ABB INDUSTRIAL DRIVES

DCT880 Thyristor power controller (20 A … 4160 A)
Manual

Safety instruction

What this chapter contains

This chapter contains the safety instructions you must follow when installing, operating and servicing the thyristor power controller. If ignored, physical injury or death may follow, or damage may occur to the thyristor power controller or the connected equipment. Read the safety instructions before you work on the unit.

To which products this chapter applies

The information is valid for the whole range of the product DCT880.

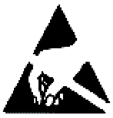
Usage of warnings and notes

There are two types of safety instructions throughout this manual: warnings and notes. Warnings caution you about conditions which can result in serious injury or death and/or damage to the equipment, and advice on how to avoid the danger. Notes draw attention to a particular condition or fact or give information on a subject.

The warning symbols are used as follows:

Dangerous voltage warning warns of high voltage which can cause physical injury or death and/or damage to the equipment.

General danger warning warns about conditions, other than those caused by electricity, which can result in physical injury or death and/or damage to the equipment.



Electrostatic sensitive devices warning warns of electrostatic discharge which can damage the equipment.

Installation and maintenance work

These warnings are intended for all who work on the thyristor power controller, the cables or the connected equipment. Ignoring the instructions can cause physical injury or death and/or damage to the equipment.

WARNING

- **Only qualified electricians are allowed to install and maintain the thyristor power controller!**
- Never work on the thyristor power controller, the cables or the connected equipment when main power is applied.
- Always ensure by measuring with a multimeter (impedance at least 1 MΩ) that:
- Voltage between thyristor power controller input phases U1, V1 and W1 and the frame is close to 0 V.
- Voltage between terminals C+ and D- and the frame is close to 0 V.
- Do not work on the control cables when power is applied to the thyristor power controller or to the external control circuits. Externally supplied control circuits may cause dangerous voltages inside the thyristor power controller even when the main power on the thyristor power controller is switched off.
- Do not make any insulation resistance or voltage withstand tests on the thyristor power controller.
- Isolate the cables to the equipment from the thyristor power controller when testing the insulation resistance or voltage withstand of the cables or the equipment.
- When reconnecting the cables to the equipment, always check that the U2, V2 and W2 cables are connected with the proper terminal.

Notes:
- The output phase cable terminals on the thyristor power controller are at a dangerously high voltage when the main power is on.
- Depending on the external wiring, dangerous voltages (115 V, 220 V or 230 V) may be present on the relay outputs of the thyristor power controller (e.g. XRO1 … XRO3).
- DCT880 with enclosure extension: Before working on the thyristor power controller, isolate the whole thyristor power controller system from the supply.

Grounding

These instructions are intended for all who are responsible for the grounding of the thyristor power controller. Incorrect grounding can cause physical injury, death and/or equipment malfunction and increase electromagnetic interference.

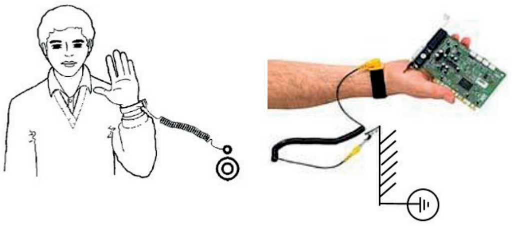
WARNING
- Ground the thyristor power controller, the connected equipment and adjoining devices to ensure personnel safety in all circumstances, and to reduce electromagnetic emission and pick-up.
- Make sure that grounding conductors are adequately sized and marked as required by safety regulations.
- In a multiple thyristor power controller installation, connect each thyristor power controller separately to protective earth (PE).
- Minimize EMC emission and make a 360° high frequency grounding (e.g. conductive sleeves) of screened cable entries at the cabinet lead-through plate.

Notes:
- Power cable shields are suitable as equipment grounding conductors only when adequately sized to meet safety regulations.
- As the normal leakage current of the thyristor power controller is higher than 3.5 mA$_{AC}$ or 10 mA$_{DC}$ (stated by EN 50178, 5.2.11.1), a fixed protective earth connection is required.

Printed circuit boards

These instructions are intended for all who handle the circuit boards. Ignoring the following instructions can cause damage to the equipment.

WARNING
- The printed circuit boards contain components sensitive to electrostatic discharge. Wear a grounding wrist band when handling the boards. Do not touch the boards unnecessarily.
- Use grounding strip:



- ABB order no.: 3ADV050035P0001

Mechanical installation

These notes are intended for all who install the thyristor power controller. Handle the unit carefully to avoid damage and injury.

WARNING

- DCT880 sizes T4 ... T6:
  - The thyristor power controller is heavy. Lift the unit by lifting lugs only.
  - The unit's center of gravity is high. Do not tilt the unit. The unit will overturn from a tilt of about 6 degrees. An overturning unit can cause physical injury.
  - Do not lift the unit by the front cover.
  - Place units T4 ... T6 only on their back.
- Make sure that dust from drilling does not enter the thyristor power controller when installing. Electrically conductive dust inside the unit may cause damage or lead to malfunction.
- Ensure sufficient cooling.
- Do not fasten the thyristor power controller by riveting or welding.

Operation

These warnings are intended for all who plan the operation of the thyristor power controller or operate the thyristor power controller. Ignoring the instructions can cause physical injury or death and/or damage to the equipment.

WARNING

- Before adjusting the thyristor power controller and putting it into service, make sure that all connected equipment is suitable for operation throughout the voltage/current range provided by the thyristor power controller.
- Do not control the connected equipment with the disconnecting device (disconnecting mains); instead, use the control panel keys ▽ and ◇, or commands via the I/O board of the thyristor power controller.
- Mains connection:
  You can use a disconnect switch (with fuses) to disconnect the electrical components of the thyristor power controller from the mains for installation and maintenance work. The type of disconnect switch used must be as per EN 60947-3, Class B, so as to comply with EU regulations, or a circuit-breaker type which switches off the load circuit by means of an auxiliary contact causing the breaker's main contacts to open. The mains disconnect must be locked in its "OPEN" position during any installation and maintenance work.
- EMERGENCY POWER OFF buttons must be installed at each control desk and at all other control panels requiring an emergency off function. Pressing the Stop button on the control panel of the thyristor power controller will not cause an emergency off by the thyristor power controller and it will not disconnect the thyristor power controller from any dangerous potential.
- To avoid unintentional operating states, or to shut the unit down in case of any imminent danger according to the standards in the safety instructions it is not sufficient to merely shut down the thyristor power controller via signals Run or Enable or from control panel or PC tool.
- Intended use:
  The operating instructions cannot take into consideration every possible case of configuration, operation or maintenance. Thus, they mainly give such advice only, which is required by qualified personnel for normal operation of the machines and devices in industrial installations.
  If in special cases the electrical machines and devices are intended for use in non-industrial installations - which may require stricter safety regulations (e.g. protection against contact by children or similar) - these additional safety measures for the installation must be provided by the customer during assembly.

Note:

– When the control location is not set to Local, the Stop key on the control panel will not stop the thyristor power controller. To stop the thyristor power controller using the control panel, press the Loc/Rem key and then the Stop key ⏹.

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Communication 102

Parameters 104

DCT880 Manuals and Tools

List of manuals

General	Publication number	EN	DE	IT	ES	FR	PL	ZH	RU
DCT880 Quick Guide	3ADW000435	EN							
DCT880 Manual set	DCT880 Manual set	EN							
DCT880 Units									
DCT880 Flyer	3ADW000429	EN	DE	IT	ES	FR		ZH	RU
DCT880 Manual	3ADW000431	EN	DE					ZH	
DCT880 Power Optimizer Control Manual	3ADW000441	EN							
DCT880 Multitap Control Manual	3ADW000440	EN							
ACS-AP-x assistant control panels user's manual	3AUA0000085685	EN							
Door mounting kits									
DPMP-01 mounting platform for ACS-AP control panel	3AUA0000100140	EN							
DPMP-02 mounting platform for ACS-AP control panel	3AUA0000136205	EN							
Serial communication									
FCAN-01 CANopen adapter module	3AFE68615500	EN	DE						
FDNA-01 DeviceNet™ adapter module	3AFE68573360	EN							
FECA-01 EtherCAT adapter module	3AUA0000068940	EN	DE		ES				
FENA-01/-11/-21 Ethernet adapter module	3AUA0000093568	EN						ZH	
FEPL-02 Ethernet POWERLINK adapter module	3AUA0000123527	EN	DE						
FPBA-01 PROFIBUS DP adapter module	3AFE68573271	EN	DE				PL	ZH	
FSCA-01 RS-485 adapter module	3AUA0000109533	EN						ZH	
Tool and maintenance manuals and guides									
Drive composer PC tool	3AUA0000094606	EN							
Drive (IEC61131-3) application programming manual	3AUA0000127808	EN							
NETA-21 remote monitoring tool	3AUA0000096939	EN							
NETA-21 remote monitoring tool guide	3AUA0000096881	EN							
DCT880 Service Manual	3ADW000449	EN							
Status 01.2020	DCT880 Manuals list en h.docx								

Documentation

The structure of the documentation is according to the following system:

- The DCT880 Manual (3ADW000431) contains information about
  - Unit dimensions, electronic boards, fans and auxiliary parts.
  - Mechanical and electrical installation.
  - Firmware and parameter settings.
  - Start-up and maintenance of the entire thyristor power controller.
  - Faults, warnings and information for trouble shooting.
- The DCT880 Service Manual (3ADW000449) contains information for maintenance and repair of the thyristor power controller.
- Additional information about technical accessories (e.g. hardware extension or fieldbus adapter) are handled by separate manuals, see chapter List of manuals.

DCT880 Information

All Information about the DCT880 is also available on the internet like:

- DCT880 documentation.
- PC tool (Drive composer entry) for parameterization, commissioning and service.
- Drive loader 2.x for firmware download.
- DCT880 firmware.

See the DCT880 sales toolbox.

Terms and abbreviations

Term/Abbreviation	Definition
AC 800M	Type of programmable controller manufactured by ABB.
ACS-AP-I	Types of control panel used with DCT880 units.
ACS-AP-W	
AI	Analog input; interface for analog input signals.
AO	Analog output; interface for analog output signals.
Automation Builder	Tool to write application programs. See *Drive (IEC61131-3) application programming manual (3AUA0000127808)*.
D2D	Device-to-device; communication link between units.
DCT880	A product family of ABB.
DDCS	Distributed drives communication system; a protocol used in communication between ABB equipment.
DI	Digital input; interface for digital input signals.
DIO	Digital input/output; interface that can be used as a digital input or output.
DO	Digital output; interface for digital output signals.
DriveBus	A communication link used by, for example, ABB controllers. DCT880 can be connected to the DriveBus link of the controller.
DriveAP	Adaptive Programming of the unit. See *Adaptive programming, Application guide (3AXD50000028574)*.
Drive composer	PC tool for commissioning and maintenance of ABB DCT880 units.
EFB	Embedded fieldbus.
FAIO-01	Optional analog I/O extension module.
FBA	Fieldbus adapter.
FCAN-01	Optional CANopen adapter.
FCNA-01	Optional ControlNet adapter.
FDCO-0x	Optional DDCS communication module.

Term/Abbreviation	Definition
FDIO-01	Optional digital I/O extension module.
FDNA-01	Optional DeviceNet adapter.
FEA-03	Optional I/O extension module.
FECA-01	Optional EtherCAT® adapter.
FENA-11	Optional Ethernet/IP, Modbus/TCP and PROFINET IO adapter.
FENA-21	Optional dual-port Ethernet/IP, Modbus/TCP and PROFINET IO adapter.
FEPL-02	Optional POWERLINK adapter.
FIO-01	Optional digital I/O extension module.
FIO-11	Optional analog I/O extension module.
FPBA-01	Optional PROFIBUS DP adapter.
FPTC-01	Optional thermistor protection module.
FPTC-02	Optional ATEX-certified thermistor protection module for potentially explosive atmospheres.
FSCA-01	Optional Modbus/RTU adapter.
HTL	High-threshold logic.
I/O	Input/Output.
ModuleBus	A communication link used by, for example, ABB controllers. DCT880 units can be connected to the optical ModuleBus link of the controller.
Parameter	User-adjustable operation instruction to the unit.
PID controller	Proportional-integral-derivative controller.
PLC	Programmable logic controller.
PTC	Positive temperature coefficient.
RDCO-0x	DDCS communication module.
RFG	Ramp function generator.
RO	Relay output; interface for a digital output signal. Implemented with a relay.
Signal	Value measured or calculated by the unit. It can also contain status information. Most signals are read-only, but some (especially counter-type signals) can be reset.
SSI	Synchronous serial interface.
STO	Safe torque off.
TTL	Transistor-transistor logic.
UPS	Uninterruptible power supply; power supply equipment with battery to maintain output voltage during power failure.

Cybersecurity disclaimer

This product is designed to be connected to and to communicate information and data via a network interface. It is the customer's sole responsibility to provide and continuously ensure a secure connection between the product and the customer network or any other network (as the case may be). The customer shall establish and maintain any appropriate measures (such as but not limited to the installation of firewalls, application of authentication measures, encryption of data, installation of anti-virus programs, etc.) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information. ABB and its affiliates are not liable for damages and/or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information.

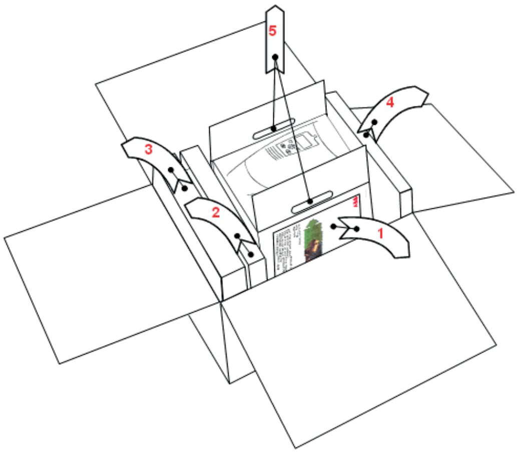
Before use

Acceptance inspection

Unpacking the unit

Open the box, remove the shock dampers, separate manual and accessories.

Attention: Do not lift the thyristor power controller by the front cover!



Delivery check

Check that there are no signs of damage. Before attempting installation and operation, check the information on the nameplate of the thyristor power controller to verify that the unit is of the correct type. The label includes an IEC rating and CE markings, a type code and a serial number, which allow individual identification of each unit. The remaining digits complete the serial number so that there are no two units with the same serial number:

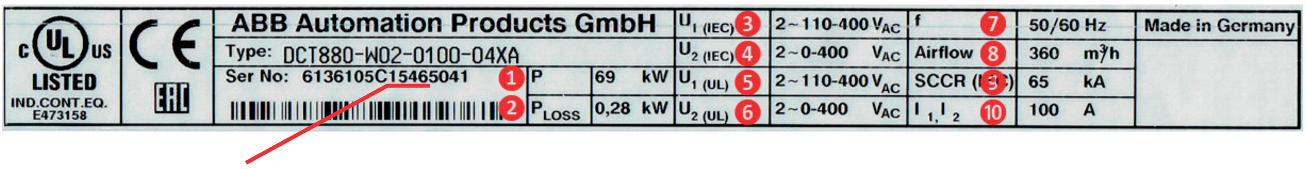


ABB Automation Products GmbH

Type: DCT880-W02-0100-04XA

Ser No: 6136105C15465041

① P	69 kW	U_1 (IEC) ③	2~110-400 V_{AC}	f ⑦	50/60 Hz	Made in Germany
② P_{LOSS}	0,28 kW	U_2 (IEC) ④	2~0-400 V_{AC}	Airflow ⑧	360 m³/h	
		U_1 (UL) ⑤	2~110-400 V_{AC}	SCCR (I ⑨)	65 kA	
		U_2 (UL) ⑥	2~0-400 V_{AC}	I_1, I_2 ⑩	100 A	

Production year 2015 and week 46

① : Rated power
② : Losses
③ : Rated input voltage for IEC
④ : Rated output voltage for IEC
⑤ : Rated input voltage for UL
⑥ : Rated output voltage for UL
⑦ : Mains frequency
⑧ : Airflow
⑨ : **S**hort **C**ircuit **C**urrent **R**ating
⑩ : Rated input/output current

Type code

The type code contains information on the specifications and configuration of the thyristor power controller:

The thyristor power controller's basic type code: DCT880-aab-cccc-ddef			
Product family:	DCT880		
Type:	aa	= W0	Standard
Power part type:	b	= 2	Two-leg anti-parallel circuit
		= 3	Three-leg anti-parallel circuit
Unit type:	cccc	=	Rated AC current (RMS) per leg
Rated AC voltage:	dd	= 04	110 V_{AC} … 415 V_{AC}
		= 05	110 V_{AC} … 500 V_{AC} (IEC)/525 V_{AC} (UL)
		= 07	315 V_{AC} … 690 V_{AC}
Power connection:	e	= X	Standard
Revision code:	f	= 0	With SDCS-PIN-H11
		= A	With SDCS-PIN-H11A

Precautions for using thyristor power controllers

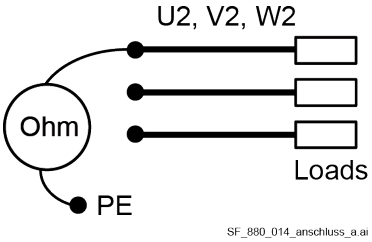
WARNING
Only a qualified electrician may carry out the work. Follow the Safety instruction on the first pages of this manual. Ignoring the safety instructions can cause injury or death.
Make sure that the thyristor power controller is disconnected from the mains (input power) during installation. If the thyristor power controller was already connected to the mains, wait for 5 minutes after disconnecting mains power.

Checking the insulation of the assembly

Every thyristor power controller was tested for insulation between the main circuit and the frame (2500 V rms 50 Hz for 1 second) at the factory. Therefore, do not make any voltage tolerance or insulation resistance tests (e.g. hi-pot or megger) on any part of the thyristor power controller. Check the insulation of the assembly as follows.

WARNING
Check the insulation before connecting the thyristor power controller to the mains. Make sure that the thyristor power controller is disconnected from the mains (input power).

- Check that the cables to the connected equipment are disconnected from the thyristor power controller output phases U2, V2 and W2.
- Measure the insulation resistances of the cables and the connected equipment between each circuit (U2, V2 and W3) and Protective Earth (PE) by using a measuring voltage of 1 kV DC. The insulation resistance must be higher than 1 MΩ.



Supply voltage

Check voltage levels of:
- Auxiliary voltage (XAUX on SDCS-PIN-H11).
- Cooling fan terminals.
- Mains voltage connected to U1, V1, W1.

Connecting the power cables

Check:
- Grounding and screening of power cables see chapter Cabling.
- Cross sectional areas and tightening torques of power cable, see chapter Power terminals.

WARNING
The XSTO terminals must not be used for thyristor power controllers.
They are not offering any certified safety functionality.

Environmental conditions

This chapter contains the technical specifications of the thyristor power controller, e.g. the ratings, sizes and technical requirements, provisions for fulfilling the requirements for CE and other markings and warranty policy.

System connection

Voltage, 3-phase:	100 … 1000 V acc. to IEC 60038 100 ... 690 V acc. to UL508c
Voltage deviation:	IEC: -10 % +15 % continuous; ±20 % short-time (0.5 to 30 cycles) UL: ±10 % continuous; ±15 % short-time (0.5 to 30 cycles)
Rated frequency:	50 Hz or 60 Hz
Static frequency deviation:	50 Hz ±2 %; 60 Hz ±2 %
Dynamic frequency range:	50 Hz: ±5 Hz; 60 Hz: ± 5 Hz
df/dt:	17 % / s

Degree of protection

Thyristor power controllers and options (fuses, etc.):	IEC: IP 00; acc. to IEC/EN 60529 UL: open type acc. to UL 508c
Overvoltage category (all inputs):	III acc. to IEC 60664-1
Protective class:	I acc. to IEC 61800-5-1

Paint finish

Thyristor power controllers:	Body RAL 7012 Cover RAL 9017 & RAL 9002

Installation category

Power network:	installation category III up to 600 V installation category II up to 690 V
Cooling fan supply:	230 V_{AC} (T4, T5) 400 ... 500 V_{AC} (T6)

Environmental limit values

Permissible cooling air temperature

With rated AC current (forced ventilation):	0 … +40°C
With different AC current see figure below:	+30 … +55°C
For options:	0 … +40°C
Relative humidity (at +5 … +40°C):	5 … 95 %, no condensation
Relative humidity (at 0 … +5°C):	5 … 50 %, no condensation
Change of the ambient temperature	< 0.5°C/minute
Storage temperature:	-40 … +55°C
Transport temperature:	-40 … +70°C
Pollution degree (IEC 60664-1, IEC 60439-1):	2

Site elevation

< 1000 m above mean sea level:	100 %, no current reduction
> 1000 m above mean sea level:	current reduction, see figure below
Duty cycle:	uninterrupted duty / continuous operation
Form designation:	form 4

Utilization categories

AC51:	non inductive or slightly Inductive loads, resistance furnaces
AC56a:	switching of transformers

Size	Sound pressure level L_P (1 m distance)	Vibration (EN 60068-2-6)	Shock (EN 60068-2-29)	Transport in original Package	Short circuit withstand rating
T1	55 dBA	3 mm, 2 ... 9 Hz 1 g, 9 ... 200 Hz	10 g/11 ms	1.2 m	The DCT880 is suitable for use in a circuit capable of delivering not more than: 65 kA rms symmetrical ampere at a maximum of 690 V_{AC}.
T2	55 dBA				
T3	60 dBA			1.0 m	
T4	66 ... 70 dBA, depending on fan				
T5	75 dBA	0,3 mm, 2 ... 9 Hz 0,1 g, 9 ... 200 Hz	4 g/22 ms	0.4 m	
T6	70 dBA				

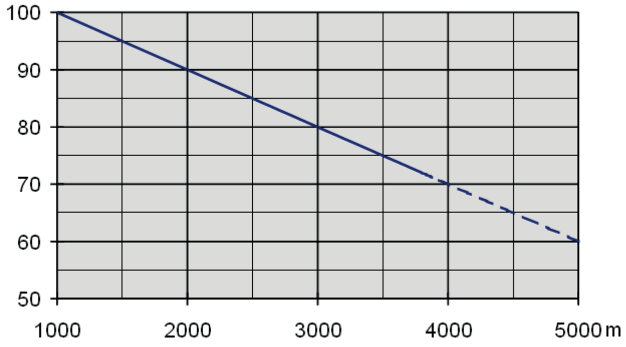
Regulatory compliance

The thyristor power controllers are designed for use in industrial environments. In EEA countries, the components fulfill the requirements of the EU directives, see table below.

European Union Directive	Manufacturer's assurance	Harmonized Standards
Low Voltage Directive		
2014/35/EU	Declaration of Conformity	EN 61800-1 [IEC 61800-1] EN 60204-1 [IEC 60204-1] EN 61800-5-1 [IEC 61800-5-1]
EMC Directive		
2014/30/EU	Declaration of Conformity (If all installation instructions concerning cable selection, cabling and EMC filters or dedicated transformer are followed.)	EN 61800-3 [IEC 61800-3]
		In accordance with 3ADW000032

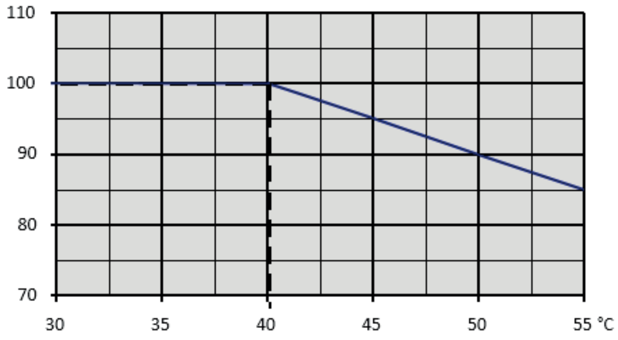
North American Standards	
In North America the system components fulfil the requirements as shown below.	
Rated supply voltage	Standards for open type thyristor power controller
Up to 600 V_{AC}	UL 508 and CSA C22.2 No. 14-13 - Industrial Control Equipment. Types with UL mark: – See UL Listing www.ul.com certificate no. E473158 or on request.

Effect of the site elevation above mean sea level on the thyristor power controller's load capacity:



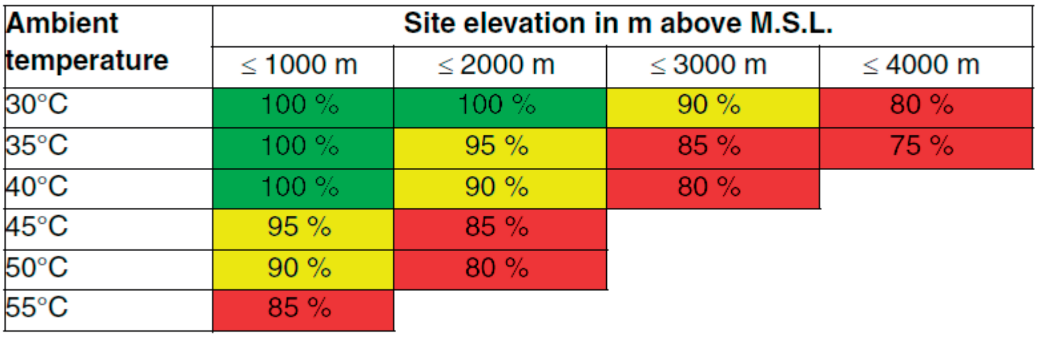
Current reduction to % of nominal thyristor power controller current

Effect of the ambient temperature on the thyristor power controller's load capacity:



Current reduction to % of nominal thyristor power controller current

Effect of site elevation and ambient temperature on the thyristor power controller‘s load capacity



Ambient temperature	Site elevation in m above M.S.L.			
	≤ 1000 m	≤ 2000 m	≤ 3000 m	≤ 4000 m
30°C	100 %	100 %	90 %	80 %
35°C	100 %	95 %	85 %	75 %
40°C	100 %	90 %	80 %	
45°C	95 %	85 %		
50°C	90 %	80 %		
55°C	85 %			

Current reduction to % of nominal thyristor power controller current

Ratings

Voltage ratings

Mains voltage UV1N [V_{AC}]	**Output voltage UV2N [V_{AC}]**	**Voltage class**
110	110	04
230	230	04
380	380	04
400	400	04
415	415	04
440	440	05
460	460	05
480	480	05
500	500	05
525	525	05
575	575	07
600	600	07
660	660	07
690	690	07

400 V/525 V units, current ratings, power ratings and power losses

Size	**I [A] (RMS)**	**P_{out} [kW] ①**	**P_{out} [kW] ②**	**P_{loss} W03 [kW]**	**P_{loss} W02 [kW]**	**Air flow [m^3/h]**	**Auxiliary voltage ③**
T1	20	13	17	0.13	0.09	no fan	+24 V_{DC}, ±10 %
	35	24	30	0.19	0.14		
	55	38	47	0.29	0.21	360	
	80	55	69	0.32	0.23		
	100	69	86	0.41	0.28		
	125	86	108	0.50	0.34		
T2	160	110	138	0.67	0.46		
	200	138	173	0.69	0.47		
	245	169	212	0.86	0.58		
T3	325	225	281	1.01	0.69		
	360	249	311	1.14	0.78		
	420	291	363	1.32	0.90	720	
T4	550	381	476	1.84	1.25	925	
	675	467	584	2.06	1.40		
	740	512	640	2.29	1.55	1860	
T5	890	616	770	3.50	-	800	
	960	-	-	-	2.90		
T6	1300	900	1125	3.80	2.50	800	
	1750	1212	1515	5.60	3.80	1600	

① Power ratings for a 3-phase load in star configuration at 400 V_{AC} (e.g. √3 • 20 A • 400 V/1000 = 13 kW).

② Power ratings for a 3-phase load in star configuration at 500 V_{AC} (e.g. √3 • 20 A • 500 V/1000 = 17 kW).

③ Please be advised, that each DCT880 should have its own 24 V_{DC} power supply.

690 V units, current ratings, power ratings and power losses

Size	I [A] (RMS)	P_{out} [kW] ④	P_{loss} W03 [kW]	P_{loss} W02 [kW]	Air flow [m^3/h]	Auxiliary voltage ③
T1	35	42	0.19	0.14	360	+24 V_{DC}, ±10 %
	80	95	0.32	0.23		
	100	120	0.41	0.28		
T2	160	191	0.67	0.46		
	200	239	-	0.47		
T3	360	430	1.14	0.78		
T4	630	753	1.90	1.29	925	
T5	890	1064	2.86	-	800	
	960	1147	-	2.90		
T6	1300	1553	4.20	2.83	800	
	1750	2091	5.60	3.75	1600	

③ Please be advised, that each DCT880 should have its own 24 V_{DC} power supply.

④ Power ratings for a 3-phase load in star configuration at 690 V_{AC} (e.g. √3 • 35 A • 690 V / 1000 = 42 kW).

Current ratings with 50 Hz and 60 Hz supplies see below. The current ratings are based on an ambient temperature of maximum 40°C and an elevation of maximum 1000 m above mean sea level:

Size	I [A] (RMS)	Thyristor power controller 400 V/525 V	Thyristor power controller 690 V
T1	20	DCT880-W0b-0020-04/05	-
	35	DCT880-W0b-0035-04/05	DCT880-W0b-0035-07
	55	DCT880-W0b-0055-04/05	-
	80	DCT880-W0b-0080-04/05	DCT880-W0b-0080-07
	100	DCT880-W0b-0100-04/05	DCT880-W0b-0100-07
	125	DCT880-W0b-0125-04/05	-
T2	160	DCT880-W0b-0160-04/05	DCT880-W0b-0160-07
	200	DCT880-W0b-0200-04/05	DCT880-W02-0200-07
	245	DCT880-W0b-0245-04/05	-
T3	325	DCT880-W0b-0325-04/05	-
	360	DCT880-W0b-0360-04/05	DCT880-W0b-0360-07
	420	DCT880-W0b-0420-04/05	-
T4	550	DCT880-W0b-0550-04/05	-
	630	-	DCT880-W0b-0630-07
	675	DCT880-W0b-0675-04/05	-
	740	DCT880-W0b-0740-04/05	-
T5	890	DCT880-W03-0890-04/05	DCT880-W03-0890-07
	960	DCT880-W02-0960-04/05	DCT880-W02-0960-07
T6	1300	DCT880-W0b-1300-04/05	DCT880-W0b-1300-07
	1750	DCT880-W0b-1750-04/05	DCT880-W0b-1750-07

Note: Input current = output current.

Installation and wiring

Installation

Before installation

Install the thyristor power controller in an upright position with the cooling section facing a wall. Check the installation site according to the requirements below. See chapter Dimensions and weights for frame details.

Requirements for the installation site

See chapter Environmental conditions for the allowed operation conditions of the thyristor power controller.

Wall

The wall should be as close to vertical as possible, of non-flammable material and strong enough to carry the weight of the unit. Check that there is nothing on the wall to inhibit the installation.

Floor

The floor or material below the installation must be non-flammable.

Free space around the unit

Around the unit free space is required to enable cooling airflow, service and maintenance see chapter Dimensions and weights.

Cabinet installation

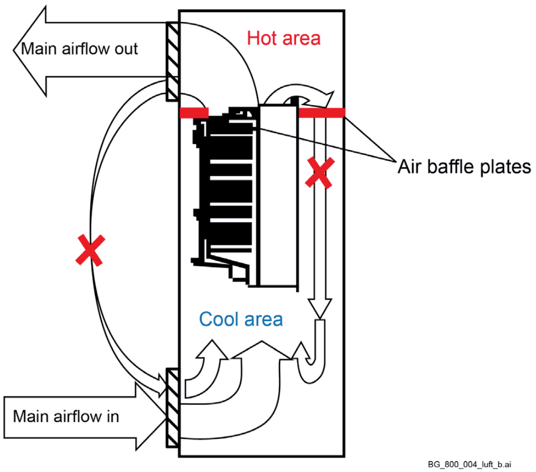
The required distance between parallel units:

Parallel units			Distance
Unit	to	Unit	[mm]
T1 … T4	to	T1 …T4	10
T1 … T4	to	T5	160
T5	to	T5	300
T6	to	T6	500

The cooling air entering the unit must not exceed +40°C.

Preventing cooling air recirculation

Prevent air recirculation inside and outside the cabinet



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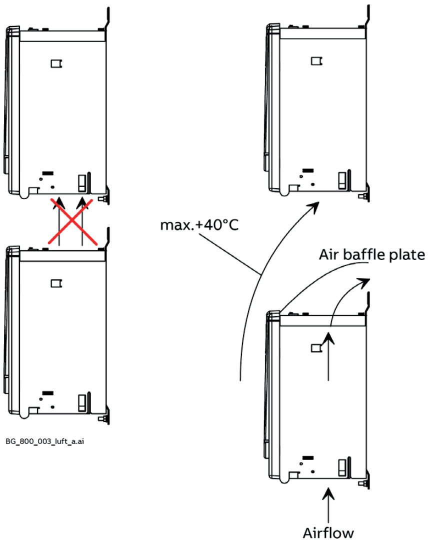
Unit above another



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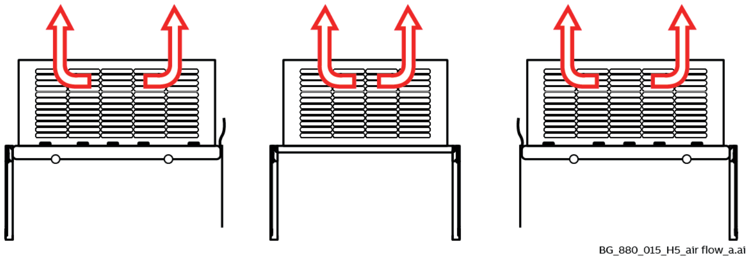
Lead the exhaust cooling air away from the unit above. Distances see chapter Dimensions and weights.

Mounting a T5 unit inside an enclosure

Cooling air inlet

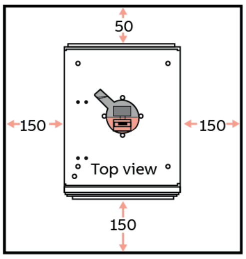
The cooling fan blows the air out of the front, right and left side of the converter module. View from:

Right side air flow Front side air flow Left side air flow



Free space around the unit

In mm:

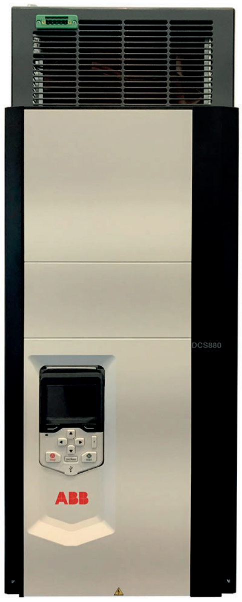


Cooling air outlet

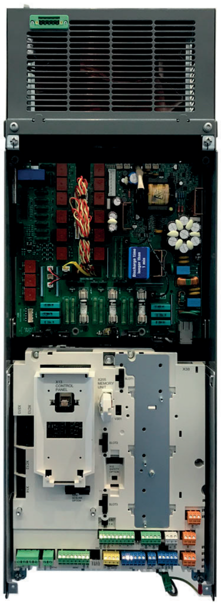
To avoid circulating air inside the enclosure make sure the exhaust air leaves the enclosure.

Mounting the converter module:

1. Remove the control panel and design cover:

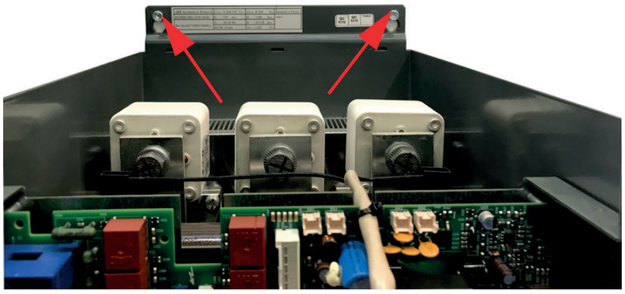


2. Remove screws (T20) and pull out the fan box:

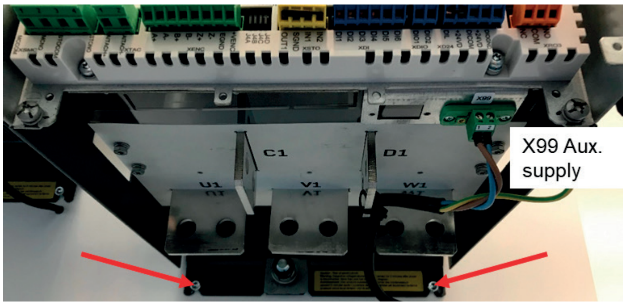


3. Now all mounting holes are accessible:

Detail top:



Detail bottom:

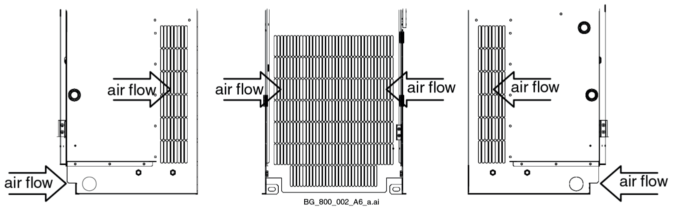


Mounting a T6 unit inside an enclosure

Cooling air inlet

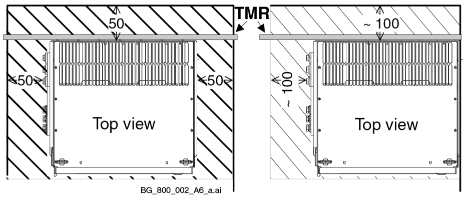
The cooling fan takes the air from the back, left, right side and from the bottom of the converter module. View from:

Right side Back side Left side



Free space around the unit

Optimum Compromise



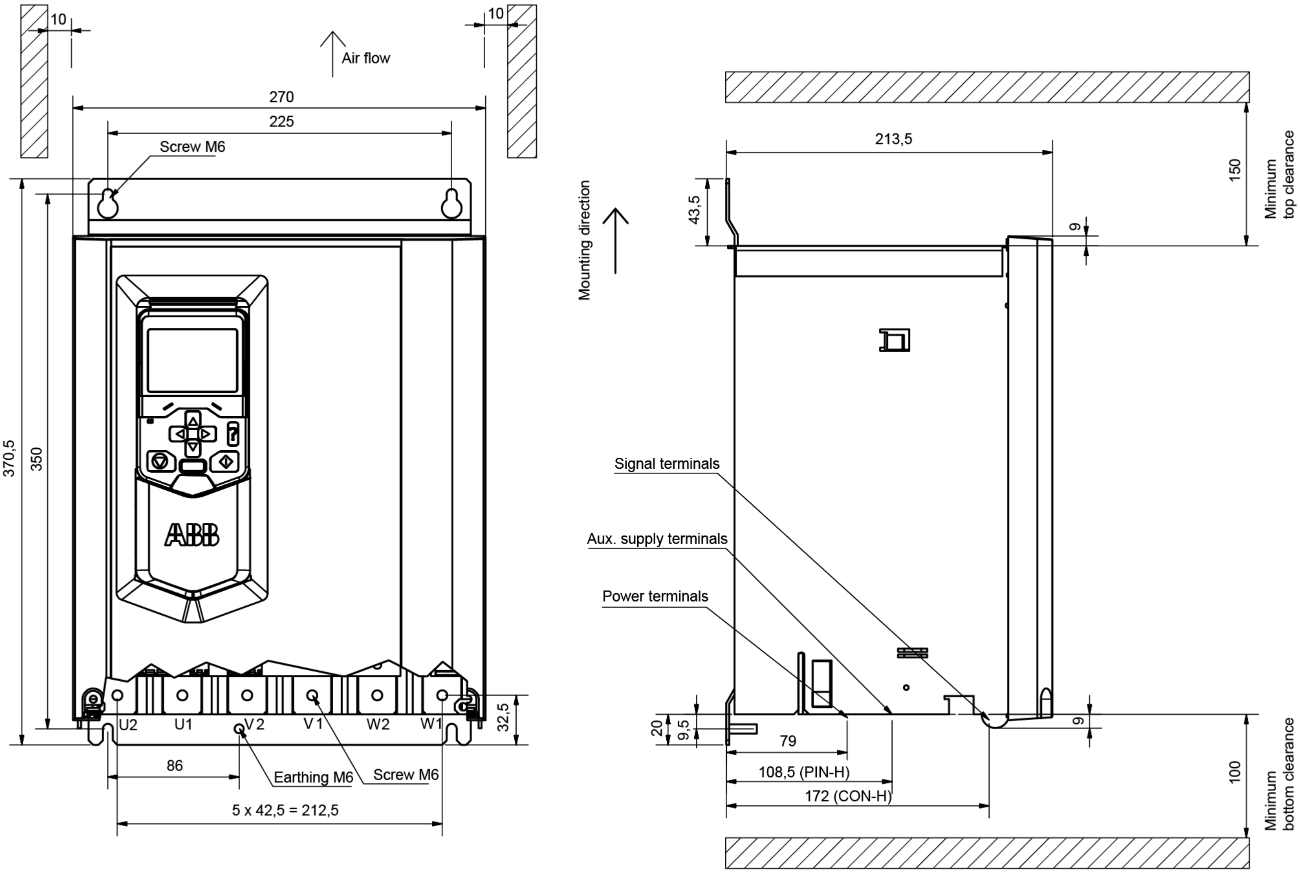
Cooling air outlet

To avoid circulating air inside the enclosure make sure the exhaust air leaves the enclosure.

Dimensions and weights

See the dimensional drawings of the DCT880 below. The dimensions are in millimeters.

Size	Thyristor power controller	h ∗ w ∗ d [mm]	weight [kg]
T1	DCT880-W0b-0020-0d DCT880-W0b-0035-0d DCT880-W0b-0055-0d DCT880-W0b-0080-0d DCT880-W0b-0100-0d DCT880-W0b-0125-0d	370 ∗ 270 ∗ 215	11



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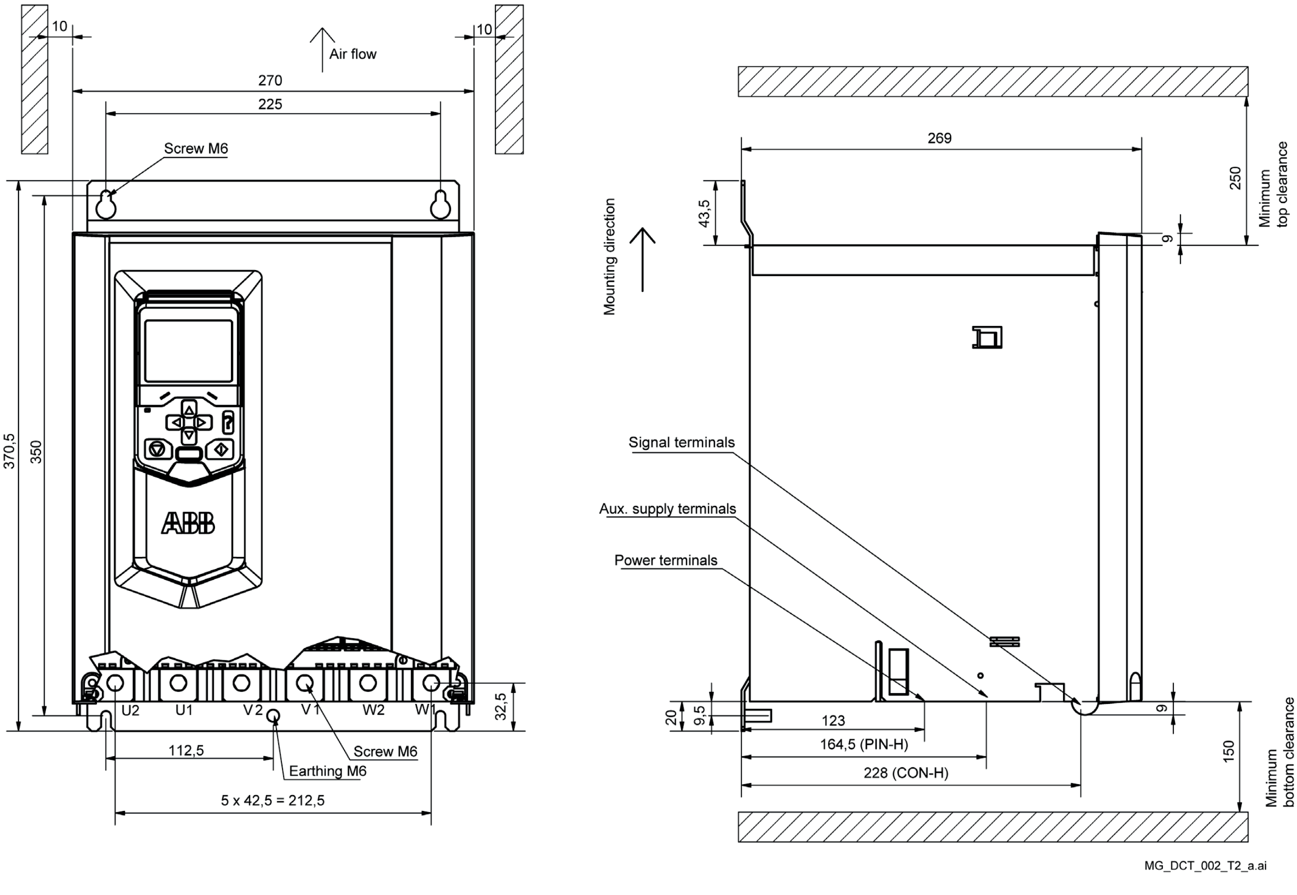
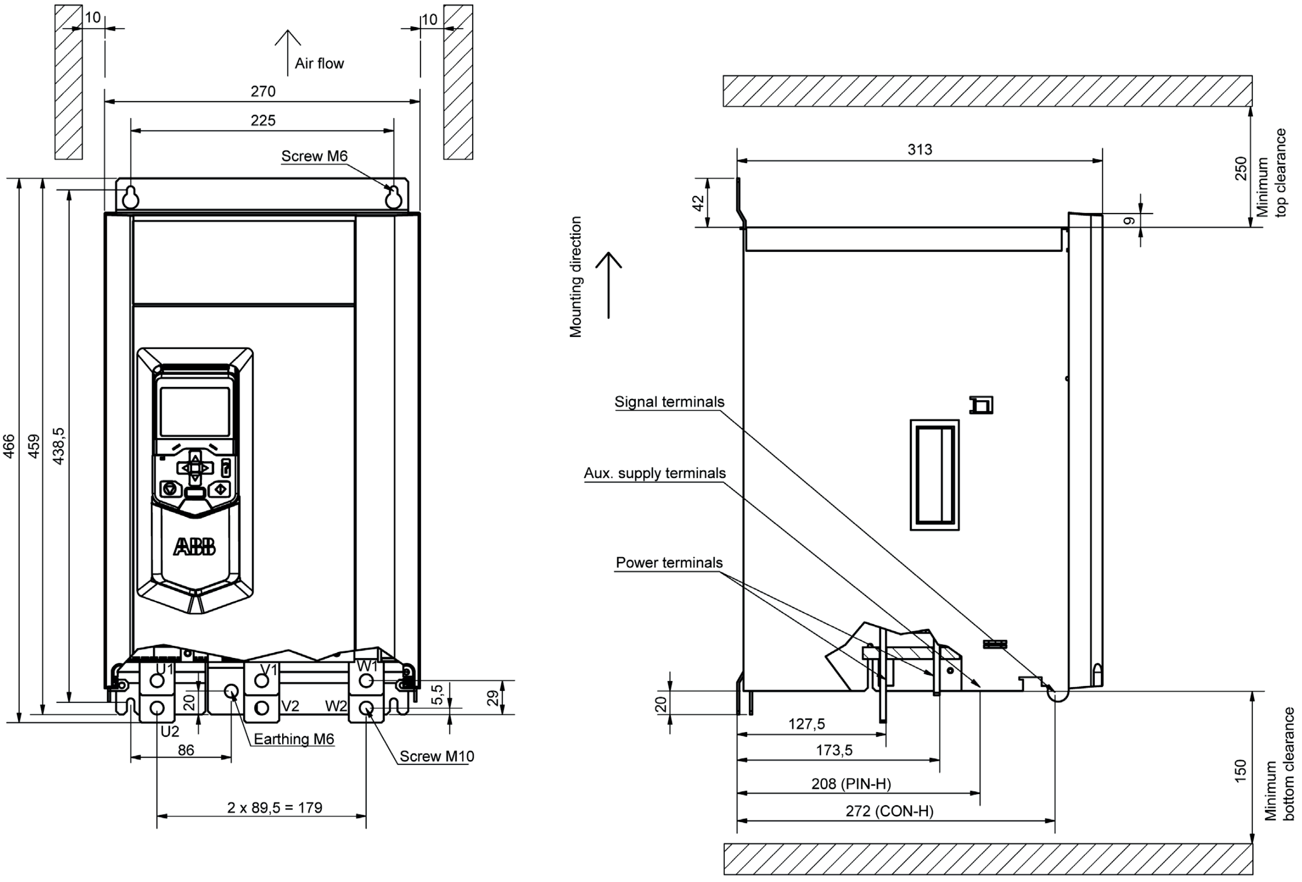
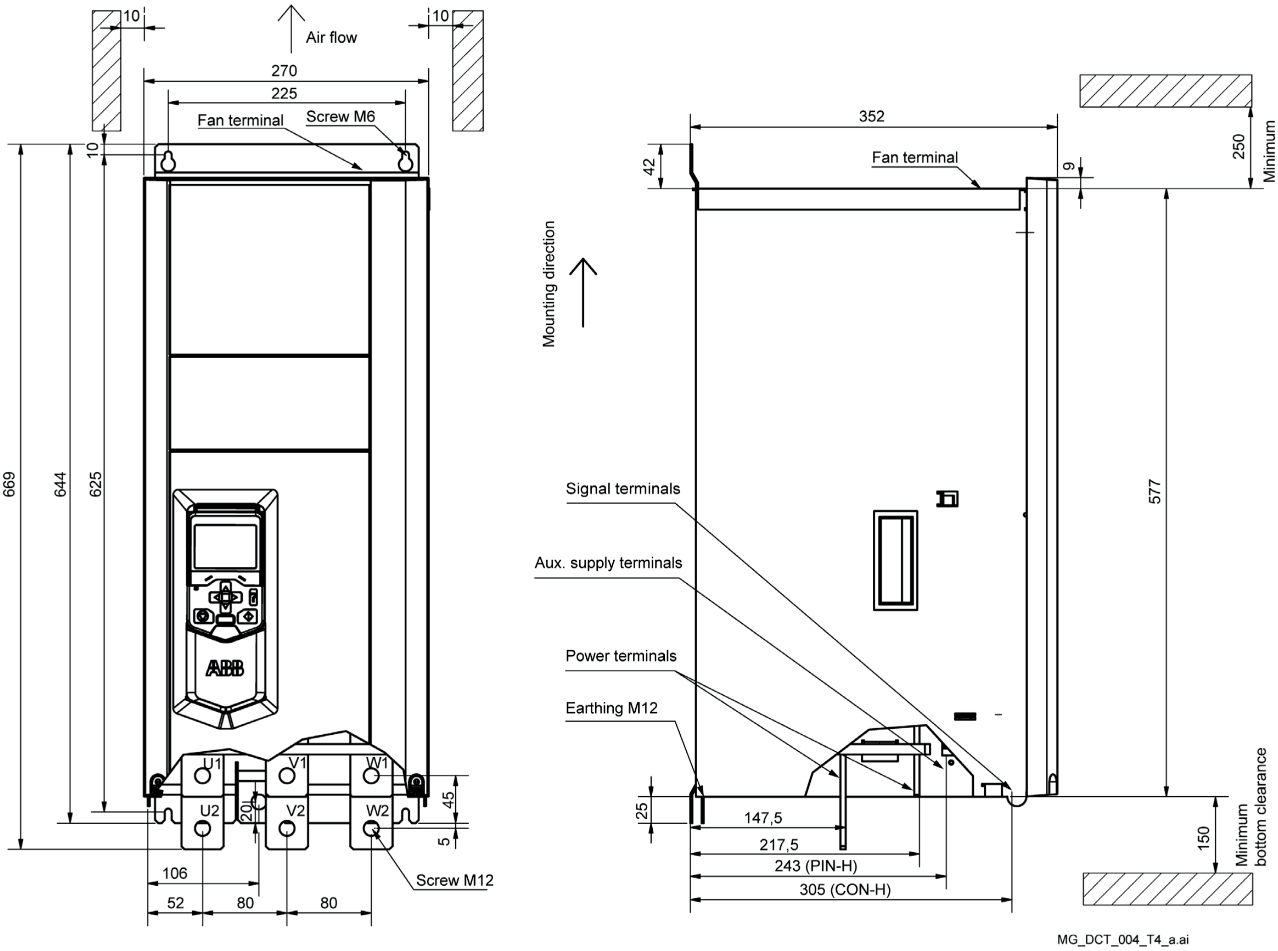
Size	Thyristor power controller	h * w * d [mm]	weight [kg]
T2	DCT880-W0b-0160-0d DCT880-W0b-0200-0d DCT880-W0b-0245-0d	370 * 270 * 270	16



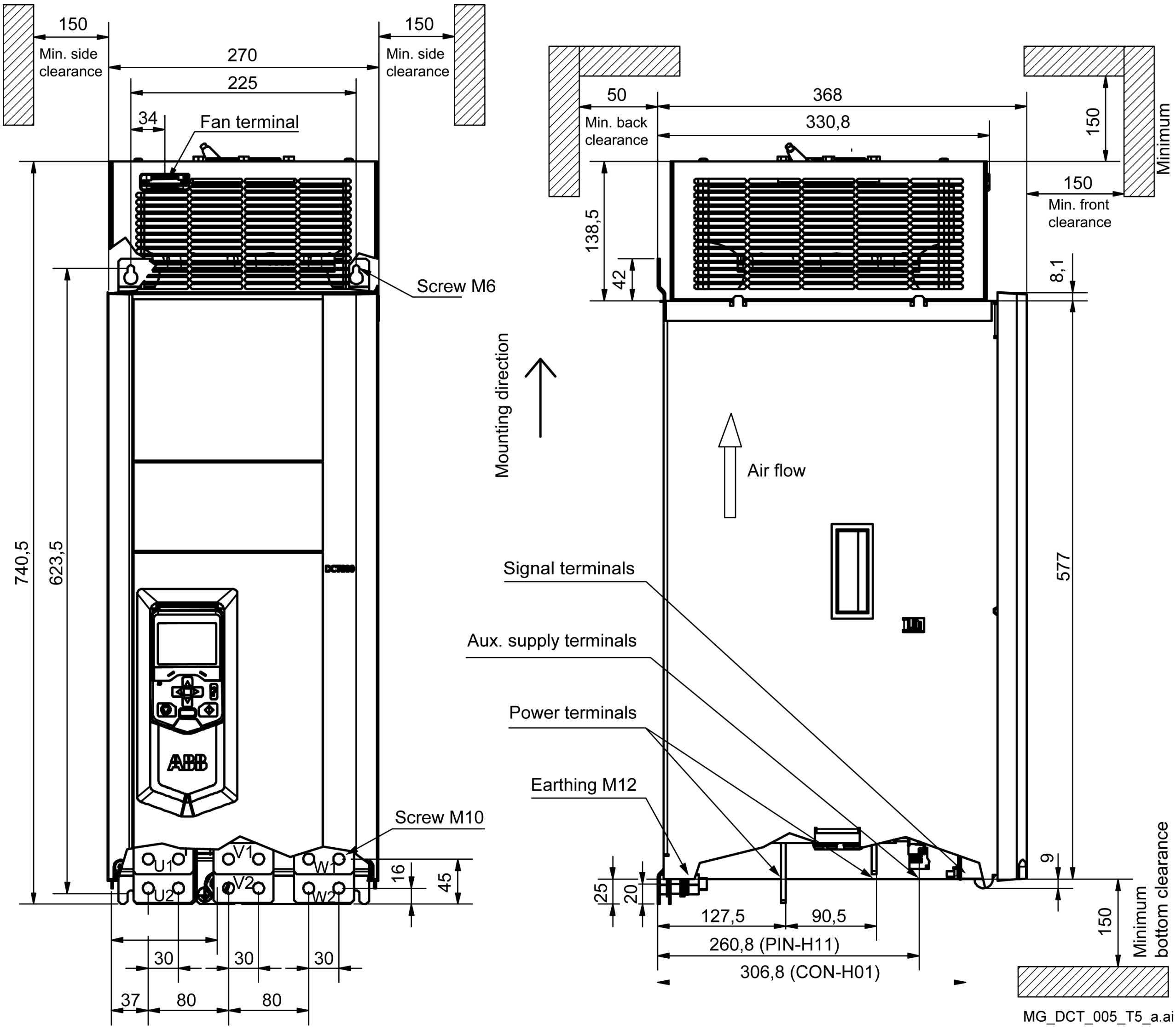
Size	Thyristor power controller	h * w * d [mm]	weight [kg]
T3	DCT880-W0b-0325-0d DCT880-W0b-0360-0d DCT880-W0b-0420-0d	466 * 270 * 315	25



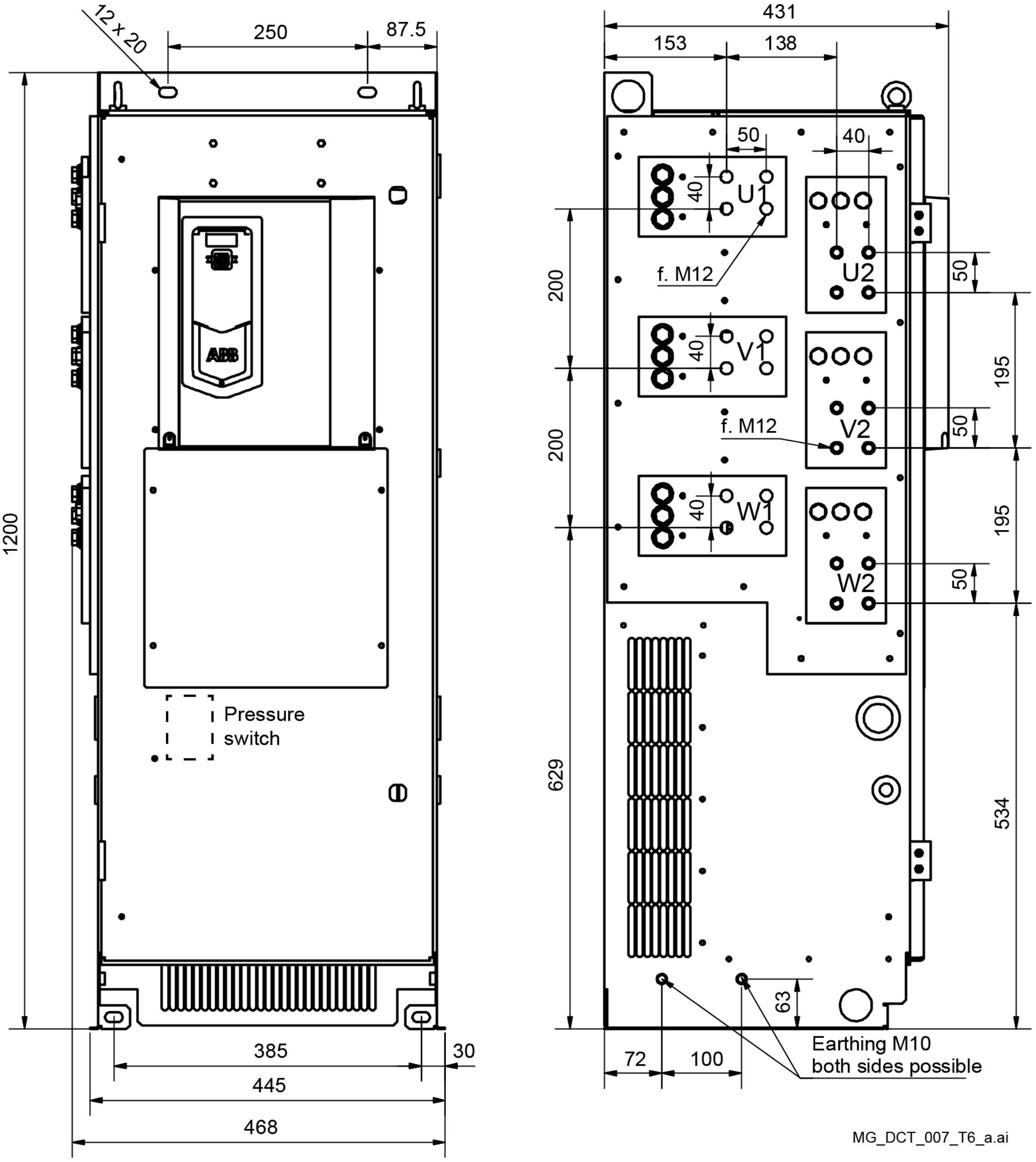
Size	Thyristor power controller	h * w * d [mm]	weight [kg]
T4	DCT880-W0b-0550-0d DCT880-W0b-0630-07 DCT880-W0b-0675-0d DCT880-W0b-0740-0d	670 * 270 * 352	38



Size	Thyristor power controller	h * w * d [mm]	weight [kg]
T5	DCT880-W03-0890-0d DCT880-W02-0960-0d	740.5 * 270 * 368	60

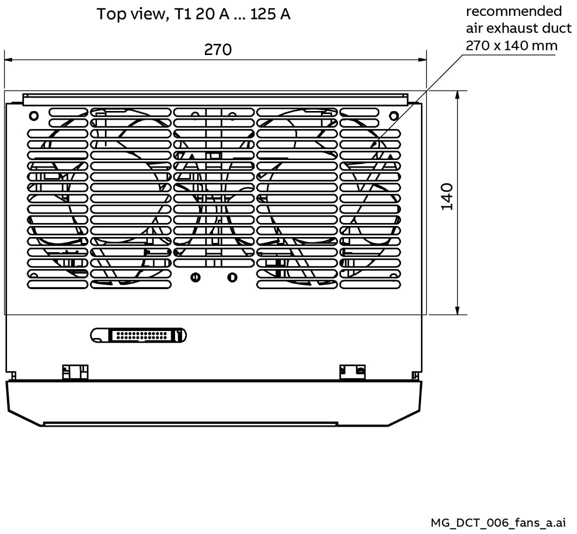


Size	Thyristor power controller	h ∗ w ∗ d [mm]	weight [kg]
T6	DCT880-W0b-1300-0d DCT880-W0b-1750-0d	1200 ∗ 468 ∗ 431	125

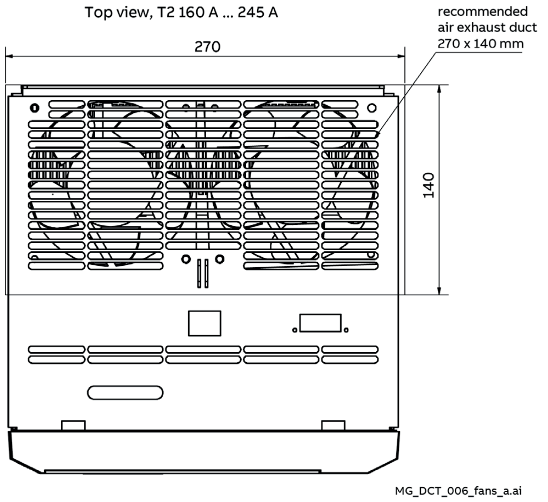


Fan terminals and cooling air duct sizes

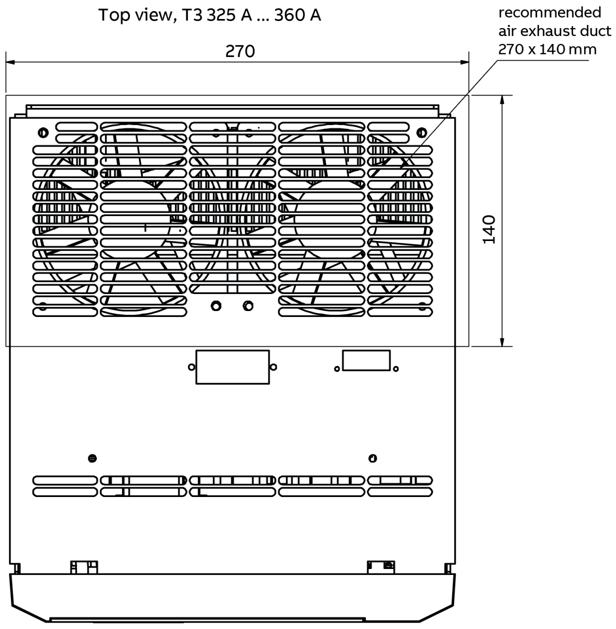
T1:

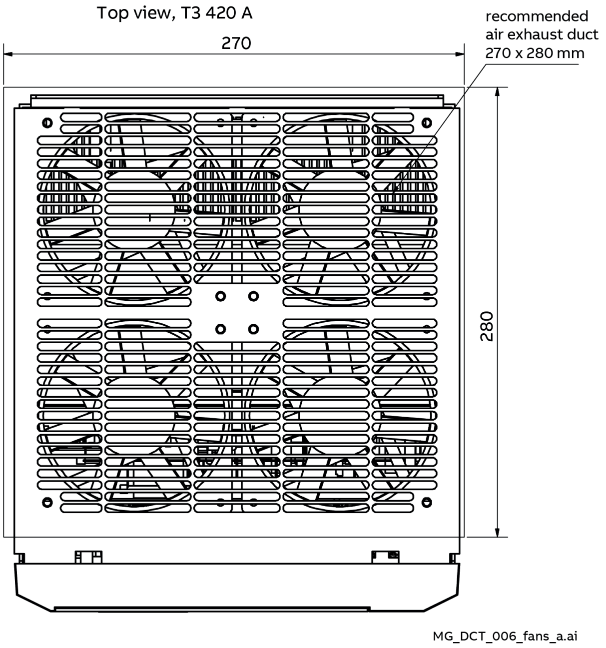

Top view, T1 20 A ... 125 A

T2:


Top view, T2 160 A ... 245 A

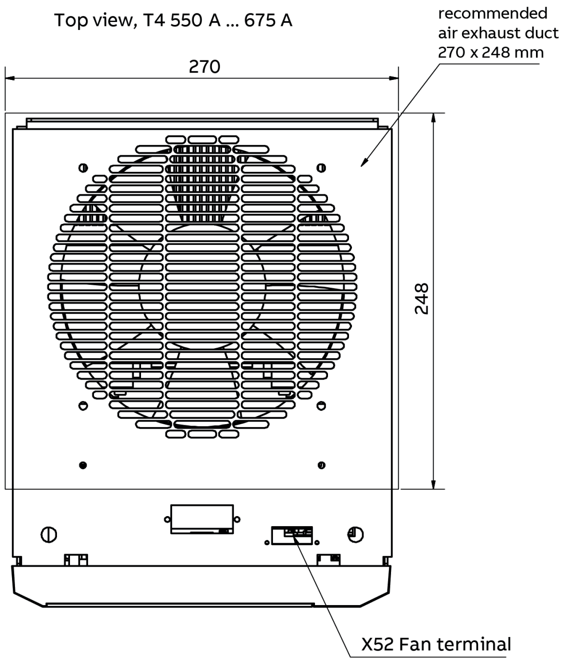
T3:


Top view, T3 325 A ... 360 A

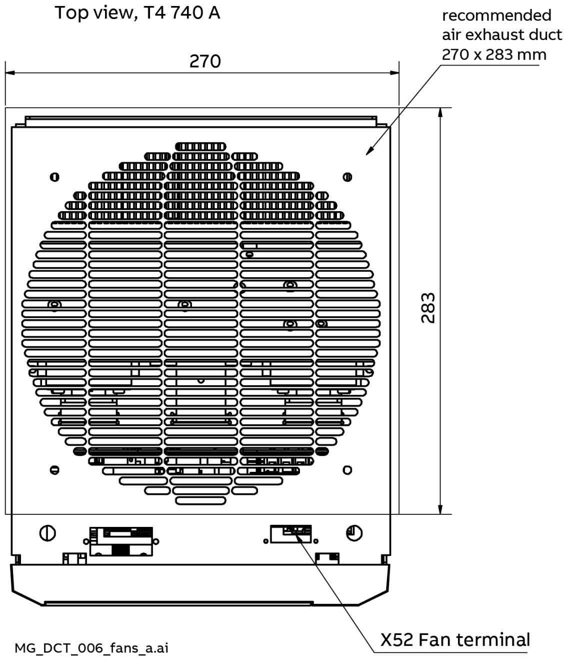

Top view, T3 420 A

T4:

Top view, T4 550 A … 675 A

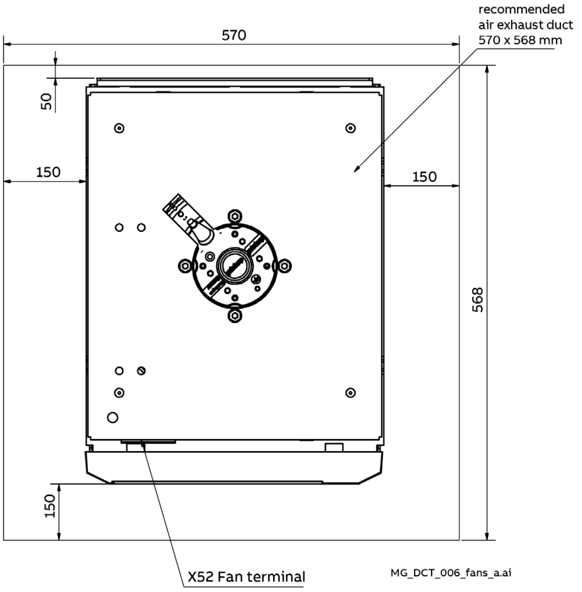


Top view, T4 740 A



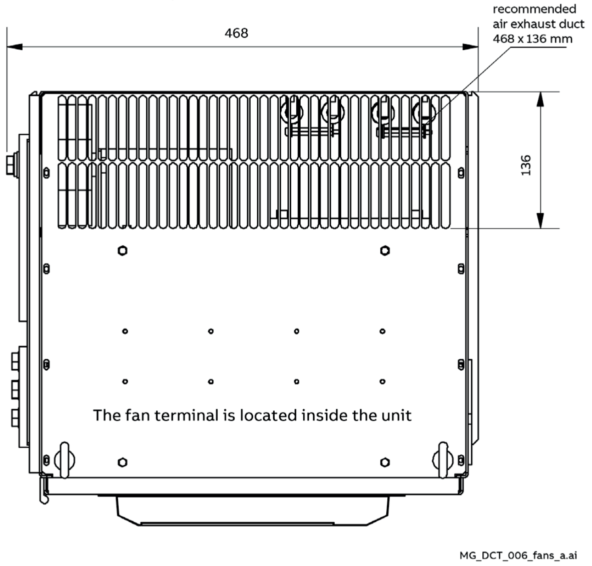
T5:

Top view, T5 890 A … 960 A



T6:

Top view, T6 1300 A … 1750 A

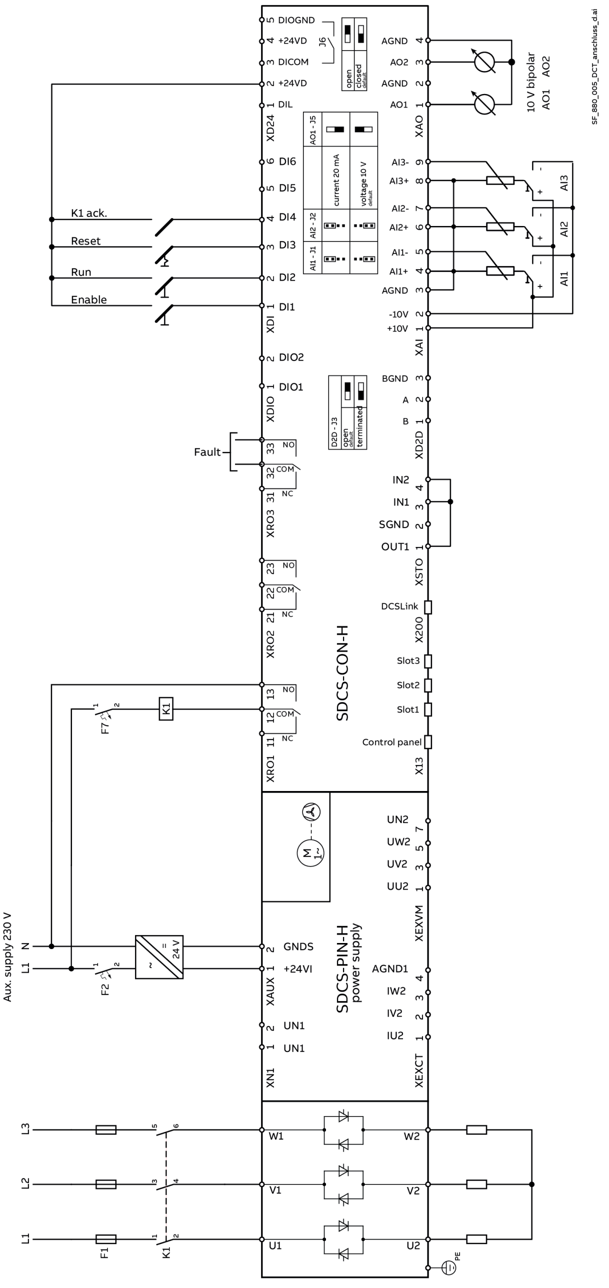


Wiring

This chapter contains the instructions that must be followed when selecting cables, protections, cable routing and way of operation of the thyristor power controller. Always follow local regulations. This chapter applies to all DCT880 thyristor power controllers.

Attention: If the recommendations given by ABB are not followed, the thyristor power controller may experience problems that the warranty does not cover.

Connection and wiring example for thyristor power controllers T1 … T5:

<table>
<tr><th>Basic connection diagram T1 …T3,
3-phase mains, W03 (3 legs):</th><th>Basic connection diagram T4 and T5,
3-phase mains, W03 (3 legs):</th></tr>
<tr><td>


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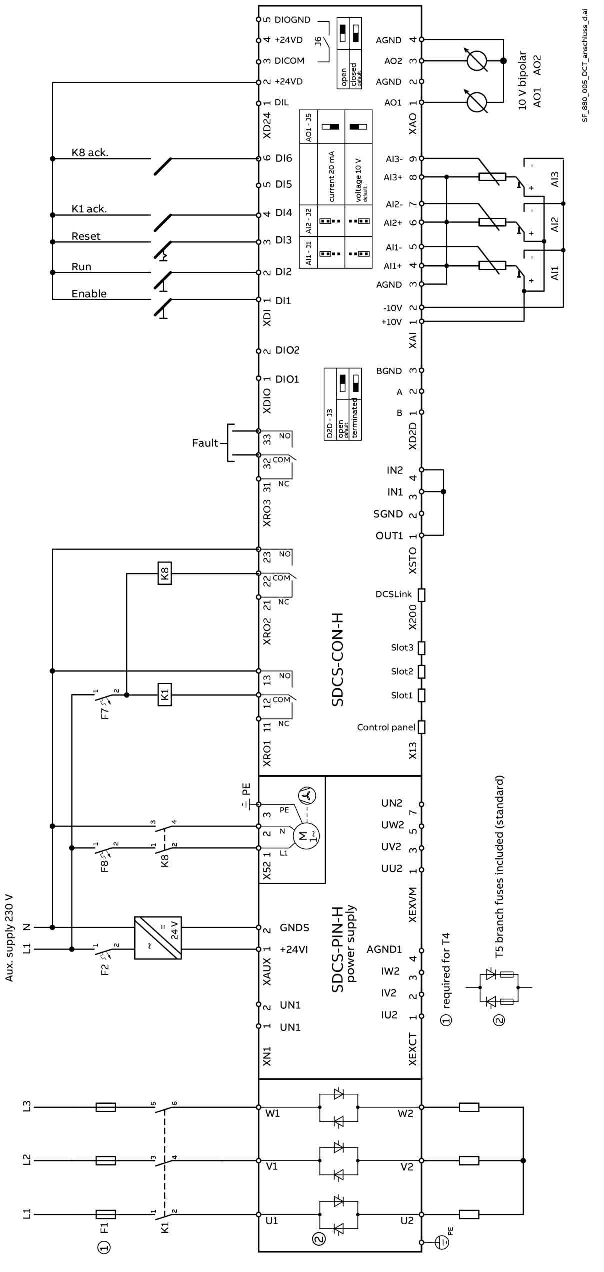

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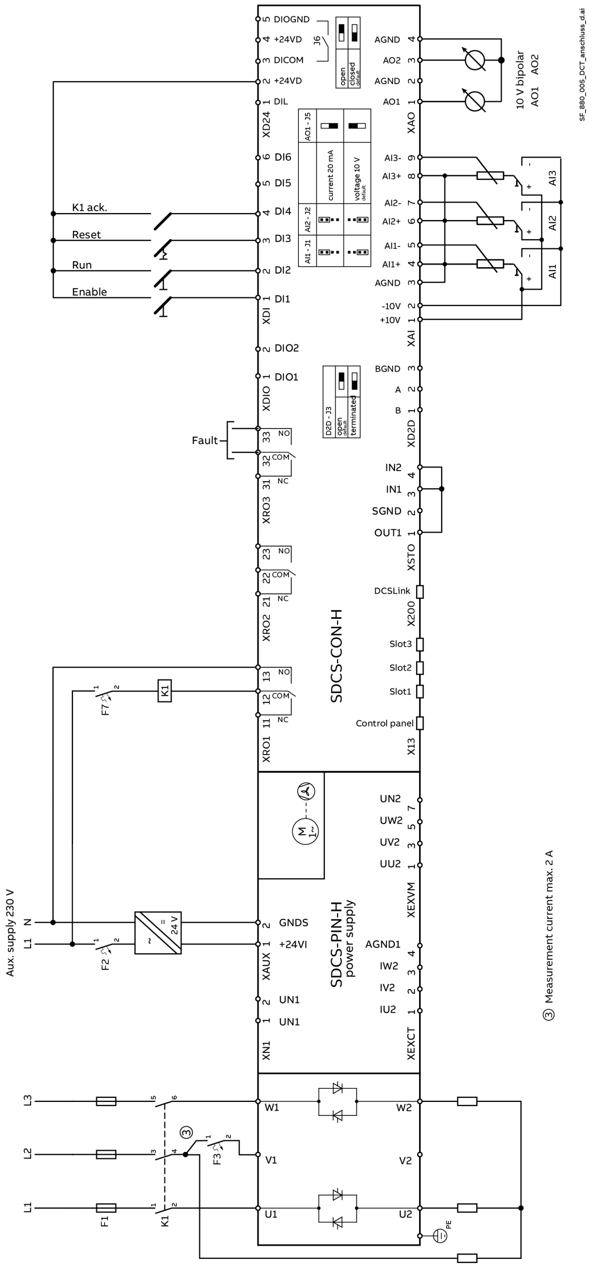
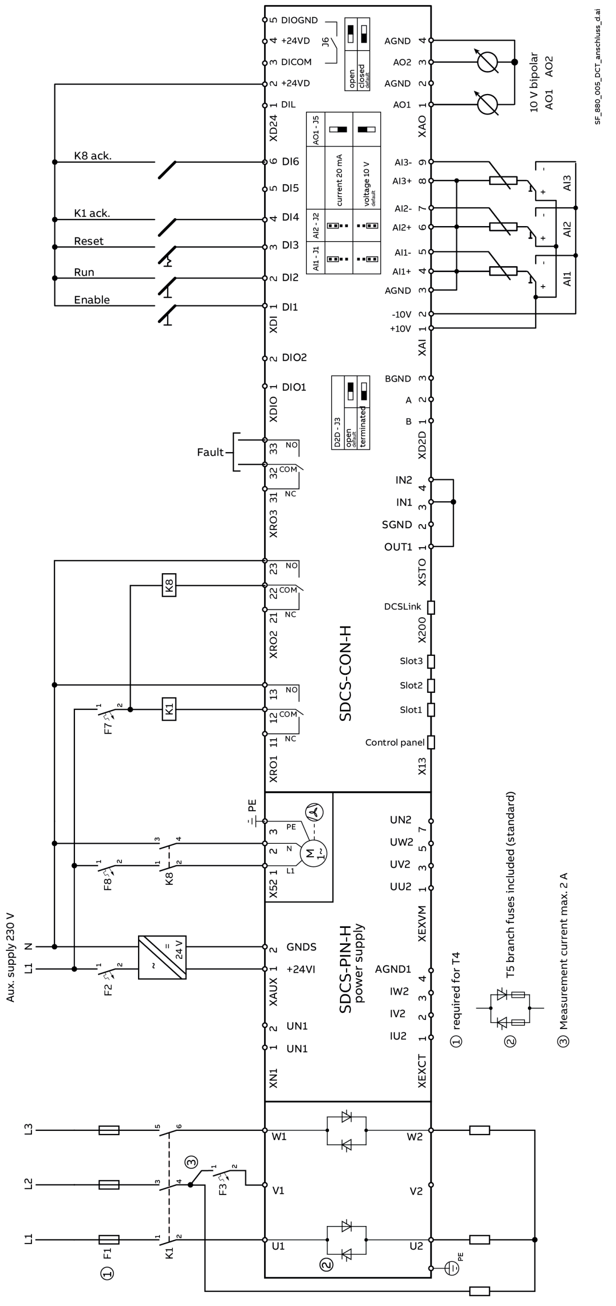
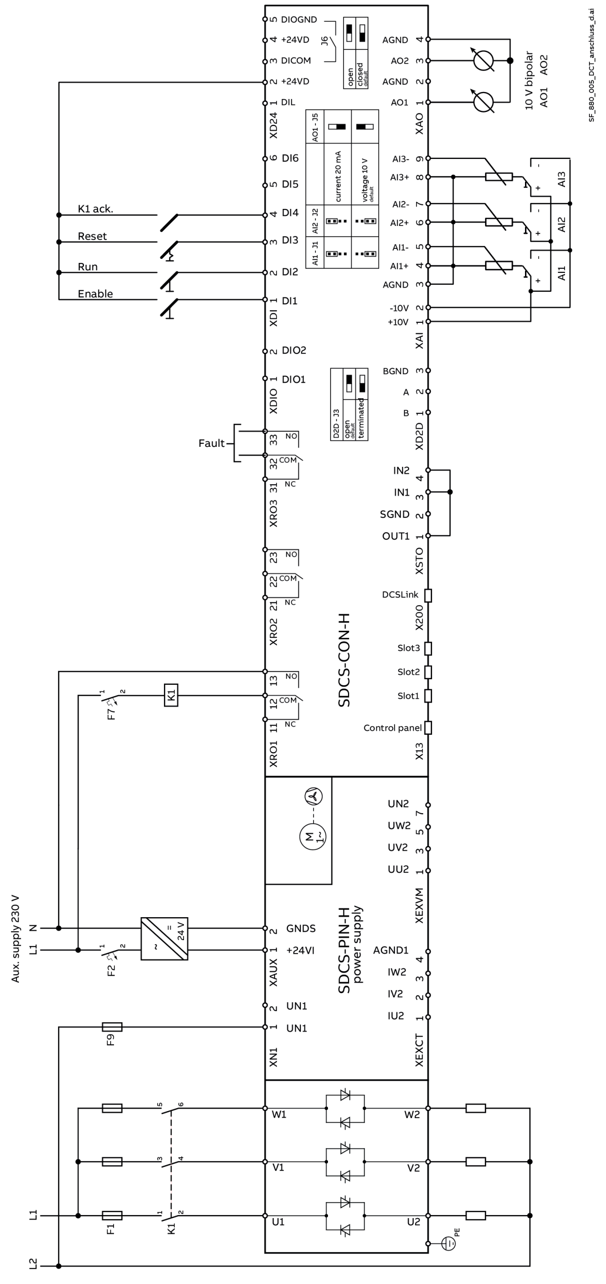
Basic connection diagram T1 …T3, 3-phase mains, W02 (2 legs):



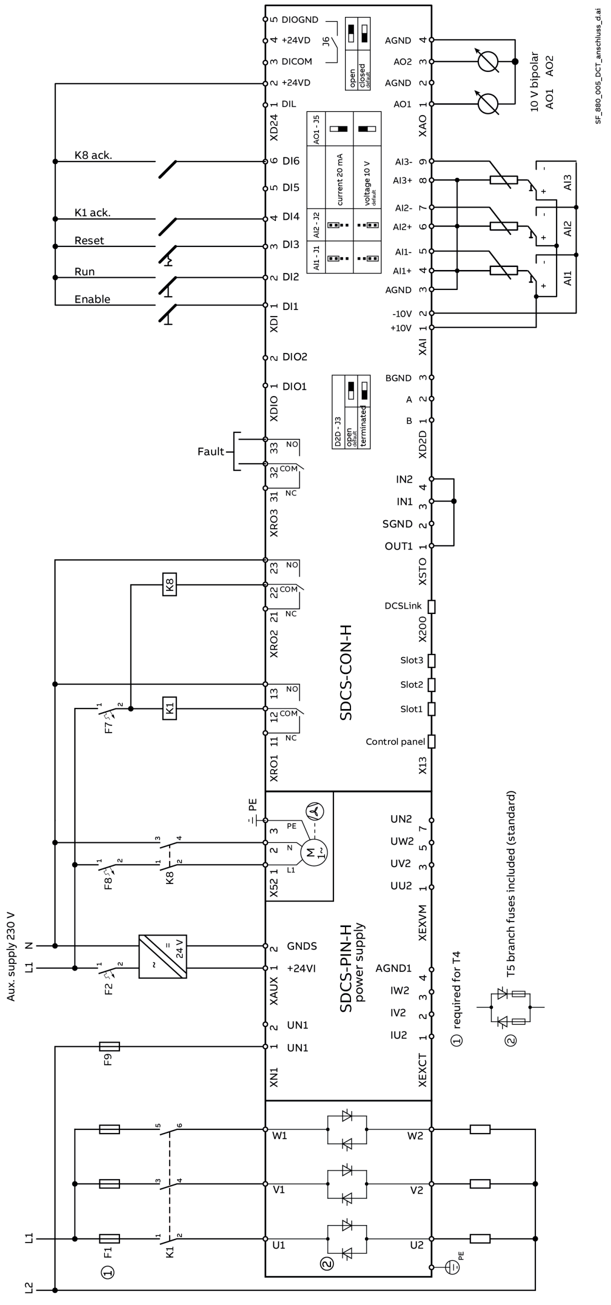
Basic connection diagram T4 and T5, 3-phase mains, W02 (2 legs):



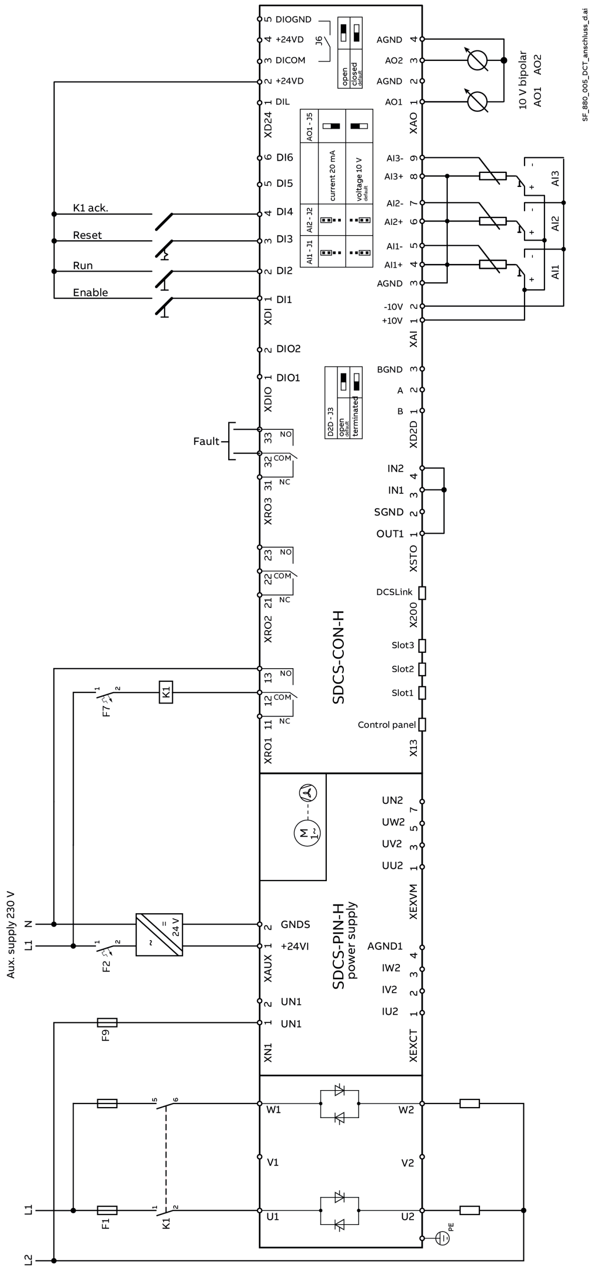
Basic connection diagram T1 …T3, phase-to-phase mains, W03 (3 legs):



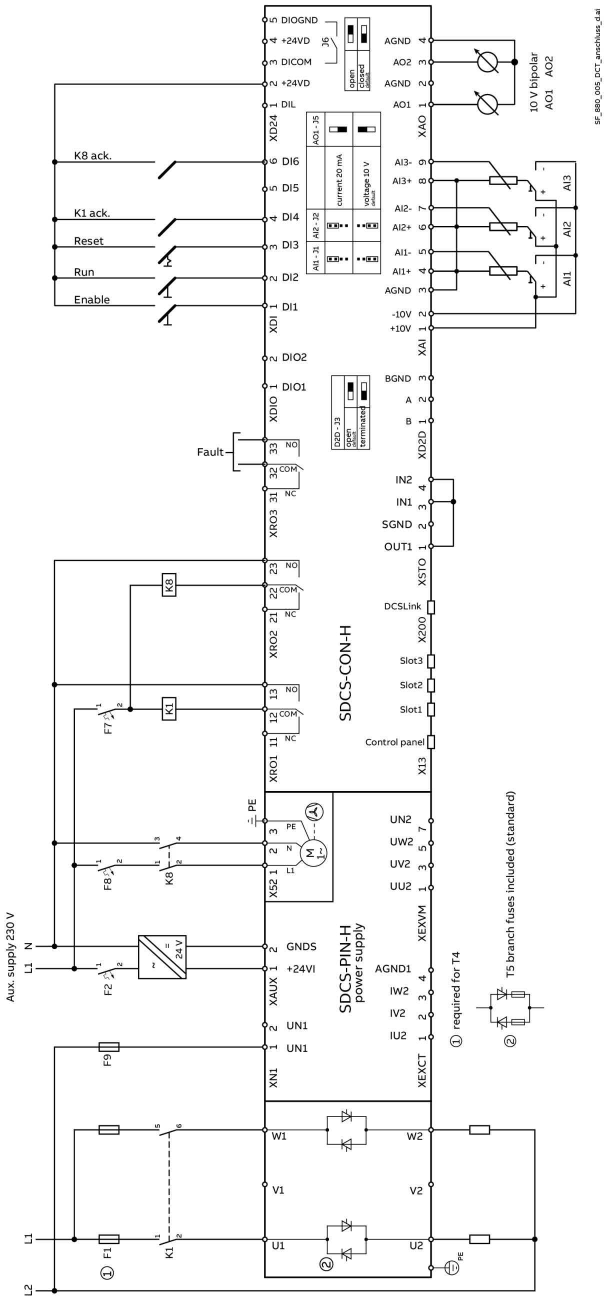
Basic connection diagram T4 and T5, phase-to-phase mains, W03 (3 legs):



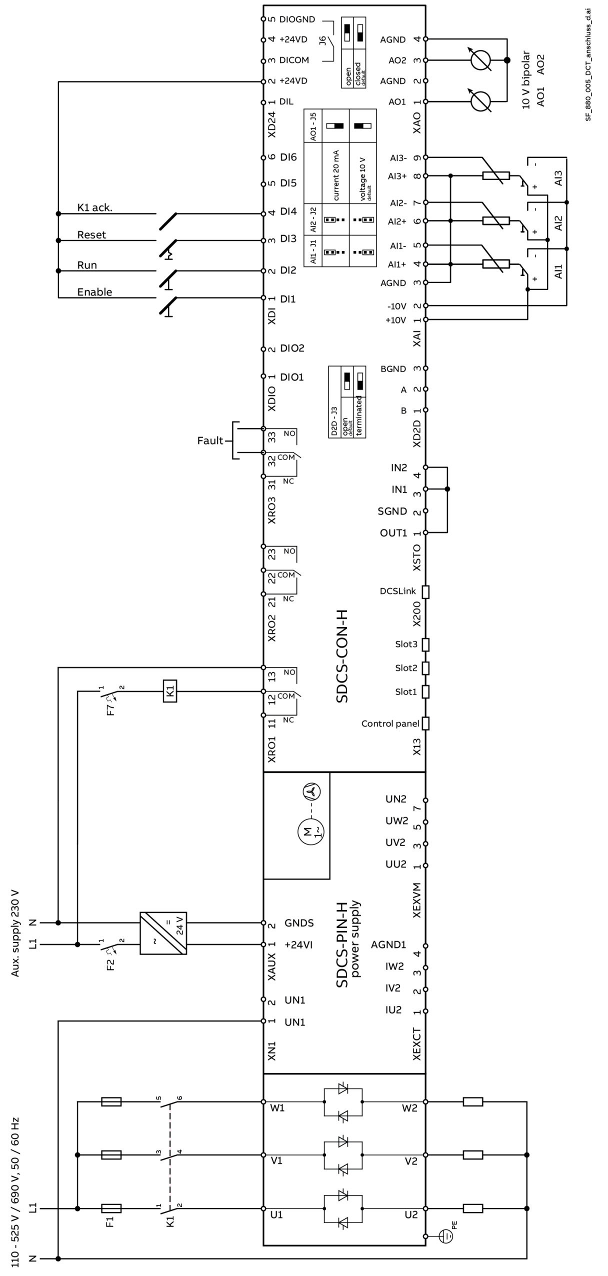
Basic connection diagram T1 …T3, phase-to-phase mains, W02 (2 legs):



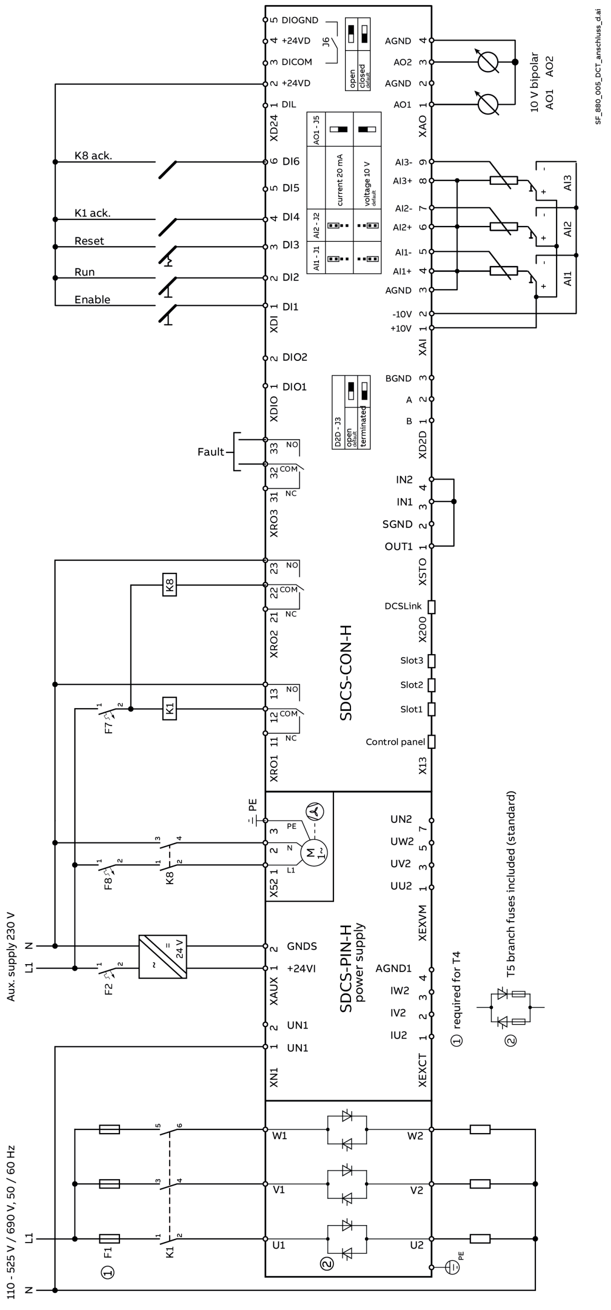
Basic connection diagram T4 and T5, phase-to-phase mains, W02 (2 legs):



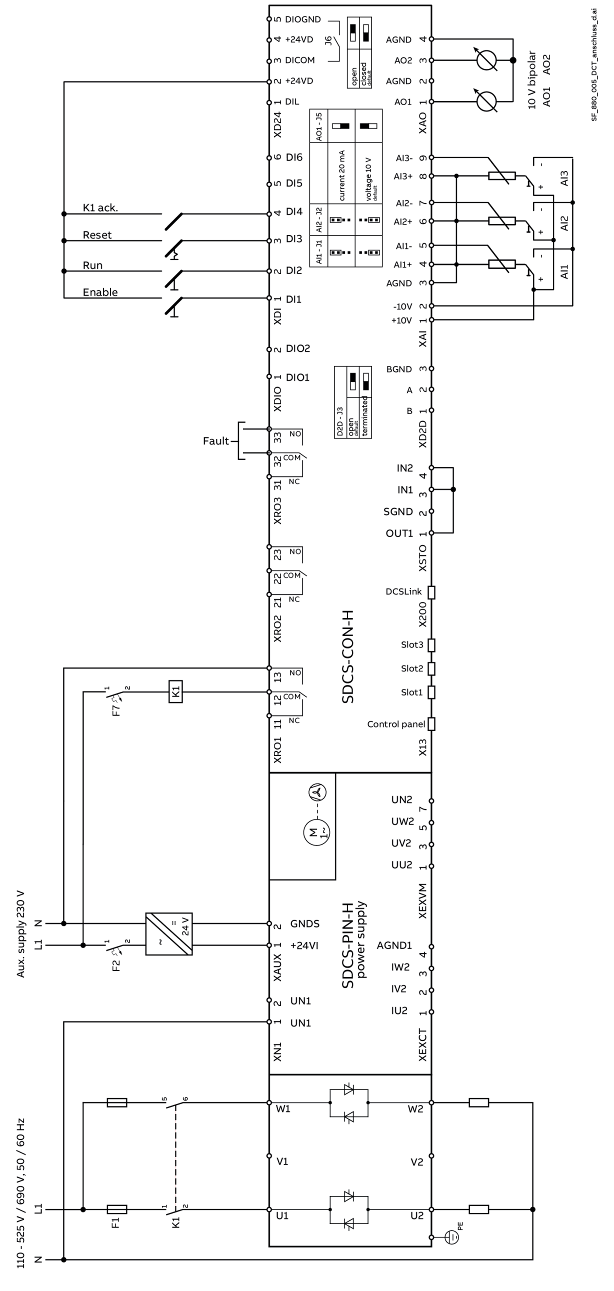
Basic connection diagram T1 …T3, single-phase mains, W03 (3 legs):



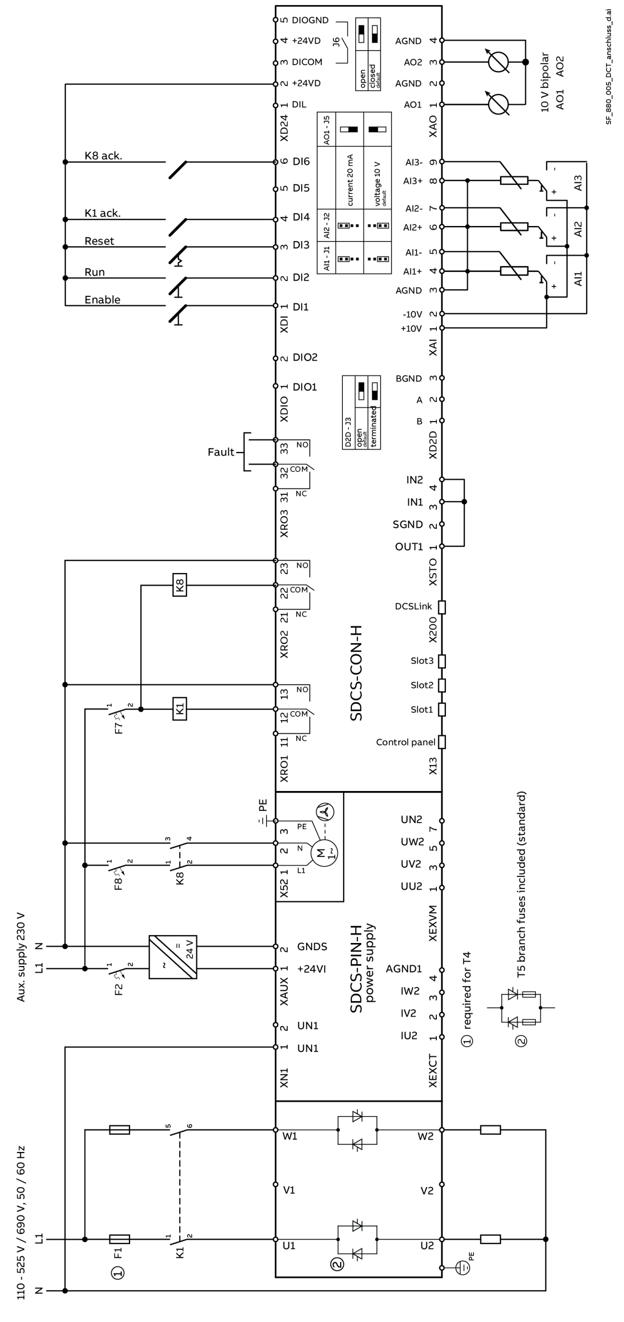
Basic connection diagram T4 and T5, single-phase mains, W03 (3 legs):



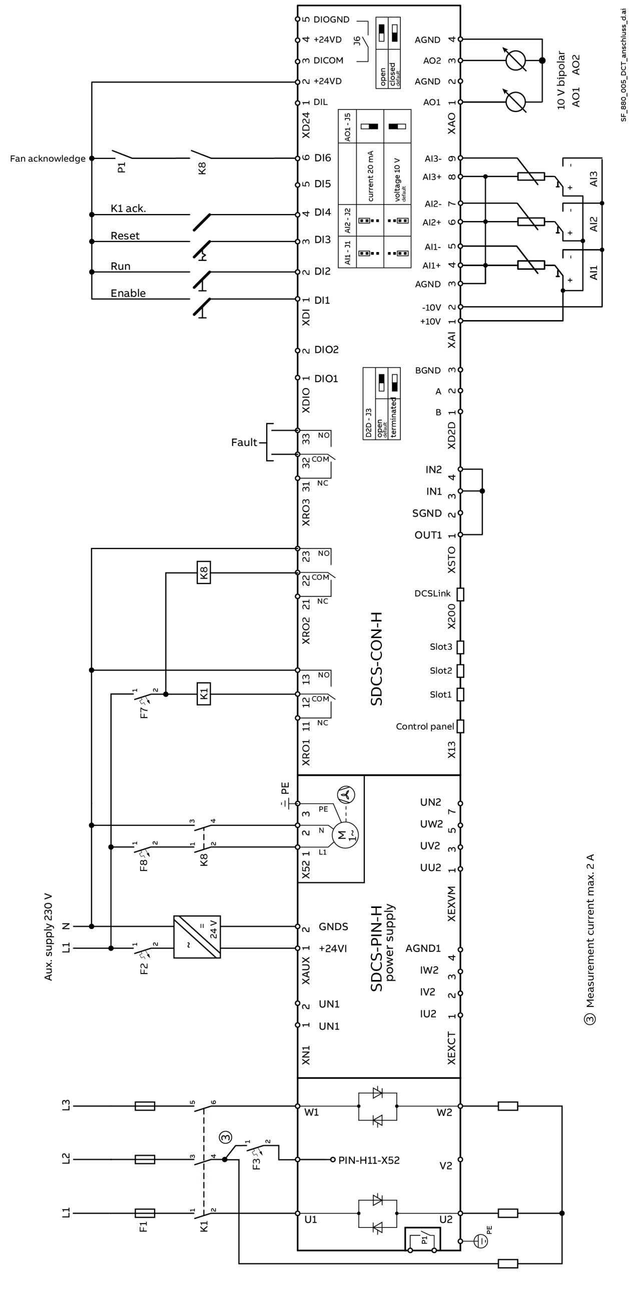
Basic connection diagram T1 …T3, single-phase mains, W02 (2 legs):



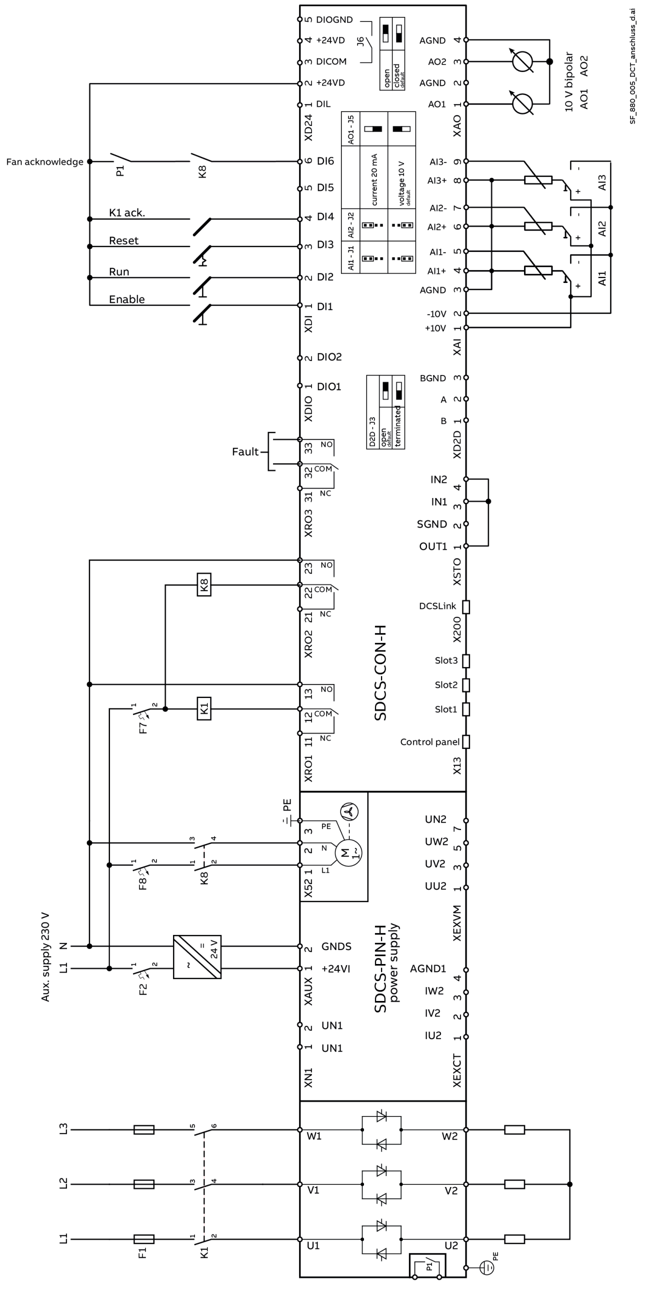
Basic connection diagram T4 and T5, single-phase mains, W02 (2 legs):

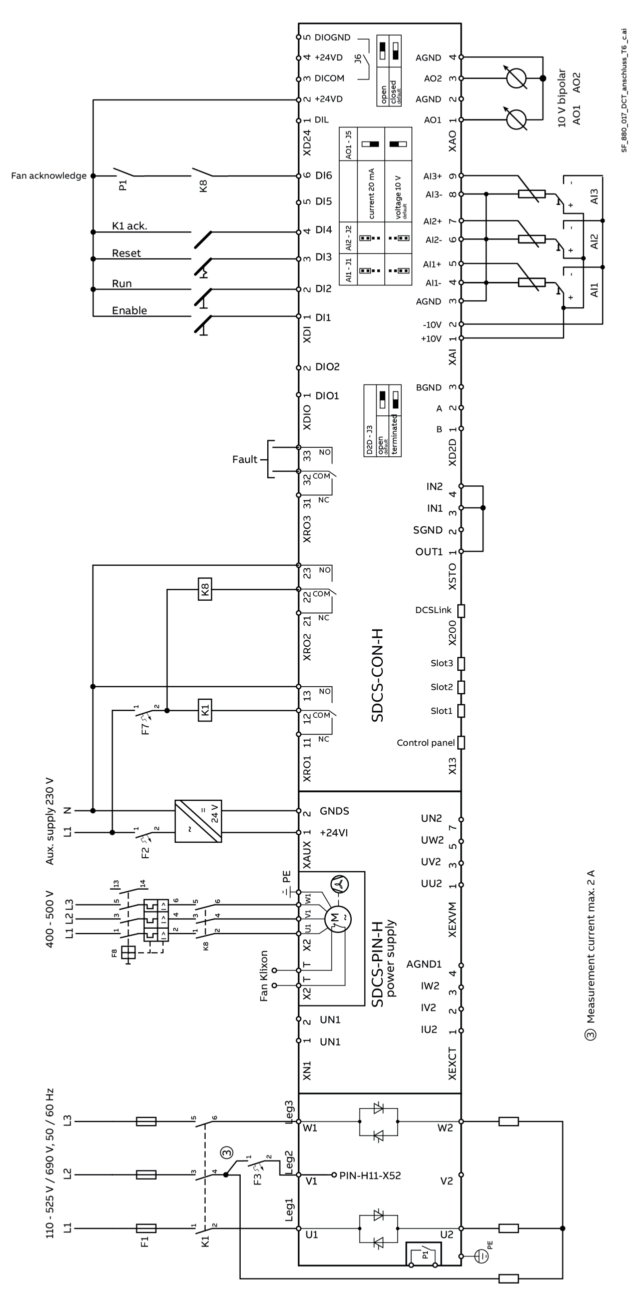
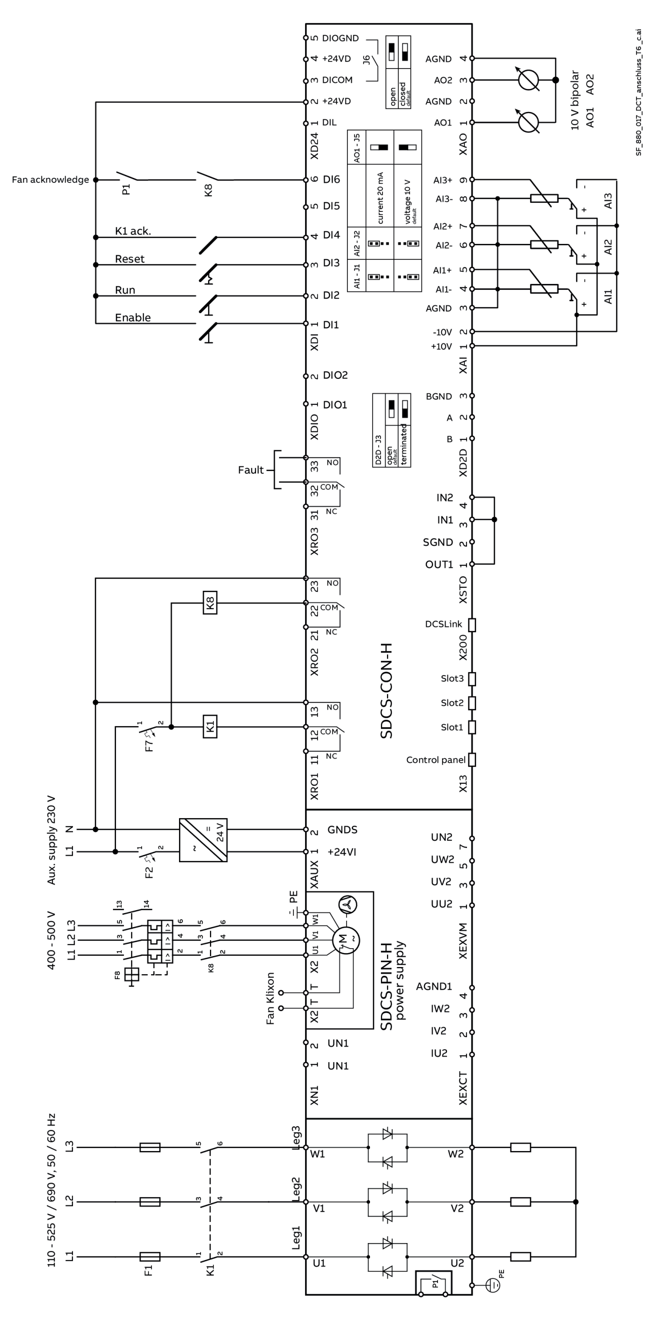


Basic connection diagram T6 1300 A, 3-phase mains, W02 (2 legs):



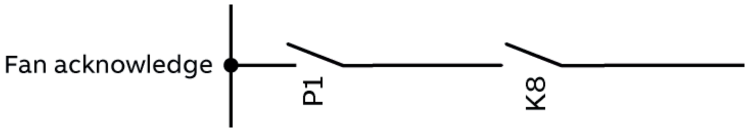
Basic connection diagram T6 1300 A, 3-phase mains, W03 (3 legs):



Basic connection diagram T6 1750 A, 3-phase mains, W02 (2 legs):	Basic connection diagram T6 1750 A, 3-phase mains, W03 (3 legs):
	

Pressure switch (P1) connection

Connect the pressure switch (P1) as shown in the figures above.



Set 19.38 Controller fan acknowledge source accordingly.

Removal and attachment of the front cover

To remove the DCT880 front cover depress the locks at the bottom ① and lift the front cover up ②. There is no need to remove the control panel.

To attach the DCT880 front cover hang it on the top notches and click in the locks at the bottom. There is no need to remove the control panel.

Cabling

Power cables

Dimension the power cables according to local regulations. The cables must:

- Be able to carry the DCT880 load current.
- Be rated for at least 60°C.
- Fulfill short-circuit protection.
- Be rated according permissible touch voltage appearing under fault conditions (so that the fault point voltage will not rise too high when an earth fault occurs).
- Be screened according to safety regulations.

Power cable short-circuit protection

Always protect the mains cables with fuses. Size the fuses according to local safety regulations, to appropriate input voltage and to the rated current of the thyristor power controller, see Environmental conditions.

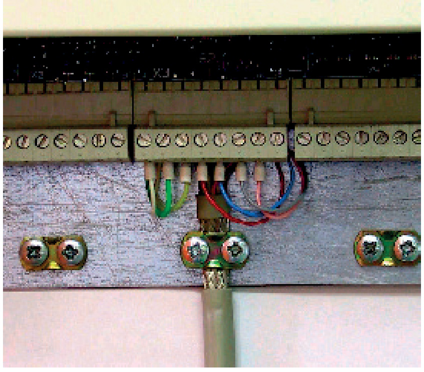
High-speed semiconductor fuses provide short-circuit protection, but do not provide thermal overload protection.

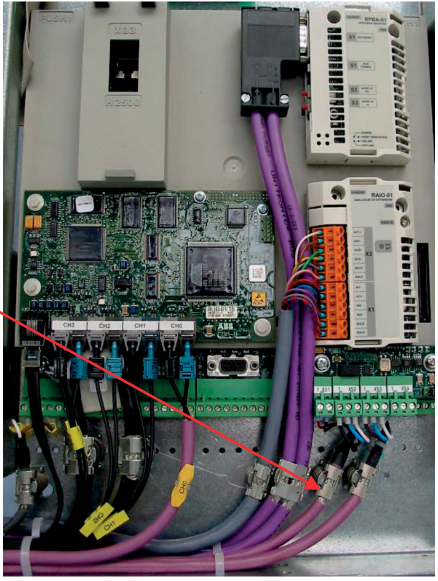
Control/Signal cables

All control cables must be shielded.

Used screened cables for digital signals, which are longer than 3 m and for all analog signals.

Connect each screen at both ends by metal clamps or comparable means directly on clean metal surfaces, if both earthing points belong to the same earth line. Otherwise, connect a capacitor to earth on one end. In the thyristor power controller cabinet this kind of connection must be made directly on the sheet metal close to the terminals and if the cable comes from outside also on the PE bar. At the other end of the cable, connect the screen well with the housing of the signal emitter or receiver.

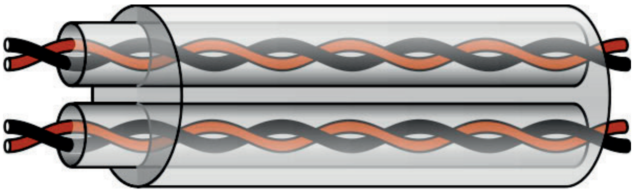




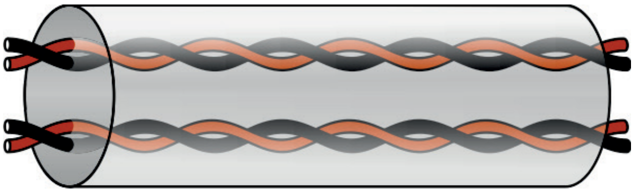
Connection of cable screens with metal clamps to the metal surface of the electronic tray.

A double-shielded twisted pair cable (figure A below), e.g. JAMAK by NK Cables, Finland, must be used for analog signals and the pulsed signals. Employ one individually shielded pair for each signal. Do not use common return for different analog signals.

A double-shielded cable (figure A below) is the best alternative for low-voltage digital signals but a single-shielded twisted multi pair cable (figure B below) is also usable.



A: Double-shielded twisted pair cable



B: Single-shielded twisted multi pair cable

Pairs should be twisted as close to terminals as possible.

Signals in separate cables

Run analog and digital signals in separate, shielded cables. Never mix 24 V_{DC} and 115/230 V_{AC} signals in the same cable.

Signals allowed to be run in the same cable

Relay-controlled signals, providing their voltage does not exceed 48 V, can be run in the same cables as digital input signals. The relay-controlled signals should be run as twisted pairs too.

Relay cable type

The cable type with braided metallic screen (e.g. ÖLFLEX by LAPPKABEL, Germany) has been tested and approved by ABB.

Control panel cable length and type

In remote use, the cable connecting the control panel to the DCT880 thyristor power controller must not exceed 3 meters. Cable type: Shielded CAT 5e or better Ethernet patch cable with RJ-45 ends.

Fieldbus cables

Fieldbus cables can be quite different, depending on the fieldbus type. Please refer to control/signal cables.

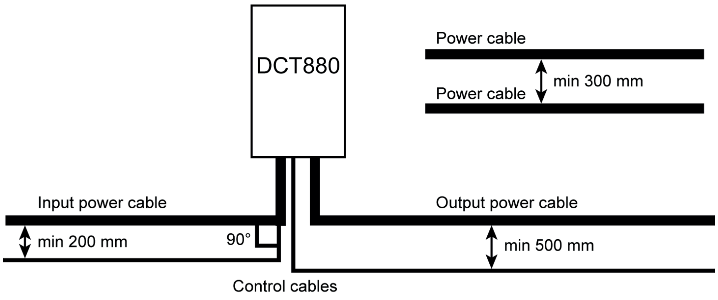
Routing the cables

Run the power cables away from other cables. Power cables of several thyristor power controllers can be run in parallel next to each other. Power cables and control cables should be installed on separate trays. Avoid long parallel runs of power cables with other cables to decrease electromagnetic interference caused by rapid changes in the thyristor power controller’s output voltage.

Where control cables must cross power cables, make sure they are arranged at an angle as close to 90 degrees as possible. Do not run spare cables through the cabinet.

The cable trays must have good electrical bonding to each other and to the grounding electrodes. Aluminum tray systems can be used to improve local equalizing of potential.

The following diagrams show the proper routing of cables:



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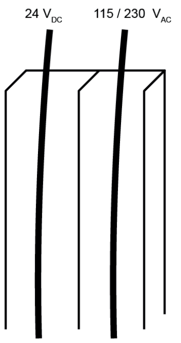
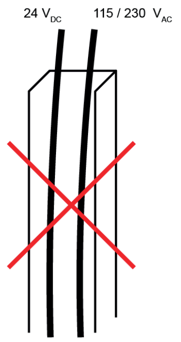


SA_DCS_002_kab-kanal_a.ai

Route 24 V_{DC} and 115/230 V_{AC} control cables in separate ducts inside the cabinet.



Not allowed unless the 24 V_{DC} cable is insulated for 115/230 V_{AC} or insulated with an insulation sleeve for 115/230 V_{AC}.

Power terminals

Cross-sectional areas - Tightening torques
Recommended cross-sectional area according to **DINVDE 0276-1000** and **DINVDE 0100-540 (PE)** in a trefoil arrangement, up to 50°C ambient temperature. The necessary wire torque at 60°C wire temperature is the same as recommended in the following table.

Power cables:
U1, V1, W1 are the input power terminal. U2, V2, W2 are the output power terminal. PE is the terminal for protective earth.

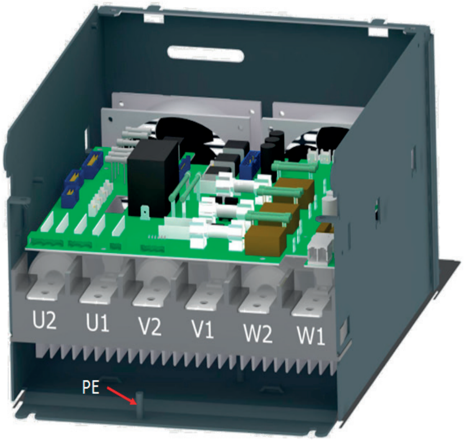
Size	**Thyristor power controller**	**U1, V1, W1 / U2, V2, W2**			**PE**		
		I [A~]	1 [mm^2]	(2.) [mm^2]	[mm^2]		[Nm]
T1	DCT880-W0b-0020-0d	20	1 x 4	-	1x 4	1 x M6	6
	DCT880-W0b-0035-0d	35	1 x 6	-	1x 6	1 x M6	6
	DCT880-W0b-0055-0d	55	1 x 25	-	1x 16	1 x M6	6
	DCT880-W0b-0080-0d	80	1 x 25	-	1x 16	1 x M6	6
	DCT880-W0b-0100-0d	100	1 x 35	-	1x 16	1 x M6	6
	DCT880-W0b-0125-0d	125	2 x 25	1 x 70	1x 25	1 x M6	6
T2	DCT880-W0b-0160-0d	160	2 x 25	1 x 70	1x 25	1 x M10	25
	DCT880-W0b-0200-0d	200	2 x 25	1 x 95	1x 25	1 x M10	25
	DCT880-W0b-0245-0d	245	2 x 50	-	1x 50	1 x M10	25
T3	DCT880-W0b-0325-0d	325	2 x 95	-	1x 50	1 x M10	25
	DCT880-W0b-0360-0d	360	2 x 95	-	1x 50	1 x M10	25
	DCT880-W0b-0420-0d	420	2 x 95	-	1x 50	1 x M10	25
T4	DCT880-W0b-0550-0d	550	2 x 120	-	1x120	1 x M12	50
	DCT880-W0b-0630-07	630	2 x 120	-	1x120	1 x M12	50
	DCT880-W0b-0675-0d	675	2 x 150	-	1x150	1 x M12	50
	DCT880-W0b-0740-0d	740	2 x 150	-	1x150	1 x M12	50
T5	DCT880-W03-0890-0d	890	4 x 95	3 x 120	1x185	2 x M10	25
	DCT880-W02-0960-0d	960	4 x 95	3 x 120	1x185	2 x M10	25
T6	DCT880-W0b-1300-0d	1300	4 x 185	3 x 240	2 x 185	3 x (4 x M12)	50
	DCT880-W0b-1750-0d	1750	4 x 240	-	2 x 240	3 x (4 x M12)	50

You will find instructions on how to calculate the PE conductor’s cross-sectional area in IEC 60364-4-xx or in equivalent national standards. We would remind you that thyristor power controller might have a current-limiting effect.

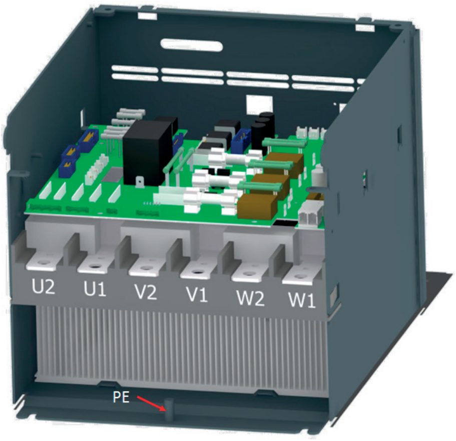
⚠ **WARNING!**
If neutral is connected to the star point of the load, the cable has to be able to carry up to 1.73 ($\sqrt{3}$) times nominal load current.

Power terminal location and layout

T1:



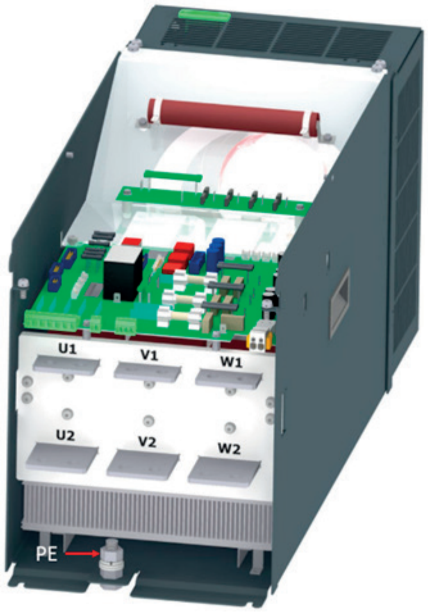
T2:



T3:

T4:

T5:



T6:

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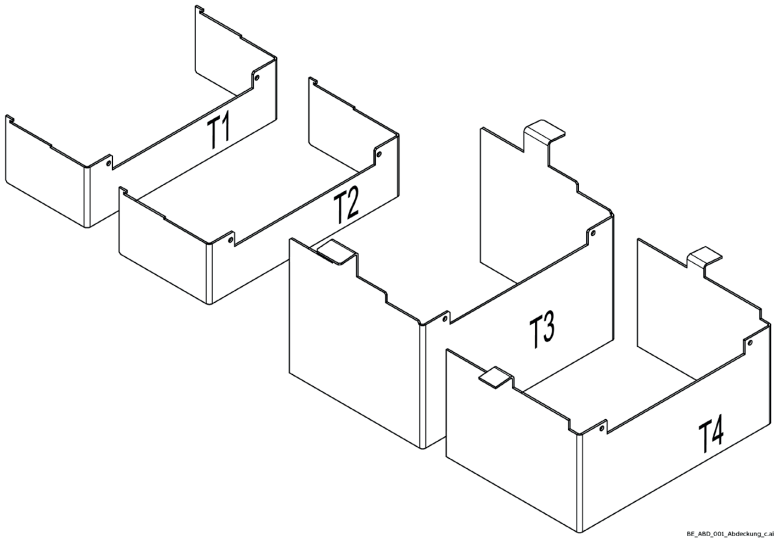
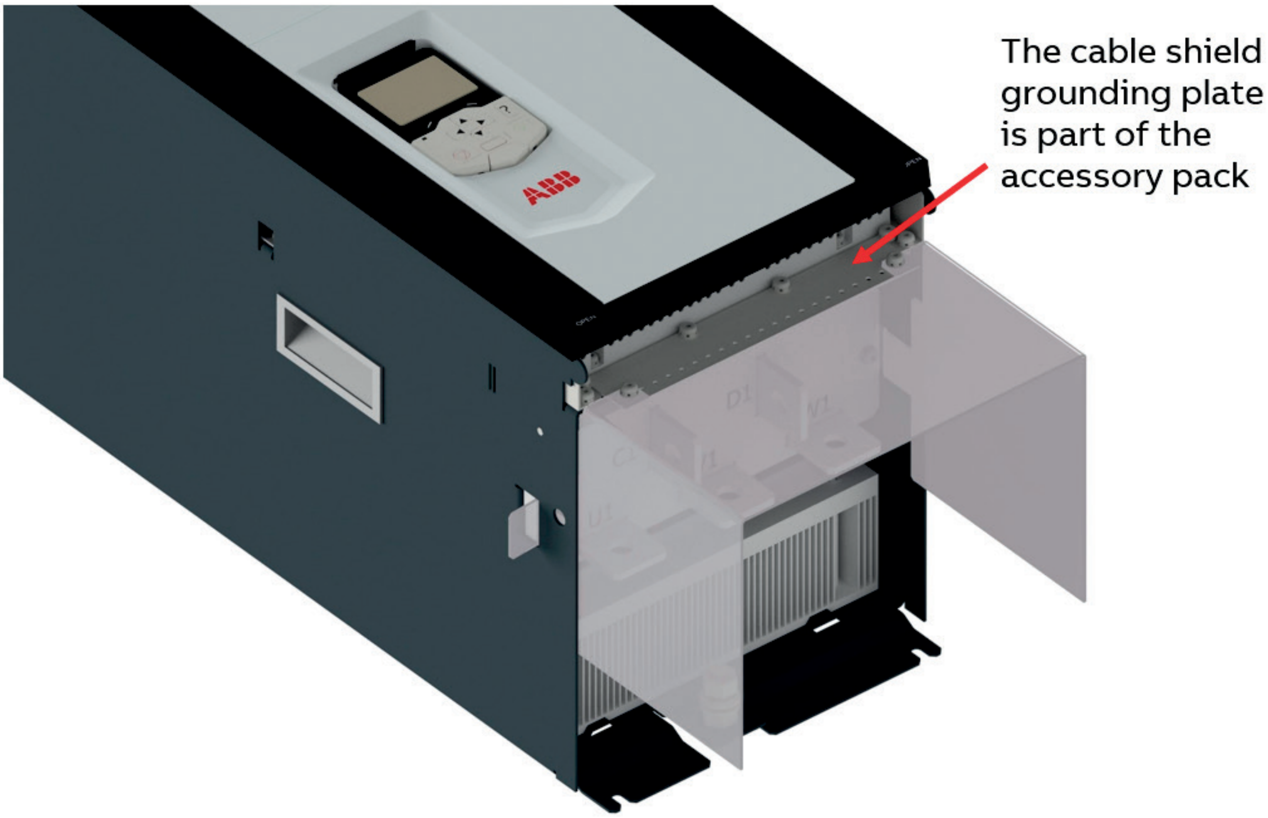
Terminal covers for units size T1 … T4

Terminal cover according to VBG 4 regulations (T1 … T4 only)

For thyristor power controllers size T1 … T4 shrouds for protection against contact are provided.

Ident number	Remark
3ADT631236P0001	T1
3ADT631237P0001	T2
3ADT631240P0001	T3
3ADT631239P0001	T4





Example of a power terminal cover for T4 thyristor power controllers.

Cooling fans

Fan assignment for DCT880:

Size	Thyristor power controller	Configuration	Fan type
T1	DCT880-W0b-0020-0d … DCT880-W0b-0035-04/05	-	No fan, convection cooled
	DCT880-W0b-0035-07 DCT880-W0b-0055-0d … DCT880-W0b-0125-0d	1	2 x 3ADT754041P0001 (internal 24 V_{DC})
T2	DCT880-W0b-0160-0d … DCT880-W0b-0245-0d		
T3	DCT880-W0b-0325-0d … DCT880-W0b-0360-0d		
	DCT880-W0b-0420-0d	2	4 x 3ADT754041P0001 (internal 24 V_{DC})
T4	DCT880-W0b-0550-0d … DCT880-W0b-0675-0d	3	1 x DCA0012171P0001 (230 V_{AC})
	DCT880-W0b-0740-0d		1 x 3ADT754028P0001 (230 V_{AC})
T5	DCT880-W03-0890-0d … DCT880-W02-0960-0d	4	1 x 3ADT754042R0002 (230 V_{AC})
T6	DCT880-W0b-1300-0d	5	1 x 3ADT754045R0001 (230 V_{AC})
	DCT880-W0b-1750-0d	6	1 x 3ADT754034P0001 (fan voltage see table below)

Fan data for DCT880 (T1 … T5):

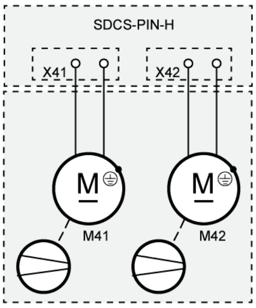
Fan	3ADT754041P0001	DCA0012171P0001		3ADT754028P0001		3ADT754042R0002	
Rated voltage [V_{AC}]	24 V_{DC} ①	230; 1~		230; 1~		230; 1~	
Tolerance [%]	+15 / -50	+6 / -10		+6 / -10		± 10	
Frequency [Hz]	-	50	60	50	60	50	60
Power consumption [W]	8.16	64	80	135	185	227	390
Current consumption [A]	0.34	0.29	0.35	0.59	0.82	1.1	1.7
Blocking current [A]	-	< 0.7	< 0.8	< 0.9	< 0.9	3.1	3.1
Air flow [m^3/h] freely blowing	180	925	1030	1860	1975	-	-
Air flow [m^3/h] @ working point	-	-		-		800; 1.0 A	850; 1.6 A
Maximum ambient temperature [°C]	< 70	< 70		< 60		< 55	
Useful lifetime of grease	Approximately 70,000 h / 25°C	Approximately 40,000 h / 60°C				Approximately 40,000 h / 40°C	
Protection	DC ②	Internal temperature detector					
① Internally connected							
② Increased losses due to increased current with a blocked rotor will not result in a winding temperature, higher than permissible for the insulation class being involved.							

Fan data for DCT880 (T6):

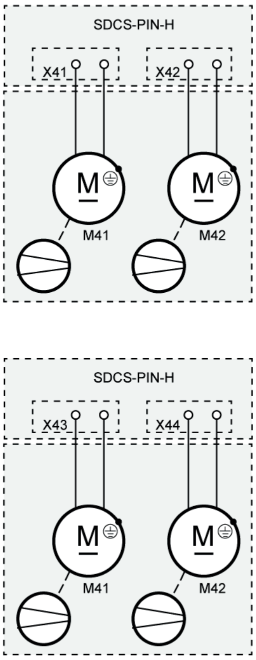
Fan	3ADT754045R0001		3ADT754034P0001	
Rated voltage [V_{AC}]	230; 1~		400 Δ 500 ⅄	460 Δ
Tolerance [%]	± 10		± 10	
Frequency [Hz]	50	60	50	60
Power consumption [W]	227	390	660 Δ 600 ⅄	1100 Δ
Current consumption [A]	1.1	1.7	1.4 Δ 0.8 ⅄	1.8 Δ
Blocking current [A]	3.1	3.1	at 400 V Δ 8.0 at 500 V ⅄ 2.8	at 460 V Δ 8.0
Air flow [m^3/h] at working point	800 at 1.0 A	800 at 1.0 A	1600 at 1.2 A (400 V Δ) 1500 at 0.7A (500 V ⅄)	1700 @ 1.6 A (460 V Δ)
Maximum ambient temperature [°C]	< 55		< 55	
Useful lifetime of grease	Appr. 40,000 h/40°		Appr. 30,000 h/40°	
Protection	Internal		Temperature detector: $U_N \leq 230$ V~; $I_N \leq 2.5$ A~	

Fan connection for DCT880 (T1 ... T5):

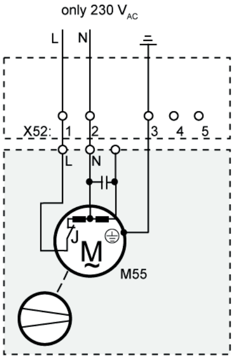
Converter housing : ▨



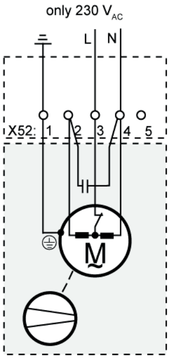
Configuration 1
T1, T2, T3



Configuration 2
T3



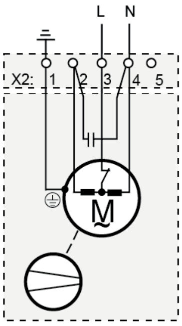
Configuration 3
T4



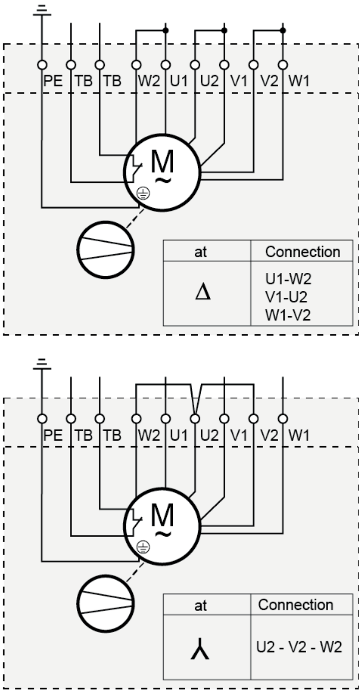
Configuration 4
T5

Fan connection for DCT880 (T6):

Converter housing : ▨



Configuration 5
T6



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Configuration 6
T6

Control board SDCS-CON-H01 (T1 ... T6)

The control circuit terminals are common for all sizes T1 … T6.

Location of the control circuit board SDCS-CON-H01

The SDCS-CON-H01 is mounted on an electronic tray. The electronic tray is attached in the housing by means of two hinges.

Watchdog function

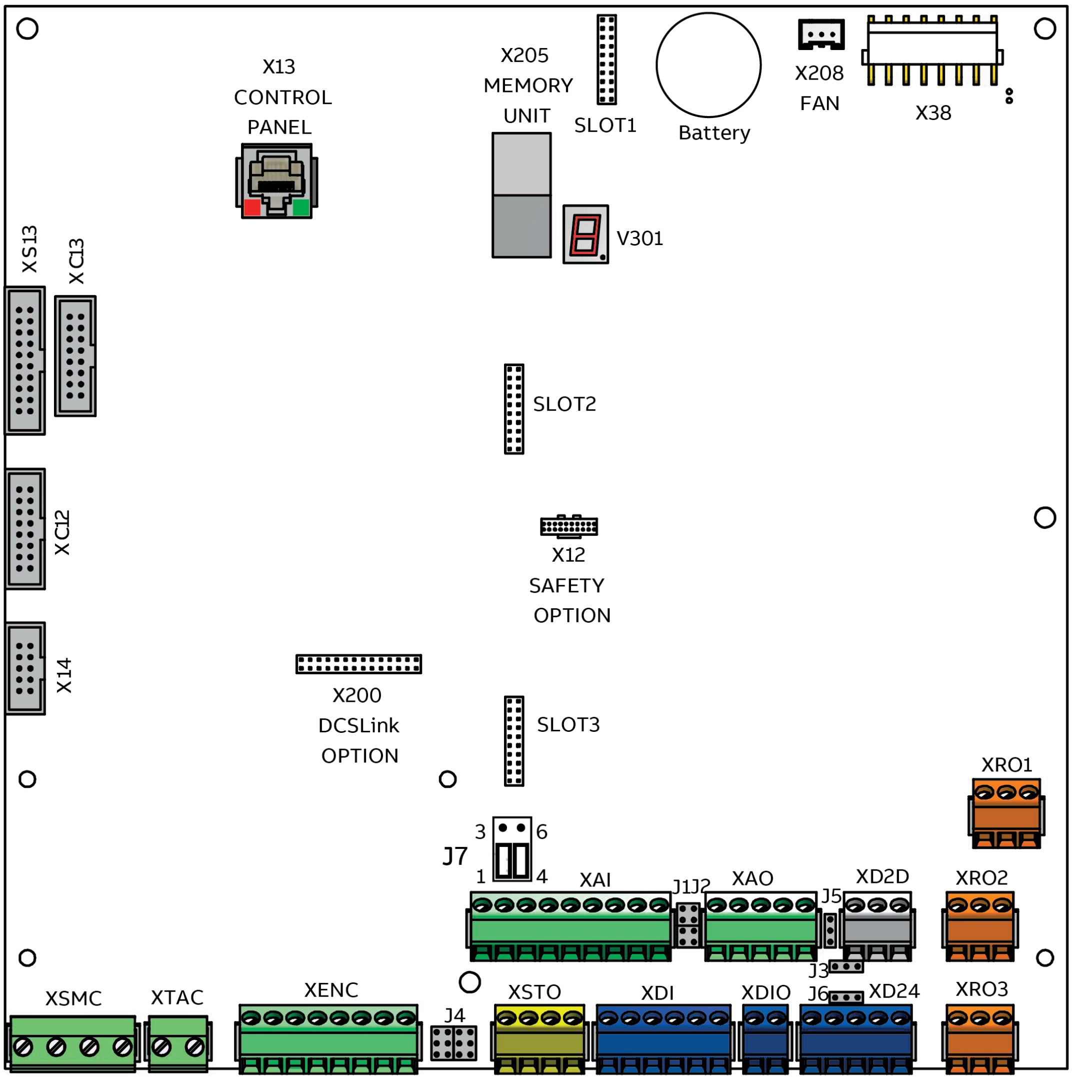
The SDCS-CON-H01 has an internal watchdog. The watchdog controls the proper function of the SDCS-CON-H01 and the firmware. If the watchdog trips, it has the following effects:

- The thyristor firing control is reset and disabled.
- All DI’s will not be processed.
- All DO’s are frozen in the actual state.
- All AI’s will not be processed.
- All programmable AO’s are frozen in the actual state.

Recommended wire size - Tightening torques

Control cables:

Wire sizes:	Tightening torques:
0.5 … 2.5 mm^2 (24 … 12 AWG)	0.5 Nm (5 lbf·in) for both stranded and solid wiring



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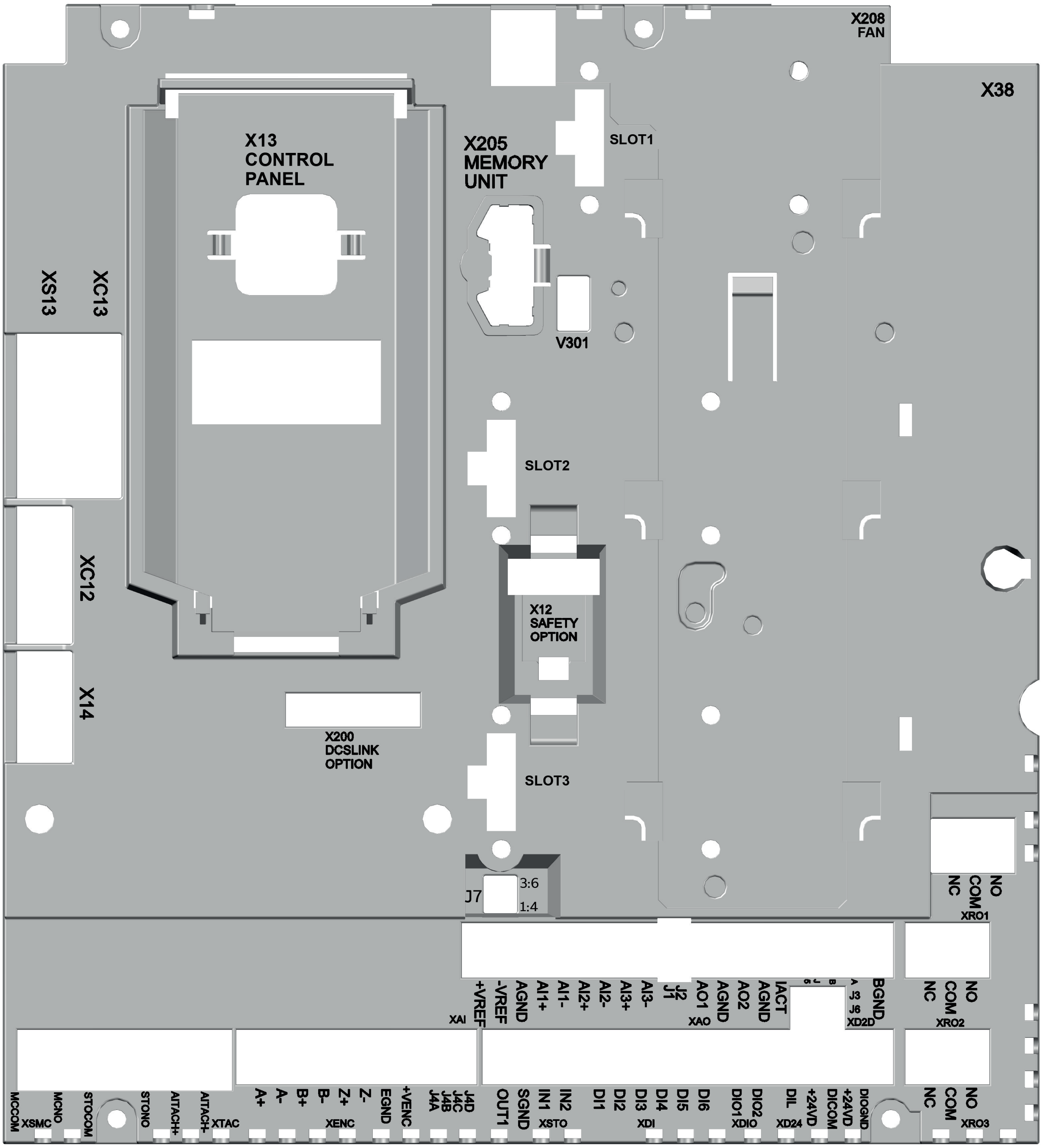
Intermediate cover



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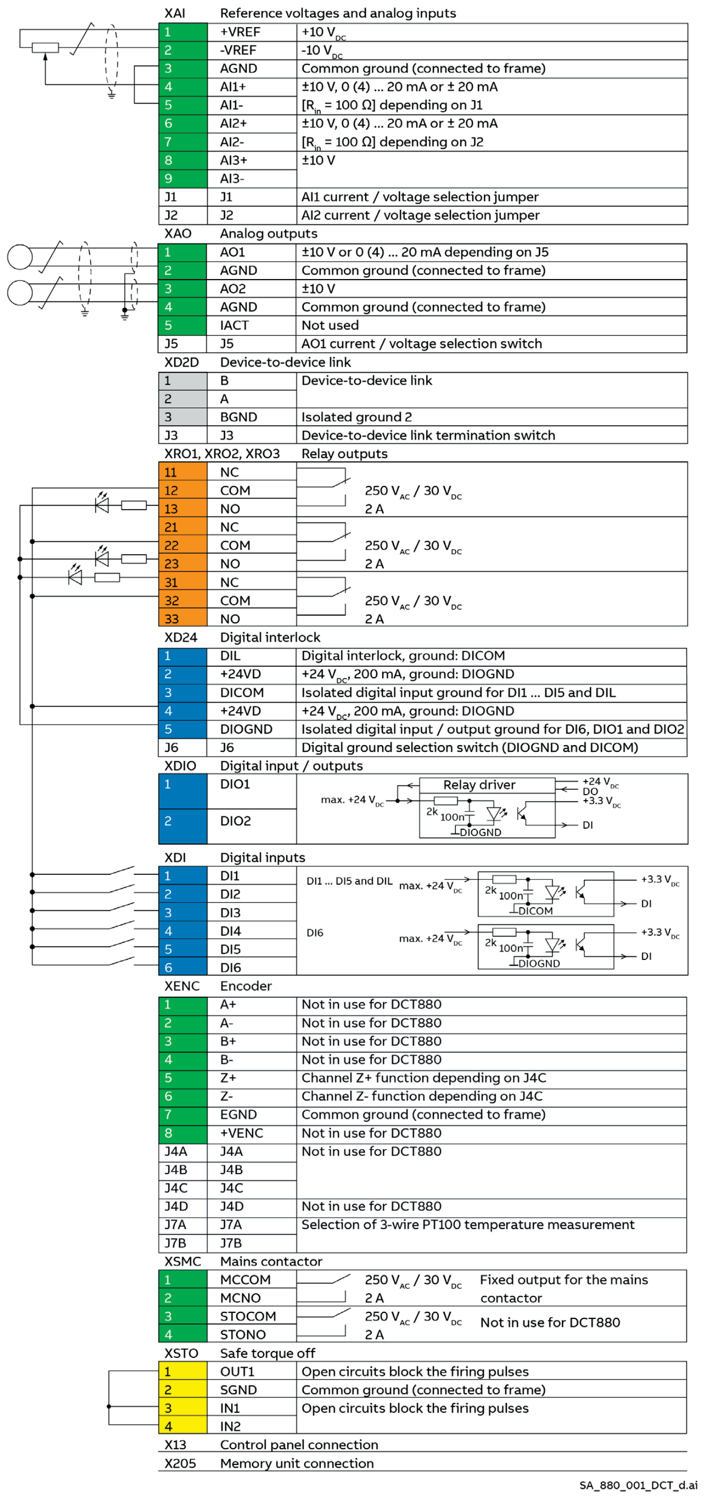
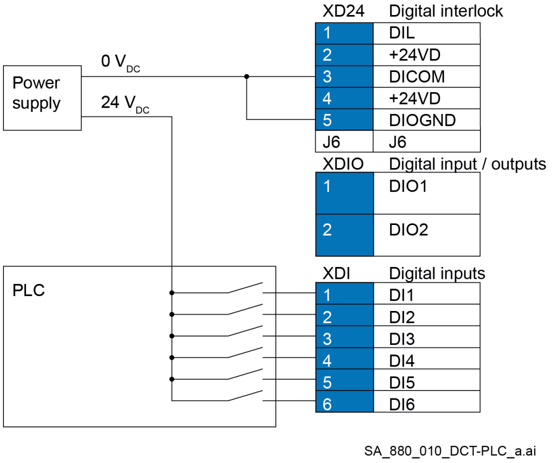
Control circuit terminal layout

Internal 24 V_{DC} used



XAI	Reference voltages and analog inputs	
1	+VREF	+10 V_{DC}
2	-VREF	-10 V_{DC}
3	AGND	Common ground (connected to frame)
4	AI1+	±10 V, 0 (4) ... 20 mA or ± 20 mA
5	AI1-	[R_{in} = 100 Ω] depending on J1
6	AI2+	±10 V, 0 (4) ... 20 mA or ± 20 mA
7	AI2-	[R_{in} = 100 Ω] depending on J2
8	AI3+	±10 V
9	AI3-	
J1	J1	AI1 current / voltage selection jumper
J2	J2	AI2 current / voltage selection jumper
XAO	Analog outputs	
1	AO1	±10 V or 0 (4) ... 20 mA depending on J5
2	AGND	Common ground (connected to frame)
3	AO2	±10 V
4	AGND	Common ground (connected to frame)
5	IACT	Not used
J5	J5	AO1 current / voltage selection switch
XD2D	Device-to-device link	
1	B	Device-to-device link
2	A	
3	BGND	Isolated ground 2
J3	J3	Device-to-device link termination switch
XRO1, XRO2, XRO3		Relay outputs
11	NC	250 V_{AC} / 30 V_{DC} 2 A
12	COM	
13	NO	
21	NC	250 V_{AC} / 30 V_{DC} 2 A
22	COM	
23	NO	
31	NC	250 V_{AC} / 30 V_{DC} 2 A
32	COM	
33	NO	
XD24	Digital interlock	
1	DIL	Digital interlock, ground: DICOM
2	+24VD	+24 V_{DC}, 200 mA, ground: DIOGND
3	DICOM	Isolated digital input ground for DI1 ... DI5 and DIL
4	+24VD	+24 V_{DC}, 200 mA, ground: DIOGND
5	DIOGND	Isolated digital input / output ground for DI6, DIO1 and DIO2
J6	J6	Digital ground selection switch (DIOGND and DICOM)
XDIO	Digital input / outputs	
1	DIO1	
2	DIO2	
XDI	Digital inputs	
1	DI1	
2	DI2	
3	DI3	
4	DI4	
5	DI5	
6	DI6	
XENC	Encoder	
1	A+	Not in use for DCT880
2	A-	Not in use for DCT880
3	B+	Not in use for DCT880
4	B-	Not in use for DCT880
5	Z+	Channel Z+ function depending on J4C
6	Z-	Channel Z- function depending on J4C
7	EGND	Common ground (connected to frame)
8	+VENC	Not in use for DCT880
J4A	J4A	Not in use for DCT880
J4B	J4B	
J4C	J4C	
J4D	J4D	Not in use for DCT880
J7A	J7A	Selection of 3-wire PT100 temperature measurement
J7B	J7B	
XSMC	Mains contactor	
1	MCCOM	250 V_{AC} / 30 V_{DC} Fixed output for the mains contactor
2	MCNO	2 A
3	STOCOM	250 V_{AC} / 30 V_{DC} Not in use for DCT880
4	STONO	2 A
XSTO	Safe torque off	
1	OUT1	Open circuits block the firing pulses
2	SGND	Common ground (connected to frame)
3	IN1	Open circuits block the firing pulses
4	IN2	
X13	Control panel connection	
X205	Memory unit connection	

External 24 V_{DC} used



WARNING!

The XSTO terminals must not be used for thyristor power controllers.

They are not offering any certified safety functionality.

XAI: Reference voltages and analog inputs

+VREF	+10 V_{DC}, ±1 % R_L = 1 … 10 kΩ Maximum wire size 2.5 mm^2
-VREF	-10 V_{DC}, ±1 % R_L = 1 … 10 kΩ Maximum wire size 2.5 mm^2
AI1+	±10 V [$R_{in} \geq$ 200 kΩ], 0 (4) ... 20 mA or ±20 mA [R_{in} = 100 Ω] depending on J1 Maximum wire size 2.5 mm^2 Differential inputs, common mode range ±30 V Sampling interval per channel: 0.25 ms Hardware filter: 0.25 ms Resolution: 15 bit + sign Inaccuracy: 1 % of full scale range
AI1-	
AI2+	±10 V [$R_{in} \geq$ 200 kΩ], 0 (4) ... 20 mA or ±20 mA [R_{in} = 100 Ω] depending on J2 Maximum wire size 2.5 mm^2 Differential inputs, common mode range ±30 V Sampling interval per channel: 0.25 ms Hardware filter: 0.25 ms Resolution: 15 bit + sign Inaccuracy: 1 % of full scale range
AI2-	
AI3+	±10 V [$R_{in} \geq$ 200 kΩ] Maximum wire size 2.5 mm^2 Differential inputs, common mode range ±30 V Sampling interval per channel: 0.25 ms Hardware filter: 0.25 ms Resolution: 15 bit + sign Inaccuracy: 1 % of full scale range
AI3-	
	Parameter settings see Group 12 Standard AI

XAO: Analog outputs

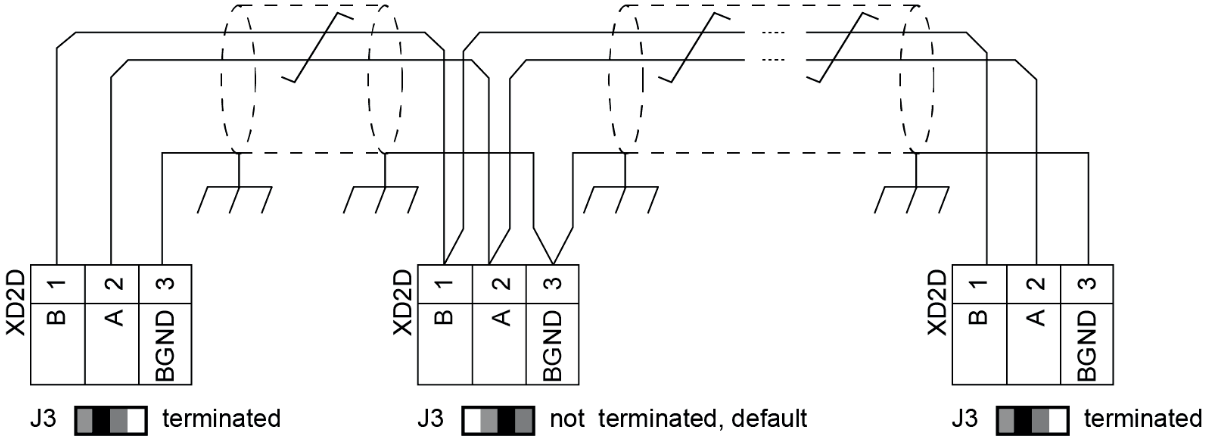
AO1	±10 V [load current ≤ 10 mA] or 0 (4) ... 20 mA [$R_L \leq$ 500 Ω] depending on J5 Maximum wire size 2.5 mm^2 Frequency range: 0 … 300 Hz Resolution: 11 bit + sign Inaccuracy: 2 % of full scale range
AO2	±10 V [load current ≤ 10 mA] Maximum wire size 2.5 mm^2 Frequency range: 0 … 300 Hz Resolution: 11 bit + sign Inaccuracy: 2 % of full scale range
IACT	Not in use for DCT880
	Parameter settings see Group 13 Standard AO

XD2D: Device-to-device link

B	Maximum wire size 2.5 mm^2 Physical layer: RS-485 Termination by switch J3
A	
	Parameter settings see Group 60 DDCS communication

The device-to-device link is a daisy-chained RS-485 transmission line that allows basic master-follower communication with one master and multiple followers. It is also used for the power optimizer.
Set the termination switches J3 (see Jumpers and switches) next to terminal block XD2D to terminated (▨■▨□) at the two physical ends of the device-to-device link. All intermediate switches have to be set to not terminated (□▨■▨).

Use double shielded twisted-pair cable (~ 100 Ω, for example, PROFIBUS compatible cable) for the wiring. For best immunity, high quality cable is recommended. Keep the cable as short as possible. The maximum complete length of the link is 50 meters. Avoid unnecessary loops and running the link near power cables.
The following diagram shows the wiring of the device-to-device link.



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RO1, RO2, RO3: Relay outputs

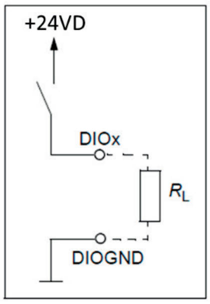
NC	250 V_{AC}/30 V_{DC}, 2 A
COM	Maximum wire size 2.5 mm^2
NO	Varistor protected
	Parameter settings see Group 10 Standard DI, RO

XD24: Digital interlock

DIL	The digital interlock works like a normal digital input and has no special function in the DCT880. It can be selected for example as the source for an emergency stop command or any other external event. See the firmware part of this document for more information. Maximum wire size 2.5 mm^2 +24 V_{DC} logic levels: low < 5 V_{DC}, high > 15 V_{DC} R_{in} = 2 kΩ Hardware filter: 0.04 ms Digital filter up to 100 ms Related ground is DICOM
+24VD	+24 V_{DC}, 200 mA Total load power of these outputs is 4.8 W (200 mA, 24 V_{DC}) minus the power taken by DIO1 and DIO2 Maximum wire size 2.5 mm^2 Related ground is DIOGND
	Parameter settings see Group 10 Standard DI, RO Switch on/off delays see chapter Switch on/off delays (reaction times)

XDIO: Digital inputs/outputs

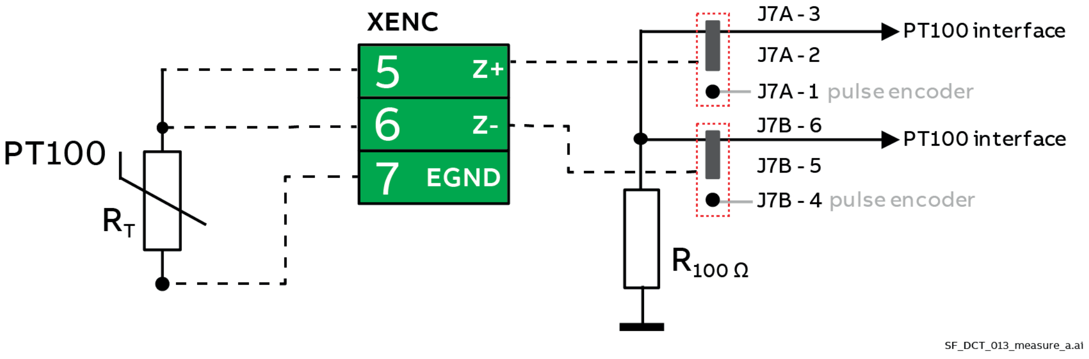
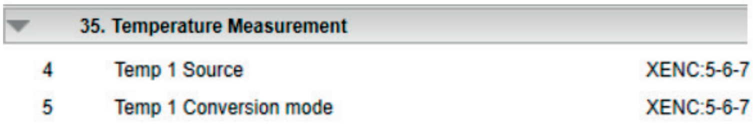
DIO1	Maximum wire size 2.5 mm^2
DIO2	As input: +24 V_{DC} logic levels: low < 5 V_{DC}, high > 15 V_{DC} R_{in} = 2 kΩ Filter: 0.25 ms

	As output: Total output current from +24VD is limited to 200 mA  Filter: 0.04 ms Related ground is DIOGND
	Parameter settings see Group 11 Standard DIO, FI, FO Switch on/off delays see chapter Switch on/off delays (reaction times)

XDI: Digital inputs

DI1 DI2 DI3 DI4 DI5 DI6	Maximum wire size 2.5 mm^2 +24 V_{DC} logic levels: low < 5 V_{DC}, high > 15 V_{DC} R_{in} = 2 kΩ Hardware filter: 0.04 ms Digital filter up to 100 ms DI1 … DI5: Related ground is DICOM DI6: Related ground is DIOGND
	Parameter settings see Group 10 Standard DI, RO Switch on/off delays see chapter Switch on/off delays (reaction times)

XENC: 3-wire PT100 temperature measurement

Z+ Z- EGND	Maximum wire size 2.5 mm^2. Used for 3-wire PT100 temperature measurement. One 3-wire PT100 for high precision temperature measurement can be connected between encoder inputs Z+, Z- and EGND (ground). Additionally set jumper J7A = 2-3 and jumper J7B = 5-6.  The 3-wire PT100 temperature measurement can be selected by.  35. Temperature Measurement 4 Temp 1 Source XENC:5-6-7 5 Temp 1 Conversion mode XENC:5-6-7 This function is released for: – Firmware 1.08 and higher. – SDCS-CON-H01 REV E and higher.
	Parameter settings see Group 35 Temperature Measurement

XTAC: Analog tacho

AITACH+	Not in use for DCT880
AITACH-	

XSMC: Mains contactor

MCCOM	Fixed output for the mains contactor 250 V_{AC}/30 V_{DC}, 2 A Maximum wire size 2.5 mm^2 Varistor protected
MCNO	
STOCOM	Not in use for DCT880 **WARNING!** The XSTO terminals must not be used for thyristor power controllers. They are not offering any certified safety functionality.
STONO	
	Mains contactor ON command: E.g. 06.14 Leg 1 Status Word bit 11 = high.

XSTO: Safe torque off

OUT1	For the thyristor power controller to start, both connections (OUT1 to IN1 and IN2) must be closed. By default, the terminal block has wires to close the circuit. Removing the wires will block the firing pulses. **WARNING!** The XSTO terminals must not be used for thyristor power controllers. They are not offering any certified safety functionality. Maximum wire size 2.5 mm^2 Current consumption per channel: 55 mA (continuous)
IN1	
IN2	

X205 Memory unit connection

The thyristor power controller is equipped with a memory unit that is plugged into X205 on the SDCS-CON-H01. The memory unit contains the firmware, the parameters and the application program (as option). It is possible to handle the parameters by control panel, PC tool or overriding control. Changed parameters are stored immediately in the memory unit.

In addition, the fault logger entries are stored in the memory unit during de-energizing the auxiliary power.

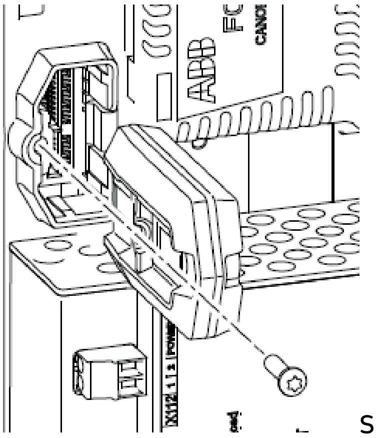
When a thyristor power controller is replaced, the parameter settings can be retained by transferring the memory unit from the defective thyristor power controller to the new thyristor power controller.

WARNING!
Do not remove or insert a memory unit when the thyristor power controller is powered.

After power-up, the thyristor power controller will scan the memory unit. If different parameter settings are detected, they are copied to the thyristor power controller. This may take several minutes.

Replacing the memory unit

Make sure, that the auxiliary power is off. Unscrew the memory unit and pull it out. Replace the memory unit in reverse order.

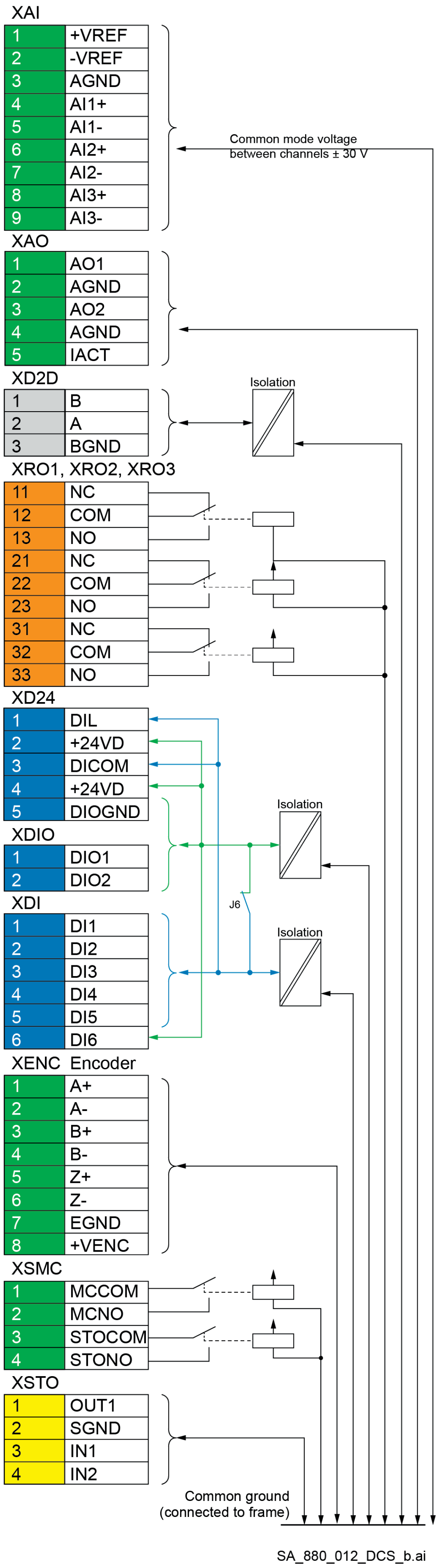


Screw is M3*5.

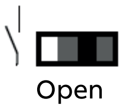
Additional terminals

- Use connectors Slot1 … Slot3 for F-type I/O extension modules and F-type fieldbus adapters.
- Connectors XC12, XS13, X14 and X38 connect the SDCS-CON-H01 to the SDCS-PIN-H11 for voltage, current, temperature measurement and safety.
- Use connector X13 to connect the control panel either directly via a jack plug or via a CAT 1:1 cable (< 3 m) with RJ-45 plugs.

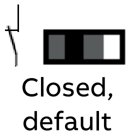
Ground isolation diagram



Switch J6 settings:



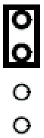
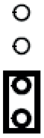
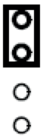
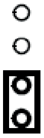
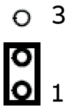
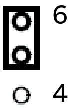
The ground (DICOM) of digital inputs DI1 … DI5 and DIL is separated from the ground (DIOGND) of digital inputs/outputs DIO1, DIO2 and DI6.
The insulation voltage between them is 50 V.



All digital inputs and outputs share the same ground, default.

WARNING!
The XSTO terminals must not be used for thyristor power controllers.
They are not offering any certified safety functionality.

Jumpers and switches

Jumper/Switch	Description	Positions	
J1 (AI1)	Determines whether analog input AI1 is used as a current or voltage input.		Current (I)
			Voltage (U), default.
J2 (AI2)	Determines whether analog input AI2 is used as a current or voltage input.		Current (I)
			Voltage (U), default.
J3 (D2D)	Device-to-device link termination. Must be set to terminated position when the thyristor power controller is the last unit on the link.		Bus is not terminated, default.
			Bus is terminated.
J4A ... J4D	Not in use for DCT880.	n/a	n/a
J5 (AO1)	Determines whether analog output AO1 is used as a current or voltage output.		Voltage (U), default.
			Current (I)
J6 (grounding)	Digital ground selection switch. Determines whether DICOM is separated from DIOGND (e.g. the common reference for digital inputs floats). See Ground isolation diagram. The insulation voltage between them is 50 V.		DIOGND and DICOM separated.
			DIOGND and DICOM connected, default.
J7A, J7B	OnBoard 3-wire PT100 temperature measurement interface.		Not in use for DCT880, default.
			Temperature measurement.

Switch on/off delays (reaction times)

Via FEA-03	**Hardware**	**Type**	**Delay**		**DIP switch**
-	SDCS-CON-H01	DI, DIO	Switch on delay	2 ms	-
			Switch off delay	1 ms	-
No	FDIO-01	DI	Switch on delay	15 ms	1 ms
				26 ms	10 ms
			Switch off delay	13 ms	1 ms
				21 ms	10 ms
	FIO-01	DIO	Switch on delay	3 ms	-
			Switch off delay	1 ms	-
	FIO-11	DIO	Switch on delay	5 ms	-
			Switch off delay	3 ms	-
Yes	FDIO-01	DI	Switch on delay	16 ms	1 ms
				26 ms	10 ms
			Switch off delay	15 ms	1 ms
				21 ms	10 ms
	FIO-01	DIO	Switch on delay	3 ms	-
			Switch off delay	1 ms	-
	FIO-11	DIO	Switch on delay	5 ms	-
			Switch off delay	3 ms	-

The given values are approximate values which were measured using a unit. Please consider, that for some operations e.g. starting and stopping, thyristor based units cannot react before a full mains cycle has passed (worst-case scenario).

Power interface terminals on the SDCS-PIN-H11 (T1 … T6)

The power interface terminals are common for all sizes T1 … T6.

Location of the power interface board SDCS-PIN-H11

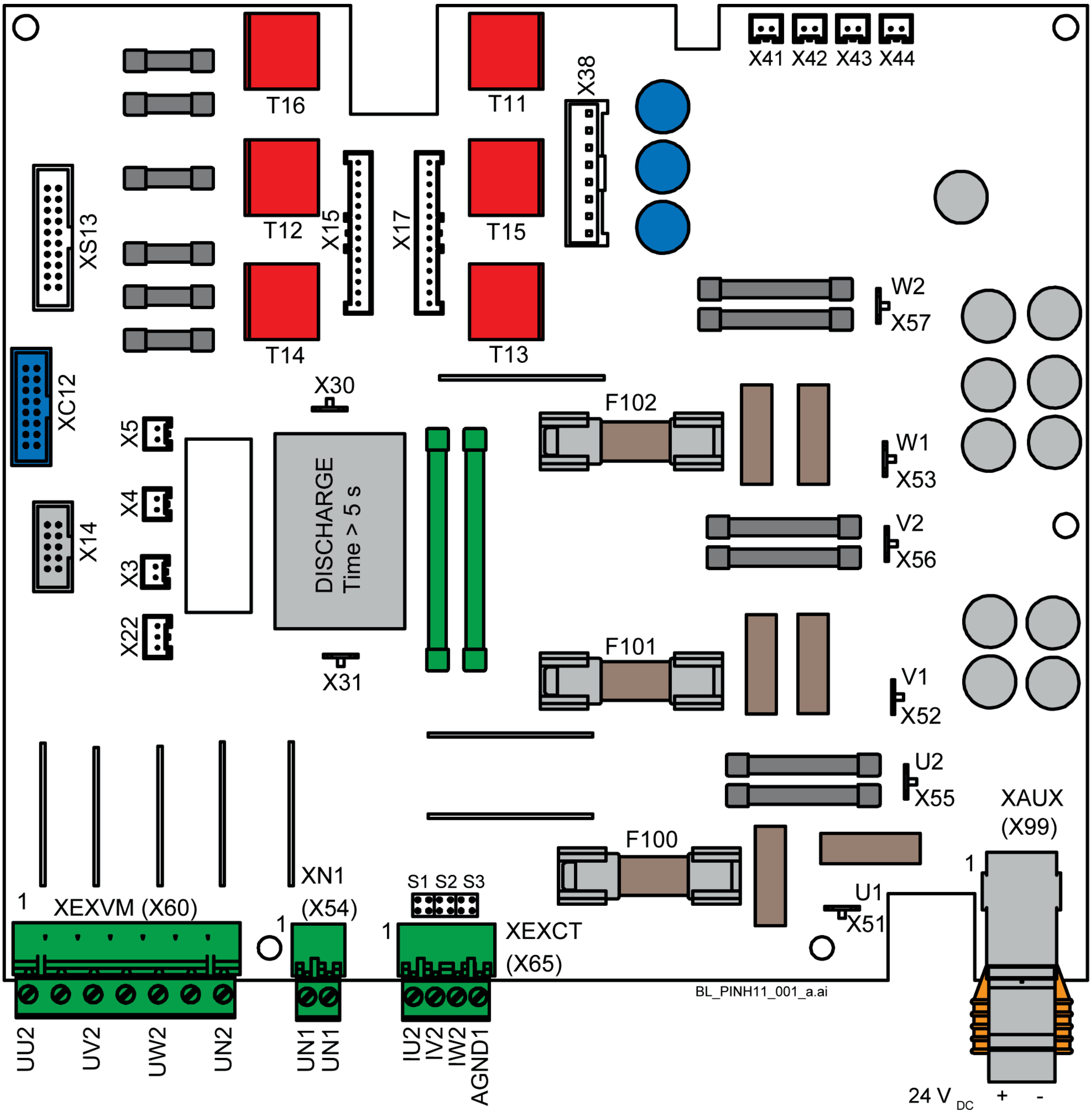
The SDCS-PIN-H11 is located between the power part and the control board SDCS-CON-H01.

Recommended wire size - Tightening torques

Power interface cables:

Wire sizes:	Tightening torques:
0.5 … 2.5 mm^2 (24 … 12 AWG)	0.5 Nm (5 lbf·in) for both stranded and solid wiring

Power interface circuit terminal location



Fuses F100 … F102:

KTK 25 = 25 A.

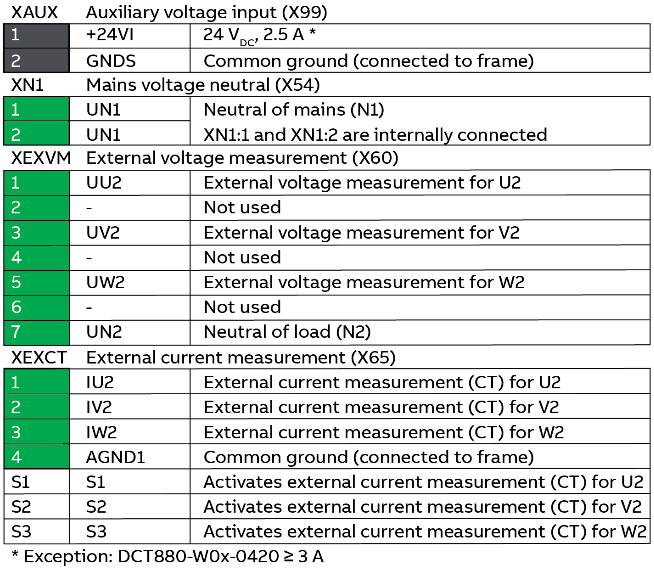
Functions

The thyristor power controller provides an adjusted setting for current-, voltage measurement and burden resistors.

The SDCS-PIN-H11 provides:

- The power supply for all small voltages of the whole thyristor power controller and the connected options (XAUX).
- An internal +24 V_{DC} power supply for the cooling fans of unit sizes T1 … T3 (X41 … X44).
- An internal high ohmic measurement of mains- and output voltages (X51 … X53 and X55 … X57).
- An interface for external high ohmic measurement of the output voltages (terminal block XEXVM).
- An interface for internal current transformers measuring the output current (X3 … X5).
- An interface for external current transformers measuring the output current (terminal block XEXCT).
- An interface for the heatsink temperature measurement with a PTC resistor (X22).
- A snubber circuit for thyristor protection together with the snubber resistor mounted on the heatsink (X30 and X31).
- The fuses protect the electronic against problems with the mains- or the output voltage (F100 … F102).
- The control of the thyristor power controller (firing pulses).
- The firing pulse transformers for the power part with 2 or 3 thyristor modules are located on the electronic board (T11 … T16).

Power interface circuit terminal layout



XAUX	Auxiliary voltage input (X99)	
1	+24VI	24 V_{DC}, 2.5 A *
2	GNDS	Common ground (connected to frame)
XN1	Mains voltage neutral (X54)	
1	UN1	Neutral of mains (N1)
2	UN1	XN1:1 and XN1:2 are internally connected
XEXVM	External voltage measurement (X60)	
1	UU2	External voltage measurement for U2
2	-	Not used
3	UV2	External voltage measurement for V2
4	-	Not used
5	UW2	External voltage measurement for W2
6	-	Not used
7	UN2	Neutral of load (N2)
XEXCT	External current measurement (X65)	
1	IU2	External current measurement (CT) for U2
2	IV2	External current measurement (CT) for V2
3	IW2	External current measurement (CT) for W2
4	AGND1	Common ground (connected to frame)
S1	S1	Activates external current measurement (CT) for U2
S2	S2	Activates external current measurement (CT) for V2
S3	S3	Activates external current measurement (CT) for W2

* Exception: DCT880-W0x-0420 ≥ 3 A

SA_880_006_DCT_b.ai

XAUX: Auxiliary voltage input (X99)

+24VI	Auxiliary voltage	+24 V_{DC}, 2.5 A Exception: DCT880-W0b-0420 ≥ 3 A Please be advised, that each DCT880 should have its own 24 V_{DC} power supply.
	Tolerance	±10 %
	Inrush current	The inrush is not limited by the board. The inrush depends on the connected power supply. Thus, each DCT880 should have its own 24 V_{DC} power supply.
	Power consumption	Maximum 72 W
	Auxiliary voltage buffering	> 150 ms
	Power fail	< 21.2 V_{DC}; recovery at 21.9 V_{DC} (0.7 V hysteresis)
	Power fail delay time	15 ms
	Additional information	Auxiliary power supply for the control unit Maximum wire size 2.5 mm^2

XN1: Mains voltage neutral (X54)

UN1	Neutral of mains XN1:1 and XN1:2 are internally connected Maximum wire size 2.5 mm^2 Cable insulation must withstand 525 V_{AC}

External measurement of output voltage and output current (CTs)

Voltage and current measurement is used to supervise the load. This includes among other things:

- Monitoring the load.
- Resistance calculation of the load.
- Aging of the load.
- Fault detection e.g. overload.
- Detection of circulating currents in the transformer e.g. in multitap configurations.

The decision to use external voltage and current measurement depends on the type of load. The load types can be generally divided into loads with and loads without transformers.

1. Loads without transformers do not need external measurement devices. The output current of each leg is measured by means of internal CTs. The output voltage is calculated using the measured mains voltage, the firing angle alpha, the measured output current and the known load configuration.
2. Loads with transformers need external measurement devices, in case accurate load monitoring on the secondary side of the transformer is desired.

Note: For power calculation, external measurement devices are not needed since the power on the primary side and secondary of a transformer is the same. Except of course for power loss calculation of the transformer itself.

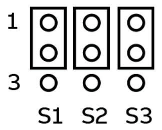
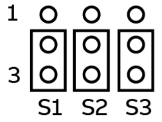
XEXVM: External voltage measurement (X60)

UU2	External voltage measurement for phase U2 Maximum wire size 2.5 mm^2 Cable insulation must withstand 525 V_{AC}
UV2	External voltage measurement for phase V2 Maximum wire size 2.5 mm^2 Cable insulation must withstand 525 V_{AC}
UW2	External voltage measurement for phase W2 Maximum wire size 2.5 mm^2 Cable insulation must withstand 525 V_{AC}
UN2	Neutral of load (N2) Maximum wire size 2.5 mm^2 Cable insulation must withstand 525 V_{AC}
	Activation see 99.60 Voltage Measurement Configuration

XEXCT: External current measurement (X65)

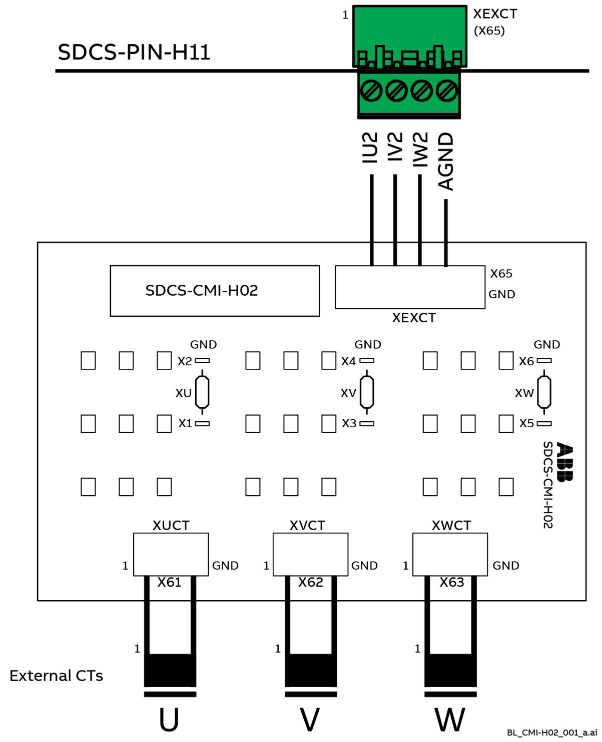
IU2	External current measurement (CT) for phase U2 Maximum wire size 2.5 mm^2 External adapter board required
IV2	External current measurement (CT) for phase V2 Maximum wire size 2.5 mm^2 External adapter board required
IW2	External current measurement (CT) for phase W2 Maximum wire size 2.5 mm^2 External adapter board required
	Activation see 99.70 Current Measurement Configuration

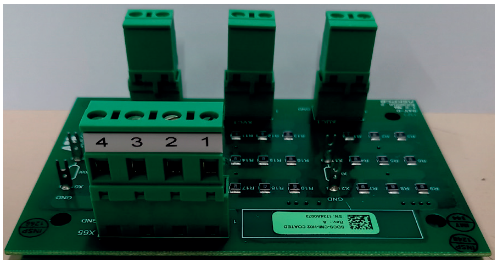
Jumpers, external current measurement

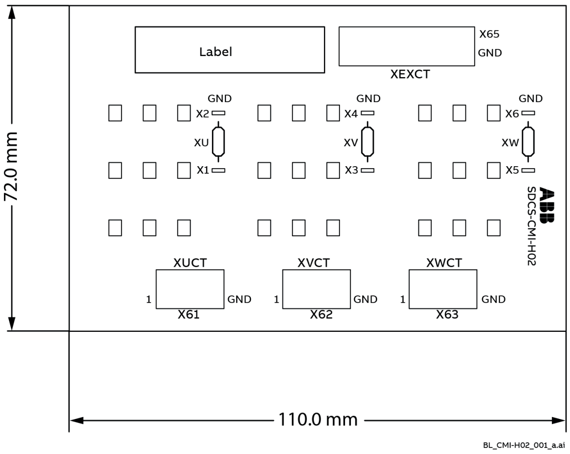
Jumper	Description	Positions	
S1 (U2). S2 (V2). S3 (W2).	Activates external current measurement (CT) for phase U2. Activates external current measurement (CT) for phase V2. Activates external current measurement (CT) for phase W2.		Internal current measurement (CT) active, default.
			External current measurement (CT) active via XEXCT (X65).

Interface board SDCS-CMI-H02, external current measurement

The SDCS-CMI-H02 is used for the external current measurement via XEXCT (X65) on the SDCS-PIN-H11:

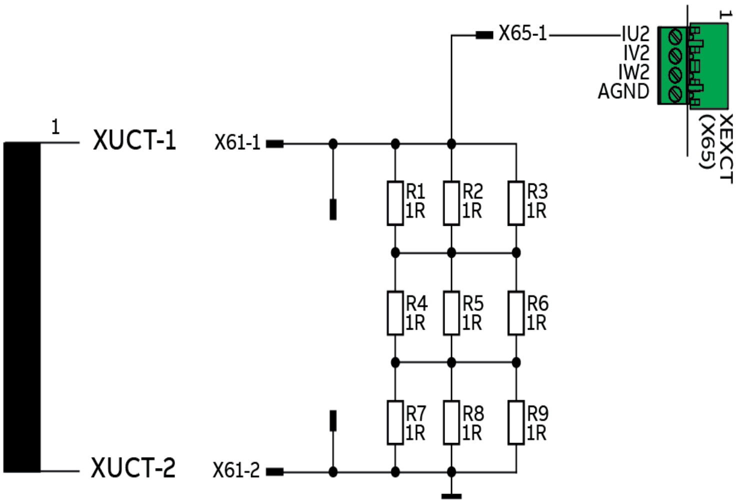






Attention: To measure the current and thus, the power correct, make sure the CTs direction is proper. The measured current is displayed in signals 01.30 Leg 1 Current RMS actual … 01.35 Leg 3 Current RMS relative actual.

As standard the board is equipped with 1 Ohm burden resistors. Here leg 1 is shown:



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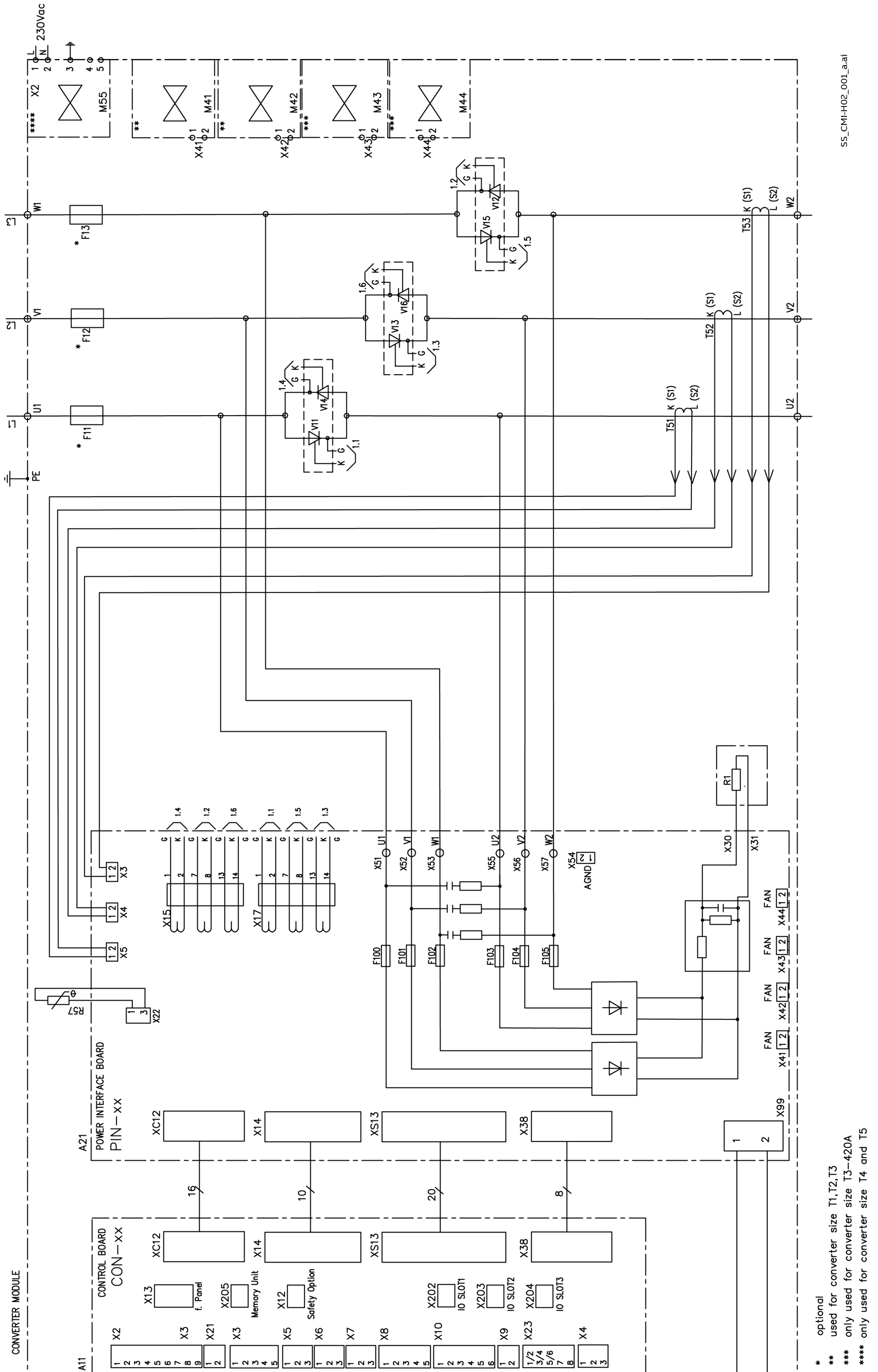
The current scaling is set by means of 95.18 Set: Unit output current scaling. The setting of 95.18 Set: Unit output current scaling equals 1 V over the burden resistor.
Example: The CT in units size T6 e.g. is 2500:1.
With a burden resistor of 1 ohm a current of 1 A generates 1 V (ohms law). Thus, 95.18 Set: Unit output current scaling must be set to 2500 A.
In case the standard burden resistor of 1 ohm is not applicable use X1:1 and X2:1 to adapt the burden resistor.

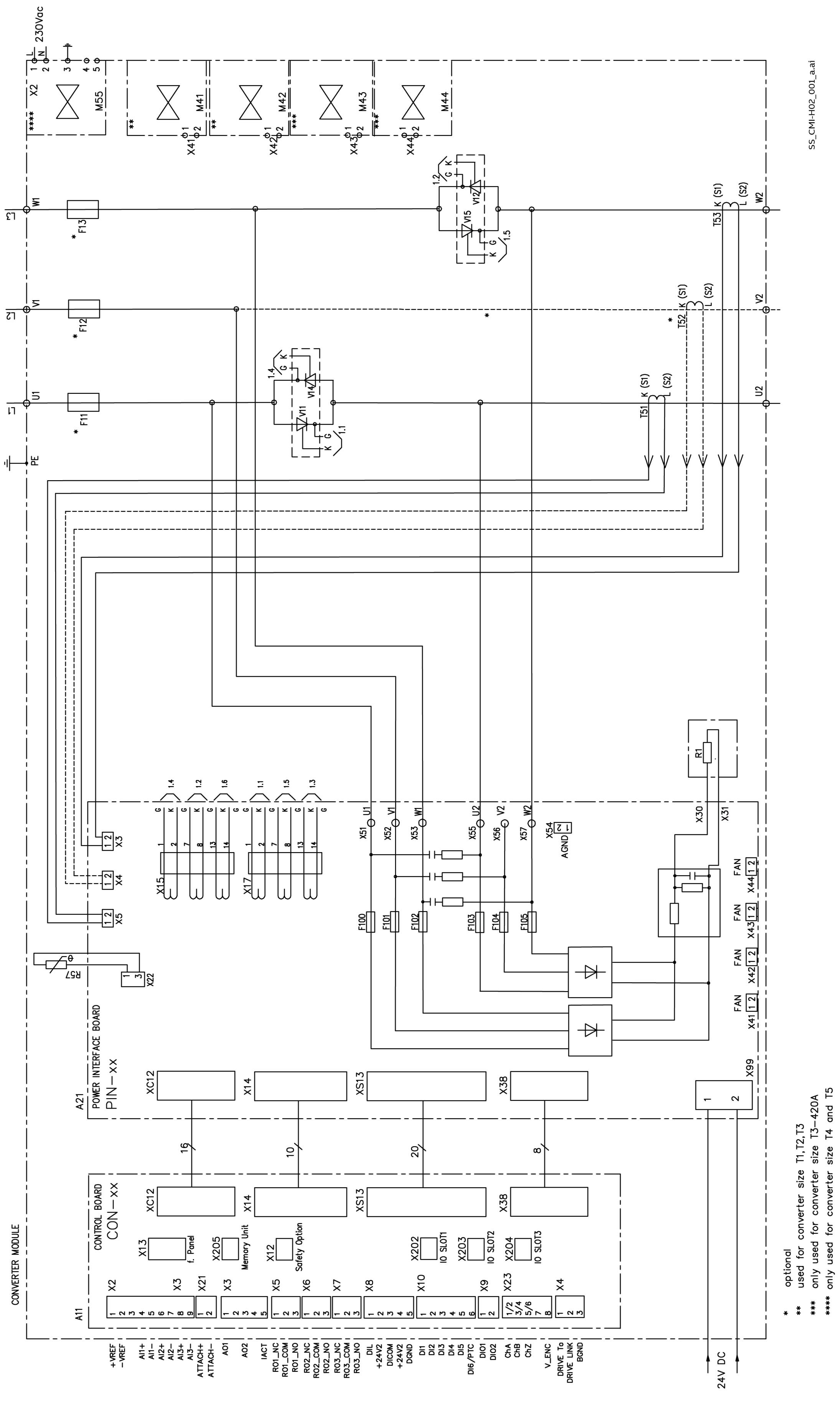
Circuit diagrams (T1 ... T5)

Typical circuit diagram for unit sizes T1 ... T5 with three legs (W03):



* optional
** used for converter size T1,T2,T3
*** only used for converter size T3-420A
**** only used for converter size T4 and T5

Typical circuit diagram for unit sizes T1 ... T5 with two legs (W02):

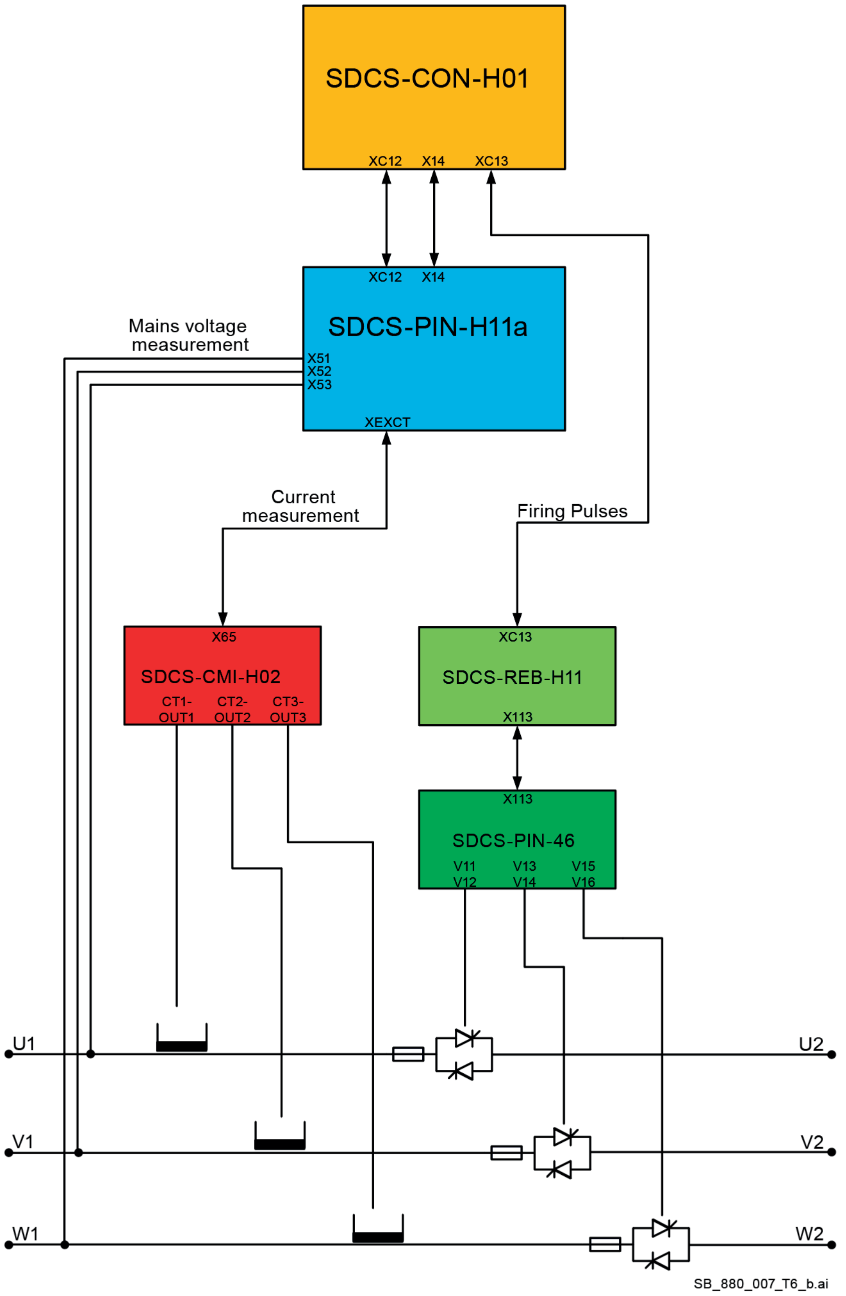


- * optional
- ** used for converter size T1,T2,T3
- *** only used for converter size T3–420A
- **** only used for converter size T4 and T5

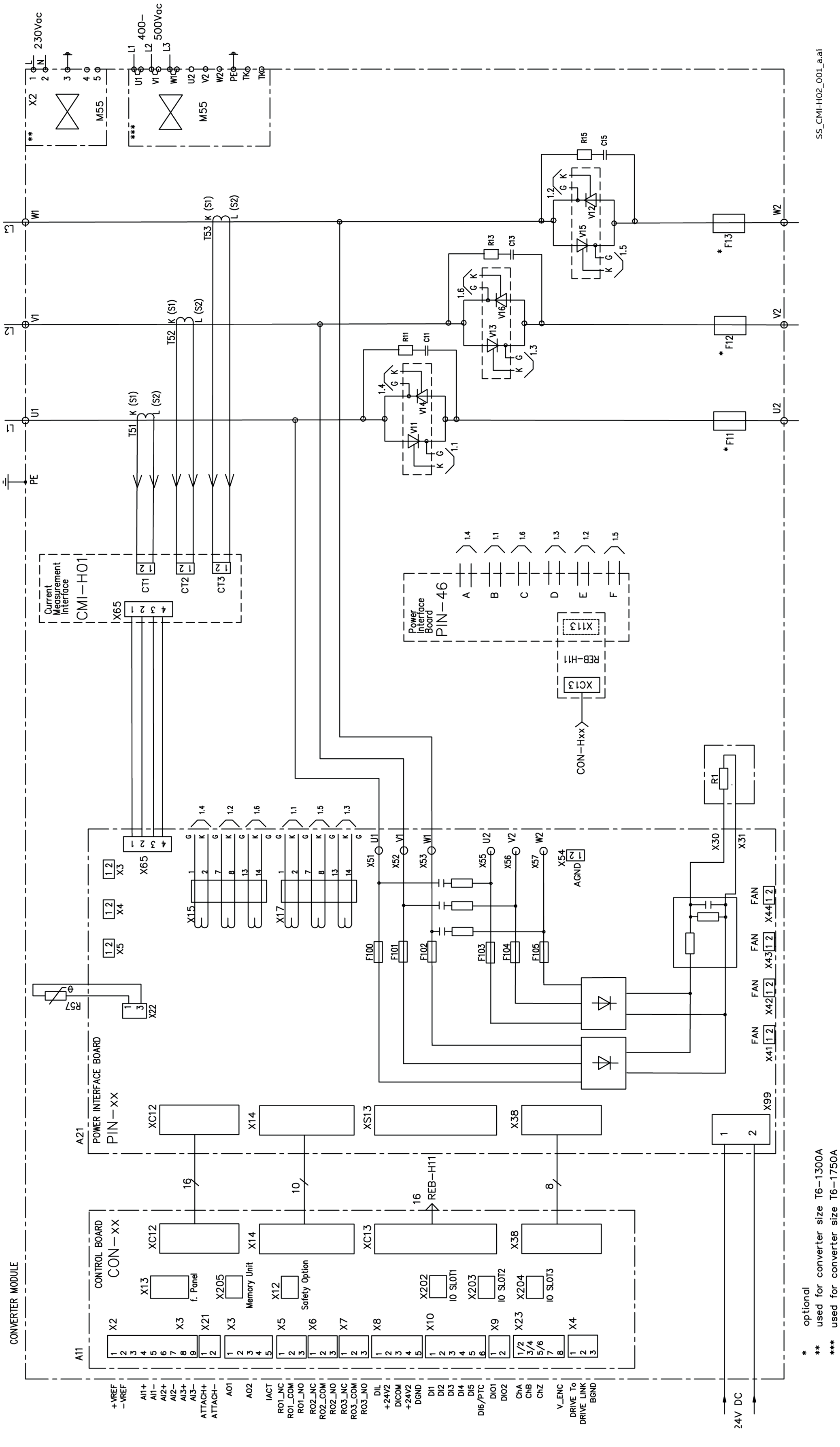
Circuit diagram (T6)

The DCT880 size T6 utilizes following printed circuit boards:

- SDCS-CON-H01.
- SDCS-PIN-H11a.
- SDCS-CMI-H02.
- SDCS-REB-H11.
- SDCS-PIN-46.



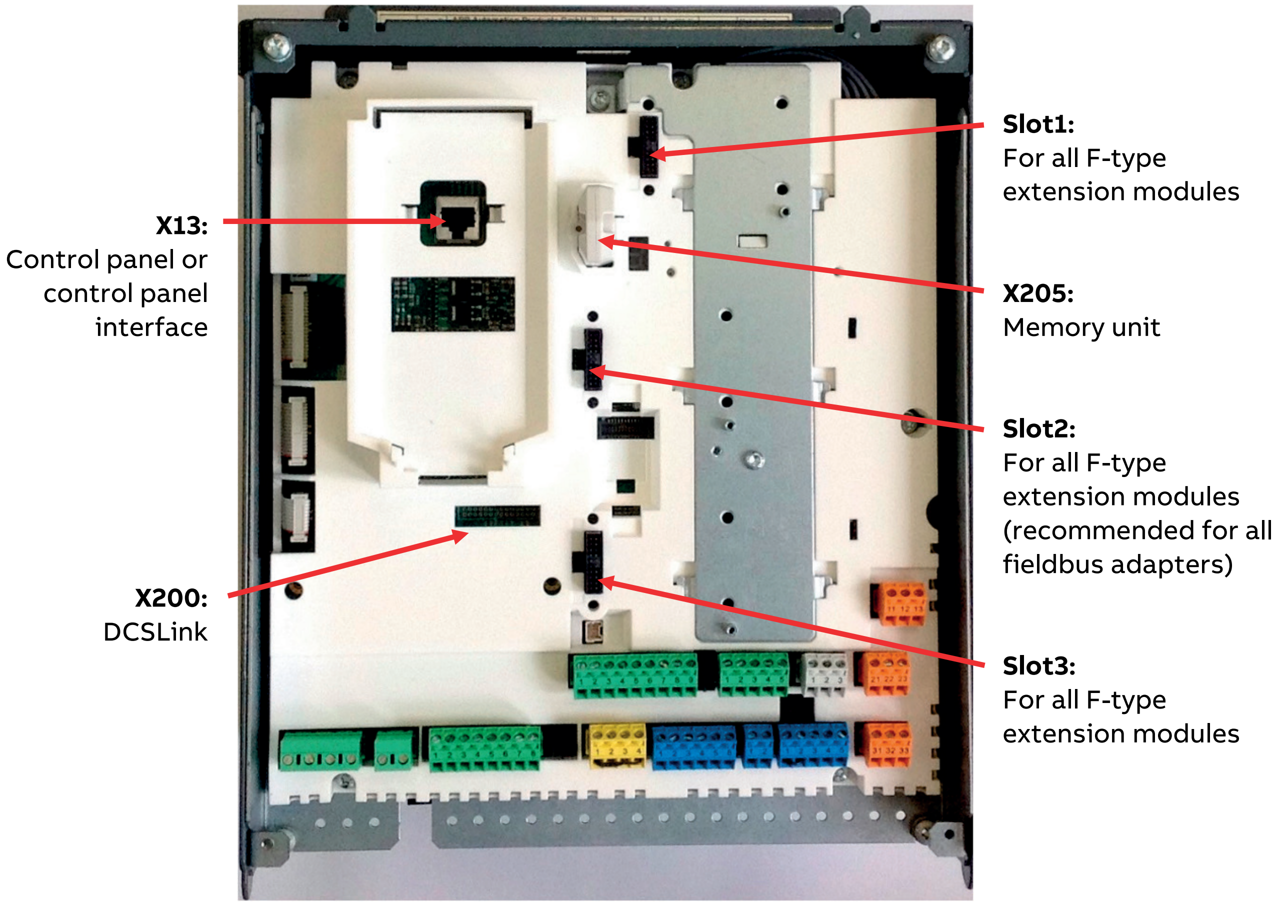
Typical circuit diagram for units size T6 with three legs (W03):



* optional
** used for converter size T6-1300A
*** used for converter size T6-1750A

Location of F-type adapters and interfaces

Tighten the screws to secure the F-type extension modules and the memory unit.



Fieldbus adapters

I/O extension modules

Accessories

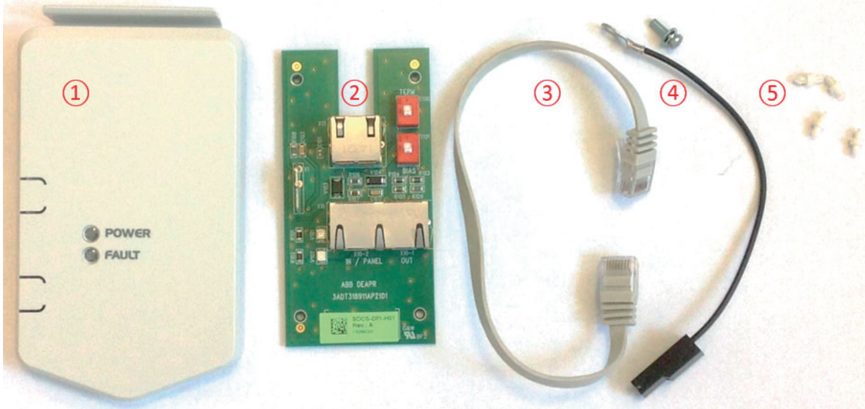
Daisy chain DPI-H01 kit (T1 ... T6)

Daisy chain adapters are used to connect several thyristor power controllers to one control panel or to a PC via a control panel. Maximum of 32 nodes are possible. The control panel/PC is the master, while the thyristor power controllers equipped with a daisy chain adapter are followers.

Note: The DPI-H01 kit can be ordered together with the thyristor power controller using pluscode +J428.

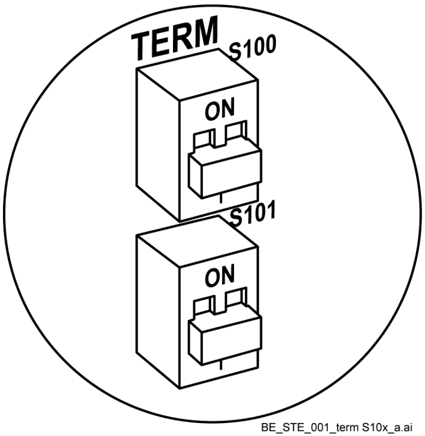
Contents of the kit

① Plastic cover.
② SDCS-DPI-H01 adapter.
③ Patch cable.
④ Grounding cable plus screw.
⑤ Stand offs.



Layout

① Clip to attach the plastic cover.
② Status LEDs via light pipes.
③ X13 for the patch cable to the unit.
④ Termination switch (S100).
⑤ Bias switch (S101).



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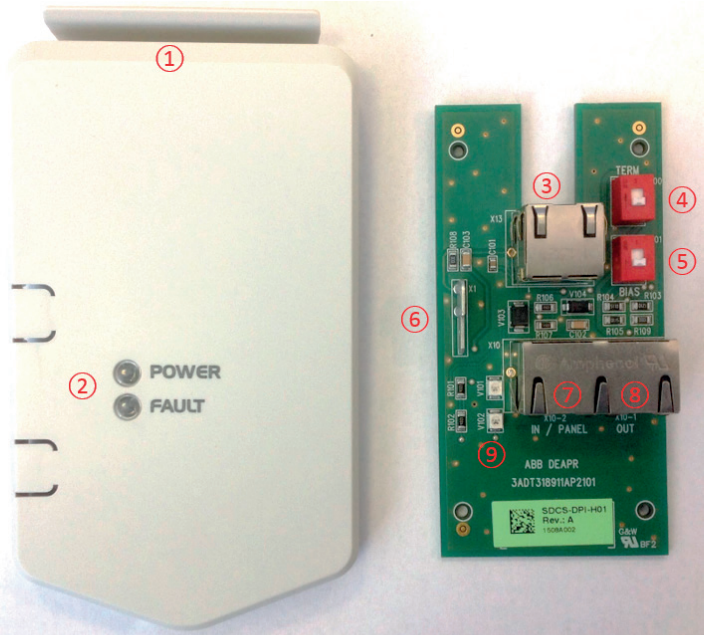
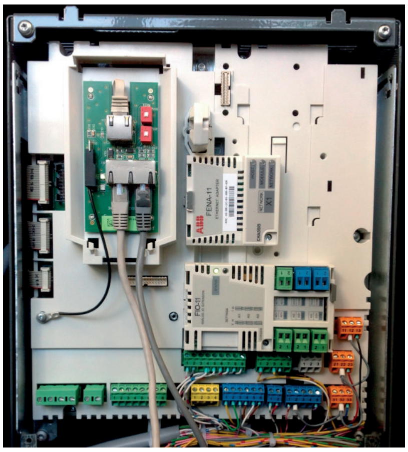


⑥ X1 for grounding.
⑦ X10-1 (IN/PANEL) for control panel.
⑧ X10-2 (OUT) for the next unit.
⑨ Status LEDs:

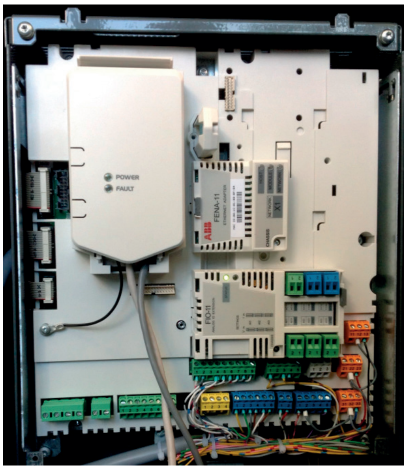
Name	Color	Description
POWER	Green	The unit is powered.
FAULT	Red	The unit has an active fault.

Installation

1. Inset the four stand offs into the intermediate cover.
2. Connect the patch cable between X13 on the SDCS-CON-H01 and X13 on the SDCS-DPI-H01 adapter.
3. Plug the SDCS-DPI-H01 adapter onto the standoffs.
4. Connect the grounding cable at X1 and the grounding standoff using the screw.
5. Connect the cables to the control panel/a thyristor power controller using X10-2 and X10-1.



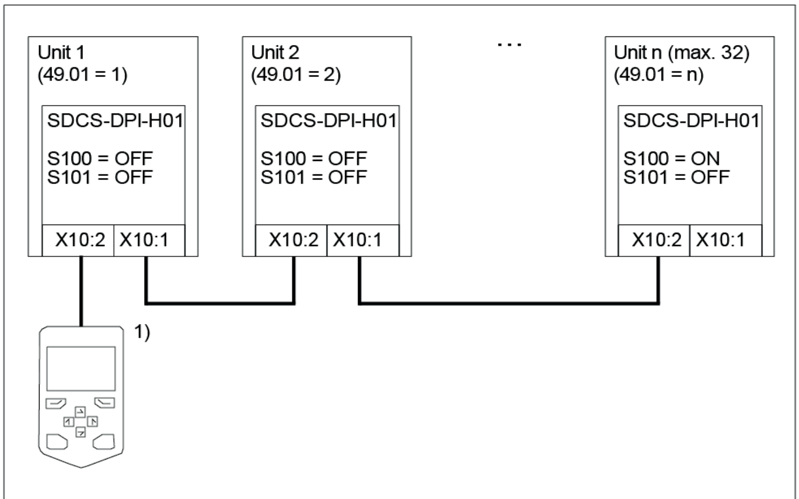
6. Attach the plastic cover.



7. Attach the front cover.

Chaining a control panel

This figure shows how to chain a control panel to several units:



[1] The control panel terminates the bus at its end, so only the other end of the bus must be terminated.

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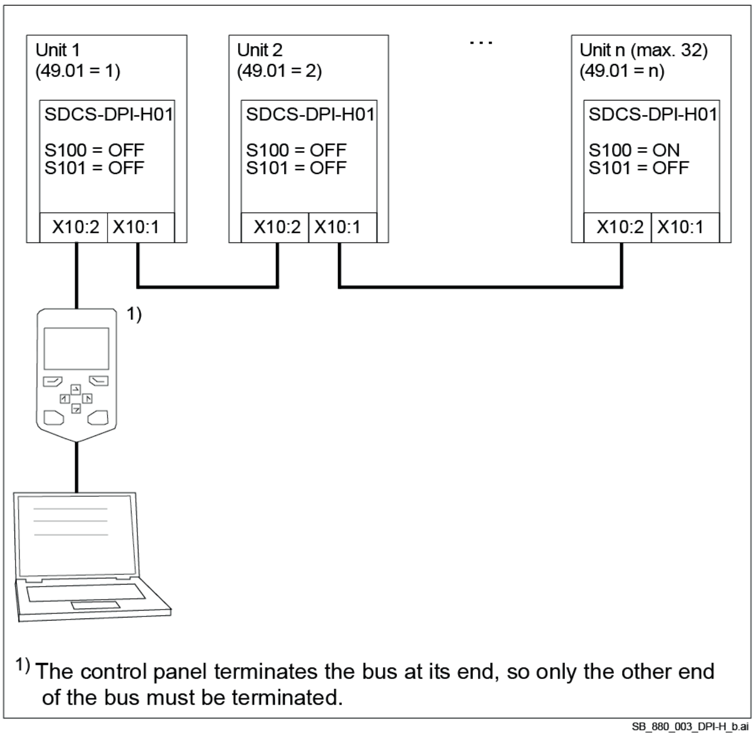
Chaining a PC via a control panel

This figure shows how to chain a PC via a control panel to several units.

Note: When a control panel is used for a PC connection, it cannot be used to operate the units.



Setting up the firmware

1. Power up the unit.
2. Set the node ID, see 49.01 Node ID number. All devices connected to the panel bus must have a unique node ID. It is advisable to reserve node ID 1 for spare/replacement units, because they have node ID 1 as default setting.
3. Set the baud rate, see 49.03 Baud rate. The baud rate has to be the same for all nodes on the panel bus.
4. Select a suitable communication loss action, see 49.04 Communication loss time and 49.05 Communication loss action.
5. Save the settings with 49.06 Refresh settings = Refresh.

Note: Refreshing may cause a communication break, thus reconnecting the units may be required.

Semiconductor fuses (F1)

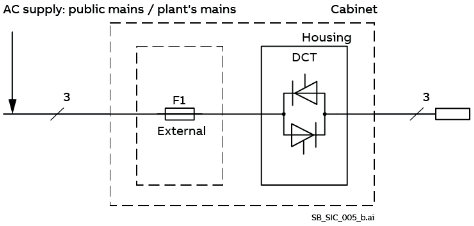
Aspects of fusing for the thyristor power controller.

Thyristor power controller configuration

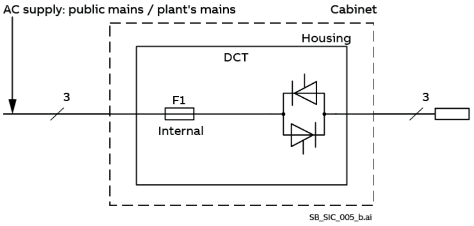
Fuses are **required** in all cases to protect against further damage. In some configurations, this will entail the following questions:

1. Where to place the fuse?
2. In the event of what faults will the fuses provide protection against damage?

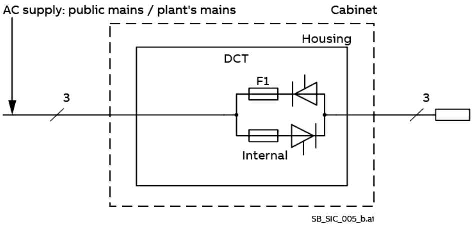
The figure shows the arrangement of external line fuses for thyristor power controllers size T1 … T4. External line fuses can be used for all T1 … T4 units with a mains voltage up to 690 V_{AC}.



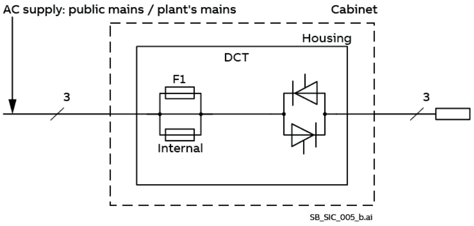
The figure shows the arrangement of internal line fuses in thyristor power controllers size T1 … T4. Optional internal line fuses are available for all T1 … T4 units with a mains voltage up to 525 V_{AC}.
Note: For higher mains voltage up to 690 V_{AC} external line fuses must be used.



The figure shows the arrangement of internal branch fuses for thyristor power controllers size T5.
Internal branch fuses are standard for all T5 with a mains voltage up to 690 V_{AC}.



The figure shows the arrangement of internal branch fuses for thyristor power controllers size T6.
Internal branch fuses are standard for all T6.



Conclusion

Never use standard fusing instead of semiconductor fusing in order to save money on the installation. In the event of a fault condition, the small amount of money saved can cause the semiconductors or other devices to explode and cause fires. Adequate protection against short circuit and earth fault, as depicted in the EN50178 standard, is possible only with appropriate semiconductor fuses.

External semiconductor fuses and fuse holders

Thyristor power controllers **require** either external or internal semiconductor fuses.
External line fuses **can** be used for all T1 … T4 units with a mains voltage up to 690 V_{AC}.
The fourth column of the tables below assigns the semiconductor fuses to the thyristor power controller.

Notes:

- External line fuses and fuse holders have to be ordered in addition to the thyristor power controller.
- Units size T5 and T6 do **not** require external fuses, since they always have internal fuses.

400 V/525 V units (external line fuses)

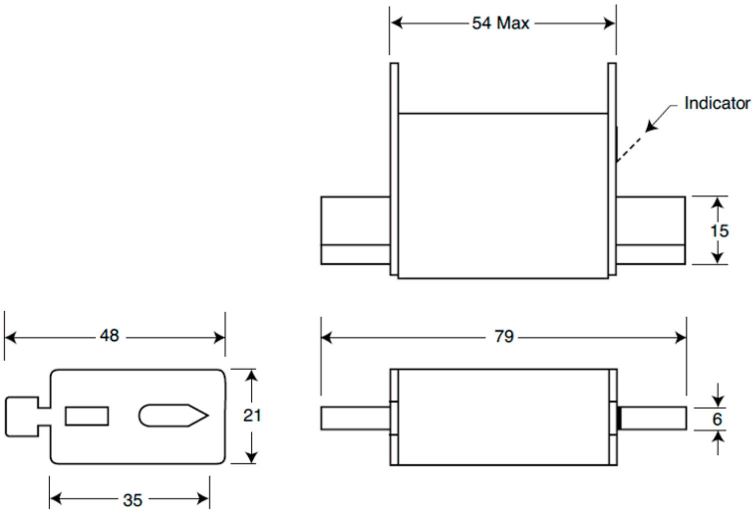
Size	Thyristor power controller 400 V/525 V	Maximum allowed I^2t value at rated voltage [A^2s]	External line fuses		
			Fuse type	**Fuse holder**	**Fuse size**
T1	DCT880-W0b-0020-04/05	1,050	50 A 690 V UR	OFAZ 00 S3L	DIN 000 Type T
	DCT880-W0b-0035-04/05				
	DCT880-W0b-0055-04/05		80 A 690 V UR	OFAZ 1 S3	DIN 1*
	DCT880-W0b-0080-04/05	5,000	125 A 690 V UR		
	DCT880-W0b-0100-04/05	11,000	160 A 690 V UR		
	DCT880-W0b-0125-04/05	20,000	200 A 690 V UR		
T2	DCT880-W0b-0160-04/05		250 A 690 V UR	OFAZ 2 S3	
	DCT880-W0b-0200-04/05	137,000	315 A 690 V UR		
	DCT880-W0b-0245-04/05	245,000	350 A 690 V UR		
T3	DCT880-W0b-0325-04/05		450 A 690 V UR	OFAZ 3 S3	DIN 2
	DCT880-W0b-0360-04/05	320,000	500 A 690 V UR		
	DCT880-W0b-0420-04/05		630 A 690 V UR		
T4	DCT880-W0b-0550-04/05	781,000	800 A 690 V UR	3 • 170H 3006	DIN 3
	DCT880-W0b-0675-04/05	980,000	900 A 690 V UR		
	DCT880-W0b-0740-04/05		1000 A 690 V UR		

690 V units (external line fuses)

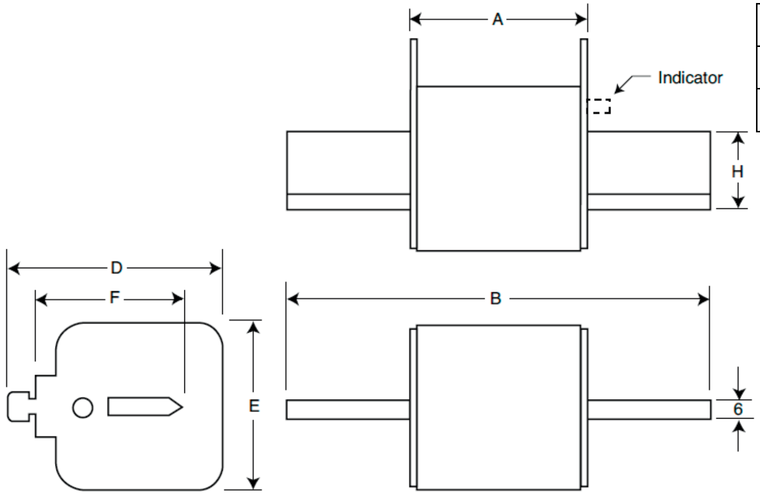
Size	Thyristor power controller 690 V	Maximum allowed I^2t value at rated voltage [A^2s]	External line fuses		
			Fuse type	**Fuse holder**	**Fuse size**
T1	DCT880-W0b-0035-07	1,050	50 A 690 V UR	OFAZ 00 S3L	DIN 000 Type T
	DCT880-W0b-0080-07	5,000	125 A 690 V UR	OFAZ 1 S3	DIN 1*
	DCT880-W0b-0100-07	11,000	160 A 690 V UR		
T2	DCT880-W0b-0160-07	20,000	250 A 690 V UR	OFAZ 2 S3	
	DCT880-W02-0200-07	137,000	315 A 690 V UR		
T3	DCT880-W0b-0360-07	320,000	500 A 690 V UR	OFAZ 3 S3	DIN 2
T4	DCT880-W0b-0630-07	980,000	900 A 690 V UR	3 • 170H 3006	DIN 3

Dimensions of external line fuses

Size DIN 000 Type T [mm]

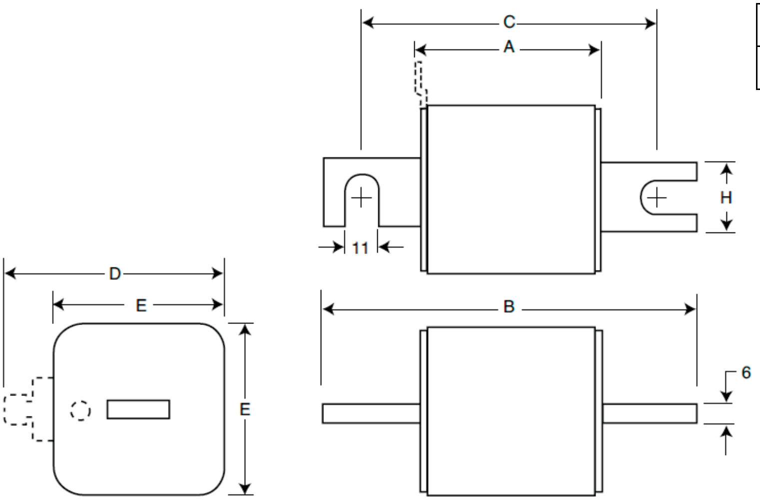


Size DIN 1* and DIN 2 [mm]



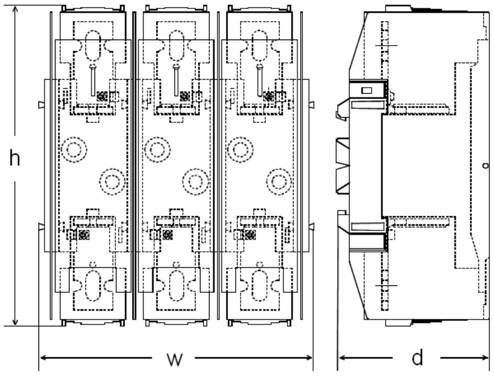
Size	A	B	D	E	F	H
1*	69	135	58	45	40	20
2	69	150	71	55	48	26

Size DIN 3 [mm]



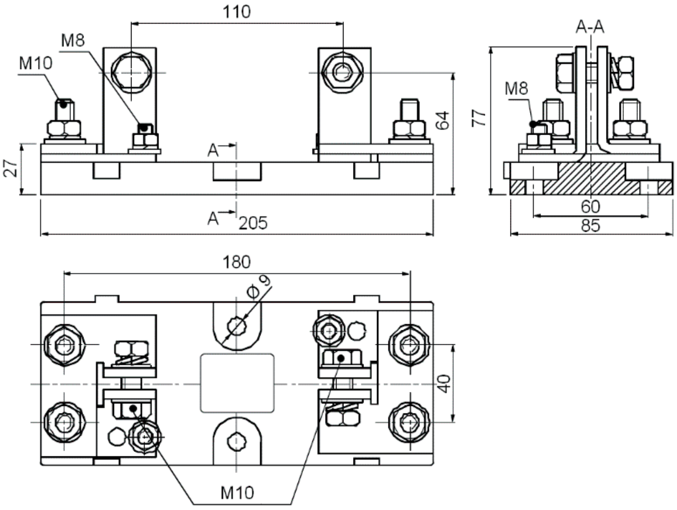
Size	A	B	C	D	E	H
3	51	139	108	90	76	30

Dimensions of fuse holders
OFAZ xx xxx



Fuse holder	h • w • d [mm]	Protection
OFAZ 00 S3L	148 •112 • 111	IP20
OFAZ 1 S3	250 • 174 • 123	IP20
OFAZ 2 S3	250 • 214 • 133	IP20
OFAZ 3 S3	265 • 246 • 160	IP20

170H 3006 (IP00)



Internal semiconductor fuses (option for T1 … T4)

Thyristor power controllers **require** either external or internal semiconductor fuses.
Optional internal line fuses are available for all T1 … T4 with a mains voltage up to 525 V_{AC}.
The fourth column of the table below assigns the semiconductor fuses to the thyristor power controller.
Note: Internal line fuses for sizes T1 … T4 can be ordered together with the thyristor power controller using pluscode +S500.

400 V/525 V units (internal line fuses)

Size	**Thyristor power controller 400 V/525 V**	**Maximum allowed I^2t value at rated voltage [A^2s]**	**Internal line fuses**	
			Fuse type	Fuse per leg
T1	DCT880-W0b-0020-04/05+S500	1,050	63 A 690 V UR	1
	DCT880-W0b-0035-04/05+S500			
	DCT880-W0b-0055-04/05+S500		71 A 690 V UR	
	DCT880-W0b-0080-04/05+S500	5,000	100 A 690 V UR	
	DCT880-W0b-0100-04/05+S500	11,000	71 A 690 V UR	2
	DCT880-W0b-0125-04/05+S500	20,000	100 A 690 V UR	
T2	DCT880-W0b-0160-04/05+S500		200 A 690 V UR	1
	DCT880-W0b-0200-04/05+S500	137,000	315 A 690 V UR	
	DCT880-W0b-0245-04/05+S500	245,000		
T3	DCT880-W0b-0325-04/05+S500		450 A 690 V UR	
	DCT880-W0b-0360-04/05+S500	320,000		
	DCT880-W0b-0420-04/05+S500		630 A 690 V UR	
T4	DCT880-W0b-0550-04/05+S500	781,000	800 A 690 V UR	
	DCT880-W0b-0675-04/05+S500	980,000	1000 A 690 V UR	
	DCT880-W0b-0740-04/05+S500		1100A 690 V UR	

Internal semiconductor fuses (standard for T5)

Thyristor power controllers **require** either external or internal semiconductor fuses.
Internal branch fuses are **standard** for all T5 units with a mains voltage up to 690 V_{AC}. Thus, T5 do not require external fuses.
The fourth column of the table below assigns the semiconductor fuses to the thyristor power controller.

400 V/525 V/690 V units (internal fuses)

Size	**Thyristor power controller 400 V/525 V/690 V**	**Maximum allowed I^2t value at rated voltage [A^2s]**	**Internal branch fuses**	
			Fuse type	**Fuse per leg**
T5	DCT880-W03-0890-0d DCT880-W02-0960-0d	670,000 per fuse	900 A 690 V UR	2

Internal semiconductor fuses (standard for T6)

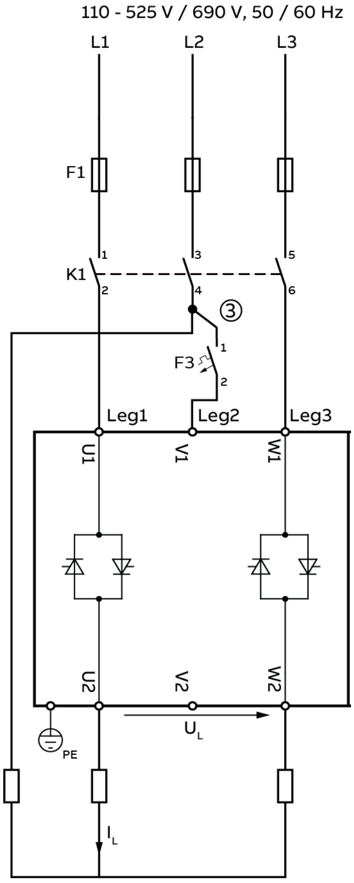
Thyristor power controllers **require** either external or internal semiconductor fuses.
Internal branch fuses are **standard** for all T6 units with a mains voltage up to 690 V_{AC}. Thus, T6 do not require external fuses.
The fourth column of the table below assigns the semiconductor fuses to the thyristor power controller.

400 V/525 V/690 V units (internal fuses)

Size	**Thyristor power controller 400 V/525 V/690 V**	**Maximum allowed I^2t value at rated voltage [A^2s]**	**Internal branch fuses**	
			Fuse type	**Fuse per leg**
T6	DCT880-W0b-1300-0d	945,000 per fuse	1000 A 690 V UR	2
	DCT880-W0b-1750-0d	2450,000 per fuse	1400 A 690 V UR	2

Synchronization fuse (F3)

A synchronization fuse (F3) is only needed for DCT880-W02 units (two legs).
It is located between phase L2 and busbar/connector V1 of the unit.

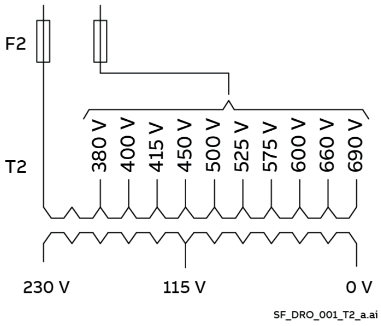


③ Measurement current max. 2 A

Fuse (F3) is needed to protect the cable connected between L2 and V1. Typically a Miniature Circuit Breaker (MCB) of 2 ... 6 A is used.

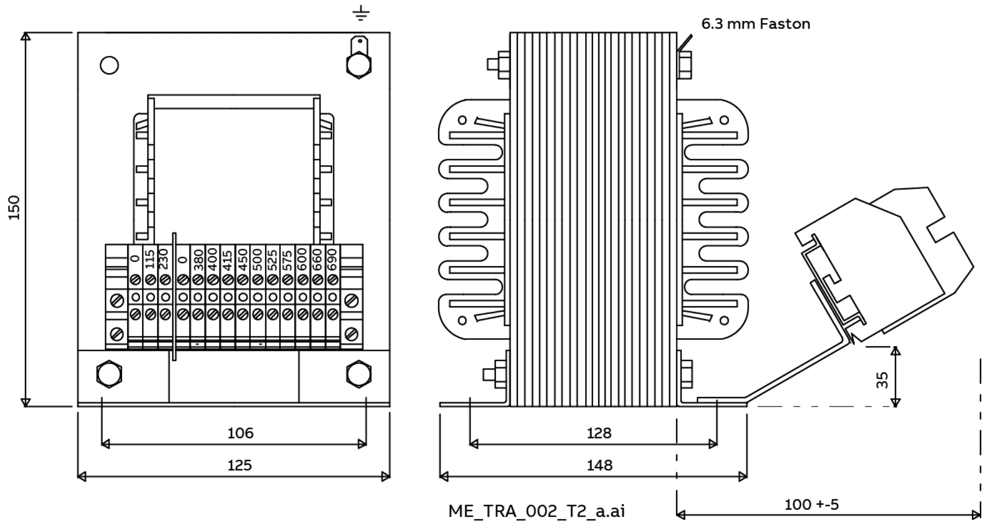
Auxiliary transformer (T2) for the +24 V_{DC} power supply and fans

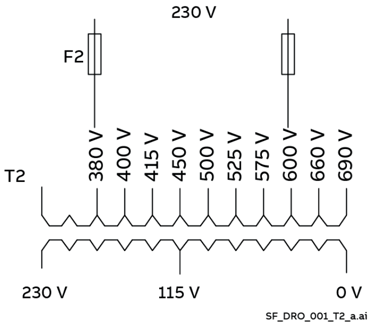
The unit requires various auxiliary voltages, e.g. the unit's electronics needs +24 V_{DC} and some cooling fans requires either a single-phase supply of 115 V_{AC} or 230 V_{AC}. The auxiliary transformer (T2) is designed to supply the +24 V_{DC} power supply for the unit's electronics and the cooling fans.
Please be advised, that each DCT880 should have its own 24 V_{DC} power supply.



Input voltage:	230/380 … 690 V_{AC}, ±10 %, single-phase
Input frequency:	50 … 60 Hz
Output voltage:	115/230 V_{AC} single-phase

Transformer (T2)	Power [VA]	Weight [kg]	Power losses [W]	Fuse F2 [A]	Secondary current [A]
T2	1400	15	100	16	6 @ 230 V 12 @ 115 V





Commissioning hint:
T2 is designed to work as a 230 V_{AC} to 230 V_{AC} isolation transformer to open or avoid ground loops. Connect the 230 V_{AC} at the 380 V_{AC} and 600 V_{AC} taping according to the drawing on the left hand side.

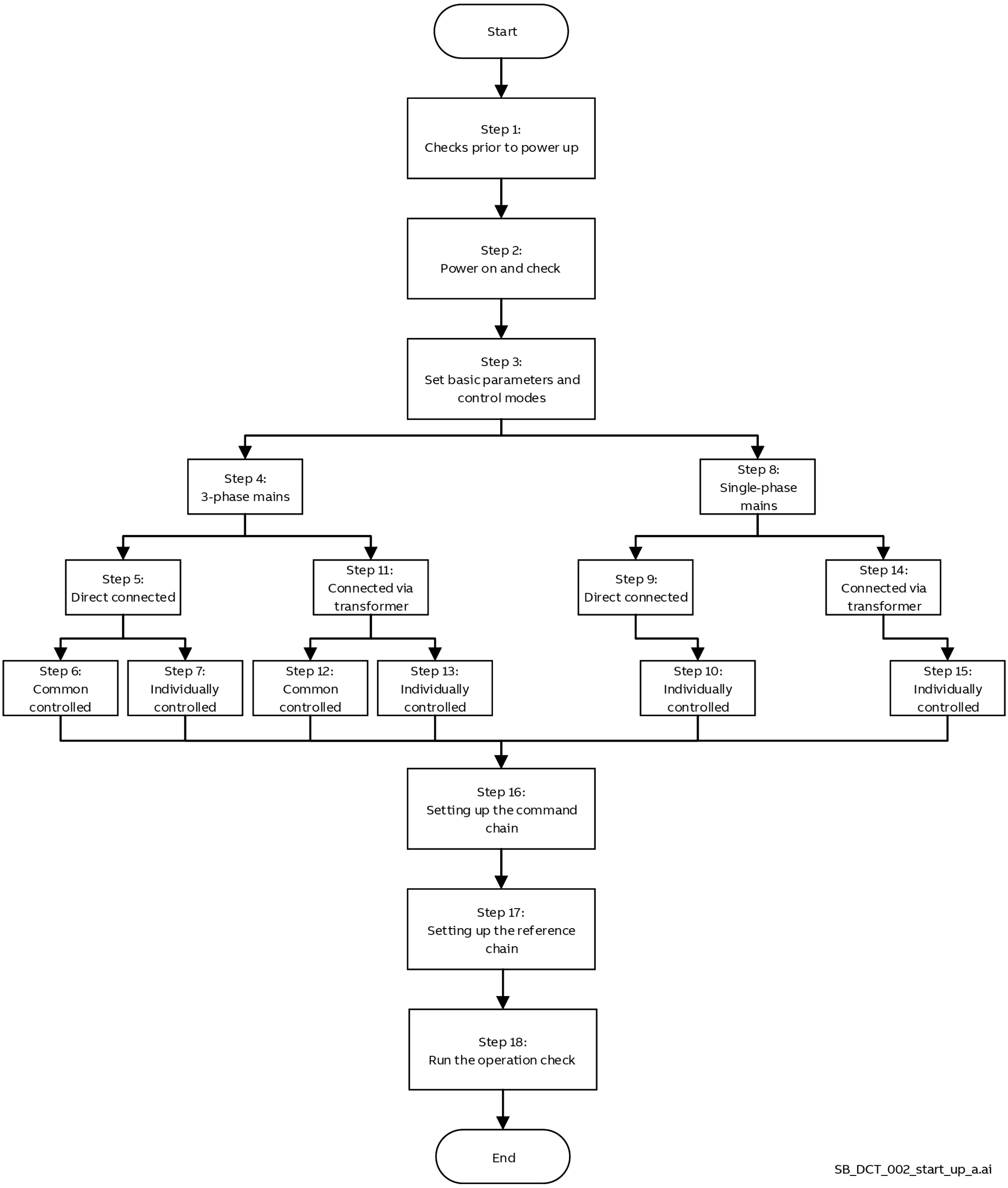
Using the control panel

Refer to the ACX-AP-x assistant control panel’s user’s manual (3AUA0000085685).

Start-up procedure

Start-up according to the flow chart below:

Overview diagram



SB_DCT_002_start_up_a.ai

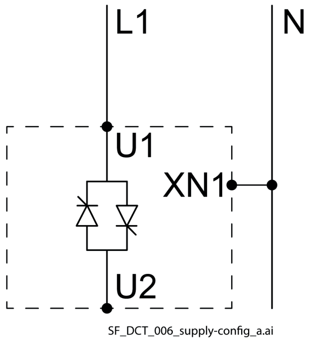
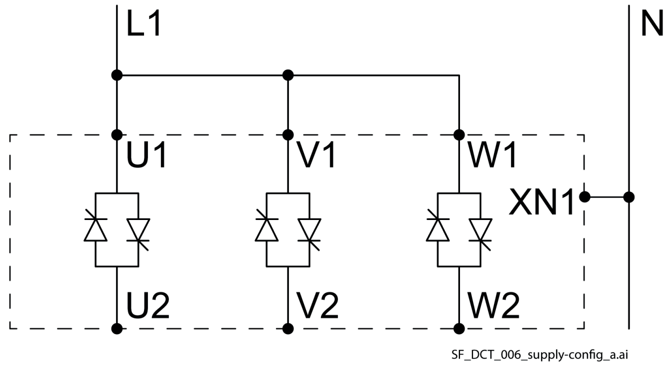
Step 1: Checks prior to power up

Check the following before power up of the thyristor power controller:

1. Check the wiring to the input terminals (U1, V1, W1) and output terminals (U2, V2, W2).
2. Check that the grounding wires are connected to ground (PE).

WARNING!
Be sure to connect the grounding wires of the power controller to the ground electrodes.
Otherwise, an electric shock could occur.

3. Check the wiring to the auxiliary voltage supply (24 V_{DC} at XAUX) and the fan supply, if applicable.
4. Check the wiring to the external voltage and current measurement connected to XEXCT: 1/3/5/7 and XEXVM: 1/2/3/4 if used.
5. Check the wiring from XN1: 1 to neutral for single-phase + neutral or 3 x single-phase + neutral configurations.

Single-phase + neutral	3 x single-phase + neutral
	

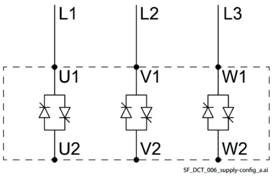
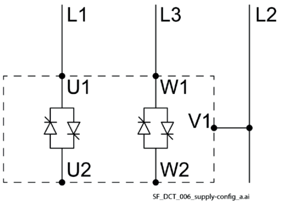
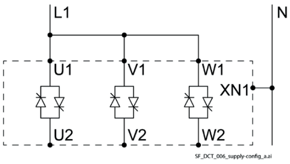
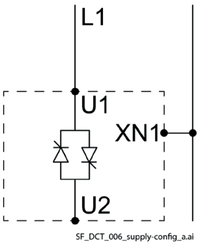
6. Check the auxiliary circuit terminals and main circuit terminals for short circuit or ground faults.
7. Check for loose terminals, connectors and screws.
8. Make sure that all switches of devices connected to the power controller are turned OFF. Power on the power controller with any of those switches being ON may cause unexpected behavior at load side.

Step 2: Power ON and check

WARNING!
Be sure to mount the front cover before turning the power on. Do not remove the cover when the power controller is on.
Do not operate switches with wet hands.
Otherwise, an electric shock could occur.

Turn the auxiliary power on and check the following:

1. Make sure all parameters are at factory settings (default).
2. Check that the control panel displays no fault and set date and time.
3. Check that the used analog inputs work properly:
   See 12.11 AI1 actual value, 12.21 AI2 actual value and 12.31 AI3 actual value.
   Set AI1 and AI2 from voltage to current if needed (12.15 AI1 unit selection and 12.25 AI2 unit selection).
   AI3 is voltage only.
4. Check that the used digital inputs work properly:
   See 10.01 DI status.
5. Set 99.01 Supply Voltage depending on the supply configuration:

99.04 Supply Configuration:		99.01 Supply Voltage:
0: 3ph UVW		Phase-to-phase voltage (U_{L1L2}, U_{L1L3}, U_{L2L3}).
1: 3ph UW Eco		
2: 3 x 1ph + N		Phase voltage (U_{L1N}).
3: 1ph + N		
Multitap	-	See separate manual.
Scott transformer	-	

6. Turn on the mains and check the following:
   In case of 3-phase mains, check the phase-to-phase voltages using 01.07 Voltage U1 - V1 actual, 01.08 Voltage V1 - W1 actual, 01.09 Voltage W1 - U1 actual.
   In case of single-phase mains, check the voltage between phase and neutral using 01.01 Voltage U1 - N actual, 01.02 Voltage V1 - N actual, 01.03 Voltage W1 - N actual.

Step 3: Set basic parameters and control modes

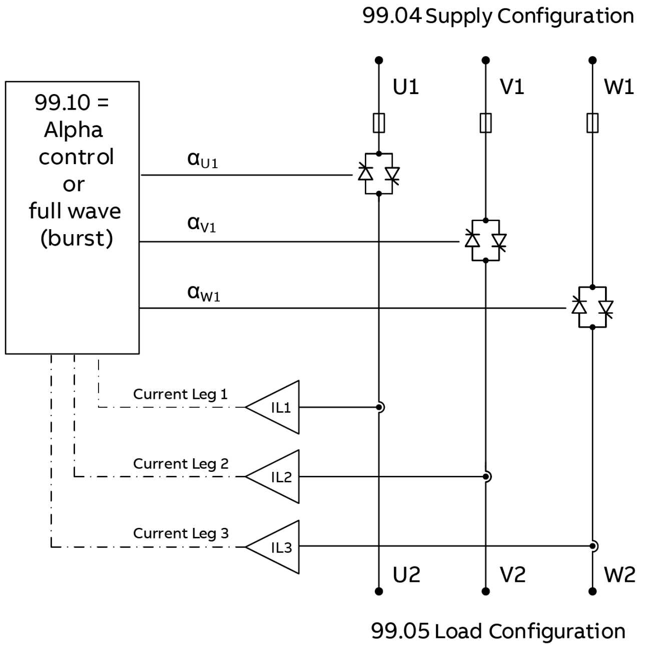
Please search for your configuration in following tables and start-up the power controller accordingly.

- Overview diagram.
- Steps 4/5/6.
- Steps 4/5/7.
- Steps 4/11/12.
- Steps 4/11/13.
- Steps 8/9/10.
- Steps 8/14/15.

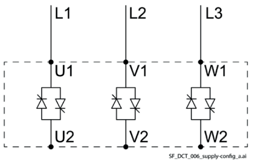
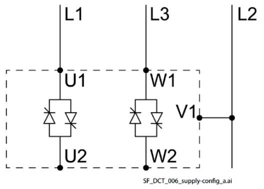
Step 4/5: Basic settings for 3-phase mains and direct coupled loads

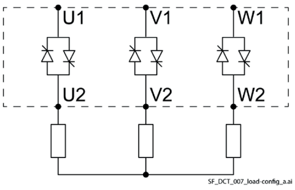
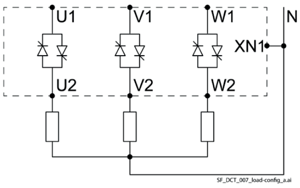
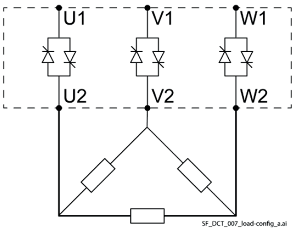
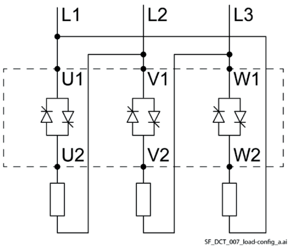
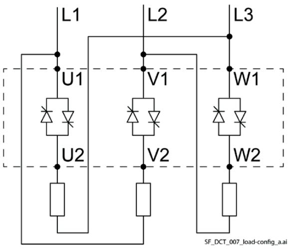
3-phase mains and no transformer between the unit's output and the load.

Step 6: Common controlled loads, leg 2 and leg 3 follow leg 1



SF_DCT_011_alpha-control_a.ai

<table>
<tr><th>Parameter</th><th colspan="2">Parameter description / setting</th></tr>
<tr><td>99.01 Supply Voltage</td><td colspan="2">Rated supply voltage.</td></tr>
<tr><td>99.02 Load current</td><td colspan="2">Rated load current.</td></tr>
<tr><td>99.03 Load Voltage</td><td colspan="2">Rated load voltage.</td></tr>
<tr><td>99.04 Supply Configuration</td><td colspan="2">Describes the configuration at the input (U1, V1, W1) of the unit.
For detailed description, see group 99.</td></tr>
<tr><td>0: 3ph UVW</td><td> </td><td>E.g. for units with 3 legs (W03).</td></tr>
<tr><td>1: 3ph UW eco</td><td> </td><td>E.g. for units with 2 legs (W02).</td></tr>
<tr><td>99.05 Load Configuration</td><td colspan="2">Describes the configuration at the output of the unit.
For detailed description, see group 99.</td></tr>
<tr><td></td><td colspan="2"></td></tr>
</table>

0: 3ph star (3S)	 SF_DCT_007_load-config_a.ai	The load is connected in a star configuration. Set 99.03 Load Voltage to the connected phase-to-phase voltage (e.g. U2 … V2).
1: 3ph star + N (4S)	 SF_DCT_007_load-config_a.ai	The load is connected in star configuration with neutral connected to the star point. Set 99.03 Load Voltage to the connected phase voltage (e.g. U2 … N).
2: 3ph delta (3D)	 SF_DCT_007_load-config_a.ai	The load is connected in a delta configuration.
3: 3ph open delta UV (6D)	 SF_DCT_007_load-config_a.ai	The load is connected in an open delta configuration (clockwise phase connection U V W).
4: 3ph open delta UW (6D)	 SF_DCT_007_load-config_a.ai	The load is connected in an open delta configuration (anti-clockwise phase connection U W V).

99.10 Leg 1 Control Mode	Selection of control mode for leg 1. Default input for the reference is AI1 see Appendix Leg 1. For detailed description, see group 99.

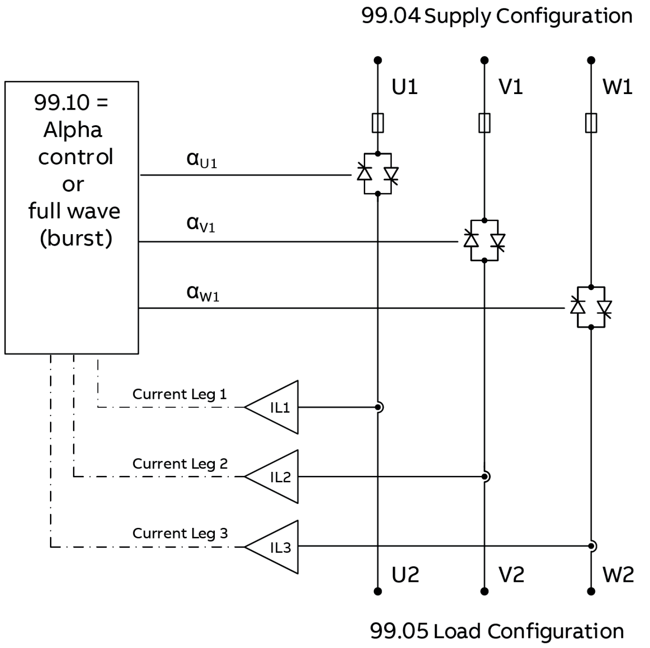
2	Full wave fix cycle; full wave (burst) with fix cycle control. The load power depends on 22.11 Leg 1 Actual Ref and 99.11 Leg 1 Cycle Time.
3	Full wave variable cycle; full wave (burst) with variable cycle control. The load power depends on 23.03 Leg 1 Minimum Cycle Variable Burst and 22.11 Leg 1 Actual Ref.
5	U α open loop control; phase angle control.
6	U^2 α open loop control; phase angle control.
7	I α control; phase angle control.
8	I^2 α control; phase angle control.
9	U α control; phase angle control.
10	U^2 α control; phase angle control.

	11 P α control; phase angle control. 12 Leg 1 External Ref 23.65; phase angle control.
99.25 Leg 2 Control Mode	Selection of control mode for leg 2. 13 Follow Leg 1; use the same control mode as leg 1.
99.40 Leg 3 Control Mode	Selection of control mode for leg 3. 13 Follow Leg 1; use the same control mode as leg 1.

Step 4/5: Basic settings for 3-phase mains and direct connected loads

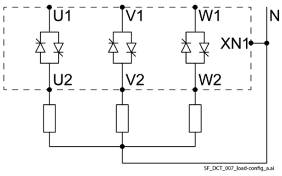
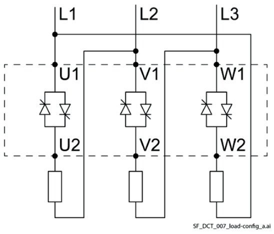
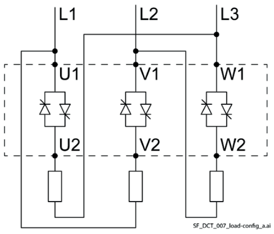
3-phase mains and no transformer between the unit's output and the load.

Step 7: Individual controlled loads, leg 1, leg 2 and leg 3 are independent



SF_DCT_011_alpha-control_a.ai

Parameter	Parameter description / setting
99.01 Supply Voltage … 99.04 Supply Configuration see above.	
99.05 Load Configuration	Describes the configuration at the output of the unit. For detailed description, see group 99.

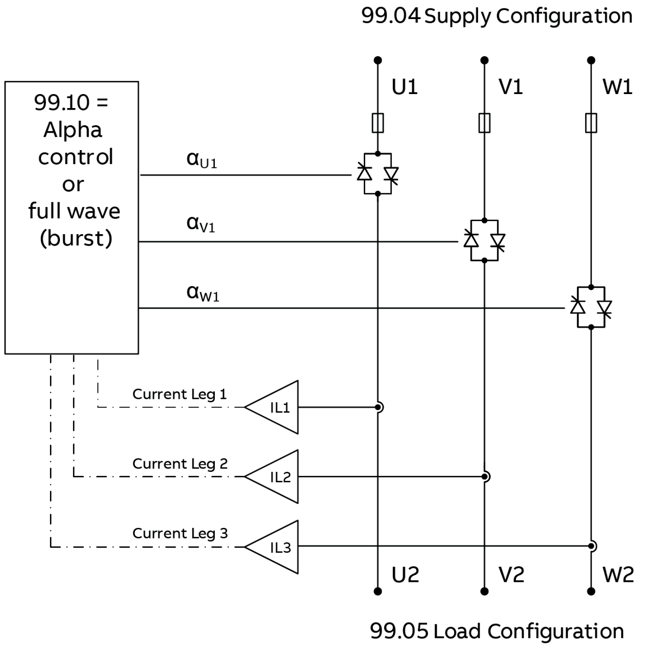
1: 3ph star + N (4S)	 SF_DCT_007_load-config_a.ai	The load is connected in star configuration with neutral connected to the star point.
3: 3ph open delta UV (6D)	 SF_DCT_007_load-config_a.ai	The load is connected in an open delta configuration (clockwise phase connection U V W).
4: 3ph open delta UW (6D)	 SF_DCT_007_load-config_a.ai	The load is connected in an open delta configuration (anti-clockwise phase connection U W V).

<table>
<tr><td>99.10 Leg 1 Control Mode</td><td>Selection of control mode for leg 1. Default input for the reference is AI1 see Appendix Leg 1.
For detailed description, see group 99.
<table>
<tr><td>2</td><td>Full wave fix cycle; full wave (burst) with fix cycle control. The load power depends on 22.11 Leg 1 Actual Ref and 99.11 Leg 1 Cycle Time.</td></tr>
<tr><td>3</td><td>Full wave variable cycle; full wave (burst) with variable cycle control. The load power depends on 23.03 Leg 1 Minimum Cycle Variable Burst and 22.11 Leg 1 Actual Ref.</td></tr>
<tr><td>5</td><td>$U \alpha$ open loop control; phase angle control.</td></tr>
<tr><td>6</td><td>$U^2 \alpha$ open loop control; phase angle control.</td></tr>
<tr><td>7</td><td>$I \alpha$ control; phase angle control.</td></tr>
<tr><td>8</td><td>$I^2 \alpha$ control; phase angle control.</td></tr>
<tr><td>9</td><td>$U \alpha$ control; phase angle control.</td></tr>
<tr><td>10</td><td>$U^2 \alpha$ control; phase angle control.</td></tr>
<tr><td>11</td><td>$P \alpha$ control; phase angle control.</td></tr>
<tr><td>12</td><td>Leg 1 External Ref 23.65; phase angle control.</td></tr>
</table>
</td></tr>
<tr><td>99.25 Leg 2 Control Mode</td><td>Selection of control mode for leg 2. Default input for the reference is AI2 see Appendix Leg 2.
See selection of 99.10 Leg 1 Control Mode.</td></tr>
<tr><td>99.40 Leg 3 Control Mode</td><td>Selection of control mode for leg 3. Default input for the reference is AI3 see Appendix Leg 3.
See selection of 99.10 Leg 1 Control Mode.</td></tr>
</table>

Step 8/9: Basic settings for single-phase mains and direct connected loads

Single-phase mains and no transformer between the unit's output and the load.

Step 10: Individual controlled loads, leg 1, leg 2 and leg 3 are independent



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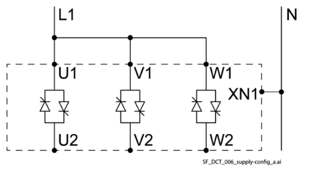
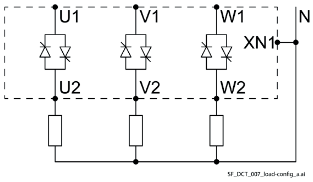
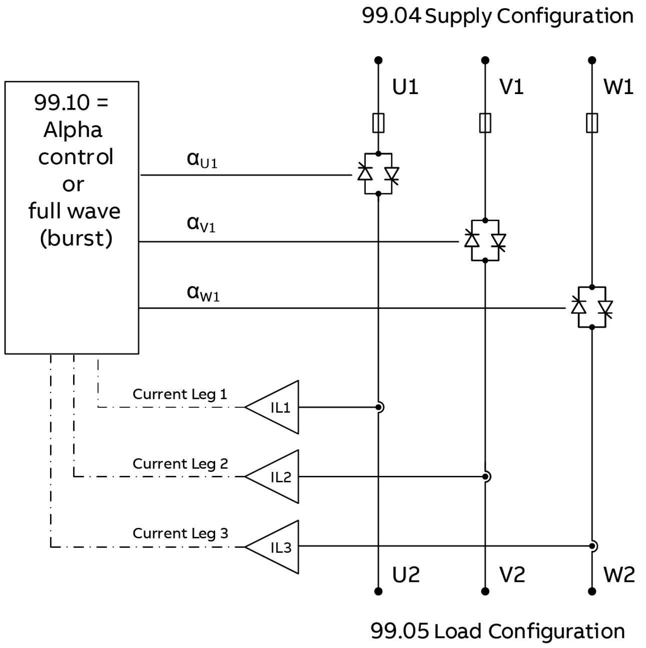
Parameter	Parameter description / setting	
99.01 Supply Voltage	Rated supply voltage.	
99.02 Load current	Rated load current.	
99.03 Load Voltage	Rated load voltage.	
99.04 Supply Configuration	Describes the configuration at the input (U1, V1, W1) of the unit. For detailed description, see group 99.	
2: 3 x 1ph + N		For units with 3 legs (W03) or 2 legs (W02) connected to single-phase mains.
99.05 Load Configuration	Describes the configuration at the output of the unit. For detailed description, see group 99.	
9: 3 x 1ph loads		The loads are connected as single-phase loads to neutral.
99.10 Leg 1 Control Mode	Selection of control mode for leg 1. Default input for the reference is AI1 see Appendix Leg 1. For detailed description, see group 99.	

<table>
<tr><td></td><td>
<table>
<tr><td>2</td><td>Full wave fix cycle; full wave (burst) with fix cycle control. The load power depends on 22.11 Leg 1 Actual Ref and 99.11 Leg 1 Cycle Time.</td></tr>
<tr><td>3</td><td>Full wave variable cycle; full wave (burst) with variable cycle control. The load power depends on 23.03 Leg 1 Minimum Cycle Variable Burst and 22.11 Leg 1 Actual Ref.</td></tr>
<tr><td>4</td><td>Half wave; half wave control. The load power depends on the relation t_{on} / t_{off} and is controlled by 22.11 Leg 1 Actual Ref:</td></tr>
<tr><td>5</td><td>U α open loop control; phase angle control.</td></tr>
<tr><td>6</td><td>U^2 α open loop control; phase angle control.</td></tr>
<tr><td>7</td><td>I α control; phase angle control.</td></tr>
<tr><td>8</td><td>I^2 α control; phase angle control.</td></tr>
<tr><td>9</td><td>U α control; phase angle control.</td></tr>
<tr><td>10</td><td>U^2 α control; phase angle control.</td></tr>
<tr><td>11</td><td>P α control; phase angle control.</td></tr>
<tr><td>12</td><td>Leg 1 External Ref 23.65; phase angle control.</td></tr>
</table>
</td></tr>
<tr><td>99.25 Leg 2 Control Mode</td><td>Selection of control mode for leg 2. Default input for the reference is AI2 see Appendix Leg 2.
See selection of 99.10 Leg 1 Control Mode.</td></tr>
<tr><td>99.40 Leg 3 Control Mode</td><td>Selection of control mode for leg 3. Default input for the reference is AI3 see Appendix Leg 3.
See selection of 99.10 Leg 1 Control Mode.</td></tr>
</table>

Step 4/11: Basic settings for 3-phase mains and loads connected via transformer

3-phase mains and a transformer between the unit’s output and the load.

Step 12: Common controlled loads, leg 2 and leg 3 follow leg 1 via transformer



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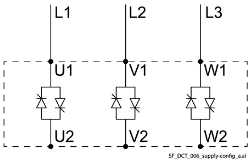
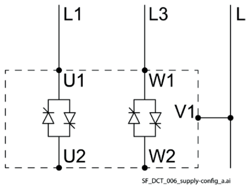
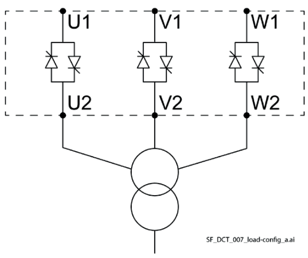
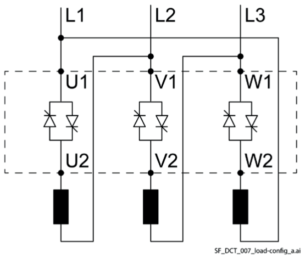
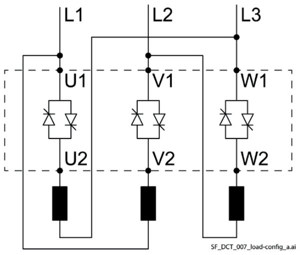
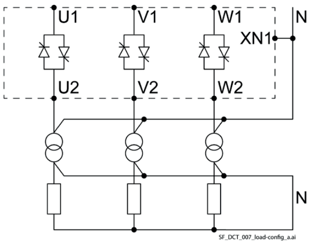
<table>
<tr><th>Parameter</th><th>Parameter description / setting</th></tr>
<tr><td>99.01 Supply Voltage</td><td>Rated supply voltage.</td></tr>
<tr><td>99.02 Load current</td><td>Rated load current.</td></tr>
<tr><td>99.03 Load Voltage</td><td>Rated load voltage or voltage at primary side of the transformer, depending on what voltage should be controlled.</td></tr>
<tr><td>99.04 Supply Configuration</td><td>Describes the configuration at the input (U1, V1, W1) of the unit.
For detailed description, see group 99.</td></tr>
<tr><td colspan="2">
<table>
<tr><td>0: 3ph UVW</td><td> </td><td>E.g. for units with 3 legs (W03).</td></tr>
<tr><td>1: 3ph UW eco</td><td> </td><td>E.g. for units with 2 legs (W02).</td></tr>
</table>
</td></tr>
<tr><td>99.05 Load Configuration</td><td>Describes the configuration at the output of the unit.
For detailed description, see group 99.</td></tr>
<tr><td></td><td></td></tr>
</table>

<table>
<tr><td>5: 3ph transformer (3D/3S)</td><td> </td><td>The load is connected via a 3-phase delta or star transformer.</td></tr>
<tr><td>6: 3ph transformer UV (6D)</td><td> </td><td>The load is connected via a 3-phase open delta transformer (clockwise phase connection U V W).</td></tr>
<tr><td>7: 3ph transformer UW (6D)</td><td> </td><td>The load is connected via a 3-phase open delta transformer (anti-clockwise phase connection U W V).</td></tr>
<tr><td>10: 3 x 1ph transformer loads</td><td> </td><td>The loads are connected as single-phase loads via single-phase transformers.</td></tr>
</table>

<table>
<tr><td>99.10 Leg 1 Control Mode</td><td>Selection of control mode for leg 1. Default input for the reference is AI1 see Appendix Leg 1.
For detailed description, see group 99.
<table>
<tr><td>2</td><td>Full wave fix cycle; full wave (burst) with fix cycle control. The load power depends on 22.11 Leg 1 Actual Ref and 99.11 Leg 1 Cycle Time.</td></tr>
<tr><td>5</td><td>U α open loop control; phase angle control.</td></tr>
<tr><td>6</td><td>U² α open loop control; phase angle control.</td></tr>
<tr><td>7</td><td>I α control; phase angle control.</td></tr>
<tr><td>8</td><td>I² α control; phase angle control.</td></tr>
<tr><td>9</td><td>U α control; phase angle control.</td></tr>
<tr><td>10</td><td>U² α control; phase angle control.</td></tr>
<tr><td>11</td><td>P α control; phase angle control.</td></tr>
<tr><td>12</td><td>Leg 1 External Ref 23.65; phase angle control.</td></tr>
</table></td></tr>
<tr><td>99.25 Leg 2 Control Mode</td><td>Selection of control mode for leg 2.
<table>
<tr><td>13</td><td>Follow Leg 1; use the same control mode as leg 1.</td></tr>
</table></td></tr>
</table>

<table>
<tr><td>99.40 Leg 3 Control Mode</td><td>Selection of control mode for leg 3.<table><tr><td>13</td><td>Follow Leg 1; use the same control mode as leg 1.</td></tr></table></td></tr>
</table>

Additional settings for 99.10 Leg 1 Control Mode = Full wave fix cycle (= 2) via transformer

<table>
<tr><th>Parameter</th><th>Parameter description / setting</th></tr>
<tr><td>99.12 Leg 1 Start Mode</td><td>Defines the start mode of leg 1.
For detailed description, see group 99.</td></tr>
<tr><td></td><td><table>
<tr><td>1</td><td>First angle; for transformer loads. This prevents the high inrush current of transformers. The first thyristors are fired with the firing angle in 99.13 Leg 1 First Angle.</td></tr>
<tr><td>2</td><td>Soft start; at start the firing angle is moved from 180° … 0° using the amount of periods in 99.14 Leg 1 Burst Soft Start Ramp. Switching OFF is done by setting the firing angle directly to 180°.</td></tr>
<tr><td>3</td><td>Soft start / soft down; at start the firing angle is moved from 180° … 0° using the amount of periods in 99.14 Leg 1 Burst Soft Start Ramp. At switching OFF the firing angle is moved to 180° depending on 99.15 Leg 1 Burst Soft Down Ramp.</td></tr>
<tr><td>4</td><td>Soft start / first angle; see 1: First angle and 2: Soft start.</td></tr>
</table></td></tr>
<tr><td>99.13 Leg 1 First Angle</td><td>Starting angle for leg 1, mainly used for transformer loads. 90.0° is e.g. the phase shift between voltage and current of a transformer.
Note: Recommended setting 75.0° … 115.0°.</td></tr>
<tr><td>99.14 Leg 1 Burst Soft Start Ramp</td><td>Soft start time in periods in which the firing angle is moved from 180° … 0°.</td></tr>
<tr><td>99.15 Leg 1 Burst Soft Down Ramp</td><td>Soft down ramp in periods in which the firing angle is moved from 0° … 180°.</td></tr>
</table>

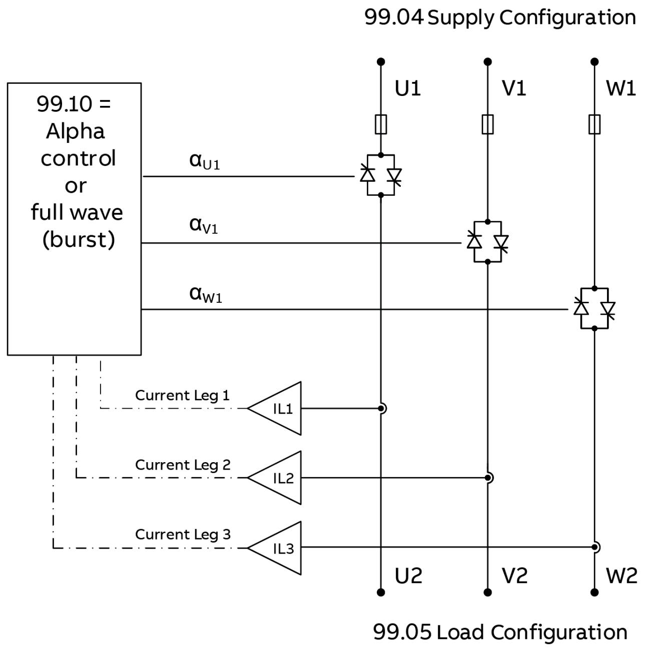
Additional settings for 99.10 Leg 1 Control Mode = Alpha controls (= 5 … 12) via transformer

Parameter	**Parameter description / setting**
99.16 Leg 1 Phase Angle Soft Start Ramp	Soft start time in which the reference is ramped from 0 … 100 %.
99.17 Leg 1 Phase Angle Soft Down Ramp	Soft down time in which the reference is ramped from 100 … 0 %.

Step 4/11: Basic settings for 3-phase mains and loads connected via transformer

3-phase mains and a transformer between the unit's output and the load.

Step 13: Individual controlled loads, leg 1, leg 2 and leg 3 are independent via transformer



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<table>
<tr><th>Parameter</th><th>Parameter description / setting</th></tr>
<tr><td colspan="2">99.01 Supply Voltage … 99.05 Load Configuration see above.</td></tr>
<tr><td>99.10 Leg 1 Control Mode</td><td>Selection of control mode for leg 1. Default input for the reference is AI1 see Appendix Leg 1.
For detailed description, see group 99.
<table>
<tr><td>2</td><td>Full wave fix cycle; full wave (burst) with fix cycle control. The load power depends on 22.11 Leg 1 Actual Ref and 99.11 Leg 1 Cycle Time.</td></tr>
<tr><td>5</td><td>U α open loop control; phase angle control.</td></tr>
<tr><td>6</td><td>U^2 α open loop control; phase angle control.</td></tr>
<tr><td>7</td><td>I α control; phase angle control.</td></tr>
<tr><td>8</td><td>I^2 α control; phase angle control.</td></tr>
<tr><td>9</td><td>U α control; phase angle control.</td></tr>
<tr><td>10</td><td>U^2 α control; phase angle control.</td></tr>
<tr><td>11</td><td>P α control; phase angle control.</td></tr>
<tr><td>12</td><td>Leg 1 External Ref 23.65; phase angle control.</td></tr>
</table></td></tr>
<tr><td>99.25 Leg 2 Control Mode</td><td>Selection of control mode for leg 2. Default input for the reference is AI2 see Appendix Leg 2.
See selection of 99.10 Leg 1 Control Mode.</td></tr>
<tr><td>99.40 Leg 3 Control Mode</td><td>Selection of control mode for leg 3. Default input for the reference is AI3 see Appendix Leg 3.
See selection of 99.10 Leg 1 Control Mode.</td></tr>
</table>

Additional settings for 99.10 Leg 1 Control Mode = Full wave fix cycle (= 2) via transformer

Parameter	**Parameter description / setting**
Leg 1	
99.12 Leg 1 Start Mode	Defines the start mode of leg 1. For detailed description, see group 99.
	1 First angle; for transformer loads. This prevents the high inrush current of transformers. The first thyristors are fired with the firing angle in 99.13 Leg 1 First Angle. 2 Soft start; at start the firing angle is moved from 180° … 0° using the amount of periods in 99.14 Leg 1 Burst Soft Start Ramp. Switching OFF is done by setting the firing angle directly to 180°. 3 Soft start / soft down; at start the firing angle is moved from 180° … 0° using the amount of periods in 99.14 Leg 1 Burst Soft Start Ramp. At switching OFF the firing angle is moved to 180° depending on 99.15 Leg 1 Burst Soft Down Ramp. 4 Soft start / first angle; see 1: First angle and 2: Soft start.
99.13 Leg 1 First Angle	Starting angle for leg 1, mainly used for transformer loads. 90.0° is e.g. the phase shift between voltage and current of a transformer. **Note:** Recommended setting 75.0° … 115.0°.
99.14 Leg 1 Burst Soft Start Ramp	Soft start time in periods in which the firing angle is moved from 180° … 0°.
99.15 Leg 1 Burst Soft Down Ramp	Soft down ramp in periods in which the firing angle is moved from 0° … 180°.
Leg 2	
99.27 Leg 2 Start Mode	Defines the start mode of leg 2. For detailed description, see group 99.
	1 First angle; for transformer loads. This prevents the high inrush current of transformers. The first thyristors are fired with the firing angle in 99.28 Leg 2 First Angle. 2 Soft start; at start the firing angle is moved from 180° … 0° using the amount of periods in 99.29 Leg 2 Burst Soft Start Ramp. Switching OFF is done by setting the firing angle directly to 180°. 3 Soft start / soft down; at start the firing angle is moved from 180° … 0° using the amount of periods in 99.29 Leg 2 Burst Soft Start Ramp. At switching OFF the firing angle is moved to 180° depending on 99.30 Leg 2 Burst Soft Down Ramp. 4 Soft start / first angle; see 1: First angle and 2: Soft start.
99.28 Leg 2 First Angle	Starting angle for leg 2, mainly used for transformer loads. 90.0° is e.g. the phase shift between voltage and current of a transformer. **Note:** Recommended setting 75.0° … 115.0°.
99.29 Leg 2 Burst Soft Start Ramp	Soft start time in periods in which the firing angle is moved from 180° … 0°.
99.30 Leg 2 Burst Soft Down Ramp	Soft down ramp in periods in which the firing angle is moved from 0° … 180°.
Leg 3	
99.42 Leg 3 Start Mode	Defines the start mode of leg 3. For detailed description, see group 99.
	1 First angle; for transformer loads. This prevents the high inrush current of transformers. The first thyristors are fired with the firing angle in 99.43 Leg 3 First Angle.

	2 Soft start; at start the firing angle is moved from 180° … 0° using the amount of periods in 99.44 Leg 3 Burst Soft Start Ramp. Switching OFF is done by setting the firing angle directly to 180°. 3 Soft start / soft down; at start the firing angle is moved from 180° … 0° using the amount of periods in 99.44 Leg 3 Burst Soft Start Ramp. At switching OFF the firing angle is moved to 180° depending on 99.45 Leg 3 Burst Soft Down Ramp. 4 Soft start / first angle; see 1: First angle and 2: Soft start.
99.43 Leg 3 First Angle	Starting angle for leg 3, mainly used for transformer loads. 90.0° is e.g. the phase shift between voltage and current of a transformer. **Note:** Recommended setting 75.0° … 115.0°.
99.44 Leg 3 Burst Soft Start Ramp	Soft start time in periods in which the firing angle is moved from 180° … 0°.
99.45 Leg 3 Burst Soft Down Ramp	Soft down ramp in periods in which the firing angle is moved from 0° … 180°.

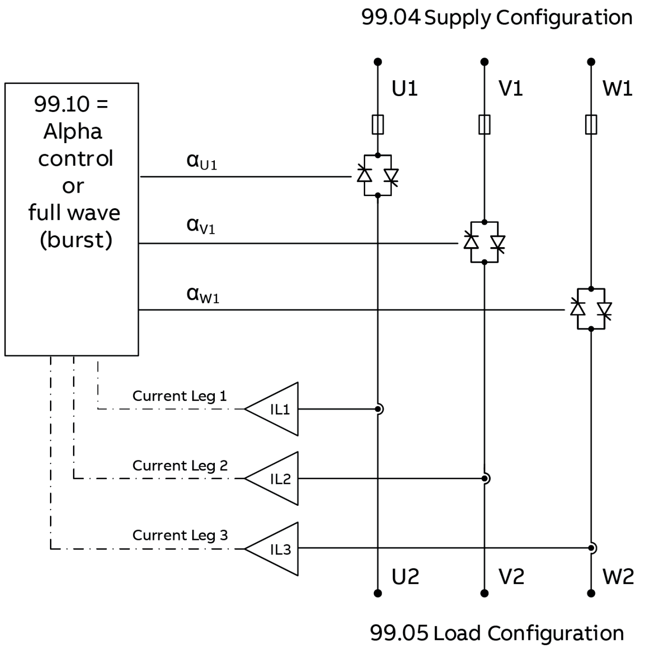
Additional settings for 99.10 Leg 1 Control Mode = Alpha controls (= 5 … 12) via transformer

Parameter	**Parameter description / setting**
Leg 1	
99.16 Leg 1 Phase Angle Soft Start Ramp	Soft start time in which the reference is ramped from 0 … 100 %.
99.17 Leg 1 Phase Angle Soft Down Ramp	Soft down time in which the reference is ramped from 100 … 0 %.
Leg 2	
99.31 Leg 2 Phase Angle Soft Start Ramp	Soft start time in which the reference is ramped from 0 … 100 %.
99.32 Leg 2 Phase Angle Soft Down Ramp	Soft down time in which the reference is ramped from 100 … 0 %.
Leg 3	
99.46 Leg 3 Phase Angle Soft Start Ramp	Soft start time in which the reference is ramped from 0 … 100 %.
99.47 Leg 3 Phase Angle Soft Down Ramp	Soft down time in which the reference is ramped from 100 … 0 %.

Step 8/14: Basic settings for single-phase mains and loads connected via transformer

Single-phase mains and a transformer between the unit’s output and the load.

Step 15: Individual controlled loads, leg 1, leg 2 and leg 3 are independent via transformer



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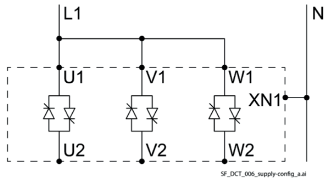
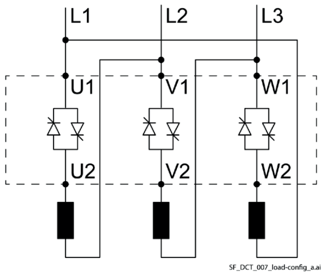
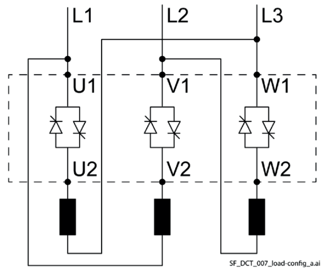
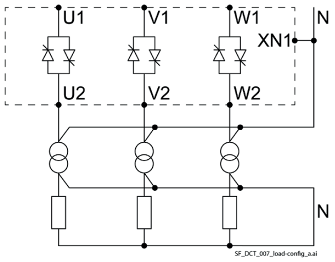
Parameter	Parameter description / setting
99.01 Supply Voltage	Rated supply voltage.
99.02 Load current	Rated load current.
99.03 Load Voltage	Rated load voltage.
99.04 Supply Configuration	Describes the configuration at the input (U1, V1, W1) of the unit. For detailed description, see group 99.
2: 3 x 1ph + N	 For units with 3 legs (W03) or 2 legs (W02) connected to single-phase mains.
99.05 Load Configuration	Describes the configuration at the output of the unit. For detailed description, see group 99.
6: 3ph transformer UV (6D)	 The load is connected via a 3-phase open delta transformer (clockwise phase connection U V W).

7: 3ph transformer UW (6D)		The load is connected via a 3-phase open delta transformer (anti-clockwise phase connection U W V).
10: 3 x 1ph transformer loads		The loads are connected as single-phase loads via single-phase transformers.

99.10 Leg 1 Control Mode	Selection of control mode for leg 1. Default input for the reference is AI1 see Appendix Leg 1. For detailed description, see group 99.

2	Full wave fix cycle; full wave (burst) with fix cycle control. The load power depends on 22.11 Leg 1 Actual Ref and 99.11 Leg 1 Cycle Time.
5	U α open loop control; phase angle control.
6	U^2 α open loop control; phase angle control.
7	I α control; phase angle control.
8	I^2 α control; phase angle control.
9	U α control; phase angle control.
10	U^2 α control; phase angle control.
11	P α control; phase angle control.
12	Leg 1 External Ref 23.65; phase angle control.

99.25 Leg 2 Control Mode	Selection of control mode for leg 2. Default input for the reference is AI2 see Appendix Leg 2. See selection of 99.10 Leg 1 Control Mode.
99.40 Leg 3 Control Mode	Selection of control mode for leg 3. Default input for the reference is AI3 see Appendix Leg 3. See selection of 99.10 Leg 1 Control Mode.

Additional settings for 99.10 Leg 1 Control Mode = Full wave fix cycle (= 2) via transformer

Parameter	**Parameter description / setting**
Leg 1	
99.12 Leg 1 Start Mode	Defines the start mode of leg 1. For detailed description, see group 99.

1	First angle; for transformer loads. This prevents the high inrush current of transformers. The first thyristors are fired with the firing angle in 99.13 Leg 1 First Angle.
2	Soft start; at start the firing angle is moved from 180° … 0° using the amount of periods in 99.14 Leg 1 Burst Soft Start Ramp. Switching OFF is done by setting the firing angle directly to 180°.

	3 Soft start / soft down; at start the firing angle is moved from 180° … 0° using the amount of periods in 99.14 Leg 1 Burst Soft Start Ramp. At switching OFF the firing angle is moved to 180° depending on 99.15 Leg 1 Burst Soft Down Ramp. 4 Soft start / first angle; see 1: First angle and 2: Soft start.
99.13 Leg 1 First Angle	Starting angle for leg 1, mainly used for transformer loads. 90.0° is e.g. the phase shift between voltage and current of a transformer. **Note:** Recommended setting 75.0° … 115.0°.
99.14 Leg 1 Burst Soft Start Ramp	Soft start time in periods in which the firing angle is moved from 180° … 0°.
99.15 Leg 1 Burst Soft Down Ramp	Soft down ramp in periods in which the firing angle is moved from 0° … 180°.
Leg 2	
99.27 Leg 2 Start Mode	Defines the start mode of leg 2. For detailed description, see group 99.
	1 First angle; for transformer loads. This prevents the high inrush current of transformers. The first thyristors are fired with the firing angle in 99.28 Leg 2 First Angle. 2 Soft start; at start the firing angle is moved from 180° … 0° using the amount of periods in 99.29 Leg 2 Burst Soft Start Ramp. Switching OFF is done by setting the firing angle directly to 180°. 3 Soft start / soft down; at start the firing angle is moved from 180° … 0° using the amount of periods in 99.29 Leg 2 Burst Soft Start Ramp. At switching OFF the firing angle is moved to 180° depending on 99.30 Leg 2 Burst Soft Down Ramp. 4 Soft start / first angle; see 1: First angle and 2: Soft start.
99.28 Leg 2 First Angle	Starting angle for leg 2, mainly used for transformer loads. 90.0° is e.g. the phase shift between voltage and current of a transformer. **Note:** Recommended setting 75.0° … 115.0°.
99.29 Leg 2 Burst Soft Start Ramp	Soft start time in periods in which the firing angle is moved from 180° … 0°.
99.30 Leg 2 Burst Soft Down Ramp	Soft down ramp in periods in which the firing angle is moved from 0° … 180°.
Leg 3	
99.42 Leg 3 Start Mode	Defines the start mode of leg 3. For detailed description, see group 99.
	1 First angle; for transformer loads. This prevents the high inrush current of transformers. The first thyristors are fired with the firing angle in 99.43 Leg 3 First Angle. 2 Soft start; at start the firing angle is moved from 180° … 0° using the amount of periods in 99.44 Leg 3 Burst Soft Start Ramp. Switching OFF is done by setting the firing angle directly to 180°. 3 Soft start / soft down; at start the firing angle is moved from 180° … 0° using the amount of periods in 99.44 Leg 3 Burst Soft Start Ramp. At switching OFF the firing angle is moved to 180° depending on 99.45 Leg 3 Burst Soft Down Ramp. 4 Soft start / first angle; see 1: First angle and 2: Soft start.
99.43 Leg 3 First Angle	Starting angle for leg 3, mainly used for transformer loads. 90.0° is e.g. the phase shift between voltage and current of a transformer. **Note:** Recommended setting 75.0° … 115.0°.

99.44 Leg 3 Burst Soft Start Ramp	Soft start time in periods in which the firing angle is moved from 180° … 0°.
99.45 Leg 3 Burst Soft Down Ramp	Soft down ramp in periods in which the firing angle is moved from 0° … 180°.

Additional settings for 99.10 Leg 1 Control Mode = Alpha controls (= 5 … 12) via transformer

Parameter	**Parameter description / setting**
Leg 1	
99.16 Leg 1 Phase Angle Soft Start Ramp	Soft start time in which the reference is ramped from 0 … 100 %.
99.17 Leg 1 Phase Angle Soft Down Ramp	Soft down time in which the reference is ramped from 100 … 0 %.
Leg 2	
99.31 Leg 2 Phase Angle Soft Start Ramp	Soft start time in which the reference is ramped from 0 … 100 %.
99.32 Leg 2 Phase Angle Soft Down Ramp	Soft down time in which the reference is ramped from 100 … 0 %.
Leg 3	
99.46 Leg 3 Phase Angle Soft Start Ramp	Soft start time in which the reference is ramped from 0 … 100 %.
99.47 Leg 3 Phase Angle Soft Down Ramp	Soft down time in which the reference is ramped from 100 … 0 %.

Step 16: Setting up the command chain

At factory setting (default) the command chain is set the following way (control via hardware, XDI):

	Leg 1	Leg 2	Leg 3
Enable command	19.01 = DI1	19.03 = DI1	19.05 = DI1
Run command	19.02 = DI2	19.04 = DI2	19.06 = DI2
Reset	19.15 = DI3		
Common control ①	19.30 = Separate		

① Selects, whether each leg is operating independent or all legs are reacting to leg 1 Enable and Run commands.

The status of the digital inputs can be seen in 10.01 DI status.
For different settings use parameters in Group 19.

Step 17: Setting up the reference chain

At factory setting (default) analog inputs AI1 … AI3 are connected to the reference chain:

	Leg 1	**Leg 2** ②	**Leg 3** ②
Ref.	22.15 = AI1 scaled (12.12)	24.15 = AI1 scaled (12.12)	26.15 = AI1 scaled (12.12)

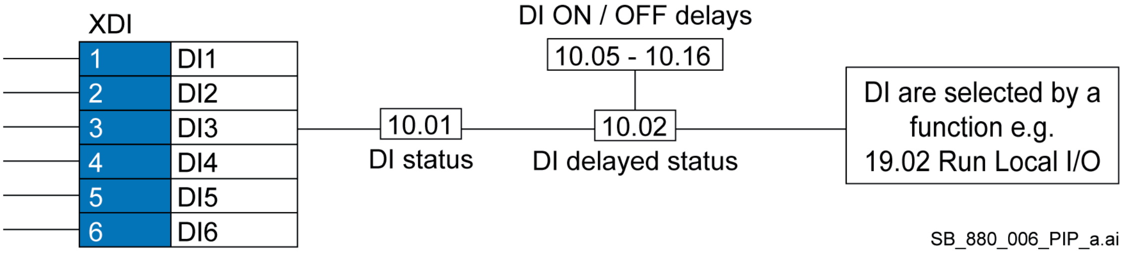
② Not valid in case of common control (99.25 Leg 2 Control Mode = 99.40 Leg 3 Control Mode = Follow Leg 1).

The value of the analog inputs can be seen in:

AI1	12.11 AI1 actual value	12.12 AI1 scaled value
AI2	12.21 AI2 actual value	12.22 AI2 scaled value
AI3	12.31 AI3 actual value	12.32 AI3 scaled value

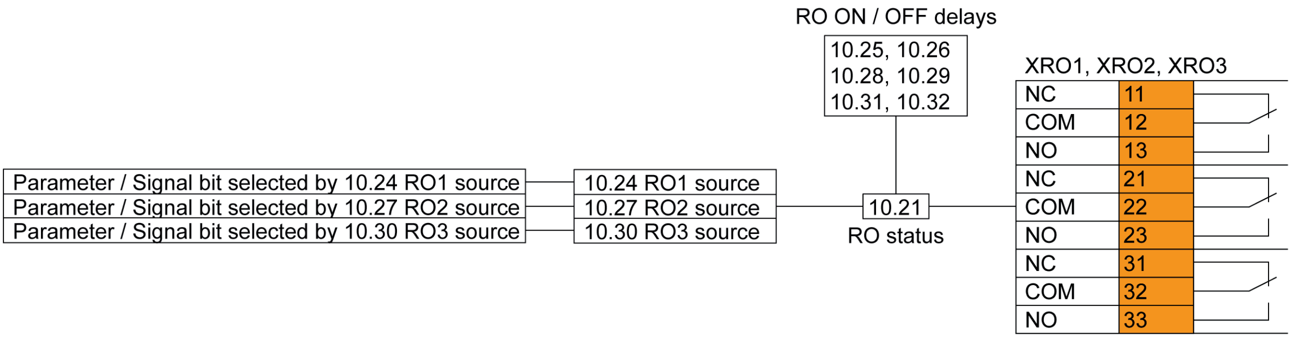
For different settings use parameters in Groups 22, 24 and 26.

Connect digital inputs (XDI)



SB_880_006_PIP_a.ai

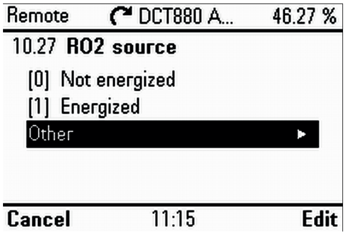
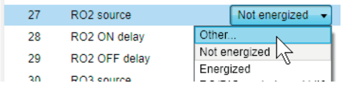
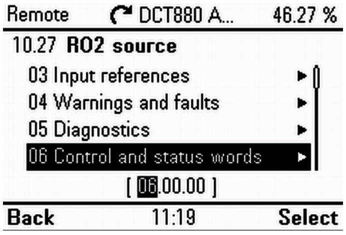
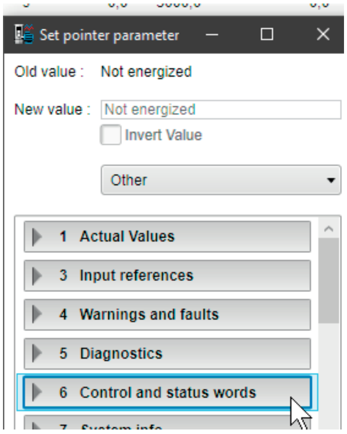
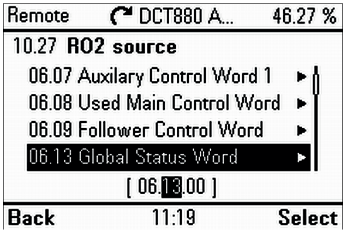
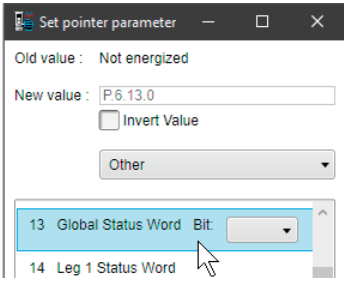
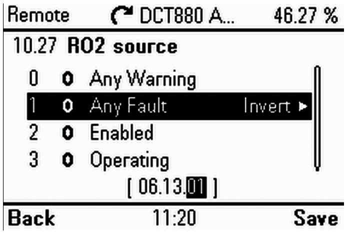
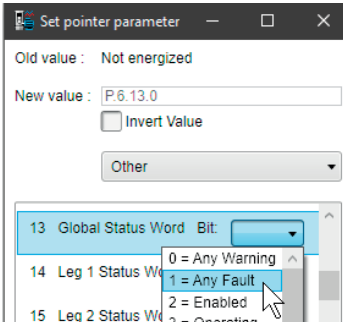
Connect relay outputs (XRO1 … XRO3)

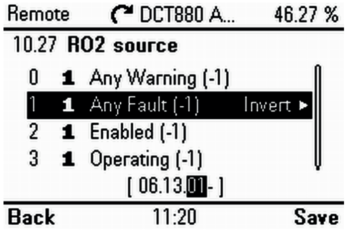
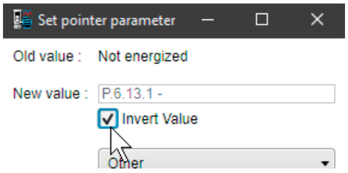
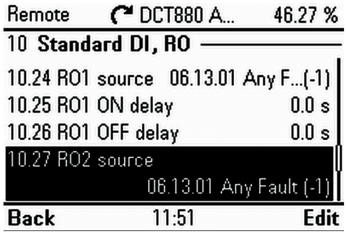


SB_880_006_PIP_a.ai

Other [bit]; bit source selection from the parameter/signal list
The value is taken from a specific bit of another parameter/signal. Choosing “Other” displays a parameter/signal list in which the user can choose the source parameter/signal and bit.
Example: Connect unit ‘no fault’ to RO2 with:

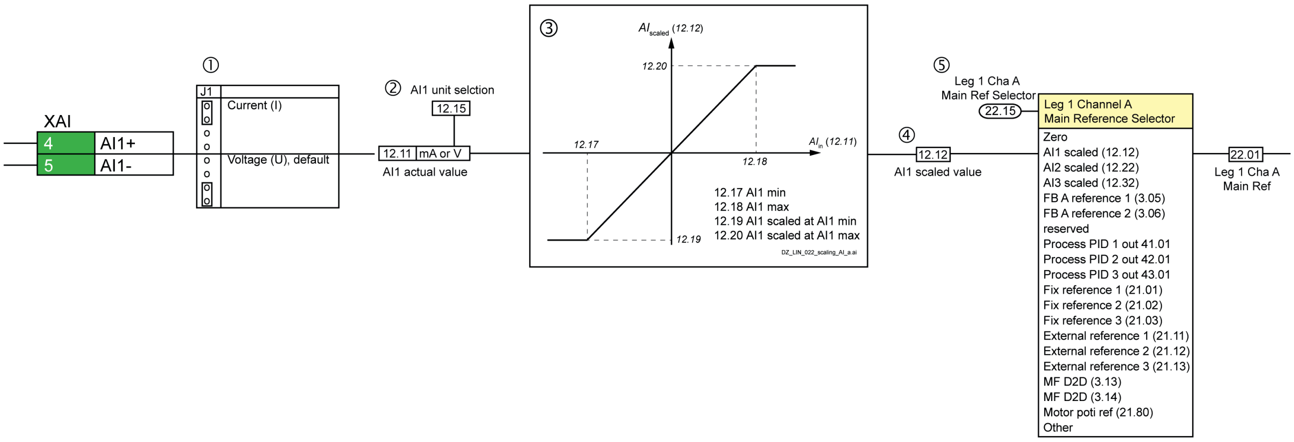
- No fault = 06.13.b01 Global Status Word bit 1 Any Fault- and
- RO2 = 10.27 RO2 source.

	Control panel	**Drive composer**
1. The source for RO2 is connected via 10.27 RO2 source. 2. In 10.27 RO2 source choose Other:	 Remote DCT880 A... 46.27 % 10.27 **RO2 source** [0] Not energized [1] Energized Other ▸ **Cancel** 11:15 **Edit**	 27 RO2 source Not energized 28 RO2 ON delay Other... 29 RO2 OFF delay Not energized Energized
3. Choose group 6 Control and status words:	 Remote DCT880 A... 46.27 % 10.27 **RO2 source** 03 Input references ▸ 04 Warnings and faults ▸ 05 Diagnostics ▸ 06 Control and status words ▸ [06.00.00] **Back** 11:19 **Select**	 Set pointer parameter Old value : Not energized New value : Not energized ☐ Invert Value Other 1 Actual Values 3 Input references 4 Warnings and faults 5 Diagnostics 6 Control and status words
4. Choose 06.13 Global Status Word:	 Remote DCT880 A... 46.27 % 10.27 **RO2 source** 06.07 Auxilary Control Word 1 ▸ 06.08 Used Main Control Word ▸ 06.09 Follower Control Word ▸ 06.13 Global Status Word ▸ [06.13.00] **Back** 11:19 **Select**	 Set pointer parameter Old value : Not energized New value : P.6.13.0 ☐ Invert Value Other 13 Global Status Word Bit: 14 Leg 1 Status Word
5. Choose 06.13 Global Status Word bit 1 Any Fault:	 Remote DCT880 A... 46.27 % 10.27 **RO2 source** 0 0 Any Warning 1 0 Any Fault Invert ▸ 2 0 Enabled 3 0 Operating [06.13.01] **Back** 11:20 **Save**	 Set pointer parameter Old value : Not energized New value : P.6.13.0 ☐ Invert Value Other 13 Global Status Word Bit: 14 Leg 1 Status Wo 15 Leg 2 Status Wo 0 = Any Warning 1 = Any Fault 2 = Enabled

6. Choose invert to get 'no fault':	 Remote DCT880 A... 46.27 % 10.27 RO2 source 0 1 Any Warning (-1) 1 1 Any Fault (-1) Invert ▸ 2 1 Enabled (-1) 3 1 Operating (-1) [06.13.01-] Back 11:20 Save	 Set pointer parameter Old value : Not energized New value : P.6.13.1 - ☑ Invert Value Other
7. Result, see 10.27 RO2 source = 06.13.01 Any Fault (-1) or P.6.13.0-:	 Remote DCT880 A... 46.27 % 10 Standard DI, RO 10.24 RO1 source 06.13.01 Any F...(-1) 10.25 RO1 ON delay 0.0 s 10.26 RO1 OFF delay 0.0 s 10.27 RO2 source 06.13.01 Any Fault (-1) Back 11:51 Edit	 24 RO1 source P.6.13.1 - NoUn

Connecting analog inputs (XAI)

AI1 connected to the reference chain of leg 1:

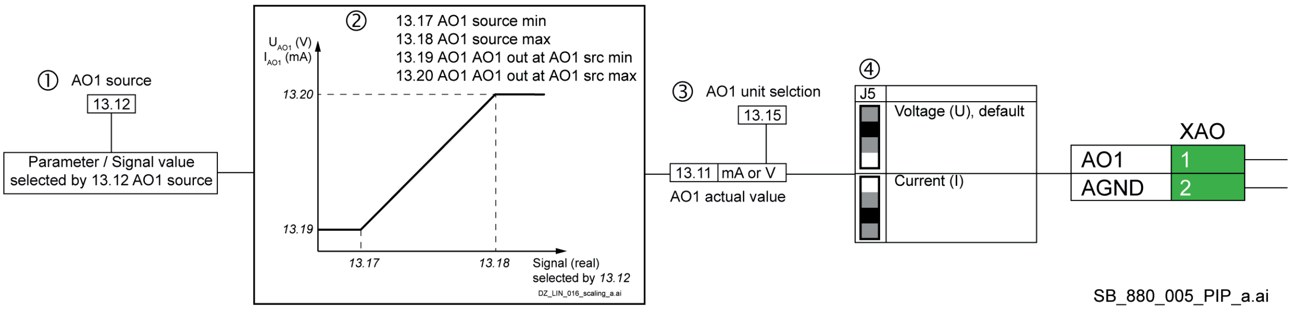


SB_880_004_PIP_a.ai

① Set jumper J1 to voltage or current depending on the desired input configuration.
② Set 12.15 AI1 unit selection to match the input configuration. 12.11 AI1 actual value displays the value of AI1 in mA or V.
③ Scale the analog input from voltage or current to the desired internal value.
④ 12.12 AI1 scaled value displays the value of AI1 after scaling.
⑤ 22.15 Leg 1 Cha A Main Ref Selector selects the source for the reference.

Connecting analog outputs (XAO)

AO1 connected to a parameter / signal value:

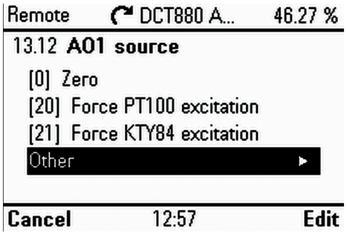
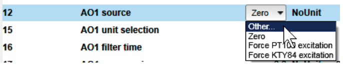
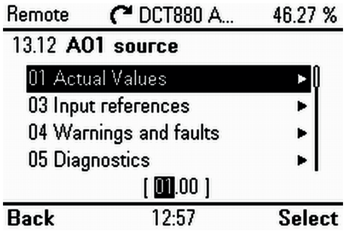
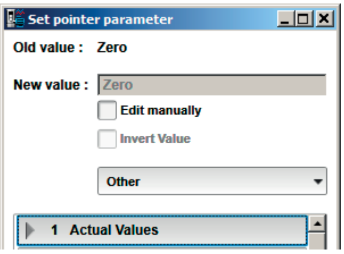
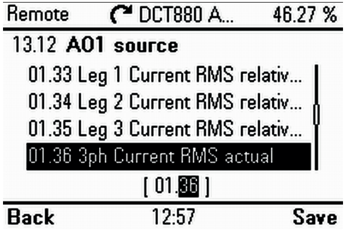
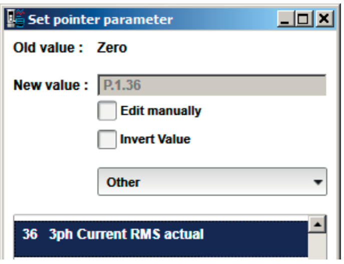
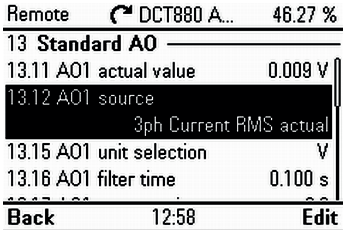
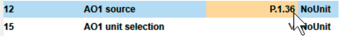


SB_880_005_PIP_a.ai

① 13.12 AO1 source selects the desired parameter / signal value (preferred: relative values in %).
② Scale the analog output from the internal value to voltage or current.
③ Set 13.15 AO1 unit selection to match the output configuration. 13.11 AO1 actual value displays the value of AO1 in mA or V.
④ Set jumper J5 to voltage or current depending on the desired output configuration.

Other; word source selection from the parameter/signal list
The value is taken from another parameter/signal. Choosing “Other” displays a parameter/signal list in which the user can choose the source parameter/signal.
Example: Connect unit 3-phase actual current to AO1 with:

- 3-phase actual current = 01.36 3ph Current RMS actual and
- AO1 = 13.12 AO1 source.

	Control panel	**Drive composer**
1. The source for AO1 is connected via 13.12 AO1 source. 2. In 13.12 AO1 source choose Other:	 Remote DCT880 A... 46.27 % 13.12 **AO1 source** [0] Zero [20] Force PT100 excitation [21] Force KTY84 excitation Other ▸ **Cancel** 12:57 **Edit**	 12 AO1 source Zero NoUnit 15 AO1 unit selection 16 AO1 filter time Other... Zero Force PT100 excitation Force KTY84 excitation
3. Choose group 1 Actual values:	 Remote DCT880 A... 46.27 % 13.12 **AO1 source** 01 Actual Values ▸ 03 Input references ▸ 04 Warnings and faults ▸ 05 Diagnostics ▸ [01.00] **Back** 12:57 **Select**	 Set pointer parameter Old value : Zero New value : Zero ☐ Edit manually ☐ Invert Value Other 1 Actual Values
4. Choose 01.36 3ph Current RMS actual:	 Remote DCT880 A... 46.27 % 13.12 **AO1 source** 01.33 Leg 1 Current RMS relativ... 01.34 Leg 2 Current RMS relativ... 01.35 Leg 3 Current RMS relativ... 01.36 3ph Current RMS actual [01.36] **Back** 12:57 **Save**	 Set pointer parameter Old value : Zero New value : P.1.36 ☐ Edit manually ☐ Invert Value Other 36 3ph Current RMS actual
5. Result, see 13.12 AO1 source = 01.36 3ph Current RMS actual or P.1.36:	 Remote DCT880 A... 46.27 % **13 Standard AO** 13.11 AO1 actual value 0.009 V 13.12 AO1 source 3ph Current RMS actual 13.15 AO1 unit selection V 13.16 AO1 filter time 0.100 s **Back** 12:58 **Edit**	 12 AO1 source P.1.36 NoUnit 15 AO1 unit selection V NoUnit

Step 18: Run the operation check

Perform the operation check.

1. Make sure no faults or warnings are present. See 06.13 Global Status Word.
2. Remember settings of:
   99.10 Leg 1 Control Mode.
   99.25 Leg 2 Control Mode.
   99.40 Leg 3 Control Mode.
3. For common controlled loads (leg 2 and leg 3 follow leg 1) set:
   99.10 Leg 1 Control Mode = U α open loop control (= 5); phase angle control.
   99.25 Leg 2 Control Mode = Follow Leg 1 (= 13); use the same control mode as leg 1.
   99.40 Leg 3 Control Mode = Follow Leg 1 (= 13); use the same control mode as leg 1.
   For individual controlled loads (leg 1, leg 2 and leg 3 are independent) set:
   99.10 Leg 1 Control Mode = U α open loop control (= 5); phase angle control.
   99.25 Leg 2 Control Mode = U α open loop control (= 5); phase angle control.
   99.40 Leg 3 Control Mode = U α open loop control (= 5); phase angle control.
4. Make sure, all references are set to zero:
   23.01 Leg 1 Main Ref (22.11).
   25.01 Leg 2 Main Ref (24.11), only for individual controlled loads.
   27.01 Leg 3 Main Ref (26.11), only for individual controlled loads.
5. Give the Enable command and then Run command. See 06.08 Used Main Control Word.
   Note: For individual controlled loads do this for each leg separately.
6. Increase the reference.
   Note: For individual controlled loads do this for each leg separately.
7. Check the load currents:
   01.30 Leg 1 Current RMS actual.
   01.31 Leg 2 Current RMS actual.
   01.32 Leg 3 Current RMS actual.
   Notes:
   For common controlled loads make sure the three currents are symmetrical.
   For individual controlled loads do this for each leg separately.
8. Set all references back to zero.
9. To switch off remove the Run command and then Enable command. See 06.08 Used Main Control Word.
   Note: For individual controlled loads do this for all legs.
10. Set 99.10 Leg 1 Control Mode, 99.25 Leg 2 Control Mode and 99.40 Leg 3 Control Mode back to the original values.
11. Test the unit using the desired modes in 99.10 Leg 1 Control Mode, 99.25 Leg 2 Control Mode and 99.40 Leg 3 Control Mode.

Communication

What this chapter contains

This chapter describes the communication capabilities of the unit.

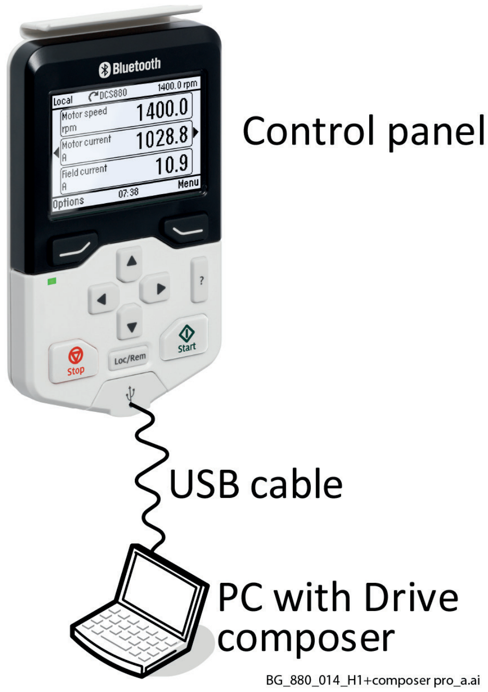
Commissioning and maintenance tools

Connect a DCT880 and a PC running Drive composer

Via control panel

To establish a connection between Drive composer and unit, connect a USB type A (PC) type mini B (control panel) cable to the USB port of the PC and the USB port of the control panel. The maximum length of the USB cable should be 3 m.

Drive composer Start-up and maintenance PC tool User's manual (3AUA0000094606).



Via an Ethernet network (FENA-x1)

The Ethernet connection is made using FENA-x1 Ethernet adapter modules. For the installation of the adapter module, see *FENA-11/-21 Ethernet adapter module user's manual (3AUA0000093568)*. Additional information (e.g. parameter settings) can be found in the *Drive composer Start-up and maintenance PC tool User's manual (3AUA0000094606)*.

Attention: Please consider the following, when connecting Drive composer pro via an Ethernet network.

- The communication supervision is not made in group 50 Fieldbus adapter (FBA), but in group 49 Panel port communication.
- To have communication supervision at all, 49.05 Communication loss action must **not** be set to No action.
- The timeout is set with 49.04 Communication loss time. Time outs of 2000 ms (default is 1000 ms) are sufficient.
- Any changed parameters must be validated by means of 49.06 Refresh settings = Refresh.

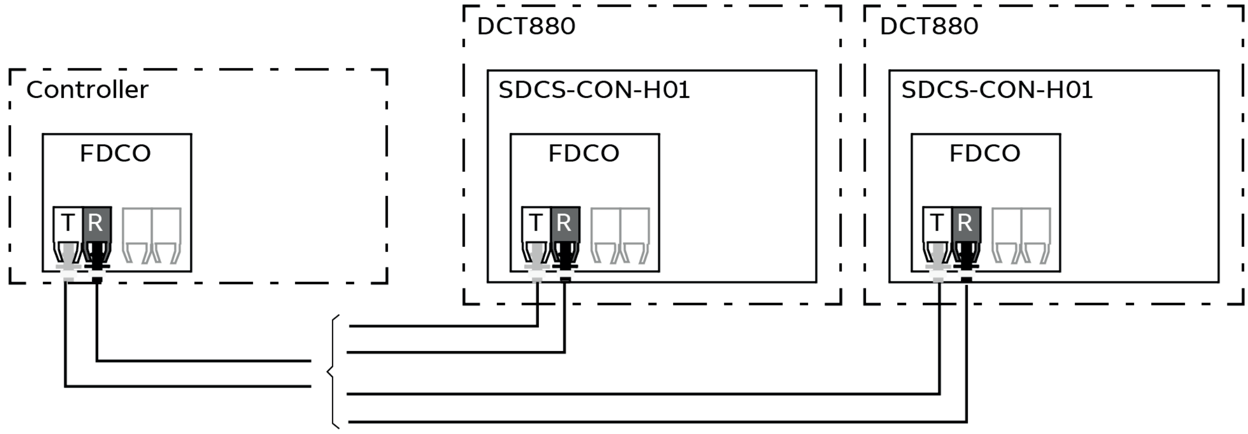
DDCS controller interface

General

The unit can be connected to a DDCS controller, such as the ABB AC 800M, using fiber optics. The DCS880 is compatible with both the ModuleBus and DriveBus connections.
Note: Some features of the DriveBus, such as BusManager, are not supported.

Topology

An example connection using fiber optic cables is shown below.
The units require an additional FDCO-0x DDCS communication module. Ring and star configurations are possible.



T = Transmitter; R = Receiver

SA_880_015_master-follower_b.ai

The selection of the connection is made by 60.51 DDCS controller comm port.
The transfer rate can be selected by 60.56 DDCS controller baud rate.

Communication

The communication between the controller and the unit consists of data sets of three 16-bit words each. The controller sends a data set to the unit, which returns the next data set to the controller.
The communication uses data sets 1 … 4, 10 … 25 and data sets 32, 33. The contents of the data sets are freely configurable, but data set 10 typically contains the control word and one or two references, while data set 11 returns the status word and selected actual values.
For ModuleBus communication, the DCT880 can be set up as an ABB standard drive or as an ABB engineered drive by 60.50 DDCS controller drive type. ModuleBus communication uses data sets 1 … 4 with an ABB standard drive and data sets 10 … 25 and data sets 32, 33 with an ABB engineered drive.
The word from the controller that is defined as the control word, e.g. 62.51 Data set 10 data 1 selection = CW 16bit, is send to 06.10 DDCS control word. The coding of the bits is shown in 06.01 Main control word.
The word from the unit that is defined as the status word, e.g. 61.51 Data set 11 data 1 selection = SW 16bit, is send to the controller. The coding of the bits is shown in 06.13 Global Status Word.

Parameters

What this chapter contains

The chapter describes the parameters and signals of the firmware.

Terms and abbreviations

Term	**Definition**
Signal	Type of parameter that is the result of a measurement or calculation by the unit, or contains status information. Most signals are read-only, but some (especially counter-type signals) can be reset.
Default (def.)	The default value of a parameter.
Scale / Fbeq16	16 bit fieldbus equivalent: The scaling between the value shown on the panel and the integer used in communication when a 16 bit value is selected for transmission to an external system. A dash (-) indicates that the parameter is not accessible in 16 bit format.
Other	The value is taken from another parameter. Choosing “Other” displays a parameter list in which the user can specify the source parameter.
Other [bit]	The value is taken from a specific bit in another parameter. Choosing “Other” displays a parameter list in which the user can specify the source parameter and bit.
Parameter	A user-adjustable operating instruction for the unit.
p.u.	Per unit

Summary of parameter groups

Group	**Contents**
1 Actual values	Basic signals for monitoring the unit.
3 Input references	Values of references received from various sources.
4 Warnings and faults	Information on warnings and faults that occurred last. For explanations of individual warning and fault codes, see chapter Fault tracing.
5 Diagnostics	Various run-time-type counters and measurements related to the unit’s maintenance.
6 Control and status word	The unit’s control, status and event words.
7 System info	The unit’s hardware and firmware information.
10 Standard DI, RO	Configuration of digital inputs and relay outputs.
11 Standard DIO, FI, FO	Configuration of digital input / outputs and frequency inputs / outputs.
12 Standard AI	Configuration of standard analog inputs.
13 Standard AO	Configuration of standard analog outputs.
14 I/O extension module 1	Configuration of I/O extension module 1.
15 I/O extension module 2	Configuration of I/O extension module 2.
16 I/O extension module 3	Configuration of I/O extension module 3.
19 Start/Stop Mode	Selection of local and external control locations and operating modes.
21 General References	Includes fix-, external references and motor potentiometer settings.
22 Leg 1 Reference Chain	Leg 1 reference source selection.

23 Leg 1 Control Detailed	Leg 1 control chain includes ramps, current / voltage / power control, control mode selector and limiters.
24 Leg 2 Reference Chain	Leg 2 reference source selection.
25 Leg 2 Control Detailed	Leg 2 control chain includes ramps, current / voltage / power control, control mode selector and limiters.
26 Leg 3 Reference Chain	Leg 3 reference source selection.
27 Leg 3 Control Detailed	Leg 3 control chain includes ramps, current / voltage / power control, control mode selector and limiters.
28 Unit Faults	Configuration of external events, selection of behavior of the thyristor power controller upon fault situations.
29 Multitap	Configuration when using a transformer with multitaps.
30 Leg 1 Limits	Thyristor power controller operation limits.
31 Leg 2 Limits	Thyristor power controller operation limits.
32 Leg 3 Limits	Thyristor power controller operation limits.
33 Maintenance timer & counter	Configuration of maintenance timers / counters.
35 Thermal Measurement	Temperature measurement configuration.
36 Leg 1 Load monitoring	Load resistance measurement, load loss function and overload function.
37 Leg 2 Load monitoring	Load resistance measurement, load loss function and overload function.
38 Leg 3 Load monitoring	Load resistance measurement, load loss function and overload function.
41 Process PID 1	Parameter values for process PID 1.
42 Process PID 2	Parameter values for process PID 2.
43 Process PID 3	Parameter values for process PID 3.
47 Data storage	Data storage parameters that can be written to and read from using other parameters.
49 Panel port communication	Communication settings for the control panel port of the unit.
50 Fieldbus adapter (FBA)	Fieldbus communication configuration.
51 FBA A settings	Fieldbus adapter A configuration.
52 FBA A data in	Selection of data sent by fieldbus adapter A to the master (e.g. PLC).
53 FBA A data out	Selection of data sent by the master (e.g. PLC) to fieldbus adapter A.
54 FBA B settings	Fieldbus adapter B configuration.
55 FBA B data in	Selection of data sent by fieldbus adapter B to the master (e.g. PLC).
56 FBA B data out	Selection of data sent by the master (e.g. PLC) to fieldbus adapter B.
58 Embedded fieldbus	Embedded fieldbus configuration.
60 DDCS communication	DDCS (fiber optic) communication configuration.
61 D2D and DDCS transmit data	Defines the data sent from the unit to the DDCS / D2D link.
62 D2D and DDCS receive data	Defines the data sent from the DDCS / D2D link to the unit.
95 HW configuration	Various hardware-related settings.
96 System	Language selection; access levels; macro selection; parameter save and restore; unit reboot; user parameter sets; unit selection.
99 Basic Settings	Unit configuration settings.

Parameter listing

1 Actual Values

Basic signals for monitoring the unit.

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
01.01	**Voltage U1 - N actual**						
	Actual phase voltage U1 - N.						
	0.0 … 3250.0	-	V	10 = 1 V	y	n	Signal
01.02	**Voltage V1 - N actual**						
	Actual phase voltage V1 - N.						
	0.0 … 3250.0	-	V	10 = 1 V	y	n	Signal
01.03	**Voltage W1 - N actual**						
	Actual phase voltage W1 - N.						
	0.0 … 3250.0	-	V	10 = 1 V	y	n	Signal
01.04	**Voltage U1 - N relative actual**						
	Relative actual phase voltage U1 - N. In percent of 99.01 Supply Voltage.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.05	**Voltage V1 - N relative actual**						
	Relative actual phase voltage V1 - N. In percent of 99.01 Supply Voltage.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.06	**Voltage W1 - N relative actual**						
	Relative actual phase voltage W1 - N. In percent of 99.01 Supply Voltage.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.07	**Voltage U1 - V1 actual**						
	Actual phase-to-phase voltage U1 - V1.						
	0.0 … 3250.0	-	V	10 = 1 V	y	n	Signal
01.08	**Voltage V1 - W1 actual**						
	Actual phase-to-phase voltage V1 - W1.						
	0.0 … 3250.0	-	V	10 = 1 V	y	n	Signal
01.09	**Voltage W1 - U1 actual**						
	Actual phase-to-phase voltage W1 - U1.						
	0.0 … 3250.0	-	V	10 = 1 V	y	n	Signal
01.10	**Voltage U1 - V1 relative actual**						
	Relative actual phase-to-phase voltage U1 - V1. In percent of 99.01 Supply Voltage.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.11	**Voltage V1 - W1 relative actual**						
	Relative actual phase-to-phase voltage V1 - W1. In percent of 99.01 Supply Voltage.						

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.12	**Voltage W1 - U1 relative actual**						
	Relative actual phase-to-phase voltage W1 - U1. In percent of 99.01 Supply Voltage.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.13	**Voltage U2 - N actual**						
	Actual phase voltage U2 - N. Measured or calculated depending on 99.60 Voltage Measurement Configuration.						
	0.0 … 3250.0	-	V	10 = 1 V	y	n	Signal
01.14	**Voltage V2 - N actual**						
	Actual phase voltage V2 - N. Measured or calculated depending on 99.60 Voltage Measurement Configuration.						
	0.0 … 3250.0	-	V	10 = 1 V	y	n	Signal
01.15	**Voltage W2 - N actual**						
	Actual phase voltage W2 - N. Measured or calculated depending on 99.60 Voltage Measurement Configuration.						
	0.0 … 3250.0	-	V	10 = 1 V	y	n	Signal
01.16	**Voltage U2 - N relative actual**						
	Relative actual phase voltage U2 - N. In percent of 99.03 Load Voltage. Measured or calculated depending on 99.60 Voltage Measurement Configuration.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.17	**Voltage V2 - N relative actual**						
	Relative actual phase voltage V2 - N. In percent of 99.03 Load Voltage. Measured or calculated depending on 99.60 Voltage Measurement Configuration.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.18	**Voltage W2 - N relative actual**						
	Relative actual phase voltage W2 - N. In percent of 99.03 Load Voltage. Measured or calculated depending on 99.60 Voltage Measurement Configuration.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.20	**Voltage U2 - V2 actual**						
	Actual phase-to-phase voltage U2 - V2. Measured or calculated depending on 99.60 Voltage Measurement Configuration.						
	0.0 … 3250.0	-	V	10 = 1 V	y	n	Signal
01.21	**Voltage V2 - W2 actual**						
	Actual phase-to-phase voltage U2 - W2. Measured or calculated depending on 99.60 Voltage Measurement Configuration.						
	0.0 … 3250.0	-	V	10 = 1 V	y	n	Signal
01.22	**Voltage W2 - U2 actual**						
	Actual phase-to-phase voltage V2 - W2. Measured or calculated depending on 99.60 Voltage Measurement Configuration.						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	0.0 … 3250.0	-	V	10 = 1 V	y	n	Signal
01.23	**Voltage U2 - V2 relative actual**						
	Relative actual phase-to-phase voltage U2 - V2. In percent of 99.03 Load Voltage. Measured or calculated depending on 99.60 Voltage Measurement Configuration.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.24	**Voltage V2 - W2 relative actual**						
	Relative actual phase-to-phase voltage U2 - W2. In percent of 99.03 Load Voltage. Measured or calculated depending on 99.60 Voltage Measurement Configuration.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.25	**Voltage W2 - U2 relative actual**						
	Relative actual phase-to-phase voltage V2 - W2. In percent of 99.03 Load Voltage. Measured or calculated depending on 99.60 Voltage Measurement Configuration.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.26	**Mains Voltage Leg 1 relative**						
	Relative mains voltage leg 1/U1. In percent of 99.01 Supply Voltage.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.27	**Mains Voltage Leg 2 relative**						
	Relative mains voltage leg 2/V1. In percent of 99.01 Supply Voltage.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.28	**Mains Voltage Leg 3 relative**						
	Relative mains voltage leg 3/W1. In percent of 99.01 Supply Voltage.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.30	**Leg 1 Current RMS actual**						
	Actual RMS current leg 1/U2.						
	0.0 … 30000.0	-	A	1 = 1 A	y	n	Signal
01.31	**Leg 2 Current RMS actual**						
	Actual RMS current leg 2/V2.						
	0.0 … 30000.0	-	A	1 = 1 A	y	n	Signal
01.32	**Leg 3 Current RMS actual**						
	Actual RMS current leg 3/W2.						
	0.0 … 30000.0	-	A	1 = 1 A	y	n	Signal
01.33	**Leg 1 Current RMS relative actual**						
	Actual RMS current leg 1/U2 relative. In percent of 99.02 Load Current.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.34	**Leg 2 Current RMS relative actual**						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	Actual RMS current leg 2/V2 relative. In percent of 99.02 Load Current.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.35	**Leg 3 Current RMS relative actual**						
	Actual RMS current leg 3/W2 relative. In percent of 99.02 Load Current.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.36	**3ph Current RMS actual**						
	Average actual three phase RMS current. Sum of 01.30 Leg 1 Current RMS actual, 01.31 Leg 2 Current RMS actual and 01.32 Leg 3 Current RMS actual divided by three: $\frac{01.30 + 01.31 + 01.32}{3}$						
	0.0 … 30000.0	-	A	1 = 1 A	y	n	Signal
01.37	**3ph Current RMS relative actual**						
	Average actual three phase RMS current relative. Sum of 01.33 Leg 1 Current RMS relative actual, 01.34 Leg 2 Current RMS relative actual and 01.35 Leg 3 Current RMS relative actual divided by three: $\frac{01.33 + 01.34 + 01.35}{3}$						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.40	**Leg 1 Alpha actual**						
	Actual firing angle leg 1/U1.						
	0.0 … 180.0	-	°	10 = 1°	y	n	Signal
01.42	**Leg 2 Alpha actual**						
	Actual firing angle leg 2/V1.						
	0.0 … 180.0	-	°	10 = 1°	y	n	Signal
01.44	**Leg 3 Alpha actual**						
	Actual firing angle leg 3/W1.						
	0.0 … 180.0	-	°	10 = 1°	y	n	Signal
01.50	**Leg 1 Power actual**						
	Actual power leg 1/U2. Measured or calculated depending on 99.60 Voltage Measurement Configuration.						
	0.0 … 5000.0	-	kW	1 = 1 kW	y	n	Signal
01.51	**Leg 2 Power actual**						
	Actual power leg 2/V2. Measured or calculated depending on 99.60 Voltage Measurement Configuration.						
	0.0 … 5000.0	-	kW	1 = 1 kW	y	n	Signal
01.52	**Leg 3 Power actual**						
	Actual power leg 3/W2.						

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	Measured or calculated depending on 99.60 Voltage Measurement Configuration.						
	0.0 … 5000.0	-	kW	1 = 1 kW	y	n	Signal
01.53	**Leg 1 Power relative actual**						
	Actual power leg 1/U2 relative. In percent of 99.09 Load Power. Measured or calculated depending on 99.60 Voltage Measurement Configuration.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.54	**Leg 2 Power relative actual**						
	Actual power leg 2/V2 relative. In percent of 99.09 Load Power. Measured or calculated depending on 99.60 Voltage Measurement Configuration.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.55	**Leg 3 Power relative actual**						
	Actual power leg 3/W2 relative. In percent of 99.09 Load Power. Measured or calculated depending on 99.60 Voltage Measurement Configuration.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.56	**3ph Power actual**						
	Actual three phase power. Measured or calculated depending on 99.60 Voltage Measurement Configuration. Sum of 01.50 Leg 1 Power actual, 01.51 Leg 2 Power actual and 01.52 Leg 3 Power actual: 01.50 + 01.51 + 01.52						
	0.0 … 5000.0	-	kW	1 = 1 kW	y	n	Signal
01.57	**3ph Power relative actual**						
	Actual relative three phase power. Complete power of all connected loads in percent of 99.09 Load Power. Measured or calculated depending on 99.60 Voltage Measurement Configuration.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.60	**Leg 1 Voltage RMS relative actual**						
	Leg 1/U2 actual relative RMS voltage. In percent of 99.03 Load Voltage. Measured or calculated depending on 99.60 Voltage Measurement Configuration.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.61	**Leg 2 Voltage RMS relative actual**						
	Leg 2/V2 actual relative RMS voltage. In percent of 99.03 Load Voltage. Measured or calculated depending on 99.60 Voltage Measurement Configuration.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.62	**Leg 3 Voltage RMS relative actual**						
	Leg 3/W2 actual relative RMS voltage. In percent of 99.03 Load Voltage. Measured or calculated depending on 99.60 Voltage Measurement Configuration.						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.65	**Peak Current Thyristor 11 relative**						
	Relative peak current of thyristor 11. In percent of 99.02 Load Current. For sinusoidal waveform is valid: All displayed values are multiplied by a factor of $\sqrt{2}$, thus e.g. 100 % load current is shown as 140 % in 01.65 Peak Current Thyristor 11 relative.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.66	**Peak Current Thyristor 12 relative**						
	Relative peak current of thyristor 12. In percent of 99.02 Load Current. For sinusoidal waveform is valid: All displayed values are multiplied by a factor of $\sqrt{2}$, thus e.g. 100 % load current is shown as 140 % in 01.66 Peak Current Thyristor 12 relative.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.67	**Peak Current Thyristor 13 relative**						
	Relative peak current of thyristor 13. In percent of 99.02 Load Current. For sinusoidal waveform is valid: All displayed values are multiplied by a factor of $\sqrt{2}$, thus e.g. 100 % load current is shown as 140 % in 01.67 Peak Current Thyristor 13 relative.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.68	**Peak Current Thyristor 14 relative**						
	Relative peak current of thyristor 14. In percent of 99.02 Load Current. For sinusoidal waveform is valid: All displayed values are multiplied by a factor of $\sqrt{2}$, thus e.g. 100 % load current is shown as 140 % in 01.68 Peak Current Thyristor 14 relative.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.69	**Peak Current Thyristor 15 relative**						
	Relative peak current of thyristor 15. In percent of 99.02 Load Current. For sinusoidal waveform is valid: All displayed values are multiplied by a factor of $\sqrt{2}$, thus e.g. 100 % load current is shown as 140 % in 01.69 Peak Current Thyristor 15 relative.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.70	**Peak Current Thyristor 16 relative**						
	Relative peak current of thyristor 16. In percent of 99.02 Load Current. For sinusoidal waveform is valid: All displayed values are multiplied by a factor of $\sqrt{2}$, thus e.g. 100 % load current is shown as 140 % in 01.70 Peak Current Thyristor 16 relative.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.71	**AVR Current Thyristor 11 relative**						
	Average current of thyristor 11.						

<table>
<tr><th>Index</th><th colspan="7">Name</th></tr>
<tr><th rowspan="2"></th><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">In percent of 99.02 Load Current.
For sinusoidal waveform is valid:
All displayed values are multiplied by a factor of $\frac{2}{\pi}$, thus e.g. 100 % load current is shown as 64 % in 01.71 AVR Current Thyristor 11 relative.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-</td><td>%</td><td>100 = 1 %</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>01.72</td><td colspan="7">AVR Current Thyristor 12 relative</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Average current of thyristor 12.
In percent of 99.02 Load Current.
For sinusoidal waveform is valid:
All displayed values are multiplied by a factor of $\frac{2}{\pi}$, thus e.g. 100 % load current is shown as 64 % in 01.72 AVR Current Thyristor 12 relative.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-</td><td>%</td><td>100 = 1 %</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>01.73</td><td colspan="7">AVR Current Thyristor 13 relative</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Average current of thyristor 13.
In percent of 99.02 Load Current.
For sinusoidal waveform is valid:
All displayed values are multiplied by a factor of $\frac{2}{\pi}$, thus e.g. 100 % load current is shown as 64 % in 01.73 AVR Current Thyristor 13 relative.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-</td><td>%</td><td>100 = 1 %</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>01.74</td><td colspan="7">AVR Current Thyristor 14 relative</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Average current of thyristor 14.
In percent of 99.02 Load Current.
For sinusoidal waveform is valid:
All displayed values are multiplied by a factor of $\frac{2}{\pi}$, thus e.g. 100 % load current is shown as 64 % in 01.74 AVR Current Thyristor 14 relative.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-</td><td>%</td><td>100 = 1%</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>01.75</td><td colspan="7">AVR Current Thyristor 15 relative</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Average current of thyristor 15.
In percent of 99.02 Load Current.
For sinusoidal waveform is valid:
All displayed values are multiplied by a factor of $\frac{2}{\pi}$, thus e.g. 100 % load current is shown as 64 % in 01.75 AVR Current Thyristor 15 relative.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-</td><td>%</td><td>100 = 1%</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>01.76</td><td colspan="7">AVR Current Thyristor 16 relative</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Average current of thyristor 16.
In percent of 99.02 Load Current.
For sinusoidal waveform is valid:
All displayed values are multiplied by a factor of $\frac{2}{\pi}$, thus e.g. 100 % load current is shown as 64 % in 01.76 AVR Current Thyristor 16 relative.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-</td><td>%</td><td>100 = 1 %</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>01.77</td><td colspan="7">Leg 1 Current real time relative</td></tr>
<tr><td></td><td colspan="7">Real time relative current leg 1/U2 sampled in 250 µs.
In percent of 99.02 Load Current.</td></tr>
</table>

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.78	**Leg 2 Current real time relative**						
	Real time relative current leg 2/V2 sampled in 250 µs. In percent of 99.02 Load Current.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.79	**Leg 3 Current real time relative**						
	Real time relative current leg 3/W2 sampled in 250 µs. In percent of 99.02 Load Current.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.80	**Leg 1 Reactive power relative**						
	Relative reactive power leg 1/U2. In percent of 99.09 Load Power. Measured or calculated depending on 99.60 Voltage Measurement Configuration.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.81	**Leg 2 Reactive power relative**						
	Relative reactive power leg 2/V2. In percent of 99.09 Load Power. Measured or calculated depending on 99.60 Voltage Measurement Configuration.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.82	**Leg 3 Reactive power relative**						
	Relative reactive power leg 3/W2. In percent of 99.09 Load Power. Measured or calculated depending on 99.60 Voltage Measurement Configuration.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.83	**3ph Reactive power relative**						
	Relative reactive power 3ph. Complete reactive power of all connected loads in percent of 99.09 Load Power. Measured or calculated depending on 99.60 Voltage Measurement Configuration.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.85	**Leg 1 Power Full Wave Fix Cycle actual**						
	Full wave fix cycle, actual average power leg 1/U2. Measured or calculated depending on 99.60 Voltage Measurement Configuration.						
	0.0 … 5000.0	-	kW	1 = 1 kW	y	n	Signal
01.86	**Leg 2 Power Full Wave Fix Cycle actual**						
	Full wave fix cycle, actual average power leg 2/V2. Measured or calculated depending on 99.60 Voltage Measurement Configuration.						
	0.0 … 5000.0	-	kW	1 = 1 kW	y	n	Signal
01.87	**Leg 3 Power Full Wave Fix Cycle actual**						
	Full wave fix cycle, actual average power leg 3/W2. Measured or calculated depending on 99.60 Voltage Measurement Configuration.						
	0.0 … 5000.0	-	kW	1 = 1 kW	y	n	Signal
01.88	**3ph Power Full Wave Fix Cycle actual**						
	Full wave fix cycle, actual average three phase power.						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale/ FbEq16**	**Volatile**	**Change running**	**Type**
	Measured or calculated depending on 99.60 Voltage Measurement Configuration. Sum of 01.85 Leg 1 Power Full Wave Fix Cycle actual, 01.86 Leg 2 Power Full Wave Fix Cycle actual and 01.87 Leg 3 Power Full Wave Fix Cycle actual: 01.85 + 01.85 + 01.86						
	0.0 … 5000.0	-	kW	1 = 1 kW	y	n	Signal
01.89	**Leg 1 Power Full Wave Fix Cycle actual relative**						
	Full wave fix cycle, actual average relative power leg 1/U2. In percent of 99.09 Load Power. Measured or calculated depending on 99.60 Voltage Measurement Configuration.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.90	**Leg 2 Power Full Wave Fix Cycle actual relative**						
	Full wave fix cycle, actual average relative power leg 2/V2. In percent of 99.09 Load Power. Measured or calculated depending on 99.60 Voltage Measurement Configuration.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.91	**Leg 3 Power Full Wave Fix Cycle actual relative**						
	Full wave fix cycle, actual average relative power leg 3/W2. In percent of 99.09 Load Power. Measured or calculated depending on 99.60 Voltage Measurement Configuration.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.92	**3ph Power Full Wave Fix Cycle actual relative**						
	Full wave fix cycle, actual average relative three phase power. Complete power of all connected loads in percent of 99.09 Load Power. Measured or calculated depending on 99.60 Voltage Measurement Configuration.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
01.95	**Quasi peak DC current**						
	Calculated peak DC current. The calculated peak DC current is based on the peak current of each of the six thyristors in percent of 99.02 Load Current. The scan time 500 µs. Note: Only valid when the DCT880 is used for the rotating rectifier of medium voltage motors.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal

3 Input references

Values of references received from various sources.

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
03.01	**Panel reference 1**						
	Reference 1 given from the control panel or PC tool. Reference 1 given from the control panel or PC tool (drive composer via USB) in percent of or temperature, nominal load current, load voltage or load power.						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	See e.g. 35.07 Temp 1 max, 99.02 Load Current, 99.03 Load Voltage and 99.09 Load Power.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
03.03	**Ethernet PC tool reference 1**						
	Reference 1 given from PC tool. Reference 1 given from PC tool (drive composer via FENA) in percent of or temperature, nominal load current, load voltage or load power. See e.g. 35.07 Temp 1 max, 99.02 Load Current, 99.03 Load Voltage and 99.09 Load Power.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
03.05	**FBA A reference 1**						
	Reference 1 received via fieldbus adapter A. Reference 1 received via fieldbus adapter A (see parameters 53.01 … 53.12) in percent of or temperature, nominal load current, load voltage or load power. See e.g. 35.07 Temp 1 max, 99.02 Load Current, 99.03 Load Voltage and 99.09 Load Power. See also chapter Fieldbus control via a fieldbus adapter.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
03.06	**FBA A reference 2**						
	Reference 2 received via fieldbus adapter A. Reference 2 received via fieldbus adapter A (see parameters 53.01 … 53.12) in percent of or temperature, nominal load current, load voltage or load power. See e.g. 35.07 Temp 1 max, 99.02 Load Current, 99.03 Load Voltage and 99.09 Load Power.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
03.07	**FBA B reference 1**						
	Reference 1 received via fieldbus adapter B. Reference 1 received via fieldbus adapter B (see parameters 56.01 … 56.12) in percent of or temperature, nominal load current, load voltage or load power. See e.g. 35.07 Temp 1 max, 99.02 Load Current, 99.03 Load Voltage and 99.09 Load Power.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
03.08	**FBA B reference 2**						
	Reference 2 received via fieldbus adapter B. Reference 2 received via fieldbus adapter B (see parameters 56.01 … 56.12) in percent of or temperature, nominal load current, load voltage or load power. See e.g. 35.07 Temp 1 max, 99.02 Load Current, 99.03 Load Voltage and 99.09 Load Power.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
03.09	**EFB reference 1**						
	Reference 1 received via the embedded fieldbus. Reference 1 received via the embedded fieldbus (see parameters 58.101 … 58.124) in percent of or temperature, nominal load current, load voltage or load power. See e.g. 35.07 Temp 1 max, 99.02 Load Current, 99.03 Load Voltage and 99.09 Load Power.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
03.10	**EFB reference 2**						
	Reference 2 received via the embedded fieldbus. Reference 2 received via the embedded fieldbus (see parameters 58.101 … 58.124) in percent of or temperature, nominal load current, load voltage or load power. See e.g. 35.07 Temp 1 max, 99.02 Load Current, 99.03 Load Voltage and 99.09 Load Power.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
03.11	**DDCS controller ref 1**						
	Reference 1 received from an external DDCS-PLC. Reference 1 received from an external DDCS-PLC in percent of or temperature, nominal load current, load voltage or load power. See e.g. 35.07 Temp 1 max, 99.02 Load Current, 99.03 Load Voltage and 99.09 Load Power.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
03.12	**DDCS controller ref 2**						
	Reference 2 received from an external DDCS-PLC Reference 2 received from an external DDCS-PLC in percent of or temperature, nominal load current, load voltage or load power. See e.g. 35.07 Temp 1 max, 99.02 Load Current, 99.03 Load Voltage and 99.09 Load Power.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
03.13	**M/F or D2D ref1**						
	Master/follower reference 1 received from the master (followers only). Master/follower reference 1 received from the master (see parameters 61.01 … 62.03) in percent of or temperature, nominal load current, load voltage or load power. See e.g. 35.07 Temp 1 max, 99.02 Load Current, 99.03 Load Voltage and 99.09 Load Power. See also section Master/follower functionality.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
03.14	**M/F or D2D ref2**						
	Master/follower reference 2 received from the master (followers only). Master/follower reference 2 received from the master (see parameters 61.01 … 62.03) in percent of or temperature, nominal load current, load voltage or load power. See e.g. 35.07 Temp 1 max, 99.02 Load Current, 99.03 Load Voltage and 99.09 Load Power.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal

4 Warnings and faults

Information on warnings and faults that occurred last. For explanations of individual warning and fault codes, see chapter Fault tracing.

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
04.01	**Tripping fault**						
	Code of the 1st active fault (the fault that caused the current trip).						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.02	**Active fault 2**						
	Code of the 2nd active fault.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.03	**Active fault 3**						
	Code of the 3rd active fault.						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.04	**Active fault 4**						
	Code of the 4th active fault.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.05	**Active fault 5**						
	Code of the 5th active fault.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.06	**Active warning 1**						
	Code of the 1st active warning.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.07	**Active warning 2**						
	Code of the 2nd active warning.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.08	**Active warning 3**						
	Code of the 3rd active warning.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.09	**Active warning 4**						
	Code of the 4th active warning.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.10	**Active warning 5**						
	Code of the 5th active warning.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.11	**Latest fault**						
	Code of the 1st stored (non-active) fault.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.12	**2nd latest fault**						
	Code of the 2nd stored (non-active) fault.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.13	**3rd latest fault**						
	Code of the 3rd stored (non-active) fault.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.14	**4th latest fault**						
	Code of the 4th stored (non-active) fault.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.15	**5th latest fault**						
	Code of the 5th stored (non-active) fault.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.16	**Latest warning**						
	Code of the 1st stored (non-active) warning.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
04.17	**2nd latest warning**						
	Code of the 2nd stored (non-active) warning.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.18	**3rd latest warning**						
	Code of the 3rd stored (non-active) warning.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.19	**4th latest warning**						
	Code of the 4th stored (non-active) warning.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.20	**5th latest warning**						
	Code of the 5th stored (non-active) warning.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
04.23	**Diagnostics**						
	Additional information on last event.						
	0 … 65535	-	-	1 = 1	y	n	Signal

5 Diagnostics

Various run-time-type counters and measurements related to the unit's maintenance.

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
05.01	**On-time counter**						
	On-time counter. The counter runs when the thyristor power controller is powered (24 V_{DC} is on).						
	0 … 65535	-	days	1 = 1 day	y	n	Signal
05.02	**Load run-time counter**						
	Load run-time counter. The counter runs when leg 1 thyristor power controller runs (load current is present).						
	0 … 65535	-	days	1 = 1 day	y	n	Signal
05.04	**Fan on-time counter**						
	Run time of the units cooling fan. Can be reset from the control panel by keeping Reset depressed for over 3 seconds. Will not be active with unit sizes T1 … T5.						
	0 … 65535	-	days	1 = 1 day	y	n	Signal
05.10	**Control board temperature**						
	Measured actual control board temperature						
	-60.0 … 1000.0	-	°C	10 = 1°C	y	n	Signal
05.50	**Power part temperature**						
	Measured actual power part temperature.						

Index	Name					
	Text					
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	-60.0 … 1000.0	-	°C	10 = 1°C	y	n	Signal

6 Control and status words

The unit's control, status and event words.

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
06.01	**Main control word**						
	Main control word. This signal shows the control signals as received from the selected sources (such as digital inputs, the fieldbus interfaces and the application program), see 06.06 MCW Source. Bit assignment:						

Bit	Name	High	Low	Remarks
0	Leg 1 Enable	Enable	Disable	Mains contactor ON command. Fans ON command.
1	Leg 1 Run	Run	Stop	
2	Leg 2 Enable	Enable	Disable	Mains contactor ON command. Fans ON command.
3	Leg 2 Run	Run	Stop	
4	Leg 3 Enable	Enable	Disable	Mains contactor ON command. Fans ON command.
5	Leg 3 Run	Run	Stop	
6	reserved			
7	Reset	Reset	No action	
8	reserved			
9	reserved			
10	Remote CMD	Enable	No action	Overriding control / IEC programming enabled (overriding control / IEC programming has to set this bit to 1).
11 … 15	Bit 11 … 15			

Note: Bits 11 … 15 can be used to carry additional control data. Additionally they can be used as a signal source by any binary-source selector parameter (see: Other [bit], source selection).

Index	Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
06.01	0000h … FFFFh	-	-	1 = 1	y	n	Signal
06.02	**Application control word**						
	Control word written to by IEC programming.						
	0000h … FFFFh	-	-	1 = 1	y	y	Parameter
06.03	**FBA A transparent control word**						
	Transparent control word received via fieldbus adapter A, see parameters 53.01 … 53.12.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
06.04	**FBA B transparent control word**						
	Transparent control word received via fieldbus adapter B, see parameters 56.01 … 56.12.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
06.05	**EFB transparent control word**						
	Transparent control word received via embedded fieldbus, see parameters 58.101 … 58.124.						

Index	Name Text Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
	0000h … FFFFh	-	-	1 = 1	y	n	Signal

06.06 **MCW Source**

Selects the source for 06.01 Main control word active.
Other; source selection.
0: **None**; inactive.
1: **FBA A (06.03)**; 06.03 FBA A CW.
2: **FBA B (06.04)**; 06.04 FBA B CW.
3: **EFB (06.05)**; 06.05 EFB CW.
4: **Application (06.02)**; 06.02 Application Control Word.
5: **D2D (06.94)**; 06.94 Follower Control Word received (follower only).
6: **DDCS CW (06.10)**; 06.10 DDCS control word.

Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
0 … 6	None	-	1 = 1	n	y	Parameter

06.07 **Auxiliary Control Word 1**

First auxiliary control word.
Bit assignment:

Bit	Name	High	Low
0 … 15	reserved		

Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	y	y	Parameter

06.08 **Used Main Control Word**

Used main control word.
Main control word used by the internal unit logic.
Bit assignment:

Bit	Name	High	Low	Remarks
0	Leg 1 Enable	Enable	Disable	Mains contactor ON command. Fans ON command.
1	Leg 1 Run	Run	Stop	
2	Leg 2 Enable	Enable	Disable	Mains contactor ON command. Fans ON command.
3	Leg 2 Run	Run	Stop	
4	Leg 3 Enable	Enable	Disable	Mains contactor ON command. Fans ON command.
5	Leg 3 Run	Run	Stop	
6	reserved			
7	Reset	Reset	No action	
8	reserved			
9	reserved			
10	Remote CMD	No action	No action	Not in use
11	Leg 1 Remote	Remote	No action	When high: Follower leg 1 is controlled by master (automatically set).
12	Leg 2 Remote	Remote	No action	When high: Follower leg 2 is controlled by master (automatically set).

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**

13	Leg 3 Remote	Remote	No action	When high: Follower leg 3 is controlled by master (automatically set).
14 … 15	reserved			

Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	y	n	Signal

06.09 **Follower Control Word**

Follower control word to followers (master only).
06.09 Follower Control Word is sent by the master, using D2D link, to 06.94 Follower Control Word received in all followers.
Bit assignment:

Bit	Name	High	Low	Remarks
0	Leg 1 Enable	Enable	Disable	Mains contactor ON command. Fans ON command.
1	Leg 1 Run	Run and no active fault in master	Stop or active fault in master	
2	Leg 2 Enable	Enable	Disable	Mains contactor ON command. Fans ON command.
3	Leg 2 Run	Run and no active fault in master	Stop or active fault in master	
4	Leg 3 Enable	Enable	Disable	Mains contactor ON command. Fans ON command.
5	Leg 3 Run	Run and no active fault in master	Stop or active fault in master	
6	reserved			
7	Reset	Reset	No action	
8	reserved			
9	reserved			
10	Remote CMD	No action	No action	Not in use
11	Leg 1 Remote	Remote	No action	When high: Follower leg 1 is controlled by master (automatically set).
12	Leg 2 Remote	Remote	No action	When high: Follower leg 2 is controlled by master (automatically set).
13	Leg 3 Remote	Remote	No action	When high: Follower leg 3 is controlled by master (automatically set).
14	reserved			
15	Master Warning / Fault	Warning / Fault active	Warning / Fault inactive	

Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	y	n	Signal

Index	Name Text Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type

06.10 **DDCS control word**

Displays the unaltered control word received from a DDCS controller via a DDCS communication option module (FDCO-0x).

Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	y	n	Signal

06.13 **Global Status Word**

Global status word.
06.13 Global Status Word contains collective messages of the whole unit. The individual message are shown in 06.14 Leg 1 Status Word, 06.15 Leg 2 Status Word and 06.16 Leg 3 Status Word.
Bit assignment:

Bit	Name	High	Low	Remarks
0	Any Warning	Warning active	Warning inactive	Collective warning message
1	Any Fault	Fault active	Fault inactive	Collective fault message
2	Enabled	Enabled	Not enabled	Collective enable message, high when one of the legs is enabled
3	Operating	In operation	Not in operation	Collective operating message, high when one of the legs is in operation
4 … 15	reserved			

Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	y	n	Signal

06.14 **Leg 1 Status Word**

Status word for leg 1.
Bit assignment:

Bit	Name	High	Low
0	Leg 1 Warning	Warning active	Warning inactive
1	Leg 1 Fault	Fault active	Fault inactive
2	Leg 1 Sync	Synchronized to mains	Not synchronized to mains
3	Leg 1 Enabled	Enabled	Not enabled
4	Leg 1 Operating	In operation	Not in operation
5	Leg 1 Current Limit active	Current limit active	Current limit inactive
6	Leg 1 Voltage Limit active	Voltage limit active	Voltage limit inactive
7	Leg 1 Power Limit active	Power limit active	Power limit inactive
8	Leg 1 at Reference	Output is at reference	Output is not at reference (more than 5 % deviation)
9	Leg 1 Burst Operation	Burst operation active	Burst operation inactive
10	Leg 1 Remote	Remote	Local
11	Mains Contactor ON Cmd	Mains contactor on command	-
12	Fans ON Cmd	Fans on command	-

Index	Name Text Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type

13	Leg 1 Current flow	Current detected (see 36.12 Leg 1 Load Loss Current level)	No current detected
14	Leg 1 2nd mode	2nd control mode active, see 23.07 Leg 1 2nd mode switching control	1st control mode active, see 23.07 Leg 1 2nd mode switching control
15	Local	Local	Remote

Index	Name Text Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
06.15	**Leg 2 Status Word**						
	Status word for leg 2. Bit assignment: See 06.14 Leg 1 Status Word.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
06.16	**Leg 3 Status Word**						
	Status word for leg 3. Bit assignment: See 06.14 Leg 1 Status Word.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
06.20	**User Status Word 1**						
	First user defined status word. This word shows the status of the binary sources selected by parameters 06.21 … 06.36. Bit assignment:						

Bit	Name	High	Low
0	User status bit 0		
1	User status bit 1		
2	User status bit 2		
3	User status bit 3		
4	User status bit 4		
5	User status bit 5		
6	User status bit 6		
7	User status bit 7		
8	User status bit 8		
9	User status bit 9		
10	User status bit 10		
11	User status bit 11		
12	User status bit 12		
13	User status bit 13		
14	User status bit 14		
15	User status bit 15		

Index	Name Text Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
06.21	**User Status Word 1 bit 0 sel**						
	Binary source for bit 0. Selects a binary source whose status is shown as bit 0 of 6.20 User Status Word 1. **Other [bit]**; source selection. 0: **FALSE**; 1: **TRUE**;						
	0 … 1	FALSE	-	1 = 1	n	y	Parameter

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3">**06.22**</td><td colspan="7">**User Status Word 1 bit 1 sel**</td></tr>
<tr><td colspan="7">Binary source for bit 1.
Selects a binary source whose status is shown as bit 1 of 6.20 User Status Word 1.
Other [bit]; source selection.
0: **FALSE**;
1: **TRUE**;</td></tr>
<tr><td>0 … 1</td><td>FALSE</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**06.23**</td><td colspan="7">**User Status Word 1 bit 2 sel**</td></tr>
<tr><td colspan="7">Binary source for bit 2.
Selects a binary source whose status is shown as bit 2 of 6.20 User Status Word 1.
Other [bit]; source selection.
0: **FALSE**;
1: **TRUE**;</td></tr>
<tr><td>0 … 1</td><td>FALSE</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**06.24**</td><td colspan="7">**User Status Word 1 bit 3 sel**</td></tr>
<tr><td colspan="7">Binary source for bit 3.
Selects a binary source whose status is shown as bit 3 of 6.20 User Status Word 1.
Other [bit]; source selection.
0: **FALSE**;
1: **TRUE**;</td></tr>
<tr><td>0 … 1</td><td>FALSE</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**06.25**</td><td colspan="7">**User Status Word 1 bit 4 sel**</td></tr>
<tr><td colspan="7">Binary source for bit 4.
Selects a binary source whose status is shown as bit 4 of 6.20 User Status Word 1.
Other [bit]; source selection.
0: **FALSE**;
1: **TRUE**;</td></tr>
<tr><td>0 … 1</td><td>FALSE</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**06.26**</td><td colspan="7">**User Status Word 1 bit 5 sel**</td></tr>
<tr><td colspan="7">Binary source for bit 5.
Selects a binary source whose status is shown as bit 5 of 6.20 User Status Word 1.
Other [bit]; source selection.
0: **FALSE**;
1: **TRUE**;</td></tr>
<tr><td>0 … 1</td><td>FALSE</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**06.27**</td><td colspan="7">**User Status Word 1 bit 6 sel**</td></tr>
<tr><td colspan="7">Binary source for bit 6.
Selects a binary source whose status is shown as bit 6 of 6.20 User Status Word 1.
Other [bit]; source selection.
0: **FALSE**;
1: **TRUE**;</td></tr>
<tr><td>0 … 1</td><td>FALSE</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**06.28**</td><td colspan="7">**User Status Word 1 bit 7 sel**</td></tr>
<tr><td colspan="7">Binary source for bit 7.
Selects a binary source whose status is shown as bit 7 of 6.20 User Status Word 1.
Other [bit]; source selection.
0: **FALSE**;
1: **TRUE**;</td></tr>
<tr><td>0 … 1</td><td>FALSE</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**06.29**</td><td colspan="7">**User Status Word 1 bit 8 sel**</td></tr>
</table>

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	Binary source for bit 8. Selects a binary source whose status is shown as bit 8 of 6.20 User Status Word 1. **Other [bit]**; source selection. 0: **FALSE**; 1: **TRUE**;						
	0 … 1	FALSE	-	1 = 1	n	y	Parameter
06.30	**User Status Word 1 bit 9 sel**						
	Binary source for bit 9. Selects a binary source whose status is shown as bit 9 of 6.20 User Status Word 1. **Other [bit]**; source selection. 0: **FALSE**; 1: **TRUE**;						
	0 … 1	FALSE	-	1 = 1	n	y	Parameter
06.31	**User Status Word 1 bit 10 sel**						
	Binary source for bit 10. Selects a binary source whose status is shown as bit 10 of 6.20 User Status Word 1. **Other [bit]**; source selection. 0: **FALSE**; 1: **TRUE**;						
	0 … 1	FALSE	-	1 = 1	n	y	Parameter
06.32	**User Status Word 1 bit 11 sel**						
	Binary source for bit 11. Selects a binary source whose status is shown as bit 11 of 6.20 User Status Word 1. **Other [bit]**; source selection. 0: **FALSE**; 1: **TRUE**;						
	0 … 1	FALSE	-	1 = 1	n	y	Parameter
06.33	**User Status Word 1 bit 12 sel**						
	Binary source for bit 12. Selects a binary source whose status is shown as bit 12 of 6.20 User Status Word 1. **Other [bit]**; source selection. 0: **FALSE**; 1: **TRUE**;						
	0 … 1	FALSE	-	1 = 1	n	y	Parameter
06.34	**User Status Word 1 bit 13 sel**						
	Binary source for bit 13. Selects a binary source whose status is shown as bit 13 of 6.20 User Status Word 1. **Other [bit]**; source selection. 0: **FALSE**; 1: **TRUE**;						
	0 … 1	FALSE	-	1 = 1	n	y	Parameter
06.35	**User Status Word 1 bit 14 sel**						
	Binary source for bit 14. Selects a binary source whose status is shown as bit 14 of 6.20 User Status Word 1. **Other [bit]**; source selection. 0: **FALSE**; 1: **TRUE**;						
	0 … 1	FALSE	-	1 = 1	n	y	Parameter
06.36	**User Status Word 1 bit 15 sel**						
	Binary source for bit 15. Selects a binary source whose status is shown as bit 15 of 6.20 User Status Word 1.						

Index	Name Text Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
	Other [bit]; source selection. 0: **FALSE**; 1: **TRUE**;						
	0 … 1	FALSE	-	1 = 1	n	y	Parameter
06.40	**User Status Word 2**						
	Second user defined status word. This word shows the status of the binary sources selected by parameters 06.41 … 06.56. Bit assignment: See 06.20 User Status Word 1.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
06.41	**User Status Word 2 bit 0 sel**						
	Binary source for bit 0. Selects a binary source whose status is shown as bit 0 of 6.40 User Status Word 2. **Other [bit]**; source selection. 0: **FALSE**; 1: **TRUE**;						
	0 … 1	FALSE	-	1 = 1	n	y	Parameter
06.42	**User Status Word 2 bit 1 sel**						
	Binary source for bit 1. Selects a binary source whose status is shown as bit 1 of 6.40 User Status Word 2. **Other [bit]**; source selection. 0: **FALSE**; 1: **TRUE**;						
	0 … 1	FALSE	-	1 = 1	n	y	Parameter
06.43	**User Status Word 2 bit 2 sel**						
	Binary source for bit 2. Selects a binary source whose status is shown as bit 2 of 6.40 User Status Word 2. **Other [bit]**; source selection. 0: **FALSE**; 1: **TRUE**;						
	0 … 1	FALSE	-	1 = 1	n	y	Parameter
06.44	**User Status Word 2 bit 3 sel**						
	Binary source for bit 3. Selects a binary source whose status is shown as bit 3 of 6.40 User Status Word 2. **Other [bit]**; source selection. 0: **FALSE**; 1: **TRUE**;						
	0 … 1	FALSE	-	1 = 1	n	y	Parameter
06.45	**User Status Word 2 bit 4 sel**						
	Binary source for bit 4. Selects a binary source whose status is shown as bit 4 of 6.40 User Status Word 2. **Other [bit]**; source selection. 0: **FALSE**; 1: **TRUE**;						
	0 … 1	FALSE	-	1 = 1	n	y	Parameter
06.46	**User Status Word 2 bit 5 sel**						
	Binary source for bit 5. Selects a binary source whose status is shown as bit 5 of 6.40 User Status Word 2. **Other [bit]**; source selection. 0: **FALSE**;						

Index	Name					
	Text					
	Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
	1: **TRUE**;						
	0 … 1	FALSE	-	1 = 1	n	y	Parameter
06.47	**User Status Word 2 bit 6 sel**						
	Binary source for bit 6. Selects a binary source whose status is shown as bit 6 of 6.40 User Status Word 2. **Other [bit]**; source selection. 0: **FALSE**; 1: **TRUE**;						
	0 … 1	FALSE	-	1 = 1	n	y	Parameter
06.48	**User Status Word 2 bit 7 sel**						
	Binary source for bit 7. Selects a binary source whose status is shown as bit 7 of 6.40 User Status Word 2. **Other [bit]**; source selection. 0: **FALSE**; 1: **TRUE**;						
	0 … 1	FALSE	-	1 = 1	n	y	Parameter
06.49	**User Status Word 2 bit 8 sel**						
	Binary source for bit 8. Selects a binary source whose status is shown as bit 8 of 6.40 User Status Word 2. **Other [bit]**; source selection. 0: **FALSE**; 1: **TRUE**;						
	0 … 1	FALSE	-	1 = 1	n	y	Parameter
06.50	**User Status Word 2 bit 9 sel**						
	Binary source for bit 9. Selects a binary source whose status is shown as bit 9 of 6.40 User Status Word 2. **Other [bit]**; source selection. 0: **FALSE**; 1: **TRUE**;						
	0 … 1	FALSE	-	1 = 1	n	y	Parameter
06.51	**User Status Word 2 bit 10 sel**						
	Binary source for bit 10. Selects a binary source whose status is shown as bit 10 of 6.40 User Status Word 2. **Other [bit]**; source selection. 0: **FALSE**; 1: **TRUE**;						
	0 … 1	FALSE	-	1 = 1	n	y	Parameter
06.52	**User Status Word 2 bit 11 sel**						
	Binary source for bit 11. Selects a binary source whose status is shown as bit 11 of 6.40 User Status Word 2. **Other [bit]**; source selection. 0: **FALSE**; 1: **TRUE**;						
	0 … 1	FALSE	-	1 = 1	n	y	Parameter
06.53	**User Status Word 2 bit 12 sel**						
	Binary source for bit 12. Selects a binary source whose status is shown as bit 12 of 6.40 User Status Word 2. **Other [bit]**; source selection. 0: **FALSE**; 1: **TRUE**;						
	0 … 1	FALSE	-	1 = 1	n	y	Parameter

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td>06.54</td><td colspan="7">User Status Word 2 bit 13 sel</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Binary source for bit 13.
Selects a binary source whose status is shown as bit 13 of 6.40 User Status Word 2.
Other [bit]; source selection.
0: FALSE;
1: TRUE;</td></tr>
<tr><td>0 … 1</td><td>FALSE</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>06.55</td><td colspan="7">User Status Word 2 bit 14 sel</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Binary source for bit 14.
Selects a binary source whose status is shown as bit 14 of 6.40 User Status Word 2.
Other [bit]; source selection.
0: FALSE;
1: TRUE;</td></tr>
<tr><td>0 … 1</td><td>FALSE</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>06.56</td><td colspan="7">User Status Word 2 bit 15 sel</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Binary source for bit 15.
Selects a binary source whose status is shown as bit 15 of 6.40 User Status Word 2.
Other [bit]; source selection.
0: FALSE;
1: TRUE;</td></tr>
<tr><td>0 … 1</td><td>FALSE</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>06.60</td><td colspan="7">Global Fault Word 1</td></tr>
<tr><td rowspan="2"></td><td colspan="7">First global fault word.
Each bit represents one specific event.
Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>High</th><th>Low</th></tr>
<tr><td>0</td><td>Type Code Mismatch</td><td>Active</td><td>Inactive</td></tr>
<tr><td>1</td><td>Option Error</td><td>Active</td><td>Inactive</td></tr>
<tr><td>2</td><td>Communication Error</td><td>Active</td><td>Inactive</td></tr>
<tr><td>3</td><td>Overtemperature Power Part</td><td>Active</td><td>Inactive</td></tr>
<tr><td>4</td><td>Inconsistent Data</td><td>Active</td><td>Inactive</td></tr>
<tr><td>5</td><td>Enable Circuit Fault</td><td>Active</td><td>Inactive</td></tr>
<tr><td>6</td><td>Overtemperature Load</td><td>Active</td><td>Inactive</td></tr>
<tr><td>7</td><td>No controller fan acknowledge</td><td>Active</td><td>inactive</td></tr>
<tr><td>8</td><td>reserved</td><td></td><td></td></tr>
<tr><td>9</td><td>reserved</td><td></td><td></td></tr>
<tr><td>10</td><td>reserved</td><td></td><td></td></tr>
<tr><td>11</td><td>Mains Synchronization Fault</td><td>Active</td><td>Inactive</td></tr>
<tr><td>12</td><td>Unicos Fault</td><td>Active</td><td>Inactive</td></tr>
<tr><td>13</td><td>Control Builder application Fault</td><td>Active</td><td>Inactive</td></tr>
<tr><td>14 … 15</td><td>reserved</td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>06.61</td><td colspan="7">Global Fault Word 2</td></tr>
<tr><td></td><td colspan="7">Second global fault word.
Each bit represents one specific event.
Bit assignment:</td></tr>
</table>

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**

Bit	Name	High	Low
0 … 15	reserved		

Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	y	n	Signal

06.62 **Global Warning Word**

Global warning word.
Each bit represents one specific event.
Bit assignment:

Bit	Name	High	Low
0	Parameter Setting Mismatch	Active	Inactive
1	reserved		
2	reserved		
3	Overtemperature Power Part	Active	Inactive
4	reserved		
5	reserved		
6	Overtemperature Load	Active	Inactive
7	No controller fan acknowledge	Active	inactive
8	reserved		
9	reserved		
10	reserved		
11	Mains Synchronization Warning	Active	Inactive
12 …15	reserved		

Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	y	n	Signal

06.63 **External Event Word**

External event word.
Each bit represents one specific event.
Bit assignment:

Bit	Name	High	Low
0	External Event 1	Active	Inactive
1	External Event 2	Active	Inactive
2	External Event 3	Active	Inactive
3	External Event 4	Active	Inactive
4	External Event 5	Active	Inactive
5 … 15	reserved		

Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	y	n	Signal

06.66 **Leg 1 Fault Word**

Fault word for leg 1.
Each bit represents one specific event.
Bit assignment:

Bit	Name	High	Low
0	Overcurrent	Active	Inactive
1	Mains Overvoltage	Active	Inactive

Index	Name Text Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type

2	Thyristor short circuit	Active	Inactive
3	Thyristor open circuit	Active	Inactive
4	Mains Undervoltage	Active	Inactive
5	Unit thermal overload	Active	Inactive
6 … 15	reserved		

	Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
	0000h … FFFFh	-	-	1 = 1	y	n	Signal

06.67 **Leg 2 Fault Word**

Fault word for leg 2.
Each bit represents one specific event.
Bit assignment:

Bit	Name	High	Low
0	Overcurrent	Active	Inactive
1	Mains Overvoltage	Active	Inactive
2	Thyristor short circuit	Active	Inactive
3	Thyristor open circuit	Active	Inactive
4	Mains Undervoltage	Active	Inactive
5	Unit thermal overload	Active	Inactive
6 … 15	reserved		

	Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
	0000h … FFFFh	-	-	1 = 1	y	n	Signal

06.68 **Leg 3 Fault Word**

Fault word for leg 3.
Each bit represents one specific event.
Bit assignment:

Bit	Name	High	Low
0	Overcurrent	Active	Inactive
1	Mains Overvoltage	Active	Inactive
2	Thyristor short circuit	Active	Inactive
3	Thyristor open circuit	Active	Inactive
4	Mains Undervoltage	Active	Inactive
5	Unit thermal overload	Active	Inactive
6 … 15	reserved		

	Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
	0000h … FFFFh	-	-	1 = 1	y	n	Signal

06.71 **Leg 1 Warning Word**

Warning word for leg 1.
Each bit represents one specific event.
Bit assignment:

Bit	Name	High	Low
0	Overcurrent	Active	Inactive
1	Mains Overvoltage	Active	Inactive
2	Thyristor short circuit	Active	Inactive
3	Thyristor open circuit	Active	Inactive
4	Mains Undervoltage	Active	Inactive
5	Unit thermal overload	Active	Inactive

Index	Name Text Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type

6 … 15	reserved		

Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	y	n	Signal

06.72 **Leg 2 Warning Word**

Warning word for leg 2.
Each bit represents one specific event:
Bit assignment:

Bit	Name	High	Low
0	Overcurrent	Active	Inactive
1	Mains Overvoltage	Active	Inactive
2	Thyristor short circuit	Active	Inactive
3	Thyristor open circuit	Active	Inactive
4	Mains Undervoltage	Active	Inactive
5	Unit thermal overload	Active	Inactive
6 … 15	reserved		

Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	y	n	Signal

06.73 **Leg 3 Warning Word**

Warning word for leg 3.
Each bit represents one specific event.
Bit assignment:

Bit	Name	High	Low
0	Overcurrent	Active	Inactive
1	Mains Overvoltage	Active	Inactive
2	Thyristor short circuit	Active	Inactive
3	Thyristor open circuit	Active	Inactive
4	Mains Undervoltage	Active	Inactive
5	Unit thermal overload	Active	Inactive
6 … 15	reserved		

Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	y	n	Signal

06.76 **Leg 1 Load Fault Word**

Fault word for the load of leg 1.
Each bit represents one specific event.
Bit assignment:

Bit	Name	High	Low
0	Load Loss	Active	Inactive
1	Partial Load loss	Active	Inactive
2	Partial Load short circuit	Active	Inactive
3	Load overload	Active	Inactive
4	Load aging	Active	Inactive
5	Load current imbalance	Active	Inactive
6 … 15	reserved		

Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	y	n	Signal

06.77 **Leg 2 Load Fault Word**

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**

Fault word for the load of leg 2.
Each bit represents one specific event.
Bit assignment:

Bit	Name	High	Low
0	Load Loss	Active	Inactive
1	Partial Load loss	Active	Inactive
2	Partial Load short circuit	Active	Inactive
3	Load overload	Active	Inactive
4	Load aging	Active	Inactive
5	Load current imbalance	Active	Inactive
6 … 15	reserved		

	Range	Default	Unit	Scale	Volatile	Change running	Type
	0000h … FFFFh	-	-	1 = 1	y	n	Signal

06.78 **Leg 3 Load Fault Word**

Fault word for the load of leg 3.
Each bit represents one specific event.
Bit assignment:

Bit	Name	High	Low
0	Load Loss	Active	Inactive
1	Partial Load loss	Active	Inactive
2	Partial Load short circuit	Active	Inactive
3	Load overload	Active	Inactive
4	Load aging	Active	Inactive
5	Load current imbalance	Active	Inactive
6 … 15	reserved		

	Range	Default	Unit	Scale	Volatile	Change running	Type
	0000h … FFFFh	-	-	1 = 1	y	n	Signal

06.81 **Leg 1 Load Warning Word**

Warning word for the load of leg 1.
Each bit represents one specific event.
Bit assignment:

Bit	Name	High	Low
0	Load Loss	Active	Inactive
1	Partial Load loss	Active	Inactive
2	Partial Load short circuit	Active	Inactive
3	Load overload	Active	Inactive
4	Load aging	Active	Inactive
5	Load current imbalance	Active	Inactive
6 … 15	reserved		

	Range	Default	Unit	Scale	Volatile	Change running	Type
	0000h … FFFFh	-	-	1 = 1	y	n	Signal

06.82 **Leg 2 Load Warning Word**

Warning word for the load of leg 2.
Each bit represents one specific event.
Bit assignment:

Index	Name Text Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type

Bit	Name	High	Low
0	Load Loss	Active	Inactive
1	Partial Load loss	Active	Inactive
2	Partial Load short circuit	Active	Inactive
3	Load overload	Active	Inactive
4	Load aging	Active	Inactive
5	Load current imbalance	Active	Inactive
6 … 15	reserved		

	0000h … FFFFh	-	-	1 = 1	y	n	Signal

06.83 **Leg 3 Load Warning Word**

Warning word for the load of leg 3.
Each bit represents one specific event.
Bit assignment:

Bit	Name	High	Low
0	Load Loss	Active	Inactive
1	Partial Load loss	Active	Inactive
2	Partial Load short circuit	Active	Inactive
3	Load overload	Active	Inactive
4	Load aging	Active	Inactive
5	Load current imbalance	Active	Inactive
6 … 15	reserved		

	0000h … FFFFh	-	-	1 = 1	y	n	Signal

06.84 **Temperature Measurement Status Word**

Status word for the temperature measurement.
Each bit represents one specific event.
Bit assignment:

Bit	Name	High	Low
0	Temp 1 Channel	Active	Inactive
1	Temp 1 Warning	Active	Inactive
2	Temp 1 Fault	Active	Inactive
3	Temp 2 Channel	Active	Inactive
4	Temp 2 Warning	Active	Inactive
5	Temp 2 Fault	Active	Inactive
6	Temp 3 Channel	Active	Inactive
7	Temp 3 Warning	Active	Inactive
8	Temp 3 Fault	Active	Inactive
9	Temp 4 Channel	Active	Inactive
10	Temp 4 Warning	Active	Inactive
11	Temp 4 Fault	Active	Inactive
12 … 15	reserved		

	0000h … FFFFh	-	-	1 = 1	y	n	Signal

06.90 **Multitap Status Word 1**

First status word for multitap.
Bit assignment:

<table>
<tr><th>Index</th><th colspan="7">Name</th></tr>
<tr><td rowspan="2"></td><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale
FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">
<table>
<tr><th>Bit</th><th>Name</th><th>High</th><th>Low</th></tr>
<tr><td>0 … 15</td><td>reserved</td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>06.91</td><td colspan="7">Multitap Status Word 2</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Second status word for multitap.
Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>High</th><th>Low</th></tr>
<tr><td>0 … 15</td><td>reserved</td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>06.93</td><td colspan="7">Follower Status Word</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Follower status word (followers only).
The follower status word can be transferred from the followers to the master, see groups 61 and 62.
Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>High</th><th>Low</th></tr>
<tr><td>0</td><td>Ready for On</td><td>Unit is ready to be switched on</td><td>Unit is not ready to be switched on</td></tr>
<tr><td>1</td><td>Enabled</td><td>Enabled</td><td>Not enabled</td></tr>
<tr><td>2</td><td>Operating</td><td>In operation</td><td>Not in operation</td></tr>
<tr><td>3</td><td>Any Fault</td><td>Fault active</td><td>Fault inactive</td></tr>
<tr><td>4</td><td>reserved</td><td></td><td></td></tr>
<tr><td>5</td><td>reserved</td><td></td><td></td></tr>
<tr><td>6</td><td>reserved</td><td></td><td></td></tr>
<tr><td>7</td><td>Any Warning</td><td>Warning active</td><td>Warning inactive</td></tr>
<tr><td>8 … 15</td><td>reserved</td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>06.94</td><td colspan="7">Follower Control Word received</td></tr>
<tr><td></td><td colspan="7">Follower control word received from master (see parameters 61.01 … 61.03, followers only).
06.09 Follower Control Word is sent by the master, using D2D link, to 06.94 Follower Control Word received in all followers.
Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>High</th><th>Low</th><th>Remarks</th></tr>
<tr><td>0</td><td>Leg 1 Enable</td><td>Enable</td><td>Disable</td><td>Mains contactor ON command.
Fans ON command.</td></tr>
<tr><td>1</td><td>Leg 1 Run</td><td>Run and no active fault in master</td><td>Stop or active fault in master</td><td></td></tr>
<tr><td>2</td><td>Leg 2 Enable</td><td>Enable</td><td>Disable</td><td>Mains contactor ON command.
Fans ON command.</td></tr>
<tr><td>3</td><td>Leg 2 Run</td><td>Run and no active fault in master</td><td>Stop or active fault in master</td><td></td></tr>
</table>
</td></tr>
</table>

Index	Name						
	Text						
	Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type

4	Leg 3 Enable	Enable	Disable	Mains contactor ON command. Fans ON command.
5	Leg 3 Run	Run and no active fault in master	Stop or active fault in master	
6	reserved			
7	Reset	Reset	No action	
8	reserved			
9	reserved			
10	Remote CMD	No action	No action	Not in use
11	Leg 1 Remote	Remote	No action	When high: Follower leg 1 is controlled by master (automatically set).
12	Leg 2 Remote	Remote	No action	When high: Follower leg 2 is controlled by master (automatically set).
13	Leg 3 Remote	Remote	No action	When high: Follower leg 3 is controlled by master (automatically set).
14	reserved			
15	Master Warning / Fault	Warning / Fault active	Warning / Fault inactive	

	0000h … FFFFh	-	-	1 = 1	y	n	Signal

7 System info

The unit's hardware and firmware information.

Index	Name						
	Text						
	Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
07.02	**Power unit set**						
	Type of power unit. The value is read from 95.14 Set: Power unit (saved on the SDCS-CON-H01). 0: DCS converter; the unit is a DCS880. 20: DCT controller; the unit is a DCT880. 40: TSU supply unit; the unit is a TSU880. 100: Unsupported power unit type; mismatch between 95.14 Set: Power unit read from SDCS-CON-H01 and 95.14 Set: Power unit read from the plugged-in memory unit. This event generates fault 5525 Type code and shows 95.14 Set: Power unit. Either adapt the SDCS-CON-H01 using 95.14 Set: Power unit and 95.25 Set: Type code or use a memory unit with an appropriate firmware.						
	0 … 100	-	-	1 = 1	y	n	Signal
07.03	**Unit rating ID set**						
	Type of the unit. The value is read from 95.16 Set: Unit type code (saved on the SDCS-CON-H01). **Example**: W03-0020-05.						

<table>
<tr><th rowspan="4">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td>0 ... 520</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">07.04</td><td colspan="7">Firmware name</td></tr>
<tr><td colspan="7">Firmware identification.
Example: DCTF1 = DCT880 Firmware.</td></tr>
<tr><td></td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">07.05</td><td colspan="7">Firmware version</td></tr>
<tr><td colspan="7">Version number of the firmware.
Example: 1.05.0.0 = Firmware version 1.05.</td></tr>
<tr><td>0.000.0.0 … 255.255.255.255</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">07.06</td><td colspan="7">Application name</td></tr>
<tr><td colspan="7">Control Builder application program name.
Displays the first five ASCII signs of the name given to the application program. The full name is visible under System info on the control panel or in the PC tool.
_N/A_: No name;</td></tr>
<tr><td></td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">07.07</td><td colspan="7">Application version</td></tr>
<tr><td colspan="7">Control Builder application version number.
Displays the version number given to the application program. Also visible under System info on the control panel or in the PC tool.
Example: 1.04.0.0 = Application program version 4.</td></tr>
<tr><td>0.000.0.0 … 255.255.255.255</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">07.08</td><td colspan="7">Control Builder system library version</td></tr>
<tr><td colspan="7">Version number of the Control Builder system library.
Example: 1.01.0.0 = Control Builder system library version 1.01.</td></tr>
<tr><td>0.000.0.0 … 255.255.255.255</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">07.09</td><td colspan="7">Control Builder application</td></tr>
<tr><td colspan="7">Control Builder application information.
Information about the Control Builder application.
0: No license; the memory unit contains no license. No Control Builder application programming possible.
1: No application; the memory unit contains a license. No Control Builder application loaded.
3: Application: see 07.06 Application name; the memory unit contains a license. A Control Builder application is loaded. The name can be found in 07.23 Application name.</td></tr>
<tr><td>0 … 3</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">07.11</td><td colspan="7">CPU usage</td></tr>
<tr><td colspan="7">Microprocessor load in percent.</td></tr>
<tr><td>0 … 100</td><td>-</td><td>%</td><td>1 = 1 %</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="2">07.13</td><td colspan="7">Application environment status 1</td></tr>
<tr><td colspan="7">Application program task status.
Shows, which tasks of the application program are running. See Drive (IEC 61131-3) application programming manual 3AUA0000127808.</td></tr>
</table>

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**

Bit assignment:

Bit	Name	Value	Remarks
0	Pre-task	1	Pre-task running.
1	Application task 1	1	Task 1 running.
2	Application task 2	1	Task 2 running.
3	Application task 3	1	Task 3 running.
4	reserved		
5	reserved		
6	reserved		
7	reserved		
8	reserved		
9	reserved		
10	reserved		
11	reserved		
12	reserved		
13	reserved		
14	reserved		
15	Task monitoring	1	Task monitoring enabled.

0000h … FFFFh	0000h	-	1 = 1	y	n	Signal

07.14 **Application environment status 2**

Application program opening status.
Shows the status of the openings in the application program. See Drive (IEC 61131-3) application programming manual 3AUA0000127808.
Bit assignment:

Bit	Name	Value	Remarks
0	Opening 1	1	Status of opening 1 in the application program.
1	Opening 2	1	Status of opening 2 in the application program.
2	Opening 3	1	Status of opening 3 in the application program.
3	Opening 4	1	Status of opening 4 in the application program.
4	Opening 5	1	Status of opening 5 in the application program.
5	Opening 6	1	Status of opening 6 in the application program.
6	Opening 7	1	Status of opening 7 in the application program.
7	Opening 8	1	Status of opening 8 in the application program.
8	Opening 9	1	Status of opening 9 in the application program.
9	Opening 10	1	Status of opening 10 in the application program.
10	Opening 11	1	Status of opening 11 in the application program.
11	Opening 12	1	Status of opening 12 in the application program.
12	Opening 13	1	Status of opening 13 in the application program.

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	13 Opening 14 1 Status of opening 14 in the application program. 14 Opening 15 1 Status of opening 15 in the application program. 15 Opening 16 1 Status of opening 16 in the application program.						
	0000h … FFFFh	0000h	-	1 = 1	y	n	Signal
07.15	**Unit type set**						
	Unit type. 0: None; when 95.16 Set: Unit type code = W00-000-00. 1: **T1**; size T1. 2: **T2**; size T2. 3: **T3**; size T3. 4: **T4**; size T4. 5: **T5**; size T5. 6: **T6**; size T6. 7: **T7**; size T7 (reserved). 8: **T8**; size T8. 9: **Manual set**; set by user. 95.18 Set: Unit output current scaling and/or 95.19 Set: Unit input voltage scaling have been changed for e.g. modernization.						
	0 … 9	-	-	1 = 1	y	n	Signal
07.16	**Unit legs set**						
	Number of legs. Amount of legs in the unit. 1: **1**; single-leg circuit. 2: **2**; two-leg circuit. 3: **3**; three-leg circuit.						
	0 … 3	-	-	1 = 1	y	n	Signal
07.17	**Unit output current scaling set**						
	Recognized output current scaling. Displays the output current measurement circuit. Adjustment of the output current measuring channels (SDCS-PIN-H11 or SDCS-PIN-H51). Read from 95.16 Set: Unit type code or set with 95.18 Set: Unit output current scaling: Read from 95.16 Set: Unit type code, if 95.18 Set: Unit output current scaling = 0. Read from 95.18 Set: Unit output current scaling, if 95.18 Set: Unit output current scaling ≠ 0.						
	0 … 30000	-	A	1 = 1 A	y	n	Signal
07.18	**Unit output overcurrent level**						
	Output overcurrent level. Displays the output current tripping level. This signal is set during initialization of the unit. New values are shown after the next power-up. Unit output overcurrent level: 2.3 • 95.16 Set: Unit type code, if 95.18 Set: Unit output current scaling = 0. 2.3 • 95.18 Set: Unit output current scaling, if 95.18 Set: Unit output current scaling ≠ 0.						
	0 … 30000	-	A	1 = 1 A	y	n	Signal
07.19	**Unit input voltage scaling set**						
	Recognized unit input voltage.						

<table>
<tr><th>Index</th><th colspan="7">Name</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Text</td></tr>
<tr><td>Range</td><td>Default</td><td>Unit</td><td>Scale FbEq16</td><td>Volatile</td><td>Change running</td><td>Type</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Displays the input voltage measurement circuit. Adjustment of input voltage measuring channels (SDCS-PIN-H11 or SDCS-PIN-H51). Read from 95.16 Set: Unit type code or set with 95.19 Set: Unit input voltage scaling:
Read from 95.16 Set: Unit type code, if 95.19 Set: Unit input voltage scaling = 0.
Read from 95.19 Set: Unit input voltage scaling, if 95.19 Set: Unit input voltage scaling ≠ 0.</td></tr>
<tr><td>0.0 … 3250.0</td><td>-</td><td>V</td><td>10 = 1 V</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>07.20</td><td colspan="7">Unit max power part temp set</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Recognized maximum power part temperature.
Displays the maximum power part bridge temperature. Read from 95.16 Set: Unit type code or set with 95.20 Set: Unit max power part temp:
Read from 95.16 Set: Unit type code, if 95.20 Set: Unit max power part temp = 0.
Read from 95.20 Set: Unit max power part temp, if 95.20 Set: Unit max power part temp ≠ 0.
The event generates fault 3804Power Part Overtemperature when 07.20 Unit max power part temp set is reached. The event generates warning 2804 Power Part Overtemperature, when the measured power part temperature is approximately 5° below 07.20 Unit max power part temp set.</td></tr>
<tr><td>0 … 150</td><td>-</td><td>°C</td><td>1 = 1°C</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>07.21</td><td colspan="7">Unit Extension Module Status Word</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Status word for extension modules.
Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>High</th><th>Low</th></tr>
<tr><td>0 … 15</td><td>Bit 0 … 15</td><td></td><td></td></tr>
</table></td></tr>
<tr><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>07.30</td><td colspan="7">Adaptive program status</td></tr>
<tr><td></td><td colspan="7">Adaptive program status.
Displays the status of the adaptive program.
Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>Value</th><th>Remarks</th></tr>
<tr><td>0</td><td>Initialized</td><td>1</td><td>Adaptive program initialized.</td></tr>
<tr><td>1</td><td>Editing</td><td>1</td><td>Adaptive program is being edited.</td></tr>
<tr><td>2</td><td>Edit done</td><td>1</td><td>Editing of adaptive program finished.</td></tr>
<tr><td>3</td><td>Running</td><td>1</td><td>Adaptive program running.</td></tr>
<tr><td>4</td><td>reserved</td><td></td><td></td></tr>
<tr><td>5</td><td>reserved</td><td></td><td></td></tr>
<tr><td>6</td><td>reserved</td><td></td><td></td></tr>
<tr><td>7</td><td>reserved</td><td></td><td></td></tr>
<tr><td>8</td><td>reserved</td><td></td><td></td></tr>
<tr><td>9</td><td>reserved</td><td></td><td></td></tr>
<tr><td>10</td><td>reserved</td><td></td><td></td></tr>
<tr><td>11</td><td>reserved</td><td></td><td></td></tr>
<tr><td>12</td><td>reserved</td><td></td><td></td></tr>
</table></td></tr>
</table>

<table>
<tr><th>Index</th><th colspan="7">Name</th></tr>
<tr><th></th><th colspan="7">Text</th></tr>
<tr><th></th><th>Range</th><th>Default</th><th>Unit</th><th>Scale FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7"><table>
<tr><td>13</td><td>reserved</td><td></td><td></td></tr>
<tr><td>14</td><td>State changing</td><td>1</td><td>State change in progress in adaptive programming engine.</td></tr>
<tr><td>15</td><td>Faulted</td><td>1</td><td>Error in adaptive program.</td></tr>
</table></td></tr>
<tr><td></td><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>**07.40**</td><td colspan="7">**IEC application CPU usage peak**</td></tr>
<tr><td></td><td colspan="7">Peak microprocessor load caused by the application program.
Displays the peak load of the microprocessor caused by the application program. 07.40 IEC application Cpu usage peak can be used to check the effect of a given application program on the CPU load.
The value is in percent of an internal microprocessor quota.
Can be reset from the control panel by keeping Reset depressed for over 3 seconds.</td></tr>
<tr><td></td><td>0 … 100</td><td>-</td><td>%</td><td>1 = 1 %</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>**07.41**</td><td colspan="7">**IEC application CPU load average**</td></tr>
<tr><td></td><td colspan="7">Average microprocessor load caused by the application program.
Displays the average load of the microprocessor caused by the application program.
The value is in percent of an internal microprocessor quota.</td></tr>
<tr><td></td><td>0 … 100</td><td>-</td><td>%</td><td>1 = 1 %</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>**07.51**</td><td colspan="7">**Slot 1 option module**</td></tr>
<tr><td></td><td colspan="7">Slot 1 option module.
Displays the option module plugged into slot 1.
0: **No option**; no option module plugged into slot 1.
1: **No communication**; no communication to option module plugged into slot 1.
2: **Unknown**; option module plugged into slot 1 is unknown, wrong type or not valid.
8: **FPBA-01**;
10: **FCAN-01**;
11: **FDNA-01**;
13: **FENA-11**;
19: **FB COMMON**;
22: **FSCA-01**;
23: **FSEA-21**;
25: **FECA-01**;
26: **FENA-21**;
28: **FMAC-01**;
29: **FCNA-01**;
27: **FEPL-02**;
33: **FPTC-01/02**;
1015: **FIO-01**;
1016: **FEN-01**;
1017: **FEN-11**;
1018: **FEN-21**;
1020: **FIO-11**;
1021: **FEN-31**;
1024: **FAIO-01**;
1025: **FDIO-01**;</td></tr>
</table>

Index	Name						
	Text						
	Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
	1026: **FSE-31**;						
	0 … 65535	-	-	1 = 1	y	n	Signal
07.52	**Slot 2 option module**						
	Slot 2 option module. Displays the option module plugged into slot 2. For values, see 07.51 Slot 1 option module.						
	0 … 65535	-	-	1 = 1	y	n	Signal
07.53	**Slot 3 option module**						
	Slot 3 option module. Displays the option module plugged into slot 3. For values, see 07.51 Slot 1 option module.						
	0 … 65535	-	-	1 = 1	y	n	Signal
07.80	**Control unit logic version**						
	Version number of the control unit logic in the FPGA on the SDCS-CON-H01. **Example**: 10.10.0.0 = Firmware version 10.10.						
	0.000.0.0 … 255.255.255.255	-	-	1 = 1	y	n	Signal
07.81	**Ch1 power unit logic version**						
	Version number of the power unit logic in the FPGA on the SDCS-OPL-H01 connected to channel1 of the SDCS-DSL-H1x. **Example**: 10.10.0.0 = Firmware version 10.10.						
	0.000.0.0 … 255.255.255.255	-	-	1 = 1	y	n	Signal

10 Standard DI, RO

Configuration of digital inputs and relay outputs.

Index	Name						
	Text						
	Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
10.01	**DI status**						
	Status of digital inputs. Displays the electrical status of DI1 … DI6 and DIL. The activation/deactivation delays of the inputs (if any are specified) are ignored. A filtering time is defined by 10.51 DI filter time. Bits 0 … 5 reflect the status of DI1 … DI6. Bit 15 reflects the status of the DIL input. **Example**: 1000000000010011b = DIL, DI5, DI2 and DI1 are on, DI3, DI4 and DI6 are off. Bit assignment:						

Bit	Name	Value	Remarks
0	DI1	1	On.
1	DI2	1	On.
2	DI3	1	On.
3	DI4	1	On.
4	DI5	1	On.

Index	Name						
	Text						
	Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type

5	DI6	1	On.
6	reserved		
7	reserved		
8	reserved		
9	reserved		
10	reserved		
11	reserved		
12	reserved		
13	reserved		
14	reserved		
15	DIL	1	On.

0000h … FFFFh	-	-	1 = 1	y	n	Signal

10.02 **DI delayed status**

Delayed status of digital inputs.
Displays the delayed status of DI1 … DI6 and DIL. This word is updated only after activation/deactivation delays (if any are specified).
Bits 0 … 5 reflect the delayed status of DI1 … DI6. Bit 15 reflects the delayed status of the DIL input.
Example: 1000000000010011b = DIIL, DI5, DI2 and DI1 are on, DI3, DI4 and DI6 are off.
Bit assignment:

Bit	Name	Value	Remarks
0	DI1	1	On.
1	DI2	1	On.
2	DI3	1	On.
3	DI4	1	On.
4	DI5	1	On.
5	DI6	1	On.
6	reserved		
7	reserved		
8	reserved		
9	reserved		
10	reserved		
11	reserved		
12	reserved		
13	reserved		
14	reserved		
15	DIL	1	On.

0000h … FFFFh	-	-	1 = 1	y	n	Signal

10.03 **DI force selection**

Override selection for digital inputs.

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**

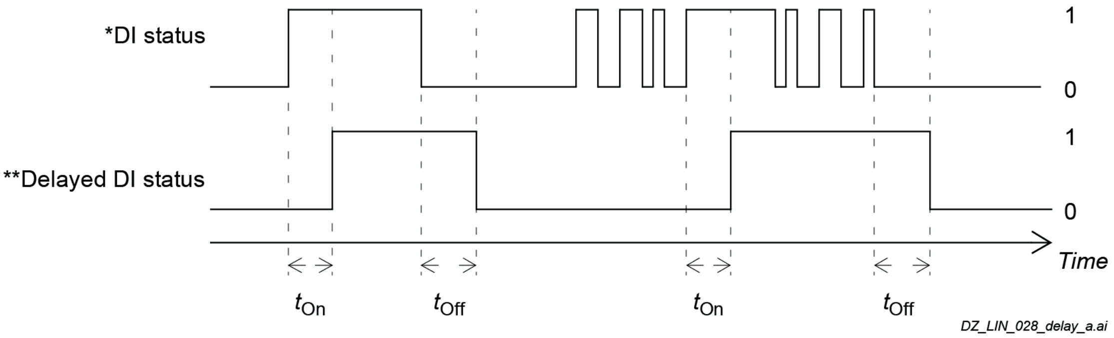
The electrical status of DI1 … DI6 and DIL can be overridden for e.g. testing purposes. A bit in 10.04 DI force data is provided for each digital input and its value is applied whenever the corresponding bit in 10.03 DI force selection is 1.
Bit assignment:

Bit	**Name**	**Value**	**Remarks**
0	DI1	1	Force DI1 to value of bit 0 of 10.04 DI force data.
1	DI2	1	Force DI2 to value of bit 1 of 10.04 DI force data.
2	DI3	1	Force DI3 to value of bit 2 of 10.04 DI force data.
3	DI4	1	Force DI4 to value of bit 3 of 10.04 DI force data.
4	DI5	1	Force DI5 to value of bit 4 of 10.04 DI force data.
5	DI6	1	Force DI6 to value of bit 5 of 10.04 DI force data.
6	reserved		
7	reserved		
8	reserved		
9	reserved		
10	reserved		
11	reserved		
12	reserved		
13	reserved		
14	reserved		
15	DIL	1	Force DIL to value of bit 15 of 10.04 DI force data.

	0000h … FFFFh	0000h	-	1 = 1	y	y	Parameter
10.04	**DI force data**						

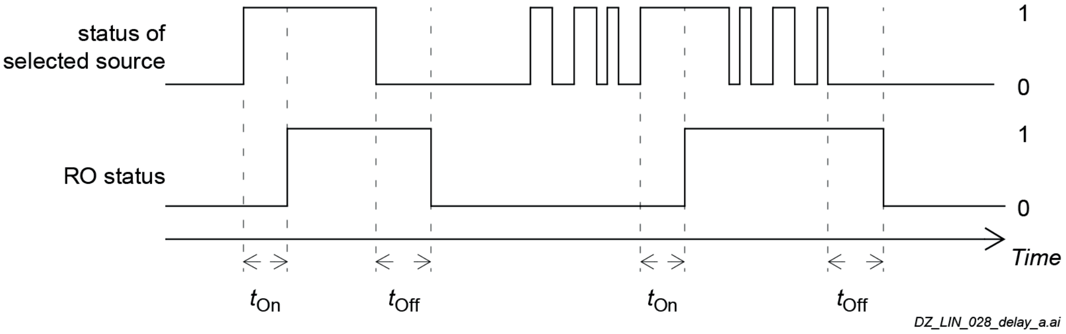
Forced values of digital inputs.
Allows the data value of a forced DI1 … DI6 and DIL to be changed from 0 to 1. It is only possible to force an input that has been selected in 10.03 DI force selection.
Bits 0 … 5 are the forced values for DI1 … DI6. Bit 15 is the forced value for the DIL input.
Bit assignment:

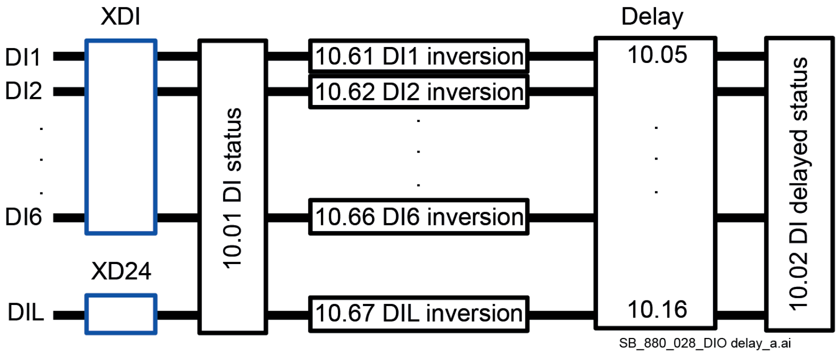
Bit	**Name**	**Value**	**Remarks**
0	DI1	1	Force DI1 to on.
1	DI2	1	Force DI2 to on.
2	DI3	1	Force DI3 to on.
3	DI4	1	Force DI4 to on.
4	DI5	1	Force DI5 to on.
5	DI6	1	Force DI6 to on.
6	reserved		
7	reserved		
8	reserved		
9	reserved		
10	reserved		
11	reserved		
12	reserved		

<table>
<tr><th>Index</th><th colspan="7">Name</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Text</td></tr>
<tr><td>Range</td><td>Default</td><td>Unit</td><td>Scale FbEq16</td><td>Volatile</td><td>Change running</td><td>Type</td></tr>
<tr><td rowspan="2"></td><td colspan="7"><table>
<tr><td>13</td><td>reserved</td><td></td><td></td></tr>
<tr><td>14</td><td>reserved</td><td></td><td></td></tr>
<tr><td>15</td><td>DIL</td><td>1</td><td>Force DIL to on.</td></tr>
</table></td></tr>
<tr><td>0000h … FFFFh</td><td>0000h</td><td>-</td><td>1 = 1</td><td>y</td><td>y</td><td>Parameter</td></tr>
<tr><td>10.05</td><td colspan="7">DI1 ON delay</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Activation delay for digital input DI1.
Defines the activation delay for DI1.

t_{On} = 10.05 DI1 ON delay
t_{Off} = 10.06 DI1 OFF delay
*Electrical status of digital input. Indicated by 10.01 DI status.
**Indicated by 10.02 DI delayed status.</td></tr>
<tr><td>0.0 … 3000.0</td><td>0.0</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>10.06</td><td colspan="7">DI1 OFF delay</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Deactivation delay for digital input DI1.
Defines the deactivation delay for DI1.
See 10.05 DI1 ON delay.</td></tr>
<tr><td>0.0 … 3000.0</td><td>0.0</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>10.07</td><td colspan="7">DI2 ON delay</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Activation delay for digital input DI2.
Defines the activation delay for DI2.
See 10.05 DI1 ON delay.</td></tr>
<tr><td>0.0 … 3000.0</td><td>0.0</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>10.08</td><td colspan="7">DI2 OFF delay</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Deactivation delay for digital input DI2.
Defines the deactivation delay for DI2.
See 10.05 DI1 ON delay.</td></tr>
<tr><td>0.0 … 3000.0</td><td>0.0</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>10.09</td><td colspan="7">DI3 ON delay</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Activation delay for digital input DI3.
Defines the activation delay for DI3.
See 10.05 DI1 ON delay.</td></tr>
<tr><td>0.0 … 3000.0</td><td>0.0</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>10.10</td><td colspan="7">DI3 OFF delay</td></tr>
</table>

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	Deactivation delay for digital input DI3. Defines the deactivation delay for DI3. See 10.05 DI1 ON delay.						
	0.0 … 3000.0	0.0	s	10 = 1 s	n	y	Parameter
10.11	**DI4 ON delay**						
	Activation delay for digital input DI4. Defines the activation delay for DI4. See 10.05 DI1 ON delay.						
	0.0 … 3000.0	0.0	s	10 = 1 s	n	y	Parameter
10.12	**DI4 OFF delay**						
	Deactivation delay for digital input DI4. Defines the deactivation delay for DI4. See 10.05 DI1 ON delay.						
	0.0 … 3000.0	0.0	s	10 = 1 s	n	y	Parameter
10.13	**DI5 ON delay**						
	Activation delay for digital input DI5. Defines the activation delay for DI5. See 10.05 DI1 ON delay.						
	0.0 … 3000.0	0.0	s	10 = 1 s	n	y	Parameter
10.14	**DI5 OFF delay**						
	Deactivation delay for digital input DI5. Defines the deactivation delay for DI5. See 10.05 DI1 ON delay.						
	0.0 … 3000.0	0.0	s	10 = 1 s	n	y	Parameter
10.15	**DI6 ON delay**						
	Activation delay for digital input DI6. Defines the activation delay for DI6. See 10.05 DI1 ON delay.						
	0.0 … 3000.0	0.0	s	10 = 1 s	n	y	Parameter
10.16	**DI6 OFF delay**						
	Deactivation delay for digital input DI6. Defines the deactivation delay for DI6. See 10.05 DI1 ON delay.						
	0.0 … 3000.0	0.0	s	10 = 1 s	n	y	Parameter
10.21	**RO status**						
	Status of relay outputs. Status of RO1 … RO3 and the output for the mains contactor (XSMC:1/2). **Example**: 0000000000000001b = RO1 is energized, RO2 … RO3 are de-energized and XSMC:1/2 is off. Bit assignment:						

Bit	Name	Value	Remarks
0	RO1	1	Energized.
1	RO2	1	Energized.
2	RO3	1	Energized.

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	3 … 15 reserved 15 XSMC:1/2 1 On.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
10.24	**RO1 source**						
	Source for relay output RO1. Selects a signal / parameter bit to be connected to RO1. **Other [bit]**; source selection. 0: **Not energized**; output is not energized. 1: **Energized**; output is energized. **40: RO/DIO control word bit0**; bit 0 of 10.99 RO/DIO control word. **41: RO/DIO control word bit1**; bit 1 of 10.99 RO/DIO control word. **42: RO/DIO control word bit2**; bit 2 of 10.99 RO/DIO control word. **43: RO/DIO control word bit8**; bit 8 of 10.99 RO/DIO control word. **44: RO/DIO control word bit9**; bit 9 of 10.99 RO/DIO control word.						
	0 … 44	Not energized	-	1 = 1	n	y	Parameter
10.25	**RO1 ON delay**						
	Activation delay for relay output RO1. Defines the activation delay for RO1.  t_{On} = 10.25 RO1 ON delay t_{Off} = 10.26 RO1 OFF delay						
	0.0 … 3000.0	0.0	s	10 = 1 s	n	y	Parameter
10.26	**RO1 OFF delay**						
	Deactivation delay for relay output RO1. Defines the deactivation delay for RO1. See 10.25 RO1 ON delay.						
	0.0 … 3000.0	0.0	s	10 = 1 s	n	y	Parameter
10.27	**RO2 source**						
	Source for relay output RO2. Selects a signal / parameter bit to be connected to RO2. See 10.24 RO1 source.						
	0 … 44	Not energized	-	1 = 1	n	y	Parameter
10.28	**RO2 ON delay**						
	Activation delay for relay output RO2. Defines the activation delay for RO2.						

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	See 10.25 RO1 ON delay.						
	0.0 … 3000.0	0.0	s	10 = 1 s	n	y	Parameter
10.29	**RO2 OFF delay**						
	Deactivation delay for relay output RO2. Defines the deactivation delay for RO2. See 10.25 RO1 ON delay.						
	0.0 … 3000.0	0.0	s	10 = 1 s	n	y	Parameter
10.30	**RO3 source**						
	Source for relay output RO3. Selects a signal / parameter bit to be connected to RO3. See 10.24 RO1 source.						
	0 … 44	Not energized	-	1 = 1	n	y	Parameter
10.31	**RO3 ON delay**						
	Activation delay for relay output RO3. Defines the activation delay for RO3 See 10.25 RO1 ON delay.						
	0.0 … 3000.0	0.0	s	10 = 1 s	n	y	Parameter
10.32	**RO3 OFF delay**						
	Deactivation delay for relay output RO3. Defines the deactivation delay for RO3. See 10.25 RO1 ON delay.						
	0.0 … 3000.0	0.0	s	10 = 1 s	n	y	Parameter
10.51	**DI filter time**						
	Filter time constant for 10.01 DI status. Defines a filter time constant for 10.01 DI status.						
	0.3 … 100.0	5.0	ms	10 = 1 ms	n	y	Parameter
10.61	**DI1 inversion**						
	Inverts digital input DI1. Inversion selection for digital input DI1.  0: **Direct**; digital input DI1 is not inverted. 1: **Inverted**; digital input DI1 is inverted.						
	0 … 1	Direct	-	1 = 1	n	y	Parameter

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
10.62	**DI2 inversion**						
	Inverts digital input DI2. Inversion selection for digital input DI2. See 10.61 DI1 inversion.						
	0 … 1	Direct	-	1 = 1	n	y	Parameter
10.63	**DI3 inversion**						
	Inverts digital input DI3. Inversion selection for digital input DI3. See 10.61 DI1 inversion.						
	0 … 1	Direct	-	1 = 1	n	y	Parameter
10.64	**DI4 inversion**						
	Inverts digital input DI4. Inversion selection for digital input DI4. See 10.61 DI1 inversion.						
	0 … 1	Direct	-	1 = 1	n	y	Parameter
10.65	**DI5 inversion**						
	Inverts digital input DI5. Inversion selection for digital input DI5. See 10.61 DI1 inversion.						
	0 … 1	Direct	-	1 = 1	n	y	Parameter
10.66	**DI6 inversion**						
	Inverts digital input DI6. Inversion selection for digital input DI6. See 10.61 DI1 inversion.						
	0 … 1	Direct	-	1 = 1	n	y	Parameter
10.67	**DIL inversion**						
	Inverts digital input DIL. Inversion selection for digital input DIL. See 10.61 DI1 inversion.						
	0 … 1	Direct	-	1 = 1	n	y	Parameter
10.99	**RO/DIO control word**						
	Control word for relay outputs (RO) and digital inputs/outputs (DIO). Storage parameter to control relay outputs and digital inputs/outputs via e.g. a fieldbus. To control the relay outputs and the digital inputs/outputs of the unit, send a control word with the bit assignments shown below e.g. as Modbus I/O data (see 58.101 Data I/O 1 … 58.124 Data I/O 24). Example for relay output RO1: 58.101 Data I/O 1 = RO/DIO control word and 10.24 RO1 source = RO/DIO control word bit 0. Bit assignment:						

Bit	Name	Value	Remarks
0	RO1	1	Energized. Bit for relay output RO1. See 10.24 RO1 source.
1	RO2	1	Energized. Bit for relay output RO2. See 10.27 RO2 source.
2	RO3	1	Energized. Bit for relay output RO3. See 10.30 RO3 source.

Index	Name					
	Text					
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**

3	reserved		
4	reserved		
5	reserved		
6	reserved		
7	reserved		
8	DIO1	1	Energized. Bit for digital input/output DIO1. See 11.06 DIO1 output source.
9	DIO2	1	Energized. Bit for digital input/output DIO2. See 11.10 DIO2 output source.
10 … 15	reserved		

Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	n	y	Parameter

11 Standard DIO, FI, FO

Configuration of digital input / outputs and frequency inputs / outputs.

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
11.01	**DIO status**						

Status of digital inputs / outputs.
Displays the status of DIO1 … DIO2. The activation / deactivation delays (if any are specified) are ignored.
Bits 0 … 1 reflect the status of DIO1 … DIO2.
Example: 0000000000000010b = DIO2 is on, DIO1 is off:
Bit assignment:

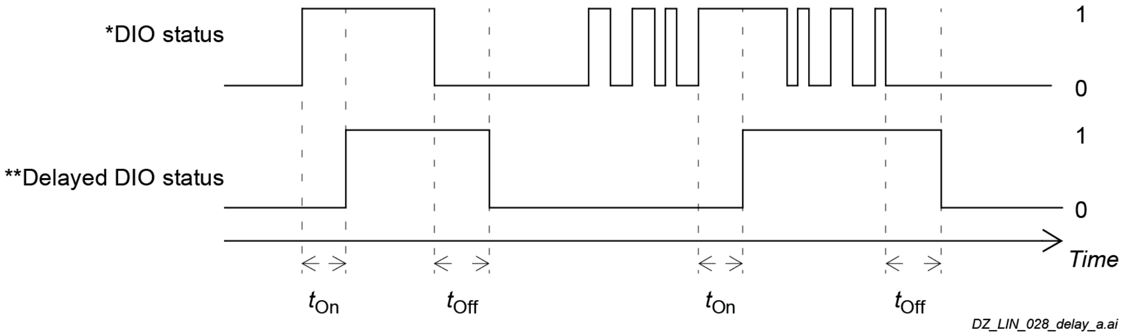
Bit	Name	Value	Remarks
0	DIO1	1	On.
1	DIO2	1	On.
2 … 15	reserved		

Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
0000h … FFFFh	-	-	1 = 1	y	n	Signal

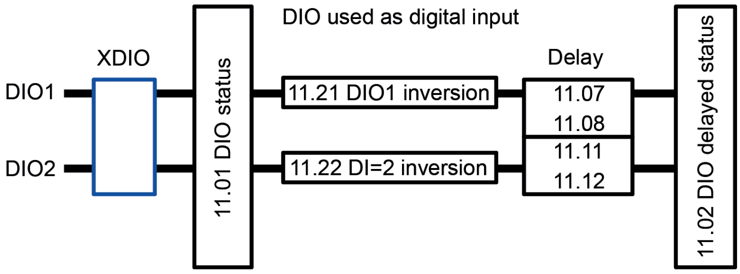
Index	Name
11.02	**DIO delayed status**

Delayed status of digital inputs / outputs.
Displays the delayed status of DIO1 … DIO2. This word is updated only after activation/deactivation delays (if any are specified).
Bits 0 … 1 reflect the status of DIO1 … DIO2.
Example: 0000000000000010b = DIO2 is on, DIO1 is off:
Bit assignment:

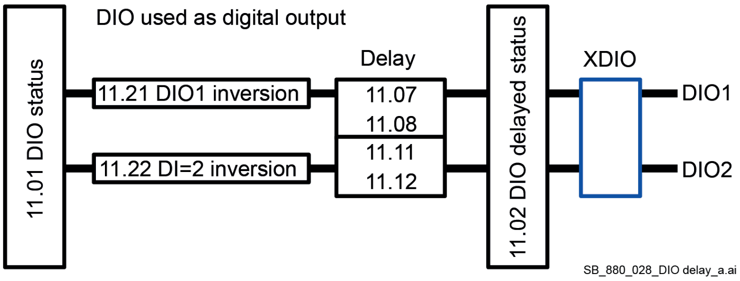
Bit	Name	Value	Remarks
0	DIO1	1	On.
1	DIO2	1	On.
2 … 15	reserved		

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
11.05	**DIO1 function**						
	Function of digital input/output DIO1. Selects whether DIO1 is used as a digital output or input, or a frequency input. 0: **Output**; DIO1 is used as a digital output. 1: **Input**; DIO1 is used as a digital input. 2: **Frequency**; DIO1 is used as a frequency input.						
	0 … 2	Output	-	1 = 1	n	y	Parameter
11.06	**DIO1 output source**						
	Source for digital input/output DIO1. Selects a signal/parameter bit to be connected to DIO1 when 11.05 DIO1 function = Output. **Other [bit]**; source selection. 0: **Not energized**; output is off. 1: **Energized**; output is on. 40: **RO/DIO control word bit0**; bit 0 of 10.99 RO/DIO control word. 41: **RO/DIO control word bit1**; bit 1 of 10.99 RO/DIO control word. 42: **RO/DIO control word bit2**; bit 2 of 10.99 RO/DIO control word. 43: **RO/DIO control word bit8**; bit 8 of 10.99 RO/DIO control word. 44: **RO/DIO control word bit9**; bit 9 of 10.99 RO/DIO control word.						
	0 … 44	Not energized	-	1 = 1	n	y	Parameter
11.07	**DIO1 ON delay**						
	Activation delay for digital input / output DIO1. Defines the activation delay for DIO1 (when used as a digital output or digital input).  t_{On} = 11.07 DIO1 ON delay t_{Off} = 11.08 DIO1 OFF delay *Electrical status of DIO (in input mode) or status of selected source (in output mode). Indicated by 11.01 DIO status. **Indicated by 11.02 DIO delayed status.						
	0.0 … 3000.0	0.0	s	10 = 1 s	n	y	Parameter
11.08	**DIO1 OFF delay**						
	Deactivation delay for digital input / output DIO1. Defines the deactivation delay for DIO1 (when used as a digital output or digital input). See 11.07 DIO1 ON delay.						
	0.0 … 3000.0	0.0	s	10 = 1 s	n	y	Parameter
11.09	**DIO2 function**						

<table>
<tr><th>Index</th><th colspan="7">Name</th></tr>
<tr><th></th><th colspan="7">Text</th></tr>
<tr><th></th><th>Range</th><th>Default</th><th>Unit</th><th>Scale
FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">Function of digital input / output DIO2.
Selects whether DIO2 is used as a digital output or input, or a frequency output.
0: Output; DIO2 is used as a digital output.
1: Input; DIO2 is used as a digital input.
2: Frequency; DIO2 is used as a frequency output.</td></tr>
<tr><td></td><td>0 … 2</td><td>Output</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>11.10</td><td colspan="7">DIO2 output source</td></tr>
<tr><td></td><td colspan="7">Source for digital input/output DIO2.
Selects a signal/parameter bit to be connected to DIO2 when 11.09 DIO2 function = Output.
See 11.06 DIO1 output source.</td></tr>
<tr><td></td><td>0 … 44</td><td>Not energized</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>11.11</td><td colspan="7">DIO2 ON delay</td></tr>
<tr><td></td><td colspan="7">Activation delay for digital input/output DIO2.
Defines the activation delay for DIO2 (when used as a digital output or digital input).
See 11.07 DIO1 ON delay.</td></tr>
<tr><td></td><td>0.0 … 3000.0</td><td>0.0</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>11.12</td><td colspan="7">DIO2 OFF delay</td></tr>
<tr><td></td><td colspan="7">Deactivation delay for digital input/output DIO2.
Defines the deactivation delay for DIO2 (when used as a digital output or digital input).
See 11.07 DIO1 ON delay.</td></tr>
<tr><td></td><td>0.0 … 3000.0</td><td>0.0</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>11.21</td><td colspan="7">DIO1 inversion</td></tr>
<tr><td></td><td colspan="7">Inverts digital input/output DIO1.
Inversion selection for digital input/output DIO1.

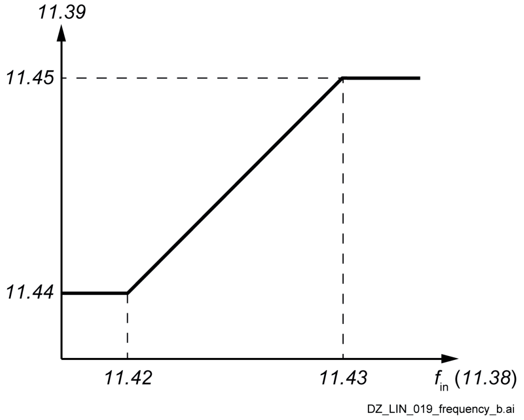


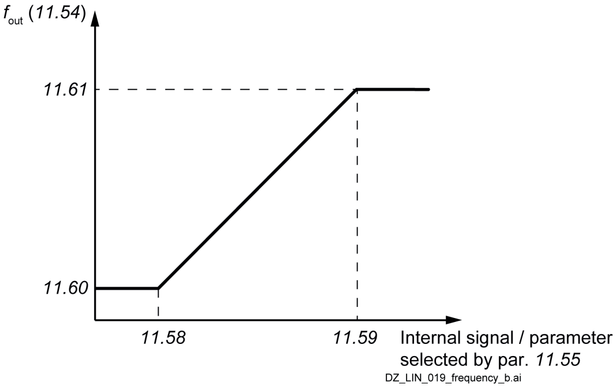
SB_880_028_DIO delay_a.ai

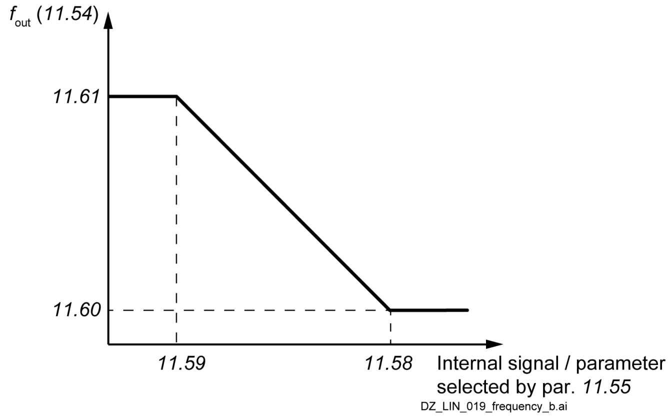


SB_880_028_DIO delay_a.ai

0: Direct; digital input/output DIO1 is not inverted.
1: Inverted; digital input/output DIO1 is inverted.</td></tr>
<tr><td></td><td>0 … 1</td><td>Direct</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
</table>

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
11.22	**DIO2 inversion**						
	Inverts digital input/output DIO2. Inversion selection for digital input/output DIO2. See 11.21 DIO1 inversion.						
	0 … 1	Direct	-	1 = 1	n	y	Parameter
11.38	**Freq in 1 actual value**						
	Unscaled value of frequency input 1. Displays the value of frequency input 1 in Hz (via DIO1 when it is used as a frequency input) before scaling. See 11.42 Freq in 1 min.						
	0 … 16000	-	Hz	1 = 1 Hz	y	n	Signal
11.39	**Freq in 1 scaled**						
	Scaled value of frequency input 1. Displays the value of frequency input 1 (via DIO1 when it is used as a frequency input) after scaling. See 11.42 Freq in 1 min.						
	-32768.000 … 32767.000	-	-	1 = 1	y	n	Signal
11.42	**Freq in 1 min**						
	Minimum frequency of frequency input 1 (DIO1). Defines the minimum input frequency for frequency input 1 in Hz (via DIO1 when it is used as a frequency input). Parameters 11.42 and 11.43 set the low and high limit of the frequency input signal in Hz. Scaling parameters 11.44 and 11.45 define the internal values that correspond to these limits as follows:  DZ_LIN_019_frequency_b.ai						
	0 … 16000	0	Hz	1 = 1 Hz	n	y	Parameter
11.43	**Freq in 1 max**						
	Maximum frequency for frequency input 1 (DIO1). Defines the maximum input frequency for frequency input 1 in Hz (via DIO1 when it is used as a frequency input). See 11.42 Freq in 1 min.						
	0 … 16000	16000	Hz	1 = 1 Hz	n	y	Parameter
11.44	**Freq in 1 at scaled min**						
	Internal value corresponding to the minimum value of frequency input 1 (DIO1).						

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	Defines the value that corresponds internally to the minimum input frequency defined by 11.42 Freq in 1 min (via DIO1 when it is used as a frequency input). See 11.42 Freq in 1 min.						
	-32768.000 … 32767.000	0.000	-	1 = 1	n	y	Parameter
11.45	**Freq in 1 at scaled max**						
	Internal value corresponding to the maximum value of frequency input 1 (DIO2). Defines the value that corresponds internally to the maximum input frequency defined by 11.43 Freq in 1 max (via DIO1 when it is used as a frequency input). See 11.42 Freq in 1 min.						
	-32768.000 … 32767.000	1500.000	-	1 = 1	n	y	Parameter
11.54	**Freq out 1 actual value**						
	Value of frequency output 1 (DIO2). Displays the value of frequency output 1 after scaling in Hz (via DIO2 when it is used as a frequency output). See 11.58 Freq out 1 src min.						
	0 … 16000	-	Hz	1 = 1 Hz	y	n	Signal
11.55	**Freq out 1 source**						
	Source for frequency output 1 (DIO2). Selects a signal/parameter to be connected to frequency output 1 (via DIO2 when it is used as a frequency output). **Other**; source selection. 0: **Zero**; output not in use.						
	0 … 0	Zero	-	1 = 1	n	y	Parameter
11.58	**Freq out 1 src min**						
	Internal value corresponding to minimum value of frequency output 1 (DIO2). Defines the internal value that corresponds to the minimum frequency of frequency output 1 (via DIO2 when it is used as a frequency output). Scaling parameters 11.58 and 11.59 set the low and high internal limits that corresponds to the frequency output values in Hz defined by parameters 11.60 and 11.61:  Setting parameter 11.58 as maximum value and parameter 11.59 as minimum value inverts the output:						

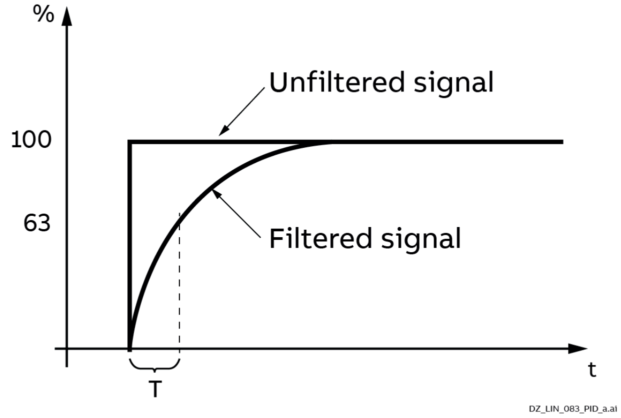
Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
							
	-32768.000 … 32767.000	0.000	-	1 = 1	n	y	Parameter
11.59	**Freq out 1 src max**						
	Internal value corresponding to maximum value of frequency output 1 (DIO2). Defines the internal value that corresponds to the maximum frequency of frequency output 1 (via DIO2 when it is used as a frequency output). See 11.58 Freq out 1 src min.						
	-32768.000 … 32767.000	1500.000	-	1 = 1	n	y	Parameter
11.60	**Freq out 1 at src min**						
	Minimum value of frequency output 1 (DIO2). Defines the minimum frequency of frequency output 1 in Hz (via DIO2 when it is used as a frequency output). See 11.58 Freq out 1 src min.						
	0 … 16000	0	Hz	1 = 1 Hz	n	y	Parameter
11.61	**Freq out 1 at src max**						
	Maximum value of frequency output 1 (DIO2). Defines the maximum frequency of frequency output 1 in Hz (via DIO2 when it is used as a frequency output). See 11.58 Freq out 1 src min.						
	0 … 16000	16000	Hz	1 = 1 Hz	n	y	Parameter

12 Standard AI

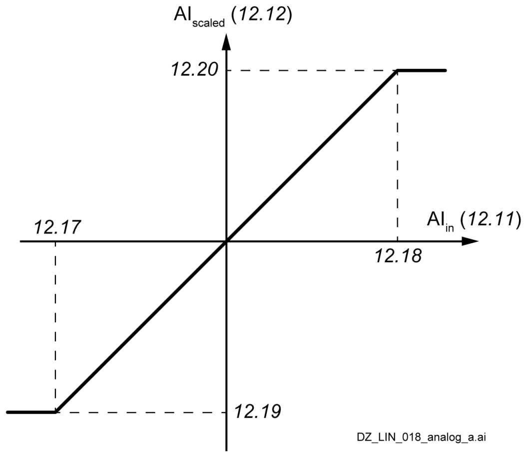
Configuration of standard analog inputs.

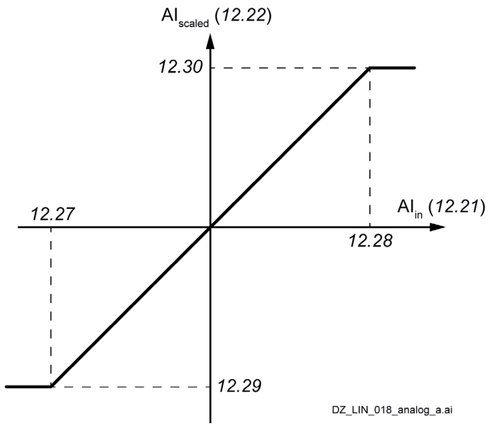
Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
12.03	**AI supervision function**						
	Supervision function analog inputs. Selects how the unit reacts when AI1 … AI3 signals move out of the minimum and/or maximum limits specified for the input. The inputs and the limits to be observed are selected by 12.04 AI supervision selection. 0: **No action**; no action taken.						

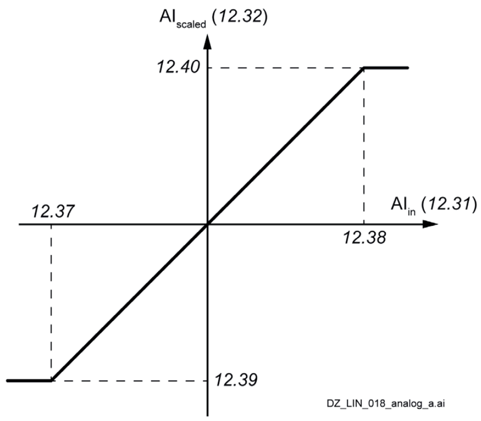
<table>
<tr><th>Index</th><th colspan="7">Name</th></tr>
<tr><th></th><th colspan="7">Text</th></tr>
<tr><th></th><th>Range</th><th>Default</th><th>Unit</th><th>Scale FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">1: Fault; the event generates fault 5551 AI supervision.
2: Warning; the event generates warning 1127 AI supervision.</td></tr>
<tr><td></td><td>0 … 2</td><td>No action</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>12.04</td><td colspan="7">AI supervision selection</td></tr>
<tr><td></td><td colspan="7">Activation of analog input supervision.
Specifies which limits of AI1 … AI3 are supervised by12.03 AI supervision function:
Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>Value</th><th>Remarks</th></tr>
<tr><td>0</td><td>AI1 < MIN</td><td>1</td><td>Minimum limit supervision of AI1 active. See12.17 AI1 min.</td></tr>
<tr><td>1</td><td>AI1 > MAX</td><td>1</td><td>Maximum limit supervision of AI1 active. See 12.18 AI1 max.</td></tr>
<tr><td>2</td><td>AI2 < MIN</td><td>1</td><td>Minimum limit supervision of AI2 active. See12.27 AI2 min.</td></tr>
<tr><td>3</td><td>AI2 > MAX</td><td>1</td><td>Maximum limit supervision of AI2 active. See 12.28 AI2 max.</td></tr>
<tr><td>4</td><td>AI3 < MIN</td><td>1</td><td>Minimum limit supervision of AI3 active. See12.37 AI3 min.</td></tr>
<tr><td>5</td><td>AI3 > MAX</td><td>1</td><td>Maximum limit supervision of AI3 active. See 12.38 AI3 max.</td></tr>
<tr><td>6 … 15</td><td>reserved</td><td></td><td></td></tr>
</table>
The supervision applies a margin of 0.5 V or 1.0 mA, see12.15 AI1 unit selection, to the limits.
Examples:
– 12.17 AI1 min = 4.000 V. The minimum limit supervision activates at values lower than 3.500 V. The limit supervision clears at values greater than 4.000 V.
– 12.18 AI1 max = 7.000 V. The maximum limit supervision activates at values greater than 7.500 V. The limit supervision clears at values lower than 7.000 V.
– 12.17 AI1 min = 4.000 mA. The minimum limit supervision activates at values lower than 3.000 mA. The limit supervision clears at values greater than 4.000 mA.
– 12.18 AI1 max = 7.000 mA. The maximum limit supervision activates at values greater than 8.000 mA. The limit supervision clears at values lower than 7.000 mA.</td></tr>
<tr><td></td><td>0000h … FFFFh</td><td>0000h</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>12.11</td><td colspan="7">AI1 actual value</td></tr>
<tr><td></td><td colspan="7">Value of analog input AI1.
Displays the value of AI1 in mA or V corresponding to the setting of jumper J1 (see chapter Jumpers and switches of this manual).</td></tr>
<tr><td></td><td>-22.000 … 22.000 or -11.000 … 11.000</td><td>-</td><td>mA or V</td><td>1000 = 1 mA or V</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>12.12</td><td colspan="7">AI1 scaled value</td></tr>
<tr><td></td><td colspan="7">Scaled value of analog input AI1.
Displays the value of AI1 after scaling.
See 12.19 AI1 scaled at AI1 min and 12.20 AI1 scaled at AI1 max.</td></tr>
<tr><td></td><td>-32768.000 … 32767.000</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>12.14</td><td colspan="7">AI1 offset</td></tr>
<tr><td></td><td colspan="7">Offset for analog input AI1.
Adds an offset to 12.11 AI1 actual value.</td></tr>
<tr><td></td><td>-0.100 … 0.100</td><td>0.000</td><td>mA or V</td><td>1000 = 1 mA or V</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>12.15</td><td colspan="7">AI1 unit selection</td></tr>
</table>

<table>
<tr><th>Index</th><th colspan="7">Name</th></tr>
<tr><th></th><th colspan="7">Text</th></tr>
<tr><th></th><th>Range</th><th>Default</th><th>Unit</th><th>Scale FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">Unit selection of analog input AI1.
Selects the unit for readings and settings related to AI1. Set to either mA or V corresponding to the setting of jumper J1 (see chapter Jumpers and switches of this manual).
2: **V**; volts.
10: **mA**; milliamps.</td></tr>
<tr><td></td><td>2 … 10</td><td>V</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**12.16**</td><td colspan="7">**AI1 filter time**</td></tr>
<tr><td></td><td colspan="7">Filter time constant of analog input AI1.
Defines the filter time constant for AI1.

O = I x (1-e$^{t/T}$)

I = filter input (step)
O = filter output
t = time
T = filter time constant
The signal is also filtered due to the analog input hardware (approximately 0.25 ms time constant). This cannot be changed by any parameter.</td></tr>
<tr><td></td><td>0.000 … 30.000</td><td>0.100</td><td>s</td><td>1000 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**12.17**</td><td colspan="7">**AI1 min**</td></tr>
<tr><td></td><td colspan="7">Minimum value of analog input AI1.
Defines the minimum input value for AI1 in mA or V.
Parameters 12.17 and 12.18 set the low and high limit of the analog input signal in mA or V. Scaling parameters 12.19 and 12.20 define the internal values that correspond to these limits as follows:</td></tr>
</table>

Index	Name Text Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
							
	-22.000 … 22.000 or -11.000 … 11.000	-20.000 or -10.000	mA or V	1000 = 1 mA or V	n	y	Parameter
12.18	**AI1 max**						
	Maximum value of analog input AI1. Defines the maximum input value for AI1 in mA or V. See 12.17 AI1 min.						
	-22.000 … 22.000 or -11.000 … 11.000	20.000 or 10.000	mA or V	1000 = 1 mA or V	n	y	Parameter
12.19	**AI1 scaled at AI1 min**						
	Internal value corresponding to minimum analog input AI1 value. Defines the internal value that corresponds to the minimum AI1 value defined by 12.17 AI1 min. Changing the polarity settings of 12.19 and 12.20 can effectively invert the analog input. See 12.17 AI1 min.						
	-32768.000 … 32767.000	-100.000	-	1 = 1	n	y	Parameter
12.20	**AI1 scaled at AI1 max**						
	Internal value corresponding to maximum analog input AI1 value. Defines the internal value that corresponds to the maximum AI1 value defined by 12.18 AI1 max. See 12.17 AI1 min.						
	-32768.000 … 32767.000	100.000	-	1 = 1	n	y	Parameter
12.21	**AI2 actual value**						
	Value of analog input AI2. Displays the value of AI2 in mA or V corresponding to the setting of jumper J2 (see chapter Jumpers and switches of this manual).						
	-22.000 … 22.000 or -11,000 … 11,000	-	mA or V	1000 = 1 mA or V	y	n	Signal
12.22	**AI2 scaled value**						
	Scaled value of analog input AI2. Displays the value of analog input AI2 after scaling. See parameters 12.29 AI2 scaled at AI2 min and 12.30 AI2 scaled at AI2 max.						
	-32768.000 … 32767.000	-	-	1 = 1	y	n	Signal
12.24	**AI2 offset**						
	Offset for analog input AI2.						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	Adds an offset to 12.21 AI2 actual value.						
	-0.100 … 0.100	0.000	mA or V	1000 = 1 mA or V	n	y	Parameter
12.25	**AI2 unit selection**						
	Unit selection of analog input AI2. Selects the unit for readings and settings related to AI2. Set to either mA or V corresponding to the setting of jumper J2 (see chapter Jumpers and switches of this manual). 2: **V**; volts. 10: **mA**; milliamps.						
	2 … 10	V	-	1 = 1	n	y	Parameter
12.26	**AI2 filter time**						
	Filter time constant of analog input AI2. Defines the filter time constant for AI2. See 12.16 AI1 filter time.						
	0.000 … 30.000	0.100	s	1000 = 1 s	n	y	Parameter
12.27	**AI2 min**						
	Minimum value of analog input AI2. Defines the minimum input value for analog input AI2 in mA or V. Parameters 12.27 and 12.28 set the low and high limit of the analog input signal in mA or V. Scaling parameters 12.29 and 12.30 define the internal values that correspond to these limits as follows:  						
	-22.000 … 22.000 or -11,000 … 11,000	-20.000 or -10.000	mA or V	1000 = 1 mA or V	n	y	Parameter
12.28	**AI2 max**						
	Maximum value of analog input AI2. Defines the maximum input value for AI2 in mA or V. See 12.27 AI2 min.						
	-22.000 … 22.000 or -11,000 … 11,000	20.000 or 10.000	mA or V	1000 = 1 mA or V	n	y	Parameter
12.29	**AI2 scaled at AI2 min**						
	Internal value corresponding to minimum analog input AI2 value. Defines the internal value that corresponds to the minimum AI2 value defined by 12.27 AI2 min. Changing the polarity settings of 12.29 and 12.30 can effectively invert the analog input.						

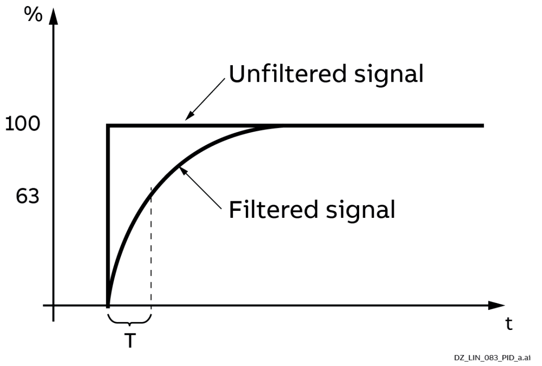
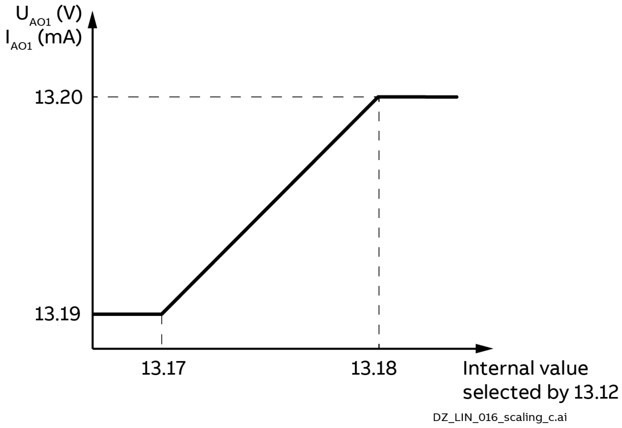
<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">See 12.27 AI2 min.</td></tr>
<tr><td>-32768.000 … 32767.000</td><td>-100.000</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>12.30</td><td colspan="7">AI2 scaled at AI2 max</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Internal value corresponding to maximum analog input AI2 value.
Defines the internal value that corresponds to the maximum AI2 value defined by 12.28 AI2 max.
See 12.27 AI2 min.</td></tr>
<tr><td>-32768.000 … 32767.000</td><td>100.000</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>12.31</td><td colspan="7">AI3 actual value</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Value of analog input AI3.
Displays the value of AI3 in V.</td></tr>
<tr><td>-11.000 … 11.000</td><td>-</td><td>V</td><td>1000 = 1 V</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>12.32</td><td colspan="7">AI3 scaled value</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Scaled value of analog input AI3.
Displays the value of AI3 after scaling.
See 12.39 AI3 scaled at AI3 min and 12.40 AI3 scaled at AI3 max.</td></tr>
<tr><td>-32768.000 … 32767.000</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>12.34</td><td colspan="7">AI3 offset</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Offset for analog input AI3.
Adds an offset to 12.31 AI3 actual value.</td></tr>
<tr><td>-0.100 … 0.100</td><td>0.000</td><td>V</td><td>1000 = 1 V</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>12.36</td><td colspan="7">AI3 filter time</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Filter time constant of analog input AI3.
Defines the filter time constant for analog input AI3.
See 12.16 AI1 filter time.</td></tr>
<tr><td>0.000 … 30.000</td><td>0.100</td><td>s</td><td>1000 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>12.37</td><td colspan="7">AI3 min</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Minimum value of analog input AI3.
Defines the minimum input value for AI3 in V.
Parameters 12.37 and 12.38 set the low and high limit of the analog input signal in V. Scaling parameters 12.39 and 12.40 define the internal values that correspond to these limits as follows:

 </td></tr>
<tr><td>-11.000 … 11.000</td><td>-10.000</td><td>V</td><td>1000 = 1 V</td><td>n</td><td>y</td><td>Parameter</td></tr>
</table>

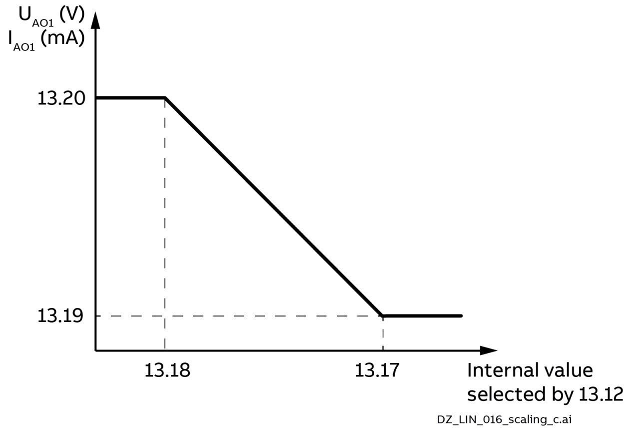
Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
12.38	**AI3 max**						
	Maximum value of analog input AI3. Defines the maximum input value for AI3 in V. See 12.37 AI3 min.						
	-11.000 … 11.000	10.000	V	1000 = 1 V	n	y	Parameter
12.39	**AI3 scaled at AI3 min**						
	Internal value corresponding to minimum analog input AI3 value. Defines the internal value that corresponds to the minimum AI3 value defined by 12.37 AI3 min. Changing the polarity settings of 12.39 and 12.40 can effectively invert the analog input. See 12.37 AI3 min.						
	-32768.000 … 32767.000	-100.000	-	1 = 1	n	y	Parameter
12.40	**AI3 scaled at AI3 max**						
	Internal value corresponding to maximum analog input AI3 value. Defines the internal value that corresponds to the maximum AI3 value defined by 12.38 AI3 max. See 12.37 AI3 min.						
	-32768.000 … 32767.000	100.000	-	1 = 1	n	y	Parameter

13 Standard AO

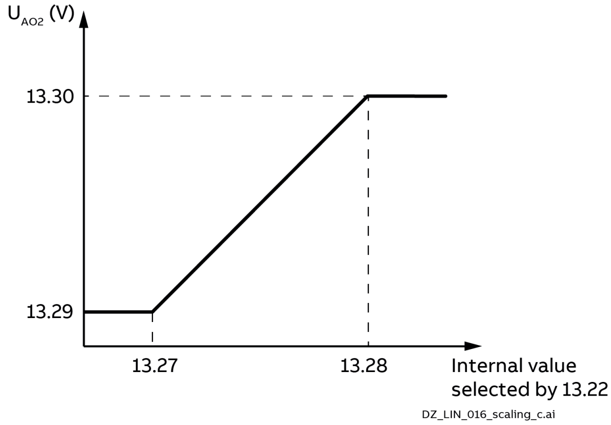
Configuration of standard analog outputs.

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
13.11	**AO1 actual value**						
	Value of analog output AO1. Displays the value of AO1 in mA or V corresponding to the setting of jumper J5 (see chapter Jumpers and switches of this manual).						
	0.000 … 22.000 or -10,000 … 10,000	-	mA or V	1000 = 1 mA or V	y	n	Signal
13.12	**AO1 source**						
	Source for analog output AO1. Selects a signal/parameter to be connected to AO1. Alternatively, sets the output to excitation mode to feed a constant current to a temperature sensor. **Other**; source selection. 0: **Zero**; none. 37: **AO1 data storage**; see 13.91 AO1 data storage. 38: **AO2 data storage**; see 13.92 AO2 data storage.						
	0 … 38	Zero	-	1 = 1	n	y	Parameter
13.15	**AO1 unit selection**						
	Unit selection of analog output AO1. Selects the unit for readings and settings related to AO1. Set to either mA or V corresponding to the setting of jumper J5 (see chapter Jumpers and switches of this manual). 2: **V**; volts.						

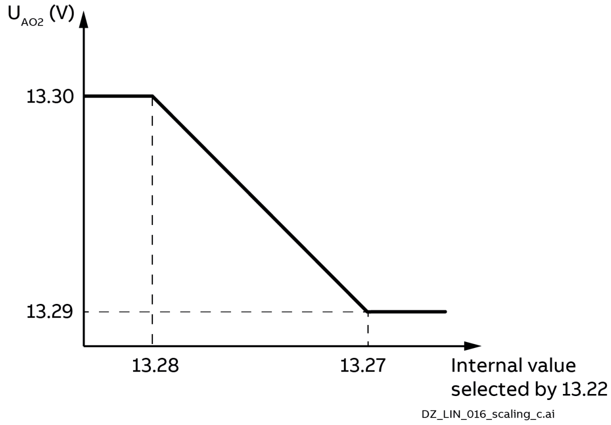
Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	10: **mA**; milli amperes.						
	2 … 10	V	-	1 = 1	n	y	Parameter
13.16	**AO1 filter time**						
	Filter time constant of analog output AO1. Defines the filter time constant for AO1.  O = I x (1-$e^{t/T}$) I = filter input (step) O = filter output t = time T = filter time constant						
	0.000 … 30.000	0.100	s	1000 = 1 s	n	y	Parameter
13.17	**AO1 source min**						
	Internal value corresponding to minimum analog output AO1 value. Defines the internal value that corresponds to the minimum required AO1 value. Scaling parameters 13.17 and 13.18 set the low and high internal limits that corresponds to the analog output values in mA or V defined by parameters 13.19 and 13.20:  Setting parameter 13.17 as maximum value and parameter 13.18 as minimum value inverts the output:						

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
							
	-32768.0 … 32767.0	-100.0	-	1 = 1	n	y	Parameter
13.18	**AO1 source max**						
	Internal value corresponding to maximum analog output AO1 value. Defines the internal value that corresponds to the maximum required AO1 value. See 13.17 AO1 source min.						
	-32768.0 … 32767.0	100.0	-	1 = 1	n	y	Parameter
13.19	**AO1 out at AO1 src min**						
	Minimum analog output AO1 value. Defines the minimum output value for AO1 in mA or V. See 13.17 AO1 source min.						
	0.000 … 22.000 or -10,000 … 10,000	0.000 or -10.000	mA or V	1000 = 1 mA or V	n	y	Parameter
13.20	**AO1 out at AO1 src max**						
	Maximum analog output AO1 value. Defines the maximum output value for AO1 in mA or V. See 13.17 AO1 source min.						
	0.000 … 22.000 or -10,000 … 10,000	20.000 or 10.000	mA or V	1000 = 1 mA or V	n	y	Parameter
13.21	**AO2 actual value**						
	Value of analog output AO2. Displays the value of AO2 in V.						
	-10.000 … 10.000	-	V	1000 = 1 V	y	n	Signal
13.22	**AO2 source**						
	Source for analog output AO2. Selects a signal/parameter to be connected to AO2. See 13.12 AO1 source.						
	0 … 38	Zero	-	1 = 1	n	y	Parameter
13.26	**AO2 filter time**						
	Filter time constant of analog output AO2. Defines the filter time constant for AO2. See 13.16 AO1 filter time.						

<table>
<tr><th>Index</th><th colspan="7">Name</th></tr>
<tr><td></td><th colspan="7">Text</th></tr>
<tr><td></td><th>Range</th><th>Default</th><th>Unit</th><th>Scale FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td>0.000 … 30.000</td><td>0.100</td><td>s</td><td>1000 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>13.27</td><td colspan="7">AO2 source min</td></tr>
<tr><td></td><td colspan="7">Internal value corresponding to minimum analog output AO2 value.
Defines the internal value that corresponds to the minimum required AO2 value.
Scaling parameters 13.27 and 13.28 set the low and high internal limits that corresponds to the analog output values in V defined by parameters 13.29 and 13.30:



Setting parameter 13.27 as maximum value and 13.28 as minimum value inverts the output:


</td></tr>
<tr><td></td><td>-32768.0 … 32767.0</td><td>-100.0</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>13.28</td><td colspan="7">AO2 source max</td></tr>
<tr><td></td><td colspan="7">Internal value corresponding to maximum analog output AO2 value.
Defines the internal value that corresponds to the maximum required AO2 value.
See 13.27 AO2 source min.</td></tr>
<tr><td></td><td>-32768.0 … 32767.0</td><td>100.0</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>13.29</td><td colspan="7">AO2 out at AO2 src min</td></tr>
<tr><td></td><td colspan="7">Minimum analog output AO2 value.
Defines the minimum output value for AO2 in V.
See 13.27 AO2 source min.</td></tr>
<tr><td></td><td>-10.000 … 10.000</td><td>-10.000</td><td>V</td><td>1000 = 1 V</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>13.30</td><td colspan="7">AO2 out at AO2 src max</td></tr>
<tr><td></td><td colspan="7">Maximum analog output AO2 value.
Defines the maximum output value for AO2 in V.</td></tr>
</table>

Index	Name					
	Text					
	Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
	See 13.27 AO2 source min.						
	-10.000 … 10.000	10.000	V	1000 = 1 V	n	y	Parameter
13.91	**AO1 data storage**						
	Storage parameter for analog output AO1. Storage parameter to set analog output AO1 via e.g. a fieldbus. To set analog output AO1 send a value e.g. via Modbus I/O data (see 58.101 Data I/O 1 … 58.124 Data I/O 24). **Example**: 58.101 Data I/O 1 = AO1 data storage and 13.12 AO1 source = AO1 data storage.						
	-327.68 … 327.67	0.00	-	100 = 1	n	y	Parameter
13.92	**AO2 data storage**						
	Storage parameter for analog output AO2. Storage parameter to set analog output AO2 via e.g. a fieldbus. To set analog output AO2 send a value e.g. via Modbus I/O data (see 58.101 Data I/O 1 … 58.124 Data I/O 24). Example: 58.101 Data I/O 1 = AO2 data storage and 13.22 AO2 source = AO2 data storage.						
	-327.68 … 327.67	0.00	-	100 = 1	n	y	Parameter

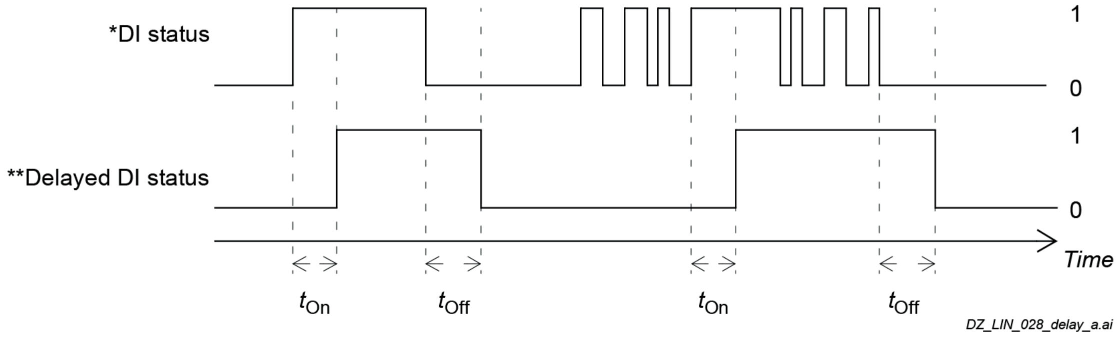
14 I/O extension module 1

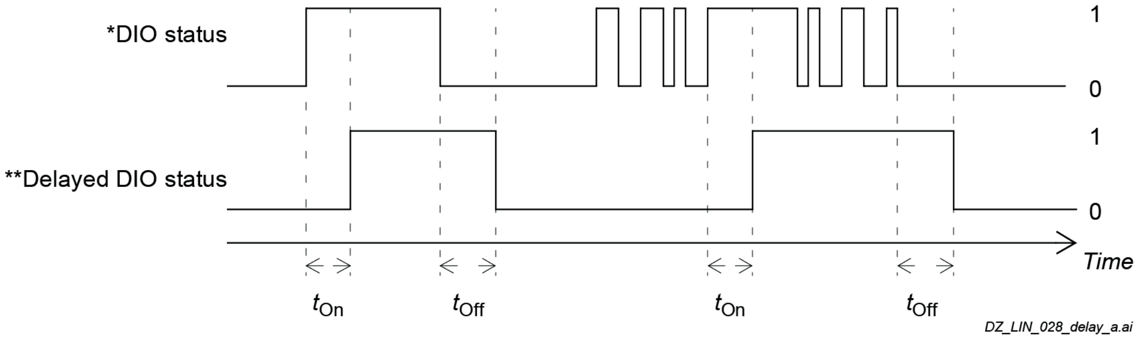
Configuration of I/O extension module 1.
The contents of the parameter group varies according to the selected I/O extension module type.

Index	Name						
	Text						
	Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
14.01	**Module 1 type**						
	First I/O extension module. Activates (and specifies the type of) I/O extension module 1. 0: **None**; inactive. 1: **FIO-01**; adds 4 DIO and 2 RO. 2: **FIO-11**; adds 2 DIO, 3 AI and 1 AO. 3: **FDIO-01**; adds 3 DI and 2 RO. 4: **FAIO-01**; adds 2 AI and 2 AO.						
	0 … 4	None	-	1 = 1	n	n	Parameter
14.02	**Module 1 location**						
	First I/O extension module location. Activates and specifies the slot (1…3) on the unit’s control board into which the I/O extension module 1 is installed. Alternatively, specifies the node ID of the slot on a FEA-03 extension module. 1: **Slot1**; I/O extension module 1 is located in Slot1. 2: **Slot2**; I/O extension module 1 is located in Slot2. 3: **Slot3**; I/O extension module 1 is located in Slot3. **04 … 254**: Node ID of the slot on the FEA-0x extension module. **Note**: The node ID of the slot on a FEA-03 extension module can be typed in. This is only possible with Drive composer.						
	1 … 254	Slot1	-	1 = 1	n	n	Parameter

<table>
<tr><th>Index</th><th colspan="7">Name</th></tr>
<tr><th></th><th colspan="7">Text</th></tr>
<tr><th></th><th>Range</th><th>Default</th><th>Unit</th><th>Scale FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td>**14.03**</td><td colspan="7">**Module 1 status**</td></tr>
<tr><td></td><td colspan="7">First I/O extension module status.
0: **No option**; no module detected in the specified slot.
1: **No communication**; a module has been detected but cannot be communicated with.
2: **Unknown**; the module type is unknown.
15: **FIO-01**; a FIO-01 has been detected and is active.
20: **FIO-11**; a FIO-11 has been detected and is active.
23: **FDIO-01**; a FDIO-01 has been detected and is active.
24: **FAIO-01**; a FAIO-01 has been detected and is active.</td></tr>
<tr><td></td><td>0 … 24</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>**14.05**</td><td colspan="7">**DI status**</td></tr>
<tr><td></td><td colspan="7">Status of digital inputs.
(Visible when 14.01 Module 1 type = FDIO-01)
Displays the electrical status of DI1 … DI3. The activation/deactivation delays of the inputs (if any are specified) are ignored. A filtering time is defined by 14.08 DI filter time.
Bits 0 … 2 reflect the status of DI1 … DI3.
Example: 0000000000000011b = DI2 and DI1 are on, DI3 is off.
Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>Value</th><th>Remarks</th></tr>
<tr><td>0</td><td>DI1</td><td>1</td><td>On.</td></tr>
<tr><td>1</td><td>DI2</td><td>1</td><td>On.</td></tr>
<tr><td>2</td><td>DI3</td><td>1</td><td>On.</td></tr>
<tr><td>3 … 15</td><td>reserved</td><td></td><td></td></tr>
</table></td></tr>
<tr><td></td><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>**14.05**</td><td colspan="7">**DIO status**</td></tr>
<tr><td></td><td colspan="7">Status of digital input / outputs.
(Visible when 14.01 Module 1 type = FIO-01 or FIO-11).
Displays the status of DIO1 … DIO2/DIO4 on the extension module. The activation/deactivation delays (if any are specified) are ignored. A filtering time (for input mode) is defined by 14.08 DIO filter time.
Bit 0 … 3 reflect the status of DIO1 … DIO4.
The number of active bits in this parameter depends on the number of digital input/outputs on the extension module.
Example: 0000000000001001b = DIO1 and DIO4 are on, remainder are off.
Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>Value</th><th>Remarks</th></tr>
<tr><td>0</td><td>DIO1</td><td>1</td><td>On.</td></tr>
<tr><td>1</td><td>DIO2</td><td>1</td><td>On.</td></tr>
<tr><td>2</td><td>DIO3</td><td>1</td><td>On.</td></tr>
<tr><td>3</td><td>DIO4</td><td>1</td><td>On.</td></tr>
<tr><td>4 … 15</td><td>reserved</td><td></td><td></td></tr>
</table></td></tr>
<tr><td></td><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
</table>

<table>
<tr><th>Index</th><th colspan="7">Name</th></tr>
<tr><th rowspan="2"></th><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td>**14.06**</td><td colspan="7">**DI delayed status**</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Delayed status of digital inputs.
(Visible when 14.01 Module 1 type = FDIO-01)
Displays the delayed status of DI1 … DI3. This word is updated only after activation/deactivation delays (if any are specified).
Bits 0 … 2 reflect the status of DI1 … DI3.
Example: 0000000000000011b = DI2 and DI1 are on, DI3 is off.
Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>Value</th><th>Remarks</th></tr>
<tr><td>0</td><td>DI1</td><td>1</td><td>On.</td></tr>
<tr><td>1</td><td>DI2</td><td>1</td><td>On.</td></tr>
<tr><td>2</td><td>DI3</td><td>1</td><td>On.</td></tr>
<tr><td>3 … 15</td><td>reserved</td><td></td><td></td></tr>
</table></td></tr>
<tr><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>**14.06**</td><td colspan="7">**DIO delayed status**</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Delayed status of digital input/outputs.
(Visible when 14.01 Module 1 type = FIO-01 or FIO-11).
Displays the delayed status of DIO1 … DIO2/DIO4 on the extension module. This word is updated only after activation/deactivation delays (if any are specified).
Bit 0 … 3 reflect the status of DIO1 … DIO4.
The number of active bits in this parameter depends on the number of digital input/outputs on the extension module.
Example: 000000000000001001b = DIO1 and DIO4 are on, remainder are off.
Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>Value</th><th>Remarks</th></tr>
<tr><td>0</td><td>DIO1</td><td>1</td><td>On.</td></tr>
<tr><td>1</td><td>DIO2</td><td>1</td><td>On.</td></tr>
<tr><td>2</td><td>DIO3</td><td>1</td><td>On.</td></tr>
<tr><td>3</td><td>DIO4</td><td>1</td><td>On.</td></tr>
<tr><td>4 … 15</td><td>reserved</td><td></td><td></td></tr>
</table></td></tr>
<tr><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>**14.08**</td><td colspan="7">**DI filter time**</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Filter time constant for 14.05 DI status.
(Visible when 14.01 Module 1 type = FDIO-01)
Defines a filter time constant for 14.05 DI status.</td></tr>
<tr><td>0.8 … 100.0</td><td>10.0</td><td>ms</td><td>10 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**14.08**</td><td colspan="7">**DIO filter time**</td></tr>
<tr><td></td><td colspan="7">Filter time constant for 14.05 DIO status.
(Visible when 14.01 Module 1 type = FIO-01 or FIO-11)
Defines a filter time constant for 14.05 DIO status.</td></tr>
</table>

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	0.8 … 100.0	10.0	ms	10 = 1 ms	n	y	Parameter
14.09	**DIO1 function**						
	Function of digital input / output DIO1. (Visible when 14.01 Module 1 type = FIO-01 or FIO-11) Selects whether DIO1 of the extension module is used as a digital input or output. 0: **Output**; DIO1 is used as a digital output. 1: **Input**; DIO1 is used as a digital input.						
	0 … 1	Input	-	1 = 1	n	y	Parameter
14.11	**DIO1 output source**						
	Source for digital input/output DIO1. (Visible when 14.01 Module 1 type = FIO-01 or FIO-11) Selects a signal/parameter bit to be connected to DIO1 of the extension module when parameter 14.09 DIO1 function = Output. **Other [bit]**; source selection. 0: **Not energized**; output is off. 1: **Energized**; output is on. 40: **RO/DIO control word bit0**; bit 0 of 10.99 RO/DIO control word. 41: **RO/DIO control word bit1**; bit 1 of 10.99 RO/DIO control word. 42: **RO/DIO control word bit2**; bit 2 of 10.99 RO/DIO control word. 43: **RO/DIO control word bit8**; bit 8 of 10.99 RO/DIO control word. 44: **RO/DIO control word bit9**; bit 9 of 10.99 RO/DIO control word.						
	0 … 44	Not energized	-	1 = 1	n	y	Parameter
14.12	**DI1 ON delay**						
	Activation delay for digital input DI1. (Visible when 14.01 Module 1 type = FDIO-01) Defines the activation delay for DI1.  t_{On} = 14.12 DI1 ON delay t_{Off} = 14.13 DI1 OFF delay *Electrical status of digital input. Indicated by 14.05 DI status. **Indicated by 14.06 DI delayed status.						
	0.00 … 3000.00	0.00	s	10 = 1 s	n	y	Parameter
14.12	**DIO1 ON delay**						
	Activation delay for digital input/output DIO1. (Visible when 14.01 Module 1 type = FIO-01 or FIO-11) Defines the activation delay for DIO1.						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	 t_{On} = 14.12 DIO1 ON delay t_{Off} = 14.13 DIO1 OFF delay *Electrical status of DIO (in input mode) or status of selected source (in output mode). Indicated by 14.05 DIO status. **Indicated by 14.06 DIO delayed status.						
	0.00 … 3000.00	0.00	s	10 = 1 s	n	y	Parameter
14.13	**DI1 OFF delay**						
	Deactivation delay for digital input DI1. (Visible when 14.01 Module 1 type = FDIO-01) Defines the deactivation delay for DI1. See 14.12 DI1 ON delay.						
	0.00 … 3000.00	0.00	s	10 = 1 s	n	y	Parameter
14.13	**DIO1 OFF delay**						
	Deactivation delay for digital input/output DIO1. (Visible when 14.01 Module 1 type = FIO-01 or FIO-11) Defines the deactivation delay for DIO1. See 14.12 DIO1 ON delay.						
	0.00 … 3000.00	0.00	s	10 = 1 s	n	y	Parameter
14.14	**DIO2 function**						
	Function of digital input/output DIO2. (Visible when 14.01 Module 1 type = FIO-01 or FIO-11) Selects whether DIO2 of the extension module is used as a digital input or output. 0: **Output**; DIO2 is used as a digital output. 1: **Input**; DIO2 is used as a digital input.						
	0 … 1	Input	-	1 = 1	n	y	Parameter
14.16	**DIO2 output source**						
	Source for digital input/output DIO2. (Visible when 14.01 Module 1 type = FIO-01 or FIO-11) Selects a signal / parameter bit to be connected to DIO2 when parameter 14.14 DIO2 function = Output. See 14.11 DIO1 output source.						
	0 … 44	Not energized	-	1 = 1	n	y	Parameter
14.17	**DI2 ON delay**						
	Activation delay for digital input / output DIO2. (Visible when 14.01 Module 1 type = FIO-01 or FIO-11)						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	Defines the activation delay for DIO2. See 14.12 DIO1 ON delay.						
	0.00 … 3000.00	0.00	s	10 = 1 s	n	y	Parameter
14.17	**DIO2 ON delay**						
	Activation delay for digital input/output DIO2. (Visible when 14.01 Module 1 type = FIO-01 or FIO-11) Defines the activation delay for DIO2. See 14.12 DIO1 ON delay.						
	0.00 … 3000.00	0.00	s	10 = 1 s	n	y	Parameter
14.18	**DI2 OFF delay**						
	Deactivation delay for digital input DI2. (Visible when 14.01 Module 1 type = FDIO-01) Defines the deactivation delay for DI2. See 14.12 DI1 ON delay.						
	0.00 … 3000.00	0.00	s	10 = 1 s	n	y	Parameter
14.18	**DIO2 OFF delay**						
	Deactivation delay for digital input/output DIO2. (Visible when 14.01 Module 1 type = FIO-01 or FIO-11) Defines the deactivation delay for DIO2. See 14.12 DIO1 ON delay.						
	0.00 … 3000.00	0.00	s	10 = 1 s	n	y	Parameter
14.19	**DIO3 function**						
	Function of digital input/output DIO3. (Visible when 14.01 Module 1 type = FIO-01) Selects whether DIO3 of the extension module is used as a digital input or output. 0: **Output**; DIO3 is used as a digital output. 1: **Input**; DIO3 is used as a digital input.						
	0 … 1	Input	-	1 = 1	n	y	Parameter
14.19	**AI supervision function**						
	Supervision function analog inputs. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Selects how the unit reacts when AI1 … AI2/AI3 signals move out of the minimum and/or maximum limits specified for the input. The inputs and the limits to be observed are selected by parameter 14.20 AI supervision selection. 0: **No action**; no action taken. 1: **Fault**; the event generates fault 80A0 AI supervision. 2: **Warning**; the event generates warning A8A0 AI supervision.						
	0 … 2	No action	-	1 = 1	n	y	Parameter
14.20	**AI supervision selection**						
	Activation of analog input supervision. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Specifies which limits of AI1 … AI2/AI3 are supervised by 14.19 AI supervision function. Bit assignment:						

Bit	Name	Value	Remarks

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**

0	AI1 < MIN	1	Minimum limit supervision of AI1 active. See 14.33 AI1 min.
1	AI1 > MAX	1	Maximum limit supervision of AI1 active. See 14.34 AI1 max.
2	AI2 < MIN	1	Minimum limit supervision of AI2 active. See 14.48 AI2 min.
3	AI2 > MAX	1	Maximum limit supervision of AI2 active. See 14.49 AI2 max.
4	AI3 < MIN	1	Minimum limit supervision of AI3 active. See 14.63 AI3 min.
5	AI3 > MAX	1	Maximum limit supervision of AI3 active. See 14.64 AI3 max.
6 … 15	reserved		

	0000h … FFFFh	0000h	-	1 = 1	n	y	Parameter
14.21	**DIO3 output source**						
	Source for digital input/output DIO3. (Visible when 14.01 Module 1 type = FIO-01) Selects a signal/parameter bit to be connected to DIO3 when 14.19 DIO3 function = Output. See 14.11 DIO1 output source.						
	0 … 44	Not energized	-	1 = 1	n	y	Parameter
14.21	**AI tune**						
	Tuning of minimum and maximum analog input values. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Triggers the analog input tuning function, which uses the actual measurement of minimum and maximum input values instead of potentially inaccurate estimated values. Apply the minimum or maximum signal to the analog input and select the appropriate tuning function. See drawing at 14.33 AI1 min. 0: **No action**; tuning action completed, or no action has been requested. The parameter automatically reverts to this value after any tuning action. 1: **AI1 min tune**; the measured value at AI1 is written as minimum value of AI1 into 14.33 AI1 min. 2: **AI1 max tune**; the measured value at AI1 is written as maximum value of AI1 into 14.34 AI1 max. 3: **AI2 min tune**; the measured value at AI2 is written as minimum value of AI2 into 14.48 AI2 min. 4: **AI2 max tune**; the measured value at AI2 is written as maximum value of AI2 into 14.49 AI2 max. 5: **AI3 min tune**; the measured value at AI3 is written as minimum value of AI3 into 14.63 AI3 min. (Visible when 14.01 Module 1 type = FIO-11) 6: **AI3 max tune**; the measured value at AI3 is written as maximum value of AI3 into 14.64 AI3 max. (Visible when 14.01 Module 1 type = FIO-11)						
	0 … 6	No action	-	1 = 1	y	y	Parameter
14.22	**DI3 ON delay**						
	Activation delay for digital input DI3. (Visible when 14.01 Module 1 type = FDIO-01) Defines the activation delay for DI3. See 14.12 DI1 ON delay.						
	0.00 … 3000.00	0.00	s	10 = 1 s	n	y	Parameter
14.22	**DIO3 ON delay**						
	Activation delay for digital input/output DIO3. (Visible when 14.01 Module 1 type = FIO-01)						

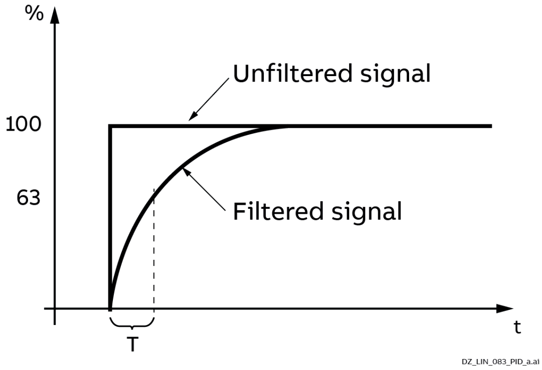
Index	Name						
	Text						
	Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
	Defines the activation delay for DIO3. See 14.12 DIO1 ON delay.						
	0.00 … 3000.00	0.00	s	10 = 1 s	n	y	Parameter
14.22	**AI force selection**						
	Forced values selector for analog inputs. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) The true readings of AI1 … AI2/AI3 can be overridden for e.g. testing purposes. A forced value parameter (see table below) is provided for each analog input and its value is applied whenever the corresponding bit in 14.22 AI force selection is 1. Bit assignment:						

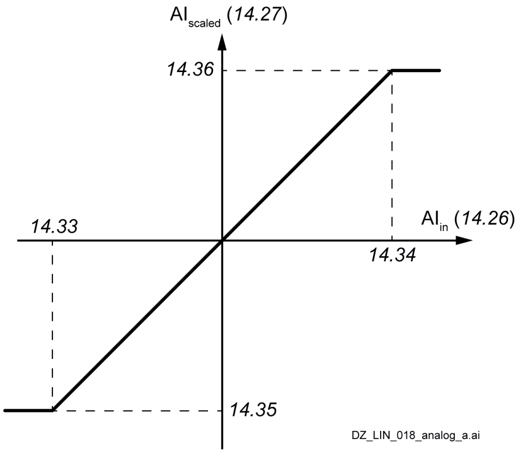
Bit	Name	Value	Remarks
0	AI1	1	Force mode: Force AI1 to value of 14.28 AI1 force data.
1	AI2	1	Force mode: Force AI2 to value of 14.43 AI2 force data.
2	AI3	1	Force mode: Force AI3 to value of 14.58 AI3 force data (FIO-11 only).
3 … 15	reserved		

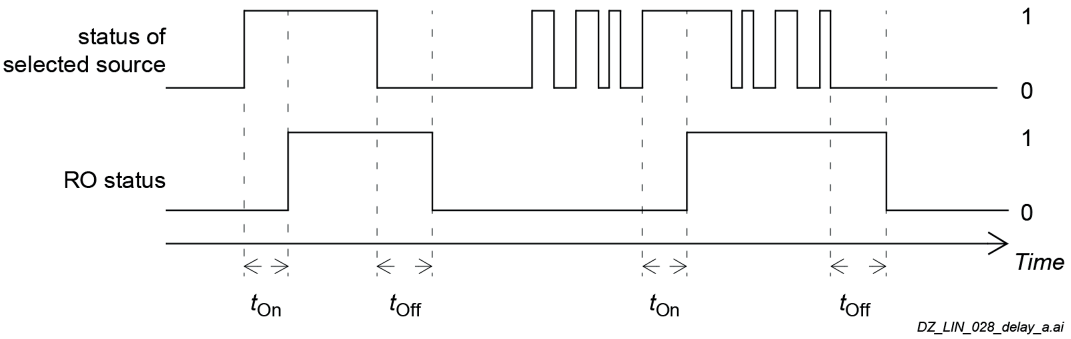
Index	Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
	0000h … FFFFh	0000h	-	1 = 1	y	y	Parameter
14.23	**DI3 OFF delay**						
	Deactivation delay for digital input DI3. (Visible when 14.01 Module 1 type = FDIO-01) Defines the deactivation delay for DI3. See 14.12 DI1 ON delay.						
	0.00 … 3000.00	0.00	s	10 = 1 s	n	y	Parameter
14.23	**DIO3 OFF delay**						
	Deactivation delay for DIO3. (Visible when 14.01 Module 1 type = FIO-01) Defines the deactivation delay for DIO3. See 14.12 DIO1 ON delay.						
	0.00 … 3000.00	0.00	s	10 = 1 s	n	y	Parameter
14.24	**DIO4 function**						
	Function of digital input/output DIO4. (Visible when 14.01 Module 1 type = FIO-01) Selects whether DIO4 of the extension module is used as a digital input or output. 0: **Output**; DIO4 is used as a digital output. 1: **Input**; DIO4 is used as a digital input.						
	0 … 1	Input	-	1 = 1	n	y	Parameter
14.26	**DIO4 output source**						
	Source for digital input/output DIO4. (Visible when 14.01 Module 1 type = FIO-01) Selects a signal/parameter bit to be connected to DIO4 when 14.24 DIO4 function = Output. See 14.11 DIO1 output source.						
	0 … 44	Not energized	-	1 = 1	n	y	Parameter

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
14.26	**AI1 actual value**						
	Value of analog input AI1. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Displays the value of AI1 in mA or V, depending on whether the input is set to current or voltage.						
	-22.000 … 22.000 or -11.000 … 11.000	-	mA or V	1000 = 1 mA or V	y	n	Signal
14.27	**DIO4 ON delay**						
	Activation delay for digital input/output DIO4. (Visible when 14.01 Module 1 type = FIO-01) Defines the activation delay for DIO4. See 14.12 DIO1 ON delay.						
	0.00 … 3000.00	0.00	s	10 = 1 s	n	y	Parameter
14.27	**AI1 scaled value**						
	Scaled value of analog input AI1. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Displays the value of AI1 after scaling. See 14.35 AI1 scaled at AI1 min and 14.36 AI1 scaled at AI1 max.						
	-32768.000 … 32767.000	-	-	1 = 1	y	n	Signal
14.28	**DIO4 OFF delay**						
	Deactivation delay for digital input/output DIO4. (Visible when 14.01 Module 1 type = FIO-01) Defines the deactivation delay for DIO4. See 14.12 DIO1 ON delay.						
	0.00 … 3000.00	0.00	s	01 = 1 s	n	y	Parameter
14.28	**AI1 force data**						
	Forced value of analog input AI1. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Forced value that can be used instead of the true reading of the input. See 14.22 AI force selection.						
	-22.000 … 22.000 or -11.000 … 11.000	0.000	mA or V	1000 = 1 mA or V	y	y	Parameter
14.29	**AI1 HW switch position**						
	Unit selection switch of analog input AI1. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Displays the position of the hardware current/voltage selector on the I/O extension module. The setting of the current/voltage selector must match the unit selection made in 14.30 AI1 unit selection. 2: V; volts. 10: mA; milliamps.						
	2 … 10	-	-	1 = 1	y	n	Signal
14.30	**AI1 unit selection**						
	Unit selection of analog input AI1. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)						

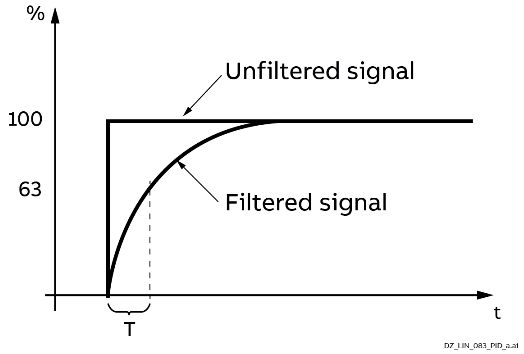
<table>
<tr><th>Index</th><th colspan="7">Name</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Text</td></tr>
<tr><td>Range</td><td>Default</td><td>Unit</td><td>Scale FbEq16</td><td>Volatile</td><td>Change running</td><td>Type</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Selects the unit for readings and settings related to AI1. Set to either mA or V corresponding to the setting of the I/O extension module (see manual of the I/O extension module). The hardware setting is also shown in 14.29 AI1 HW switch position.
2: V; volts.
10: mA; milli amperes.</td></tr>
<tr><td>2 … 10</td><td>mA</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>14.31</td><td colspan="7">RO status</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Status of relay outputs.
(Visible when 14.01 Module 1 type = FIO-01)
Status of RO1 … RO2 on the I/O extension module.
Example: 0000000000000001b = RO1 is energized, RO2 is de-energized.
Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>Value</th><th>Remarks</th></tr>
<tr><td>0</td><td>RO1</td><td>1</td><td>Energized.</td></tr>
<tr><td>1</td><td>RO2</td><td>1</td><td>Energized.</td></tr>
<tr><td>2 … 15</td><td>reserved</td><td></td><td></td></tr>
</table></td></tr>
<tr><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>14.31</td><td colspan="7">AI1 filter gain</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Hardware filter time constant of analog input AI1.
(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)
Selects a hardware filter time for AI1.
See also 14.32 AI1 filter time.
0: No filtering; no filtering.
1: 125 µs; 125 microseconds.
2: 250 µs; 250 microseconds.
3: 500 µs; 500 microseconds.
4: 1 ms; 1 millisecond.
5: 2 ms; 2 milliseconds.
6: 4 ms; 4 milliseconds.
7: 7.9375 ms; 7.9375 milliseconds.</td></tr>
<tr><td>0 … 7</td><td>1 ms</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>14.32</td><td colspan="7">AI1 filter time</td></tr>
<tr><td></td><td colspan="7">Filter time constant of analog input AI1.
(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)
Defines the filter time constant for AI1.</td></tr>
</table>

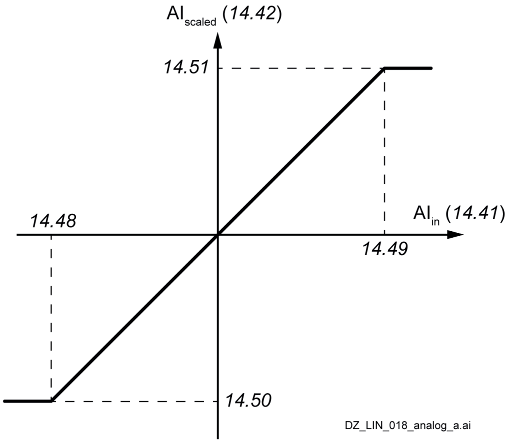
<table>
<tr><th>Index</th><th colspan="7">Name</th></tr>
<tr><th></th><th colspan="7">Text</th></tr>
<tr><th></th><th>Range</th><th>Default</th><th>Unit</th><th>Scale FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">
$O = I x (1-e^{t/T})$

I = filter input (step)
O = filter output
t = time
T = filter time constant
The signal is also filtered due to the analog input hardware. See 14.31 AI1 filter gain.</td></tr>
<tr><td></td><td>0.000 … 30.000</td><td>0.100</td><td>s</td><td>1000 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>14.33</td><td colspan="7">AI1 min</td></tr>
<tr><td></td><td colspan="7">Minimum value of analog input AI1.
(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)
Defines the minimum value for analog input AI1 in mA or V.
Parameters 14.33 and 14.34 set the low and high limit of the analog input signal in mA or V. Scaling parameters 14.35 and 14.36 define the internal values that correspond to these limits as follows:
 </td></tr>
<tr><td></td><td>-22.000 … 22.000 or
-11.000 … 11.000</td><td>-20.000 or
-10.000</td><td>mA or V</td><td>1000 = 1 mA or V</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>14.34</td><td colspan="7">RO1 source</td></tr>
<tr><td></td><td colspan="7">Source for relay output RO1.
(Visible when 14.01 Module 1 type = FIO-01)
Selects a signal/parameter bit to be connected to RO1.
See 14.11 DIO1 output source.</td></tr>
</table>

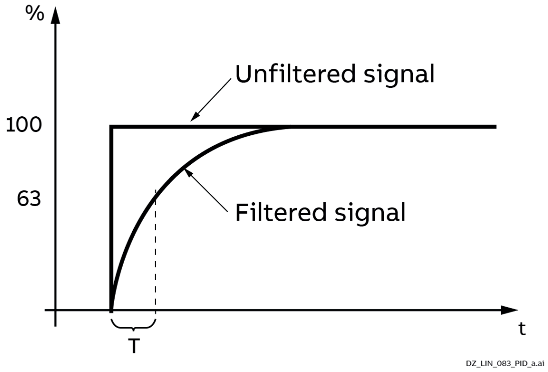
Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	0 … 44	Not energized	-	1 = 1	n	y	Parameter
14.34	**AI1 max**						
	Maximum value of analog input AI1. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Defines the maximum value for AI1 in mA or V. See 14.21 AI tune. See 14.33 AI1 min.						
	-22.000 … 22.000 or -11.000 … 11.000	20.000 or 10.000	mA or V	1000 = 1 mA or V	n	y	Parameter
14.35	**RO1 ON delay**						
	Activation delay for relay output RO1. (Visible when 14.01 Module 1 type = FIO-01) Defines the activation delay for RO1.  t_{On} = 14.35 RO1 ON delay t_{Off} = 14.36 RO1 OFF delay						
	0.00 … 3000.00	0.00	s	10 = 1 s	n	y	Parameter
14.35	**AI1 scaled at AI1 min**						
	Internal value corresponding to minimum analog input AI1 value. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Defines the internal value that corresponds to the minimum AI1 value defined by 14.33 AI1 min. See 14.33 AI1 min.						
	-32768.000 … 32767.000	-100.000	-	1 = 1	n	y	Parameter
14.36	**RO1 OFF delay**						
	Deactivation delay for relay output RO1. (Visible when 14.01 Module 1 type = FIO-01) Defines the deactivation delay for RO1. See 14.35 RO1 ON delay.						
	0.00 … 3000.00	0.00	s	10 = 1 s	n	y	Parameter
14.36	**AI1 scaled at AI1 max**						
	Internal value corresponding to maximum analog input AI1 value. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Defines the internal value that corresponds to the maximum AI1 value defined by 14.34 AI1 max. See 14.33 AI1 min.						
	-32768.000 … 32767.000	100.000	-	1 = 1	n	y	Parameter

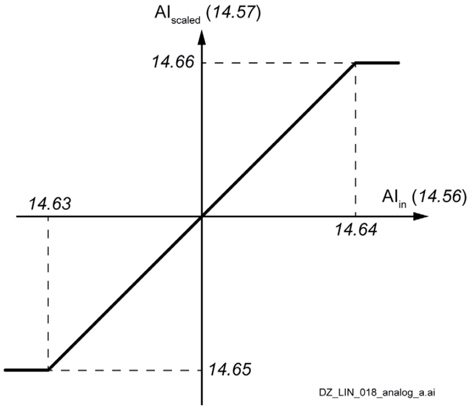
Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
14.37	**RO2 source**						
	Source for relay output RO2. (Visible when 14.01 Module 1 type = FIO-01) Selects a signal/parameter bit to be connected to RO2. See 14.11 DIO1 output source.						
	0 … 44	Not energized	-	1 = 1	n	y	Parameter
14.38	**RO2 ON delay**						
	Activation delay for relay output RO2. (Visible when 14.01 Module 1 type = FIO-01) Defines the activation delay for RO2. See 14.35 RO1 ON delay.						
	0.00 … 3000.00	0.00	s	10 = 1 s	n	y	Parameter
14.39	**RO2 OFF delay**						
	Deactivation delay for relay output RO2. (Visible when 14.01 Module 1 type = FIO-01) Defines the deactivation delay for RO2. See 14.35 RO1 ON delay.						
	0.00 … 3000.00	0.00	s	10 = 1 s	n	y	Parameter
14.41	**AI2 actual value**						
	Value of analog input AI2. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Displays the value of AI2 in mA or V, depending on whether the input is set to current or voltage.						
	-22.000 … 22.000 or -11.000 … 11.000	-	mA or V	1000 = 1 mA or V	y	n	Signal
14.42	**AI2 scaled value**						
	Scaled value of analog input AI2. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Displays the value of AI2 after scaling. See 14.50 AI2 scaled at AI2 min and 14.51 AI2 scaled at AI2 max.						
	-32768.000 … 32767.000	-	-	1 = 1	y	n	Signal
14.43	**AI2 force data**						
	Forced value of analog input AI2. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Forced value that can be used instead of the true reading of the input. See 14.22 AI force selection.						
	-22.000 … 22.000 or -11.000 … 11.000	0.000	mA or V	1000 = 1 mA or V	y	y	Parameter
14.44	**AI2 HW switch position**						
	Unit selection switch of analog input AI2. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Displays the position of the hardware current/voltage selector on the I/O extension module.						

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	The setting of the current/voltage selector must match the unit selection made in 14.45 AI2 unit selection. 2: V; volts. 10: mA; milliamps.						
	2 … 10	-	-	1 = 1	y	n	Signal
14.45	**AI2 unit selection**						
	Unit selection of analog input AI2. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Selects the unit for readings and settings related to AI2. Set to either mA or V corresponding to the setting of the I/O extension module (see the manual of the I/O extension module). The hardware setting is also shown in 14.44 AI2 HW switch position. 2: **V**; volts. 10: **mA**; milli amperes.						
	2 … 10	mA	-	1 = 1	n	y	Parameter
14.46	**AI2 filter gain**						
	Hardware filter time constant of analog input AI2. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Selects a hardware filter time for AI2. See also 14.47 AI2 filter time. 0: **No filtering**; no filtering. 1: **125 µs**; 125 microseconds. 2: **250 µs**; 250 microseconds. 3: **500 µs**; 500 microseconds. 4: **1 ms**; 1 millisecond. 5: **2 ms**; 2 milliseconds. 6: **4 ms**; 4 milliseconds. 7: **7.9375 ms**; 7.9375 milliseconds.						
	0 … 7	1 ms	-	1 = 1	n	y	Parameter
14.47	**AI2 filter time**						
	Filter time constant of analog input AI2. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Defines the filter time constant for AI2.  O = I x (1-$e^{t/T}$) I = filter input (step) O = filter output t = time T = filter time constant The signal is also filtered due to the analog input hardware. See 14.46 AI2 filter gain.						

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	0.000 … 30.000	0.100	s	1000 = 1 s	n	y	Parameter
14.48	**AI2 min**						
	Minimum value of analog input AI2. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Defines the minimum value for AI2 in mA or V. See 14.21 AI tune. Parameters 14.48 and 14.49 set the low and high limit of the analog input signal in mA or V. Scaling parameters 14.50 and 14.51 define the internal values that correspond to these limits as follows:  						
	-22.000 … 22.000 or -11.000 … 11.000	-20.000 or -10.000	mA or V	1000 = 1 mA or V	n	y	Parameter
14.49	**AI2 max**						
	Maximum value of analog input AI2. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Defines the maximum value for AI2 in mA or V. See 14.48 AI2 min.						
	-22.000 … 22.000 or -11.000 … 11.000	20.000 or 10.000	mA or V	1000 = 1 mA or V	n	y	Parameter
14.50	**AI2 scaled at AI2 min**						
	Internal value corresponding to minimum analog input AI2 value. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Defines the internal value that corresponds to the minimum AI2 value defined by 14.48 AI2 min. See 14.48 AI2 min.						
	-32768.000 … 32767.000	-100.000	-	1 = 1	n	y	Parameter
14.51	**AI2 scaled at AI2 max**						
	Internal value corresponding to maximum analog input AI2 value. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Defines the internal value that corresponds to the maximum AI2 value defined by 14.49 AI2 max. See 14.48 AI2 min.						
	-32768.000 … 32767.000	100.000	-	1 = 1	n	y	Parameter

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
14.56	**AI3 actual value**						
	Value of analog input AI3. (Visible when 14.01 Module 1 type = FIO-11) Displays the value of AI3 in mA or V, depending on whether the input is set to current or voltage.						
	-22.000 … 22.000 or -11.000 … 11.000	-	mA or V	1000 = 1 mA or V	y	n	Signal
14.57	**AI3 scaled value**						
	Scaled value of analog input AI3. (Visible when 14.01 Module 1 type = FIO-11) Displays the value of AI3 after scaling. See 14.65 AI3 scaled at AI3 min and 14.66 AI3 scaled at AI3 max.						
	-32768.000 … 32767.000	-	-	1 = 1	y	n	Signal
14.58	**AI3 force data**						
	Forced value of analog input AI3. (Visible when 14.01 Module 1 type = FIO-11) Forced value that can be used instead of the true reading of the input. See 14.22 AI force selection.						
	-22.000 … 22.000 or -11.000 … 11.000	0.000	mA or V	1000 = 1 mA or V	y	y	Parameter
14.59	**AI3 HW switch position**						
	Unit selection switch of analog input AI3. (Visible when 14.01 Module 1 type = FIO-11) Displays the position of the hardware current/voltage selector on the I/O extension module. The setting of the current/voltage selector must match the unit selection made in 14.60 AI3 unit selection. 2: V; volts. 10: mA; milliamps.						
	2 … 10	-	-	1 = 1	y	n	Signal
14.60	**AI3 unit selection**						
	Unit selection of analog input AI3. (Visible when 14.01 Module 1 type = FIO-11) Selects the unit for readings and settings related to AI3. Set to either mA or V corresponding to the setting of the I/O extension module (see manual of the I/O extension module). The hardware setting is also shown in 14.59 AI3 HW switch position. 2: **V**; volts. 10: **mA**; milli amperes.						
	2 … 10	mA	-	1 = 1 mA or V	n	y	Parameter
14.61	**AI3 filter gain**						
	Hardware filter time constant of analog input AI3. (Visible when 14.01 Module 1 type = FIO-11) Selects a hardware filter time for AI3. See also 14.62 AI3 filter time. 0: **No filtering**; no filtering.						

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	1: **125 µs**; 125 microseconds. 2: **250 µs**; 250 microseconds. 3: **500 µs**; 500 microseconds. 4: **1 ms**; 1 millisecond. 5: **2 ms**; 2 milliseconds. 6: **4 ms**; 4 milliseconds. 7: **7.9375 ms**; 7.9375 milliseconds.						
	0 … 7	1 ms	-	1 = 1	n	y	Parameter
14.62	**AI3 filter time**						
	Filter time constant of analog input AI3. (Visible when 14.01 Module 1 type = FIO-11) Defines the filter time constant for AI3.  O = I x (1-$e^{t/T}$) I = filter input (step) O = filter output t = time T = filter time constant The signal is also filtered due to the analog input hardware. See 14.61 AI3 filter gain.						
	0.000 … 30.000	0.100	s	1000 = 1 s	n	y	Parameter
14.63	**AI3 min**						
	Minimum value of analog input AI3. (Visible when 14.01 Module 1 type = FIO-11) Defines the minimum value for AI3 mA or V. See 14.21 AI tune. Parameters 14.63 and 14.64 set the low and high limit of the analog input signal in mA or V. Scaling parameters 14.65 and 14.66 define the internal values that correspond to these limits as follows:						

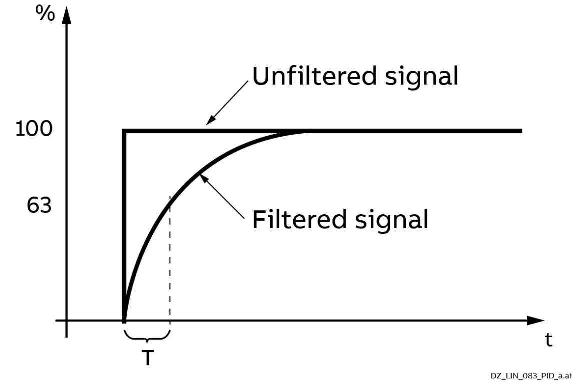
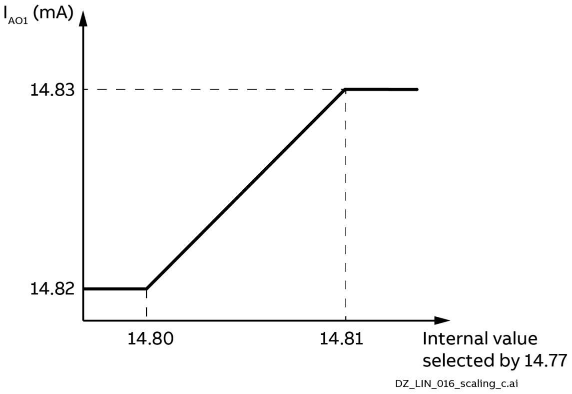
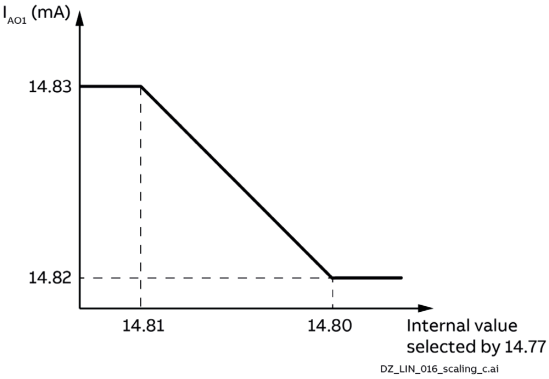
Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
							
	-22.000 … 22.000 or -11.000 … 11.000	-20.000 or -10.000	mA or V	1000 = 1 mA or V	n	y	Parameter
14.64	**AI3 max**						
	Maximum value of analog input AI3. (Visible when 14.01 Module 1 type = FIO-11) Defines the maximum value for AI3 in mA or V. See 14.21 AI tune. See 14.63 AI3 min.						
	-22.000 … 22.000 or -11.000 … 11.000	20.000 or 10.000	mA or V	1000 = 1 mA or V	n	y	Parameter
14.65	**AI3 scaled at AI3 min**						
	Internal value corresponding to minimum analog input AI3 value. (Visible when 14.01 Module 1 type = FIO-11) Defines the internal value that corresponds to the minimum AI3 value defined by 14.63 AI3 min. See 14.63 AI3 min.						
	-32768.000 … 32767.000	-100.000	-	1 = 1	n	y	Parameter
14.66	**AI3 scaled at AI3 max**						
	Internal value corresponding to maximum analog input AI3 value. (Visible when 14.01 Module 1 type = FIO-11) Defines the internal value that corresponds to the maximum AI3 value defined by 14.64 AI3 max. See 14.63 AI3 min.						
	-32768.000 … 32767.000	100.000	-	1 = 1	n	y	Parameter
14.71	**AO force selection**						
	Forced values selector for analog outputs. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) The value of AO1 … AO1/AO2 can be overridden for e.g. testing purposes. A forced value parameter (see table below) is provided for each analog output and its value is applied whenever the corresponding bit in 14.71 AO fore selection is 1. Bit assignment:						

Bit	**Name**	**Value**	**Remarks**
0	AO1	1	Force mode: Force AO1 to value of 14.78 AO1 force data.

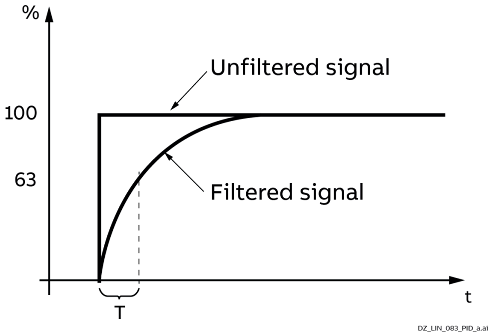
Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**

1	AO2	1	Force mode: Force AO2 to value of 14.88 AO2 force data (FAIO-01 only).
2 … 15	reserved		

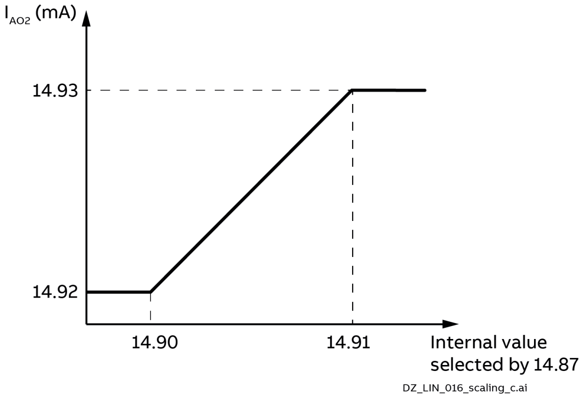
Index	Name						
	0000h … FFFFh	0000h	-	1 = 1	y	y	Parameter
14.76	**AO1 actual value**						
	Value of analog output AO1. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Displays the value of AO1 in mA.						
	0.000 … 22.000	-	mA	1000 = 1 mA	y	n	Signal
14.77	**AO1 source**						
	Source for analog output AO1. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Selects a signal/parameter to be connected to AO1. Alternatively, sets the output to excitation mode to feed a constant current to a temperature sensor. **Other**; source selection. 0: **Zero**; none. 37: **AO1 data storage**; see 13.91 AO1 data storage. 38: **AO2 data storage**; see 13.92 AO2 data storage.						
	0 … 38	Zero	-	1 = 1	n	y	Parameter
14.78	**AO1 force data**						
	Forced value of analog output AO1. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Forced value that can be used instead of the selected output signal. See 14.71 AO force selection.						
	0.000 … 22.000	0.000	mA	1000 = 1 mA	y	y	Parameter
14.79	**AO1 filter time**						
	Filter time constant of analog output AO1. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Defines the filter time constant for AO1.						

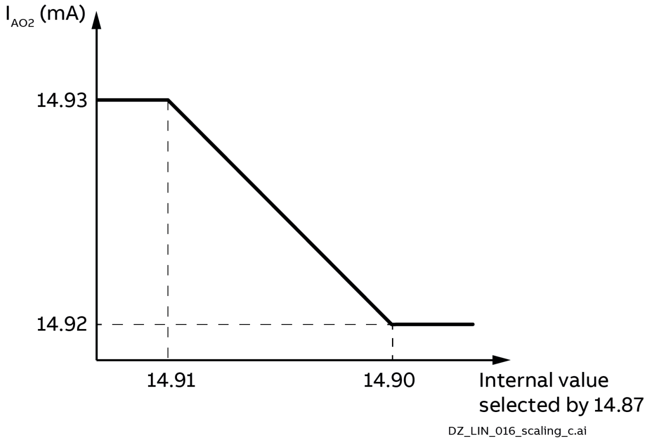
Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	 $O = I \times (1-e^{t/T})$ I = filter input (step) O = filter output t = time T = filter time constant						
	0.000 … 30.000	0.100	s	1000 = 1 s	n	y	Parameter
14.80	**AO1 source min**						
	Internal value corresponding to minimum analog output AO1 value. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Defines the internal value that corresponds to the minimum required AO1 value. Scaling parameters 14.80 and 14.81 set the low and high internal limits that corresponds to the analog output values in mA defined by parameters 14.82 and 14.83:  Setting parameter 14.82 as maximum value and 14.83 as minimum value inverts the output: 						
	-32768.0 … 32767.0	0.0	-	1 = 1	n	y	Parameter

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
14.81	**AO1 source max**						
	Internal value corresponding to maximum analog output AO1 value. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Defines the internal value that corresponds to the maximum required AO1 value. See 14.80 AO1 source min.						
	-32768.0 … 32767.0	100.0	-	1 = 1	n	y	Parameter
14.82	**AO1 out at AO1 src min**						
	Minimum analog output AO1 value. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Defines the minimum output value for AO1 in mA. See 14.80 AO1 source min.						
	0.000 … 22.000	0.000	mA	1000 = 1 mA	n	y	Parameter
14.83	**AO1 out at AO1 src max**						
	Maximum analog output AO1 value. (Visible when 14.01 Module 1 type = FIO-11 or FAIO-01) Defines the maximum output value for AO1 in mA. See 14.80 AO1 source min.						
	0.000 … 22.000	20.000	mA	1000 = 1 mA	n	y	Parameter
14.86	**AO2 actual**						
	Value of analog output AO2. (Visible when 14.01 Module 1 type = FAIO-01) Displays the value of AO2 in mA.						
	0.000 … 22.000	-	mA	1000 = 1 mA	y	n	Signal
14.87	**AO2 source**						
	Source for analog output AO2. (Visible when 14.01 Module 1 type = FAIO-01) Selects a signal/parameter to be connected to AO2. Alternatively, sets the output to excitation mode to feed a constant current to a temperature sensor. See 14.77 AO1 source.						
	0 … 38	Zero	-	1 = 1	n	y	Parameter
14.88	**AO2 force data**						
	Forced value of analog output AO2. (Visible when 14.01 Module 1 type = FAIO-01) Forced value that can be used instead of the selected output signal. See 14.71 AO force selection.						
	0.000 … 22.000	0.000	mA	1000 = 1 mA	y	y	Parameter
14.89	**AO2 filter time**						
	Filter time constant of analog output AO2. (Visible when 14.01 Module 1 type = FAIO-01) Defines the filter time constant for AO2.						

<table>
<tr><th>Index</th><th colspan="7">Name</th></tr>
<tr><th></th><th colspan="7">Text</th></tr>
<tr><th></th><th>Range</th><th>Default</th><th>Unit</th><th>Scale FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">

$O = I \times (1-e^{t/T})$

I = filter input (step)
O = filter output
t = time
T = filter time constant</td></tr>
<tr><td></td><td>0.000 … 30.000</td><td>0.100</td><td>s</td><td>1000 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>14.90</td><td colspan="7">AO2 source min</td></tr>
<tr><td></td><td colspan="7">Internal signal value corresponding to minimum analog output AO2 value.
(Visible when 14.01 Module 1 type = FAIO-01)
Defines the internal value that corresponds to the minimum required AO2 value.
Scaling parameters 14.90 and 14.91 set the low and high internal limits that corresponds to the analog output values in mA defined by parameters 14.92 and 14.93:


Setting parameter 14.92 as maximum value and 14.93 as minimum value inverts the output:

</td></tr>
<tr><td></td><td>-32768.0 … 32767.0</td><td>0.0</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
</table>

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
14.91	**AO2 source max**						
	Internal value corresponding to maximum analog output AO2 value. (Visible when 14.01 Module 1 type = FAIO-01) Defines the internal value that corresponds to the maximum required AO2 value. See 14.90 AO2 source min.						
	-32768.0 … 32767.0	100.0	-	1 = 1	n	y	Parameter
14.92	**AO2 out at AO2 src min**						
	Minimum analog output AO2 value. (Visible when 14.01 Module 1 type = FAIO-01) Defines the minimum output value for AO2. See 14.90 AO2 source min.						
	0.000 … 22.000	0.000	mA	1000 = 1 mA	n	y	Parameter
14.93	**AO2 out at AO2 src max**						
	Maximum analog output AO2 value. (Visible when 14.01 Module 1 type = FAIO-01) Defines the maximum output value for AO2. See 14.90 AO2 source min.						
	0.000 … 22.000	20.000	mA	1000 = 1 mA	n	y	Parameter

15 I/O extension module 2

Description see group 14 I/O extension module 1.
Configuration of I/O extension module 2.
The contents of the parameter group vary according to the selected I/O extension module type.

16 I/O extension module 3

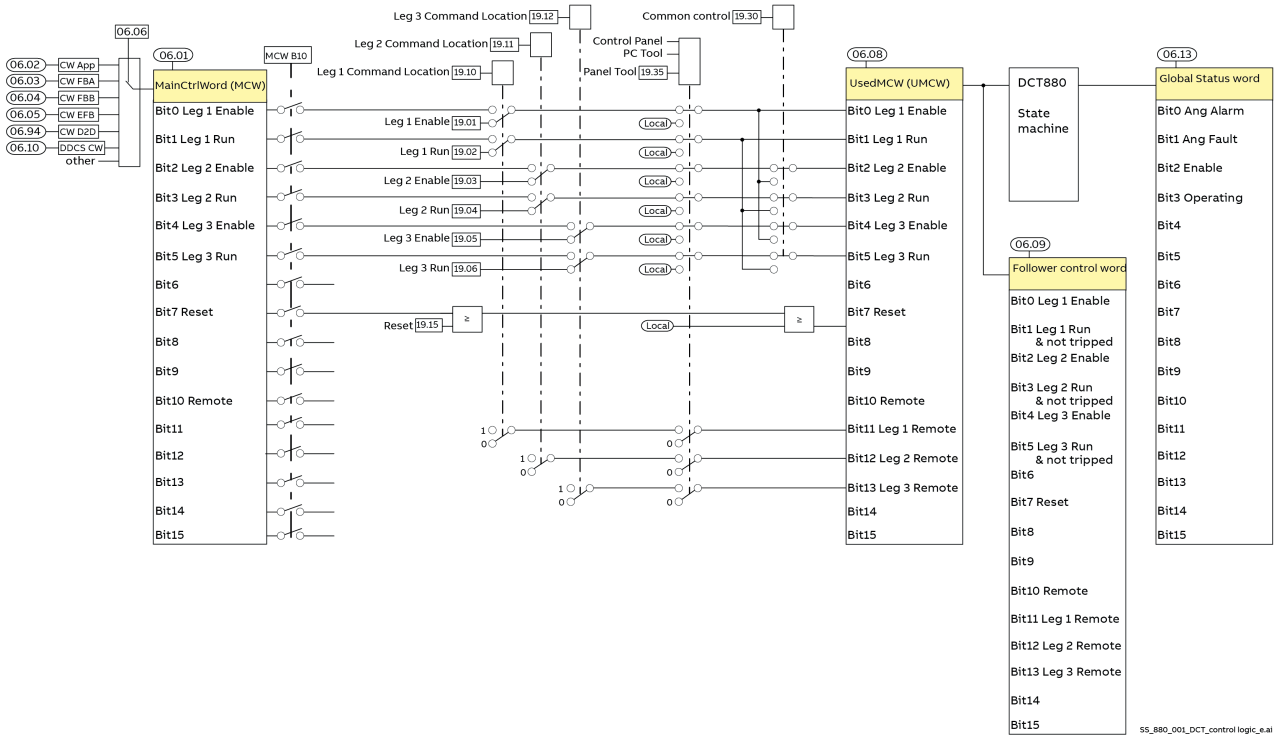
Description see group 14 I/O extension module 1.
Configuration of I/O extension module 3.
The contents of the parameter group vary according to the selected I/O extension module type.

19 Start/Stop Mode

Selection of local and external control locations and operating modes.

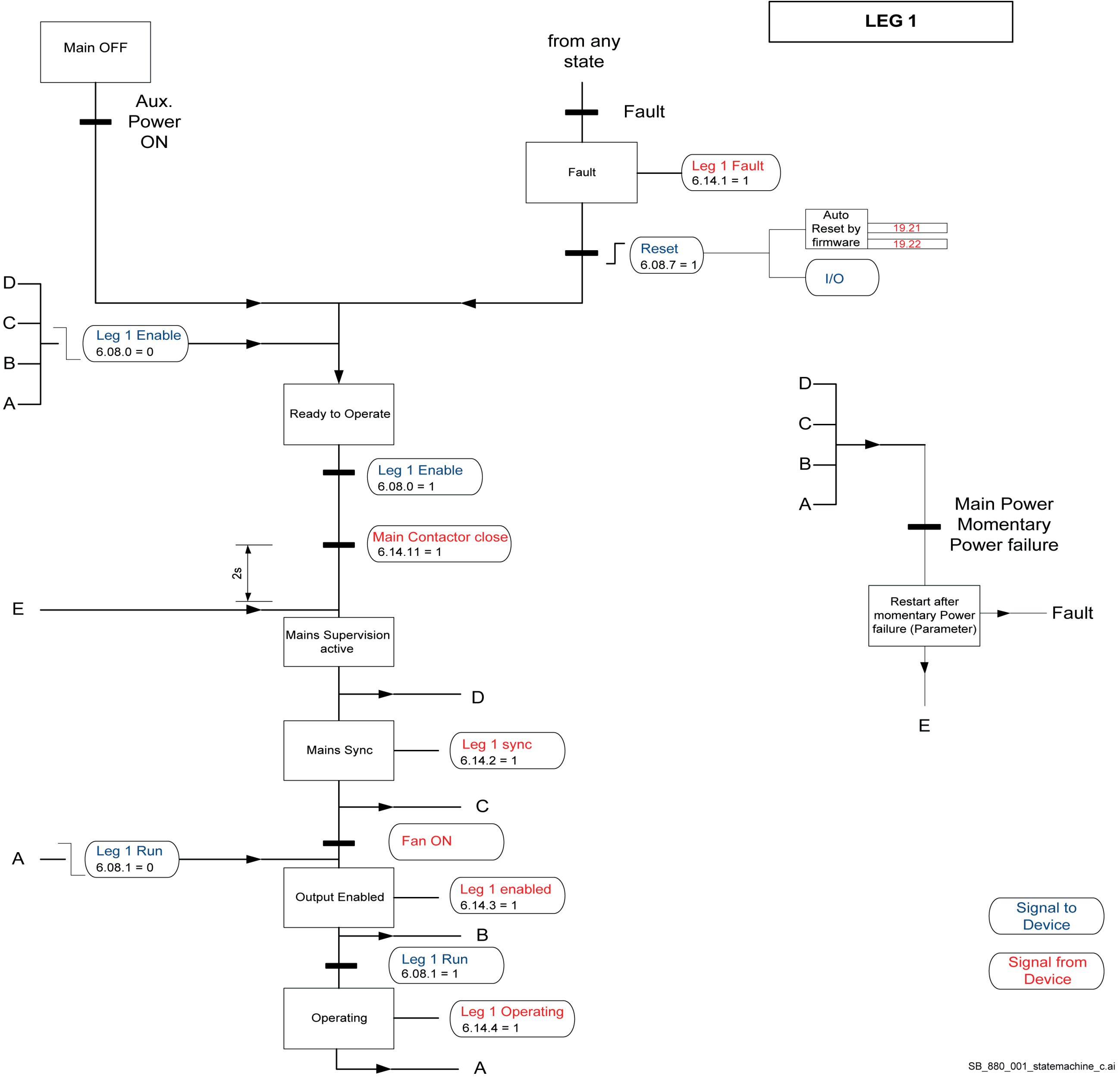
Index	Name						
	Text						
	Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type

Control locations:



Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**

Leg 1 state machine:



State machines of leg 2 and leg 3 see Appendix.

19.01	**Leg 1 Enable Local I/O**
	Source for leg 1 Enable command from local I/O. See 19.10 Leg 1 Command Location Selector. **Other [bit]**; source selection. 0: **Open**; 0, disable leg 1. 1: **Close**; 1, enable leg 1. 3: **DI1**; 10.02.b00 DI delayed status. 4: **DI2**; 10.02.b01 DI delayed status. 5: **DI3**; 10.02.b02 DI delayed status. 6: **DI4**; 10.02.b03 DI delayed status.

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale
FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">7: DI5; 10.02.b04 DI delayed status.
8: DI6; 10.02.b05 DI delayed status.
11: DIO1; 11.02.b00 DIO delayed status.
12: DIO2; 11.02.b01 DIO delayed status.
19: DIL; 10.02.b15 DI delayed status.
21: Mains ON; automatically enable the unit when the mains voltage is present.</td></tr>
<tr><td>0 … 21</td><td>DI1</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>19.02</td><td colspan="7">Leg 1 Run Local I/O</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Source for leg 1 Run command from local I/O. See 19.10 Leg 1 Command Location Selector.
Other [bit]; source selection.
0: Open; 0, stop leg 1.
1: Close; 1, run leg 1.
3: DI1; 10.02.b00 DI delayed status.
4: DI2; 10.02.b01 DI delayed status.
5: DI3; 10.02.b02 DI delayed status.
6: DI4; 10.02.b03 DI delayed status.
7: DI5; 10.02.b04 DI delayed status.
8: DI6; 10.02.b05 DI delayed status.
11: DIO1; 11.02.b00 DIO delayed status.
12: DIO2; 11.02.b01 DIO delayed status.
19: DIL; 10.02.b15 DI delayed status.
21: Auto reference; see 19.46 Leg 1 Auto reference ON level.</td></tr>
<tr><td>0 … 21</td><td>DI2</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>19.03</td><td colspan="7">Leg 2 Enable Local I/O</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Source for leg 2 Enable command from local I/O. See 19.11 Leg 2 Command Location Selector.
See 19.01 Leg 1 Enable Local I/O.</td></tr>
<tr><td>0 … 21</td><td>DI1</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>19.04</td><td colspan="7">Leg 2 Run Local I/O</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Source for leg 2 Run command from local I/O. See 19.11 Leg 2 Command Location Selector.
See 19.02 Leg 1 Run Local I/O and 19.47 Leg 2 Auto reference ON level.</td></tr>
<tr><td>0 … 21</td><td>DI2</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>19.05</td><td colspan="7">Leg 3 Enable Local I/O</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Source for leg 3 Enable command from local I/O. See 19.12 Leg 3 Command Location Selector.
See 19.01 Leg 1 Enable Local I/O.</td></tr>
<tr><td>0 … 21</td><td>DI1</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>19.06</td><td colspan="7">Leg 3 Run Local I/O</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Source for leg 3 Run command from local I/O. See 19.12 Leg 3 Command Location Selector.
See 19.02 Leg 1 Run Local I/O and 19.48 Leg 3 Auto reference ON level.</td></tr>
<tr><td>0 … 21</td><td>DI2</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>19.10</td><td colspan="7">Leg 1 Command Location Selector</td></tr>
<tr><td></td><td colspan="7">Switch to change the source for leg 1 Enable and Run commands from 06.01 Main Control Word active to local I/O.
Other [bit]; source selection.
0: MCW (06.01); 0, always follow 06.01 Main Control Word active.
1: Hardware DI; 1, always follow local I/O, see parameters 19.01 & 19.02, 19.03 & 19.04, 19.05 & 19.06.</td></tr>
</table>

<table>
<tr><th>Index</th><th colspan="7">Name</th></tr>
<tr><th></th><th colspan="7">Text</th></tr>
<tr><th></th><th>Range</th><th>Default</th><th>Unit</th><th>Scale FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">3: DI1; 0, follow 06.01 Main Control Word active. 1, follow local I/O.
4: DI2; 0, follow 06.01 Main Control Word active. 1, follow local I/O.
5: DI3; 0, follow 06.01 Main Control Word active. 1, follow local I/O.
6: DI4; 0, follow 06.01 Main Control Word active. 1, follow local I/O.
7: DI5; 0, follow 06.01 Main Control Word active. 1, follow local I/O.
8: DI6; 0, follow 06.01 Main Control Word active. 1, follow local I/O.
11: DIO1; 0, follow 06.01 Main Control Word active. 1, follow local I/O.
12: DIO2; 0, follow 06.01 Main Control Word active. 1, follow local I/O.
19: DIL; 0, follow 06.01 Main Control Word active. 1, follow local I/O.</td></tr>
<tr><td></td><td>0 … 19</td><td>Hardware DI</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>19.11</td><td colspan="7">Leg 2 Command Location Selector</td></tr>
<tr><td></td><td colspan="7">Switch to change the source for leg 2 Enable and Run commands from Main Control Word to local I/O.
See 19.10 Leg 1 Command Location Selector.</td></tr>
<tr><td></td><td>0 … 19</td><td>Hardware DI</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>19.12</td><td colspan="7">Leg 3 Command Location Selector</td></tr>
<tr><td></td><td colspan="7">Switch to change the source for leg 3 Enable and Run commands from Main Control Word to local I/O.
See 19.10 Leg 1 Command Location Selector.</td></tr>
<tr><td></td><td>0 … 19</td><td>Hardware DI</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>19.15</td><td colspan="7">Reset</td></tr>
<tr><td></td><td colspan="7">Source for the external fault reset signal.
Other [bit]; source selection.
0: Open; 0, no reset.
1: Close; 1, reset.
3: DI1; 10.02.b00 DI delayed status.
4: DI2; 10.02.b01 DI delayed status.
5: DI3; 10.02.b02 DI delayed status.
6: DI4; 10.02.b03 DI delayed status.
7: DI5; 10.02.b04 DI delayed status.
8: DI6; 10.02.b05 DI delayed status.
11: DIO1; 11.02.b00 DIO delayed status.
12: DIO2; 11.02.b01 DIO delayed status.
19: DIL; 10.02.b15 DI delayed status.
21: Mains ON; automatically enable the unit when the mains voltage is present.</td></tr>
<tr><td></td><td>0 … 21</td><td>DI3</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>19.17</td><td colspan="7">Local control</td></tr>
<tr><td></td><td colspan="7">Enable/Disable the local control via control panel and PC tool.
Enable/Disable the local control (start and stop buttons of the control panel and the local controls of the PC tool).
WARNING!
Before disabling local control, ensure that the control panel is not needed to stop the unit.
0: Enable; enable the local control.
1: Disable; disable the local control.</td></tr>
<tr><td></td><td>0 … 1</td><td>Enable</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>19.20</td><td colspan="7">3 Phase Sequence</td></tr>
</table>

<table>
<tr><th>Index</th><th colspan="7">Name</th></tr>
<tr><th></th><th colspan="7">Text</th></tr>
<tr><th></th><th>Range</th><th>Default</th><th>Unit</th><th>Scale
FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">Only for 3 phase systems.
Defines whether the unit starts operation with the next phase zero crossing or at the next zero crossing of phase U.
0: Start Stop: Any order; starts with zero crossing of any phase U, V or W.
1: Start: U Stop: W; starts with zero crossing of phase U, stops with zero crossing of phase W.</td></tr>
<tr><td></td><td>0 … 1</td><td>Start Stop: Any order</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>19.21</td><td colspan="7">Auto Reset Retries</td></tr>
<tr><td></td><td colspan="7">Defines the number of attempts the unit tries to reset a fault automatically. In case of setting 0, no auto reset is performed.</td></tr>
<tr><td></td><td>0 … 10</td><td>0</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>19.22</td><td colspan="7">Auto Reset Time</td></tr>
<tr><td></td><td colspan="7">Defines the delay time from occurrence of a fault until the unit tries to reset the fault automatically.</td></tr>
<tr><td></td><td>0.0 … 10.0</td><td>1.0</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>19.23</td><td colspan="7">Auto Reset Leg 1 Events</td></tr>
<tr><td></td><td colspan="7">Defines which leg 1 events are affected by auto reset.
Each bit represents one specific event.
Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>Value</th><th>Remarks</th></tr>
<tr><td>0</td><td>Overcurrent</td><td>1</td><td>Auto reset leg 1 overcurrent.</td></tr>
<tr><td>1</td><td>Mains Overvoltage</td><td>1</td><td>Auto reset leg 1 mains overvoltage.</td></tr>
<tr><td>2</td><td>Thyristor Short Circuit</td><td>1</td><td>Auto reset leg 1 thyristor(s) short circuit.</td></tr>
<tr><td>3</td><td>Thyristor Open Circuit</td><td>1</td><td>Auto reset leg 1 thyristor(s) open circuit.</td></tr>
<tr><td>4</td><td>Mains Undervoltage</td><td>1</td><td>Auto reset leg 1 mains undervoltage.</td></tr>
<tr><td>5</td><td>Unit Thermal Overload</td><td>1</td><td>Auto reset unit thermal overload.</td></tr>
<tr><td>6 … 15</td><td>reserved</td><td></td><td></td></tr>
</table></td></tr>
<tr><td></td><td>0000h … FFFFh</td><td>0000h</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>19.24</td><td colspan="7">Auto Reset Leg 2 Events</td></tr>
<tr><td></td><td colspan="7">Defines which leg 2 events are affected by auto reset.
Each bit represents one specific event.
Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>Value</th><th>Remarks</th></tr>
<tr><td>0</td><td>Overcurrent</td><td>1</td><td>Auto reset leg 2 overcurrent.</td></tr>
<tr><td>1</td><td>Mains Overvoltage</td><td>1</td><td>Auto reset leg 2 mains overvoltage.</td></tr>
<tr><td>2</td><td>Thyristor Short Circuit</td><td>1</td><td>Auto reset leg 2 thyristor(s) short circuit.</td></tr>
<tr><td>3</td><td>Thyristor Open Circuit</td><td>1</td><td>Auto reset leg 2 thyristor(s) open circuit.</td></tr>
<tr><td>4</td><td>Mains Undervoltage</td><td>1</td><td>Auto reset leg 2 mains undervoltage.</td></tr>
<tr><td>5</td><td>Unit Thermal Overload</td><td>1</td><td>Auto reset unit thermal overload.</td></tr>
<tr><td>6 … 15</td><td>reserved</td><td></td><td></td></tr>
</table></td></tr>
<tr><td></td><td>0000h … FFFFh</td><td>0000h</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
</table>

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
19.25	**Auto Reset Leg 3 Events**						

Defines which leg 3 events are affected by auto reset.
Each bit represents one specific event.
Bit assignment:

Bit	**Name**	**Value**	**Remarks**
0	Overcurrent	1	Auto reset leg 3 overcurrent.
1	Mains Overvoltage	1	Auto reset leg 3 mains overvoltage.
2	Thyristor Short Circuit	1	Auto reset leg 3 thyristor(s) short circuit.
3	Thyristor Open Circuit	1	Auto reset leg 3 thyristor(s) open circuit.
4	Mains Undervoltage	1	Auto reset leg 3 mains undervoltage.
5	Unit Thermal Overload	1	Auto reset unit thermal overload.
6 … 15	reserved		

	0000h … FFFFh	0000h	-	1 = 1	n	y	Parameter
19.26	**Auto Reset Leg 1 Load Events**						

Defines which leg 1 load events are affected by auto reset.
Each bit represents one specific event.
Bit assignment:

Bit	**Name**	**Value**	**Remarks**
0	Load Loss	1	Auto reset leg 1 load loss.
1	Partial Load Loss	1	Auto reset leg 1 partial load loss.
2	Partial Load short circuit	1	Auto reset leg 1 partial load short circuit.
3	Load overload	1	Auto reset leg 1 load overload.
4	Load aging	1	Auto reset leg 1 load aging.
5	Load current imbalance	1	Auto reset leg 1 load current imbalance.
6 … 15	reserved		

	0000h … FFFFh	0000h	-	1 = 1	n	y	Parameter
19.27	**Auto Reset Leg 2 Load Events**						

Defines which leg 2 load events are affected by auto reset.
Each bit represents one specific event.
Bit assignment:

Bit	**Name**	**Value**	**Remarks**
0	Load Loss	1	Auto reset leg 2 load loss.
1	Partial Load Loss	1	Auto reset leg 2 partial load loss.
2	Partial Load short circuit	1	Auto reset leg 2 partial load short circuit.
3	Load overload	1	Auto reset leg 2 load overload.
4	Load aging	1	Auto reset leg 2 load aging.
5	Load current imbalance	1	Auto reset leg 2 load current imbalance.
6 … 15	reserved		

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	0000h … FFFFh	0000h	-	1 = 1	n	y	Parameter

19.28 **Auto Reset Leg 3 Load Events**

Defines which leg 3 load events are affected by auto reset.
Each bit represents one specific event.
Bit assignment:

Bit	Name	Value	Remarks
0	Load Loss	1	Auto reset leg 3 load loss.
1	Partial Load Loss	1	Auto reset leg 3 partial load loss.
2	Partial Load short circuit	1	Auto reset leg 3 partial load short circuit.
3	Load overload	1	Auto reset leg 3 load overload.
4	Load aging	1	Auto reset leg 3 load aging.
5	Load current imbalance	1	Auto reset leg 3 load current imbalance.
6 … 15	reserved		

Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
0000h … FFFFh	0000h	-	1 = 1	n	y	Parameter

19.29 **Auto Reset External Events**

Defines which external events are affected by auto reset.
Each bit represents one specific event.
Bit assignment:

Bit	Name	Value	Remarks
0	External Event 1	1	Auto reset external event 1.
1	External Event 2	1	Auto reset external event 2.
2	External Event 3	1	Auto reset external event 3.
3	External Event 4	1	Auto reset external event 4.
4	External Event 5	1	Auto reset external event 5.
5 … 15	reserved		

Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
0000h … FFFFh	0000h	-	1 = 1	n	y	Parameter

19.30 **Common Control Selector**

Selects, whether all legs operate independent or if leg 2 and leg 3 react to leg 1 Enable and Run commands.
0: **Separate**; all legs operate independent.
1: **Follow Leg 1**; leg 2 and leg 3 follow leg 1.

Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
0 … 1	Separate	-	1 = 1	n	y	Parameter

19.35 **Panel / Tool Control Selector**

Selects which leg is reacting to the control from control panel/PC tool.
0: **None**; inactive.
1: **Leg 1**;
2: **Leg 2**;
3: **Leg 3**;
4: **All**;

Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
0 … 4	All	-	1 = 1	n	y	Parameter

19.38 **Controller fan acknowledge source**

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Unit fan acknowledge source (cooling fan).
The event generates fault 3808 Controller fan acknowledge if the unit fan acknowledge is missing.
Other [bit]; source selection.
0: **No acknowledge**; 0, generates fault 3808 Controller fan acknowledge.
1: **Acknowledge unused**; disable fault 3808 Controller fan acknowledge.
3: **DI1**; 10.02.b00 DI delayed status.
4: **DI2**; 10.02.b01 DI delayed status.
5: **DI3**; 10.02.b02 DI delayed status.
6: **DI4**; 10.02.b03 DI delayed status.
7: **DI5**; 10.02.b04 DI delayed status.
8: **DI6**; 10.02.b05 DI delayed status.
11: **DIO1**; 11.02.b00 DIO delayed status.
12: **DIO2**; 11.02.b01 DIO delayed status.
19: **DIL**; 10.02.b15 DI delayed status.</td></tr>
<tr><td>0 ... 19</td><td>Acknowledge unused</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**19.39**</td><td colspan="7">**Controller fan delay time**</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Delay time for the unit fan.
After the unit has removed the Enable command the fan continues to run until 19.39 Controller fan delay time is elapsed. If a unit overtemperature is pending, the delay starts after the temperature has dropped below the overtemperature level.</td></tr>
<tr><td>0.0 … 3250.0</td><td>0.0</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**19.40**</td><td colspan="7">**Leg 1 Phase Angle Ramps Enable**</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Enables the phase angle ramps of leg 1. In disabled condition, the outputs of the ramps are forced to zero.
Other [bit]; source selection.
0: **Disable**; 0; disable the phase angle ramp of leg 1.
1: **Enable**; 1; enable the phase angle ramp of leg 1.
3: **DI1**; 10.02.b00 DI delayed status.
4: **DI2**; 10.02.b01 DI delayed status.
5: **DI3**; 10.02.b02 DI delayed status.
6: **DI4**; 10.02.b03 DI delayed status.
7: **DI5**; 10.02.b04 DI delayed status.
8: **DI6**; 10.02.b05 DI delayed status.
11: **DIO1**; 11.02.b00 DIO delayed status.
12: **DIO2**; 11.02.b01 DIO delayed status.
19: **DIL**; 10.02.b15 DI delayed status.
21: **Leg 1 Operating (06.14.b04)**; see 06.14.b04 Leg 1 Status Word.</td></tr>
<tr><td>0 … 21</td><td>Leg 1 Operating 6.14.04</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**19.41**</td><td colspan="7">**Leg 2 Phase Angle Ramps Enable**</td></tr>
<tr><td></td><td colspan="7">Enables the phase angle ramps of leg 2. In disabled condition, the outputs of the ramps are forced to zero.
Other [bit]; source selection.
0: **Disable**; 0; disable the phase angle ramp of leg 2.
1: **Enable**; 1; enable the phase angle ramp of leg 2.
3: **DI1**; 10.02.b00 DI delayed status.</td></tr>
</table>

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	4: **DI2**; 10.02.b01 DI delayed status. 5: **DI3**; 10.02.b02 DI delayed status. 6: **DI4**; 10.02.b03 DI delayed status. 7: **DI5**; 10.02.b04 DI delayed status. 8: **DI6**; 10.02.b05 DI delayed status. 11: **DIO1**; 11.02.b00 DIO delayed status. 12: **DIO2**; 11.02.b01 DIO delayed status. 19: **DIL**; 10.02.b15 DI delayed status. 21: **Leg 1 Operating (06.15.b04)**; see 06.15.b04 Leg 2 Status Word.						
	0 … 21	Leg 2 Operating 6.15.04	-	1 = 1	n	y	Parameter
19.42	**Leg 3 Phase Angle Ramps Enable**						
	Enables the phase angle ramps of leg 2. In disabled condition, the outputs of the ramps are forced to zero. **Other [bit]**; source selection. 0: **Disable**; 0; disable the phase angle ramp of leg 3. 1: **Enable**; 1; enable the phase angle ramp of leg 3. 3: **DI1**; 10.02.b00 DI delayed status. 4: **DI2**; 10.02.b01 DI delayed status. 5: **DI3**; 10.02.b02 DI delayed status. 6: **DI4**; 10.02.b03 DI delayed status. 7: **DI5**; 10.02.b04 DI delayed status. 8: **DI6**; 10.02.b05 DI delayed status. 11: **DIO1**; 11.02.b00 DIO delayed status. 12: **DIO2**; 11.02.b01 DIO delayed status. 19: **DIL**; 10.02.b15 DI delayed status. 21: **Leg 1 Operating (06.16.b04)**; see 06.16.b04 Leg 2 Status Word.						
	0 … 21	Leg 3 Operating 6.16.04	-	1 = 1	n	y	Parameter
19.46	**Leg 1 Auto reference ON level**						
	Automatic Run command generation for leg 1. 19.02 Leg 1 Run Local I/O = Auto reference is active, if 23.01 Leg 1 Main Ref (22.11) is greater than 19.46 Leg 1 Auto reference ON level.						
	0.00 … 325.00	10.00	%	100 = 1 %	n	y	Parameter
19.47	**Leg 2 Auto reference ON level**						
	Automatic Run command generation for leg 2. 19.04 Leg 2 Run Local I/O = Auto reference is active, if 25.01 Leg 2 Main Ref (24.11) is greater than 19.47 Leg 2 Auto reference ON level.						
	0.00 … 325.00	10.00	%	100 = 1 %	n	y	Parameter
19.48	**Leg 3 Auto reference ON level**						
	Automatic Run command generation for leg 3. 19.06 Leg 3 Run Local I/O = Auto reference is active, if 27.01 Leg 3 Main Ref (26.11) is greater than 19.48 Leg 3 Auto reference ON level.						
	0.00 … 325.00	10.00	%	100 = 1 %	n	y	Parameter

21 General References

Includes fix references, external references and motor potentiometer settings.

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
21.01	**Fix reference 1**						
	Fix reference 1 in percent of nominal load current, load voltage or load power. Selection see groups 22, 24 and 26.						
	0.00 … 325.00	0.00	%	100 = 1 %	n	y	Parameter
21.02	**Fix reference 2**						
	Fix reference 2 in percent of nominal load current, load voltage or load power. Selection see groups 22, 24 and 26.						
	0.00 … 325.00	0.00	%	100 = 1 %	n	y	Parameter
21.03	**Fix reference 3**						
	Fix reference 3 in percent of nominal load current, load voltage or load power. Selection see groups 22, 24 and 26.						
	0.00 … 325.00	0.00	%	100 = 1 %	n	y	Parameter
21.04	**Fix reference 4**						
	Fix reference 4 in percent of nominal load current, load voltage or load power. Selection see groups 22, 24 and 26. **Note**: Can only be selected using function Other.						
	0.00 … 325.00	0.00	%	100 = 1 %	n	y	Parameter
21.05	**Fix reference 5**						
	Fix reference 5 in percent of nominal load current, load voltage or load power. Selection see groups 22, 24 and 26. **Note**: Can only be selected using function Other.						
	0.00 … 325.00	0.00	%	100 = 1 %	n	y	Parameter
21.06	**Fix reference 6**						
	Fix reference 6 in percent of nominal load current, load voltage or load power. Selection see groups 22, 24 and 26. **Note**: Can only be selected using function Other.						
	0.00 … 325.00	0.00	%	100 = 1 %	n	y	Parameter
21.11	**Ext reference 1**						
	External reference 1 in percent of nominal load current, load voltage or load power. Selection see groups 22, 24 and 26.						
	0.00 … 325.00	0.00	%	100 = 1 %	n	y	Parameter
21.12	**Ext reference 2**						
	External reference 2 in percent of nominal load current, load voltage or load power. Selection see groups 22, 24 and 26.						
	0.00 … 325.00	0.00	%	100 = 1 %	n	y	Parameter
21.13	**Ext reference 3**						
	External reference 3 in percent of nominal load current, load voltage or load power. Selection see groups 22, 24 and 26.						
	0.00 … 325.00	0.00	%	100 = 1 %	n	y	Parameter
21.14	**Ext reference 4**						

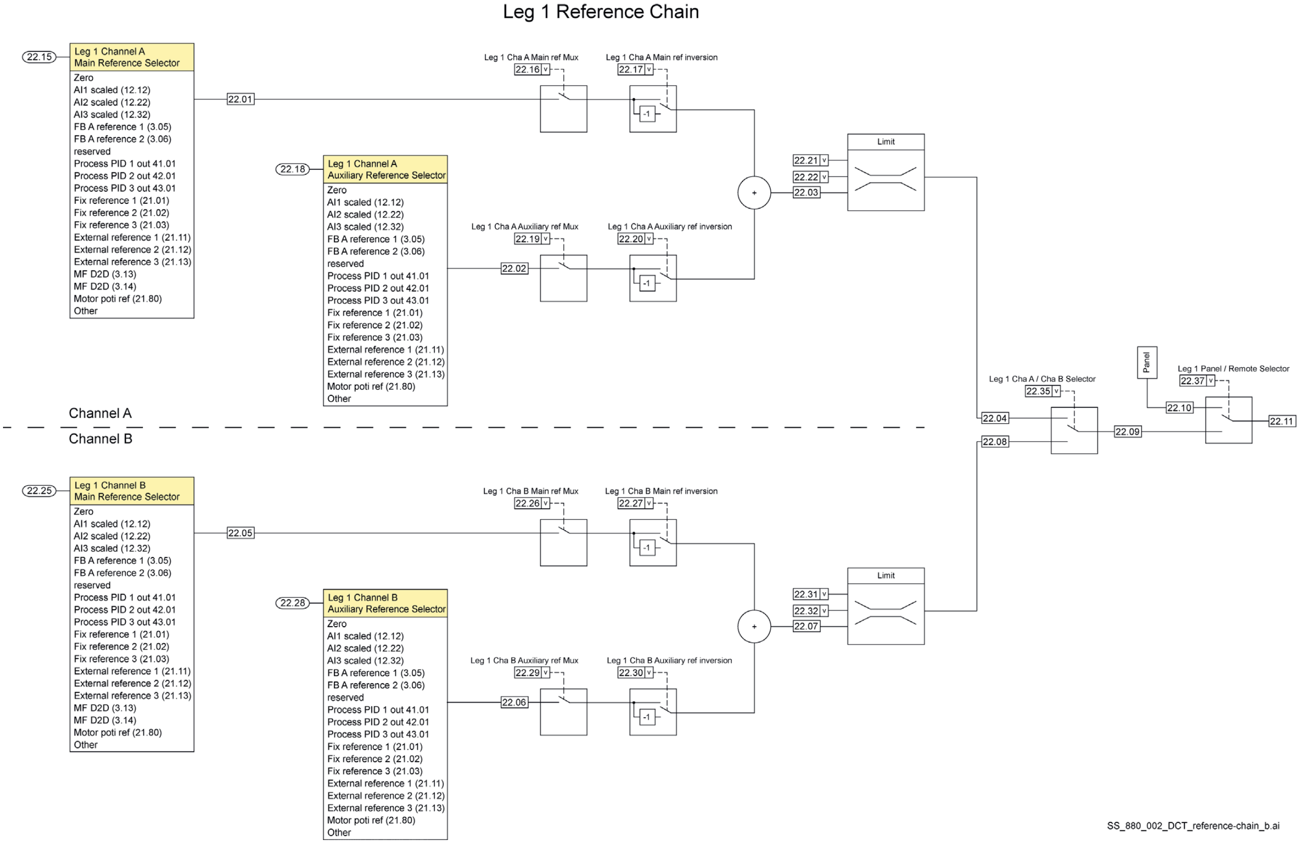
<table>
<tr><th>Index</th><th colspan="7">Name</th></tr>
<tr><th></th><th colspan="7">Text</th></tr>
<tr><th></th><th>Range</th><th>Default</th><th>Unit</th><th>Scale FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">External reference 4 in percent of nominal load current, load voltage or load power. Selection see groups 22, 24 and 26.
Note: Can only be selected using function Other.</td></tr>
<tr><td></td><td>0.00 … 325.00</td><td>0.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>21.15</td><td colspan="7">Ext reference 5</td></tr>
<tr><td></td><td colspan="7">External reference 5 in percent of nominal load current, load voltage or load power. Selection see groups 22, 24 and 26.
Note: Can only be selected using function Other.</td></tr>
<tr><td></td><td>0.00 … 325.00</td><td>0.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>21.16</td><td colspan="7">Ext reference 6</td></tr>
<tr><td></td><td colspan="7">External reference 6 in percent of nominal load current, load voltage or load power. Selection see groups 22, 24 and 26.
Note: Can only be selected using function Other.</td></tr>
<tr><td></td><td>0.00 … 325.00</td><td>0.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>21.71</td><td colspan="7">Motor potentiometer function</td></tr>
<tr><td></td><td colspan="7">Motor potentiometer function.
Activates and selects the mode of the motor potentiometer.
0: Disable; disable the motor potentiometer and set its value to 0.
1: Enable (initialization at stop/power-up); the motor potentiometer first adopts the value set by 21.72 Motor potentiometer initial value. When the unit is operating, the value can be adjusted from the up and down sources defined by 21.73 Motor potentiometer up source and 21.74 Motor potentiometer down source.
A stop or a power cycle will reset the motor potentiometer to the initial value set by 21.72 Motor potentiometer initial value.
2: Enable (resume always); the motor potentiometer value is retained over a stop or a power cycle. The value can be adjusted from the up and down sources defined by 21.73 Motor potentiometer up source and 21.74 Motor potentiometer down source, independent of the unit status.</td></tr>
<tr><td></td><td>0 … 2</td><td>Disable</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>21.72</td><td colspan="7">Motor potentiometer initial value</td></tr>
<tr><td></td><td colspan="7">Initial value for motor potentiometer.
Defines an initial value (starting point) for the motor potentiometer. See 21.71 Motor potentiometer function.</td></tr>
<tr><td></td><td>0.00 … 325.00</td><td>0.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>21.73</td><td colspan="7">Motor potentiometer up source</td></tr>
<tr><td></td><td colspan="7">Source for motor potentiometer up.
Selects the source for motor potentiometer up signal.
Other [bit]; source selection.
0: Disable; 0, hold the motor potentiometer value.
1: Enable; 1, increase the motor potentiometer value. If both the up and down sources are on, the potentiometer value will not change.
3: DI1; 10.02 DI delayed status bit 0.
4: DI2; 10.02 DI delayed status bit 1.
5: DI3; 10.02 DI delayed status bit 2.
6: DI4; 10.02 DI delayed status bit 3.
7: DI5; 10.02 DI delayed status bit 4.
8: DI6; 10.02 DI delayed status bit 5.</td></tr>
</table>

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	11: **DIO1**; 11.02 DIO delayed status bit 0. 12: **DIO2**; 11.02 DIO delayed status bit 1. 19: **DIL**; 10.02 DI delayed status bit 15.						
	0 … 19	Disable	-	1 = 1	n	y	Parameter
21.74	**Motor potentiometer down source**						
	Source for motor potentiometer down. Selects the source for motor potentiometer down signal. **Other [bit]**; source selection. 0: **Disable**; 0, hold the motor potentiometer value. 1: **Enable**; 1, decrease the motor potentiometer value. If both the up and down sources are on, the potentiometer value will not change. 3: **DI1**; 10.02 DI delayed status bit 0. 4: **DI2**; 10.02 DI delayed status bit 1. 5: **DI3**; 10.02 DI delayed status bit 2. 6: **DI4**; 10.02 DI delayed status bit 3. 7: **DI5**; 10.02 DI delayed status bit 4. 8: **DI6**; 10.02 DI delayed status bit 5. 11: **DIO1**; 11.02 DIO delayed status bit 0. 12: **DIO2**; 11.02 DIO delayed status bit 1. 19: **DIL**; 10.02 DI delayed status bit 15. 21: **DI1 or stop**; 10.02.b00 DI delayed status plus stop. DI1 = 1 or stop command active → the motor potentiometer value is decreased, DI1 = 0: the motor potentiometer value is held. 22: **DI2 or stop**; 10.02.b01 DI delayed status plus stop. DI2 = 1 or stop command active → the motor potentiometer value is decreased, DI2 = 0: the motor potentiometer value is held. 23: **DI3 or stop**; 10.02.b02 DI delayed status plus stop. DI3 = 1 or stop command active → the motor potentiometer value is decreased, DI3 = 0: the motor potentiometer value is held. 24: **DI4 or stop**; 10.02.b03 DI delayed status plus stop. DI4 = 1 or stop command active → the motor potentiometer value is decreased, DI4 = 0: the motor potentiometer value is held. 25: **DI5 or stop**; 10.02.b04 DI delayed status plus stop. DI5 = 1 or stop command active → the motor potentiometer value is decreased, DI5 = 0: the motor potentiometer value is held. 26: **DI6 or stop**; 10.02.b05 DI delayed status plus stop. DI6 = 1 or stop command active → the motor potentiometer value is decreased, DI6 = 0: the motor potentiometer value is held. 29: **DIO1 or stop**; 11.02.b00 DIO delayed status plus stop. DIO1 = 1 or stop command active → the motor potentiometer value is decreased, DIO1 = 0: the motor potentiometer value is held. 30: **DIO2 or stop**; 11.02.b01 DIO delayed status plus stop. DIO2 = 1 or stop command active → the motor potentiometer value is decreased, DIO2 = 0: the motor potentiometer value is held. 37: **DIL or stop**; 10.02.b15 DI delayed status plus stop. DIL = 1 or stop command active → the motor potentiometer value is decreased, DIL = 0: the motor potentiometer value is held.						
	0 … 37	Disable	-	1 = 1	n	y	Parameter
21.75	**Motor potentiometer ramp time**						
	Motor potentiometer change time. Defines the change rate of the motor potentiometer. This is the time required for the motor potentiometer to change from 21.76 Motor potentiometer min value to 21.77 Motor potentiometer max value. The same change rate applies in both directions (up and down).						
	0.0 … 3000.0	10.0	s	10 = 1 s	n	y	Parameter
21.76	**Motor potentiometer min value**						
	Motor potentiometer minimum.						

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	Defines the minimum value of the motor potentiometer in percent of nominal load current, load voltage or load power. See 99.02 Load Current, 99.03 Load Voltage and 99.09 Load Power.						
	0.00 … 325.00	0.00	%	100 = 1 %	n	y	Parameter
21.77	**Motor potentiometer max value**						
	Motor potentiometer maximum. Defines the maximum value of the motor potentiometer in percent of nominal load current, load voltage or load power. See 99.02 Load Current, 99.03 Load Voltage and 99.09 Load Power.						
	0.00 … 325.00	100.00	%	100 = 1 %	n	y	Parameter
21.80	**Motor potentiometer ref act**						
	Value of the motor potentiometer. Displays the output of the motor potentiometer function in percent of nominal load current, load voltage or load power. See 99.02 Load Current, 99.03 Load Voltage and 99.09 Load Power.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal

22 Leg 1 Reference Chain

Leg 1 reference source selection.

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
Leg 1 reference chain: 							

SS_880_002_DCT_reference-chain_b.ai

22.01	**Leg 1 Cha A Main Ref**						
	Main reference. Leg 1 channel A main reference in percent of nominal load current, load voltage or load power. See 99.02 Load Current, 99.03 Load Voltage and 99.09 Load Power.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
22.02	**Leg 1 Cha A Auxiliary Ref**						
	Auxiliary reference. Leg 1 channel A auxiliary reference in percent of nominal load current, load voltage or load power. See 99.02 Load Current, 99.03 Load Voltage and 99.09 Load Power.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
22.03	**Leg 1 Cha A Sum Ref**						
	Sum of main and auxiliary references. Leg 1 channel A sum of main and auxiliary references in percent of nominal load current, load voltage or load power. See 99.02 Load Current, 99.03 Load Voltage and 99.09 Load Power.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
22.04	**Leg 1 Cha A Sum Ref after limit**						
	Sum reference after limit. Leg 1 channel A sum reference after applying limits 22.21 Leg 1 Cha A Max and 22.22 Leg 1 Cha A Min in percent of nominal load current, load voltage or load power. See 99.02 Load Current, 99.03 Load Voltage and 99.09 Load Power.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
22.05	**Leg 1 Cha B Main Ref**						
	Main reference. Leg 1 channel B main reference in percent of nominal load current, load voltage or load power. See 99.02 Load Current, 99.03 Load Voltage and 99.09 Load Power.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
22.06	**Leg 1 Cha B Auxiliary Ref**						
	Auxiliary reference. Leg 1 channel B auxiliary reference in percent of nominal load current, load voltage or load power. See 99.02 Load Current, 99.03 Load Voltage and 99.09 Load Power.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
22.07	**Leg 1 Cha B Sum Ref**						
	Sum of main and auxiliary references. Leg 1 channel B sum of main and auxiliary references in percent of nominal load current, load voltage or load power. See 99.02 Load Current, 99.03 Load Voltage and 99.09 Load Power.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
22.08	**Leg 1 Cha B Sum Ref after limit**						
	Sum reference after limit. Leg 1 channel B sum reference after applying limits 22.31 Leg 1 Cha B Max and 22.32 Leg 1 Cha B Min in percent of nominal load current, load voltage or load power. See 99.02 Load Current, 99.03 Load Voltage and 99.09 Load Power.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
22.09	**Leg 1 Reference**						
	Leg 1 general reference. Leg 1 reference after 22.35 Leg 1 Cha A / Cha B Selector in percent of nominal load current, load voltage or load power. See 99.02 Load Current, 99.03 Load Voltage and 99.09 Load Power.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
22.10	**Leg 1 Panel Ref**						
	Reference from control panel. Leg 1 reference from control panel in percent of nominal load current, load voltage or load power. See 99.02 Load Current, 99.03 Load Voltage and 99.09 Load Power.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
22.11	**Leg 1 Actual Ref**						
	Leg 1 final (actual) reference. Leg 1 final (actual) reference after 22.37 Leg 1 Panel / Remote Selector in percent of nominal load current, load voltage or load power.						

Index	Name					
	Text					
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	See 99.02 Load Current, 99.03 Load Voltage and 99.09 Load Power.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
22.15	**Leg 1 Cha A Main Ref Selector**						
	Source for main reference. Selects the source for 22.01 Leg 1 Cha A Main ref. **Other**; source selection. 0: **Zero**; 0 %, reference is set to zero. 1: **AI1 scaled (12.12)**; 12.12 AI1 scaled value. 2: **AI2 scaled (12.22)**; 12.22 AI2 scaled value. 3: **AI3 scaled (12.32)**; 12.32 AI3 scaled value. 4: **FBA A reference 1 (03.05)**; 03.05 FBA A reference 1. 5: **FBA A reference 2 (03.06)**; 03.06 FBA A reference 2. 7: **Process PID 1 out (41.01)**; 41.01 Process PID 1 output actual. 8: **Process PID 2 out (42.01)**; 42.01 Process PID 2 output actual. 9: **Process PID 3 out (43.01)**; 43.01 Process PID 3 output actual. 10: **Fix reference 1 (21.01)**; 21.01 Fix reference 1. 11: **Fix reference 2 (21.02)**; 21.02 Fix reference 2. 12: **Fix reference 3 (21.03)**; 21.03 Fix reference 3. 13: **External reference 1 (21.11)**; 21.11 Ext reference 1. 14: **External reference 2 (21.12)**; 21.12 Ext reference 2. 15: **External reference 3 (21.13)**; 21.13 Ext reference 3. 16: **MF D2D ref1 (03.13)**; 03.13 M/F or D2D ref1. 17: **MF D2D ref2 (03.14)**; 03.14 M/F or D2D ref2. 18: **Motor poti ref (21.80)**; 21.80 Motor potentiometer ref act.						
	0 … 18	AI1 scaled (12.12)	-	1 = 1	n	y	Parameter
22.16	**Leg 1 Cha A Main Ref Mux**						
	On/Off main reference. Selects the operator for leg 1 channel A main reference switch. **Other [bit]**; source selection. 0: **Open**; 0, disable leg 1 channel A reference. 1: **Close**; 1, enable leg 1 channel A reference. 3: **DI1**; 10.02 DI delayed status bit 0. 4: **DI2**; 10.02 DI delayed status bit 1. 5: **DI3**; 10.02 DI delayed status bit 2. 6: **DI4**; 10.02 DI delayed status bit 3. 7: **DI5**; 10.02 DI delayed status bit 4. 8: **DI6**; 10.02 DI delayed status bit 5. 11: **DIO1**; 11.02 DIO delayed status bit 0. 12: **DIO2**; 11.02 DIO delayed status bit 1. 19: **DIL**; 10.02 DI delayed status bit 15.						
	0 … 19	Close	-	1 = 1	n	y	Parameter
22.17	**Leg 1 Cha A Main Ref Inversion**						
	Direct/Inverted main reference. Selects the operator for leg 1 channel A main reference inversion switch (multiplication with -1). **Other [bit]**; source selection. 0: **Normal**; 0, direct reference. 1: **Inverse**; 1, inverse reference.						

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	3: **DI1**; 10.02 DI delayed status bit 0. 4: **DI2**; 10.02 DI delayed status bit 1. 5: **DI3**; 10.02 DI delayed status bit 2. 6: **DI4**; 10.02 DI delayed status bit 3. 7: **DI5**; 10.02 DI delayed status bit 4. 8: **DI6**; 10.02 DI delayed status bit 5. 11: **DIO1**; 11.02 DIO delayed status bit 0. 12: **DIO2**; 11.02 DIO delayed status bit 1. 19: **DIL**; 10.02 DI delayed status bit 15.						
	0 … 19	Normal	-	1 = 1	n	y	Parameter
22.18	**Leg 1 Cha A Auxiliary Ref Selector**						
	Source for auxiliary reference. Selects the source for 22.02 Leg 1 Cha A Auxiliary Ref. See 22.15 Leg 1 Cha A Main Ref Selector.						
	0 … 18	Zero	-	1 = 1	n	y	Parameter
22.19	**Leg 1 Cha A Auxiliary Ref Mux**						
	On/Off auxiliary reference. Selects the operator for leg 1 channel A auxiliary reference switch. See 22.16 Leg 1 Cha A Main Ref Mux.						
	0 … 19	Open	-	1 = 1	n	y	Parameter
22.20	**Leg 1 Cha A Auxiliary Ref Inversion**						
	Direct/Inverted auxiliary reference. Selects the operator for leg 1 channel A auxiliary reference inversion switch (multiplication with -1). See 22.17 Leg 1 Cha A Main Ref Inversion.						
	0 … 19	Normal	-	1 = 1	n	y	Parameter
22.21	**Leg 1 Cha A Max**						
	Upper limit for the sum reference. Upper limit for leg 1 channel A sum reference in percent of nominal load current, load voltage or load power. See 99.02 Load Current, 99.03 Load Voltage and 99.09 Load Power.						
	0.00 … 325.00	100.00	%	100 = 1 %	n	y	Parameter
22.22	**Leg 1 Cha A Min**						
	Lower limit for the sum reference. Lower limit for leg 1 channel A sum reference in percent of nominal load current, load voltage or load power. See 99.02 Load Current, 99.03 Load Voltage and 99.09 Load Power.						
	0.00 … 325.00	0.00	%	100 = 1 %	n	y	Parameter
22.25	**Leg 1 Cha B Main Ref Selector**						
	Source for main reference. Selects the source for 22.05 Leg 1 Cha B Main ref. See 22.15 Leg 1 Cha A Main Ref Selector.						
	0 … 18	Fix reference 1 (21.01)	-	1 = 1	n	y	Parameter
22.26	**Leg 1 Cha B Main Ref Mux**						
	On/Off main reference.						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	Selects the operator for leg 1 channel B main reference switch. See 22.16 Leg 1 Cha A Main Ref Mux.						
	0 … 19	Close	-	1 = 1	n	y	Parameter
22.27	**Leg 1 Cha B Main Ref Inversion**						
	Direct/Inverted main reference. Selects the operator for leg 1 channel B main reference inversion switch (multiplication with -1). See 22.17 Leg 1 Cha A Main Ref Inversion.						
	0 … 19	Normal	-	1 = 1	n	y	Parameter
22.28	**Leg 1 Cha B Auxiliary Ref Selector**						
	Source for auxiliary reference. Selects the source for 22.06 Leg 1 Cha B Auxiliary Ref. See 22.15 Leg 1 Cha A Main Ref Selector.						
	0 … 18	Zero	-	1 = 1	n	y	Parameter
22.29	**Leg 1 Cha B Auxiliary Ref Mux**						
	On/Off auxiliary reference. Selects the operator for leg 1 channel B auxiliary reference switch. See 22.16 Leg 1 Cha A Main Ref Mux.						
	0 … 19	Open	-	1 = 1	n	y	Parameter
22.30	**Leg 1 Cha B Auxiliary Ref Inversion**						
	Direct/Inverted auxiliary reference. Selects the operator for leg 1 channel B auxiliary reference inversion switch (multiplication with -1). See 22.17 Leg 1 Cha A Main Ref Inversion.						
	0 … 19	Normal	-	1 = 1	n	y	Parameter
22.31	**Leg 1 Cha B Max**						
	Upper limit for the sum reference. Upper limit for leg 1 channel B sum reference in percent of nominal load current, load voltage or load power. See 99.02 Load Current, 99.03 Load Voltage and 99.09 Load Power.						
	0.00 … 325.00	100.00	%	100 = 1 %	n	y	Parameter
22.32	**Leg 1 Cha B Min**						
	Lower limit for the sum reference. Lower limit for leg 1 channel B sum reference in percent of nominal load current, load voltage or load power. See 99.02 Load Current, 99.03 Load Voltage and 99.09 Load Power.						
	0.00 … 325.00	0.00	%	100 = 1 %	n	y	Parameter
22.35	**Leg 1 Cha A / Cha B Selector**						
	Source for general reference. Selects the source for 22.09 Leg 1 Reference. Low activates leg 1 channel A reference and high activates leg 1 channel B reference. **Other [bit]**; source selection. 0: **Channel A**; 0, enable channel A. 1: **Channel B**; 1, enable channel B. 3: **DI1**; 10.02 DI delayed status bit 0.						

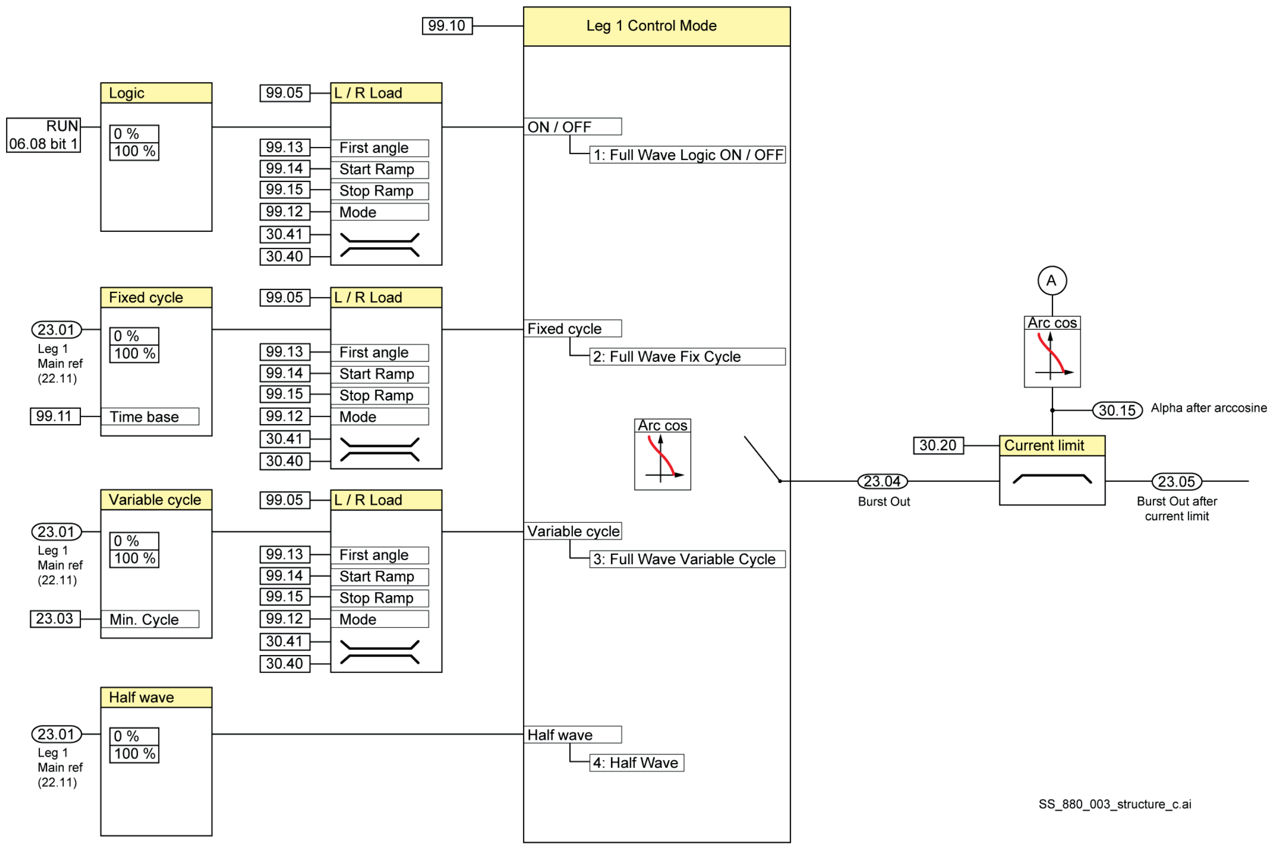
Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	4: **DI2**; 10.02 DI delayed status bit 1. 5: **DI3**; 10.02 DI delayed status bit 2. 6: **DI4**; 10.02 DI delayed status bit 3. 7: **DI5**; 10.02 DI delayed status bit 4. 8: **DI6**; 10.02 DI delayed status bit 5. 11: **DIO1**; 11.02 DIO delayed status bit 0. 12: **DIO2**; 11.02 DIO delayed status bit 1. 19: **DIL**; 10.02 DI delayed status bit 15.						
	0 … 19	Channel A	-	1 = 1	n	y	Parameter
22.37	**Leg 1 Panel / Remote Selector**						
	Source for the final (actual) reference. Selects the source for 22.11 Leg 1 Actual Ref. Low activates leg 1 general reference (reference chain) and high activates the control panel reference. **Other [bit]**; source selection. 0: **Remote**; 0, enable general reference. 1: **Panel**; 1, enable reference from the control panel. 2: **Auto**; automatic selection depending on local/remote selection. 3: **DI1**; 10.02 DI delayed status bit 0. 4: **DI2**; 10.02 DI delayed status bit 1. 5: **DI3**; 10.02 DI delayed status bit 2. 6: **DI4**; 10.02 DI delayed status bit 3. 7: **DI5**; 10.02 DI delayed status bit 4. 8: **DI6**; 10.02 DI delayed status bit 5. 11: **DIO1**; 11.02 DIO delayed status bit 0. 12: **DIO2**; 11.02 DIO delayed status bit 1. 19: **DIL**; 10.02 DI delayed status bit 15.						
	0 … 19	Auto	-	1 = 1	n	y	Parameter

23 Leg 1 Control Detailed

Leg 1 control chain includes ramps, current/voltage/power control, control mode selector and limiters.

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
23.01	**Leg 1 Main Ref (22.11)**						
	Main reference for leg 1 control chain from leg 1 reference chain. See 22.11 Leg 1 Actual Ref.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal

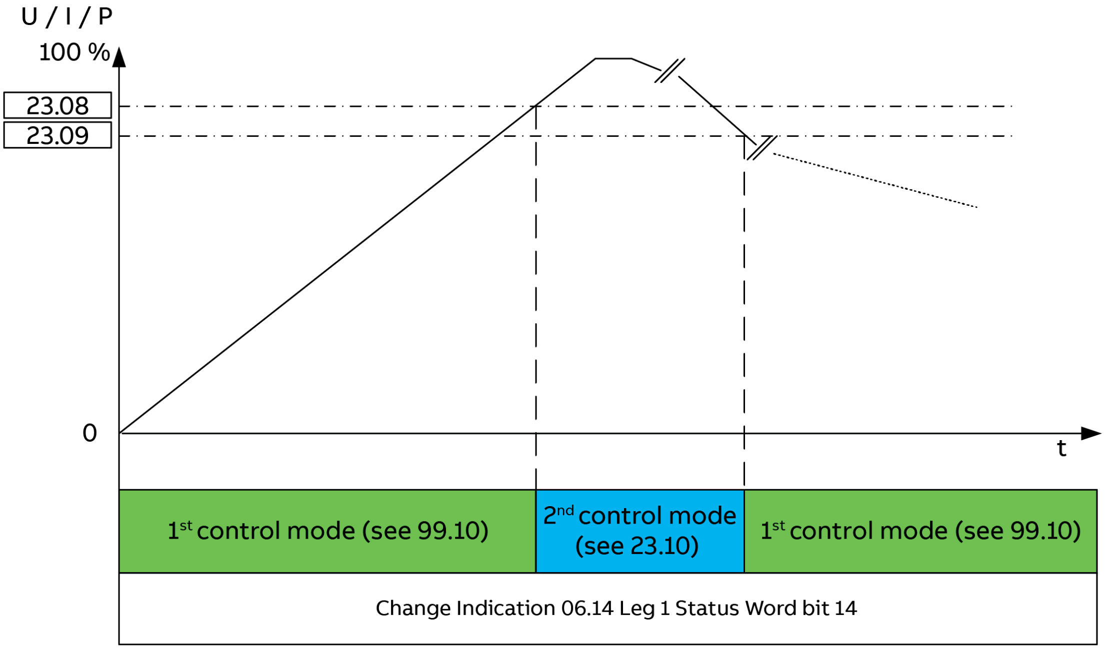
Leg 1 control chain II:



Index	**Name**						
23.03	**Leg 1 Minimum Cycle Variable Burst**						
	Minimum on/off time for a full wave (burst) variable cycle. Defines the minimum on/off time when 99.10 Leg 1 Control Mode = Full wave variable cycle (= 3). For reference values below or equal 50 %, it defines the minimum on time. For reference values above 50 %, it defines the minimum off time.						
	1 … 6000	10	Periods	1 = 1 Periods	n	y	Parameter
23.04	**Leg 1 Burst Out**						
	Alpha reference after leg 1 control mode. Firing angle reference for 99.10 Leg 1 Control Mode = Full wave (burst)/Half wave (= 1 … 4).						
	0.0 … 180.0	-	°	10 = 1°	y	n	Signal
23.05	**Leg 1 Burst Out after Current Limit**						
	Alpha reference after limit.						

Index	Name Text Range	 Default	 Unit	 Scale FbEq16	 Volatile	 Change running	 Type
	Firing angle reference for 99.10 Leg 1 Control Mode = Full wave (burst)/Half wave (= 1 … 4) after the current limiter.						
	0.0 … 180.0	-	°	10 = 1°	y	n	Signal
23.07	**Leg 1 2nd mode switching control**						

Switching between control modes.
Switching between 1st control mode (see 99.10 Leg 1 Control Mode) and 2nd control mode (see 23.10 Leg 1 2nd mode):
Fix either 1st control mode or 2nd control mode.
Automatic switching between 1st control mode and 2nd control mode by function 1 (preferred), function 2 or function 3:



DZ_LIN_084_control mode_a.ai

Remote switching between 1st control mode and 2nd control mode by bit (see 23.11 Leg 1 2nd mode control bit).

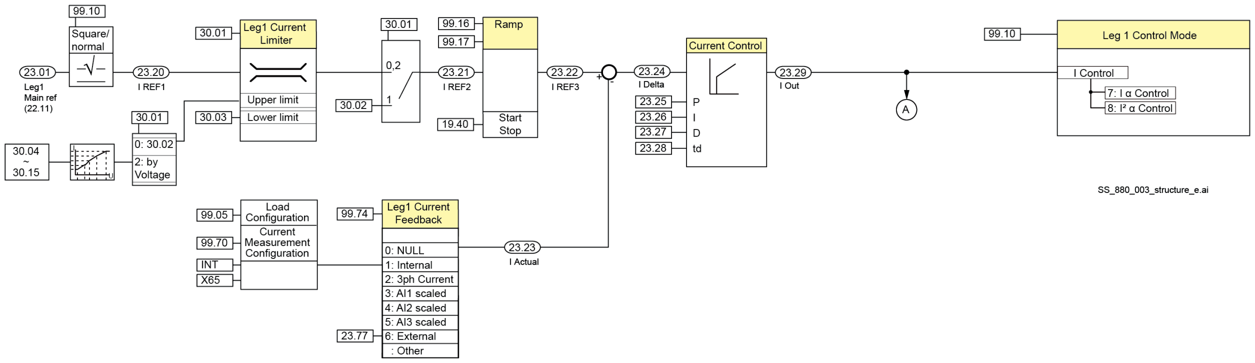
0: Use (99.10); 0, 1st control mode active. See 99.10 Leg 1 Control Mode.
1: Use (23.10); 1, 2nd control mode active. See 23.10 Leg 1 2nd mode.
2: Function 1; automatic switching between 1st control mode and 2nd control mode, see table below.
3: Function 2; automatic switching between 1st control mode and 2nd control mode, see table below.
4: Function 3; automatic switching between 1st control mode and 2nd control mode, see table below.
20: By bit (23.11); remote switching between 1st control mode and 2nd control mode, see table below.
All in percent of 99.02 Load Current, 99.03 Load Voltage or 99.09 Load Power.

	Switch from 1st control mode to 2nd control mode	Switch from 2nd control mode to 1st control mode

<table>
<tr><td>Index</td><td colspan="7">Name</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Text</td></tr>
<tr><td>Range</td><td>Default</td><td>Unit</td><td>Scale FbEq16</td><td>Volatile</td><td>Change running</td><td>Type</td></tr>
<tr><td rowspan="2"></td><td colspan="7">
<table>
<tr><td>Function 1</td><td>Load voltage ≥ 23.08 Leg 1 2nd mode switching level 1</td><td>Load current ≥ 23.09 Leg 1 2nd mode switching level 2</td></tr>
<tr><td>Function 2</td><td>Load voltage ≥ 23.08 Leg 1 2nd mode switching level 1</td><td>Load voltage ≤ 23.09 Leg 1 2nd mode switching level 2</td></tr>
<tr><td>Function 3</td><td>Load current ≤ 23.08 Leg 1 2nd mode switching level 1</td><td>Load current ≥ 23.09 Leg 1 2nd mode switching level 2</td></tr>
<tr><td>By bit (23.11)</td><td>0 → 1</td><td>1 → 0</td></tr>
</table>
Note: Switching between 1st control mode and 2nd control mode is usually used to start resistive loads with high cold to hot ratios.</td></tr>
<tr><td>0 … 20</td><td>Use (99.10)</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>23.08</td><td colspan="7">Leg 1 2nd mode switching level 1</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Level for automatic switching between control modes.
First level for automatic switching between control modes set in 99.10 Leg 1 Control Mode and in 23.10 Leg 1 2nd mode, in percent of 99.02 Load Current, 99.03 Load Voltage or 99.09 Load Power.
See 23.07 Leg 1 2nd mode switching control = 2 … 19.</td></tr>
<tr><td>0.00 … 325.00</td><td>95.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>23.09</td><td colspan="7">Leg 1 2nd mode switching level 2</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Level for automatic switching between control modes.
Second level for automatic switching between control modes set in 99.10 Leg 1 Control Mode and in 23.10 Leg 1 2nd mode, in percent of 99.02 Load Current, 99.03 Load Voltage or 99.09 Load Power.
See 23.07 Leg 1 2nd mode switching control = 2 … 19.</td></tr>
<tr><td>0.00 … 325.00</td><td>90.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>23.10</td><td colspan="7">Leg 1 2nd mode</td></tr>
<tr><td rowspan="2"></td><td colspan="7">2nd control mode.
Select the 2nd control mode.
0: Full wave logic ON/OFF; full wave is on (= 100 % load power) when 06.08 Used Main Control Word bit 0 = 1. Full wave is off (= 0 % load power) when 06.08 Used Main Control Word bit 0 = 0.
1: Full wave fix cycle; full wave (burst) with fix cycle control. The load power depends on 22.11 Leg 1 Actual Ref.
2: Full wave variable cycle; full wave (burst) with variable cycle control. The load power depends on 22.11 Leg 1 Actual Ref.
3: Half wave; half wave control. The load power depends on 22.11 Leg 1 Actual Ref.</td></tr>
<tr><td>0 … 3</td><td>Full wave fix cycle</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>23.11</td><td colspan="7">Leg 1 2nd mode control bit</td></tr>
<tr><td></td><td colspan="7">Switching between control modes via a bit or a digital input.
Switching between control modes set in 99.10 Leg 1 Control Mode and 23.10 Leg 1 2nd mode via a bit or a digital input.
Other [bit]; source selection.
0: Disable; 0, enable the control mode set in 99.10 Leg 1 Control Mode.
1: Enable; 1, enable the control mode set in 23.10 Leg 1 2nd mode.
3: DI1; 10.02 DI delayed status bit 0.
4: DI2; 10.02 DI delayed status bit 1.
5: DI3; 10.02 DI delayed status bit 2.</td></tr>
</table>

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	6: **DI4**; 10.02 DI delayed status bit 3. 7: **DI5**; 10.02 DI delayed status bit 4. 8: **DI6**; 10.02 DI delayed status bit 5. 11: **DIO1**; 11.02 DIO delayed status bit 0. 12: **DIO2**; 11.02 DIO delayed status bit 1. 19: **DIL**; 10.02 DI delayed status bit 15.						
	0 … 19	Disable	-	1 = 1	n	y	Parameter

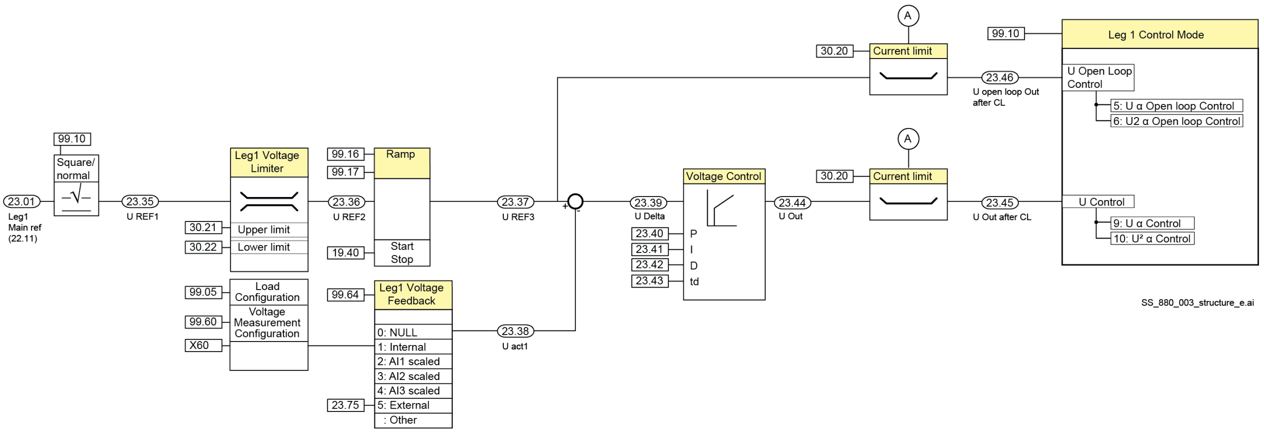
Leg 1 current control chain:



23.20	**Leg 1 Current Control Ref 1**						
	Current reference 1. Leg 1 current reference after the square root block for I^2 control in percent of 99.02 Load Current. Valid when 99.10 Leg 1 Control Mode = I α control or I^2 α control (= 7 or 8).						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
23.21	**Leg 1 Current Control Ref 2**						
	Current reference 2. Leg 1 current reference after applying 30.02 Leg 1 Current Limit Max and 30.03 Leg 1 Current Limit Min in percent of 99.02 Load Current.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
23.22	**Leg 1 Current Control Ref 3**						
	Current reference 3. Leg 1 current reference after 99.16 Leg 1 Phase Angle Soft Start Ramp in percent of 99.02 Load Current.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
23.23	**Leg 1 Current Actual**						
	Current actual. Leg 1 actual current for the current controller in percent of 99.02 Load Current.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
23.24	**Leg 1 Current Control Delta**						
	Current deviation. Leg 1 delta current for the current controller in percent of 99.02 Load Current.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
23.25	**Leg 1 Current Control P-Gain**						
	P-gain.						

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	Leg 1 p-gain for the current controller.						
	0.000 … 100.000	0.300	-	100 = 1	n	y	Parameter
23.26	**Leg 1 Current Control I-Time**						
	I-time. Leg 1 i-time for the current controller.						
	0.00 … 100.00	0.10	s	100 = 1 s	n	y	Parameter
23.27	**Leg 1 Current Control D-Time**						
	D-time. Leg 1 d-time for the current controller.						
	0.00 … 100.00	0.00	s	100 = 1 s	n	y	Parameter
23.28	**Leg 1 Current Control D-Filter Time**						
	D-filter time. Leg 1 d-filter time for the current controller.						
	0.00 … 100.00	0.01	s	100 = 1 s	n	y	Parameter
23.29	**Leg 1 Current Control Out**						
	Output current controller. Leg 1 output of the current controller in percent of 99.02 Load Current.						
	0.00 … 325.00	-	%	100 =1 %	y	n	Signal

Leg 1 voltage control chain:

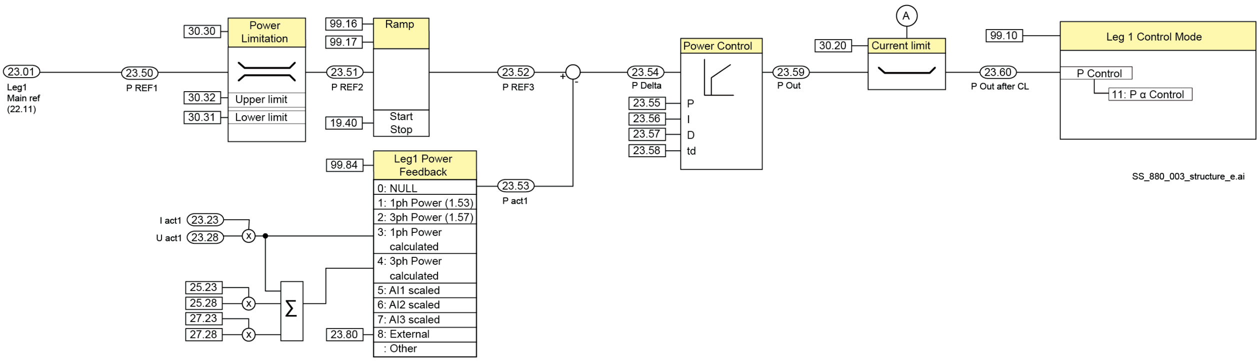


23.35	**Leg 1 Voltage Control Ref 1**						
	Voltage reference 1. Leg 1 voltage reference after the square root block for U² control in percent of 99.03 Load Voltage. Valid when 99.10 Leg 1 Control Mode = U α Open loop control, U² α Open loop control, U α control or U² α control (= 5, 6, 9 or 10).						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
23.36	**Leg 1 Voltage Control Ref 2**						
	Voltage reference 2. Leg 1 voltage reference after applying limits 30.21 Leg 1 Voltage Limit Max and 30.22 Leg 1 Voltage Limit Min in percent of 99.03 Load Voltage.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal

Index	Name						
	Text						
	Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
23.37	**Leg 1 Voltage Control Ref 3**						
	Voltage reference 3. Leg 1 voltage reference after 99.16 Leg 1 Phase Angle Soft Start Ramp in percent of 99.03 Load Voltage.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
23.38	**Leg 1 Voltage Actual**						
	Voltage actual. Leg 1 actual voltage for the voltage controller in percent of 99.03 Load Voltage.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
23.39	**Leg 1 Voltage Control Delta**						
	Voltage deviation. Leg 1 delta voltage for the voltage controller in percent of 99.03 Load Voltage.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
23.40	**Leg 1 Voltage Control P-Gain**						
	P-gain. Leg 1 p-gain for the voltage controller.						
	0.000 … 100.000	0.300	-	100 = 1	n	y	Parameter
23.41	**Leg 1 Voltage Control I-Time**						
	I-time. Leg 1 i-time for the voltage controller.						
	0.00 … 100.00	0.10	s	100 = 1 s	n	y	Parameter
23.42	**Leg 1 Voltage Control D-Time**						
	D-time. Leg 1 d-time for the voltage controller.						
	0.00 … 100.00	0.00	s	100 = 1 s	n	y	Parameter
23.43	**Leg 1 Voltage Control D-Filter Time**						
	D-filter time. Leg 1 d-filter time for the voltage controller.						
	0.00 … 100.00	0.01	s	100 = 1 s	n	y	Parameter
23.44	**Leg 1 Voltage Control Out**						
	Output voltage controller. Leg 1 output of the voltage controller in percent of 99.03 Load Voltage.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
23.45	**Leg 1 Voltage Control Out after Current Limit**						
	Output voltage controller after limit. Leg 1 output of the voltage controller after applying limit 30.20 Leg 1 Current Limit in percent of 99.03 Load Voltage.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
23.46	**Leg 1 Voltage Control Out open loop**						
	Voltage reference for open loop control after limit. Leg 1 voltage reference for open loop control after applying limit 30.20 Leg 1 Current Limit in percent of 99.03 Load Voltage.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**

Leg 1 power control chain:



Index	**Name**						
23.50	**Leg 1 Power Control Ref 1**						
	Power reference 1. Leg 1 power reference in percent of 99.09 Load Power. Valid when 99.10 Leg 1 Control Mode = P α control (= 11).						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
23.51	**Leg 1 Power Control Ref 2**						
	Power reference 2. Leg 1 power reference after applying limits 30.31 Leg 1 Power Limit Max and 30.32 Leg 1 Power Limit Min in percent of 99.09 Load Power.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
23.52	**Leg 1 Power Control Ref 3**						
	Power reference 3. Leg 1 power reference after 99.16 Leg 1 Phase Angle Soft Start Ramp in percent of 99.09 Load Power.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
23.53	**Leg 1 Power Actual**						
	Power actual. Leg 1 actual power for the power controller in percent of 99.09 Load Power.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
23.54	**Leg 1 Power Control Delta**						
	Power deviation. Leg 1 delta power for the power controller in percent of 99.09 Load Power.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
23.55	**Leg 1 Power Control P-Gain**						
	P-gain. Leg 1 p-gain for the power controller.						
	0.000 … 100.000	0.300	-	100 = 1	n	y	Parameter
23.56	**Leg 1 Power Control I-Time**						
	I-time. Leg 1 i-time for the power controller						
	0.00 … 100.00	0.10	s	100 = 1 s	n	y	Parameter
23.57	**Leg 1 Power Control D-Time**						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	D-time. Leg 1 d-time for the power controller.						
	0.00 … 100.00	0.00	s	100 = 1 s	n	y	Parameter
23.58	**Leg 1 Power Control D-Filter Time**						
	D-filter time. Leg 1 d-filter time for the power controller.						
	0.00 … 100.00	0.01	s	100 = 1 s	n	y	Parameter
23.59	**Leg 1 Power Control Out**						
	Output power controller. Leg 1 output of the power controller in percent of 99.09 Load Power.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
23.60	**Leg 1 Power Control Out after Current Limit**						
	Output power controller after limit. Leg 1 output of the power controller after applying limit 30.20 Leg 1 Current Limit in percent of 99.09 Load Power.						
	0.00 … 325.00	-	%	100 = 1 %	y	n	Signal
23.65	**Leg 1 External Ref**						
	External reference. Leg 1 external reference in percent: 0 % ≡ 180.0°. 100 % ≡ 0.0°. Valid when 99.10 Leg 1 Control Mode = Leg 1 External Ref 23.65 (= 12).						
	0.00 … 325.00	0.00	%	100 = 1 %	y	y	Parameter
23.66	**Leg 1 Thyristor Control**						
	Thyristor control. Activate/Deactivate thyristors in leg 1. 0: **Both active**; activate both thyristors in leg 1. 1: **Forward blocked**; deactivate the forward thyristor (U1 to U2). 2: **Reverse blocked**; deactivate the reverse thyristor (U2 to U1).						
	0 … 2	Both active	-	1 = 1	n	y	Parameter
23.67	**Leg 1 Delta Alpha DC Offset**						
	reserved						
	-30.000 … 30.000	0.000	°	1000 = 1°	n	y	Parameter
23.70	**Leg 1 Phase Angle Out**						
	Final alpha reference for Leg 1. Leg 1 final alpha reference in percent: 0 % ≡ 180.0°. 100 % ≡ 0.0°. Valid for the phase angle controls. 99.10 Leg 1 Control Mode = α controls / External Ref 23.65 (= 5 … 12).						
	0.00 … 100.00	-	%	100 = 1 %	y	n	Signal
23.75	**Leg 1 External Voltage Feedback**						
	Actual voltage measured by the overriding control system.						

<table>
<tr><th>Index</th><th colspan="7">Name</th></tr>
<tr><th></th><th colspan="7">Text</th></tr>
<tr><th></th><th>Range</th><th>Default</th><th>Unit</th><th>Scale FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">Leg 1 actual voltage measured by the overriding control system in percent of 99.03 Load Voltage.
Valid when 99.64 Leg 1 Voltage Feedback = External (23.75).</td></tr>
<tr><td></td><td>0.00 … 325.00</td><td>0.00</td><td>%</td><td>100 = 1 %</td><td>y</td><td>y</td><td>Parameter</td></tr>
<tr><td>23.77</td><td colspan="7">Leg 1 External Current Feedback</td></tr>
<tr><td></td><td colspan="7">Actual current measured by the overriding control system.
Leg 1 actual current measured by the overriding control system in percent of 99.02 Load Current.
Valid when 99.74 Leg 1 Current Feedback = External (23.77).</td></tr>
<tr><td></td><td>0.00 … 325.00</td><td>0.00</td><td>%</td><td>100 = 1 %</td><td>y</td><td>y</td><td>Parameter</td></tr>
<tr><td>23.80</td><td colspan="7">Leg 1 External Power Feedback</td></tr>
<tr><td></td><td colspan="7">Actual power measured by the overriding control system.
Leg 1 actual power measured by the overriding control system in percent of 99.09 Load Power.
Valid when 99.84 Leg 1 Power Feedback = External (23.80).</td></tr>
<tr><td></td><td>0.00 … 325.00</td><td>0.00</td><td>%</td><td>100 = 1 %</td><td>y</td><td>y</td><td>Parameter</td></tr>
<tr><td>23.90</td><td colspan="7">Leg 1 Firing Pulse Prolonging</td></tr>
<tr><td></td><td colspan="7">Increasing the firing pulse train length.
Prolonging the duration of the firing pulse train e.g. for inductive loads.</td></tr>
<tr><td></td><td>0.0 … 95.0</td><td>0.0</td><td>°</td><td>10 = 1°</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>23.95</td><td colspan="7">Leg 1 Control Mode Options</td></tr>
<tr><td></td><td colspan="7">23.95 Leg 1 Control mode options enables additional functions depending on 99.10 Leg 1 Control Mode:
<table>
<tr><th>Bit</th><th>Name</th><th>High</th><th>Low</th><th>Remark</th></tr>
<tr><td>0</td><td>Full wave half cycle</td><td>Active</td><td>Inactive</td><td rowspan="2">Only for 99.10 Leg 1 Control Mode = Full wave fix cycle (= 2)</td></tr>
<tr><td>1</td><td>Fix cycle resolution</td><td>Active</td><td>Inactive</td></tr>
<tr><td>2 … 15</td><td></td><td></td><td></td><td></td></tr>
</table>
Full wave half cycle:
If active, 99.10 Leg 1 Control Mode = Full wave fix cycle (= 2) operates using half cycles instead of full cycles.
Fix cycle resolution:
If active, the resolution of 99.10 Leg 1 Control Mode = Full wave fix cycle (= 2) is ‘increased’.
Due to the system, the best possible resolution is one full wave (one cycle). If the reference is not inside this resolution, the remaining parts are added up and if they equal a full wave, the full wave is conducted.</td></tr>
<tr><td></td><td>0000h … FFFFh</td><td>0000h</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
</table>

24 Leg 2 Reference Chain

Description see group 22 Leg 1 Reference Chain.

25 Leg 2 Control Detailed

Description see group 23 Leg 1 Control Detailed.

26 Leg 3 Reference Chain

Description see group 22 Leg 1 Reference Chain.

27 Leg 3 Control Detailed

Description see group 23 Leg 1 Control Detailed.

28 Unit Faults

Configuration of external events, selection of behavior of the thyristor power controller upon fault situations.

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
28.01	**External event 1 source**						
	Source of external event 1. Defines the source of external event 1. See 28.02 External event 1 type. The external event is low active, thus: 0 = Trigger event. 1 = Normal operation. **Other [bit]**; source selection. 0: **Active**; trigger event. 1: **Inactive**; no trigger event. Normal operation. 3: **DI1**; 10.02.b00 DI delayed status. 4: **DI2**; 10.02.b01 DI delayed status. 5: **DI3**; 10.02.b02 DI delayed status. 6: **DI4**; 10.02.b03 DI delayed status. 7: **DI5**; 10.02.b04 DI delayed status. 8: **DI6**; 10.02.b05 DI delayed status. 11: **DIO1**; 11.02.b00 DIO delayed status. 12: **DIO2**; 11.02.b01 DIO delayed status. 19: **DIL**; 10.02.b15 DI delayed status.						
	0 … 19	Inactive	-	1 = 1	n	y	Parameter
28.02	**External event 1 type**						
	Type of external event 1. Selects the type of external event 1. 0: **Fault**; the event generates fault 5211 External fault 1. 1: **Warning**; the event generates warning 1201 External warning 1. 3: **Warning/Fault**; if the unit is operating, see 06.13 Global Status Word bit 3 = 1, fault 5211 is generated. Otherwise, warning 1201 is generated.						
	0 … 3	Fault	-	1 = 1	n	y	Parameter
28.03	**External event 2 source**						
	Source of external event 2. Defines the source for external event 2. See 28.01 External event 1 source and 28.02 External event 1 type.						
	0 … 19	Inactive	-	1 = 1	n	y	Parameter
28.04	**External event 2 type**						
	Type of external event 2. Selects the type of external event 2. See 28.02 External event 1 type.						
	0 … 3	Fault	-	1 = 1	n	y	Parameter
28.05	**External event 3 source**						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	Source of external event 3. Defines the source for external event 3. See 28.01 External event 1 source and 28.02 External event 1 type.						
	0 … 19	Inactive	-	1 = 1	n	y	Parameter
28.06	**External event 3 type**						
	Type of external event 3. Selects the type of external event 2. See 28.02 External event 1 type.						
	0 … 3	Fault	-	1 = 1	n	y	Parameter
28.07	**External event 4 source**						
	Source of external event 4. Defines the source for external event 4. See 28.01 External event 1 source and 28.02 External event 1 type.						
	0 … 19	Inactive	-	1 = 1	n	y	Parameter
28.08	**External event 4 type**						
	Type of external event 4. Selects the type for external event 4. See 28.02 External event 1 type.						
	0 … 3	Fault	-	1 = 1	n	y	Parameter
28.09	**External event 5 source**						
	Source of external event 5. Defines the source for external event 5. See 28.01 External event 1 source and 28.02 External event 1 type.						
	0 … 19	Inactive	-	1 = 1	n	y	Parameter
28.10	**External event 5 type**						
	Type of external event 5. Selects the type for external event 5. See 28.02 External event 1 type.						
	0 … 3	Fault		1 = 1	n	y	Parameter
28.20	**Fault function Leg 2 / Leg 3**						
	Follow fault/warning function of leg 1. Selects if the faults/warnings for overcurrent, mains overvoltage and mains undervoltage are set up individually for each leg or if leg 2 and leg 3 follow leg 1. 0: **Follow Leg 1**; the fault/warning parameters settings of leg 1 are also valid for leg 2 and leg 3. Thus, fault/warning parameters settings of leg 2 and leg 3 are invalid. **Attention**: Fault/Warning messages are still active for each leg. E.g. if there is an overcurrent in leg 2, it will be indicated as a Leg 2 overcurrent fault. 1: **Individual**; the fault/warning parameters settings of each leg are active. Thus, the supervision for each leg is working independently.						
	0 … 1	Follow Leg 1	-	1 = 1	n	y	Parameter
28.21	**Leg 1 Overcurrent Fault level**						
	Leg 1 overcurrent fault level. The event generates fault 3101 Leg 1 Overcurrent, if 28.21 Leg 1 Overcurrent Fault level in percent of 99.02 Load Current is exceeded. See description in chapter Fault tracing.						
	0.00 … 325.00	150.00	%	100 = 1 %	n	y	Parameter
28.22	**Leg 1 Overcurrent Warning level**						

Index	Name					
	Text					
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	Leg 1 overcurrent warning level. The event generates warning 2101 Leg 1 Overcurrent, if 28.22 Leg 1 Overcurrent Warning level in percent of 99.02 Load Current is exceeded. See description in chapter Fault tracing.						
	0.00 … 325.00	130.00	%	100 = 1 %	n	y	Parameter
28.23	**Leg 2 Overcurrent Fault level**						
	Leg 2 overcurrent fault level. The event generates fault 3201 Leg 2 Overcurrent, if 28.23 Leg 2 Overcurrent Fault level in percent of 99.02 Load Current is exceeded. See description in chapter Fault tracing.						
	0.00 … 325.00	150.00	%	100 = 1 %	n	y	Parameter
28.24	**Leg 2 Overcurrent Warning level**						
	Leg 2 overcurrent warning level. The event generates warning 2201 Leg 2 Overcurrent, if 28.24 Leg 2 Overcurrent Warning level in percent of 99.02 Load Current is exceeded. See description in chapter Fault tracing.						
	0.00 … 325.00	130.00	%	100 = 1 %	n	y	Parameter
28.25	**Leg 3 Overcurrent Fault level**						
	Leg 3 overcurrent fault level. The event generates fault 3301 Leg 3 Overcurrent, if 28.25 Leg 3 Overcurrent Fault level in percent of 99.02 Load Current is exceeded. See description in chapter Fault tracing.						
	0.00 … 325.00	150.00	%	100 = 1 %	n	y	Parameter
28.26	**Leg 3 Overcurrent Warning level**						
	Leg 3 overcurrent warning level. The event generates warning 2301 Leg 3 Overcurrent, if 28.26 Leg 3 Overcurrent Warning level in percent of 99.02 Load Current is exceeded. See description in chapter Fault tracing.						
	0.00 … 325.00	130.00	%	100 = 1 %	n	y	Parameter
28.30	**Leg 1 Mains Overvoltage Fault level**						
	Leg 1 overvoltage fault level. The event generates fault 3102 Leg 1 Mains Overvoltage, if 28.30 Leg 1 Overvoltage Fault level in percent of 99.01 Supply Voltage is exceeded. See description in chapter Fault tracing.						
	0.00 … 325.00	150.00	%	100 = 1 %	n	y	Parameter
28.31	**Leg 1 Mains Overvoltage Warning level**						
	Leg 1 overvoltage warning level. The event generates warning 2102 Leg 1 Mains Overvoltage, if 28.31 Leg 1 Overvoltage Warning level in percent of 99.01 Supply Voltage is exceeded. See description in chapter Fault tracing.						
	0.00 … 325.00	130.00	%	100 = 1 %	n	y	Parameter
28.32	**Leg 2 Mains Overvoltage Fault level**						
	Leg 2 overvoltage fault level. The event generates fault 3302 Leg 2 Mains Overvoltage, if 28.32 Leg 2 Overvoltage Fault level in percent of 99.01 Supply Voltage is exceeded.						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	See description in chapter Fault tracing.						
	0.00 … 325.00	150.00	%	100 = 1 %	n	y	Parameter
28.33	**Leg 2 Mains Overvoltage Warning level**						
	Leg 2 overvoltage warning level. The event generates warning 2202 Leg 2 Mains Overvoltage, if 28.33 Leg 2 Overvoltage Warning level in percent of 99.01 Supply Voltage is exceeded. See description in chapter Fault tracing.						
	0.00 … 325.00	130.00	%	100 = 1 %	n	y	Parameter
28.34	**Leg 3 Mains Overvoltage Fault level**						
	Leg 3 overvoltage fault level. The event generates fault 3302 Leg 3 Mains Overvoltage, if 28.34 Leg 3 Overvoltage Fault level in percent of 99.01 Supply Voltage is exceeded. See description in chapter Fault tracing.						
	0.00 … 325.00	150.00	%	100 = 1 %	n	y	Parameter
28.35	**Leg 3 Mains Overvoltage Warning level**						
	Leg 3 overvoltage warning level. The event generates warning 2302 Leg 3 Mains Overvoltage, if 28.35 Leg 3 Overvoltage Warning level in percent of 99.01 Supply Voltage is exceeded. See description in chapter Fault tracing.						
	0.00 … 325.00	130.00	%	100 = 1 %	n	y	Parameter
28.40	**Leg 1 Mains Undervoltage short time Fault level**						
	Leg 1 absolute minimum mains voltage limit. Leg 1 mains undervoltage short time fault level in volts. The event immediately generates fault 3105 Leg 1 Mains Undervoltage, if 28.40 Leg 1 Mains Undervoltage short time Fault level is undercut. **Notes:** – Do not set lower than 80.00 V. – In case the mains contactor is controlled by the overriding control, it might be necessary to suppress the short time mains undervoltage fault. For this set 19.01 Leg 1 Enable Local I/O = Mains ON. See description in chapter Fault tracing.						
	0.0 … 3250.0	80.0	V	10 = 1 V	n	y	Parameter
28.41	**Leg 1 Mains Undervoltage Fault level**						
	Leg 1 undervoltage fault level. The event generates fault 3105 Leg 1 Mains Undervoltage, if 28.41 Leg 1 Undervoltage Fault level in percent of 99.01 Supply Voltage is undercut for longer than 28.42 Leg 1 Mains Undervoltage Fault delay time. See description in chapter Fault tracing.						
	0.00 … 325.00	75.00	%	100 = 1 %	n	y	Parameter
28.42	**Leg 1 Mains Undervoltage Fault delay time**						
	Leg 1 mains undervoltage fault delay time. Leg 1 mains undervoltage fault delay time for 28.41 Leg 1 Mains Undervoltage Fault level. See description in chapter Fault tracing.						
	0.0 … 3000.0	2.0	s	10 = 1 s	n	y	Parameter
28.43	**Leg 1 Mains Undervoltage Warning level**						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	Leg 1 undervoltage warning level. The event immediately generates warning 2105 Leg 1 Mains Undervoltage, if 28.43 Leg 1 Undervoltage Warning level in percent of 99.01 Supply Voltage is undercut. See description in chapter Fault tracing.						
	0.00 … 325.00	90.00	%	100 = 1 %	n	y	Parameter
28.44	**Leg 2 Mains Undervoltage short time Fault level**						
	Leg 2 absolute minimum mains voltage limit. Leg 2 mains undervoltage short time fault level in volts. The event immediately generates fault 3205 Leg 2 Mains Undervoltage, if 28.44 Leg 2 Mains Undervoltage short time Fault level is undercut. **Notes:** – Do not set lower than 80.00 V. – In case the mains contactor is controlled by the overriding control, it might be necessary to suppress the short time mains undervoltage fault. For this set 19.03 Leg 2 Enable Local I/O = Mains ON. See description in chapter Fault tracing.						
	0.0 … 3250.0	80.0	V	10 = 1 V	n	y	Parameter
28.45	**Leg 2 Mains Undervoltage Fault level**						
	Leg 2 undervoltage fault level. The event generates fault 3205 Leg 2 Mains Undervoltage, if 28.45 Leg 2 Undervoltage Fault level in percent of 99.01 Supply Voltage is undercut for longer than 28.46 Leg 2 Mains Undervoltage Fault delay time. See description in chapter Fault tracing.						
	0.00 … 325.00	75.00	%	100 = 1 %	n	y	Parameter
28.46	**Leg 2 Mains Undervoltage Fault delay time**						
	Leg 2 mains undervoltage fault delay time. Leg 2 mains undervoltage fault delay time for 28.45 Leg 2 Mains Undervoltage Fault level. See description in chapter Fault tracing.						
	0.0 … 3000.0	2.0	s	10 = 1 s	n	y	Parameter
28.47	**Leg 2 Mains Undervoltage Warning level**						
	Leg 2 undervoltage warning level. The event generates warning 2205 Leg 2 Mains Undervoltage, if 28.47 Leg 2 Undervoltage Warning level in percent of 99.01 Supply Voltage is undercut. See description in chapter Fault tracing.						
	0.00 … 325.00	90.00	%	100 = 1 %	n	y	Parameter
28.48	**Leg 3 Mains Undervoltage short time Fault level**						
	Leg 3 absolute minimum mains voltage limit. Leg 3 mains undervoltage short time fault level in volts. The event immediately generates fault 3305 Leg 3 Mains Undervoltage, if 28.48 Leg 3 Mains Undervoltage short time Fault level is undercut. **Notes:** – Do not set lower than 80.00 V. – In case the mains contactor is controlled by the overriding control, it might be necessary to suppress the short time mains undervoltage fault. For this set 19.05 Leg 3 Enable Local I/O = Mains ON. See description in chapter Fault tracing.						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	0.0 … 3250.0	80.0	V	10 = 1 V	n	y	Parameter
28.49	**Leg 3 Mains Undervoltage Fault level**						
	Leg 3 undervoltage fault level. The event generates fault 3305 Leg 3 Mains Undervoltage, if 28.49 Leg 3 Undervoltage Fault level in percent of 99.01 Supply Voltage is undercut for longer than 28.50 Leg 3 Mains Undervoltage Fault delay time. See description in chapter Fault tracing.						
	0.00 … 325.00	75.00	%	100 = 1 %	n	y	Parameter
28.50	**Leg 3 Mains Undervoltage Fault delay time**						
	Leg 3 mains undervoltage fault delay time. Leg 3 mains undervoltage fault delay time for 28.49 Leg 2 Mains Undervoltage Fault level. See description in chapter Fault tracing.						
	0.0 … 3000.0	2.0	s	10 = 1 s	n	y	Parameter
28.51	**Leg 3 Mains Undervoltage Warning level**						
	Leg 3 undervoltage warning level. The event generates warning 2305 Leg 3 Mains Undervoltage, if 28.51 Leg 3 Undervoltage Warning level in percent of 99.01 Supply Voltage is undercut. See description in chapter Fault tracing.						
	0.00 … 325.00	90.00	%	100 = 1 %	n	y	Parameter
28.55	**Thyristor short function**						
	Type of event thyristor short circuit during full wave (burst) (= 1 … 3). This function measures the current when the firing angle = 30.41 Leg 1 Alpha Max. During that time the current should be zero. Selects the type of event thyristor short circuit. 0: **No action**; none, disable event thyristor short circuit. 1: **Warning**; the event generates warning 2103/2203/2303 Leg 1/2/3 Thyristor short circuit. 2: **Fault**; the event generates fault 3103/3203/3303 Leg1/2/3 Thyristor short circuit.						
	0 … 2	Warning	-	1 = 1	n	y	Parameter
28.56	**Thyristor short trip level**						
	Trip level for the thyristor short function. Thyristor short circuit fault level in percent of 99.02 Load Current. In case the measured current exceeds the set level, when the firing angle = 30.41 Leg 1 Alpha Max, the event defined in 28.55 Thyristor short function is executed.						
	0.00 ... 100.00	5.00	%	100 = 1 %	n	y	Parameter
28.72	**STO indication run/stop**						
	reserved Not applicable for DCT. Leave at default. **WARNING!** The XSTO terminals must not be used for thyristor power controllers. They are not offering any certified safety functionality.						
	0 … 6	Fault/Fault	-	1 = 1	n	n	Parameter
28.90	**XSMC:STO indication**						
	reserved Not applicable for DCT. Leave at default. **WARNING!** The XSTO terminals must not be used for thyristor power controllers.						

<table>
<tr><th>Index</th><th colspan="7">Name</th></tr>
<tr><th rowspan="2"></th><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">They are not offering any certified safety functionality.</td></tr>
<tr><td>0 … 2</td><td>Fault</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>28.91</td><td colspan="7">STO status word</td></tr>
<tr><td rowspan="2"></td><td colspan="7">reserved
Not applicable for DCT. Leave at default.
WARNING!
The XSTO terminals must not be used for thyristor power controllers.
They are not offering any certified safety functionality.</td></tr>
<tr><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>28.94</td><td colspan="7">STO time 1</td></tr>
<tr><td rowspan="2"></td><td colspan="7">reserved
Not applicable for DCT. Leave at default.
WARNING!
The XSTO terminals must not be used for thyristor power controllers.
They are not offering any certified safety functionality.</td></tr>
<tr><td>0 … 65535</td><td>-</td><td>ms</td><td>1 = 1 ms</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>28.95</td><td colspan="7">STO time 2</td></tr>
<tr><td rowspan="2"></td><td colspan="7">reserved
Not applicable for DCT. Leave at default.
WARNING!
The XSTO terminals must not be used for thyristor power controllers.
They are not offering any certified safety functionality.</td></tr>
<tr><td>0 … 65535</td><td>-</td><td>ms</td><td>1 = 1 ms</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>28.98</td><td colspan="7">STO actual status</td></tr>
<tr><td rowspan="2"></td><td colspan="7">reserved
Not applicable for DCT. Leave at default.
WARNING!
The XSTO terminals must not be used for thyristor power controllers.
They are not offering any certified safety functionality.</td></tr>
<tr><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>28.99</td><td colspan="7">STO fault diagnostic</td></tr>
<tr><td rowspan="2"></td><td colspan="7">reserved
Not applicable for DCT. Leave at default.
WARNING!
The XSTO terminals must not be used for thyristor power controllers.
They are not offering any certified safety functionality.</td></tr>
<tr><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>28.100</td><td colspan="7">STO test mode</td></tr>
<tr><td rowspan="2"></td><td colspan="7">reserved
Not applicable for DCT. Leave at default.
WARNING!
The XSTO terminals must not be used for thyristor power controllers.
They are not offering any certified safety functionality.</td></tr>
<tr><td>0 … 2</td><td>None</td><td>-</td><td>1 = 1</td><td>y</td><td>y</td><td>Parameter</td></tr>
</table>

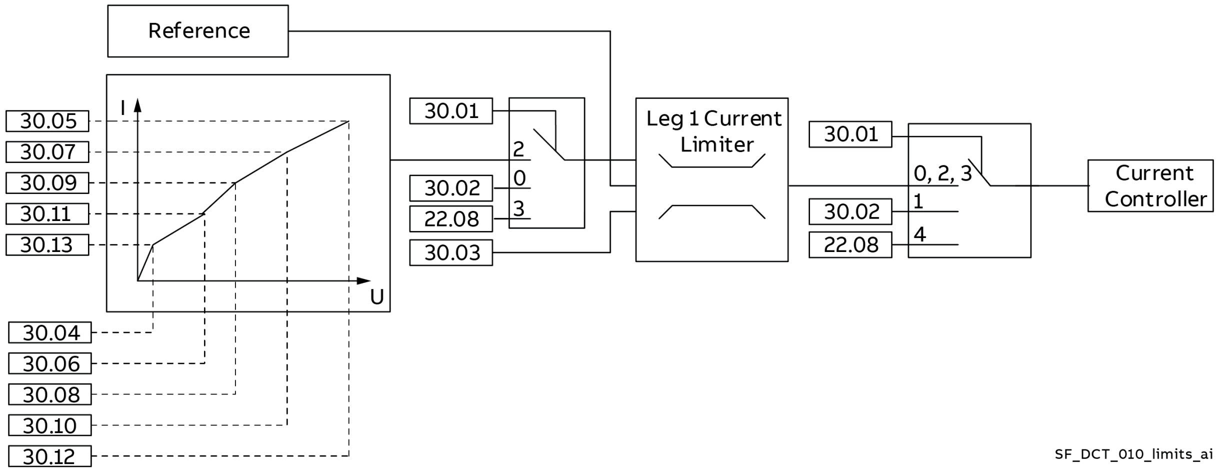
29 Multitap

Configuration when using a transformer with multitaps. See DCT880 Multitap Control Manual (3ADW000440).

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
29.01	**Leg 1 Output Voltage relative**						
	reserved						
	0.00 … 325.00	33.00	%	100 = 1 %	n	y	Parameter
29.02	**Leg 2 Output Voltage relative**						
	reserved						
	0.00 … 325.00	67.00	%	100= 1 %	n	y	Parameter
29.03	**Leg 3 Output Voltage relative**						
	reserved						
	0.00 … 325.00	100.00	%	100 = 1 %	n	y	Parameter

30 Leg 1 Limits

Thyristor power controller operation limits.

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
Leg 1 limits:  							
30.01	**Leg 1 Current Limiter Mode**						
	Leg 1 current limiter operation mode. 0: **Fix (30.02)**; fixed limits. 30.02 Leg 1 Current Limit Max and 30.03 Leg 1 Current Limit Min are used. 1: **Auto (current controller)**; uses value of 30.02 Leg 1 Current Limit Max as reference for the current controller. This releases the current controller working as current limiter for 99.10 Leg 1 Control Mode = 1 … 6 and 9 … 12, when 30.20 Leg 1 Current Limiters = Enable. 2: **By voltage**; 30.02 Leg 1 Current Limit Max is set depending on the load voltage using parameters 30.04 … 30.13. 3: **Ref channel B (22.08)**; 22.08 Leg 1 Cha B Sum Ref after limit is used as current limiter for leg 1.						

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	4: **Auto/RefChB (current controller/22.08)**; uses value of 22.08 Leg 1 Cha B Sum Ref after limit as reference for the current controller. This releases the current controller working as current limiter for 99.10 Leg 1 Control Mode = 1 … 6 and 9 … 12, when 30.20 Leg 1 Current Limiters = Enable. **Example**: 99.10 Leg 1 Control Mode = U α open loop control (5). Thus, the current is normally dependent on the load resistance. After the load current reaches the limit defined by 22.08 Leg 1 Cha B Sum Ref after limit, the current controller follows the selected reference via channel B.						
	0 … 4	Fix (30.02)	-	1 = 1	n	y	Parameter
30.02	**Leg 1 Current Limit Max**						
	Leg 1 upper current reference limit. Leg 1 upper current reference limit in percent of 99.02 Load Current.						
	0.00 … 325.00	325.00	%	100 = 1 %	n	y	Parameter
30.03	**Leg 1 Current Limit Min**						
	Leg 1 lower current reference limit. Leg 1 lower current reference limit in percent of 99.02 Load Current.						
	0.00 … 325.00	0.00	%	100 = 1 %	n	y	Parameter
30.04	**Leg 1 Current Limit Voltage 1**						
	Leg 1 voltage depending current reference limit. First U axis-supporting point in percent of 99.03 Load Voltage.						
	0.00 … 325.00	20.00	%	100 = 1 %	n	y	Parameter
30.05	**Leg 1 Current Limit Level 1**						
	Leg 1 voltage depending current reference limit. First I axis-supporting point in percent of 99.02 Load Current.						
	0.00 … 325.00	20.00	%	100 = 1 %	n	y	Parameter
30.06	**Leg 1 Current Limit Voltage 2**						
	Leg 1 voltage depending current reference limit. Second U axis-supporting point in percent of 99.03 Load Voltage.						
	0.00 … 325.00	40.00	%	100 = 1 %	n	y	Parameter
30.07	**Leg 1 Current Limit Level 2**						
	Leg 1 voltage depending current reference limit. Second I axis-supporting point in percent of 99.02 Load Current.						
	0.00 … 325.00	40.00	%	100 = 1 %	n	y	Parameter
30.08	**Leg 1 Current Limit Voltage 3**						
	Leg 1 voltage depending current reference limit. Third U axis-supporting point in percent of 99.03 Load Voltage.						
	0.00 … 325.00	60.00	%	100 = 1 %	n	y	Parameter
30.09	**Leg 1 Current Limit Level 3**						
	Leg 1 voltage depending current reference limit. Third I axis-supporting point in percent of 99.02 Load Current.						
	0.00 … 325.00	60.00	%	100 = 1 %	n	y	Parameter
30.10	**Leg 1 Current Limit Voltage 4**						
	Leg 1 voltage depending current reference limit. 4th U axis-supporting point in percent of 99.03 Load Voltage.						
	0.00 … 325.00	80.00	%	100 = 1 %	n	y	Parameter
30.11	**Leg 1 Current Limit Level 4**						
	Leg 1 voltage depending current reference limit. 4th I axis-supporting point in percent of 99.02 Load Current.						
	0.00 … 325.00	80.00	%	100 = 1 %	n	y	Parameter
30.12	**Leg 1 Current Limit Voltage 5**						
	Leg 1 voltage depending current reference limit.						

Index	Name						
	Text						
	Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
	5th U axis-supporting point in percent of 99.03 Load Voltage.						
	0.00 … 325.00	100.00	%	100 = 1 %	n	y	Parameter
30.13	**Leg 1 Current Limit Level 5**						
	Leg 1 voltage depending current reference limit. 5th I axis-supporting point in percent of 99.02 Load Current.						
	0.00 … 325.00	100.00	%	100 = 1 %	n	y	Parameter
30.15	**Leg 1 Alpha min Current Controller**						
	Output of the current controller after the arccosine for 99.10 Leg 1 Control Mode = full wave (burst)/half wave (= 1 … 4). See 30.20 Leg 1 Current Limit.						
	0.0 … 180.0	-	°	10 = 1°	y	n	Signal
30.20	**Leg 1 Current Limiters**						
	Enable/Disable the current limiters for 99.10 Leg 1 Control Mode = 1 … 6 and 9 … 12. This is all control modes except I α control and I2 α control (= 7 and 8). 0: **Disable**; disable the current limiters. 1: **Enable**; enable the current limiters.						
	0 … 1	Disable	-	1 = 1	n	y	Parameter
30.21	**Leg 1 Voltage Limit Max**						
	Leg 1 upper voltage reference limit. Leg 1 upper voltage reference limit in percent of 99.03 Load Voltage.						
	0.00 … 325.00	325.00	%	100 = 1 %	n	y	Parameter
30.22	**Leg 1 Voltage Limit Min**						
	Leg 1 lower voltage reference limit. Leg 1 lower voltage reference limit in percent of 99.03 Load Voltage.						
	0.00 … 325.00	0.00	%	100 = 1 %	n	y	Parameter
30.31	**Leg 1 Power Limit Max**						
	Leg 1 upper power reference limit. Leg 1 upper power reference limit in percent of 99.09 Load Power.						
	0.00 … 325.00	325.00	%	100 = 1 %	n	y	Parameter
30.32	**Leg 1 Power Limit Min**						
	Leg 1 lower power reference limit. Leg 1 lower power reference limit in percent of 99.09 Load Power.						
	0.00 … 325.00	0.00	%	100 = 1 %	n	y	Parameter
30.40	**Leg 1 Alpha Min**						
	Leg 1 minimum α limit. Leg 1 minimum firing angle in degrees. Thus, maximum load voltage.						
	0.0 … 180.0	0.0	°	10 = 1°	n	y	Parameter
30.41	**Leg 1 Alpha Max**						
	Leg 1 maximum α limit. Leg 1 maximum firing angle in degrees. Thus, minimum load voltage.						
	0.0 … 180.0	180.0	°	10 = 1°	n	y	Parameter

31 Leg 2 Limits

Description see Group 30 Leg 1 Limits.

32 Leg 3 Limits

Description see Group 30 Leg 1 Limits.

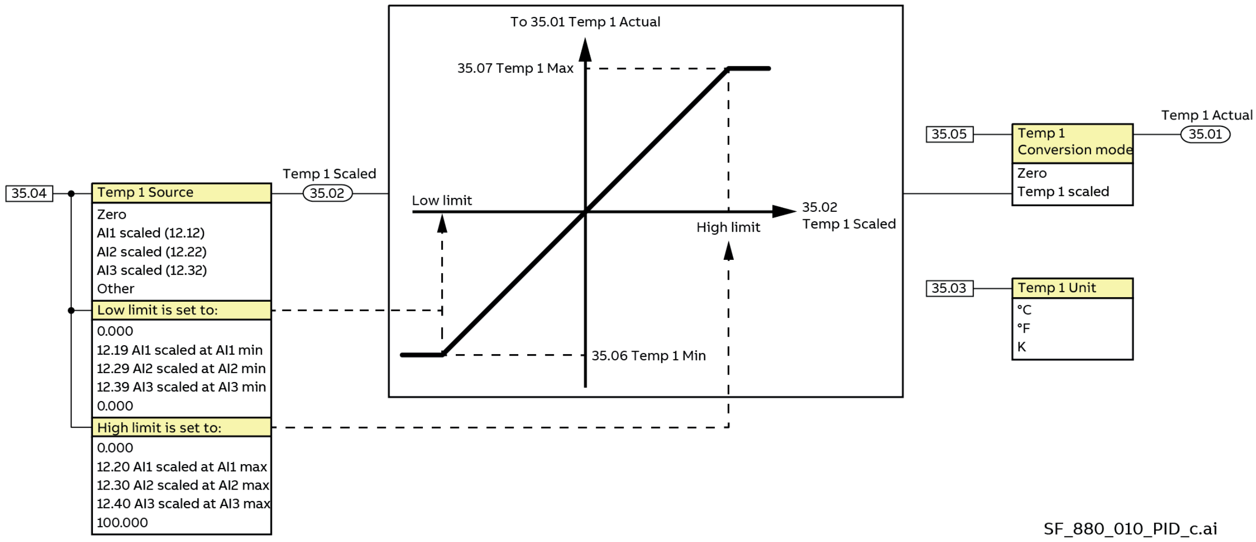
33 Generic timer & counter

Configuration of maintenance timers / counters.

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
33.01 **…** **33.65**	reserved						
	reserved						

35 Temperature Measurement

Temperature measurement channel 1 … 4 configuration.

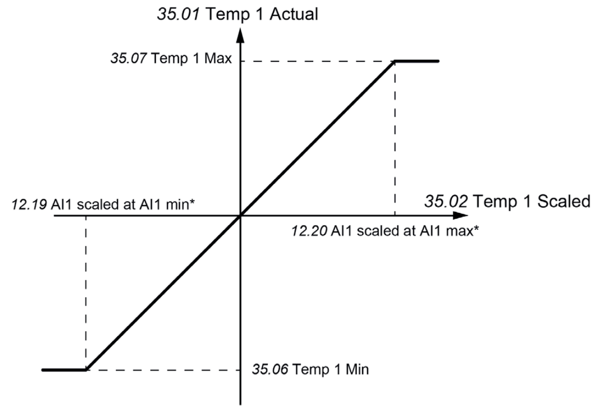
Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
Temperature measurement channel 1 overview:  SF_880_010_PID_c.ai							
35.01	**Temp 1 Actual**						
	Temperature measurement actual temperature 1. Displays the actual temperature of channel 1 defined by 35.05 Temp 1 Conversion mode. Is also used for events temperature 1 warning/fault. See parameters 35.10 ... 35.14.						
	-50.0 … 2000.0°C, -60.0 … 4000.0°F or 0.0 … 2300.0 K	-	See 35.03	10 = 1 (35.03)	y	n	Signal
35.02	**Temp 1 Scaled**						
	Temperature measurement scaled temperature 1. Displays the scaled temperature value of channel 1 selected by 35.04 Temp 1 Source.						
	-32768.000 … 32767.000	-	-	1 = 1	y	n	Signal
35.03	**Temp 1 Unit**						
	Temperature measurement unit selection temperature 1.						

<table>
<tr><td rowspan="3">**Index**</td><td colspan="7">**Name**</td></tr>
<tr><td colspan="7">**Text**</td></tr>
<tr><td>**Range**</td><td>**Default**</td><td>**Unit**</td><td>**Scale FbEq16**</td><td>**Volatile**</td><td>**Change running**</td><td>**Type**</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Defines the unit for signals/parameters 35.01, 35.06, 35.07, 35.11, 35.12 and 35.14.
150: °**C**; degree Celsius.
151: °**F**; degree Fahrenheit.
152: **K**; Kelvin.</td></tr>
<tr><td>150 … 152</td><td>°C</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**35.04**</td><td colspan="7">**Temp 1 Source**</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Temperature measurement source for scaled temperature 1.
Selects the source of temperature measurement channel 1 connected to the scaling. Additionally the scaling of low and high limit from the chosen analog input signal are selected.
Other; source selection
0: **Zero**; output is set to zero.
1: **AI1 scaled (12.12)**; the temperature measurement source is connected to analog input AI1.
2: **AI2 scaled (12.22)**; the temperature measurement source is connected to analog input AI2.
3: **AI2 scaled (12.32)**; the temperature measurement source is connected to analog input AI3.
4: **XENC:5-6-7**; the temperature measurement source is connected to XENC:5-6-7. See chapter XENC: Temperature measurement.
<table>
<tr><td>**35.04 Temp 1 Source**</td><td>**Scaling value/parameter for the low limit**</td><td>**Scaling value/parameter for the high limit**</td></tr>
<tr><td>**Other**; source selection</td><td>0.000</td><td>100.000</td></tr>
<tr><td>0: **Zero**; output is set to zero</td><td>0.000</td><td>0.000</td></tr>
<tr><td>1: **AI1 scaled (12.12)**</td><td>12.19 AI1 scaled at AI1 min</td><td>12.20 AI1 scaled at AI1 max</td></tr>
<tr><td>2: **AI2 scaled (12.22)**</td><td>12.29 AI2 scaled at AI2 min</td><td>12.30 AI2 scaled at AI2 max</td></tr>
<tr><td>3: **AI3 scaled (12.32)**</td><td>12.39 AI3 scaled at AI3 min</td><td>12.40 AI3 scaled at AI3 max</td></tr>
<tr><td>4: **XENC:5-6-7**</td><td>Autoscaling, no setting needed.</td><td>Autoscaling, no setting needed.</td></tr>
</table></td></tr>
<tr><td>0 … 4</td><td>Zero</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**35.05**</td><td colspan="7">**Temp 1 Conversion mode**</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Temperature measurement conversion mode temperature 1.
Selects the source of temperature measurement channel 1
0: **Zero**; output is set to zero.
1: **Temp signal converter**; the temperature is selected by 35.04 Temp 1 Source = AI1 scaled (12.12) ... AI3 scaled (12.32) and scaled via 35.06 Temp 1 Min and 35.07 Temp 1 Max.
2: **XENC:5-6-7**; the temperature is selected by 35.04 Temp 1 Source = XENC:5-6-7 and scaled automatically, because only 3-wire PT100 are allowed to be used. See chapter XENC: Temperature measurement.</td></tr>
<tr><td>0 … 1</td><td>Zero</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**35.06**</td><td colspan="7">**Temp 1 Min**</td></tr>
<tr><td></td><td colspan="7">Temperature measurement minimum value temperature 1.
Defines the minimum input value for the temperature measurement channel 1 in °C, °F or K, depending on 35.03 Temp 1 Unit.
Scaling values/parameters, depending on setting of 35.04 Temp 1 Source (see table below), set the low and high limit of the scaled temperature, the result can be seen in 35.02 Temp 1 Scaled.</td></tr>
</table>

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**

35.04 Temp 1 Source	**Scaling value/parameter for the low limit**	**Scaling value/parameter for the high limit**
Other; source selection	0.000	100.000
0: **Zero**; output is set to zero	0.000	0.000
1: **AI1 scaled (12.12)**	12.19 AI1 scaled at AI1 min	12.20 AI1 scaled at AI1 max
2: **AI2 scaled (12.22)**	12.29 AI2 scaled at AI2 min	12.30 AI2 scaled at AI2 max
3: **AI3 scaled (12.32)**	12.39 AI3 scaled at AI3 min	12.40 AI3 scaled at AI3 max
4: **XENC:5-6-7**	Autoscaling, no setting needed.	Autoscaling, no setting needed.

Parameters 35.06 and 35.07 define the temperature values that correspond to these limits as follows:



* For 35.04 Temp 1 Source = AI1 scaled (12.12)

	-50.0 … 2000.0°C, -60.0 … 4000.0°F or 0.0 … 2300.0 K	0.0°C, 32.0°F or 273.2 K	See 35.03	10 = 1 (35.03)	n	y	Parameter
35.07	**Temp 1 Max**						
	Temperature measurement maximum value temperature 1. Defines the maximum input value for the temperature measurement channel 1 in °C, °F or K, depending on 35.03 Temp 1 Unit. See 35.06 Temp 1 min.						
	-50.0 … 2000.0°C, -60.0 … 4000.0°F or 0.0 … 2300.0 K	250.0°C, 482.0°F or 523.2 K	See 35.03	10 = 1 (35.03)	n	y	Parameter
35.08	**Temp 1 Offset**						
	reserved						
	-0.100 … 0.100	0.000	V	1000 = 1 V	n	y	Parameter
35.09	**Temp 1 Measurement current**						
	reserved						
	0.00 … 20.00	0.00	mA	100 = 1 mA	n	y	Parameter
35.10	**Temp 1 warning function**						
	Type of event temperature 1 warning.						

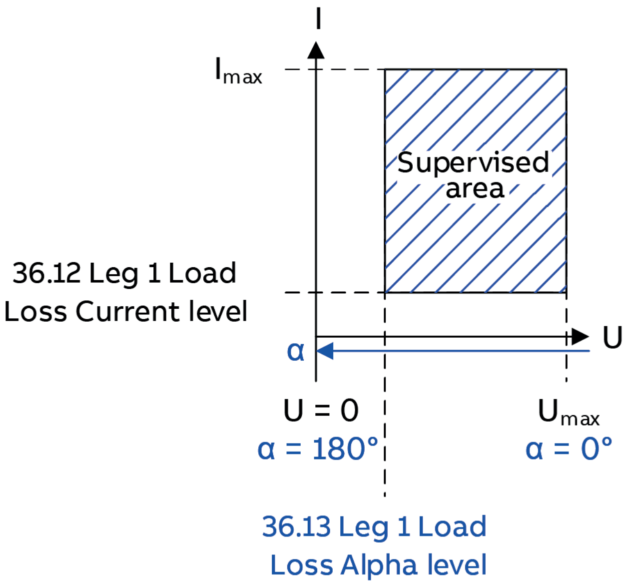
Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	Selects the type of event temperature 1 warning. 0: **No reaction**; none, disable temperature 1 warning. 1: **Warning (greater than)**; the event generates warning 1101 Temperature 1 warning. When 35.01 Temp 1 Actual exceeds 35.11 Temp 1 warning level. 2: **Warning (less than)**; the event generates warning 1101 Temperature 1 warning. When 35.01 Temp 1 Actual undercuts 35.11 Temp 1 warning level.						
	0 ... 2	No reaction	-	1 = 1	n	y	Parameter
35.11	**Temp 1 warning level**						
	Warning level for temperature 1 warning. Defines the warning level for temperature 1 warning function. When 35.01 Temp 1 Actual exceeds/undercuts 35.11 Temp 1 warning level, the event generates warning 1101 Temperature 1 warning. See 35.10 Temp 1 warning function.						
	-50.0 … 2000.0°C, -60.0 … 4000.0°F or 0.0 … 2300.0 K	250.0°C, 482.0°F or 523.2 K	See 35.03	10 = 1 (35.03)	n	y	Parameter
35.12	**Temp 1 warning hysteresis**						
	Hysteresis for temperature 1 warning.						
	0.0 ... 50.0°C 0.0 ... 90.0°F 0.0 ... 50.0 K	10.0°C 18°F 10.0 K	See 35.03	10 = 1 (35.03)	n	y	Parameter
35.13	**Temp 1 fault function**						
	Type of event temperature 1 fault. Selects the type of event temperature 1 fault. 0: **No reaction**; none, disable temperature 1 fault. 1: **Fault (greater than)**; the event generates fault 5201 Temperature 1 fault. When 35.01 Temp 1 Actual exceeds 35.14 Temp 1 fault level. 2: **Fault (less than)**; the event generates fault 5201 Temperature 1 fault. When 35.01 Temp 1 Actual undercuts 35.14 Temp 1 fault level.						
	0 ... 2	No reaction	-	1 = 1	n	y	Parameter
35.14	**Temp 1 fault level**						
	Fault level for temperature 1 fault. Defines the fault level for temperature 1 fault function. When 35.01 Temp 1 Actual exceeds/undercuts 35.14 Temp 1 fault level, the event generates fault 5201 Temperature 1 fault. See 35.13 Temp 1 fault function.						
	-50.0 … 2000.0°C, -60.0 … 4000.0°F or 0.0 … 2300.0 K	250.0°C, 482.0°F or 523.2 K	See 35.03	10 = 1 (35.03)	n	y	Parameter
35.21 … 35.29	**Temperature measurement channel 2.**						
	See 35.01 Temp 1 Actual … 35.09 Temp 1 Measurement current.						
35.41 … 35.49	**Temperature measurement channel 3.**						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	See 35.01 Temp 1 Actual … 35.09 Temp 1 Measurement current.						
35.61 … 35.69	**Temperature measurement channel 4.**						
	See 35.01 Temp 1 Actual … 35.09 Temp 1 Measurement current.						

36 Leg 1 Load monitoring

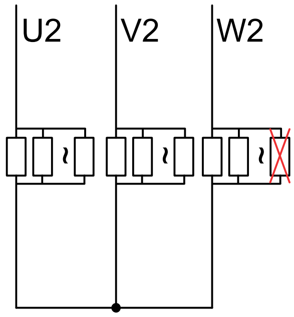
Load resistance measurement, load loss function and overload function.

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
36.01	**Leg 1 Resistance actual**						
	Leg 1 resistance. Leg 1 calculated actual resistance. For the calculation, RMS load current and RMS load voltage are used and adapted by 99.05 Load Configuration.						
	0.00 … 1000.00	-	Ohm	10 = 1 ohm	y	n	Signal
36.02	**3ph Resistance actual**						
	3-phase resistance. 3-phase calculated actual resistance. For the calculation, all three RMS load currents and all three RMS load voltages are used and adapted by 99.05 Load Configuration. **Note**: There is no equivalent signal in groups 37 and 38.						
	0.00 … 1000.00	-	Ohm	10 = 1 Ohm	y	n	Signal
36.03	**3ph Load Unbalance**						
	3-phase load unbalance. 36.03 3ph Load Unbalance shows the actual load current imbalance in symmetrical 3-phase load configurations. See 99.05 Load Configuration. The highest and lowest load current are taken, and the difference is shown. **Note**: There is no equivalent signal in groups 37 and 38.						
	-325.00 ... 325.00	-	%	100 = 1 %	y	n	Signal
36.10	**Leg 1 Load Loss Function**						
	Type of event leg 1 load loss. Selects the type of event leg 1 load loss for e.g. defective loads, high ohmic loads. The detection is based on RMS load current and RMS load voltage for the last positive or negative half-wave of the mains voltage. In case of total load failure, still a load voltage is measured, but the load current is equal or close to zero. **Note**: This method might not indicate the failed load accurately for all load configurations (e.g. closed delta configuration for 3-phase loads). Additional detection methods are not possible for references close to 0. 0: **No reaction**; none, disable event leg 1 load loss. 1: **Warning**; warning 2151 Leg 1 Load Loss is generated. 2: **Fault**; fault 3151 Leg 1 Load Loss is generated.						

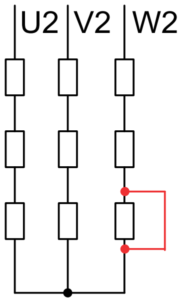
Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	0 … 2	No reaction	-	1 = 1	n	y	Parameter
36.11	**Leg 1 Load Loss activation time**						
	Leg 1 load loss start time. Delay time after a Run signal is given until the monitoring of event leg 1 load loss is activated.						
	0.01 … 300.00	1.00	s	100 = 1 s	n	y	Parameter
36.12	**Leg 1 Load Loss Current level**						
	Leg 1 load loss current level. Sets leg 1 load loss current level in percent of 99.02 Load Current. Exceeding the level activates event leg 1 load loss.  DZ_LIN_085_load loss current_a.ai						
	0.00 … 325.00	10.00	%	100 = 1 %	n	y	Parameter
36.13	**Leg 1 Load Loss Alpha level**						
	Leg 1 load loss alpha (firing angle) level. Sets the alpha level to activate event leg 1 load loss function. Alpha values smaller than 36.13 Leg 1 Load Loss Alpha level activate the load loss function. See 36.12 Leg 1 Load Loss Current level.						
	0.0 … 180.0	120.0	°	10 = 1°	n	y	Parameter
36.15	reserved						
36.16	reserved						
36.20	**Leg 1 Partial Load Loss Function**						
	Type of event leg 1 partial load loss. Selects the type of event leg 1 partial load loss for e.g. increased ohmic values. This function detects a static increase in load resistance by comparing 36.41 Leg 1 Initial resistance with the actual measured load resistance, see 36.01 Leg 1 Resistance actual. The threshold of event leg 1 partial load loss can be set using 36.22 Leg 1 Partial Load Loss level. 0: **No reaction**; none, disable event leg 1 partial load loss. 1: **Warning**; warning 2152 Leg 1 Partial Load Loss is generated.						

Index	Name Text Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
	2: **Fault**; fault 3152 Leg 1 Partial Load Loss is generated.						
	0 … 2	No reaction	-	1 = 1	n	y	Parameter
36.21	**Leg 1 Partial Load Loss activation time**						
	Leg 1 partial load loss start time. Delay time after a Run signal is given until the monitoring of event leg 1 partial load loss is activated.						
	0.01 … 300.00	1.00	s	100 = 1 %	n	y	Parameter
36.22	**Leg 1 Partial Load Loss level**						
	Leg 1 partial load loss level. Level for event leg 1 partial load loss in percent of 36.41 Leg 1 Initial resistance. Recommended threshold settings for resistance fault detection (all -10 %):						

Parallel elements	**99.05 Load Configuration**				
	3 x 1ph loads	**3ph star (3S)**	**3ph delta (3D)**	**3ph star + N (4S)**	**3ph open delta UV / UW (6D)**
2	200 %	167 %	122 %	200 %	200 %
3	150 %	133 %	111 %	150 %	150 %
4	133 %	122 %	107 %	133 %	133 %
5	126 %	117 %	-	126 %	126 %
6	120 %	113 %	-	120 %	120 %



Index	Name Text Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
	0.00 … 325.00	110.00	%	100 = 1 %	n	y	Parameter
36.23	**Leg 1 Partial Load Loss delay time**						
	Leg 1 partial load loss delay time. Delay time of event leg 1 partial load loss after the conditions are met.						
	0.0 … 3000.0	1.0	s	10 = 1 s	n	y	Parameter
36.25	**Leg 1 Partial Load Short Function**						
	Type of event leg 1 partial load short circuit. Selects the type of event leg 1 partial load short circuit for e.g. decreased ohmic values. This function detects a static decrease in load resistance by comparing 36.41 Leg 1 Initial resistance with the actual measured load resistance, see 36.01 Leg 1 Resistance actual. The threshold of the partial load short circuit can be set using 36.27 Leg 1 Partial Load Short level. 0: **No reaction**; none, disable event leg 1 partial load short circuit.						

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">1: Warning; warning 2153 Leg 1 Partial Load Short Circuit is generated.
2: Fault; fault 3153 Leg 1 Partial Load Short Circuit is generated.</td></tr>
<tr><td>0 … 2</td><td>No reaction</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>36.26</td><td colspan="7">Leg 1 Partial Load Short activation time</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Leg 1 partial load short circuit start time.
Delay time after a Run signal is given until the monitoring of event leg 1 partial load short circuit is activated.</td></tr>
<tr><td>0.01 … 300.00</td><td>1.00</td><td>s</td><td>100 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>36.27</td><td colspan="7">Leg 1 Partial Load Short level</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Leg 1 partial load short circuit level.
Level for event leg 1 partial load short circuit in percent of 36.41 Leg 1 Initial resistance.
Recommended threshold settings for resistance fault detection (all +10 %):
<table>
<tr><th rowspan="2">Serial elements</th><th colspan="5">99.05 Load Configuration</th></tr>
<tr><th>3 x 1ph loads</th><th>3ph star (3S)</th><th>3ph delta (3D)</th><th>3ph star + N (4S)</th><th>3ph open delta UV / UW (6D)</th></tr>
<tr><td>2</td><td>50 %</td><td>67 %</td><td>80 %</td><td>50 %</td><td>50 %</td></tr>
<tr><td>3</td><td>67 %</td><td>78 %</td><td>90 %</td><td>67 %</td><td>67 %</td></tr>
<tr><td>4</td><td>75 %</td><td>83 %</td><td>93 %</td><td>75 %</td><td>75 %</td></tr>
<tr><td>5</td><td>80 %</td><td>87 %</td><td>-</td><td>80 %</td><td>80 %</td></tr>
<tr><td>6</td><td>83 %</td><td>89 %</td><td>-</td><td>83 %</td><td>83 %</td></tr>
</table>


</td></tr>
<tr><td>0.00 … 325.00</td><td>90.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>36.28</td><td colspan="7">Leg 1 Partial Load Short delay time</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Leg 1 partial load short circuit delay time.
Delay time of event leg 1 partial load short circuit after the conditions are met.</td></tr>
<tr><td>0.0 … 3000.0</td><td>1.0</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>36.30</td><td colspan="7">Leg 1 Load Overload Function</td></tr>
<tr><td></td><td colspan="7">Type of event leg 1 load overload.
Selects the type of event leg 1 load overload.
If leg 1 actual current, see 01.33 Leg 1 Current RMS relative actual, exceeds the current and the time set by 36.31 Leg 1 Load Overload level and 36.32 Leg 1 Load Overload time event leg 1 load overload is generated.</td></tr>
</table>

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	0: **No reaction**; none, disable event leg 1 partial load overload. 1: **Warning**; warning 2155 Leg 1 Load Overload is generated. 2: **Fault**; fault 3155 Leg 1 Load Overload is generated.						
	0 … 2	No reaction	-	1 = 1	n	y	Parameter
36.31	**Leg 1 Load Overload level**						
	Leg 1 load overload level. Sets leg 1 load overload level in percent of 99.02 Load Current. Exceeding the level activates event leg 1 load overload.						
	0.00 … 325.00	110.00	%	100 = 1 %	n	y	Parameter
36.32	**Leg 1 Load Overload time**						
	Leg 1 load overload delay time. Delay time of event leg 1 load overload after the conditions are met.						
	0.0 … 3000.0	10.0	s	10 = 1 s	n	y	Parameter
36.35	**Leg 1 Unit Overload Function**						
	Type of event leg 1 unit thermal overload. Selects the type of event leg 1 unit thermal overload. If leg 1 actual current, see 01.30 Leg 1 Current RMS actual, exceeds the units rated current, see 07.17 Unit output current scaling set, by 36.36 Leg 1 Unit Overload level for the time in 36.37 Leg 1 Unit Overload time event is leg 1 unit thermal overload generated. 0: **No reaction**; none, disable event leg 1 unit thermal overload. 1: **Warning**; warning 2154 Leg 1 Unit Thermal Overload is generated. 2: **Fault**; fault 3154 Leg 1 Unit Thermal Overload is generated.						
	0 … 2	No reaction	-	1 = 1	n	y	Parameter
36.36	**Leg 1 Unit Overload level**						
	Leg 1 unit thermal overload level. Sets leg 1 unit thermal overload level in percent of 07.17 Unit output current scaling set. Exceeding the level activates event leg 1 unit thermal overload.						
	0.00 … 325.00	110.00	%	100 = 1 %	n	y	Parameter
36.37	**Leg 1 Unit Overload time**						
	Leg 1 unit thermal overload delay time. Delay time of event leg 1 unit thermal overload after the conditions are met.						
	0.0 … 3000.0	10.0	s	10 = 1 s	n	y	Parameter
36.40	**Leg 1 Resistance Change Function**						
	Type of event leg 1 load aging. Selects the type of event leg 1 load aging. If leg 1 resistance is outside the dead band of 36.41 Leg 1 Initial resistance ± 36.42 Leg 1 Resistance change level event leg 1 load aging is generated. Leg 1 resistance is shown in either 36.01 Leg 1 Resistance actual or 36.02 3ph Resistance actual depending on 99.05 Load Configuration. 0: **No reaction**; none, disable event leg 1 load aging. 1: **Warning**; warning 2157 Leg 1 Load Aging is generated. 2: **Fault**; fault 3157 Leg 1 Load Aging is generated.						
	0 … 2	No reaction	-	1 = 1	n	y	Parameter
36.41	**Leg 1 Initial resistance**						
	Leg 1 resistance change, initial resistance for the load monitoring.						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	Leg 1 initial resistance is either set manually by the user or automatically by means of 36.43 Leg 1 initial resistance teach in.						
	0.00 … 1000.00	0.00	Ohm	10 = 1 Ohm	n	y	Parameter
36.42	**Leg 1 Resistance change level**						
	Leg 1 resistance change level. Sets leg 1 resistance change level in percent of 36.41 Leg 1 Initial resistance. Exceeding/Undercutting the level activates event leg 1 load aging.						
	-325.00 … 325.00	10.00	%	100 = 1 %	n	y	Parameter
36.43	**Leg 1 Initial resistance teach-in**						
	Leg 1 resistance change, teach-in. Copies the value from 36.01 Leg 1 Resistance actual to 36.41 Leg 1 Initial resistance. The teach-in must only be started when the load is at operating temperature. 0: **Done**; teach-in done or not requested. 1: **Teach-in**; activates the teach-in. The value reverts automatically to Done, when the teach-in is done.						
	0 … 1	Done	-	1 = 1	y	y	Parameter
36.44	**Leg 1 Resistance Change activation time**						
	Leg 1 resistance change start time. Delay time after a Run signal is given until the monitoring of event leg 1 resistance change is activated.						
	0.01 … 300.00	1.00	s	100 = 1 s	n	y	Parameter
35.45	**Leg 1 Resistance Change delay time**						
	Leg 1 resistance change delay time. Delay time of event leg 1 resistance change after the conditions are met.						
	0.1 … 300.0	1.0	s	10 = 1 s	n	y	Parameter
36.50	**Load Current Imbalance Function**						
	Type of events leg1/2/3 load current imbalance. Selects the type of events leg1/2/3 load current imbalance. This function detects a load current imbalance in symmetrical 3-phase load configurations. See 99.05 Load Configuration. The highest and lowest load current are compared. If the difference reaches the value set in 36.52 Load Current Imbalance level one of the events leg1/2/3 load current imbalance is generated. See 36.03 3ph Load Unbalance. 0: **No reaction**; none, disable events leg1/2/3 load current imbalance. 1: **Warning**; warning 2158/2258/2358 Leg 1/2/3 Load Current Imbalance is generated. 2: **Fault**; fault 3158/3258/3358 Leg 1/2/3 Load Current Imbalance is generated. **Note**: There is no equivalent signal in groups 37 and 38.						
	0 … 2	No reaction	-	1 = 1	n	y	Parameter
36.51	**Load Current Imbalance activation time**						
	Leg 1/2/3 load current imbalance start time. Delay time after a Run signal is given until the monitoring of event leg 1/2/3 load current imbalance is activated. **Note**: There is no equivalent signal in groups 37 and 38.						
	0.01 … 300.00	1.00	s	100 = 1 s	n	y	Parameter
36.52	**Load Current Imbalance level**						

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	Leg 1/2/3 load current imbalance level. Sets leg 1/2/3 load current imbalance level in percent of 99.02 Load Current. Exceeding the level activates event leg 1/2/3 load current imbalance. Recommended settings are 5 % … 50 %. **Note**: There is no equivalent signal in groups 37 and 38.						
	0.00 … 325.00	50.00	%	100 = 1 s	n	y	Parameter
36.53	**Load Current Imbalance delay time**						
	Leg 1/2/3 load current imbalance delay time. Delay time of event leg 1/2/3 load current imbalance after the conditions are met. **Note**: There is no equivalent signal in groups 37 and 38.						
	0.0 … 3000.0	1.0	s	10 = 1 s	n	y	Parameter

37 Leg 2 Load monitoring

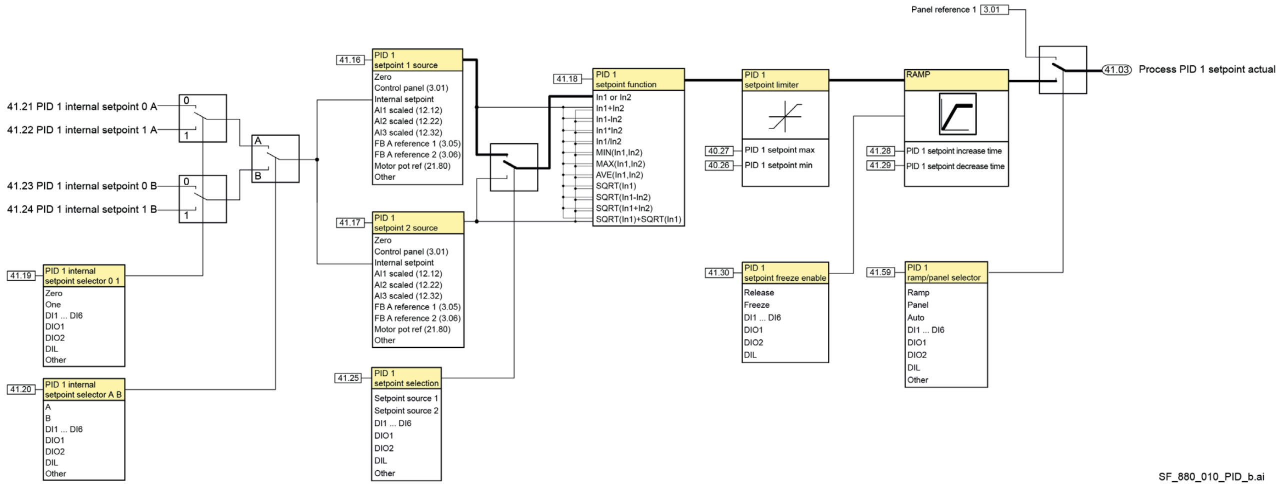
Description see group 36 leg 1 Load monitoring.

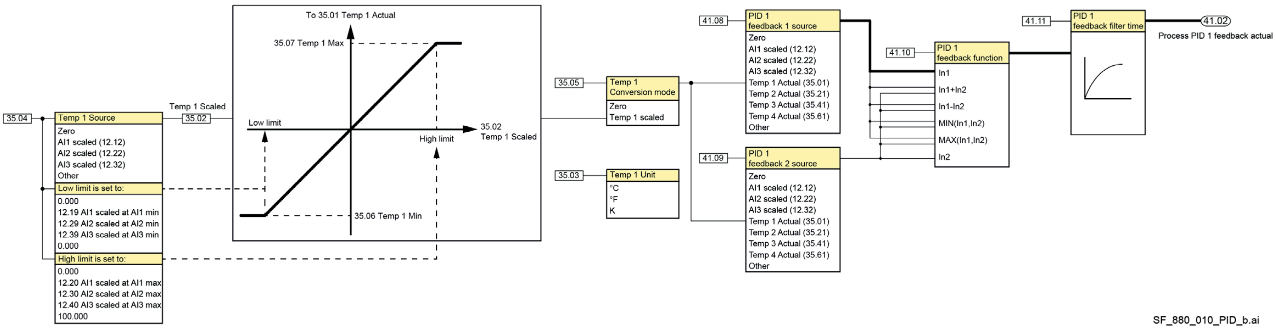
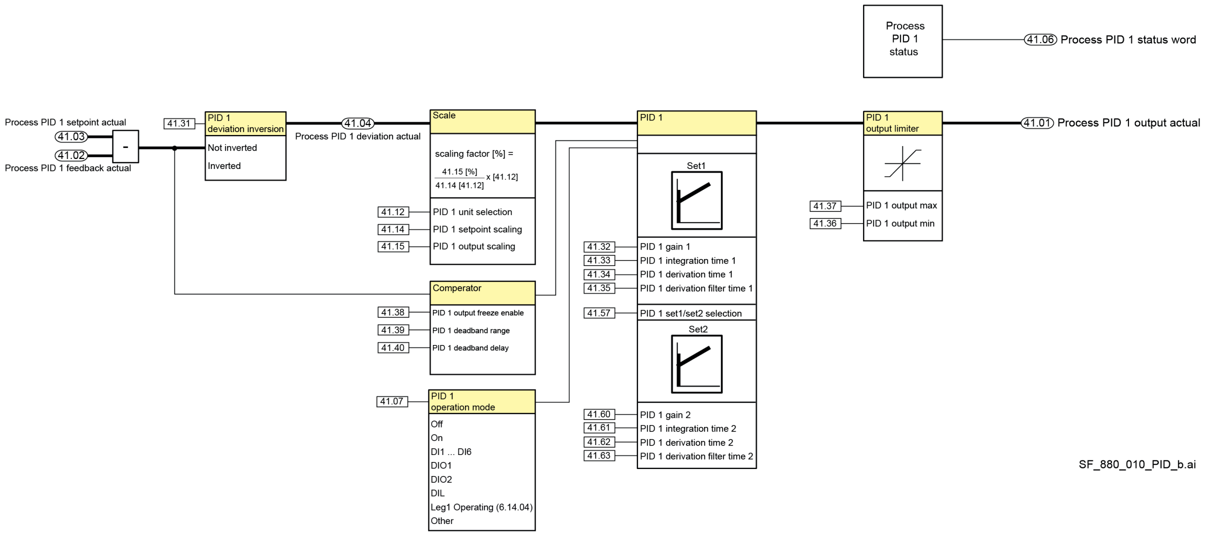
38 Leg 3 Load monitoring

Description see group 36 leg 1 Load monitoring.

41 Process PID set 1

Parameter values for process PID 1 controller.

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
Process PID 1 controller input selection: 							

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
Process PID 1 controller function:  SF_880_010_PID_b.ai  SF_880_010_PID_b.ai							
41.01	**Process PID 1 output actual**						
	Process PID 1 controller output. Displays process PID 1 controller output in percent of 41.14 PID 1 setpoint scaling and 41.15 PID 1 output scaling.						
	-325.00 … 325.00	-	%	100 = 1 %	y	n	Signal
41.02	**Process PID 1 feedback actual**						
	Process PID 1 controller feedback (actual value). Displays process PID 1 controller feedback after source selection and filtering.						
	-32767.00 … 32767.00	-	See 41.12	1 = 1 (41.12)	y	n	Signal
41.03	**Process PID 1 setpoint actual**						
	Process PID 1 controller setpoint (reference value). Displays process PID 1 controller setpoint after source selection, limitation, ramping and control panel reference selection.						
	-32767.00 … 32767.00	-	See 41.12	1 = 1 (41.12)	y	n	Signal
41.04	**Process PID 1 deviation actual**						
	Process PID 1 controller deviation (delta). Displays process PID 1 controller deviation. By default, it is setpoint - feedback, but it can be inverted using 41.31 PID 1 deviation inversion.						

Index	Name					
	Text					
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	-32767.00 … 32767.00	-	See 41.12	1 = 1 (41.12)	y	n	Signal
41.06	**Process PID 1 status word**					
	Process PID 1 controller status word. Displays process PID 1 controller status information. Bit assignment:					

Bit	Name	High	Low
0	PID active	Process PID 1 controller active, see 41.07 PID 1 operation mode.	Process PID 1 controller inactive.
1	Setpoint frozen	Process PID 1 controller setpoint frozen, see 41.30 PID 1 setpoint freeze enable.	Process PID 1 controller setpoint is released.
2	Output frozen	Process PID 1 controller output frozen, see 41.38 PID 1 output freeze enable.	Process PID 1 controller output is released.
3	PID sleep mode	reserved	
4	Sleep boost	reserved	
5	reserved		
6	reserved		
7	Output limit high	Process PID 1 controller output is limited by 41.37 PID 1 output max.	Process PID 1 controller output is not in max. limit.
8	Output limit low	Process PID 1 controller output is limited by 41.36 PID 1 output min.	Process PID 1 controller output is not in min. limit.
9	Deadband active	Process PID 1 controller dead band active, see 41.39 PID 1 deadband range.	Process PID 1 controller dead band inactive.
10	PID set	Process PID 1 controller set2 in use, see 41.57 PID 1 set1/set2 selection.	Process PID 1 controller set1 in use.
11	reserved		
12	Internal setpoint active	Internal setpoint active, see 41.16 PID 1 setpoint 1 source or 41.17 PID 1 setpoint 2 source.	External setpoint active.
13 … 15	reserved		

	0000h … FFFFh	-	-	1 = 1	y	n	Signal
41.07	**PID 1 operation mode**						
	Process PID 1 controller mode. Enable/Disable process PID 1. **Other**; source selection. 0: **Disable**; 0, disable process PID 1. 1: **Enable**; 1, enable process PID 1. 3: **DI1**; 10.02 DI delayed status bit 0. 4: **DI2**; 10.02 DI delayed status bit 1. 5: **DI3**; 10.02 DI delayed status bit 2. 6: **DI4**; 10.02 DI delayed status bit 3. 7: **DI5**; 10.02 DI delayed status bit 4. 8: **DI6**; 10.02 DI delayed status bit 5.						

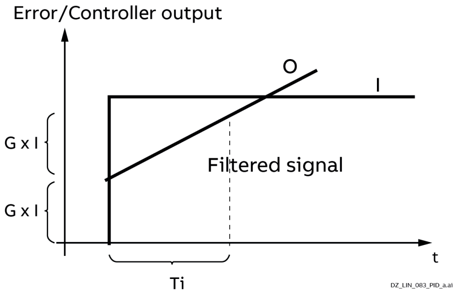
Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	11: **DIO1**; 11.02 DIO delayed status bit 0. 12: **DIO2**; 11.02 DIO delayed status bit 1. 19: **DIL**; 10.02 DI delayed status bit 15. 21: **Leg 1 Operating (06.14.b04)**; process PID 1 controller is enabled when leg 1 is operating. 06.14.b04 Leg 1 Status Word.						
	0 … 21	Leg 1 Operating 06.14.04	-	1 = 1	n	y	Parameter
41.08	**PID 1 feedback 1 source**						
	Process PID 1 controller feedback sources. Selects the first source of process PID 1 controller feedback. **Other**; source selection. 0: **Zero**; output is set to zero. 1: **AI1 scaled (12.12)**; 12.12 AI1 scaled value. 2: **AI2 scaled (12.22)**; 12.22 AI2 scaled value. 3: **AI3 scaled (12.32)**; 12.32 AI3 scaled value. 4: **Temp 1 Actual (35.01)**; 35.01 Temp 1 Actual. 5: **Temp 2 Actual (35.21)**; 35.21 Temp 2 Actual. 6: **Temp 3 Actual (35.41)**; 35.41 Temp 3 Actual. 7: **Temp 4 Actual (35.61)**; 35.61 Temp 4 Actual.						
	0 … 7	AI1 scaled (12.12)	-	1 = 1	n	y	Parameter
41.09	**PID 1 feedback 2 source**						
	Process PID 1 controller feedback sources. Selects the second source of process PID 1 controller feedback. **Other**; source selection. 0: **Zero**; output is set to zero. 1: **AI1 scaled (12.12)**; 12.12 AI1 scaled value. 2: **AI2 scaled (12.22)**; 12.22 AI2 scaled value. 3: **AI3 scaled (12.32)**; 12.32 AI3 scaled value. 4: **Temp 1 Actual (35.01)**; 35.01 Temp 1 Actual. 5: **Temp 2 Actual (35.21)**; 35.21 Temp 2 Actual. 6: **Temp 3 Actual (35.41)**; 35.41 Temp 3 Actual. 7: **Temp 4 Actual (35.61)**; 35.61 Temp 4 Actual.						
	0 … 7	Zero	-	1 = 1	n	y	Parameter
41.10	**PID 1 feedback function**						
	Process PID 1 controller feedback processing. Defines how process PID 1 controller feedback is calculated using the two feedback sources selected by 41.08 PID 1 feedback 1 source and 41.09 PID 1 feedback 2 source. 0: **In1**; source 1. 1: **In1+In2**; source 1 plus source 2. 2: **In1-In2**; source 1 minus source 2. 5: **MIN(In1,In2)**; the lower value of the two sources. 6: **MAX(In1,In2)**; the greater value of the two sources. 12 **In2**; source 2.						
	0 … 12	In1	-	1 = 1	n	y	Parameter
41.11	**PID 1 feedback filter time**						

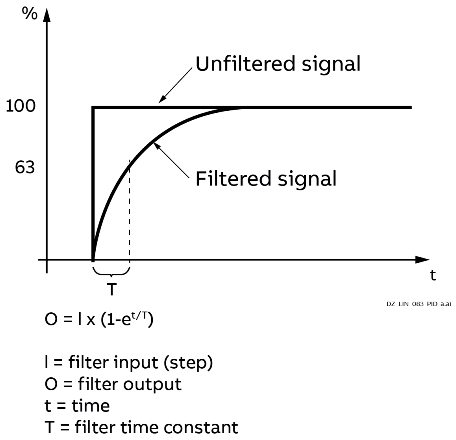
<table>
<tr><th>Index</th><th colspan="7">Name</th></tr>
<tr><th></th><th colspan="7">Text</th></tr>
<tr><th></th><th>Range</th><th>Default</th><th>Unit</th><th>Scale FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">Process PID 1 controller feedback filter.
Defines the filter time constant for process PID 1 controller feedback.</td></tr>
<tr><td></td><td>0.00 … 100.00</td><td>0.00</td><td>s</td><td>100 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>41.12</td><td colspan="7">PID 1 unit selection</td></tr>
<tr><td></td><td colspan="7">Process PID 1 controller unit selection.
Defines the unit for signals/parameters 41.02 … 41.04, 41.14, 41.21 … 41.24, 41.26, 41.27, 41.39, 41.70 and 41.71.
0: No Unit;
1: A; ampere.
2: V; volt.
4: %; percent.
150: °C; degree Celsius.
151: °F; degree Fahrenheit.
152: K; Kelvin.
153: kA; kilo ampere.</td></tr>
<tr><td></td><td>0 … 153</td><td>%</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>41.14</td><td colspan="7">PID 1 setpoint scaling</td></tr>
<tr><td></td><td colspan="7">Process PID 1 controller scaling.
Defines, together with 41.15 PID 1 output scaling, a general scaling factor for the process PID 1 control chain.
The output of process PID 1 controller is always in percent [%]. The scaling can be utilized when, for example, the process setpoint is put in as degree Celsius [°C].
Following formula is valid:
$$\text{Scaling factor } [\%] = \frac{41.15\ [\%]}{41.14\ [41.12]} \bullet [41.12]$$
With 400 [°C] equals 50 [%] process PID 1 controller output value follows:
$$\text{Scaling factor } [\%] = \frac{50\ [\%]}{400\ [^\circ\text{C}]} \bullet [^\circ\text{C}] = 0.125\ \%$$</td></tr>
<tr><td></td><td>-32767.00 … 32767.00</td><td>100.00</td><td>See 41.12</td><td>1 = 1 (41.12)</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>41.15</td><td colspan="7">PID 1 output scaling</td></tr>
<tr><td></td><td colspan="7">Process PID 1 controller scaling.
See 41.14 PID 1 setpoint scaling.</td></tr>
<tr><td></td><td>0.00 … 325.00</td><td>100.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>41.16</td><td colspan="7">PID 1 setpoint 1 source</td></tr>
<tr><td></td><td colspan="7">Process PID 1 controller setpoint sources.
Selects the first source of process PID 1 controller setpoint. Available in 41.25 PID 1 setpoint selection as setpoint source 1.
Other; source selection.
0: Zero; 0 %, setpoint is set to zero.
1: Control panel (03.01); 03.01 Panel reference 1.
2: Setpoint ChA or ChB; depending on setting of 41.19 PID 1 internal setpoint selector 0 1 and 41.20 PID 1 internal setpoint selector A B.
3: AI1 scaled (12.12); 12.12 AI1 scaled value.
4: AI2 scaled (12.22); 12.22 AI2 scaled value.</td></tr>
</table>

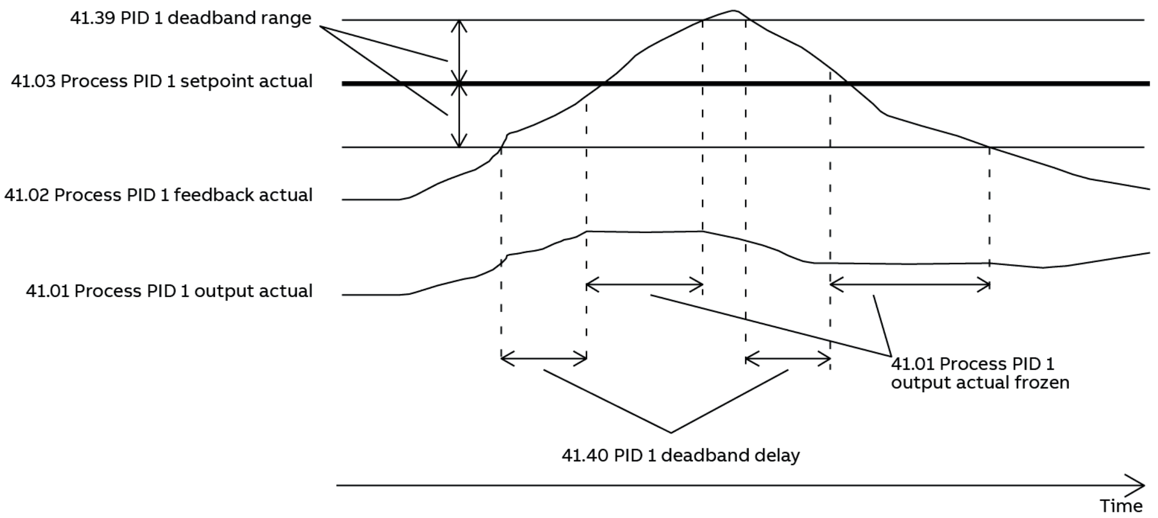
<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">5: AI3 scaled (12.32); 12.32 AI3 scaled value.
6: FBA A reference 1 (03.05); 03.05 FBA A reference 1.
7: FBA A reference 2 (03.06); 03.06 FBA A reference 2.
9: Motor potentiometer; 21.80 Motor potentiometer ref act.</td></tr>
<tr><td>0 … 9</td><td>AI2 scaled (12.22)</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>41.17</td><td colspan="7">PID 1 setpoint 2 source</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Process PID 1 controller setpoint sources.
Selects the second source of process PID 1 controller setpoint. Available in 41.25 PID 1 setpoint selection as setpoint source 2.
See 41.16 PID 1 setpoint 1 source.</td></tr>
<tr><td>0 … 9</td><td>Zero</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>41.18</td><td colspan="7">PID 1 setpoint function</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Process PID 1 controller setpoint processing.
Defines how process PID 1 controller setpoint is calculated using the two setpoint sources selected by 41.16 PID 1 setpoint 1 source, 41.17 PID 1 setpoint 2 source and 41.25 PID 1 setpoint selection.
0: In1 or In2; the source selected by 41.25 PID 1 setpoint selection.
1: In1+In2; source 1 plus source 2.
2: In1-In2; source 1 minus source 2.
3: In1*In2; source 1 multiplied by source 2.
4: In1/In2; source 1 divided by source 2.
5: MIN(In1,In2); the lower value of the two sources.
6: MAX(In1,In2); the greater value of the two sources.
7: AVE(In1,In2); average of the two sources.
8: sqrt(In1); square root of source 1.
9: sqrt(In1-In2); square root of (source 1 - source 2).
10: sqrt(In1+In2); square root of (source 1 + source 2).
11: sqrt(In1)+sqrt(In2); square root of source 1 + square root of source 2.</td></tr>
<tr><td>0 … 11</td><td>In1 or In2</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>41.19</td><td colspan="7">PID 1 internal setpoint selector 0 1</td></tr>
<tr><td></td><td colspan="7">Process PID 1 controller internal setpoint selection.
41.19 PID 1 internal setpoint selector 0 1 and 41.20 PID 1 internal setpoint selector A B choose the internal setpoint out of parameters 41.21 … 41.24.
<table>
<tr><th>41.19 PID 1 internal setpoint selector 0 1</th><th>41.20 PID 1 internal setpoint selector A B</th><th>Selected internal setpoint</th></tr>
<tr><td>Zero</td><td>A</td><td>41.21 PID 1 internal setpoint 0 A</td></tr>
<tr><td>One</td><td>A</td><td>41.22 PID 1 internal setpoint 1 A</td></tr>
<tr><td>Zero</td><td>B</td><td>41.23 PID 1 internal setpoint 0 B</td></tr>
<tr><td>One</td><td>B</td><td>41.24 PID 1 internal setpoint 1 B</td></tr>
</table>
Other [bit]; source selection.
0: Zero; 0, choose zero.
1: One; 1, choose one.
3: DI1; 10.02 DI delayed status bit 0.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale
FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">4: DI2; 10.02 DI delayed status bit 1.
5: DI3; 10.02 DI delayed status bit 2.
6: DI4; 10.02 DI delayed status bit 3.
7: DI5; 10.02 DI delayed status bit 4.
8: DI6; 10.02 DI delayed status bit 5.
11: DIO1; 11.02 DIO delayed status bit 0.
12: DIO2; 11.02 DIO delayed status bit 1.
19: DIL; 10.02 DI delayed status bit 15.</td></tr>
<tr><td>0 … 19</td><td>Zero</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>41.20</td><td colspan="7">PID 1 internal setpoint selector A B</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Process PID 1 controller internal setpoint selection.
41.19 PID 1 internal setpoint selector 0 1 and 41.20 PID 1 internal setpoint selector A B choose the internal setpoint out of parameters 41.21 … 41.24.
<table>
<tr><th>41.19 PID 1 internal setpoint selector 0 1</th><th>41.20 PID 1 internal setpoint selector A B</th><th>Selected internal setpoint</th></tr>
<tr><td>Zero</td><td>A</td><td>41.21 PID 1 internal setpoint 0 A</td></tr>
<tr><td>One</td><td>A</td><td>41.22 PID 1 internal setpoint 1 A</td></tr>
<tr><td>Zero</td><td>B</td><td>41.23 PID 1 internal setpoint 0 B</td></tr>
<tr><td>One</td><td>B</td><td>41.24 PID 1 internal setpoint 1 B</td></tr>
</table>
Other [bit]; source selection.
0: A; 0, choose A.
1: B; 1, choose B.
3: DI1; 10.02 DI delayed status bit 0.
4: DI2; 10.02 DI delayed status bit 1.
5: DI3; 10.02 DI delayed status bit 2.
6: DI4; 10.02 DI delayed status bit 3.
7: DI5; 10.02 DI delayed status bit 4.
8: DI6; 10.02 DI delayed status bit 5.
11: DIO1; 11.02 DIO delayed status bit 0.
12: DIO2; 11.02 DIO delayed status bit 1.
19: DIL; 10.02 DI delayed status bit 15.</td></tr>
<tr><td>0 … 19</td><td>A</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>41.21</td><td colspan="7">PID 1 internal setpoint 0 A</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Process PID 1 controller internal setpoint 0 A.
Defines PID 1 internal process setpoint 0 A.</td></tr>
<tr><td>-32767.00 … 32767.00</td><td>0.00</td><td>See 41.12</td><td>1 = 1 (41.12)</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>41.22</td><td colspan="7">PID 1 internal setpoint 1 A</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Process PID 1 controller internal setpoint 1 A.
Defines PID 1 internal process setpoint 1 A.</td></tr>
<tr><td>-32767.00 … 32767.00</td><td>0.00</td><td>See 41.12</td><td>1 = 1 (41.12)</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>41.23</td><td colspan="7">PID 1 internal setpoint 0 B</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Process PID 1 controller internal setpoint 0 B.
Defines PID 1 internal process setpoint 0 B.</td></tr>
<tr><td>-32767.00 … 32767.00</td><td>0.00</td><td>See 41.12</td><td>1 = 1 (41.12)</td><td>n</td><td>y</td><td>Parameter</td></tr>
</table>

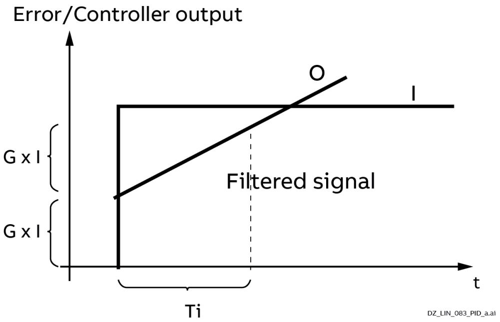
<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td>41.24</td><td colspan="7">PID 1 internal setpoint 1 B</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Process PID 1 controller internal setpoint 1 B.
Defines PID 1 internal process setpoint 1 B.</td></tr>
<tr><td>-32767.00 … 32767.00</td><td>0.00</td><td>See 41.12</td><td>1 = 1 (41.12)</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>41.25</td><td colspan="7">PID 1 setpoint selection</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Process PID 1 controller setpoint selection.
Configures the selection between 41.16 PID 1 setpoint 1 source and 41.17 PID 1 setpoint 2 source.
This parameter is only effective when 41.18 PID 1 setpoint function = In1 or In2.
Other [bit]; source selection.
0: Setpoint source 1; 0, 41.16 PID 1 setpoint 1 source.
1: Setpoint source 2; 1, 41.17 PID 1 setpoint 2 source.
3: DI1; 10.02 DI delayed status bit 0.
4: DI2; 10.02 DI delayed status bit 1.
5: DI3; 10.02 DI delayed status bit 2.
6: DI4; 10.02 DI delayed status bit 3.
7: DI5; 10.02 DI delayed status bit 4.
8: DI6; 10.02 DI delayed status bit 5.
11: DIO1; 11.02 DIO delayed status bit 0.
12: DIO2; 11.02 DIO delayed status bit 1.
19: DIL; 10.02 DI delayed status bit 15.</td></tr>
<tr><td>0 … 19</td><td>Setpoint source 1</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>41.26</td><td colspan="7">PID 1 setpoint min</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Process PID 1 controller minimum setpoint limit.
Defines the minimum limit for process PID 1 controller setpoint.</td></tr>
<tr><td>-32767.00 … 32767.00</td><td>-32767.00</td><td>See 41.12</td><td>1 = 1 (41.12)</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>41.27</td><td colspan="7">PID 1 setpoint max</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Process PID 1 controller maximum setpoint limit.
Defines the maximum limit for process PID 1 controller setpoint.</td></tr>
<tr><td>-32767.00 … 32767.00</td><td>32767.00</td><td>See 41.12</td><td>1 = 1 (41.12)</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>41.28</td><td colspan="7">PID 1 setpoint increase time</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Process PID 1 controller setpoint increase time.
Defines the minimum time it takes for the setpoint to increase from 0 units to 100 units. The unit depend on setting of 41.12 PID 1 unit selection.</td></tr>
<tr><td>0.0 … 200000.0</td><td>0.0</td><td>s</td><td>1 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>41.29</td><td colspan="7">PID 1 setpoint decrease time</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Process PID 1 controller setpoint decrease time.
Defines the minimum time it takes for the setpoint to decrease from 100 units to 0 units. The unit depend on setting of 41.12 PID 1 unit selection.</td></tr>
<tr><td>0.0 … 200000.0</td><td>0.0</td><td>s</td><td>1 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>41.30</td><td colspan="7">PID 1 setpoint freeze enable</td></tr>
<tr><td></td><td colspan="7">Process PID 1 controller setpoint freeze selection.</td></tr>
</table>

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	Freezes, or defines a source that can be used to freeze, the setpoint of process PID 1 controller. This feature is useful when the setpoint is based on a process feedback connected to an analog input and the connected sensor must be e.g. serviced without stopping the process. **Other [bit]**; source selection. 0: **Release**; 0, release process PID 1 controller setpoint. 1: **Freeze**; 1, freeze process PID 1 controller setpoint. 3: **DI1**; 10.02 DI delayed status bit 0. 4: **DI2**; 10.02 DI delayed status bit 1. 5: **DI3**; 10.02 DI delayed status bit 2. 6: **DI4**; 10.02 DI delayed status bit 3. 7: **DI5**; 10.02 DI delayed status bit 4. 8: **DI6**; 10.02 DI delayed status bit 5. 11: **DIO1**; 11.02 DIO delayed status bit 0. 12: **DIO2**; 11.02 DIO delayed status bit 1. 19: **DIL**; 10.02 DI delayed status bit 15.						
	0 … 19	Release	-	1 = 1	n	y	Parameter
41.31	**PID 1 deviation inversion**						
	Process PID 1 controller deviation (delta) inversion. Inverts the input of process PID 1 controller. **Other [bit]**; source selection. 0: **Not inverted (Ref - Fbk)**; 0, deviation not inverted (deviation = setpoint - feedback). 1: **Inverted (Fbk - Ref)**; 1, deviation inverted (deviation = feedback - setpoint).						
	0 … 1	Not inverted (Ref - Fbk)	-	1 = 1	n	y	Parameter
41.32	**PID 1 gain 1**						
	Process PID 1 controller gain 1. Defines gain 1 of process PID 1 controller. See 41.33 PID 1 integration time 1.						
	0.000 … 100.000	1.000	-	1000 = 1	n	y	Parameter
41.33	**PID 1 integration time 1**						
	Process PID 1 controller integration time 1. Defines integration time 1 of process PID 1 controller. This time needs to be set to the same order of magnitude as the reaction time of the process. Otherwise, it will cause instability.  I = controller input (error) O = controller output G = gain Ti = integraqtion time **Note**: Setting 41.33 PID 1 integration time 1 = 0 disables integration time 1 and turns the process PID controller into a process PD controller.						

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	0.0 … 32767.0	60.0	s	10 = 1 s	n	y	Parameter
41.34	**PID 1 derivation time 1**						
	Process PID 1 controller derivation time 1. Defines derivation time 1 of process PID 1 controller. The derivative component at the controller output is calculated on basis of two consecutive error values, EK-1 and EK, according to following formula: $\frac{(41.34) \bullet (E_K-E_{K-1})}{T_S}$ TS = 2 ms sample time. Error = E = setpoint - feedback.						
	0.00 … 100.00	0.00	s	100 = 1 s	n	y	Parameter
41.35	**PID 1 derivation filter time 1**						
	Process PID 1 controller derivation filter time 1. Defines derivation filter time 1 of process PID 1 controller. Filter time of the 1-pole filter used to smooth the derivative component 1 of process PID 1 controller. 						
	0.00 … 100.00	0.02	s	100 = 1 s	n	y	Parameter
41.36	**PID 1 output min**						
	Process PID 1 controller minimum output limit. Defines the minimum limit for process PID 1 controller output in percent of 41.14 PID 1 setpoint scaling and 41.15 PID 1 output scaling. Using the minimum and maximum limits restricts the operation range.						
	-325.00 … 325.00	0.00	%	100 = 1 %	n	y	Parameter
41.37	**PID 1 output max**						
	Process PID 1 controller maximum output limit. Defines the minimum limit for process PID 1 controller output in percent of 41.14 PID 1 setpoint scaling and 41.15 PID 1 output scaling. Using the minimum and maximum limits restricts the operation range.						
	-325.00 … 325.00	100.00	%	100 = 1 %	n	y	Parameter
41.38	**PID 1 output freeze enable**						
	Process PID 1 controller output freeze selection.						

<table>
<tr><th>Index</th><th colspan="7">Name</th></tr>
<tr><th></th><th colspan="7">Text</th></tr>
<tr><th></th><th>Range</th><th>Default</th><th>Unit</th><th>Scale FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">Freezes, or defines a source that can be used to freeze, the output of process PID 1 controller. This feature can be used when e.g. a sensor providing process feedback must to be serviced without stopping the process.
Other [bit]; source selection.
0: Release; 0, release process PID 1 controller output.
1: Freeze; 1, freeze process PID 1 controller output.
3: DI1; 10.02 DI delayed status bit 0.
4: DI2; 10.02 DI delayed status bit 1.
5: DI3; 10.02 DI delayed status bit 2.
6: DI4; 10.02 DI delayed status bit 3.
7: DI5; 10.02 DI delayed status bit 4.
8: DI6; 10.02 DI delayed status bit 5.
11: DIO1; 11.02 DIO delayed status bit 0.
12: DIO2; 11.02 DIO delayed status bit 1.
19: DIL; 10.02 DI delayed status bit 15.</td></tr>
<tr><td></td><td>0 … 19</td><td>Release</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>41.39</td><td colspan="7">PID 1 deadband range</td></tr>
<tr><td></td><td colspan="7">Process PID 1 controller dead band range.
Defines a dead band around the setpoint. Whenever the process feedback enters the dead band, a delay timer starts. If the feedback remains within the dead band longer than the delay in 40.40 PID dead band delay, the PID 1 controller output is frozen. Normal operation resumes after the feedback value leaves the dead band.

DZ_LIN_032_PID_deadband_b.ai</td></tr>
<tr><td></td><td>0.00 … 32767.00</td><td>0.00</td><td>See 41.12</td><td>1 = 1 (41.12)</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>41.40</td><td colspan="7">PID 1 deadband delay</td></tr>
<tr><td></td><td colspan="7">Process PID 1 controller delay for dead band area.
Delay for the dead band. See 41.39 PID 1 deadband range.</td></tr>
<tr><td></td><td>0.0 … 3600.0</td><td>0.0</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>41.57</td><td colspan="7">PID 1 set1/set2 selection</td></tr>
<tr><td></td><td colspan="7">Process PID 1 controller set selection.</td></tr>
</table>

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	Configures the selection between process PID 1 controller set1 (parameters 41.32 … 41.35) or PID 1 controller set2 (parameters 41.60 … 41.63). **Other [bit]**; source selection. 0: **Select set1**; 0, select PID 1 controller set1. 1: **Select set2**; 1, select PID 1 controller set2. 3: **DI1**; 10.02 DI delayed status bit 0. 4: **DI2**; 10.02 DI delayed status bit 1. 5: **DI3**; 10.02 DI delayed status bit 2. 6: **DI4**; 10.02 DI delayed status bit 3. 7: **DI5**; 10.02 DI delayed status bit 4. 8: **DI6**; 10.02 DI delayed status bit 5. 11: **DIO1**; 11.02 DIO delayed status bit 0. 12: **DIO2**; 11.02 DIO delayed status bit 1. 19: **DIL**; 10.02 DI delayed status bit 15. 20: **Set1/Set2 adaptive**; uses process PID 1 controller set1 and process PID 1 controller set2 to adapt the gain and integration time of process PID 1 controller according to 41.70 PID 1 adaptive switching level A and 41.71 PID 1 adaptive switching level B.						
	0 … 20	Select set1	-	1 = 1	n	y	Parameter
41.59	**PID 1 ramp/panel selector**						
	Process PID 1 controller setpoint selector. Selects the source for 41.03 Process PID 1 setpoint actual out of the process PID 1 controller ramp output or the control panel. **Other [bit]**; source selection. 0: **Ramp**; 0, select setpoint from the process PID 1 controller ramp output. 1: **Panel**; 1, select setpoint from the control panel. 2: **Auto**; the control panel is set to remote mode, follows Auto = 0 (Ramp), the control panel is set to local mode, follows Auto = 1 (Panel). 3: **DI1**; 10.02 DI delayed status bit 0. 4: **DI2**; 10.02 DI delayed status bit 1. 5: **DI3**; 10.02 DI delayed status bit 2. 6: **DI4**; 10.02 DI delayed status bit 3. 7: **DI5**; 10.02 DI delayed status bit 4. 8: **DI6**; 10.02 DI delayed status bit 5. 11: **DIO1**; 11.02 DIO delayed status bit 0. 12: **DIO2**; 11.02 DIO delayed status bit 1. 19: **DIL**; 10.02 DI delayed status bit 15.						
	0 … 19	Auto	-	1 = 1	n	y	Parameter
41.60	**PID 1 gain 2**						
	Process PID 1 controller gain 2. Defines gain 2 of process PID 1 controller. See 41.61 PID 1 integration time 2.						
	0.000 … 100.000	1.000	-	1000 = 1	n	y	Parameter
41.61	**PID 1 integration time 2**						
	Process PID 1 controller integration time 2. Defines integration time 2 of process PID 1 controller. This time needs to be set to the same order of magnitude as the reaction time of the process. Otherwise, it will cause instability.						

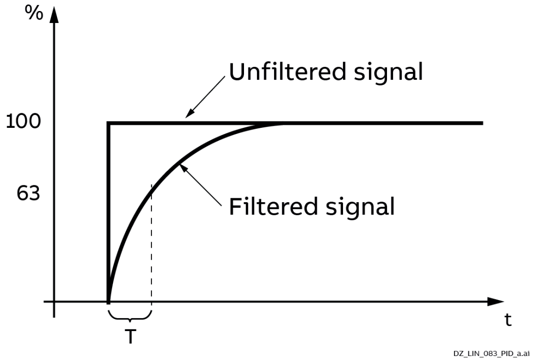
<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">

I = controller input (error)
O = controller output
G = gain
Ti = integraqtion time

Note: Setting 41.61 PID 1 integration time 2 = 0 disables integration time 2 and turns the process PID controller into a process PD controller.</td></tr>
<tr><td></td><td>0.0 … 32767.0</td><td>60.0</td><td>s</td><td>1 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>41.62</td><td colspan="7">PID 1 derivation time 2</td></tr>
<tr><td></td><td colspan="7">Process PID 1 controller derivation time 2.
Defines derivation time 2 of process PID 1 controller. The derivative component at the controller output is calculated on basis of two consecutive error values, EK-1 and EK, according to following formula:

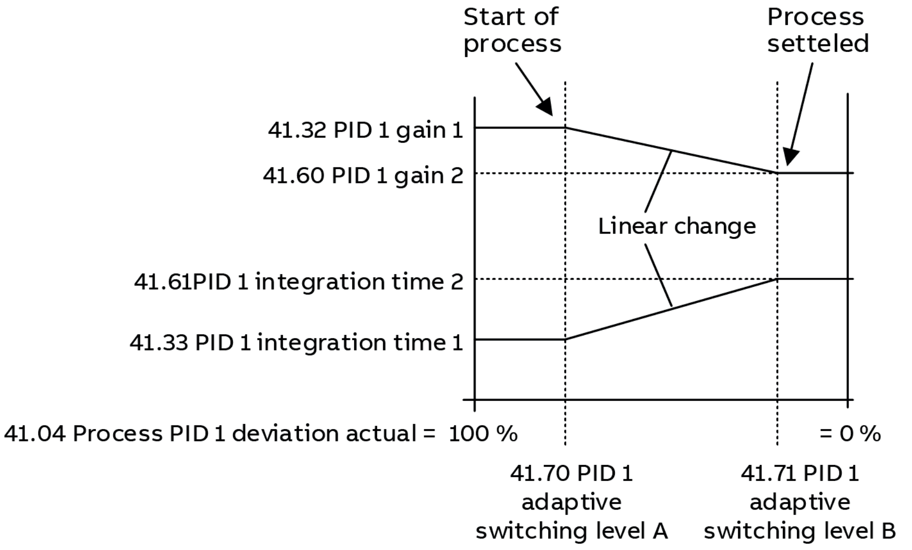
$\frac{(41.62) \cdot (E_K-E_{K-1})}{T_S}$

TS = 2 ms sample time.
Error = E = setpoint - feedback.</td></tr>
<tr><td></td><td>0.00 … 100.00</td><td>0.00</td><td>s</td><td>100 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>41.63</td><td colspan="7">PID 1 derivation filter time 2</td></tr>
<tr><td></td><td colspan="7">Process PID 1 controller derivation filter time 2.
Defines derivation filter time 2 of process PID 1 controller. Filter time of the 1-pole filter used to smooth the derivative component 2 of process PID 1 controller.</td></tr>
</table>

<table>
<tr><th>Index</th><th colspan="7">Name</th></tr>
<tr><th></th><th colspan="7">Text</th></tr>
<tr><th></th><th>Range</th><th>Default</th><th>Unit</th><th>Scale FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">

DZ_LIN_083_PID_a.ai

O = I x $(1-e^{t/T})$

I = filter input (step)
O = filter output
t = time
T = filter time constant</td></tr>
<tr><td></td><td>0.00 … 100.00</td><td>0.02</td><td>s</td><td>100 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>41.70</td><td colspan="7">PID 1 adaptive switching level A</td></tr>
<tr><td></td><td colspan="7">Process PID 1 controller adaptive switching level A.
Process PID 1 controller set1 and process PID 1 controller set2 can be used to adapt the gain and integration time of process PID 1 controller according to 41.70 PID 1 adaptive switching level A and 41.71 PID 1 adaptive switching level B:


DZ_LIN_086_PID-switch_a.ai

Activation, see 41.57 PID 1 set1/set2 selection.</td></tr>
<tr><td></td><td>-32767.00 … 32767.00</td><td>20.00</td><td>See 41.12</td><td>1 = 1 (41.12)</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>41.71</td><td colspan="7">PID 1 adaptive switching level B</td></tr>
<tr><td></td><td colspan="7">Process PID 1 controller adaptive switching level B.
See 41.70 PID 1 adaptive switching level A.</td></tr>
<tr><td></td><td>-32767.00 … 32767.00</td><td>10.00</td><td>See 41.12</td><td>1 = 1 (41.12)</td><td>n</td><td>y</td><td>Parameter</td></tr>
</table>

42 Process PID set 2

Description see group 41 Process PID 1.

43 Process PID set 3

Description see group 41 Process PID 1.

47 Data storage

Data storage parameters that can be written to and read from using other parameters.
Note: For different data types, different storage parameters are available.

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
47.01	**Data storage 1 real32**						
	32-bit data. Data storage parameter 1. **Note**: Not useable in association with bit type signals/parameters e.g. 06.01 Main Control Word active.						
	-2147483.000 … 2147483.000	0.000	-	1 = 1	n	y	Parameter
47.02	**Data storage 2 real32**						
	32-bit data. Data storage parameter 2. **Note**: Not useable in association with bit type signals/parameters e.g. 06.01 Main Control Word active.						
	-2147483.000 … 2147483.000	0.000	-	1 = 1	n	y	Parameter
47.03	**Data storage 3 real32**						
	32-bit data. Data storage parameter 3. **Note**: Not useable in association with bit type signals/parameters e.g. 06.01 Main Control Word active.						
	-2147483.000 … 2147483.000	0.000	-	1 = 1	n	y	Parameter
47.04	**Data storage 4 real32**						
	32-bit data. Data storage parameter 4. **Note**: Not useable in association with bit type signals/parameters e.g. 06.01 Main Control Word active.						
	-2147483.000 … 2147483.000	0.000	-	1 = 1	n	y	Parameter
47.05	**Data storage 5 real32**						
	32-bit data. Data storage parameter 5. **Note**: Not useable in association with bit type signals/parameters e.g. 06.01 Main Control Word active.						
	-2147483.000 … 2147483.000	0.000	-	1 = 1	n	y	Parameter
47.06	**Data storage 6 real32**						
	32-bit data. Data storage parameter 6. **Note**: Not useable in association with bit type signals/parameters e.g. 06.01 Main Control Word active.						
	-2147483.000 … 2147483.000	0.000	-	1 = 1	n	y	Parameter

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
47.07	**Data storage 7 real32**						
	32-bit data. Data storage parameter 7. **Note**: Not useable in association with bit type signals/parameters e.g. 06.01 Main Control Word active.						
	-2147483.000 … 2147483.000	0.000	-	1 = 1	n	y	Parameter
47.08	**Data storage 8 real32**						
	32-bit data. Data storage parameter 8. **Note**: Not useable in association with bit type signals/parameters e.g. 06.01 Main Control Word active.						
	-2147483.000 … 2147483.000	0.000	-	1 = 1	n	y	Parameter
47.11	**Data storage 1 int32**						
	32-bit data. Data storage parameter 9.						
	-2147483648 … 2147483647	0	-	1 = 1	n	y	Parameter
47.12	**Data storage 2 int32**						
	32-bit data. Data storage parameter 10.						
	-2147483648 … 2147483647	0	-	1 = 1	n	y	Parameter
47.13	**Data storage 3 int32**						
	32-bit data. Data storage parameter 11.						
	-2147483648 … 2147483647	0	-	1 = 1	n	y	Parameter
47.14	**Data storage 4 int32**						
	32-bit data. Data storage parameter 12.						
	-2147483648 … 2147483647	0	-	1 = 1	n	y	Parameter
47.15	**Data storage 5 int32**						
	32-bit data. Data storage parameter 13.						
	-2147483648 … 2147483647	0	-	1 = 1	n	y	Parameter
47.16	**Data storage 6 int32**						
	32-bit data. Data storage parameter 14.						
	-2147483648 … 2147483647	0	-	1 = 1	n	y	Parameter
47.17	**Data storage 7 int32**						
	32-bit data. Data storage parameter 15.						
	-2147483648 … 2147483647	0	-	1 = 1	n	y	Parameter
47.18	**Data storage 8 int32**						
	32-bit data. Data storage parameter 16.						

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	-2147483648 … 2147483647	0	-	1 = 1	n	y	Parameter
47.21	**Data storage 1 int16**						
	16-bit data. Data storage parameter 17. **Note**: Not useable in association with bit type signals/parameters e.g. 06.01 Main Control Word active.						
	-32768 … 32767	0	-	1 = 1	n	y	Parameter
47.22	**Data storage 2 int16**						
	16-bit data. Data storage parameter 18. **Note**: Not useable in association with bit type signals/parameters e.g. 06.01 Main Control Word active.						
	-32768 … 32767	0	-	1 = 1	n	y	Parameter
47.23	**Data storage 3 int16**						
	16-bit data. Data storage parameter 19. **Note**: Not useable in association with bit type signals/parameters e.g. 06.01 Main Control Word active.						
	-32768 … 32767	0	-	1 = 1	n	y	Parameter
47.24	**Data storage 4 int16**						
	16-bit data. Data storage parameter 20. **Note**: Not useable in association with bit type signals/parameters e.g. 06.01 Main Control Word active.						
	-32768 … 32767	0	-	1 = 1	n	y	Parameter
47.25	**Data storage 5 int16**						
	16-bit data. Data storage parameter 21. **Note**: Not useable in association with bit type signals/parameters e.g. 06.01 Main Control Word active.						
	-32768 … 32767	0	-	1 = 1	n	y	Parameter
47.26	**Data storage 6 int16**						
	16-bit data. Data storage parameter 22. **Note**: Not useable in association with bit type signals/parameters e.g. 06.01 Main Control Word active.						
	-32768 … 32767	0	-	1 = 1	n	y	Parameter
47.27	**Data storage 7 int16**						
	16-bit data. Data storage parameter 23. **Note**: Not useable in association with bit type signals/parameters e.g. 06.01 Main Control Word active.						
	-32768 … 32767	0	-	1 = 1	n	y	Parameter
47.28	**Data storage 8 int16**						
	16-bit data.						

Index	Name					
	Text					
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	Data storage parameter 24. **Note**: Not useable in association with bit type signals/parameters e.g. 06.01 Main Control Word active.						
	-32768 … 32767	0	-	1 = 1	n	y	Parameter

49 Panel port communication

Communication settings for the control panel/PC tool link.

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	Attention: Any changed parameters must be validated by means of 49.06 Refresh settings = Refresh.						
49.01	**Node ID number**						
	Control panel/PC tool link node ID number. Defines the node ID of the unit. All units connected to the network (panel bus) must have a unique node ID. **Note**: For units in a network, it is advisable to reserve 49.01 Network ID number = 1 for spare/replacement units.						
	1 … 32	1	-	1 = 1	n	y	Parameter
49.03	**Baud rate**						
	Control panel/PC tool link speed. Defines the transfer rate of the control panel/PC tool link. 0: **9.6 kbps**; 9.6 kbit/s. 1: **38.4 kbps**; 38.4 kbit/s. 2: **57.6 kbps**; 57.6 kbit/s. 3: **86.4 kbps**; 86.4 kbit/s. 4: **115.2 kbps**; 115.2 kbit/s. 5: **230.4 kbps**; 230.4 kbit/s. 6: **460.8 kbps**; 460.8 kbit/s. 7: **921.6 kbps**; 921.6 kbit/s.						
	0 … 7	230.4 kbps	-	1 = 1	n	y	Parameter
49.04	**Communication loss time**						
	Control panel/PC tool link communication loss timeout. Defines the time delay for the control panel/PC tool communication loss, before the action defined in 49.05 Communication loss action is executed. Time count starts when the communication link fails to update the message.						
	0 … 32500	1000	ms	1 = 1 ms	n	y	Parameter
49.05	**Communication loss action**						
	Control panel/PC tool link communication loss action. Selects how the unit reacts to a control panel/PC tool communication break. 0: **No action**; none, disable communication loss function. 1: **Fault**; the event generates fault 5546 Control panel loss and the unit is disabled. This occurs only when the unit is controlled from the control panel/PC tool (local mode).						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	2: **Warning**; the event generates warning 1130 Control panel loss. The unit continues with the same current/voltage/power level it was operating at. This occurs only when the unit is controlled from the control panel/PC tool (local mode). 4: **Fault always**; reserved. **WARNING** Make sure that it is safe to continue operation in case of a communication break.						
	0 … 5	Fault	-	1 = 1	n	y	Parameter
49.06	**Refresh settings**						
	Control panel/PC tool link communication refresh command. Applies the settings of parameters 49.01 … 49.05. The value reverts automatically to Done, when the refresh is done. **Note**: Refreshing may cause a communication break, thus reconnecting the unit may be required. 0: **Done**; 0, normal operation or refreshing done. 1: **Refresh**; 1, refresh parameters 49.01 … 49.05.						
	0 … 1	Done	-	1 = 1	y	y	Parameter

50 Fieldbus adapter (FBA)

Fieldbus communication configuration.

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
50.01	**FBA A enable**						
	Fieldbus adapter A enable/disable. Enables/disables communication between the unit and fieldbus adapter A. Specifies the location of the adapter in slot 1 … slot 3. 0: **Disable**; disable communication between the unit and fieldbus adapter A. 1: **Option slot 1**; enable communication between the unit and fieldbus adapter A. The adapter is in slot 1. 2: **Option slot 2**; enable communication between the unit and fieldbus adapter A. The adapter is in slot 2. 3: **Option slot 3**; enable communication between the unit and fieldbus adapter A. The adapter is in slot 3.						
	0 … 3	Disable	-	1 = 1	n	n	Parameter
50.02	**FBA A comm loss func**						
	Fieldbus adapter A communication loss action. Selects how the unit reacts to a fieldbus communication break. 0: **No action**; none, disable communication loss function. 1: **Fault**; the event generates fault 5223 FBA A communication and the unit is disabled. This occurs only when the unit is controlled from the fieldbus. 2: **Warning**; the event generates warning 1220 FBA A communication. The unit continues with the same current/voltage/power level it was operating at. This occurs only when the unit is controlled from the fieldbus. **WARNING** Make sure that it is safe to continue operation in case of a communication break. 4: **Fault always**; the event generates fault 5223 FBA A communication and the unit is disabled. This occurs even though no control is expected from the fieldbus.						

<table>
<tr><th>Index</th><th colspan="7">Name</th></tr>
<tr><th></th><th colspan="7">Text</th></tr>
<tr><th></th><th>Range</th><th>Default</th><th>Unit</th><th>Scale FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">5: Warning always; the event generates warning 1220 FBA A communication. The unit continues with the same current/voltage/power level it was operating at. This occurs even though no control is expected from the fieldbus.
WARNING
Make sure that it is safe to continue operation in case of a communication break.</td></tr>
<tr><td></td><td>0 … 5</td><td>No action</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>50.03</td><td colspan="7">FBA A comm loss timeout</td></tr>
<tr><td></td><td colspan="7">Fieldbus adapter A communication loss timeout.
Defines the time delay for the fieldbus communication loss, before the action defined in 50.02 FBA A comm loss func is executed. Time count starts when the communication link fails to update the message.</td></tr>
<tr><td></td><td>0 … 32500</td><td>300</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>50.09</td><td colspan="7">FBA A SW transparent source</td></tr>
<tr><td></td><td colspan="7">Fieldbus adapter A status word transparent source.
Selects the source for the status word when the fieldbus adapter is set to a transparent communication profile e.g. by its configuration parameters in group 51. The parameter to be used is fieldbus dependent.
Other; source selection e.g. 06.13 Global Status Word.
0: Not selected; no source selected.</td></tr>
<tr><td></td><td>0 … 0</td><td>Not selected</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>50.10</td><td colspan="7">FBA A act1 transparent source</td></tr>
<tr><td></td><td colspan="7">Fieldbus adapter A actual value 1 transparent source.
Selects the source for actual value 1 sent by fieldbus adapter A to the master (e.g. PLC)
Other; source selection e.g. a value from group 1.
0: Not selected; no source selected.</td></tr>
<tr><td></td><td>0 … 0</td><td>Not selected</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>50.11</td><td colspan="7">FBA A act2 transparent source</td></tr>
<tr><td></td><td colspan="7">Fieldbus adapter A actual value 2 transparent source.
Selects the source for actual value 2 sent by fieldbus adapter A to the master (e.g. PLC)
Other; source selection e.g. a value from group 1.
0: Not selected; no source selected.</td></tr>
<tr><td></td><td>0 … 0</td><td>Not selected</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>50.12</td><td colspan="7">FBA A debug mode</td></tr>
<tr><td></td><td colspan="7">Fieldbus adapter A debug mode.
Enables the display of the raw (unmodified) data received from and sent to fieldbus adapter A. The data are displayed in parameters 50.13 … 50.18.
Note: This functionality should only be used for debugging.
0: Disable; disable the display of raw data from fieldbus adapter A.
1: Enable; enable the display of raw data from fieldbus adapter A.</td></tr>
<tr><td></td><td>0 … 1</td><td>Disable</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td>50.13</td><td colspan="7">FBA A control word</td></tr>
<tr><td></td><td colspan="7">Fieldbus adapter A raw control word.
Displays the raw (unmodified) control word sent by the master (e.g. PLC) to fieldbus adapter A if 50.12 FBA A debug mode = Enable.</td></tr>
<tr><td></td><td>00000000h … FFFFFFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
</table>

<table>
<tr><th>Index</th><th colspan="7">Name</th></tr>
<tr><th></th><th colspan="7">Text</th></tr>
<tr><th></th><th>Range</th><th>Default</th><th>Unit</th><th>Scale FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td>50.14</td><td colspan="7">FBA A reference 1</td></tr>
<tr><td></td><td colspan="7">Fieldbus adapter A raw reference 1.
Displays the raw (unmodified) reference 1 (REF1) sent by the master (e.g. PLC) to fieldbus adapter A if 50.12 FBA A debug mode = Enable.</td></tr>
<tr><td></td><td>-2147483648 … 2147483647</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>50.15</td><td colspan="7">FBA A reference 2</td></tr>
<tr><td></td><td colspan="7">Fieldbus adapter A raw reference 2.
Displays the raw (unmodified) reference 2 (REF2) sent by the master (e.g. PLC) to fieldbus adapter A if 50.12 FBA A debug mode = Enable.</td></tr>
<tr><td></td><td>-2147483648 … 2147483647</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>50.16</td><td colspan="7">FBA A status word</td></tr>
<tr><td></td><td colspan="7">Fieldbus adapter A raw status word.
Displays the raw (unmodified) status word sent by fieldbus adapter A to the master (e.g. PLC) if 50.12 FBA A debug mode = Enable.</td></tr>
<tr><td></td><td>00000000h … FFFFFFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>50.17</td><td colspan="7">FBA A actual value 1</td></tr>
<tr><td></td><td colspan="7">Fieldbus adapter A raw actual value 1.
Displays the raw (unmodified) actual value 1 (ACT1) sent by fieldbus adapter A to the master (e.g. PLC) if 50.12 FBA A debug mode = Enable.</td></tr>
<tr><td></td><td>-2147483648 … 2147483647</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>50.18</td><td colspan="7">FBA A actual value 2</td></tr>
<tr><td></td><td colspan="7">Fieldbus adapter A raw actual value 2.
Displays the raw (unmodified) actual value 2 (ACT2) sent by fieldbus adapter A to the master (e.g. PLC) if 50.12 FBA A debug mode = Enable.</td></tr>
<tr><td></td><td>-2147483648 … 2147483647</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>50.21</td><td colspan="7">FBA A timelevel sel</td></tr>
<tr><td></td><td colspan="7">Fieldbus adapter A communication time levels.
In general, lower time levels of read/write services reduce the CPU load. The table below shows the time levels of the read/write services for cyclic high and cyclic low data depending on 50.21 FBA A timelevel sel:
<table>
<tr><th>50.21 FBA A timelevel sel</th><th>Cyclic high*</th><th>Cyclic low**</th></tr>
<tr><td>Normal</td><td>2 ms</td><td>10 ms</td></tr>
<tr><td>Fast</td><td>500 µs</td><td>2 ms</td></tr>
<tr><td>Very fast</td><td>250 µs</td><td>2 ms</td></tr>
<tr><td>Monitoring</td><td>10 ms</td><td>2 ms</td></tr>
</table>
*Cyclic high data consist of fieldbus status word, ACT1 and ACT2 from the fieldbus.
**Cyclic low data consist of the parameter data mapped in groups 52 FBA A data in, 53 FBA A data out and acyclic data.
Control word, REF1 and REF2 from the fieldbus are handled as interrupts generated on receipt of cyclic high messages.
0: Normal; normal speed.
1: Fast; fast speed.
2: Very fast; very fast speed.</td></tr>
</table>

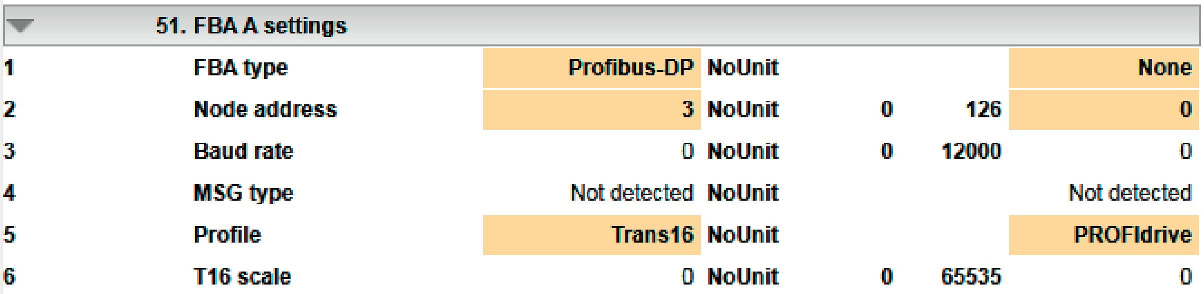
<table>
<tr><th>Index</th><th colspan="7">Name</th></tr>
<tr><th></th><th colspan="7">Text</th></tr>
<tr><th></th><th>Range</th><th>Default</th><th>Unit</th><th>Scale FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">3: **Monitoring**; slow speed. Optimized for PC tool communication and monitoring usage.</td></tr>
<tr><td></td><td>0 … 3</td><td>Normal</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td>**50.31**</td><td colspan="7">**FBA B enable**</td></tr>
<tr><td></td><td colspan="7">Fieldbus adapter B enable/disable.
Enables/disables communication between the unit and fieldbus adapter B. Specifies the location of the adapter in slot 1 … slot 3.
0: **Disable**; disable communication between the unit and fieldbus adapter B.
1: **Option slot 1**; enable communication between the unit and fieldbus adapter B. The adapter is in slot 1.
2: **Option slot 2**; enable communication between the unit and fieldbus adapter B. The adapter is in slot 2.
3: **Option slot 3**; enable communication between the unit and fieldbus adapter B. The adapter is in slot 3.</td></tr>
<tr><td></td><td>0 … 3</td><td>Disable</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td>**50.32**</td><td colspan="7">**FBA B comm loss func**</td></tr>
<tr><td></td><td colspan="7">Fieldbus adapter B communication loss action.
Selects how the unit reacts to a fieldbus communication break.
0: **No action**; none, disable communication loss function.
1: **Fault**; the event generates fault 5224 FBA B communication and the unit is disabled. This occurs only when the unit is controlled from the fieldbus.
2: **Warning**; the event generates warning 1221 FBA B communication. The unit continues with the same current/voltage/power level it was operating at. This occurs only when the unit is controlled from the fieldbus.
WARNING
Make sure that it is safe to continue operation in case of a communication break.
4: **Fault always**; the event generates fault 5224 FBA B communication and the unit is disabled. This occurs even though no control is expected from the fieldbus.
5: **Warning always**; the event generates warning 1220 FBA A communication. The unit continues with the same current/voltage/power level it was operating at. This occurs even though no control is expected from the fieldbus.
WARNING
Make sure that it is safe to continue operation in case of a communication break.</td></tr>
<tr><td></td><td>0 … 5</td><td>No action</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**50.33**</td><td colspan="7">**FBA B comm loss timeout**</td></tr>
<tr><td></td><td colspan="7">Fieldbus adapter B communication loss timeout.
Defines the time delay for the fieldbus communication loss before the action defined in 50.32 FBA B comm loss func is executed. Time count starts when the communication link fails to update the message.</td></tr>
<tr><td></td><td>0 … 32500</td><td>300</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**50.39**</td><td colspan="7">**FBA B SW transparent source**</td></tr>
<tr><td></td><td colspan="7">Fieldbus adapter B status word transparent source.
Selects the source for the status word when the fieldbus adapter is set to a transparent communication profile e.g. by its configuration parameters in group 54. The parameter to be used is fieldbus dependent.
Other; source selection e.g. 06.13 Global Status Word.
0: **Not selected**; no source selected.</td></tr>
</table>

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	0 … 0	Not selected	-	1 = 1	n	y	Parameter
50.40	**FBA B act1 transparent source**						
	Fieldbus adapter B actual value 1 transparent source. Selects the source for actual value 1 sent by fieldbus adapter B to the master (e.g. PLC) **Other**; source selection e.g. a value from group 1. 0: **Not selected**; no source selected.						
	0 … 0	Not selected	-	1 = 1	n	y	Parameter
50.41	**FBA B act2 transparent source**						
	Fieldbus adapter B actual value 2 transparent source. Selects the source for actual value 2 sent by fieldbus adapter B to the master (e.g. PLC) **Other**; source selection e.g. a value from group 1. 0: **Not selected**; no source selected.						
	0 … 0	Not selected	-	1 = 1	n	y	Parameter
50.42	**FBA B debug mode**						
	Fieldbus adapter B debug mode. Enables the display of the raw (unmodified) data received from and sent to fieldbus adapter B. The data are displayed in parameters 50.43…50.48. Note: This functionality should only be used for debugging. 0: **Disable**; disable the display of raw data from fieldbus adapter B. 1: **Enable**; enable the display of raw data from fieldbus adapter B.						
	0 … 1	Disable	-	1 = 1	n	n	Parameter
50.43	**FBA B control word**						
	Fieldbus adapter B raw control word. Displays the raw (unmodified) control word sent by the master (e.g. PLC) to fieldbus adapter B if 50.42 FBA B debug mode = Enable						
	00000000h … FFFFFFFFh	-	-	1 = 1	y	n	Signal
50.44	**FBA B reference 1**						
	Fieldbus adapter B raw reference 1. Displays the raw (unmodified) reference 1 (REF1) sent by the master (e.g. PLC) to fieldbus adapter B if 50.42 FBA B debug mode = Enable.						
	-2147483648 … 2147483647	-	-	1 = 1	y	n	Signal
50.45	**FBA B reference 2**						
	Fieldbus adapter B raw reference 2. Displays the raw (unmodified) reference 2 (REF2) sent by the master (e.g. PLC) to fieldbus adapter B if 50.42 FBA B debug mode = Enable.						
	-2147483648 … 2147483647	-	-	1 = 1	y	n	Signal
50.46	**FBA B status word**						
	Fieldbus adapter B raw status word. Displays the raw (unmodified) status word sent by fieldbus adapter B to the master (e.g. PLC) if 50.42 FBA B debug mode = Enable.						
	00000000h … FFFFFFFFh	-	-	1 = 1	y	n	Signal
50.47	**FBA B actual value 1**						
	Fieldbus adapter B raw actual value 1. Displays the raw (unmodified) actual value 1 (ACT1) sent by fieldbus adapter B to the master (e.g. PLC) if 50.42 FBA B debug mode = Enable.						

<table>
<tr><th>Index</th><th colspan="7">Name</th></tr>
<tr><td rowspan="3"></td><td colspan="7">Text</td></tr>
<tr><td>Range</td><td>Default</td><td>Unit</td><td>Scale FbEq16</td><td>Volatile</td><td>Change running</td><td>Type</td></tr>
<tr><td>-2147483648 … 2147483647</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>50.48</td><td colspan="7">FBA B actual value 2</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Fieldbus adapter B raw actual value 2.
Displays the raw (unmodified) actual value 1 (ACT2) sent by fieldbus adapter B to the master (e.g. PLC) if 50.42 FBA B debug mode = Enable.</td></tr>
<tr><td>-2147483648 … 2147483647</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>50.51</td><td colspan="7">FBA B timelevel sel</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Fieldbus adapter B communication time levels.
In general, lower time levels of read/write services reduce the CPU load. The table below shows the time levels of the read/write services for cyclic high and cyclic low data depending on 50.51 FBA B timelevel sel:
<table>
<tr><th>50.51 FBA B timelevel sel</th><th>Cyclic high*</th><th>Cyclic low**</th></tr>
<tr><td>Normal</td><td>2 ms</td><td>10 ms</td></tr>
<tr><td>Fast</td><td>500 µs</td><td>2 ms</td></tr>
<tr><td>Very fast</td><td>250 µs</td><td>2 ms</td></tr>
<tr><td>Monitoring</td><td>10 ms</td><td>2 ms</td></tr>
</table>
*Cyclic high data consist of fieldbus status word, ACT1 and ACT2 from the fieldbus.
**Cyclic low data consist of the parameter data mapped in groups 55 FBA B data in, 56 FBA B data out and acyclic data.
Control word, REF1 and REF2 from the fieldbus are handled as interrupts generated on receipt of cyclic high messages.
0: Normal; normal speed.
1: Fast; fast speed.
2: Very fast; very fast speed.
3: Monitoring; slow speed. Optimized for PC tool communication and monitoring usage.</td></tr>
<tr><td>0 … 3</td><td>Normal</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
</table>

51 FBA A settings

Fieldbus adapter A configuration.

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
Attention: Any changed parameters must be validated by means of 51.27 FBA A par refresh = Refresh. **Note**: Since the DCT880 is not a drive, it is not possible to use e.g. the profile ABB DRIVES. Use transparent profile e.g. Trans16. Example for Profibus-DP: 							
51.01	**FBA A type**						
	Fieldbus adapter A type. Displays the type of the connected fieldbus adapter A module. 0: **None**; module is not found or is not properly connected or is disabled by 50.01 FBA A enable. 1: **FPBA**; 32: **FCAN**; 37: **FDNA**; 101: **FCNA**; 128: **FENA-11/21**; 135: **FECA**; 136: **FEPL**; 485: **FSCA**;						
	0 … 485	-	-	1 = 1	y	n	Signal
51.02 to 51.26	**FBA A Par2 … FBA A Par26**						
	Fieldbus adapter A configuration parameter. Parameters 51.02 … 51.26 are adapter module-specific. For more information, see the documentation of the fieldbus adapter module. **Note**: Not all of these parameters are necessarily in use.						
	0 … 65535	0	-	1 = 1	n	y	Parameter
51.27	**FBA A par refresh**						
	Fieldbus adapter A refresh. Validates any changed fieldbus adapter A module configuration settings The value reverts to Done automatically, when the refresh is done. 0: **Done**; refreshing done. 1: **Refresh**; refreshing.						
	0 … 1	Done	-	1 = 1	y	n	Parameter
51.28	**FBA A par table ver**						
	Fieldbus adapter A parameter table revision.						

51. FBA A settings

1	FBA type	Profibus-DP	NoUnit			None
2	Node address	3	NoUnit	0	126	0
3	Baud rate	0	NoUnit	0	12000	0
4	MSG type	Not detected	NoUnit			Not detected
5	Profile	Trans16	NoUnit			PROFIdrive
6	T16 scale	0	NoUnit	0	65535	0

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	Displays the parameter table revision of the fieldbus adapter A module-mapping file (stored in the memory of the unit) in format axyz, where ax = major table revision number and yz = minor table revision number.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
51.29	**FBA A drive type code**						
	Fieldbus adapter A unit type code. Displays the unit's type code in the fieldbus adapter A module-mapping file (stored in the memory of the unit).						
	0 … 65535	-	-	1 = 1	y	n	Signal
51.30	**FBA A mapping file ver**						
	Fieldbus adapter A mapping file revision. Displays the fieldbus adapter A module-mapping file revision stored in the memory of the unit in decimal format.						
	0 … 65535	-	-	1 = 1	y	n	Signal
51.31	**D2FBA A comm status**						
	Unit to fieldbus adapter A communication status. Displays the status of the fieldbus adapter A module communication. 0: **Not configured**; fieldbus adapter A is not configured. 1: **Initializing**; fieldbus adapter A is initializing. 2: **Time out**; a timeout has occurred in the communication between fieldbus adapter A and the unit. 3: **Configuration error**; fieldbus adapter A configuration error. Mapping file is not found in the file system of the unit, or mapping file upload has failed more than three times. 4: **Off-line**; fieldbus adapter A communication is off-line. 5: **On-line**; fieldbus adapter A communication is on-line or fieldbus adapter A has been configured not to detect a communication break. For more information, see the documentation of the fieldbus adapter. 6: **Reset**; fieldbus adapter A is performing a hardware reset.						
	0 … 6	-	-	1 = 1	y	n	Signal
51.32	**FBA A comm SW ver**						
	Fieldbus adapter A, firmware patch and build versions. Displays the patch and build versions of the adapter module A firmware in format xxyy, where xx = patch version number and yy = build version number. **Example**: C802 = 200.02 (patch version 200, build version 2).						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
51.33	**FBA A appl SW ver**						
	Fieldbus adapter A, firmware major and minor versions. Displays the major and minor versions of the adapter module A firmware in format xyy, where x = major revision number and yy = minor revision number. **Example**: 300 = 3.00 (major version 3, minor version 00).						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal

52 FBA A data in

Selection of data sent by fieldbus adapter A to the master (e.g. PLC).
Note: 32-bit values require two consecutive parameters. Whenever a 32-bit value is selected in a data parameter, the next parameter is automatically reserved.

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
52.01 to 52.12	**FBA A data in1 … FBA A data in12**						
	Fieldbus adapter A data from the unit to the master (e.g. PLC). Parameters 52.01 … 52.12 select data sent from the unit by fieldbus adapter A to the fieldbus controller (e.g. PLC). **Other**; source selection (10 ms update). 0: **None**; inactive. Disable FBA A data in. 4: **SW 16bit**; status word (16 bit) (2 ms update) via 50.09 FBA A SW transparent source. 5: **Act1 16bit**; actual value ACT1 (16 bit) (2 ms update) via 50.10 FBA A act1 transparent source. 6: **Act2 16bit**; actual value ACT2 (16 bit) (2 ms update) via 50.11 FBA A act2 transparent source. 15: **Act1 32bit**; actual value ACT1 (32 bits). 16: **Act2 32bit**; actual value ACT2 (32 bits).						
	0 … 16	None	-	1 = 1	n	y	Parameter

53 FBA A data out

Selection of data sent by the master (e.g. PLC) to fieldbus adapter A.
Note: 32-bit values require two consecutive parameters. Whenever a 32-bit value is selected in a data parameter, the next parameter is automatically reserved.

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
53.01 to 53.12	**FBA A data out1**						
	Fieldbus adapter A data from the master (e.g. PLC) to the unit. Parameters 53.01 … 53.12 select data sent from the fieldbus controller (e.g. PLC) by fieldbus adapter A to the unit. **Other**; source selection (10 ms update). 0: **None**; inactive. Disable FBA A data out. 1: **CW 16bit**; control word (16 bit) (2 ms update). Send to 06.03 FBA A transparent control word. 2: **Ref1 16bit**; reference REF1 (16 bit) (2 ms update). Send to 03.05 FBA A reference 1. 3: **Ref2 16bit**; reference REF2 (16 bit) (2 ms update). Send to 03.06 FBA A reference 2. 12: **Ref1 32bit**; reference REF1 (32 bits). 13: **Ref2 32bit**; reference REF2 (32 bits).						
	0 … 13	None	-	1 = 1	n	y	Parameter

54 FBA B settings

Description see group 51 FBA A settings.

55 FBA B data in

Description see group 52 FBA A data in.

56 FBA B data out

Description see group 53 FBA A data out.

58 Embedded fieldbus

Embedded fieldbus (EFB) configuration.

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	Attention: Any changed parameters must be validated by means of 58.06 Communication control = Refresh settings.						
58.01	**Protocol enable**						
	Embedded fieldbus, enable/disable. Enables/disables the embedded fieldbus and selects the protocol to use. **Note**: When the embedded fieldbus interface is enabled, the device-to-device link in group 60 DDCS communication is disabled. 0: **None**; inactive, disable communication. 1: **Modbus RTU**; enable the embedded fieldbus. Modbus RTU protocol is used.						
	0 … 1	None	-	1 = 1	n	n	Parameter
58.02	**Protocol ID**						
	Embedded fieldbus, Protocol ID and revision. Displays the protocol ID and revision. First 4 bits specify the protocol ID, last 12 bits specify the revision.						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
58.03	**Node address**						
	Embedded fieldbus, node address. Defines the node address of the unit for the embedded fieldbus communication. All units connected to the network must have a unique node address. **Notes:** – The address range for the embedded fieldbus is 1 … 247. – For units in a network, it is advisable to reserve 58.03 Node address = 1 for spare/replacement units. – Changes to 58.03 Node address take effect after the unit is rebooted or the new setting is validated by 58.06 Communication control.						
	0 … 255	1	-	1 = 1	n	y	Parameter
58.04	**Baud rate**						
	Embedded fieldbus, link speed. Defines the transfer rate of the embedded fieldbus link. Use the same setting as in the master station. **Note**: Changes to 58.04 Baud rate take effect after the unit is rebooted or the new setting is validated by 58.06 Communication control. 0: **Autodetect**; detects the speed automatically. 1: **4.8 kbps**; 4.8 kbit/s. 2: **9.6 kbps**; 9.6 kbit/s. 3: **19.2 kbps**; 19.2 kbit/s. 4: **38.4 kbps**; 38.4 kbit/s.						

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	5: **57.6 kbps**; 57.6 kbit/s. 6: **76.8 kbps**; 76.8 kbit/s. 7: **115.2 kbps**; 115.2 kbit/s.						
	0 … 7	19.2 kbps	-	1 = 1	n	y	Parameter
58.05	**Parity**						
	Embedded fieldbus, parity bit and stop bits. Selects the type of parity bit and the number of stop bits. Use the same setting as in the master station. **Note**: Changes to 58.05 Parity take effect after the unit is rebooted or the new setting is validated by 58.06 Communication control. 0: **8 NONE 1**; eight data bits, no parity bit, one stop bit. 1: **8 NONE 2**; eight data bits, no parity bit, two stop bits. 2: **8 EVEN 1**; eight data bits, even parity bit, one stop bit. 3: **8 ODD 1**; eight data bits, odd parity bit, one stop bit.						
	0 … 3	8 EVEN 1	-	1 = 1	n	y	Parameter
58.06	**Communication control**						
	Embedded fieldbus, refresh command. Applies any changed embedded fieldbus settings or activates silent mode. The value reverts automatically to Enabled, when the refresh is done. 0: **Enabled**; normal operation or refreshing done. 1: **Refresh settings**; refresh changed configuration settings of the embedded fieldbus. 2: **Silent Mode**; activate the silent mode. No messages are transmitted. Silent mode can be terminated by setting 58.06 Communication = Refresh settings.						
	0 … 2	Enabled	-	1 = 1	y	y	Parameter
58.07	**Communication diagnostics**						
	Embedded fieldbus, communication status word. Displays the status of the embedded fieldbus communication. Bit assignment:						

Bit	**Name**	**Value**	**Remarks**
0	Initialization failed	1	Embedded fieldbus initialization failed.
1	Address configuration error	1	Node address not allowed by protocol.
2	Silent mode	1	Unit is not allowed transmitting.
		0	Unit is allowed transmitting.
3	reserved		
4	Wiring error	1	Error detected: Possibly A/B wires swapped.
5	Parity error	1	Error detected: Check 58.04 Baud rate and 58.05 Parity.
6	Baud rate error	1	Error detected: Check 58.05 Parity and 58.04 Baud rate.
7	No bus activity	1	0 bytes received during the last 5 seconds.
8	No packets	1	0 packets (addressed to any device) detected during the last 5 seconds.
9	Noise or addressing error	1	Error detected: Interference or another unit with the same address is online.
10	Communication loss	1	0 packets addressed to the unit received within 58.16 Communication loss time.

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7"><table>
<tr><td>11</td><td>CW/References loss</td><td>1</td><td>No control word or references received within 58.16 Communication loss time.</td></tr>
<tr><td>12</td><td>reserved</td><td></td><td></td></tr>
<tr><td>13</td><td>reserved</td><td></td><td></td></tr>
<tr><td>14</td><td>reserved</td><td></td><td></td></tr>
<tr><td>15</td><td>reserved</td><td></td><td></td></tr>
</table></td></tr>
<tr><td></td><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>58.08</td><td colspan="7">Received packets</td></tr>
<tr><td></td><td colspan="7">Embedded fieldbus, number of received packets addressed to the unit.
Displays a count of valid packets addressed to the unit. During normal operation, this number increases constantly.
Can be reset from the control panel by keeping Reset depressed for over 3 seconds.</td></tr>
<tr><td></td><td>0 … 4294967295</td><td>0</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>58.09</td><td colspan="7">Transmitted packets</td></tr>
<tr><td></td><td colspan="7">Embedded fieldbus, number of transmitted packets.
Displays a count of valid packets transmitted by the unit. During normal operation, this number increases constantly.
Can be reset from the control panel by keeping Reset depressed for over 3 seconds.</td></tr>
<tr><td></td><td>0 … 4294967295</td><td>0</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>58.10</td><td colspan="7">All packets</td></tr>
<tr><td></td><td colspan="7">Embedded fieldbus, number of all received packets.
Displays a count of valid packets addressed to any unit on the bus. During normal operation, this number increases constantly.
Can be reset from the control panel by keeping Reset depressed for over 3 seconds.</td></tr>
<tr><td></td><td>0 … 4294967295</td><td>0</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>58.11</td><td colspan="7">UART errors</td></tr>
<tr><td></td><td colspan="7">Embedded fieldbus, number of UART errors.
Displays a count of character errors received by the unit. An increasing count indicates a configuration problem on the bus.
Can be reset from the control panel by keeping Reset depressed for over 3 seconds.</td></tr>
<tr><td></td><td>0 … 4294967295</td><td>0</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>58.12</td><td colspan="7">CRC errors</td></tr>
<tr><td></td><td colspan="7">Embedded fieldbus, number of CRC errors.
Displays a count of packets with a CRC error received by the unit. An increasing count indicates interference on the bus.
Can be reset from the control panel by keeping Reset depressed for over 3 seconds.</td></tr>
<tr><td></td><td>0 … 4294967295</td><td>0</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>58.14</td><td colspan="7">Communication loss action</td></tr>
<tr><td></td><td colspan="7">Embedded fieldbus, communication loss action.
Selects how the unit reacts to an embedded fieldbus communication loss.
Note: Changes to 58.14 Communication loss action take effect after the unit is rebooted or the new setting is validated by 58.06 Communication control.
0: No action; none, disable communication loss function.
1: Fault; the event generates fault 5225 EFB communication and the unit is disabled. This occurs only when the unit is controlled from the fieldbus.</td></tr>
</table>

Index	Name						
	Text						
	Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
	2: **Warning**; the event generates warning 1224 EFB communication. The unit continues with the same current/voltage/power level it was operating at This occurs even though no control is expected from the fieldbus. **WARNING** Make sure that it is safe to continue operation in case of a communication break. 4: **Fault always**; the event generates fault 5225 EFB communication and the unit is disabled. This occurs even though no control is expected from the embedded fieldbus.						
	0 … 5	No action	-	1 = 1	n	y	Parameter
58.15	**Communication loss mode**						
	Embedded fieldbus, communication loss mode. Defines which message types reset the timeout counter detecting an embedded fieldbus communication loss. See 58.14 Communication loss action and 58.16 Communication loss time. **Note**: Changes to 58.15 Communication loss mode take effect after the unit is rebooted or the new setting is validated by 58.06 Communication control. 0: **None**; no resetting of the timeout counter. 1: **Any message**; any message addressed to the unit resets the timeout. 2: **Cw / Ref1 / Ref2**; a write of the control word or a reference from the embedded fieldbus resets the timeout.						
	0 … 2	Cw / Ref1 / Ref2	-	1 = 1	n	y	Parameter
58.16	**Communication loss time**						
	Embedded fieldbus, communication loss timeout. Defines the time delay for the embedded fieldbus communication loss, before the action defined in 58.14 Communication loss action is executed. See also 58.15 Communication loss mode. **Note**: Changes to 58.16 Communication loss time take effect after the unit is rebooted or the new setting is validated by 58.06 Communication control.						
	0 … 32.5	0.3	s	10 = 1 s	n	y	Parameter
58.17	**Transmit delay**						
	Embedded fieldbus, minimum response delay. Defines a minimum response delay in addition to any fixed delay imposed by the protocol. Note: Changes to 58.17 Transmit delay take effect after the unit is rebooted or the new setting is validated by 58.06 Communication control.						
	0 … 32500	0	ms	1 = 1 ms	n	y	Parameter
58.18	**EFB control word**						
	Embedded fieldbus, raw control word. Displays the raw (unmodified) control word sent by the Modbus controller (e.g. PLC) to the unit. For debugging purposes.						
	00000000h … FFFFFFFFh	-	-	1 = 1	y	n	Signal
58.19	**EFB status word**						
	Embedded fieldbus, raw status word. Displays the raw (unmodified) status word sent by the unit to the Modbus controller (e.g. PLC). For debugging purposes.						
	00000000h … FFFFFFFFh	-	-	1 = 1	y	n	Signal
58.25	**Control profile**						
	Embedded fieldbus, control profile. Defines the control profile used by the protocol. **Note**: Changes to 58.25 Control profile take effect after the unit is rebooted or the new setting is validated by 58.06 Communication control.						

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">2: Transparent; transparent profile (16-bit or 32-bit control word) with registers in the classic format.</td></tr>
<tr><td>2 … 2</td><td>Transparent</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>58.26</td><td colspan="7">EFB ref1 type</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Embedded fieldbus, reference 1 type.
Selects the type and scaling of 03.09 EFB reference 1 sent by the Modbus controller (e.g. PLC) to the embedded fieldbus.
1: Transparent; No scaling is applied.
2: General; Generic reference with a scaling of 100 = 1 (e.g. integer and two decimals).</td></tr>
<tr><td>1 ... 2</td><td>Transparent</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>58.27</td><td colspan="7">EFB ref2 type</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Embedded fieldbus, reference 2 type.
Selects the type and scaling of 03.10 EFB reference 2 sent by the Modbus controller (e.g. PLC) to the embedded fieldbus. See 58.26 EFB ref1 type.</td></tr>
<tr><td>1 … 2</td><td>Transparent</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>58.28</td><td colspan="7">EFB act1 type</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Embedded fieldbus, actual value 1 type.
Selects the type/source and scaling of actual value 1 sent by the embedded fieldbus to the Modbus controller (e.g. PLC).
1: Transparent; The value selected by 58.31 EFB act1 transparent source is sent as actual value 1. No scaling is applied. The 16-bit scaling is 1 = 1 unit.
2: General; The value selected by parameter 58.31 EFB act1 transparent source is sent as actual value 1 with a 16-bit scaling of 100 = 1 unit (e.g. integer and two decimals).</td></tr>
<tr><td>1 … 2</td><td>Transparent</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>58.29</td><td colspan="7">EFB act2 type</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Embedded fieldbus, actual value 2 type.
Selects the type/source and scaling of actual value 2 sent by the embedded fieldbus to the Modbus controller (e.g. PLC). See 58.28 EFB act1 type.</td></tr>
<tr><td>1 … 2</td><td>Transparent</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>58.30</td><td colspan="7">EFB status word transparent source</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Embedded fieldbus, status word transparent source.
Selects the source for the status word.
Other; source selection e.g. 06.13 Global Status Word.
0: Not selected; no source selected.</td></tr>
<tr><td>0 … 0</td><td>Not selected</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>58.31</td><td colspan="7">EFB act1 transparent source</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Embedded fieldbus, actual value 1 transparent source.
Selects the source of actual value 1 sent by the embedded fieldbus to the Modbus controller (e.g. PLC).
Other; source selection e.g. a value from group 1.
0: Not selected; no source selected.</td></tr>
<tr><td>0 … 0</td><td>Not selected</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>58.32</td><td colspan="7">EFB act2 transparent source</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Embedded fieldbus, actual value 2 transparent source.
Selects the source of actual value 2 sent by the embedded fieldbus to the Modbus controller (e.g. PLC).
Other; source selection e.g. a value from group 1.
0: Not selected; no source selected.</td></tr>
<tr><td>0 … 0</td><td>Not selected</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>58.33</td><td colspan="7">Addressing mode</td></tr>
</table>

<table>
<tr><td>**Index**</td><td colspan="7">**Name**</td></tr>
<tr><td rowspan="2"></td><td colspan="7">**Text**</td></tr>
<tr><td>**Range**</td><td>**Default**</td><td>**Unit**</td><td>**Scale FbEq16**</td><td>**Volatile**</td><td>**Change running**</td><td>**Type**</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Embedded fieldbus, addressing mode.
Defines the mapping between parameters and holding registers in the 400101 … 465535 Modbus register range.
Note: Changes to 58.33 Addressing mode take effect after the unit is rebooted or the new setting is validated by 58.06 Communication control.
0: **Mode 0**; 16-bit values (groups 1 … 99, indexes 1 … 99):
Register address = 400000 + 100 × parameter group + parameter index.
For example, parameter 22.80 would be mapped to register 400000 + 2200 + 80 = 402280.
32-bit values (groups 1 … 99, indexes 1 … 99):
Register address = 420000 + 200 × parameter group + 2 × parameter index.
For example, parameter 22.80 would be mapped to register 420000 + 4400 + 160 = 424560.
1: **Mode 1**; 16-bit values (groups 1 … 255, indexes 1 … 255):
Register address = 400000 + 256 × parameter group + parameter index.
For example, parameter 22.80 would be mapped to register 400000 + 5632 + 80 = 405712.
2: **Mode 2**; 32-bit values (groups 1 … 127, indexes 1 … 255):
Register address = 400000 + 512 × parameter group + 2 × parameter index.
For example, parameter 22.80 would be mapped to register 400000 + 11264 + 160 = 411424.</td></tr>
<tr><td>0 … 2</td><td>Mode 0</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**58.34**</td><td colspan="7">**Word order**</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Embedded fieldbus, word order.
Selects in which order 16-bit registers of 32-bit parameters are transferred. For each register, the first byte contains the high order byte and the second byte contains the low order byte.
Note: Changes to 58.34 Word order take effect after the unit is rebooted or the new setting is validated by 58.06 Communication control.
0: **HI-LO**; the 1st register contains the high order word. The 2nd register contains the low order word.
1: **LO-HI**; the 1st register contains the low order word. The 2nd register contains the high order word.</td></tr>
<tr><td>0 … 1</td><td>LO-HI</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**58.101 to 58.124**</td><td colspan="7">**Data I/O 1 … Data I/O 24**</td></tr>
<tr><td></td><td colspan="7">Embedded fieldbus, I/O data.
Defines the address in the unit, which the Modbus master accesses when it reads from or writes to register address 400001 … 400024.
The master defines the type of the data (input/ output). The value is transmitted in a Modbus frame consisting of two 16- bit words. If the value is 16-bit, it is transmitted in the LSW (least significant word). If the value is 32-bit, the subsequent parameter is also reserved for it and must be set to None.
Notes:
– Input means data transfer from the unit to the master (e.g. PLC).
– Output means data transfer from the master (e.g. PLC) to the unit.
Other; source selection (10 ms update).
0: **None**; inactive. Data I/O is disabled.
1: **CW 16bit**; control word (16-bit) (2 ms update). Taken from 06.08 Used main control word./Send to 06.01 Main control word.</td></tr>
</table>

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	2: **Ref1 16bit**; reference 1 REF1 (16-bit) (2 ms update). Taken from 03.09 EFB reference 1./Send to 03.09 EFB reference 1. 3: **Ref2 16bit**; reference 2 REF2 (16-bit) (2 ms update). Taken from 03.10 EFB reference 2./Send to 03.10 EFB reference 2. 4: **SW 16bit**; status word (16-bit) (2 ms update). via 58.30 EFB status word transparent source./NA. 5: **Act1 16bit**; actual value 1 ACT1 (16-bit) (2 ms update). Depending on 58.28 EFB act1 type./NA. 6: **Act2 16bit**; actual value 2 ACT2 (16-bit) (2 ms update). Depending on 58.29 EFB act2 type./NA. 12: **Ref1 32bit**; reference 1 REF1 (32-bit) (2 ms update). Taken from 03.09 EFB reference 1./Send to 03.09 EFB reference 1. 13: **Ref2 32bit**; reference 2 REF2 (32-bit) (2 ms update). Taken from 03.10 EFB reference 2./Send to 03.10 EFB reference 2. 15: **Act1 32bit**; actual value 1 ACT1 (32-bit) (2 ms update). Depending on 58.28 EFB act1 type./NA. 16: **Act2 32bit**; actual value 2 ACT2 (32-bit) (2 ms update). Depending on 58.29 EFB act2 type./NA. 31: **RO/DIO control word**; see 10.99 RO/DIO control word. Taken from 10.99 RO/DIO control word./Send to 10.99 RO/DIO control word. 32: **AO1 data storage**; see 13.91 AO1 data storage. Taken from 13.91 AO1 data storage./Send to 13.91 AO1 data storage. 33: **AO2 data storage**; see 13.92 AO2 data storage. Taken from 13.92 AO2 data storage./Send to 13.92 AO2 data storage.						
	0 … 33	None	-	1 = 1	n	y	Parameter

60 DDCS communication

DDCS communication configuration.

The DDCS protocol is used in the communication between:

- Units in a master-follower link configuration.
- Units and a DDCS controller such as an AC 800M.

All of the above utilize a fiber optic link, which requires FDCO modules. Master-follower link and DDCS controller communication can also be implemented through shielded twisted-pair cable via connector XD2D (device-to-device link) of the unit.

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
60.01	**M/F communication port**						
	Master-follower link, communication port. Selects the connection used by the master-follower link. 0: **Not in use**; not in use, disable communication. 1: **Slot 1A**; activates channel A on the FDCO-0x which is in slot 1. 2: **Slot 2A**; activates channel A on the FDCO-0x which is in slot 2. 3: **Slot 3A**; activates channel A on the FDCO-0x which is in slot 3. 4: **Slot 1B**; activates channel B on the FDCO-0x which is in slot 1. 5: **Slot 2B**; activates channel B on the FDCO-0x which is in slot 2. 6: **Slot 3B**; activates channel B on the FDCO-0x which is in slot 3. 7: **XD2D**; activates connector XD2D.						
	0 … 7	Not in use	-	1 = 1	n	y	Parameter
60.02	**M/F node address**						

<table>
<tr><th>Index</th><th colspan="7">Name</th></tr>
<tr><th></th><th colspan="7">Text</th></tr>
<tr><th></th><th>Range</th><th>Default</th><th>Unit</th><th>Scale FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">Master-follower link, node address.
Defines the node address of the unit for master-follower link. Two units with the same node address are not allowed.
Notes:
– The allowable address for the master is 1.
– The allowable addresses for followers are 2 … 60.</td></tr>
<tr><td></td><td>1 … 254</td><td>1</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**60.03**</td><td colspan="7">**M/F mode**</td></tr>
<tr><td></td><td colspan="7">Master-follower link, mode.
Defines the role of the unit on the master-follower link.
0: **Not in use**; not in use, disable master-follower link.
1: **FDCO-XD2D Master**; the unit is the master on the master-follower link either via FDCO-0x or via connector XD2D.
2: **FDCO-XD2D Follower**; the unit is a follower on the master-follower link either via FDCO-0x or via connector XD2D.
3: **ApplPrg Master**; reserved.
4: **ApplPrg Follower**; reserved.
5: **FDCO-XD2D forcing**; the role of the unit on the master-follower link is defined by 60.15 Force master and 60.16 Force follower.
6: **ApplPrg forcing**; reserved.</td></tr>
<tr><td></td><td>0 … 6</td><td>Not in use</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**60.05**</td><td colspan="7">**M/F HW connection**</td></tr>
<tr><td></td><td colspan="7">Master-follower link, hardware connection.
Selects the topology of the master-follower link.
0: **Ring**; the units are connected in a ring topology. Forwarding of messages is enabled. Not to be set when using connector XD2D.
1: **Star**; the units are connected in a star topology, e.g. through a branching unit. Forwarding of messages is disabled. To be set when using connector XD2D.</td></tr>
<tr><td></td><td>0 … 1</td><td>Ring</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**60.08**</td><td colspan="7">**M/F comm loss timeout**</td></tr>
<tr><td></td><td colspan="7">Master-follower link, communication loss timeout.
Defines the time delay for the master-follower link before the action defined in 60.09 M/F comm loss function is executed.</td></tr>
<tr><td></td><td>0 … 65535</td><td>100</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**60.09**</td><td colspan="7">**M/F comm loss function**</td></tr>
<tr><td></td><td colspan="7">Master-follower link, communication loss action.
Selects how the unit reacts to a master-follower link loss.
0: **No action**; none, disable communication loss function.
1: **Warning**; the event generates warning 1223 Master-follower link communication. The unit continues with the same current/voltage/power level it was operating at. This occurs only when the unit is controlled from the master-follower link.
WARNING
Make sure that it is safe to continue operation in case of a communication break.
2: **Fault**; the event generates fault 5228 Master-follower link communication and the unit is disabled. This occurs only when the unit is controlled from the master-follower link.
3: **Fault always**; the event generates fault 5228 Master-follower link communication and the unit is disabled. This occurs even though no control is expected from the master-follower link.</td></tr>
</table>

Index	Name						
	Text						
	Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
	0 … 3	Fault	-	1 = 1	n	y	Parameter
60.14	**M/F follower selection**						
	Master-follower link, follower supervision selection (master only). Defines the supervised followers. Reaction see 60.17 Follower fault action. **Note**: Wrong setting of 60.14 M/F follower selection causes either warning 1223 Master-follower link communication or fault 5228 Master-follower link communication depending on 60.09 M/F comm loss function. 0: **Broadcast**; supervision is disabled. 2: **Follower node 2**; data is read from follower node 2, supervision is enabled. 4: **Follower node 3**; data is read from follower node 3, supervision is enabled. 6: **Follower node 2+3**; data is read from followers’ node 2 and 3, supervision is enabled. 8: **Follower node 4**; data is read from follower node 4, supervision is enabled. 10: **Follower node 2+4**; data is read from followers’ node 2 and 4, supervision is enabled. 12: **Follower node 3+4**; data is read from followers’ node 3 and 4, supervision is enabled. 14: **Follower node 2+3+4**; data is read from followers’ node 2, 3 and 4, supervision is enabled.						
	0 … 14	Broadcast	-	1 = 1	n	y	Parameter
60.15	**Force master**						
	Master-follower link, force master. In case 60.03 M/F mode is set to FDCO-XD2D forcing or ApplPrg forcing, 60.15 Force master selects a source that forces the unit to be the master on the master-follower link. 0 = Unit is not the master on the master-follower link. 1 = Unit is the master on the master-follower link. **Other [bit]**; source selection. 0: **False**; 0, not the master. 1: **True**; 1, the master.						
	0 … 1	False	-	1 = 1	n	y	Parameter
60.16	**Force follower**						
	Master-follower link, force follower. In case 60.03 M/F mode is set to FDCO-XD2D forcing or ApplPrg forcing, 60.16 Force follower selects a source that forces the unit to be a follower on the master-follower link. 0 = Unit is not a follower on the master-follower link. 1 = Unit is a follower on the master-follower link. **Other [bit]**; source selection. 0: **False**; 0, not a follower. 1: **True**; 1, a follower.						
	0 … 1	False	-	1 = 1	n	y	Parameter
60.17	**Follower fault action**						
	Master-follower link, follower fault action (master only). Selects how the master reacts to a faulty follower on the master-follower link. 0: **No action**; no action taken. Unaffected units on the master-follower link will continue running. 1: **Warning**; the event generates warning AFE7 Follower in the master. Unaffected units on the master-follower link will continue running. 2: **Fault**; the event generates fault FF7E Follower in the master and all units are disabled. **Note**: Each follower to be supervised must be configured to feed 06.93 Follower Status Word back to the master. Thus: – In all followers one of the three data words in parameters 61.01 … 61.03 must be set to 06.93 Follower Status Word.						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	– In the master the corresponding target parameter 62.04 … 62.14 must be set to Follower SW.						
	0 … 2	Fault	-	1 = 1	n	y	Parameter
60.18	**Follower enable**						
	Master-follower link, follower enable action (master only). Interlocks the starting of the master depending on the status of all followers on the master-follower link. 0: **FSW bit 0**; the master can only be started if all followers are Ready for On, see 06.93.b00 Follower Status Word. 1: **FSW bit 1**; the master can only be started if all followers are Enabled, see 06.93.b01 Follower Status Word. 2: **FSW bits 0 + 1**, the master can only be started if all followers are Ready for On and Enabled, see 06.93.b00 Follower Status Word and 06.93.b01 Follower Status Word. 3: **Always**; the starting of the master is not interlocked by the status of any follower. **Note**: Each follower to be supervised must be configured to feed 06.93 Follower Status Word back to the master. Thus: – In all followers one of the three data words in parameters 61.01 … 61.03 must be set to 06.93 Follower Status Word. – In the master the corresponding target parameter 62.04 … 62.14 must be set to Follower SW.						
	0 … 3	Always	-	1 = 1	n	y	Parameter
60.31	**M/F wake up delay**						
	Master-follower link, wake-up delay. Defines a wake-up delay during which no master-follower communication faults or warnings can be generated. This is to allow all units on the master-follower link to power up without causing nuisance events. The master cannot be started until the delay elapses or all monitored followers are Ready for On, see 06.93.b00 Follower Status Word.						
	0.0 … 180.0	10.0	s	10 = 1 s	n	y	Parameter
60.41	**Extension adapter com port**						
	FEA-03 extension adapter communication port. Selects the connection used by the FEA-03 extension adapter. 0: **Not in use**; not in use, disable communication. 1: **Slot 1A**; activates channel A on the FDCO-0x which is in slot 1. 2: **Slot 2A**; activates channel A on the FDCO-0x which is in slot 2. 3: **Slot 3A**; activates channel A on the FDCO-0x which is in slot 3. 4: **Slot 1B**; activates channel B on the FDCO-0x which is in slot 1. 5: **Slot 2B**; activates channel B on the FDCO-0x which is in slot 2. 6: **Slot 3B**; activates channel B on the FDCO-0x which is in slot 3.						
	0 … 6	Not in use	-	1 = 1	n	y	Parameter
60.50	**DDCS controller drive type**						
	DDCS controller link, communication type of unit. In ModuleBus communication, defines whether the unit is of “engineered” or “standard” type. 0: **ABB engineered drive**; the unit is an “engineered unit” (data sets 10 … 25 are used). 1: **ABB standard drive**; the unit is a “standard unit” (data sets 1 … 4 are used).						
	0 … 1	ABB engineered drive	-	1 = 1	n	y	Parameter
60.51	**DDCS controller comm port**						
	DDCS controller link, communication port. Selects the connection used by a DDCS controller (such as an AC 800M).						

<table>
<tr><th>Index</th><th colspan="7">Name</th></tr>
<tr><th rowspan="2"></th><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale
FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">0: Not in use; not in use, communication is disabled.
1: Slot 1A; activates channel A on the FDCO-0x which is in slot 1.
2: Slot 2A; activates channel A on the FDCO-0x which is in slot 2.
3: Slot 3A; activates channel A on the FDCO-0x which is in slot 3.
4: Slot 1B; activates channel B on the FDCO-0x which is in slot 1.
5: Slot 2B; activates channel B on the FDCO-0x which is in slot 2.
6: Slot 3B; activates channel B on the FDCO-0x which is in slot 3.
7: XD2D; activates connector XD2D.</td></tr>
<tr><td>0 … 7</td><td>Not in use</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td>60.52</td><td colspan="7">DDCS controller node address</td></tr>
<tr><td rowspan="2"></td><td colspan="7">DDCS controller link, node address.
Defines the node address of the unit for the DDCS controller. Two units with the same node address are not allowed.
DriveBus connection:
– AC 800M with CI858, units must be addressed from 1 … 24.
– AC 80, units must be addressed from 1 … 12.
Optical ModuleBus:
AC 800M, units must be addressed the following way:
1. Multiply the hundreds of the position value by 16.
2. Add the tens and ones of the position value to the result.
Examples:
<table>
<tr><td>Position value</td><td>60.52 DDCS controller node address</td></tr>
<tr><td>101</td><td>16 • 1 + 01 = 17</td></tr>
<tr><td>712</td><td>16 • 7 + 12 = 124</td></tr>
</table>
– AC 80 with TB810 or TB811, units must be addressed the following way:
1. Multiply the hundreds of the position value by 16.
2. Add the tens and ones of the position value to the result.
Examples:
<table>
<tr><td>Position value</td><td>60.52 DDCS controller node address</td></tr>
<tr><td>101</td><td>16 • 1 + 01 = 17</td></tr>
<tr><td>712</td><td>16 • 7 + 12 = 124</td></tr>
</table></td></tr>
<tr><td>1 … 254</td><td>1</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td>60.55</td><td colspan="7">DDCS controller HW connection</td></tr>
<tr><td rowspan="2"></td><td colspan="7">DDCS controller link, hardware connection.
Selects the topology of the DDCS controller link.
0: Ring; The units are connected in a ring topology. Forwarding of messages is enabled.
1: Star; The units are connected in a star topology, e.g. through a branching unit. Forwarding of messages is disabled.</td></tr>
<tr><td>0 … 1</td><td>Star</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td>60.56</td><td colspan="7">DDCS controller baud rate</td></tr>
<tr><td></td><td colspan="7">DDCS controller link, link speed.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Selects the communication speed of the DDCS controller link channel selected by 60.51 DDCS controller comm port.
1: 1 Mbps; 1 Mbit/s.
2: 2 Mbps; 2 Mbit/s.
4: 4 Mbps; 4 Mbit/s.
8: 8 Mbps; 8 Mbit/s.</td></tr>
<tr><td>1 … 8</td><td>4 Mbps</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>60.58</td><td colspan="7">DDCS controller comm loss time</td></tr>
<tr><td rowspan="2"></td><td colspan="7">DDCS controller link, loss timeout.
Defines the time delay for the DDCS controller link loss, before the action defined in 60.59 DDCS controller comm loss function is executed.
Notes:
– 60.58 DDCS controller comm loss time should be set to at least 3 times the transmit interval of the DDCS controller.
– There is a 60-second boot-up delay immediately after power-up of the unit. During the delay, the communication loss function is disabled, but communication itself can be active.
– The AC 800M immediately detects a communication break. Re-establishing the communication is done at 9-second idle intervals.
– The sending interval of a data set is not the same as the execution interval of the application task. When using ModuleBus, the sending interval is defined by the DDCS controller parameter Scan Cycle Time (by default, 100 ms).</td></tr>
<tr><td>0 … 65535</td><td>100</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>60.59</td><td colspan="7">DDCS controller comm loss function</td></tr>
<tr><td rowspan="2"></td><td colspan="7">DDCS controller link, loss action.
Selects how the unit reacts to a DDCS controller link loss.
0: No action; none, disable communication loss function.
1: Fault; the event generates fault 7581 DDCS controller comm loss and the unit is disabled. This occurs only when the unit is controlled from the DDCS controller link.
4: Fault always; the event generates fault 7581 DDCS controller comm loss and the unit is disabled. This occurs even though no control is expected from the DDCS controller link.
5: Warning; the event generates warning A7CA DDCS controller comm loss. The unit continues with the same current/voltage/power level it was operating at. This occurs only when the unit is controlled from the DDCS controller link.
WARNING
Make sure that it is safe to continue operation in case of a communication break.</td></tr>
<tr><td>0 … 5</td><td>No action</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>60.64</td><td colspan="7">Mailbox data set selection</td></tr>
<tr><td rowspan="2"></td><td colspan="7">DDCS controller link, mailbox data set selection.
Selects the pair of data sets used by the mailbox service in the DDCS controller link. See chapter DDCS controller interface.
0: Data set 32/33; data sets 32 and 33 are dedicated for the mailbox service.
1: Data set 24/25; Data sets 24 and 25 are dedicated for the mailbox service.</td></tr>
<tr><td>0 … 1</td><td>Data set 32/33</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
</table>

61 D2D and DDCS transmit data

Defines the data sent from the unit to the DDCS/D2D link.

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
61.01	**M/F data 1 selection**						
	Master-follower link, data 1 from the unit to the master-follower link. Selects data sent as word 1 from the unit to the master-follower link. The value is visible in 61.25 M/F data 1 value. **Other**; source selection. 0: **None**; inactive.						
	0 … 0	None	-	1 = 1	n	y	Parameter
61.02	**M/F data 2 selection**						
	Master-follower link, data 2 from the unit to the master-follower link. Selects data sent as word 2 from the unit to the master-follower link. The value is visible in 61.26 M/F data 2 value. See 61.01 M/F data 1 selection.						
	0 … 0	None	-	1 = 1	n	y	Parameter
61.03	**M/F data 3 selection**						
	Master-follower link, data 3 from the unit to the master-follower link. Selects data sent as word 3 from the unit to the master-follower link. The value is visible in 61.27 M/F data 3 value. See 61.01 M/F data 1 selection.						
	0 … 0	None	-	1 = 1	n	y	Parameter
61.25	**M/F data 1 value**						
	Master-follower link, data 1 value from the unit to the master-follower link. Shows the value sent as word 1 to the master-follower link as integer. If no data has been preselected by 61.01 M/F data 1 selection, the value to be sent can be written directly into 61.25 M/F data 1 value.						
	0 … 65535	-	-	1 = 1	y	n	Signal
61.26	**M/F data 2 value**						
	Master-follower link, data 2 value from the unit to the master-follower link. Shows the value sent as word 2 to the master-follower link as integer. If no data has been preselected by 61.02 M/F data 2 selection, the value to be sent can be written directly into 61.26 M/F data 2 value.						
	0 … 65535	-	-	1 = 1	y	n	Signal
61.27	**M/F data 3 value**						
	Master-follower link, data 3 value from the unit to the master-follower link. Shows the value sent as word 3 to the master-follower link as integer. If no data has been preselected by 61.03 M/F data 3 selection, the value to be sent can be written directly into 61.27 M/F data 3 value.						
	0 … 65535	-	-	1 = 1	y	n	Signal
	Parameters 61.45 … 61.50 select data sent from the unit, in data sets 2 and 4, to the DDCS controller. These data sets are used in communication with 60.50 DDCS controller drive type = ABB standard drive. Signals 61.95 … 61.100 display the data to be sent to the DDCS controller in integer format. If no data has been preselected, the value to be sent can be written directly into these signals.						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	Example: 61.45 Data set 2 data 1 selection preselects the data for data set 2 word 1. 61.95 Data set 2 data 1 value displays the selected data in integer format. If no data is preselected, the value to be sent can be written directly into 61.95 Data set 2 data 1 value.						
61.45	**Data set 2 data 1 selection**						
	DDCS controller link, data set 2 data 1 from the unit to the DDCS controller link. Select data sent as data set 2 data 1 from the unit to the DDCS controller link. The value is visible in 61.95 Data set 2 data 1 value. **Other**; source selection. 0: **None**; inactive. Disable DDCS controller link data in. 4: **SW 16bit**; status word (16-bit). Taken from 06.13 Global Status Word. 5: **Act1 16bit**; actual value 1 ACT1 (16-bit). 6: **Act2 16bit**; actual value 2 ACT2 (16-bit).						
	0 … 6	None	-	1 = 1	n	y	Parameter
61.46	**Data set 2 data 2 selection**						
	DDCS controller link, data set 2 data 2 from the unit to the DDCS controller link. Select data sent as data set 2 data 2 from the unit to the DDCS controller link. The value is visible in 61.96 Data set 2 data 2 value. See 61.45 Data set 2 data 1 selection.						
	0 … 6	None	-	1 = 1	n	y	Parameter
61.47 to 61.50	**Data set 2 data 3 selection … Data set 4 data 3 selection**						
	See 61.45 Data set 2 data 1 selection.						
	0 … 6	None	-	1 = 1	n	y	Parameter
	Parameters 61.51 … 61.74 select data sent from the unit, in data sets 11, 13, 15, 17, 19, 21, 23 and 25, to the DDCS controller. These data sets are used in communication with 60.50 DDCS controller drive type = ABB engineered drive. The update intervals of the data sets are as follows: – Data sets 10 and 11: 2 ms. – Data sets 12 and 13: 4 ms. – Data sets 14 … 17: 10 ms. – Data sets 18 … 25, 32 and 33: 100 ms. Signals 61.101 … 61.124 display the data to be sent to the DDCS controller in integer format. If no data has been preselected, the value to be sent can be written directly into these signals. **Example**: 61.51 Data set 11 data 1 selection preselects the data for data set 11 word 1. 61.101 Data set 11 data 1 value displays the selected data in integer format. If no data is preselected, the value to be sent can be written directly into 61.101 Data set 11 data 1 value.						
61.51	**Data set 11 data 1 selection**						
	DDCS controller link, data set 11 data 1 from the unit to the DDCS controller link. Select data sent as data set 11 data 1 from the unit to the DDCS controller link. The value is visible in 61.101 Data set 11 data 1 value. **Other**; source selection. 0: **None**; inactive. Disable DDCS controller link data in. 4: **SW 16bit**; status word (16-bit). Taken from 06.13 Global Status Word. 5: **Act1 16bit**; actual value 1 ACT1 (16-bit). 6: **Act2 16bit**; actual value 2 ACT2 (16-bit).						
	0 … 6	None	-	1 = 1	n	y	Parameter
61.52	**Data set 11 data 2 selection**						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	DDCS controller link, data set 11 data 2 from the unit to the DDCS controller link. Select data sent as data set 11 data 2 from the unit to the DDCS controller link. The value is visible in 61.102 Data set 11 data 2 value. See 61.51 Data set 11 data 1 selection.						
	0 … 6	None	-	1 = 1	n	y	Parameter
61.53 to 61.74	**Data set 11 data 3 selection … Data set 25 data 3 selection**						
	See 61.51 Data set 11 data 1 selection.						
	0 … 6	None	-	1 = 1	n	y	Parameter
61.95	**Data set 2 data 1 value**						
	DDCS controller link, data set 2 data 1 from the unit to the DDCS controller link. Shows the value sent as data set 2 data 1 to the DDCS controller link as integer. If no data has been preselected by 61.45 Data set 2 data 1 selection, the value to be sent can be written directly into 61.95 Data set 2 data 1 value.						
	0 … 65535	-	-	1 = 1	y	n	Signal
61.96	**Data set 2 data 2 value**						
	DDCS controller link, data set 2 data 2 from the unit to the DDCS controller link. Shows the value sent as data set 2 data 2 to the DDCS controller link as integer. If no data has been preselected by 61.46 Data set 2 data 2 selection, the value to be sent can be written directly into 61.96 Data set 2 data 2 value.						
	0 … 65535	-	-	1 = 1	y	n	Signal
61.97 to 61.100	**set 2 data 3 value … Data set 4 data 3 value**						
	See 61.95 Data set 2 data 1 value.						
	0 … 65535	-	-	1 = 1	y	n	Signal
61.101	**Data set 11 data 1 value**						
	DDCS controller link, data set 11 data 1 from the unit to the DDCS controller link. Shows the value sent as data set 11 data 1 to the DDCS controller link as integer. If no data has been preselected by 61.51 Data set 11 data 1 selection, the value to be sent can be written directly into 61.101 Data set 11 data 1 value.						
	0 … 65535	-	-	1 = 1	y	n	Signal
61.102	**Data set 11 data 2 value**						
	DDCS controller link, data set 11 data 2 from the unit to the DDCS controller link. Shows the value sent as data set 11 data 2 to the DDCS controller link as integer. If no data has been preselected by 61.52 Data set 11 data 2 selection, the value to be sent can be written directly into 61.102 Data set 11 data 2 value.						
	0 … 65535	-	-	1 = 1	y	n	Signal
61.103 to 61.124	**Data set 11 data 3 value … Data set 25 data 3 value**						
	See 61.101 Data set 11 data 1 value.						
	0 … 65535	-	-	1 = 1	y	n	Signal

62 D2D and DDCS receive data

Defines the data sent from the DDCS/D2D link to the unit.

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td>**62.01**</td><td colspan="7">**M/F data 1 selection**</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Master-follower link, data 1 from the master via master-follower link to the followers (followers only).
Selects data sent as word 1 from the master via master-follower link to the followers. The value is visible in 62.25 MF/D2D data 1 value.
Other; source selection.
0: **None**; inactive.
1: **CW 16bit**; control word (16 bit). Send to 06.94 Follower Control Word received.
2: **Ref1 16bit**; reference REF1 (16 bit). Send to 03.13 M/F or D2D ref1.
3: **Ref2 16bit**; reference REF2 (16 bit). Send to 03.14 M/F or D2D ref2.</td></tr>
<tr><td>0 … 3</td><td>CW 16bit</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**62.02**</td><td colspan="7">**M/F data 2 selection**</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Master-follower link, data 2 from the master via master-follower link to the followers (followers only).
Selects data sent as word 2 from the master via master-follower link to the followers. The value is visible in 62.26 MF/D2D data 2 value. See 62.01 M/F data 1 selection.</td></tr>
<tr><td>0 … 3</td><td>Ref1 16bit</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**62.03**</td><td colspan="7">**M/F data 3 selection**</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Master-follower link, data 3 from the master via master-follower link to the followers (followers only).
Selects data sent as word 3 from the master via master-follower link to the followers The value is visible in 62.27 MF/D2D data 3 value. See 62.01 M/F data 1 selection.</td></tr>
<tr><td>0 … 3</td><td>Ref2 16bit</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**62.04**</td><td colspan="7">**Follower node 2 data 1 sel**</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Master-follower link, data 1 from follower node 2 via master-follower link to the master (master only).
Selects data sent as word 1 from follower node 2 via master-follower link to the master. The value is visible in 62.28 Follower node 2 data 1 value.
Other; source selection.
0: **None**; inactive.
26: **Follower SW**; follower status word node 2 (16-bit). 06.13 Global Status Word received from follower node 2. See 60.18 Follower enable.</td></tr>
<tr><td>0 … 26</td><td>none</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**62.05**</td><td colspan="7">**Follower node 2 data 2 sel**</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Master-follower link, data 2 from follower node 2 via master-follower link to the master (master only).
Selects data sent as word 2 from follower node 2 via master-follower link to the master The value is visible in 62.29 Follower node 2 data 2 value. See 62.04 Follower node 2 data 1 sel.</td></tr>
<tr><td>0 … 26</td><td>none</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**62.06**</td><td colspan="7">**Follower node 2 data 3 sel**</td></tr>
<tr><td></td><td colspan="7">Master-follower link, data 3 from follower node 2 via master-follower link to the master (master only).
Selects data sent as word 3 from follower node 2 via master-follower link to the master. The value is visible in 62.30 Follower node 2 data 3 value.</td></tr>
</table>

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	See 62.04 Follower node 2 data 1 sel.						
	0 … 26	None	-	1 = 1	n	y	Parameter
62.07	**Follower node 3 data 1 sel**						
	Master-follower link, data 1 from follower node 3 via master-follower link to the master (master only). Selects data sent as word 1 from follower node 3 via master-follower link to the master. The value is visible in 62.31 Follower node 3 data 1 value. **Other**; source selection. 0: **None**; inactive. 26: **Follower SW**; follower status word node 3 (16-bit). 06.13 Global Status Word received from follower node 3. See 60.18 Follower enable.						
	0 … 26	None	-	1 = 1	n	y	Parameter
62.08	**Follower node 3 data 2 sel**						
	Master-follower link, data 2 from follower node 3 via master-follower link to the master (master only). Selects data sent as word 2 from follower node 3 via master-follower link to the master. The value is visible in 62.32 Follower node 3 data 2 value. See 62.07 Follower node 3 data 1 sel.						
	0 … 26	None	-	1 = 1	n	y	Parameter
62.09	**Follower node 3 data 3 sel**						
	Master-follower link, data 3 from follower node 3 via master-follower link to the master (master only). Selects data sent as word 3 from follower node 3 via master-follower link to the master. The value is visible in 62.33 Follower node 3 data 3 value. See 62.07 Follower node 3 data 1 sel.						
	0 … 26	None	-	1 = 1	n	y	Parameter
62.10	**Follower node 4 data 1 sel**						
	Master-follower link, data 1 from follower node 4 via master-follower link to the master (master only). Selects data sent as word 1 from follower node 4 via master-follower link to the master. The value is visible in 62.34 Follower node 4 data 1 value. **Other**; source selection. 0: **None**; inactive. 26: **Follower SW**; follower status word node 4 (16-bit). 06.13 Global Status Word received from follower node 4. See 60.18 Follower enable.						
	0 … 26	Follower SW	-	1 = 1	n	y	Parameter
62.11	**Follower node 4 data 2 sel**						
	Master-follower link, data 2 from follower node 4 via master-follower link to the master (master only). Selects data sent as word 2 from follower node 4 via master-follower link to the master. The value is visible in 62.35 Follower node 4 data 2 value. See 62.10 Follower node 3 data 1 sel.						
	0 … 26	None	-	1 = 1	n	y	Parameter
62.12	**Follower node 4 data 3 sel**						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	Master-follower link, data 3 from follower node 4 via master-follower link to the master (master only). Selects data sent as word 3 from follower node 4 via master-follower link to the master. The value is visible in 62.36 Follower node 4 data 3 value. See 62.10 Follower node 3 data 1 sel.						
	0 … 26	None		1 = 1	n	y	Parameter
62.25	**MF data 1 value**						
	Master-follower link, data 1 value from the master via master-follower link to the followers (followers only). Shows the value sent as word 1 from the master via master-follower link to the followers as integer by 62.01 M/F data 1 selection. Can also be used as source by other parameters.						
	0 … 65535	-	-	1 = 1	y	n	Signal
62.26	**MF data 2 value**						
	Master-follower link, data 2 value from the master via master-follower link to the followers (followers only). Shows the value sent as word 2 from the master via master-follower link to the followers as integer by 62.02 M/F data 2 selection. Can also be used as source by other parameters.						
	0 … 65535	-	-	1 = 1	y	n	Signal
62.27	**MF data 3 value**						
	Master-follower link, data 3 value from the master via master-follower link to the followers (followers only). Shows the value sent as word 3 from the master via master-follower link to the followers as integer by 62.03 M/F data 3 selection. Can also be used as source by other parameters.						
	0 … 65535	-	-	1 = 1	y	n	Signal
62.28	**Follower node 2 data 1 value**						
	Master-follower link, data 1 value from follower node 2 via master-follower link to the master (master only). Shows the value sent as word 1 from follower node 2 via master-follower link to the master as integer by 62.04 Follower node 2 data 1 sel. Can also be used as source by other parameters.						
	0 … 65535	-	-	1 = 1	y	n	Signal
62.29	**Follower node 2 data 2 value**						
	Master-follower link, data 2 value from follower node 2 via master-follower link to the master (master only). Shows the value sent as word 2 from follower node 2 via master-follower link to the master as integer by 62.05 Follower node 2 data 2 sel. Can also be used as source by other parameters.						
	0 … 65535	-	-	1 = 1	y	n	Signal
62.30	**Follower node 2 data 3 value**						
	Master-follower link, data 3 value from follower node 2 via master-follower link to the master (master only). Shows the value sent as word 3 from follower node 2 via master-follower link to the master as integer by 62.06 Follower node 2 data 3 sel. Can also be used as source by other parameters.						
	0 … 65535	-	-	1 = 1	y	n	Signal
62.31	**Follower node 3 data 1 value**						
	Master-follower link, data 1 value from follower node 3 via master-follower link to the master (master only).						

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	Shows the value sent as word 1 from follower node 3 via master-follower link to the master as integer by 62.07 Follower node 3 data 1 sel. Can also be used as source by other parameters.						
	0 … 65535	-	-	1 = 1	y	n	Signal
62.32	**Follower node 3 data 2 value**						
	Master-follower link, data 2 value from follower node 3 via master-follower link to the master (master only). Shows the value sent as word 2 from follower node 3 via master-follower link to the master as integer by 62.08 Follower node 3 data 2 sel. Can also be used as source by other parameters.						
	0 … 65535	-		1 = 1	y	n	Signal
62.33	**Follower node 3 data 3 value**						
	Master-follower link, data 3 value from follower node 3 via master-follower link to the master (master only). Shows the value sent as word 3 from follower node 3 via master-follower link to the master as integer by 62.09 Follower node 3 data 3 sel. Can also be used as source by other parameters.						
	0 … 65535	-	-	1 = 1	y	n	Signal
62.34	**Follower node 4 data 1 value**						
	Master-follower link, data 1 value from follower node 4 via master-follower link to the master (master only). Shows the value sent as word 1 from follower node 4 via master-follower link to the master as integer by 62.10 Follower node 4 data 1 sel. Can also be used as source by other parameters.						
	0 … 65535	-	-	1 = 1	y	n	Signal
62.35	**Follower node 4 data 2 value**						
	Master-follower link, data 2 value from follower node 4 via master-follower link to the master (master only). Shows the value sent as word 2 from follower node 4 via master-follower link to the master as integer by 62.11 Follower node 4 data 2 sel. Can also be used as source by other parameters.						
	0 … 65535	-	-	1 = 1	y	n	Signal
62.36	**Follower node 4 data 3 value**						
	Master-follower link, data 3 value from follower node 4 via master-follower link to the master (master only). Shows the value sent as word 3 from follower node 4 via master-follower link to the master as integer by 62.12 Follower node 4 data 3 sel. Can also be used as source by other parameters.						
	0 … 65535	-	-	1 = 1	y	n	Signal
62.37	**M/F communication status 1**						
	reserved						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
62.38	**M/F communication status 2**						
	reserved						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
62.41	**M/F follower ready status 1**						
	reserved						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
62.42	**M/F follower ready status 2**						

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	reserved						
	0000h … FFFFh	-	-	1 = 1	y	n	Signal
	Parameters 62.45 … 62.50 select targets for the data received from the DDCS controller in data sets 1 and 3. These data sets are used in communication with 60.50 DDCS controller drive type = ABB standard drive. Signals 62.95 … 62.100 display the data received from the DDCS controller in integer format and can also be used as sources by other parameters. **Example**: 62.45 Data set 1 data 1 selection selects a target for data set 1 data 1. Then 62.95 Data set 1 data 1 value displays the received data in integer format and can also be used as a source by other parameters.						
62.45	**Data set 1 data 1 selection**						
	DDCS controller link, data set 1 data 1 from the DDCS controller via DDCS controller link to the unit. Select data sent as data set 1 data 1 from the DDCS controller via DDCS controller link to the unit. The value is visible in 62.95 Data set 1 data 1 value. **Other**; source selection. 0: **None**; inactive. Disable DDCS controller link data out. 1: **CW 16bit**; control word (16-bit). Send to 06.10 DDCS control word. 2: **Ref1 16bit**; reference REF1 (16-bit). Send to 03.11 DDCS controller ref1. 3: **Ref2 16bit**; reference REF2 (16-bit). Send to 03.12 DDCS controller ref2.						
	0 … 3	None	-	1 = 1	n	y	Parameter
62.46	**Data set 1 data 2 selection**						
	DDCS controller link, data set 1 data 2 from the DDCS controller via DDCS controller link to the unit. Select data sent as data set 1 data 2 from the DDCS controller via DDCS controller link to the unit. The value is visible in 62.96 Data set 1 data 2 value. See 62.45 Data set 1 data 1 selection.						
	0 … 3	None	-	1 = 1	n	y	Parameter
62.47 to 62.50	**Data set 1 data 3 selection … Data set 3 data 3 selection**						
	See 62.45 Data set 1 data 1 selection.						
	0 … 3	None	-	1 = 1	n	y	Parameter
	Parameters 62.51 … 62.74 select targets for the data received from the DDCS controller in data sets 10, 12, 14, 16, 18, 20, 22 and 24. These data sets are used in communication with 60.50 DDCS controller drive type = ABB engineered drive. The update intervals of the data sets are as follows: – Data sets 10 and 11: 2 ms. – Data sets 12 and 13: 4 ms. – Data sets 14 … 17: 10 ms. – Data sets 18 … 25, 32 and 33: 100 ms. Signals 62.101 … 62.124 display the data received from the DDCS controller in integer format and can also be used as sources by other parameters. **Example**: 62.51 Data set 10 data 1 selection selects a target for data set 10 data 1. Then 62.101 Data set 10 data 1 value displays the received data in integer format and can also be used as a source by other parameters.						
62.51	**Data set 10 data 1 selection**						

Index	Name					
	Text					
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	DDCS controller link, data set 10 data 1 from the DDCS controller via DDCS controller link to the unit. Select data sent as data set 10 data 1 from the DDCS controller via DDCS controller link to the unit. The value is visible in 62.101 Data set 10 data 1 value. **Other**; source selection. 0: **None**; inactive. Disable DDCS controller link data out. 1: **CW 16bit**; control word (16-bit). Send to 06.10 DDCS control word. 2: **Ref1 16bit**; reference REF1 (16-bit). Send to 03.11 DDCS controller ref1. 3: **Ref2 16bit**; reference REF2 (16-bit). Send to 03.12 DDCS controller ref2.						
	0 … 3	None	-	1 = 1	n	y	Parameter
62.52	**Data set 10 data 2 selection**						
	DDCS controller link, data set 10 data 2 from the DDCS controller via DDCS controller link to the unit. Select data sent as data set 10 data 2 from the DDCS controller via DDCS controller link to the unit. The value is visible in 62.102 Data set 10 data 2 value. See 62.51 Data set 10 data 1 selection.						
	0 … 3	None	-	1 = 1	n	y	Parameter
62.53 to 62.74	**Data set 10 data 3 selection … Data set 24 data 3 selection**						
	See 62.51 Data set 10 data 1 selection.						
	0 … 3	None	-	1 = 1	n	y	Parameter
62.95	**Data set 1 data 1 value**						
	DDCS controller link, data set 1 data 1 from the DDCS controller via DDCS controller link to the unit. Shows the value sent as data set 1 data 1 from the DDCS controller via DDCS controller link to the unit as integer by 62.45 Data set 1 data 1 selection. Can also be used as source by other parameters.						
	0 … 65535	0	-	1 = 1	y	n	Signal
62.96	**Data set 1 data 2 value**						
	DDCS controller link, data set 1 data 2 from the DDCS controller via DDCS controller link to the unit. Shows the value sent as data set 1 data 2 from the DDCS controller via DDCS controller link to the unit as integer by 62.46 Data set 1 data 2 selection. Can also be used as source by other parameters.						
	0 … 65535	0	-	1 = 1	y	n	Signal
62.97 to 62.100	**Data set 1 data 3 value … Data set 3 data 3 value**						
	See 62.95 Data set 1 data 1 value.						
	0 … 65535	0	-	1 = 1	y	n	Signal
62.101	**Data set 10 data 1 value**						
	DDCS controller link, data set 10 data 1 from the DDCS controller via DDCS controller link to the unit.						

Index	Name						
	Text						
	Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
	Shows the value sent as data set 10 data 1 from the DDCS controller via DDCS controller link to the unit as integer by 62.51 Data set 10 data 1 selection. Can also be used as source by other parameters.						
	0 … 65535	0	-	1 = 1	y	n	Signal
62.102	**Data set 10 data 2 value**						
	DDCS controller link, data set 10 data 2 from the DDCS controller via DDCS controller link to the unit. Shows the value sent as data set 10 data 2 from the DDCS controller via DDCS controller link to the unit as integer by 62.52 Data set 10 data 2 selection. Can also be used as source by other parameters.						
	0 … 65535	0	-	1 = 1	y	n	Signal
62.102 to 62.124	**Data set 10 data 3 value … Data set 24 data 3 value**						
	See 62.101 Data set 10 data 1 value.						
	0 … 65535	0	-	1 = 1	y	n	Signal

95 HW configuration

Various hardware-related settings.

Index	Name						
	Text						
	Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
95.14	**Set: Power unit**						
	Set the type of power unit. 95.14 Set: Power unit is only shown and available when there is a mismatch between 95.14 Set: Power unit read from SDCS-CON-H01 and 95.14 Set: Power unit read from the plugged-in memory unit. See also 07.02 Power unit set. Either adapt the SDCS-CON-H01 using 95.14 Set: Power unit and 95.25 Set: Type code or use a memory unit with an appropriate firmware. 0: **DCS converter**; the unit is a DCS880. 20: **DCT controller**; the unit is a DCT880. 40: **TSU supply unit**; the unit is a TSU880. 100: **Unsupported power unit type**; mismatch between 95.14 Set: Power unit read from SDCS-CON-H01 and 95.14 Set: Power unit read from the plugged-in memory unit. This event generates fault 5525 Type code and shows 95.14 Set: Power unit.						
	0 … 100	Unsupported power unit type	-	1 = 1	n	n	Parameter
95.16	**Set: Unit type code**						
	Set the type code of the unit. Contains the unit's type, power part type, current-, voltage- and temperature measurement. 95.16 Set: Unit type code is preset in the factory and is write protected. To enable use 99.07 Service mode = Set Type Code. The change of the type code is immediately taken over. 99.07 Service mode = Set Type Code must be set back to Normal Operation by the user.						

Index	Name Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**

0: **W00-0000-00**; the type code is set by the user, see 95.17 Set: Unit legs, 95.18 Set: Unit output current scaling, 95.19 Set: Unit input voltage scaling and 95.20 Set: Unit max power part temp for e.g. rebuild kits.
1: **W02-0020-04**; type code, see table.
...
231: **W03-0890-07**; type code, see table:

The thyristor power controller's basic type code: DCT880-aab-cccc-ddef			
Product family:	DCT880		
Type:	aa	= W0	Standard
Power part type:	b	= 2	Two-leg anti-parallel circuit
		= 3	Three-leg anti-parallel circuit
Module type:	cccc	=	Rated AC current (RMS) per leg
Rated AC voltage:	dd	= 04 = 05 = 07	110 V_{AC} … 400 V_{AC} 110 V_{AC} … 525 V_{AC} 315 V_{AC} … 690 V_{AC}
Power connection:	e	= X	Standard
Revision code:	f	= 0 = A	With SDCS-PIN-H11 With SDCS-PIN-H11A

Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
0 ... 231	W00-0000-00	-	1 = 1	n	n	Parameter

95.17 **Set: Unit legs**

Hardware setting (open).
Amount of legs in the unit. This value overrides the type code and is immediately visible in 07.16 Unit legs set.
0: **Automatic**; set automatically according to 95.16 Set: Unit type code.
1: **1 Leg**; single-leg circuit.
2: **2 Legs**; two-leg circuit.
3: **3 Legs**; three-leg circuit.

Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
0 … 3	Automatic	-	1 = 1	n	n	Parameter

95.18 **Set: Unit output current scaling**

Set the nominal output current of the unit.
Adjustment of the output current measuring channels (XEXCT on SDCS-PIN-H11). 95.18 Set: Unit output current scaling is write protected. To enable use 99.07 Service Mode = Set Type Code. 99.07 Service mode = Set Type Code must be set back to Normal Operation by the user.

0 A	Take value from 95.16 Unit type code.
1 … 30000 A	Take value from 95.18 Set: Unit output current scaling.

This value overrides the type code and is immediately visible in 07.17 Unit output current scaling set.
Note: For units size T6 (DCT880-W0b-1300-04/05/07 and DCT880-W0b-1750-04/05/07) set 95.18 Set: Unit output current scaling to 2500 A.

Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
0 … 30000	0	A	1 = 1 A	n	n	Parameter

95.19 **Set: Unit input voltage scaling**

Set the nominal input voltage of the unit.

<table>
<tr><th>Index</th><th colspan="7">Name</th></tr>
<tr><th></th><th colspan="7">Text</th></tr>
<tr><th></th><th>Range</th><th>Default</th><th>Unit</th><th>Scale
FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">Adjustment of input voltage measuring channels (XEXVM on SDCS-PIN-H11). 95.19 Set: Unit input voltage scaling is write protected. To enable use 99.07 Service Mode = Set Type Code. 99.07 Service mode = Set Type Code must be set back to Normal Operation by the user.
<table><tr><td>0.0 V</td><td>Take value from 95.16 Unit type code.</td></tr><tr><td>0.1 … 3250.0 V</td><td>Take value from 95.19 Set: Unit input voltage scaling.</td></tr></table>
This value overrides the type code and is immediately visible in 07.19 Unit input voltage scaling set.</td></tr>
<tr><td></td><td>0.0 … 3250.0</td><td>0.0</td><td>V</td><td>10 = 1 V</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td>95.20</td><td colspan="7">Set: Unit max power part temp</td></tr>
<tr><td></td><td colspan="7">Set the maximum bridge temperature of the unit.
Adjustment of the unit bridge temperature tripping level in degree centigrade.
<table><tr><td>0°C</td><td>Take value from 95.16 Unit type code.</td></tr><tr><td>1°C … 149°C</td><td>Take value from 95.20 Set: Unit max power part temp.</td></tr><tr><td>150°C</td><td>The temperature supervision is inactive, e.g. for rebuild kits.</td></tr></table>
This value overrides the type code and is immediately visible in 07.20 Unit max power part temp set.</td></tr>
<tr><td></td><td>0 … 150</td><td>0</td><td>°C</td><td>1 = 1°C</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td>95.26</td><td colspan="7">Stack configuration</td></tr>
<tr><td></td><td colspan="7">Stack configuration.
Stack configuration of the DCT880 power part. Switch-over delay is a mains voltage period. Thus, not dependent on the zero current signal.
Other; source selection.
0: CD1; 0, normal power part configuration with one SDCS-PIN-H41 and one set of 6 thyristors.
1: CD2; 1, special power part configuration with two SDCS-PIN-H41 and two sets of 6 thyristors. Typically used for the excitation of medium voltage motors.</td></tr>
<tr><td></td><td>0 ... 1</td><td>0</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Parameter</td></tr>
<tr><td>95.30</td><td colspan="7">PLL input deviation</td></tr>
<tr><td></td><td colspan="7">PLL input deviation.
Actual measured mains voltage cycle (period) time. Is used as input of the PLL controller.
For 50 Hz mains the value should be: . $\frac{1}{60Hz}=16.67\,ms\equiv0^\circ$
For 60 Hz mains the value should be: . $\frac{1}{50Hz}=20\ ms\equiv0^\circ$</td></tr>
<tr><td></td><td>-180.00 … 180.00</td><td>-</td><td>°</td><td>100 = 1°</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>95.31</td><td colspan="7">PLL output, internal mains frequency</td></tr>
<tr><td></td><td colspan="7">PLL output.
Calculated and internally controlled mains frequency. Output of PLL controller.</td></tr>
<tr><td></td><td>0.00 … 100.00</td><td>-</td><td>Hz</td><td>100 = 1 Hz</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>95.34</td><td colspan="7">PLL offset synchronization transformer</td></tr>
<tr><td></td><td colspan="7">PLL offset due to a synchronization transformer.</td></tr>
</table>

<table>
<tr><th>Index</th><th colspan="7">Name</th></tr>
<tr><th rowspan="2"></th><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Compensation of a synchronization transformer’s phase shift compared to the mains transformer. The maximum phase shift compensation is ± 60.00°.</td></tr>
<tr><td>-60.00 … 60.00</td><td>0.00</td><td>°</td><td>100 = 1°C</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>95.35</td><td colspan="7">PLL deviation level</td></tr>
<tr><td rowspan="2"></td><td colspan="7">PLL deviation level to block the current controller.
Maximum allowed deviation of the PLL controller. Exceeding the level generates alarm A131 PLL deviation. Thus, the unit is blocked.
For 50 Hz mains is valid: $\frac{1}{50Hz} = 20\ ms \equiv 0°$.
For 60 Hz mains is valid: $\frac{1}{60Hz} = 16.67\ ms \equiv 0°$.</td></tr>
<tr><td>5.00 … 20.00</td><td>10.00</td><td>°</td><td>100 = 1°C</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>95.36</td><td colspan="7">PLL proportional gain</td></tr>
<tr><td rowspan="2"></td><td colspan="7">PLL p-part.
Gain of firing unit’s phase lock loop. See 95.46 PLL filter time.</td></tr>
<tr><td>0.01 … 2.00</td><td>0.50</td><td>-</td><td>100 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>95.37</td><td colspan="7">PLL filter time</td></tr>
<tr><td rowspan="2"></td><td colspan="7">PLL filter time constant.
Filter of firing unit’s phase lock loop.
Commissioning hint:
<table>
<tr><th>95.45 PLL proportional gain</th><th>95.46 PLL filter time</th></tr>
<tr><td>1.0</td><td>≤ 5 msec</td></tr>
<tr><td>0.5</td><td>≤ 10 msec</td></tr>
<tr><td>0.2</td><td>≤ 20 msec</td></tr>
<tr><td>0.1</td><td>≤ 50 msec</td></tr>
<tr><td>0.05</td><td>≤ 100 msec</td></tr>
<tr><td>0.02</td><td>≤ 200 msec</td></tr>
<tr><td>0.01</td><td>≤ 500 msec</td></tr>
</table>
</td></tr>
<tr><td>0.0 … 500.0</td><td>0.0</td><td>ms</td><td>10 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>95.38</td><td colspan="7">PLL Uk compensation</td></tr>
<tr><td rowspan="2"></td><td colspan="7">PLL mains transformer uk compensation.
reserved</td></tr>
<tr><td>0.0 … 15.0</td><td>0.0</td><td>%</td><td>10 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
</table>

96 System

Language selection, access levels, macro selection, parameter save and restore, unit reboot, user parameter sets, unit selection.

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
96.01	**Language**						
	Language selection. Selects the language of the parameter interface and other displayed information when viewed on the control panel. **Notes:** – Not all languages listed below are necessarily supported. – 96.01 Language does not affect the languages visible in the PC tool. 0: **Not selected**; none. 1029: **Czech**; Czech. 1030: **Dansk**; Danish. 1031: **Deutsch**; German. 1033: **English**; English. 1035: **Suomi**; Finnish. 1036: **Français**; French. 1040: **Italiano**; Italian. 1043: **Nederlands**; Dutch. 1045: **Polski**; Polish. 1049: **Russki**; Russian. 1053: **Svenska**; Swedish. 1055: **Türkçe**; Turkish. 2052: **Chinese (Simplified, PRC)**; Simplified Chinese. 2070: **Portugues**; Portuguese. 3082: **Español**; Spanish.						
	0 … 3082	Not selected	-	1 = 1	n	y	Parameter
96.02	**Pass code**						
	Pass code. Enter a pass code to activate the parameter lock or to configure the user lock. See 96.102 User lock functionality. Parameter lock: Entering “358” toggles the parameter lock, which prevents the changing of all other parameters through control panel or PC tool. User lock (opening generates warning A6B0 User lock open): Entering the user pass code, by default “10,000,000”, unhides parameters 96.100 … 96.102. Now it is possible to define a new user pass code and to select the actions to be prevented. Entering an invalid pass code will close an open user lock, by hiding parameters 96.100 … 96.102. After entering the code, check that the parameters are in fact hidden. **Example**: For better cyber security, set a user pass code preventing change of parameter values or loading of firmware and other files. To activate the user lock for the first time, enter the default user pass code “10,000,000” into 96.07 Pass code. This unhide parameters 96.100 … 96.102. Then enter a new user pass code into 96.100 Change user pass code and confirm the code in 96.101 Confirm user pass code. In 96.102 User lock functionality define the actions to be prevented. To close the user lock, enter an invalid user pass code into 96.07 Pass code then activate 96.27 Control board boot or cycle the power. With the lock closed, parameters 96.100 … 96.102 are hidden.						

<table>
<tr><th>Index</th><th colspan="7">Name</th></tr>
<tr><th></th><th colspan="7">Text</th></tr>
<tr><th></th><th>Range</th><th>Default</th><th>Unit</th><th>Scale FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">To reopen the lock, enter Your user pass code into 96.07 Pass code. This will again unhide parameters 96.100 … 96.102.
WARNING
Do not forget Your user pass code. The factory has no means to reset the control board! A new control board must be purchased.</td></tr>
<tr><td></td><td>0 … 99999999</td><td>0</td><td>-</td><td>1 = 1</td><td>y</td><td>y</td><td>Parameter</td></tr>
<tr><td>96.03</td><td colspan="7">Access levels active</td></tr>
<tr><td></td><td colspan="7">Active access levels.
Shows, which access levels, have been activated by 96.02 Pass code and 96.102 User lock functionality.
Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>Value</th><th>Remarks</th></tr>
<tr><td>0</td><td>End user</td><td>1</td><td>End user active.</td></tr>
<tr><td>1</td><td>Service</td><td>0</td><td>Service active.</td></tr>
<tr><td>2</td><td>Advanced programmer</td><td>0</td><td>Advanced programmer active.</td></tr>
<tr><td>3</td><td>reserved</td><td></td><td></td></tr>
<tr><td>4</td><td>reserved</td><td></td><td></td></tr>
<tr><td>5</td><td>reserved</td><td></td><td></td></tr>
<tr><td>6</td><td>reserved</td><td></td><td></td></tr>
<tr><td>7</td><td>reserved</td><td></td><td></td></tr>
<tr><td>8</td><td>reserved</td><td></td><td></td></tr>
<tr><td>9</td><td>reserved</td><td></td><td></td></tr>
<tr><td>10</td><td>reserved</td><td></td><td></td></tr>
<tr><td>11</td><td>OEM access level 1</td><td></td><td>OEM access level 1 active.</td></tr>
<tr><td>12</td><td>OEM access level 2</td><td></td><td>OEM access level 2 active.</td></tr>
<tr><td>13</td><td>OEM access level 3</td><td></td><td>OEM access level 3 active.</td></tr>
<tr><td>14</td><td>Parameter lock</td><td>0</td><td>Parameter lock is active.</td></tr>
<tr><td>15</td><td>reserved</td><td></td><td></td></tr>
</table></td></tr>
<tr><td></td><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>96.04</td><td colspan="7">Macro select</td></tr>
<tr><td></td><td colspan="7">Selects a macro (pre-defined parameter set).
Selects a macro. The value reverts automatically to Done, when the macro selection is done. The selected macro is shown in 96.05 Macro active.
Notes:
– Only macro depending parameters will be set. The rest of the parameters will not be changed.
– It is possible to change all preset parameters of a loaded macro.
– Selecting the actual macro again restores all macro depending parameters to the macro’s default values.
0: Done; normal operation or application macro selection done.
1: Factory; factory (default) parameter set.</td></tr>
</table>

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	0 … 1	Done	-	1 = 1	n	n	Parameter
96.05	**Macro active**						
	Shows the active macro. Shows which macro is currently selected. To change the macro, use 96.04 Macro select. 0: **None**; no macro selected. 1: **Factory**; factory (default) parameter set. See 96.14 Macro select.						
	0 … 1	-	-	1 = 1	y	n	Signal
96.07	**Parameter save manually**						
	Save/Load parameters. Saves valid parameter values to the flash memory. 96.07 Parameter save manually should be used to save e.g. values sent from a fieldbus. The value reverts automatically to Done, when the parameter save is done. **Notes**: – Use the parameter save function only when needed. – A new parameter value is saved automatically when changed from the control panel or PC tool but not when altered through a fieldbus adapter connection. 0: **Done**; normal operation or save completed. 1: **Save**; command to save parameters or saving parameters in progress.						
	0 … 1	Done	-	1 = 1	y	y	Parameter
96.08	**Control board boot**						
	Reboot the control board. Reboots the control unit. No cycling the power of the complete unit required. The value reverts automatically to Done, when the reboot is done. 0: **Done**; 0, normal operation or reboot done. 1: **Reboot**; 1, reboot the control board.						
	0 … 1	0	-	1 = 1	y	n	Parameter
96.10	**User set status**						
	User parameter set status display. Shows the status of the user parameter sets. 0: **None**; No user parameter sets have been saved. 1: **Loading**; currently loading a user parameter set. 2: **Saving**; currently saving a user parameter set. 3: **Faulted**; invalid or empty user set. 4: **User set 1**; user set 1 is loaded. 5: **User set 2**; user set 2 is loaded. 6: **User set 3**; user set 3 is loaded. 7: **User set 4**; user set 4 is loaded.						
	0 … 7	-	-	1 = 1	y	n	Signal
96.11	**User set save/load**						
	User parameter set handling. Enables the saving and restoring of up to four user parameter sets. The value reverts automatically to Done, when the loading or saving is done. **Notes:** – Hardware configuration settings such as I/O extension module, and fieldbus configuration parameters (groups 14 … 16, 47 and 51 … 56, 58) are not included in the user parameter sets. – Forced input/output values such as 10.03 DI force selection and 10.04 DI force data are not included in the user parameter sets.						

<table>
<tr><th>Index</th><th colspan="7">Name</th></tr>
<tr><th rowspan="2"></th><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">– The user parameter set that was in use before powering down the unit is in use after the next power-up. Except User set I/O mode is used. See parameters 96.12 and 96.13.
– Parameter changes made after loading a user parameter set are not automatically stored in it. They must be saved again using 96.11 User set save/load.
– The loaded user parameter set is shown in 96.10 User set status.
– The PC tool ‘Backup/restore’ function saves the active parameter set and all 4 user sets.
– The PC tool ‘Save parameters to file’ function only saves the active parameter set. Thus, user set 1 … user set 4 must be saved separately.
0: **Done**; normal operation, loading or saving is done.
1: **User set I/O mode**; load user parameter set using 96.12 User set I/O mode in1 and 96.13 User set I/O mode in2.
2: **Load set 1**; load user set 1.
3: **Load set 2**; load user set 2.
4: **Load set 3**; load user set 3.
5: **Load set 4**; load user set 4.
18: **Save to set 1**; save parameters to user set 1.
19: **Save to set 2**; save parameters to user set 2.
20: **Save to set 3**; save parameters to user set 3.
21: **Save to set 4**; save parameters to user set 4.</td></tr>
<tr><td>0 … 21</td><td>Done</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**96.12**</td><td colspan="7">**User set I/O mode in1**</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Load user sets using digital I/O.
With 96.11 User set save/load = User set I/O mode it is possible to select user parameter sets via 96.12 User set I/O mode in1 and 96.13 User set I/O mode in2 according to the following table.

<table>
<tr><th>96.12 User set I/O mode in1</th><th>96.13 User set I/O mode in2</th><th>Selected user parameter set</th></tr>
<tr><td>0</td><td>0</td><td>User set 1</td></tr>
<tr><td>1</td><td>0</td><td>User set 2</td></tr>
<tr><td>0</td><td>1</td><td>User set 3</td></tr>
<tr><td>1</td><td>1</td><td>User set 4</td></tr>
</table>

0 = Always off.
1 = Always on.
Other [bit]; source selection.
0: **Not selected**; 0, normal operation.
1: **Selected**; 1.
3: **DI1**; 10.02.b00 DI delayed status.
4: **DI2**; 10.02.b01 DI delayed status.
5: **DI3**; 10.02.b02 DI delayed status.
6: **DI4**; 10.02.b03 DI delayed status.
7: **DI5**; 10.02.b04 DI delayed status.
8: **DI6**; 10.02.b05 DI delayed status.
11: **DIO1**; 11.02.b00 DIO delayed status.
12: **DIO2**; 11.02.b01 DIO delayed status.
19: **DIL**; 10.02.b15 DI delayed status</td></tr>
<tr><td>0 … 19</td><td>Not selected</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**96.13**</td><td colspan="7">**User set I/O mode in2**</td></tr>
</table>

Index	Name						
	Text						
	Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
	Load user sets using digital I/O. See 96.12 User set I/O mode in1.						
	0 … 19	Not selected	-	1 = 1	n	y	Parameter
96.20	**Time sync primary source**						
	1st priority time synchronization source. Defines the 1st priority external source for the unit time and date synchronization. 0: **Internal**; no external source selected. 1: **DDCS Controller**; external DDCS-PLC. 2: **Fieldbus A or B**; fieldbus adapter A or fieldbus adapter B. 3: **Fieldbus A**; fieldbus adapter A. 4: **Fieldbus B**; fieldbus adapter B. 5: **D2D or M/F**; master unit of a master-follower link or device-to-device link. 6: **Embedded FB**; embedded fieldbus. 7: **reserved**; 8: **Panel link**; control panel or the PC tool connected to the control panel. 9: **Ethernet tool link**; PC tool through a FENA module. 10: reserved;						
	0 … 9	DDCS Controller	-	1 = 1	n	y	Parameter
96.23	**M/F and D2D clock synchronization**						
	Activate the clock synchronization. Activates the clock synchronization for master-follower link and device-to-device communication. 0: **Inactive**; clock synchronization not active. 1: **Active**; clock synchronization active.						
	0 … 1	Inactive	-	1 = 1	n	y	Parameter
96.24	**Full days since 1st Jan 1980**						
	Days since beginning of 1980. Number of full days passed since beginning of the year 1980. Together with 96.25 Time in minutes within 24 h and 96.26 Time in ms within one minute makes it possible to set the date and time in the unit via the parameter interface from a fieldbus or application program. This may be necessary if the fieldbus protocol does not support time synchronization.						
	1 … 59999	12055	days	1 = 1 days	n	y	Parameter
96.25	**Time in minutes within 24 h**						
	Minutes since midnight. Number of full minutes passed since midnight. For example, the value 860 corresponds to 14:20. See 96.24 Full days since 1st Jan 1980.						
	0 … 1439	0	min	1 = 1 min	n	y	Parameter
96.26	**Time in ms within one minute**						
	Number of milliseconds since the last minute. Number of milliseconds passed since the last minute. See 96.24 Full days since 1st Jan 1980.						
	0 … 59999	0	ms	1 = 1 ms	n	y	Parameter
96.29	**Time source status**						
	Time source status word. Displays the time source status word. See 96.20 Time sync primary source.						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**

Bit assignment:

Bit	Name	Value	Remarks
0	Time tick received	1	1st priority tick received: Tick has been received from 1st priority source.
1	Aux time tick received	1	2nd priority tick received: Tick has been received from 2nd priority.
2	Tick interval is too long	1	Yes: Tick interval too long, accuracy compromised.
3	DDCS controller	1	Tick received: Tick has been received from an external DDCS-PLC.
4	M/F	1	Tick received: Tick has been received through the master-follower link.
5	reserved		
6	D2D	1	Tick received: Tick has been received through the device-to-device link.
7	FBA A	1	Tick received: Tick has been received through fieldbus adapter A.
8	FBA B	1	Tick received: Tick has been received through fieldbus adapter B.
9	EFB	1	Tick received: Tick has been received through the embedded fieldbus.
10	reserved		
11	Panel link	1	Tick received: Tick has been received from the control panel, or the PC tool connected to the control panel.
12	Ethernet tool link	1	Tick received: Tick has been received from the PC tool through a FENA module.
13	Parameter setting	1	Tick received: Tick has been set by parameters 96.37 … 96.39.
14	RTC	1	RTC time in use: Time and date have been read from the real-time clock.
15	Unit On-Time	1	Unit on-time in use: Time and date are displaying unit on-time.

	0000h … FFFFh	-	-	1 = 1	y	n	Signal
96.31	**Unit ID number**						
	reserved						
	0 ... 32767	0	-	1 = 1	n	y	Parameter
96.51	**Clear fault and event logger**						
	Clears the fault and event logger in the Drive composer by setting to a value greater than 0. 96.51 Clear fault and event logger is automatically reset to 0 after the cleaning has been finished.						

<table>
<tr><th>Index</th><th colspan="7">Name</th></tr>
<tr><td></td><td colspan="7">Text</td></tr>
<tr><td></td><td>Range</td><td>Default</td><td>Unit</td><td>Scale FbEq16</td><td>Volatile</td><td>Change running</td><td>Type</td></tr>
<tr><td></td><td>0 … 65535</td><td>0</td><td>-</td><td>1 = 1</td><td>y</td><td>y</td><td>Parameter</td></tr>
<tr><td>96.61</td><td colspan="7">User data logger status word</td></tr>
<tr><td></td><td colspan="7">User data logger status word.
Provides status information about the user data logger.
Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>Value</th><th>Remarks</th></tr>
<tr><td>0</td><td>Running</td><td>1</td><td>Running.</td></tr>
<tr><td></td><td></td><td>0</td><td>The post-trigger time is passed.</td></tr>
<tr><td>1</td><td>Triggered</td><td>1</td><td>Triggered.</td></tr>
<tr><td></td><td></td><td>0</td><td>Restarted.</td></tr>
<tr><td>2</td><td>Data available</td><td>1</td><td>Contains data that can be read.</td></tr>
<tr><td></td><td></td><td>0</td><td>Contains no data.</td></tr>
<tr><td>3</td><td>Configured</td><td>1</td><td>Configured.</td></tr>
<tr><td></td><td></td><td></td><td>Not configured.</td></tr>
<tr><td>4 … 15</td><td>reserved</td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td></td><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>96.63</td><td colspan="7">User data logger trigger</td></tr>
<tr><td></td><td colspan="7">Trigger source for the user data logger.
Triggers or selects a source that triggers the user data logger.
0: No trigger command; 0, normal operation.
1: Trigger; 1.</td></tr>
<tr><td></td><td>0 … 1</td><td>No trigger command</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>96.64</td><td colspan="7">User data logger start</td></tr>
<tr><td></td><td colspan="7">Start source for the user data logger.
Starts or selects a source that starts the user data logger.
0: No start command; 0, normal operation.
1: Start; 1.</td></tr>
<tr><td></td><td>0 … 1</td><td>No start command</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>96.65</td><td colspan="7">Factory data logger time level</td></tr>
<tr><td></td><td colspan="7">Factory data logger sample time.
Selects the sampling interval for the factory data logger. The values that are recorded in the factory data logger are:
– 01.33 Leg 1 Current RMS relative actual.
– 01.34 Leg 2 Current RMS relative actual.
– 01.35 Leg 3 Current RMS relative actual.
– 01.40 Leg 1 Alpha actual.
– 01.42 Leg 2 Alpha actual.
– 01.44 Leg 3 Alpha actual.
– 04.01 Tripping fault.
– 04.02 Active fault 2.
– 06.08 Used Main Control Word.
– 06.13 Global Status Word.
This selection of parameters cannot be changed by the user.</td></tr>
</table>

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	500: **500 µs**; 500 microseconds. 2000: **2 ms**; 2 milliseconds. 10000: **10 ms**; 10 milliseconds.						
	500 … 10000	500 µs	-	1 = 1	n	y	Parameter
96.70	**Disable adaptive program**						
	Enable/Disable an adaptive program. Enables/Disables an adaptive program, if present. 0: **Enable adaptive program**; 0, normal operation. 1: **Disable adaptive program**; 1.						
	0 … 1	Enable adaptive program	-	1 = 1	n	n	Parameter
96.71	**Disable application program**						
	Enable/Disable an application program. Enables/Disables an application program, if present. 0: **Enable application program**; 0, normal operation. 1: **Disable application program**; 1.						
	0 … 1	Enable application program	-	1 = 1	n	n	Parameter
96.100	**Change user pass code**						
	New user pass code. Only visible when the user lock is open. To change the current user pass code, enter a new one here and confirm using 96.101 Confirm user pass code. Warning 1236 User lock is open is active until the new pass code is confirmed. To cancel changing the pass code, close the user lock without confirming. To close the user lock, enter an invalid user pass code into 96.02 Pass code then activate 96.08 Control board boot or cycle the power. See 96.02 Pass code.						
	10000000 … 99999999	10000000	-	1 = 1	y	y	Parameter
96.101	**Confirm user pass code**						
	Confirms the new user pass code. Only visible when the user lock is open. Confirms the new user pass code entered in 96.100 Change user pass code. See 96.02 Pass code.						
	10000000 … 99999999	10000000	-	1 = 1	y	y	Parameter
96.102	**User lock functionality**						
	Selects the actions to be prevented by the user lock. Only visible when the user lock is open. Selects the actions or functionalities to be prevented by the user lock. **Note**: Changes made, take effect after the user lock is closed. See 96.02 Pass code. Bit assignment:						

Bit	Name	Value	Remarks
0	Disable ABB access levels	1	Disable ABB access levels like service, advanced programmer, etc. See 96.03 Access levels active.
1	Freeze parameter lock state	1	Prevent changing the parameter lock state. See 96.02 Pass code = 358.

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**

2	Disable file download	1	Prevent loading of files to the unit. This applies to: Firmware upgrades. Safety functions module FSO-xx configuration. Loading of adaptive or application programs. Changing the home view of the control panel. Editing unit texts. Editing the favorite parameters list on the control panel. Configuration settings made via the control panel such as time/date formats and enabling/disabling the clock display.
3	reserved		
4	reserved		
5	reserved		
6	reserved		
7	reserved		
8	reserved		
9	reserved		
10	reserved		
11	Disable OEM access level 1	1	Disable OEM access level 1.
12	Disable OEM access level 2	1	Disable OEM access level 2.
13	Disable OEM access level 3	1	Disable OEM access level 3.
14 … 15	reserved		

0000h … FFFFh	-	-	1 = 1	n	y	Parameter

99 Basic Settings

Unit configuration settings.

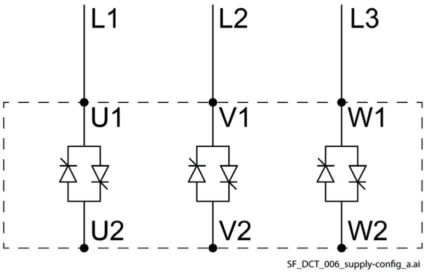
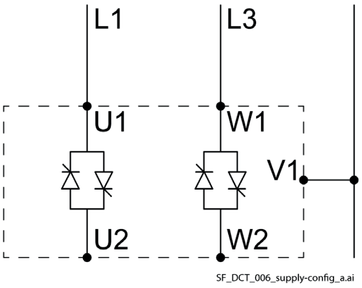
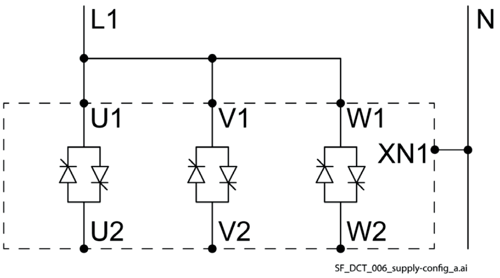
<table>
<tr><th>Index</th><th colspan="7">Name</th></tr>
<tr><td></td><td colspan="7">Text</td></tr>
<tr><td></td><td>Range</td><td>Default</td><td>Unit</td><td>Scale FbEq16</td><td>Volatile</td><td>Change running</td><td>Type</td></tr>
</table>

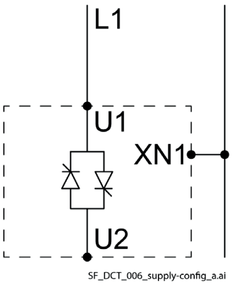
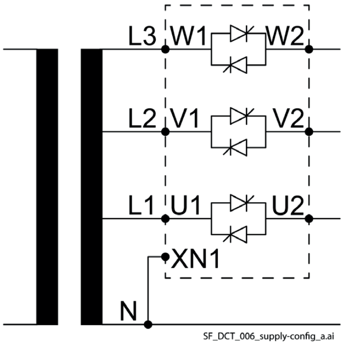
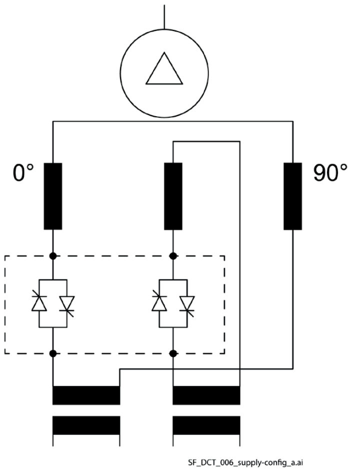
The following tables give an overview, which combinations between 99.04 Supply Configuration, 99.05 Load Configuration and 99.10 Leg 1 Control Mode are suitable.

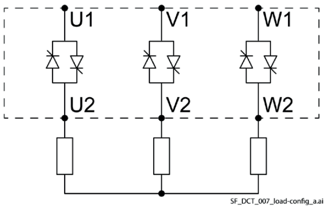
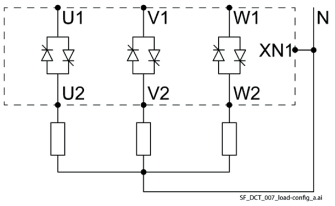
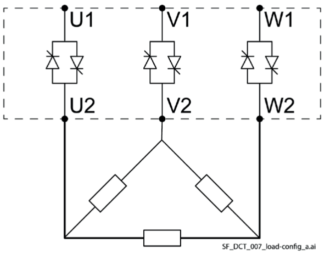
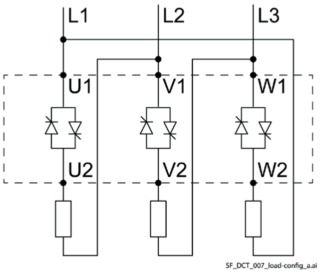
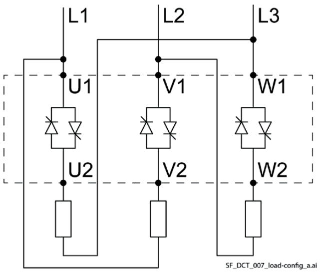
99.05 Load Configuration	**Number of active control loops**	
	One	Three
Single-phase: 9: 3 x 1ph loads 10: 3 x 1ph transformer loads	X (leg 1 or leg 2 or leg 3)	n/a
3 x single-phase: 9: 3 x 1ph loads 10: 3 x 1ph transformer loads	X (leg 2 and leg 3 follow leg 1)	X (leg 1, leg 2 and leg 3)
3-phase (individual loads): 1: 3ph star + N (4S) 3: 3ph open delta UV (6D) 4: 3ph open delta UW (6D) 6: 3ph transformer UV (6D) 7: 3ph transformer UW (6D)	X (leg 2 and leg 3 follow leg 1)	X (leg 1, leg 2 and leg 3)
3-phase (common load): 0: 3ph star (3S) 2: 3ph delta (3D) 5: 3ph transformer (3D/3S)	X (leg 2 and leg 3 follow leg 1)	n/a

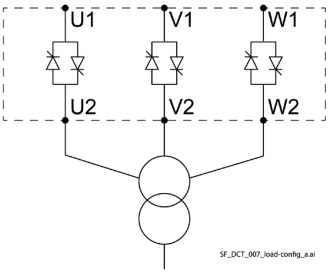
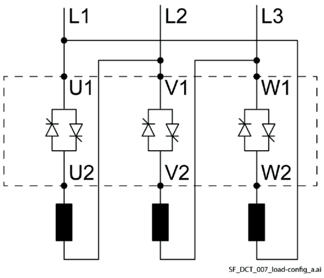
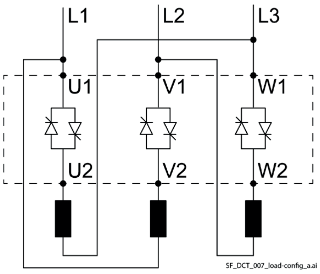
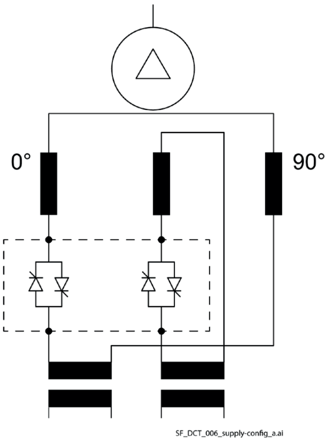
99.05 Load Configuration	**99.10 Leg 1 Control Mode**				
	Phase angle controls (5 … 12)	Full wave controls (1 … 3)	Full wave controls (2, 3), with 99.12 Leg 1 Start Mode = First angle	Full wave controls (2, 3), with 99.14 Leg 1 Burst Soft Start Ramp	Half wave control (4)
Single-phase direct: 9: 3 x 1ph loads	X	X	n/a	X	X
3 x single-phase direct: 9: 3 x 1ph loads	X	X	n/a	X	X
3-phase direct (individual loads): 1: 3ph star + N (4S) 3: 3ph open delta UV (6D) 4: 3ph open delta UW (6D)	X	X	n/a	X	X
3-phase direct (common load): 0: 3ph star (3S) 2: 3ph delta (3D)	X	X	n/a	X	n/a
Single-phase via transformer: 10: 3 x 1ph transformer loads	X	n/a	X	X	n/a
3 x single-phase via transformer: 10: 3 x 1ph transformer loads	X	n/a	X	X	n/a
3-phase via transformer (individual loads): 6: 3ph transformer UV (6D) 7: 3ph transformer UW (6D)	X	n/a	X	X	n/a
3-phase via transformer (common load): 5: 3ph transformer (3D/3S)	X	n/a	X	X	n/a

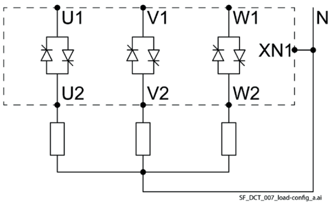
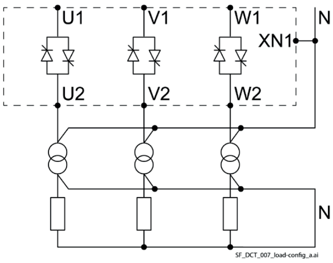
99.01	**Supply Voltage**
	Nominal mains voltage.

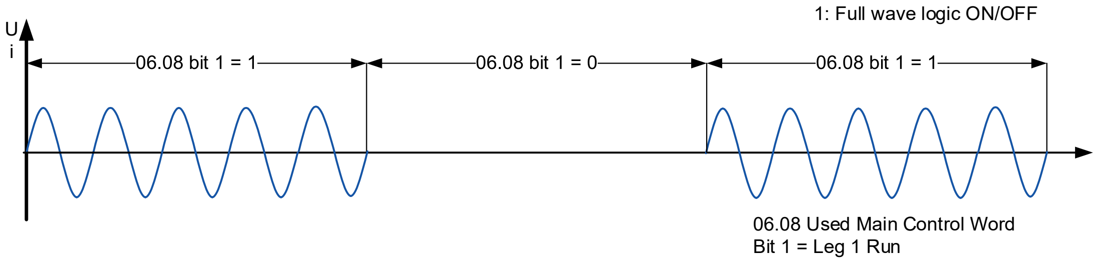
Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	Nominal mains voltage of the supply. The default and maximum values are preset automatically according to 95.16 Set: Unit type code and 95.19 Set: Unit input voltage scaling. The absolute maximum is 1200.0 V_{AC}.						
	0.0 … 95.16/19	0.0	V	10 = 1 V	n	y	Parameter
99.02	**Load Current**						
	Nominal load current. This value equals 100 % current for all relative current signals/parameters.						
	0.0 … 30000.0	0.0	A	1 = 1 A	n	y	Parameter
99.03	**Load Voltage**						
	Nominal voltage across the load. This value equals 100 % voltage for all relative voltage signals/parameters. The maximum value is preset automatically according to 95.16 Set: Unit type code and 95.19 Set: input voltage scaling.						
	0.0 … 3250.0	0.0	V	10 = 1 V	n	y	Parameter
99.04	**Supply Configuration**						
	Describes the configuration at the input (U1, V1, W1) of the unit. 0: 3ph UVW;  SF_DCT_006_supply-config_a.ai E.g. for units with 3 legs (W03). Set 99.01 Supply Voltage to the connected phase-to-phase voltage (e.g. L1 … L2). 1: 3ph UW eco;  SF_DCT_006_supply-config_a.ai E.g. for units with 2 legs (W02). Set 99.01 Supply Voltage to the connected phase-to-phase voltage (e.g. L1 … L2). 2: 3 x 1ph + N;  SF_DCT_006_supply-config_a.ai For units with 3 legs (W03) or 2 legs (W02) connected to single-phase mains. Set 99.01 Supply Voltage to the connected phase voltage (e.g. L1 … N).						

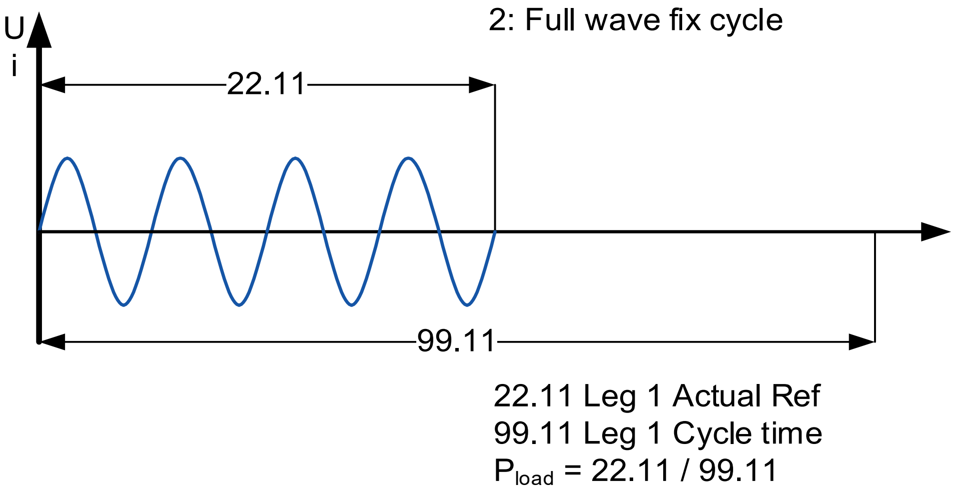
<table>
<tr><th>Index</th><th colspan="7">Name</th></tr>
<tr><th></th><th colspan="7">Text</th></tr>
<tr><th></th><th>Range</th><th>Default</th><th>Unit</th><th>Scale FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">3: 1ph + N;

Set 99.01 Supply Voltage to the connected phase voltage (e.g. L1 … N).
4: Multitap 1ph;

See DCT880 Multitap Control Manual (3ADW000440).
5: Multitap 3ph; See DCT880 Multitap Control Manual (3ADW000440).
6: 2ph Scott;

Converts a 3-phase system to a 2-phase system with 90° phase shift.
Set 99.01 Supply Voltage to the connected phase-to-phase voltage (e.g. L1 … L2).</td></tr>
<tr><td></td><td>0 … 6</td><td>3ph UVW</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>99.05</td><td colspan="7">Load Configuration</td></tr>
<tr><td></td><td colspan="7">Describes the configuration at the output (U2, V2, W2) of the unit.</td></tr>
</table>

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	0: 3ph star (3S);			The load is connected in a star configuration. Set 99.03 Load Voltage to the connected phase-to-phase voltage (e.g. U2 … V2).			
	1: 3ph star + N (4S);			The load is connected in star configuration with neutral connected to the star point. Set 99.03 Load Voltage to the connected phase voltage (e.g. U2 … N).			
	2: 3ph delta (3D);			The load is connected in a delta configuration. Set 99.03 Load Voltage to the connected phase-to-phase voltage (e.g. U2 … V2).			
	3: 3ph open delta UV (6D);			The load is connected in an open delta configuration (clockwise phase connection U V W). Set 99.03 Load Voltage to the connected phase-to-phase voltage (e.g. U2 … V2).			
	4: 3ph open delta UW (6D);			The load is connected in an open delta configuration (anti-clockwise phase connection U W V). Set 99.03 Load Voltage to the connected phase-to-phase voltage (e.g. U2 … V2).			

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	5: 3ph transformer (3D/3S);		The load is connected via a 3-phase delta or star transformer. Set 99.03 Load Voltage to the connected phase-to-phase voltage (e.g. U2 … V2).				
	6: 3ph transformer UV (6D);		The load is connected via a 3-phase open delta transformer (clockwise phase connection U V W). Set 99.03 Load Voltage to the connected phase-to-phase voltage (e.g. U2 … V2).				
	7: 3ph transformer UW (6D);		The load is connected via a 3-phase open delta transformer (anti-clockwise phase connection U W V). Set 99.03 Load Voltage to the connected phase-to-phase voltage (e.g. U2 … V2).				
	8: Scott transformer;		The load is connected via a Scott transformer. Set 99.03 Load Voltage to the connected phase-to-phase voltage (e.g. U2 … V2).				

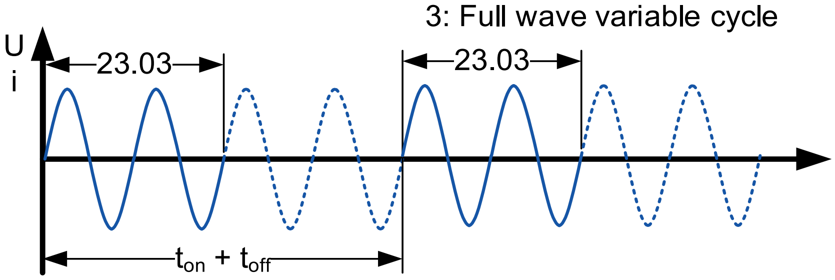
Index	Name Text Range	 Default	 Unit	 Scale FbEq16	 Volatile	 Change running	 Type
	9: 3 x 1ph loads;  The three loads are connected as single-phase loads to neutral. Also possible for only one or two loads. Set 99.03 Load Voltage to the connected phase voltage (e.g. U2 … N). 10: 3 x 1ph transformer loads;  The three loads are connected as single-phase loads via single-phase transformers. Also possible for only one or two loads. Set 99.03 Load Voltage to the connected phase voltage (e.g. U2 … N).						
	0 … 10	3ph star (3S)	-	1 = 1	n	y	Parameter
99.06	**Start UP Macro**						
	Start-up macro depending on the load configuration. Macro to preset parameters in groups 23 … 28 and 30 … 33 according to the used load configuration in 99.05 Load Configuration. The value reverts automatically to Disable, when the parameters are set. 0: **Disable**; no macro chosen, normal operation. 1: **3ph star (3S)**; the load is connected in a star configuration. 2: **3ph star + N (4S)**; the load is connected in star configuration with neutral connected to the star point. 3: **3ph delta (3D)**; the load is connected in a delta configuration. 4: **3ph open delta UV (6D)**; the load is connected in an open delta configuration (clockwise phase connection U V W). 5: **3ph open delta UW (6D)**; the load is connected in an open delta configuration (anti-clockwise phase connection U W V). 6: **3ph transformer (3D/3S)**; the load is connected via a 3-phase delta or star transformer. 7: **3ph transformer UV (6D)**; the load is connected via a 3-phase open delta transformer (clockwise phase connection U V W). 8: **3ph transformer UW (6D)**; the load is connected via a 3-phase open delta transformer (anti-clockwise phase connection U W V). 9: **Scott transformer**; the load is connected via a Scott transformer. 10: **3 x 1ph loads**; the loads are connected as single-phase loads to neutral. 11: **3 x 1ph transformer loads**; the loads are connected as single-phase loads via single-phase transformers.						
	0 … 11	Disable	-	1 = 1	n	n	Parameter
99.07	**Service Mode**						
	99.07 Service Mode contains test modes, help modes and parameter macros. The value reverts automatically to Normal operation, when the chosen procedure is finished. Service mode = Set: Type code for: – 95.18 Set: Unit output current scaling. – 95.19 Set: Unit input voltage scaling. Has to be set back to Normal mode by the user.						

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	0: **Normal operation**; no service mode chosen, normal operation. 2: **Factory Reset**; load macro factory (default parameter set). 5: **Set Type Code**; enables the type code parameters of the unit. See 95.16 Set: Unit type code, 95.18 Set: Unit output current scaling and 95.19 Set: Unit input voltage scaling. 6: **Reset Leg 1**; parameters related to leg 1 (groups 23/24/30) are set back to factory values (default values). 7: **Reset Leg 2**; parameters related to leg 2 (groups 25/26/31) are set back to factory values (default values). 8: **Reset Leg 3**; parameters related to leg 3 (groups 27/28/32) are set back to factory values (default values). 9: **Copy Grp 23/24/30/36 to Leg 2**; copies leg 1 parameters from groups 23/24/30/36 to leg 2 parameters in groups 25/26/31/37. 10: **Copy Grp 23/24/30/36 to Leg 3**; copies leg 1 parameters from groups 23/24/30/36 to leg 3 parameters in groups 27/28/32/38. 16: **Thyristor Diagnosis**; start thyristor diagnosis. The result is displayed in the event logger of the control panel/PC tool.						
	0 … 16	Normal operation	-	1 = 1	y	n	Parameter
99.08	**External Current Transformer Scaling**						
	External CT scaling. Sets the rated current of external current transformers (CTs) connected to XEXCT on the SDCS-PIN-H11.						
	0.0 … 30000.0	0.0	A	1 = 1 A	n	y	Parameter
99.09	**Load Power**						
	Calculated rated load power of the whole unit. $\frac{power\ leg\ 1\ +\ power\ leg\ 2\ +\ power\ leg\ 2}{3}$ This value equals 100 % power for all relative power signals/parameters. It depends on 99.02 Load Current, 99.03 Load Voltage and 99.05 Load Configuration.						
	0.0 … 5000.0	-	kW	10 = 1 kW	y	n	Signal
99.10	**Leg 1 Control Mode**						
	Leg 1 control mode. Selection of control mode for leg 1. 0: **Disable**; leg 1 is off. 1: **Full wave logic ON/OFF**; full wave (burst) is on (= 100 % load power) when 06.08 Used Main Control Word bit 0 = 1. Full wave is off (= 0 % load power) when 06.08 Used Main Control Word bit 0 = 0:  						

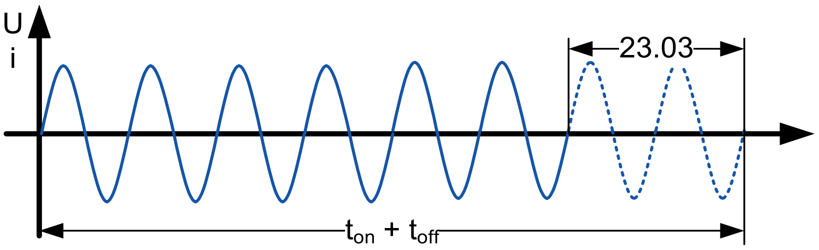
Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	2: **Full wave fix cycle**; full wave (burst) with fix cycle control. The load power depends on the ratio of 22.11 Leg 1 Actual Ref and 99.11 Leg 1 Cycle Time:  3: **Full wave variable cycle**; full wave (burst) with variable cycle control. There is no predefined cycle time. The power controller calculates the optimal ton/toff ratio by itself. It is possible to define a minimum number of ON or OFF periods by 23.03 Leg 1 Minimum Cycle Variable Burst. The load power depends on the ratio of ON periods divided by the sum of all ON and OFF periods. Thus, the load power depends on 23.03 Leg 1 Minimum Cycle Variable Burst and 22.11 Leg 1 Actual Ref:						

Index	Name						
	Text						
	Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type

3: Full wave variable cycle



Valid for 22.11 Leg 1 Actual Ref ≤ 50 %



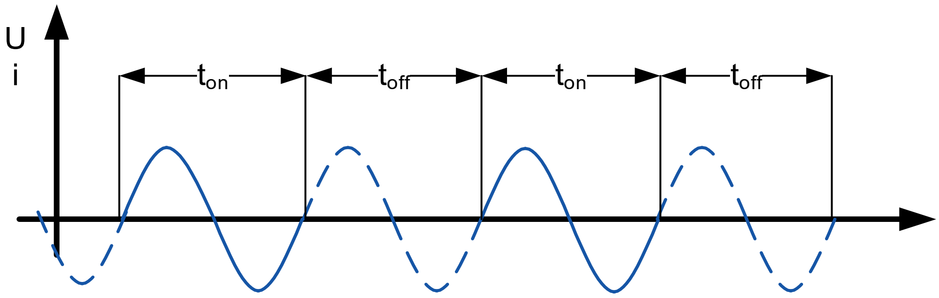
Valid for 22.11 Leg 1 Actual Ref > 50 %

23.03 Leg 1 Minimum Cycle Variable Burst

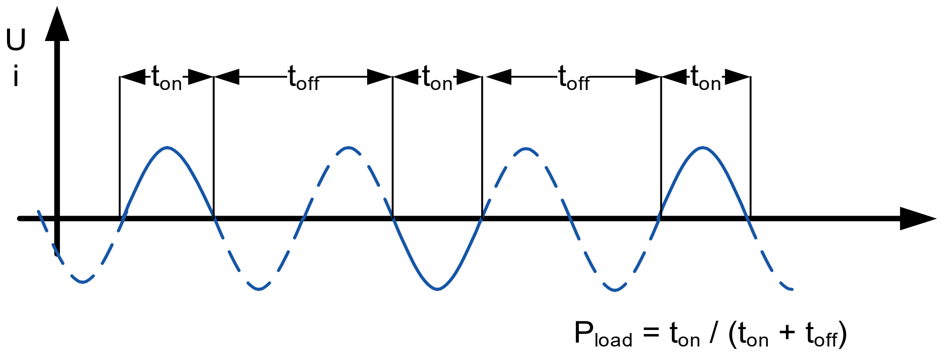
$P_{load} = t_{on} / (t_{on} + t_{off})$

4: **Half wave**; half wave control. Half wave control is especially designed for infrared or ultraviolet lamps. It works similar to full wave (burst) with variable cycle control, but instead of full waves, half waves are controlled. This allows a more precise control with a much faster reaction time. The load power depends on the ratio of ON half waves divided by the sum of all ON and OFF half waves. Thus, the load power depends on 22.11 Leg 1 Actual Ref:

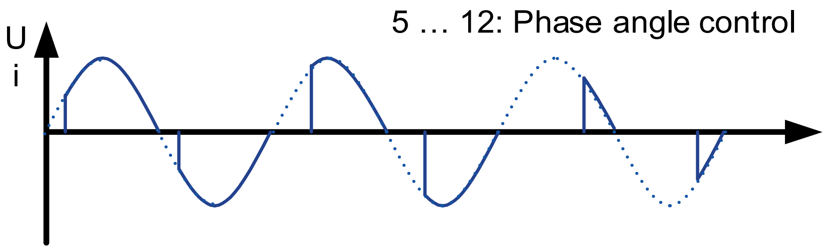
4: Half wave



<table>
<tr><td rowspan="3">**Index**</td><td colspan="7">**Name**</td></tr>
<tr><td colspan="7">**Text**</td></tr>
<tr><td>**Range**</td><td>**Default**</td><td>**Unit**</td><td>**Scale FbEq16**</td><td>**Volatile**</td><td>**Change running**</td><td>**Type**</td></tr>
<tr><td></td><td colspan="7">



5: **U α open loop control**; phase angle control. The load voltage depends on 23.46 Leg 1 Voltage Control Out open loop (open loop control):



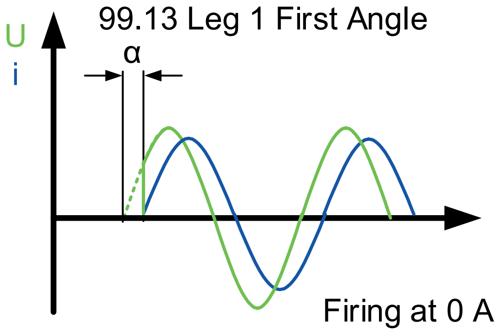
6: **U^2 α open loop control**; phase angle control. The output is proportional to power and depends on 23.46 Leg 1 Voltage Control Out open loop (open loop control).
7: **I α control**; phase angle control. The load current depends on 23.29 Leg 1 Current Control Out (closed loop control).
8: **I^2 α control**; phase angle control. The output is proportional to power and depends on 23.29 Leg 1 Current Control Out (closed loop control).
9: **U α control**; phase angle control. The load voltage depends on 23.45 Leg 1 Voltage Control Out after Current Limit (closed loop control).
10: **U^2 α control**; phase angle control. The output is proportional to power and depends on 23.45 Leg 1 Voltage Control Out after Current Limit (closed loop control).
11: **P α control**; phase angle control. The load power depends on 23.60 Leg 1 Power Control Out after Current Limit (closed loop control).
12: **Leg 1 External Ref 23.65**; phase angle control. Leg 1 external reference in percent of 0 % ≡ 180.0° and 100 % ≡ 0.0°.
</td></tr>
<tr><td></td><td>0 … 12</td><td>U a open loop control</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**99.11**</td><td colspan="7">**Leg 1 Cycle Time**</td></tr>
<tr><td></td><td colspan="7">Leg 1 cycle time.
Cycle time for 99.10 Leg 1 Control Mode = Full wave fix cycle (= 2).</td></tr>
<tr><td></td><td>0 … 6000</td><td>100</td><td>Periods</td><td>1 = 1 Periods</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**99.12**</td><td colspan="7">**Leg 1 Start Mode**</td></tr>
<tr><td></td><td colspan="7">Leg 1 start.</td></tr>
</table>

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**

Defines the start mode of leg 1.

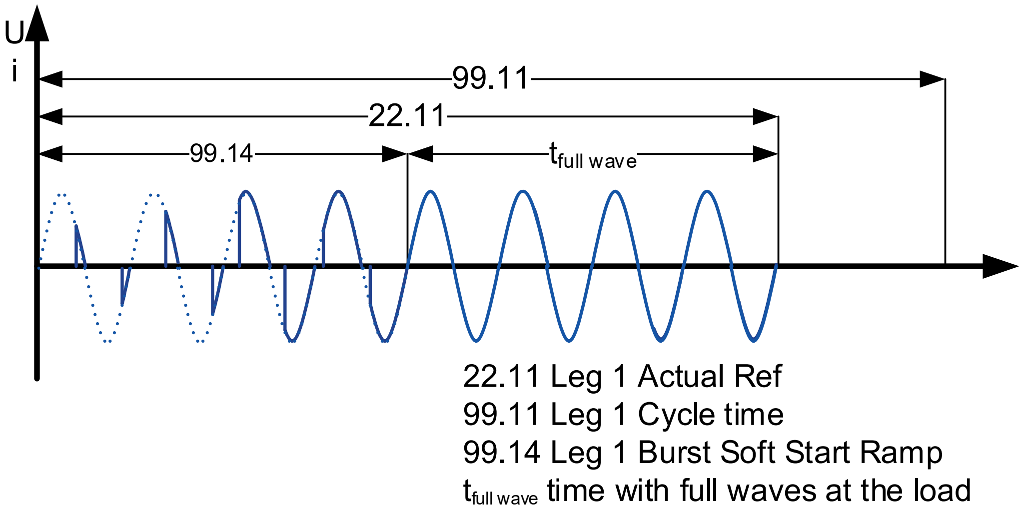
0: **Normal**; unit starts immediately.

1: **First angle**; for transformer loads or weak networks. This prevents the high inrush current of transformers or high starting currents. The first thyristors are fired with the firing angle set in 99.13 Leg 1 First Angle:



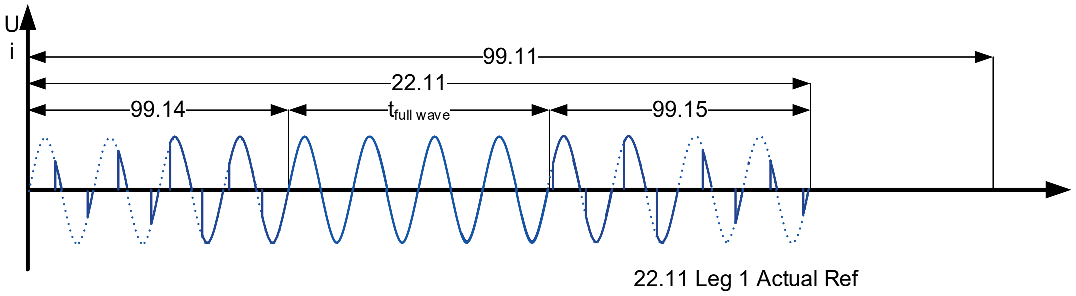
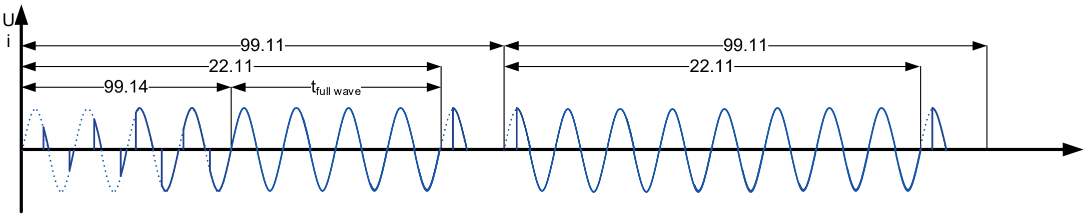
2: **Soft start**; at start the firing angle is moved from 180° … 0° using the amount of periods in 99.14 Leg 1 Burst Soft Start Ramp. Switching OFF is done by setting the firing angle directly to 180°.

Note: This influences only the periods after the start of the unit:



3: **Soft start / soft down**; at start the firing angle is moved from 180° … 0° using the amount of periods in 99.14 Leg 1 Burst Soft Start Ramp. At switching OFF the firing angle is moved to 180° depending on 99.15 Leg 1 Burst Soft Down Ramp.

Note: This influences only the periods after the start or after switching OFF the unit:

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">
22.11 Leg 1 Actual Ref
99.11 Leg 1 Cycle time
99.14 Leg 1 Burst Soft Start Ramp
99.15 Leg 1 Burst Soft Down Ramp
$t_{full\ wave}$ time where the full wave is at the load
4: Soft start / first angle; see 1: First angle and 2: Soft start.
Note: This mode is recommended for weak mains:

22.11 Leg 1 Actual Ref
99.11 Leg 1 Cycle time
99.14 Leg 1 Burst Soft Start Ramp
$t_{full\ wave}$ time where the full wave is at the load</td></tr>
<tr><td>0 … 4</td><td>Soft start / soft down</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>99.13</td><td colspan="7">Leg 1 First Angle</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Leg 1 full wave (burst) first angle.
Starting angle for leg 1, mainly used for transformer loads. 90.0° is e.g. the phase shift between voltage and current of a transformer.
Valid when 99.12 Leg 1 Start Mode = First angle or Soft start / first angle and 99.10 Leg 1 Control Mode = Full wave fix cycle or Full wave variable cycle.
Note: Recommended setting 75.0° … 115.0°.</td></tr>
<tr><td>0.0 … 180.0</td><td>90.0</td><td>°</td><td>10 = 1°</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>99.14</td><td colspan="7">Leg 1 Burst Soft Start Ramp</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Leg 1 full wave (burst) soft start.
Soft start time in periods in which the firing angle is moved from 180° … 0°.
Valid when 99.12 Leg 1 Start Mode = Soft start … (= 2 … 4) and 99.10 Leg 1 Control Mode = Full wave fix cycle or Full wave variable cycle.</td></tr>
<tr><td>0 … 6000</td><td>10</td><td>Periods</td><td>1 = 1 Periods</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>99.15</td><td colspan="7">Leg 1 Burst Soft Down Ramp</td></tr>
<tr><td></td><td colspan="7">Leg 1 full wave (burst) soft down.
Soft down ramp in periods in which the firing angle is moved from 0° … 180°.
Valid when 99.12 Leg 1 Start Mode = Soft start / soft down and 99.10 Leg 1 Control Mode = Full wave fix cycle or Full wave variable cycle.</td></tr>
</table>

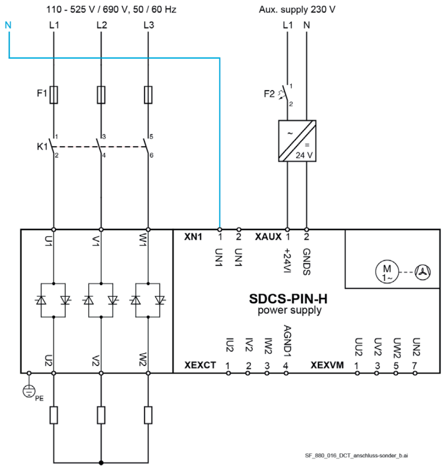
Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	0 … 6000	10	Periods	1 = 1 Periods	n	y	Parameter
99.16	**Leg 1 Phase Angle Soft Start Ramp**						
	Leg 1 phase angle control modes start ramp. Soft start time in which the reference (either 23.22 Leg 1 Current Control Ref 3, 23.37 Leg 1 Voltage Control Ref 3 or 23.52 Leg 1 Power Control Ref 3) is ramped from 0 … 100 %. Valid when 99.10 Leg 1 Control Mode = α controls (= 5 … 12). **Note**: This influences only the positive slope of the reference.						
	0 … 6000	20	Periods	1 = 1 Periods	n	y	Parameter
99.17	**Leg 1 Phase Angle Soft Down Ramp**						
	Leg 1 phase angle control modes down ramp. Soft down time in which the reference (either 23.22 Leg 1 Current Control Ref 3, 23.37 Leg 1 Voltage Control Ref 3 or 23.52 Leg 1 Power Control Ref 3) is ramped from 100 … 0 %. Valid when 99.10 Leg 1 Control Mode = α controls (= 5 … 12). **Note**: This influences only the negative slope of the reference and does not prolong the Run command. A stop command terminates the ramping process.						
	0 … 6000	20	Periods	1 = 1 Periods	n	y	Parameter
99.25	**Leg 2 Control Mode**						
	Leg 2 control mode. Selection of control mode for leg 2. 0 … 12: see 99.10 Leg 1 Control Mode. 12: **Leg 2 External Ref 25.65**; phase angle control. Leg 2 external reference in percent of 0 % ≡ 180.0° and 100 % ≡ 0.0°. 13: **Follow Leg 1**; use the same control mode as leg 1. 14: **Follow Leg 1 alternating**; reserved.						
	0 … 14	Follow leg 1	-	1 = 1	n	y	Parameter
99.26	**Leg 2 Cycle Time**						
	Leg 2 cycle time. Cycle time for 99.25 Leg 2 Control Mode = Full wave fix cycle.						
	0 … 6000	100	Periods	1 = 1 Periods	n	y	Parameter
99.27	**Leg 2 Start Mode**						
	Leg 2 start. Defines the start mode of leg 2. See 99.12 Leg 1 Start Mode.						
	0 … 4	Soft start / soft down	-	1 = 1	n	y	Parameter
99.28	**Leg 2 First Angle**						
	Leg 2 full wave (burst) first angle. Starting angle for leg 2, mainly used for transformer loads. 90.0° is e.g. the phase shift between voltage and current of a transformer. Valid when 99.27 Leg 2 Start Mode = First angle or Soft start / first angle and 99.25 Leg 2 Control Mode = Full wave fix cycle or Full wave variable cycle. **Note**: Recommended setting 75.0° … 115.0°.						
	0.0 … 180.0	90.0	°	10 = 1°	n	y	Parameter
99.29	**Leg 2 Burst Soft Start Ramp**						
	Leg 2 full wave (burst) soft start. Soft start time in periods in which the firing angle is moved from 180° … 0°.						

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	Valid when 99.27 Leg 2 Start Mode = Soft start … (= 2 … 4) and 99.25 Leg 2 Control Mode = Full wave fix cycle or Full wave variable cycle.						
	0 … 6000	10	Periods	1 = 1 Periods	n	y	Parameter
99.30	**Leg 2 Burst Soft Down Ramp**						
	Leg 2 full wave (burst) soft down. Soft down ramp in periods in which the firing angle is moved from 0° … 180°. Valid when 99.27 Leg 2 Start Mode = Soft start / soft down and 99.25 Leg 2 Control Mode = Full wave fix cycle or Full wave variable cycle.						
	0 … 6000	10	Periods	1 = 1 Periods	n	y	Parameter
99.31	**Leg 2 Phase Angle Soft Start Ramp**						
	Leg 2 phase angle control modes start ramp. Soft start time in which the reference (either 25.22 Leg 2 Current Control Ref 3, 25.37 Leg 2 Voltage Control Ref 3 or 25.52 Leg 2 Power Control Ref 3) is ramped from 0 … 100 %. Valid when 99.25 Leg 2 Control Mode = α controls (= 5 … 12). **Note**: This influences only the positive slope of the reference.						
	0 … 6000	20	Periods	1 = 1 Periods	n	y	Parameter
99.32	**Leg 2 Phase Angle Soft Down Ramp**						
	Leg 2 phase angle control modes down ramp. Soft down time in which the reference (either 25.22 Leg 1 Current Control Ref 3, 25.37 Leg 1 Voltage Control Ref 3 or 25.52 Leg 1 Power Control Ref 3) is ramped from 100 … 0 %. Valid when 99.25 Leg 1 Control Mode = α controls (= 5 … 12). **Note**: This influences only the negative slope of the reference and does not prolong the Run command. A stop command terminates the ramping process.						
	0 … 6000	20	Periods	1 = 1 Periods	n	y	Parameter
99.40	**Leg 3 Control Mode**						
	Leg 3 control mode. Selection of control mode for leg 3. 0 … 12: see 99.10 Leg 1 Control Mode. 12: **Leg 3 External Ref 27.65**; phase angle control. Leg 3 external reference in percent of 0 % ≡ 180.0° and 100 % ≡ 0.0°. 13: **Follow Leg 1**; use the same control mode as leg 1. 14: **Follow Leg 1 alternating**; reserved.						
	0 … 14	Follow Leg 1	-	1 = 1	n	y	Parameter
99.41	**Leg 3 Cycle Time**						
	Leg 3 cycle time. Cycle time for 99.40 Leg 3 Control Mode = Full wave fix cycle.						
	0 … 6000	100	Periods	1 = 1 Periods	n	y	Parameter
99.42	**Leg 3 Start Mode**						
	Leg 3 start. Defines the start mode of leg 3. See 99.12 Leg 1 Start Mode.						
	0 … 4	Soft start / soft down	-	1 = 1	n	y	Parameter
99.43	**Leg 3 First Angle**						
	Leg 3 full wave (burst) first angle.						

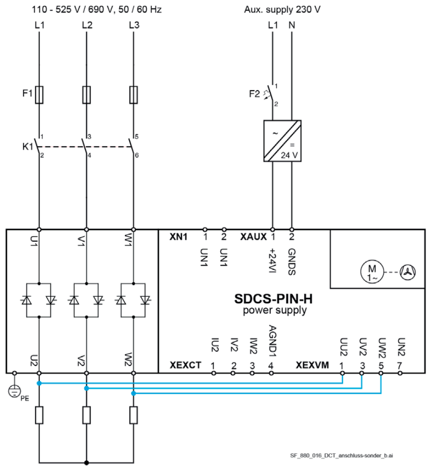
Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	Starting angle for leg 3, mainly used for transformer loads. 90.0° is e.g. the phase shift between voltage and current of a transformer. Valid when 99.42 Leg 3 Start Mode = First angle or Soft start / first angle and 99.40 Leg 3 Control Mode = Full wave fix cycle or Full wave variable cycle. **Note**: Recommended setting 75.0° … 115.0°.						
	0.0 … 180.0	90.0	°	10 = 1°	n	y	Parameter
99.44	**Leg 3 Burst Soft Start Ramp**						
	Leg 3 full wave (burst) soft start. Soft start time in periods in which the firing angle is moved from 180° … 0°. Valid when 99.42 Leg 3 Start Mode = Soft start … (= 2 … 4) and 99.40 Leg 3 Control Mode = Full wave fix cycle or Full wave variable cycle.						
	0 … 6000	10	Periods	1 = 1 Periods	n	y	Parameter
99.45	**Leg 3 Burst Soft Down Ramp**						
	Leg 3 full wave (burst) soft down. Soft down ramp in periods in which the firing angle is moved from 0° … 180°. Valid when 99.42 Leg 3 Start Mode = Soft start / soft down and 99.40 Leg 3 Control Mode = Full wave fix cycle or Full wave variable cycle.						
	0 … 6000	10	Periods	1 = 1 Periods	n	y	Parameter
99.46	**Leg 3 Phase Angle Soft Start Ramp**						
	Leg 3 phase angle control modes start ramp. Soft start time in which the reference (either 27.22 Leg 3 Current Control Ref 3, 27.37 Leg 3 Voltage Control Ref 3 or 27.52 Leg 3 Power Control Ref 3) is ramped from 0 … 100 %. Valid when 99.40 Leg 3 Control Mode = α controls (= 5 … 12). **Note**: This influences only the positive slope of the reference.						
	0 … 6000	20	Periods	1 = 1 Periods	n	y	Parameter
99.47	**Leg 3 Phase Angle Soft Down Ramp**						
	Leg 3 phase angle control modes down ramp. Soft down time in which the reference (either 27.22 Leg 1 Current Control Ref 3, 27.37 Leg 1 Voltage Control Ref 3 or 27.52 Leg 1 Power Control Ref 3) is ramped from 100 … 0 %. Valid when 99.40 Leg 1 Control Mode = α controls (= 5 … 12). **Note**: This influences only the negative slope of the reference and does not prolong the Run command. A stop command terminates the ramping process.						
	0 … 6000	20	Periods	1 = 1 Periods	n	y	Parameter
99.60	**Voltage Measurement Configuration**						
	Output voltage measurement configuration. 99.60 Voltage Measurement Configuration describes how the voltages of output phases U2, V2, W2 are measured or calculated. The values can be seen in 01.60 Leg 1 Voltage RMS relative actual, 01.61 Leg 2 Voltage RMS relative actual and 01.62 Leg 3 Voltage RMS relative actual. 0: **UVW1**; the input phase voltages U1, V1, W1 are measured. The output phase voltages U2, V2, W2 and N1 (neutral) are calculated depending on the firing angle, see 99.04 Supply Configuration and 99.05 Load Configuration.						

Index	Name						
	Text						
	Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type

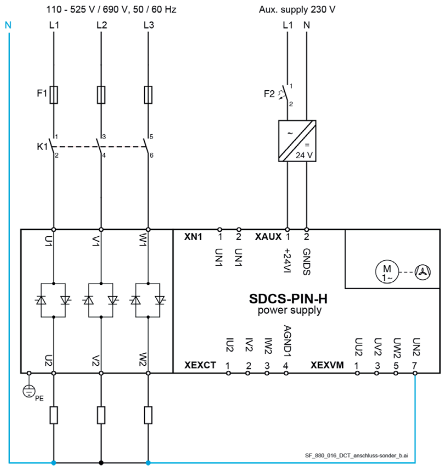
1: **UVW1+N1**; the input phase voltages U1, V1,W1 and N1 (neutral) are measured. The output phase voltages U2, V2, W2 are calculated depending on the firing angle, see 99.04 Supply Configuration, and 99.05 Load Configuration. The voltage of N1 (neutral) is measured via XN1 (X54) on the SDCS-PIN-H11.

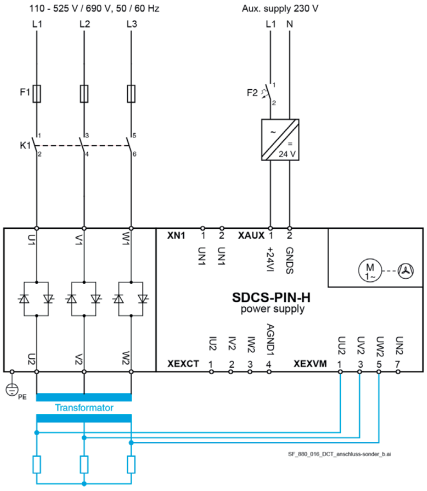
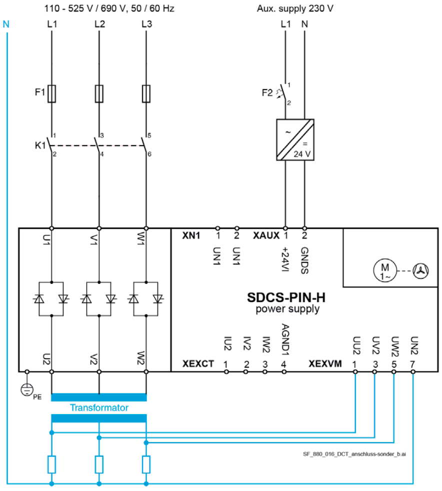


2: **UVW1 and X60 UVW2**; the input phase voltages U1, V1 and W1 are measured. Additionally the output phase voltages U2, V2, W2 are measured against each other via XEXVM (X60) on the SDCS-PIN-H11 directly at the output.



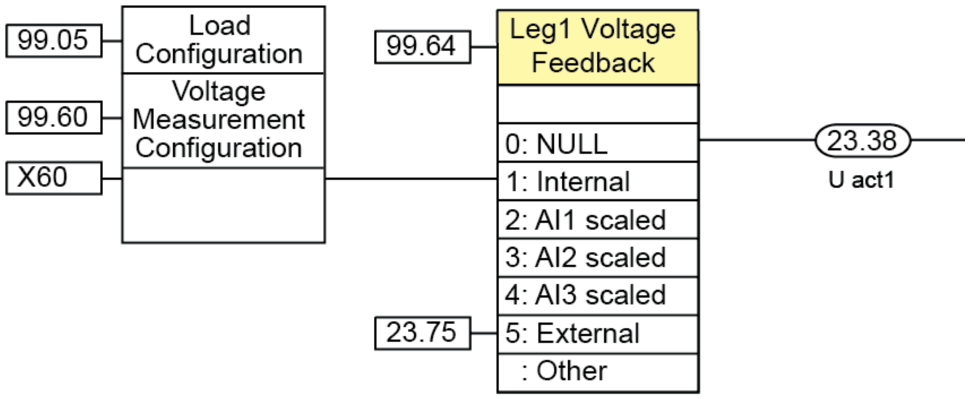
3: **UVW1 and X60 UVW2+N2**; the input phase voltages U1, V1 and W1 are measured. Additionally the output phase voltages U2, V2, W2 are measured against N2 (neutral) via XEXVM (X60) on the SDCS-PIN-H11 directly at the output.



Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	4: **UVW1 and X60 Uext**; the input phase voltages U1, V1 and W1 are measured. Additionally the output phase voltages U2, V2, W2 are measured against each other via XEXVM (X60) on the SDCS-PIN-H11 e.g. after a transformer, directly at the load. 						
	5: **UVW1 and X60 Uext+N2**; the input phase voltages U1, V1 and W1 are measured. Additionally the output phase voltages U2, V2, W2 are measured against N2 (neutral) via XEXVM (X60) on the SDCS-PIN-H11 e.g. after a transformer, directly at the load. 						
	0 … 5	UVW1	-	1 = 1	n	y	Parameter
99.61	**Load Transformer Primary Voltage**						
	Primary voltage of a transformer (see nameplate) connected to the load side (U2, V2, W2) of the unit. This information is needed for 99.60 Voltage Measurement Configuration = UVW1 and X60 Uext or UVW1 and X60 Uext+N2 (= 4, 5).						
	0.0 … 3250.0	380.0	V	10 = 1 V	n	y	Parameter
99.62	**Load Transformer Secondary Voltage**						
	Secondary voltage of a transformer (see nameplate) connected to the load side (U2, V2, W2) of the unit. This information is needed for 99.60 Voltage Measurement Configuration = UVW1 and X60 Uext or UVW1 and X60 Uext+N2 (= 4, 5).						
	0.0 … 3250.0	380.0	V	10 = 1 V	n	y	Parameter
99.64	**Leg 1 Voltage Feedback**						
	Leg 1, output phase U2 voltage feedback source.						

Index	Name Text Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type

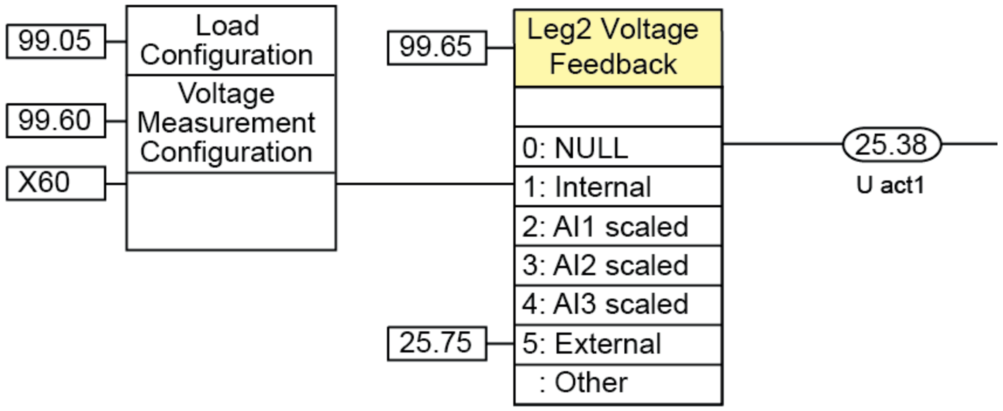
Leg 1 source for the actual voltage of the voltage controller. The value can be seen in 23.38 Leg 1 Voltage Actual:



Other; source selection.
0: **NULL**; no voltage feedback selected, output value is forced to zero.
1: **Internal (01.60)**; U2 internal voltage feedback, see 99.60 Voltage Measurement Configuration.
2: **AI1 scaled (12.12)**; U2 voltage feedback via analog input 1.
3: **AI2 scaled (12.22)**; U2 voltage feedback via analog input 2.
4: **AI3 scaled (12.32)**; U2 voltage feedback via analog input 3.
5: **External (23.75)**; U2 voltage feedback via overriding control system.

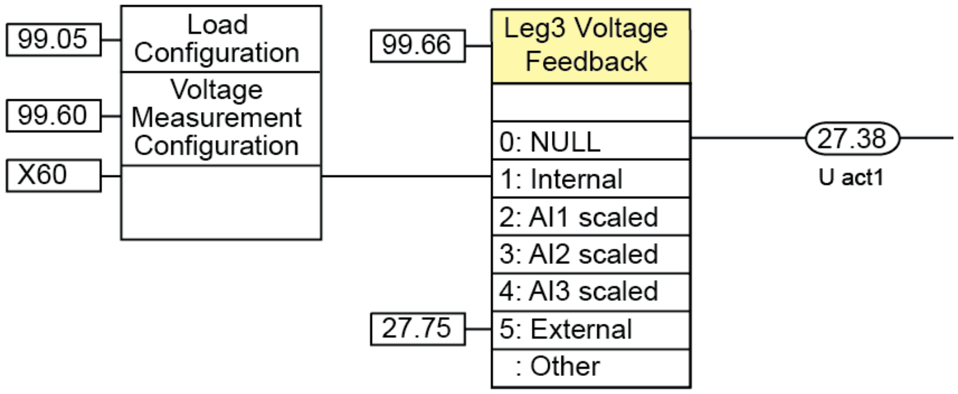
	Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
	0 … 5	Internal (01.60)	-	1 = 1	n	y	Parameter
99.65	**Leg 2 Voltage Feedback**						

Leg 2, output phase V2 voltage feedback source.
Leg 2 source for the actual voltage of the voltage controller. The value can be seen in 25.38 Leg 2 Voltage Actual:

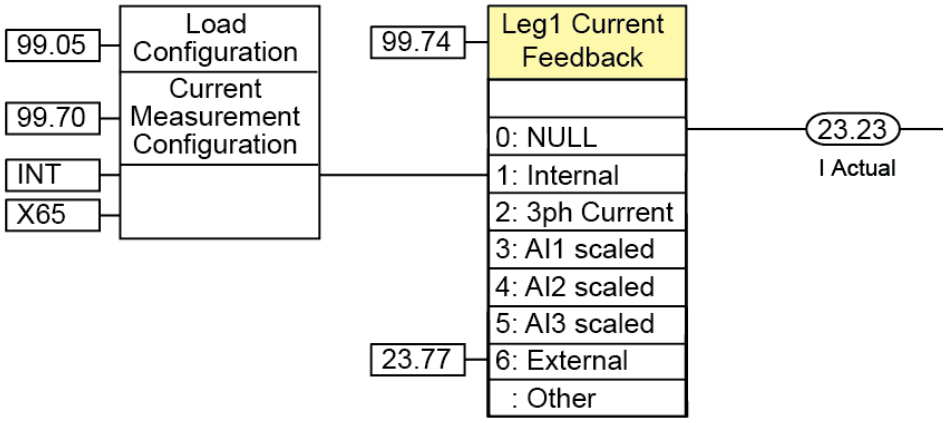


Other; source selection.
0: **NULL**; no voltage feedback selected, output value is forced to zero.
1: **Internal (01.61)**; V2 internal voltage feedback, see 99.60 Voltage Measurement Configuration.
2: **AI1 scaled (12.12)**; V2 voltage feedback via analog input 1.
3: **AI2 scaled (12.22)**; V2 voltage feedback via analog input 2.
4: **AI3 scaled (12.32)**; V2 voltage feedback via analog input 3.
5: **External (25.75)**; V2 voltage feedback via overriding control system.

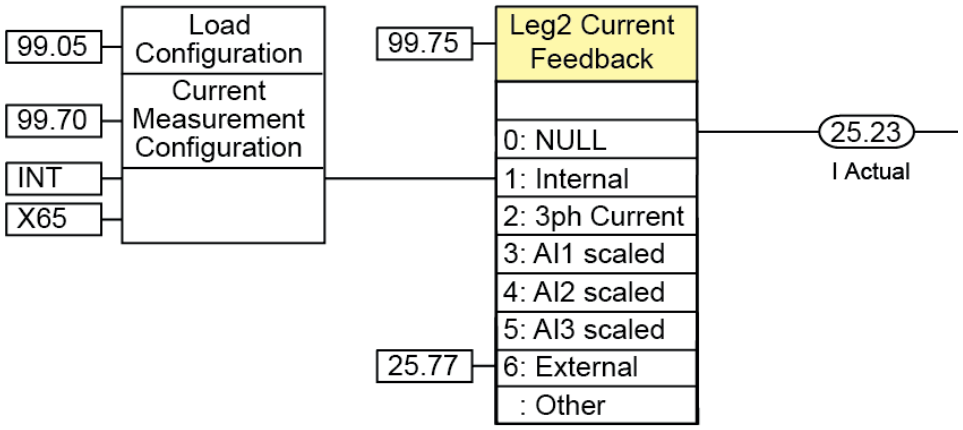
	Range	Default	Unit	Scale FbEq16	Volatile	Change running	Type
	0 … 5	Internal (01.61)	-	1 = 1	n	y	Parameter

<table>
<tr><td rowspan="3">Index</td><td colspan="7">Name</td></tr>
<tr><td colspan="7">Text</td></tr>
<tr><td>Range</td><td>Default</td><td>Unit</td><td>Scale FbEq16</td><td>Volatile</td><td>Change running</td><td>Type</td></tr>
<tr><td>99.66</td><td colspan="7">Leg 3 Voltage Feedback</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Leg 3, output phase W2 voltage feedback source.
Leg 3 source for the actual voltage of the voltage controller. The value can be seen in 27.38 Leg 3 Voltage Actual:

Other; source selection.
0: NULL; no voltage feedback selected, output value is forced to zero.
1: Internal (01.62); W2 internal voltage feedback, see 99.60 Voltage Measurement Configuration.
2: AI1 scaled (12.12); W2 voltage feedback via analog input 1.
3: AI2 scaled (12.22); W2 voltage feedback via analog input 2.
4: AI3 scaled (12.32); W2 voltage feedback via analog input 3.
5: External (27.75); W2 voltage feedback via overriding control system.</td></tr>
<tr><td>0 … 5</td><td>Internal (01.62)</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>99.70</td><td colspan="7">Current Measurement Configuration</td></tr>
<tr><td rowspan="2"></td><td colspan="7">Output current measurement configuration.
99.70 Current Measurement Configuration describes how the current of output phases U2, V2, W2 are measured or calculated. The values can be seen in 01.33 Leg 1 Current RMS relative actual, 01.34 Leg 2 Current RMS relative actual and 01.35 Leg 3 Current RMS relative actual.
0: Internal, measure phase V; the output phase U2, V2, W2 currents are measured internally. This is possible in units W03. For units W02 a 3^{rd} external CT is needed.
1: Internal, calculate phase V; the output phase U2, W2 currents are measured internally. Output phase V2 current is calculated. This is needed for units W02 without a 3^{rd} external CT.
2: External star; the output phase U2, V2, W2 currents are measured via external CTs connected at XEXCT on the SDCS-PIN-H11. The load is a star configuration.
3: External delta; the output phase U2, V2, W2 currents are measured via external CTs connected at XEXCT on the SDCS-PIN-H11. The load is a delta configuration.</td></tr>
<tr><td>0 … 3</td><td>Internal, phase V measured</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>99.74</td><td colspan="7">Leg 1 Current Feedback</td></tr>
<tr><td></td><td colspan="7">Leg 1, output phase U2 current feedback source.
Leg 1 source for the actual current of the current controller. The value can be seen in 23.23 Leg 1 Current Actual:</td></tr>
</table>

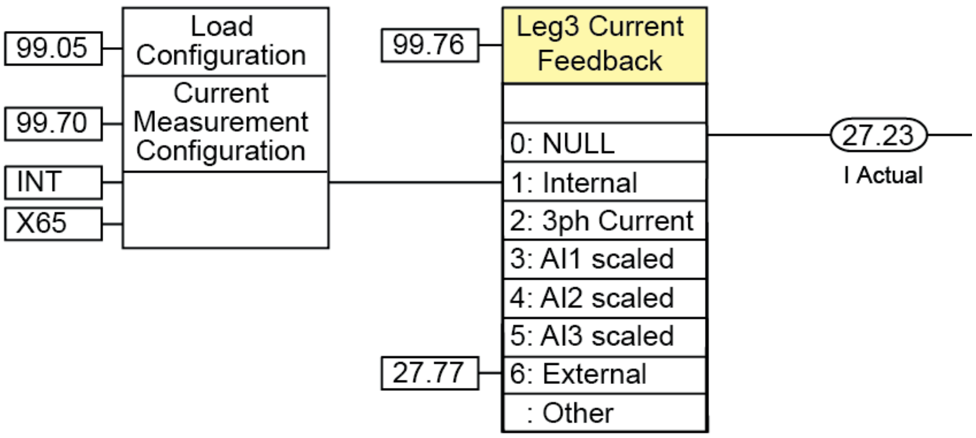
<table>
<tr><th>Index</th><th colspan="7">Name</th></tr>
<tr><th></th><th colspan="7">Text</th></tr>
<tr><th></th><th>Range</th><th>Default</th><th>Unit</th><th>Scale FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">

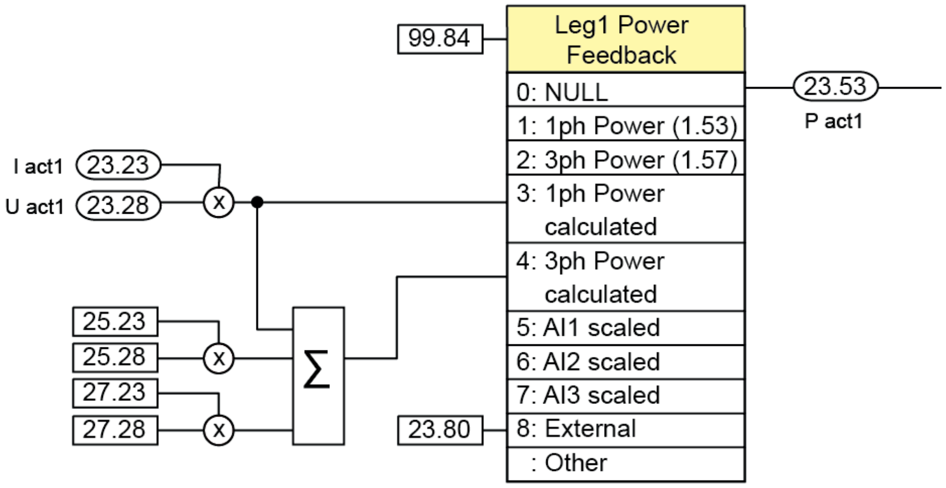


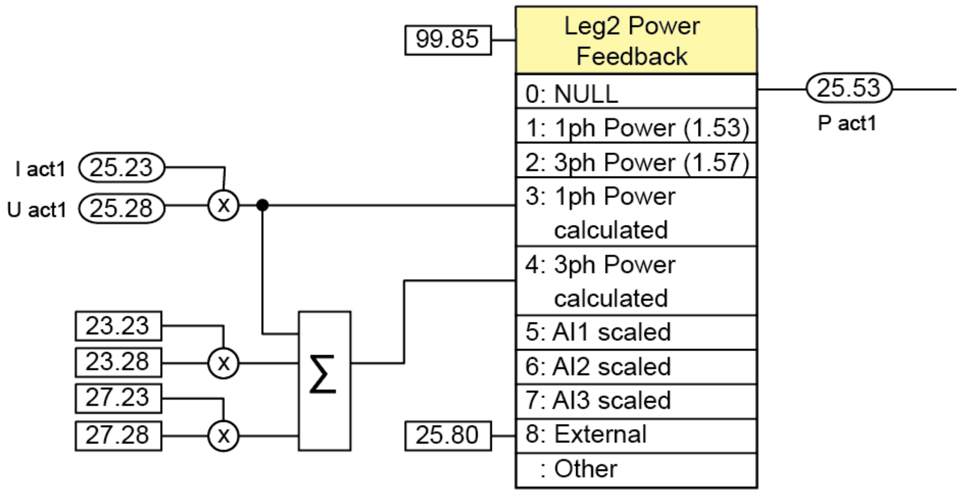
Other; source selection.
0: **NULL**; no current feedback selected, output value is forced to zero.
1: **Internal (01.33)**; U2 internal current feedback, see 99.70 Current Measurement Configuration.
2: **3ph current (01.37)**; 3-phase current feedback for delta load configurations.
3: **AI1 scaled (12.12)**; U2 current feedback via analog input 1.
4: **AI2 scaled (12.22)**; U2 current feedback via analog input 2.
5: **AI3 scaled (12.32)**; U2 current feedback via analog input 3.
6: **External (23.77)**; U2 current feedback via overriding control system.</td></tr>
<tr><td></td><td>0 … 6</td><td>Internal (01.33)</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>99.75</td><td colspan="7">Leg 2 Current Feedback</td></tr>
<tr><td></td><td colspan="7">Leg 2, output phase V2 current feedback source.
Leg 2 source for the actual current of the current controller. The value can be seen in 25.23 Leg 2 Current Actual:

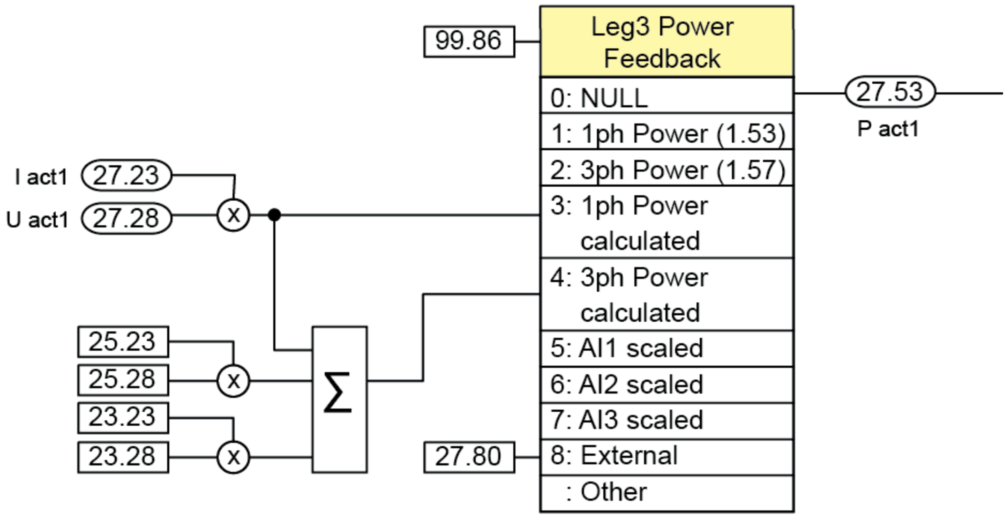


Other; source selection.
0: **NULL**; no current feedback selected, output value is forced to zero.
1: **Internal (01.34)**; V2 internal current feedback, see 99.70 Current Measurement Configuration.
2: **3ph current (01.37)**; 3-phase current feedback for delta load configurations.
3: **AI1 scaled (12.12)**; V2 current feedback via analog input 1.
4: **AI2 scaled (12.22)**; V2 current feedback via analog input 2.
5: **AI3 scaled (12.32)**; V2 current feedback via analog input 3.
6: **External (25.77)**; V2 current feedback via overriding control system.</td></tr>
<tr><td></td><td>0 … 6</td><td>Internal (01.34)</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
</table>

<table>
<tr><th>Index</th><th colspan="7">Name</th></tr>
<tr><th></th><th colspan="7">Text</th></tr>
<tr><th></th><th>Range</th><th>Default</th><th>Unit</th><th>Scale FbEq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td>**99.76**</td><td colspan="7">**Leg 3 Current Feedback**</td></tr>
<tr><td></td><td colspan="7">Leg 3, output phase W2 current feedback source.
Leg 3 source for the actual current of the current controller. The value can be seen in 27.23 Leg 3 Current Actual:


Other; source selection.
0: **NULL**; no current feedback selected, output value is forced to zero.
1: **Internal (01.35)**; W2 internal current feedback, see 99.70 Current Measurement Configuration.
2: **3ph current (01.37)**; 3-phase current feedback for delta load configurations.
3: **AI1 scaled (12.12)**; W2 current feedback via analog input 1.
4: **AI2 scaled (12.22)**; W2 current feedback via analog input 2.
5: **AI3 scaled (12.32)**; W2 current feedback via analog input 3.
6: **External (27.77)**; W2 current feedback via overriding control system.</td></tr>
<tr><td></td><td>0 … 6</td><td>Internal (01.35)</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**99.84**</td><td colspan="7">**Leg 1 Power Feedback**</td></tr>
<tr><td></td><td colspan="7">Leg 1, output phase U2 power feedback source.
Leg 1 source for the actual power of the power controller. The value can be seen in 23.53 Leg 1 Power Actual:

 </td></tr>
</table>

Index	Name						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	Other; source selection. 0: **NULL**; no power feedback selected, output value is forced to zero. 1: **1ph Power (01.53)**; U2 power feedback measured internally for single controlled load configurations. 2: **3ph Power (01.57)**; 3-phase power feedback measured internally for delta/star load configurations. 3: **1ph Power calculate**; U2 power feedback calculated for single controlled load configurations. 4: **3ph Power calculate**; 3-phase power feedback calculated for delta/star load configurations. 5: **AI1 scaled (12.12)**; U2 power feedback via analog input 1. 6: **AI2 scaled (12.22)**; U2 power feedback via analog input 2. 7: **AI3 scaled (12.32)**; U2 power feedback via analog input 3. 8: **External (23.80)**; U2 power feedback via overriding control system.						
	0 … 8	1ph Power (01.53)	-	1 = 1	n	y	Parameter
99.85	**Leg 2 Power Feedback**						
	Leg 2, output phase V2 power feedback source. Leg 2 source for the actual power of the power controller. The value can be seen in 25.53 Leg 2 Power Actual:  **Other**; source selection. 0: **NULL**; no power feedback selected, output value is forced to zero. 1: **1ph Power (01.54)**; V2 power feedback measured internally for single controlled load configurations. 2: **3ph Power (01.57)**; 3-phase power feedback measured internally for delta/star load configurations. 3: **1ph Power calculate**; V2 power feedback calculated for single controlled load configurations. 4: **3ph Power calculate**; 3-phase power feedback calculated for delta/star load configurations. 5: **AI1 scaled (12.12)**; V2 power feedback via analog input 1. 6: **AI2 scaled (12.22)**; V2 power feedback via analog input 2. 7: **AI3 scaled (12.32)**; V2 power feedback via analog input 3. 8: **External (25.80)**; V2 power feedback via overriding control system.						
	0 … 8	1ph Power (01.54)	-	1 = 1	n	y	Parameter
99.86	**Leg 3 Power Feedback**						

Index	**Name**						
	Text						
	Range	**Default**	**Unit**	**Scale FbEq16**	**Volatile**	**Change running**	**Type**
	Leg 3, output phase W2 power feedback source. Leg 3 source for the actual power of the power controller. The value can be seen in 27.53 Leg 3 Power Actual:  **Other**; source selection. 0: **NULL**; no power feedback selected, output value is forced to zero. 1: **1ph Power (01.55)**; W2 power feedback measured internally for single controlled load configurations. 2: **3ph Power (01.57)**; 3-phase power feedback measured internally for delta/star load configurations. 3: **1ph Power calculate**; W2 power feedback calculated for single controlled load configurations. 4: **3ph Power calculate**; 3-phase power feedback calculated for delta/star load configurations. 5: **AI1 scaled (12.12)**; W2 power feedback via analog input 1. 6: **AI2 scaled (12.22)**; W2 power feedback via analog input 2. 7: **AI3 scaled (12.32)**; W2 power feedback via analog input 3. 8: **External (27.80)**; W2 power feedback via overriding control system.						
	0 … 8	1ph Power (01.55)	-	1 = 1	n	y	Parameter

Fault tracing

This chapter lists all warning/fault messages including possible causes and corrective actions. By means of this chapter, the causes of all warnings/faults can be identified and corrected. If not, an ABB service representative should be contacted.
Warnings/faults are listed below in separate tables. Each table is sorted by warning and fault code.

Safety

⚠ WARNING! Only qualified electricians are allowed to service the unit. Read the Safety instruction on the first pages of this manual before working on it.

If any of the protective functions has been activated do the following:

- Check that the all Run commands are set to OFF.
- Disconnect the mains voltage and auxiliary voltage, wait at least two minutes and follow the safety rules.
- Remove the cause of the trip.
- Reset the fault.

Attention, injury may occur:

- If the fault is reset while any Run commands are set to ON, the power controller will supply power to the load.
- Even if the power controller has interrupted power to the load, as long as mains voltage is applied to the input terminals U1/V1/W1, voltage may be at the output terminals U2/V2/W2. Make sure, using a multimeter or a similar instrument, that the voltage between the terminals U1/V1/W1 and U2/V2/W2 has dropped to the safe level (+25 V_{DC} or below).
  Otherwise electric shock may occur.

Protective functions

The DCT880 power controller has various protective functions as listed below to prevent the system from going down and reduce system downtime.
One of the protective functions is the fault. Upon detection of an abnormal state a fault code is displayed, and the power controller trips.
A warning displays the warning code but lets the power controller continue the current operation.
If any problem arises, understand the protective functions listed below and follow the procedures given in the following section and onwards for troubleshooting.
All indications are stored in the event log with a time stamp and other information. The event log stores information on the last 5 faults that tripped the unit and the last 20 secondary events that occurred. The event log can be accessed from the main Menu of the control panel. It can also be accessed (and reset) using the PC tool.

Protective function	Description
Warnings	This function detects an abnormal state categorized as a warning. A warning code is displayed, and the power converter continues the current operation without tripping. It is possible to define which abnormal load states should be categorized as a warning using parameters in groups 36 … 38. For details of each warning code, see Warnings and AUX codes.
Fault	This function detects an abnormal state, displays the corresponding fault code, and causes the power controller to trip. For details of each fault code, see Faults and AUX codes.
Auto Reset	When the power controller has stopped because of a trip, this function allows the power controller to automatically reset and restart itself. The number of retries and the waiting time between stop and reset can be specified.
Reset	This function enables a reset of any protective function/faults.

Before proceeding with troubleshooting

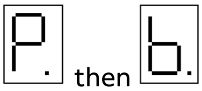
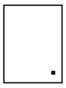
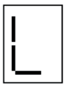
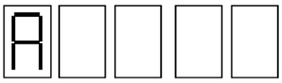
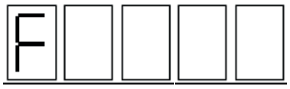
Follow the procedure below to solve problems:

- First, check that the power controller is correctly wired, see chapter Wiring.
- Check, whether a warning- or fault code is displayed on the PC tool, control panel or 7-segment display.
- If a warning code appears, go to the warning description, see Warnings and AUX codes.
- If a fault code appears, go to the fault description, see Faults and AUX codes.
- If any problems persist after the above recovery procedure, contact your ABB representative.

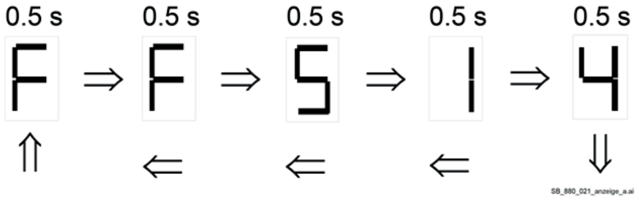
Messages

Display of status messages, fault and warning signals

A seven-segment display (V301) is located on the control board SDCS-CON-H01 and it shows the state of the unit:

	Power up, firmware is not yet running.
	Dot is slowly flashing (1 s), firmware is running. No warnings, no faults.
	Indication while loading firmware into the SDCS-CON-H01.
	Warning.
	Fault .

The seven-segment display shows the event in code. The letters and numbers of multi-character codes are displayed one after the other for 0.5 seconds at a time. Plain text messages are available on the control panel and in the fault logger of Drive composer.



F514 Mains synchronization lost.

Status messages

Status messages will only be indicated on the seven-segment display of the SDCS-CON-H01.

7-segment display	Text on control panel, and Drive composer	Definition
P. then b.	Not available.	Power up, firmware is yet not running.
.	Not available.	Dot is slowly flashing (1 s), firmware is running. No warnings, no faults.
L	Not available.	Indication while loading firmware into the SDCS-CON-H01.

Numerical list of warning and fault codes

If the power controller detects an event, check whether any warning or fault code appears on the PC tool, the control panel or the 7-segment display.

As listed below, some warnings and fault codes are followed by auxiliary codes (see event log in the PC tool) that show detailed problem causes.

Overview

Type	From	To
Notices	7100	7199
Events	8100	8199
User events	8300	8399
DCT880 leg 1 warnings	2100	2199
DCT880 leg 2 warnings	2200	2299
DCT880 leg 3 warnings	2300	2399
DCT800 global warnings	2800	2899
Warnings	1100	1299
User warnings	1300	1399
DCT880 leg 1 faults	3100	3199
DCT880 leg 2 faults	3200	3299
DCT880 leg 3 faults	3300	3399
DCT800 global faults	3800	3899
Faults 1	5200	5299
Faults 2	5500	5599
User faults	5600	5699

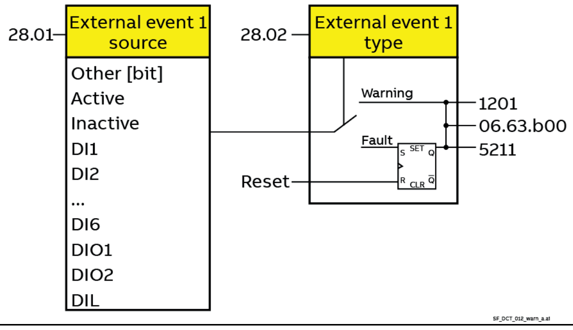
From	To	Type
1100	1299	Warnings
1300	1399	User warnings
2100	2199	DCT880 leg 1 warnings
2200	2299	DCT880 leg 2 warnings
2300	2399	DCT880 leg 3 warnings
2800	2899	DCT800 global warnings
3100	3199	DCT880 leg 1 faults
3200	3299	DCT880 leg 2 faults
3300	3399	DCT880 leg 3 faults
3800	3899	DCT800 global faults
5200	5299	Faults 1
5500	5599	Faults 2
5600	5699	User faults
7100	7199	Notices
8100	8199	Events
8300	8399	User events
FB00	FBFF	Bootloader faults

Warnings and AUX codes

General warnings

Code	Warning/Notice	Cause and what to do
1122	FBA A parameter conflict.	Fieldbus adapter A (FBA A): The unit does not have a functionality requested by a PLC or a requested functionality has not been activated. The settings of parameter groups 50 Fieldbus adapter (FBA) and 51 FBA A settings are not set according to the fieldbus adapter or the device has not been selected. Check: – The PLC programming. – The settings of parameter groups 50 Fieldbus adapter (FBA) and 51 FBA A settings. – The configuration of the fieldbus adapter.
1123	FBA B parameter conflict.	Fieldbus adapter B (FBA B): The unit does not have a functionality requested by a PLC or a requested functionality has not been activated. The settings of parameter groups 50 Fieldbus adapter (FBA) and 54 FBA B settings are not set according to the fieldbus adapter or the device has not been selected. Check: – The PLC programming. – The settings of parameter groups 50 Fieldbus adapter (FBA) and 54 BA B settings. – The configuration of the fieldbus adapter.
1127	AI supervision. Programmable, see 12.03 AI supervision function.	An analog signal is outside the limits specified for the analog input. Check: – The AUX code (format XYY). X specifies the location of the input. – 0: Control board. – 1: I/O extension module 1. – 2: I/O extension module 2 – 3: I/O extension module 3. – 4: …. YY specifies the input and limit. – 01: AI1 under minimum. – 02: AI1 over maximum. – 03: AI2 under minimum. – 04: AI2 over maximum. – 05: AI3 under minimum. – 06: AI3 over maximum. – The signal level at the analog input. – The wiring connected to the input. – Polarity of the connection. – The minimum and maximum limits of the input in groups 12 Standard AI, 14 I/O extension module 1, 15 I/O extension module 2 and 16 I/O extension module 3.
1129	Service active	reserved
1130	Control panel/PC tool link communication.	This alarm occurs even though no control is expected from the control panel/PC tool. The control panel/PC tool connected via USB or the PC tool connected via FENA-11/21 has stopped communicating. Check:

<table>
<tr><th>Code</th><th>Warning/Notice</th><th>Cause and what to do</th></tr>
<tr><td></td><td>Programmable, see 49.05 Communication loss action.</td><td>– The setting of 49.04 Communication loss time.
If needed extend the time out to 2000 ms. Do not forget to verify the setting by means of 49.06 Refresh settings Refresh.
– The setting of 49.05 Communication loss action.
If changed, do not forget to verify the setting by means of 49.06 Refresh settings Refresh.
– The control panel/PC tool connection/cable.
– The control panel connector.
– The mounting platform if being used (e.g. DPMP-01).
– Disconnect and reconnect the control panel/PC tool.</td></tr>
<tr><td>1131</td><td>AI parametrization.</td><td>The current/voltage hardware setting of an analog input does not correspond to the parameter settings.
Check the AUX code. The code identifies the analog input whose settings are in conflict. Adjust either the jumper (J1, J2) setting on the control board or parameters 12.15, 12.25.</td></tr>
<tr><td>1132</td><td>Parameter Setting Mismatch</td><td>The power controller detected a parameter settings mismatch.
See the AUX code and check the indicated parameters.
Related parameters for leg 1:
<table>
<tr><td></td><td>Leg 1</td><td>Leg 2</td><td>Leg 3</td></tr>
<tr><td>Warning word bit</td><td colspan="3">06.62.b00</td></tr>
<tr><td>Supply Configuration</td><td colspan="3">99.04</td></tr>
<tr><td>Load Configuration</td><td colspan="3">99.05</td></tr>
</table></td></tr>
<tr><td rowspan="8">1133</td><td>Internal firmware.</td><td>Internal firmware error.
To reset, cycle the auxiliary power of the unit. If the problem persists, contact your local ABB representative, quoting the AUX code.
Check the AUX code (format YYYY).
YYYY indicates the problem. Actions see below.</td></tr>
<tr><td>0001</td><td>Default setting of parameters wrong.</td></tr>
<tr><td>0002</td><td>Parameter flash memory image too small for all parameters.</td></tr>
<tr><td>0004</td><td>Illegal write attempt on a signal or write-protected parameter.</td></tr>
<tr><td>0006</td><td>Wrong type code.</td></tr>
<tr><td>0007</td><td>An un-initialized interrupt has occurred.</td></tr>
<tr><td>0010</td><td>Wrong parameter value.</td></tr>
<tr><td>0101 … 9999</td><td>The read only parameter, which is being written to by means of a pointer parameter, e.g. 62.51 Data set 10 data 1 selection, Adaptive Program or application program, can be identified by means of the last 4 digits.</td></tr>
<tr><td>1134</td><td>Flash erase speed exceeded</td><td>The flash memory in the memory unit has been erased too frequently. This compromises the lifetime of the memory.
Avoid forcing unnecessary parameter saves by 96.07 Parameter save manually or cyclic parameter writes. E.g. user logger triggering via parameters.
Check the AUX code (format XYYYYZZZ).
X specifies the source of warning.
– 1: Generic flash memory erase supervision.
ZZZ specifies the flash memory subsector number that generated the warning.</td></tr>
<tr><td>1201</td><td>External warning 1.</td><td>There is no problem with the unit itself!
Warning generated by external device 1. See group 28 Unit Faults.</td></tr>
</table>

Code	Warning/Notice	Cause and what to do
	(Editable message text) Programmable, see 28.01 External event 1 source and 28.02 External event 1 type.	Check: – External device 1. – 28.01 External event 1 source. 
1202	External warning 2. (Editable message text) Programmable, see 28.03 External event 2 source and 28.04 External event 2 type.	There is no problem with the unit itself! Warning generated by external device 2. See group 28 Unit Faults. Check: – External device 2. – 31.03 External event 2 source.
1203	External warning 3. (Editable message text) Programmable, see 28.05 External event 3 source and 28.06 External event 3 type.	There is no problem with the unit itself! Warning generated by external device 3. See group 28 Unit Faults. Check: – External device 3. – 31.05 External event 3 source.
1204	External warning 4. (Editable message text) Programmable, see 28.07 External event 4 source and 28.08 External event 4 type.	There is no problem with the unit itself! Warning generated by external device 4. See group 28 Unit Faults. Check: – External device 4. – 31.07 External event 4 source.
1205	External warning 5. (Editable message text) Programmable, see 28.09 External event 5 source and 28.10 External event 5 type.	There is no problem with the unit itself! Warning generated by external device 5. See group 28 Unit Faults. Check: – External device 5. – 31.09 External event 5 source.
1217	Extension AI parameterization.	The hardware current/voltage and parameter settings do not match for an analog input on an I/O extension module. Check the AUX code (format XX0000YY). XX specifies the number of the I/O extension module. – 01: Group 14 I/O extension module 1. – 02: Group 15 I/O extension module 2. – 03: Group 16 I/O extension module 3. YY specifies the analog input on the module. **Example:** In case of I/O extension module 1 and analog input AI1 the AUX code is 01000001). The hardware current/voltage setting on the module is shown by 14.29 AI1 HW switch position. The corresponding parameter setting is in 14.30 AI1 unit selection.

Code	**Warning/Notice**	Cause and what to do
		Adjust either the hardware setting on the module or the parameter to solve the mismatch.
1218	I/O extension configuration.	The I/O extension module types and locations specified by parameters do not match the detected configuration or do not communicate with the unit. Check: – The type and location settings of the modules/board. See parameters 14.01, 14.02, 15.01, 15.02, 16.01 and 16.02. – That the module is properly seated in its slot. – That the module and the slot connector is not damaged. – Try installing the module into another slot. – Check the AUX code (format XXYYYYYY). XX specifies the number of the I/O extension module. – 01: Group 14 I/O extension module 1. – 02: Group 15 I/O extension module 2. – 03: Group 16 I/O extension module 3. YYYYYY indicates the problem. Actions see below.
	000001	Communication with module failed.
	000002	Module/Board not found.
	000003	Configuration of module failed.
	000004	
1220	FBA A communication. Programmable, see 50.02 FBA A comm loss func.	Fieldbus adapter A (FBA A): Cyclical communication between PLC and fieldbus adapter module A or between unit and fieldbus adapter module A is lost. Fault 5223 FBA A communication is only activated after the first data set from the overriding control is received by the unit. Before the first data set is received, only warning 1220 FBA A communication is active. The reason is to suppress unnecessary faults (the startup of the overriding control is usually slower than the one of the units). Check: – The status of the fieldbus communication. See user documentation of the fieldbus interface. – The settings of groups 50 Fieldbus adapter (FBA), 51 FBA A settings, 52 FBA A data in and 53 FBA A data out. – The cable connections. – The fieldbus termination. – The fieldbus adapter. – That the master can communicate.
1221	FBA B communication. Programmable, see 50.32 FBA B comm loss func.	Fieldbus adapter B (FBA B): Cyclical communication between PLC and fieldbus adapter module B or between unit and fieldbus adapter module B is lost. Fault 5224 FBA B communication is only activated after the first data set from the overriding control is received by the unit. Before the first data set is received, only warning 1221 FBA B communication is active. The reason is to suppress unnecessary faults (the startup of the overriding control is usually slower than the one of the units). Check: – The status of the fieldbus communication. See user documentation of the fieldbus interface. – The settings of group 50 Fieldbus adapter (FBA), 54 FBA B settings, 55 FBA B data in and 56 FBA B data out.

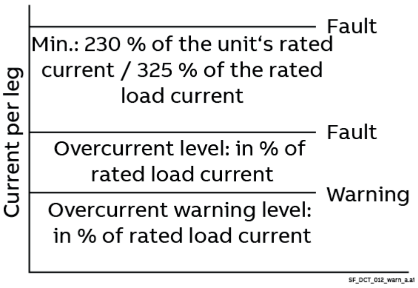
Code	**Warning/Notice**	Cause and what to do
		– The cable connections. – The fieldbus termination. – The fieldbus adapter. – That the master can communicate.
1222	DDCS controller communication. Programmable, see 60.59 DDCS controller comm loss function.	Cyclical communication between DDCS controller and unit is lost or there is no communication at all. The unit is waiting for the very first data set. Check: – The status/settings of the DDCS controller. See user documentation of the DDCS controller. – The adapters between DDCS controller and unit. – The settings of group 60 DDCS communication, 61 D2D and DDCS transmit data and 62 D2D and DDCS receive data. – The fiber optic cable connections.
1223	Master-follower link communication. Programmable, see 60.09 M/F comm loss function.	Cyclical communication between master and a follower (DDCS/D2D) is lost or there is no communication at all. The unit is waiting for the very first data set. Check: – The AUX code. It indicates which node address on the master-follower link is affected. See 60.02 M/F node address in each drive. – The setting of 60.14 M/F follower selection. – The setting of 20.01 Command location. – The settings of group 60 DDCS communication. – The cable connections.
1224	EFB communication. Programmable, see 58.14 Communication loss action.	Cyclical communication to the embedded fieldbus (EFB) is lost. Fault 5225 EFB communication is only activated after the first data set from the overriding control is received by the unit. Before the first data set is received, only warning 1224 EFB communication is active. The reason is to suppress unnecessary faults (the startup of the overriding control is usually slower than the one of the units). Check: – The status of the fieldbus master (online, offline, error etc.). – The settings of group 58 FBA Embedded fieldbus. – The cable connections to connector XD2D on the control board. – The fieldbus termination.
1225	Process PID 1 sleep mode.	The process PID 1 is entering sleep mode. Informative warning.
1226	Process PID 2 sleep mode.	The process PID 2 is entering sleep mode. Informative warning.
1227	Process PID 3 sleep mode.	The process PID 3 is entering sleep mode. Informative warning.
1229	DDCS communication.	DDCS (fiber optic) communication between thyristor power controllers is lost. – Check the status of the thyristor power controllers. – Check settings in group 60 DDCS communication. – Check fiber optic cable connections. If necessary, replace fiber optic cables.
1230	Follower. Programmable, see 60.17 Follower fault action.	A follower has tripped. Check the AUX code to find out the node address of the faulted follower. See 60.02 M/F node address. Correct the fault in the follower.

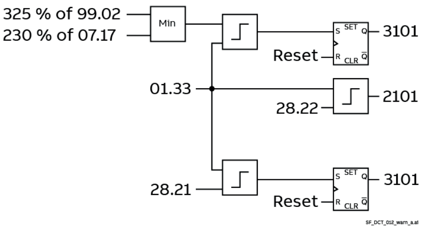
User warnings

Code	Warning/Notice	Cause and what to do
1301	AP Warning 1.	reserved
1302	AP Warning 2.	reserved
1303	AP Warning 3.	reserved
1304	AP Warning 4.	reserved
1305	AP Warning 5.	reserved

Leg 1 warnings

Code	Warning/Notice	Cause and what to do
2101	Leg 1 Overcurrent.	
	Related codes:	2101, 2201, 2301, 3101, 3201, 3301.
	Problem:	The power controller detected an abnormal high RMS current.
	Description (for leg 1):	Related parameters see below.

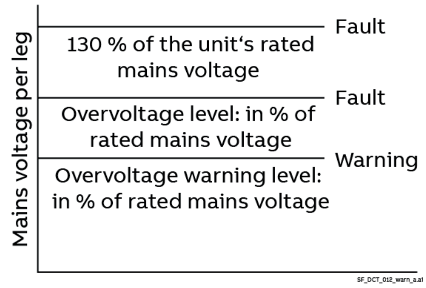


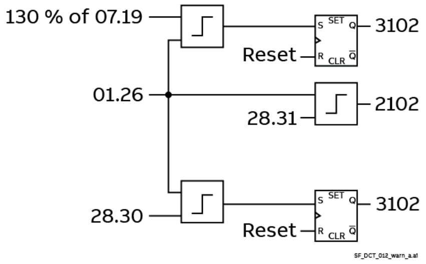


	Leg 1	Leg 2	Leg 3
Unit output current scaling set	07.17		
Unit output overcurrent level	07.18		
Load Current	99.02		
Overcurrent Fault level	28.21	28.23	28.25
Overcurrent Warning level	28.22	28.24	28.26
Fault Word	06.66.b00	06.67.b00	06.68.b00
Warning word	06.71.b00	06.72.b00	06.73.b00
Current RMS relative actual	01.33	01.34	01.35
Fault Function Leg 2 / Leg 3	-	28.20	

Code	Warning/Notice	Cause and what to do
	Possible causes:	What to check and suggested measures.
	Wrong parameter setting:	Check parameters as listed above.
	A ground fault has occurred at the output:	Disconnect the wiring from the output terminals (U2/V2/W2) and perform a high voltage (megger) test. Remove the grounded parts (including replacement of the wires, relay terminals and load elements).
	Cold resistance is too low:	In phase angle control (see 99.10, 99.25, 99.40 Leg x Control Mode): – Increase the phase angle soft start ramp (see 99.16, 99.31, 99.46 Leg x Phase Angle Soft Start Ramp). In full wave fix cycle control (see 99.10, 99.25, 99.40 Leg x Control Mode): – Use Start mode: Soft Start (see 99.12, 99.27, 99.32 Leg x Start Mode) and set up the soft start ramp.
	The load resistance is too low for the reached output voltage resulting in too high current:	Set up the current limiter in Groups 30/31/32.
2102	Leg 1 Mains Overvoltage	
	Related codes:	2102, 2202, 2302, 3102, 3202, 3302.
	Problem:	The power controller detected an abnormal high input voltage.
	Description (for leg 1):	Related parameters see below.

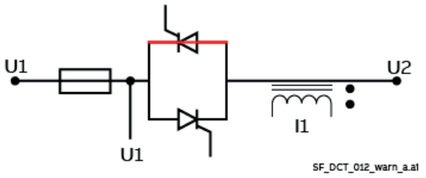
Code	Warning/Notice	Cause and what to do





	Leg 1	Leg 2	Leg 3
Unit input voltage scaling set	07.19		
Supply Voltage	99.01		
Mains Overvoltage Fault level	28.30	28.32	28.34
Mains Overvoltage Warring level	28.31	28.33	28.35
Fault Word	06.66.b01	06.67.b01	06.68.b01
Warning word	06.71.b01	06.72.b01	06.73.b01
Mains Voltage relative	01.26	01.27	01.28
Fault Function Leg 2 / Leg 3	-	28.20	

Code	Warning/Notice	Cause and what to do
	Possible causes:	What to check and suggested measures.
	Wrong parameter setting:	Check parameters as listed above.
	Mains voltage too high:	Measure the mains voltage.
	Mains voltage out of specification:	Check the nameplate of the DCT880.
	Measurement fuse broken:	Check fuses (F100 … F102) on the SDCS-PIN-H11.
2103	Leg 1 Thyristor Short Circuit.	
	Related codes:	2103, 2203, 2303, 3103, 3203, 3303.
	Problem:	The power controller detected a short-circuited thyristor.
	Description (for leg 1):	Related parameters see below.

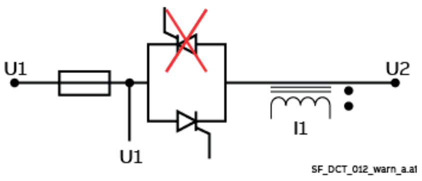


	Leg 1	Leg 2	Leg 3
Fault Word	06.66.b02	06.67.b02	06.68.b02
Warning word	06.71.b02	06.72.b02	06.73.b02
AVR Current forward Thyristor relative	01.71	01.73	01.75
AVR Current reverse Thyristor relative	01.72	01.74	01.76

Code	Warning/Notice	Cause and what to do
	Possible causes:	What to check and suggested measures.
	Thyristor broken:	Exchange Thyristor.
2104	Leg 1 Thyristor Open Circuit	
	Related codes:	2104, 2204, 2304, 3104, 3204, 3304.
	Problem:	The power controller detected an open thyristor.
	Description (for leg 1):	Related parameters see below.

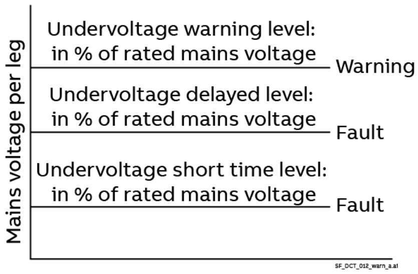
	Leg 1	Leg 2	Leg 3

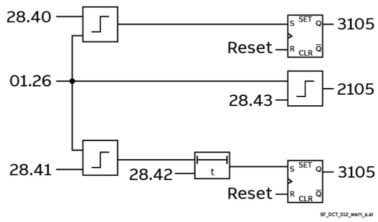
Code	Warning/Notice	Cause and what to do



Fault Word	06.66.b03	06.67.b03	06.68.b03
Warning word	06.71.b03	06.72.b03	06.73.b03
AVR Current forward Thyristor relative	01.71	01.73	01.75
AVR Current reverse Thyristor relative	01.72	01.74	01.76

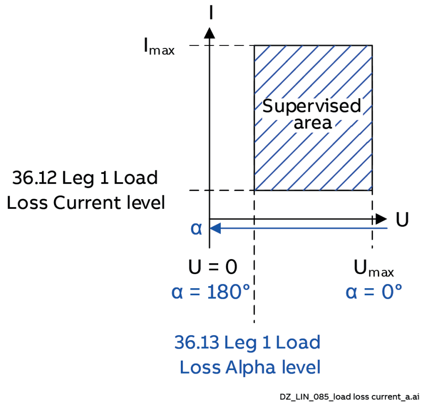
Code	Warning/Notice	Cause and what to do
	Possible causes:	What to check and suggested measures.
	Thyristor broken:	Exchange Thyristor.
2105	Leg 1 Mains Undervoltage	
	Related codes:	2105, 2205, 2305, 3105, 3205, 3305.
	Event active:	After Enable command 2 s delay, after Run command not delayed, see 06.08 Used Main Control Word.
	Problem:	The power controller detected an abnormal low input voltage.
	Description (for leg 1):	Related parameters see below.





	Leg 1	Leg 2	Leg 3
Supply Voltage	99.01		
Mains Undervoltage short time Fault level	28.40	28.44	28.48
Enable Local I/O	19.01	19.03	19.05
Mains Undervoltage Fault level	28.41	28.45	28.49
Undervoltage Fault delay time	28.42	28.46	28.50
Undervoltage Warning level	28.43	28.47	28.51
Fault Word	06.66.b04	06.67.b04	06.68.b04
Warning word	06.71.b04	06.72.b04	06.73.b04
Mains Voltage relative	01.26	01.27	01.28
Fault Function Leg 2 / Leg 3	-	28.20	

Code	Warning/Notice	Cause and what to do
	Possible causes:	What to check and suggested measures.
	Mains contactor is controlled by the overriding control:	Suppress the short time mains undervoltage fault by means of 19.01 Leg 1 Enable Local I/O = 19.03 Leg 2 Enable Local I/O = 19.05 Leg 3 Enable Local I/O = Mains ON.
	Wrong parameter setting:	Check parameters as listed above.
	Mains voltage too low:	Measure the mains voltage.
	Possible power dip:	Check factory recordings/information.
	Mains voltage out of specification:	Check the nameplate of the DCT880.
	External/Internal line fuse broken:	Check and exchange external/internal fuses.
2106	Leg 1 Internal Semiconductor Fuse Open Circuit	reserved
2151	Leg 1 Load Loss.	

<table>
<tr><th>Code</th><th>Warning/Notice</th><th>Cause and what to do</th></tr>
<tr><td></td><td>Programmable, see 36.10 Leg 1 Load Loss Function.</td><td></td></tr>
<tr><td></td><td>Related codes:</td><td>2151, 2251, 2351, 3151, 3251, 3351.</td></tr>
<tr><td></td><td>Event active:</td><td>At Run command, see 06.08 Used Main Control Word.</td></tr>
<tr><td></td><td>Problem:</td><td>The power controller detected a total load loss.</td></tr>
<tr><td></td><td>Description (for leg 1):</td><td>Related parameters see below.</td></tr>
<tr><td colspan="2">
</td><td>
<table>
<tr><th></th><th>Leg 1</th><th>Leg 2</th><th>Leg 3</th></tr>
<tr><td>Load Loss Function</td><td>36.10</td><td>37.10</td><td>38.10</td></tr>
<tr><td>Load Loss activation time</td><td>36.11</td><td>37.11</td><td>38.11</td></tr>
<tr><td>Load Loss Current level</td><td>36.12</td><td>37.12</td><td>38.12</td></tr>
<tr><td>Load Loss Alpha level</td><td>36.13</td><td>37.13</td><td>38.13</td></tr>
<tr><td>Load Fault Word</td><td>06.76.b00</td><td>06.77.b00</td><td>06.78.b00</td></tr>
<tr><td>Load Warning Word</td><td>06.81.b00</td><td>06.82.b00</td><td>06.83.b00</td></tr>
<tr><td>Current RMS actual</td><td>01.30</td><td>01.31</td><td>01.32</td></tr>
<tr><td>Power actual</td><td>01.50</td><td>01.51</td><td>01.52</td></tr>
<tr><td>Resistance actual</td><td>36.01</td><td>37.01</td><td>38.01</td></tr>
<tr><td>3ph Resistance actual</td><td>36.02</td><td>37.02</td><td>38.02</td></tr>
</table></td></tr>
<tr><td></td><td>Possible causes:</td><td>What to check and suggested measures.</td></tr>
<tr><td></td><td>Wrong parameter setting:</td><td>Check parameters as listed above.</td></tr>
<tr><td></td><td>Load:</td><td>Check the loads and their connections.</td></tr>
<tr><td>2152</td><td>Leg 1 Partial Load Loss.

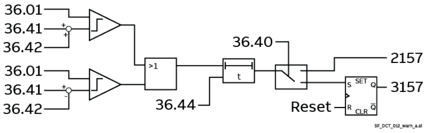
Programmable, see 36.20 Leg 1 Partial Load Loss Function.</td><td></td></tr>
<tr><td></td><td>Related codes:</td><td>2152, 2252, 2352, 3152, 3252, 3352.</td></tr>
<tr><td></td><td>Event active:</td><td>At Run command, see 06.08 Used Main Control Word.</td></tr>
<tr><td></td><td>Problem:</td><td>The power controller detected a partial load loss. A static change in resistance of the load is detected.</td></tr>
<tr><td></td><td>Description (for leg 1):</td><td>Related parameters see below.</td></tr>
<tr><td></td><td>All elements must be connected in parallel and must have same characteristics and identical impedance.</td><td>
<table>
<tr><th></th><th>Leg 1</th><th>Leg 2</th><th>Leg 3</th></tr>
<tr><td>Parallel Elements</td><td>36.15</td><td>37.15</td><td>38.15</td></tr>
<tr><td>Partial Load Loss Function</td><td>36.20</td><td>37.20</td><td>38.20</td></tr>
<tr><td>Partial Load Loss activation time</td><td>36.21</td><td>37.21</td><td>38.21</td></tr>
<tr><td>Partial Load Loss level</td><td>36.22</td><td>37.22</td><td>38.22</td></tr>
<tr><td>Partial Load Loss delay time</td><td>36.23</td><td>37.23</td><td>38.23</td></tr>
<tr><td>Load Fault Word</td><td>06.76.b01</td><td>06.77.b01</td><td>06.78.b01</td></tr>
<tr><td>Load Warning Word</td><td>06.81.b01</td><td>06.82.b01</td><td>06.83.b01</td></tr>
<tr><td>Current RMS actual</td><td>01.30</td><td>01.31</td><td>01.32</td></tr>
<tr><td>Power actual</td><td>01.50</td><td>01.51</td><td>01.52</td></tr>
</table></td></tr>
</table>

<table>
<tr><th>Code</th><th>Warning/Notice</th><th>Cause and what to do</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td>Resistance actual</td><td>36.01</td><td>37.01</td><td>38.01</td></tr>
<tr><td>3ph Resistance actual</td><td>36.02</td><td>37.02</td><td>38.02</td></tr>
<tr><td>Initial resistance</td><td>36.41</td><td>37.41</td><td>37.41</td></tr>
</table>
</td></tr>
<tr><td></td><td>Possible causes:</td><td>What to check and suggested measures.</td></tr>
<tr><td></td><td>Wrong parameter setting:</td><td>Check parameters as listed above.</td></tr>
<tr><td></td><td>Load:</td><td>Check the loads and their connections.</td></tr>
<tr><td>2153</td><td>Leg 1 Partial Load Short Circuit.

Programmable, see 36.25 Leg 1 Partial Load Short Function.</td><td></td></tr>
<tr><td></td><td>Related codes:</td><td>2153, 2253, 2353, 3153, 3253, 3353.</td></tr>
<tr><td></td><td>Event active:</td><td>At Run command, see 06.08 Used Main Control Word.</td></tr>
<tr><td></td><td>Problem:</td><td>The power controller detected a partial load short circuit. A static change in resistance of the load is detected.</td></tr>
<tr><td></td><td>Description (for leg 1):</td><td>Related parameters see below.</td></tr>
<tr><td></td><td>All elements must be connected in series and must have same characteristics and identical impedance values.</td><td>
<table>
<tr><th></th><th>Leg 1</th><th>Leg 2</th><th>Leg 3</th></tr>
<tr><td>Serial Elements</td><td>36.16</td><td>37.16</td><td>38.16</td></tr>
<tr><td>Partial Load Short Function</td><td>36.25</td><td>37.25</td><td>38.25</td></tr>
<tr><td>Partial Load Short activation time</td><td>36.26</td><td>37.26</td><td>38.26</td></tr>
<tr><td>Partial Load Short level</td><td>36.27</td><td>37.27</td><td>38.27</td></tr>
<tr><td>Partial Load Short delay time</td><td>36.28</td><td>37.28</td><td>38.28</td></tr>
<tr><td>Load Fault Word</td><td>06.76.b02</td><td>06.77.b02</td><td>06.78.b02</td></tr>
<tr><td>Load Warning Word</td><td>06.81.b02</td><td>06.82.b02</td><td>06.83.b02</td></tr>
<tr><td>Current RMS actual</td><td>01.30</td><td>01.31</td><td>01.32</td></tr>
<tr><td>Power actual</td><td>01.50</td><td>01.51</td><td>01.52</td></tr>
<tr><td>Resistance actual</td><td>36.01</td><td>37.01</td><td>38.01</td></tr>
<tr><td>3ph Resistance actual</td><td>36.02</td><td>37.02</td><td>38.02</td></tr>
<tr><td>Initial resistance</td><td>36.41</td><td>37.41</td><td>37.41</td></tr>
</table>
</td></tr>
<tr><td></td><td>Possible causes:</td><td>What to check and suggested measures.</td></tr>
<tr><td></td><td>Wrong parameter setting:</td><td>Check parameters as listed above.</td></tr>
<tr><td></td><td>Load:</td><td>Check the loads and their connections.</td></tr>
<tr><td>2154</td><td>Leg 1 Unit Thermal Overload.

Programmable, see 36.35 Leg 1 Unit Overload Function.</td><td></td></tr>
<tr><td></td><td>Related codes:</td><td>2154, 2254, 2354, 3154, 3254, 3354.</td></tr>
<tr><td></td><td>Event active:</td><td>At Run command, see 06.08 Used Main Control Word.</td></tr>
</table>

<table>
<tr><th>Code</th><th>Warning/Notice</th><th>Cause and what to do</th></tr>
<tr><td></td><td>Problem:</td><td>The power controller detected a thermal overload in the unit. The load current is constantly over the unit’s rated current.</td></tr>
<tr><td></td><td>Description (for leg 1):</td><td>Related parameters see below.</td></tr>
<tr><td></td><td>-</td><td>
<table>
<tr><th></th><th>Leg 1</th><th>Leg 2</th><th>Leg 3</th></tr>
<tr><td>Unit output current scaling set</td><td>07.17</td><td></td><td></td></tr>
<tr><td>Unit Overload Function</td><td>36.35</td><td>37.35</td><td>38.35</td></tr>
<tr><td>Unit Overload level</td><td>36.36</td><td>37.36</td><td>38.36</td></tr>
<tr><td>Unit Overload time</td><td>36.37</td><td>37.37</td><td>38.37</td></tr>
<tr><td>Current RMS actual</td><td>01.30</td><td>01.31</td><td>01.32</td></tr>
</table>
</td></tr>
<tr><td></td><td>Possible causes:</td><td>What to check and suggested measures.</td></tr>
<tr><td></td><td>Wrong parameter setting:</td><td>Check parameters as listed above.</td></tr>
<tr><td></td><td>Unit out of specification:</td><td>Check the nameplate of the DCT880.</td></tr>
<tr><td></td><td>The load resistance is too low for the reached output voltage, resulting in too high current.</td><td>Set up the current limiter in Groups 30/31/32.</td></tr>
<tr><td>2155</td><td>Leg 1 Load Overload.
Programmable, see 36.30 Leg 1 Load Overload Function.</td><td></td></tr>
<tr><td></td><td>Related codes:</td><td>2155, 2255, 2355, 3155, 3255, 3355.</td></tr>
<tr><td></td><td>Event active:</td><td>At Run command, see 06.08 Used Main Control Word.</td></tr>
<tr><td></td><td>Problem:</td><td>The power controller detected a load overload (I^2t integral).</td></tr>
<tr><td></td><td>Description (for leg 1):</td><td>Related parameters see below.</td></tr>
<tr><td></td><td>-</td><td>
<table>
<tr><th></th><th>Leg 1</th><th>Leg 2</th><th>Leg 3</th></tr>
<tr><td>Load Overload Function</td><td>36.30</td><td>37.30</td><td>38.30</td></tr>
<tr><td>Load Overload level</td><td>36.31</td><td>37.31</td><td>38.31</td></tr>
<tr><td>Load Overload time</td><td>36.32</td><td>37.32</td><td>38.32</td></tr>
<tr><td>Load Fault Word</td><td>06.76.b03</td><td>06.77.b03</td><td>06.78.b03</td></tr>
<tr><td>Load Warning Word</td><td>06.81.b03</td><td>06.82.b03</td><td>06.83.b03</td></tr>
<tr><td>Current RMS relative actual</td><td>01.33</td><td>01.34</td><td>01.35</td></tr>
</table>
</td></tr>
<tr><td></td><td>Possible causes:</td><td>What to check and suggested measures.</td></tr>
<tr><td></td><td>Wrong parameter setting:</td><td>Check parameters as listed above.</td></tr>
<tr><td></td><td>Load:</td><td>Check the loads and their connections.
Check the setting of 99.02 Load Current.</td></tr>
<tr><td>2157</td><td>Leg 1 Load Aging.
Programmable, see 36.40 Leg 1 Resistance change function.</td><td></td></tr>
<tr><td></td><td>Related codes:</td><td>2157, 2257, 2357, 3157, 3257, 3357.</td></tr>
</table>

<table>
<tr><th>Code</th><th>Warning/Notice</th><th>Cause and what to do</th></tr>
<tr><td></td><td>Event active:</td><td>At Run command, see 06.08 Used Main Control Word.</td></tr>
<tr><td></td><td>Problem:</td><td>The power controller detected a static change in the load resistance.</td></tr>
<tr><td></td><td>Description (for leg 1):</td><td>Related parameters see below.</td></tr>
<tr><td colspan="2">
</td><td>
<table>
<tr><th></th><th>Leg 1</th><th>Leg 2</th><th>Leg 3</th></tr>
<tr><td>Resistance change function</td><td>36.40</td><td>37.40</td><td>38.40</td></tr>
<tr><td>Initial Resistance</td><td>36.41</td><td>37.41</td><td>38.41</td></tr>
<tr><td>Resistance change level</td><td>36.42</td><td>37.42</td><td>38.42</td></tr>
<tr><td>Resistance Change activation time</td><td>36.44</td><td>37.44</td><td>38.44</td></tr>
<tr><td>Load Fault Word</td><td>06.76.b04</td><td>06.77.b04</td><td>06.78.b04</td></tr>
<tr><td>Load Warning Word</td><td>06.81.b04</td><td>06.82.b04</td><td>06.83.b04</td></tr>
<tr><td>Resistance actual</td><td>36.01</td><td>37.01</td><td>38.01</td></tr>
<tr><td>3ph Resistance actual</td><td>36.02</td><td>37.02</td><td>38.02</td></tr>
</table>
</td></tr>
<tr><td></td><td>Possible causes:</td><td>What to check and suggested measures.</td></tr>
<tr><td></td><td>Wrong parameter setting:</td><td>Check parameters as listed above.</td></tr>
<tr><td></td><td>Load:</td><td>Check the loads and their connections.</td></tr>
<tr><td>2158</td><td>Leg 1 Load Current Imbalance.
Programmable, see 36.50 Leg 1 Load Current Imbalance Function</td><td></td></tr>
<tr><td></td><td>Related codes:</td><td>2158, 2258, 2358, 3158, 3258, 3358.</td></tr>
<tr><td></td><td>Event active:</td><td>At Run command, see 06.08 Used Main Control Word.</td></tr>
<tr><td></td><td>Problem:</td><td>The power controller detected a load current imbalance in a symmetrical 3-phase load configuration. The highest and lowest load current are compared, and they are out of range.</td></tr>
<tr><td></td><td>-</td><td>
<table>
<tr><th></th><th>Leg 1</th><th>Leg 2</th><th>Leg 3</th></tr>
<tr><td>Load Current Imbalance Function</td><td>36.50</td><td>-</td><td>-</td></tr>
<tr><td>Load Current Imbalance activation time</td><td>36.51</td><td>-</td><td>-</td></tr>
<tr><td>Load Current Imbalance level</td><td>36.52</td><td>-</td><td>-</td></tr>
<tr><td>Load Current Imbalance delay time</td><td>36.53</td><td>-</td><td>-</td></tr>
<tr><td>Load Fault Word</td><td>06.76.b05</td><td>06.77.b05</td><td>06.78.b05</td></tr>
<tr><td>Load Warning Word</td><td>06.81.b05</td><td>06.82.b05</td><td>06.83.b05</td></tr>
<tr><td>Current RMS relative actual</td><td>01.33</td><td>01.34</td><td>01.35</td></tr>
</table>
</td></tr>
<tr><td></td><td>Possible causes:</td><td>What to check and suggested measures.</td></tr>
<tr><td></td><td>Wrong parameter setting:</td><td>Check parameters as listed above.</td></tr>
<tr><td></td><td>Load:</td><td>Check the loads and their connections.</td></tr>
</table>

Leg 2 warnings

Code	Warning/Notice	Cause and what to do
2201	Leg 2 Overcurrent.	See warning 2101.
2202	Leg 2 Mains Overvoltage.	See warning 2102.
2203	Leg 2 Thyristor Short Circuit.	See warning 2103.
2204	Leg 2 Thyristor Open Circuit.	See warning 2104.
2205	Leg 2 Mains Undervoltage.	See warning 2105.
2206	Leg 2 Internal Semiconductor Fuse Open Circuit.	See warning 2106.
2251	Leg 2 Load Loss Programmable, see 37.10 Leg 2 Load Loss Function.	See warning 2151.
2252	Leg 2 Partial Load Loss. Programmable, see 37.20 Leg 2 Partial Load Loss Function.	See warning 2152.
2253	Leg 2 Partial Load Short Circuit. Programmable, see 37.25 Leg 2 Partial Load Short Function.	See warning 2153.
2254	Leg 2 Unit Thermal Overload. Programmable, see 37.35 Leg 2 Unit Overload Function.	See warning 2154.
2255	Leg 2 Load Overload. Programmable, see 37.30 Leg 2 Load Overload Function.	See warning 2155.
2257	Leg 2 Load Aging. Programmable, see 37.40 Leg 2 Resistance change function.	See warning 2157.
2258	Leg 2 Load Current Imbalance. Programmable, see 36.50 Leg 1 Load Current Imbalance Function.	See warning 2158.

Leg 3 warnings

Code	Warning/Notice	Cause and what to do
2201	Leg 3 Overcurrent.	See warning 2101.
2202	Leg 3 Mains Overvoltage.	See warning 2102.
2203	Leg 3 Thyristor Short Circuit.	See warning 2103.
2204	Leg 3 Thyristor Open Circuit.	See warning 2104.
2205	Leg 3 Mains Undervoltage.	See warning 2105.
2206	Leg 3 Internal Semiconductor Fuse Open Circuit.	See warning 2106.
2251	Leg 3 Load Loss Programmable, see 38.10 Leg 3 Load Loss Function.	See warning 2151.
2252	Leg 3 Partial Load Loss. Programmable, see 38.20 Leg 3 Partial Load Loss Function.	See warning 2152.
2253	Leg 3 Partial Load Short Circuit. Programmable, see 38.25 Leg 3 Partial Load Short Function.	See warning 2153.
2254	Leg 3 Unit Thermal Overload. Programmable, see 38.35 Leg 3 Unit Overload Function.	See warning 2154.
2255	Leg 3 Load Overload.	See warning 2155.

Code	Warning/Notice	Cause and what to do
	Programmable, see 38.30 Leg 3 Load Overload Function.	
2257	Leg 3 Load Aging. Programmable, see 38.40 Leg 3 Resistance change function.	See warning 2157.
2258	Leg 3 Load Current Imbalance. Programmable, see 36.50 Leg 1 Load Current Imbalance Function.	See warning 2158.

Global warnings

Code	Warning/Notice	Cause and what to do
2804	Power Part Overtemperature	Excessive power part temperature. Wait until the power part is cooled down. Shutdown temperature, see 07.20 Unit max power part temp set. The power part overtemperature warning will already appear at approximately 5°C below the shutdown temperature. Check: – The value of 05.50 Power part temperature. – The ambient conditions (e.g. ambient temperature). – The airflow and fan operation. – The unit fan supply voltage. – The unit fan direction of rotation. – The unit fan components. – The heatsink fins for dust pick-up. – The unit cooling air inlet (e.g. filters). – The unit cooling air outlet. – For open unit doors. – Inadmissible load cycle. – When 95.16 Set: Unit type code = W00-0000-00, that 95.20 Set: Unit max power part temp is set properly.
2850	PowerOpt comm timeout	See DCT880 Power Optimizer Control Manual (3ADW000441).
2851	PowerOpt Ping	
2852	PowerOpt Missing	
2853	PowOpt sync loss	
8130	Service started	Is shown when a service is requested. E.g. 99.07 Service Mode = Thyristor Diagnosis.
8131	Service success	Is shown when a requested service is successfully finished. E.g. 99.07 Service Mode = Thyristor Diagnosis.
8132	Service failed	Is shown when a requested service failed. E.g. 99.07 Service Mode = Thyristor Diagnosis.
8140	Leg 1 Thyristor Short Circuit	Thyristor diagnosis detected at least one short-circuited thyristor in leg 1, see 99.07 Service Mode = Thyristor Diagnosis.
8141	Leg 2 Thyristor Short Circuit	Thyristor diagnosis detected at least one short-circuited thyristor in leg 2, see 99.07 Service Mode = Thyristor Diagnosis.
8142	Leg 3 Thyristor Short Circuit	Thyristor diagnosis detected at least one short-circuited thyristor in leg 3, see 99.07 Service Mode = Thyristor Diagnosis.
8143	Leg 1 Thyristor Open Circuit	Thyristor diagnosis detected at least one open thyristor in leg 1, see 99.07 Service Mode = Thyristor Diagnosis.
8144	Leg 2 Thyristor Open Circuit	Thyristor diagnosis detected at least one open thyristor in leg 2, see 99.07 Service Mode = Thyristor Diagnosis.

Code	Warning/Notice	Cause and what to do
8145	Leg 3 Thyristor Open Circuit	Thyristor diagnosis detected at least one open thyristor in leg 3, see 99.07 Service Mode = Thyristor Diagnosis.
8146	Leg 1 Internal Semiconductor Fuse Open Circuit	Thyristor diagnosis detected at least one open semiconductor fuse in leg 1, see 99.07 Service Mode = Thyristor Diagnosis.
8147	Leg 2 Internal Semiconductor Fuse Open Circuit	Thyristor diagnosis detected at least one open semiconductor fuse in leg 2, see 99.07 Service Mode = Thyristor Diagnosis.
8148	Leg 3 Internal Semiconductor Fuse Open Circuit	Thyristor diagnosis detected at least one open semiconductor fuse in leg 3, see 99.07 Service Mode = Thyristor Diagnosis.

User events

Code	Warning/Notice	Cause and what to do
8301	AP Pure Event 1.	reserved
8302	AP Pure Event 2.	reserved
8303	AP Pure Event 3.	reserved
8304	AP Pure Event 4.	reserved
8305	AP Pure Event 5.	reserved

Faults and AUX codes

Leg 1 faults

Code	Fault/Notice	Cause and what to do
3101	Leg 1 Overcurrent.	See warning 2101.
3102	Leg 1 Mains Overvoltage.	See warning 2102.
3103	Leg 1 Thyristor Short Circuit.	See warning 2103.
3104	Leg 1 Thyristor Open Circuit.	See warning 2104.
3105	Leg 1 Mains Undervoltage.	See warning 2105.
3106	Leg 1 Internal Semiconductor Fuse Open Circuit.	See warning 2106.
3151	Leg 1 Load Loss Programmable, see 36.10 Leg 1 Load Loss Function.	See warning 2151.
3152	Leg 1 Partial Load Loss. Programmable, see 36.20 Leg 1 Partial Load Loss Function.	See warning 2152.
3153	Leg 1 Partial Load Short Circuit. Programmable, see 36.25 Leg 1 Partial Load Short Function.	See warning 2153.
3154	Leg 1 Unit Thermal Overload. Programmable, see 36.35 Leg 1 Unit Overload Function.	See warning 2154.
3155	Leg 1 Load Overload. Programmable, see 36.30 Leg 1 Load Overload Function.	See warning 2155.
3157	Leg 1 Load Aging. Programmable, see 36.40 Leg 1 Resistance change function.	See warning 2157.
3158	Leg 1 Load Current Imbalance.	See warning 2158.

Code	Fault/Notice	Cause and what to do
	Programmable, see 36.50 Leg 1 Load Current Imbalance Function.	

Leg 2 faults

Code	Fault/Notice	Cause and what to do
3201	Leg 2 Overcurrent.	See warning 2101.
3202	Leg 2 Mains Overvoltage.	See warning 2102.
3203	Leg 2 Thyristor Short Circuit.	See warning 2103.
3204	Leg 2 Thyristor Open Circuit.	See warning 2104.
3205	Leg 2 Mains Undervoltage.	See warning 2105.
3206	Leg 2 Internal Semiconductor Fuse Open Circuit.	See warning 2106.
3251	Leg 2 Load Loss Programmable, see 37.10 Leg 2 Load Loss Function.	See warning 2151.
3252	Leg 2 Partial Load Loss. Programmable, see 37.20 Leg 2 Partial Load Loss Function.	See warning 2152.
3253	Leg 2 Partial Load Short Circuit. Programmable, see 37.25 Leg 2 Partial Load Short Function.	See warning 2153.
3254	Leg 2 Unit Thermal Overload. Programmable, see 37.35 Leg 2 Unit Overload Function.	See warning 2154.
3255	Leg 2 Load Overload. Programmable, see 37.30 Leg 2 Load Overload Function.	See warning 2155.
3257	Leg 2 Load Aging. Programmable, see 37.40 Leg 2 Resistance change function.	See warning 2157.
3258	Leg 2 Load Current Imbalance. Programmable, see 36.50 Leg 1 Load Current Imbalance Function.	See warning 2158.

Leg 3 faults

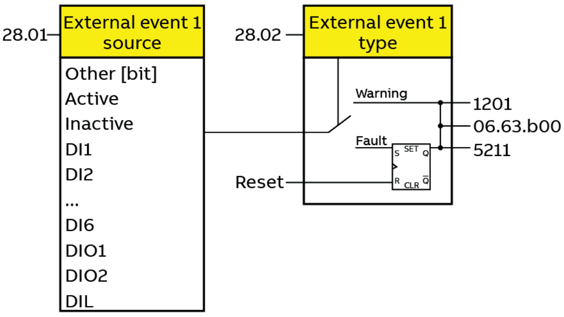
Code	Fault/Notice	Cause and what to do
3301	Leg 3 Overcurrent.	See warning 2101.
3302	Leg 3 Mains Overvoltage.	See warning 2102.
3303	Leg 3 Thyristor Short Circuit.	See warning 2103.
3304	Leg 3 Thyristor Open Circuit.	See warning 2104.
3305	Leg 3 Mains Undervoltage.	See warning 2105.
3306	Leg 3 Internal Semiconductor Fuse Open Circuit.	See warning 2106.
3351	Leg 3 Load Loss Programmable, see 38.10 Leg 2 Load Loss Function.	See warning 2151.
3352	Leg 3 Partial Load Loss. Programmable, see 38.20 Leg 2 Partial Load Loss Function.	See warning 2152.
3353	Leg 3 Partial Load Short Circuit. Programmable, see 38.25 Leg 2 Partial Load Short Function.	See warning 2153.
3354	Leg 3 Unit Thermal Overload.	See warning 2154.

Code	Fault/Notice	Cause and what to do
	Programmable, see 38.35 Leg 2 Unit Overload Function.	
3355	Leg 3 Load Overload. Programmable, see 38.30 Leg 2 Load Overload Function.	See warning 2155.
3357	Leg 3 Load Aging. Programmable, see 38.40 Leg 2 Resistance change function.	See warning 2157.
3358	Leg 3 Load Current Imbalance. Programmable, see 36.50 Leg 1 Load Current Imbalance Function.	See warning 2158.

General faults

Code	Fault/Notice	Cause and what to do
3804	Power Part Overtemperature	Excessive power part temperature. Wait until the power part is cooled down. Shutdown temperature, see 07.20 Unit max power part temp set. The power part overtemperature warning will already appear at approximately 5°C below the shutdown temperature. Check: – The value of 05.50 Power part temperature. – The ambient conditions (e.g. ambient temperature). – The airflow and fan operation. – The unit fan supply voltage. – The unit fan direction of rotation. – The unit fan components. – The heatsink fins for dust pick-up. – The unit cooling air inlet (e.g. filters). – The unit cooling air outlet. – For open unit doors. – Inadmissible load cycle. When 95.16 Set: Unit type code = W00-0000-00, that 95.20 Set: Unit max power part temp is set properly.

3811	Synchronization	The synchronization with the mains has been lost.
		Check:
		– That the supply configuration fits to the setting of 99.04 Supply Configuration.
		– That 99.01 Supply Voltage has the proper value after an On command has been given.
		– The mains frequency (50 Hz ±5 Hz; 60 Hz ±5 Hz) and stability (df/dt = 17 %/s) see 95.30 PLL input deviation and 95.31 PLL output, internal mains frequency.
		– The condition of the mains (voltage, cabling, fuses, switchgear).
		– For mains supply imbalance.
		– For loose mains cable connections.
		– That the mains contactor closes and opens.
		– For a ground fault.
		– The AUX code:
		    – 1: No synchronization signal.
		    – 2: Phase sequence lost.
		    – 3: Deviation level of PLL exceeded. See 95.35 PLL deviation level.

Code	Fault/Notice	Cause and what to do
3850	PowerOpt comm timeout	See DCT880 Power Optimizer Control Manual (3ADW000441).
3853	PowOpt sync loss	
5211	External fault 1. (Editable message text) Programmable, see 28.01 External event 1 source and 28.02 External event 1 type.	There is no problem with the unit itself! Fault generated by external device 1. See group 28 Unit Faults. Check: – External device 1. – 28.01 External event 1 source. 
5212	External fault 2. (Editable message text) Programmable, see 28.03 External event 2 source and 28.04 External event 2 type.	There is no problem with the unit itself! Fault generated by external device 2. See group 28 Unit Faults. Check: – External device 2. – 31.03 External event 2 source.
5213	External fault 3. (Editable message text) Programmable, see 28.05 External event 3 source and 28.06 External event 3 type.	There is no problem with the unit itself! Fault generated by external device 3. See group 28 Unit Faults. Check: – External device 3. – 31.05 External event 3 source.
5214	External fault 4. (Editable message text) Programmable, see 28.07 External event 4 source and 28.08 External event 4 type.	There is no problem with the unit itself! Fault generated by external device 4. See group 28 Unit Faults. Check: – External device 4. – 31.07 External event 4 source.
5215	External fault 5. (Editable message text) Programmable, see 28.09 External event 5 source and 28.10 External event 5 type.	There is no problem with the unit itself! Fault generated by external device 5. See group 28 Unit Faults. Check: – External device 5. – 31.09 External event 5 source.
5091	STO active. Programmable, see 28.72 STO indication run/stop.	Safe torque off active, no unit problem. Check: – 31.22 STO indication run/stop. – The safe torque off circuit. **WARNING!** The XSTO terminals must not be used for thyristor power controllers.

Code	Fault/Notice	Cause and what to do
		They are not offering any certified safety functionality.
5221	Rating ID mismatch.	The hardware of the thyristor power converter/SDCS-CON-H01 does not match the information stored in the memory unit. This may occur e.g. after a firmware update, memory unit replacement or replacement of the SDCS-CON-H01. To reset, cycle the auxiliary power of the drive. Check: – The settings of 95.14 Set: Power unit (if shown and available), 95.16 Set: Unit type code, 95.17 Set: Unit legs, 95.18 Set: Unit output current scaling and 95.19 Set: Unit input voltage scaling. – The AUX code (format ZZ). ZZ indicates the AUX code category. – 06 = Power unit rating ID invalid. – 07 = Reading power unit rating ID or power unit type failed on power unit connection. – 08 = Power unit not supported (illegal rating ID). – 10 = Type code out of range. For module sizes H1 … H5 the current and voltage range of the type code setting is limited to max 1190 A_{DC} and max 600 V_{AC}. – 20 = Saving of 95.25 Set: Type code failed. – 21 = Saving of 95.14 Set: Power unit failed.
5223	FBA A communication. Programmable, see 50.02 FBA A comm loss func.	Fieldbus adapter A (FBA A): Cyclical communication between PLC and fieldbus adapter module A or between unit and fieldbus adapter module A is lost. Fault 5223 FBA A communication is only activated after the first data set from the overriding control is received by the unit. Before the first data set is received, only warning 1220 FBA A communication is active. The reason is to suppress unnecessary faults (the startup of the overriding control is usually slower than the one of the units). Check: – The status of the fieldbus communication. See user documentation of the fieldbus interface. – The settings of groups 50 Fieldbus adapter (FBA), 51 FBA A settings, 52 FBA A data in and 53 FBA A data out. – The cable connections. – The fieldbus termination. – The fieldbus adapter. – That the master can communicate.
5224 7520	FBA B communication. Programmable, see 50.32 FBA B comm loss func.	Fieldbus adapter B (FBA B): Cyclical communication between PLC and fieldbus adapter module B or between unit and fieldbus adapter module B is lost. Fault 5224 FBA B communication is only activated after the first data set from the overriding control is received by the unit. Before the first data set is received, only warning 1221 FBA B communication is active. The reason is to suppress unnecessary faults (the startup of the overriding control is usually slower than the one of the units). Check: – The status of the fieldbus communication. See user documentation of the fieldbus interface. – The settings of group 50 Fieldbus adapter (FBA), 54 FBA B settings, 55 FBA B data in and 56 FBA B data out.

Code	Fault/Notice	Cause and what to do
		– The cable connections. – The fieldbus termination. – The fieldbus adapter. – That the master can communicate.
5225	EFB communication. Programmable, see 58.14 Communication loss action.	Cyclical communication to the embedded fieldbus (EFB) is lost. Fault 5225 EFB communication is only activated after the first data set from the overriding control is received by the unit. Before the first data set is received, only warning 1224 EFB communication is active. The reason is to suppress unnecessary faults (the startup of the overriding control is usually slower than the one of the units). Check: – The status of the fieldbus master (online, offline, error etc.). – The settings of group 58 FBA Embedded fieldbus. – The cable connections to connector XD2D on the control board. – The fieldbus termination.
0x5227	DDCS controller communication. Programmable, see 60.59 DDCS controller comm loss function.	Cyclical communication between DDCS controller and unit is lost or there is no communication at all. The unit is waiting for the very first data set. Check: – The status/settings of the DDCS controller. See user documentation of the DDCS controller. – The adapters between DDCS controller and unit. – The settings of group 60 DDCS communication, 61 D2D and DDCS transmit data and 62 D2D and DDCS receive data. – The fiber optic cable connections.
5228	Master-follower link communication. Programmable, see 60.09 M/F comm loss function.	Cyclical communication between master and a follower (DDCS/D2D) is lost or there is no communication at all. The unit is waiting for the very first data set. Check: – The AUX code. It indicates which node address on the master-follower link is affected. See 60.02 M/F node address in each drive. – The setting of 60.14 M/F follower selection. – The setting of 20.01 Command location. – The settings of group 60 DDCS communication. – The cable connections.
5229	FBA A force trip.	A fault has been forced through fieldbus adapter A. Check the fault information provided by the PLC.
5230	FBA B force trip.	A fault has been forced through fieldbus adapter B. Check the fault information provided by the PLC.
5231	EFB force trip.	A fault has been forced through the embedded fieldbus (EFB) interface. Check the fault information provided by the Modbus controller.
5232	Follower. Programmable, see 60.17 Follower fault action.	A follower has tripped. Check the AUX code to find out the node address of the faulted follower. See 60.02 M/F node address. Correct the fault in the follower.
5233	FBA A mapping file.	Fieldbus adapter A mapping file read error. Contact your local ABB representative.
5234	FBA A parameter conflict.	Fieldbus adapter A (FBA A): The unit does not have a functionality requested by a PLC or a requested functionality has not been activated.

Code	Fault/Notice	Cause and what to do
		The settings of parameter groups 50 Fieldbus adapter (FBA) and 51 FBA A settings are not set according to the fieldbus adapter or the device has not been selected. Check: – The PLC programming. – The settings of parameter groups 50 Fieldbus adapter (FBA) and 51 FBA A settings. – The configuration of the fieldbus adapter.
5235	FBA B mapping file.	Fieldbus adapter B mapping file read error. Contact your local ABB representative.
5236	FBA B parameter conflict.	Fieldbus adapter B (FBA B): The unit does not have a functionality requested by a PLC or a requested functionality has not been activated. The settings of parameter groups 50 Fieldbus adapter (FBA) and 54 FBA B settings are not set according to the fieldbus adapter or the device has not been selected. Check: – The PLC programming. – The settings of parameter groups 50 Fieldbus adapter (FBA) and 54 BA B settings. The configuration of the fieldbus adapter.
5237	EFB configuration file.	Embedded fieldbus (EFB) configuration file could not be read. Reload firmware or replace the unit.
5238	EFB invalid parameterization.	Embedded fieldbus (EFB) parameter settings are inconsistent or not compatible with the selected protocol. Check the settings of group 58 Embedded fieldbus and verify they are consistent with the configured protocol.
5239	EFB load fault.	Embedded fieldbus (EFB) protocol firmware could not be loaded. Version mismatch between embedded fieldbus (EFB) protocol firmware and drive firmware. Reload firmware or replace the unit.
5242	Text data overflow.	Internal fault. Reset the fault. Contact your local ABB representative if the fault persists.
5243	Text 32-bit table overflow.	
5245	Text 64-bit table overflow.	
5245	Text file overflow.	
5249	Internal task overload.	Internal fault. Cycle the power of the unit or use 96.08 Control board boot. If the problem persists, contact your local ABB representative stating the AUX code.
5250	Internal stack overflow.	Internal fault. Cycle the power of the unit or use 96.08 Control board boot. If the problem persists, contact your local ABB representative stating the AUX code.
5251	Internal file load.	File read error. Cycle the power of the unit or use 96.08 Control board boot. Check: – The memory unit.

Code	Fault/Notice	Cause and what to do
		– Re-load the firmware. – Exchange the memory unit. – Exchange the SDCS-CON-H01. If the problem persists, contact your local ABB representative.
5252	Internal record load.	Internal record load error. Contact your local ABB representative.
5254	Memory unit detached.	The memory unit was detached while the unit is powered. Switch off the power to the unit and reinstall the memory unit. In case the memory unit was not actually removed when the fault occurred, check that the memory unit is properly inserted into its connector and its mounting screw is tight. Then cycle the power of the unit or use 96.27 Control board boot. If the problem persists, contact your local ABB representative.
5255	Internal firmware.	Internal firmware fault. Cycle the power of the unit or use 96.08 Control board boot. If the problem persists, contact your local ABB representative.
5256	User set fault.	Loading of user parameter set failed. Ensure that a valid user parameter set exists. Reload if uncertain. Check: – That the requested set does exists. See 96.04 Macro select. – That the set is compatible with the control program. – If the unit was switched off during loading. – The memory unit.
5257	Kernel overload.	Operating system error. Cycle the power of the unit or use 96.08 Control board boot. If the problem persists, contact your local ABB representative.
5258	Parameter system.	Parameter load or save failed. Try forcing a save using 96.07 Parameter save manually.
5260	Licensing.	Running the control program is prevented either because a restrictive license exists, or because a required license is missing. Record the AUX codes of all active licensing faults and contact your product vendor for further instructions.
5261	Adaptive program.	Error running the adaptive program. Check the AUX code (format XXXXYYYY). XXXX specifies the number of the function block. XXXX = 0000 is a generic error. YYYY indicates the problem. Actions see below.
	000A	Program corrupted or block non-existent. Restore the template program or download the program to the unit.
	000C	Required block input missing. Check the inputs of the block.
	000E	Program corrupted or block non-existent. Restore the template program or download the program to the unit.
	0011	Program too large. Remove blocks until the error stops.
	0012	Program is empty. Correct the program and download it to the unit.
	001C	A nonexistent parameter or block is used in the program. Edit the program to correct the parameter reference, or to use an existing block.
	001D	Parameter type invalid for selected input. Edit the program to correct the parameter reference.
	001E	Output to parameter failed because the parameter was write-protected.

Code	Fault/Notice	Cause and what to do
		Check: – The parameter reference in the program. – For other sources affecting the target parameter.
	0023	Program file incompatible with current firmware version. Adapt the program to current block library and firmware version.
	0024	
	002A	Too many blocks. Edit the program to reduce the number of blocks.
	Other	Contact your local ABB representative, quoting the AUX code.
5299	Fault reset.	A fault has been reset. Notice.
5265	Incompatible option module.	Option module not supported. E.g. type Fxxx-xx-M fieldbus adapters are not supported. Replace the module with a supported type. Check the AUX code. It specifies the interface to which the unsupported module is connected: – 1: Fieldbus interface A. – 2: Fieldbus interface B.
5501	Aux undervoltage	Aux voltage < 21.2 V_{DC}. Recovery at 21.9 V_{DC} (0.7 V hysteresis). Check: – 24 V_{DC} auxiliary voltage at XAUX. – Chapter XAUX: Auxiliary voltage input (X99).
5508	I/O extension configuration.	The I/O extension module types and location specified by parameters do not match the detected configuration or do not communicate with the unit. Check: – The type and location settings of the modules. See parameters 14.01, 14.02, 15.01, 15.02, 16.01 and 16.02. – That the module is properly seated in its slot. – That the module and the slot connector is not damaged. – Try installing the module into another slot. – The AUX code (format XXYYYYYY). XX specifies the number of the I/O extension module. – 01: Group 14 I/O extension module 1. – 02: Group 15 I/O extension module 2. – 03: Group 16 I/O extension module 3. YYYYYY indicates the problem. Actions see below.
	00 0001	Communication with module failed.
	00 0002	Module not found.
	00 0003	Configuration of module failed.
	00 0004	
5525	Type code.	The hardware of the unit/SDCS-CON-H01 does not match the information stored in the memory unit. This may occur e.g. after a firmware update, memory unit replacement or replacement of the SDCS-CON-H01. To reset, cycle the auxiliary power of the unit. Check: – The settings of 95.14 Set: Power unit (if shown and available), 95.16 Set: Unit type code, 95.17 Set: Unit legs, 95.18 Set: Unit output current scaling and 95.19 Set: Unit input voltage scaling. – The AUX code (format ZZ). ZZ indicates the AUX code category. – 06 = Power unit rating ID invalid.

Code	Fault/Notice	Cause and what to do
		– 07 = Reading power unit rating ID or power unit type failed on power unit connection. – 08 = Power unit not supported (illegal rating ID). – 10 = Type code out of range. – 20 = Saving of 95.16 Set: Type code failed. – 21 = Saving of 95.14 Set: Power unit failed.
5545	Application loading.	Application file incompatible or corrupted. Check the AUX code. Actions see below.
	8006	Not enough memory for the application.
	8007	The application contains the wrong library version.
	800A	The application contains an unknown target (system) library function.
	800B … XXXX	The application load failed.
5546	Control panel/PC tool link communication. Programmable, see 49.05 Communication loss action.	This fault occurs only when the unit is controlled from the control panel/PC tool (local mode). The control panel/PC tool connected via USB or the PC tool connected via FENA-11/21 has stopped communicating. Check: – The setting of 49.04 Communication loss time. – If needed extend the time out to 2000 ms. Do not forget to verify the setting by means of 49.06 Refresh settings Refresh. – The setting of 49.05 Communication loss action. – If changed, do not forget to verify the setting by means of 49.06 Refresh settings Refresh. – The control panel/PC tool connection/cable. – The control panel connector. – The mounting platform if being used (e.g. DPMP-01). – Disconnect and reconnect the control panel/PC tool.
5547	Unit hardware.	Drive hardware failure. To reset, cycle the auxiliary power of the unit. If the problem persists, check the AUX code (format YYYY). YYYY indicates the problem. Actions see below.
	0050	Parameter flash memory faulty (erase).
	0051	Parameter flash memory faulty (program).
	0052	Check connector XC12 on SDCS-CON-H01 and connector XC12 on SDCS-PIN-H11.
5548	Internal firmware.	Internal firmware error. To reset, cycle the auxiliary power of the unit. If the problem persists, contact your local ABB representative, quoting the AUX code. Check the AUX code (format YYYY). YYYY indicates the problem. Actions see below.
	0001	Default setting of parameters wrong.
	0002	Parameter flash memory image too small for all parameters.
	0004	Illegal write attempt on a signal or write-protected parameter.
	0006	Wrong type code.
	0007	An un-initialized interrupt has occurred.
	0010	Wrong parameter value.
	0101 … 9999	The read only parameter, which is being written to by means of a pointer parameter, e.g. 62.51 Data set 10 data 1 selection, Adaptive Program or application program, can be identified by means of the last 4 digits.

Code	Fault/Notice	Cause and what to do
5551	AI supervision. Programmable, see 12.03 AI supervision function.	An analog signal is outside the limits specified for the analog input. Check: – The AUX code (format XYY). X specifies the location of the input. – 0: Control board. – 1: I/O extension module 1. – 2: I/O extension module 2 – 3: I/O extension module 3. – 4: …. YY specifies the input and limit. – 01: AI1 under minimum. – 02: AI1 over maximum. – 03: AI2 under minimum. – 04: AI2 over maximum. – 05: AI3 under minimum. – 06: AI3 over maximum. – The signal level at the analog input. – The wiring connected to the input. – Polarity of the connection. – The minimum and maximum limits of the input in groups 12 Standard AI, 14 I/O extension module 1, 15 I/O extension module 2 and 16 I/O extension module 3.

User faults

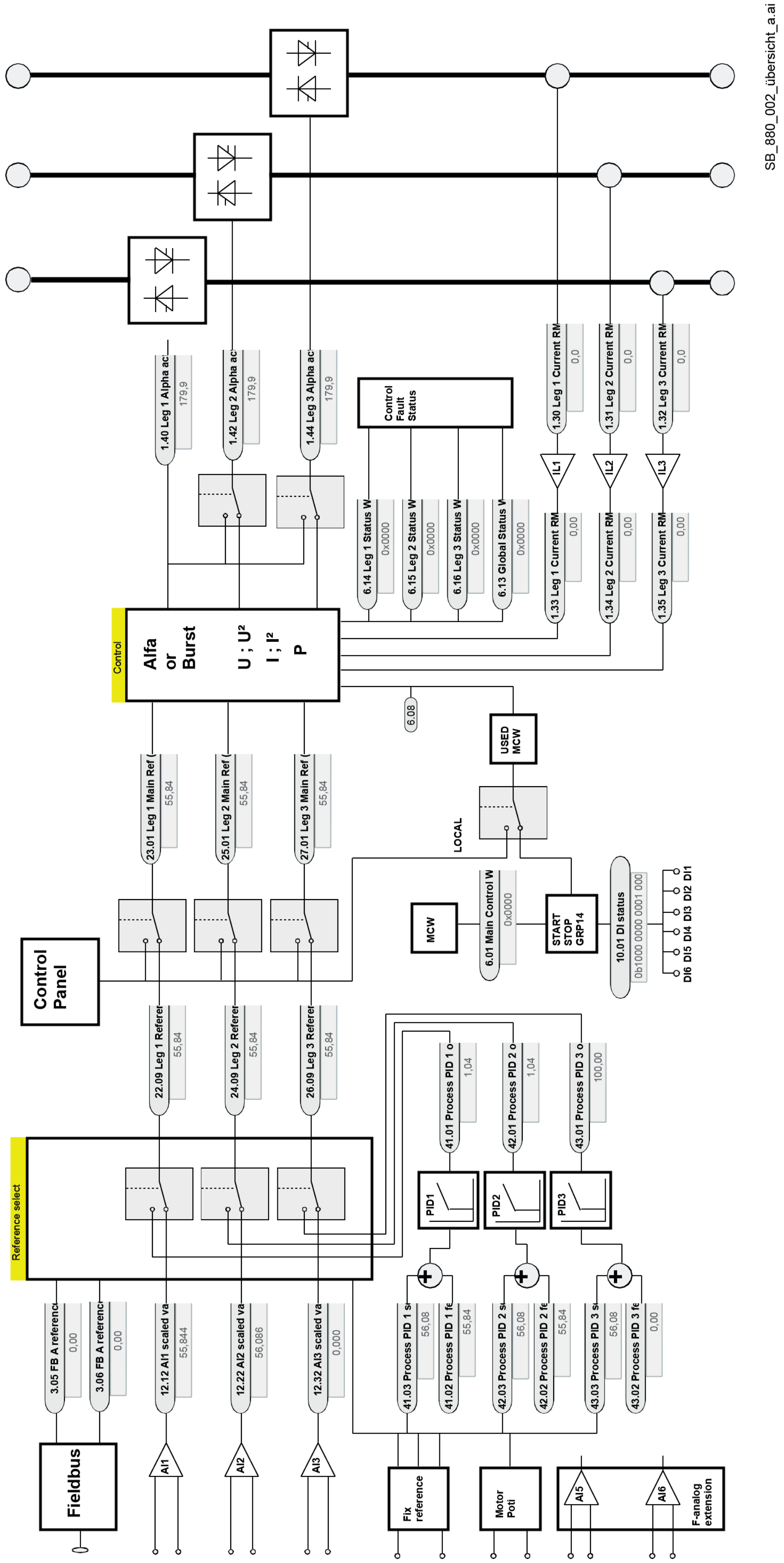
Code	Fault/Notice	Cause and what to do
5601	AP Fault 1.	reserved
5602	AP Fault 2.	reserved
5603	AP Fault 3.	reserved
5604	AP Fault 4.	reserved
5605	AP Fault 5.	reserved

Bootloader faults

Code	Fault/Notice	Cause and what to do
FB11	Memory unit missing.	No memory unit is attached to the unit. Power down the unit. Check that the memory unit is properly inserted into the unit.
		The memory unit attached to the unit is empty. Power down the unit. Attach a memory unit with the appropriate firmware to the unit.
FB12	Memory unit incompatible.	The memory unit attached to the unit is incompatible. Try to download a compatible firmware. If the problem persists, power down the unit. Attach a compatible memory unit.
-	Panel and Drive not compatible.  Panel and Drive not Compatible	The control panel attached to the unit is incompatible or broken. Attach a working and compatible control panel.
FB13	Memory unit, firmware incompatible.	The firmware on the attached memory unit is incompatible with the unit.

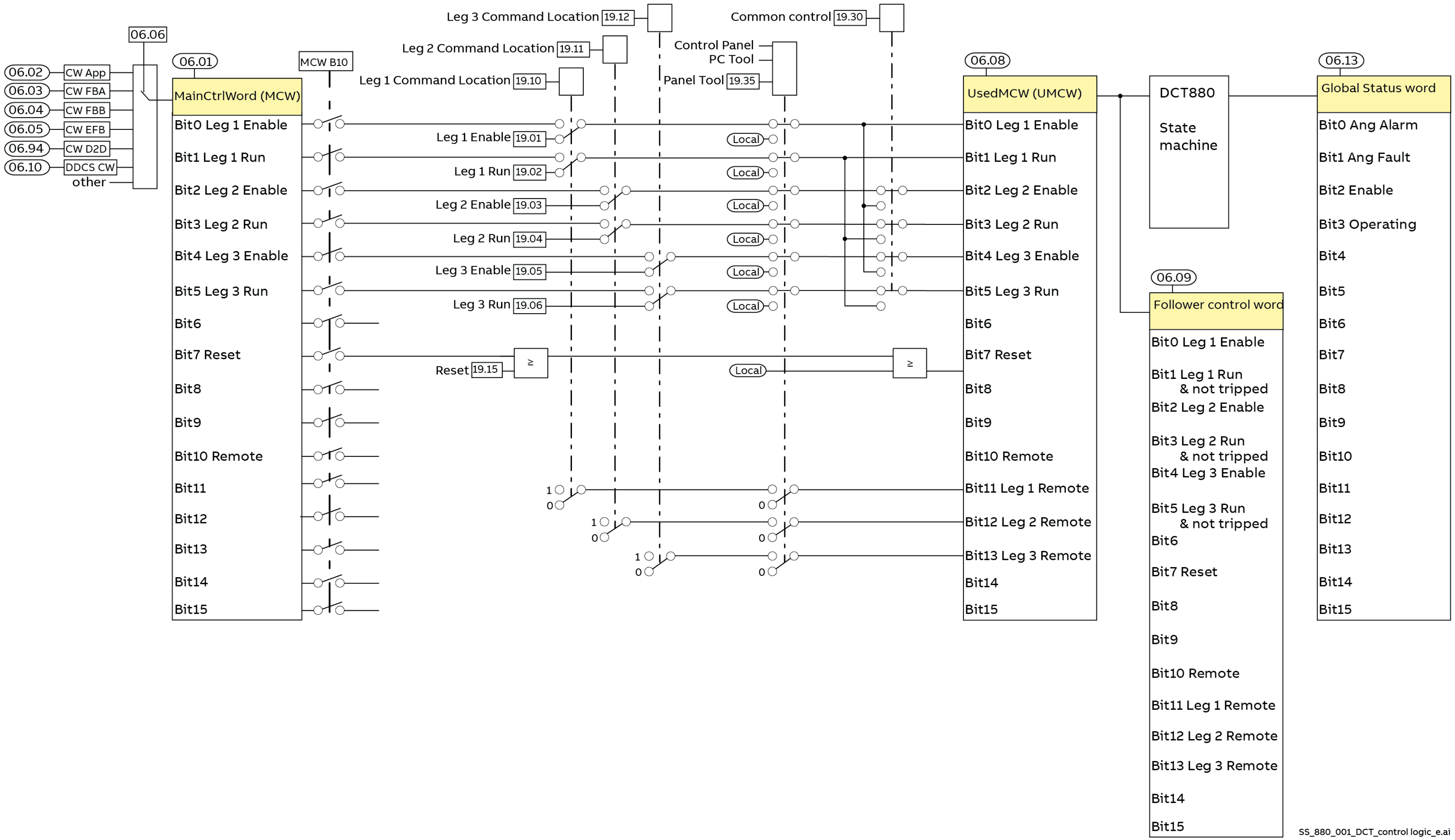
Code	Fault/Notice	Cause and what to do
		Try to download a compatible firmware. If the problem persists, power down the unit. Attach a memory unit with a compatible firmware.
FB14	Memory unit, firmware load failed.	The firmware on the attached memory unit could not be loaded to the unit. Memory unit might be empty, download a compatible firmware. If the problem persists, power down the unit. Check that the memory unit is properly inserted into the unit. If the problem persists, replace the memory unit.

Appendix



Firmware overview diagram

Command chain diagram



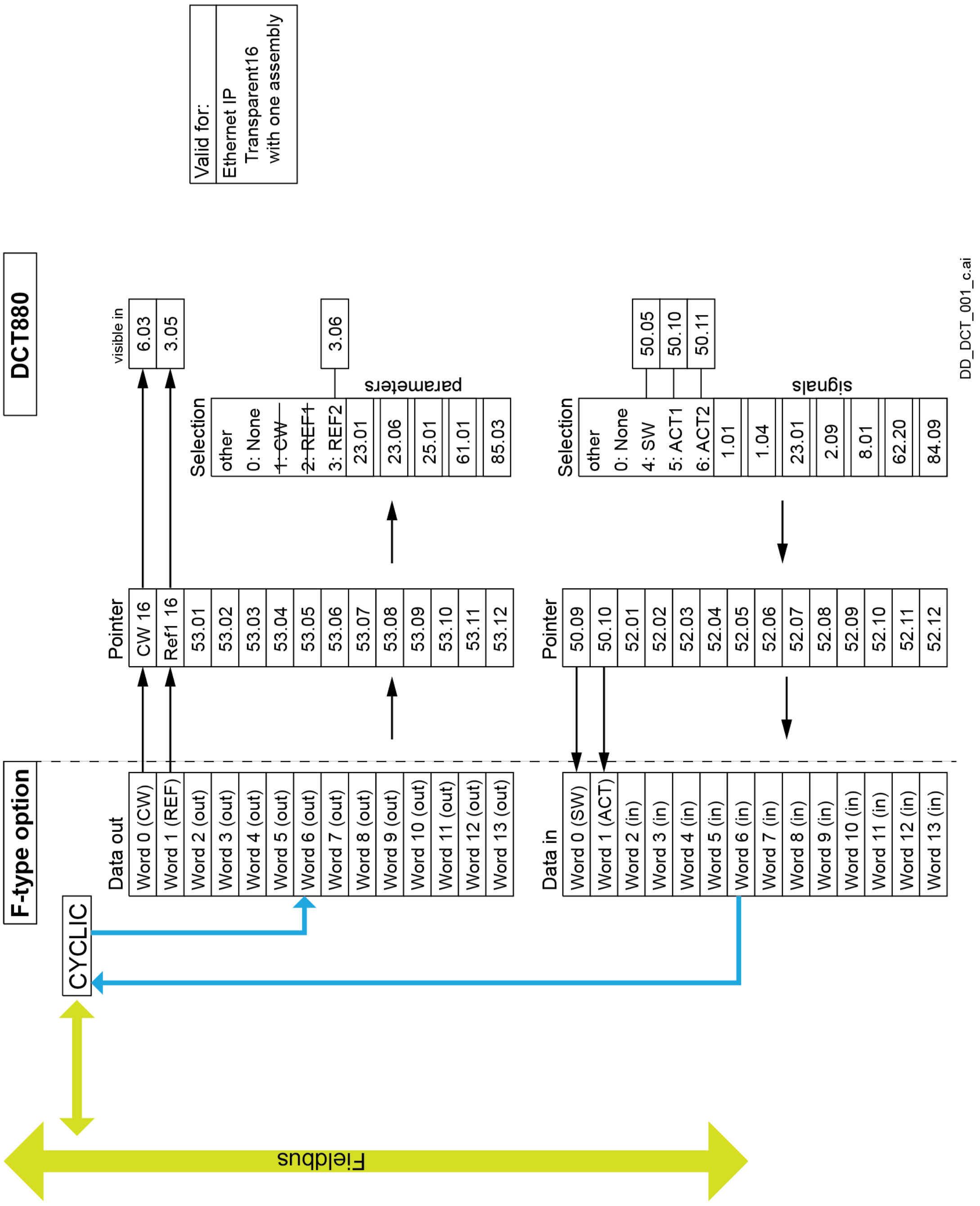
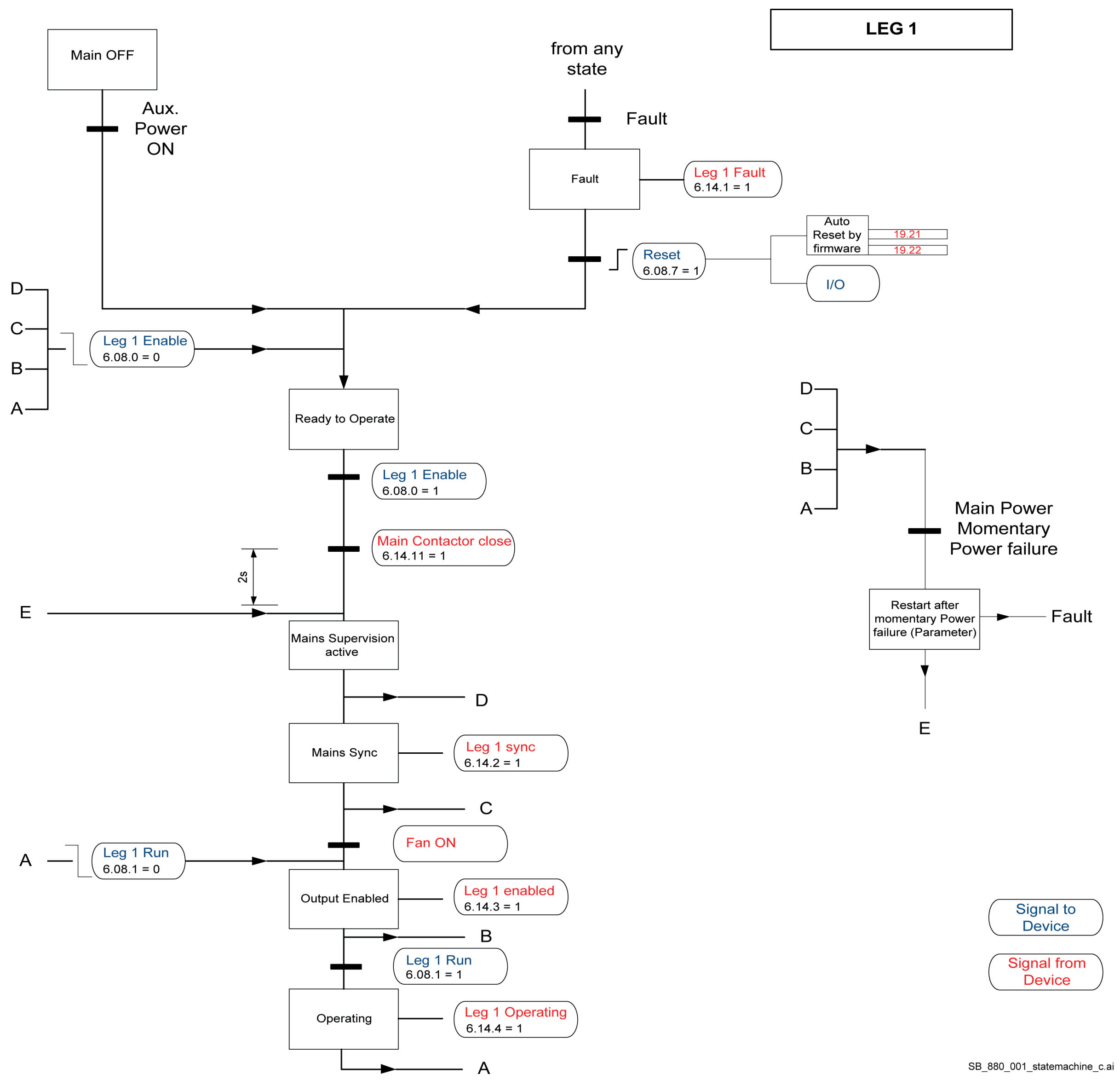
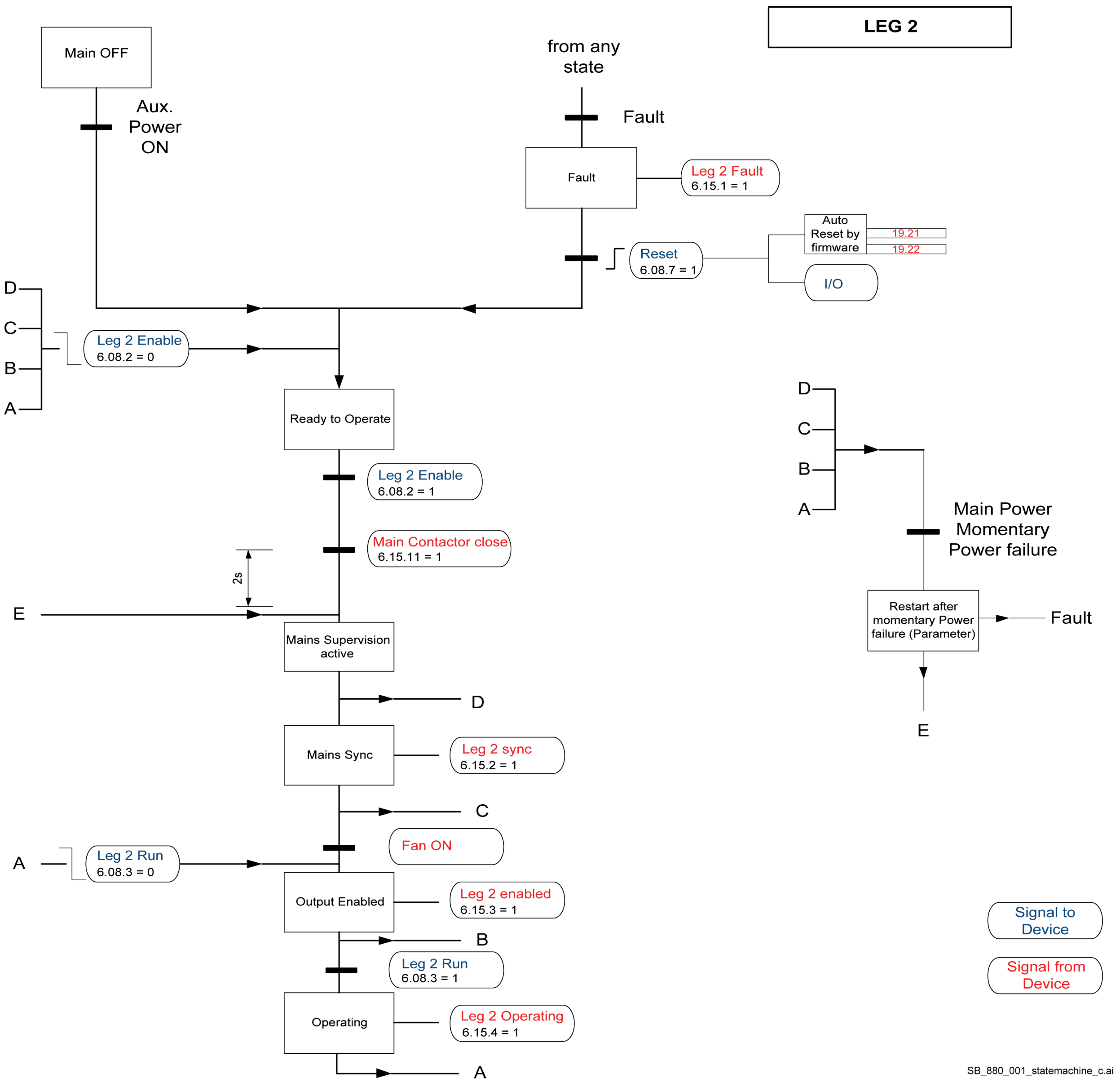


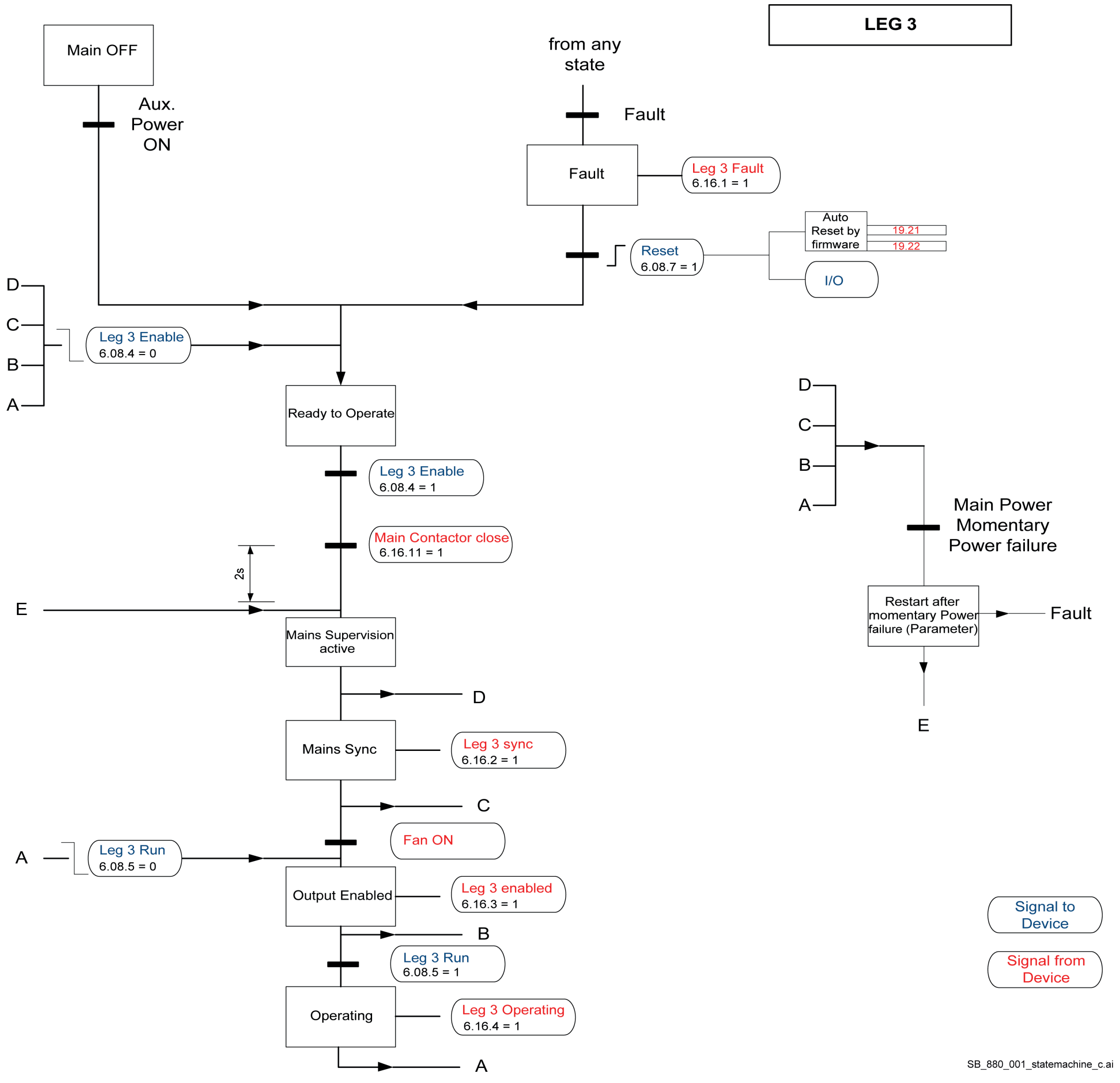
Diagram of data transfer via F-type fieldbus adapter using FBA and transparent 16 bit profile



Leg 1 state machine

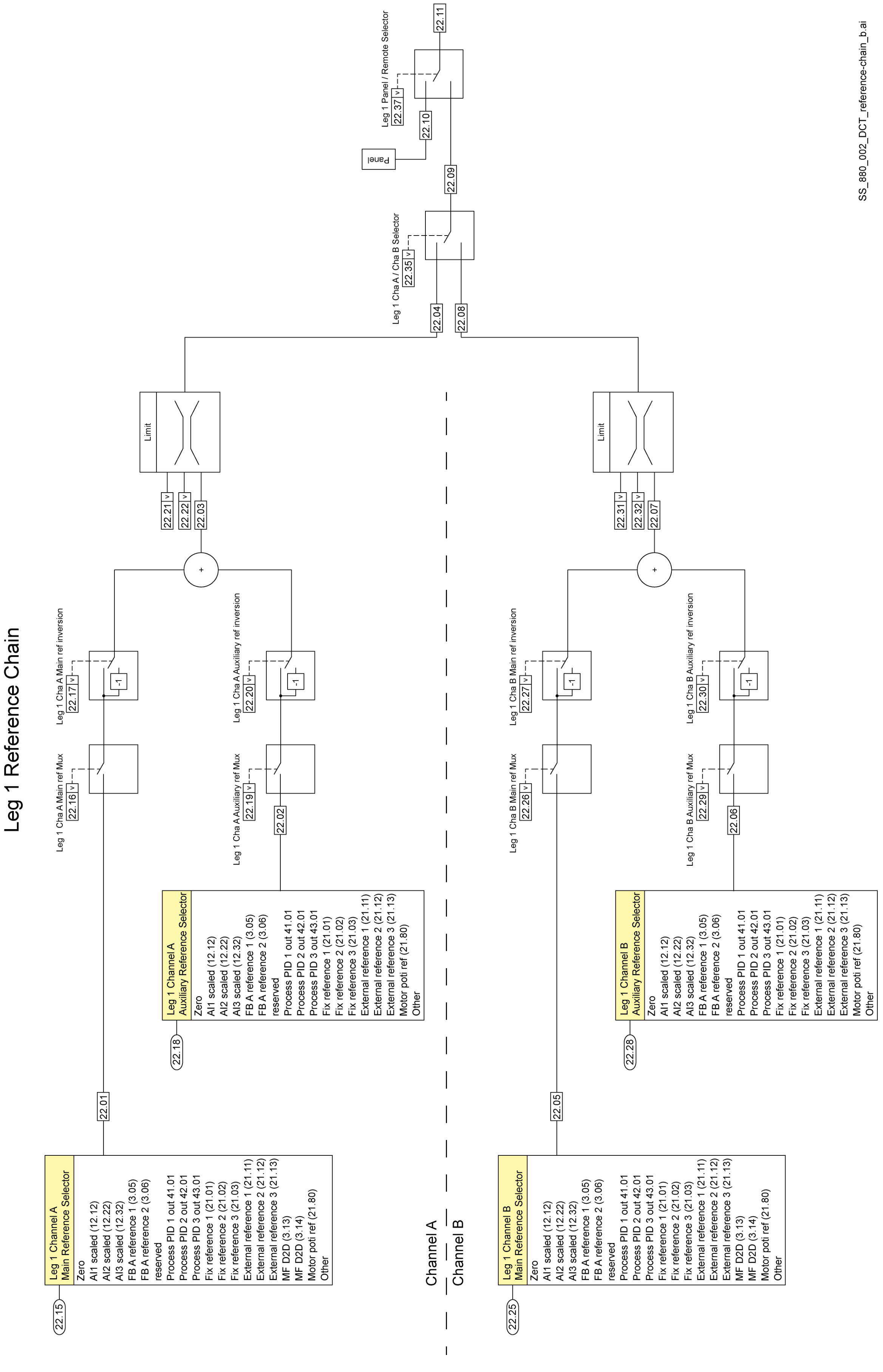


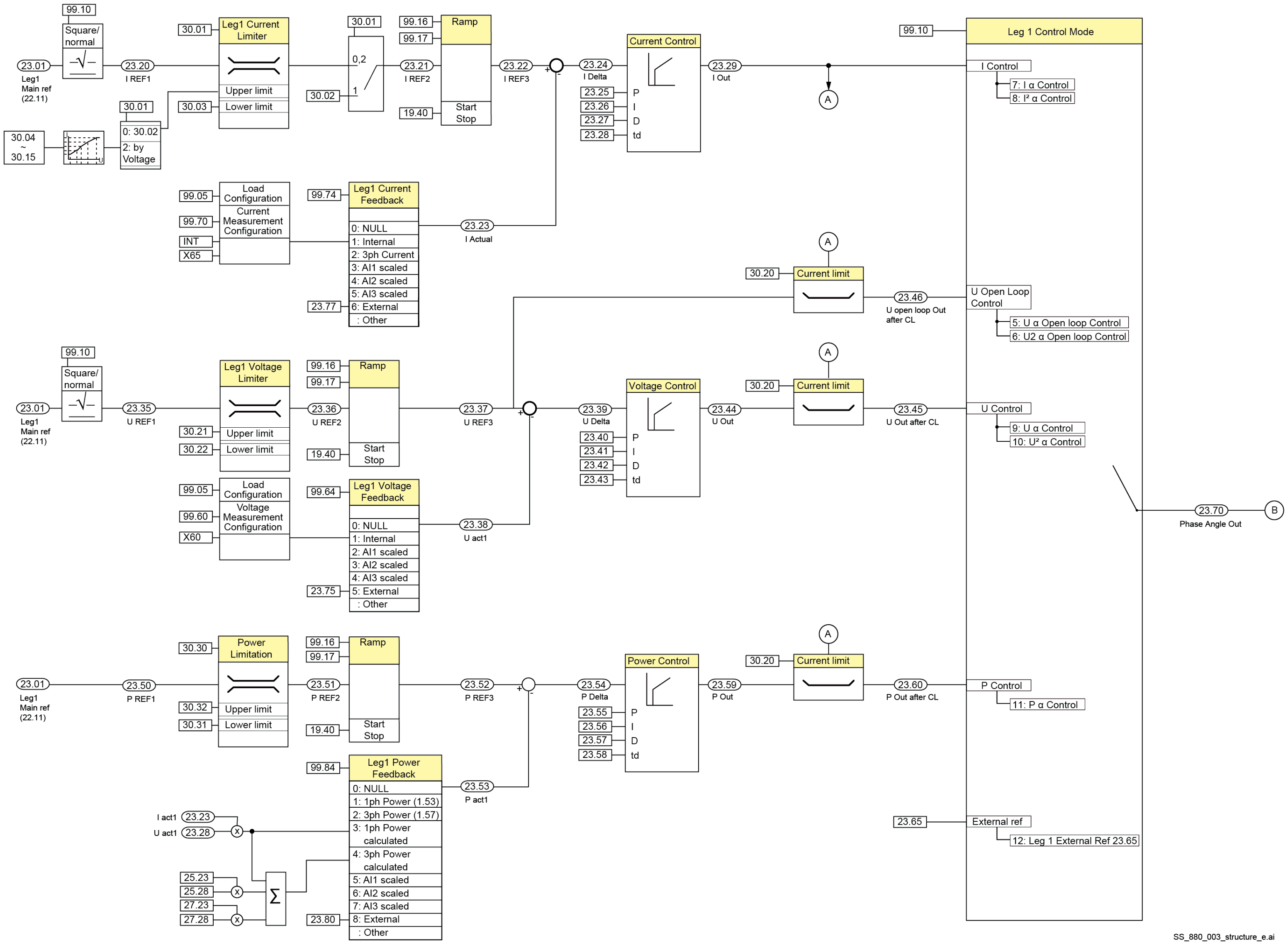
Leg 2 state machine



Leg 3 state machine

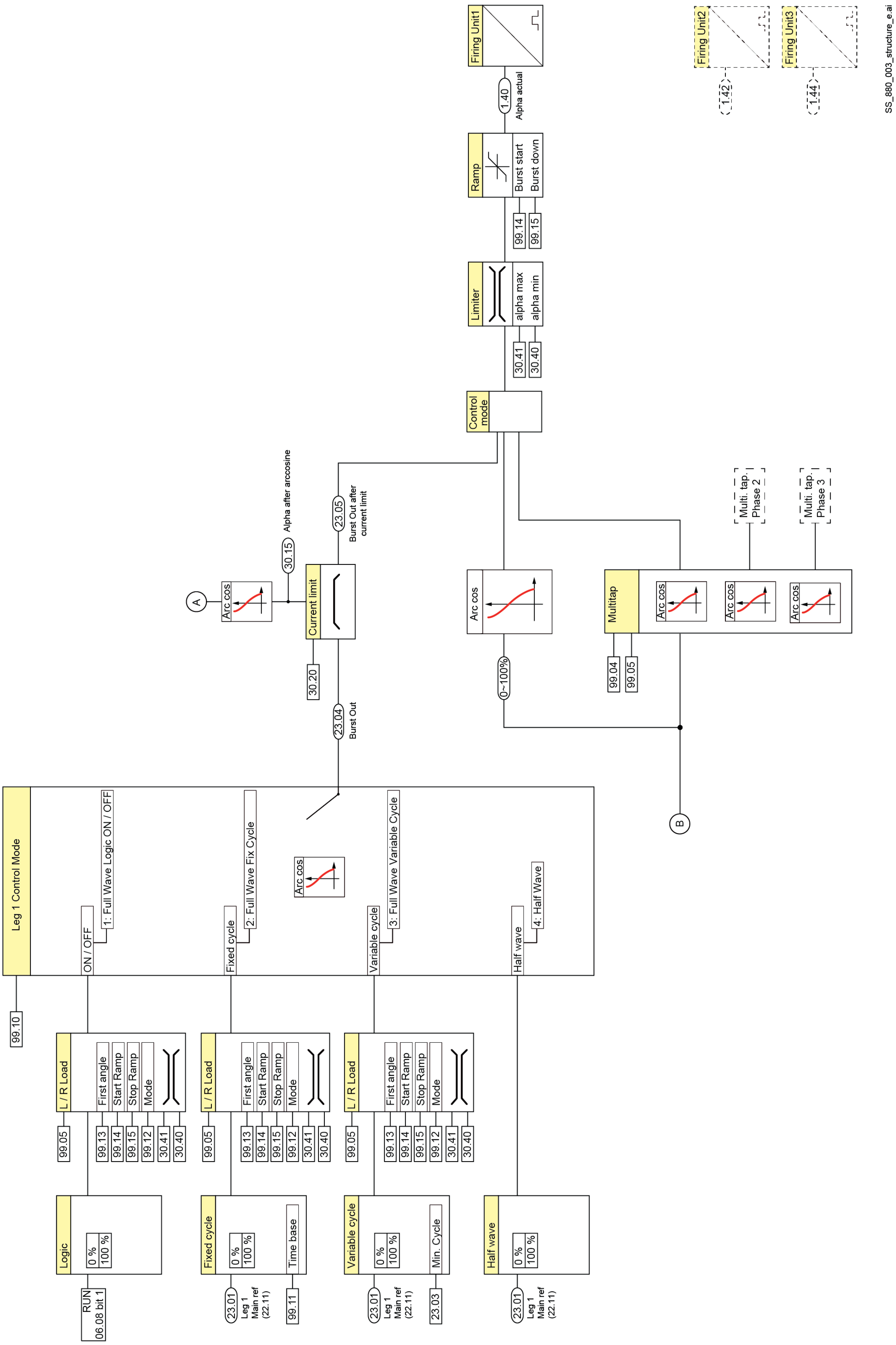
Leg 1 Reference chain diagram





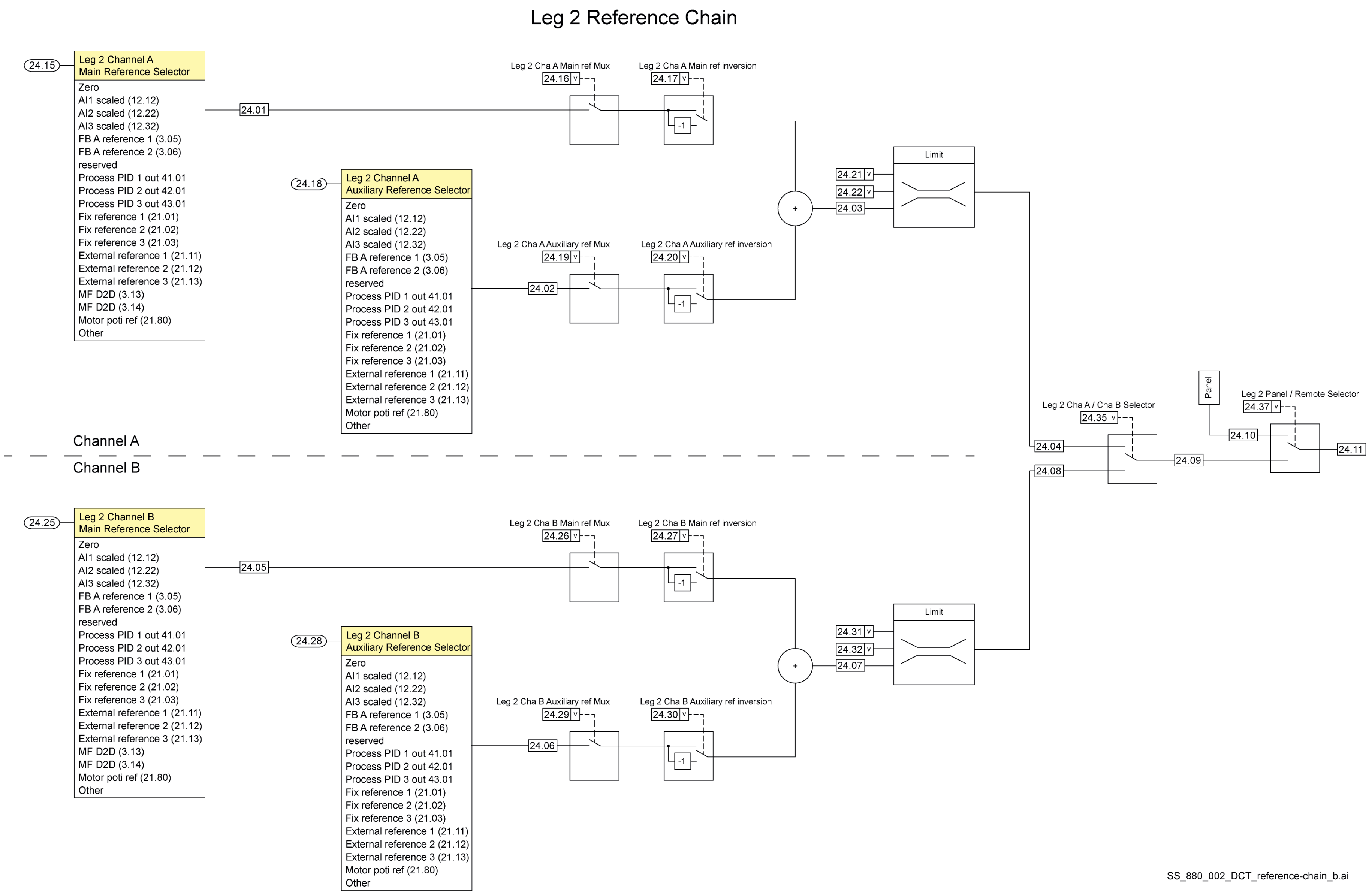
Leg 1 Reference chain diagram

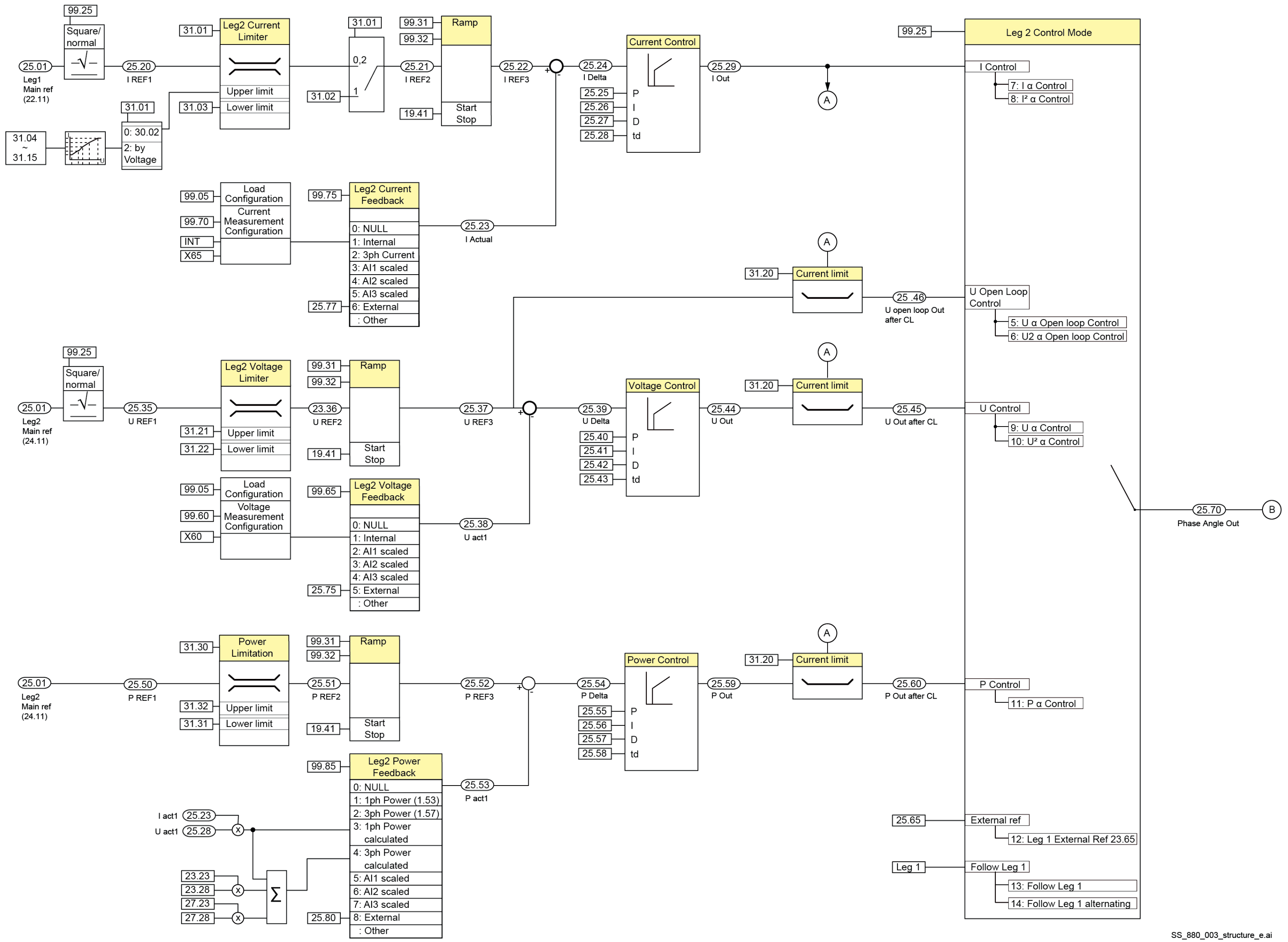
Leg 1 Reference chain diagram



SS_880_003_structure_e.ai

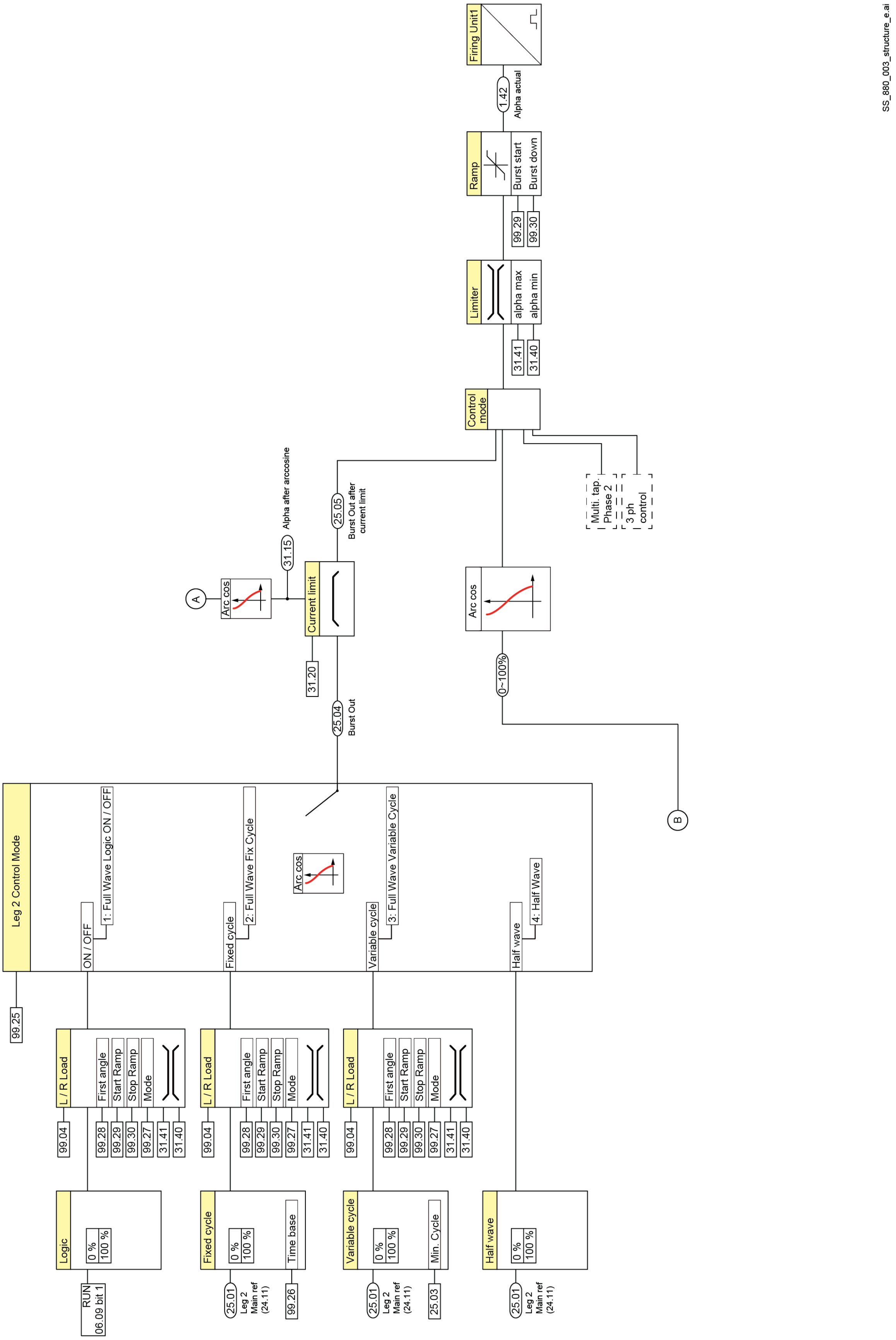
Leg 2 Reference chain diagram





Leg 2 Reference chain diagram

Leg 2 Reference chain diagram



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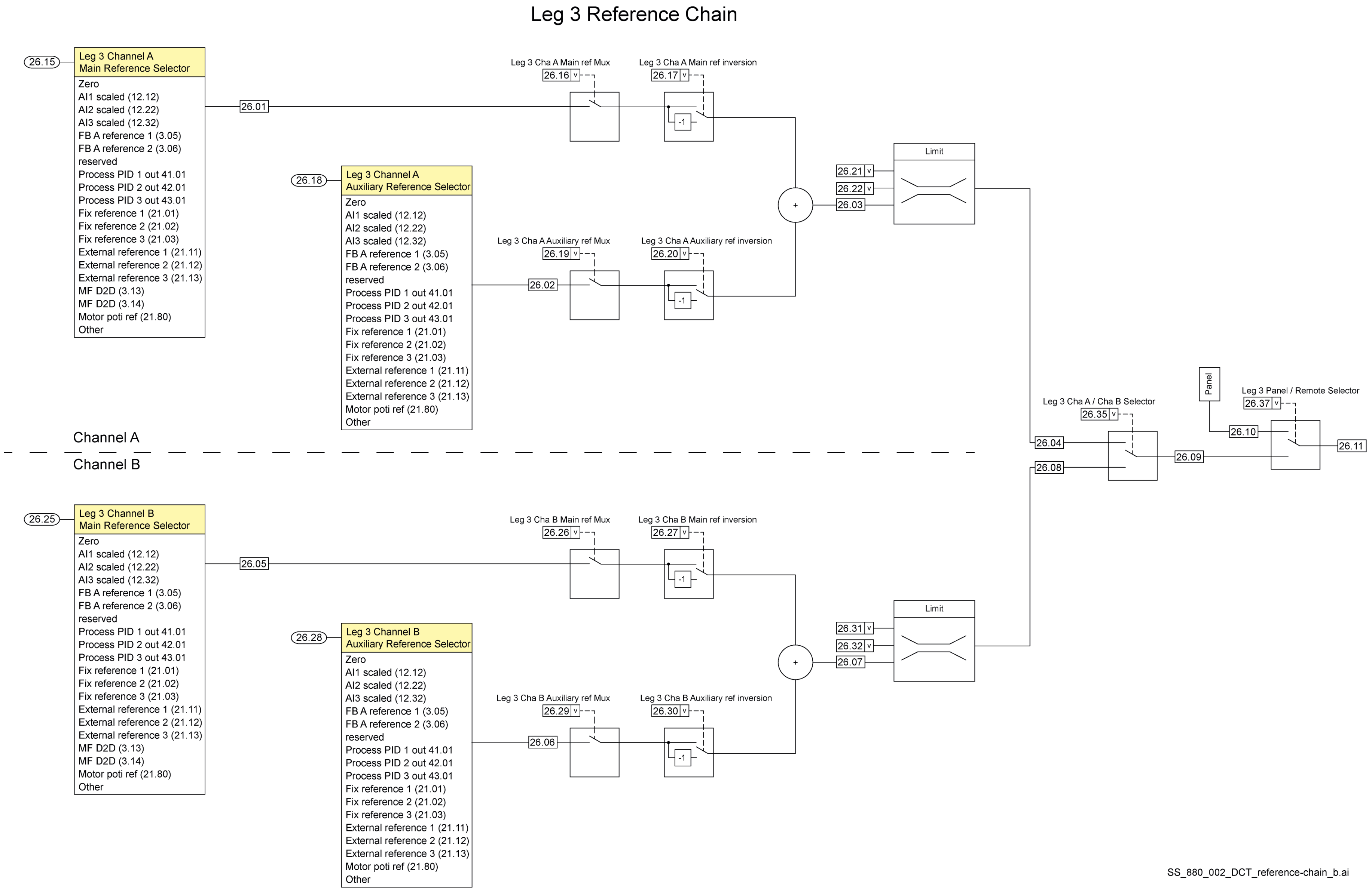
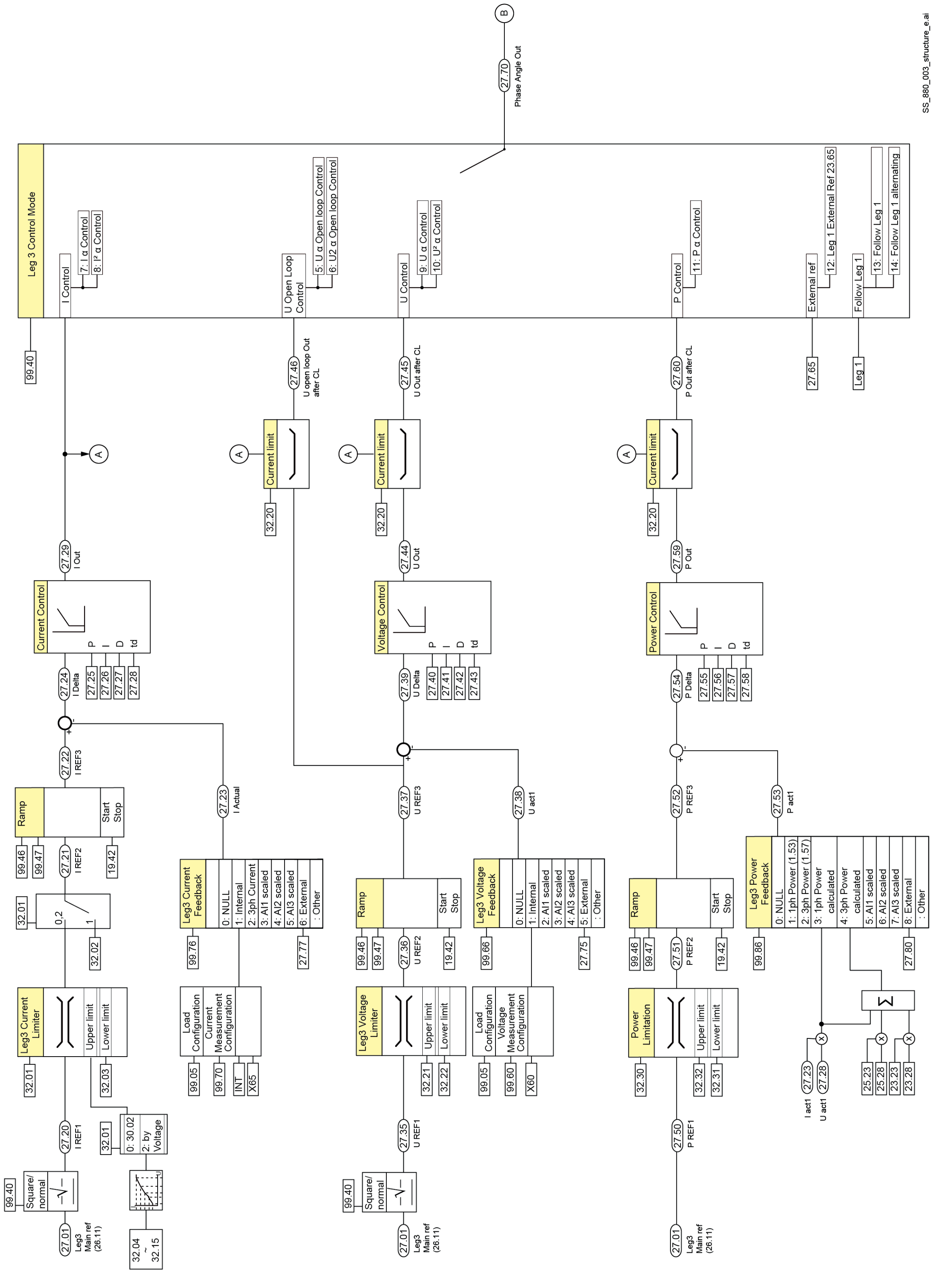
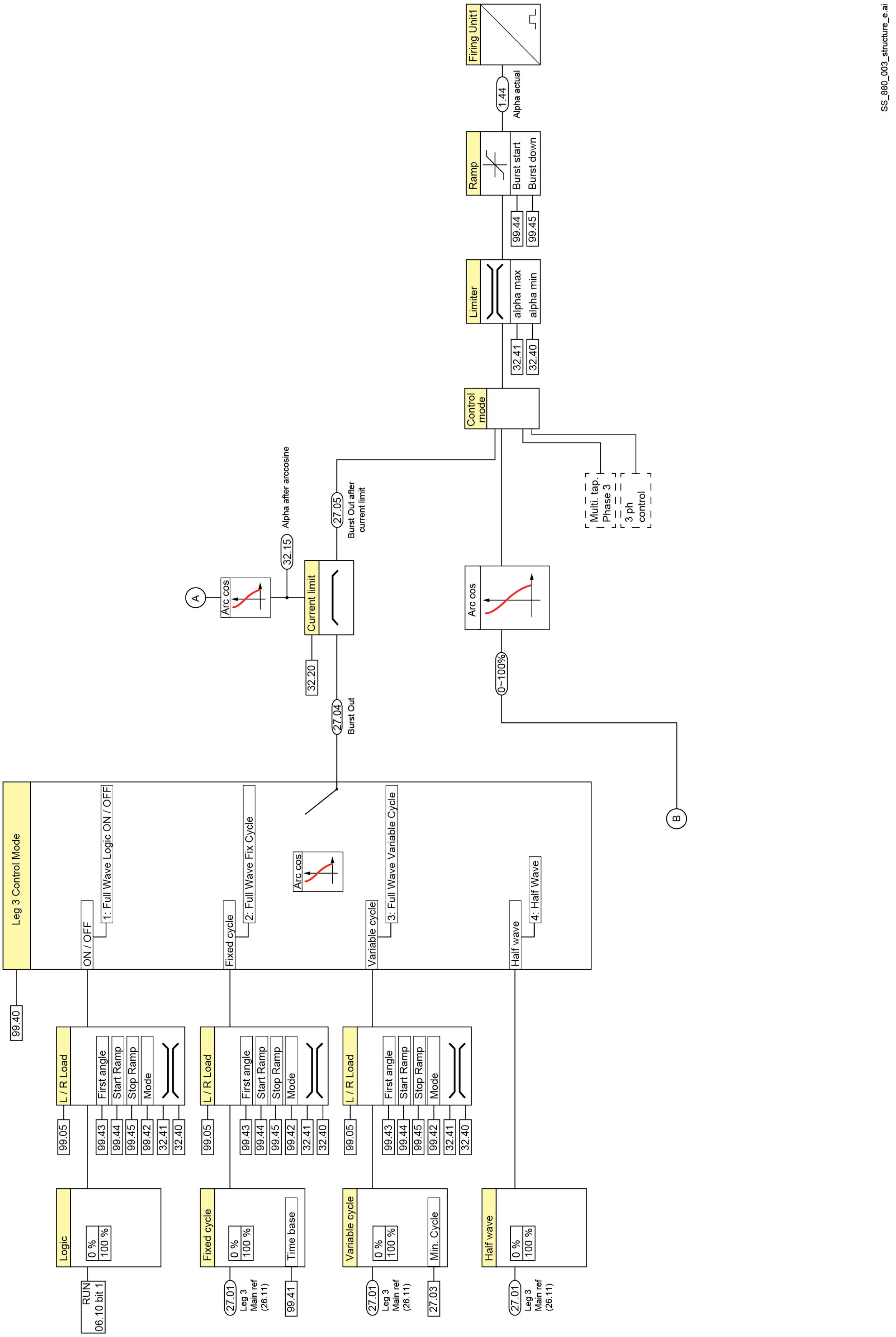


Leg 3 Reference chain diagram

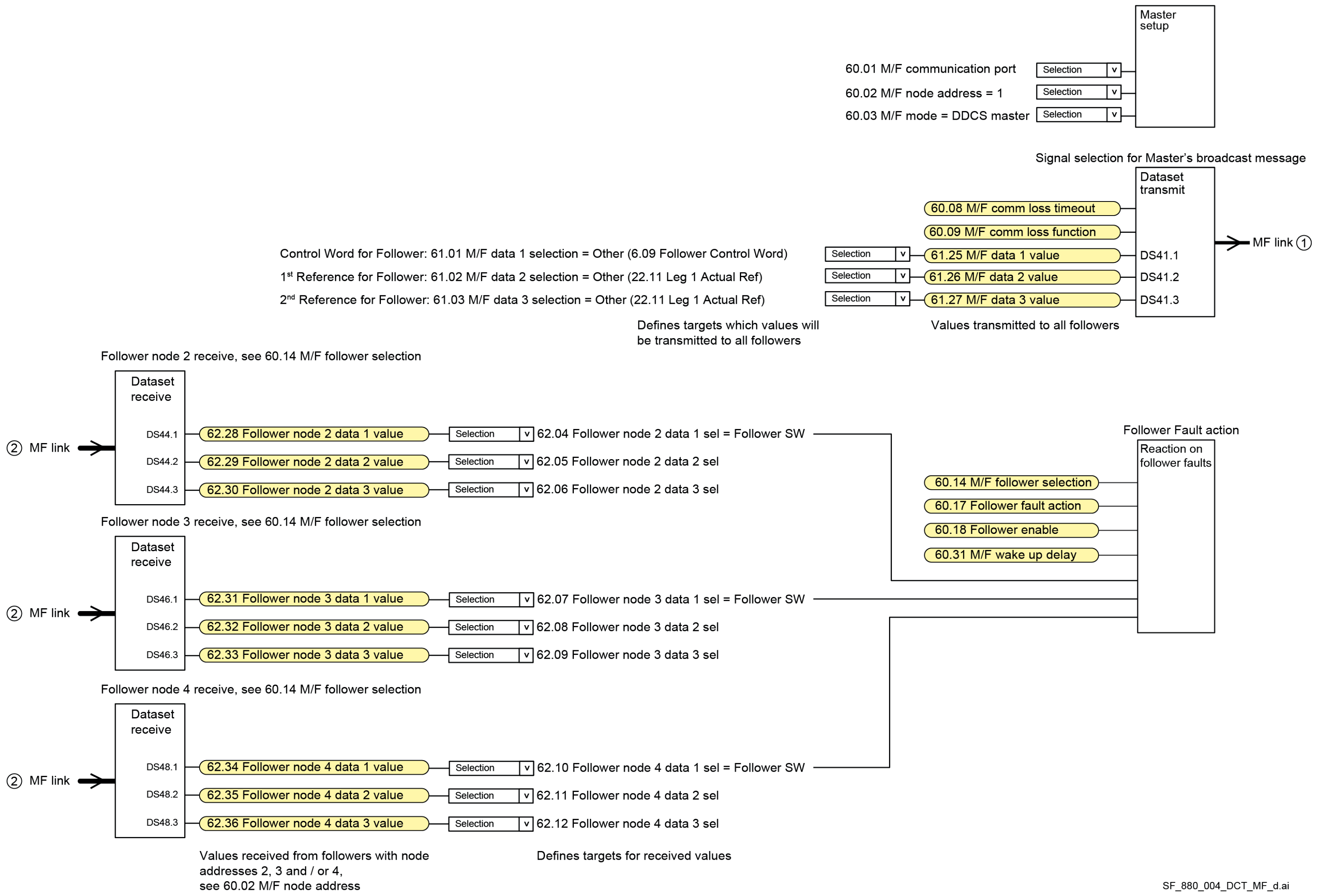


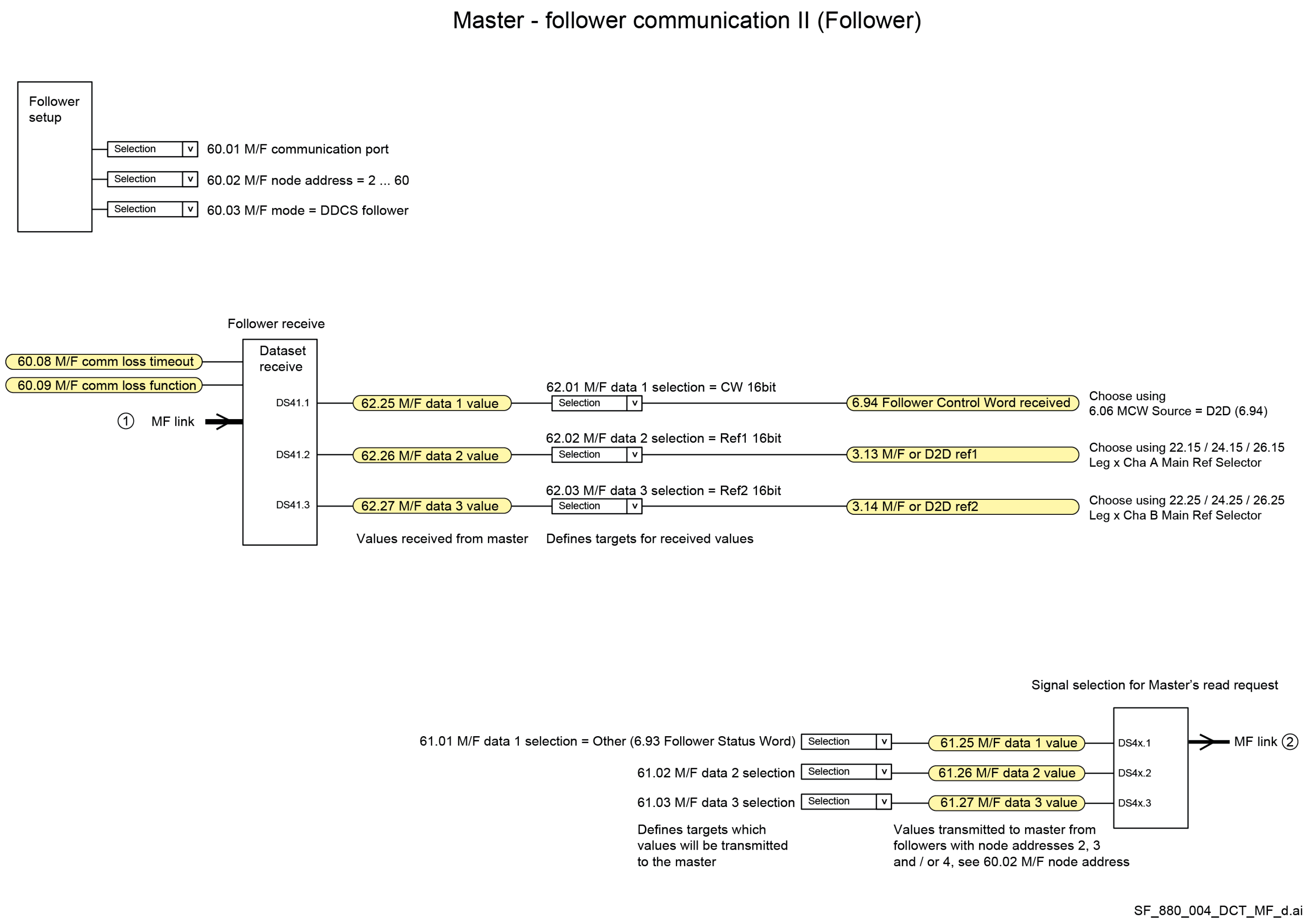
Leg 3 Reference chain diagram



Master - follower communication (Master)

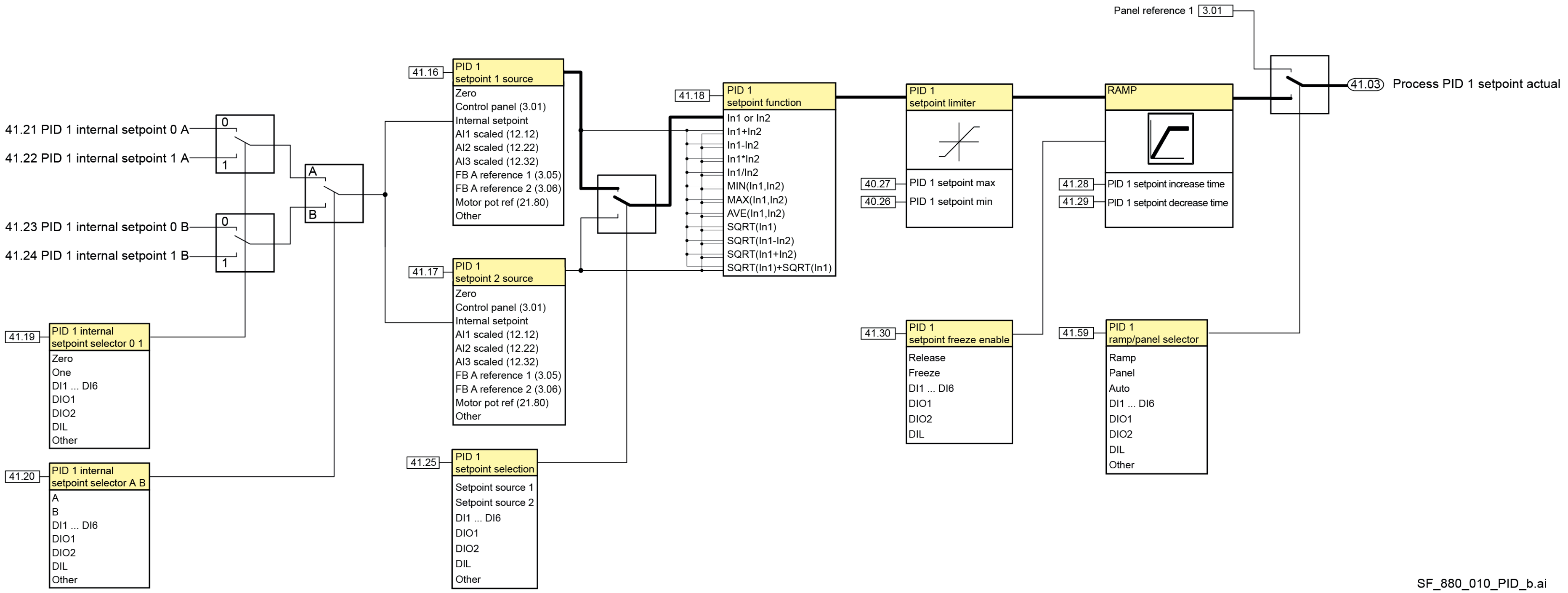
Master - follower communication I (Master)





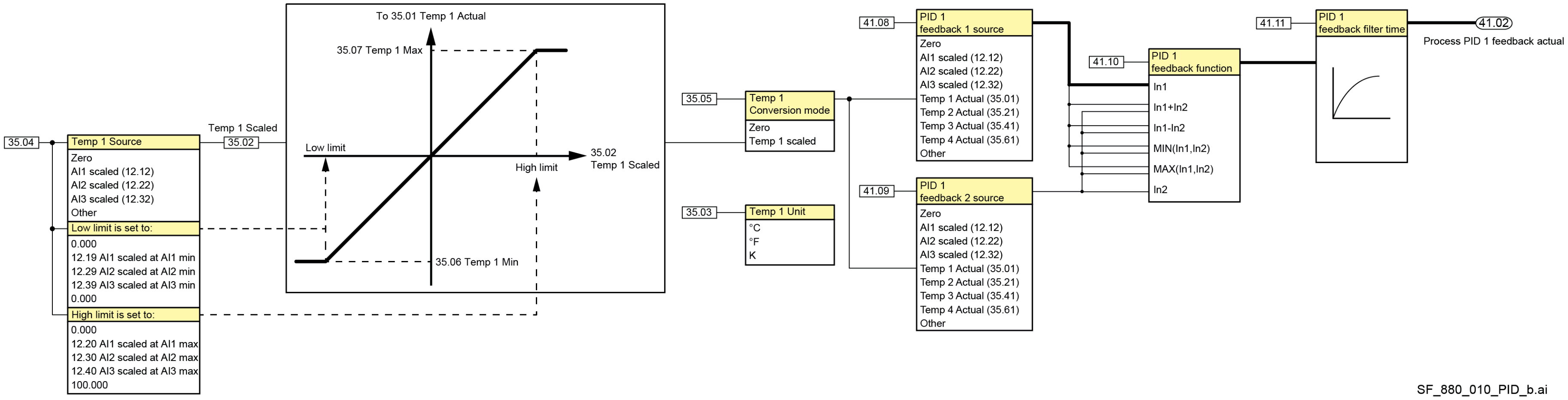
Master - follower communication (Follower)

Process PID 1 Setpoint

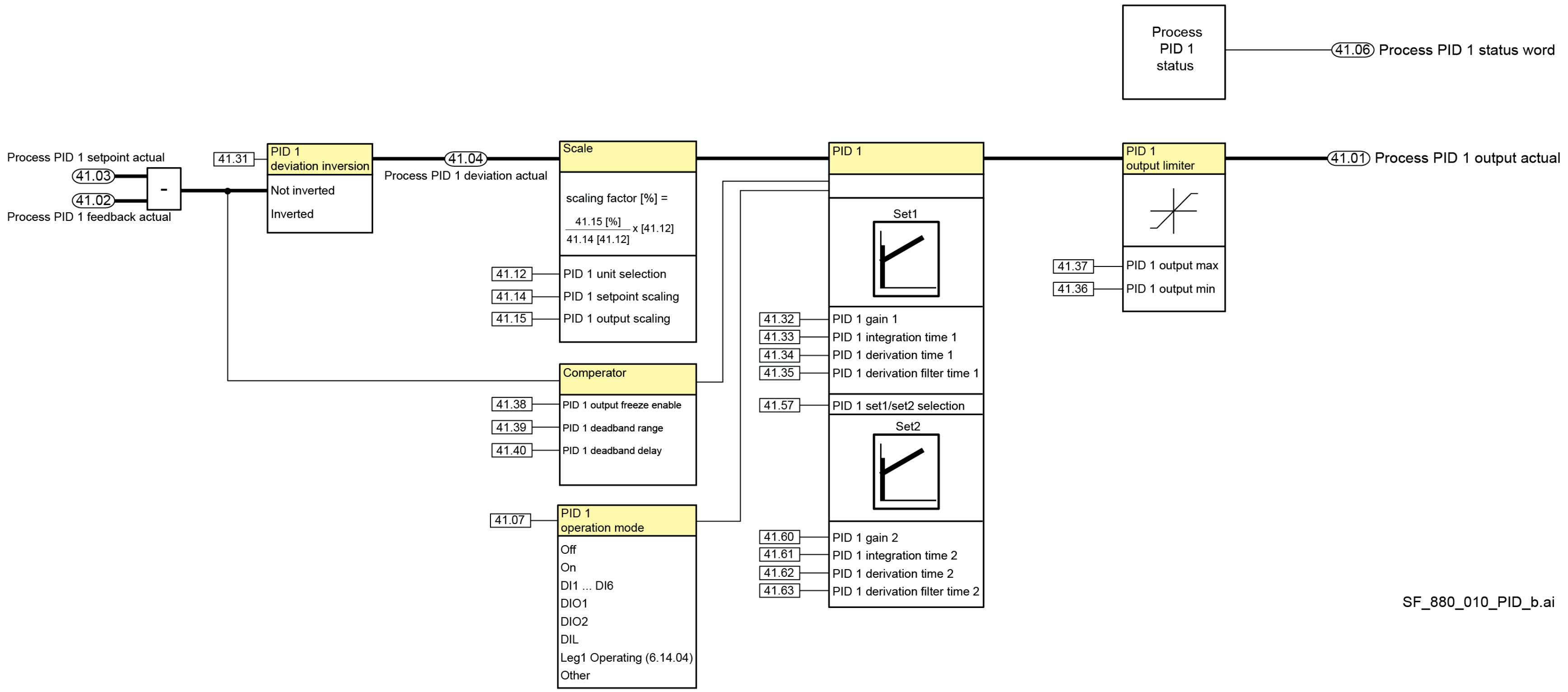


SF_880_010_PID_b.ai

Process PID 1 Feedback



Process PID 1 Output



DCS Family

DCS550-S modules
The compact drive for machinery application

20 … 1,000 A_{DC}
0 … 610 V_{DC}
230 … 525 V_{AC}
IP00

- Compact
- Robust design
- Adaptive and winder program
- High field exciter current

DCS880 modules
For safe productivity

20 … 5,200 A_{DC}
0 … 1,600 V_{DC}
230 … 1,000 V_{AC}
IP00

- Safe torque off (STO) built in as standard
- Compact and robust
- Single drives, 20 A to 5,200 A, up to 1,600 V_{DC}
- IEC 61131 programmable
- Intuitive control panel and PC tool with USB connection and start up assistant
- Wide range of options to serve any DC motor application

DCS800-A enclosed converters
Complete drive solutions

20 … 20,000 A_{DC}
0 … 1,500 V_{DC}
230 … 1,200 V_{AC}
IP21 – IP54

- Individually adaptable to customer requirements
- User-defined accessories like external PLC or automation systems can be included
- High power solutions in 6- and 12-pulse up to 20,000 A, 1,500 V
- In accordance to usual standards
- Individually factory load tested
- Detailed documentation

DCT880 modules
Thyristor controller

20 … 4,200 A_{AC}
110 … 990 V_{AC}
IP00

- Precise power control in industrial heating applications
- Two or three phase devices
- Power optimizer for peak load reduction
- Built on ABB's all-compatible drives architecture
- Intuitive control panel and PC tool with USB connection and start up assistant
- Application control programs and drive application programming with IEC 61131 programming

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