Exc. Current	MM	A	590			
Aux. Exc. Voltage	EM (°C)	V	100			
Aux. Exc. Current	EM	A	105			
Cooling Temp.	sec./prim.	°C	55 /65			
Stator Winding Temperature		°C	<=125	(ETD)	<=	<=
Field Winding Temperature		°C	<=130		<=	<=
Duty Type			S1			

Exciting Data	Voltage	Current
No-load	40 V	230 A
Rated Point	105 V	590 A
Air Gap Line		208 A

Figure 4-1 Example: Motor data sheet

Equivalent circuit diagram data

The following figure shows an example of equivalent circuit diagram data:

Synchronous resistances		**Air gap reactances**			**Leakage reactances**		
			unsaturated	**saturated**		**unsaturated**	**saturated**
r1	3.40 ‰	xhd	1.058 p.u.	0.893 p.u.	xσ1e	0.023 p.u.	0.013 p.u
r2	0.70 ‰	xhq	0941 p.u.	0795 p.u.	xσ1k	0.033 p.u.	0.026 p.u
r3	4.80 ‰				xσ1s	0.057 p.u.	0.039 p.u.
					xσ2	0.062 p.u.	0.048 p.u
					xσ3	0.018 p.u.	0.011 p.u

.

Synchronous, transient and subtransient reactances									
	unsaturated	**saturated**		**unsaturated**	**saturated**		**unsaturated**	**saturated**
xd	1.115 p.u.	0.932 p.u.	xd‘	0.115 p.u.	0.084 p.u.	xd“	0.071 p.u.	0.049 p.u.
xq	0.998 p.u.	0.834 p.u.				xq“	0075 p.u.	0.049 p.u
					Comm.reactance	xk	0.06 p.u.	

Figure 4-2 Example: Equivalent circuit diagram data

4.2.2 Entering the motor parameters

Enter the motor parameters from the rating plate:

In the example below, the data are entered according to the diagram "Example: motor data sheet" in the section "General information about motor commissioning"

Parameter	D	+	+	Parameter text	Online value VECTORGL_02	Unit
Motor_Data						
p304[0]	M			Rated motor voltage	1200	Vrms
p305[0]	M			Rated motor current	770.00	Arms
p307[0]	M			Rated motor power	1600.00	kW
p308[0]	M			Rated motor power factor	0.925	
p310[0]	M			Rated motor frequency	87.00	Hz
p311[0]	M			Rated motor speed	1740.0	RPM
Exitation_Data						
p388[0]	M			Rated excitation voltage	94.6	V
p389[0]	M			Excitation rated no-load current	117.40	A
p390[0]	M			Rated excitation current	1000.00	A
MSC_Transformer, if available						
p240[0]	M			MSC rated transformer voltage, secondary voltage side	0	Vrms
p241[0]	M			MSC rated transformer voltage, primary side	0	Vrms
p242[0]	M			MSC rated transformer current, primary side	0.00	Arms
CCW_Exitation, if available						
p689[0]	M			Counter-clockwise rotating field excitation rated voltage	0	Vrms
p690[0]	M			Counter-clockwise rotating field excitation rated current	0.00	Arms
p697[0]	M			Counter-clockwise rotating field excitation pole pair number	0	

Figure 4-3 Example: Enter according to motor data sheet

1. Enter the rating plate parameters of the motor. This is based on the data sheet of the motor. Even on motors with two winding systems, you only have to enter the value of one winding system in the rated current (p305).
2. Enter the excitation data.
   If you enter all data as <0> in parameters p388…p390, it is assumed that the excitation is controlled externally. In this case, the flux controller is deactivated.

3. Enter the data for the transformer on the load side (if installed).
   If you enter <0> for all data in the parameters p240…p242, it is assumed that no load-side transformer is used.
4. Enter the data for the negative-sequence excitation.
   If you enter <0> for all data in the parameters p689…p697, it is assumed that there is no negative-sequence excitation.

Enter the equivalent circuit diagram data for the primary machine

In the example below, the data are entered according to the diagram "Example: equivalent circuit diagram data" in the section "General information about motor commissioning".

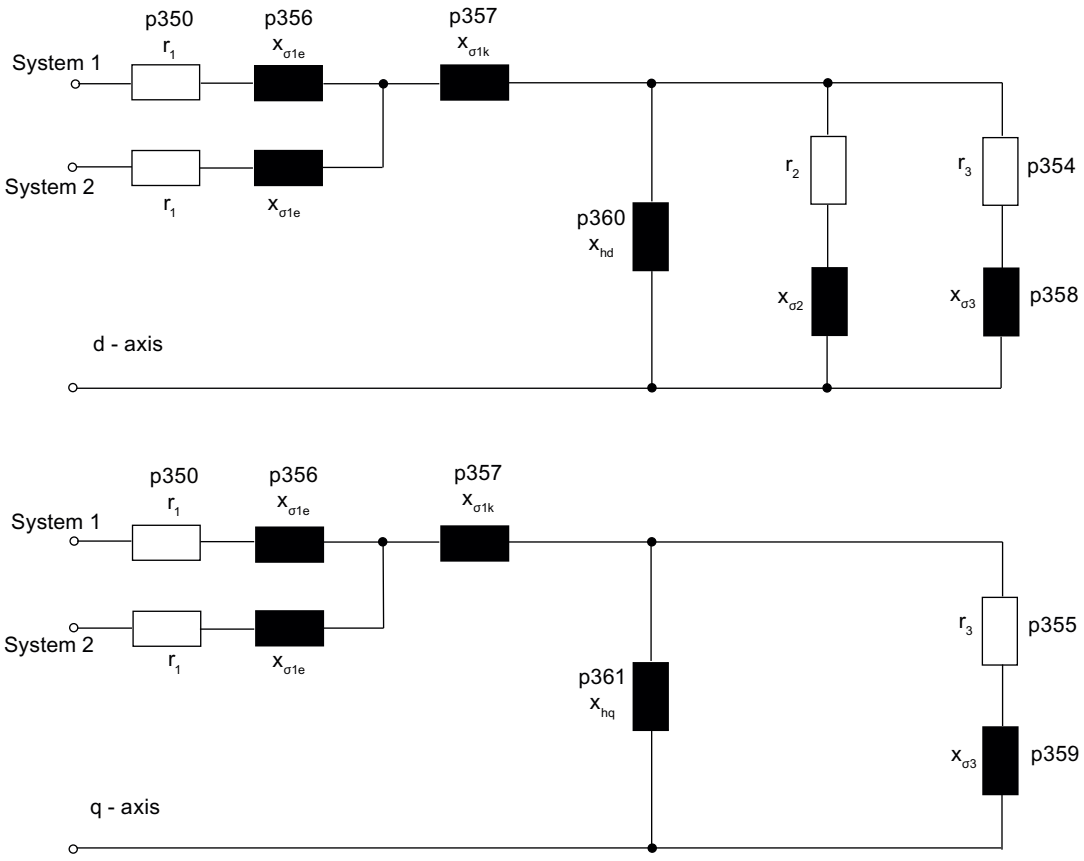


Figure 4-4 Example: Equivalent circuit diagram data for primary machine with parameters

Parameter	D	+	+	Parameter text	Value VECTORGL_02	Unit
equivalent_circuit_diagram_data						
p350[0]	M			Motor stator resistance, cold	0.34000	%
p354[0]	M			Motor rotor resistance cold / damping resistance d axis	0.48000	%
p355[0]	M			Motor damping resistance, q axis	0.48000	%
p356[0]	M			Motor stator leakage inductance	1.30000	%
p357[0]	M			Motor stator leakage inductance common	0.00000	%
p358[0]	M			Motor rotor leakage inductance / damping inductance, d axis	1.10000	%
p359[0]	M			Motor damping inductance, q axis	1.10000	%
p360[0]	M			Motor magnetizing inductance/magn. inductance, d axis saturated	105.80000	%
p361[0]	M			Motor magnetizing inductance q axis, saturated	94.10000	%
MSC_Transformer, if available						
p243[0]	M			MSC transformer resistance	0.00000	%
p243[0]	M			MSC transformer resistance	0.00000	%
p244[0]	M			MSC transformer reactance	0.00000	%
CCW_Exitation, if available						
p692[0]	M			Counter-clockwise rotating field excitation, iron resistance	0.00000	Ohm
p693[0]	M			CCW rotating field excitation, magnetizing inductance	0.00000	mH
p694[0]	M			Counter-clockwise rotating field excitation, leakage inductance	0.00000	mH
p695[0]	M			Counter-clockwise rotating field excitation, rotor resistance	0.00000	Ohm
p696[0]	M			Counter-clockwise rotating field excitation ratio	0.000	
p698[0]	M			CCW rotating field excitation, excitation resistance	0.00000	Ohm

Figure 4-5 Example: Parameters for saturated data

The connection between the data on the datasheet and the value entered for the relevant parameter is shown in the table below:

Designation on the datasheet	Value	Entry in parameter	Value
r1	3,40 ‰	p350	0.34000%
r3	4,80 ‰	p354, p355	0.48000%
xhd	1.058 p.u.	p360	105.80000%
xhq	0.941 p.u.	p361	94.10000%
xσ1e	0.023 p.u.	p356	1.30000%
xσ1k	0.033 p.u.	p357	2.60000%
xσ3 (xσ3// xσ2)	0.014 p.u.	p358, p359	1.10000%

Note

The equivalent circuit diagram data applies to:

- Cold machine
  For converting the data sheet values "warm resistors" to "cold resistors", the following formula is used for GL150: $R_{kalt} = \frac{(235\,°C + \vartheta\,cold)}{(235\,°C + \vartheta\,hot)} \cdot R_{warm}$
- Non-saturated for leakage inductances
- Saturated for mutual inductances

In the example, it is assumed that the leakage inductances of the stator are symmetrical.

You must enter the resistances and leakage inductances of the rotor separately for the d-axis and q-axis.

You must enter the main inductances separately for the d-axis and q-axis. You can enter the value of the resistances and inductances as absolute values (in ohm and mH) or per-unit values. To do this, you must enable the parameter <p0349>.

- p0349=1 (standard setting)
  - The parameters must be entered as physical quantities
- p0349=2
  - The parameters must be entered as per-unit data.

You will find more detailed notes in the List Manual on the CD supplied with the converter.

- Enter the values for parameters <p0350> - <p0361> according to the data in the datasheet, as shown in the figure.

If a load-side transformer or negative-sequence excitation is used, you can enter the relevant data in the corresponding parameters according to the equivalent circuit diagram data for the excitation unit or transformer.

Enter the equivalent circuit diagram data for the excitation unit

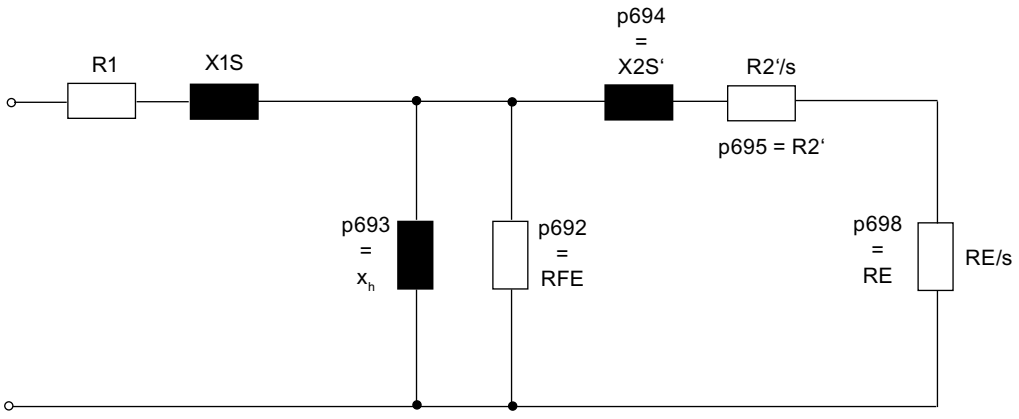


Figure 4-6 Equivalent circuit diagram data for excitation unit with parameters

- Enter the values for parameters <p0691> - <p0698> in the relevant parameters according to the equivalent circuit diagram data.

Reference impedance	Reference frequency	Slip calculation	Transformation ratio
$ZN = \frac{p0689}{\sqrt{3} \cdot p0690}$	f1 = r211	$s = 1 + \frac{r63 \cdot p0697}{r211 \cdot 60}$	$p0696 = \frac{\omega 1}{\omega 2} = \frac{U10}{U20}$

Table 4-10 Equivalent circuit diagram data for negative-sequence excitation (NPSE) (if used)

Parameter	Designation	Value
p0691	Negative-sequence excitation correction factor	%
p0692	Negative-sequence iron resistance	Ω
p0693	Negative-sequence main inductance	mH
p0694	Negative-sequence rotor leakage inductance	mH
p0695	Negative-sequence rotor resistance	Ω
p0696	Negative-sequence ratio	-
p0697	Negative-sequence number of pole pairs	-
p0698	Negative-sequence excitation resistance	Ω

Completing motor commissioning

Complete motor commissioning by setting parameter p0340 = 3.
The controller parameters and threshold values are recalculated based on the data entered.

4.3 Setting the parameters for the excitation system

4.3.1 General information about parameterizing the excitation system

The excitation system is delivered with pre-assigned parameters.

The Commissioning Manual for the excitation system provides a detailed description of how to commission the excitation system.

4.3.2 Important parameters for the SIMOREG DC-Master

Description

Note

If there is a parameter set for the excitation, it is necessary to perform optimization of the precontrol and current controller (P051 = 25) after downloading the parameter set.

1. Set the values to factory setting with parameter p0051 = 21.
2. Set the parameterizing enable with parameter p0927.1 = 111.
3. Set the parameters according to the following list:

Parameter	Description	Remark
p076.001	Reduction of converter rated DC current (armature)	Scaling of the actual field current
p076.002	Reduction of converter rated DC current (field)	Parameter is not used for GL150; leave default value.
p079	Enable long pulses for armature gating unit	This is necessary for field supply to the armature terminals
p082	Operating mode for field	Parameter is not used for GL150; leave default value.
p0837	Actual speed value	Freely connectable
p084.	Selection of closed-loop speed / current or torque control	Current-controlled operation
p100	Rated armature current	Motor excitation current in this case
p102	Rated excitation current	Parameter is not used for GL150; leave default value.
p153.3	Armature precontrol	Required for high inductances at armature terminals
p161	Additional Alpha W pulses (approx. 10)	Depending on the inductance level
p402	Fixed setpoint 2	Current setpoint for standstill field 100% = Converter rated current of the armature circuit
p430.001	Source for fixed-setpoint injection	Inject standstill field via binary input terminal X171: 36 1..... Standstill field routing, setpoint standstill field
p431.001	Source for fixed setpoint	Routing of setpoint for operating field
p433	Source for the default setpoint	Analog setpoint from terminal X174: 4
p601.003	Source for armature current controller setpoint.	Routing of excitation current setpoint
p609	Source for actual speed controller value.	Source actual speed value
p820	Deactivation of fault messages	Deactivate fault message "Tachometer fault"

The digital inputs and outputs (DI/DO) must be assigned as appropriate to the system.

Note

The converter rated DC current (armature) must be adapted by setting parameter p0076.001 (in %) or parameter p0067, when the following prerequisite is satisfied:

$$\frac{\text{Max. armature current}}{\text{Converter rated current (armature) (r0072.1)}} = < 0{,}5$$

The following values can be set in parameter p07.001:

10,0 %, 20,0 %, 33,3 %, 40,0 %, 50,0 %, 60,0 %, 66,6 %, 70,0 %, 80,0 % 90,0 %, 100,0 %

1. Perform optimization for precontrol and current controller with parameter p0051 = 25. The precise procedure is explained in the "RA 70 Excitation System Manual / Chapter Commissioning Steps"

4.3.3 Important parameters for the SIMOTRAS HD

Description

Note

If there is a parameter set for the excitation, it is necessary to perform optimization of the precontrol and current controller (P051 = 25) after downloading the parameter set.

1. Set the values to factory setting with parameter p0051 = 21.
2. Set the parameterizing enable with parameter p0051 = 40.
3. Set the parameters according to the following list:

Parameter	Description	Remark
p100	Motor data	Rated motor current (in Ampere)
p114		Thermal time constant of the motor (in minutes) (factory setting: 10 min) (0 = Monitoring is switched off)
p490.001		Type of temperature sensor at terminal 22/23 (factory setting = 1) • 0 = No temperature sensor present • 1 = KTY84; P491 = Warning temperature (factory setting = 20 ° C) • 4 = PTC with Rn = 1330 Ohm; for R < Rn: B0184 = 0, for R > Rn: B0184 = 1
p083 = 1	Speed measurement with analog tachometer (displayed at r002)	Tachometer connected to terminals 103 and 104
p741		Tachometer voltage at maximum speed (approx. 8 V to +270.00 V) (factory setting = 60.00 V)

Parameter	Description	Remark
P083 = 2	Speed measurement with incremental encoder (displayed at r024)	Incremental encoder connected to terminals 28/29 and 30/31
P140 = 1		Incremental encoder has two pulse tracks offset by 90 ° (factory setting = 1)
P141		Incremental encoder pulse number (factory setting = 250 pulses per rotation)
P142 = 1		The incremental encoder supplies 15-volt signals (factory setting = 1)
P143		Maximum speed (in rpm) (factory setting = 1450 rpm)
P401	Speed setpoint normalization	Speed setpoint up to which the master switch should be used for stabilized travel of lifting gear. approx. 60 %, for travelling gears: up to 100 % (factory setting = 60 %)
U628		Changeover threshold for full conduction
P171	Current limits (actual current value displayed at r019)	for torque direction I (in % of p100) (factory setting: + 200 %)
P172		for torque direction II (in % of p100) (factory setting = -200 %)
P155	Current controller	Controller gain Kp (factory setting = 0.2)
P156		Integral time Tn (factory setting 0.02 s)
P225	Speed controller	Controller gain Kp (factory setting = 3.0)
P226		Integral time Tn (factory setting 0.2 s)
P200		Smoothing of actual speed value (factory setting = 10 ms)
P303	Ramp function generator, ramping times in stabilized range	Ramp-up time (factory setting 10 s)
P304		Ramp-down time (factory setting = 10 s)
P305		Initial rounding (factory setting = 0 s)
P306		Final rounding (factory setting = 0 s)
P307	Ramp function generator, ramping times in the open-loop controlled range	Ramp-up time (factory setting 10 s)
P308		Ramp-down time (factory setting = 10 s)
P309		Initial rounding (factory setting = 0 s)
P310		Final rounding (factory setting = 0 s)
U651	Start pulse for the speed controller	Start pulse for clockwise rotation (= raise) in % of p100 (factory setting = 0 %)
U652		Reduction factor for the start pulse for counterclockwise rotation (= lower) (factory setting = 50%)
U634	Rotor protection advance	Speed at which the rotor protection is activated for level 2 (factory setting = 50%)
U636		Speed at which the rotor protection is activated for level 3 (factory setting = 75 %)
U638		Speed at which the rotor protection is activated for level 4 (factory setting = 90 %)
U630		Speed at which the rotor protection is activated prematurely for level 1 in operating state "delay lowering" (counter operation) (factory setting = -1 %)

Parameter	Description	Remark
U441	Reverse monitoring	When the travel command is cancelled, the motor must have reached the minimum speed (p370) within the time set here; otherwise, F023 is triggered (factory setting = 10.5 s) (recommended value: p304 + 10% or p308 + 10%, the higher of the two values)
U608	Setpoint reduction for pre-limit switch	When approaching a pre-limit switch, the speed setpoint is multiplied by the value set here (factory setting = 15%)

4.4 Data sets

4.4.1 CDS: Command Data Set

The BICO parameters (binector and connector inputs) are grouped together in a command data set. These parameters are used to interconnect the signal sources of a drive.

By configuring several command data sets and switching between them, the drive can be operated with different pre-configured signal sources.

A command data set contains the following (examples):

- Binector inputs for control commands (digital signals)
  - ON/OFF, enable signals (p0844, etc.)
  - Jog (p1055, etc.)
- Connector inputs for setpoints (analog signals)
  - Speed setpoint for ramp function generator setting value (p1144)
  - Torque limits and scaling factors (p1522, p1523, p1528, p1529)

A drive object can – depending on the type – manage up to 4 command data sets. The number of command data sets is configured with p0170.

The following parameters are available for selecting command data sets and for displaying currently selected command data sets - e.g. in the vector mode, the following parameters are available:

Binector inputs p0810 to p0811 are used to select a command data set. They represent the number of the command data set (0 to 3) in binary format (where p0811 is the most significant bit).

- p0810 BI: Command data set selection CDS bit 0
- p0811 BI: Command data set selection CDS bit 1

If a command data set that does not exist is selected, the current data set remains active. The selected data set is displayed using parameter (r0836). The active data set is displayed in r0050.

4.4.2 DDS: Drive Data Set

A drive data set contains various adjustable parameters that are relevant with respect to open and closed-loop drive control:

- Numbers of the assigned motor and encoder data sets:
  - p0186: assigned motor data set (MDS)
  - p0187 to p0189: up to 3 assigned encoder data sets (EDS)
- Various control parameters, e.g.:
  - Fixed speed setpoints (p1001 to p1015)
  - Speed limits min./max. (p1080, p1082)
  - Characteristic data of ramp-function generator (p1120 ff)
  - ...

The parameters that are grouped together in the drive data set are identified in the List Manual by "Data Set DDS" and are assigned an index [0..n].

More than one drive data set can be configured. You can switch easily between different drive configurations (control type, motor, encoder) by selecting the corresponding drive data set.

One drive object can manage up to 32 drive data sets. The number of drive data sets is configured with p0180.

Binector inputs p0820 to p0824 are used to select a drive data set. They represent the number of the drive data set (0 to 31) in binary format (where p0824 is the most significant bit).

- p0820 BI: Drive data set selection DDS, bit 0
- p0821 BI: Drive data set selection DDS, bit 1
- p0822 BI: Drive data set selection DDS, bit 2
- p0823 BI: Drive data set selection DDS, bit 3
- p0824 BI: Drive data set selection DDS, bit 4

Boundary conditions and recommendations

- Recommendation for the number of drive data sets for a drive
  The number of drive data sets for a drive should correspond to the options for changeover.
  The following must therefore apply:
  p0180 (DDS) ≥ max. (p0120 (PDS), p0130 (MDS))
- Max. number of DDS for one drive object = 32 DDS

4.4.3 MDS: Motor Data Set

A motor data set contains various adjustable parameters describing the connected motor for the purpose of configuring the drive. It also contains certain visualization parameters with calculated data.

- Adjustable parameters, e.g.:
  - Motor component number (p0131)
  - Motor type selection (p0300)
  - Rated motor data (p0304 ff)
  - ...
- Visualization parameters, e.g.:
  - Calculated rated data (r0332 ff)
  - ...

The parameters that are grouped together in the motor data set are identified in the List Manual by "Data Set DDS" and are assigned an index [0..n].

A separate motor data set is required for each motor that is controlled by the Control Unit via a Motor Module. The motor data set is assigned to a drive data set via parameter p0186.

A motor data set can only be changed using a DDS changeover. The motor data set changeover is, for example, used for:

- Switching over different motors
- Switching over different windings in a motor (e.g. star-delta changeover)
- Adapting the motor data

If several motors are operated alternately on a Motor Module, a matching number of drive data sets must be created. For further information about motor changeover, see the "Motor changeover" section in the Function Manual.

One drive object can manage up to 16 motor data sets. The number of motor data sets in p0130 must not exceed the number of drive data sets in p0180.

Examples for a data set assignment

Table 4-11 Example, data set assignment

DDS	Motor (p0186)	Encoder 1 (p0187)	Encoder 2 (p0188)	Encoder 3 (p0189)
DDS 0	MDS 0	EDS 0	EDS 1	EDS 2
DDS 1	MDS 0	EDS 0	EDS 3	-
DDS 2	MDS 0	EDS 0	EDS 4	EDS 5
DDS 3	MDS 1	EDS 6	-	-

4.4.4 Copying data sets

Copying a command data set

Set parameter p0809 as follows:

1. p0809[0] = Number of the command data set to be copied (source)
2. p0809[1] = Number of the command data to which the data is to be copied (target)
3. p0809[2] = 1

Start copying.

Copying is finished when parameter p0809[2] = 0.

Note

In STARTER, you can copy the command data sets (Vector GL -> Configuration -> "Command data sets" tab page).

You can select the displayed command data set in the relevant STARTER screens.

Copying a drive data set

Set parameter p0819 as follows:

1. p0819[0] = Number of the drive data set to be copied (source)
2. p0819[1] = Number of the drive data set to which the data is to be copied (target)
3. p0819[2] = 1

Start copying.

Copying is finished when parameter p0819[2] = 0.

Note

In STARTER, you can copy the drive data sets (Vector GL -> Configuration -> "Drive data sets" tab page).

You can select the displayed drive data set in the relevant STARTER screens.

Copying the motor data set

Set parameter p0139 as follows:

1. p0139[0] = Number of the motor data set that is to be copied (source)
2. p0139[1] = Number of the motor data set which should be copied into (target)
3. p0139[2] = 1

Start copying.

Copying is finished when parameter p0139[2] = 0.

Note

In STARTER, you can set the drive data sets via the drive configuration.

4.4.5 Overview of function diagrams and parameters

Function diagrams

You will find the function diagrams in the Chapter "Function Diagrams", Section "Data sets" in the List Manual on the CD supplied with the converter.

Overview of important parameters (refer to the List Manual)

Table 4-12 Overview of important parameters (data sets)

Parameter	Description
p0120	Power Module data sets (PDS) number
p0130	Motor data sets (MDS) number
p0139	Copy motor data set (MDS)
p0140	Encoder data sets (EDS) number
p0170	Command data set (CDS) number
p0180	Drive data set (DDS) number
p0186	Motor data sets (MDS) number
p0187	Encoder 1 Encoder data set number (display "99" if no encoder is connected)
p0188	Encoder 2 Encoder data set number (display "99" if no encoder is connected)
p0189	Encoder 3 Encoder data set number (display "99" if no encoder is connected)
p0809	Copy command data set CDS
p0810	BI: Command data set selection CDS bit 0
p0811	BI: Command data set selection CDS bit 1
p0819[0...2]	Copy drive data set DDS
p0820	BI: Drive data set selection DDS, bit 0
p0821	BI: Drive data set selection DDS, bit 1
p0822	BI: Drive data set selection DDS, bit 2
p0823	BI: Drive data set selection DDS, bit 3
p0824	BI: Drive data set selection DDS, bit 4

Commissioning (software) 5

5.1 Introduction

The order of test modes in this document is based on the priority, not on the number of the parameter.

Note

Test modes are only possible in "ONLINE operation".

5.2 SIMATIC S7 and SINAMICS GL150 cross-communication

Note

Minimum configuration

As a SIEMENS commissioning engineer, you will find a suggested minimum configuration on the Intranet (Prodis) under ID 34833133.

Overview

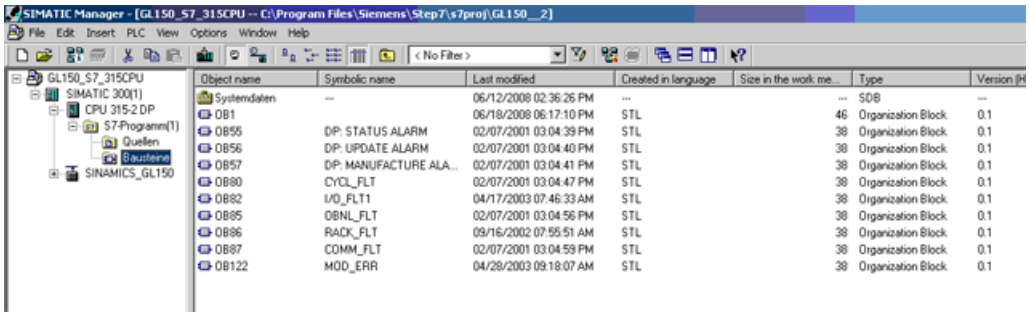


Figure 5-1 Example: Project with minimum configuration

Hardware configuration

The PROFIBUS message frame for the GL150 comprises a maximum of 32 words, including cross-communication to the excitation converter.

In the example below, 16 words for "cyclical data exchange" (256 - 287) and 6 words for the cross-communication are parameterized.

The corresponding configuration must be carried out in STARTER. Cross-communication data is preassigned from word 16 as standard.

The PROFIBUS address 10 is parameterized for GL150, while for the excitation converter the PROFIBUS address 3 is parameterized.

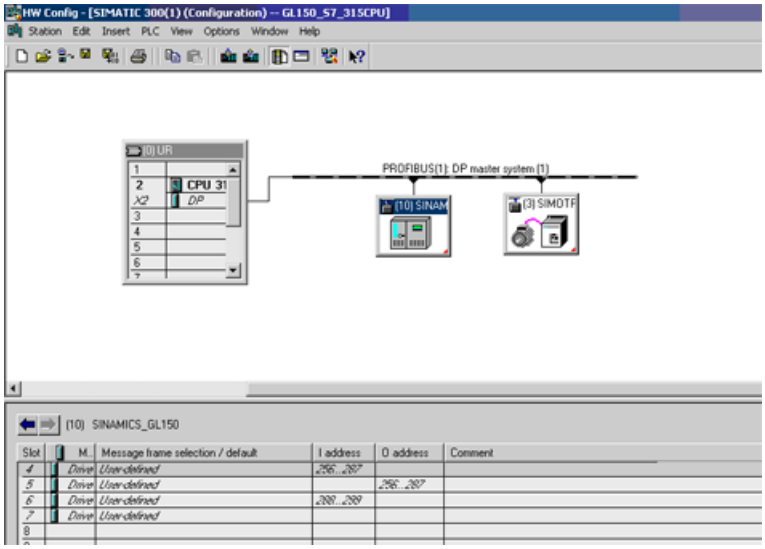


Figure 5-2 SINAMICS hardware configuration

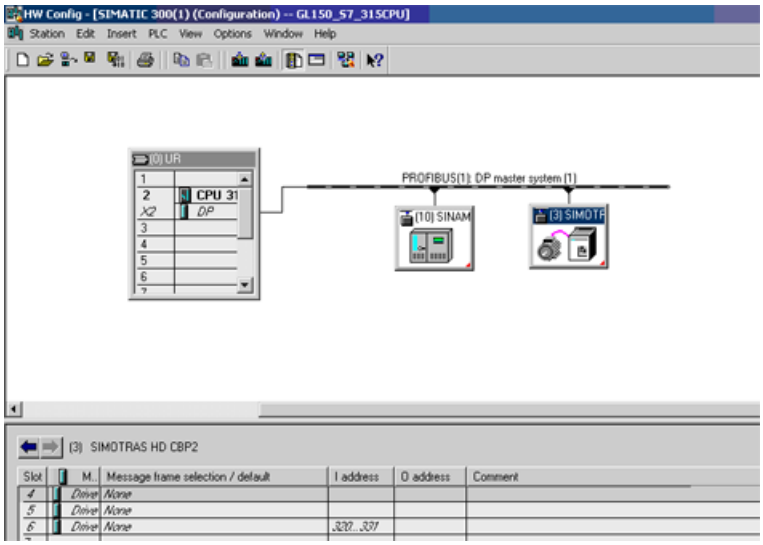


Figure 5-3 SIMOTRAS hardware configuration

Parameter assignment

The following is parameterized under "DP slave properties":

- GL150

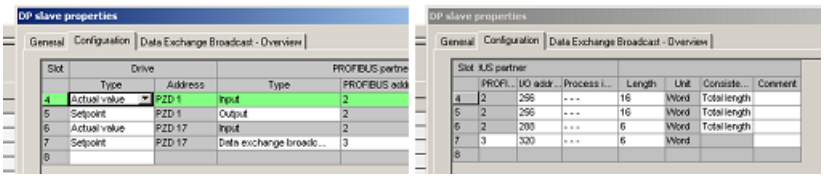


Figure 5-4 Parameter assignment of DP slave GL150

- Excitation converter

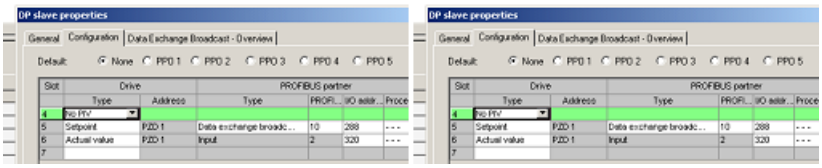


Figure 5-5 Parameter assignment of DP slave excitation converter

Cross-communication overview

The following cross-communication results from the configuration:

- GL150

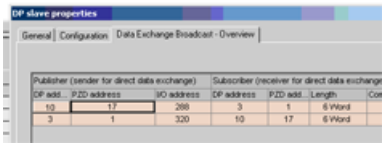


Figure 5-6 Converter cross-communication overview

- Excitation converter

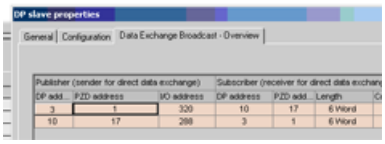


Figure 5-7 Excitation converter cross-communication overview

This hardware configuration must be downloaded to the control system.

S7 software

- For activating PROFIBUS communication, set the PROFIBUS control bit (bit 10) in control word 1. In the sample project, this bit is always set to 1 in OB1.

The remaining organization blocks do not contain any codes. They are added so that S7 can continue to run in the event of an error and so it does not switch to the STOP mode.

5.3 Testing the sequential control

5.3.1 Notes on the testing of the sequential control

Description

Test mode of the sequential control is activated / deactivated with parameter p6650.

The following values can be set:

Table 5-1 Parameter 6650

Value	Description
0	not active
1	Test mode auxiliaries
2	Test mode outgoing disconnector
3	Test mode exciter power circuit
4	Test mode demagnetization output transformer
10	Test mode incoming circuit breaker
20	Test mode outgoing circuit breaker
99	Test mode switch-off

Note

The test is started when the logical AND gating of the signal values of BI p6651 and p0840 supplies a '1' signal. Please heed the description of the parameters in the List Manual.

The test must only be set and performed by service and maintenance personnel with appropriate training.

5.3.2 Testing auxiliaries

Description

In the air-cooled version, only the fans are controlled with this setting.

The figure shows the parameters relevant for commissioning the auxiliaries.

Parameter	D	+	+	Parameter text
p6060[0]		-		External command switch in power unit cooling signal source, Redundancy subsystem 1
p6060[1]				External command switch in power unit cooling signal source, Redundancy subsystem 2
p6577[14]				Circuit monitoring functions signal source, Protective breaker trip fan circuit
r6587.14				Protective breaker fan circuit
p6794				Fan monitoring time when powering up
p6797				Fan run-on time

Figure 5-8 Parameters relevant for the auxiliaries

Procedure

1. Activate the test by setting the parameter p6650 = 1.
2. Check the pressure drop across the heat sinks. It should be 500 - 550 Pa for a 50 Hz fan with the air filter fitted.
3. Deactivate the test by setting the parameter p6650 = 0.

5.3.3 Testing the line-side circuit breaker

Description

In this test, the make time r6672 and the break time r6673 are checked. If the measured times are greater than those set in p6674 and p6675, an alarm is output.

Note

The cooling unit must be switched on when testing a liquid-cooled converter.

The figure shows the parameters relevant for commissioning the circuit breaker.

Parameter	D	+	+	Parameter text	Value VECTORGL_02	Unit
r6136			+	CO/BO: Changeover switch line supply LSS feedback signal statu	3DH	
r6138			+	CO/BO: Changeover switch line supply LSS 0 control signals	20H	
r6672[0]		-		Switch closing time measured, Switch 0	0.140	s
r6672[1]				Switch closing time measured, Switch 1	0.000	s
r6672[2]				Switch closing time measured, Switch 2	0.000	s
r6672[3]				Switch closing time measured, Switch 3	0.000	s
r6672[4]				Switch closing time measured, Switch 4	0.000	s
r6673[0]		+		Switch opening time measured, Switch 0	0.056	s
p6674[0]		+		Switch close monitoring time, Switch 0	10.000	s
p6675[0]		+		Switch open monitoring time, Switch 0	0.160	s
p6676[0]		+		Switch max. opening time, Switch 0	0.100	s
p6677[0]		+		Switch close command signal type, Switch 0	Continuous signal (0)	
p6678[0]		+		Switch open command signal type, Switch 0	Continuous signal (0)	
p6679[0]		+		Switch on command pulse type, Switch 0	Switch with constant pulse signal (0)	
p6680[0]		+		Switch open command pulse type, Switch 0	Switch with continuous signal until feedback signal received (1)	
p6681[0]		+		Switch close/open commands pulse time, Switch 0	1.000	s
p6682[0]		+		Switch inhibit time, Switch 0	2.00	s
p6683[0]		+		Switch bounce time, Switch 0	0.010	s
r6690[0]		+	+	Switch status word display, Switch 0	3DH	

Figure 5-9 Parameters relevant for commissioning the circuit breaker

Note

A larger selection can only be displayed in the expert list under the search term LSS.

You will find further notes in the List Manual on the CD supplied with the converter.

Procedure

1. Set the signal type for activating and deactivating in parameters p6677 and p6678 respectively.
   If you select a pulse signal here, parameters p6679, p6680 and p6681 are used.
2. Activate "Test mode of the incoming circuit breaker". For this, set parameter p6650 = 10.
3. Check the feedback signals and make sure that the circuit breaker works properly.
4. Deactivate the test mode by setting the parameter p6650 = 0.

5.3.4 Testing the outgoing disconnector

Description

The figure shows the parameters relevant for commissioning the outgoing disconnector.

Parameter	D	+	+	Parameter text
r46.27				Internal output disconnector not ready
r6020			+	PU internal output disconnector status word
p6021[0]		+		PU internal output disconnector close enable signals, Close enable signal 2
r6022			+	PU internal output disconnector control word
r6221.1				Internal output disconnector close
r6222.1				Output disconnector close
r6225[0].27				Internal output disconnector not ready

Figure 5-10 Parameters relevant for the outgoing disconnector

Procedure

1. How is the "test mode of the outgoing disconnector" activated. For this, set parameter p6650 = 2.
2. Check that the outgoing disconnector works properly.
3. Deactivate the test mode by setting parameter p6650 = 0.

5.3.5 Testing the excitation unit for synchronous machine

Description

This function can be used to check that the excitation unit of the synchronous machine works properly.

The excitation current is tested without switching on the converter circuit breaker

Testing the excitation circuit

Note

Pay attention to heating of the exciter winding and the diodes in the motor.

1. Activate the excitation circuit by setting the parameter p6650 = 3. The excitation is activated and you can check the feedback signals.

- r1648 = Control word from excitation unit.
- r1649 = Status word from excitation unit.

No pulse are enabled.

1. Set parameter 6350 = 1 to select the operating mode "Open-loop control mode without line voltage"

Specification of an excitation setpoint

The figure shows the relevant parameters specifying an excitation setpoint.

Parameter	D	+	+	Parametertext	Online-Wert VECTORGL_02
p6265				Motor sequence control test operations	Manual operation (110)
p6266				Motor sequence control manual operation	Pulse enable excitation equipment (99)
p6350				LSC manual operation mode	Manual operation off (0)
p6351				LSC manual operation, line substituting frequency	50.000
p6352				LSC manual operation, firing angle	125.000
p6353				LSC manual operation, current setpoint	0.000
r6320				CO: DC link current setpoint	3.0
r6321[0]				CO: DC link current actual value smoothed	0.0
p6270[0]	D			Motor closed-loop control minimum frequency	1.7
p6285				Test operation frequency	20.0
r6260			+	CO/BO: Motor sequence control control commands	80100025H
r6221			+	CO/BO: Sequence control control command	85000080H
p6286				CO: Excitation current setpoint for test operation	15.0
r1626[0]		+		Excitation current setpoint, Excitation current of the excitation equipment	15.0
r6196				CO: Changeover switch excitation, excitation current actual value	15.0
r83				CO: Flux setpoint	0.0
r84[0]		+		Flux actual value, Unsmoothed	0.1
r6325[0]				CO: LSC firing angle	109.83
r2				Drive operating display	[00] Operation - everything enabled (0)
r1648			+	CO/BO: Excitation, control word	40FH
r1649			+	CO/BO: Excitation status word	4H
p6010				BI: External command switch in excitation signal source	TM15DI_DO_07 : r4022.0
p6060				BI: External command switch in power unit cooling signal source	VECTORGL_02 : r2093.8
p6650				Sequence control test mode	Inactive (0)
p6651				BI: Sequence control test mode ON/OFF	TM15DI_DO_07 : r4022.0
r76				CO: Current actual value field-generating	0.07
r78				CO: Current actual value torque-generating	0.13

Figure 5-11 Specification of an excitation setpoint

1. Set parameter p6265 = 110 (manual operation).
2. Set parameter p6266 = 99 to select the excitation unit.
3. Use parameter p6286 = xx to specify the excitation setpoint. The maximum permissible value is 80%.
   The excitation system is switched on and pulses are enabled.

The excitation setpoint and the actual excitation value are displayed in the following parameters:

- r1626 displays the excitation setpoint.
- r6196 displays the excitation setpoint after pulse enable.

1. Deactivate the test mode by setting the parameter p6265 = 0.

5.3.6 Testing the demagnetization of the output transformer

Description

The figure shows the parameters relevant for demagnetization of the output transformer.

Parameter	D	+	+	Parameter text
r46.14				De-magnetization output transformer active
r46.15				Output transformer not de-magnetized
p6000				De-magnetizing equipment, ON command
p6001				BI: De-magnetizing equipment, ON feedback signal
p6002				BI: Feedback signal de-magnetization completed
p6003				BI: De-magnetizing equipment, disconnector open feedback signal
p6004				BI: De-magnetizing equipment fault feedback signal
r6005			+	CO/BO: De-magnetizing equipment, status word
p6006[0]		+		De-magnetizing equipment timeout, De-magnetizing equipment timeout total
r6007			+	CO/BO: De-magnetizing equipment control word
p6008[0]	M			Enable de-magnetizing equipment
p6015.4				Option A7x: Transformer monit. or demagnetiz. interconnected
p6015.8				Option A71: Demagnetizing equipment interconnected
r6221.3				Output transformer de-magnetization on
r6222.3				Output transformer de-magnetization on
r6225[0].14				De-magnetization output transformer active
r6225[0].15				Output transformer not de-magnetized

Figure 5-12 Parameters relevant for demagnetization of the output transformer

1. Activate the test for the demagnetization of the output transformer by setting the parameter p6650 = 4.
2. Check that the demagnetization of the output transformer works properly.
3. Deactivate the test mode by setting the parameter p6650 = 0.

5.4 Testing the motor sequential control

5.4.1 Notes on the testing of the motor sequential control

Description

Parameter p6265 is used for testing of the motor sequential control.

The set mode determines the running sequence on switch-on. In each of these modes, switch-on is performed with the ON command in control word 1 bit 0 (r0840.0) and operation enable in control word 1 bit 3 (r0852.3).

The following test modes are possible:

Table 5-2 Overview of parameter 6265

Value	Description
0	Normal operation
1	Location
2	Current-controlled operation
3	Determination offset angle line converter
4	Determination offset angle motor converter
10	Circular operation
100	Partially manual operation
110	Manual mode

You will find further notes in the List Manual on the CD supplied with the converter.

- "Normal operation" test mode
  The auxiliaries, existing circuit breakers (p6230) and the excitation system are switched on. After motor excitation and location, the converters are enabled.
- "Location" test mode
  The excitation system is switched on. The motor is excited and located according to the number in p6240. The pulses of the converters are not enabled.
- "Current-controlled operation" test mode
  The auxiliaries are switched on and existing circuit breakers (p6230) are closed. The motor is not excited. The pulses of the converters are enabled and DC link pulsing (p6260) forced.

  Note

  With the setting "current-controlled operation", p6350 = 3 and p6353 = 20.0 % are preset.

- Test mode "Determination of offset angle line converter"
  The auxiliaries are switched on and existing incoming circuit breakers (p6230) are closed. The motor is not excited. After the state of the sequential control "determination of the offset angle of the line converters" in r3402 is reached, the offset angle of the converters is determined. The determined offset angle is displayed in r6068.

- Test mode "Angle offset determination motor converter"
  The auxiliaries, existing circuit breakers (p6230) and the excitation system are switched on. After motor excitation and location, the converters are enabled in subsystem 1 only. If the levels for motor voltage and frequency are sufficient, offset angle determination is enabled between the winding systems. The pulses of the converter in subsystem 1 are blocked during measurement. If the levels for motor voltage and frequency are insufficient, the measurement is interrupted and the pulses in the subsystem are enabled again to re-accelerated the motor. When the levels for motor voltage and frequency are sufficient, the procedure restarts (prerequisite is a drive system with 2 windings). The minimum speed for offset angle determination on the load side is displayed in parameter r6065 and should be taken as fixed speed setpoint p1001 for the measurement. The measured offset angle is displayed in r6068[0].
- "Circular operation" test mode
  The auxiliaries are switched on and existing circuit breakers (p6230) are closed. After the motor PLL is synchronized, the pulses of the converters are enabled. The converter is connected to the line via the outgoing terminals.
- "Partially manual operation" mode
  The auxiliaries, existing circuit breakers (p6230) and the excitation system are switched on. The enables of the converters are controlled via p6266.
- "Manual operation" test mode
  The auxiliaries, existing circuit breakers (p6230) and the excitation system are not switched on. The enables of the converters are controlled via p6266.

5.4.2 Determining the offset angle of the line converter

Procedure

Parameter	D	+	+	Parameter text	Online value VECTORGL_02	Unit
p6265				Motor sequence control test operations	Determination offset angle line-side converter	
r6066[0]				PU LSC rotating field detection	Clockwise rotating field (0)	
p6067[0]				PU offset angle	12.77	°
r6068[0]				PU offset angle measured	12.74	°
r6222.11				Determination offset angle line-side converter	Active	

Figure 5-13 Offset angle

1. Activate test mode "determination of offset angle line converter" by setting parameter p6265 = 3.
2. Switch on the drive.
   The auxiliaries are switched on and existing incoming circuit breakers (p6230) are closed. The motor is not excited.
3. Check parameter r6222.11.
4. Check the rotating field in parameter r6066.

5. After the state of the sequential control "determination of the offset angle of the line converters" in r3402 is reached, the offset angle of the converters is determined and displayed in r6068. The parameters are given indices if there are multiple systems.
6. Enter the offset angle displayed in r6068 between the line and synchronization voltage in p6067. Round the input up or down to obtain useful values (e.g. 31.59 ° = Input 30 °)
7. Select p0971 = 1 to save the changes you have made.
8. Switch off the drive.
9. Deactivate the test mode by setting the parameter p6265 = 0.

5.4.3 Determine the offset angle between system 1 and system 2 on the load side

Procedure

Note

The measurement is possible only with the motor decoupled or with no load, since a gradually decelerating machine is required.

1. Activate test mode "Determine load-side offset angle" by setting parameter p6265 = 4. The auxiliaries, existing incoming circuit breakers (p6230) and the excitation are switched on. After motor excitation and location, the converters are enabled in subsystem 1 only.
2. Read out the minimum speed in parameter r6065.
3. Set the minimum speed read with the permissible direction of rotation as default fixed speed.
4. Switch on the converter. The ramp-up settings are retained.
   As soon as the actual value reaches the setpoint, all pulses are blocked and the measurement of the phase voltages is performed on the decelerating machine via the TAS cards. The drive decelerates to a minimum speed (calculated internally) and then accelerates with the default ramp. The measurement is repeated cyclically until shutdown. The results are given in parameters r6068 [0] and r6066. They are available only during the deceleration phase.
   - Rotating field detection r6068
     This rotating filed must match the sign of the actual speed value (positive = right; negative = left)
   - Measured offset angle r6068
     This value must be set in parameter p6397 rounded to + 30 ° or - 30 ° with the drive disabled (directly for measurement in the right rotating field; with inverted sign for left rotating field)

5.4.4 Testing "Machine location"

Procedure

1. Modify the location cycles via parameter p6240.
   The remaining location cycles can be read in parameter r6241.
2. Activate "test mode of location" by setting the parameter p6265 = 1.
   The location process can be observed via parameters r0084 and r0094.
3. Deactivate the test mode by setting the parameter p6265 = 0.

No further message is output in this test mode after the location cycles have run.

For further information, see the description of the relevant parameters in the List Manual.

In the figure "Location on stopped machine", it is possible to read the angle of around -125° during location on the stopped machine. This angle should not change on further location attempts. The value specified for the flux actual value in parameter r0084 is displayed in this figure. The flux rises from 0% to approx. 100%.

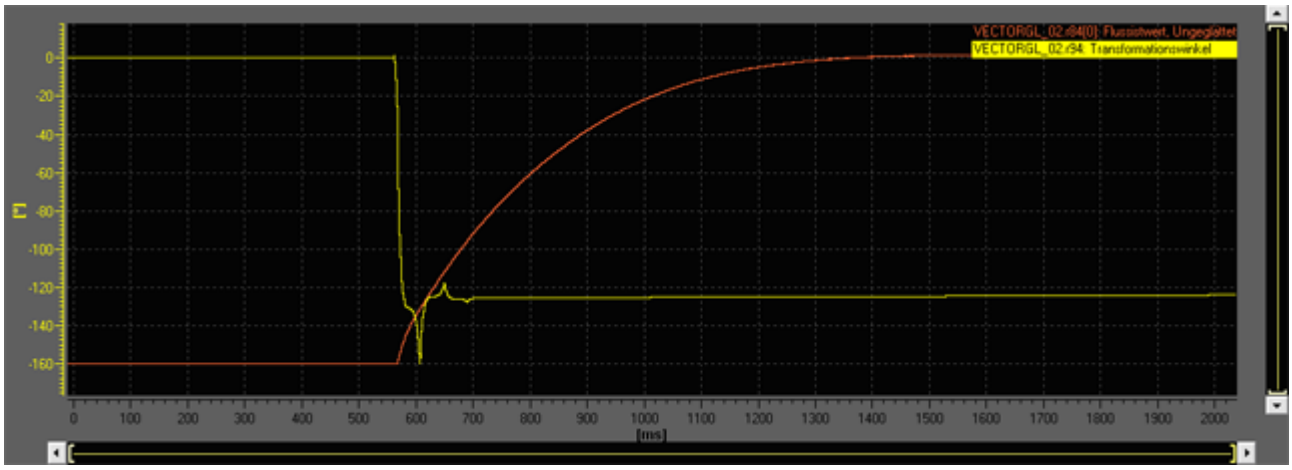


Figure 5-14 Location on stopped machine

The figure "location on slow turning machine" shows location on a machine that is still rotating slowly. It can be seen that the machine was located at around -50° and the angle then runs between ±180°.

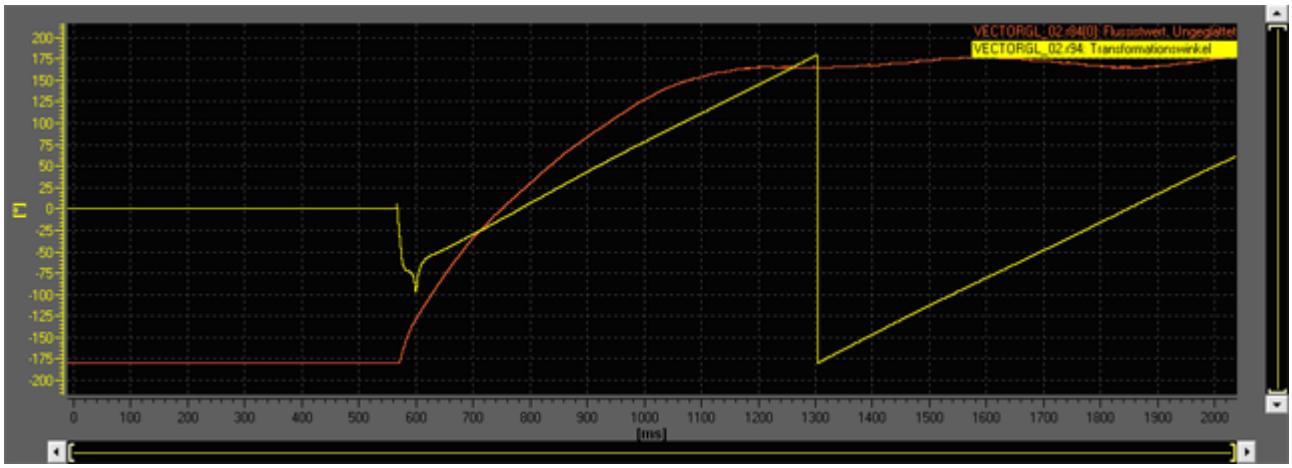


Figure 5-15 Location on slowly turning machine

5.4.5 Testing current-controlled operation

Procedure

The following figure shows the parameters relevant to "current-controlled operation".

Parameter	D	+	+	Parameter text	Online value VECTORGL_02	Unit
p6265				Motor sequence control test operations	Closed-loop current controlled operation (2)	
p6266				Motor sequence control manual operation	No pulse enable (0)	
p6350				LSC manual operation mode	Closed-loop current controlled operation (3)	
p6351				LSC manual operation, line substituting frequency	50.000	Hz
p6352				LSC manual operation, firing angle	100.000	°
p6353				LSC manual operation, current setpoint	10.000	%
r6320				CO: DC link current setpoint	100.0	A
r6321[0]				CO: DC link current actual value smoothed	101.4	A
p6270[0]	D			Motor closed-loop control minimum frequency	1.7	Hz
p6285				Test operation frequency	2.0	Hz

Figure 5-16 Test mode of "current-controlled operation"

- Activate the "test mode current-controlled operation" For this, set parameter p6265 = 2.
  - After activating this mode, the current setpoint is specified as 20 % in p6353. This percentage value refers to the value in parameter r0207 "power section rated DC link circuit current". The absolute value is displayed in parameter r6320.
  - Via parameter p6285, it is possible to define the required output frequency. This value should be higher than the value in parameter p6270, otherwise the alarm "minimum value not reached" appears.

Note

Parameters p6265, p6266 and p6350 are mutually interlocked so that only meaningful combinations are permitted. If a message box appears with the message "value rejected", then you must check the settings.

You will find further information in the help and in the List Manual for the description of the parameter in question.

5.4.6 Testing manual operation / partially manual operation

Description

This test mode can be used to control the converters individually for testing purposes. The example below explains how to perform partially manual testing:

The diagram shows the most important parameters for partially manual operation. This is a user-defined parameter list. The difference between "partially manual" and "manual" is described in detail in the help for parameter p6265.

Parameter	D	+	+	Parameter text	Online value VECTORGL_02	Unit
p6265				Motor sequence control test operations	Semi-manual operation (100)	
p6266				Motor sequence control manual operation	Pulse enable LSC 1 (1)	
p6350				LSC manual operation mode	Open-loop controlled operation with line supply voltage (2)	
p6351				LSC manual operation, line substituting frequency	50.000	Hz
p6352				LSC manual operation, firing angle	100.000	*
p6353				LSC manual operation, current setpoint	0.000	%
r6320				CO: DC link current setpoint	0.0	A
r6321[0]				CO: DC link current actual value smoothed	30.0	A
p6270[0]	D			Motor closed-loop control minimum frequency	1.7	Hz
p6285				Test operation frequency	2.0	Hz
r6260			+	CO/BO: Motor sequence control control commands	80180121H	
r6221			+	CO/BO: Sequence control control command	85000985H	
p6286				CO: Excitation current setpoint for test operation	0.0	%
r83				CO: Flux setpoint	100.0	%
r84[0]		+		Flux actual value, Unsmoothed	1.4	%
r6325[0]				CO: LSC firing angle	100.00	*
r2				Drive operating display	[00] Operation - everything enabled (0)	

Figure 5-17 Example: "Partially manual operation" parameter

Wiring

Carry out the following wiring for partially manual operation:

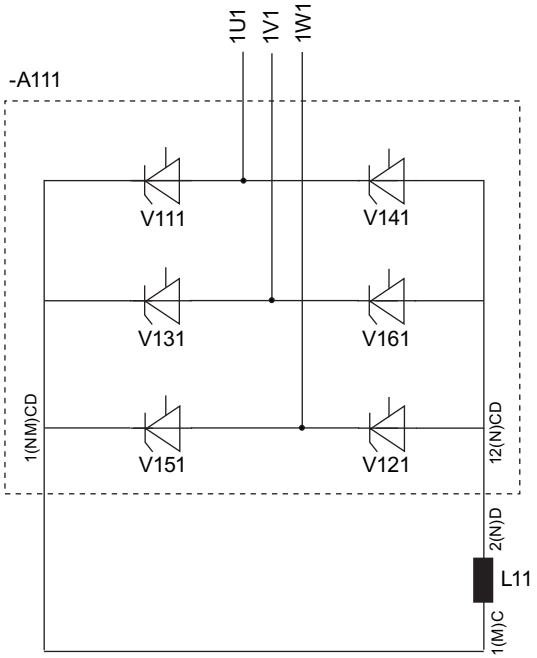


Figure 5-18 Wiring for partially manual operation

Performing partially manual operation

1. Select the test mode with p6265 = 100.
2. Select the converter with p6266 = 1 (example for LSC1).
3. Set the mode with p6350 = 2.
4. Use p6352 to specify the delay angle. Monitor the currents and voltages using an external measuring system.

Depending on the delay angle set in p6352, the following results may be obtained:

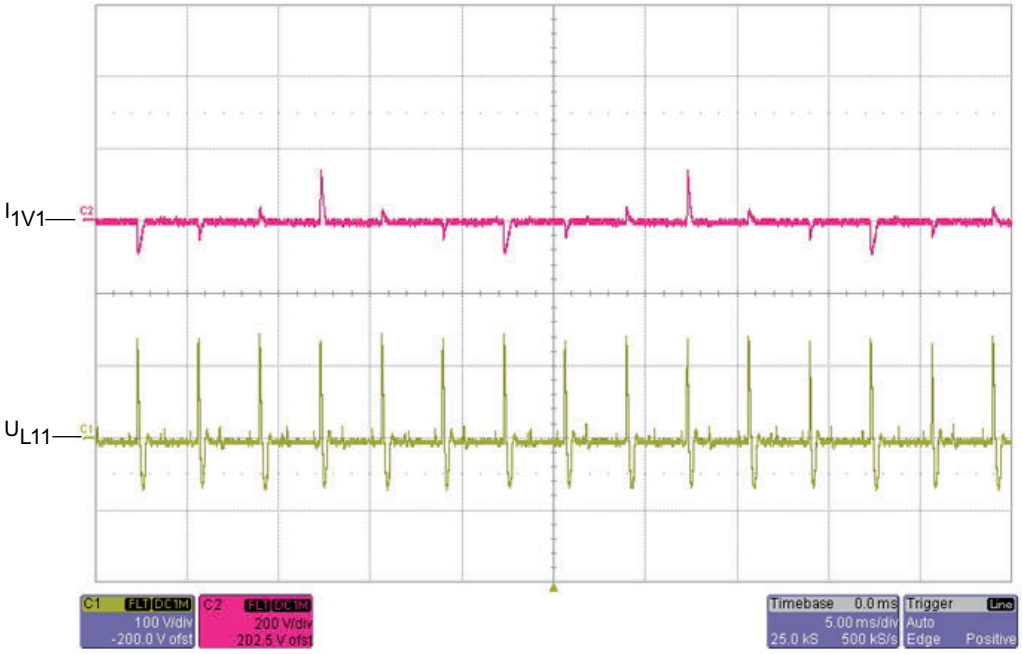


Figure 5-19 Delay angle p6225 = 125°

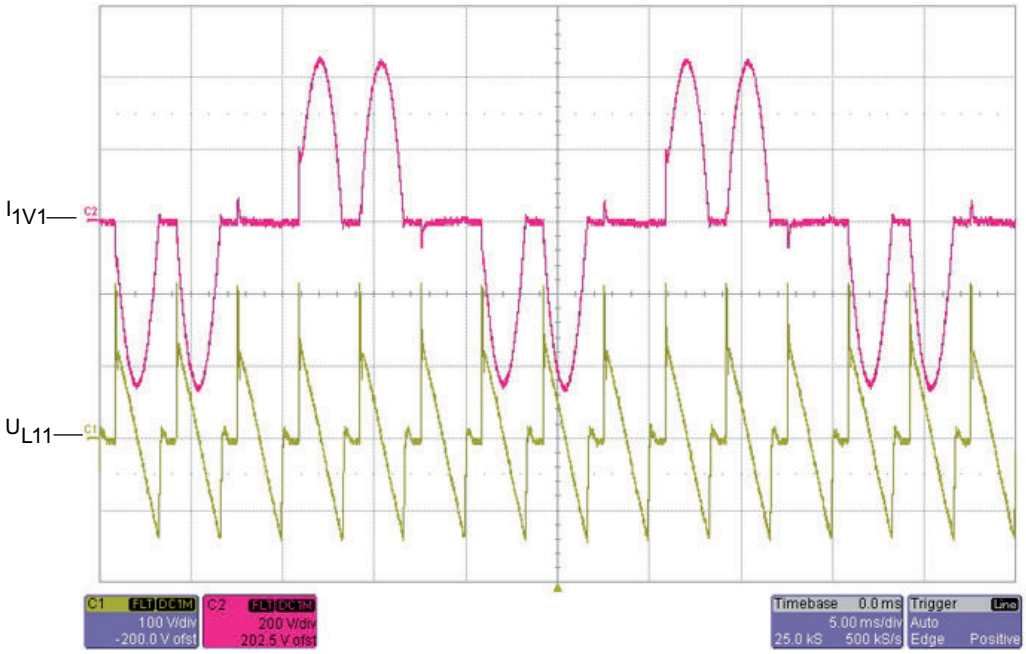


Figure 5-20 Delay angle p6225 = 100°

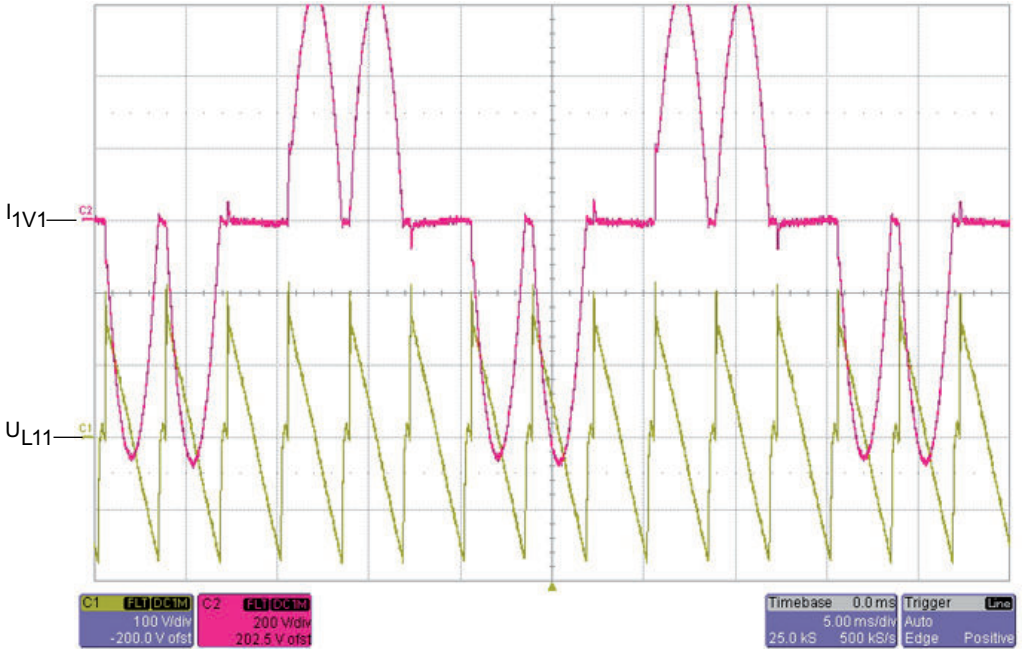


Figure 5-21 Delay angle p6225 = 95°

If a valve arm is not conductive, the following result is obtained:

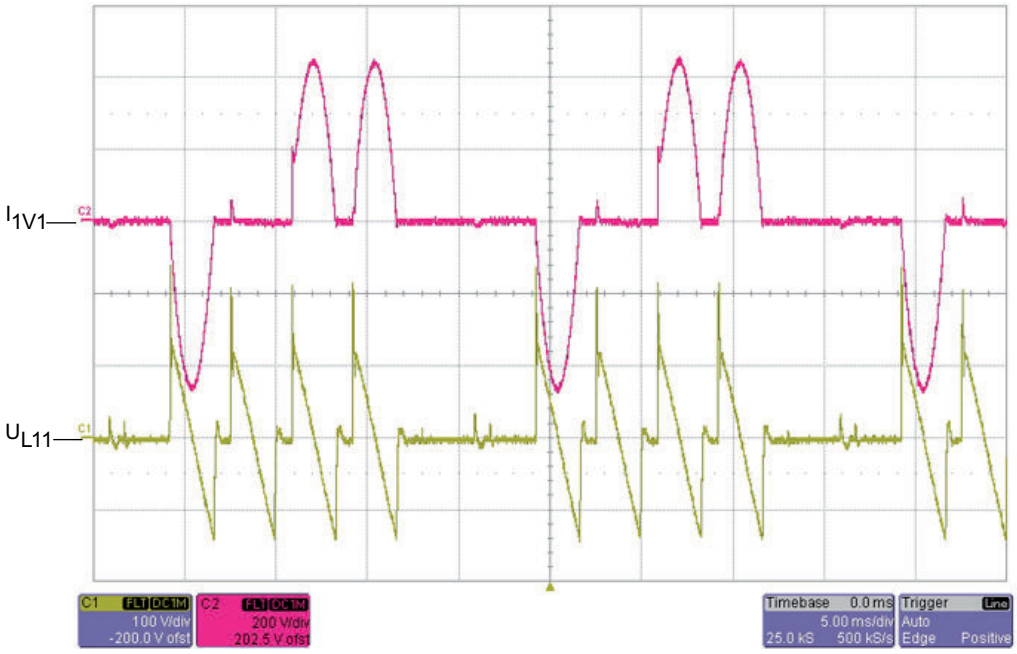


Figure 5-22 Delay angle p6352 = 100°, V151 defective

5.5 Setting the ground fault detection

Procedure

Make sure that no ground fault is present (converter power unit, including connected cables and transformer / motor).

The following figure shows the relevant parameters for setting the ground fault detection.

Parameter	Data set	+	+	Parameter text	Value VECTORGL_02	Unit	Modifiable to	Access level	Minimum	Maximum
r6047[0]				CO: ELP line supply displacement voltage	0.00	V		3		
r6048[0]				CO: ELP motor displacement voltage	0.00	V		3		
p6049[0]	D			ELP motor compensation factor 1	3.00		Operation	3	-100	100
p6050[0]				ELP motor compensation factor 2	1.00		Operation	3	-100	100
r6051[0]				CO: ELP line supply motor displacement voltage sum before the filter	0.00	V		3		
r6052[0]				CO: ELP line supply motor displacement voltage, total filtered	0.00	V		3		
p6053[0]	D			ELP integrator start threshold	673.61	V	Operation	3	0	100000
p6054[0]	D			ELP integrator increasing time constant	0.20	s	Operation	3	0	10
p6055[0]	D			ELP integrator decreasing time constant	0.50	s	Operation	3	0	10
r6056[0]				CO: ELP integrator output	0.00	%		3		
p6057[0]	D			ELP alarm thresh	25.00	%	Operation	3	0	200
p6058[0]	D			ELP fault thresh	50.00	%	Operation	3	0	200

Figure 5-23 Important parameters for ground fault detection

1. Set p6050 with compensation factor 2 so that parameter r6052 (filtered displacement voltage) is at a minimum during operation. Check the setting at several stationary operating points (speed, load).
2. If the configurations are different (e.g. with or without output transformer), use different data sets to achieve enhanced matching with compensation factor 1 (p6049).
3. Use p6053 to set the activation threshold slightly higher (approx. 1 or 2 times) than the highest value measured at r6052.

4. In cases where there are two systems, repeat the settings for parameter p6049[1] for the second system. Use parameter r6052[1] to check the setting.
5. If monitoring trips prematurely during dynamic processes, increase the settings of p6057 and p6058 slightly.

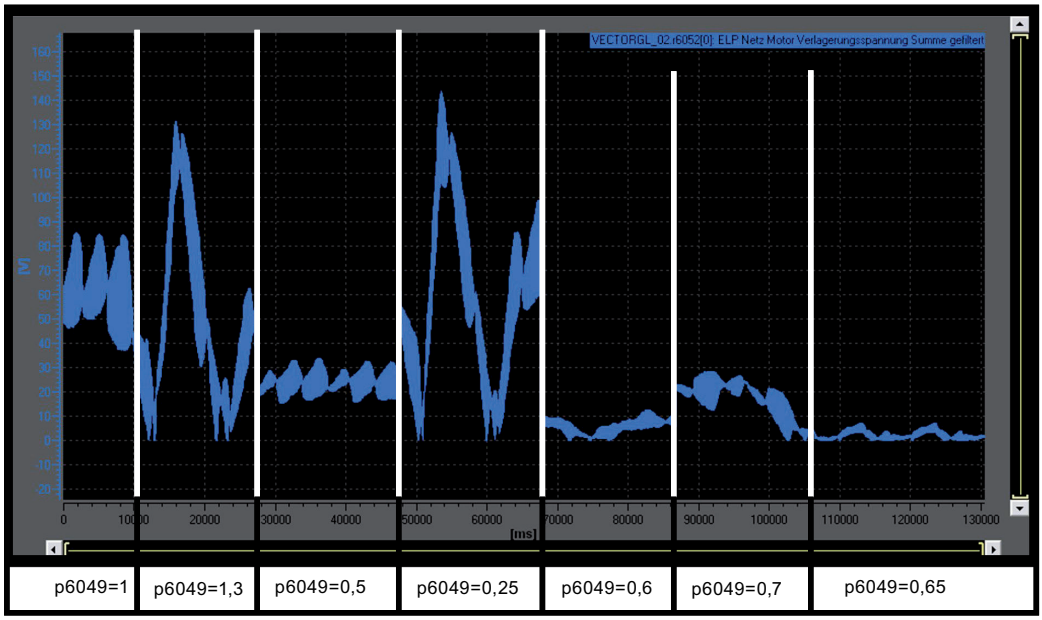


Figure 5-24 Displacement voltage during adaptation

You will find further information in the help and in the List Manual for the description of the parameter in question.

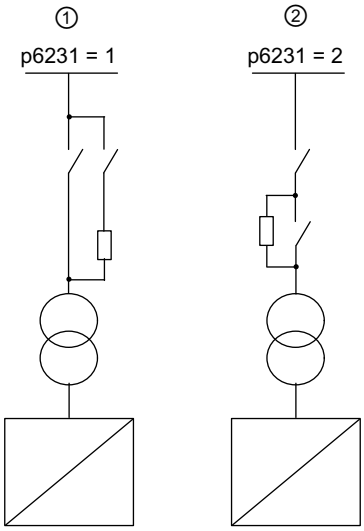
5.6 Setting the inrush circuit breaker

Description

The same hardware components (TM modules, terminals and contactors) are used for the load-side circuit breaker and the inrush switch. Therefore, you can only choose between inrush switch **or** load-side circuit breaker. It is not possible to choose an inrush switch **and** load-side circuit breaker.

A variety of parameter sets are used to specify the functionality.

The configuration of the inrush switch is selected using parameter p6231.



① Parallel arrangement
② Serial arrangement

Figure 5-25 Configuration of the inrush circuit breaker

Procedure

You must set and/or check the following parameters:

Table 5-3 Parameters for setting the inrush circuit breaker

Parameter	Description
p6150…p6155	Load-side change-over contact for circuit breaker (ready, on, off, etc.). The hardware components used for the inrush circuit breaker are the same as those that can be used for a load-side circuit breaker (for constellations with circuit breaker at the converter output and without inrush circuit breaker)
p6219	Delay for transformer inrush
p6231	Inrush line-side circuit breaker configuration
p6233	Inrush line-side circuit breaker number of configuration power on sequences
p6235	Inrush line-side circuit breaker monitoring period
p6237	Inrush line-side circuit breaker quiescent time
p6239	Inrush line-side circuit breaker bridging time

5.7 Optimizing the excitation data

5.7.1 Setting the no-load excitation current

Procedure

1. Trace the following parameters:
   - r0063[0] Actual speed value unsmoothed.
   - r0084[0] Actual flux value unsmoothed.
   - r1593[0] Flux controller output, PI output.
2. Monitor the output of the flux controller in stationary operation.
3. Modify parameter p1625 (excitation current setpoint calibration) so that the flux controller output is at approx. 0 A during stationary operation. Note the following figures.

Example: setting the no-load excitation current

P1625 = 100 %: Flux controller output -140 A. The no-load excitation current is too low.

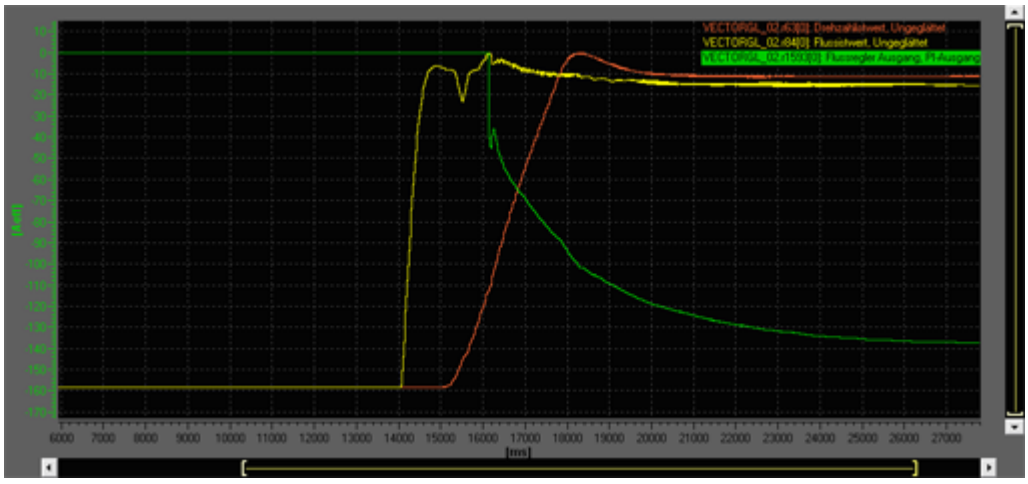


Figure 5-26 No-load excitation current p1625 = 100%

P1625 = 85 %: Flux controller output +62 A. The no-load excitation current is too high.

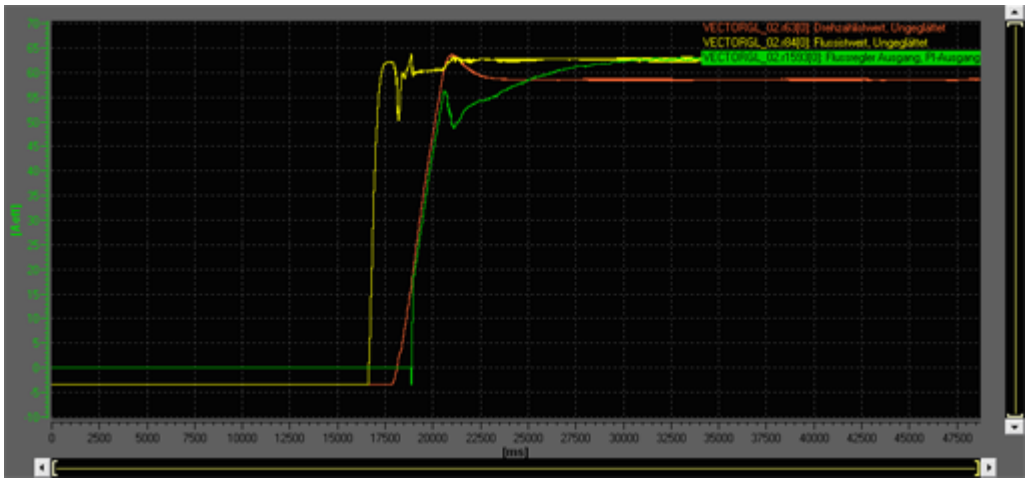


Figure 5-27 No-load excitation current p1625 = 85%

P1625 = 90 %: Flux controller output -2 A. An no-load excitation current of approx. -2A is achieved with this setting. The setting is correct.

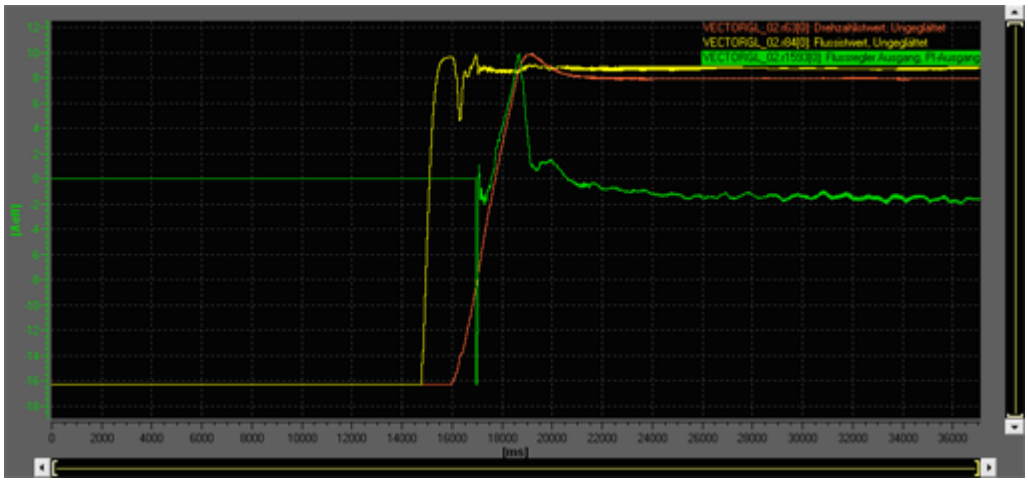


Figure 5-28 No-load excitation current p1625 = 90%

You will find further information in the help and in the List Manual for the description of the parameter in question.

5.7.2 Setting the actual flux value

Setting the actual flux value

1. Trace the following parameters on approach:
   - r0063[0] Actual speed value unsmoothed.
   - r0084[0] Actual flux value unsmoothed.
   - r1593[0] Flux controller output, PI output.
2. Modify parameter p0350 (motor stator resistance cold) so, that drops in the actual flux value are kept to a minimum on approach.
3. Use p1625[0] (Excitation current setpoint calibration) for fine adjustment. Note the following figures.

Example: setting the actual flux value with p350 "Motor stator resistance cold"

P350 = 0.67880%

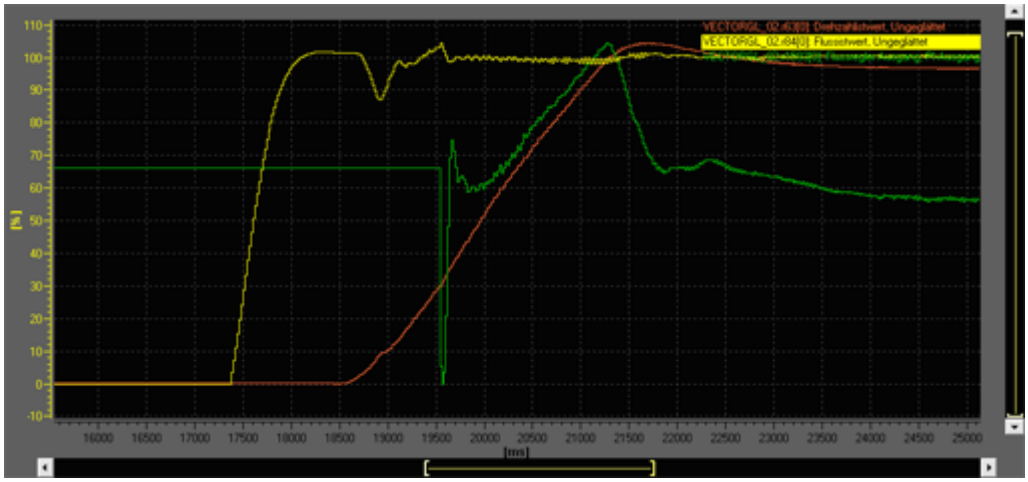


Figure 5-29 Set the actual flux value p350 = 0.067880%

p0350 = 0.60%

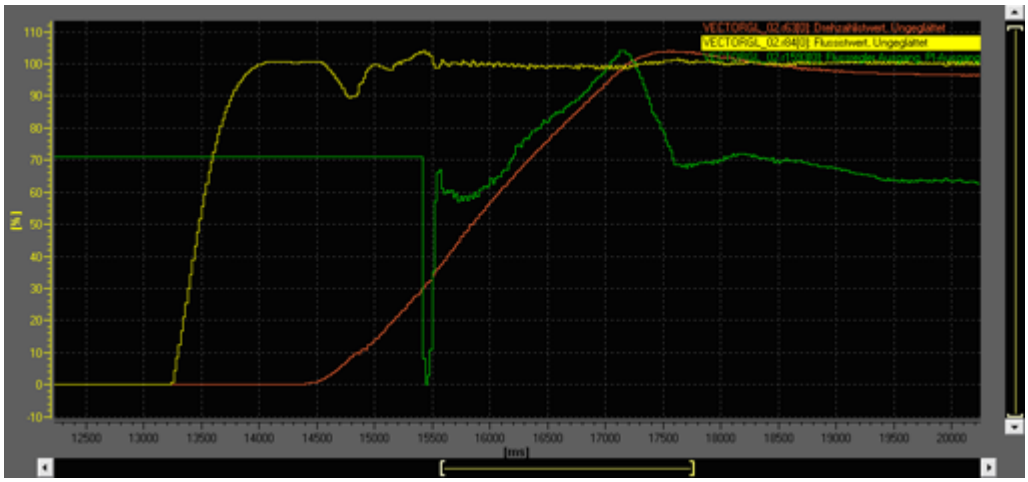


Figure 5-30 Set the actual flux value p350 = 0.60%

p0350 = 0.40%

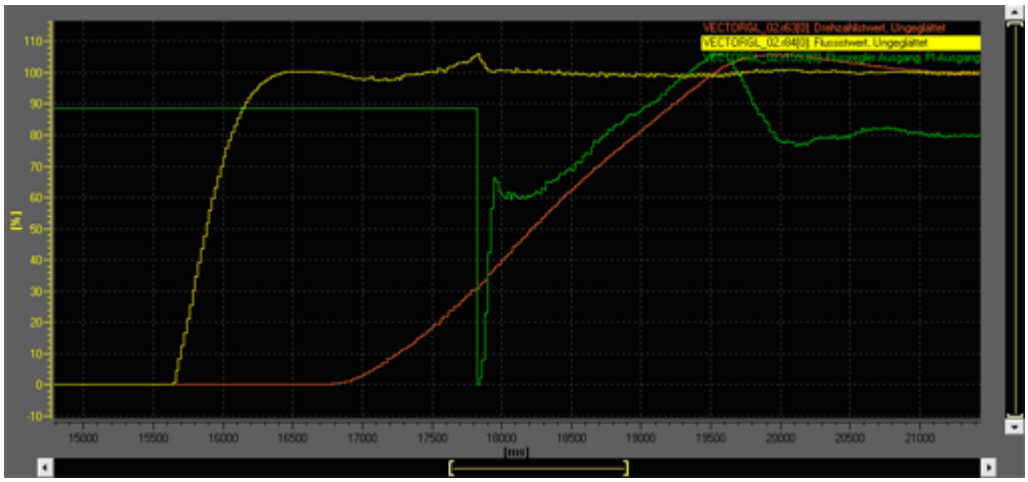


Figure 5-31 Set the actual flux value p0350 = 0.40%

You will find further information in the help and in the List Manual for the description of the parameter in question.

Functions 6

6.1 Activating the free function blocks

Description

The following free function blocks are available for customized configuration of the drive system.

The free function blocks are available for each drive object (CU, vector, TM). They must be activated each time as required. Activation must be carried out prior to further commissioning steps. To do this, proceed as follows:

1. Restore the online connection to the device.
2. Save all settings in the drive unit via RAM to ROM.
3. Load the data to the programming device and save them there too.
4. Disconnect the link to the drive.
5. Open Properties pop-up in the desired object with a right mouse click.
6. Open the function modules tab and activate the selection.
   After successful activation, the Properties pop-up is closed again automatically.
7. At the end of the expert list, the parameters appear for the free function blocks p20000 and the following.

For more information, see "Free Function Blocks" in the manual.

You can find the manual on the Internet (http://support.automation.siemens.com/WW/llisapi.dll).

1. Enter the Internet address
2. Select the desired language
3. In the navigation bar on the left of the homepage, select the GL150 converter and then the manual for the free function blocks.

6.2 Extended monitoring for sychronous motor and transformers

6.2.1 Description

Note

System-specific project engineering with extended monitoring functions

As a SIEMENS commissioning engineer, you will find a suggestion for system-specific project engineering with extended monitoring functions on the Intranet (Prodis) under ID 34833133.

The monitoring functions for the motor temperature and the transformer temperature are often implemented in an external automation system (PLC), for example S7. The DO vector GL supports this PLC evaluation. It is therefore possible, for example, to set temperature limits and/or trigger alarms with a plain-text message.

The precondition is a Profibus or Profinet connection between the PLC and the CU320 that supports the DP-Vx profile. In total, there are 32 receive and/or transmit process data words in this profile.

Because usually more than 32 words have to be exchanged, the drive object Vector-GL contains the following multiplexers / demultiplexers with which it is possible to reduce the number of process data items:

- Two 48-fold multiplexers for the setting values of temperature limits or bit masks.
- Two 48-fold demultiplexers for displaying temperature actual values or bit words.
- An 8-fold multiplexer for triggering 8x32 alarms.

The multiplexers can optionally be 'interconnected' with process data words or written or read to the corresponding inputs via the 'write/read' parameter services.

PLC application

For SINAMICS GL150 solutions, an application has been produced for an S7-300 CPU. This application uses the following process data (PZD).

- Send PZD3 – address send parameter.
- Send PZD4 – parameter 16bit analog.
- Send PZD5 – parameter 16bit binary.
- Send PZD6 – address message 32bit.
- Send PZD7 – messages bits 0-15.
- Send PZD8 – messages bits 16-31.
- Send PZD3 – address receive parameter.
- Send PZD4 – parameter 16bit analog.
- Send PZD5 – parameter 16bit binary.
- Send PZD6 – address message 32bit.

PZD (send)	SinamicsGL parameter	PZD (receive)	SinamicsGL parameter
PZD3	r2050[2]	PZD3	r2051[2]
PZD4	r2050[3]	PZD4	r2051[3]
PZD5	r2050[4]	PZD5	r2051[4]
PZD6	r2050[5]	PZD6	r2051[5]
PZD7+PZD8	r2066[6]		

The diagram below shows the two 48-fold multiplexers for the setting values. The valid range of values of the control signal in r7719 is 0...47.

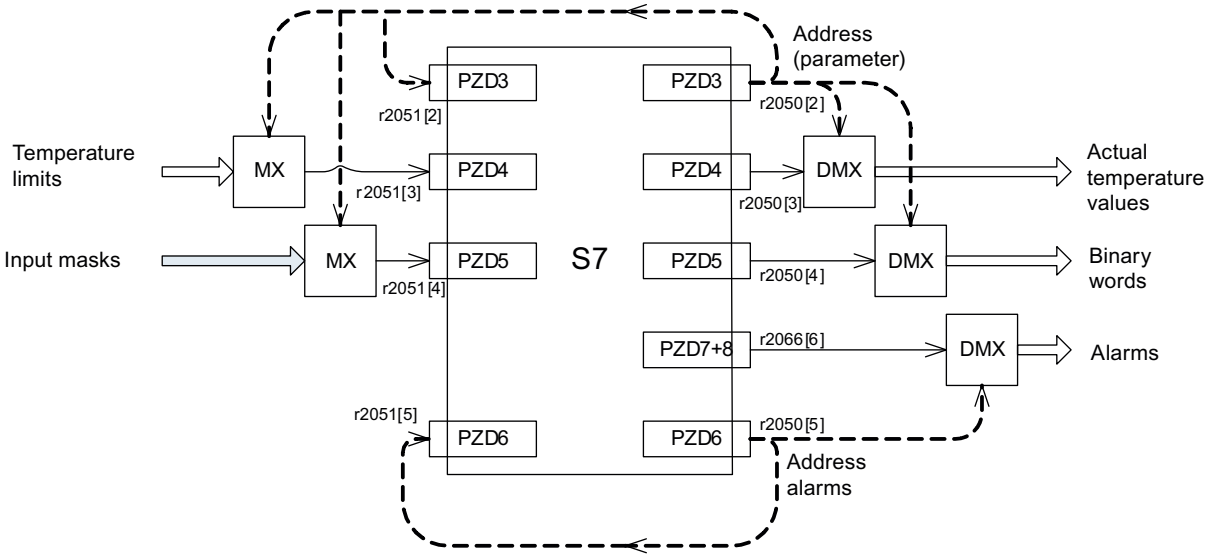


Figure 6-1 Communication between Sinamics GL and S7

Adjustable parameters

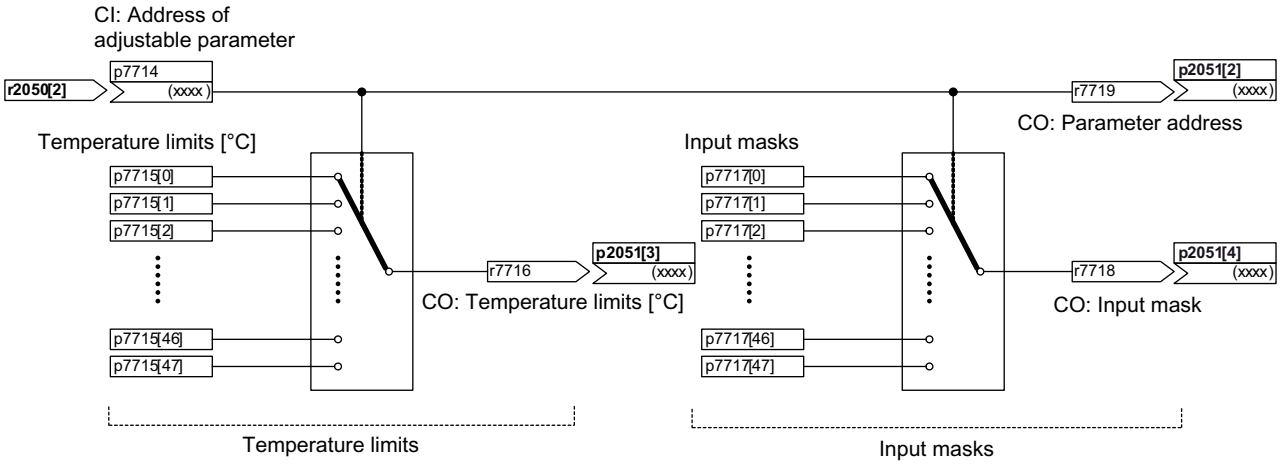


Figure 6-2 Adjustable parameters

- The temperature limits in p7715 are used to set the alarm and fault thresholds for temperature monitoring.
- The input masks in p7718 are used to set the configuration and adapt the level of digital inputs to the PLC application.
- Instead of PZD exchange of setting values, these values can also be read by the PLC from p7715 and/or p7717 using the 'Read parameters' service.
- Scaling:
  The temperatures are scaled with 16384/100 °C. A temperature of 100 °C corresponds to a fixed decimal point value of 16384.

Principle of operation

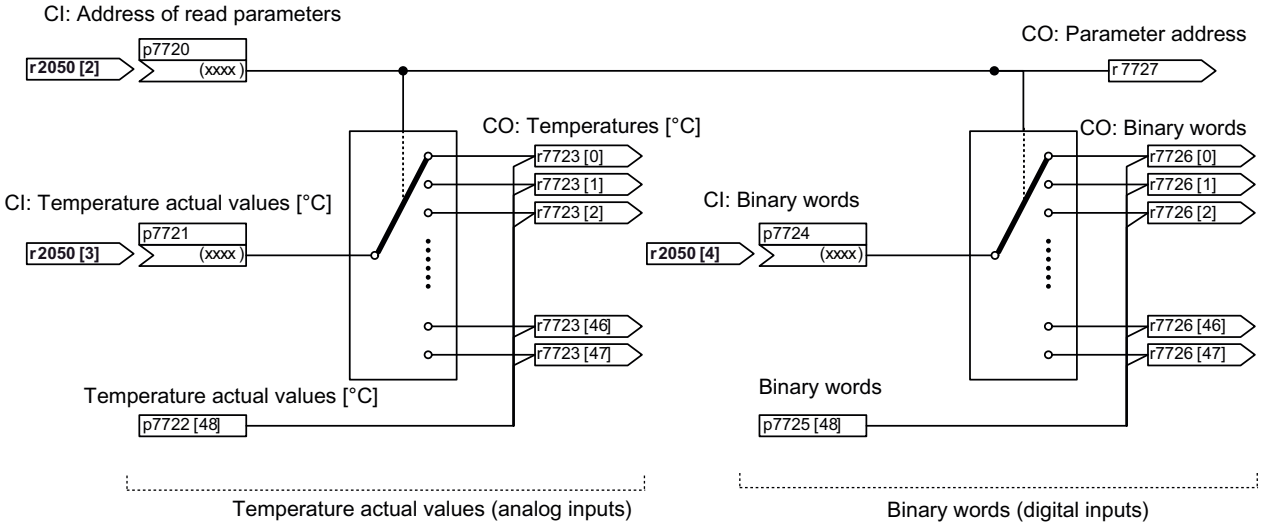


Figure 6-3 Read parameters

Multiplexing and demultiplexing works as follows:

The automation system (PLC, e.g. S7) sends the current address and waits for confirmation from Sinamics that the address has been read correctly. At the same time, the data are sent. The address is read and forwarded by the PLC. If only the PLC receives the address just sent, the address is incremented and new data are made available.

The measured actual temperatures are read, demultiplexed and displayed in parameter p7723. Binary words show the states of the digital inputs (p7726).

The actual temperature values and binary words can also be overwritten using the 'Write parameter' service (p7722, p7725). In this case, the BICO inputs must not be connected.

Alarms

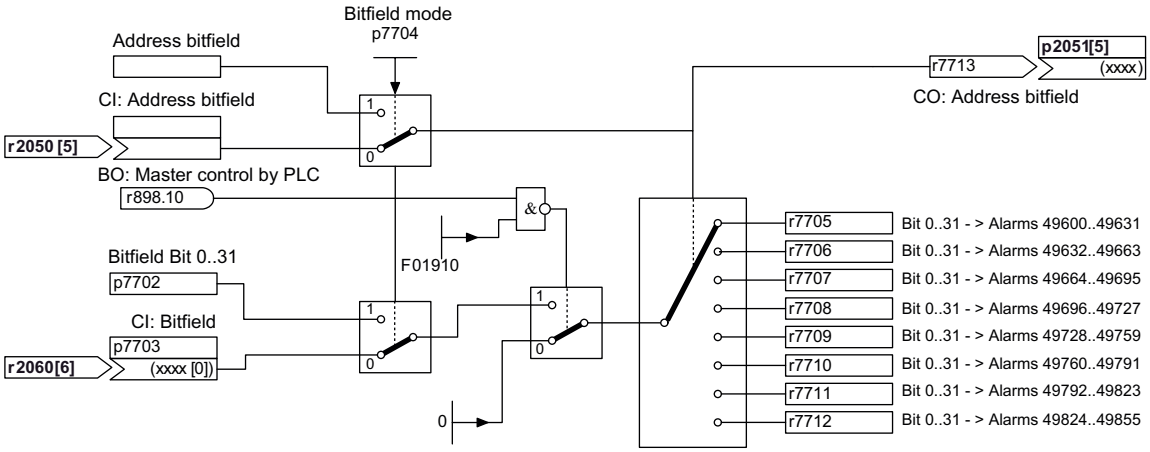


Figure 6-4 Alarms

A bit set in parameter r7705 ff. produces one of the alarms listed in the diagram.

Parameters r7705 ff. are described at the relevant control signal of the multiplexer. The valid range is 0..7.

The multiplexer can be controlled both via the BICO inputs p7701 and p7703 and by writing parameters p7700 and p7702. You must make the selection in parameter p7704.

If PROFIBUS control is missing (control word 1, bit 10), or if there is a cyclic telegram error from the DP master, the entries in the bit field can be reset with the fault acknowledgement depending on the mode set in parameter p7704. During CU power-up, parameters r7705ff. are initialized with '0'.

The sections below provide a list of the parameters and alarms in the PLC application and their meanings.

6.2.2 Binary value displays

Table 6-1 Binary value displays

Parameter #	Parameter description	Signal Description		r7727
r7726[0]	Status digital inputs (input Transformer)	Input Dry Transformer	Bit 0 T1-CORE TEMPERATURE ALARM	0
			Bit 1 T1 WINDING TEMP.ALARM	
			Bit 2 T1 CORE TEMPERATURE TRIP	
			Bit 3 T1 WINDING TEMP.TRIP	
			Bit 4 T2 CORE TEMPERATURE ALARM	
			Bit 5 T2 WINDING TEMP.ALARM	
			Bit 6 T2 CORE TEMPERATURE TRIP	
			Bit 7 T2 WINDING TEMP.TRIP	
		Input Oil Transformer	Bit 8 BUCHHOLZ PROTECTION ALARM	
			Bit 9 BUCHHOLZ PROTECTION TRIP	
			Bit 10 OIL LEVEL LIMIT 1	
			Bit 11 OIL LEVEL LIMIT 2	
			Bit 12 OIL TEMPERATURE LIMIT 1	
			Bit 13 OIL TEMPERATURE LIMIT 2	
			Bit 14 OIL PRESSURE LIMIT 1	
			Bit 15 OIL PRESSURE LIMIT 2	
r7726[1]	Status digital inputs (output Transformer)	Output Dry Transformer	Bit 0 T1 CORE TEMPERATURE ALARM	1
			Bit 1 T1 WINDING TEMP.ALARM	
			Bit 2 T1 CORE TEMPERATURE TRIP	
			Bit 3 T1 WINDING TEMP.TRIP	
			Bit 4 T2 CORE TEMPERATURE ALARM	
			Bit 5 T2 WINDING TEMP.ALARM	
			Bit 6 T2 CORE TEMPERATURE TRIP	
			Bit 7 T2 WINDING TEMP.TRIP	
		Output Oil Transformer	Bit 8 BUCHHOLZ PROTECTION ALARM	
			Bit 9 BUCHHOLZ PROTECTION TRIP	
			Bit 10 OIL LEVEL LIMIT 1	
			Bit 11 OIL LEVEL LIMIT 2	
			Bit 12 OIL TEMPERATURE LIMIT 1	
			Bit 13 OIL TEMPERATURE LIMIT 2	
			Bit 14 OIL PRESSURE LIMIT 1	
			Bit 15 OIL PRESSURE LIMIT 2	

Parameter #	Parameter description	Signal Description		r7727
r7726[2]	Status digital inputs (Motor monitoring)	Motor monitoring	Bit 0 LEAKAGE-WATER SENSOR 1	**2**
			Bit 1 LEAKAGE-WATER SENSOR 2	
			Bit 2 PRESSURE BEARING-OIL 1 OK	
			Bit 3 PRESSURE BEARING-OIL 2 OK	
			Bit 4 OIL FLOW DE-BEARING LIMIT	
			Bit 5 OIL FLOW NDE-BEARING LIMIT	
			Bit 6 OIL FLOW EXCITAT.-BEARING LIMIT	
			Bit 7 SPARE	
			Bit 8 VIBRATION DE-BEARING LIMIT 1	
			Bit 9 VIBRATION DE-BEARING LIMIT 2	
			Bit 10 VIBRATION NDE-BEARING LIMIT 1	
			Bit 11 VIBRATION NDE-BEARING LIMIT 2	
			Bit 12 VIBRATION EXCIT.-BEARING LIMIT 1	
			Bit 13 VIBRATION EXCIT.-BEARING LIMIT 2	
			Bit 14 VIBRATION MEASUREMENT OK	
			Bit 15 MOTOR PRESSURIZED	
r7726[3]	Status digital inputs (Spare)	Free	Bit 0 …Bit 7 Free	**3**
		Spare	Bit 8… Bit 9 Spare	
r7726[4]	Status digital inputs (Free)	Free	Bit 0 …Bit 15 Free	**4**
r7726[5]	Status digital inputs (Filter CB)	Filter CB	Bit 0 FILTER CB FEEDBACK READY (NU)	**5**
			Bit 1 FILTER CB FEEDBACK ON (NU)	
			Bit 2 .. Bit 7 Free	
			Bit 8 FILTER CB COMMAND ON (NU)	
			Bit 9 FILTER CB COMMAND OFF(NU)	
			Bit 10 .. Bit 15 Free	
r7726[6]..[47]	Free	Free	Free	**6..47**

6.2.3 Display the actual temperature values

Table 6-2 Display the actual temperature values

Parameter #	Parameter description	Signal Description		r7727
r7723[0]	Status analog inputs	Actual value input transformer dry / oil	T1 core temp. / oil temp.	0
r7723 [1]			T2 core temp. / Winding 1 temp.	1
r7723 [2]			T1 Winding temp. / Winding 2 temp.	2
r7723 [3]			T2 Winding temp. / Winding 3 temp.	3
r7723 [4]			T1 Analog input spare / Winding 4 temp.	4
r7723 [5]			T2 Analog input spare / Analog input spare	5
r7723 [6]			Not used / Winding 5 temp.	6
r7723 [7]			Not used / Winding 6 temp.	7
r7723 [8]		Actual value output transformer dry / oil	T1 core temp. / oil temp.	8
r7723 [9]			T2 core temp. / Winding 1 temp.	9
r7723 [10]			T1 Winding temp. / Winding 2 temp.	10
r7723 [11]			T2 Winding temp. / Winding 3 temp.	11
r7723 [12]			T1 Analog input spare / Winding 4 temp.	12
r7723 [13]			T2 Analog input spare / Analog input spare	13
r7723 [14]			Not used / Winding 5 temp.	14
r7723 [15]			Not used / Winding 6 temp.	15
r7723 [16]		Actual value motor monitoring	Temperature excitation bearing	16
r7723 [17]			Temperature excitation winding 1	17
r7723 [18]			Temperature excitation winding 2	18
r7723 [19]			Temperature excitation winding 3	19
r7723 [20]			Analog input 1 spare	20
r7723 [21]			Analog input 2 spare	21
r7723 [22]			Analog input 3 spare	22
r7723 [23]			Analog input 4 spare	23
r7723 [24]			Temperature DE bearing	24
r7723 [25]			Temperature NDE bearing	25
r7723 [26]			Temperature stator winding 1	26
r7723 [27]			Temperature stator winding 2	27
r7723 [28]			Temperature stator winding 3	28
r7723 [29]			Temperature stator winding 4	29
r7723 [30]			Temperature stator winding 5	30
r7723 [31]			Temperature stator winding 6	31
r7723 [32]			Temperature cold air 1	32
r7723 [33]			Temperature cold air 2	33
r7723 [34]			Temperature cold air 3	34
r7723 [35]			Temperature hot air 1	35
r7723 [36]			Temperature hot air 2	36
r7723 [37]			Analog input 5 spare	37
r7723 [38]..[47]			free	38..47

6.2.4 Limit values for temperature monitoring

Table 6-3 Limit values for temperature monitoring

Parameter #	Parameter description	Signal Description		r7719
p7715[0]	Limit General		Hysteresis %	0
p7715[1]	Limits input transformer	Trip dry / oil	T1/T2 core temp. / oil temp.	1
p7715[2]		Alarm dry / oil	T1/T2 core temp. / oil temp.	2
p7715[3]		Trip dry / oil	T1/T2 Winding temp. / Winding 1-4 temp.	3
p7715[4]		Alarm dry / oil	T1/T2 Winding temp. / Winding 1-4 temp.	4
p7715[5]		Trip dry / oil	spare 1 / spare	5
p7715[6]		Alarm dry / oil	spare 1 / spare	6
p7715[7]		Trip dry / oil	spare 2 / free	7
p7715[8]		Alarm dry / oil	spare 2 / free	8
p7715[9]	Limits output transformer	Trip dry / oil	T1/T2 core temp. / oil temp.	9
p7715[10]		Alarm dry / oil	T1/T2 core temp. / oil temp.	10
p7715[11]		Trip dry / oil	oil T1/T2 Winding temp. / Winding 1-4 temp.	11
p7715[12]		Alarm dry / oil	oil T1/T2 Winding temp. / Winding 1-4 temp.	12
p7715[13]		Trip dry / oil	spare 1 / spare	13
p7715[14]		Alarm dry / oil	spare 1 / spare	14
p7715[15]		Trip dry / oil	spare 2 / free	15
p7715[16]		Alarm dry / oil	spare 2 / free	16

Parameter #	Parameter description	Signal Description		r7719
p7715[17]	Limits motor monitoring	Trip	Temperature excitation bearing	**17**
p7715[18]		Alarm	Temperature excitation bearing	**18**
p7715[19]		Trip	Temperature excitation winding 1-3	**19**
p7715[20]		Alarm	Temperature excitation winding 1-3	**20**
p7715[21]		Trip	Spare 1	**21**
p7715[22]		Alarm	Spare 1	**22**
p7715[23]		Trip	Spare 2	**23**
p7715[24]		Alarm	Spare 2	**24**
p7715[25]		Trip	Spare 3	**25**
p7715[26]		Alarm	Spare 3	**26**
p7715[27]		Trip	Spare 4	**27**
p7715[28]		Alarm	Spare 4	**28**
p7715[29]		Trip	Temperature DE bearing	**29**
p7715[30]		Alarm	Temperature DE bearing	**30**
p7715[31]		Trip	Temperature NDE bearing	**31**
p7715[32]		Alarm	Temperature NDE bearing	**32**
p7715[33]		Trip	Temperature stator winding 1-6	**33**
p7715[34]		Alarm	Temperature stator winding 1-6	**34**
p7715[35]		Trip	Temperature cold air 1-3	**35**
p7715[36]		Alarm	Temperature cold air 1-3	**36**
p7715[37]		Trip	Temperature hot air 1, 2	**37**
p7715[38]		Alarm	Temperature hot air 1, 2	**38**
p7715[39]		Trip	Spare 5	**39**
p7715[40]		Alarm	Spare 5	**40**
p7715[41]…[47]		Free	Free	**41…47**

6.2.5 Adaptation of configuration/level for binary inputs

Table 6-4 Adaptation of configuration/level for binary inputs

Parameter #	Parameter Description	Signal Description		r7719
p7717[0]	General	Bit 0	With A07_2 Input dry transformer	0
		Bit 1	With A07_2 Input oil transformer	
		Bit 2	With A08 Output dry transformer	
		Bit 3	With A09 Motor monitoring	
		Bit 4	With AXX Inrush circuit breaker (not used)	
		Bit 5	With AXY breaker filter/compen. (not used)	
		Bit 6	Free	
		Bit 7	With Modus 32-Bit messages (not used)	
		Bit 8	9 With Bit field AI (not used)	
		Bit 9… 15	Free	
p7717[1]	With analog inputs	Bit 0	T1 core temperature analog input	1
		Bit 1	T2 core temperature analog input	
		Bit 2	T1 winding temperature analog input	
		Bit 3	T2 winding temperature analog input	
		Bit 4	T1 spare analog input	
		Bit 5	T2 spare analog input	
		Bit 6	Free	
		Bit 7	Free	
	With analog inputs (Input oil transformer)	Bit 8	Oil temperature analog input	
		Bit 9	Winding 1 temperature analog input	
		Bit 10	Winding 2 temperature analog input	
		Bit 11	Winding 3 temperature analog input	
		Bit 12	Winding 4 temperature analog input	
		Bit 13	Spare analog input	
		Bit 14	Winding 5 temperature analog input	
		Bit 15	Winding 6 temperature analog input	

Parameter #	Parameter Description	Signal Description		r7719
p7717[2]	With analog inputs (Output dry transformer)	Bit 0	T1 core temperature analog input	**2**
		Bit 1	T2 core temperature analog input	
		Bit 2	T1 winding temperature analog input	
		Bit 3	T2 winding temperature analog input	
		Bit 4	T1 spare analog input	
		Bit 5	T2 spare analog input	
		Bit 6	Free	
		Bit 7	Free	
	With analog inputs (Output oil transformer)	Bit 8	Oil temperature analog input	
		Bit 9	Winding 1 temperature analog input	
		Bit 10	Winding 2 temperature analog input	
		Bit 11	Winding 3 temperature analog input	
		Bit 12	Winding 4 temperature analog input	
		Bit 13	Spare analog input	
		Bit 14	Winding 5 temperature analog input	
		Bit 15	Winding 6 temperature analog input	
p7717[3]	With analog inputs (Motor monitoring)	Bit 0	Temp. Excitation bearing analog input	**3**
		Bit 1	Temp. Excitation winding 1 analog input	
		Bit 2	Temp. Excitation winding 2 analog input	
		Bit 3	Temp. Excitation winding 3 analog input	
		Bit 4	Spare analog input 1	
		Bit 5	Spare analog input 2	
		Bit 6	Spare analog input 3	
		Bit 7	Spare analog input 4	
		Bit 8	DE bearing analog input	
		Bit 9	NDE bearing analog input	
		Bit 10	Temp. Stator winding 1 analog input	
		Bit 11	Temp. Stator winding 2 analog input	
		Bit 12	Temp. Stator winding 3 analog input	
		Bit 13	Temp. Stator winding 4 analog input	
		Bit 14	Temp. Stator winding 5 analog input	
		Bit 15	Temp. Stator winding 6 analog input	
p7717[4]	With analog inputs (Motor monitoring)	Bit 0	Temp. Cold air 1 analog input	**4**
		Bit 1	Temp. Cold air 2 analog input	
		Bit 2	Temp. Cold air 3 analog input	
		Bit 3	Temp. Hot air 1 analog input	
		Bit 4	Temp. Hot air 2 analog input	
		Bit 5	Spare analog input 5	
		Bit 6… 15	Free	

Parameter #	Parameter Description	Signal Description		r7719
p7717[5]	Selection binary inputs normally closed Output transformer	dry/oil	Bit 0 T1 core temp. alarm / buchholz protection alarm	**5**
		dry/oil	Bit 1 T1 winding temp.alarm / buchholz protection trip	
		dry/oil	Bit 2 T1 core temp. trip / oil level limit 1	
		dry/oil	Bit 3 T1 winding temp.trip / / oil level limit 2	
		dry/oil	Bit 4 T2 core temp. alarm / oil temperature limit 1	
		dry/oil	Bit 5 T2 winding temp. alarm / / oil temperature limit 2	
		dry/oil	Bit 6 T2 core temp. trip / oil pressure limit 1	
		dry/oil	Bit 7 T2 winding temp.trip / / oil pressure limit 2	
	Selection binary inputs normally closed Input transformer	dry/oil	Bit 8 T1 core temp. alarm / buchholz protection alarm	
		dry/oil	Bit 9 T1 winding temp.alarm / buchholz protection trip	
		dry/oil	Bit 10 10 T1 core temp. trip / oil level limit 1	
		dry/oil	Bit 11 T1 winding temp.trip / / oil level limit 2	
		dry/oil	Bit 12 T2 core temp. alarm / oil temperature limit 1	
		dry/oil	Bit 13 T2 winding temp. alarm / / oil temperature limit 2	
		dry/oil	Bit 14 T2 core temp. trip / oil pressure limit 1	
		dry/oil	Bit 15 T2 winding temp.trip / / oil pressure limit 2	
p7717[6]	Selection binary inputs normally closed Circuit breaker filter / compensation	Bit 0	feedback ready (not used)	**6**
		Bit 1	feedback on (not used)	
		Bit 3 … 7	Free	
	Selection binary inputs normally closed Inrush circuit breaker	Bit 8..15	Free	
p7717[7]	Selection binary inputs normally closed Motor monitoring	Bit 0	Vibration DE bearing limit 1	**7**
		Bit 1	Vibration DE bearing limit 2	
		Bit 2	Vibration NDE bearing limit 1	
		Bit 3	Vibration NDE bearing limit 2	
		Bit 4	Vibration excitation bearing limit 1	
		Bit 5	Vibration excitation bearing limit 2	
		Bit 6	Vibration measurement OK	
		Bit 7	Motor pressurized	
		Bit 8	Leakage water sensor 1	
		Bit 9	Leakage water sensor 2	
		Bit 10	Pressure bearing oil 1 OK	
		Bit 11	Pressure bearing oil 2 OK	
		Bit 12	Oil flow DE bearing limit	
		Bit 13	Oil flow NDE bearing limit	
		Bit 14	Oil flow excitation bearing limit	
		Bit 15	Spare	

Parameter #	**Parameter Description**	**Signal Description**		**r7719**
p7717[8]	Selection binary inputs normally closed Motor monitoring	Bit 0 …7	Free	**8**
		Bit 8 … 15	Spare	
p7717[9]…[47]	Free	Bit 0 … 15	Free	**9..47**

6.2.6 Alarms

Table 6-5 Alarms

Parameter #	Alarm #	Alarm Description	r7713
r7726[0]	A49600	Bit 0 Input dry transformer: T1 core temperature alarm analog input	0
	F49601	Bit 1 Input dry transformer: T1 core temperature trip analog input	
	A49602	Bit 2 Input dry transformer: T2 core temperature alarm analog input	
	F49603	Bit 3 Input dry transformer: T2 core temperature trip analog input	
	A49604	Bit 4 Input dry transformer: T1 winding temperature alarm analog input	
	F49605	Bit 5 Input dry transformer: T1 winding temperature trip analog input	
	A49606	Bit 6 Input dry transformer: T2 winding temperature alarm analog input	
	F49607	Bit 7 Input dry transformer: T2 winding temperature trip analog input	
	A49608	Bit 8 Input dry transformer: T1 core temperature alarm binary input	
	F49609	Bit 9 Input dry transformer: T1 core temperature trip binary input	
	A49610	Bit 10 Input dry transformer: T1 winding temperature alarm binary input	
	F49611	Bit 11 Input dry transformer: T1 winding temperature trip binary input	
	A49612	Bit 12 Input dry transformer: T2 core temperature alarm binary input	
	F49613	Bit 13 Input dry transformer: T2 core temperature trip binary input	
	A49614	Bit 14 Input dry transformer: T2 winding temperature alarm binary input	
	F49615	Bit 15 Input dry transformer: T2 winding temperature trip binary input	
	A49616	Bit 16 Input dry transformer: T1 spare AI alarm	
	F49617	Bit 17 Input dry transformer: T1 spare AI trip	
	A49618	Bit 18 Input dry transformer: T2 spare AI alarm	
	F49619	Bit 19 Input dry transformer: T2 spare AI trip	
	A49620	Bit 20 Input dry transformer: Free	
	A49621	Bit 21 Input dry transformer: Free	
	A49622	Bit 22 Input dry transformer: Free	
	A49623	Bit 23 Input dry transformer: Free	
	A49624	Bit 24 Input dry transformer: T1 core AI overload alarm	
	F49625	Bit 25 Input dry transformer: T2 core AI overload trip	
	A49626	Bit 26 Input dry transformer: T1 winding AI overload alarm	
	F49627	Bit 27 Input dry transformer: T2 winding AI overload trip	
	A49628	Bit 28 Input dry transformer: T1 spare AI overload alarm	
	F49629	Bit 29 Input dry transformer: T2 spare AI overload trip	
	A49630	Bit 30 Input dry transformer: Free	
	A49631	Bit 31 Input dry transformer: Free	

Parameter #	Alarm #	Alarm Description	r7713
r7706	A49632	Bit 0 Input oil transformer: oil temperature alarm	1
	F49633	Bit 1 Input oil transformer: oil temperature trip	
	A49634	Bit 2 Input oil transformer: winding 1 temperature alarm	
	F49635	Bit 3 Input oil transformer: winding 1 temperature trip	
	A49636	Bit 4 Input oil transformer: winding 2 temperature alarm	
	F49637	Bit 5 Input oil transformer: winding 2 temperature trip	
	A49638	Bit 6 Input oil transformer: winding 3 temperature alarm	
	F49639	Bit 7 Input oil transformer: winding 3 temperature trip	
	A49640	Bit 8 Input oil transformer: Bucholz protection alarm	
	F49641	Bit 9 Input oil transformer: Bucholz protection trip	
	A49642	Bit 10 Input oil transformer: oil level limit 1 alarm	
	F49643	Bit 11 Input oil transformer: oil level limit 2 trip	
	A49644	Bit 12 Input oil transformer: oil temperature limit 1 binary input alarm	
	F49645	Bit 13 Input oil transformer: oil temperature limit 2 binary input trip	
	A49646	Bit 14 Input oil transformer: oil pressure limit 1 alarm	
	F49647	Bit 15 Input oil transformer: oil pressure limit 2 trip	
	A49648	Bit 16 Input oil transformer: winding 4 temperature alarm	
	F49649	Bit 17 Input oil transformer: winding 4 temperature trip	
	A49650	Bit 18 Input oil transformer: spare AI alarm	
	F49651	Bit 19 Input oil transformer: spare AI trip	
	A49652	Bit 20 Input oil transformer: winding 5 temperature alarm	
	F49653	Bit 21 Input oil transformer: winding 5 temperature trip	
	A49654	Bit 22 Input oil transformer: winding 6 temperature alarm	
	F49655	Bit 23 Input oil transformer: winding 6 temperature trip	
	A49656	Bit 24 Input oil transformer: oil temperature AI overload	
	A49657	Bit 25 Input oil transformer: winding 1 temperature AI overload	
	A49658	Bit 26 Input oil transformer: winding 2 temperature AI overload	
	A49659	Bit 27 Input oil transformer: winding 3 temperature AI overload	
	A49660	Bit 28 Input oil transformer: winding 4 temperature AI overload	
	A49661	Bit 29 Input oil transformer: spare AI overload	
	A49662	Bit 30 Input oil transformer: winding 5 temperature AI overload	
	A49663	Bit 31 Input oil transformer: winding 6 temperature AI overload	

Parameter #	Alarm #	Alarm Description	r7713
r7707	A49664	Bit 0 Output dry transformer: T1 core temperature alarm analog input	2
	F49665	Bit 1 Output dry transformer: T1 core temperature trip analog input	
	A49666	Bit 2 Output dry transformer: T2 core temperature alarm analog input	
	F49667	Bit 3 Output dry transformer: T2 core temperature trip analog input	
	A49668	Bit 4 Output dry transformer: T1 winding temperature alarm analog input	
	F49669	Bit 5 Output dry transformer: T1 winding temperature trip analog input	
	A49670	Bit 6 Output dry transformer: T2 winding temperature alarm analog input	
	F49671	Bit 7 Output dry transformer: T2 winding temperature trip analog input	
	A49672	Bit 8 Output dry transformer: T1 core temperature alarm binary input	
	F49673	Bit 9 Output dry transformer: T1 core temperature trip binary input	
	A49674	Bit 10 Output dry transformer: T1 winding temperature alarm binary input	
	F49675	Bit 11 Output dry transformer: T1 winding temperature trip binary input	
	A49676	Bit 12 Output dry transformer: T2 core temperature alarm binary input	
	F49677	Bit 13 Output dry transformer: T2 core temperature trip binary input	
	A49678	Bit 14 Output dry transformer: T2 winding temperature alarm binary input	
	F49679	Bit 15 Output dry transformer: T2 winding temperature trip binary input	
	A49680	Bit 16 Output dry transformer: T1 spare AI alarm	
	F49681	Bit 17 Output dry transformer: T1 spare AI trip	
	A49682	Bit 18 Output dry transformer: T2 spare AI alarm	
	F49683	Bit 19 Output dry transformer: T2 spare AI trip	
	A49684	Bit 20 Output dry transformer: Free	
	A49685	Bit 21 Output dry transformer: Free	
	A49686	Bit 22 Output dry transformer: Free	
	A49687	Bit 23 Output dry transformer: Free	
	A49688	Bit 24 Output dry transformer: T1 core AI overload	
	A49689	Bit 25 Output dry transformer: T2 core AI overload	
	A49690	Bit 26 Output dry transformer: T1 winding AI overload	
	A49691	Bit 27 Output dry transformer: T2 winding AI overload	
	A49692	Bit 28 Output dry transformer: T1 spare AI overload	
	A49693	Bit 29 Output dry transformer: T2 spare AI overload	
	A49694	Bit 30 Output dry transformer: Free	
	A49695	Bit 31 Output dry transformer: Free	

Parameter #	Alarm #	Alarm Description	r7713
r7708	A49696	Bit 0 Output oil transformer: oil temperature alarm	**3**
	F49697	Bit 1 Output oil transformer: oil temperature trip	
	A49698	Bit 2 Output oil transformer: winding 1 temperature alarm	
	F49699	Bit 3 Output oil transformer: winding 1 temperature trip	
	A49700	Bit 4 Output oil transformer: winding 2 temperature alarm	
	F49701	Bit 5 Output oil transformer: winding 2 temperature trip	
	A49702	Bit 6 Output oil transformer: winding 3 temperature alarm	
	F49703	Bit 7 Output oil transformer: winding 3 temperature trip	
	A49704	Bit 8 Output oil transformer: Bucholz protection alarm	
	F49705	Bit 9 Output oil transformer: Bucholz protection trip	
	A49706	Bit 10 Output oil transformer: oil level limit 1 alarm	
	F49707	Bit 11 Output oil transformer: oil level limit 2 trip	
	A49708	Bit 12 Output oil transformer: oil temperature limit 1 binary input alarm	
	F49709	Bit 13 Output oil transformer: oil temperature limit 2 binary input trip	
	A49710	Bit 14 Output oil transformer: oil pressure limit 1 alarm	
	F49711	Bit 15 Output oil transformer: oil pressure limit 2 trip	
	A49712	Bit 16 Output oil transformer: winding 4 temperature alarm	
	F49713	Bit 17 Output oil transformer: winding 4 temperature trip	
	A49714	Bit 18 Output oil transformer: spare AI alarm	
	F49715	Bit 19 Output oil transformer: spare AI trip	
	A49716	Bit 20 Output oil transformer: winding 5 temperature alarm	
	F49718	Bit 21 Output oil transformer: winding 5 temperature trip	
	A49718	Bit 22 Output oil transformer: winding 6 temperature alarm	
	F49719	Bit 23 Output oil transformer: winding 6 temperature trip	
	A49720	Bit 24 Output oil transformer: oil temperature AI overload	
	A49721	Bit 25 Output oil transformer: winding 1 temperature AI overload	
	A49722	Bit 26 Output oil transformer: winding 2 temperature AI overload	
	A49723	Bit 27 Output oil transformer: winding 3 temperature AI overload	
	A49724	Bit 28 Output oil transformer: winding 4 temperature AI overload	
	A49725	Bit 29 Output oil transformer: spare AI overload	
	A49726	Bit 30 Output oil transformer: winding 5 temperature AI overload	
	A49727	Bit 31 Output oil transformer: winding 6 temperature AI overload	

Parameter #	Alarm #	Alarm Description	r7713
r7709	A49728	Bit 0 Motor monitoring: vibration DE bearing limit 1 alarm	**4**
	F49729	Bit 1 Motor monitoring: vibration DE bearing limit 2 trip	
	A49730	Bit 2 Motor monitoring: vibration NDE bearing limit 1 alarm	
	F49731	Bit 3 Motor monitoring: vibration NDE bearing limit 2 trip	
	A49732	Bit 4 Motor monitoring: vibration excitation bearing limit 1 alarm	
	F49733	Bit 5 Motor monitoring: vibration excitation bearing limit 2 trip	
	A49734	Bit 6 Motor monitoring: vibration measurement OK alarm	
	A49735	Bit 7 Motor monitoring: motor pressurized alarm	
	A49736	Bit 8 Motor monitoring: leakage water sensor 1 alarm	
	A49737	Bit 9 Motor monitoring: leakage water sensor 2 alarm	
	A49738	Bit 10 Motor monitoring: pressure bearing oil 1 OK alarm	
	A49739	Bit 11 Motor monitoring: pressure bearing oil 2 OK alarm	
	A49740	Bit 12 Motor monitoring: oil flow DE bearing limit alarm	
	A49741	Bit 13 Motor monitoring: oil flow NDE bearing limit alarm	
	A49742	Bit 14 Motor monitoring: oil flow excitation bearing limit alarm	
	A49743	Bit 15 Motor monitoring: spare DI	
	A49744	Bit 16 Motor monitoring: temperature excitation bearing alarm	
	F49745	Bit 17 Motor monitoring: temperature excitation bearing trip	
	A49746	Bit 18 Motor monitoring: temperature excitation winding 1 alarm	
	F49747	Bit 19 Motor monitoring: temperature excitation winding 1 trip	
	A49748	Bit 20 Motor monitoring: temperature excitation winding 2 alarm	
	F49749	Bit 21 Motor monitoring: temperature excitation winding 2 trip	
	A49750	Bit 22 Motor monitoring: temperature excitation winding 3 alarm	
	F49751	Bit 23 Motor monitoring: temperature excitation winding 3 trip	
	A49752	Bit 24 Motor monitoring: spare DI	
	A49753	Bit 25 Motor monitoring: spare DI	
	A49754	Bit 26 Motor monitoring: spare DI	
	A49755	Bit 27 Motor monitoring: spare DI	
	A49756	Bit 28 Motor monitoring: free	
	A49757	Bit 29 Motor monitoring: spare DI	
	A49758	Bit 30 Motor monitoring: spare DI	
	A49759	Bit 31 Motor monitoring: spare DI	

Parameter #	Alarm #	Alarm Description	r7713
r7710	A49760	Bit 0 Motor monitoring: temperature DE bearing alarm	**5**
	F49761	Bit 1 Motor monitoring: temperature DE bearing trip	
	A49762	Bit 2 Motor monitoring: temperature NDE bearing alarm	
	F49763	Bit 3 Motor monitoring: temperature NDE bearing trip	
	A49764	Bit 4 Motor monitoring: temperature stator winding 1 alarm	
	F49765	Bit 5 Motor monitoring: temperature stator winding 1 trip	
	A49766	Bit 6 Motor monitoring: temperature stator winding 2 alarm	
	F49767	Bit 7 Motor monitoring: temperature stator winding 2 trip	
	A49768	Bit 8 Motor monitoring: spare AI 1 alarm	
	F49769	Bit 9 Motor monitoring: spare AI 1 trip	
	A49770	Bit 10 Motor monitoring: spare AI 2 alarm	
	F49771	Bit 11 Motor monitoring: spare AI 2 trip	
	A49772	Bit 12 Motor monitoring: spare AI 3 alarm	
	F49773	Bit 13 Motor monitoring: spare AI 3 trip	
	A49774	Bit 14 Motor monitoring: spare AI 4 alarm	
	F49775	Bit 15 Motor monitoring: spare AI 4 trip	
	A49776	Bit 16 Motor monitoring: temperature cold air 1 alarm	
	F49777	Bit 17 Motor monitoring: temperature cold air 1 trip	
	A49778	Bit 18 Motor monitoring: temperature cold air 2 alarm	
	F49779	Bit 19 Motor monitoring: temperature cold air 2 trip	
	A49780	Bit 20 Motor monitoring: temperature cold air 3 alarm	
	F49781	Bit 21 Motor monitoring: temperature cold air 3 trip	
	A49782	Bit 22 Motor monitoring: temperature hot air 1 alarm	
	F49783	Bit 23 Motor monitoring: temperature hot air 1 trip	
	A49784	Bit 24 Motor monitoring: temperature stator winding 3 alarm	
	F49785	Bit 25 Motor monitoring: temperature stator winding 3 trip	
	A49786	Bit 26 Motor monitoring: temperature stator winding 4 alarm	
	F49787	Bit 27 Motor monitoring: temperature stator winding 4 trip	
	A49788	Bit 28 Motor monitoring: temperature stator winding 5 alarm	
	F49789	Bit 29 Motor monitoring: temperature stator winding 5 trip	
	A49790	Bit 30 Motor monitoring: temperature stator winding 6 alarm	
	F49791	Bit 31 Motor monitoring: temperature stator winding 6 trip	

Parameter #	Alarm #	Alarm Description	r7713
r7711	A49792	Bit 0 Motor monitoring: spare AI 1 overload	6
	A49793	Bit 1 Motor monitoring: spare AI 2 overload	
	A49794	Bit 2 Motor monitoring: spare AI 3 overload	
	A49795	Bit 3 Motor monitoring: spare AI 4 overload	
	A49796	Bit 4 Motor monitoring: temperature DE bearing AI overload	
	A49797	Bit 5 Motor monitoring: temperature NDE bearing AI overload	
	A49798	Bit 6 Motor monitoring: temperature stator winding 1 AI overload	
	A49799	Bit 7 Motor monitoring: temperature stator winding 2 AI overload	
	A49800	Bit 8 Motor monitoring: temperature hot air 2 alarm	
	F49801	Bit 9 Motor monitoring: temperature hot air 2 trip	
	A49802	Bit 10 Motor monitoring: spare AI 5 alarm	
	F49803	Bit 11 Motor monitoring: spare AI 5 trip	
	A49804	Bit 12 Motor monitoring: temperature excitation bearing AI overload	
	A49805	Bit 13 Motor monitoring: temperature excitation winding 1 AI overload	
	A49806	Bit 14 Motor monitoring: temperature excitation winding 2 AI overload	
	A49807	Bit 15 Motor monitoring: temperature excitation winding 3 AI overload	
	A49808	Bit 16 Motor monitoring: temperature hot air 2 AI overload	
	A49809	Bit 17 Motor monitoring: spare AI 5 overload	
	A49810	Bit 18 Motor monitoring: free	
	A49811	Bit 19 Motor monitoring: free	
	A49812	Bit 20 Motor monitoring: free	
	A49813	Bit 21 Motor monitoring: free	
	A49814	Bit 22 Motor monitoring: free	
	A49815	Bit 23 Motor monitoring: free	
	A49816	Bit 24 Motor monitoring: temperature stator winding 3 AI overload	
	A49817	Bit 25 Motor monitoring: temperature stator winding 4 AI overload	
	A49818	Bit 26 Motor monitoring: temperature stator winding 5 AI overload	
	A49819	Bit 27 Motor monitoring: temperature stator winding 6 AI overload	
	A49820	Bit 28 Motor monitoring: cold air 1 AI overload	
	A49821	Bit 29 Motor monitoring: cold air 2 AI overload	
	A49822	Bit 30 Motor monitoring: cold air 3 AI overload	
	A49823	Bit 31 Motor monitoring: temperature hot air 1 AI overload	

Parameter #	Alarm #	Alarm Description	r7713
	A49824	Bit 0 Parameter input transformer plausibility check option	7
	A49825	Bit 1 Parameter output transformer plausibility check option	
	A49826	Bit 2 Parameter input dry/oil transformer plausibility check AI	
	A49827	Bit 3 Parameter output dry/oil transformer plausibility check AI	
	A49828	Bit 4 Free	
	A49829	Bit 5 Free	
	A49830	Bit 6 Free	
	A49831	Bit 7 Free	
	A49832	Bit 8 Free	
	A49833	Bit 9 Free	
	A49834	Bit 10 Free	
	A49835	Bit 11 Free	
	A49836	Bit 12 FILTER CIRCUIT BREAKER: TRIP FEEDBACK READY (not used)	
	A49837	Bit 13 FILTER CIRCUIT BREAKER: TRIP FEEDBACK ON (not used)	
	A49838	Bit 14 FILTER CIRCUIT BREAKER: TRIP FEEDBACK OF(not used)	
	A49839… A49855	Bit 15… 31 Free	

Alarm, error and system messages 7

7.1 Evaluation of thyristor alarms

Description

In addition to the fault messages in STARTER or AOP, further information is displayed in parameters p6072 to p6077.

Thyristors are numbered as follows:

- The first number states the number of the system (1 to 4).
- The second describes the thyristor location (1 to 6).
- The third figure states the location in the series connection (1 to 6).

Example

In the following figure, for example, there is a faulty thyristor in system 1, arm 5, the third in the series connection.

Parameter	D	+	+	Parameter text	Online value VECTORGL_02
//Thyristor monitoring					
r6069			+	PU sequence control enable signals for valve monitoring	0H
p6070[0]		-		PU thyristor monitoring operating mode, Line side	Thyristor monitoring test mode (1)
p6070[1]				PU thyristor monitoring operating mode, Motor side	Thyristor monitoring normal operation (2)
r6071			+	CO: PU thyristor monitoring status word	4000H
r6072[0]			+	CO: PU LSC thyristor location fault arm 1/4	0H
r6073[0]			+	CO: PU LSC thyristor location fault arm 3/6	0H
r6074[0]			-	CO: PU LSC thyristor location fault arm 5/2	400H
r6074[0].0				Arm 2 thyristor location 1	OK
r6074[0].1				Arm 2 thyristor location 2	OK
r6074[0].2				Arm 2 thyristor location 3	OK
r6074[0].3				Arm 2 thyristor location 4	OK
r6074[0].4				Arm 2 thyristor location 5	OK
r6074[0].5				Arm 2 thyristor location 6	OK
r6074[0].6				Reserved	0
r6074[0].7				Reserved	0
r6074[0].8				Arm 5 thyristor location 1	OK
r6074[0].9				Arm 5 thyristor location 2	OK
r6074[0].10				Arm 5 thyristor location 3	Defect
r6074[0].11				Arm 5 thyristor location 4	OK
r6074[0].12				Arm 5 thyristor location 5	OK
r6074[0].13				Arm 5 thyristor location 6	OK
r6074[0].14				Reserved	0
r6074[0].15				Reserved	0
r6075[0]			+	CO: PU MSC thyristor location fault arm 1/4	0H
r6076[0]			+	CO: PU MSC thyristor location fault arm 3/6	0H
r6077[0]			+	CO: PU MSC thyristor location fault arm 5/2	0H

Figure 7-1 Example: Thyristor V153 defective

For comparison, the following figure shows a 24/12-pulse system. Here, each parameter for the line side appears with four and each parameter for the load side, with two indices. These indicate the individual thyristor locations as shown in the figure above.

Parameter	D	+	+	Parameter text	Value Drive
r6072[0]		+	+	CO: PU LSC thyristor location fault arm 1/4	0H
r6073[0]		+	+	CO: PU LSC thyristor location fault arm 3/6	0H
r6074[0]		-	+	CO: PU LSC thyristor location fault arm 5/2	0H
r6074[1]			+	CO: PU LSC thyristor location fault arm 5/2	0H
r6074[2]			+	CO: PU LSC thyristor location fault arm 5/2	0H
r6074[3]			+	CO: PU LSC thyristor location fault arm 5/2	0H
r6075[0]		+	+	CO: PU MSC thyristor location fault arm 1/4	0H
r6076[0]		+	+	CO: PU MSC thyristor location fault arm 3/6	0H
r6077[0]		-	+	CO: PU MSC thyristor location fault arm 5/2	0H
r6077[1]			+	CO: PU MSC thyristor location fault arm 5/2	0H

Figure 7-2 Example of four systems on the line side, two systems on the load side

7.2 Hardware trace

Description

Each time there is a fault trip, the drive dumps data to the CompactFlash card; these data are required by Customer Support in the case of a fault.

Save your data as follows:

1. Switch off the drive.
2. Remove the Compact Flash card from the CU.
3. Save all data (TRACE***.bin and TRACE_INFO.txt) in the directory "user/sinamics/data".
4. Send these data to Customer Support.

Troubleshooting/FAQs 8

8.1 FAQs

Question	Response
I cannot obtain sufficient torque / power. What can I do?	Check parameter p1520 (upper torque limit) / p1530 (motoring power limit). If automatic default values are entered here, you can input values up to 1.2 times the default values.

8.2 Contacts and technical support

Competent personnel

Note

Siemens-trained personnel

Certain components described in this documentation may be replaced or repaired only by personnel trained by Siemens. This guarantees that the product is safe.

Work carried out incorrectly can result in damage to the equipment and in breakdown during operation.

Ensure that only personnel trained by Siemens carry out work on the equipment. Siemens accepts no liability for any damage that occurs because these instructions have not been observed e.g. if an untrained person carries out a repair or replaces components.

For information on training courses and help with technical questions please contact the persons listed in the following section.

Spare parts and repairs

You can find the spare parts list for your converter online at:

- **https://b2b-extern.automation.siemens.com/spares_on_web**

If you wish to request a spare parts list, you must provide the order number and serial number of your converter. You can find the required information on the converter rating plate.

The spare parts service keeps a stock of key spare parts for round-the-clock delivery. You can find out online whether the spare part you require is currently in stock:

- **www.weblogxparts.industry.siemens.com**

Spare parts service in Germany (at weekends: emergency service)

- **Tel.: +49 (0)180 50 50 448**

Note

Always indicate the part number and - if known - the order number (MLFB) of the spare part required.

Where to find these:

On the side of each component, its item code is attached to the cabinet wall. Find out which item code the required spare part has. The parts list supplied with the converter indicates the part number and, where appropriate, the order number (MLFB) corresponding to the item code.

Online support

The homepage to the complete Siemens I DT service for external customers and for Siemens I IS can be found under:

www.siemens.com/automation/service&support

Technical inquiries

You can send your inquiries directly via the Internet to a specialist in Technical Support. Technical support is available round the clock 365 days a year. Your inquiries are delivered directly to the responsible specialist. If you have all relevant data available, Technical Support can respond to your inquiry as quickly as possible. Furthermore, you can send records, screen shots and photos to the specialists. You thus support the fault analysis.

www.siemens.com/automation/support-request

Technical Support (Hotline)

Technical advice from experts or the initiation of the necessary actions are accessed **exclusively** via Siemens AG I DT Technical Support.

Inquiries can be made worldwide at three Technical Support Centers.

Telephone inquiries

- Europe and Africa time zone:
  Tel.: **+49 (0)180 50 50 222**
- Asia and Australia time zone:
  Tel.: **+86 1064 719 990**
- America time zone:
  Tel.: **+1 423 262 2522**

On the Internet worldwide:

www.siemens.com/automation/support-request

The contacts may change. Please find the current contact partners in the Siemens AG I DT service catalog: www.automation.siemens.com/partner

Country-specific phone numbers

You will find the country-specific phone numbers on our Internet page:

http://support.automation.siemens.com/WW/view/en/16604318

8.3 Software update from version 2.5.1 to version 2.6.1

Notes

- The hardware description (ACX file) of version 2.5.1 on the CompactFlash card is not compatible with version 2.6.1.
- The evaluation of the ground switches has been changed.

SINAMICS software	Ground switch open	Ground switch closed
V 2.5.1	1	0
V 2.6.1	0	1

- The firmware of the Power Stack Adapter must be updated.
- A project that has already been parameterized with software version V2.5.1 cannot be transformed to a project in software version V2.6.1. The project must be re-parameterized in software version V2.6.1 (where appropriate via script).

Procedure

1. Disconnect the DRIVE-CliQ components
2. Replace the existing CompactFlash card in the CU320 with the new CompactFlash card that contains software version 2.6.1.
3. Switch on the voltage to the DRIVE-CliQ components.
4. Create a new project with software version 2.6.1 in the STARTER and go online.
5. Monitor the alarm window. While the update is in progress, alarm 1306 is present showing the relevant fault value for the component.

Figure 8-1 Alarm 1306

6. After the software update, alarm 1007 (restart of DRIVE-CliQ components) appears. Restart must not be carried out until update is completed.

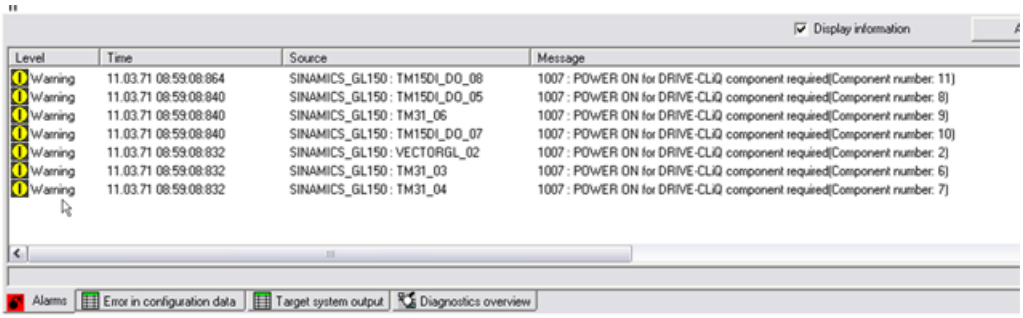


Figure 8-2 Alarm 1007

7. As a rule, the firmware update of the Power Stack Adapter starts automatically. If not, you must perform a manual firmware update (chapter "Auto-Hotspot ").

8.4 Configuring and performing firmware update of the Power Stack Adapter (PSA)

8.4.1 Basic information about configuring and updating the firmware of the PSA

General information

If a new Power Stack Adapter (PSA) is installed, it must be configured for use in GL150.

After stamping, a firmware update of the PSA is carried out automatically.

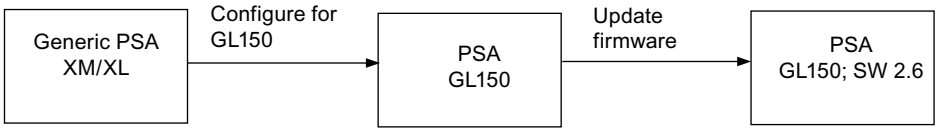


Figure 8-3 Configuring the PSA and firmware update

Note

Remarks on configuring the PSA

If several PSAs are connected to the CU320, configuration is only possible using a configured CF card.
If an empty CF card is used in this case, the procedure aborts with the message "Internal software error".

If only one PSA is connected to the CU320, configuration is possible using either a configured CF card or an empty one.

There are two options for configuration:

1. Configuration without dongle CF card for PSA version B and higher.
2. Configuration with dongle CF card for PSA version A.

The following sections contain detailed descriptions.

8.4.2 Configuring and performing firmware update of the Power Stack Adapter without dongle CF card

Preparation

DANGER

Danger due to high voltages

High voltages cause death or serious injury if the safety instructions are not observed or if the equipment is handled incorrectly.

Potentially fatal voltages occur when this equipment is in operation which can remain present even after the converter is switched off.

Ensure that only qualified and trained personnel carry out work on the equipment.
Follow the five rules at all times and during each stage of the work.

The five safety rules:

1. **Disconnect the system**
2. **Protect against reconnection**
3. **Make sure that the equipment is de-energized**
4. **Ground and short-circuit**
5. **Cover or enclose adjacent components that are still live**

1. Save the current project.
2. Make a copy of the CF card.
3. Delete all the data from the user directory on the CF card.
4. Disconnect the supply to the converter, in particular the auxiliary voltage.
5. Replace the defective PSA.
6. Remove the DRIVE-CliQ connection to all other PSAs (if installed).
7. Switch on the auxiliary voltages.
8. Create a new STARTER project.
9. Connect the converter to the target system.
10. Upload the project to the programming device.

11. Determine the component ID of the new PSA; in the example, ID "2".

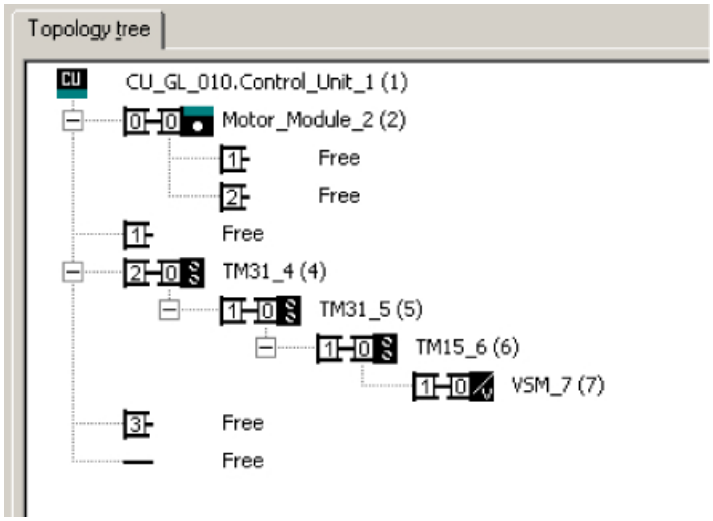


Figure 8-4 Check topology

12. Open the expert list of the CU and set the access level to "4".
13. Configure the PSA. This is done by setting the following parameters:

Parameter	Setting	Description
p7814[0]	2	ID of the PSA; in this example "2"
P7814[1]	0	
p7815[0]	0	
p7816[0]	2	Starts the ID download of the PSA

14. Immediately after these settings are made, the firmware update is performed automatically. If not, you must perform a manual firmware update (chapter Manual firmware update of the Power Stack Adapter (Page 89)). The corresponding message is displayed in the alarm window of the STARTER.
15. Wait until the firmware update is completed. This is the case when parameter r7827 has the value 100.

NOTICE

Do not disconnect auxiliary voltage

Disconnecting the auxiliary voltage during the firmware update can cause destruction of the PSA.

The old firmware is overwritten during the update process.

Ensure that auxiliary voltage is never switched off during the firmware update.

16. Switch off the auxiliary voltage.
17. Delete the STARTER project.
18. Delete all the data from the user directory on the CF card.
19. Copy the original user directory to the CF card.

20. Switch on the auxiliary voltage.
21. Check the current firmware version ("Configuration" - "Version overview")
22. Repeat the process for all replaced PSAs.

Note

Firmware update abort

If the firmware update aborts with the message "Internal software error", you require dongle CF card 6SL3957-6DC00-0AA0. Contact E-Support in this case.

Continue with chapter Configuring and performing firmware update of the Power Stack Adapter with dongle CF card (Page 87) when you have received the dongle card.

8.4.3 Configuring and performing firmware update of the Power Stack Adapter with dongle CF card

Preparation

DANGER

Danger due to high voltages

High voltages cause death or serious injury if the safety instructions are not observed or if the equipment is handled incorrectly.

Potentially fatal voltages occur when this equipment is in operation which can remain present even after the converter is switched off.

Ensure that only qualified and trained personnel carry out work on the equipment.
Follow the five rules at all times and during each stage of the work.

The five safety rules:

1. **Disconnect the system**
2. **Protect against reconnection**
3. **Make sure that the equipment is de-energized**
4. **Ground and short-circuit**
5. **Cover or enclose adjacent components that are still live**

1. Disconnect the supply to the converter, in particular the auxiliary voltage.
2. Replace the defective PSA.
3. Insert the GL150 dongle CF card (6SL3957-6DC00-0AA0) into the CU 320.
4. Switch on the auxiliary voltages.
5. Create a new STARTER project.
6. Connect the converter to the target system.

7. Upload the project to the programming device.
8. Determine the component ID of the new PSA; in the example, ID "2".

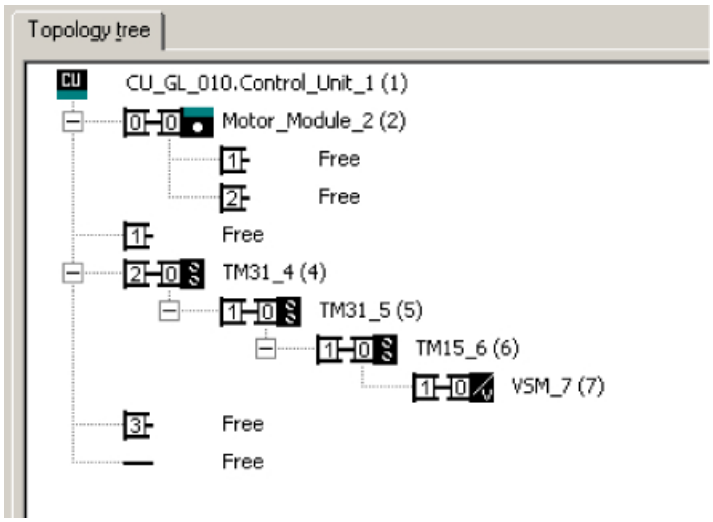


Figure 8-5 Check topology

9. Open the expert list of the CU and set the access level to "4".
10. Configure the PSA. This is done by setting the following parameters:

Parameter	Setting	Description
p7814[0]	2	ID of the PSA; in this example "2"
P7814[1]	0	
p7815[0]	0	
p7816[0]	2	Starts the ID download of the PSA

11. Immediately after these settings are made, the firmware update is performed automatically. If not, you must perform a manual firmware update (Section "Manual firmware update of the Power Stack Adapter (Page 89) "). The corresponding message is displayed in the alarm window of the STARTER.
12. Wait until the firmware update is completed. This is the case when parameter r7827 has the value 100.

NOTICE
Do not disconnect auxiliary voltage Disconnecting the auxiliary voltage during the firmware update can cause destruction of the PSA. The old firmware is overwritten during the update process. Ensure that auxiliary voltage is never switched off during the firmware update.

13. Switch off the auxiliary voltage.
14. Delete the STARTER project.
15. Insert the customer-specific CF card again.

16. Turn on the auxiliary voltage.
17. The firmware of the PSA is now updated.
18. Check the current firmware version ("Configuration" - "Version overview")

Repeat the process for all replaced PSAs.

If the firmware does not start automatically, proceed as described in chapter Manual firmware update of the Power Stack Adapter (Page 89)

8.4.4 Manual firmware update of the Power Stack Adapter

Procedure

NOTICE
Do not disconnect auxiliary voltage Disconnecting the auxiliary voltage during the firmware update can cause destruction of the PSA. The old firmware is overwritten during the update process. Ensure that auxiliary voltage is never switched off during the firmware update.

If you need to update the firmware of the PSA, proceed as follows:

1. Determine the component ID of the relevant PSA (in the example, ID "2").

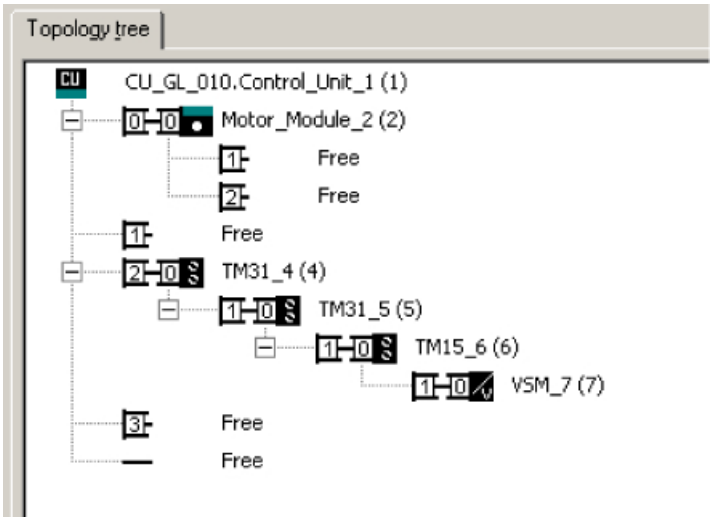


Figure 8-6 Check topology

2. Open the expert list of the CU and set the access level to "4".

3. Set the following parameters:

Parameter	Setting	Description
p7828[0]	2	ID of the PSA; in this example "2"
p7828[1]	0	
p7829	1	Starts the firmware download
r7827	2	Update completed if the value is "100"

4. The firmware update commences. On successful completion of the firmware update, a message "A1007 Power on required for DRIVE-CliQ component" appears.
5. Switch on the auxiliary voltage. The firmware update is completed.

8.5 Firmware update of the thyristor electronics TAS CPLD

For your personal safety, you must comply with the five safety rules (chapter "Safety Information").

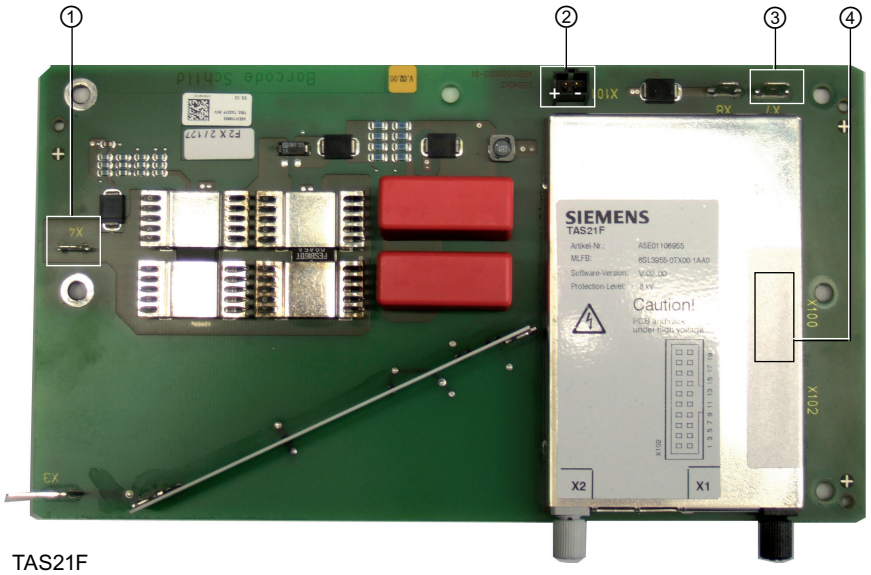
If a firmware update of the thyristor electronics is necessary, proceed as follows:

Prerequisite

To update the firmware of the thyristor electronics, the following components must be available or preconditions met:

- Power source +24 V DC
- PC with USB interface
- Programming interface "XILINX DLC9G"
- Software" Xilinx ISE 10.1 WebPack" (must be installed on the computer).
- .jed-file for programming (tas_"VersionsNummer".jed)

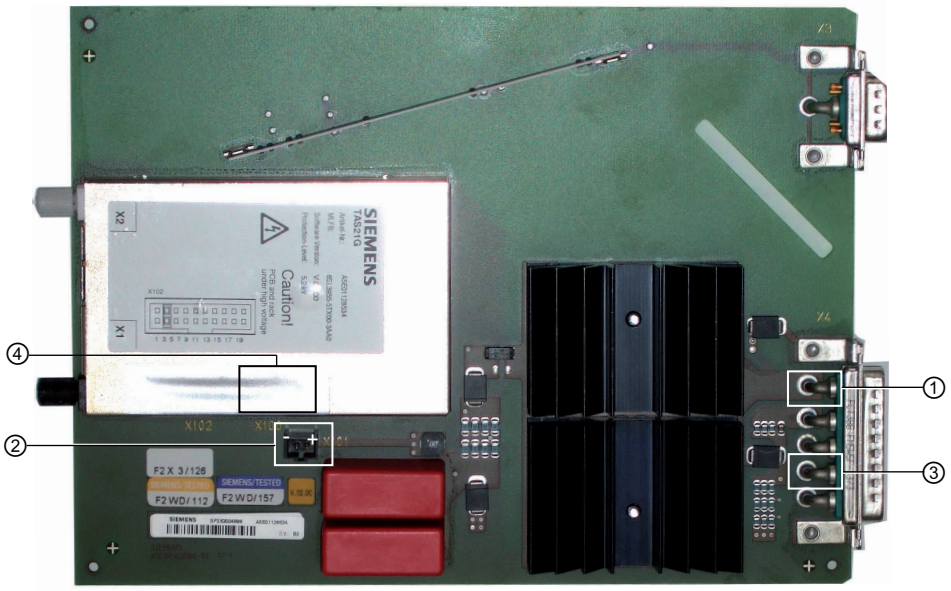
Terminals of the thyristor electronics



TAS21F

① + terminal for power source 24 V DC
② Terminal for alternate power supply
③ Ground
④ JTAG programming interface (below the label)

Figure 8-7 TAS21F thyristor electronics



TAS21G

① + terminal for power source 24 V DC
② Terminal for alternate power supply
③ Ground
④ JTAG programming interface (below the label)

Figure 8-8 Thyristor module TAS21G

Procedure

DANGER

Danger due to high voltages

High voltages cause death or serious injury if the safety instructions are not observed or if the equipment is handled incorrectly.

Potentially fatal voltages occur when this equipment is in operation which can remain present even after the converter is switched off.

Ensure that only qualified and trained personnel carry out work on the equipment.
Follow the five rules at all times and during each stage of the work.

The five safety rules:

1. **Disconnect the system**
2. **Protect against reconnection**
3. **Make sure that the equipment is de-energized**
4. **Ground and short-circuit**
5. **Cover or enclose adjacent components that are still live**

1. Connect the 24 V power source to the terminals ① (+) and ③ (-) or to socket ② of the thyristor electronics (see figure).
2. Plug in the USB cable of the XILINX DLC9G programming interface into the USB socket of the PC.
3. Plug the JTAG connector of the programming interface into the ④ socket of the thyristor electronics. This is done by removing the label above the socket. The green LED on the programming interface lights up.
4. Start the <IMPACT> program. Note that the figures shown may vary depending on the version of the <IMPACT> program.
5. After the program has started, the <IMPACT Project> dialog box opens.
6. Close the window by clicking on the <Cancel> button.
7. Double-click on the <Boundary Scan> menu item in the left-hand side of the programming window.

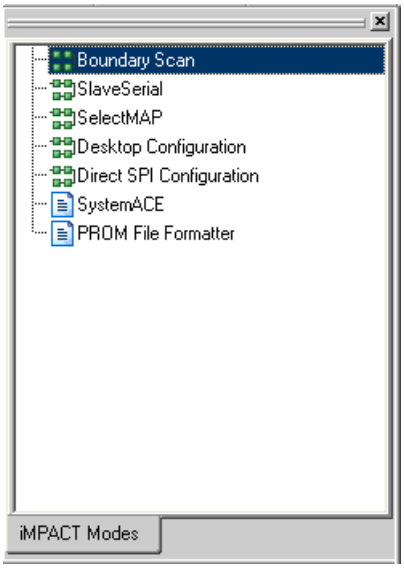


Figure 8-9 Menu items

8. Click into the central window with the right mouse button. A menu opens.

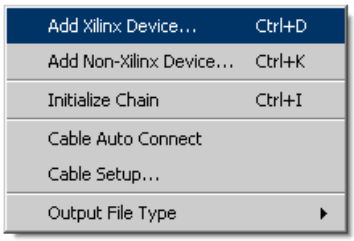


Figure 8-10 Selection of software

9. Select menu item <Add Xilinx Device>. The <Add Device> dialog box opens.
10. Select the file of the current software version. The file is loaded.

11. Right-click the <Xilinx> icon and select menu item <Program...>.

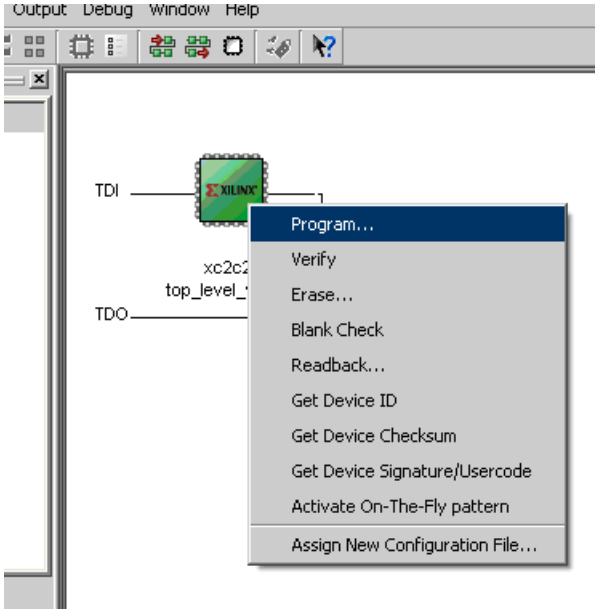


Figure 8-11 "Programming" dialog box

12. In the <Programming Properties> window, choose the settings as shown in the figure "Programming Properties". And then click <OK>.
    The thyristor electronics is programmed. After successful programming "Program succeeded" is shown.

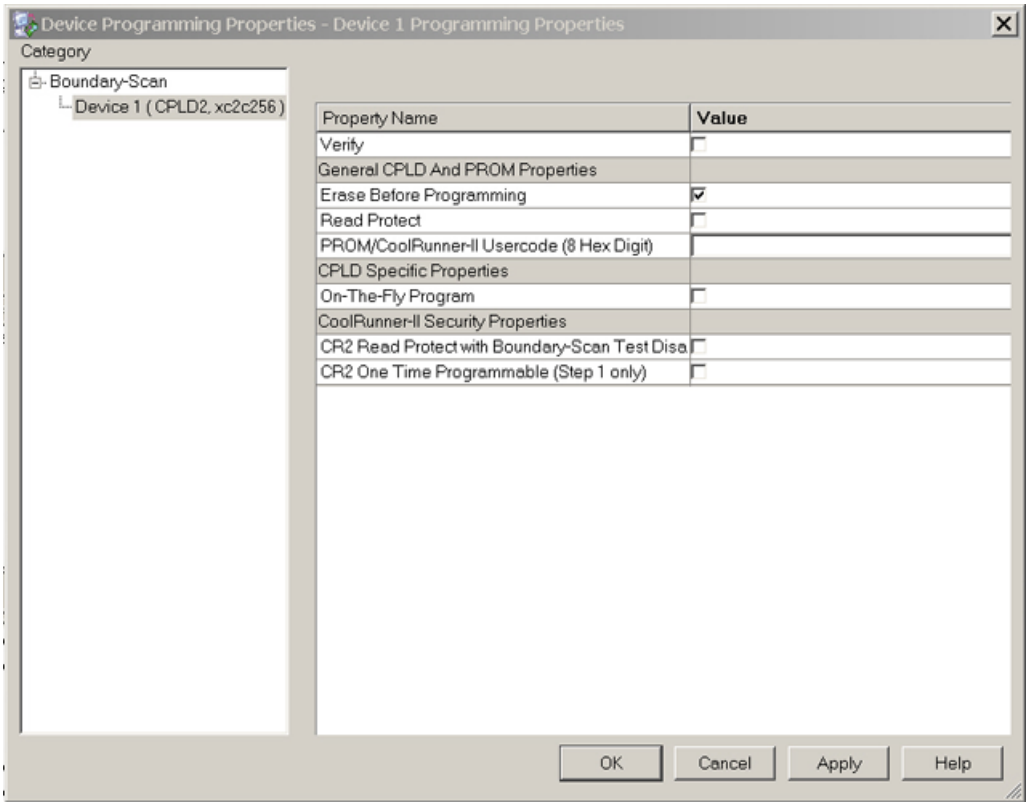


Figure 8-12 "Programming properties"

13. Check the checksum. To do this, right-click the <Xilinx> icon and select menu item <Get Device Checksum>.

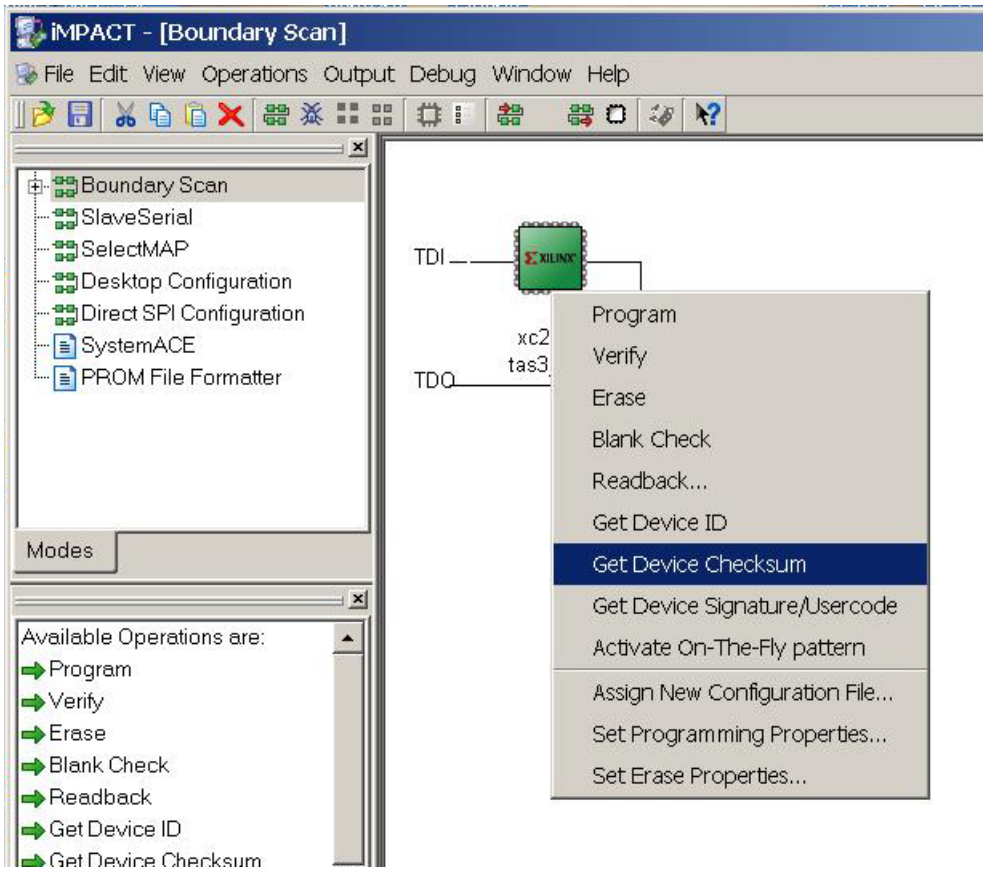


Figure 8-13 Verify checksum

The checksums in the file and in the CPLD are compared. If they match, the message "Checksum Succeeded" appears.

14. Remove the connectors from the thyristor electronics after programming.
15. Label the TAS on the printed circuit board and on the shield housing with the new version number.
16. Cover the JTAG programming interface ④ again.

Note

A firmware update should be performed for each TAS CPLD. Repeat the above procedure to do this.

8.6 Testing PROFIBUS communication

Description

PROFIBUS communication with the excitation unit is tested in this test mode.

A general overview of the bus settings is given by the following parameters in the expert list of the CU:

Parameter	D	+	+	Parametertext	Online-Wert CU_GL_010
p918				PROFIBUS address	10
r963				PROFIBUS baud rate	1.5 Mbit/s (6)
r965				PROFIdrive profile number	329H
p2042				PROFIBUS Ident Number	SINAMICS S/G (0)
p2047				PROFIBUS additional monitoring time	0
p2048				IF1 PROFIdrive PZD sampling time	4.00
r2054				PROFIBUS status	Cyclic data O. K. (4)
r2055[0]		+		PROFIBUS diagnostics standard, Master bus address	2
r2057				PROFIBUS address switch diagnostics	10
r2064[0]		+		PROFIdrive diagnostics clock synchronous mode, Clock synchronous mode activate	0
r2077[0]		+		PROFIBUS diagnostics peer-to-peer data transfer addresses	12

Figure 8-14 Overview of bus settings

The diagram below shows the drive parameters that are relevant for data transfer:

Parameter	D	+	+	Parametertext	Online-Wert VECTORGL_02
r108.31				PROFINET	Not activated
p922				PROFIdrive telegram selection	Free telegram configuration with BICO (999)
p925				PROFIdrive clock synchronous sign-of-life tolerance	1
r930				PROFIdrive operating mode	1
r975[5]				Drive object identification, PROFIdrive drive object, type class	1
r979[0]		+		PROFIdrive encoder format, Header	21265
p2037				PROFIdrive STW1.10 = 0 mode	Freeze setpoints and continue to process sign-of-life (0)
p2038				PROFIdrive STW/ZSW interface mode	SINAMICS (0)
p2044				PROFIdrive fault delay	0
p2045				Ct: PROFIdrive clock-cyc. synchr. master sign-of-life, signal source	0%
r2050[0]		+		IF1 PROFIdrive PZD receive word, PZD 1	47EH
p2051[0]		+		IF1 PROFIdrive PZD send word, PZD 1	VECTORGL_02 : r2089[0]
r2053[0]		+	+	IF1 PROFIdrive diagnostics PZD send word, PZD 1	C340H
r2060[0]		+		IF1 PROFIdrive PZD receive double word, PZD 1 + 2	47E0B08H
p2061[0]		+		IF1 PROFIdrive PZD send double word, PZD 1 + 2	0%
r2063[0]		+	+	IF1 PROFIdrive diagnostics PZD send double word, PZD 1 + 2	C3400000H
r2065				PROFIdrive master sign-of-life, diagnostics	0
p2068[0]		+		PROFIdrive telegram extension PZD receive	0
p2069[0]		+		PROFIdrive telegram extension PZD send	0
r2074[0]		+		IF1 PROFIdrive diagnostics bus address PZD receive, PZD 1	2
r2075[0]		+		IF1 PROFIdrive diagnostics telegram offset PZD receive, PZD 1	0
r2076[0]		+		IF1 PROFIdrive diagnostics telegram offset PZD send, PZD 1	0
p2079				PROFIdrive PZD telegram selection extended	Free telegram configuration with BICO (999)
r2090			+	BO: IF1 PROFIBUS PZD1 receive bit-serial	47EH
r2091			+	BO: IF1 PROFIdrive PZD2 receive bit-serial	B08H
r2092			+	BO: IF1 PROFIdrive PZD3 receive bit-serial	25H
r2093			+	BO: IF1 PROFIdrive PZD4 receive bit-serial	0H

Figure 8-15 Drive parameters for data transfer

You will find further information in the help and in the List Manual for the description of the parameter in question.

The following diagrams provide a clear overview. To display them:

1. In the project navigator of the STARTER user interface under Vector, double-click "Communication".
2. Double-click on "PROFIBUS".

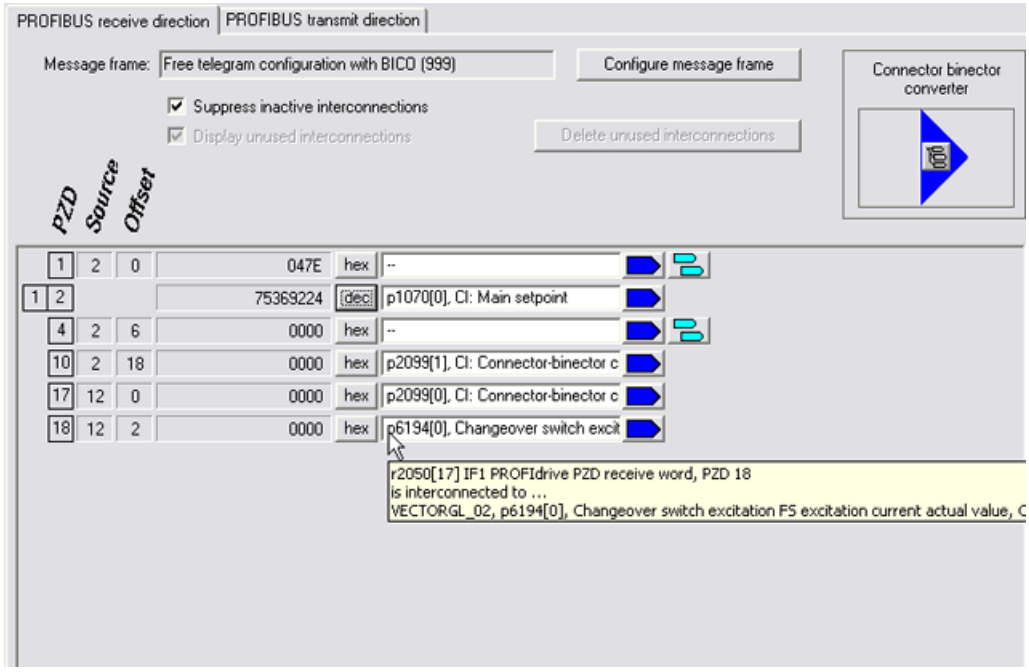


Figure 8-16 PROFIBUS communication data received at the VECTOR

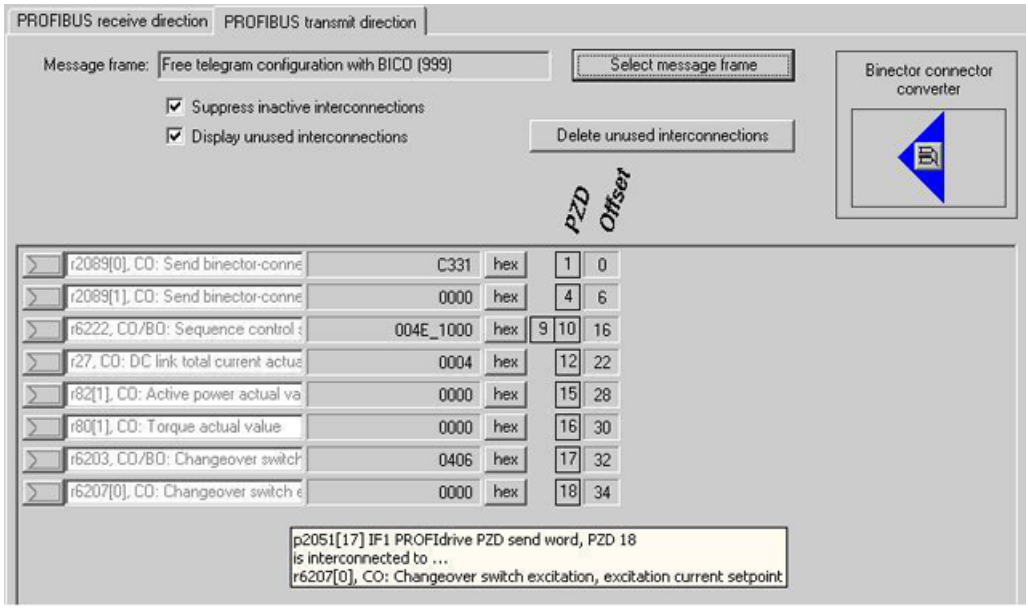


Figure 8-17 PROFIBUS communication data sent from Vector

8.7 Installing the DP/DP coupler

Description

DP/DP couplers are required when two masters are installed on one bus.

1. Connect the 24 V supply to both sides of the coupler and set the "PS" switch on the device to <ON>.
2. Divide the network with two masters into two networks each with one master. Connect the two networks to the coupler.
3. Use the address switches to set the addresses at the coupler.
4. Switch on the 24 V supply voltage and set the "ADDR" switch on the device to <OFF>.
5. Insert the coupler into the HW configuration of the S7 projects. The addresses must be identical to the ones set using the address switch.

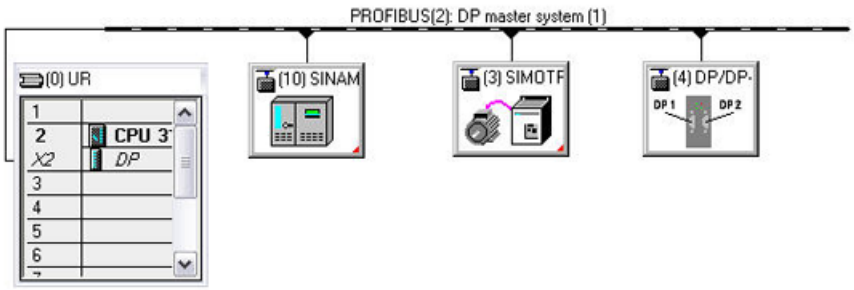


Figure 8-18 Inserting the coupler into the HW configuration

6. Add the inputs and outputs to the HW configuration.

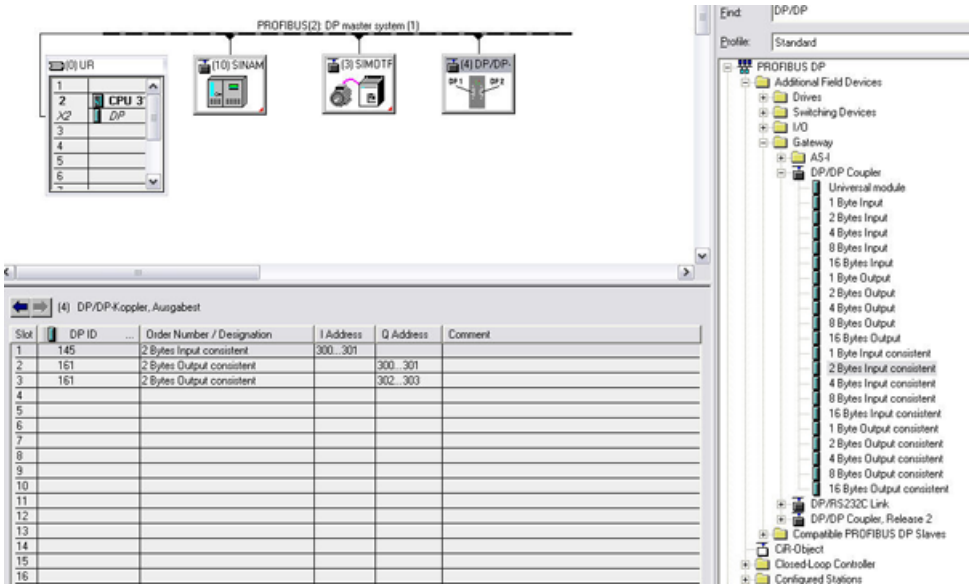


Figure 8-19 Adding coupler inputs and outputs

The CU320 sends the data to the CPU.

Slot	M..	Message frame selection / default	I address	Q address
4	Drive		600...631	
5	Drive			600...631
6	Drive		632...643	
7	Drive			

Figure 8-20 Sending of data to the CPU

The CPU then uploads and transfers the process data (PZD) to the coupler.

Example

```
L    PEW 600    // from CU320 (PZD 1 - Status word 1)
T    PAW 300    // from DP/DP coupler
L    PEW 602    // from CU320 (PZD 2)
T    PAW 302    // to DP/DP coupler
L    PEW 300    // from DP/DP coupler
T    PAW 608    //to CU320 (indirectly from second master)
```

The coupler copies the data and transfers them to network 2.

Both sides of the DP/DP coupler must be consistent. Its inputs from network 1 must be the outputs from network 2 and vice versa.

Slot	DP ID ...	Order Number / Designation	I Address	Q Address
1	145	2 Bytes Input consistent	300...301	
2	161	2 Bytes Output consistent		300...301
3	161	2 Bytes Output consistent		302...303

Figure 8-21 DP/DP coupler inputs and outputs consistent

Appendix A

A.1 List of abbreviations

Overview

Table A-1 Meaning of the abbreviations and terminology

Abbreviation	Description
AC	AC voltage
AVT	Actual Value Transmission
BI	Binector Input
BO	Binector Output
CDS	Command Data Set
CF card	CompactFlash card
CI	Connector Input
CPLD	Complex Programmable Logic Device
CU	Control Unit
CO	Connector Output
DC	DC voltage
DDS	Drive data set
DO	Drive Object
EDS	Encoder data set
ESD	Electrostatically Sensitive Devices
FBD	Function Block Diagram
Hz	Hertz
CB	Circuit-Breaker
FOC	Fiber Optic Cable
M	Motor
MDS	Motor data set
MLFB	Machine-readable product designation
PDS	Power section data set
PLC	Programmable Logic Controller
PG	Programming device
PSA	Power Stack Adapter
RAM	Random Access Memory
ROM	Read Only Memory
TAS	Thyristor control and protection
TM	Terminal Module
VDC link	DC link voltage
VSM	Voltage Sensing Module

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