DCS880

Hardware Manual
DCS880 Drives (20 ... 5200 A)





DCS880 Drive Manuals

List of manuals

		Language						
	Publication number	E	D	I	ES	F	CN	RU
DCS880 Quick Guide	*3ADW000435*	x						
DCS880 Units								
DCS880 Flyer	*3ADW000475*	x	x					
DCS880 Technical Catalog	3ADW000465	x						
DCS880 Hardware Manual	3ADW000462	x						
DCS880 Firmware Manual	*3ADW000474*	x						
DCS880 Service Manual	3ADW000488	p						
ACS-AP-x assistant control panels user's manual	*3AUA0000085685*	x						
Adaptive programming, Application guide	*3AXD50000028574*	x						
Option manuals and guides								
SDCS-DPI-H01 panel bus adapter module	HW DCT880 0001E	x						
Door mounting kits								
DPMP-01 mounting platform for ACS-AP control panel	*3AUA0000100140*	x						
DPMP-02 mounting platform for ACS-AP control panel	*3AUA0000136205*	x						
Serial communication								
FCAN-01 CANopen adapter module	*3AFE68615500* *3AUA0000121752*	x	x					
FDNA-01 DeviceNet™ adapter module	*3AFE68573360*	x						
FECA-01 EtherCAT adapter module	*3AUA0000068940* *3AUA0000083936*	x	x					
FENA-01/-11/-21 Ethernet adapter module	*3AUA0000093568*	x						
FEPL-02 Ethernet POWERLINK adapter module	*3AUA0000123527* *3AUA0000133138*	x	x					
FPBA-01 PROFIBUS DP adapter module	*3AFE68573271* *3AFE68989078*	x	x					
FSCA-01 RS-485 adapter module	*3AUA0000109533*	x						
FDCO-01/02 DDCS communication modules	*3AUA0000114058*							
Drive (IEC61131-3) application programming manual	*3AUA0000127808*	x						
Tool and maintenance manuals and guides								
Drive composer PC tool	*3AUA0000094606*	x						
NETA-21 remote monitoring tool	3AUA00000969391	x						
NETA-21 remote monitoring tool installation and startup guide	*3AUA0000096881*	x						
Extension modules								
FIO-11 Analog extension module	*3AFE68784930*							
FIO-01 Digital extension modules	*3AFE68784921*							
FAIO-01 Analaog extension module	*3AUA0000124968*							
FEN-01 TTL encoder interface	*3AFE68784603*							
FEN-31 HTL encoder interface	*3AUA0000031044*							
FEA-01 F-series Extension Adapter	*3AUA0000071412*							
FEA-03 F series extension adapter	*3AUA0000115811*							
x → existingp → planned								

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DCS880 Drives
20 ... 5200 A

Hardware Manual

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Safety instructions

What this chapter contains

This chapter contains the safety instructions which you must follow when installing, operating and servicing the drive. If ignored, physical injury or death may follow, or damage may occur to the drive, the motor or driven 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 DCS880, the converter modules DCS880-S0x size H1 ... H8, field exciter units DCF80x, etc. like the Rebuild Kit DCS800-R00.

Use 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 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 discharge warning warns of electrostatic discharge which can damage the equipment.

Installation and maintenance work

These warnings are intended for all who work on the drive, motor cable or motor. 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 drive!**
- Never work on the drive, motor cable or motor when main power is applied. Always ensure by measuring with a multimeter (impedance at least 1 Mohm) that:
    1. Voltage between drive input phases U1, V1 and W1 and the frame is close to 0 V.
    2. 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 drive or to the external control circuits. Externally supplied control circuits may cause dangerous voltages inside the drive even when the main power on the drive is switched off.
- Do not make any insulation resistance or voltage withstand tests on the drive or drive modules.
- Isolate the motor cables from the drive when testing the insulation resistance or voltage withstand of the cables or the motor.
- When reconnecting the motor cable, always check that the C+ and D- cables are connected with the proper terminal.

Note:

- The motor cable terminals on the drive are at a dangerously high voltage when the main power is on, regardless of whether the motor is running or not.
- Depending on the external wiring, dangerous voltages (115 V, 220 V or 230 V) may be present on the relay outputs of the drive system (e.g. XRO1 ... XRO3).
- DCS880 with enclosure extension: Before working on the drive, isolate the whole drive from the supply.

Grounding



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



WARNING

- Ground the drive, motor and adjoining equipment 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-drive installation, connect each drive 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.
- Do not install a drive equipped with an EMC filter to an ungrounded power system or a high resistance-grounded (> 30 ohms) power system.

Note:

- Power cable shields are suitable as equipment grounding conductors only when adequately sized to meet safety regulations.
- As the normal leakage current of the drive 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.

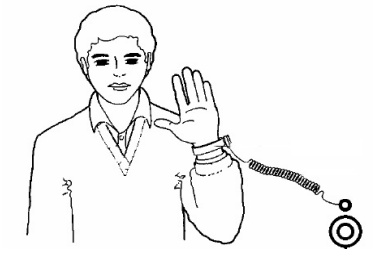
Printed circuit boards and fiber optic cables

These instructions are intended for all who handle the circuit boards and fiber optic cables. 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:



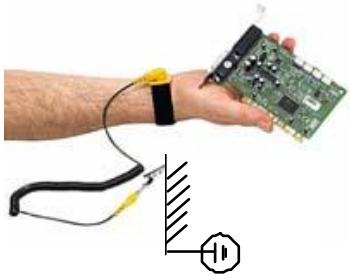


ABB order no.: 3ADV050035P0001



WARNING

- Handle the fiber optic cables with care.
- When unplugging optic cables, always grab the connector, not the cable itself.
- Do not touch the ends of the fibers with bare hands as the fiber is extremely sensitive to dirt.
- The minimum allowed bend radius is 35 mm (1.4 in.).

Mechanical installation

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



WARNING

- DCS880 sizes H4 ... H8: The drive is heavy. Do not lift it alone. Do not lift the unit by the front cover. Place units H4 ... H6 only on its back.
  DCS880 sizes H6 ... H8: The drive is heavy. Lift the drive by the lifting lugs only. Do not tilt the unit. The unit will overturn from a tilt of about 6 degrees.
- Make sure that dust from drilling does not enter the drive when installing. Electrically conductive dust inside the unit may cause damage or lead to malfunction.
- Ensure sufficient cooling.
- Do not fasten the drive by riveting or welding.

Operation

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



WARNING

- Before adjusting the drive and putting it into service, make sure that the motor and all driven equipment are suitable for operation throughout the speed range provided by the drive. The drive can be adjusted to operate the motor at speeds above and below the base speed.
- Do not control the motor with the disconnecting device (disconnecting mains); instead, use the control panel keys  and  , or commands via the I/O board of the drive.
- Mains connection:
  You can use a disconnect switch (with fuses) to disconnect the electrical components of the drive 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 STOP buttons must be installed at each control desk and at all other control panels requiring an emergency stop function. Pressing the STOP button on the control panel of the drive will neither cause an emergency stop of the motor, nor will the drive be disconnected 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 drive via signals "RUN", "drive OFF" or "Emergency Stop" respectively "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 (Local not shown in the status row of the display), the stop key on the control panel will not stop the drive. To stop the drive using the control panel, press the Loc/Rem key and then the stop key .

The DCS880

Chapter overview

This chapter describes briefly the operating principle and construction of the converter modules in short.

The DCS880

The DCS880-S size H1 ... H8 are intended for controlling DC motors.



Size H1 ... H5
20 **...** 1190 A



Size H6
900 **...** 2000 A

Type code

The type code contains information on the specification and configuration of the drive. The first digits from left show the basic configuration (e.g. DCS880-S01-2000). The optional selections are given thereafter on the name plate by plus code. The main selections are described below. Not all selections are available for all types.

The drive's basic type code: DCS880-AAB-CCCC-DDEF + plus code			
Product family	DCS880		
Product type:	AA	= S0 = R0 = E0 = A0	Standard converter module Rebuild kit Panel solution Enclosed converter
Bridge type:	B	= 1 = 2	Single bridge (2-Q) 2 anti-parallel bridges (4-Q)
Module type:	CCCC	=	Rated DC current (IP00)
Rated AC voltage:	DD	= 04 = 05 = 06 = 07 = 08 = 10 = 12	100 V_{AC} - 415 V_{AC} 100 V_{AC} - 525 V_{AC} 270 V_{AC} - 600 V_{AC} 315 V_{AC} - 690 V_{AC} 360 V_{AC} - 800 V_{AC} 450 V_{AC} - 990 V_{AC} 540 V_{AC} - 1200 V_{AC}
Power connection:	E	= X = L = R	Standard H1 ... H7 Left side H8 Right side H8
Revision code:	F	= 0	1st generation
Field exciter configuration:		+0S163 +S164	H1 ... H4 without OnBoard field exciter H5 and H6 with internal field exciter, supply external (H5 and H6: 25 A, Rebuild kit: 16 A / 25 A)
Fan voltage:		 Standard +S171	**Size H4** Fan voltage: 230 V / 1-ph Fan voltage: 115 V / 1-ph
Application programming		+S551	Memory unit including drive application programming license
Control panel:		+0J404 +J428 +J429	Without control panel daisy-chain option DPI-H01 kit Bluetooth control panel ACS-AP-W

The technical data and specifications are valid as of going to press. ABB reserves the right to make subsequent alterations.

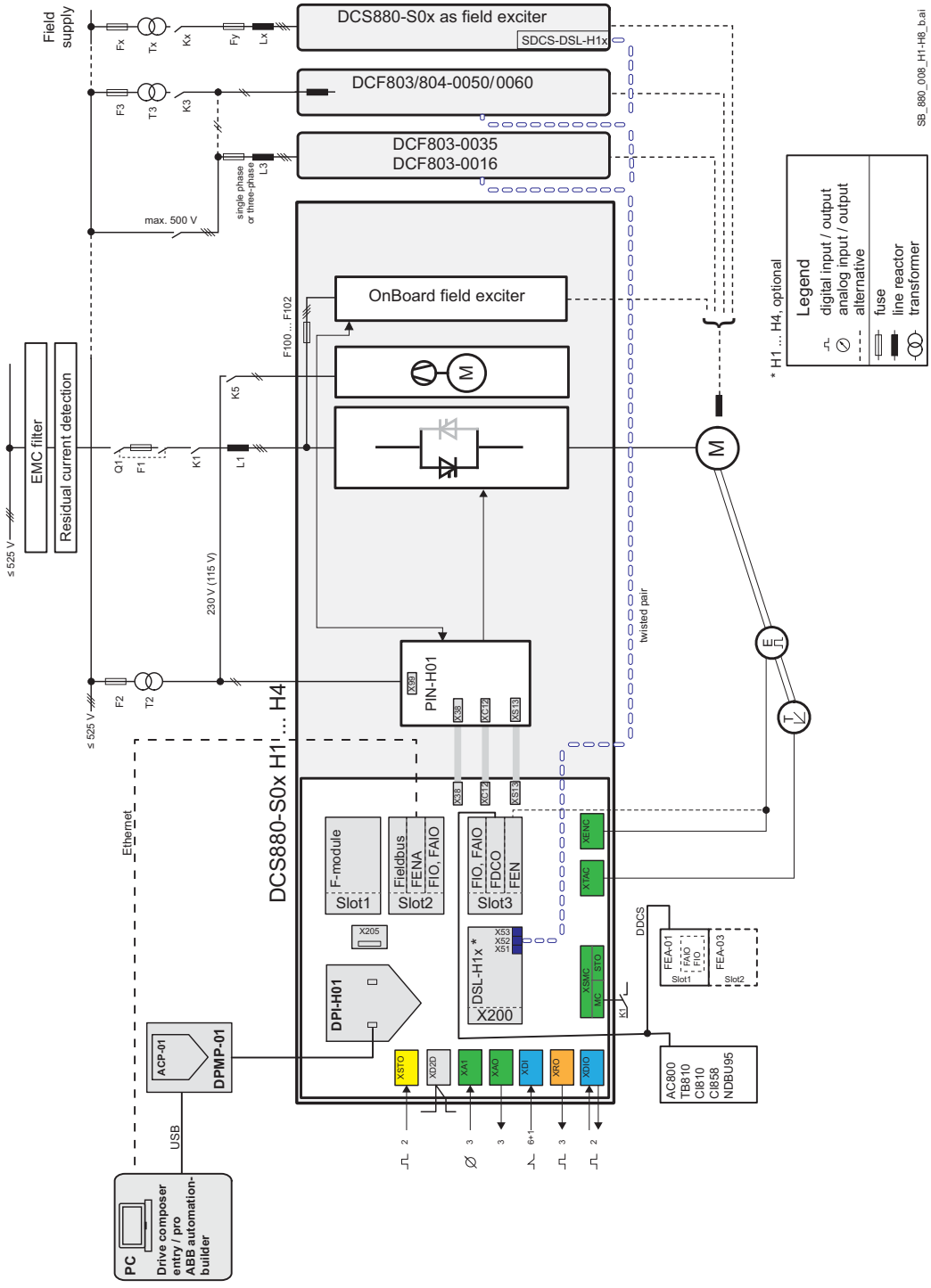
Plus codes

Option	Option code	Description
ACS-AP-I	standard	built-in
no ACS-AP-I	0J404	No Control Panel
ACS-AP-W	+J429	Bluetooth panel
DPI-H01	+J428	daisy-chain option
FDNA-01	+K451	Fieldbus DeviceNet
FPBA-01	+K454	Fieldbus PROFIBUS
FCAN-01	+K457	Fieldbus CANOpen
FSCA-01	+K458	Fieldbus Modbus
FCNA-01	+K462	Fieldbus ControlNet
FECA-01	+K469	Fieldbus EtherCat
FEPL-02	+K470	Fieldbus Ethernet POWERLINK
FENA-11	+K473	Ethernet/IP, Modbus/TCP, Profinet
FENA-21	+K475	Ethernet/IP, Modbus/TCP, Profinet
FIO-11	+L500	Analog I/O Extension (3 AI, 1 AO, 2 DIO)
FIO-01	+L501	Digital I/O Extension (4 DIO, 2 RO)
FAIO-01	+L525	Analog I/O Extension (2 AI, 2 AO)
FDIO-01	+L526	Digital I/O Extension (3 DI, 2 RO)
FPTC-01	+L536	Thermistor protection module
FEN-31	+L502	HTL Encoder Interface
FEN-21	+L516	Resolver Interface
FEN-01	+L517	TTL Encoder interface
FEN-11	+L518	Absolute Encoder Interafce
FDCO-01	+L503	DDCS communication 10/10 MBd
FDCO-02	+L508	DDCS communication 5/10 MBd
Application programming	+S551	Memory unit including drive application programming license
no OnBoard field exciter	0S163	Excludes OnBoard field exciter (H1 ... H4)
SDCS-DSL-H10	+S521	1 DCSLink channel, 0 channels optical power link
SDCS-DSL-H12	+S522	1 DCSLink channel, 2 channels optical power link
SDCS-DSL-H14	+S523	1 DCSLink channel, 4 channels optical power link
FSO-21	+Q972	Functional Safety Option
FSE-31	+L521	Functional Safety Encoder

Main circuit and control

Armature converter DCS880-S0x H1 ... H4

400 V and 525 V units with OnBoard field exciter
600 V units are always without OnBoard field exciter



Mechanical installation

Chapter overview

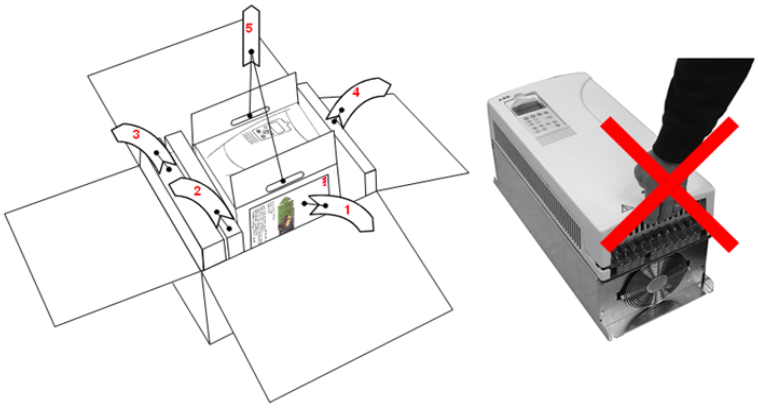
This chapter describes the mechanical installation of the DCS880.

Unpacking the unit

- Open the box,
- take out shock dampers,
- separate manual and accessories.

Attention:

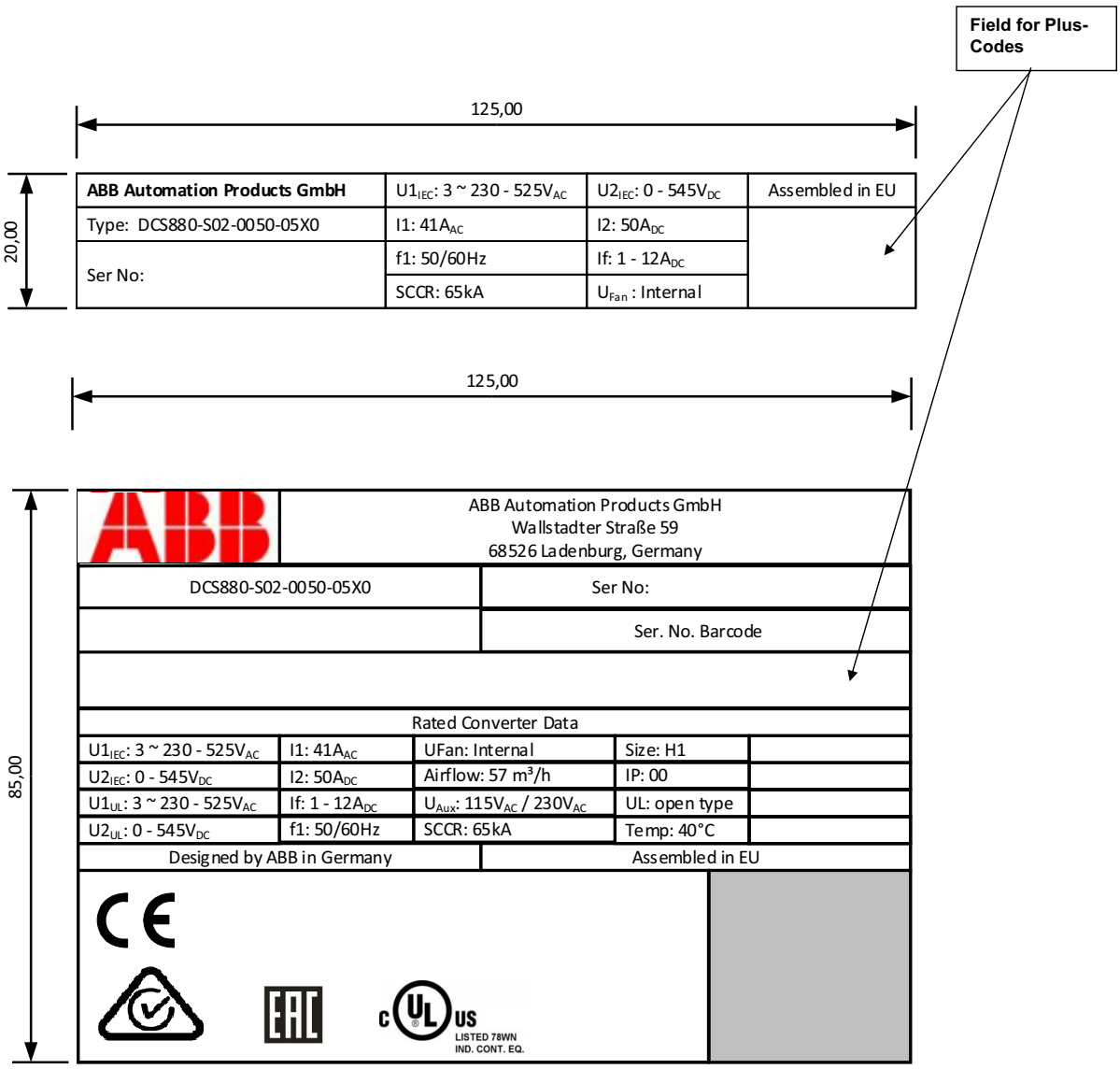
Do not lift the drive by the cover!



Delivery check

Check that there are no signs of damage. Before attempting installation and operation, check the information on the nameplate of the converter module to verify that the unit is of the correct type. The label includes an IEC rating, cULus, C-tick (N713) 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.

See an example nameplate below.



Before installation

Install the drive in an upright position with the cooling section facing a wall. Check the installation site according to the requirements below. Refer to chapter *Dimensions and weights* for frame details.

Requirements for the installation site

See chapter *Technical data* for the allowed operation conditions of the drive.

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 should be non-flammable.

Free space around the unit

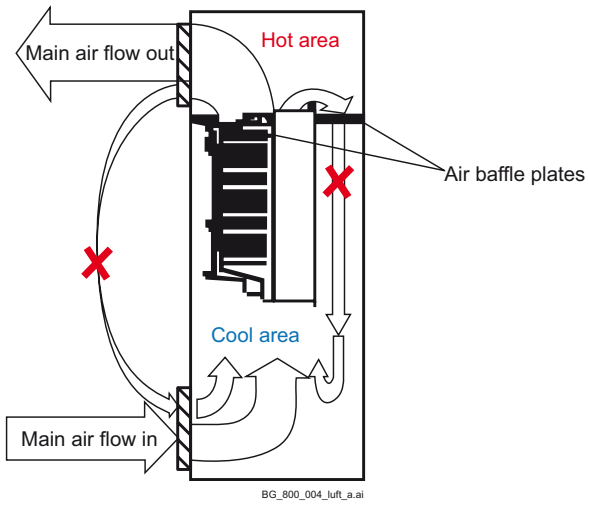
Around the unit free space is required to enable cooling airflow, service and maintenance see chapter *Dimensions and weights*.

Cabinet installation

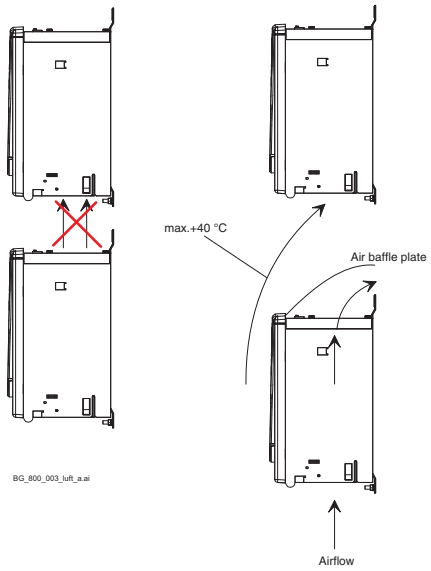
The required distance between parallel units is five millimetres (0.2 in.) in installations without the front cover. The cooling air entering the unit must not exceed +40 °C (+104 °F).

Preventing cooling air recirculation

Prevent air recirculation inside and outside the cabinet.



Unit above another



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

Recommended air entry / exit sizes in case of filters (IP22)

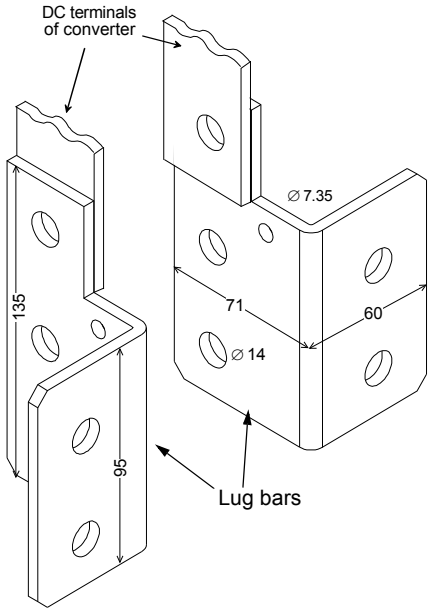
Size	Nominal converter current [A]	Air entry size [m^2]	Air exit size [m^2]
H1	20 ... 100	0.22	0.11
H2	135 ... 300		
H3	290 ... 350		
H3	405 ... 520	0.31	0.15
H4	590 ... 1000		
H5	1190	0.22	0.11
H6	900 ... 2000		
H7	1900 ... 3000	0.44	0.31
H8	2050 ... 5200	0.52	

Terminal options for converter modules size H1 ... H4

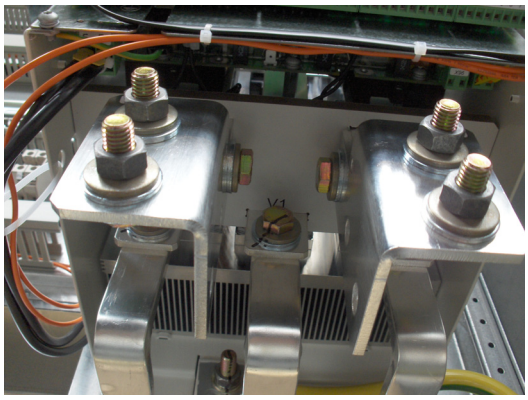
There are different options to protect and connect the terminals of converter modules size H1 ... H4.

Connection of H4 converter module DC terminals

In some cases it is beneficial to use lug bars for easy DC cable connection.



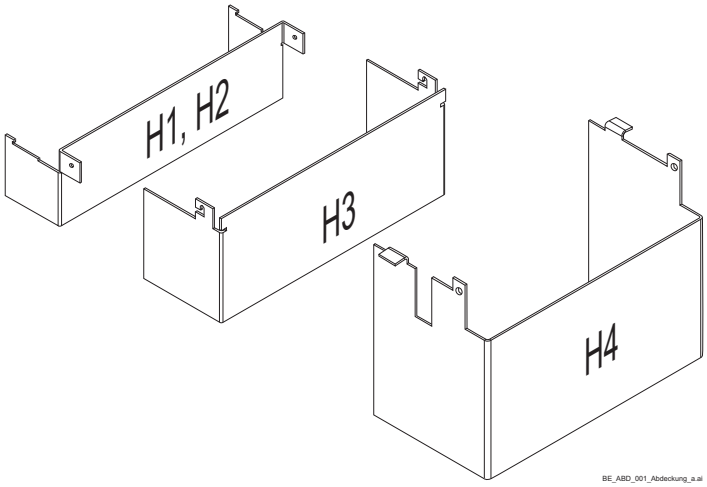
Id No.	Remark
3ADV280706P0001	right
3ADV280706P0002	left



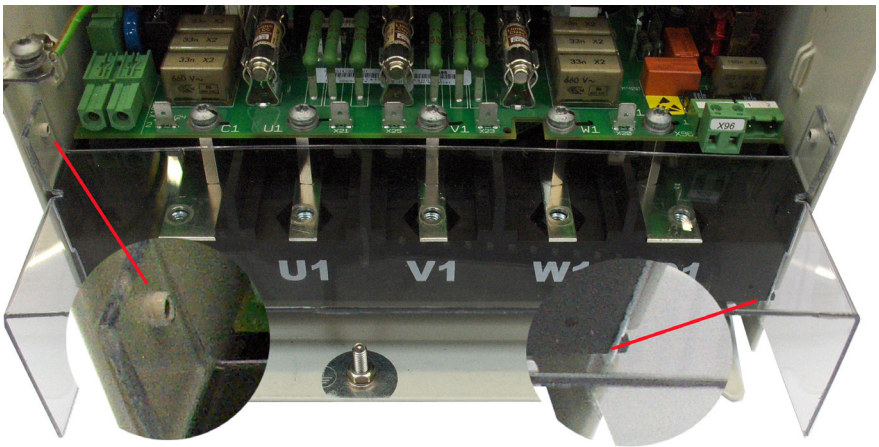
Bottom view

Terminal cover according to VBG 4 regulations

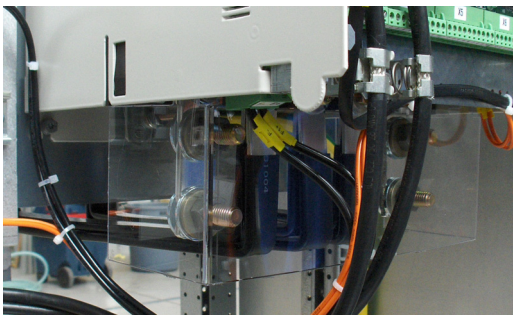
For converter modules size H1 - H4 shrouds for protection against contact are provided.

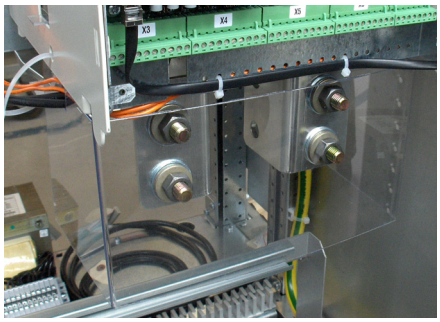


Id No.	Remark
3ADT631137P0001	H1, H2
3ADV400208P0001	H3
3ADV400207P0001	H4



Mount the H1, H2 cover using the existing lateral pins and than swing it down to snap it into the terminal row. H3 and H4 mounting is the same, without the snap-in mechanism.





Examples for DC main terminal covers for H3 (left) and H4 (right) converter modules.

Planning the electrical installation

Chapter overview

This chapter contains the instructions that must be followed when selecting the motor, cables, protections, cable routing and way of operation for the drive system. Always follow local regulations. This chapter applies to all DCS880 converter modules.

Attention:

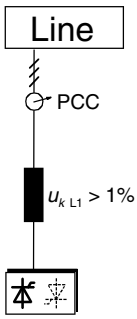
If the recommendations given by ABB are not followed, the drive may experience problems not covered by warranty. See also *Technical Guide*.

Options

Line reactors (L1)

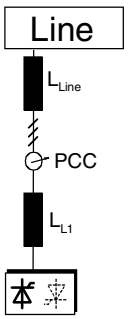
For armature and field supply.

When thyristor converters operate, the line voltage is short-circuited during commutation from one thyristor to the next. This operation causes voltage dips in the mains PCC (point of common coupling). For the connection of a power converter system to the mains, one of the following configurations applies:



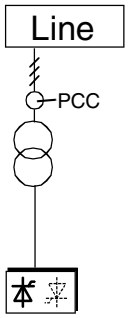
Configuration A

When using a converter, a minimum of impedance is required to ensure proper performance of the snubber circuit. Use a line reactor to meet this minimum impedance requirement. The value must therefore not drop below 1 % u_k (relative impedance voltage). It should not exceed 10 % u_k, due to considerable voltage drops at the converters outputs.



Configuration B

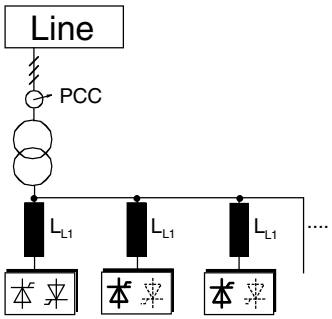
If special requirements have to be met at the PCC (standards like EN 61 800-3, DC and AC drives at the same line, etc), different criteria must be applied for selecting a line reactor. These requirements are often defined as a voltage dip in percent of the nominal supply voltage. The combined impedance of Z_{Line} and Z_{L1} constitute the total series impedance of the installation. The ratio between the line impedance and the line reactor impedance determines the voltage dip at the PCC. In such cases, line chokes with an impedance around 4 % are often used.
Example calculation with u_{kLine} = 1 % and u_{kL1} = 4 %:
Voltage dip = Z_{Line} / (Z_{Line} + Z_{L1}) = 20 %. Detailed calculations see *Technical Guide*.



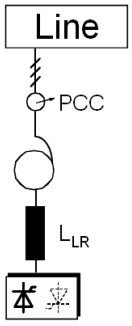
Configuration C

If a dedicated transformer / isolation transformer is used, it is possible to comply with certain connecting conditions per Configuration B without using an additional line reactor. The condition described in Configuration A will then likewise be satisfied, since the u_k is > 1 %.

Configuration C1



If 2 or more converters should be supplied by one transformer the final configuration depends on the number of drives in use and their power capability. Configuration A or B has to be used, if the drive system consists of any of the converters H1, H2, H3, H4, H5, H6, H7, H8.
In case if **only** two converters of type H8 are used no line reactors are necessary because the design of these converters allows that configuration.



Configuration D

In the case of thyristor converters, frequently transformers are used for voltage matching. When using an autotransformer for this purpose, additionally install a line reactor, because the u_k of commonly used autotransformers is too small.
In case of converters size H1 ... H5 the allowed voltage at the PCC is $\leq 600\ V_{AC}$.

Line reactors for converters

The line reactors listed in table below

- have been sized to the units nominal current and frequency (50 / 60 Hz)
- are independent of converter's voltage classification; at some converter types the same line choke is used up to 690 V line voltage
- are based on a duty cycle
- can be used for DCS880 as armature converter as well as field converter, but rated line choke current must be considered.

For further information see also *Technical Guide*.

Line reactors (L_1) Selection

Size	DCS Type 400 V... 690 V 50 / 60 Hz		Line reaktor (u_k = 1 %)	Design Fig.	Line reaktor (u_k = 4 %)	Design Fig.
	2-Q Converter	4-Q Converter				
H1	DCS880-S01-0020-04/05	DCS880-S02-0025-04/05	ND01	1	ND401	4
	DCS880-S01-0045-04/05	DCS880-S02-0050-04/05	ND02	1	ND402	4
	DCS880-S01-0065-04/05	DCS880-S02-0075-04/05	ND04	1	ND403	5
	DCS880-S01-0090-04/05	DCS880-S02-0100-04/05	ND06	1	ND404	5
H2	DCS880-S01-0135-04/05	DCS880-S02-0150-04/05	ND06	1	ND405	5
	DCS880-S01-0180-04/05	DCS880-S02-0200-04/05	ND07	2	ND406	5
	DCS880-S01-0225-04/05	DCS880-S02-0250-04/05	ND07	2	ND407	5
	DCS880-S01-0270-04/05	DCS880-S02-0300-04/05	ND09	2	ND408	5
H3	DCS880-S01-0290-06	DCS880-S02-0320-06	ND08	2	on request	-
	DCS880-S01-0315-04/05	DCS880-S02-0350-04/05	ND09	2	ND408	5
	DCS880-S01-0405-04/05	DCS880-S02-0450-04/05	ND10	2	ND409	5
	DCS880-S01-0470-04/05	DCS880-S02-0520-04/05	ND10	2	ND410	5
H4	DCS880-S01-0590-06	DCS880-S02-0650-06	ND13	3	on request	-
	DCS880-S01-0610-04/05	DCS880-S02-0680-04/05	ND12	2	ND411	5
	DCS880-S01-0740-04/05	DCS880-S02-0820-04/05	ND13	3	ND412	5
	DCS880-S01-0900-04/05	DCS880-S02-1000-04/05	ND13	3	ND413	5

Line reactors (details see chapter *Line reactors IEC*)

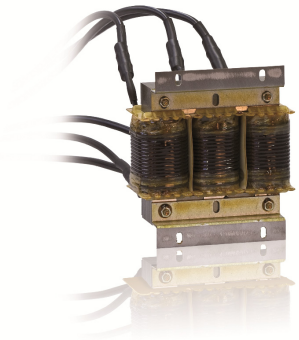


Fig. 1



Fig. 2



Fig. 3



Fig. 4



Fig. 5

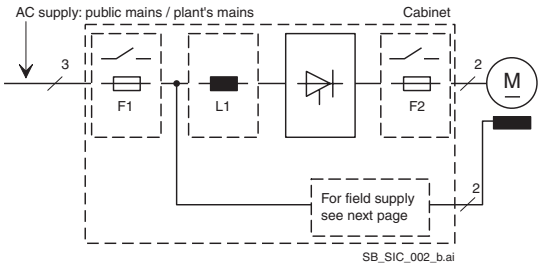
Semiconductor fuses (F1)

Aspects of fusing for the armature and field circuit of DC drives.

Unit configuration

Protection elements such as fuses or overcurrent trip circuits are required in all cases to protect against further damage. In some configurations, this will entail the following questions:

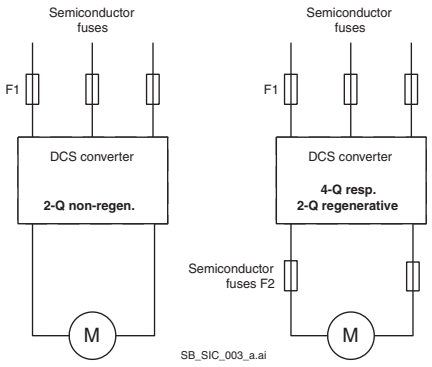
1. Where to place which protective element?
2. In the event of what faults will the element in question provide protection against damage?



The figure shows the arrangement of the switch-off elements in the armature-circuit. Further information is available in the *Technical Guide*.

Conclusion for the armature circuit

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.
Use DC fuses (2 of them) for all regenerative drives to protect the motor in case of a fault during regeneration. DC fuses must be rated for the same current and voltage as AC fuses, thus follows DC fuses = AC fuses.



Typical selection of DC fuses / high speed DC-breakers

Operation mode	**H1 ... H4**	
no regeneration	-	
seldom regeneration (< 10 %)	-	
regeneration (10 % ... 30 %)	DC fuses recommended	
often regeneratio (> 30 %)	DC fuses strongly recommended	

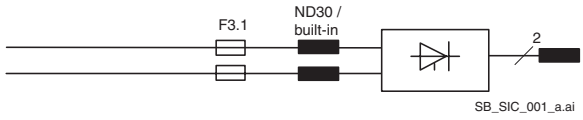
Conclusion for the field circuit

Basically, similar conditions apply for both field and armature circuit. Depending on the converter used (half-controlled bridge, fully controlled bridge), some of the fault sources may not always be applicable. Due to special system conditions, such as supply via an autotransformer or an isolating transformer, new protection conditions may occur.

The following configurations are very often used:

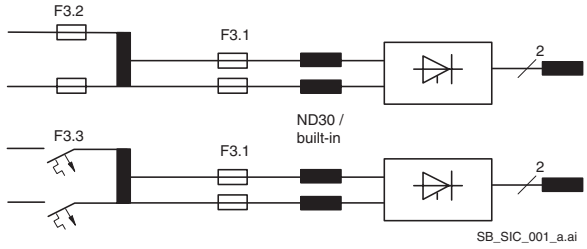
In contrast to the armature circuit, fuses are **never** used on the DC side of the field circuit, since a fuse trip might lead to additional damage e.g. small, but long-lasting overcurrent, contact problems, explosions, fires, etc.

Semiconductor fuses F3.1 (super-fast acting) should be used, in case of similar conditions compared to the armature circuit (4-Q operation). E.g. protection of the field circuit and the field winding.



Configuration for field circuit

Fuses F3.2 and F3.3 are used as line protectors and **cannot protect the field supply** unit. Only pure HRC fuses or miniature circuit-breakers must be used. Semiconductor fuses will be tripped, for example, by the transformer's inrush current.



Configurations for field circuit

Semiconductor fuses (F1) and fuse holders for armature circuit

The converters are subdivided into two groups:

- Unit sizes H1, H2, H3 and H4 with rated currents up to 1000 A require external fuses.
- In unit sizes H5, H6, H7 and H8 with rated currents from 900 A to 5200 A, branch fuses are internally installed (no additional external AC or DC fuses are needed).

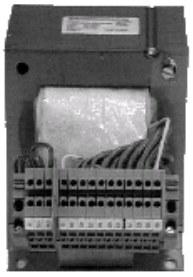
The fourth column of the table below assigns the AC fuse to the unit. In case the converter should be equipped with DC fuses, use the same type of fuse as on the AC side.

Size	Converter type (2-Q)	Converter type (4-Q)	Fuse	Fuse holder	Fuse type	Fuse holder
					North America	
H1	DCS880-S01-0020-04/05	DCS880-S02-0025-04/05	50A 660V UR	OFAX 00 S3L	FWP-50B	1BS101
	DCS880-S01-0045-04/05	DCS880-S02-0050-04/05	80A 660V UR	OFAX 00 S3L	FWP-80B	1BS101
	DCS880-S01-0065-04/05	DCS880-S02-0075-04/05	125A 660V UR	OFAX 00 S3L	FWP-125A	1BS103
	DCS880-S01-0090-04/05	DCS880-S02-0100-04/05	125A 660V UR	OFAX 00 S3L	FWP-125A	1BS103
H2	DCS880-S01-0135-04/05	DCS880-S02-0150-04/05	200A 660V UR	OFAX 1 S3	FWP-200A	1BS103
	DCS880-S01-0180-04/05	DCS880-S02-0200-04/05	250A 660V UR	OFAX 1 S3	FWP-250A	1BS103
	DCS880-S01-0225-04/05	DCS880-S02-0250-04/05	315A 660V UR	OFAX 2 S3	FWP-300A	1BS103
	DCS880-S01-0270-04/05	DCS880-S02-0300-04/05	500A 660V UR	OFAX 3 S3	FWP-300A	1BS103
H3	DCS880-S01-0315-04/05	DCS880-S02-0350-04/05	500A 660V UR	OFAX 3 S3	FWP-500A	1BS103
	DCS880-S01-0405-04/05	DCS880-S02-0450-04/05	700A 660V UR	OFAX 3 S3	FWP-700A	See Note 1
	DCS880-S01-0470-04/05	DCS880-S02-0520-04/05	700A 660V UR	OFAX 3 S3	FWP-700A	See Note 1
H4	DCS880-S01-0610-04/05	DCS880-S02-0680-04/05	900A 660V UR	3x 170H 3006	FWP-900A	See Note 1
	DCS880-S01-0740-04/05	DCS880-S02-0820-04/05	900A 660V UR	3x 170H 3006	FWP-900A	See Note 1
	DCS880-S01-0900-04/05	DCS880-S02-1000-04/05	1250A 660V UR	3x 170H 3006	FWP-1200A	See Note 1
H3	DCS880-S01-0290-06	DCS880-S02-0320-06	500A 660V UR	OFAX 3 S3	FWP-500A	See Note 1
H4	DCS880-S01-0590-06	DCS880-S02-0650-06	900A 660V UR	3x 170H 3006	FWP-900A	See Note 1

Note 1: No fuse holder is available; attach the fuses directly to the busbar.
Fuses and fuse holders for armature circuit (details see chapter *Fuses and fuse holders IEC*)

Auxiliary transformer (T2) for electronic system / fan supply

The converter requires various auxiliary voltages, e.g. the unit's electronics require 115 V or 230 V single-phase. The fans require 230 V single-phase or 400 V / 460 V / 500 V 3-phases, according to their size. The auxiliary transformer (T2) is designed to supply the unit's electronic system and all the single-phase fans for converter sizes H4 ... H6.



Input voltage: 380 ... 690 V single-phase; 50 / 60 Hz
Output voltage: 115 / 230 V single-phase
Power: 1400 VA

Auxiliary transformer data, details see chapter *Auxiliary transformer (T2)*

EMC filters (E1)

Filter in a grounded line (earthed TN or TT network)

The filters are suitable for grounded lines only, for example in public European 400 V_{AC} lines. According to EN 61800-3 filters are not needed in insulated industrial networks with own supply transformers. Furthermore they could cause safety risks in such floating lines (IT networks). According to EN 61800-3 filters are not needed in industrial zone (Second Environment) for DCS880 drives above 100 A_{DC} rated current. For rated currents below 100 A_{DC} the filter requirement is identical to Light Industry (First Environment).

Three-phase filters

EMC filters are necessary to fulfil the standard for emitted interference if a converter shall be run at a public low voltage line, in Europe for example with 400 V_{AC}. Such lines have a grounded neutral conductor. ABB offers suitable three-phase filters for 400 V_{AC}. For 440 V_{AC} public low voltage lines outside Europe 500 V_{AC} filters are available. Optimize the filters for the real motor currents:

$I_{Filter} = 0.8 \bullet I_{MOT\ max}$; the factor 0.8 respects the current ripple.

Lines with 500 V_{AC} up to 1000 V_{AC} are not public. They are local networks inside factories, and they do not supply sensitive electronics. Therefore converters do not need EMC filters if they shall run with 500 V_{AC} and more.

Size	Converter type (2-Q)	I_{DC} [A]	Converter type (4-Q)	I_{DC} [A]	Filter type for y = 4	Filter type for y = 5
H1	DCS880-S01-0020-0y	20	DCS880-S02-0025-0y	25	NF3-440-25	NF3-500-25
	DCS880-S01-0045-0y	45	DCS880-S02-0050-0y	50	NF3-440-50	NF3-500-50
	DCS880-S01-0065-0y	65	DCS880-S02-0075-0y	75	NF3-440-64	NF3-500-64
	DCS880-S01-0090-0y	90	DCS880-S02-0100-0y	100	NF3-440-80	NF3-500-80
H2	DCS880-S01-0135-0y	135	DCS880-S02-0150-0y	150	NF3-440-110	NF3-500-110
	DCS880-S01-0180-0y	180	DCS880-S02-0200-0y	200	NF3-500-320	NF3-500-320
	DCS880-S01-0225-0y	225	DCS880-S02-0250-0y	250	NF3-500-320	NF3-500-320
	DCS880-S01-0270-0y	270	DCS880-S02-0300-0y	300	NF3-500-320	NF3-500-320
H3	DCS880-S01-0315-0y	315	DCS880-S02-0350-0y	350	NF3-500-320	NF3-500-320
	DCS880-S01-0405-0y	405	DCS880-S02-0450-0y	450	NF3-500-600	NF3-500-600
	DCS880-S01-0470-0y	470	DCS880-S02-0520-0y	520	NF3-500-600	NF3-500-600
H4	DCS880-S01-0610-0y	610	DCS880-S02-0680-0y	680A	NF3-500-600	NF3-500-600
	DCS880-S01-0740-0y	740	—	—	NF3-500-600	NF3-500-600
	—	—	DCS880-S02-0820-0y	820	NF3-690-1000 ①	NF3-690-1000 ①
	DCS880-S01-0900-0y	900	DCS880-S02-1000-0y	1000	NF3-690-1000 ①	NF3-690-1000 ①

① Filter only available on request

EMC filters

Further information is available in the *Technical Guide*:

The paragraphs below describe selection of the electrical components in conformity with the EMC Guideline. The aim of the EMC Guideline is, as the name implies, to achieve electromagnetic compatibility with other products and systems. The guideline ensures that the emissions from the product concerned are so low that they do not impair another product's interference immunity.

In the context of the EMC Guideline, two aspects must be borne in mind:

- the product's interference immunity and
- the product's actual emissions.

The EMC Guideline expects EMC to be taken into account when a product is being developed; however, EMC cannot be designed in, it can only be quantitatively measured.

Note on EMC conformity:

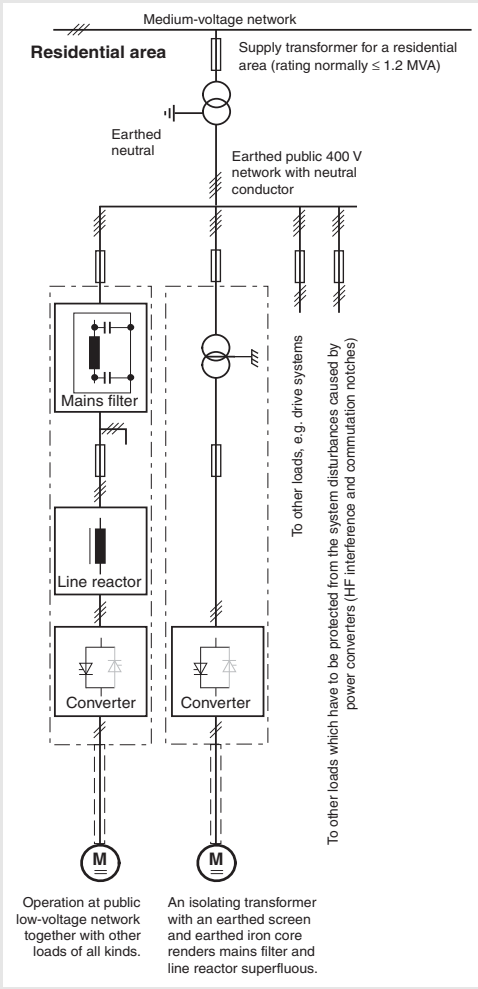
The conformity procedure is the responsibility of both the power converter's supplier and the manufacturer of the machine or system concerned, in proportion to their share in expanding the electrical equipment involved.

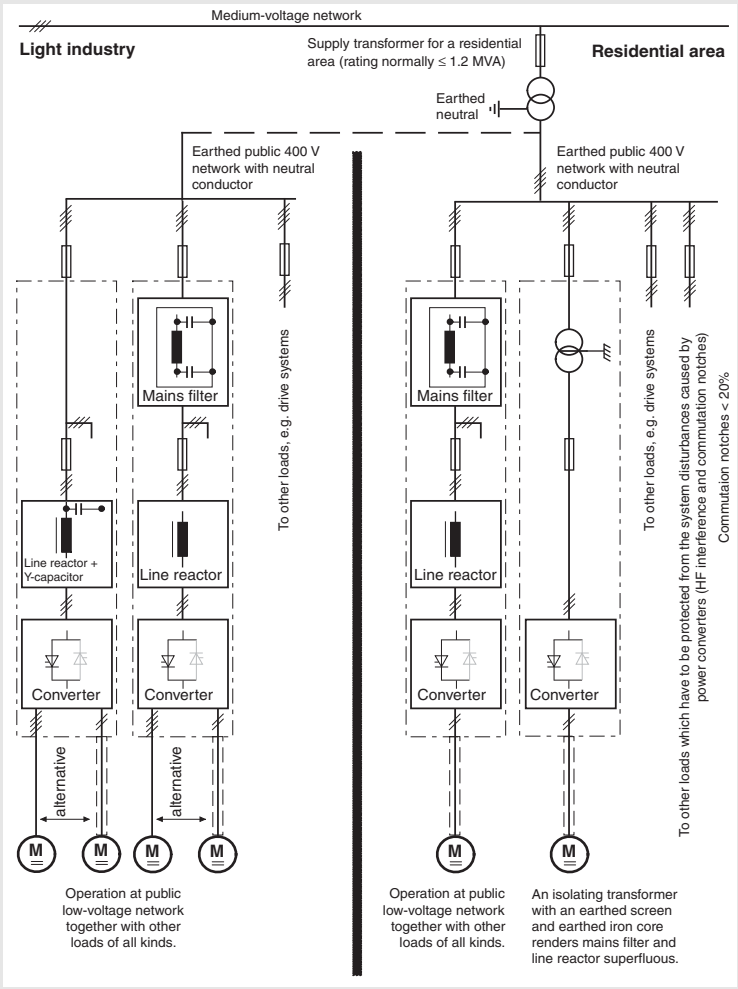
ND30

First environment (residential area with light industry) with PDS category C2		
Not applied, since category C1 (**general distribution** sales channel) excluded		
Not applicable		**satisfied**
satisfied		

ND401

ND402





For compliance with the protection objectives of the German EMC Act (EMVG) in systems and machines, the following EMC standards must be satisfied:

Product Standard EN 61800-3

EMC standard for drive systems (**P**ower**D**rive**S**ystem), interference immunity and emissions in residential areas, enterprise zones with light industry and in industrial facilities.

This standard must be complied with in the EU for satisfying the EMC requirements for systems and machines!

For emitted interference, the following apply:

EN 61000-6-3 Specialised basic standard for emissions in **light industry** can be satisfied with special features (mains filters, screened power cables) in the lower rating range *(EN 50081-1).

EN 61000-6-4 Specialised basic standard for emissions in **industry** *(EN 50081-2)

For interference immunity, the following apply:

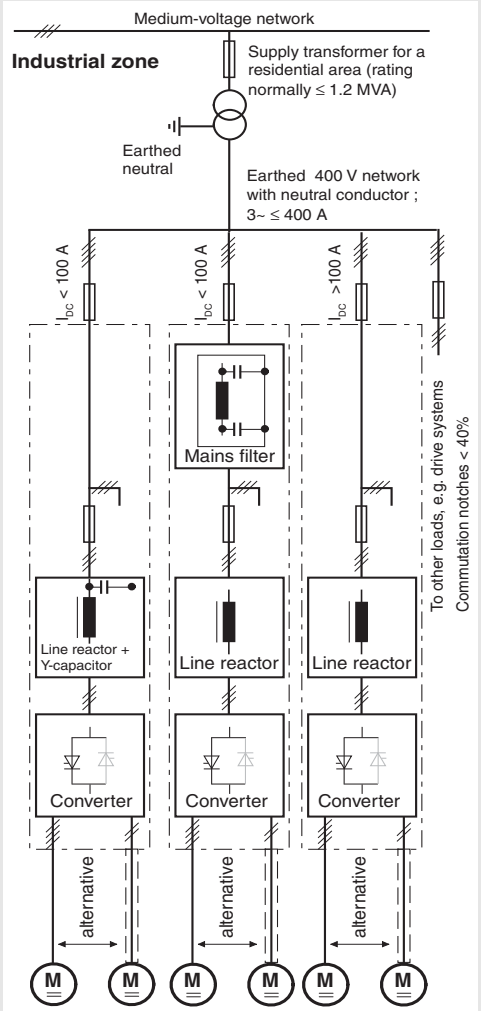
EN 61000-6-1 Specialised basic standard for interference immunity in **residential areas** *(EN 50082-1)

EN 61000-6-2 Specialised basic standard for interference immunity in **industry**. If this standard is satisfied, then the EN 61000-6-1 standard is automatically satisfied as well *(EN 50082-2).

* The old generic standards are given in brackets

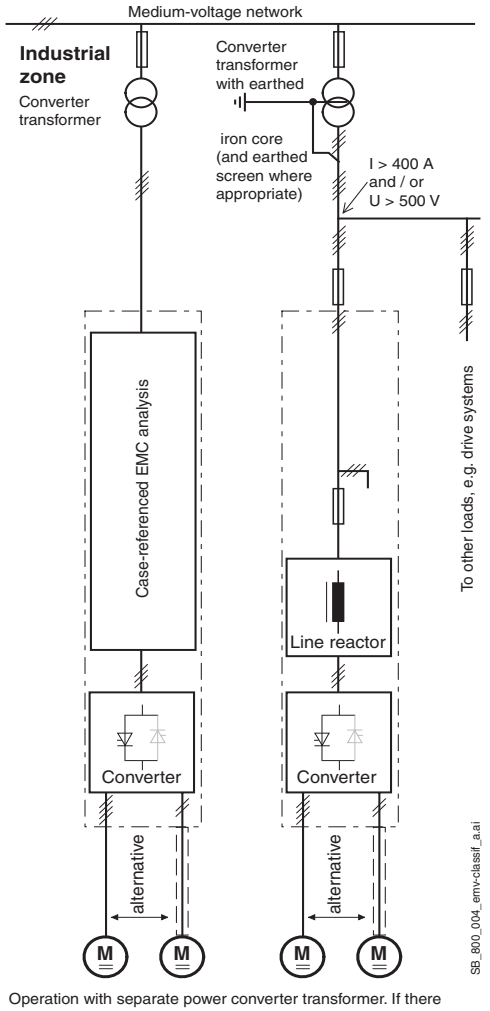
				Standards
Second environment (industry) with PDS categories C3, C4				**EN 61800-3**
Not applicable				**EN 61000-6-3**
satisfied		**on customer's request**	**satisfied**	**EN 61000-6-4**
satisfied				**EN 61000-6-2** **EN 61000-6-1**

PDS category C3



Operation at low-voltage network together with other loads of all kinds, apart from some kinds of sensitive communication equipment.

PDS category C4



Operation with separate power converter transformer. If there are other loads at the same secondary winding, these must be able to cope with the commutation gaps caused by the power converter. In some cases, commutating reactors will be required.

Classification

The following overview utilises the terminology and indicates the action required in accordance with Product Standard **EN 61800-3**

For the DCS880 series, the limit values for emitted interference are complied with, provided the measure indicated is carried out.

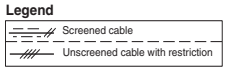
PDS of category C2 (formerly restricted distribution in first environment) is intended to be installed and commissioned only by a professional (person or organization with necessary skills in installing and/or commissioning PDS including their EMC aspects).

For power converters without additional components, the following warning applies:

This is a product of category C2 under IEC 61800-3:2004. In a domestic/residential environment this product may cause radio interference in which case supplementary mitigation measures my be required.

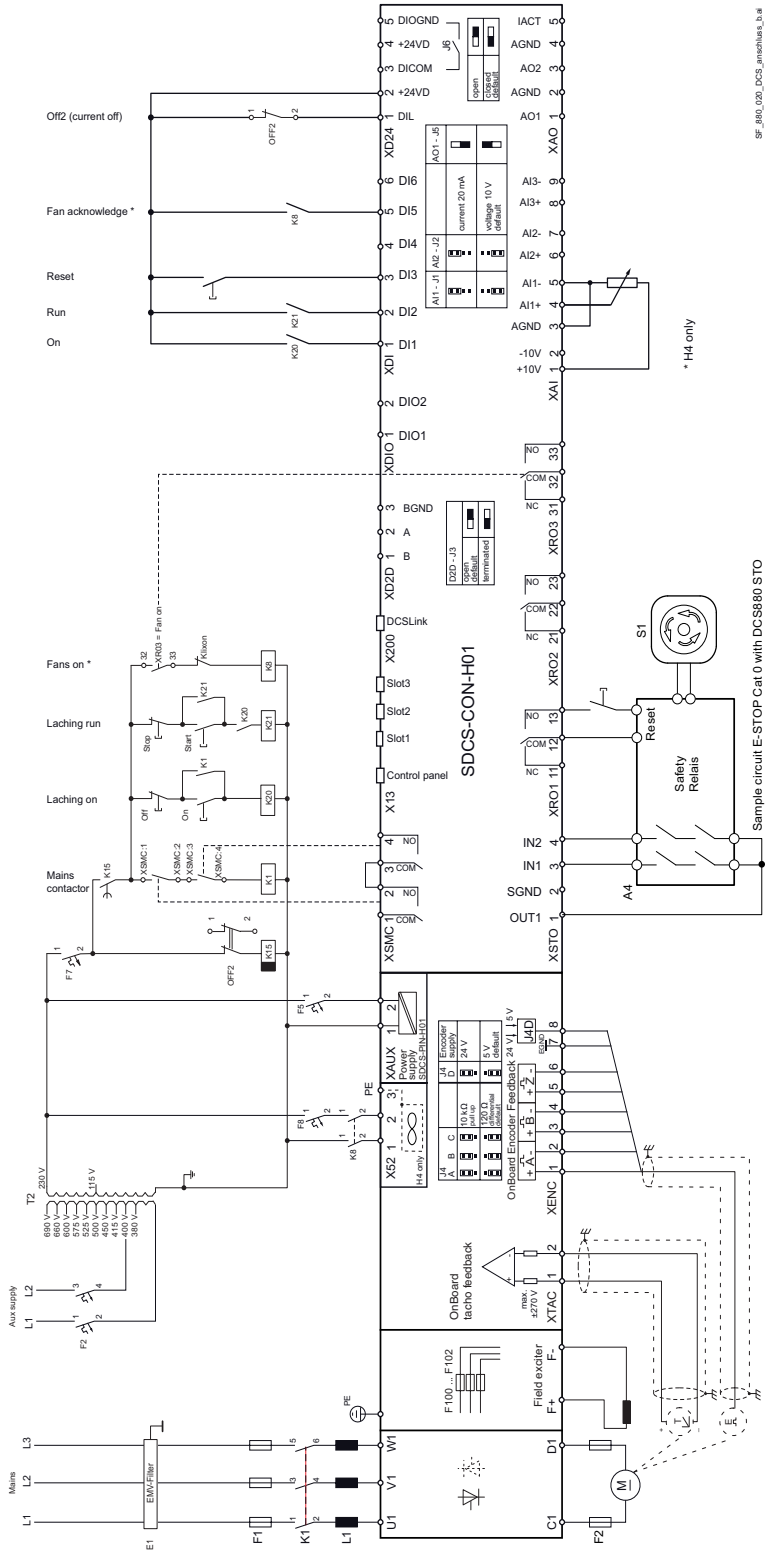
The field supply is not depicted in this overview diagram. For the field current cables, the same rules apply as for the armature-circuit cables.

Legend



Converters size H1 ... H4 configuration using an OnBoard field exciter

Wiring the drive according to this diagram offers the highest degree of monitoring functions done by the drive.



Cooling fans

Fan assignment for DCS880

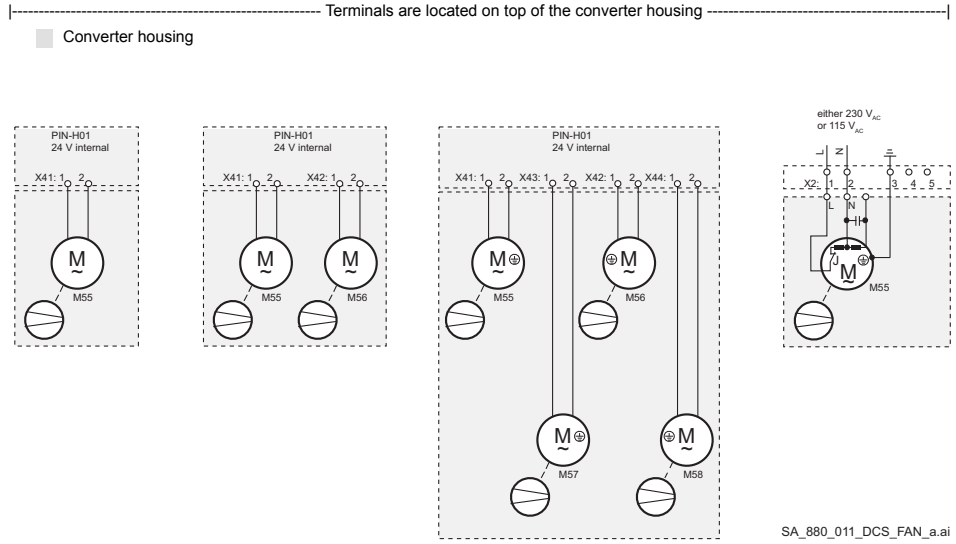
Converter type	Size	Configuration	Fan type
DCS880-S0x-0045-04/05 ... DCS880-S0x-00100-05/05	H1	1	1 x 3110UL
DCS880-S0x-0135-04/05 ... DCS880-S0x-0300-04/05	H2	2	2 x AFB122
DCS880-S0x-0315-04/05 ... DCS880-S0x-0450-04/05	H3		
DCS880-S0x-0470-04/05 ... DCS880-S0x-0520-04/05		3	2 x 3110UL 2 x AFB122
DCS880-S0x-0610-04/05 ... DCS880-S0x-0820-04/05	H4	4	1 x W2E200 230 V; 1~
DCS880-S0x-0610-04/05 ... DCS880-S0x-0820-04/05			
DCS880-S0x-0900-04/05 ... DCS880-S0x-1000-04/05			1 x W2E250 230 V; 1~
DCS880-S0x-0900-04/05 ... DCS880-S0x-1000-04/05			
DCS880-S0x-1190-04/05	H5	5	R2E250-RB 230 V; 1~
DCS880-S0x-0900-0y ... DCS880-S0x-2000-0y	H6		
DCS880-S0x-1900-0y ... DCS880-S0x-3000-0y	H7	6	GR28C-2DK 400 V / 500 V @ 50 Hz or 460 V @ 60 Hz
DCS880-S0x-2050-yy ... DCS880-S0x-5200-yy	H8	7	GR35C-2DD 400 V @ 50 Hz or 460 V @ 60 Hz

y = voltage class

Fan Data for DCS880 (H1 ... H4)

Fan	3110UL	AFB122	W2E200		W2E 200		W2E 250		W2E 250	
Rated voltage [V_{AC}]	24 V intern	24 V intern	230; 1~		115; 1~		115; 1~		230; 1~	
Tolerance [%]			+6 / -10		+6 / -10		±10		+6 / -10	
Frequency [Hz]			50	60	50	60	50	60	50	60
Power consumption [W]			64	80	64	80	120	165	135	185
Current consumption [A]			0.29	0.35	0.6	0.7	1.06	1.44	0.59	0.82
Blocking current [A]			< 0.7	< 0,8	< 1.5	< 1.8	< 1.8	< 1.8	< 0.9	< 0.9
Air flow [m^3/h] freely blowing	50	190	925	1030	925	1030	1835	1940	1860	1975
Max. ambient temperature [° C]	< 70	< 70	< 75		< 75		60		60	
Useful lifetime of grease	70,000 h/25°	100,000 h/25°	appr. 45,000 h/60°		appr. 45,000 h/60°		appr. 40,000 h		appr. 40,000 h	
Protection	Internal temperature detectors									

Fan connection for DCS880 (H1 ... H4)



Configuration 1
H1

Configuration 2
H2 ... H3

Configuration 3
H3

Configuration 4
H4

Monitoring the DCS880 power section

The power part of converters size H1 ... H6 is monitored by means of a galvanic isolated PTC thermistor. The PTC is installed on the heat sink in an isolated configuration. The PTC's resistance and protective effect correspond to the maximum temperature defined by the type code.

The air entry temperature at the power part of converters size H7 and H8 is monitored by means of a galvanic isolated PTC thermistor. The sensor measures the power part's radiated heat and any changes in the cooling air temperature and volume.

The resistance change proportional to the temperature is read and evaluated in the drive's firmware. If the temperature increases above the preset value, then first a warning and - if the temperature continues to rise - a fault message is generated. The preset value must not be set more than 5 degrees above the permissible ambient temperature.

Since the cooling air volume can only be detected indirectly, a differential-pressure switch has been additionally installed at the unit's housing. It is always located close to the power terminals.

The differential-pressure switch compares the pressure inside the drive with the normal air pressure. If the fan is switched on, the drive's door is closed, no covers have been removed and the pressure switch signals 'cooling conditions ok' it is possible to release the converter. There is no need to set a specific differential pressure (recommendation: use the center setting). The differential pressure switch should be connected to the converter fan acknowledge signal.

Thermal overload and short-circuit protection

The drive protects itself and the input and motor cables against thermal overload when the cables are dimensioned according to the nominal current of the drive.

Mains cable (AC line cable) short-circuit protection

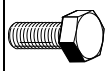
Always protect the input cable with fuses. Size the fuses according to local safety regulations, appropriate input voltage and the rated current of the drive (see chapter *Technical data*).

High-speed semiconductor fuses provide short-circuit protection, but don’t provide thermal overload protection.

Cross-sectional areas - Tightening torques

Recommended cross-sectional area to **DINVDE 0276-1000** and **DINVDE 0100-540 (PE)** trefoil arrangement, up to 50°C ambient temperature.

Armature:

Converter type	C1, D1			U1, V1, W1			PE		
		1 	(2.) 		1 	(2.) 			
	I_{DC} [A-]	[mm²]	[mm²]	Iv [A~]	[mm²]	[mm²]	[mm²]		[Nm]
DCS880-S0x-0025-xx	25	1 x 6	-	21	1 x 4	-	1x 4	1 x M6	6
DCS880-S0x-0050-xx	50	1 x 10	-	41	1 x 6	-	1x 6	1 x M6	6
DCS880-S0x-0075-xx	75	1 x 25	-	61	1 x 25	-	1x 16	1 x M6	6
DCS880-S0x-0100-xx	100	1 x 25	-	82	1 x 25	-	1x 16	1 x M6	6
DCS880-S0x-0150-xx	150	1 x 35	-	114	1 x 35	-	1x 16	1 x M10	25
DCS880-S0x-0200-xx	200	2 x 35	1 x 95	163	2 x 25	1 x 95	1x 25	1 x M10	25
DCS880-S0x-0250-xx	250	2 x 35	1 x 95	204	2 x 25	1 x 95	1x 25	1 x M10	25
DCS880-S0x-0300-xx	300	2 x 70	1 x 95	220	2 x 50	1 x 95	1x 50	1 x M10	25
DCS880-S0x-0320-xx	320	2 x 70	1 x 95	220	2 x 50	1 x 95	1x 50	1 x M10	25
DCS880-S0x-0350-xx	350	2 x 70	-	286	2 x 50		1x 50	1 x M10	25
DCS880-S0x-0450-xx	450	2 x 95	-	367	2 x 95	-	1x 50	1 x M10	25
DCS880-S0x-0520-xx	520	2 x 95	-	424	2 x 95	-	1x 50	1 x M10	25
DCS880-S0x-0650-xx	650	2 x 120	-	555	2 x 120	-	1x120	1 x M12	50
DCS880-S0x-0680-xx	680	2 x 120	-	555	2 x 120	-	1x120	1 x M12	50
DCS880-S0x-0820-xx	820	2 x 150	-	669	2 x 120	-	1x120	1 x M12	50
DCS880-S0x-1000-xx	1000	2 x 185	-	816	2 x 150	-	1x150	1 x M12	50

You will find instructions on how to calculate the PE conductor's cross-sectional area in VDE 0100 or in equivalent national standards. We would remind you that power converters may have a current-limiting effect.

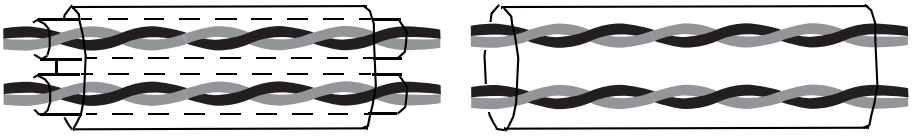
Excitation:

Size	H1	H1	H2	H3, H5, H6	H4	
DC output current	6 A	12 A	18 A	25 A	30 A	
max. cross sectional area	6 mm²/ AWG 10	6 mm²/ AWG 10	6 mm²/ AWG 10	6 mm²/ AWG 10	6 mm²/ AWG 10	
min. cross sectional area	1 mm²/ AWG 16	2.5 mm²/ AWG 13	4 mm²/ AWG 11	6 mm²/ AWG 10	6 mm²/ AWG 10	
Tightening torque	1.5 ... 1.7 Nm					

Selecting the control cables

A double shielded twisted pair cable, e.g. JAMAK by NK Cables, Finland must be used for analog signals and pulse encoder signals. Employ one individually shielded pair for each signal. Do not use common return for different analog signals.

A double-shielded cable is the best alternative for low voltage digital signals but single-shielded twisted multi pair cable is also usable.



Double shielded twisted pair cable

Single shielded twisted multi pair cable

Pairs should be twisted as close to terminals as possible.
Run analog and digital signals in separate, screened cables.

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

Never run 24 V_{DC} and 115 / 230 V_{AC} signals in the same cable!

Control panel cable

The cable connection of the control panel to the DCS880 converter must not exceed 3 meters (10 ft). The cable type tested and approved by ABB is included in the control panel option kits.

Connection of a motor temperature sensor to the drive I/O



WARNING

IEC 60664 requires double or reinforced insulation between live parts and the surface of accessible parts of electrical equipment which are either nonconductive or conductive but not connected to the protective earth.

To fulfill this requirement, the connection of a thermistor (or other similar components) to the inputs of the drive can be implemented by 3 alternate ways:

1. There is double or reinforced insulation between the thermistor and live parts of the motor.
2. Circuits connected to all digital and analogue inputs of the drive are protected against contact and insulated with basic insulation (the same voltage level as the drive main circuit) from other low voltage circuits.
3. An external thermistor relay is used. Rate the insulation of the relay for the same voltage level as the main circuit of the drive.

Also see section Fault Tracing / Motor Protection in *DCS880 Firmware Manual*.

Electrical installation

Chapter overview

This chapter describes the electrical installation procedure of the DCS880.

WARNING
A qualified electrician may only carry out the work described in this chapter. Follow the *Safety instructions* on the first pages of this manual. Ignoring the safety instructions can cause injury or death.

Make sure that the drive is disconnected from the mains (input power) during installation. If the drive was already connected to the mains, wait for 5 min. after disconnecting mains power.

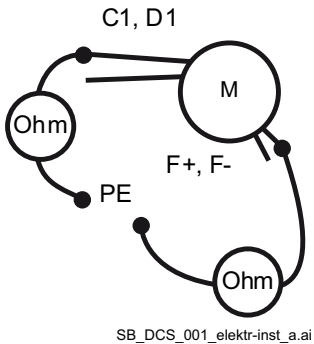
Further information is available in the *Technical Guide*.

Checking the insulation of the drive

Every converter has been tested for insulation between the main circuit and the chassis (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 converter. Check the insulation of the drive as follows.

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

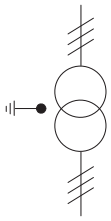
1. Check that the motor cables are disconnected from the converter output terminals C1, D1, F+ and F-.
2. Measure the insulation resistances of the motor cable and the motor between each circuit (C1, D1) / (F+, F-) and the Protective Earth (PE) by using a measuring voltage of 1 kV DC. The insulation resistance must be higher than 1 Mohm.



IT (ungrounded) systems

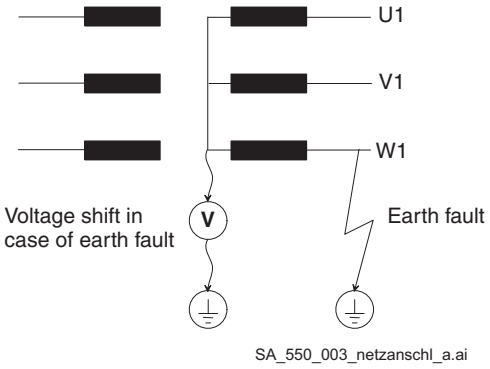
Don’t use EMC filters in IT systems.

The screen winding of existing dedicated transformers must be grounded.



For installation without low voltage switch (e.g. contactor, air-circuit-breaker) use an overvoltage protection on the secondary side of the mains transformer.

The voltage shift of the isolated supply must not be larger than the voltage shift in case on an earth fault.



Supply voltage

Check supply voltages of:

Auxiliary voltage	XAUX (X99) on SDCS-PIN-H01 / SDCS-POW-H01
Cooling fan	Terminals
Mains voltage for field circuit	U1, V1, W1 (if used)
Mains voltage for armature circuit	U1, V1, W1

Connecting the power cables

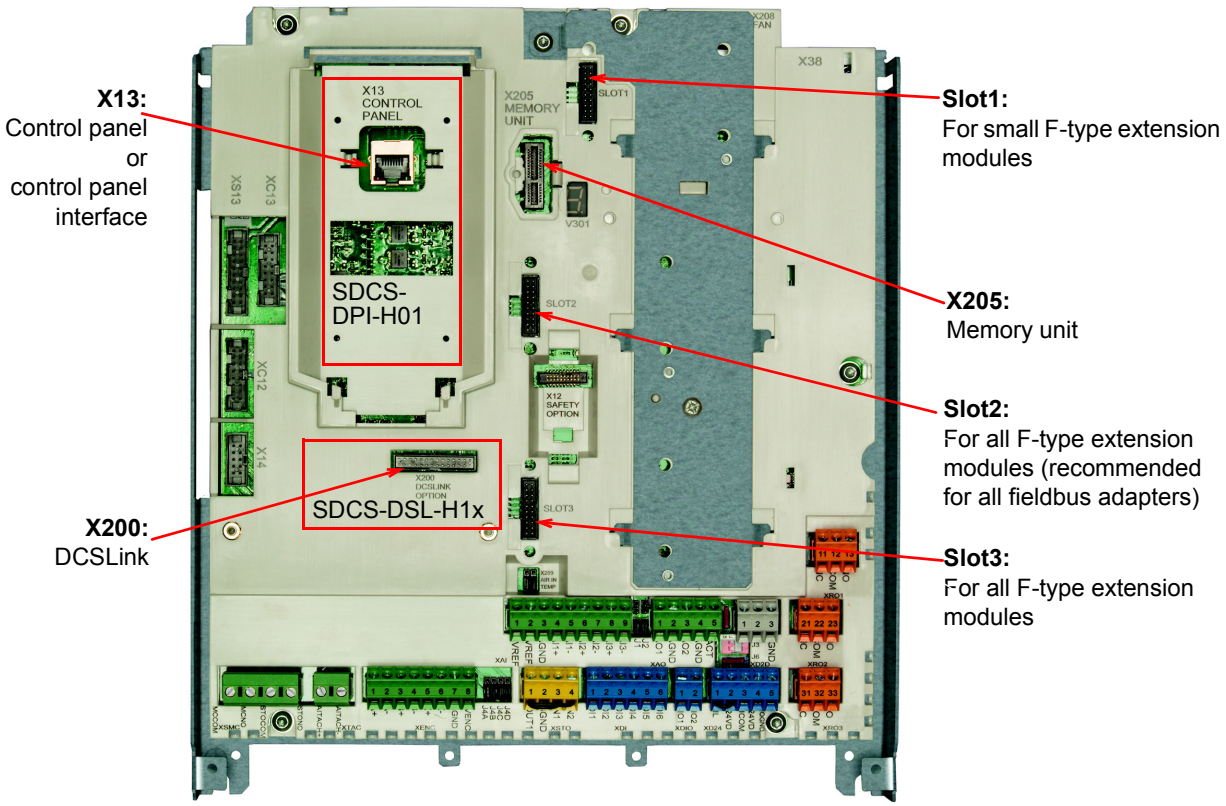
Check:

Grounding and screening of power cables see manual *Technical Guide*.

Cross sectional areas and tightening torques of power cable see chapter *Cross-sectional areas - Tightening torques*.

Location F-type options and interfaces

Connect the signal cables as described below. Tighten the screws to secure the extension modules and the memory unit.

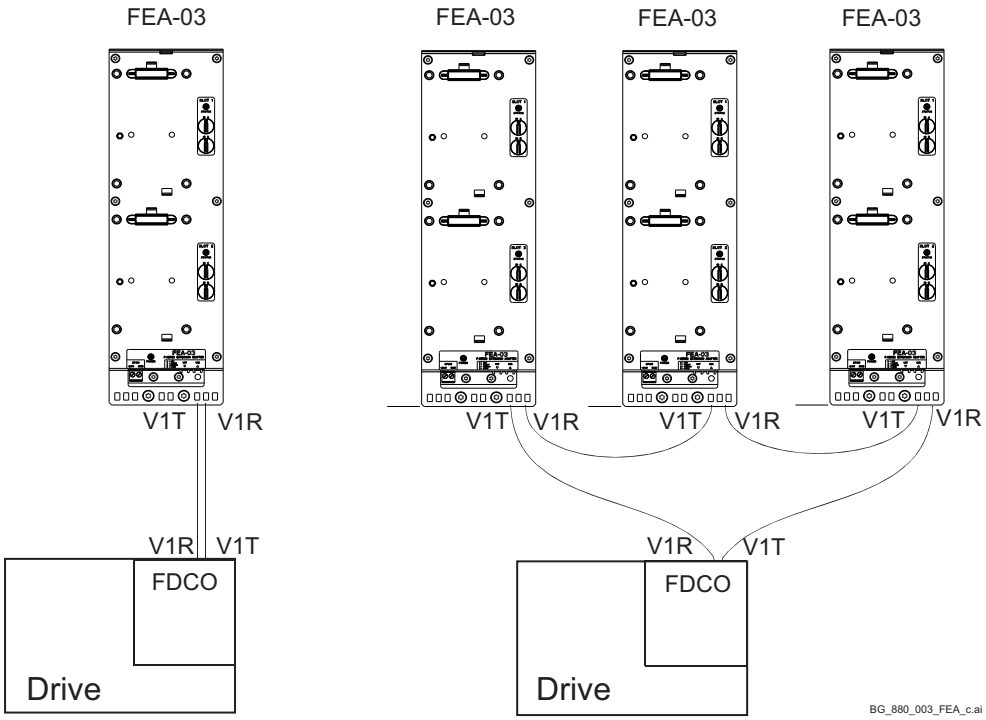


Fieldbus adapters



I/O extension modules




FEA-03
FEA-03
FEA-03
FEA-03
V1T
V1R
V1T
V1R
V1T
V1R
V1T
V1R
V1R
V1T
V1R
V1T
FDCO
Drive
FDCO
Drive
BG_880_003_FEA_c.ai

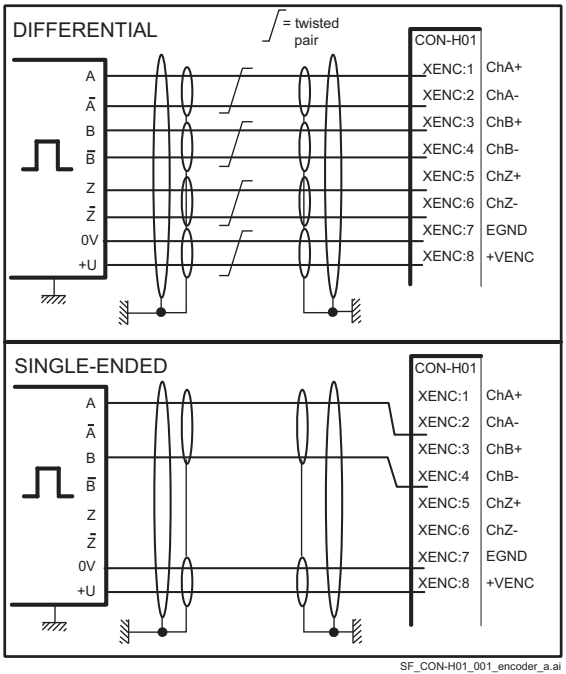
Pulse encoder connection

Connecting a pulse encoder to the DCS880 converter

On the SDCS-CON-H01 it is possible to select the supply voltage using jumper J4D.

	Hardware configuration	
Encoder supply	SDCS-CON-H01	J4D
5 V	no sense	
24 V	no sense	

The wiring is shown in the figure below.

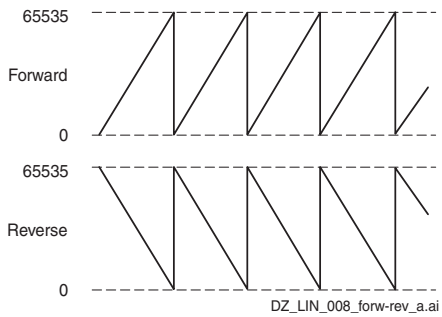


Commissioning hint:

If the drive's measured direction of rotation is wrong or does not correspond to the measured EMF speed, 7301 Motor speed feedback may appear during start-up.
If necessary correct it by exchanging the field connections F1 and F2 or exchange tracks A+ and A-.

For single-ended encoders tracks A- and B- must be exchanged.

94.16 OnBoard encoder position should look like this:

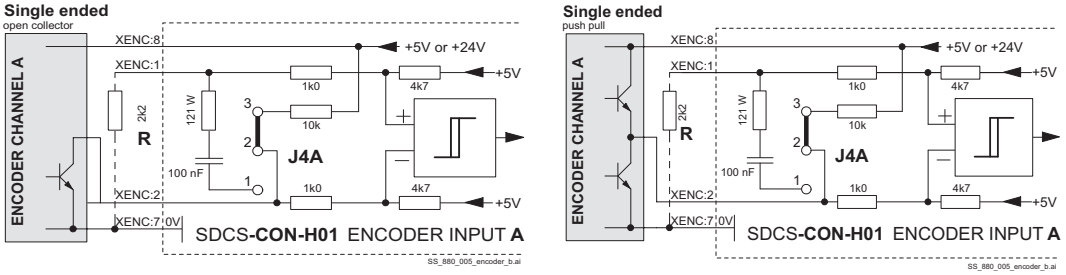


Pulse encoder connection principles

Two different encoder connections are available.

1. Differential connection; only pulse encoders generating voltage signals can be used.
2. Single-ended (push pull) connection; only pulse encoders generating voltage signals can be used.

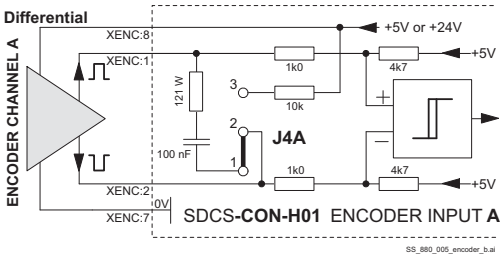
Pulse encoder connection principles:



In case of single ended encoders jumpers J4A ... J4C have to be set to a neutral position according to the table below.
To get a threshold lower than 5 V each terminal XENC:1, 3 and 5 must be connected via a resistor R to GND.

Jumper settings for single ended connected to SDCS-CON-H01

Jumper	**SDCS-CON-H01**		
J4A J4B J4C	2 - 3 5 - 6 8 - 9	2 - 3 5 - 6 8 - 9	Single ended
J4D	5 V: 10 - 11	24 V: 11 - 12	Voltage source



Jumper settings for differential encoders connected to SDCS-CON-H01

Jumper	SDCS-CON-H01		
J4A J4B J4C	1 - 2 4 - 5 7 - 8	1 - 2 4 - 5 7 - 8	Single ended
J4D	5 V: 10 - 11	24 V: 11 - 12	Voltage source

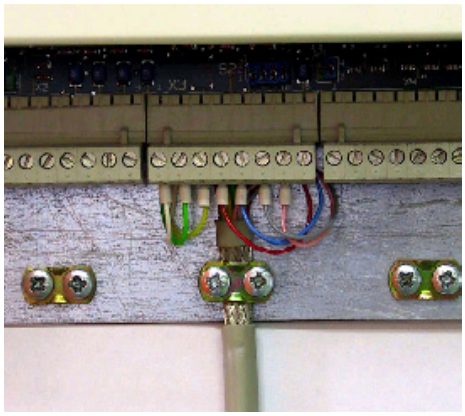
The maximum distance between pulse encoder and SDCS-CON-H01 dependents on the voltage drop of the connecting lines and on the output and input configuration of the used components. Use cables according to the table below. Use twisted pair cables with pair shielding plus overall shielding.

Cable length	Parallel wires for power source & GND	Cable used
0 to 50 m	1 x 0.25 mm²	12 x 0.25 mm²
50 to 100 m	2 x 0.25 mm²	12 x 0.25 mm²
100 to 150 m	3 x 0.25 mm²	14 x 0.25 mm²

Cable length	Parallel wires for power source & GND	Cable used
0 to 164 ft	1 x 24 AWG	12 x 24 AWG
164 to 328 ft	2 x 24 AWG	12 x 24 AWG
328 to 492 ft	3 x 24 AWG	14 x 24 AWG

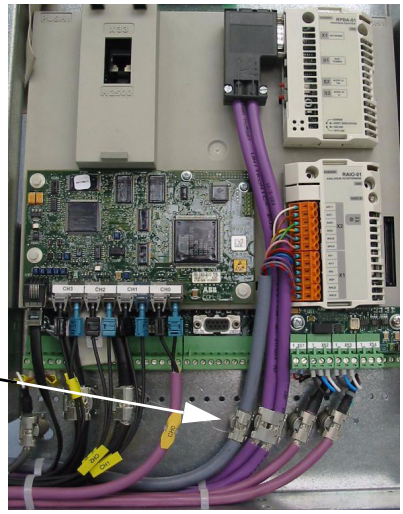
Connecting the signal and control cables

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 converter 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.

Size H7, H8
screen connection



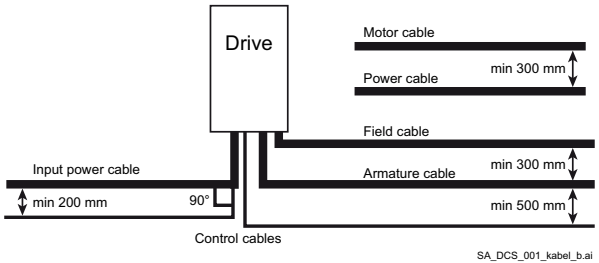
Routing the cables

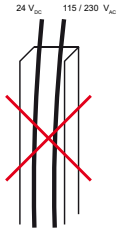
Run the motor cable away from other cables. Motor cables of several drives can be run in parallel next to each other. It is recommended that motor cables, input power cables and control cables be installed on separate trays. Avoid long parallel runs of motor cables with other cables in order to reduce electromagnetic interference caused by rapid changes in the drive output voltage.

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

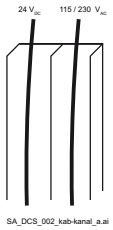
All cable trays must have good electrical connection to each other and to ground. Aluminium tray systems can be used to improve equalizing of potential.

The following diagrams show the proper routing of cables:





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



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

Installation checklist

Check the mechanical and electrical installation of the drive before start-up. Go through the checklist below together with another person. Read the *Safety instructions* on the first pages of this manual before you work on the unit.

MECHANICAL INSTALLATION

- ☐ The ambient operating conditions are allowed (see *Environmental Conditions*, *Current ratings*)
- ☐ The unit is mounted properly on a vertical non-flammable wall (see *Mechanical installation*)
- ☐ The cooling air will flow freely (see *Cabinet installation*, *Mounting the converter module inside an enclosure*)
- ☐ The motor and the driven equipment are ready for start
- ☐ All screen terminals are checked for tightness (see *Connecting the signal and control cables*)
- ☐ All cable connections are seated properly (see *Connecting the signal and control cables*)

ELECTRICAL INSTALLATION (see *Planning the electrical installation*, *Electrical installation*)

- ☐ The converter modules are grounded properly
- ☐ The mains voltage matches the converter module‘s nominal input voltage
- ☐ The mains (input power) connections at U1, V1 and W1 (L1, L2 and L3) and their tightening torques are OK
- ☐ The appropriate mains fuses and disconnector are installed
- ☐ The drive connections at C1, D1 and F+, F- and their tightening torques are OK
- ☐ Motor cable routing (armature and exitation) is OK
- ☐ Check that the screens are properly installed at the motor and the drive cabinet
- ☐ The motor connections L+, L-, F+ and F- and their tightening torques are OK
- ☐ The control connections are OK
- ☐ If a pulse encoder is used, check the encoder cables and correct direction of rotation
- ☐ PTC, klixon cables: Check that the connections are appropriate for the type of sensor used in the motor
- ☐ Check the Safe Torque Off (STO) circuit for proper function
- ☐ Check the prevention of unexpected start-up (on inhibit, coast stop) circuit for proper function
- ☐ Proper function of E-stop circuit and relay
- ☐ Cooling fan power wiring connected
- ☐ The external control connections inside the drive are OK
- ☐ Converter, motor connection box and other covers are in place

Maintenance

Chapter overview

This chapter contains preventive maintenance instructions. For more information see *DCS880 Service Manual*.

Safety



WARNING
Read the *Safety instructions* on the first pages of this manual before performing any maintenance on the equipment. Ignoring the safety instructions can cause injury or death.

Technical data

Chapter overview

The technical data contain the technical specifications of the converter, e.g. the ratings, sizes and technical requirements, provisions for fulfilling the requirements for CE and other markings and warranty policy.

Environmental Conditions

System connections

Voltage, 3-phase:	100 ... ≤ 1000 V acc. to IEC 60038
Voltage deviation:	±10 % continuous; ±15% short-time *
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

* = 0.5 ... 30 cycles

Please note: Special consideration must be taken for voltage deviation in regenerative mode.

Degree of protection

Converter module and options (line chokes, fuse holder, field exciter, etc.):	IP 00
Enclosed converters:	IP 20/21/31/41

Paint finish

Converter module:	RAL 7012
Enclosed converter:	Light grey RAL 7035

Sound pressure level and vibration

Size	Sound pressure level L_P (1 m distance)		Vibration
	as module	enclosed conv.	as module
H1	55 dBA	68 dBA	0.5 g, 5 ... 55 Hz
H2	55 dBA	72 dBA	
H3	60 dBA	78 dBA	
H4	66 ... 70 dBA, depending on fan	77 dBA	
H5	75 dBA	77 dBA	1 mm, 2 ... 9 Hz
H6	70 dBA	78 dBA	
H7	69 dBA	67 dBA	0.3 mm, 2 ... 9 Hz
H8	82 dBA	80 dBA	

Environmental limit values

Permissible cooling air temp.	
- at converter module air inlet:	0 ... +55°C
with rated DC current:	0 ... +40°C
with different DC current:	+30 ... +55°C
- 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 temp.:	< 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 M.S.L.:	100 %, without current reduction
> 1000 m above M.S.L.:	with current reduction, see figures next page

North American Standards

In North America the system components fulfil the requirements of the table below.

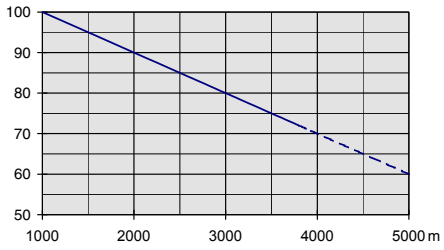
Rated supply voltage	Standards	
	Converter module	Enclosed converter
to 600 V	UL 61800-5-1 Power Conversion Equipment CSA C 22.2 No. 274-13 Industrial Control Equipment, Industrial Products Available for converter modules including field exciter units. Types with UL mark: • see UL Listing www.ul.com / certificate no. E196914 • or on request	UL/CSA types: on request

Regulatory compliance

The converter module and enclosed converter components are designed for use in industrial environments. In EEA countries, the components fulfil the requirements of the EU directives, see table below:

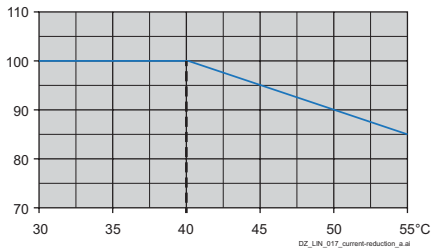
European Union Directive **Machinery Directive**	**Manufacturer's Assurance**	**Harmonized Standards** **Converter module**	
2006/42/EC	Declaration of Incorporation	EN61800-5-2:2007 EN62061:2005 + Cor.:2010 + A1:2013 + A2:2015 EN13849-1:2015 EN60204-1:2006 + A1:2009	
Low Voltage Directive			
2014/35/EU	Declaration of Conformity	EN61800-5-1:2007	
EMC Directive			
014/30/EU	Declaration of Conformity (Provided that all installation instructions concerning cable selection, cabling and EMC filters or dedicated transformer are followed.)	EN61800-3:2004 + A1:2012	
RoHS Directive			
2011/65/EU	Declaration of Conformity		

Effect of the site elevation above sea level on the converter's load capacity



Current reduction to % of nominal converter current

Effect of the ambient temperature on the converter's load capacity



Current reduction to % of nominal converter current

Effect of site elevation and ambient temperature on the converter'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 converter current

Current ratings - IEC regenerative

Unit type	$I_{DC\ I}$	$I_{DC\ II}$		$I_{DC\ III}$		$I_{DC\ IV}$		Size	Internal field current
4-Q converters	continu-ous	100 % 15 min	150 % 60 s	100 % 15 min	150 % 120 s	100 % 15 min	200 % 10 s		
400 V / 525 V	[A]	[A]		[A]		[A]			
DCS880-S02-0025-04/05**	25	22	33	21	31	20	40	H1	0.3 ... 6 A
DCS880-S02-0050-04/05**	50	38	57	37	55	33	66		1 ... 12 A
DCS880-S02-0075-04/05**	75	60	90	59	88	54	108		
DCS880-S02-0100-04/05**	100	85	127	83	124	80	160		
DCS880-S02-0150-04/05	150	114	171	110	165	100	200	H2	1 ... 18 A
DCS880-S02-0200-04/05**	200	145	217	140	210	115	230		
DCS880-S02-0250-04/05	250	185	277	180	270	165	330		
DCS880-S02-0300-04/05	300	225	337	220	330	200	400		
DCS880-S02-0350-04/05**	350	275	412	265	397	245	490	H3	2 ... 25 A
DCS880-S02-0450-04/05**	450	350	525	340	510	310	620		
DCS880-S02-0520-04/05	520	400	600	380	570	350	700		
DCS880-S02-0680-04/05**	680	525	787	510	765	475	950	H4	2 ... 30 A
DCS880-S02-0820-04/05	820	630	945	610	915	565	1130		
DCS880-S02-1000-04/05	1000	750	1125	725	1087	660	1320		
600 V / 690 V									
DCS880-S02-0320-06	320	256	384	246	369	235	470	H3	-
DCS880-S02-0650-06	650	514	771	508	762	462	924	H4	-

** This unit type can be used as large field exciter. Do not forget the SDCS-DSL-H1x (+S199).
A 10 % current de-rating is strongly recommended.

Sizing:

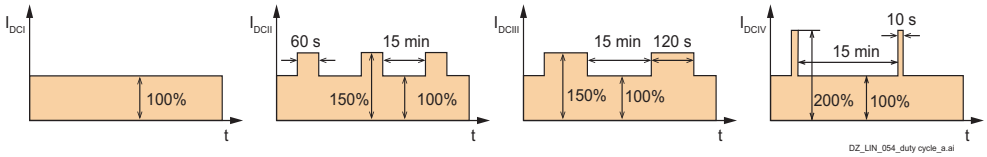
Notes:

AC current $I_{AC} = 0.82 * I_{DC}$

The ratings apply at ambient temperature of 40°C (104°F). For lower temperatures the H6, H7, H8 ratings are higher (except I_{max}).

Use DriveSize for detailed dimensioning in case the ambient temperature is below 40°C (104°F) or the drive is loaded cyclically.

Standard duty cycles



Current ratings - IEC non regenerative

See the current ratings including several standard duty cycles for the DCS880 with 50 Hz and 60 Hz supplies 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:

Unit type	$I_{DC\ I}$	$I_{DC\ II}$		$I_{DC\ III}$		$I_{DC\ IV}$		Size	Internal field current
2-Q converters	continu-ous	100 % 15 min	150 % 60 s	100 % 15 min	150 % 120 s	100 % 15 min	200 % 10 s		
400 V / 500 V / 525 V	[A]	[A]		[A]		[A]			
DCS880-S01-0020-04/05**	20	16	24	16	24	15	30	H1	0.3 ... 6 A
DCS880-S01-0045-04/05**	45	36	54	35	52	31	62		1 ... 12 A
DCS880-S01-0065-04/05**	65	54	81	52	78	49	98		
DCS880-S01-0090-04/05**	90	76	114	74	111	73	146		
DCS880-S01-0135-04/05	135	105	157	100	150	93	186	H2	1 ... 18 A
DCS880-S01-0180-04/05**	180	130	195	125	187	110	220		
DCS880-S01-0225-04/05	225	170	255	165	247	148	296		
DCS880-S01-0270-04/05	270	200	300	195	292	180	360		
DCS880-S01-0315-04/05**	315	240	360	235	352	215	430	H3	2 ... 25 A
DCS880-S01-0405-04/05**	405	310	465	300	450	270	540		
DCS880-S01-0470-04/05	470	350	525	340	510	310	620		
DCS880-S01-0610-04/05**	610	455	682	435	652	425	850	H4	2 ... 30 A
DCS880-S01-0740-04/05	740	570	855	540	810	525	1050		
DCS880-S01-0900-04/05	900	680	1020	650	975	615	1230		
600 V / 690 V									
DCS880-S01-0290-06	290	240	360	225	337	205	410	H3	-
DCS880-S01-0590-06	590	470	705	472	708	434	868	H4	-

** This unit type can be used as large field exciter. Do not forget the SDCS-DSL-H1x (+S199). A 10 % current de-rating is strongly recommended.

Notes:

AC current $I_{AC} = 0.82 * I_{DC}$

①1190 A_{DC} for 35°C and 1140 A_{DC} for 40°C ambient temperature

Control circuit terminals on the SDCS-CON-H01

The control circuit terminals are common for all sizes H1 … H8.

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

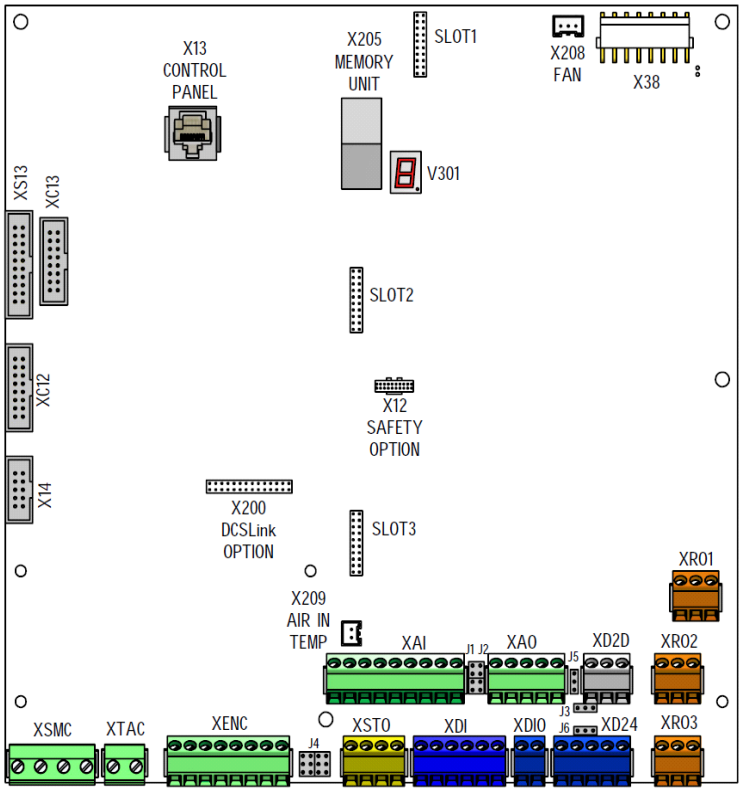
The SDCS-CON-H01 has an internal watchdog. The watchdog controls the proper function of the SDCS-CON-H01 and the firmware. If the watchdog trips, it has the following effects:

- 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

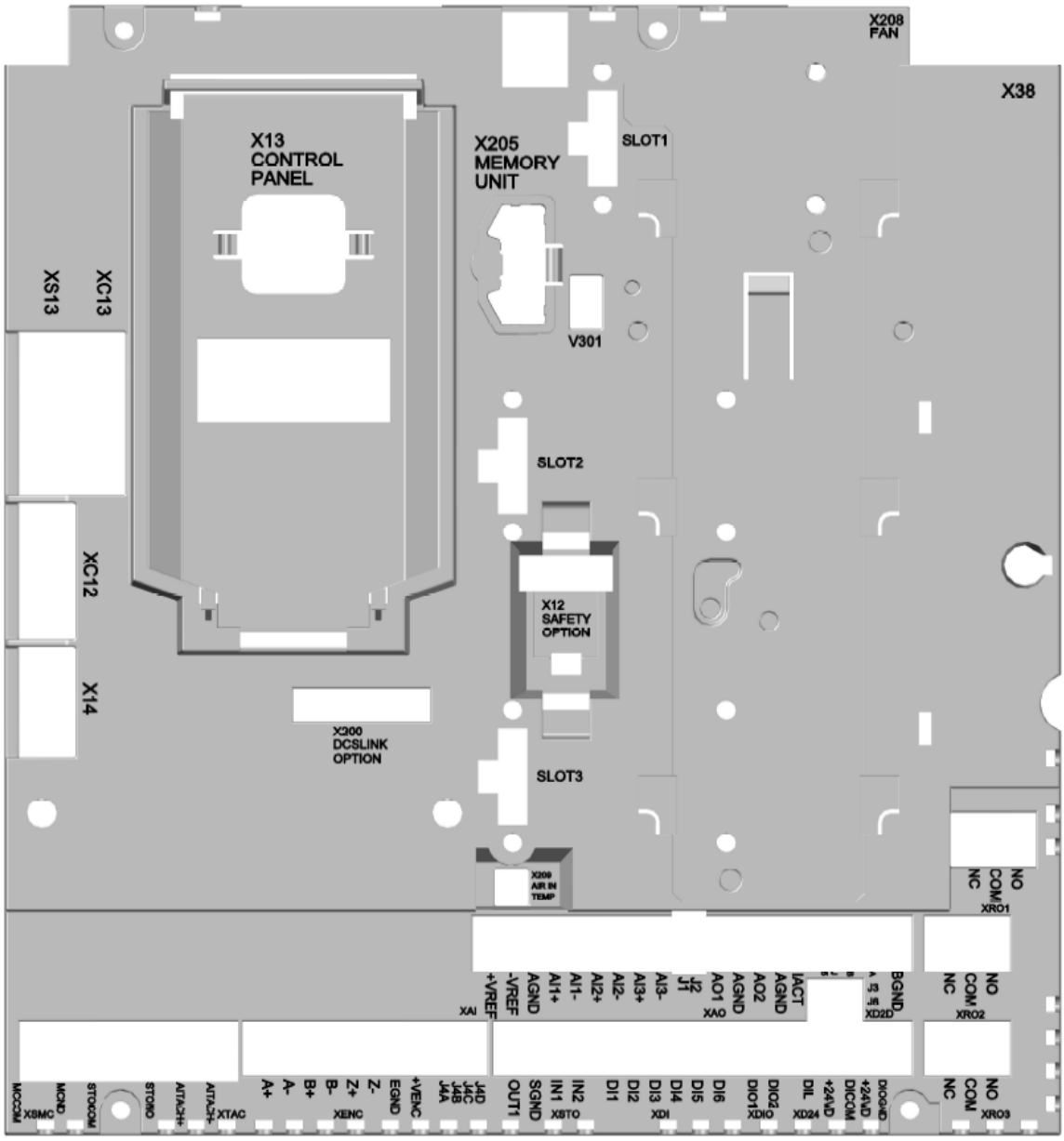
Recommended wire size - Tightening torques

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



Intermediate cover



Control circuit terminal layout

Internal 24 V_{DC} used

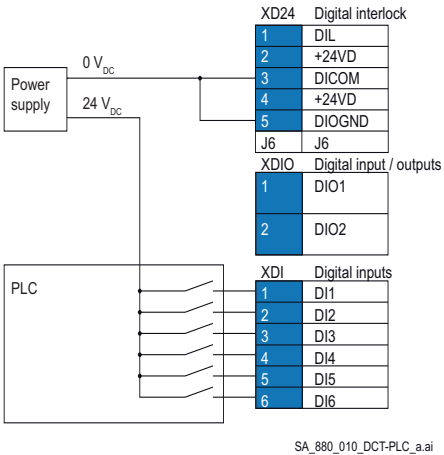
DCS880

XAI	Reference voltage and analog inputs	
1	+VREF	+10 V_{DC}
2	-VREF	-10 V_{DC}
3	AGND	Common ground (connected to frame)
4	AI1+	±10 V or 0 (4) ... 20 mA depending on J1
5	AI1-	
6	AI2+	±10 V or 0 (4) ... 20 mA depending on J2
7	AI2-	
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	Connection point for a scope
J5	J5	AO1 current / voltage selection switch
XD2D	Drive-to-drive link	
1	B	Drive-to-drive link (master-follower or embedded fieldbus)
2	A	
3	BGND	Isolated ground 2
J3	J3	Drive-to-drive 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
2	+24VD	+24 V_{DC}, 200 mA
3	DICOM	Isolated digital input ground for DI1 ... DI5 and DIL
4	+24VD	+24 V_{DC}, 200 mA
5	DIOGND	Isolated digital input / output ground for DI6, DIO1 and DIO2
J6	J6	Digital ground selection switch (DIOGND and DICOM)
XDIO	Digital inputs / outputs	
1	DIO1	Relay driver, max. +24 V_{DC}, 2k, 100n, DIOGND, +24 V_{DC}, DO, +3.3 V_{DC}, DI
2	DIO2	
XDI	Digital inputs	
1	DI1	DI1 - DI5 and DIL: max. +24 V_{DC}, 2k, 100n, DICOM, +3.3 V_{DC}, DI
2	DI2	
3	DI3	
4	DI4	
5	DI5	
6	DI6	DI6: max. +24 V_{DC}, 2k, 100n, DIOGND, +3.3 V_{DC}, DI
XENC	Encoder	
1	A+	Channel A+ function depending on J4A
2	A-	Channel A- function depending on J4A
3	B+	Channel B+ function depending on J4B
4	B-	Channel B- function depending on J4B
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	Encoder supply 5 V_{DC} or 24 V_{DC} depending on J4D
J4A	J4A	Differential or single ended (10 k pull up) selection jumpers
J4B	J4B	
J4C	J4C	
J4D	J4D	Encoder supply 5 V_{DC} or 24 V_{DC} selection jumper
J7A	J7A	Not in use for DCS880
J7B	J7B	
XTAC	Analog tacho	
1	AITACH+	±8 … 270 V_{DC}
2	AITACH-	
XSMC	Mains contactor	
1	MCCOM	250 V_{AC} / 30 V_{DC} 2 A — Fixed output for the mains contactor
2	MCNO	
3	STOCOM	250 V_{AC} / 30 V_{DC} 2 A — Fixed output for safe torque off (STO) zero current monitor
4	STONO	
XSTO	Safe torque off (STO)	
1	OUT1	24 V_{DC} for STO circuit
2	SGND	Common ground (connected to frame)
3	IN1	Both circuits must be closed for drive to start
4	IN2	Open circuits block the firing pulses
X12	Safety functions module connection	
X13	Control panel connection	
X205	Memory unit connection	

Safety relais

SA_880_005_DCS_b.ai

External 24 V_{DC} used



SA_880_010_DCT-PLC_a.ai

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+ AI1-	±10 V [R_{in} ≥ 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
AI2+ AI2-	±10 V [R_{in} ≥ 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
AI3+ AI3-	±10 V [R_{in} ≥ 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
	Parameter settings see *DCS880 Firmware Manual Group 12 Standard AI*

XAO: Analog outputs

AO1	±10 V [load current ≤ 10 mA] or 0 (4) ... 20 mA [R_L ≤ 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	Connection point for a scope to measure the current directly over the burden resistor
	Parameter settings see *DCS880 Firmware Manual Group 13 Standard AO*

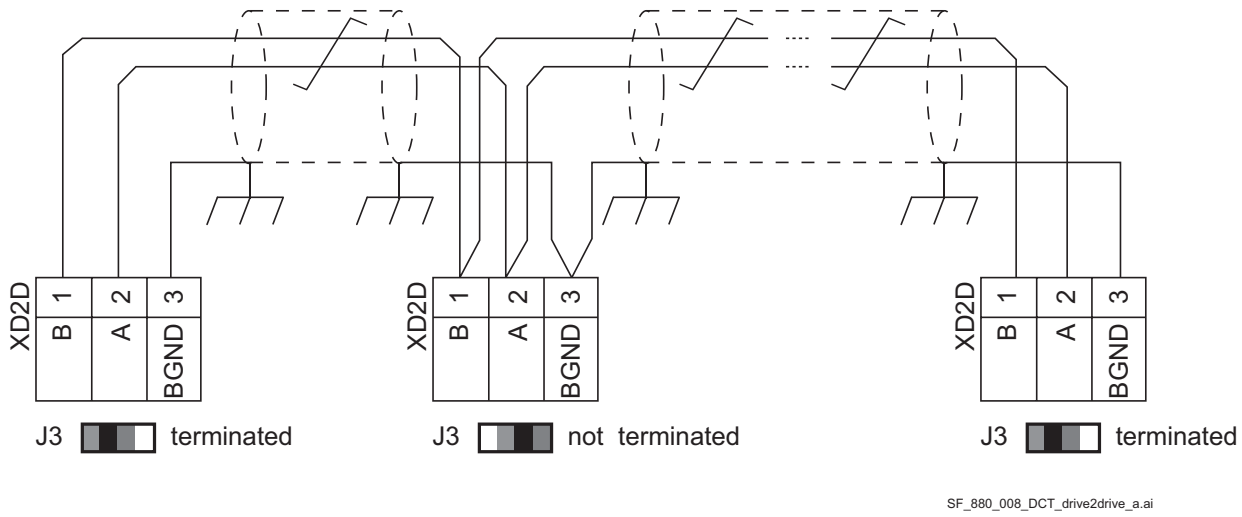
XD2D: Drive-to-drive link

B A	Maximum wire size 2.5 mm^2 Physical layer: RS-485 Termination by switch J3
	Parameter settings see *DCS880 Firmware Manual Group 60 DDCS communication*

The drive-to-drive 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 embedded fieldbus.

Set the termination switches J3 (see *Jumpers and switches*) next to terminal block XD2D to terminated (▣) at the two physical ends of the drive-to-drive 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 drive-to-drive link.



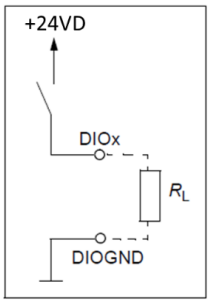
RO1, RO2, RO3: Relay outputs

NC COM NO	250 V_{AC} / 30 V_{DC}, 2 A Maximum wire size 2.5 mm^2 Varistor protected
	Parameter settings see *DCS880 Firmware Manual 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 DCS880. It can be selected for example as the source for an emergency stop command or any other external event. See the *DCS880 Firmware Manual* 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 8 ms
+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
	Parameter settings see *DCS880 Firmware Manual Group 10 Standard DI, RO*

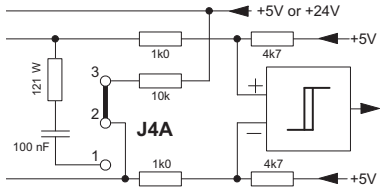
XDIO: Digital inputs / outputs

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
	Parameter settings see *DCS880 Firmware Manual Group 11 Standard DIO, FI, FO*

XDI: Digital inputs

DI1	Maximum wire size 2.5 mm^2
DI2	+24 V_{DC} logic levels: low < 5 V_{DC}, high > 15 V_{DC}
DI3	R_{in} = 2 kΩ
DI4	Hardware filter: 0.04 ms
DI5	Digital filter up to 8 ms
DI6	
	Parameter settings see *DCS880 Firmware Manual Group 10 Standard DI, RO*

XENC: Encoder

A+	OnBoard encoder interface supply voltage 5 V or 24 V (non isolated) depending on J4D
A-	OnBoard encoder interface type differential or single ended depending on J4A ... J4C
B+	Maximum wire size 2.5 mm^2
B-	 SDCS-**CON-H01** ENCODER INPUT **A**
Z+	
Z-	
EGND	
+VENC	
	Parameter settings see *DCS880 Firmware Manual Group 94 OnBoard speed feedback configuration*

XTAC: Analog tacho

AITACH+	OnBoard tacho interface
AITACH-	Maximum wire size 2.5 mm^2 Differential input max. voltage 8 ... 270 V
	Parameter settings see *DCS880 Firmware Manual Group 94 OnBoard speed feedback configuration*

XSMC: Mains contactor

MCCOM MCNO	Fixed output for the mains contactor 250 V_{AC} / 30 V_{DC}, 2 A Maximum wire size 2.5 mm^2 Varistor protected
STOCOM STONO	Fixed output for safe torque off (STO) zero current monitor 250 V_{AC} / 30 V_{DC}, 2 A Maximum wire size 2.5 mm^2 Varistor protected
	Mains contactor ON command: 06.24.b07 Current controller status word 1

XSTO: Safe torque off

OUT1 IN1 IN2	For the drive 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. Maximum wire size 2.5 mm^2 Current consumption per channel: 55 mA (continuous)

X205 Memory unit connection

The drive 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 drive is replaced, the parameter settings can be retained by transferring the memory unit from the defective drive to the new drive.



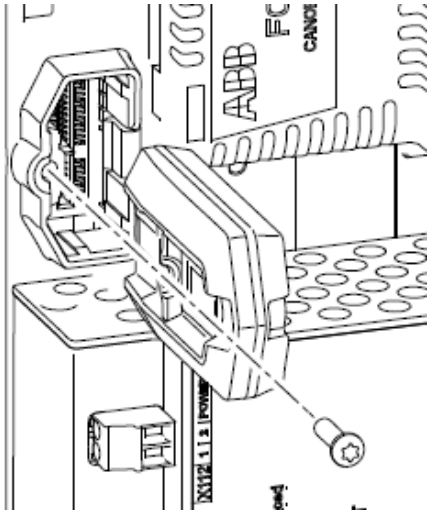
WARNING

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

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

Replacing the memory unit

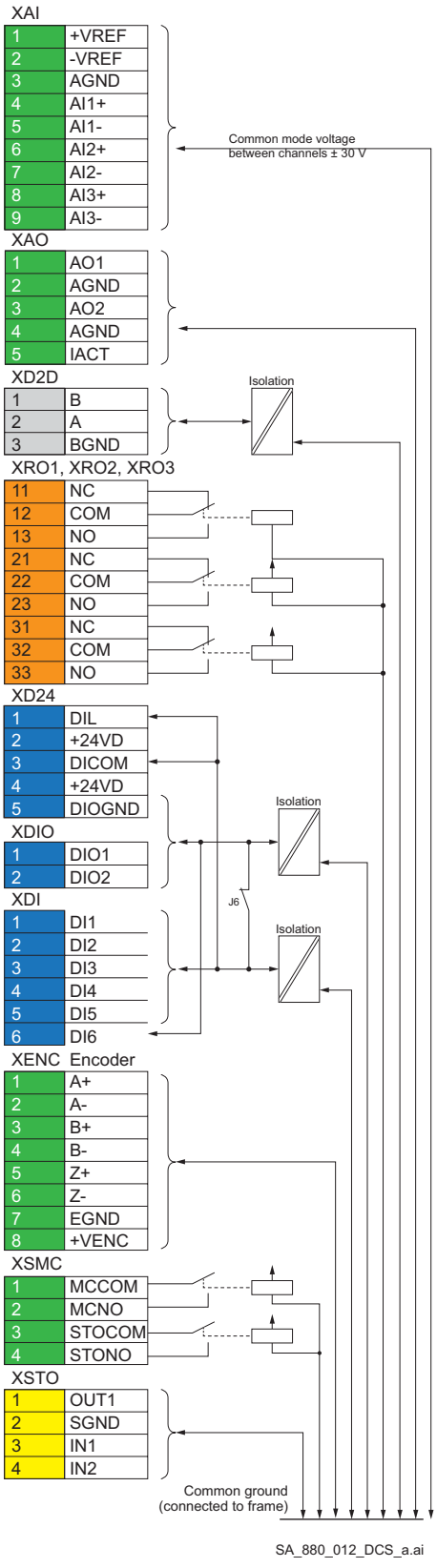
Make sure, that the auxiliary power is off. Unscrew the memory unit and pull it out. Replace the memory unit in reverse order.



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-H01 or SDCS-POW-H01 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





Open

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.

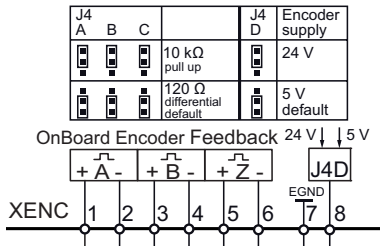
The insulation voltage between them is 50 V.



Closed

All digital inputs and outputs share the same ground, default

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 (D20)	Drive-to-drive 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 (encoder)	OnBoard encoder interface	
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 encoder interface	 Encoder, default  Not in use for DCS880

DPI-H01 kit

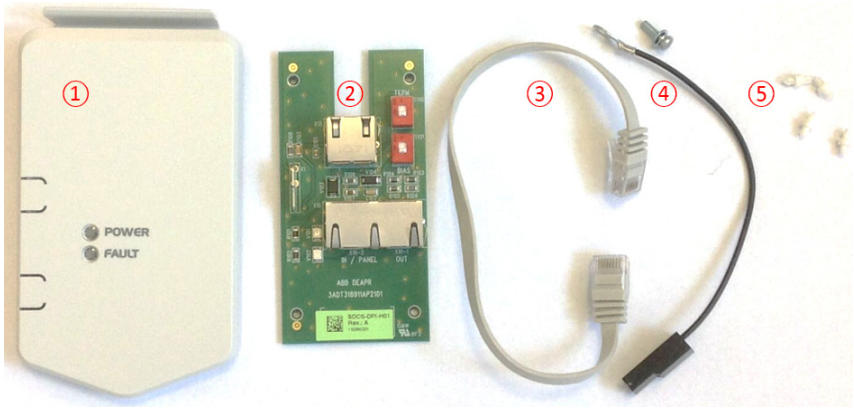
Daisy chain adapters are used to connect several drives to one control panel or to a PC via a control panel. Maximum of 32 nodes are possible. The control panel / PC is the master, while the drives equipped with a daisy chain adapter are followers.

Note:

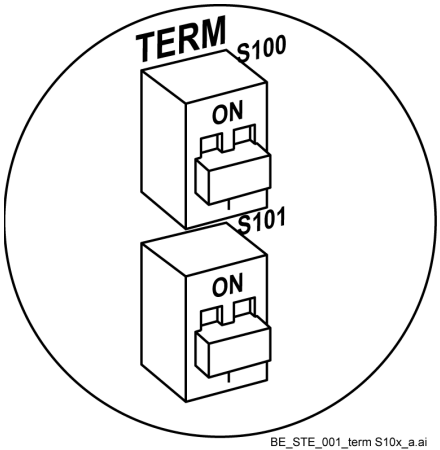
The DPI-H01 kit can be ordered together with the drives using pluscode +J428.

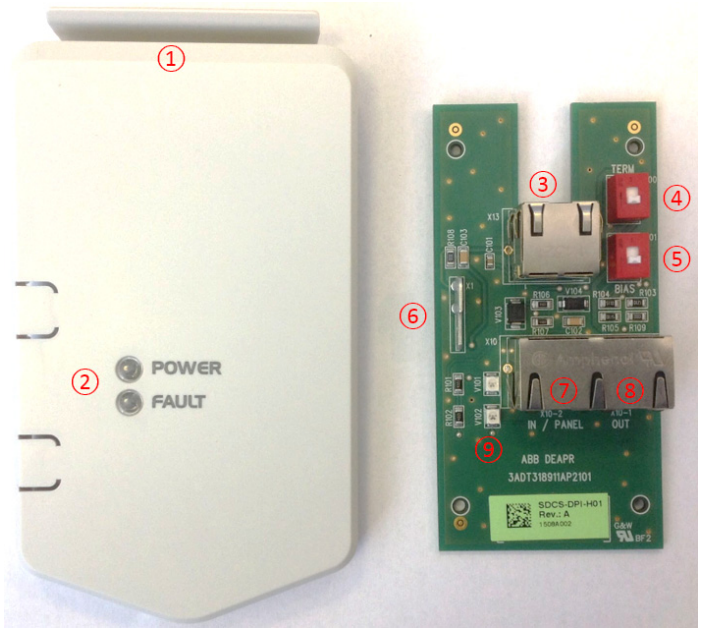
Contents of the kit

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



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).



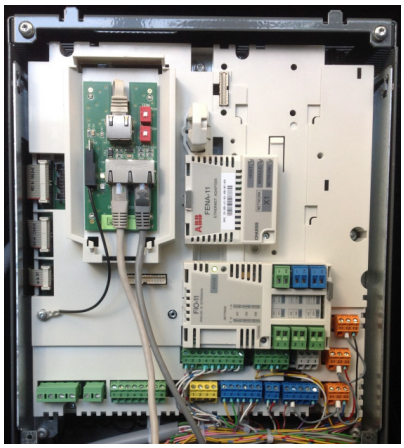


⑥ X1 for grounding.
⑦ X10-1 (IN / PANEL) for control panel.
⑧ X10-2 (OUT) for the next unit.
⑨ Status LEDs:

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.

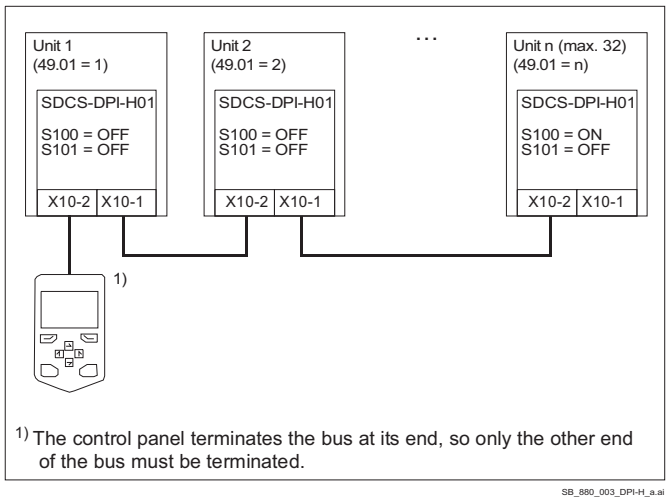


7. Attach the front cover



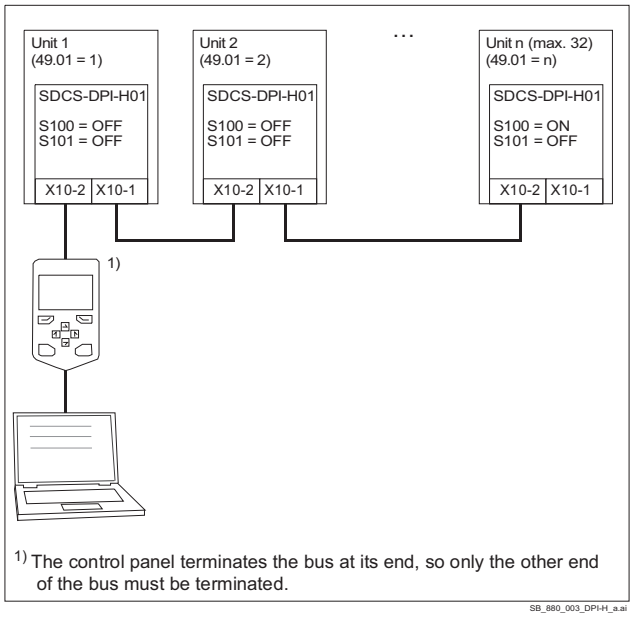
Chaining a control panel

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



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 the 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 unit may be required.

Interface board SDCS-PIN-H01

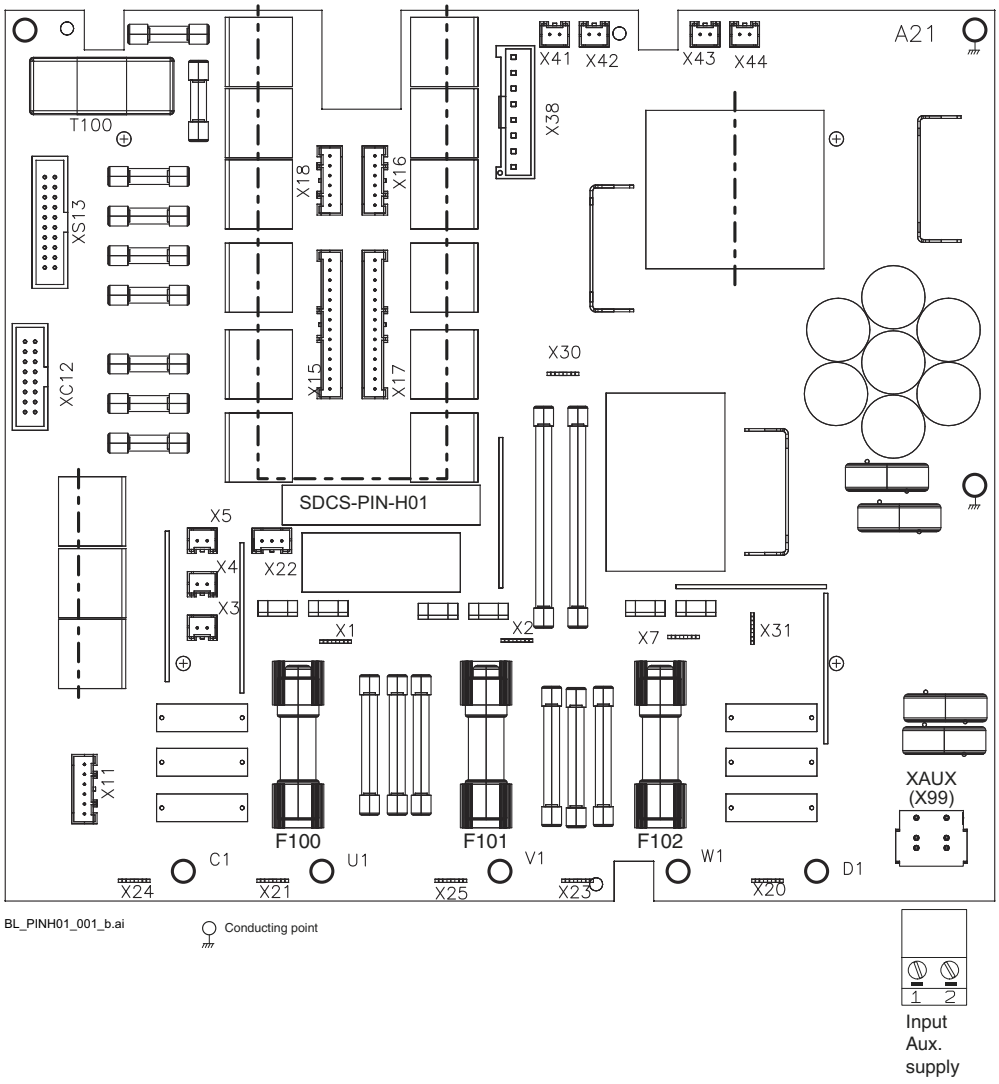
General

The SDCS-PIN-H01 is designed for DCS880 converter modules sizes H1 ... H5 (20 A ... 1190 A).
It has 4 different functions:

1. The power supply for all internal voltages of the whole drive and the connected options (H1 ... H5).
2. Control of armature bridge including high ohmic measurement of DC- and AC voltage and an interface for the current transformer measuring the armature current (H1 ... H5).
3. Control of the OnBoard field exciter and field current measurement (H1 ... H4).
4. An automatic adaptation of the auxiliary voltage of either 230 V_{AC} or 115 V_{AC}.

The board is connected to ground at points (⏚) inside the module.
The board is used for mains supply voltages from 100 V up to 525 V and 600 V.
The DCS880 provides an automatic adjustment for current and voltage measurement, burden resistor settings and 2-Q or 4-Q operation by means of setting parameters in the firmware.

Layout SDCS-PIN-H01



Layout SDCS-PIN-H01

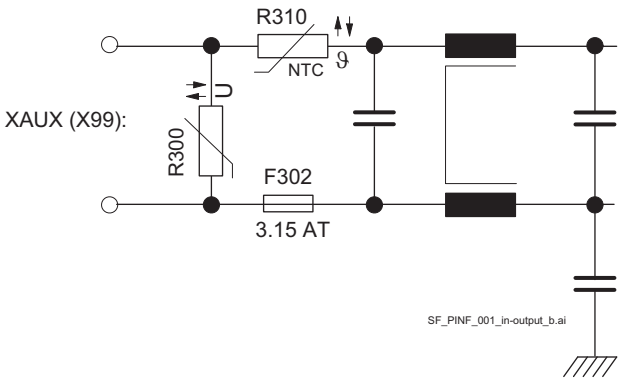
Technical data

Auxiliary incoming power XAUX (X99)

Auxiliary voltage	115 V_{AC}	230 V_{AC}	230 V_{DC}
Tolerance	-15 % / +10 %	-15 % / +10 %	-15 % / +10 %
Frequency	45 Hz ... 65 Hz	45 Hz ... 65 Hz	-
Power consumption	120 VA	120 VA	-
Power loss	≤ 60 W	≤ 60 W	≤ 60 W
Inrush current	20 A / 20 ms	10 A / 20 ms	10 A / 20 ms
Recommended fusing	6 AT	6 AT	6 AT
Mains buffering	min. 30 ms	min. 300 ms	min. 150 ms
Powerfail	< 95 V_{AC}	< 95 V_{AC}	< 140 V_{DC}

Input circuit XAUX (X99)

Features a hardware filter and a voltage limitation.



Armature circuit interface

The function for the armature circuit interface consist of:

- Firing the armature bridge of 6 or 12 thyristors.
- High ohmic measurement of DC and AC voltages.
- Residual measurement current of armature circuit to ground = 5 mA at 500 V supply (≈ 1 MΩ).
- Interface for the current transformers for current measurement.
- Snubber circuit for the thyristor protection together with R1 on the heatsink.
- Interface for heatsink temperature measurement with a PTC.
- Fuses for overvoltage protection and field circuit.

Field circuit interfaces SDCS-BAB-F01 and SDCS-BAB-F02 (H1 ... H4)

The OnBoard field exciter is located internally. The firing pulses are synchronized using the mains circuit L1, L2, L3 and the SDCS-CON-H01. The pulses are amplified on the SDCS-PIN-H01.
The hardware structure is a three phase half controlled bridge supplied directly from the mains U1, V1 , W1 via fuses F100, F101, F102.

If the OnBoard field exciter is not needed it can be deselected in the firmware.

The field circuit interface consists of:

- Firing the three phase half controlled field bridge.
- Measuring the field current on the DC side. The scaling is automatically selected using the rated motor field current.
- The snubber circuit is shared with the armature bridge.
- Fuses F100, F101, F102 are used for cable and motor field winding protection.
- Size H3 and H4 converters for 600 V are always delivered without OnBoard field exciter.
- Size H5 converters do not use the field circuit interface on the SDCS-PIN-H01

Ratings OnBoard field exciter

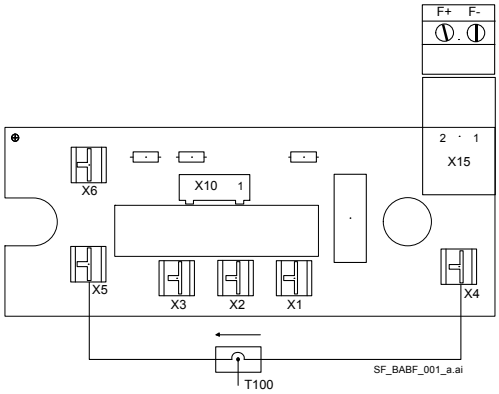
AC voltage range	110 ... 525 V
AC insulation voltage	600 V
Frequency	50 Hz / 60 Hz
AC input current	< Field current

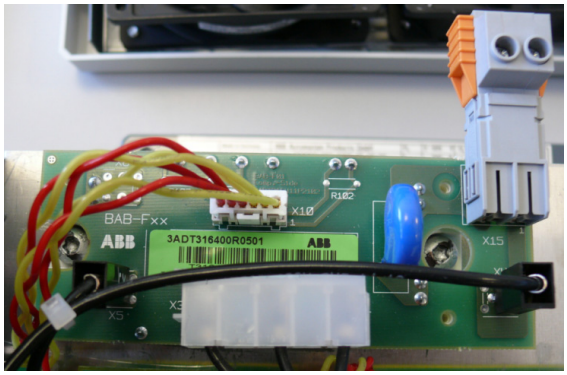
Cables

Size	H1	H1	H2	H3	H4
DC output current	6 A	12 A	18 A	25 A	30 A
max. cross sectional area	6 mm² AWG 10	6 mm² AWG 10	6 mm² AWG 10	6 mm² AWG 10	6 mm² AWG 10
min. cross sectional area	1 mm² AWG 16	2.5 mm² AWG 13	4 mm² AWG 11	6 mm² AWG 10	6 mm² AWG 10

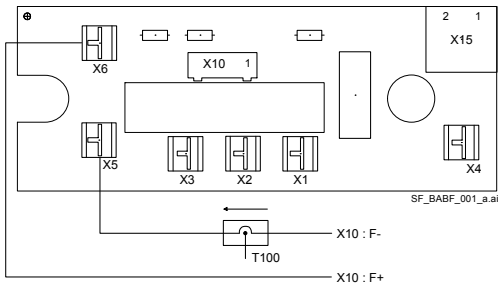
Layout

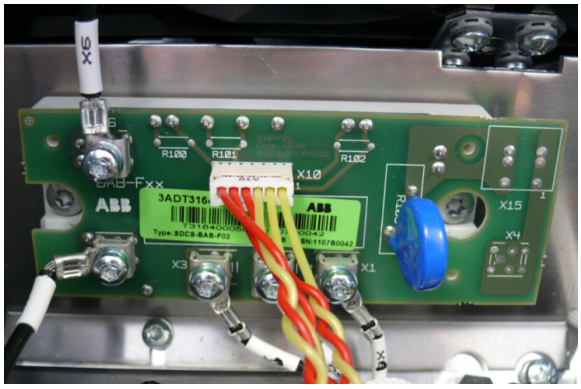
SDCS-BAB-F01 for module sizes H1 and H2:





Layout SDCS-BAB-F02 for module sizes H3 and H4:





Location

The SDCS-BAB-F0x is located between the power part and the control board SDCS-CON-H01.

Functions

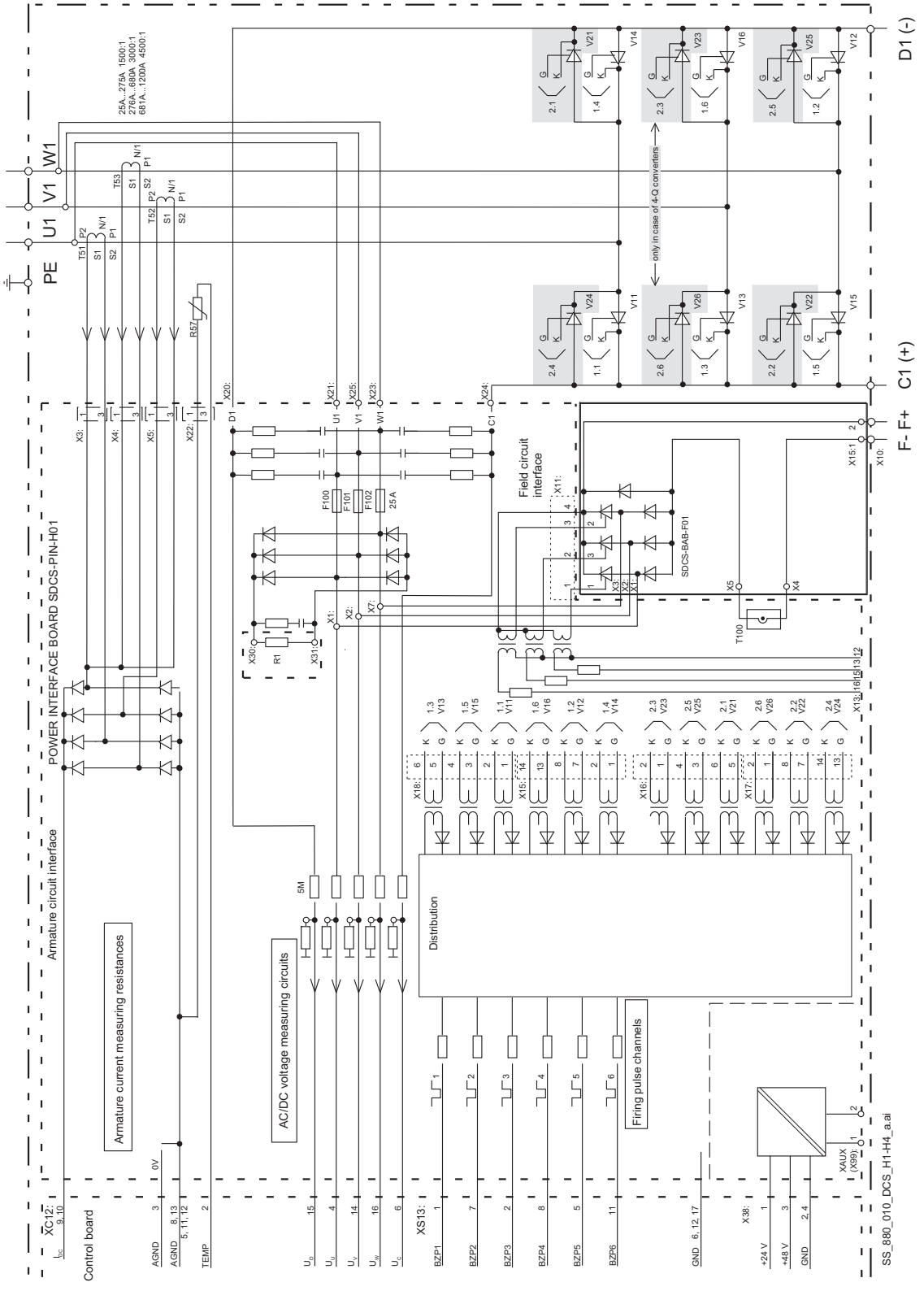
The SDCS-BAB-F0x is a three-phase half-controlled field exciter. The field exciter is directly supplied from the armature mains. Its firing pulses and snubbers are located on the SDCS-PIN-H01. For connection details see next pages.

Size	Converter type	Used type	Used fuses	T100 threads	I_F [A]
H1	DCS880-S01-0020 ... DCS880-S02-0025	SDCS-BAB-F01	F100 ... F102 on SDCS-PIN-H01 KTK 25 = 25 A	4*	0.3 ... 6
H1	DCS880-S01-0045 ... DCS880-S02-0100	SDCS-BAB-F01	F100 ... F102 on SDCS-PIN-H01 KTK 25 = 25 A	3*	1 ... 12
H2	DCS880-S01-0135 ... DCS880-S02-0300	SDCS-BAB-F01	F100 ... F102 on SDCS-PIN-H01 KTK 25 = 25 A	2*	1 ... 18
H3	DCS880-S01-0315 ... DCS880-S02-0520	SDCS-BAB-F02	F100 ... F102 on SDCS-PIN-H01 KTK 25 = 25 A	2*	2 ... 25
H4	DCS880-S01-0610 ... DCS880-S02-1000	SDCS-BAB-F02	F401 ... F403 in drive KTK 30 = 30 A	1*	2 ... 30

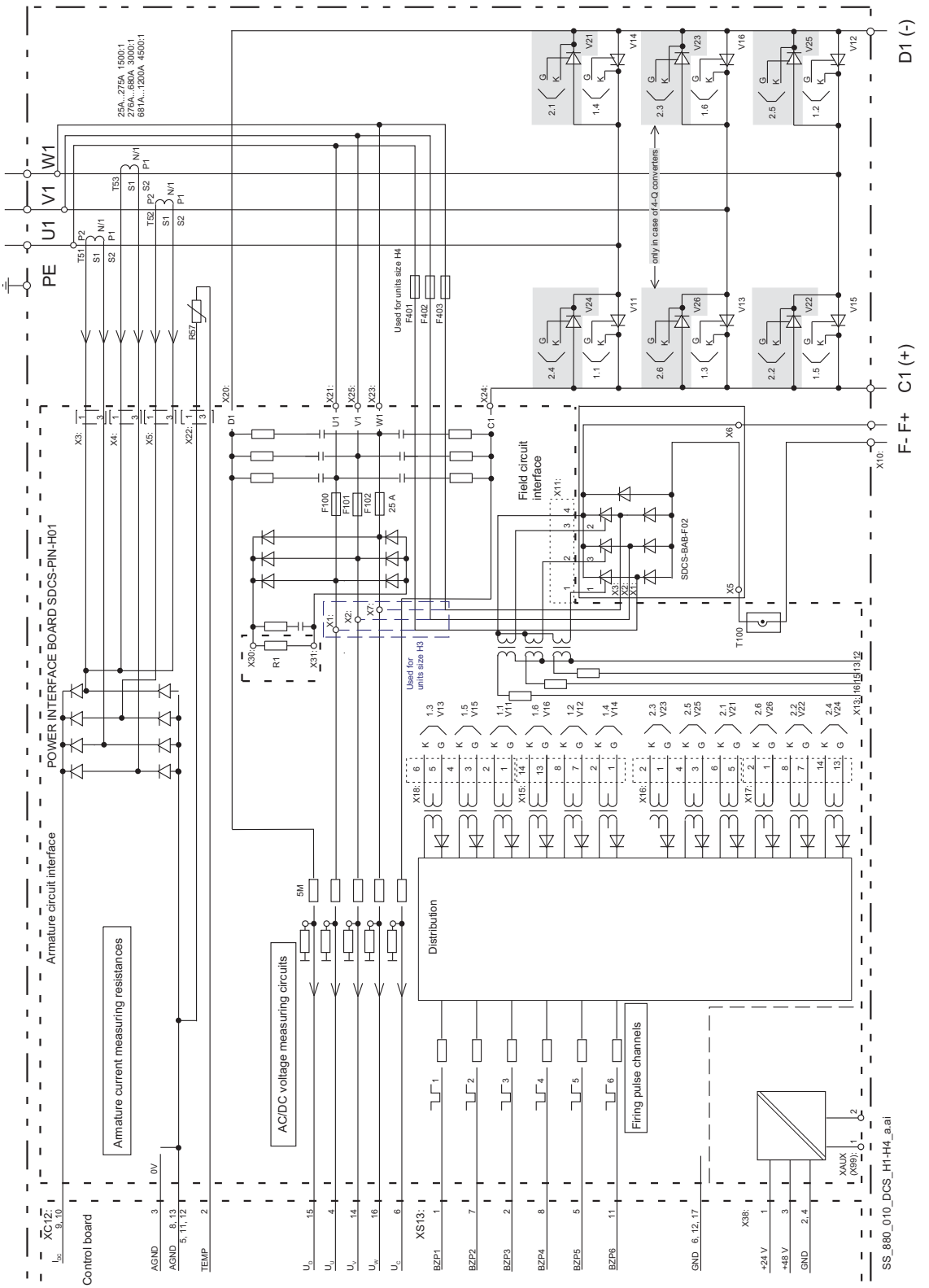
*Number of threads through the hole in the T100 (e.g. 3 threads equal 2 loops)

Circuit diagram

Typical armature circuit diagram for module sizes H1 and H2 using SDCS-PIN-H01 and SDCS-BAB-F01:



Typical armature circuit diagram for module sizes H3 and H4 using SDCS-PIN-H01 and SDCS-BAB-F02:



Dimensions and weights

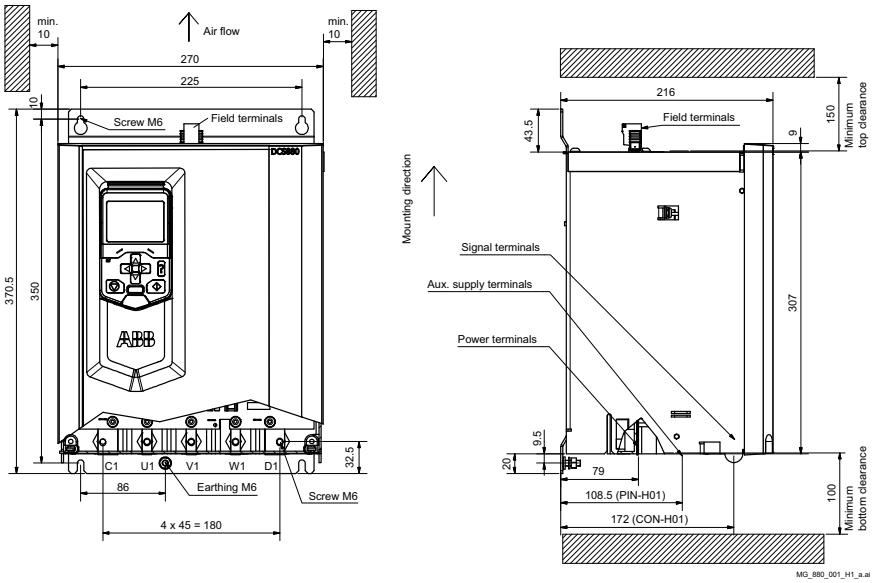
See the dimensional drawings of the DCS880 below. The dimensions are in milllimeters.

Size	h * w * d [mm]	h * w * d [inch]	weight [kg]	weight [lbs]
H1	370*270*215	14.56*10.63*8.46	11	25
H2	370*270*271	14.56*10.63*10.67	16	36
H3	460*270*317	18.11*10.63*12.48	25	56
H4	645*270*352	25.39*10.63*13.86	38	84
H5	750*270*372	29.53*10.63*14.65	55	122
H6	944*510*410	37.17*20.08*16.14	110	243
H7	1750*460*410	68.90*18.11*16.14	180	397
H8	1750*760*570	68.90*29.92*22.44	315	695

Size H1

DCS880-S01-0020
DCS880-S01-0045
DCS880-S01-0065
DCS880-S01-0090

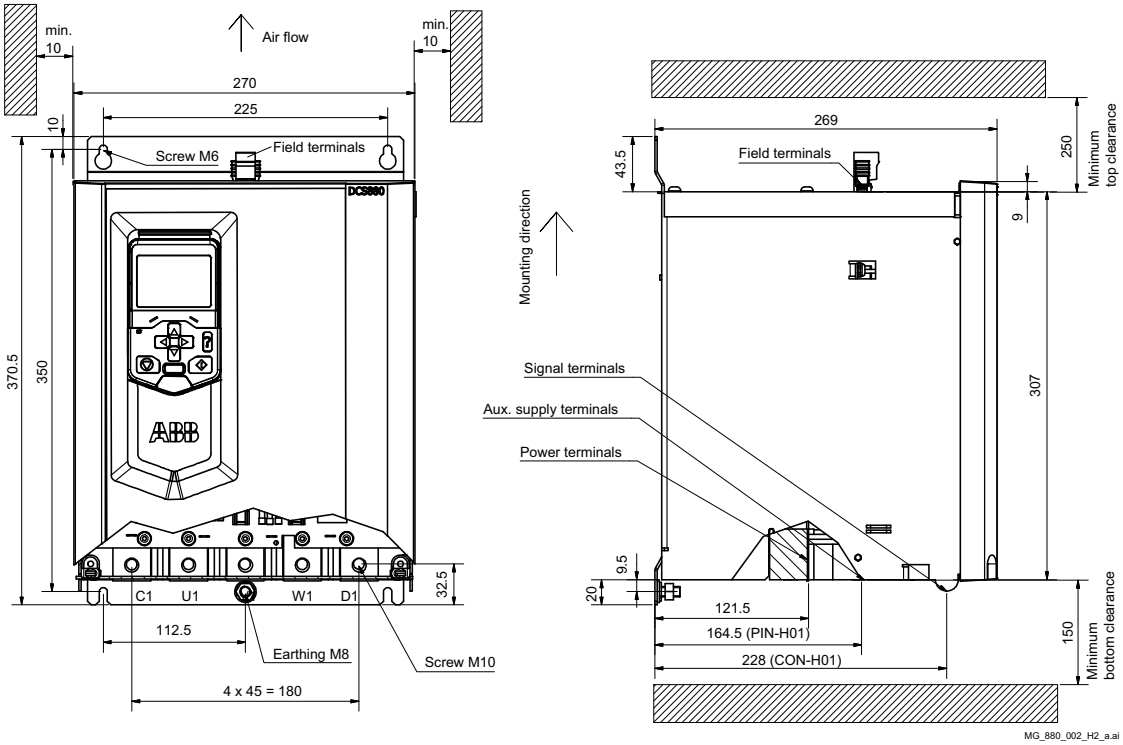
DCS880-S02-0025
DCS880-S02-0050
DCS880-S02-0075
DCS880-S02-0100



Size H2

DCS880-S01-0135
DCS880-S01-0180
DCS880-S01-0225
DCS880-S01-0270

DCS880-S02-0150
DCS880-S02-0200
DCS880-S02-0250
DCS880-S02-0300



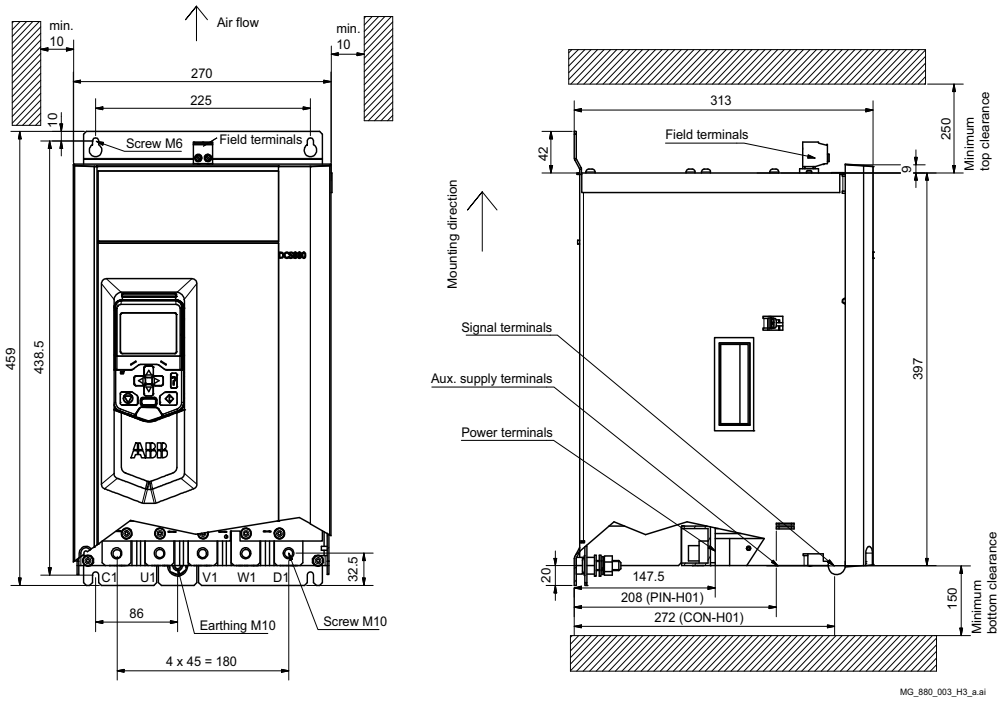
Size H3

DCS880-S01-0315
DCS880-S01-0405
DCS880-S01-0470

DCS880-S02-0350
DCS880-S02-0450
DCS880-S02-0520

600 V Units

DCS880-S01-0290
DCS880-S02-0320



Size H4

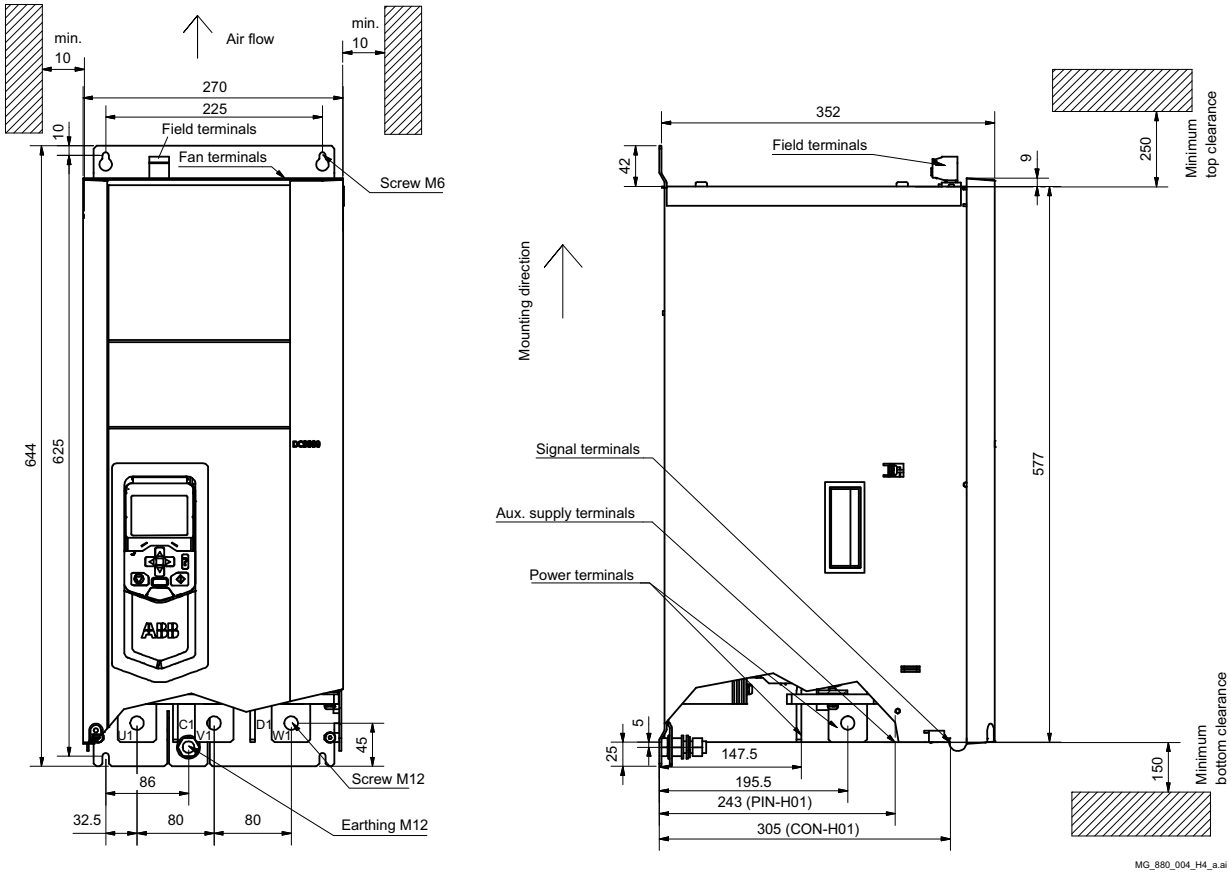
DCS880-S01-0610
DCS880-S01-0740
DCS880-S01-0900

DCS880-S02-0680
DCS880-S02-0820
DCS880-S02-1000

600 V Units

DCS880-S01-0590
DCS880-S02-0650

Weight appr. 38 kg



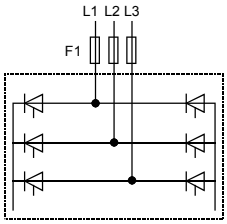
Accessories

Fuses and fuse holders IEC

Semiconductor fuses and fuse holders for AC and DC power lines

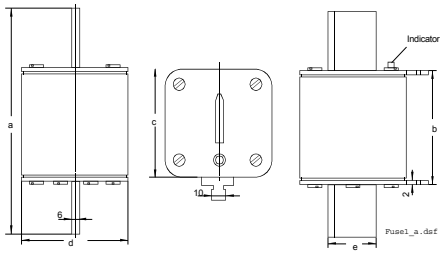
The DCS880 size H1 ... H4 requires external mains fuses. For regenerative drives, DC fuses are recommended. The 4th column of the table below assigns the AC fuse to the unit. In case the unit should be equipped with DC fuses, use the same type of fuse as used on the AC side.

Size	Converter type (2-Q)	Converter type (4-Q)	Fuse type	Fuse size	Resistance [mΩ]	Fuse holder
-	-	-	10A 660V UR	0	30	OFAX 00 S3L
-	-	-	25A 660V UR		15	OFAX 00 S3L
H1	DCS880-S01-0020-04/05	DCS880-S02-0025-04/05	50A 660V UR		6	OFAX 00 S3L
	DCS880-S01-0045-04/05	DCS880-S02-0050-04/05	80A 660V UR		3	OFAX 00 S3L
	DCS880-S01-0065-04/05	DCS880-S02-0075-04/05	125A 660V UR		1.8	OFAX 00 S3L
	DCS880-S01-0090-04/05	DCS880-S02-0100-04/05				OFAX 00 S3L
H2	DCS880-S01-0135-04/05	DCS880-S02-0150-04/05	200A 660V UR	1	0.87	OFAX 1 S3
	DCS880-S01-0180-04/05	DCS880-S02-0200-04/05	250A 600V UR		0.59	OFAX 1 S3
	DCS880-S01-0225-04/05	DCS880-S02-0250-04/05	315A 660V UR	2	0.47	OFAX 2 S3
	DCS880-S01-0270-04/05	DCS880-S02-0300-04/05	500A 660V UR	3	0.30	OFAX 3 S3
H3	DCS880-S01-0290-06	DCS880-S02-0320-06				OFAX 3 S3
	DCS880-S01-0315-04/05	DCS880-S02-0350-04/05				OFAX 3 S3
	DCS880-S01-0405-04/05	DCS880-S02-0450-04/05	700A 660V UR		0.22	OFAX 3 S3
	DCS880-S01-0470-04/05	DCS880-S02-0520-04/05				OFAX 3 S3
H4	DCS880-S01-0590-06	DCS880-S02-0650-06	900A 660V UR	4	0.15	3 x 170H 3006
	DCS880-S01-0610-04/05	DCS880-S02-0680-04/05				3 x 170H 3006
	DCS880-S01-0740-04/05	DCS880-S02-0820-04/05				3 x 170H 3006
	DCS880-S01-0900-04/05	DCS880-S02-1000-04/05	1250A 660V UR		0.09	3 x 170H 3006



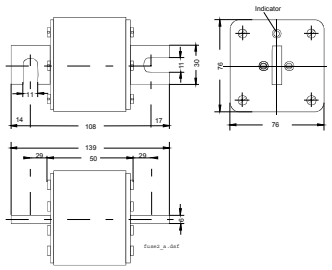
Dimensions of fuses

Size 0 - 3



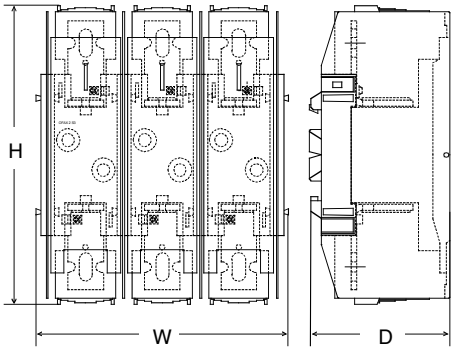
Size	a [mm]	b [mm]	c [mm]	d [mm]	e [mm]
0	78.5	50	35	21	15
1	135	69	45	45	20
2	150	69	55	55	26
3	150	68	76	76	33

Size 4

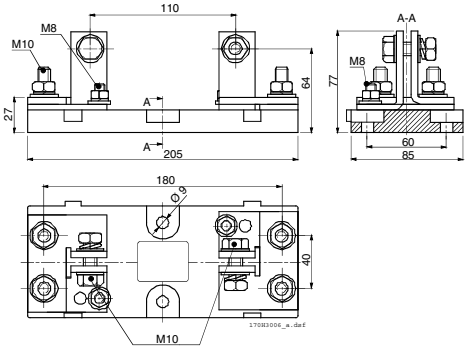


Dimensions of fuse holders

OFAX xx xxx



170H 3006 (IP00)



Fuse holder	HxWxD [mm]	Protection
OFAX 00 S3L	148 x 112 x 111	IP20
OFAX 1 S3	250 x 174 x 123	IP20
OFAX 2 S3	250 x 214 x 133	IP20
OFAX 3 S3	265 x 246 x 160	IP20

Line reactors IEC

Line reactors type ND01 to ND17 (u_k = 1 %)

Line reactors of Types ND01 to ND17 are sized to the unit‘s nominal current and frequency (50 / 60 Hz). These line reactors with a u_k of 1 % are designed for use in industrial environment (minimum requirements). They have low inductive voltage drop, but deep commutation notches.

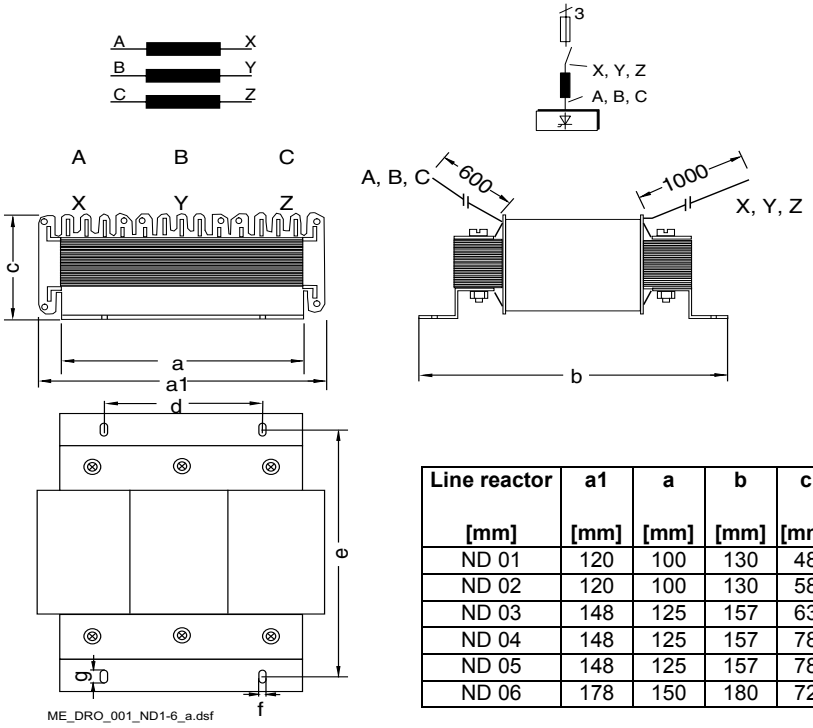
Line reactors ND01 to ND06 are equipped with cables. The larger ones ND07 to ND17 are equipped with busbars. When connecting them to other components, please consider relevant standards in case the busbar materials are different.

Attention:
Don't use reactor terminals as cable or busbar support!

Line reactor (u_k = 1 %)	L [µH]	I_{RMS} [A]	I_{peak} [A]	Rated Voltage [U_N]	Weight [kg]	Power losses		Recommended for armature converter
						Fe [W]	Cu [W]	
ND01	512	18	27	500	2.0	5	16	DCS...-0025
ND02	250	37	68	500	3.0	7	22	DCS...-0050
ND03*	300	37	68	600	3.8	9	20	(DCS...-0050)
ND04	168	55	82	500	5.8	10	33	DCS...-0075
ND05*	135	82	122	600	6.4	5	30	(DCS...-0100)
ND06	90	102	153	500	7.6	7	41	DCS...-0140
ND07	50	184	275	500	12.6	45	90	DCS...-0260
ND08	56.3	196	294	600	12.8	45	130	DCS...-0320
ND09	37.5	245	367	500	16.0	50	140	DCS...-0350
ND10	25.0	367	551	500	22.2	80	185	DCS...-0520
ND11*	33.8	326	490	600	22.6	80	185	(DCS...-0450)
ND12	18.8	490	734	500	36.0	95	290	DCS...-0680
ND13	18.2	698	1047	690	46.8	170	160	DCS...-0900
ND14	9.9	930	1395	500	46.6	100	300	DCS...-1190 / 1200
ND15	10.9	1163	1744	690	84.0	190	680	DCS...-1500
ND16	6.1	1510	2264	500	81.2	210	650	DCS...-2000
ND17	4.0	1800	2700	800	86.0	250	700	DCS...-2500

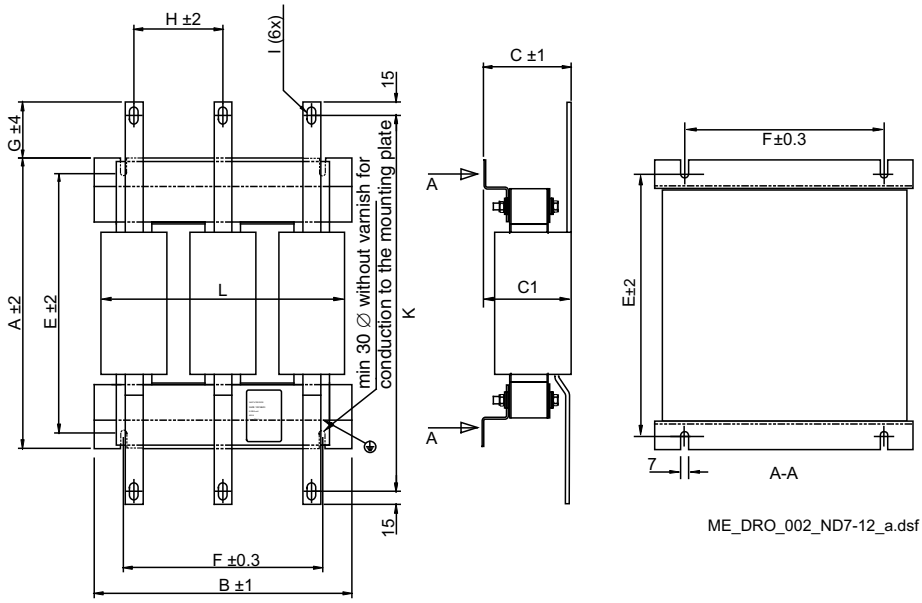
* not used for DCS880

Line reactors type ND01 to ND06



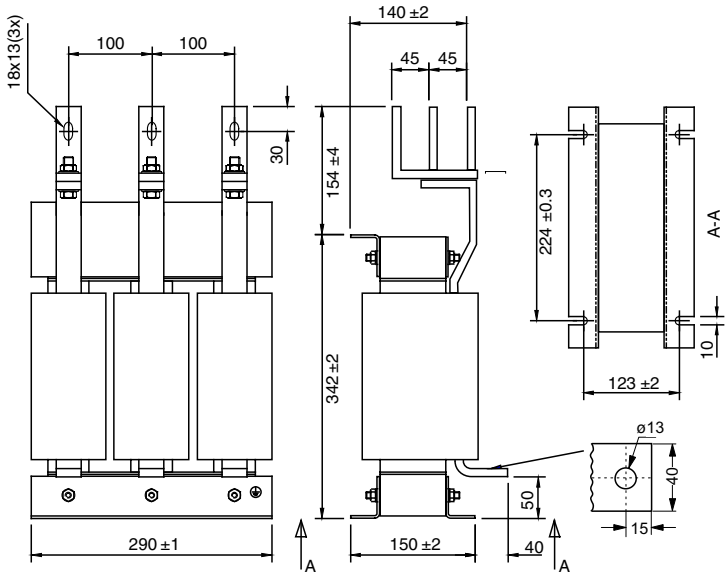
Line reactor	a1	a	b	c	d	e	f	g	
[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm^2]
ND 01	120	100	130	48	65	116	4	8	6
ND 02	120	100	130	58	65	116	4	8	10
ND 03	148	125	157	63	80	143	5	10	10
ND 04	148	125	157	78	80	143	5	10	16
ND 05	148	125	157	78	80	143	5	10	25
ND 06	178	150	180	72	90	170	5	10	35

Line reactors type ND07 to ND12

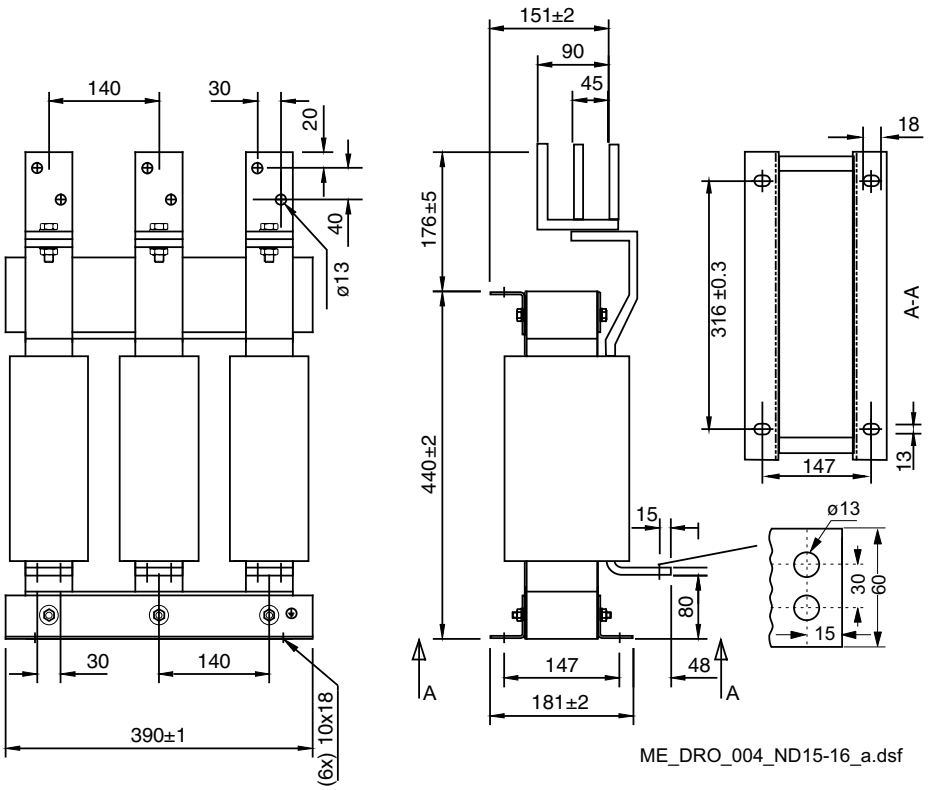


Line reactor (u_k = 1%)	A [mm]	B [mm]	C [mm]	C1 [mm]	E [mm]	F [mm]	G [mm]	H [mm]	I [mm]	K [mm]	L [mm]	busbar
ND07, 08	285	230	86	100	250	176	65	80	9 * 18	385	232	20 * 4
ND09	327	250	99	100	292	224	63	100	9 * 18	423	280	30 * 5
ND10, 11	408	250	99	100	374	224	63	100	11 * 18	504	280	30 * 6
ND12	458	250	112	113	424	224	63	100	13 * 18	554	280	40 * 6

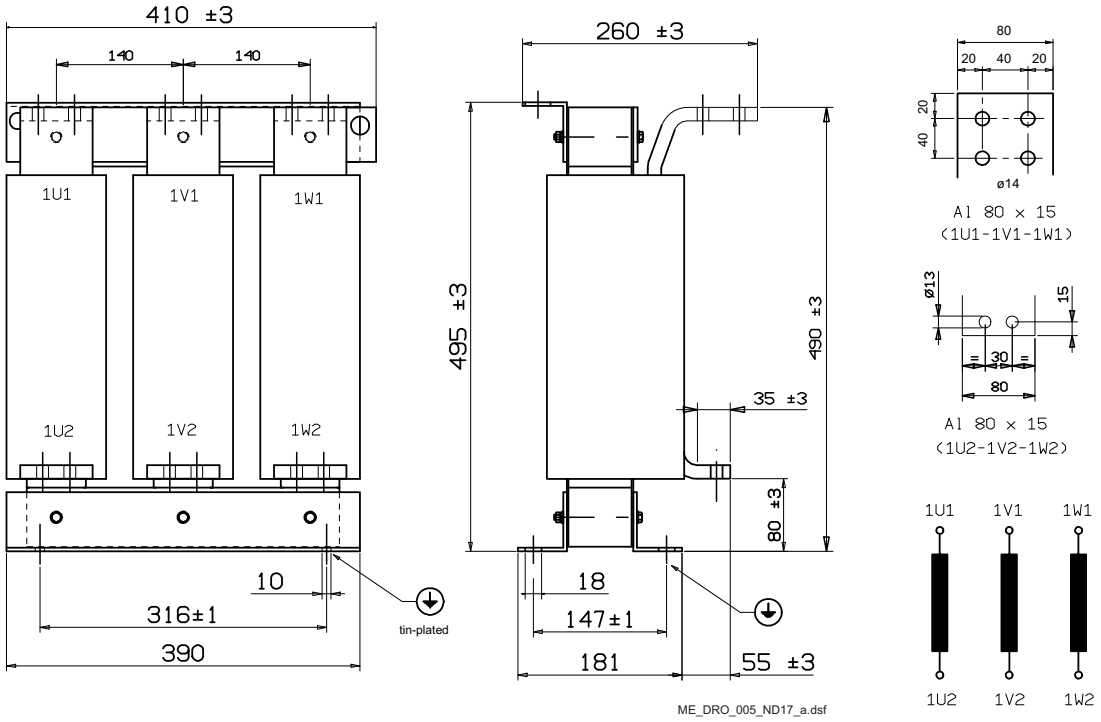
Line reactors type ND13, 14 all busbars are 40 x 10



Line reactors type ND15, 16 all busbars are 60 x 10



Line reactors type ND17



Line reactors type ND401 to ND413 (u_k = 4 %)

Line reactors of types ND401 to ND413 are sized to the unit's nominal current and frequency (50 / 60 Hz). These line reactors with a u_k of 4 % are designed for use in light industrial / residential environment. They have high inductive voltage drop, but reduced commutation notches. These line reactors are designed for drives, which usually operate in speed control mode with 400 or 500 V_{AC} mains. Thus the load cycle has to be taken into account. The percentage which is taken into account for that duty cycle is different depending on the mains.

- for U_{Mains} = 400 V_{AC} follows I_{DC1} = 90 % of nominal current
- for U_{Mains} = 500 V_{AC} follows I_{DC2} = 72 % of nominal current

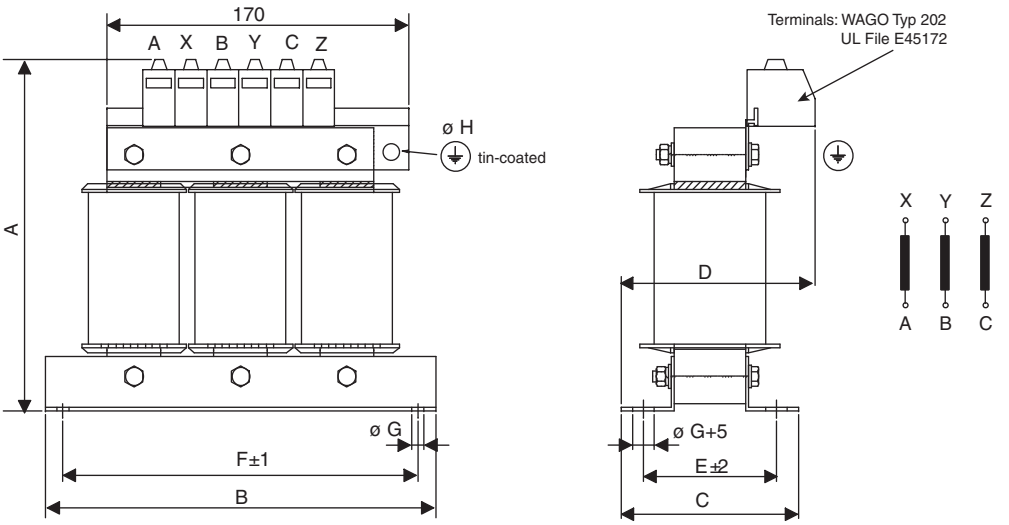
Line reactors ND401 to ND402 are equipped with terminals. The larger ones ND403 to ND413 are equipped with busbars. When connecting them to other components, please consider relevant standards in case the busbar materials are different.

Attention:
Do not use the line reactor terminals as cable or busbar support!

Line reactor (u_k = 4 %)	L [µH]	I_{RMS} [A]	i_{peak} [A]	$U_{Nominal}$ [V]	Weight [kg]	Power losses		DC current for U_{mains} = 400 V_{AC}	DC current for U_{mains} = 500 V_{AC}
						Fe [W]	Cu [W]		
ND401	1000	18.5	27	400	3.5	13	35	22.6	18
ND402	600	37	68		7.5	13	50	45	36
ND403	450	55	82		11	42	90	67	54
ND404	350	74	111		13	78	105	90	72
ND405	250	104	156		19	91	105	127	101
ND406	160	148	220		22	104	130	179	143
ND407	120	192	288		23	117	130	234	187
ND408	90	252	387		29	137	160	315	252
ND409	70	332	498		33	170	215	405	324
ND410	60	406	609		51	260	225	495	396
ND411	50	502	753		56	260	300	612	490
ND412	40	605	805		62	280	335	738	590
ND413	35	740	1105		75	312	410	900	720

Line reactors type ND401, 402

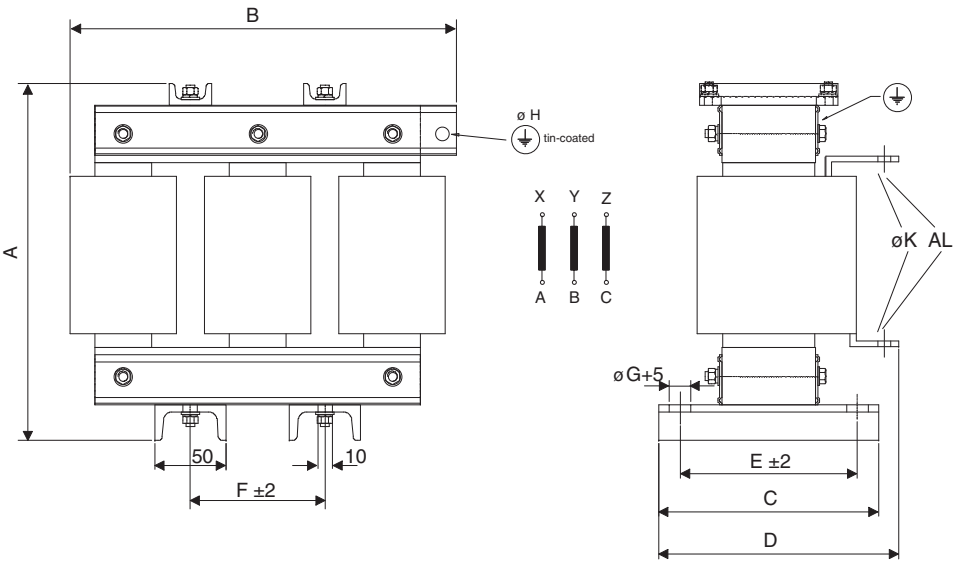
Line reactor (u_k = 4 %)	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	Ø G [mm]	Ø H [mm]
ND401	160	190	75	80	51	175	7	9
ND402	200	220	105	115	75	200	7	9



ME_DRO_006_ND401-402_a.ai

Line reactors type ND403 to ND408

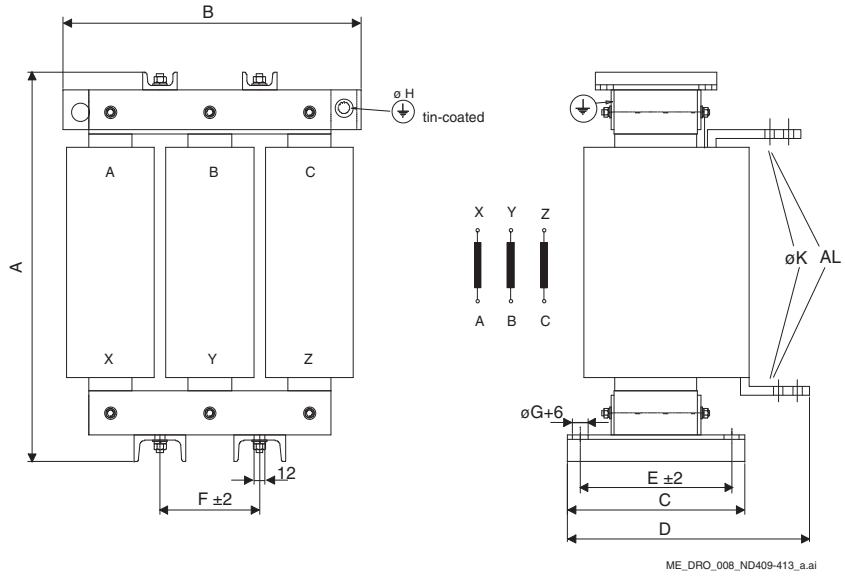
Line reactor (u_k = 4 %)	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	Ø G [mm]	Ø H [mm]	Ø K [mm]
ND403	220	230	120	135	100	77.5	7	9	6.6
ND404	220	225	120	140	100	77.5	7	9	6.6
ND405	235	250	155	170	125	85	10	9	6.6
ND406	255	275	155	175	125	95	10	9	9
ND407	255	275	155	175	125	95	10	9	11
ND408	285	285	180	210	150	95	10	9	11



ME_DRO_007_ND403-408_a.ai

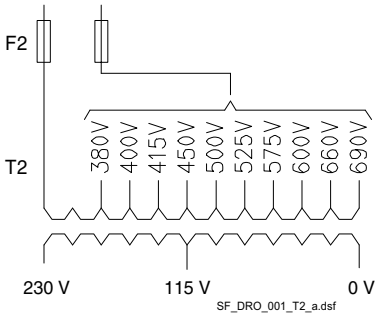
Line reactors type ND409 to ND413

Line reactor (u_k = 4 %)	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	Ø G [mm]	Ø H [mm]	Ø K [mm]
ND409	320	280	180	210	150	95	10	11	11
ND410	345	350	180	235	150	115	10	13	14
ND411	345	350	205	270	175	115	12	13	2 * 11
ND412	385	350	205	280	175	115	12	13	2 * 11
ND413	445	350	205	280	175	115	12	13	2 * 11



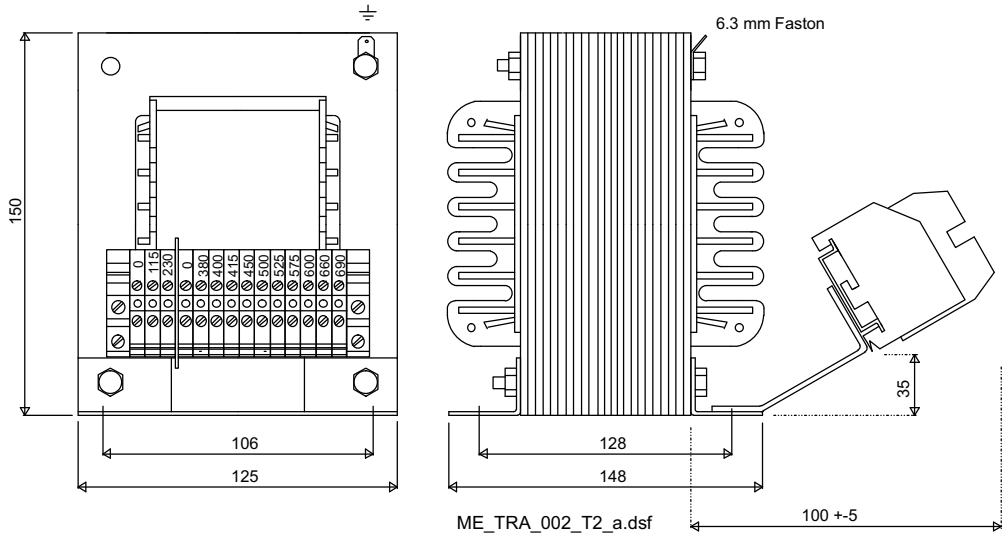
Auxiliary transformer (T2) for converter electronics and fans

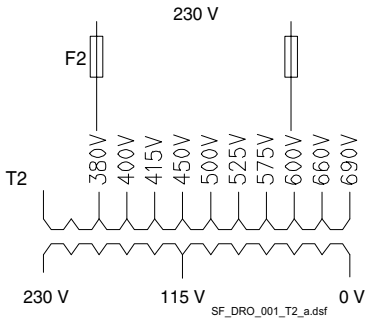
The auxiliary transformer (T2) is designed to supply the module‘s electronics and cooling fans. One transformers power and current allow supplying the single-phase fans and electronics of e.g. two H6 converters.



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]	Powerlosses [W]	Fuse F2 [A]	Secondary current [A]
T2	1,400	15	100	16	6 @ 230 V 12 @ 115 V

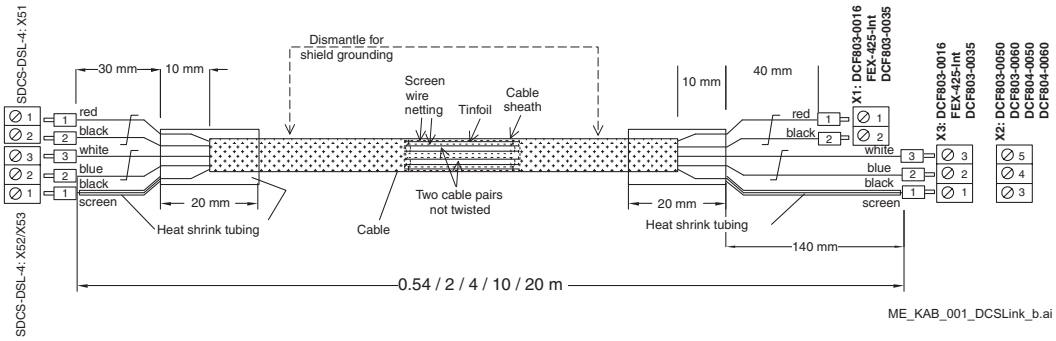




Commissioning hint:
T2 is designed to work as a 230 V_{AC} to 230 V_{AC} isolation transformer to open or avoid ground loops. Connect the 230 V_{AC} at the 380 V_{AC} and 600 V_{AC} tapings according to the drawing on the left hand side.

Other cables

DCSLink cable



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