DCS800

Hardware Manual
DCS800 Drives (20 to 5200 A)









DCS800 Drive Manuals

		Language									
	Public. number	E	D	I	ES	F	CN	RU	PL	PT	SE
DCS800 Quick Guide	3ADW000191	x	x	x	x	x				x	x
DCS800 Tools & Documentation CD	3ADW000211	x									
DCS800 Converter module											
Flyer DCS800	3ADW000190	x	x		x	x				x	
Technical Catalog DCS800	3ADW000192	x	x	x	x	x	x	x	x	x	
Hardware Manual DCS800	3ADW000194	x	x	x	x	x	x	x	x		
Hardware Manual DCS800 update DCF503B/DCF504B	3ADW000194Z	x									
Firmware Manual DCS800	3ADW000193	x	x	p	x	x	x	x	x		
Installation according to EMC	3ADW000032	x									
Technical Guide	3ADW000163	x									
Service Manual DCS800	3ADW000195	x	x								
12-Pulse Manual	3ADW000196	x									
CMA-2 Board	3ADW000136	x									
Flyer Hard - Parallel	3ADW000213	x									
Drive Tools											
DriveWindow 2.x - User's Manual	3BFE64560981	x									
DriveOPC 2.x - User's Manual	3BFE00073846	x									
Optical DDCS Communication Link	3AFE63988235	x									
DDCS Branching Units - User's Manual	3BFE64285513	x									
DCS800 Applications											
PLC Programming with C_____s	C_____s_V23	x	x			x					
61131 DCS800 target +tool description - Application Program	3ADW000199	x									
DCS800 Crane Drive											
DCS800 Crane Drive Manual suppl.	3AST004143	x									
DCS800 Crane Drive Product note	PDC5 EN	x									
DCS800 Winder ITC											
DCS800 Winder Product note	PDC2 EN	x									
DCS800 Winder description ITC	3ADW000308	x									
Winder Questionnaire	3ADW000253Z	x									
DCS800-E Panel Solution											
Flyer DCS800-E Panel solution	3ADW000210	x									
Hardware Manual DCS800-E	3ADW000224	x									
DCS800-A Enclosed Converters											
Flyer DCS800-A	3ADW000213	x									
Technical Catalog DCS800-A	3ADW000198	x									
Installation of DCS800-A	3ADW000091	x	x								
DCS800-R Rebuild System											
Flyer DCS800-R	3ADW000007	x	x								
DCS800-R Rebuild Kits	3ADW000197	x									
DCS800-R Optical Rebuild Kits	3ADW000415	x									
DCS800-R DCS500/DCS600 Upgrade Kits	3ADW000256	x									
Extension Modules											
RAIO-01 Analog IO Extension	3AFE64484567	x									
RDIO-01 Digital IO Extension	3AFE64485733	x									
RRIA-01 Resolver Interface Module	3AFE68570760	x									
RTAC-01 Pulse Encoder Interface	3AFE64486853	x									
RTAC-03 TTL Pulse Encoder Interface	3AFE68650500	x									
AIMA R-slot extension	3AFE64661442	x									
Door mounting kits											
Door mounting DCS Control Panel (IP54, click in)	3AUA0000076085	x									
Door mounting DCS Control Panel (fix mounting)	3AFE68294673	x									
Door mounting DCS Control Panel (IP66, fix mounting)	3AFE68829593	x									
Serial Communication											
Drive specific serial communication											
NETA Remote diagnostic interface	3AFE64605062	x									
Fieldbus Adapter with DC Drives RPBA- (PROFIBUS)	3AFE64504215	x									
Fieldbus Adapter with DC Drives RCAN-02 (CANopen)											
Fieldbus Adapter with DC Drives RCNA-01 (ControlNet)	3AFE64506005	x									
Fieldbus Adapter with DC Drives RDNA- (DeviceNet)	3AFE64504223	x									
Fieldbus Adapter with DC Drives RMBA (MODBUS)	3AFE64498851	x									
Fieldbus Adapter with DC Drives RETA (Ethernet)	3AFE64539736	x									
x -> existing p -> planned											
Status 01.2015											

DCS800 Drives
20 to 5200 A

Hardware Manual

Code: 3ADW000194R0801 Rev H

Effective: 11.2014
Supersedes: Rev G 07.2013

© 2014 ABB Automation Products GmbH. All rights reserved.

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 DCS800, the converter modules DCS800-S0x size D1 to D7, field exciter units DCF80x, etc. like the Rebuild Kit DCS800-R00-9xxx.

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. They also tell you 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. SDCS-IOB-2 and RDIO).
- DCS800 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 (over 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:



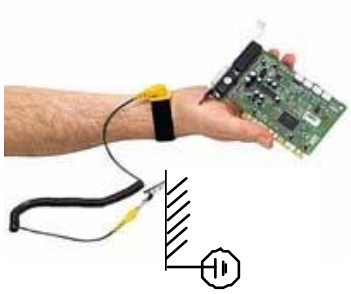


ABB order no.: 3ADV050035P0001

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!

- DCS800 sizes D4 ... D7: The drive is heavy. Do not lift it alone. Do not lift the unit by the front cover. Place units D4, D4+ and D5 only on their back.

  DCS800 sizes D5 ... D7: 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 in-tended 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 (L 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 .

Table of contents

DCS800 Drive Manuals 2

Safety instructions

What this chapter contains 4
To which products this chapter applies 4
Use of warnings and notes 4
Installation and maintenance work 5
Grounding 6
Printed circuit boards and fiber optic cables 7
Mechanical installation 7
Operation 8

Table of contents

The DCS800

Chapter overview 13
The DCS800 13
Type code 14
Main circuit and control 15
Armature converter DCS800-S0x D1 - D4 15
Armature converter DCS800-S0x D4+ 16
Armature converter DCS800-S0x D5, D6 and D7 (+P905) 17
Armature converter DCS800-S0x D7 (+P906) 18
Rebuild kit DCS800-R0x 19

Mechanical installation

Chapter overview 20
Unpacking the unit 20
Delivery check 20
Before installation 21
Requirements for the installation site 21
Wall 21
Floor 21
Free space around the unit 21
Cabinet installation 21
Preventing cooling air recirculation 21
Unit above another 21
Terminal options for converter modules size D1 - D4 22
Connection of D4 converter module DC terminals 22
Terminal cover according to VBG 4 regulations 23
Mounting the converter module D4+ inside an enclosure 24
Mounting the converter module D6 inside an enclosure 25

Mounting the converter module D7 inside an enclosure 26
Connecting the external control unit of a D7 module (+P906). 27

Planning the electrical installation

Chapter overview 28
Options 28
Line reactors (L1). 28
Line reactors (L1) Selection 30
Semiconductor fuses (F1) 31
Semiconductor fuses (F1) and fuse holders for armature circuit 32
Fuses (F3.x) and fuse holders for field circuit 33
Single-phase autotransformer (T3) for field circuit (adapt voltage) 34
Line reactors for single- and 3-phase connection of field converters. 35
Auxiliary transformer (T2) for electronic system / fan supply 35
Residual current detection 35
EMC filters (E1) 36
Three-phase filters 36
EMC filters for single-phase connection of field converters 37
Converters size D1 - D4 configuration using an OnBoard field exciter 40
Converters size D4+ configuration using FEX-425-Int field exciter 41
Converters size D5 configuration using FEX-425-Int field exciter 42
Converters size D4+ - D7 configuration using external field exciters DCF803, DCF804 43
Converters size D1 - D3 as large field exciter 44
Start, Stop and E-Stop control. 45
Drive configuration with reduced components 47
Cooling fans 48
Monitoring the DCS800 power section. 52
Thermal overload and short-circuit protection 52
Mains cable (AC line cable) short-circuit protection 52
Cross-sectional areas - Tightening torques. 53
Selecting the control cables 54
DCS Control Panel cable 54
Connection of a motor temperature sensor to the drive I/O 55

Electrical installation

Chapter overview 56
Checking the insulation of the drive 56
IT (ungrounded) systems 57
Supply voltage. 57
Connecting the power cables 57
Location R-type options and interfaces 58
I/O Board Configuration. 59
Pulse encoder connection 60
Pulse encoder connection principles. 61
Connecting the signal and control cables 63
Routing the cables. 63
DCSLink wiring 64

Installation checklist

Maintenance

Chapter overview 68
Safety 68

Technical data

Chapter overview 69
Environmental Conditions 69
Current ratings - IEC non regenerative 71
Current ratings - IEC regenerative 72
    Standard duty cycles 72
Control Board SDCS-CON-4 73
    Layout of the control board SDCS-CON-4 73
    Memory circuit 73
    Watchdog function 73
    Seven segment display 74
    Terminal description 74
    Digital and analog I/O connection of the SDCS-CON-4 76
Interface board SDCS-COM-8 77
    Ch2 master-follower connection 78
    Ch0 DriveBus connection to Advant Controller (star) 78
    Ch0 connection to overriding control (N-type fieldbus adapter) 79
    Ch3 ring connection to DriveWindow 79
    Ch3 star connection to DriveWindow 80
DDCS branching unit NDBU-95 81
Drive-to-drive board SDCS-DSL-4 82
Digital I/O board SDCS-IOB-2 83
Analog I/O and encoder I/O board SDCS-IOB-3 85
Power supply board SDCS-POW-4 87
Interface board SDCS-PIN-4 / SDCS-PIN-4b 88
    General 88
    Power supply 89
    Technical data 90
    Armature circuit interface 91
    Field circuit interface (D1 - D4) 91
SDCS-PIN-51, SDCS-PIN-46, SDCS-PIN-48 interface to the power part 94
Interface board SDCS-SUB-4 98
    General 98
Galvanic isolation - T90, A92, F11, F90 101
    DC-DC transducer A92 (1) 103
    Transformer T90 104

Dimensions and weights

Size D1 105
Size D2 105

Size D3 105
Size D4 106
Size D4+ 107
Size D5 108
Size D6 109
Size D7 lefthand (+P905) 110
Size D7 lefthand (+P906) 111
Size D7 righthand (+P905) 112
Size D7 righthand (+P906) 113
Branch fuses installed inside converter sizes D4+, D5, D6, D7 114

Accessories

DCF803-0016, FEX-425-Int and DCF803-0035 117
Electrical data. 118
Control unit. 118
Power part 118
DCSLink communication 119
RS232-Port 119
Diagnostics. 120
DCF803-0016 and DCF803-0035 configuration 121
Dimensions 122
FEX-425-INT configuration (size D4+). 123
FEX-425-INT configuration (size D5). 124
DCF803-0050, DCF804-0050, DCF803-0060 and DCF804-0060 125
Electrical data 126
Control unit. 126
Power part 127
DCSLink communication 127
RS232-Port 128
Diagnostics. 129
DCF803-0050 / 0060 and DCF804-0050 / 0060 configuration (e.g. 2 motors) 130
Dimensions 133
DCF505 / DCF506 Overvoltage Protection 134
Fuses and fuse holders IEC 137
Line reactors IEC. 138
Line reactors type ND01 to ND17 (uk = 1 %). 138
Line reactors type ND401 to ND413 (uk = 4 %) 141
Autotransformer (T3) 143
Line reactor (L3) 144
Auxiliary transformer (T2) for converter electronics and fans 145
Supply transformer (T8) for cooling fan. 146
Residual current detection. 147
Optical cables 149
Other cables 150

The DCS800

Chapter overview

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

The DCS800

The DCS800-S size D1 - D7 are intended for controlling DC motors.



Size D1 - D4+
20 - 1190 A



Size D5
900 - 2000 A



Size D6
1900 - 3000 A



Size D7
2050 - 5200

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. DCS800-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.

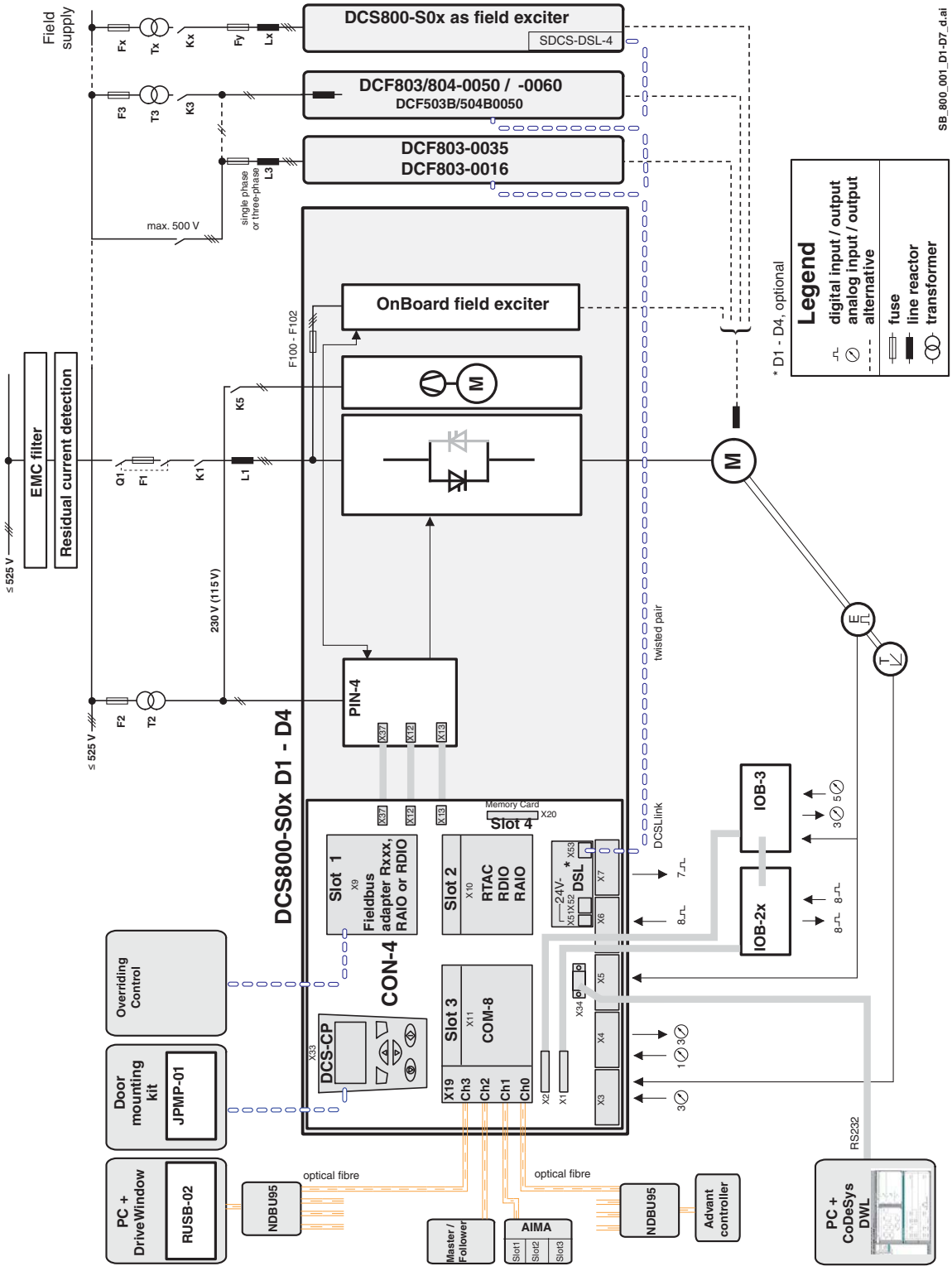
The drive's basic type code: DCS800-AAX-YYYY-ZZ-B + plus code			
Product family	DCS800		
Type:	AA	= S0	Standard converter module
		= R0	Rebuild kit
		= E0	Panel solution
		= A0	Enclosed converter
Bridge type:	X	= 1	Single bridge (2-Q)
		= 2	2 anti-parallel bridges (4-Q)
Module type:	YYYY	=	Rated DC current
Rated AC voltage:	ZZ	= 04	230 V_{AC} - 400 V_{AC}
		= 05	230 V_{AC} - 525 V_{AC}
		= 06	270 V_{AC} - 600 V_{AC}
		= 07	315 V_{AC} - 690 V_{AC}
		= 08	360 V_{AC} - 800 V_{AC}
		= 10	450 V_{AC} - 990 V_{AC}
		= 12	540 V_{AC} - 1200 V_{AC}
Power connection:	-	=	Standard D1 - D6
		= L	Left side D7
		= R	Right side D7
Revision code:	B	=	Standard
		= a	Second thyristor type D5, D6
		= b	ErP compliant cooling fan D5, D6, D7 and second thyristor type
Field exciter configuration:		+0S163	D1 - D4 without OnBoard field exciter
		+S164	D4+ and D5 with internal field exciter, supply external (D4+ and D5: 25 A, Rebuild kit: 16 A / 25 A)
Fan voltage:			**Size D4**
		Standard	Fan voltage: 230 V / 1-ph
		+S171	Fan voltage: 115 V / 1-ph
Current measurement:		+S175	SDCS-CMA-2 (D5 - D7)
Voltage measurement:		+S186	120 V SDCS-SUB-4 (D1 - D4+)
		+S185	SDCS-PIN-51 configured to 120 V (D5 - D7)
		+S180	SDCS-PIN-51 configured to 600 V (D5 - D7), 12-pulse serial / serial sequential
		+S181	SDCS-PIN-51 configured to 690 V (D5 - D7), 12-pulse serial / serial sequential
		+S182	SDCS-PIN-51 configured to 800 V (D6, D7), 12-pulse serial / serial sequential
		+S183	SDCS-PIN-51 configured to 990 V (D6, D7), 12-pulse serial / serial sequential
		+S189	SDCS-PIN-51 configured to galvanic isolation (D6, D7)
		+P905	Electronic boards are located in the D7 module
		+P906	Electronic boards are in an external control unit (outside the D7 module)
SDCS-DSL-4:		+S199	With SDCS-DSL-4
		+0S199	Without SDCS-DSL-4
DCS Control Panel:		+0J404	Without DCS Control Panel
		+J409	Door mounting kit, including 3 m cable
Fieldbus:		+K454	Profibus RPBA-01
		+K451	DeviceNet RDNA-01
		+K457	CANopen RCAN-01
		+K466	Ethernet/IP, Modbus/TCP RETA-01
		+K458	Modbus (RTU) RMBA-01
I/O and DDCS:		+L500	Analog Extension RAIO-01
		+L501	Digital Extension RDIO-01
		+L508	DDCS communication board (10 Mbaud CH0) SDCS-COM-81
		+L509	DDCS communication board (5 Mbaud CH0) SDCS-COM-82

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

Main circuit and control

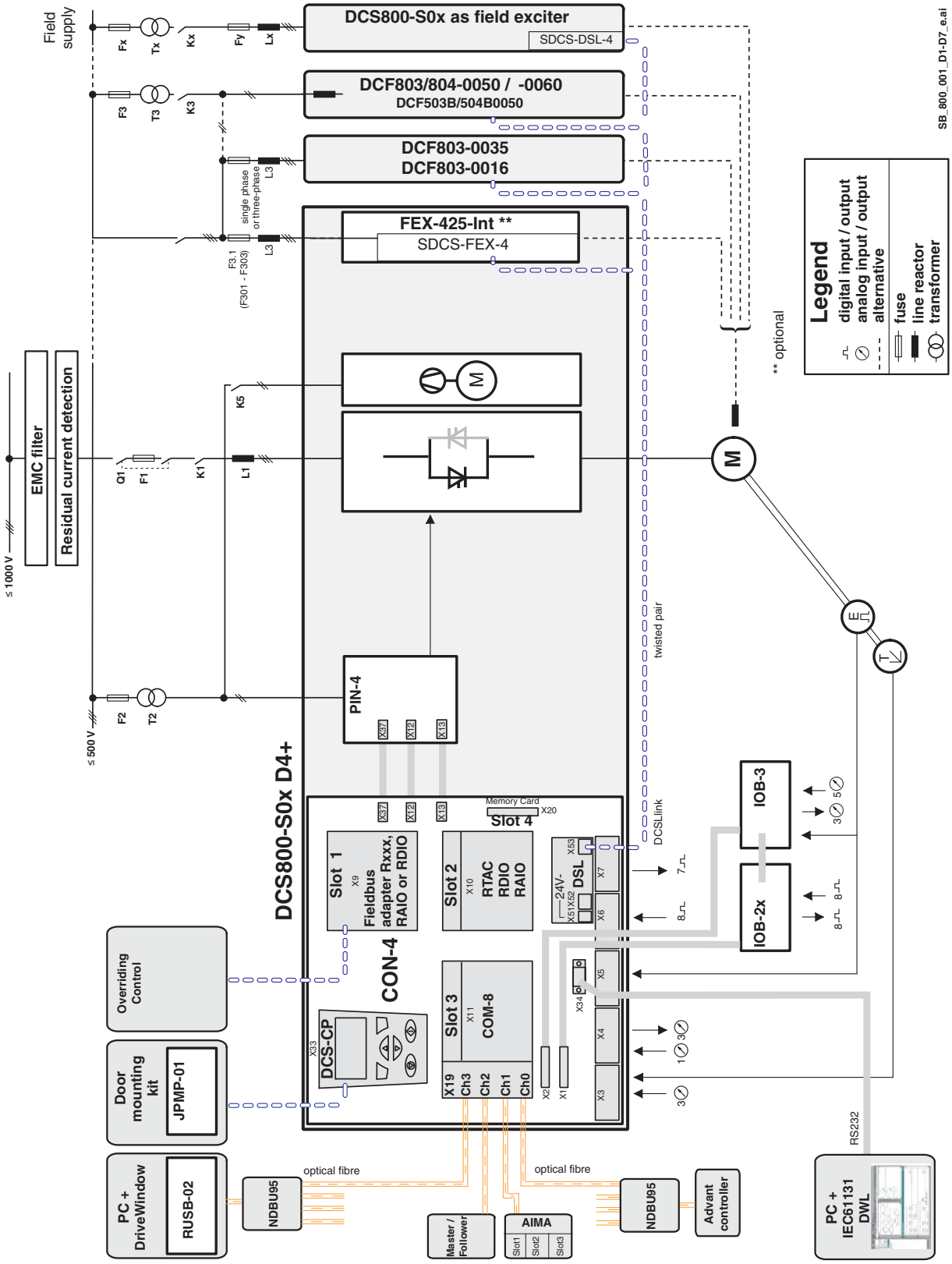
Armature converter DCS800-S0x D1 - D4

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

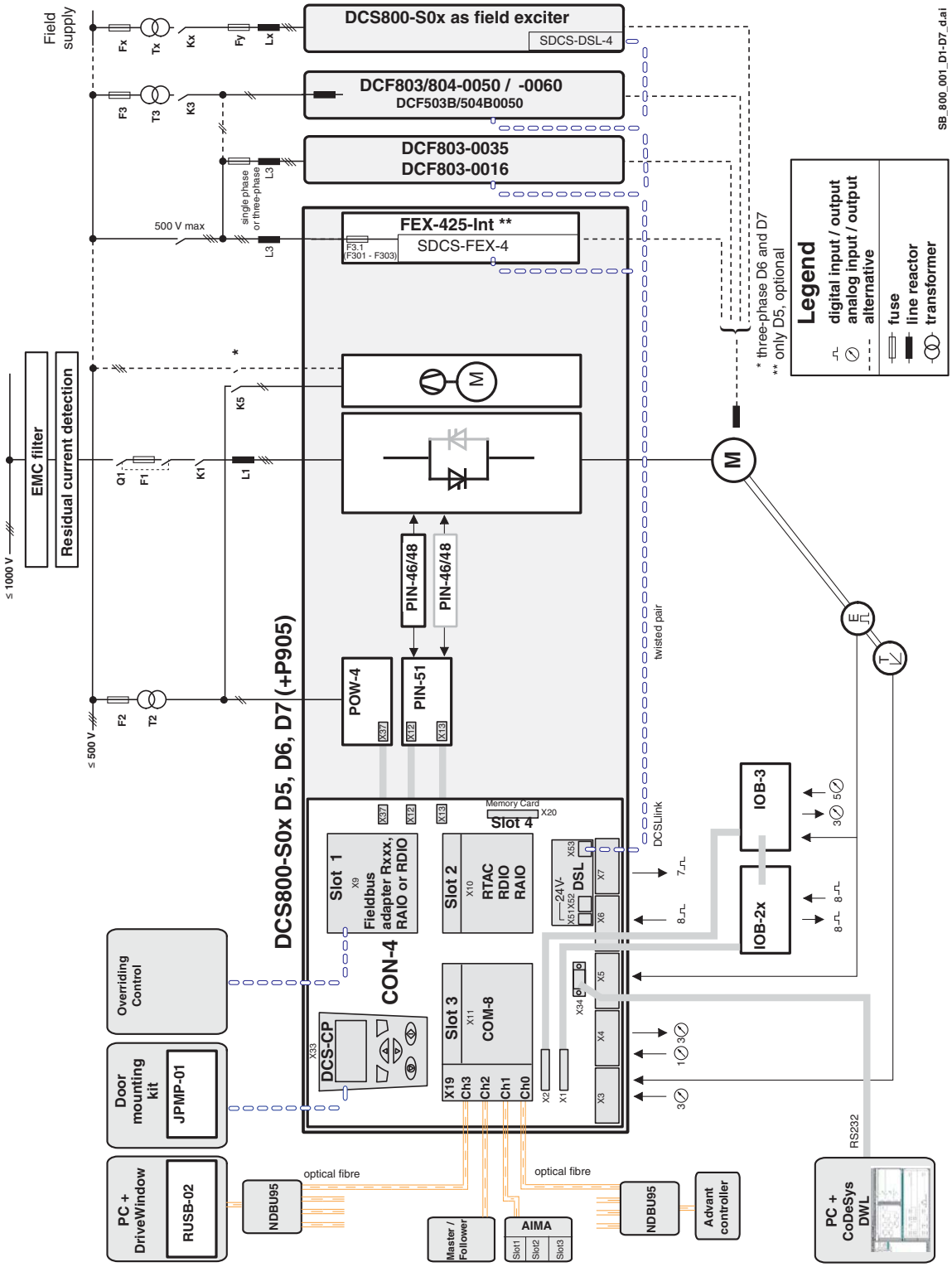


Armature converter DCS800-S0x D4+

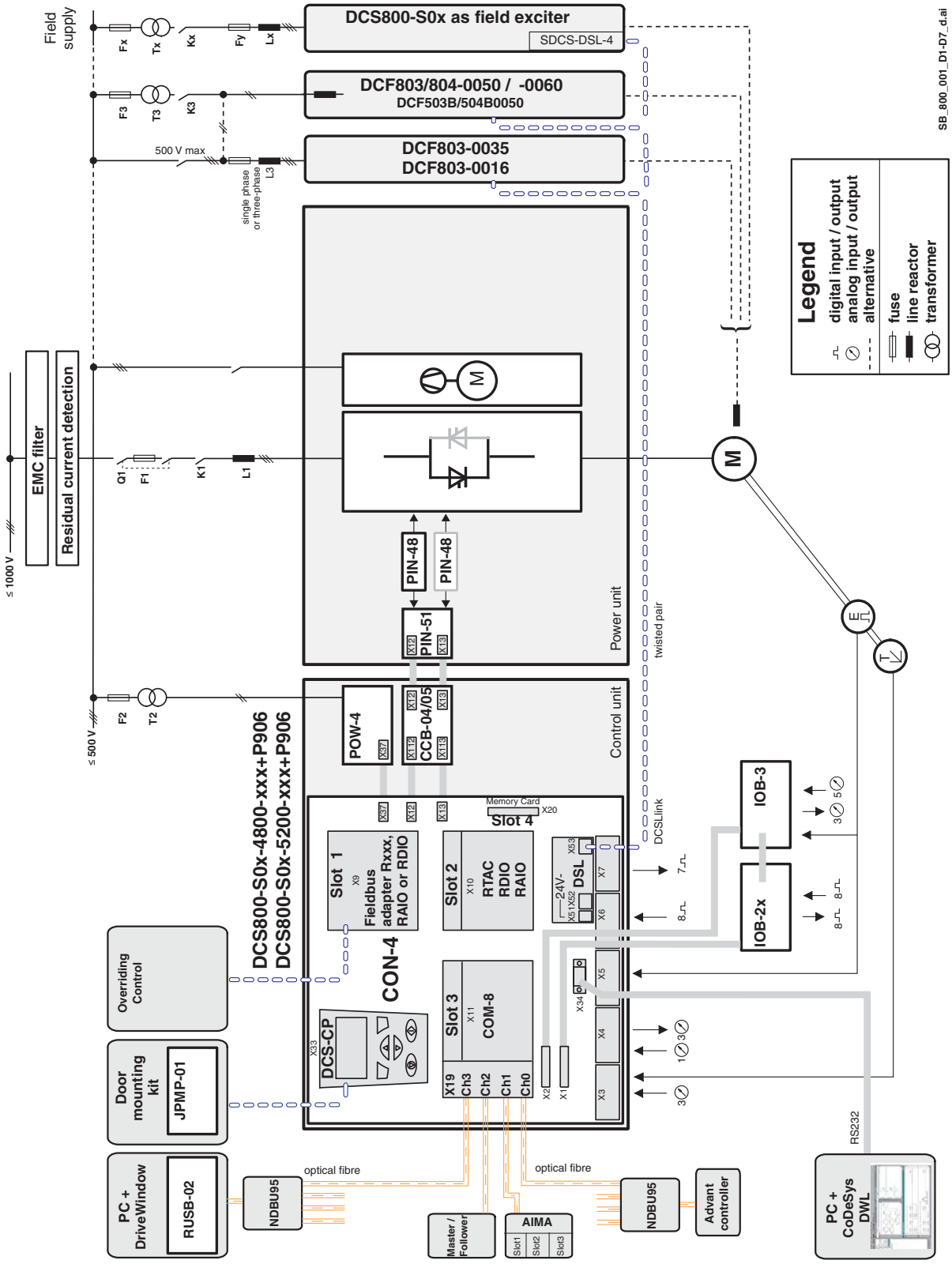
D4+ units optional with internal field exciter



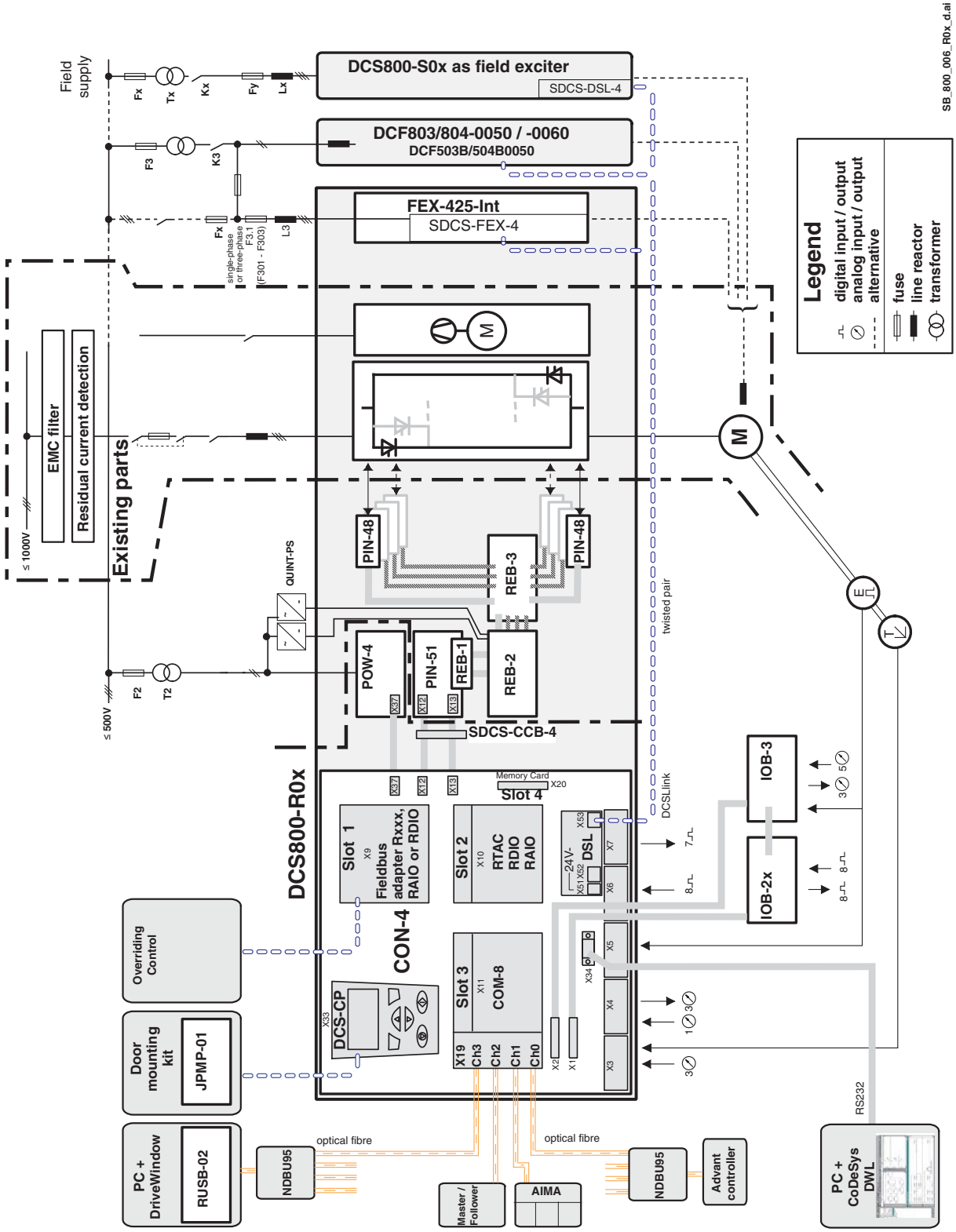
Armature converter DCS800-S0x D5, D6 and D7 (+P905)



Armature converter DCS800-S0x D7 (+P906)



Rebuild kit DCS800-R0x



Mechanical installation

Chapter overview

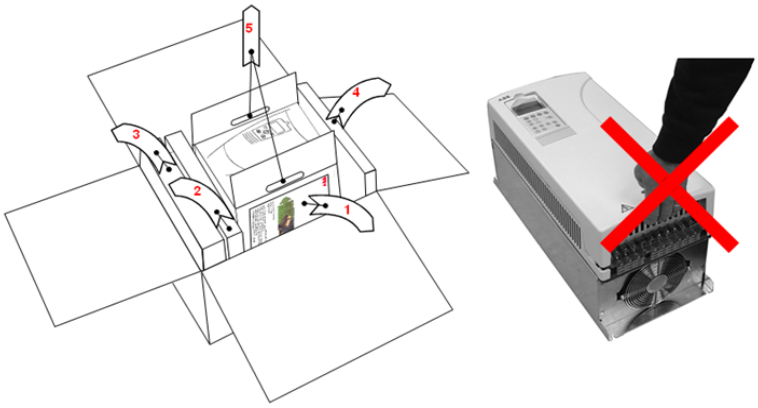
This chapter describes the mechanical installation of the DCS800.

Unpacking the unit

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

Attention:

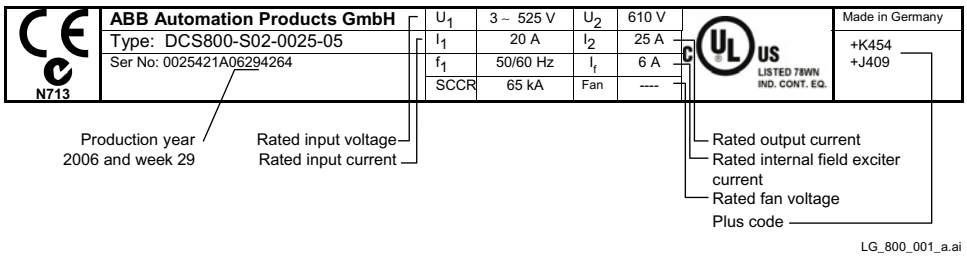
Do not lift the drive by the cover!



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

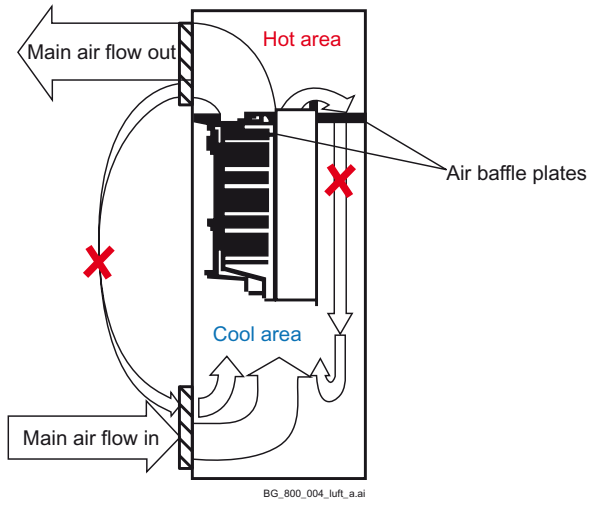
Around the unit free space is required to enable cooling airflow, service and maintenance see chapter *Dimensions and weights*.

Cabinet installation

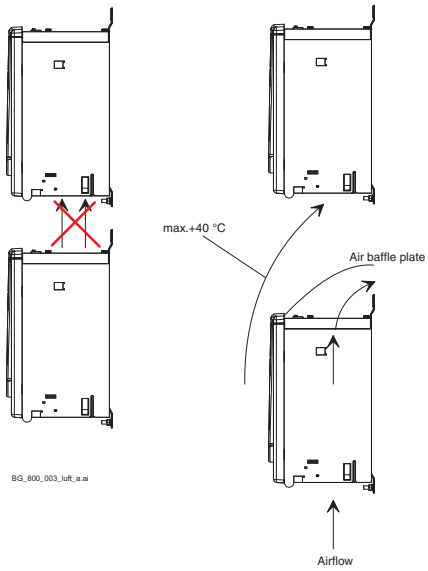
The required distance between parallel units is five millimetres (0.2 in.) in installations without the front cover. The cooling air entering the unit must not exceed +40 °C (+104 °F).

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)

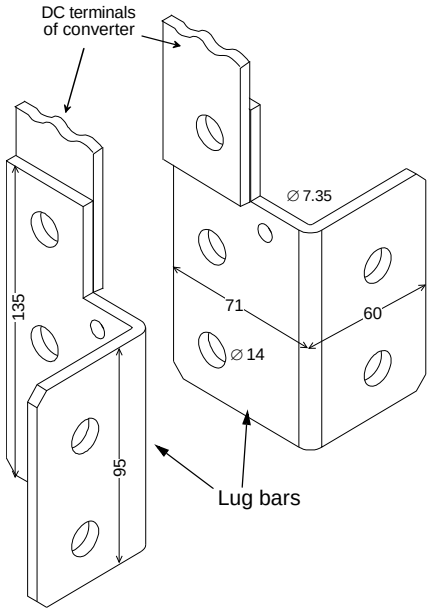
Size	Nominal converter current [A]	Air entry size [m^2]	Air exit size [m^2]
D1	20 to 140	0.22	0.11
D2	180 to 260		
D3	315 to 350		
D3	405 to 520	0.31	0.15
D4	610 to 1000		
D4+	1190	0.22	0.11
D5	900 to 2000		
D6	1900 to 3000	0.44	0.31
D7	2050 to 5200	0.52	

Terminal options for converter modules size D1 - D4

There are different options to protect and connect the terminals of converter modules size D1 - D4.

Connection of D4 converter module DC terminals

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



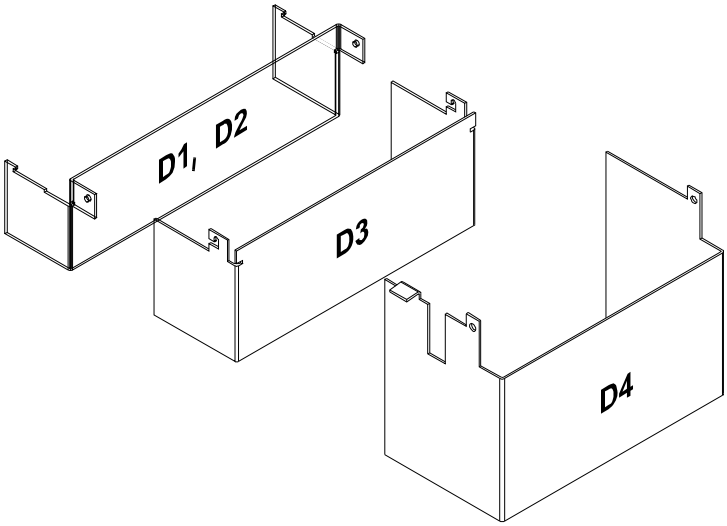
Id No.	Remark
3ADV280706P0001	right
3ADV400706P0001	left



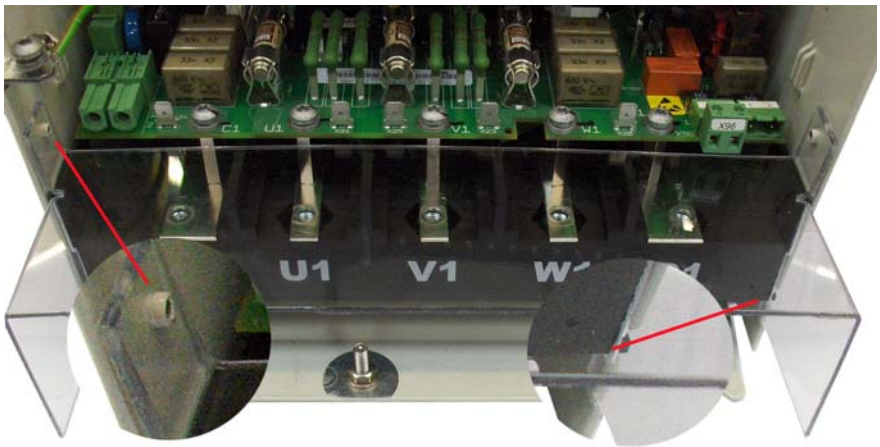
Bottom view

Terminal cover according to VBG 4 regulations

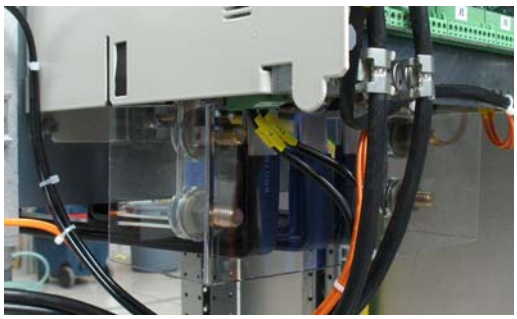
For converter modules size D1 - D4 shrouds for protection against contact are provided.



Id No.	Remark
3ADT631137P0001	D1, D2
3ADV400208P0001	D3
3ADV400207P0001	D4



Mount the D1, D2 cover using the existing lateral pins and than swing it down to snap it into the terminal row. D3 and D4 mounting is the same, without the snap-in mechanism.



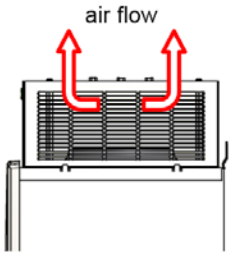


Examples for DC main terminal covers for D3 (left) and D4 (right) converter modules.

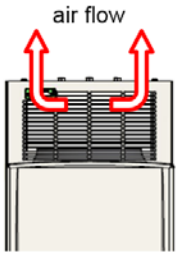
Mounting the converter module D4+ inside an enclosure

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

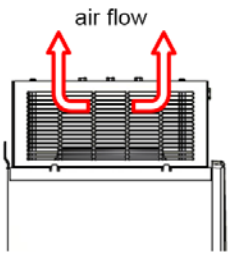
View from: right side



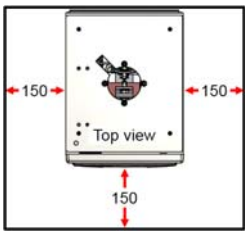
front side



left side:



Free space around the converter module
In mm:



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

Mounting the converter module:

1. Remove the Control Panel and design cover:



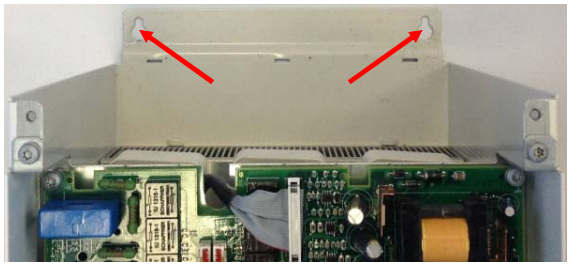
2. Remove screws (T20) and pull out box (incl. fan):



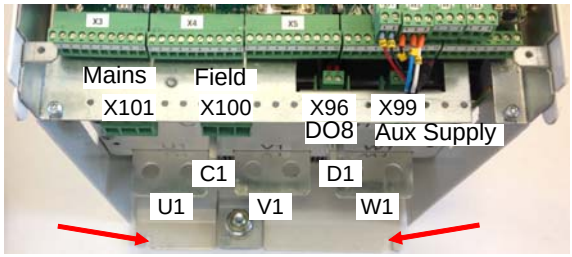
3. Now all mounting holes are accessible:



Detail top:



Detail bottom:

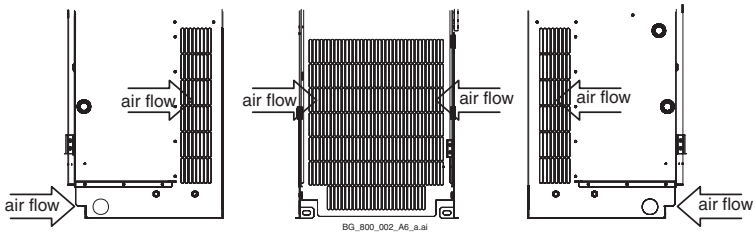


Mounting the converter module D6 inside an enclosure

Cooling air inlet

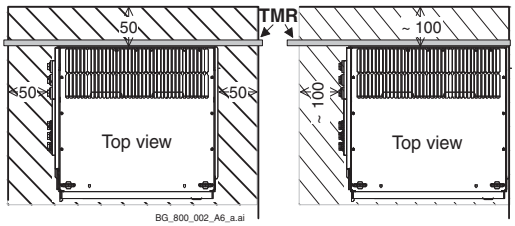
The cooling fan takes the air from the back, left, right side and from the bottom of the converter module.

View from: right side back side left side



Free space around the converter module

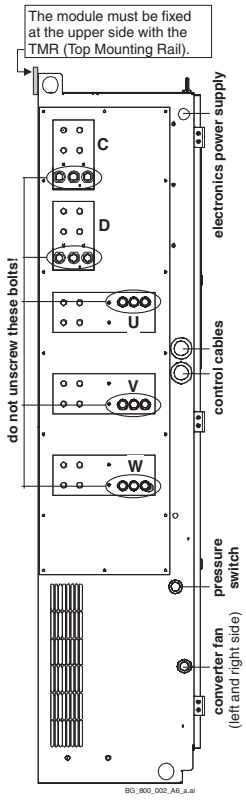
Optimum Compromise



Cooling air outlet

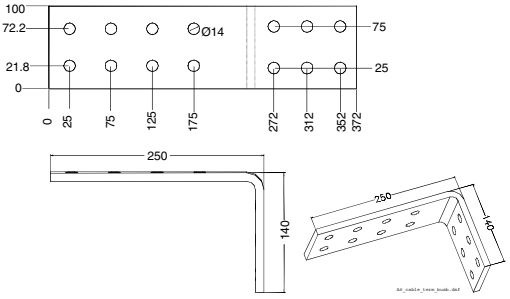
To avoid circulating air inside the enclosure make sure the exhaust air leaves the enclosure.

Cable entries

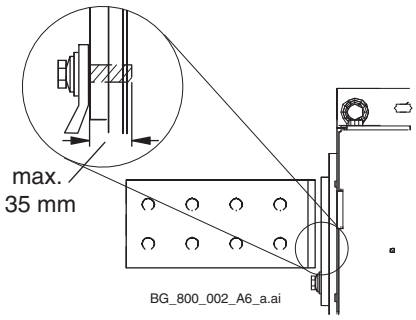


Power cable connection

The power cable connection is done via **option 3ADT786223**. This option consists of 5 rectangular copper busbars with screws. The mechanical details are shown in the figure below.

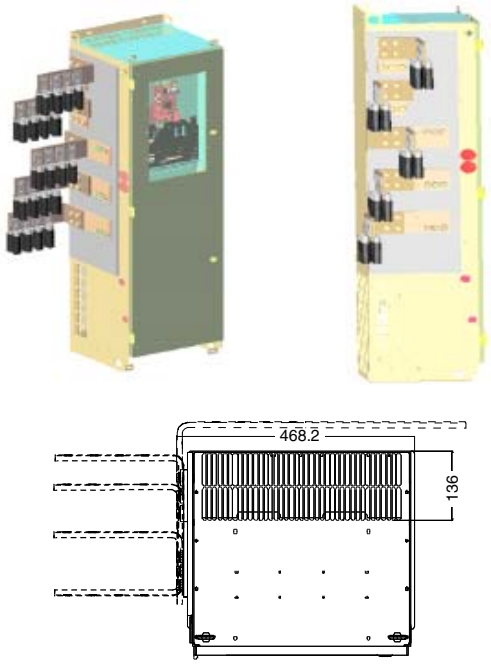


When mounting the rectagular busbars or connecting cables directly please make sure the correct bolts are used. The converter module is equipped with threaded holes at its left side. Because of that the length of the screw threads is limited to 35 mm (see drawing below).



The figure below gives an example, how the rectangular busbars can be mounted in case all cable connections are made at the left side of the converter module. This results in four layers of power cables.

In case the AC or DC connection or perhaps both of them have to be made at the right side of the converter module use the space behind the converter. Move the power terminals via rectangular busbars to the final connection points. In this case the busbars need to be fixed at the enclosure, not at the converter module! The figures below give a rough example, how connections can be made.

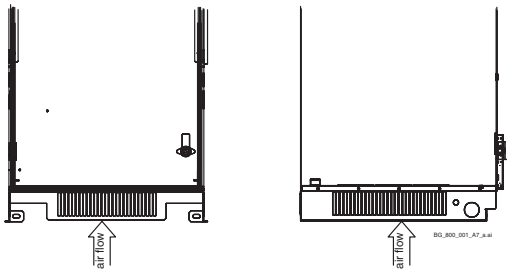


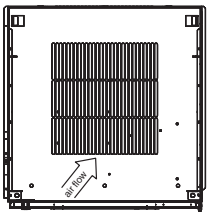
Example right side connection

Mounting the converter module D7 inside an enclosure

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

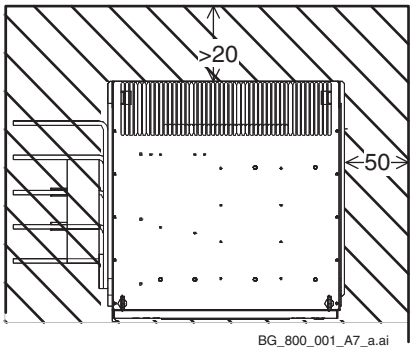
View from front left side / (right side)





View from bottom

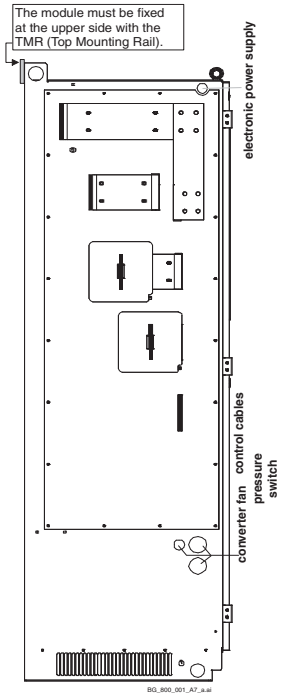
Free space around the converter module
Do not place the converter module in a corner. In case the fan cannot take the air through the bottom plate of the enclosure none of the remaining entries must be blocked.



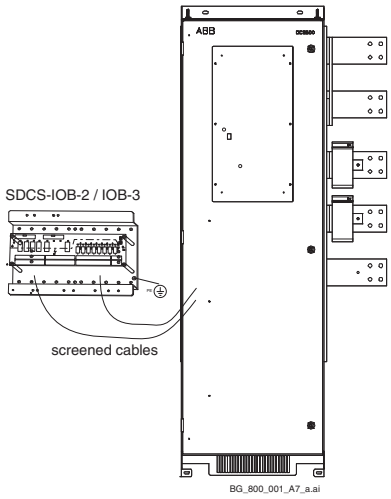
Air entry through the bottom plate
Make sure the converter module gets clean air, because there is no air filter in front of the converter fan.

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

Cable entries
The cable entries are symmetric on both sides. Nevertheless only the entries on the left side should be used for cables connected to the electronic power supply (SDCS-POW-4) or the controller board (SDCS-CON-4).



Screened cables for the I/O boards SDCS-IOB-2 / IOB-3 are strongly recommended. Ground card holder accordingly.



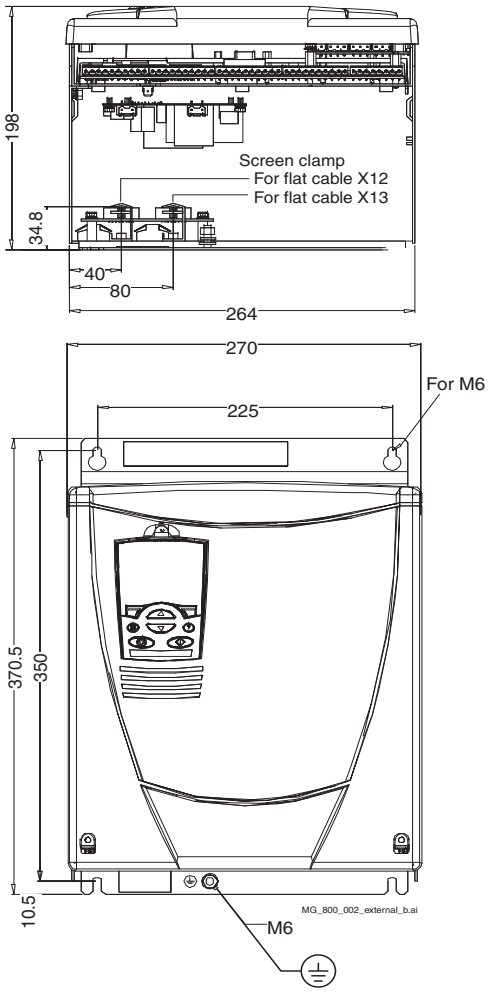


Internal cable ducts are used for the snubber cables. Do not use these cable ducts for other cables e.g. process signals!

Use cable ties to fix the fan cable!

Fix all cables, otherwise the air flow from fan will destroy them!

Connecting the external control unit of a D7 module (+P906)

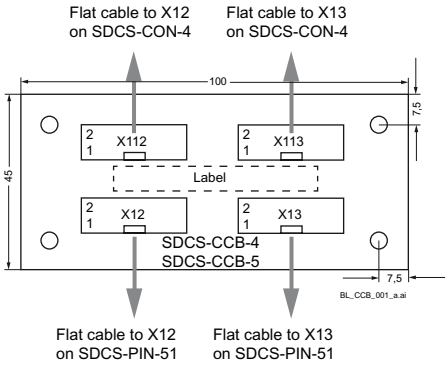


Control unit

During installation the SDCS-CON-4 needs to be connected with the SDCS-PIN-51 using two shielded 16 pole flat cables. These cables connect terminals X12 with each other, as well as terminals X13. For easier access to the terminals in the control unit, connecting boards SDCS-CCB-4 or SDCS-CCB-5 are placed close to the lower end of the metal frame.

When connecting X12 and X13 make sure the flat cables are marked at both ends, one with X12, the other with X13. Worst case put stickers on!

Wedge the blank screen of the flat cable in position using the screen clamp, then place the plug into its socket.



SDCS-CCB-4

SDCS-CCB-5



Connect the cables in the control unit as indicated in the picture of the SDCS-CCB-4 / SDCS-CCB-5. Make sure (once again) X12 and X13 are plugged into the correct sockets (cross wise connection results in component damage!!!).
Take care of proper grounding.

X13

X12

Maximum cable length X12, X13 is 4 meter.

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 DCS800 converter modules.

Attention:

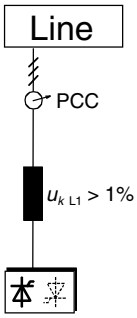
If the recommendations given by ABB are not followed, the drive may experience problems that the warranty does not cover. See also *Technical Guide*.

Options

Line reactors (L1)

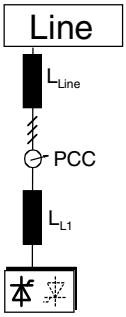
For armature and field supply.

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:



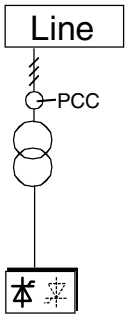
Configuration A

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

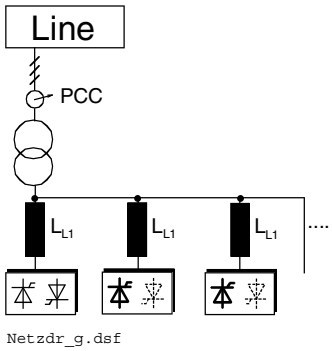
If special requirements have to be met at the PCC (standards like EN 61 800-3, DC and AC drives at the same line, etc), different criteria must be applied for selecting a line reactor. These requirements are often defined as a voltage dip in percent of the nominal supply voltage. The combined impedance 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*.



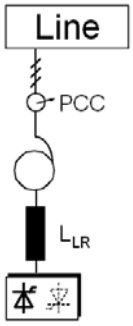
Configuration C

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 D1, D2, D3, D4, D4+, D5, D6, D7.
In case if **only** two converters of type D7 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 D1 - D4+ 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 DCS800 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				
D1	DCS800-S01-0020-04/05	DCS800-S02-0025-04/05	ND01	1	ND401	4
	DCS800-S01-0045-04/05	DCS800-S02-0050-04/05	ND02	1	ND402	4
	DCS800-S01-0065-04/05	DCS800-S02-0075-04/05	ND04	1	ND403	5
	DCS800-S01-0090-04/05	DCS800-S02-0100-04/05	ND06	1	ND404	5
	DCS800-S01-0125-04/05	DCS800-S02-0140-04/05	ND06	1	ND405	5
D2	DCS800-S01-0180-04/05	DCS800-S02-0200-04/05	ND07	2	ND406	5
	DCS800-S01-0230-04/05	DCS800-S02-0260-04/05	ND07	2	ND407	5
D3	DCS800-S01-0290-06	DCS800-S02-0320-06	ND08	2	on request	-
	DCS800-S01-0315-04/05	DCS800-S02-0350-04/05	ND09	2	ND408	5
	DCS800-S01-0405-04/05	DCS800-S02-0450-04/05	ND10	2	ND409	5
	DCS800-S01-0470-04/05	DCS800-S02-0520-04/05	ND10	2	ND410	5
D4	DCS800-S01-0590-06	DCS800-S02-0650-06	ND13	3	on request	-
	DCS800-S01-0610-04/05	DCS800-S02-0680-04/05	ND12	2	ND411	5
	DCS800-S01-0740-04/05	DCS800-S02-0820-04/05	ND13	3	ND412	5
	DCS800-S01-0900-04/05	DCS800-S02-1000-04/05	ND13	3	ND413	5
D4+	DCS800-S01-1190-04/05	DCS800-S02-1190-04/05	ND14	3	on request	-
D5	DCS800-S01-0900-06/07	DCS800-S02-0900-06/07	ND13	3	on request	-
	DCS800-S01-1200-04/05	DCS800-S02-1200-04/05	ND14	3	on request	-
	DCS800-S01-1500-04/05/06/07	DCS800-S02-1500-04/05/06/07	ND15	3	on request	-
	DCS800-S01-2000-04/05	DCS800-S02-2000-04/05	ND16	3	on request	-
	DCS800-S01-2000-06/07	-	ND16 *	3	on request	-

* with forced cooling (1 m/s)

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



Fig. 1



Fig. 2



Fig. 3



Fig. 4



Fig. 5

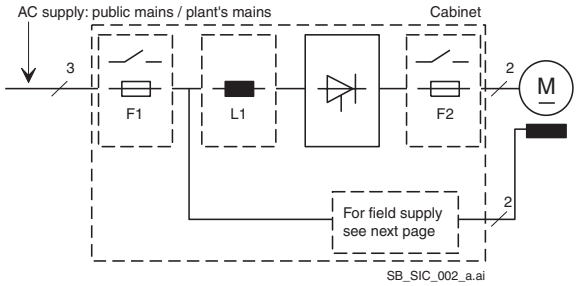
Semiconductor fuses (F1)

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:

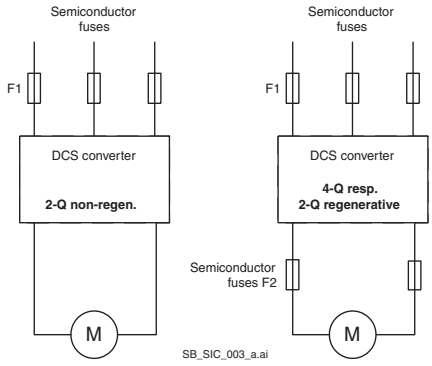
1. Where to place which protective element?
2. In the event of what faults will the element in question provide protection against damage?



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	D1 - D4	D4+ - D7
no regeneration	-	-
seldom regeneration (<10 %)	-	-
regeneration (10 % - 30 %)	DC fuses recommended	high speed DC-breaker recommended
often regeneration (>30 %)	DC fuses strongly recommended	high speed DC-breaker strongly recommended

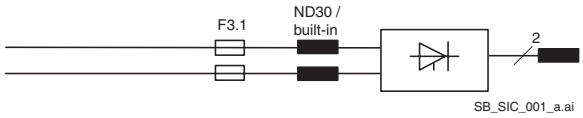
Conclusion for the field circuit

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:

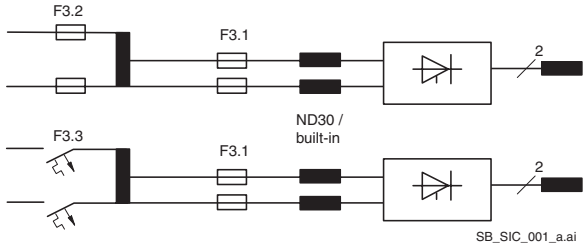
In contrast to the armature circuit, fuses are never used on the DC side of the field circuit, since a fuse trip might lead to additional damage e.g. small, but long-lasting overcurrent, contact problems, explosions, fires, etc.

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 D1, D2, D3 and D4 with rated currents up to 1000 A require external fuses.
- In unit sizes D4+, D5, D6 and D7 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	
D1	DCS800-S01-0020-04/05	DCS800-S02-0025-04/05	50A 660V UR	OFAX 00 S3L	FWP-50B	1BS101
	DCS800-S01-0045-04/05	DCS800-S02-0050-04/05	80A 660V UR	OFAX 00 S3L	FWP-80B	1BS101
	DCS800-S01-0065-04/05	DCS800-S02-0075-04/05	125A 660V UR	OFAX 00 S3L	FWP-125A	1BS103
	DCS800-S01-0090-04/05	DCS800-S02-0100-04/05	125A 660V UR	OFAX 00 S3L	FWP-125A	1BS103
	DCS800-S01-0125-04/05	DCS800-S02-0140-04/05	200A 660V UR	OFAX 1 S3	FWP-200A	1BS103
D2	DCS800-S01-0180-04/05	DCS800-S02-0200-04/05	250A 660V UR	OFAX 1 S3	FWP-250A	1BS103
	DCS800-S01-0230-04/05	DCS800-S02-0260-04/05	315A 660V UR	OFAX 2 S3	FWP-300A	1BS103
D3	DCS800-S01-0315-04/05	DCS800-S02-0350-04/05	500A 660V UR	OFAX 3 S3	FWP-500A	1BS103
	DCS800-S01-0405-04/05	DCS800-S02-0450-04/05	700A 660V UR	OFAX 3 S3	FWP-700A	See Note 1
	DCS800-S01-0470-04/05	DCS800-S02-0520-04/05	700A 660V UR	OFAX 3 S3	FWP-700A	See Note 1
D4	DCS800-S01-0610-04/05	DCS800-S02-0680-04/05	900A 660V UR	3x 170H 3006	FWP-900A	See Note 1
	DCS800-S01-0740-04/05	DCS800-S02-0820-04/05	900A 660V UR	3x 170H 3006	FWP-900A	See Note 1
	DCS800-S01-0900-04/05	DCS800-S02-1000-04/05	1250A 660V UR	3x 170H 3006	FWP-1200A	See Note 1
D3	DCS800-S01-0290-06	DCS800-S02-0320-06	500A 660V UR	OFAX 3 S3	FWP-500A	See Note 1
D4	DCS800-S01-0590-06	DCS800-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*)

Fuses (F3.x) and fuse holders for field circuit

Depending on the protection strategy different types of fuses are used. The fuses can be sized according to the maximum field current. In this case take the fuse, which fits to the rated field current levels. If the field converter is connected to two phases of a network, two fuses should be used. In case the unit is connected to one phase and neutral only one fuse at the phase can be used. The table below lists the fuse currents depending on the table above.

Field converter type	Field current	F3.1	F3.2	F 3.3
DCF803-0016	$I_F \leq 6$ A	10 A 660 V UR*	OFAA 00 H10	10 A
FEX-425-Int *	$I_F \leq 12$ A	16 A 660 V UR*	OFAA 00 H16	16 A
DCF803-0035 DCF803-0050 DCF804-0050	$I_F \leq 16$ A	25 A 660 V UR*	OFAA 00 H25	25 A
FEX-425-Int* DCF803-0035 DCF803-0050 DCF804-0050	$I_F \leq 25$ A	50 A 660 V UR*	OFAA 00 H50	35 A
DCF803-0035 DCF803-0050 DCF804-0050	$I_F \leq 35$ A			50 A
DCF803-0050 DCF804-0050	$I_F \leq 50$ A	80 A 660 V UR	OFAA 00 H80	63 A
DCF803-0060 DCF804-0060	$I_F \leq 60$ A			80 A
Type of protection elements		Semiconductor fuse fuse holder OFAX 00 S3L	LV HRC type for 690 V, fuse holder OFAX 00 S3L	Circuit breaker for 500 V or 690 V

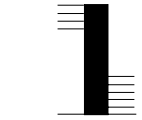
* Fuse (F3.1) KTK25 included in FEX-425-Int package. D4+ field fuses are external. D5 field fuses are internal.

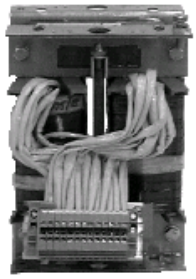
Fuses and fuse holders for field circuit

Single-phase autotransformer (T3) for field circuit (adapt voltage)

The field converters insulation voltage is higher than its rated voltage (see chapter *Accessories*). This provides the possibility in systems with more than 500 V mains voltage to supply the field converter directly. An autotransformer is used to match the mains voltage to the field voltage. Moreover, the autotransformer reduces the voltage ripple. Different autotransformer types (primary voltages from 400 to 500 V and from 525 to 690 V) with several rated currents are available.

Field converter type	Field current	Autotransformer type
DCF803-0016 FEX-425-Int DCF803-0035 DCF803-0050 DCF804-0050	$I_F \leq 6$ A, $I_F \leq 12$ A $I_F \leq 16$ A	$U_{prim} = \leq 500$ V T 3.01, T 3.02, T 3.03
DCF803-0035 DCF803-0050 DCF804-0050	$I_F \leq 30$ A	T 3.04
DCF803-0050 DCF804-0050	$I_F \leq 50$ A	T 3.05
DCF803-0060 DCF804-0060	$I_F \leq 60$ A	on request
DCF803-0016 FEX-425-Int DCF803-0035 DCF803-0050 DCF804-0050	$I_F \leq 6$ A, $I_F \leq 12$ A $I_F \leq 16$ A	$U_{prim} = \leq 600$ V T 3.11, T 3.12, T 3.13
DCF803-0035 DCF803-0050 DCF804-0050	$I_F \leq 30$ A	T 3.14
DCF803-0050 DCF804-0050	$I_F \leq 50$ A	T 3.15
DCF803-0060 DCF804-0060	$I_F \leq 60$ A	on request
DCF803-0050 DCF804-0050	$I_F \leq 6$ A, $I_F \leq 12$ A, $I_F \leq 16$ A, $I_F \leq 30$ A, $I_F \leq 50$ A	$U_{prim} = \leq 690$ V T 3.11, T 3.12, T 3.13, T 3.14, T 3.15
DCF803-0060, DCF804-0060	$I_F \leq 60$ A	on request





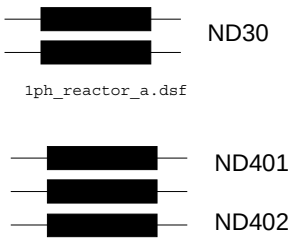
Autotransformer (T3)

Autotransformer data, details see chapter *Autotransformer (T3)*

Line reactors for single- and 3-phase connection of field converters

Field converters DCF803-0016, FEX-425-Int and DCF803-0035 need additional external line reactors. Field converters DCF803-0050, DCF804-0050, DCF803-0060 and DCF804-0060 do **not** need additional line reactors since they already have internal line reactors.

Field converter type	**Field current**	**Line reactor type**			
		IEC		US	
		Single-phase	3-phase	Single-phase	3-phase
DCF803-0016 FEX-425-Int. DCF803-0035	$I_F \leq 16$ A	ND30	ND401 *	KLR 45 CTB*	
FEX-425-Int. DCF803-0035	$I_F \leq 25$ A	ND402 *			
DCF803-0035	$I_F \leq 35$ A				

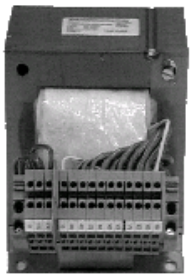


* 3-phase operation or single-phase operation

Line reactors (details see chapter *Line reactors 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 / 690 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 including the fan for converter sizes D4+ and D5.



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)*

Residual current detection

This function detects current to ground. If needed, activate analog input AI4 of the SDCS-IOB-3. A current signal of the three phase currents has to be supplied to AI4 via a special current transformer (details see chapter *Residual current detection*).

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 DCS800 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. There 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
D1	DCS800-S01-0020-0y	20	DCS800-S02-0025-0y	25	NF3-440-25	NF3-500-25
	DCS800-S01-0045-0y	45	DCS800-S02-0050-0y	50	NF3-440-50	NF3-500-50
	DCS800-S01-0065-0y	65	DCS800-S02-0075-0y	75	NF3-440-64	NF3-500-64
	DCS800-S01-0090-0y	90	DCS800-S02-0100-0y	100	NF3-440-80	NF3-500-80
	DCS800-S01-0125-0y	125	DCS800-S02-0140-0y	140	NF3-440-110	NF3-500-110
D2	DCS800-S01-0180-0y	180	DCS800-S02-0200-0y	200	NF3-500-320	NF3-500-320
	DCS800-S01-0230-0y	230	DCS800-S02-0260-0y	260	NF3-500-320	NF3-500-320
D3	DCS800-S01-0315-0y	315	DCS800-S02-0350-0y	350	NF3-500-320	NF3-500-320
	DCS800-S01-0405-0y	405	DCS800-S02-0450-0y	450	NF3-500-600	NF3-500-600
	DCS800-S01-0470-0y	470	DCS800-S02-0520-0y	520	NF3-500-600	NF3-500-600
D4	DCS800-S01-0610-0y	610	DCS800-S02-0680-0y	680A	NF3-500-600	NF3-500-600
	DCS800-S01-0740-0y	740	—	—	NF3-500-600	NF3-500-600
	—	—	DCS800-S02-0820-0y	820	NF3-690-1000 ①	NF3-690-1000 ①
	DCS800-S01-0900-0y	900	DCS800-S02-1000-0y	1000	NF3-690-1000 ①	NF3-690-1000 ①
D4+	DCS800-S01-1190-0y	1190	DCS800-S02-1190-0y	1190	NF3-690-1000 ①	NF3-690-1000 ①
D5	DCS800-S01-0900-0y	900	DCS800-S02-0900-0y	900	NF3-690-1000 ①	NF3-690-1000 ①
	DCS800-S01-1200-0y	1200	DCS800-S02-1200-0y	1200	NF3-690-1000 ①	NF3-690-1000 ①
	DCS800-S01-1500-0y	1500	DCS800-S02-1500-0y	1500	NF3-690-1600 ①	NF3-690-1600 ①
	DCS800-S01-2000-0y	2000	DCS800-S02-2000-0y	2000	NF3-690-1600 ①	NF3-690-1600 ①
D6		≤ 3000		≤ 3000	NF3-690-2500 ①	NF3-690-2500 ①

① Filter only available on request

EMC filters for single-phase connection of field converters

Field converters up to 50 A_{DC} field current can be / have to be connected to a single-phase. If they are supplied by two of the three input phases of the mains for the armature converter, then the field converter does not need its own filter.

If a phase to neutral voltage is taken (230 V_{AC} in a 400 V_{AC} line) then a separate filter is necessary. ABB offers such filters for 250 V_{AC} and 6 - 30 A_{DC}.

Field converter type	**Field current**	**EMC filter type U_{max} = 250 V_{AC}**
DCF803-0016 FEX-425-Int. DCF803-0035	$I_F \leq 16$ A	NF1-250-8
DCF803-0016 FEX-425-Int. DCF803-0035	$I_F \leq 16$ A	NF1-250-12
DCF803-0016 FEX-425-Int. DCF803-0035 DCF803-0050 DCF804-0050	$I_F \leq 16$ A	NF1-250-20
DCF803-0035 DCF803-0050 DCF804-0050	$I_F \leq 25$ A	NF1-250-30
DCF803-0050 DCF804-0050	$I_F \leq 50$ A	NF1-250-55
DCF803-0060 DCF804-0060	$I_F \leq 60$ A	on request

The filters can be optimized for the real field currents:

$I_{Filter} = I_{Field}$

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:

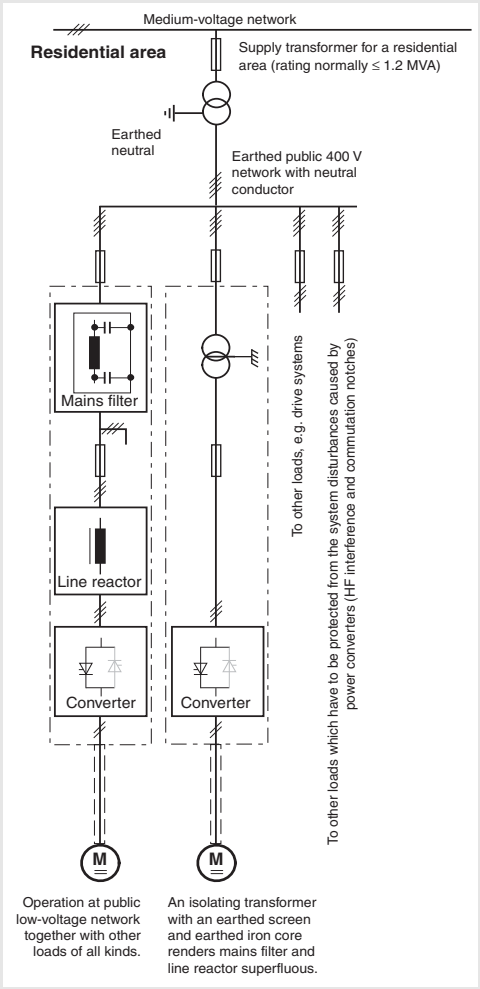
- the product's interference immunity and
- the product's actual emissions.

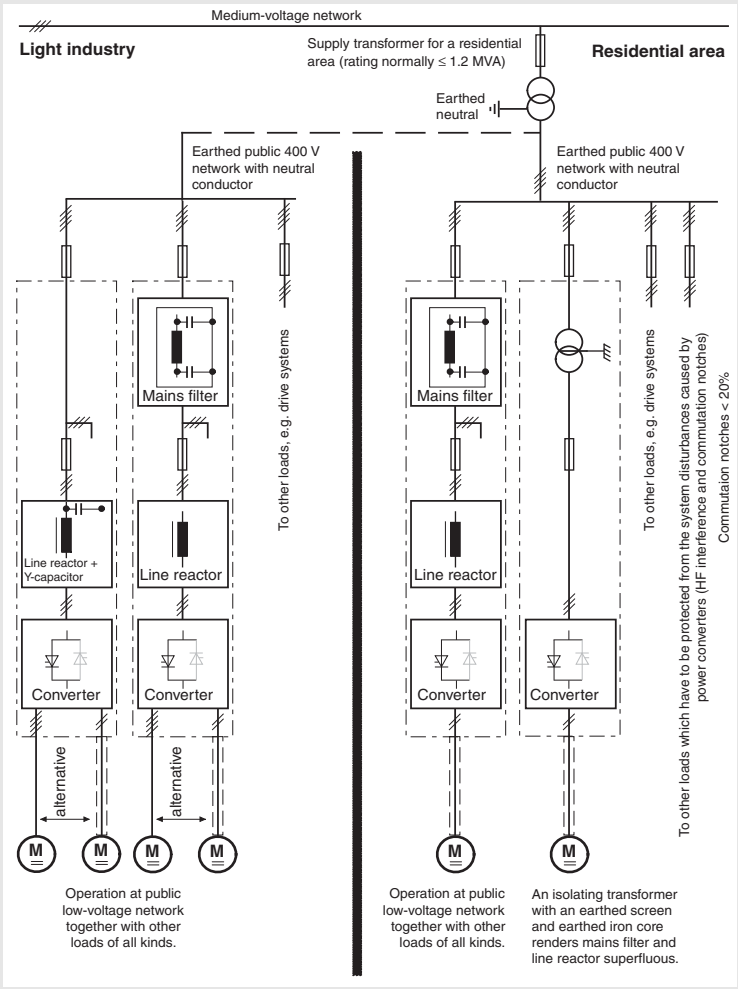
The EMC Guideline expects EMC to be taken into account when a product is being developed; however, EMC cannot be designed in, it can only be quantitatively measured.

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.

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		





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:

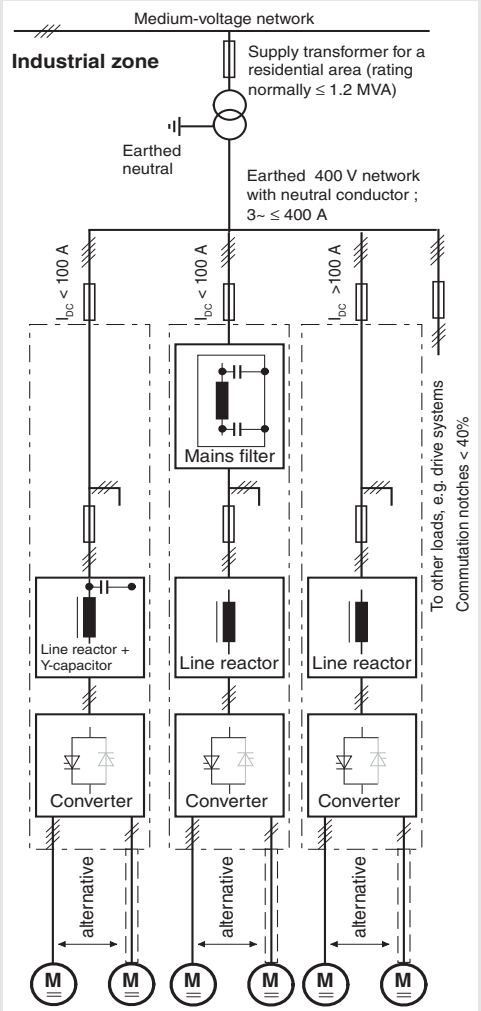
EN 61000-6-1 Specialised basic standard for interference immunity in **residential areas** *(EN 50082-1)

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

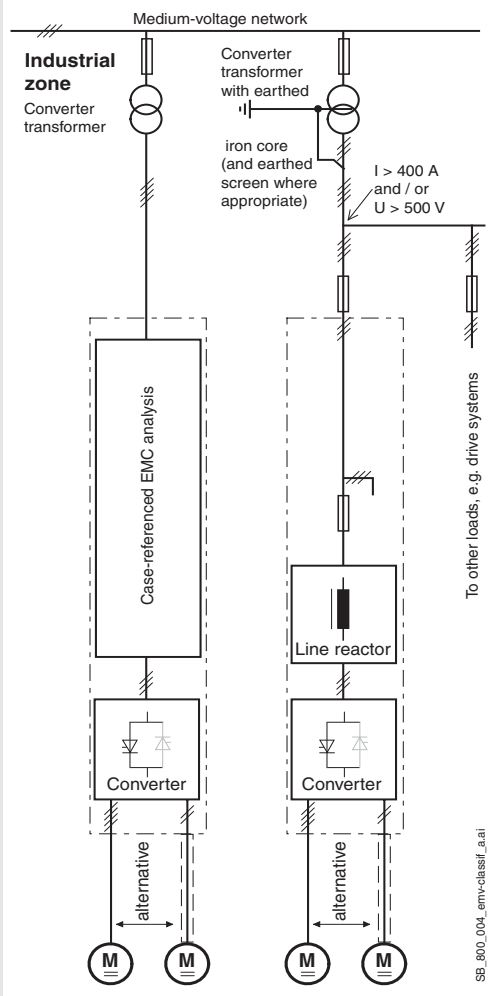
				Standards
Second environment (industry) with PDS categories C3, C4				**EN 61800-3**
Not applicable				**EN 61000-6-3**
satisfied		**on customer's request**	**satisfied**	**EN 61000-6-4**
satisfied				**EN 61000-6-2** **EN 61000-6-1**

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**

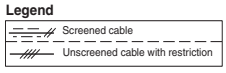
For the DCS800 series, the limit values for emitted interference are complied with, provided the measure indicated is carried out. PDS of category C2 (formerly restricted distribution in first environment) is intended to be installed and commissioned only by a professional (person or organization with 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.

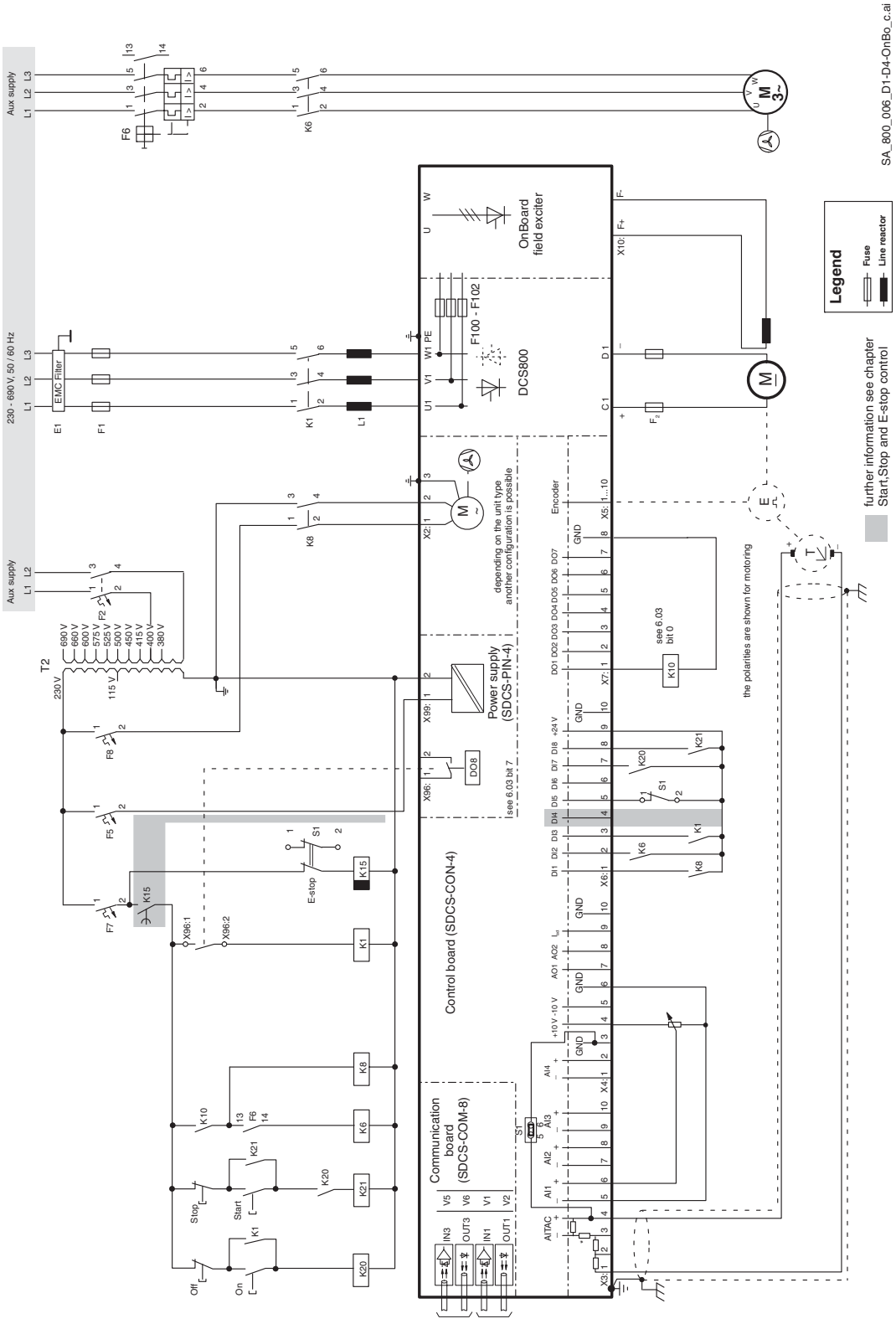
The field supply is not depicted in this overview diagram. For the field current cables, the same rules apply as for the armature-circuit cables.

Legend



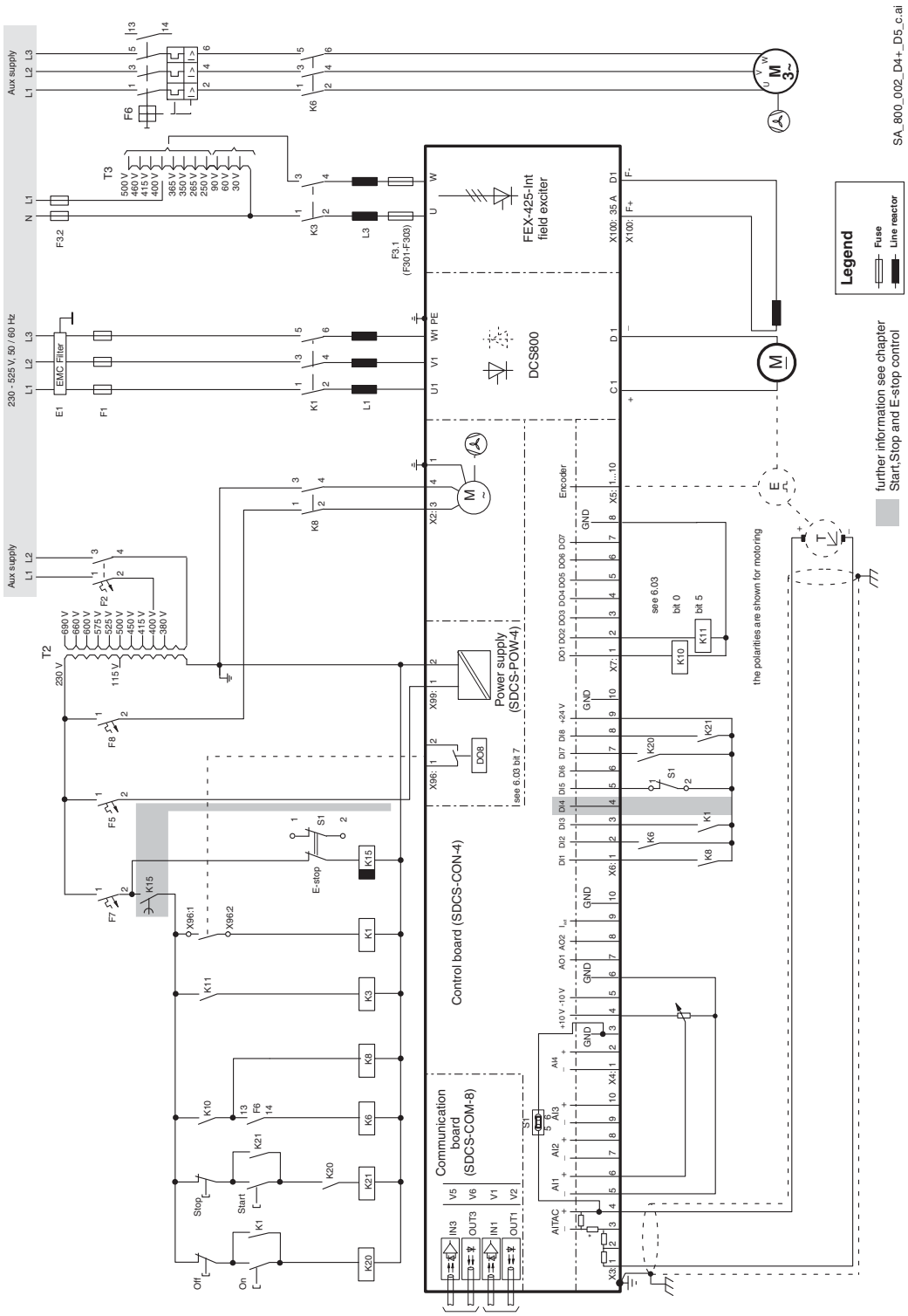
Converters size D1 - D4 configuration using an OnBoard field exciter

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



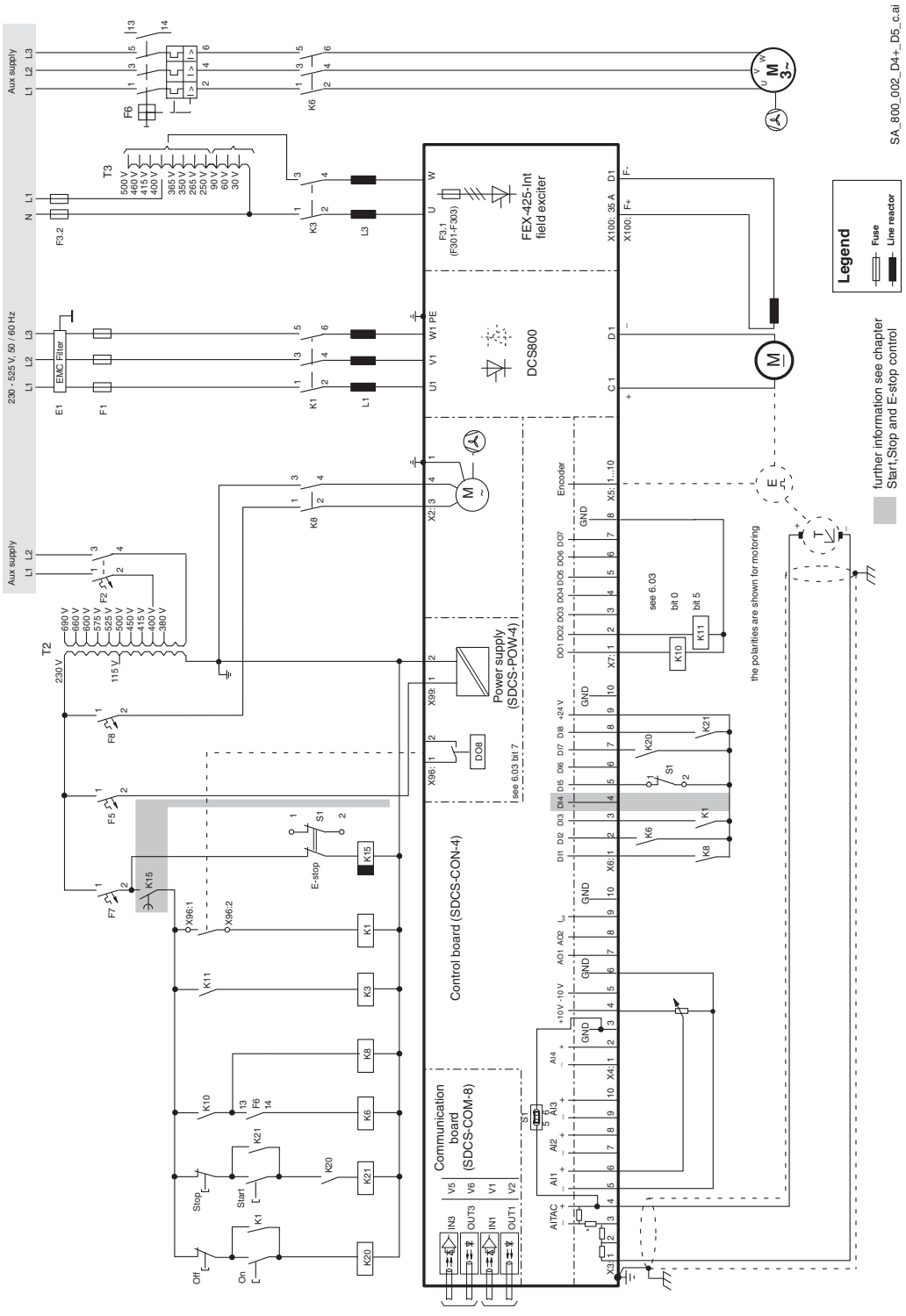
Converters size D4+ configuration using FEX-425-Int field exciter

Wiring the drive according to this diagram offers the highest degree of monitoring functions done by the drive. Field converters FEX-425-Int are equipped with their own synchronization and must be supplied from independent mains supply voltage max. 500 V (single-phase or 3-phase).



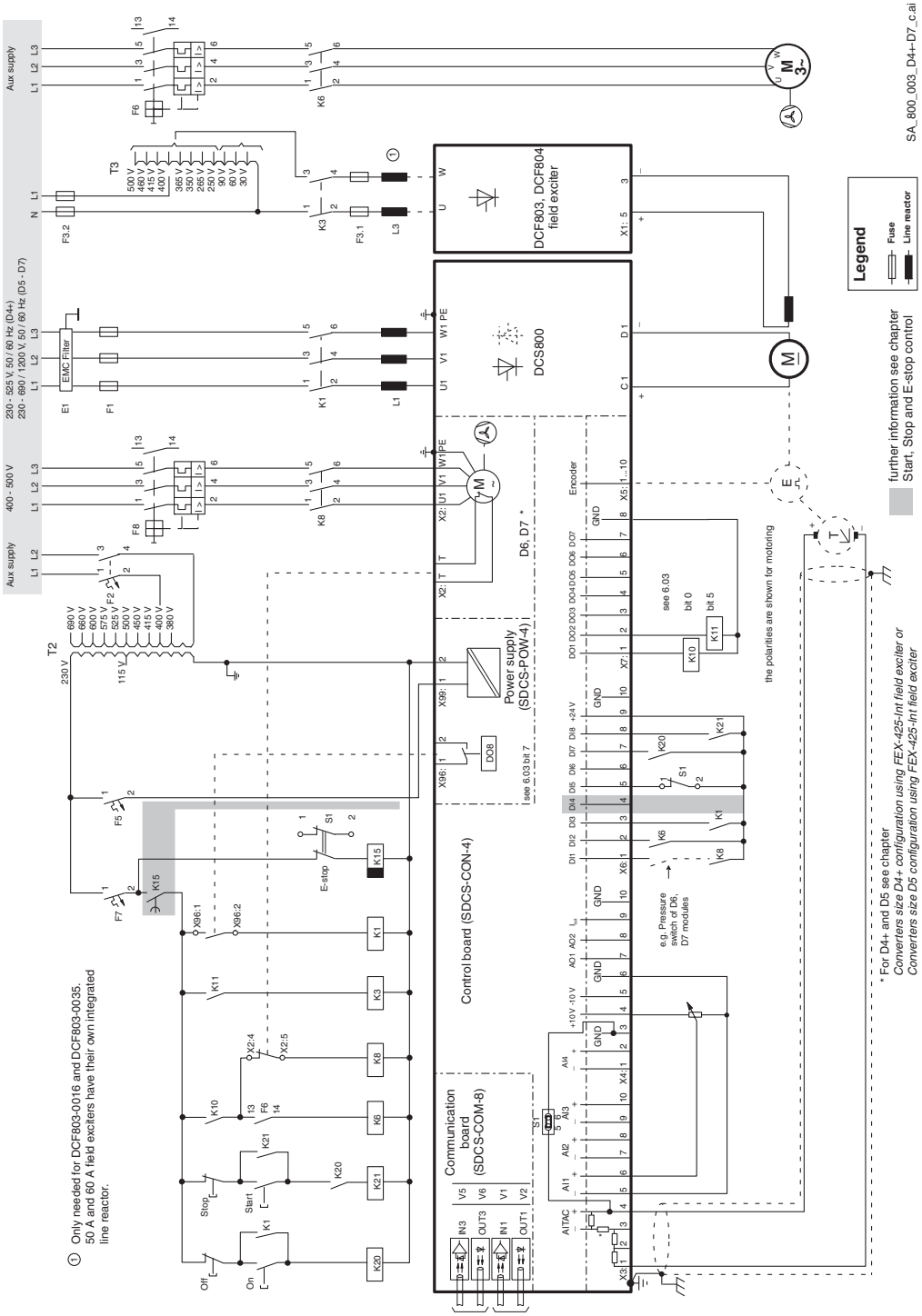
Converters size D5 configuration using FEX-425-Int field exciter

Wiring the drive according to this diagram offers the highest degree of monitoring functions done by the drive. Field converters FEX-425-Int are equipped with their own synchronization and must be supplied from independent mains supply voltage max. 500 V (single-phase or 3-phase).



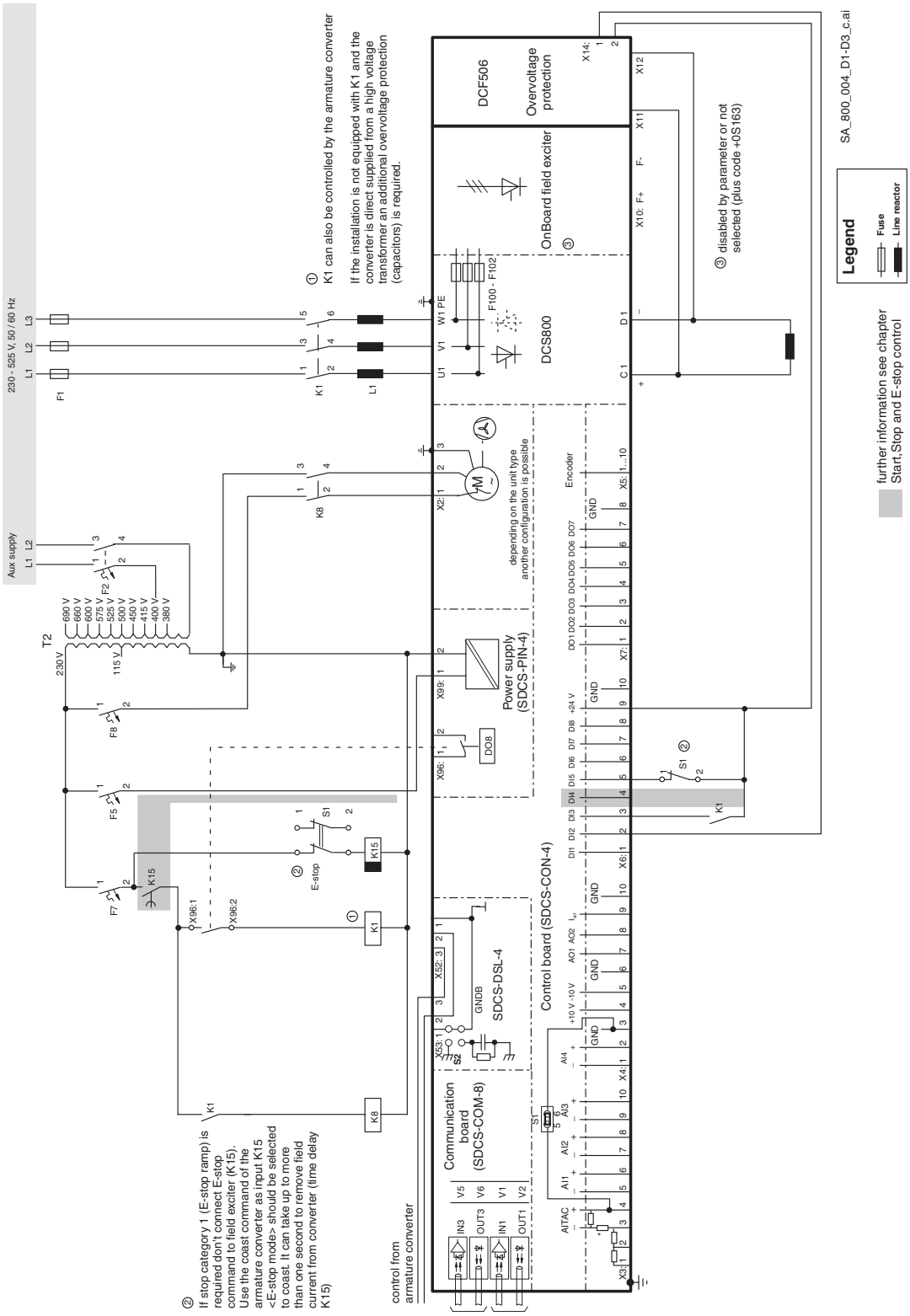
Converters size D4+ - D7 configuration using external field exciters DCF803, DCF804

Wiring the drive according to this diagram offers the highest degree of monitoring functions done by the drive. Field converters DCF803 / DCF804 are equipped with their own synchronization and must be supplied from independent mains supply voltage max. 500 V (single-phase or 3-phase).



Converters size D1 - D3 as large field exciter

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

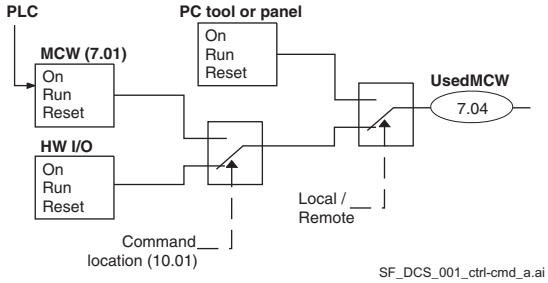


Start, Stop and E-Stop control

The relay logic is splitted into four parts:

1: Generation of the On / Off and Start / Stop command:

The commands represented by K20 and K21 (latching interface relay) can also be generated by a PLC and transferred to the terminals of the converter either by relays, using galvanic isolation or directly via 24 V signals. There is no need to use hardwired signals. Transfer these commands via serial communication. Even a mixed solution can be realized by selecting different possibilities for the one or the other signal (see parameter group 11).



2: Generation of control and monitoring signals:

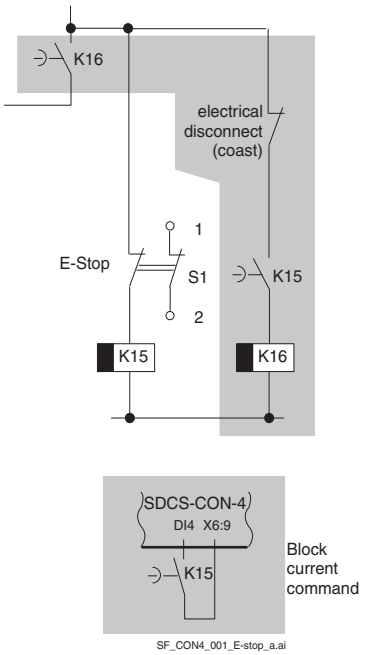
Control the main contactor K1 for the armature circuit by the dry contact of DO8 located on the SDCS-PIN-4 or SDCS-POW-4. The status of motor (K6) and converter (K8) fans can be monitored by means of *MotFanAck* (10.06) and *ConvFanAck* (10.20).

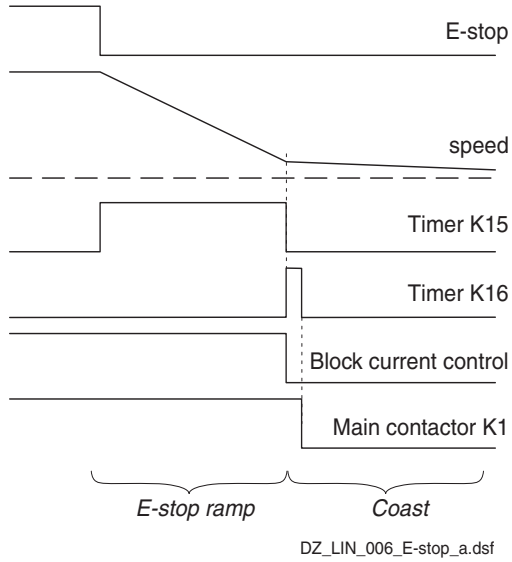
3: Off2 (Coast Stop) and Off3 (E-stop):

Beside **On / Off** and **Start / Stop** the drive is equipped with two additional stop functions **Off2** (Coast Stop) and **Off3** (E-stop) according to Profibus standard.
Off3 (E-stop) is scalable via *E StopMode* (21.04) to perform stop category 1. Connect this function to the E-stop push button without any time delay. In case of *E StopMode* (21.04) = **RampStop** the K15 timer relay must be set longer than *E StopRamp* (22.04). For *E StopMode* (21.04) = **Coast** the drive opens the main contactor immediately.
Off2 (Coast Stop) switches the DC current off as fast as possible and prepares the drive to open the main contactor or drop the mains supply. For a normal DC motor load the time to force the DC current to zero is below 20 ms. This function should be connected to all signals and safety functions opening the main contactor. This function is important for 4-Q drives. Do not open main contactor during regenerative current. The correct sequence is:

1. switch off regenerative current
2. then open the main contactor

In case the E-stop push button is hit, the information is transferred to the converter via DI5. In case *E StopMode* (21.04) = **RampStop** or **TorqueLimit** the converter will decelerate the motor and then open the main contactor. If the drive has not finished the function within the K15 timer setting, the drive must get the command to switch off the current via K16. After the K16 timer has elapsed, the main contactor is opened immediately, independent of the drive's status.

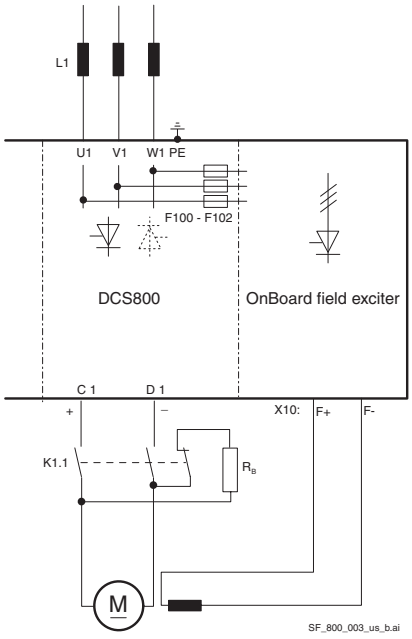


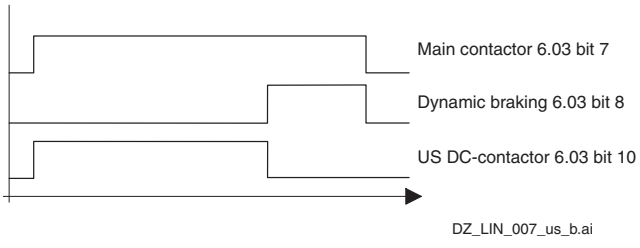


E-stop reaction

4: DC-contactor (US style):

The DC-contactor (US style) K1.1 is a special designed DC-contactor with one normally closed contact for the dynamic braking resistor R_B and two normally open cantacts for C1 and D1. The DC-contactor should be controlled by *CurCtrlStart1* (6.03) bit 10. The acknowledge signal can be connected to either *MainContAck* (10.21) or *DCBreakAck* (10.23):

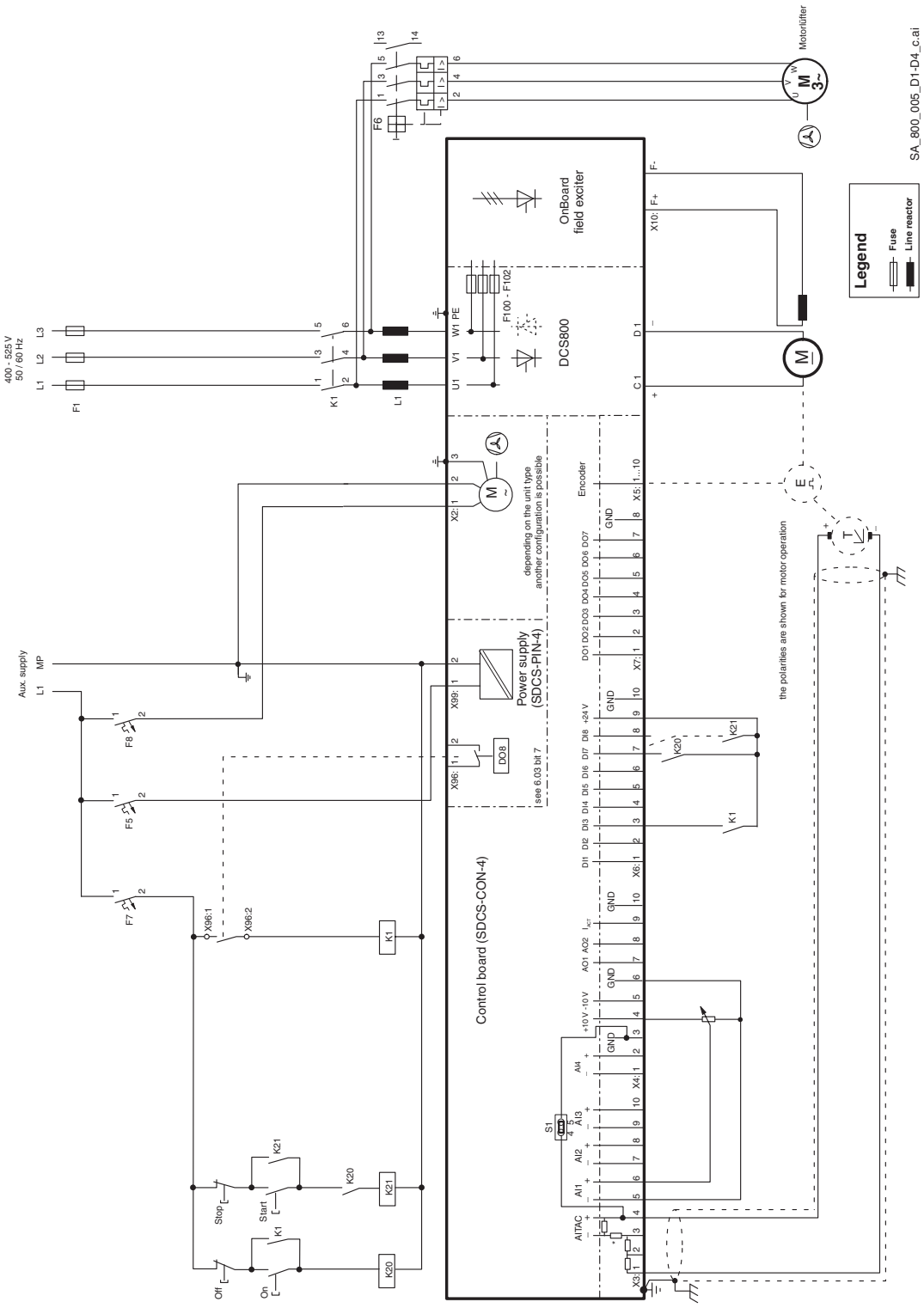




Drive configuration with reduced components

Converters size D1 - D4, 400 - 525 V using OnBoard field exciters.

Wiring the drive according to this diagram gives the same control performance, but a lower degree of monitoring functions.



Selection of components: The wiring diagram is valid for a DCS800 converters size D1 - D4 ≤ 525 V. The OnBoard field exciter can be used for line voltages up to 525 V. Field currents up to 6 / 15 / 20 / 25 A depending on the converter size are possible. For larger field currents use a DCF803/804 or a large field exciter (DCS800).

Cooling fans

Fan assignment for DCS800

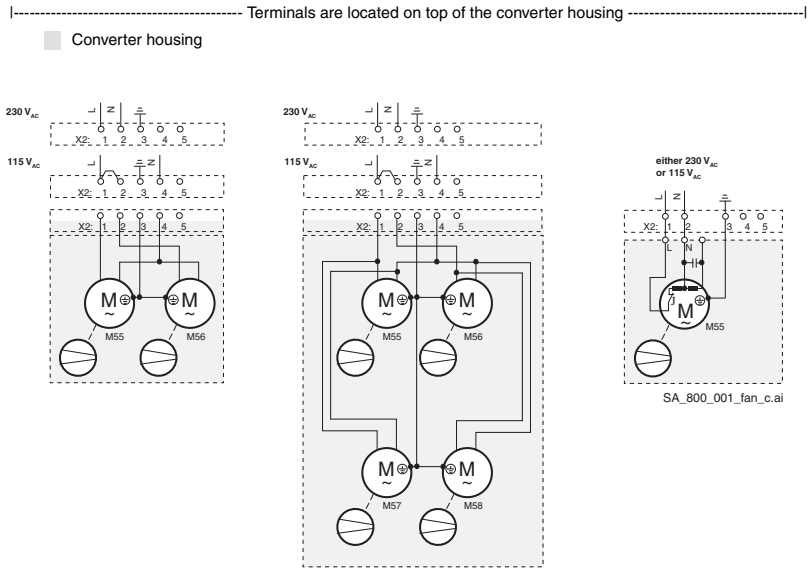
Converter type	Size	Configuration	Fan type
DCS800-S0x-0045-04/05 ... DCS800-S0x-00140-05/05	D1	1	2 x CN2B2
DCS800-S0x-0180-04/05 ... DCS800-S0x-0260-04/05	D2		2 x CN2B2
DCS800-S0x-0315-04/05 ... DCS800-S0x-0350-04/05	D3		2 x CN2B2
DCS800-S0x-0405-04/05 ... DCS800-S0x-0520-04/05		2	4 x CN2B2
DCS800-S0x-0610-04/05 ... DCS800-S0x-0820-04/05	D4	3	1 x W2E200 (230 V)
DCS800-S0x-0610-04/05 ... DCS800-S0x-0820-04/05			1 x W2E200 (115 V) Pluscode S171
DCS800-S0x-0900-04/05 ... DCS800-S0x-1000-04/05			1 x W2E250 (230 V)
DCS800-S0x-0900-04/05 ... DCS800-S0x-1000-04/05			1 x W2E250 (115 V) Pluscode S171
DCS800-S0x-1190-04/05	D4+	4	R2E250-RB 230 V; 1~
DCS800-S0x-0900-0y ... DCS800-S0x-2000-0y	D5	4	R2E250-RB 230 V; 1~
DCS800-S0x-1900-04/05/08 ... DCS800-S0x-3000-04/05/08	D6	5	GR28C-2DK 400 V / 500 V @ 50 Hz or 460 V @ 60 Hz
DCS800-S0x-1900-06/07 ... DCS800-S0x-3000-06/07			
DCS800-S0x-3300-yy ... DCS800-S0x-5200-yy	D7	6	GR35C-2DD 400 V @ 50 Hz or 460 V @ 60 Hz

y = voltage class

Fan Data for DCS800 (D1 - D4)

Fan	CN2B2		W2E200		W2E 200		W2E 250		W2E 250	
Rated voltage [V_{AC}]	115; 1~		230; 1~		115; 1~		115; 1~		230; 1~	
Tolerance [%]	±10		+6 / -10		+6 / -10		±10		+6 / -10	
Frequency [Hz]	50	60	50	60	50	60	50	60	50	60
Power consumption [W]	16	13	64	80	64	80	120	165	135	185
Current consumption [A]	0.2	0.17	0.29	0.35	0.6	0.7	1.06	1.44	0.59	0.82
Blocking current [A]	< 0.3	< 0.26	< 0.7	< 0,8	< 1.5	< 1.8	< 1.8	< 1.8	< 0.9	< 0.9
Air flow [m^3/h] freely blowing	156	180	925	1030	925	1030	1835	1940	1860	1975
Max. ambient temperature [° C]	< 60		< 75		< 75		60		60	
Useful lifetime of grease	appr. 40000 h/60°		appr. 45000 h/60°		appr. 45000 h/60°		appr. 40000 h		appr. 40000 h	
Protection	① Impedance		Internal temperature detectors							
① Increased losses due to increased current with a blocked rotor will not result in an increased winding temperature, higher than permissible for the insulation class being involved.										

Fan connection for DCS800 (D1 - D4)



Configuration 1
D1 - D3

Configuration 2
D3

Configuration 3
D4

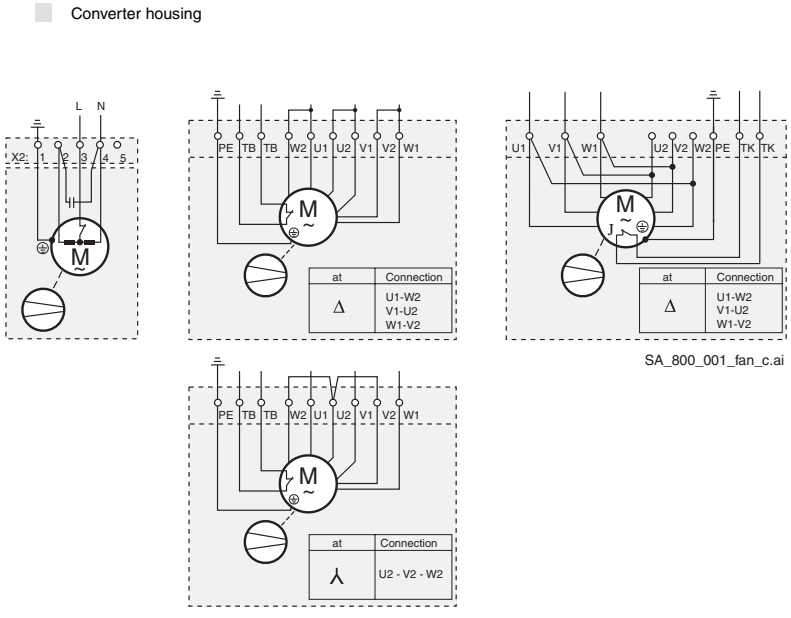
ErP compliant cooling fans D4+, D5, D6, D7

Fan	R2E250-RB		GR28C-2DK		GR35C-2DD	
Rated voltage [V_{AC}]	230; 1~		400 Δ 500 人	460 Δ	400 / 460 / 500 V *	460 / 500 V **
Tolerance [%]	±10		±10		±10	±10
Frequency [Hz]	50	60	50	60	50	60
Power consumption [W]	227	390	660 Δ 600 人	1100 Δ	2100	3000
Current consumption [A]	1.1	1.7	1.4 Δ 0.8 人	1.8 Δ	4.0 Δ	5.3 Δ
Blocking current [A]	3.1	3.1	at 400 V Δ 8.0 at 500 V 人 2.8	at 460 V Δ 8.0	at 400 V > 17	at 460 V > 15
Air flow [m^3/h] at working point	800 1.0 A	850 1.6 A	1600 @ 1.2 A (400 V Δ) 1500 @ 0.7 A (500 V 人)	1700 @ 1.6 A (460 V Δ)	4200 @ 4 A (400 V)	4500 @ 5.3 A (400 V)
Max. ambient temperature [°C]	< 55		< 55			
Useful lifetime of grease	appr. 40,000 h/40°C		appr. 30,000 h/40°C			
Protection	internal		Temperature detector: $U_N \leq 230$ V~; $I_N \leq 2.5$ A~			

* 460 / 500 V use autotransformer (T8)

** 500 V use autotransformer (T8)

Fan connection for DCS800 (D4+, D5, D6, D7)



Configuration 4
D4+, D5

Configuration 5
D6

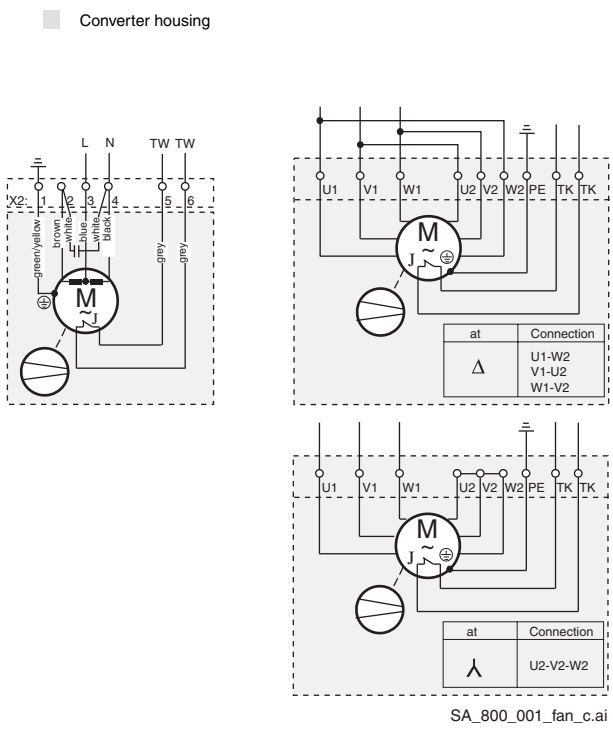
Configuration 6
D7

Classic cooling fans D5, D6, D7

Fan	D2E 160		GR31M				GR35C	
Rated voltage [V_{AC}]	230; 1~		400 - 450 Δ 450 - 500 人	400 - 500 Δ 人	500 - 690 人	500 - 600 Δ 600 - 690 人	400 - 500 Δ * 600 - 690 人	
Tolerance [%]	±10		±10		±10		+5 / -10	±10
Frequency [Hz]	50	60	50	60	50	60	50	60
Power consumption [W]	653	860	800 Δ 700 人	1340 Δ	800 人	1200 人	2900 Δ 2200 人	3600 Δ 3300 人
Current consumption [A]	2.50	3.4	1.45 Δ 0.91 人	2.0 Δ	0.9 人	1.2 人	6.5 Δ 2.3 人	4.9 Δ 3.0 人
Blocking current [A]	3.75	4.5	at 450 V Δ 8.5	at 500 V Δ 8.5	at 690 V 人 4.4	at 500 V Δ 8.5	at 400 V Δ > 25	at 400 V Δ > 30
Air flow [m^3/h] at working point	800 2.5 A	750 3.2 A	1500 1.26 A (450 V Δ)	1600 1.6 A (500 V Δ)	1500 0.7 A (690 V 人)	1600 1.65 A (500 V Δ)	4200 3.6 A (400 V Δ)	4250 4.1 A (400 V Δ)
Max. ambient temperature [°C]	< 55							
Useful lifetime of grease	ca. 30,000 h/40°C							
Protection	Temperature detector: $U_N \leq 230$ V~; $I_N \leq 2.5$ A~							

* 500 V < supply < 600 V autotransformer (T8) is strongly recommended, energy saving 20,000 kWh/a

Fan connection for DCS800 (D5, D6, D7)



Configuration 4
D5

Configuration 5
D6, D7

Fan voltage:		Size D6	
	Standard	400 V / 525 V / 800 V units:	400 V - 500 V / 3-ph
	Standard	600 V / 690 V units:	525 V - 690 V / 3-ph
	+S172	600 V / 690 V units:	400 V - 500 V / 3-ph

Monitoring the DCS800 power section

The power part of converters size D1 - D5 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 D6 and D7 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

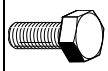
Always protect the input cable with fuses. Size the fuses according to local safety regulations, appropriate input voltage and the rated current of the drive (see chapter *Technical data*).

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]
DCS800-S0x-0025-xx	25	1 x 6	-	21	1 x 4	-	1x 4	1 x M6	6
DCS800-S0x-0050-xx	50	1 x 10	-	41	1 x 6	-	1x 6	1 x M6	6
DCS800-S0x-0075-xx	75	1 x 25	-	61	1 x 25	-	1x 16	1 x M6	6
DCS800-S0x-0100-xx	100	1 x 25	-	82	1 x 25	-	1x 16	1 x M6	6
DCS800-S0x-0140-xx	140	1 x 35	-	114	1 x 35	-	1x 16	1 x M6	6
DCS800-S0x-0200-xx	200	2 x 35	1 x 95	163	2 x 25	1 x 95	1x 25	1 x M10	25
DCS800-S0x-0260-xx	260	2 x 35	1 x 95	204	2 x 25	1 x 95	1x 25	1 x M10	25
DCS800-S0x-0320-xx	320	2 x 70	1 x 95	220	2 x 50	1 x 95	1x 50	1 x M10	25
DCS800-S0x-0350-xx	350	2 x 70	-	286	2 x 50		1x 50	1 x M10	25
DCS800-S0x-0450-xx	450	2 x 95	-	367	2 x 95	-	1x 50	1 x M10	25
DCS800-S0x-0520-xx	520	2 x 95	-	424	2 x 95	-	1x 50	1 x M10	25
DCS800-S0x-0650-xx	650	2 x 120	-	555	2 x 120	-	1x120	1 x M12	50
DCS800-S0x-0680-xx	680	2 x 120	-	555	2 x 120	-	1x120	1 x M12	50
DCS800-S0x-0820-xx	820	2 x 150	-	669	2 x 120	-	1x120	1 x M12	50
DCS800-S0x-0900-6/7	900	4 x 95	3 x 150	734	4 x 70	3 x 95	1x150	2 x M12	50
DCS800-S0x-1000-xx	1000	2 x 185	-	816	2 x 150	-	1x150	1 x M12	50
DCS800-S0x-1190-xx	1190	4 x 120	-	971	4 x 95	3 x 120	1x185	2 x M12	50
DCS800-S0x-1200-xx	1200	4 x 120	-	979	4 x 95	3 x 120	1x185	2 x M12	50
DCS800-S0x-1500-xx	1500	4 x 185	-	1224	4 x 150	-	2x150	2 x M12	50
DCS800-S0x-2000-xx	2000	8 x 120	6 x 185	1632	4 x 240	-	2x240	2 x M12	50
DCS800-S0x-1900-xx ②	1900	8 x 120	6 x 185	1550	4 x 240		3x120	4 x M12	50
DCS800-S0x-2050-xx ②	2050	8 x 120	6 x 185	1673	6 x 120	5 x 150	3x120	4 x M12	50
DCS800-S0x-2500-xx ②	2500	7 x 185	-	2040	8 x 120	6 x 185	4x120	4 x M12	50
DCS800-S0x-2600-xx	2600	7 x 185	-	2122	8 x 120	6 x 185	4x120	4 x M12	50
DCS800-S0x-3000-xx ②	3000	8 x 185	-	2448	7 x 185	-	4x150	4 x M12	50
DCS800-S0x-3300-xx	3300	8 x 185	-	2693	7 x 185	-	4x150	4 x M12	50
DCS800-S0x-4000-xx	4000	7 x 300	-	3264	8 x 240	-	4x240	4 x M12	50
DCS800-S0x-4800-xx ①	4800	8 x 300	-	3876	6 x 300	-	3x300	4 x M12	50
DCS800-S0x-5200-xx ①	5200	8 x 300	-	4202	6 x 300	-	3x300	4 x M12	50

① Reduced ambient temperature 40°C

② Option for more flexible cable connection available

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.

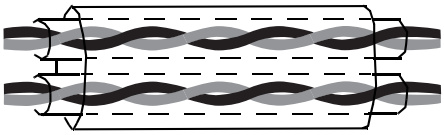
Excitation:

Size	D1	D2	D3	D4, D4+, D5	DCF803-0035
DC output current	6 A	15 A	20 A	25 A	35 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				

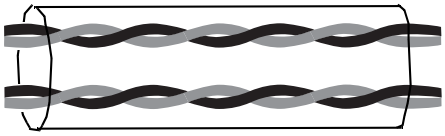
Selecting the control cables

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!

DCS Control Panel cable

The cable connection of the DCS Control Panel to the DCS800 converter must not exceed 3 meters (10 ft). The cable type tested and approved by ABB is included in the DCS 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 *DCS800 Firmware Manual*.

Electrical installation

Chapter overview

This chapter describes the electrical installation procedure of the DCS800.

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.

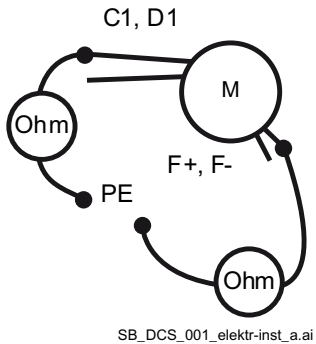
Further information is available in the *Technical Guide*.

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).

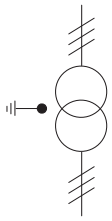
1. Check that the motor cables are disconnected from the converter output terminals C1, D1, F+ and F-.
2. Measure the insulation resistances of the motor cable and the motor between each circuit (C1, D1) / (F+, F-) and the Protective Earth (PE) by using a measuring voltage of 1 kV DC. The insulation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



IT (ungrounded) systems

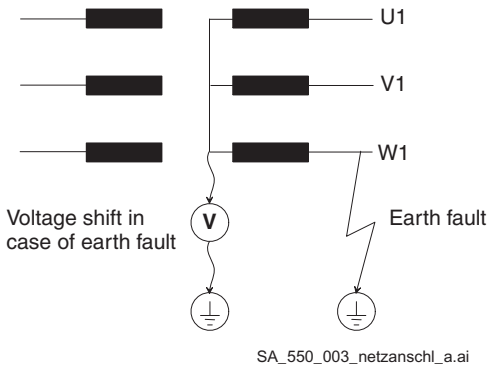
Don’t use EMC filters in IT systems.

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	X99 on SDCS-PIN-4 / SDCS-POW-4
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 R-type options and interfaces

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



R-type extensions:

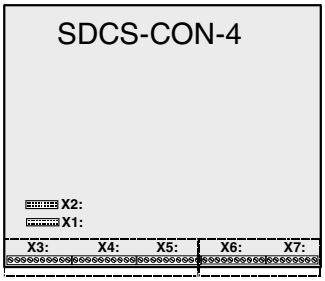
RAIO (analog I/O)
RDIO (digital I/O)
RTAC (Encoder)
RRIA (Resolver)



I/O Board Configuration

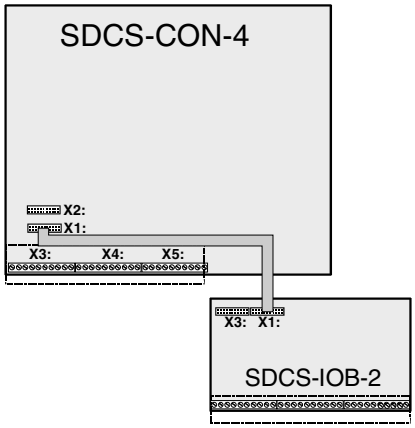
In-/output signals

Analog and digital signals can be connected in four different ways to a SDCS-CON-4. Only one of the four choices can be used at the same time.



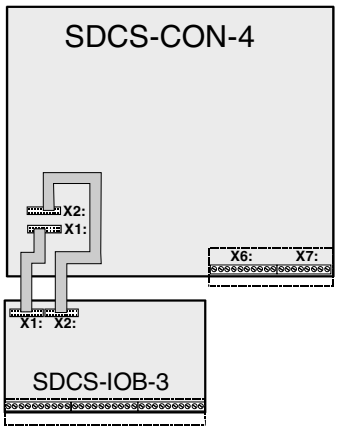
I/O directly connected to a SDCS-CON-4

Analog I/O:	standard (X3, X4)
Digital I/O:	not isolated (X6, X7)
Encoder input:	not isolated (X5)
Analog tacho input:	standard (X3)



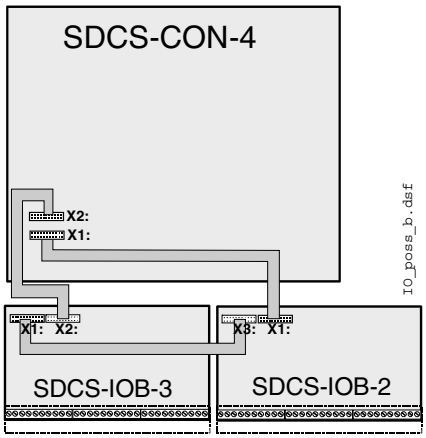
I/O via SDCS-CON-4 and SDCS-IOB-2

Analog I/O:	standard (X3, X4)
Digital I/O:	isolated by means of optocoupler / relay, the signal status is indicated by LED
Encoder input:	not isolated (X5)
Analog tacho input:	standard (X3)



I/O via SDCS-CON-4 and SDCS-IOB-3

Analog I/O:	standard, one channel for residual current detection
Digital I/O:	not isolated (X6, X7)
Encoder input:	isolated
Analog tacho input:	standard (X3)
Current source for:	PT100 / PTC element



I/O via SDCS-IOB-2 and SDCS-IOB-3

Analog I/O:	standard one channel for residual current detection
Digital I/O:	isolated by means of optocoupler / relay, the signal status is indicated by LED
Encoder input:	isolated
Analog tacho input:	standard (X3)
Current source for:	PT100 / PTC element

Pulse encoder connection

Connecting a pulse encoder to the DCS800 converter

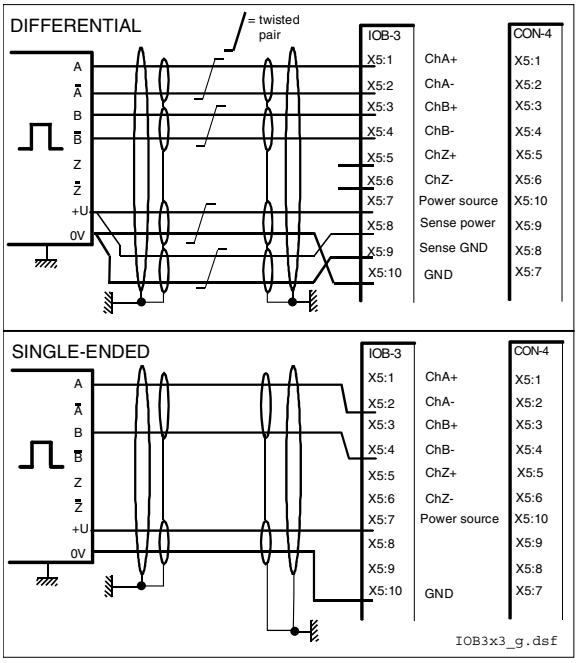
The connection of a pulse encoder to the electronics of a DCS800 is quite similar, if a SDCS-CON-4 or a SDCS-IOB-3 is used. The basic difference between these 2 boards is the galvanically isolated circuit via opto coupler on the SDCS-IOB-3.

Power supply for pulse encoders

SDCS-CON-4 and SDCS-IOB-3 have jumpers to select the supply voltage. LED V17 on the SDCS-IOB-3 indicates a working supply.

	Hardware configuration		
Encoder supply	SDCS-CON-4 supplied by SDCS-PIN-4 (for sizes D1 - D4+)	SDCS-CON-4 supplied by SDCS-POW-4 (for sizes D5 - D7)	SDCS-IOB-3 (for sizes D1 - D7)
5 V	sense controlled	sense controlled	sense controlled
12 V	-	no sense	sense controlled
24 V	no sense	no sense	no sense

Use the sense feedback when the power supply level of a differential pulse encoder is only 5 V. The sense function automatically compensates voltage drops of up to 1 V over the cable. The wiring is shown in the figure below.

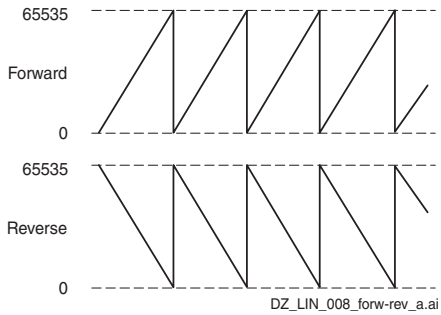


Commissioning hint:

If the drive's measured direction of rotation is wrong or does not correspond to the measured EMF speed, **F522 SpeedFb** 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.

PosCountLow (3.07) should look like this:

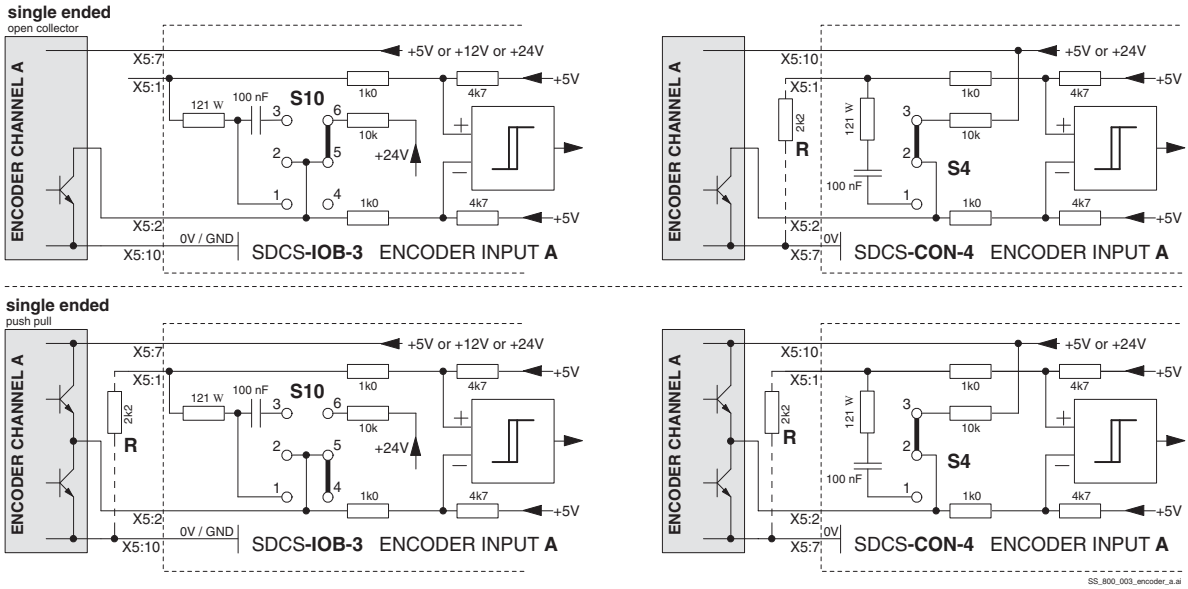


Pulse encoder connection principles

Two different encoder connections are available.

1. Differential connection; pulse encoders generating either voltage or current signals can be used.
   Line termination (current signals) via S4 / S10 should not be used for 12 V or 24 V encoders, due to the current consumption by the encoder.
   Only 5 V pulse encoders with a build in current source can be used. A burden resistor of 120 Ω must be activated via jumper S10:1-2 on SDCS-IOB-3 and so on, see table for differential current source. This is only available on the SDCS-IOB-3.
2. Single-ended (push pull) connection; only voltage signals can be used.

Pulse encoder connection principles:



In case of a single ended 5 V encoder the jumper S4 / S10 has to be set to a neutral position according to the table below. To get a threshold lower than 5 V each terminal X5:2, 4, 6 must be connected via a resistor R to GND.

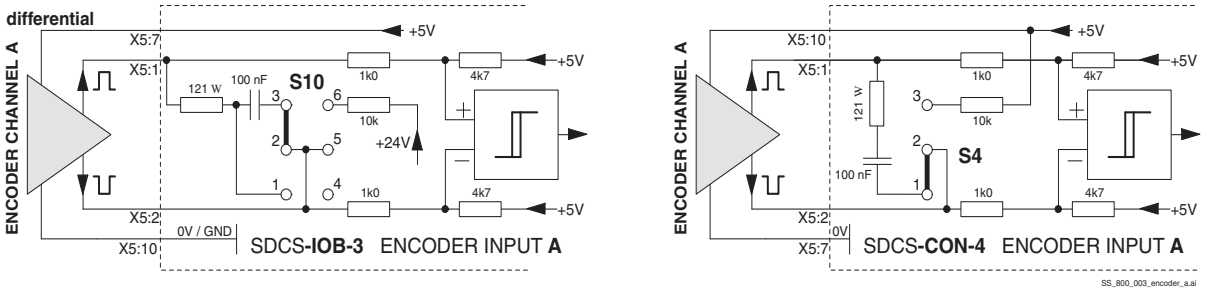
Jumper settings for single ended connected to SDCS-CON-4

SDCS-CON-4 jumper S4		
single ended voltage source	5 V 2 - 3 5 - 6 8 - 9 10 - 11	24 V 2 - 3 5 - 6 8 - 9 11 - 12

Jumper settings for single ended encoders connected to SDCS-IOB-3

SDCS-IOB-3 jumper S10		SDCS-CON-4* jumper S4
single ended push-pull	5 / 12 / 24 V 4 - 5 10 - 11 16 - 17	- 3 - park 6 - park 9 - park
single ended open collector	5 / 12 / 24 V 5 - 6 11 - 12 17 - 18	- 3 - park 6 - park 9 - park

* If an encoder is connected to a SDCS-IOB-3 the S4 jumper settings on the SDCS-CON-4 are required!



Jumper settings for differential encoders connected to SDCS-CON-4

SDCS-CON-4 jumper S4		
differential voltage source	5 V 1 - 2 4 - 5 7 - 8 10 - 11	24 V 1 - 2 4 - 5 7 - 8 11 - 12

Jumper settings for differential encoders connected to SDCS-IOB-3

SDCS-IOB-3 jumper S10			SDCS-CON-4* jumper S4
differential voltage source	5 V 2 - 3 8 - 9 14 - 15	12 / 24 V 4 - 5 10 - 11 16 - 17	- 3 - park 6 - park 9 - park
differential current source	13 mA 1 - 2 7 - 8 13 - 14	-	- 3 - park 6 - park 9 - park

* If an encoder is connected to a SDCS-IOB-3 the S4 jumper settings on the SDCS-CON-4 are required!

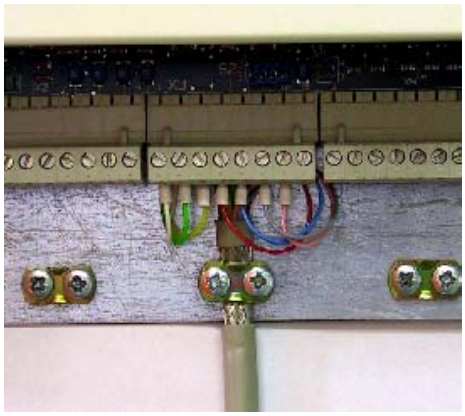
The maximum distance between pulse encoder and interface board dependents on the voltage drop of the connecting lines and on the output and input configuration of the used components. Use cables according to the table below. The voltage (5 V supply) regulator can compensate the voltage drop caused by the cable. 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

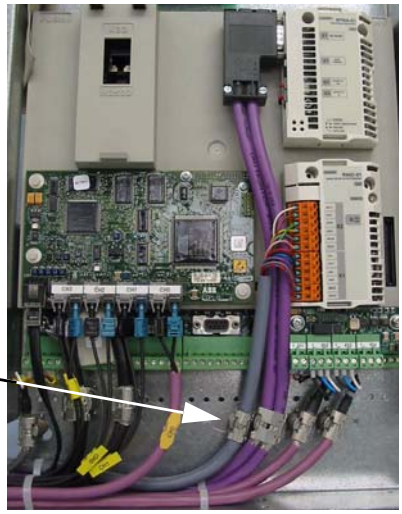
Connecting the signal and control cables

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 D6, D7
screen connection



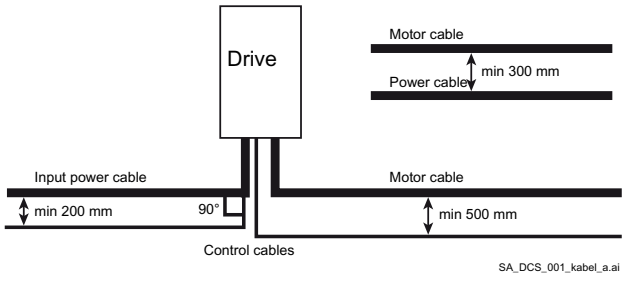
Routing the cables

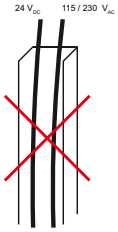
Run the motor cable away from other cables. Motor cables of several drives can be run in parallel next to each other. It is recommended that motor cables, input power cables and control cables be installed on separate trays. Avoid long parallel runs of motor cables with other cables in order to reduce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

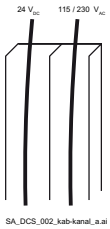
All cable trays must have good electrical connection to each other and to ground. Aluminium tray systems can be used to improve equalizing of potential.

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.

DCSLink wiring

The DCSLink is a 500 kBaud serial communication between drives and drives to field exciters.
It is based on CAN hardware and using twisted cables.
The topology is a bus system.

Switched OFF nodes can remain in the bus and do not disturb the serial communication.

The function of the interface is predefined:

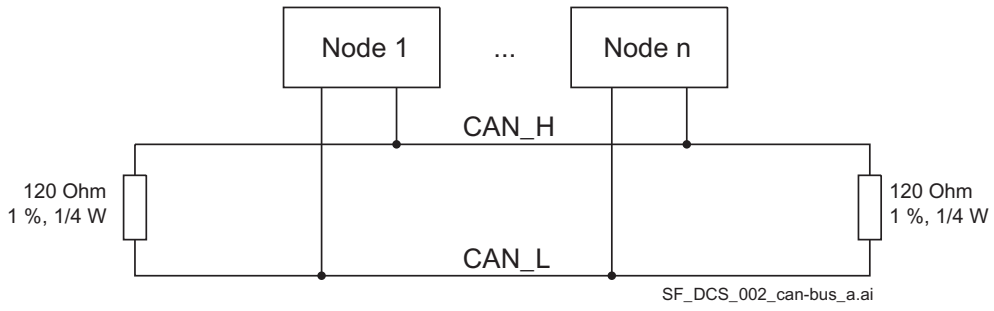
1 Mailbox function for drive to drive communication (e.g. master - follower).

2 Communication to field exciter types DCF803, DCF804 and large field exciters using standard DCS800 modules.

3 Communication for 12-pulse operation, DCS800 to DCS800.

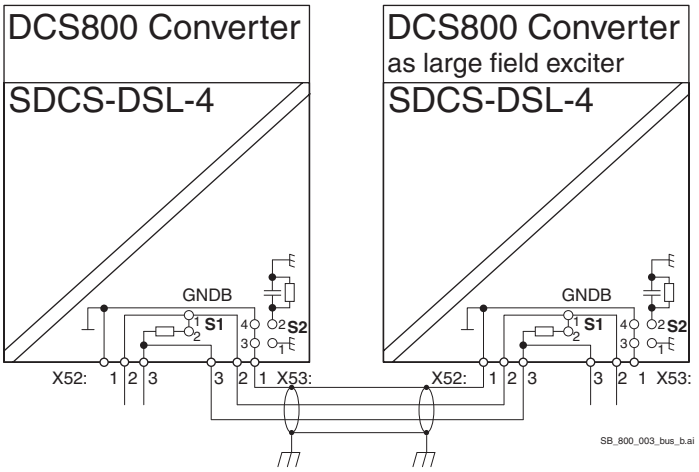
Cabling

Every bus device requires its own individual node number. Only two physical ends are allowed for the bus system.
The bus termination of the twisted pair cable is done using a termination resistor of 120 Ohm inside the drives or field exciters.
The termination resistance of 120 Ohm is selected for typical twisted pair cables.
The cables must be terminated at both ends. This is done using jumpers or switches.
Preferred cable type: DEVICENET
Supplier: Helu Kabel, Germany; type 81910PUR
Belden, USA; type 3084A



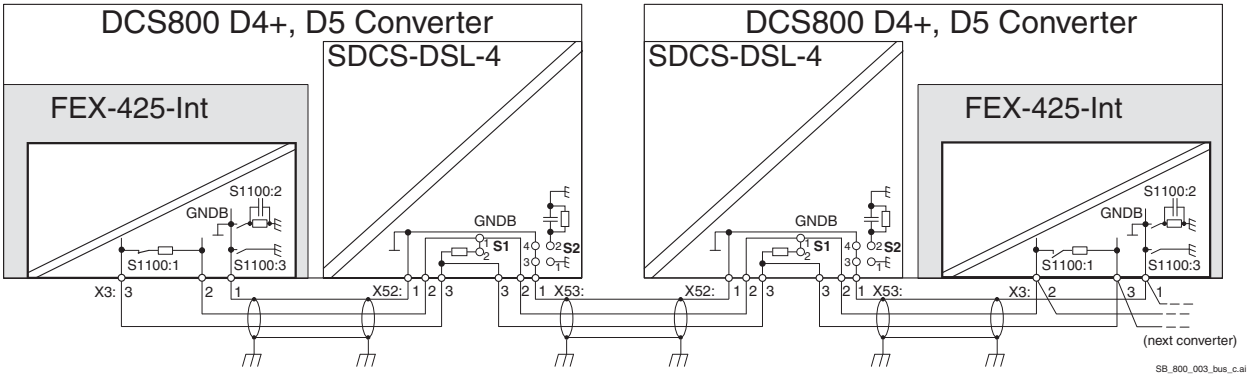
The bus ground (GNDB) is isolated.

Example of two DCS800 converters, one as armature converter, the other as large field exciter.



Ground termination	NO (S2 = 3-4)	NO (S2 = 3-4)
Bus termination	ON (S1 = 1-2)	ON (S1 = 1-2)

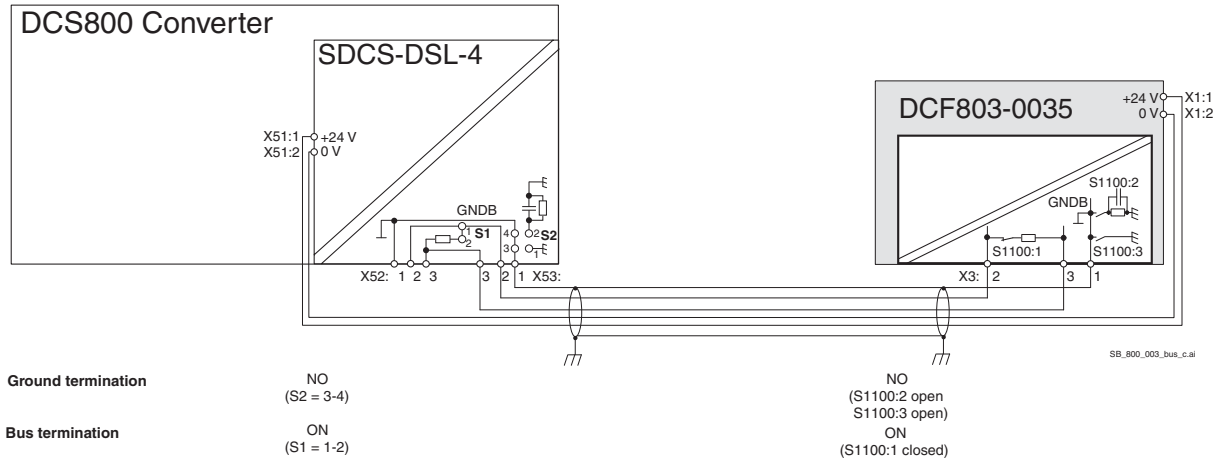
Example of two DCS800 D4+, D5 converters with FEX-425-Int internal field supply.



Ground termination	NO (S1100:2 open S1100:3 open)	NO (S2 = 3-4)	NO (S2 = 3-4)	NO (S1100:2 open S1100:3 open)
Bus termination	ON (S1100:1 closed)	OFF (S1 = 2-3)	OFF (S1 = 2-3)	ON at the end of the bus

The connection of isolated GNDB between two or more serial communication interfaces is optional. It is recommended to connect GNDB if the supply voltage is above 690 V and the cabling is made from cubicle to cubicle.

Example of one DCS800 converter plus external field supply.



Cable length

The cable length influences the maximum baudrate.

Baudrate	max. cable length	
50 k	500 m	
125 k	500 m	
250 k	250 m	
500 k	100 m	default and recommended setting
800 k	50 m	
888 k	35 m	
1000 k	25 m	

The bus is designed for a total cable length up to 100 meters. Larger distances on request.

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 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
- ☐ There are no tools, foreign objects or drill cuttings inside the drive
- ☐ Converter, motor connection box and other covers are in place

Maintenance

Chapter overview

This chapter contains preventive maintenance instructions. For more information see *DCS800 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:	230 to ≤ 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 to 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 9002
Enclosed converter:	light grey RAL 7035

Environmental limit values

Permissible cooling air temp.	
- at converter module air inlet:	0 to +55°C
with rated DC current:	0 to +40°C
with different DC current:	+30 to +55°C
- Options:	0 to +40°C
Relative humidity (at 5...+40°C):	5 to 95 %, no condensation
Relative humidity (at 0...+5°C):	5 to 50 %, no condensation
Change of the ambient temp.:	< 0.5°C / minute
Storage temperature:	-40 to +55°C
Transport temperature:	-40 to +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

Sound pressure level

Size	Sound pressure level L_P (1 m distance)		Vibration
	as module	enclosed conv.	as module
D1	55 dBA	68 dBA	0.5 g, 5 - 55 Hz
D2	55 dBA	72 dBA	
D3	60 dBA	78 dBA	
D4	66 - 70 dBA, depending on fan	77 dBA	
D4+	75 dBA	77 dBA	1 mm, 2 - 9 Hz
D5	70 dBA	78 dBA	
D6	69 dBA	67 dBA	0.3 mm, 2 - 9 Hz
D7	82 dBA	80 dBA	

North American Standards

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

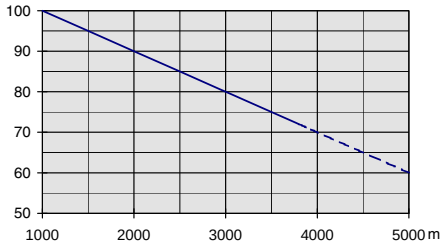
Rated supply voltage	Standards	
	Converter module	Enclosed converter
to 600 V	UL 508 C Power Conversion Equipment CSA C 22.2 No. 14-95 Industrial Control Equipment, Industrial Products Available for converter modules including field exciter units. Types with UL mark: • see UL Listing www.ul.com / certificate 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:

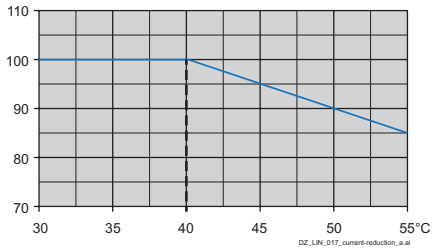
European Union Directive **Machinery Directive**	**Manufacturer's Assurance**	**Harmonized Standards**	
		Converter module	**Enclosed converter**
98/37/EEC 93/68/EEC	Declaration of Incorporation	EN 60204-1 [IEC 60204-1]	EN 60204-1 [IEC 60204-1]
Low Voltage Directive			
73/23/EEC 93/68/EEC	Declaration of Conformity	EN 60146-1-1 [IEC 60146-1-1] EN 61800-5-1 (EN 50178 [IEC --]) véase también IEC 60664	EN 60204-1 [IEC 60204-1] EN 61800-5-1 EN 60439-1 [IEC 60439-1]
EMC Directive			
89/336/EEC 93/68/EEC	Declaration of Conformity (Provided that all installation instructions concerning cable selection, cabling and EMC filters or dedicated transformer are followed.)	EN 61800-3 ① [IEC 61800-3]	EN 61800-3 ① [IEC 61800-3]
		① in accordance with 3ADW000032	① in accordance with 3ADW000032/ 3ADW000091

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 non regenerative

See the current ratings including several standard duty cycles for the DCS800 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]			
DCS800-S01-0020-04/05**	20	18	27	18	27	18	36	D1	6 A
DCS800-S01-0045-04/05**	45	40	60	37	56	38	76		
DCS800-S01-0065-04/05**	65	54	81	52	78	55	110		
DCS800-S01-0090-04/05**	90	78	117	72	108	66	132		
DCS800-S01-0125-04/05	125	104	156	100	150	94	188		
DCS800-S01-0180-04/05**	180	148	222	144	216	124	248	D2	15 A
DCS800-S01-0230-04/05	230	200	300	188	282	178	356		
DCS800-S01-0315-04/05**	315	264	396	250	375	230	460	D3	20 A
DCS800-S01-0405-04/05**	405	320	480	310	465	308	616		
DCS800-S01-0470-04/05	470	359	539	347	521	321	642		
DCS800-S01-0610-04/05**	610	490	735	482	723	454	908	D4	25 A
DCS800-S01-0740-04/05	740	596	894	578	867	538	1076		
DCS800-S01-0900-04/05	900	700	1050	670	1005	620	1240		
DCS800-S01-1190-04/05	1190 ①	860	1290	835	1253	745	1490	D4+	25 A * +S164
DCS800-S01-1200-04/05	1200	888	1332	872	1308	764	1528	D5	
DCS800-S01-1500-04/05	1500	1200	1800	1156	1734	1104	2208		
DCS800-S01-2000-04/05	2000	1479	2219	1421	2132	1361	2722		
DCS800-S01-2050-05	2050	1550	2325	1480	2220	1450	2900	D6	-
DCS800-S01-2500-04/05	2500	1980	2970	1880	2820	1920	3840		
DCS800-S01-3000-04/05	3000	2350	3525	2220	3330	2280	4560		
DCS800-S01-3300-04/05	3300	2416	3624	2300	3450	2277	4554	D7	-
DCS800-S01-4000-04/05	4000	2977	4466	2855	4283	2795	5590		
DCS800-S01-5200-04/05	5200	3800	5700	3669	5504	3733	7466		
600 V / 690 V									
DCS800-S01-0290-06	290	240	360	225	337	205	410	D3	-
DCS800-S01-0590-06	590	470	705	472	708	434	868	D4	-
DCS800-S01-0900-06/07	900	684	1026	670	1005	594	1188	D5	25 A * +S164
DCS800-S01-1500-06/07	1500	1200	1800	1104	1656	1104	2208		
DCS800-S01-2000-06/07	2000	1479	2219	1421	2132	1361	2722		
DCS800-S01-2050-06/07	2050	1520	2280	1450	2175	1430	2860	D6	-
DCS800-S01-2500-06/07	2500	1940	2910	1840	2760	1880	3760		
DCS800-S01-3000-06/07	3000	2530	3795	2410	3615	2430	4860		
DCS800-S01-3300-06/07	3300	2416	3624	2300	3450	2277	4554	D7	-
DCS800-S01-4000-06/07	4000	3036	4554	2900	4350	2950	5900		
DCS800-S01-4800-06/07	4800	3734	5601	3608	5412	3700	7400		
800 V									
DCS800-S01-1900-08	1900	1500	2250	1430	2145	1400	2800	D6	-
DCS800-S01-2500-08	2500	1920	2880	1820	2730	1860	3720		
DCS800-S01-3000-08	3000	2500	3750	2400	3600	2400	4800		
DCS800-S01-3300-08	3300	2655	3983	2540	3810	2485	4970	D7	-
DCS800-S01-4000-08	4000	3036	4554	2889	4334	2933	5866		
DCS800-S01-4800-08	4800	3734	5601	3608	5412	3673	7346		
990 V									
DCS800-S01-2050-10	2050	1577	2366	1500	2250	1471	2942	D7	-
DCS800-S01-2600-10	2600	2000	3000	1900	2850	1922	3844		
DCS800-S01-3300-10	3300	2551	3827	2428	3642	2458	4916		
DCS800-S01-4000-10	4000	2975	4463	2878	4317	2918	5836		
1190 V	Data on request								

* as option

** The 525 V version can be used as large field exciter. Do not forget the SDCS-DSL-4 (+S199). A 10 % current de-rating is strongly recommended.

Note:

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

① 1190 A_{DC} for 35°C and 1140 A_{DC} for 40°C ambient temperature

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]			
DCS800-S02-0025-04/05**	25	23	35	22	33	21	42	D1	6 A
DCS800-S02-0050-04/05**	50	45	68	43	65	38	76		
DCS800-S02-0075-04/05**	75	66	99	64	96	57	114		
DCS800-S02-0100-04/05**	100	78	117	75	113	67	134		
DCS800-S02-0140-04/05	140	110	165	105	158	99	198		
DCS800-S02-0200-04/05**	200	152	228	148	222	126	252	D2	15 A
DCS800-S02-0260-04/05	260	214	321	206	309	184	368		
DCS800-S02-0350-04/05**	350	286	429	276	414	265	530	D3	20 A
DCS800-S02-0450-04/05**	450	360	540	346	519	315	630		
DCS800-S02-0520-04/05	520	398	597	385	578	356	712		
DCS800-S02-0680-04/05**	680	544	816	538	807	492	984	D4	25 A
DCS800-S02-0820-04/05	820	664	996	648	972	598	1196		
DCS800-S02-1000-04/05	1000	766	1149	736	1104	675	1350		
DCS800-S02-1190-04/05	1190 ①	860	1290	835	1253	745	1490	D4+	25 A * +S164
DCS800-S02-1200-04/05	1200	888	1332	872	1308	764	1528	D5	
DCS800-S02-1500-04/05	1500	1200	1800	1156	1734	1104	2208		
DCS800-S02-2000-04/05	2000	1479	2219	1421	2132	1361	2722		
DCS800-S02-2050-05	2050	1550	2325	1480	2220	1450	2900	D6	-
DCS800-S02-2500-04/05	2500	2000	3000	1930	2895	1790	3580		
DCS800-S02-3000-04/05	3000	2330	3495	2250	3375	2080	4160		
DCS800-S02-3300-04/05	3300	2416	3624	2300	3450	2277	4554	D7	-
DCS800-S02-4000-04/05	4000	2977	4466	2855	4283	2795	5590		
DCS800-S02-5200-04/05	5200	3800	5700	3669	5504	3733	7466		
600 V / 690 V									
DCS800-S02-0320-06	320	256	384	246	369	235	470	D3	-
DCS800-S02-0650-06	650	514	771	508	762	462	924	D4	-
DCS800-S02-0900-06/07	900	684	1026	670	1005	594	1188	D5	25 A * +S164
DCS800-S02-1500-06/07	1500	1200	1800	1104	1656	1104	2208		
DCS800-S02-2050-06/07	2050	1520	2280	1450	2175	1430	2860	D6	-
DCS800-S02-2500-06/07	2500	1940	2910	1870	2805	1740	3480		
DCS800-S02-3000-06/07	3000	2270	3405	2190	3285	2030	4060		
DCS800-S02-3300-06/07	3300	2416	3624	2300	3450	2277	4554	D7	-
DCS800-S02-4000-06/07	4000	3036	4554	2900	4350	2950	5900		
DCS800-S02-4800-06/07	4800	3734	5601	3608	5412	3700	7400		
800 V									
DCS800-S02-1900-08	1900	1500	2250	1430	2145	1400	2800	D6	-
DCS800-S02-2500-08	2500	1910	2865	1850	2775	1710	3420		
DCS800-S02-3000-08	3000	2250	3375	2160	3240	2000	4000		
DCS800-S02-3300-08	3300	2655	3983	2540	3810	2485	4970	D7	-
DCS800-S02-4000-08	4000	3036	4554	2889	4334	2933	5866		
DCS800-S02-4800-08	4800	3734	5601	3608	5412	3673	7346		
990 V									
DCS800-S02-2050-10	2050	1577	2366	1500	2250	1471	2942	D7	-
DCS800-S02-2600-10	2600	2000	3000	1900	2850	1922	3844		
DCS800-S02-3300-10	3300	2551	3827	2428	3642	2458	4916		
DCS800-S02-4000-10	4000	2975	4463	2878	4317	2918	5836		
1190 V	Data on request								

* as option ** The 525 V version can be used as large field exciter. Do not forget the SDCS-DSL-4 (+S199). A 10 % current de-rating is strongly recommended.

Sizing:

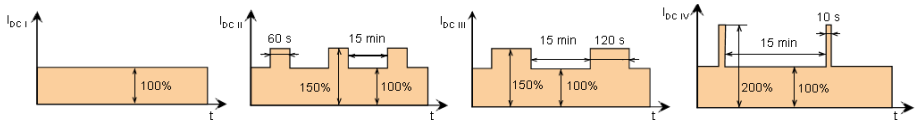
Note: AC current $I_{AC} = 0.82 * I_{DC}$

Note 1: The ratings apply at ambient temperature of 40°C (104°F). For lower temperatures the D5, D6, D7 ratings are higher (except I_{max}).

Note 2: Use DriveSize for detailed dimensioning in case the ambient temperature is below 40°C (104°F) or the drive is loaded cyclically.

① 1190 A_{DC} for 35°C and 1140 A_{DC} for 40°C ambient temperature

Standard duty cycles



Control Board SDCS-CON-4

Layout of the control board SDCS-CON-4

Jumper coding

S1
- * Jumper parking position; normal DC tacho
- Filter for AC tacho with rectifier
- * AITAC1+ (X3:4) connected to GND
- Jumper parking position; AITAC1+ (X3:4) not grounded
- * AITAC1 via SDCS-CON-4 X3:4 and X3:1/2/3
- reserved, AITAC2 via SDCS-IOB-3 / PS5311 X2:23 and X2:24

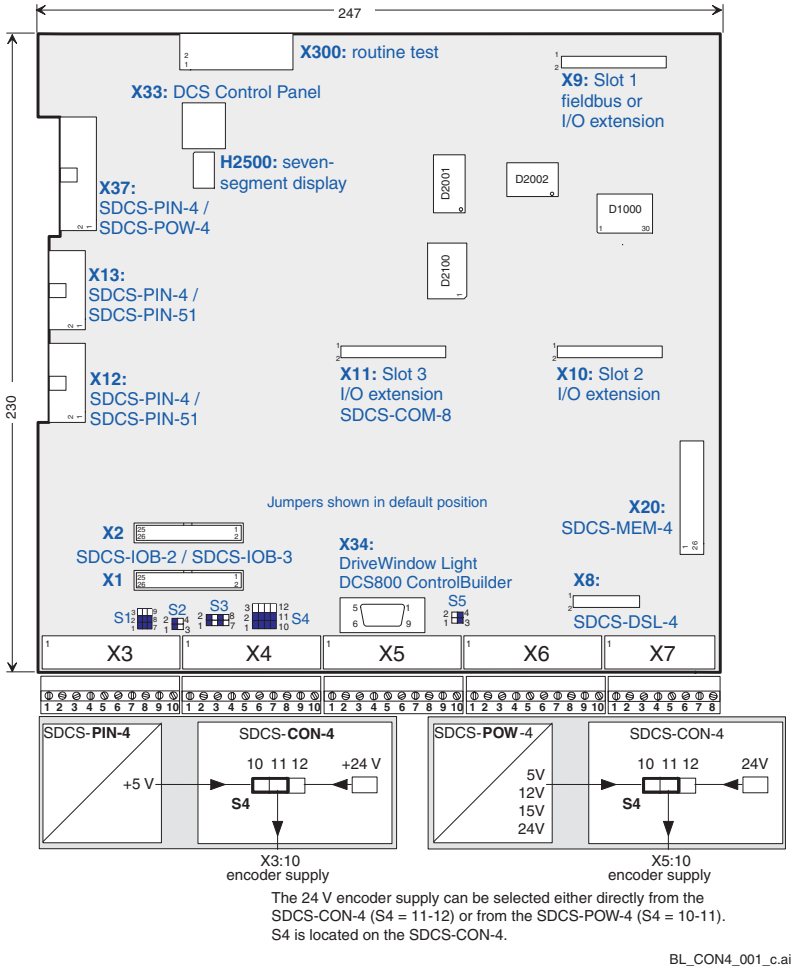
S2
- * AI1 (X3:5-6): R_{in} = 200 kΩ; range ±10 V
- AI1 (X3:5-6): R_{in} = 250 Ω**; range ±20 mA

S3
- * AI2 (X3:7-8): R_{in} = 200 kΩ; range ±10 V
- AI2 (X3:7-8): R_{in} = 250 Ω**; range ±20 mA
- * Jumper parking position; no PTC connected
- PTC connected at X3:7-8, 4.75 kΩ pull-up resistor activated

S4
- * Encoder mode: **differential;** RC loads activated with R = 121 Ω and C = 100 nF
- Encoder mode: **single ended;** 10 kΩ pull-up resistor activated
- * Encoder supply +5 V, sense at X5:8-9 is active or see SDCS-POW-4
- Encoder supply +24 V, no sense available, supply from SDCS-CON-4
- Park position, when connecting an encoder to an SDCS-IOB-3

S5
- Firmware download
- * Normal program execution or text download

* default value
** 250 Ω x 20 mA = 5 V == 100 %



The 24 V encoder supply can be selected either directly from the SDCS-CON-4 (S4 = 11-12) or from the SDCS-POW-4 (S4 = 10-11). S4 is located on the SDCS-CON-4.

BL_CON4_001_c.ai

Memory circuit

The SDCS-CON-4 is equipped with a flash PROM that contains the firmware and the parameters. It is possible to handle the parameters by DCS Control Panel, DW, DWL or overriding control. Changed parameters are stored immediately in the flash with the exception of parameters for cyclic communication via the dataset table in groups 90 to 92 and pointers in group 51.

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

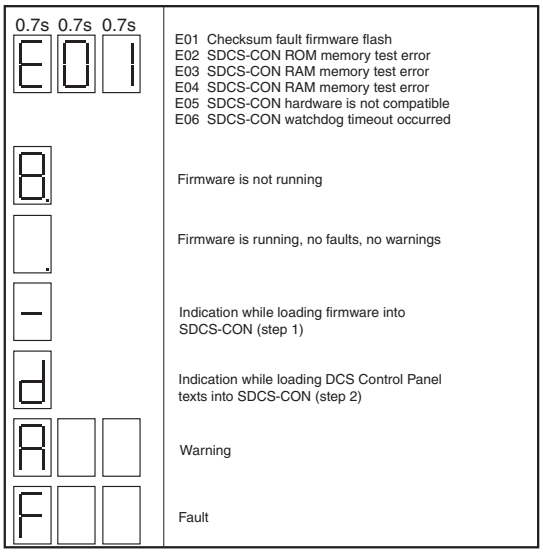
Watchdog function

The SDCS-CON-4 has an internal watchdog. The watchdog controls the proper function of the SDCS-CON-4 and the firmware. If the watchdog trips, it has the following effects:

- The thyristor firing control is reset and disabled.
- All digital outputs are forced low (zero).
- All programmable AOs are reset to zero (0V).

Seven segment display

A seven segment display (H2500) is located on the control board SDCS-CON-4 and it shows the state of the converter.



Terminal description

X37: Connector is used to supply the SDCS-CON-4 from the SDCS-PIN-4 or SDCS-POW-4.

The supply voltages can be measured to ground.

X37:2,3,4 = 48 V_{DC}

X37:5,6 = 24 V_{DC}

X37:7,8 = 15 V_{DC}

X37:11,12 = -15 V_{DC}

X37:13,14 = 5 V_{DC} for encoder

X37:17,19,21,23 = 5 V_{DC} for CPU

Supply voltage monitoring

The 5 V_{DC} for the CPU is monitored. Power dips under 4.75 V_{DC} forces the CPU to reset. In parallel the CPU monitors the powerfail signal from the power supply (SDCS-PIN-4 or SDCS-POW-4).

X12: and **X13:** Connectors are used to measure voltage, current and temperature as well as distributing the firing pulses to the thyristors via SDCS-PIN-4, SDCS-PIN-51, SDCS-PIN-46 or SDCS-PIN-48. See chapter *Power interfaces*.

X300: Is a routine test connector.

X1: and **X2:** Are used to connect *SDCS-IOB-2* and *SDCS-IOB-3*.

X33: Is used to connect the DCS Control Panel. It can be connected direct via 40 mm jack or via a CAT 1:1 cable (RJ45).

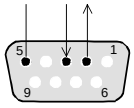
X34: Is used for DWL and DCS800 ControlBuilder.

The RS232 interface is normally used to set parameters in the drive via DWL.

The default settings of this interface are:

Signal level:	RS232 (+12V / -12V)
Data format:	UART
Message format:	Modbus-Protocol
Transmission method:	half-duplex
Baudrate:	DriveWindow Light: variable, 38.4 kBaud default DCS800 Conrol Builder download: 38.4 kBaud FDT firmware download: self-adapting
Number of Data bits:	8
Number of Stop bits:	1
Parity-Bit:	Odd

X34:	Description
1	Not connected
2	TxD
3	RxD
4	Not connected
5	SGND Signal ground
6 - 9	Not connected



X34

X8: Is needed for the SDCS-DSL-4 which provides the serial communication interface for field exciters, 12-pulse communication, master-follower and drive-to-drive communication.

X9:, **X10:** and **X11:** Slots 1 to 3 are used for extension IO modules and serial communication interface adapters.

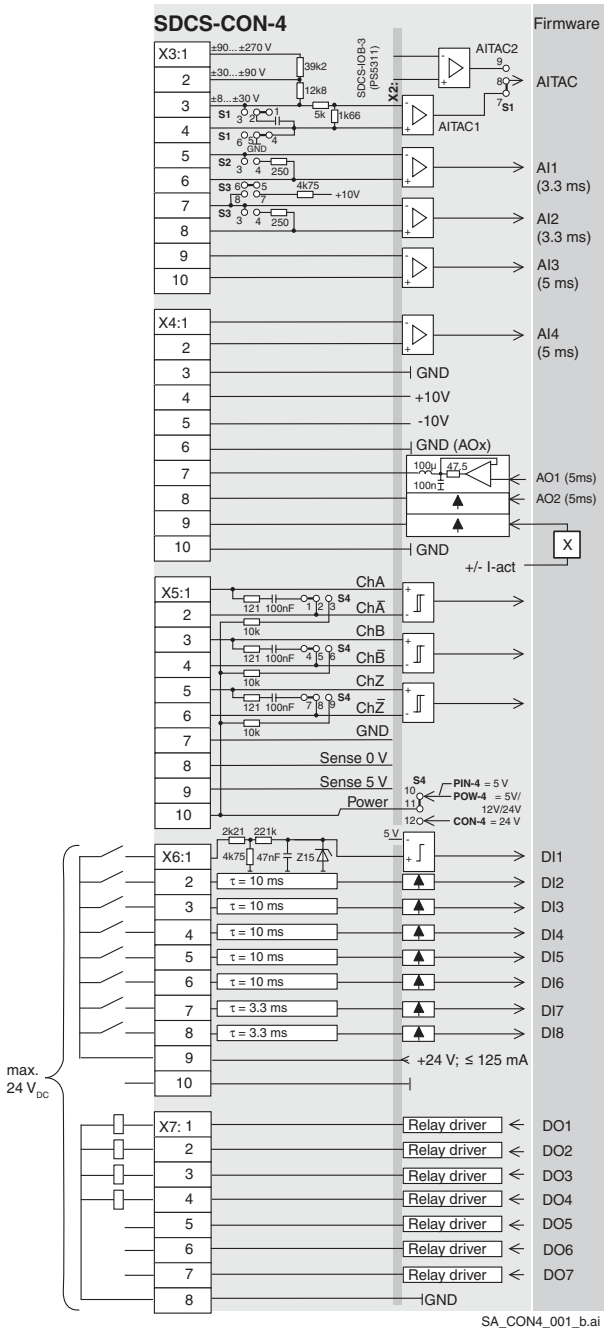
For detailed description see chapter *DCS800 Manuals*.

X20: Slot 4 is used for the SDCS-MEM-8 (Memory Card), see description DCS800 ControlBuilder.

Prepared function of:

	Slot 1 X9:	Slot 2 X10:	Slot 3 X11:	Slot 4 X20:
RDIO / RAIO / RTAC / RRIA	x	x	x	
R-type fieldbus adapters	x			
SDCS-COM-8			x	
Second fieldbus adapter RMBA		x	x	
SDCS-MEM-8 (Memory Card)				x

Digital and analog I/O connection of the SDCS-CON-4



Resolution [bit]	Input/output values Hardware	Scaling by	Common mode range	Remarks
15 + sign	±90...270 V ±30...90 V ±8...30 V	Firmware	±15 V	Analog tacho
15 + sign	±10 V	Firmware	±15 V	For AI1 - AI4 use a potentiometer with minimum 2 kΩ resistance.
15 + sign	±10 V	Firmware	±15 V	
15 + sign	±10 V	Firmware	±15 V	
15 + sign	±10 V	Firmware	±15 V	

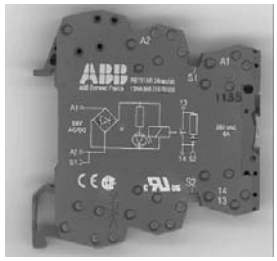
			Power	
	+10 V		≤ 5 mA	
	-10 V		≤ 5 mA	
11 + sign	±10 V	Firmware	≤ 5 mA	
11 + sign	±10 V	Firmware	≤ 5 mA	
	±10 V	Firmware, Hardware	≤ 5 mA	8 V -> min. of 325% of (99.03) or 230% of (4.05)

Encoder supply		Remarks
		Inputs are not isolated Impedance = 120 Ω, if selected maximum frequency ≤ 300 kHz
5 V 24 V	≤ 250 mA ≤ 200 mA	Sense lines for GND and supply to correct voltage drops on cable (only available for 5 V encoders)

Input	Signal definition	Remarks
0...7.3 V 7.5...50 V	Firmware	-> “0“ status -> “1“ status

Output	Signal definition	Remarks
50 * mA 22 V at no load	Firmware	Current limit for all 7 outputs together is maximum160 mA.* Do not apply any reverse voltages

* Short circuit protected. To lower the current load of the digital outputs use an external interface relay (1SNA645018R0300):

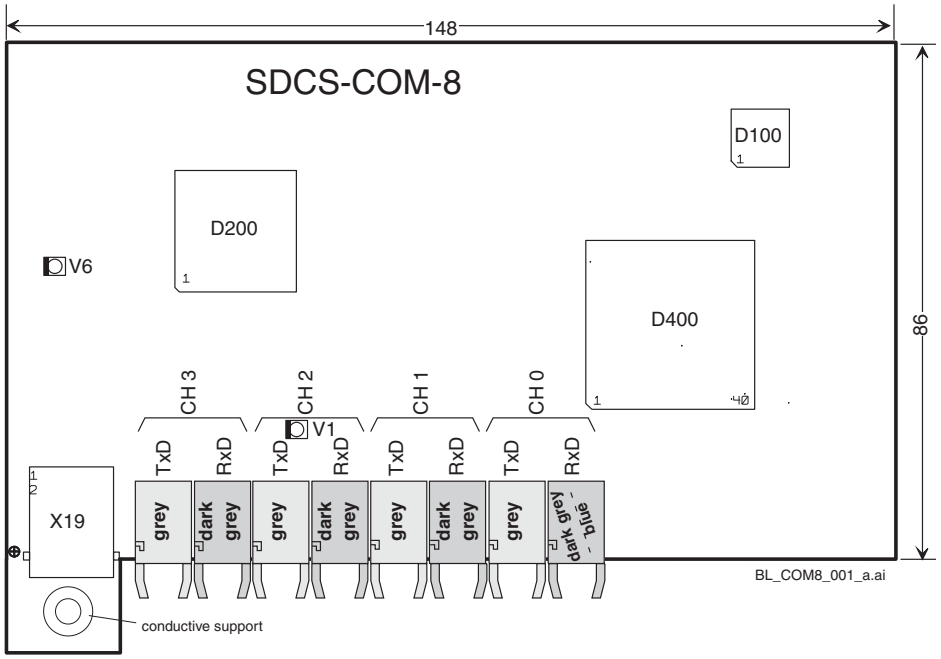


Interface board SDCS-COM-8

This board is used together with a DCS800 and provides DDCS communication.

The board is equipped with four optical channels (max. data transmission speed is 4 Mb for each optical channel):

- **Channel 0** is used for communication with the overriding control (e.g. FCI, AC 800M)
- **Channel 1** is used for the I/O Module Adapter AIMA-01, FEA-01
- **Channel 2** is used for master - follower
- **Channel 3** is prepared to connect DriveWindow or IBA interface



Explanation of the SDCS-COM-8 LEDs

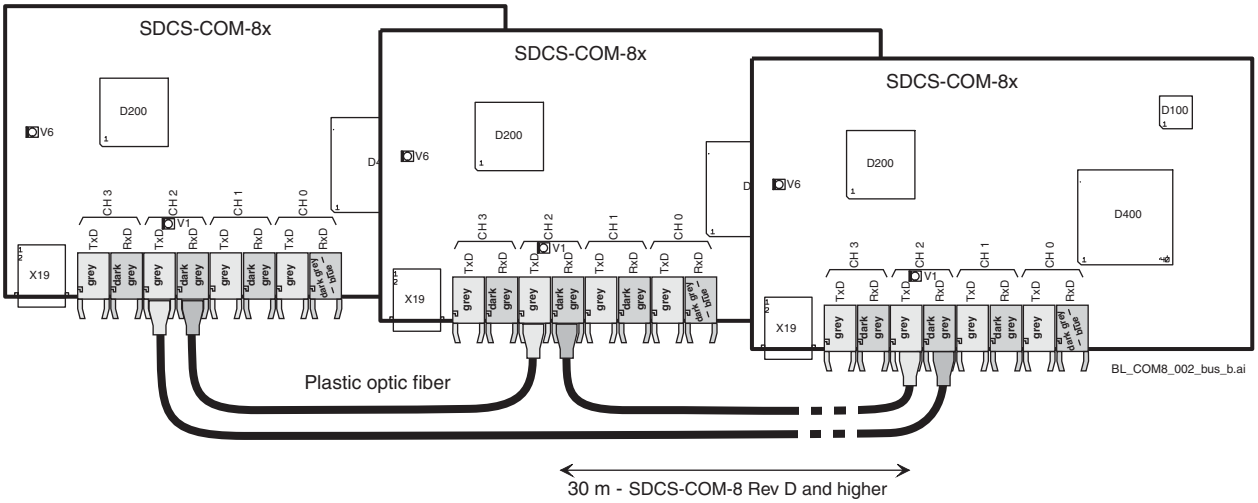
LED	Color	Meaning
V6	Green	5 V supply ok
V1	Red	Blinking: boot procedure Permanent: fault

Type	Revision	Optical components				Channel 0 used for	Max. driver current		Cunductive support
		Ch 0 PLC	Ch 1 I/O	Ch 2 M/F	Ch 3 DW				
SDCS-COM-81	G - I	10 Mb	5 Mb	10 Mb	10 Mb	ABB PLCs	Ch 0, 2, 3	50 mA	x
SDCS-COM-82	G - I	5 Mb	5 Mb	10 Mb	10 Mb	N-type fieldbus adapters	Ch 2, 3	50 mA	x
SDCS-COM-81	K and higher	10 Mb	10 Mb	10 Mb	10 Mb	ABB PLCs	Ch 0 - 3	50 mA	x
SDCS-COM-82	K and higher	5 Mb	10 Mb	10 Mb	10 Mb	N-type fieldbus adapters	Ch 1 - 3	50 mA	x

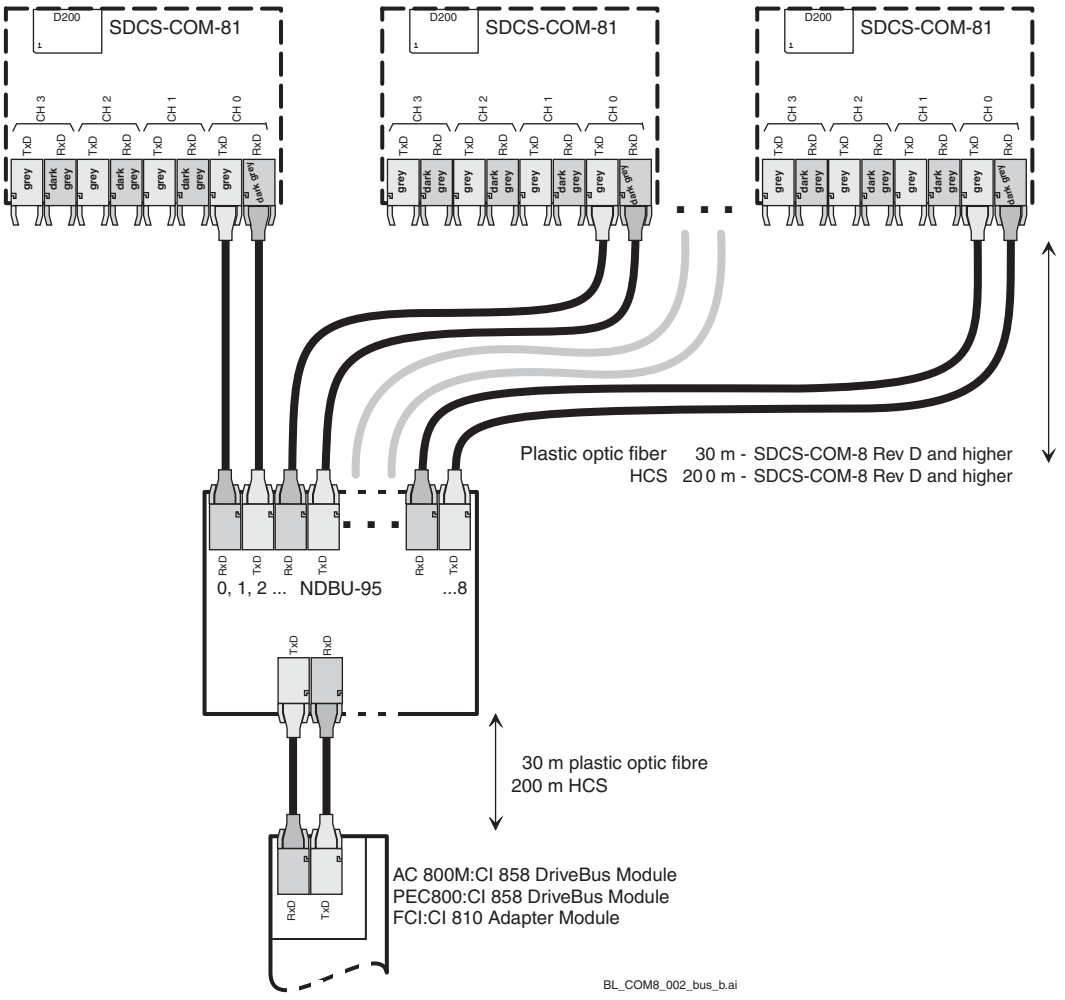
Color of optical components:
5 Mb -> blue driver current maximum 30 mA
10 Mb -> dark grey driver current maximum 50 mA

Remark:
Only channels with the same hardware components (e.g. 10 Mb) are allowed to be connected together.

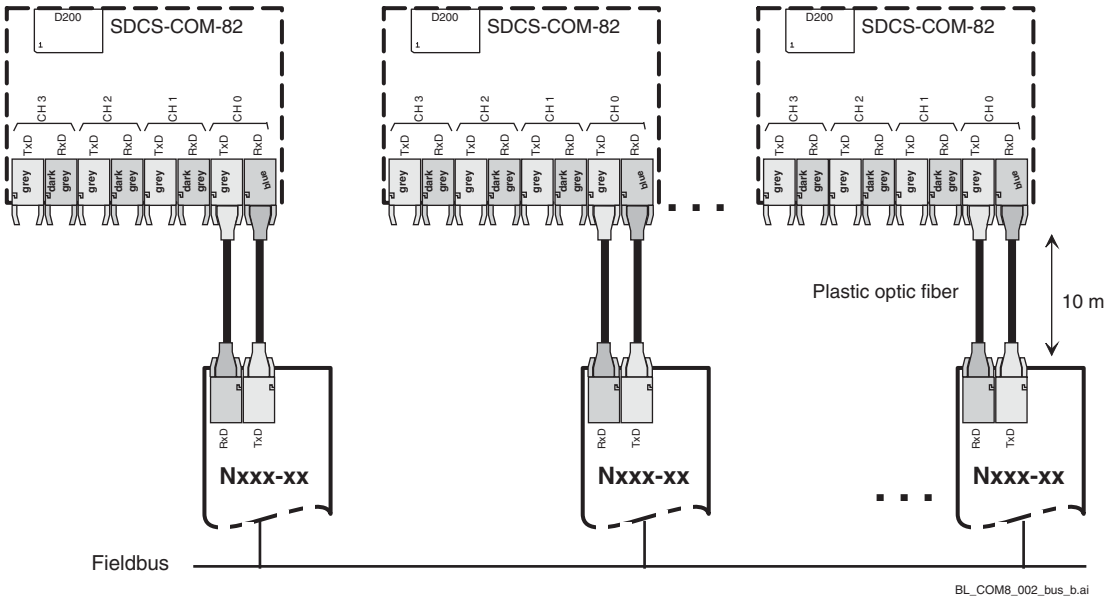
Ch2 master-follower connection



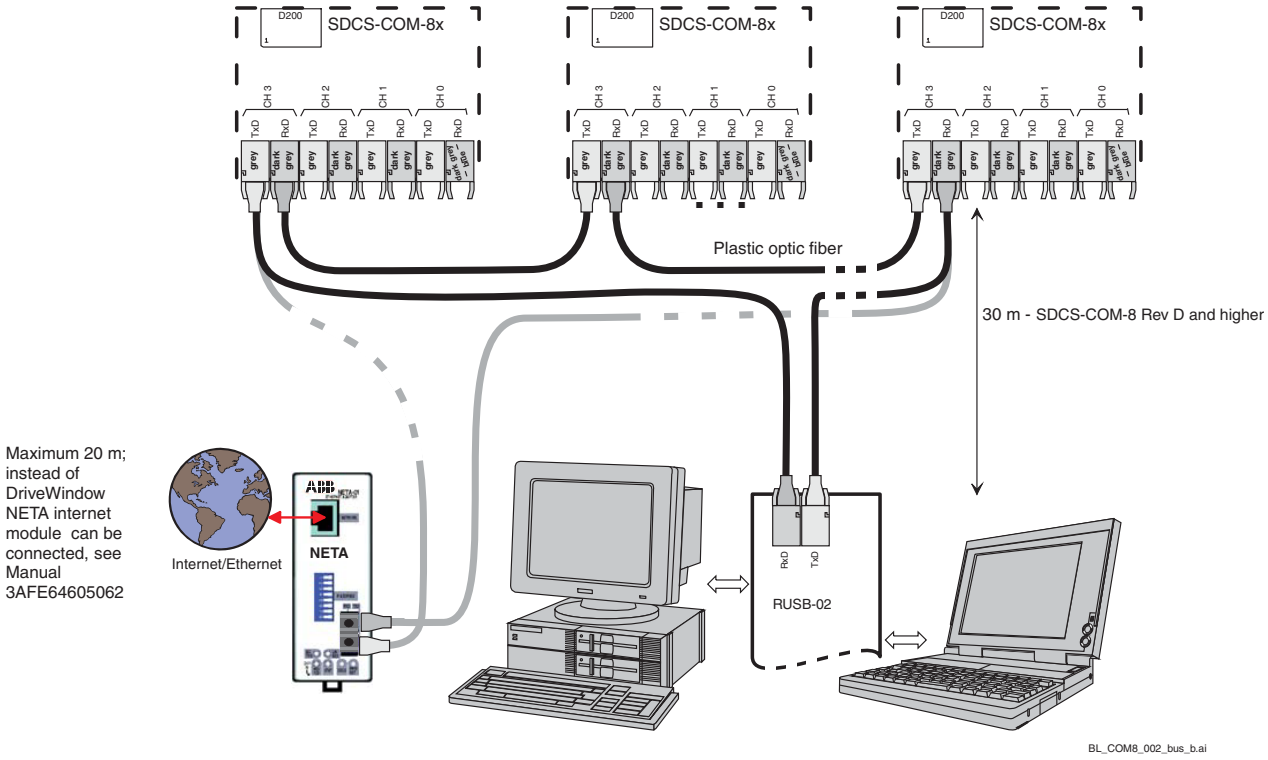
Ch0 DriveBus connection to Advant Controller (star)



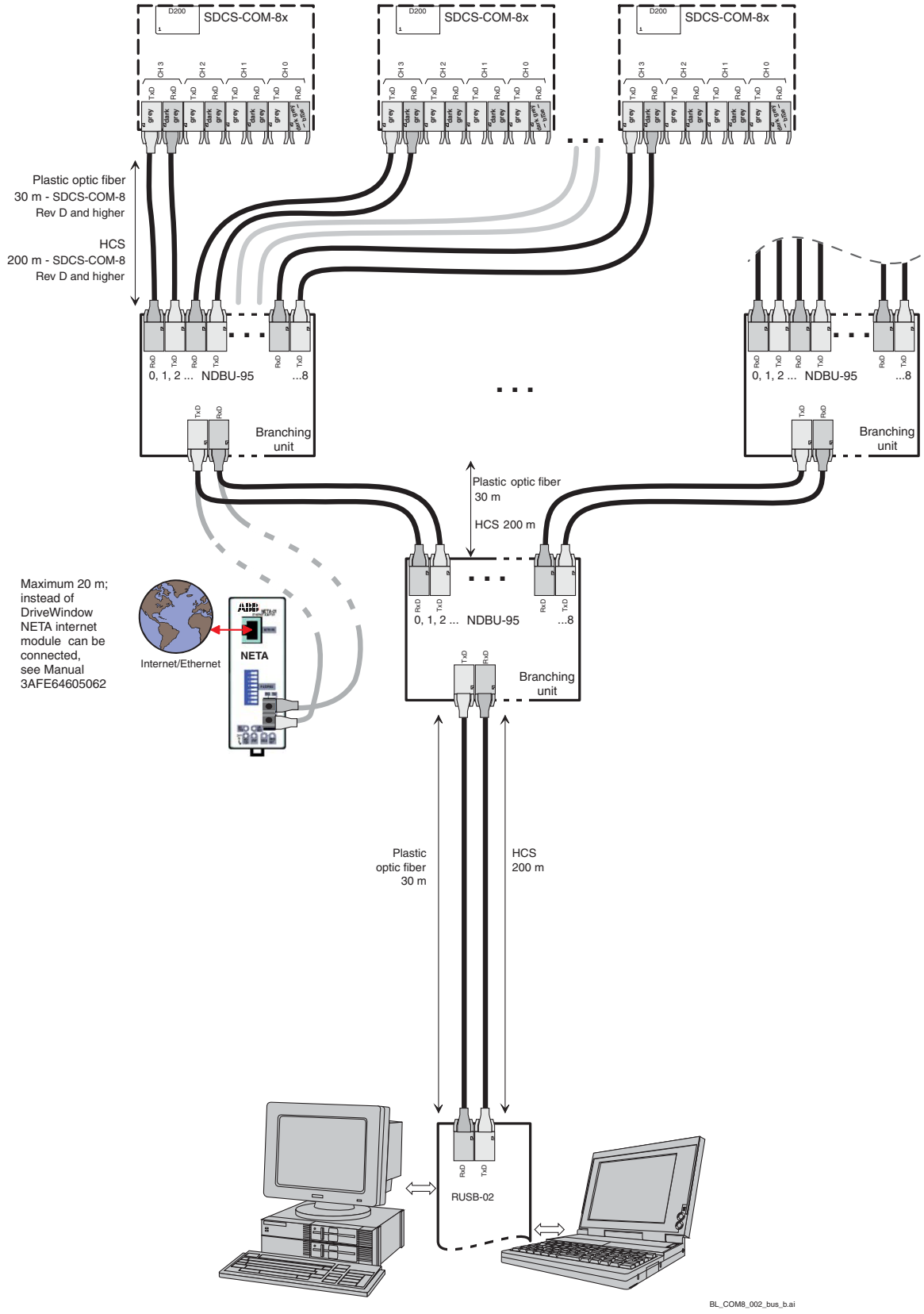
Ch0 connection to overriding control (N-type fieldbus adapter)



Ch3 ring connection to DriveWindow



Ch3 star connection to DriveWindow



DDCS branching unit NDBU-95

The NDBU-95 is used to implement star topology for DDCS communication. This allows a drive to fail or become unpowered without disabling the complete communication. The NDBU-95 receives messages from the master (e.g. PC) and sends them to all the drives simultaneously. Each drive has an individual address and only the addressed drive sends a reply message to the master.

NDBU-95 has nine output channels. The reply message sent by a drive is delivered to the master. Several NDBU-95s can be used in parallel, in series or in any combination of these. The maximum distance between the master and a NDBU-95 as well as between two NDBU-95s, see manual *Branching units NDBU-95*.

Technical data

Optical links:

Master channels	1 DDCS input and 1 DDCS output
Drive channels	9 DDCS inputs and 9 DDCS outputs
Data rate	1 - 4 MBd, (see X12)
Driving current	20 mA, 30 mA, 50 mA, channel disabling, (see X2 - X11)
Monitoring	A green LED for each channel is switched on, when messages are received
Transmission device	10 Mb components

Power supply:

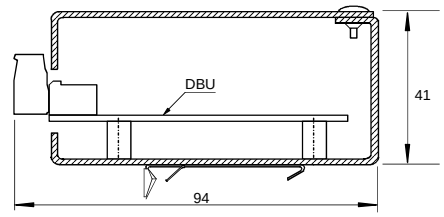
Input voltage	+24 V_{DC} ±10 %
Input current	300 mA
Monitoring	A green LED is switched on, when the output voltage is normal

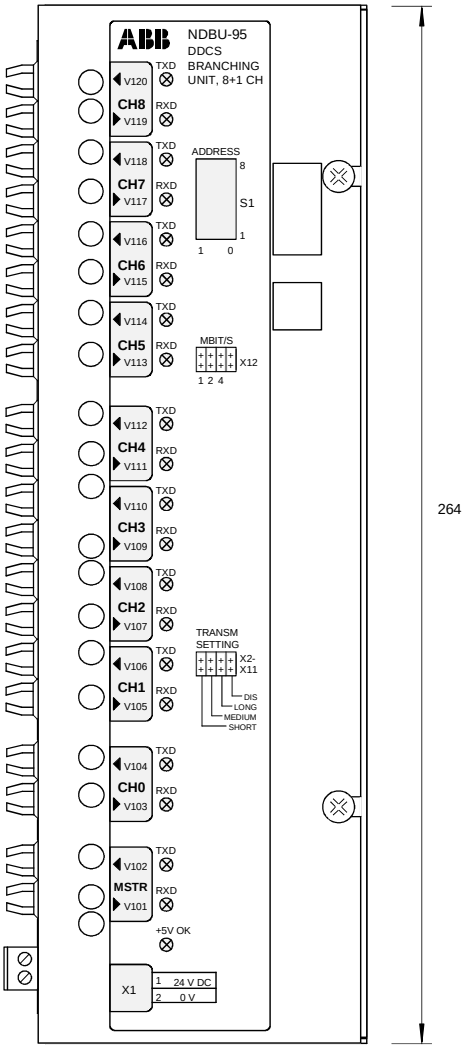
Operating temperature: +0 - +50°C
Dimensions: See diagram

Remark: Only channels with the same hardware components (e.g. 10 Mb component) are allowed to be connected together.

For further information see *Branching units NDBU-95*.

Layout of the NDBU-95



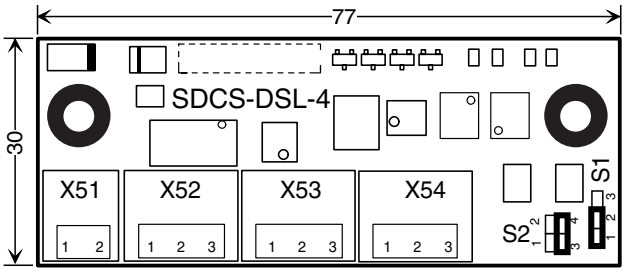


Drive-to-drive board SDCS-DSL-4

The SDCS-DSL-4 provides a communication between drives. The communication hardware and protocol is based on CAN bus.

This communication will be used for drive-to-drive communication (e.g. master-follower), 12-pulse operation and communication to field exciters.

The communication hardware is equipped with an isolated power supply and an isolated transmitter. The bus termination can be set by jumper S1. See also chapter *DCSLink communication*.



Jumper coding

S1 Bus termination

120 Ohm	
*	no termination, park position

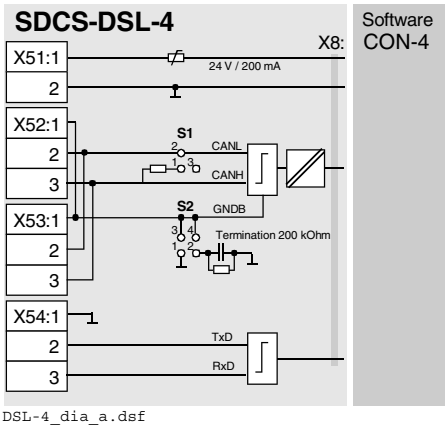
S2 Ground termination

0 Ohm (direct) ground termination	
200 kOhm R-C ground termination	
*	no termination, park position

* Default value

BL_DSL4_001_+Tab_a.dsf

- X51 supplies 24 V_{DC}
- X52 and X53 are connected in parallel and provide two connectors for the DCSLink
- X54 is not used



DSL-4_dia_a.dsf

Supply		Remarks
24 V	≤ 200 mA	24 V grounded supply for DCF803-0016, FEX-425-Int and DCF803-0035 field exciters; short circuit protected 250 mA

DSL communication		Remarks
Bus termination		
S1	1-2	120 Ohm
	2-3	no termination; park position
Ground termination		
S2	2-4	200 kOhm R-C ground termination
	1-3	0 Ohm ground termination
	3-4	no termination; park position
RS 485 communication		**Remarks**
		no isolation

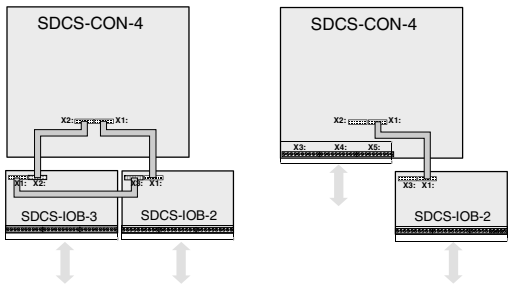
Digital I/O board SDCS-IOB-2

As described at the beginning of the chapter, there are various options for configuring the inputs and outputs. The SDCS-IOB-2x has 8 digital inputs and 8 digital outputs.
There are three different types existing, depending on the input voltage level:

SDCS-IOB-21 24 - 48 V_{DC}
SDCS-IOB-22 115 V_{AC}
SDCS-IOB-23 230 V_{AC}

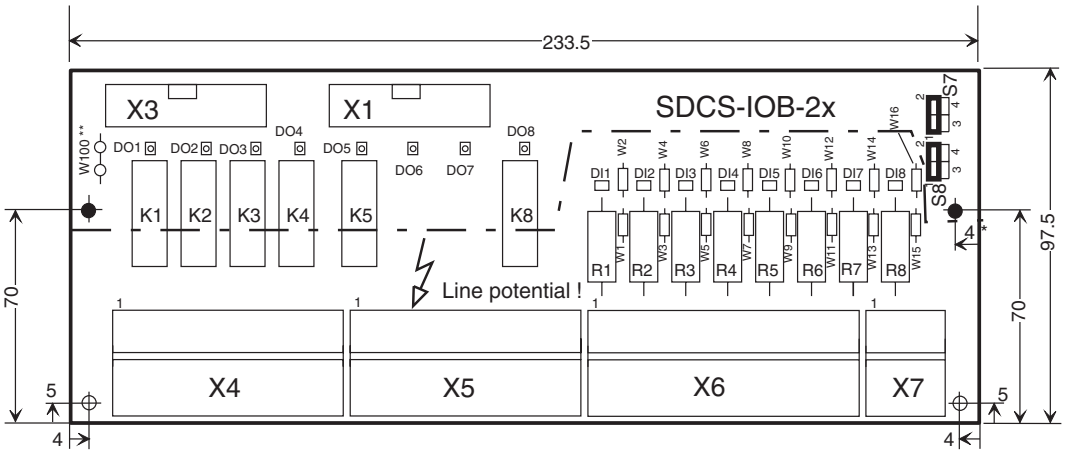
The inputs are filtered and galvanically isolated via optocouplers. Inputs can form two galvanically separated groups by using either X7:1 or X7:2.
If these boards are in use, they have to be mounted outside the converter. They must be mounted in a way, that the conductive supports have a good connection to ground of the installation.
The SDCS-IOB-2 is substituting the standard DI and DO of the SDCS-CON-4.
Also see *I/O Board Configuration.*

I/O via SDCS-IOB-2x / IOB-3 and SDCS-CON-4



The cable length between X1-X1 and X2-X2 is max. 1.7 m (D1 - D5 converters) or max. 4 m screened (required for D6 and D7 converters). Between X1-X3 it is max. 0.5 m because of EMC reasons. See chapter *Other cables*.

Layout and jumper settings of the SDCS-IOB-2x



Jumper coding

	Input	Time constant 2 ms **	Time constant 10 ms
S7	DI7		*
S8	DI8		*

* Default value

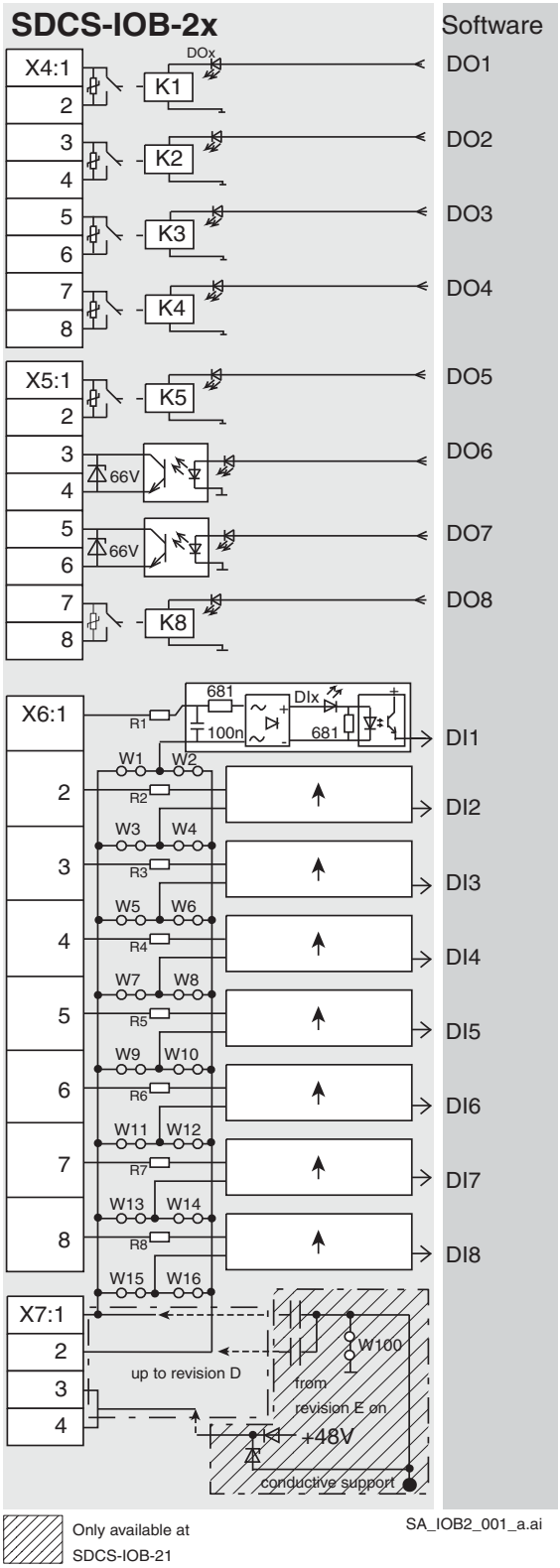
**

Connected voltage	2 ms	10 ms
24 V_{DC}	Ok	Ok
115 / 230 V_{AC}	not permitted	Ok

● Supports are conductive
Diameter of all supports: 4.3 mm
* This dimension may vary (4/5 mm) depending on the revision
** W100 as printed circuit

BL_Iob2_001_+Tab_b.ai

There is a card holder available as option for fastening the SDCS-IOB-2. For more information see chapter *Card holder for SDCS-IOB-2/3*.



Note:
When the SDCS-IOB-2 is connected to a SDCS-CON-4, DIs and DOs of the SDCS-CON-4 cannot be used (connectors X6 and X7).

Output value	Signal definition by	Remarks
K1 - K5, K8	Firmware	Isolated by relays (NO contacts) Contact ratings: **AC**: ≤ 250 V~/ ≤ 3 A~ **DC**: ≤ 24 V-/ ≤ 3 A- or ≤ 115/230 V-/ ≤ 0.3 A- MOV-protected (275 V)
K6, K7	Firmware	Potential-Isolated by optocouplers Switching capacity: ≤ 50 mA external voltage: ≤ 24 V-

X4, X5 are screw-clamp terminals for wires up to 4 mm² cross-sectional area.
Default values are shown within the software diagrams.
The ground potential of the digital outputs may vary within ±100 V against each other.

Input value	Signal definition by	Remarks
1 - 8	Firmware	Isolated by optocoupler
IOB-21		**(24 - 48 V-)** R1 - R8 = 4.7 kΩ
0 - 8 V		-> "0 signal"
18 - 60 V		-> "1 signal"
IOB-22	Firmware	**(115 V~)** R1 - R8 = 22 kΩ
0 - 20 V		-> "0 signal"
60 - 130 V		-> "1 signal"
IOB-23	Firmware	**(230 V~)** R1 - R8 = 47 kΩ
0 - 40 V		-> "0 signal"
90 - 250 V		-> "1 signal"
		Including tolerance; absolute max. values

X6, X7 are screw-clamp terminals for wires up to 4 mm² cross-sectional area
Input resistance: see diagram.
Input smoothing time constant: see diagram.
Filter time constant of DI7 and DI8 can be changed by jumper S7 or S8.

Power supply for digital inputs (X7:3,4):
• Only available at **SDCS-IOB-21**
• 48 V / ≤ 50 mA
• Not isolated from the DCS electronics!
If the inputs are supplied from the internal +48 V (X7:3 and/or X7:4) a connection must be routed from either X7:1 and/or X7:2 to ground of the DCS800 module. Usually the ground is identical to the converter's frame.

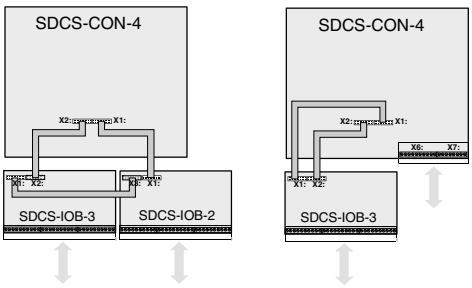
If the inputs are supplied by any external source (+48 V_{DC}, 115 V_{AC} or 230 V_{AC}) the neutral line / - line must be connected to either X7:1 or X7:2. If the inputs should be controlled with the same voltage level, but from two different voltage sources, having probably two different ground levels, the first neutral line should be connected to X7:1 and the second to X7:2. In this case the jumpers Wx connecting the inputs to X7:2, but controlled by the source, connected to X7:1, must be cut out.
The same method is needed for the other jumpers Wx.

High frequency grounding is done via 100 nF capacitors.

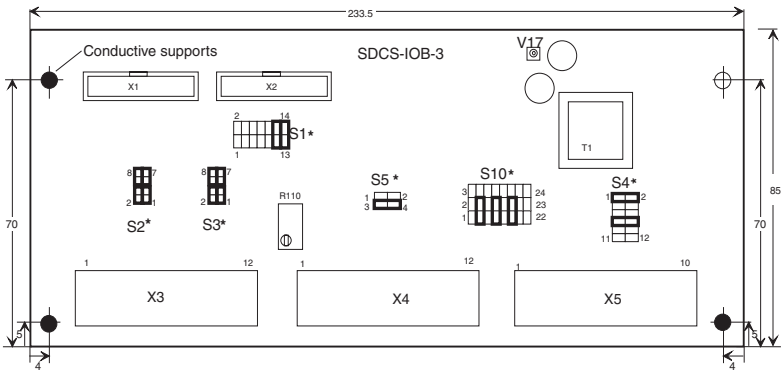
Analog I/O and encoder I/O board SDCS-IOB-3

As described at the beginning of the chapter, there are various options for configuring the inputs and outputs. The board SDCS-IOB-3 consists of the 5 analog inputs, 3 analog outputs, a galvanically isolated pulse encoder interface and a current source for temperature measuring devices.
If these boards are in use, they have to be mounted outside the DCS module. They must be mounted in a way, that the conductive supports have a good connection to ground of the installation.
The SDCS-IOB-3 is substituting the standard AI, AO and encoder connections of the SDCS-CON-4.
Also see *I/O Board Configuration.*
The cable length between X1-X1 and X2-X2 is max. 1.7 m (D1 - D5 converters) or max. 4 m screened (required for D6 and D7 converters). Between X1-X3 it is max. 0.5 m because of EMC reasons.
See chapter *Other cables.*

I/O via SDCS-IOB-2x / IOB-3 and SDCS-CON-4



Layout and jumper settings of the SDCS-IOB-3 board



Jumper coding

Functionallity of analog inputs

	Ch	Paralleling of 500 W between input terminal for 0/4 - 20 mA	gain = 1 * -10 V - +10 V	gain = 10 -1 V - +1 V	Residual current detection X3:11 X3:12
S1 S2 S3	AITAC	S1:1-2	YES		
	AI1	S1:3-4	YES		
	AI2	S1:5-6	S2	S2	
	AI3	S1:7-8	S3	S3	
	AI4	S1:9-10	YES		S1:11-12 S1:13-14

S4 Pulse encoder supply: 5 V | 12 V | 24 V *

S5 Temperature sensor supply

PTC 1.5 mA	PT100 5 mA *

S10 Characteristics for pulse encoder inputs

Single ended push/pull * (5 V / 12 V / 24 V)

Single ended open collector

Differential: 5 V | 12 V / 24 V * | 13 mA

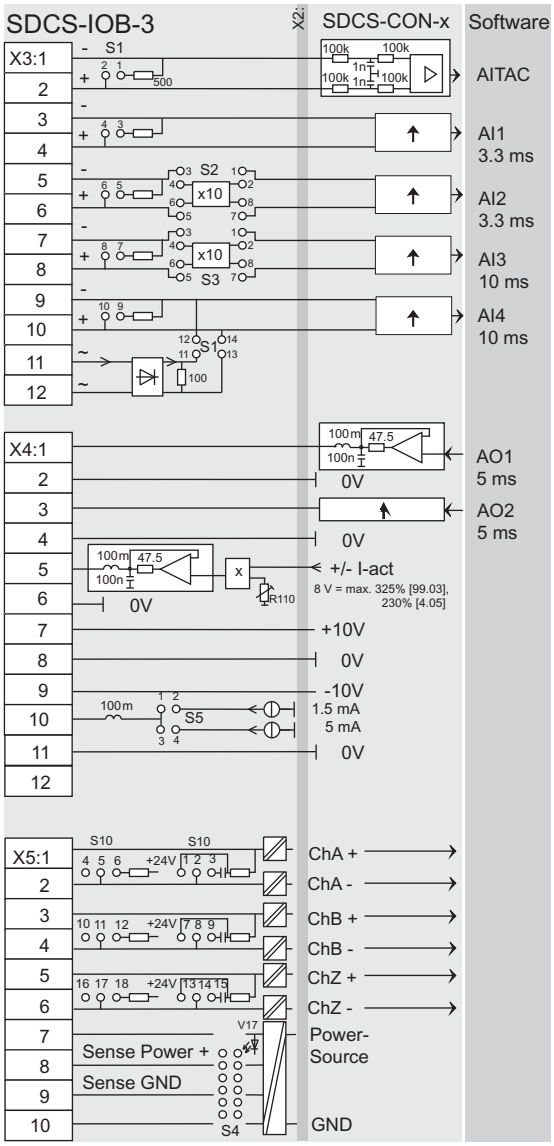
* Default value

When using the SDCS-IOB-3 encoder input, the following S4 jumper setting has to be made on the SDCS-CON-4.

S4 on SDCS-CON-4

BL_IOB3_001_+Tab_a.ai

There is a card holder available as option for fastening the SDCS-IOB-3. For more information see chapter *Card holder for SDCS-IOB-2/3*.



SA_IOB3_001_b.ai

Note:
When the SDCS-IOB-3 is connected to a SDCS-CON-4 AIs, AOs and encoder connections of the SDCS-CON-4 cannot be used (connectors X3, except for terminals 1, 2, 3, 4, X4 and X5). As an exception analog tachos have to be connected at the SDCS-CON-4 (connector X3:1-4).

Resolution [bit]	Input / output values hardware	Scaling by	Common mode range	Remarks
15 + sign	±10 V	Firmware	±20 V	①②③⑥
15 + sign	±10 V	Firmware	±20 V	①②③
15 + sign	±10 V	Firmware	±40 V	①②③④⑤
15 + sign	±10 V	Firmware	±40 V	①②③④⑤
15 + sign	±10 V	Firmware	±40 V	①②③⑦

			Power	
11 + sign	±10 V	Firmware	≤ 5 mA*	
11 + sign	±10 V	Firmware	≤ 5 mA*	
Analog	±10 V	R110	≤ 5 mA*	Gain: 0.5 - 5
	R_i = 3 Ω		≤ 5 mA*	For external use
			≤ 5 mA*	E.g. reference pot.
	1.5 mA 5 mA			Current source for PTC or PT100

Encoder supply		Remarks
		Inputs not isolated Impedance = 120 Ω, if selected max. frequence ≤ 300 kHz
5 V 12 V / 24 V	≤ 250 mA * ≤ 200 mA *	Sense lines for GND and supply to correct voltage drops on cable (only available for 5 V or 12 V encoders)

① Total filter time ≤ 2 ms
② ±20 mA by setting S1
③ 4 - 20 mA by ② + Firmware function
④ ±1 V by setting S2/S3 (CMR ±10 V)
±2 mA by setting S2/S3 + S1 (CMR ±10 V)
⑤ Designated for PT100 evaluation via firmware and hardware
⑥ Should always be used directly at SDCS-CON-4 X3:1-4
* Short circuit proof

⑦ **Residual current detection** is selected as default. If the jumpers S1:11-12 and S1:13-14 are set, inputs X3:9 and X3:10 and jumper S1:9-10 must not be used. Inputs X3:11 and X3:12 now serve as input for the current signal taken from a current transformer. This detection is based on a sum current transformer where the secondary side is connected through a diode bridge to a 100 Ω resistor. Voltage will appear across the resistor, if the sum of the 3-phase currents is not zero. In case AI4 should be used for a different purpose, use the inputs / jumpers accordingly and take the block diagram as a help.

Restrictions using jumper S1, S2 or S3:
The selection of the burden resistor across the input terminals can be done independent from S2 or S3 settings for inputs AITAC, AI1, AI2, AI3 and AI4.
If the gain is set to 10 by using S2 or S3 and the 500 Ω burden resistor is activated, the input signal level is changed to ±2 mA.
For input AI4 there are the following configurations available:
- Input range ±20 mA
- Input range ±10 V
- Residual current detection by Isum not equal to zero via X3:11 and X3:12

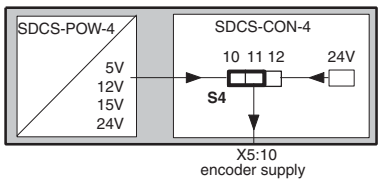
Power supply board SDCS-POW-4

The SDCS-POW-4 is designed for DCS800 converter modules and is mounted on the electronic tray. It is used for sizes D5, D6, D7 and the rebuild kit DCS800-R.

The SDCS-POW-4 generates all necessary DC voltages for the SDCS-CON-4 and all other electronic boards. The input voltage is automatically detected and set to either 230 V_{AC} or 115 V_{AC}.
If an encoder is connected to X5 of the SDCS-CON-4, the encoder supply voltage of 5 V, 12 V, 15 V or 24 V can be selected the following way:

① Choose the power supply source via jumper S4 on the SDCS-CON-4.
② Setting jumper S4 to 11-12 chooses SDCS-CON-4. Thus only 24 V are available.
③ Setting jumper S4 to 10-11 chooses SDCS-POW-4. Thus 5 V, 12 V, 15 V and 24 V are available. The selection is done by means of S3, S4 and S5 on the SDCS-POW-4. Maximum current for the encoder is limited to 250 mA.

① ②



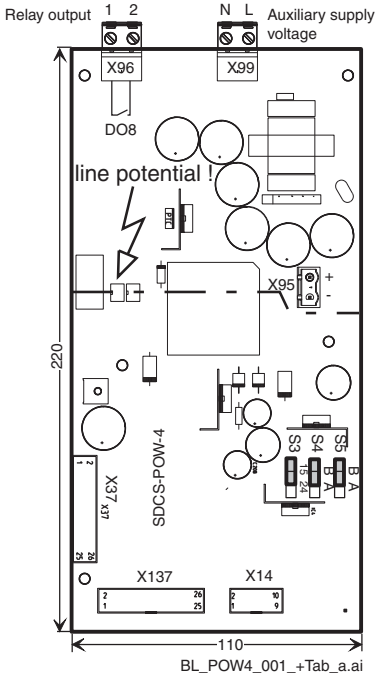
③

Jumper coding

S3 Encoder supply selection
S4
S5

	S3 S4 S5	Sense-function
5 V*	15V 24V B A B A	yes
12 V	15V 24V B A B A	yes
15 V	15V 24V B A B A	no
24 V	15V 24V B A B A	no

* default value



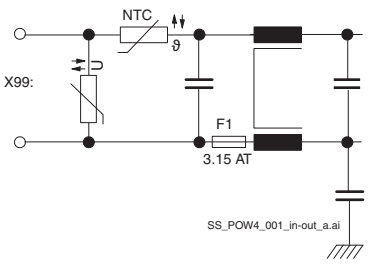
- X37 and X137 are connected in parallel
- X14 is used to connect the SDCS-PAR-1 in hard parallel converters

Auxiliary supply voltage X99

Supply voltage	115 V_{AC}	230 V_{AC}
Tolerance	-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
Inrush current *	20 A / 20 ms	10 A / 20 ms
Recommended fusing	6 AT	6 AT
Mains buffering	min. 30 ms	min. 300 ms
Powerfail	95 V	95 V

* Frequently switching ON and OFF increases the inrush current

Input circuit X99 on SDCS-POW-4



Relay output X96 (DO8)

Isolated by relay (NO contact)
Contact ratings: **AC**: ≤ 250 V~ / ≤ 3 A~
DC: ≤ 24 V- / ≤ 3 A- or
≤ 115 / 230 V- / ≤ 0.3 A-
MOV-protected (275 V)

Interface board SDCS-PIN-4 / SDCS-PIN-4b

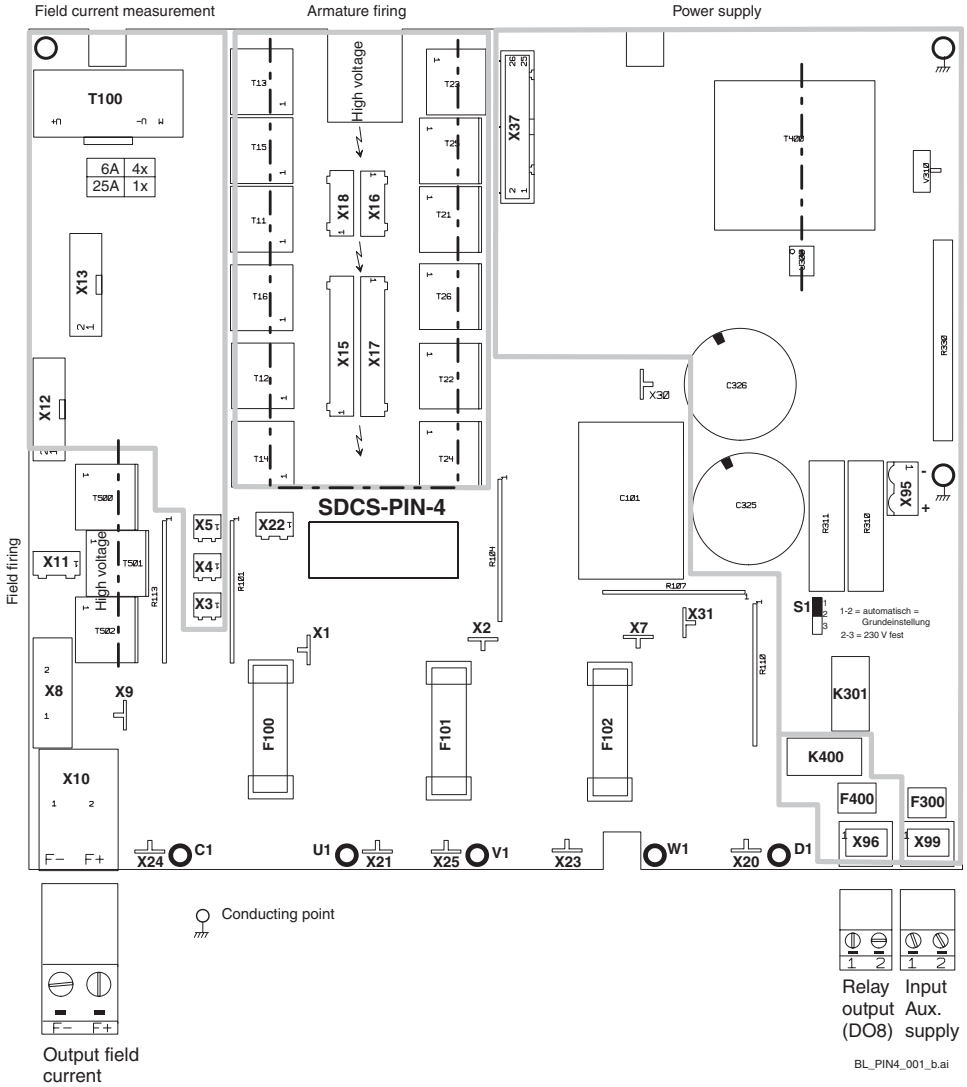
General

The SDCS-PIN-4 / SDCS-PIN-4b is designed for DCS800 converter modules sizes D1 to D4+ (20 A - 1190 A).
It has three different functions:

1. The power supply for all small voltages of the whole drive and the connected options (D1 - D4+).
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 (D1 - D4+).
3. Control of the OnBoard field exciter and field current measurement (D1 - D4).

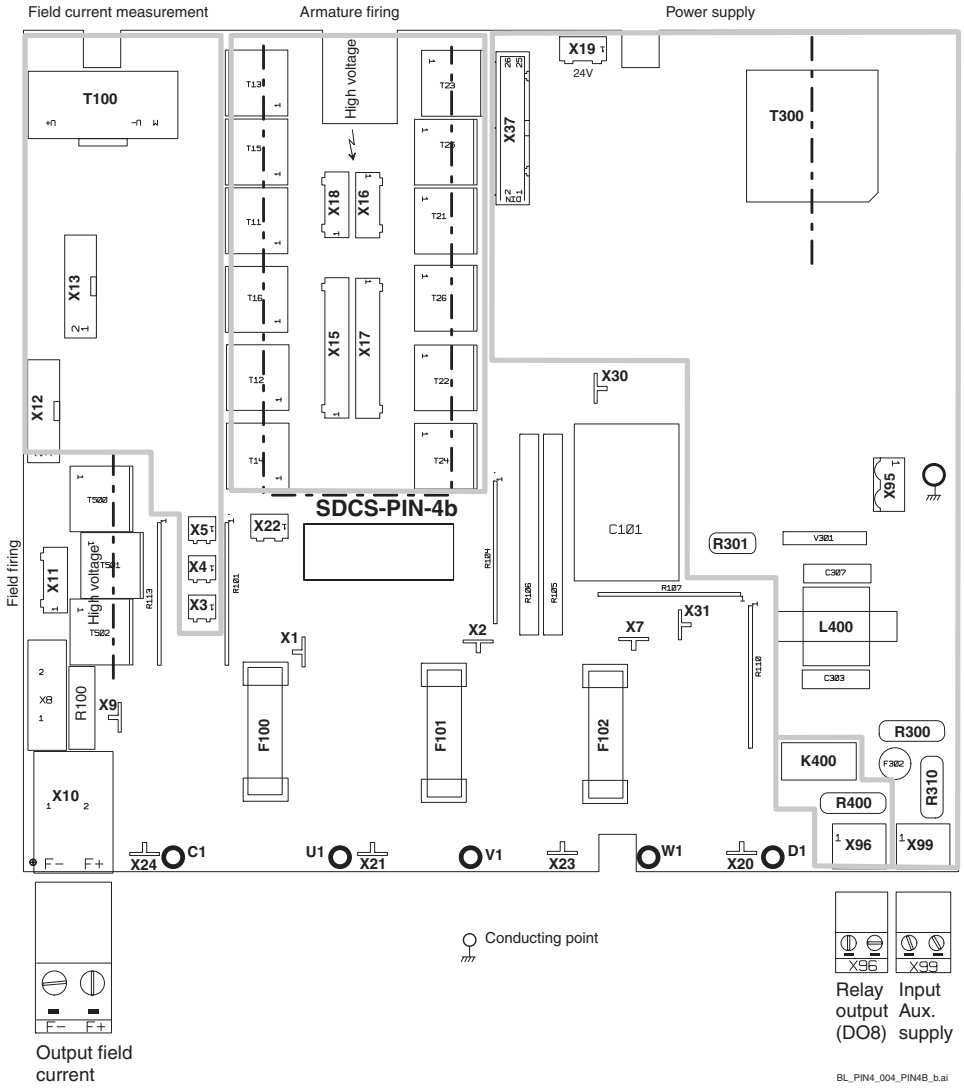
The board is connected to ground at points (⏚) inside the module.
The board is used for mains supply voltages from 230 V up to 525 V and 600 V.
The DCS800 provides an automatic adjustment for current and voltage measurement, burden resistor settings and 2-Q or 4-Q operation by means of setting parameters in the firmware.

Layout SDCS-PIN-4



Layout SDCS-PIN-4

Layout SDCS-PIN-4b



Layout SDCS-PIN-4b

Power supply

SDCS-PIN-4:

The SDCS-PIN-4 automatically adapts the auxiliary voltage of either 230 V_{AC} or 115 V_{AC} and switches relay K301 in case of jumper setting S1 = 1-2.

In case of varying 230 V_{AC} input voltage (e.g. diesel generator network) the operation must be fixed to 230 V_{AC} by setting jumper S1 = 2-3.

SDCS-PIN-4b:

The SDCS-PIN-4b automatically adapts the auxiliary voltage of either 230 V_{AC} or 115 V_{AC}.

Technical data

Auxiliary incoming power X99

Auxiliary voltage	115 V_{AC}	230 V_{AC}	230 V_{DC} (SDCS-PIN-4b only)
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. 30 ms (SDCS-PIN-4) min. 300 ms (SDCS-PIN-4b)	min. 150 ms
Powerfail	< 95 V_{AC}	< 185 V_{AC} (SDCS-PIN-4) < 95 V_{AC} (SDCS-PIN-4b)	< 140 V_{DC}

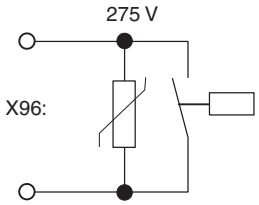
Jumper S1 (SDCS-PIN-4 only)

1-2: Automatic detection of auxiliary voltage (default). Either 115 V_{AC} or 230 V_{AC}.

2-3: Auxiliary voltage is fixed to 230 V_{AC}.

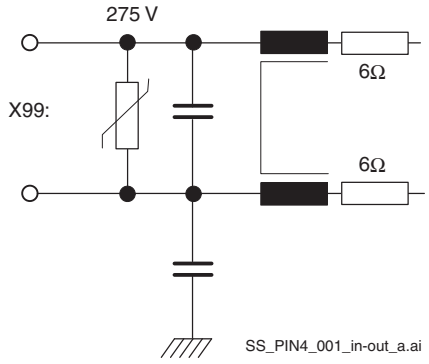
Relay output X96 (DO8)

Isolated by relay (normally open contact)
Contact ratings: **AC**: 250 V~ / ≤ 3 A~
DC: 24 V- / ≤ 3 A- or
115 / 230 V- / ≤ 0.3 A-



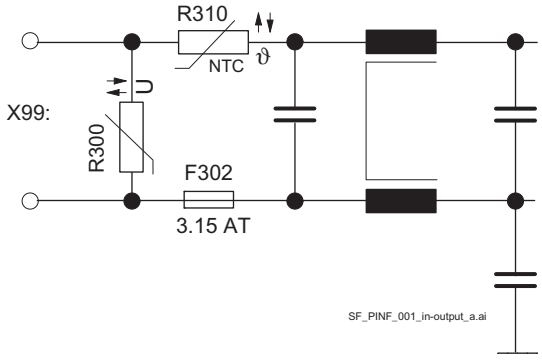
Input circuit X99

SDCS-PIN-4:



SDCS-PIN-4b:

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 interface (D1 - D4)

The OnBoard field exciter is located internally. The firing pulses are synchronized using the mains circuit L1, L2, L3 and the SDCS-CON-4. The pulses are amplified on the SDCS-PIN-4 / SDCS-PIN-4b. 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 D3 and D4 converters for 600 V are always delivered without OnBoard field exciter.
- Size D4+ converters do not use the field circuit interface on the SDCS-PIN-4 / SDCS-PIN-4b.

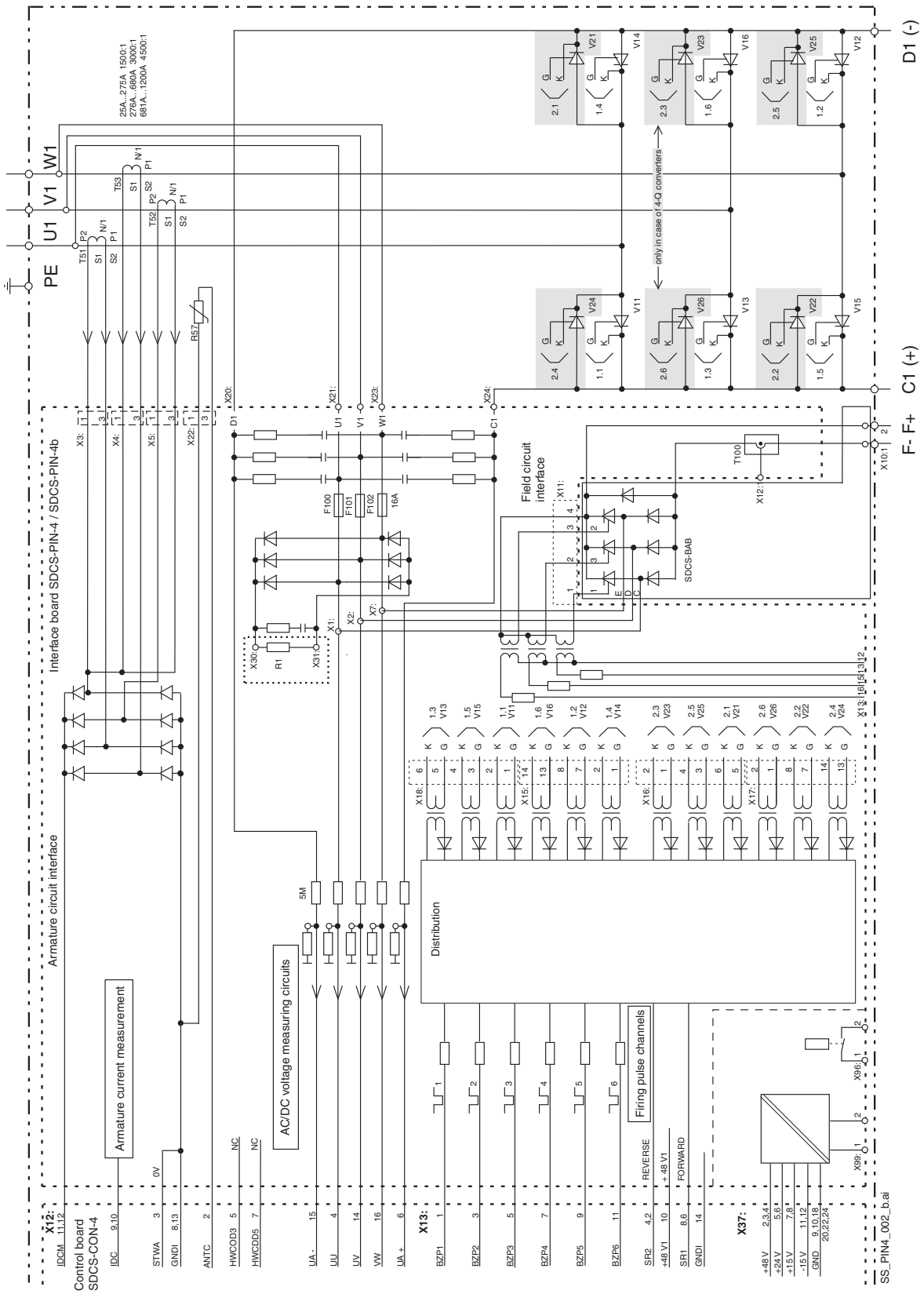
Ratings OnBoard field exciter

AC voltage range	110 - 525 V
AC insulation voltage	600 V
Frequency	50 Hz / 60 Hz
AC input current	< Field current
Minimum field current	300 mA

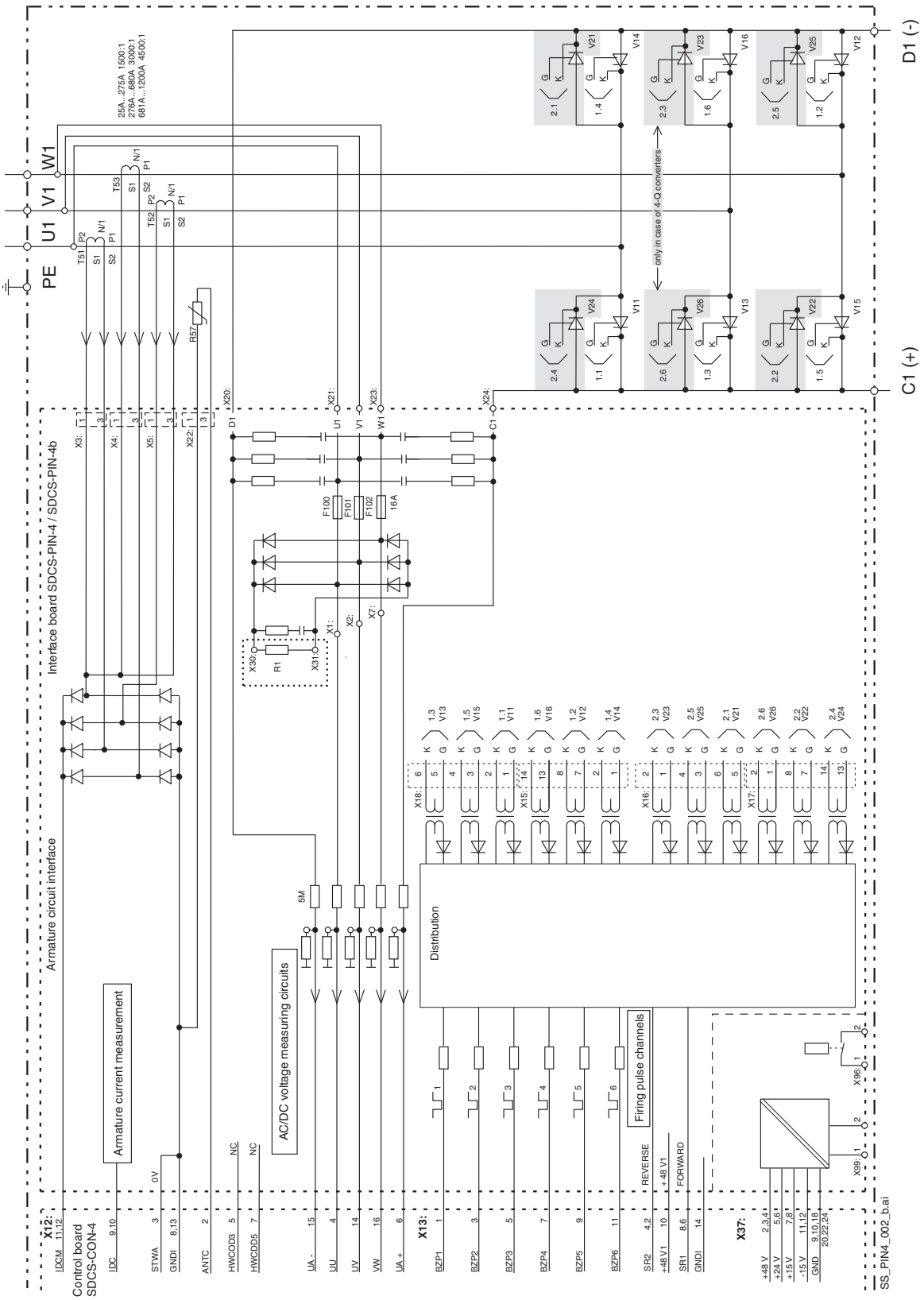
Cables

Size	D1	D2	D3	D4
DC output current	6 A	15 A	20 A	25 A
max. cross sectional area	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
Fuse type	KTK - 25			

Typical thyristor converter diagram with SDCS-PIN-4 / SDCS-PIN-4b for D1 - D4 converter.



Typical thyristor converter diagram with SDCS-PIN-4 / SDCS-PIN-4b for D4+ converter.



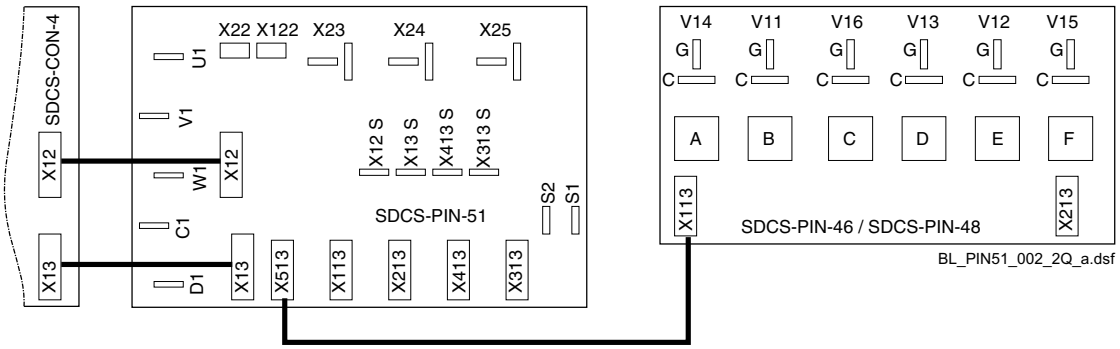
SDCS-PIN-51, SDCS-PIN-46, SDCS-PIN-48 interface to the power part

The interface to the power part of the converter modules size D5/D6/D7 from 900 A up to 5200 A consists of two boards, the measuring board SDCS-PIN-51 and the pulse transformer board SCDS-PIN-46 or SCDS-PIN-48.

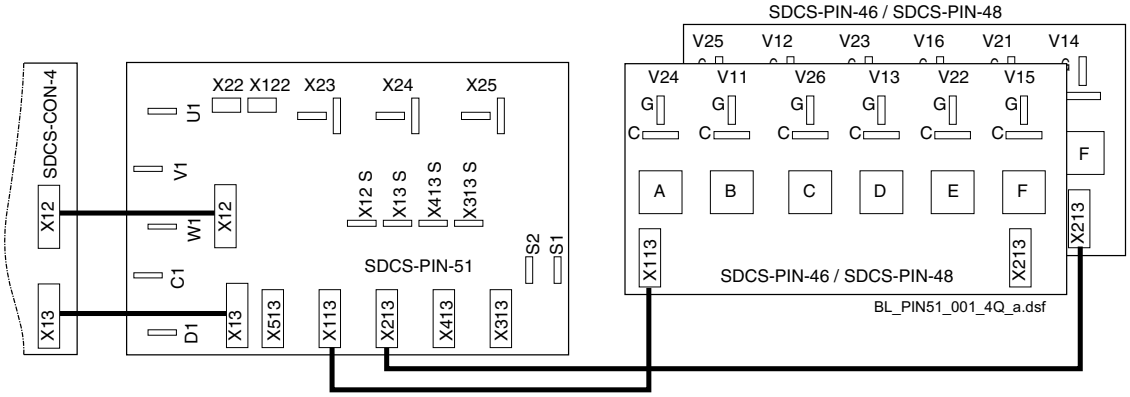
The following figures show the different connections between the SDCS-PIN-51 and SDCS-PIN-46 or SDCS-PIN-48 depending on 2-Q or 4-Q and the size.

The SDCS-PIN-46 is used for converters DCS800-S02-2500 and DCS800-S02-3000 (size D6).

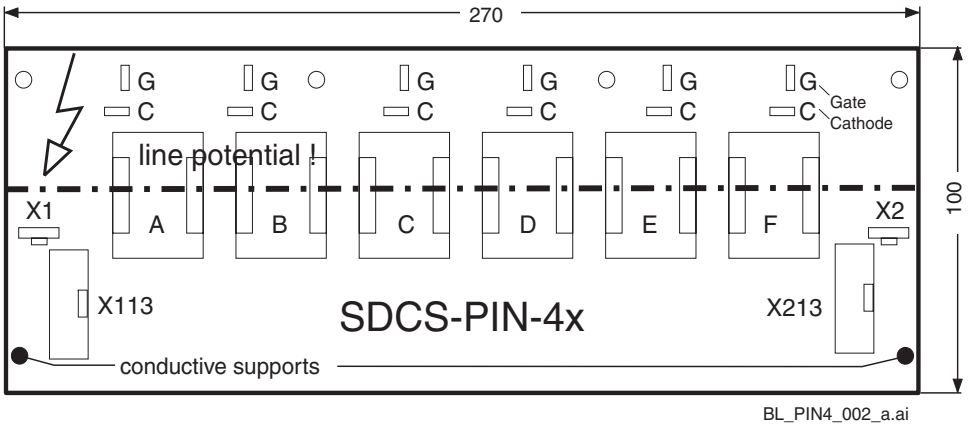
2-Q, no parallel thyristors, size D5/D6/D7



4-Q, no parallel thyristors, size D5/D6/D7



Layout of the SDCS-PIN-46 / SDCS-PIN-48



The board consists of six pulse transformers with amplifiers.

Measuring board SDCS-PIN-51

The SDCS-PIN-51 is always used together with a SDCS-PIN-4x. This board includes the circuits needed for current-, voltage- and temperature measurement and for hardware coding.

The current is measured by current transformers at the main AC inputs, rectified by a diode bridge and scaled by burden resistors. The nominal current is adjusted by cutting out resistors (R1 - R21) according to the current coding table.

Voltages U1, V1, W1, C1(+) and D1(-) are measured using high ohm resistors. Scaling of the AC and DC voltages is done by activating 1 MΩ resistors (= cutting out short circuit bridges, which are represented by zero ohm resistors).

The voltage measurement uses 5 resistors:

U1: W1 - W5
V1: W6 - W11
W1: W12 - W16
C1(+): W17 - W21
D1(-): W22 - W26

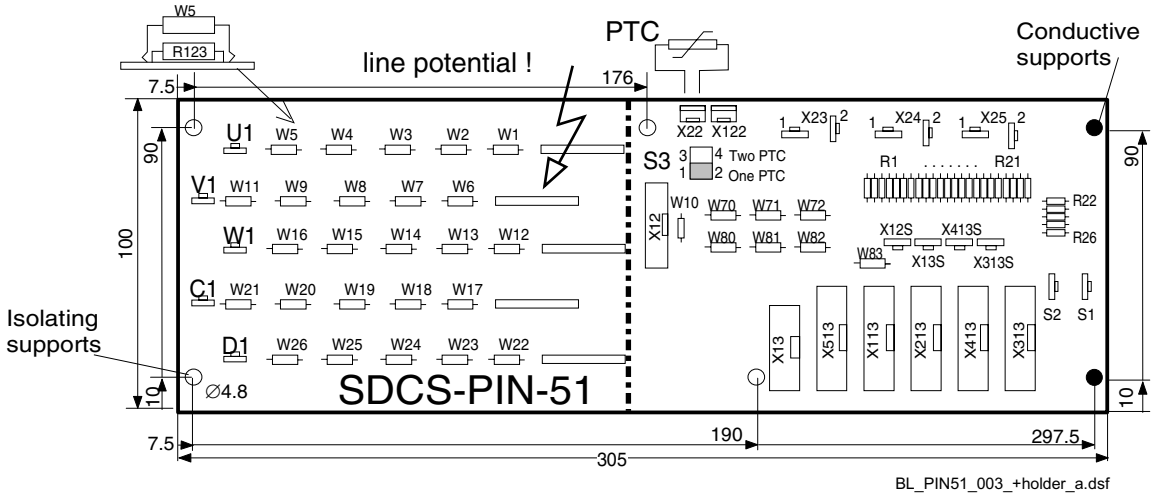
During a voltage adaptation, all 5 resistor chains must be cut the same way.

Residual measurement current of armature circuit to ground
= 5 mA at 500 V supply (≈ 1 MΩ)
= 5 mA at 1000 V supply (≈ 2 MΩ).

Note! The actual voltage signals U1, V1, W1, C1(+) and D1(-) are not galvanically isolated from the control board. Because of that a current of less than 1 mA will flow to ground.

For more information see chapter *Galvanic isolation*.

Layout of the SDCS-PIN-51



BL_PIN51_003_+holder_a.dsf

Settings of the SDCS-PIN-51 for converter size D5, D6, D7

Current coding

Size			D5				D6				D7					
Current transf. ratio			2500:1				2500:1				4000:1					
Rated current [A_{DC}] ①			900	1200	1500	2000	1900	2050	2500	3000	2050	2600	3300	4000	4800	5200
R1-R4	18 Ω	Rated current scaling	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖
R5	18 Ω		⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖
R6	18 Ω		⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖
R7	18 Ω		⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖
R8	18 Ω		⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖
R9	18 Ω		⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖
R10	18 Ω		⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖
R11	18 Ω		⊖✕⊖	⊖✕⊖	⊖✕⊖	⊖✕⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖
R12	18 Ω		⊖✕⊖	⊖✕⊖	⊖✕⊖	⊖✕⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖
R13	18 Ω		⊖✕⊖	⊖✕⊖	⊖✕⊖	⊖✕⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖
R14	18 Ω		⊖✕⊖	⊖✕⊖	⊖✕⊖	⊖✕⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖
R15	18 Ω		⊖✕⊖	⊖✕⊖	⊖✕⊖	⊖✕⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖
R16	18 Ω		⊖✕⊖	⊖✕⊖	⊖✕⊖	⊖✕⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖
R17	33 Ω		⊖✕⊖	⊖✕⊖	⊖✕⊖	⊖✕⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖
R18	68 Ω		⊖✕⊖	⊖✕⊖	⊖✕⊖	⊖✕⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖
R19	120 Ω		⊖✕⊖	⊖✕⊖	⊖✕⊖	⊖✕⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖
R20	270 Ω		⊖✕⊖	⊖✕⊖	⊖✕⊖	⊖✕⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖
R21	560 Ω		⊖✕⊖	⊖✕⊖	⊖✕⊖	⊖✕⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖
R22	47 Ω	Zero current detection	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖
R23	47 Ω		⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖
R24	47 Ω		⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖
R25	47 Ω		⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖
R26	100 Ω		⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖

① Rated current see the name plate of the converter

Voltage coding

Size	D5			D6 / D7				D7	
Conv. nom. voltage [V] U1 [V_{AC}] ①	Y=4 (400 V) Y=5 (500 V)	Y=6 (600 V)	Y=7 (690 V)	Y=4 (400 V) Y=5 (500 V)	Y=6 (600 V)	Y=7 (690 V)	Y=8 (800 V)	Y=10 (1000 V)	Y=12 (>1000 V)
Voltage measurement scaled by type code or parameter (97.03)	500 V	600 V	690 V	500 V	600 V	690 V	800 V	1000 V	
Measuring board	SDCS-PIN-51								see chapter Galvanic isolation
W1, 6, 12, 17, 22	⊖—⊖	⊖✕⊖	⊖✕⊖	⊖—⊖	⊖✕⊖	⊖✕⊖	⊖✕⊖	⊖✕⊖	
W2, 7, 13, 18, 23	⊖—⊖	⊖—⊖	⊖✕⊖	⊖—⊖	⊖—⊖	⊖✕⊖	⊖✕⊖	⊖✕⊖	
W3, 8, 14, 19, 24	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖✕⊖	⊖✕⊖	
W4, 9, 15, 20, 25	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖✕⊖	
W5, 11, 16, 21, 26	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖—⊖	⊖✕⊖	

① Rated voltage see the name plate of the converter

TL_PIN51_001_a.ai

The converters can be used at lower mains voltage as specified without hardware modifications, if the mains voltage connected to the converter is not lower than 45 % for voltages ≥ 500 V and not lower than 55 % for voltages < 500 V.

Temperature sensor coding

Temperature sensor (R57) for D5, D6, D7	
S3	4 ○ ○ 3 2 ○—○ 1

Indicates the original hardware

⊖—⊖

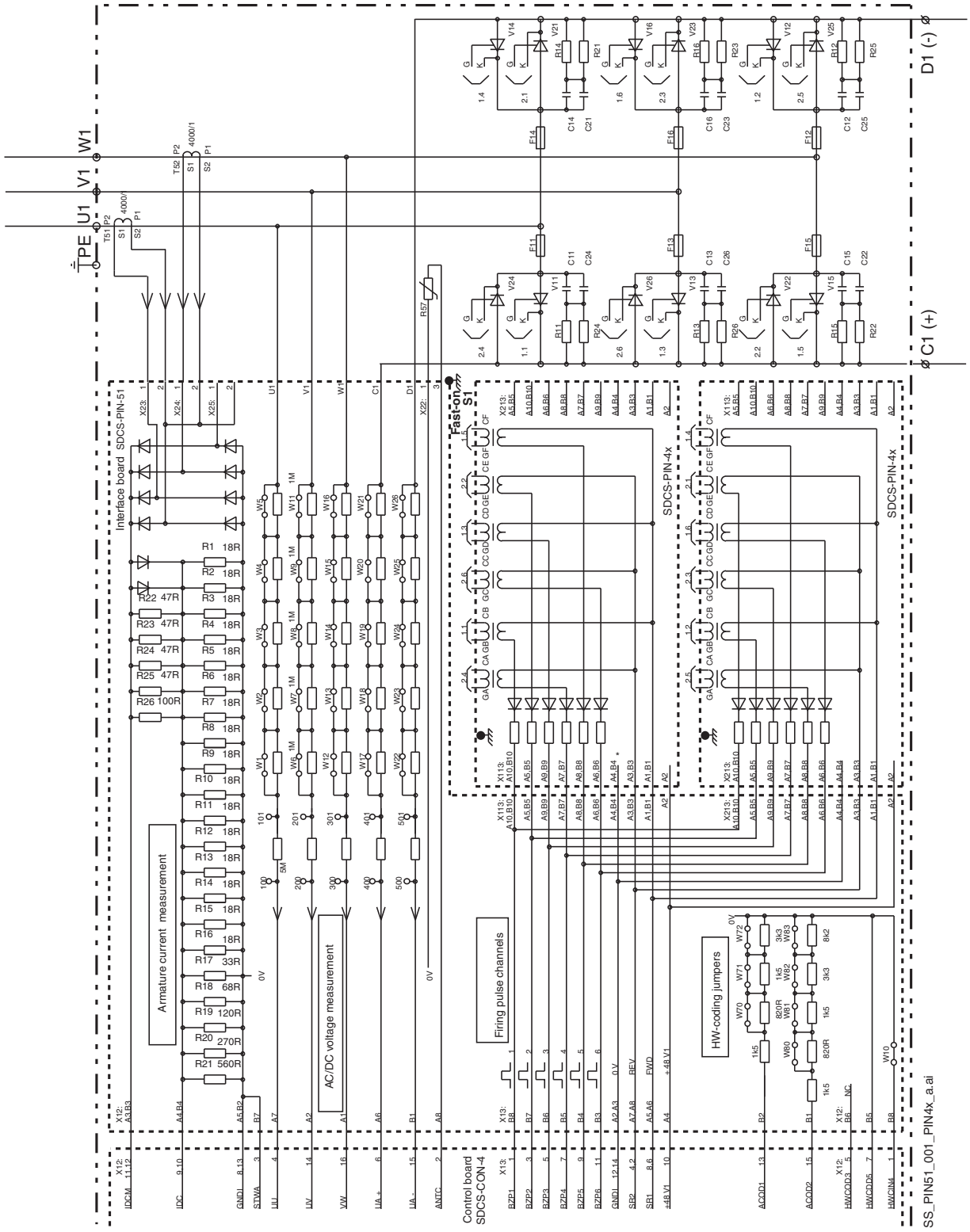
Board used as a spare part:

- Default: all jumpers Wxx, Rxx are in ⊖—⊖ condition.
- Ensure the correct settings before the board is used.

Indicates a removed resistor or zero ohm resistor

⊖✕⊖

Typical armature circuit thyristor converter diagram with SDCS-PIN-51 and SDCS-PIN-46 or SDCS-PIN-48 for a 4-Q D5, D6, D7 converter.



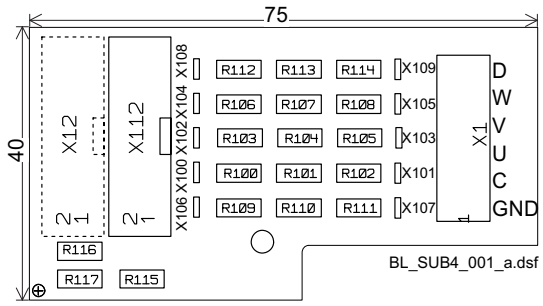
Interface board SDCS-SUB-4

General

The SDCS-PIN-4 / SDCS-PIN-4b measures the line voltage and DC voltage via high ohmic resistors. Typical 5 MOhm for 500 V units of size D1 - D4+.

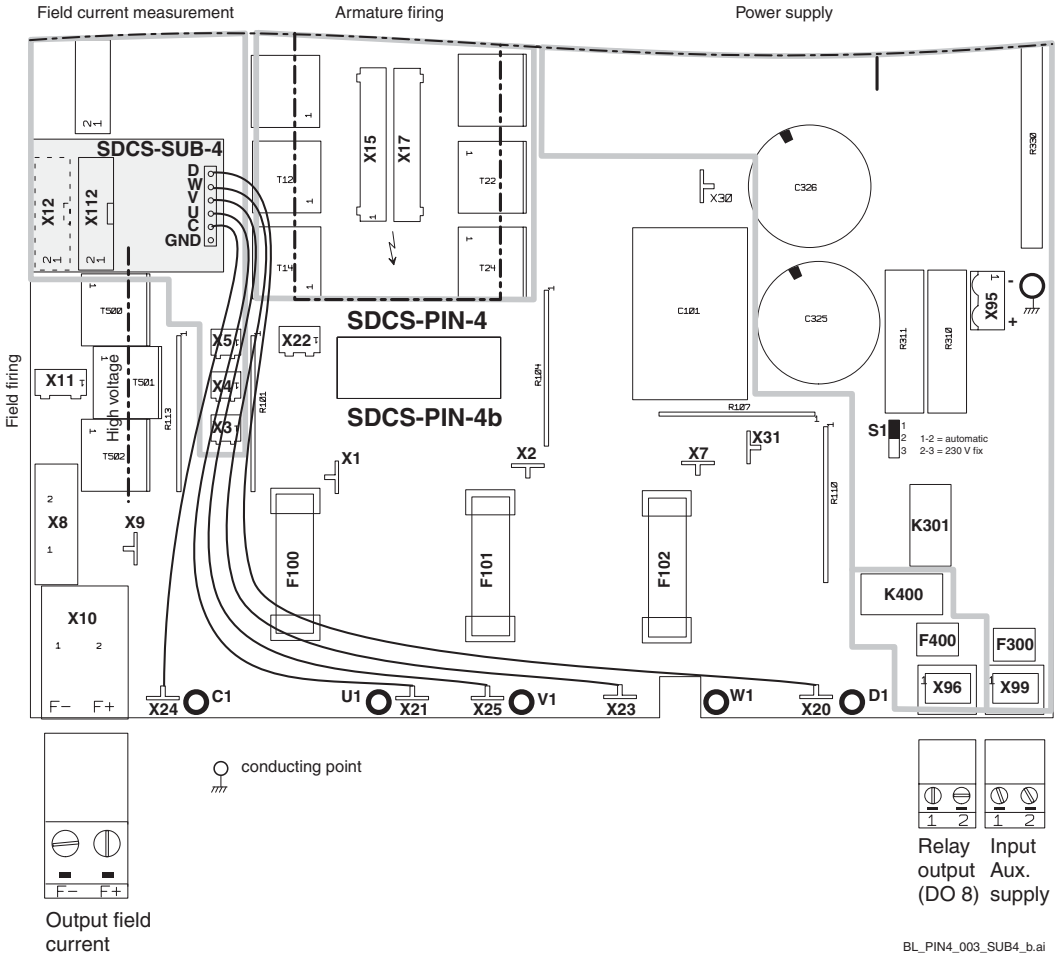
Line voltages below 100 V must be adapted using smaller resistance and thus the measurement channel must be rescaled. The rescaling provides improved mains synchronization and a better DC measurement resolution of small voltages.

The SDCS-SUB-4 provides the needed voltage scaling. The default selection is 1.17 MOhm for a maximum mains voltage of 120 V. The maximum measurement voltage scale is 200 V. Adjust the voltage scaling parameter according to the table below.



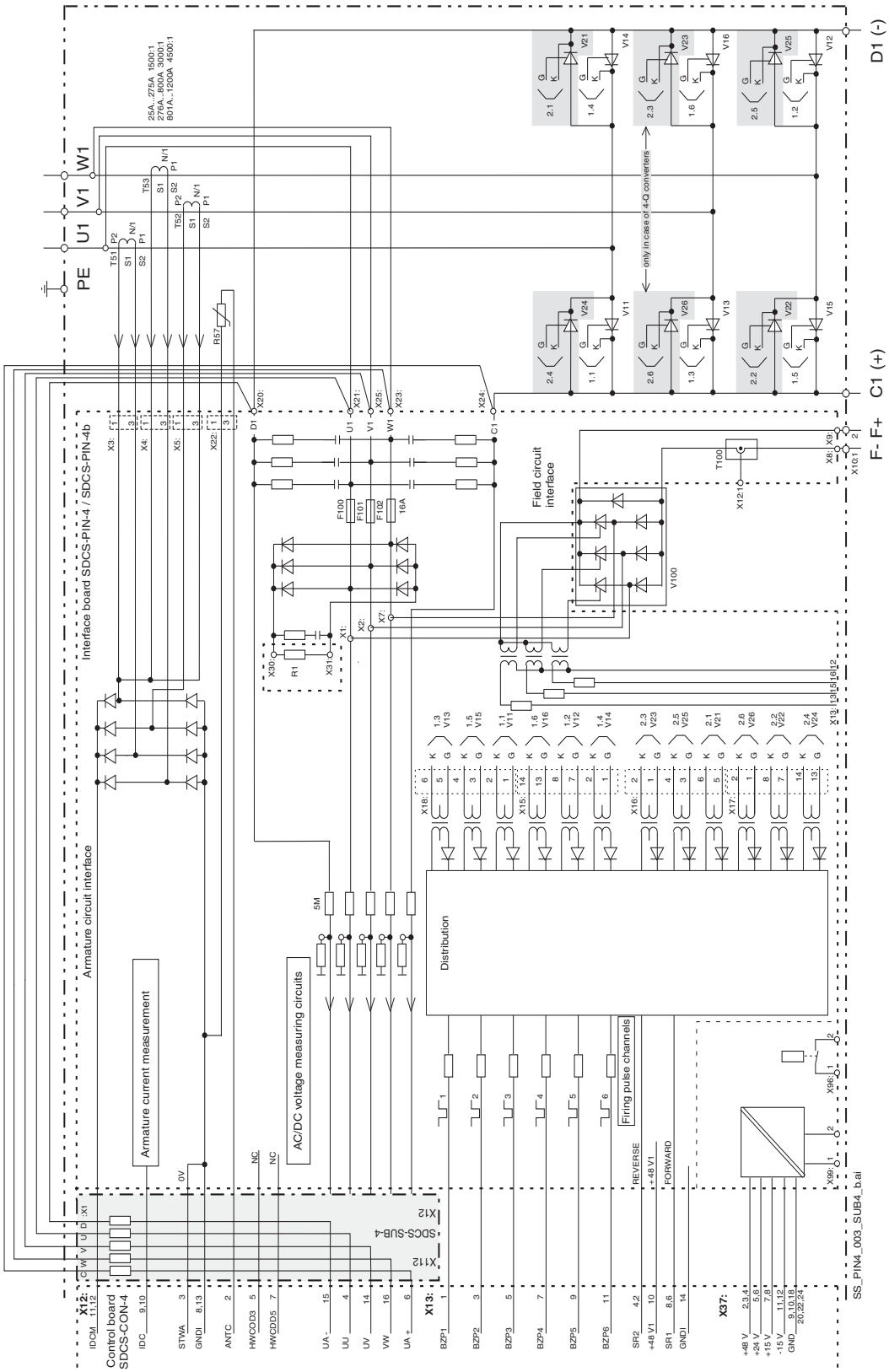
Mains voltage	Chain R_C, R_D	Setting (97.03)	Size
30 - 120 V	about 1.17 MOhm	117 V	D1 - D4+

Example: chain R_C = R109 + R110 + R111

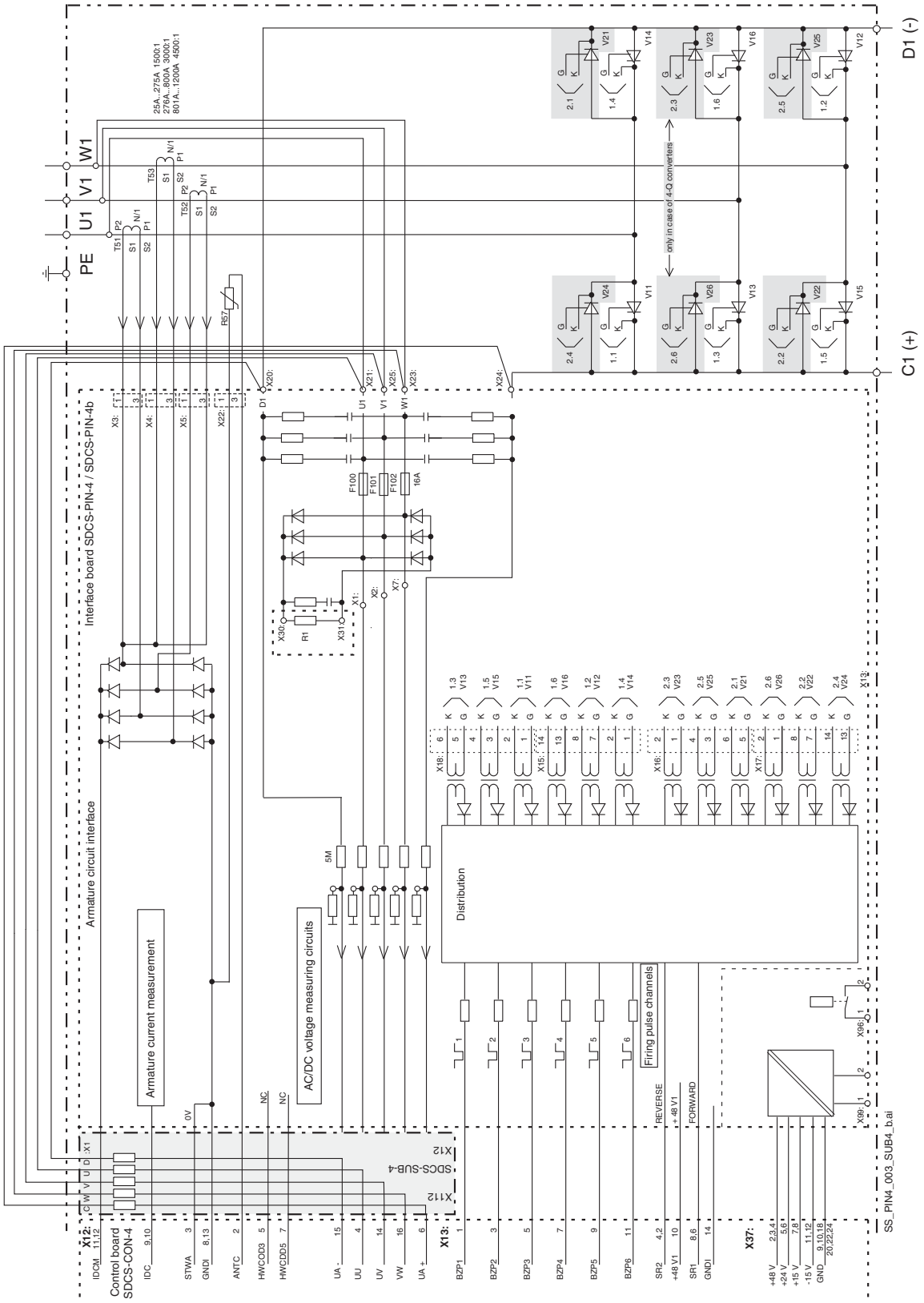


Layout of the SDCS-SUB-4 and its location on the SDCS-PIN-4 / SDCS-PIN-4b

Typical armature circuit thyristor converter diagram with SDCS-PIN-4 / SDCS-PIN-4b and SDCS-SUB-4 for D1 - D4 converter.



Typical armature circuit thyristor converter diagram with SDCS-PIN-4 / SDCS-PIN-4b and SDCS-SUB-4 for D4+ converter.



Galvanic isolation - T90, A92, F11, F90

The Galvanic isolation is an option for converters size D5, D6, D7 and rated voltages ≤ 1000 V. For converters with a rated AC voltage of > 1000 V or 12-pulse serial > 2 x 500 V galvanic isolation must be used. It is used to replace the high-ohmic voltage measurement and gives the advantage of a total isolation between power part and drive electronics.

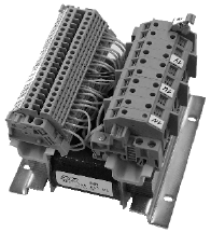
The transformer T90 and the DC-DC transducer A92 are located outside the converter module. The internal AC and DC voltage measurement channels are removed and connected to T90 and A92.

DC-DC transducer A92



P42000D3-0111 (3ADN260008P0001) or P42001D3 (3ADV050096P0007)

Transformer T90



3ADT745047P0001

SDCS-PIN-51-1190



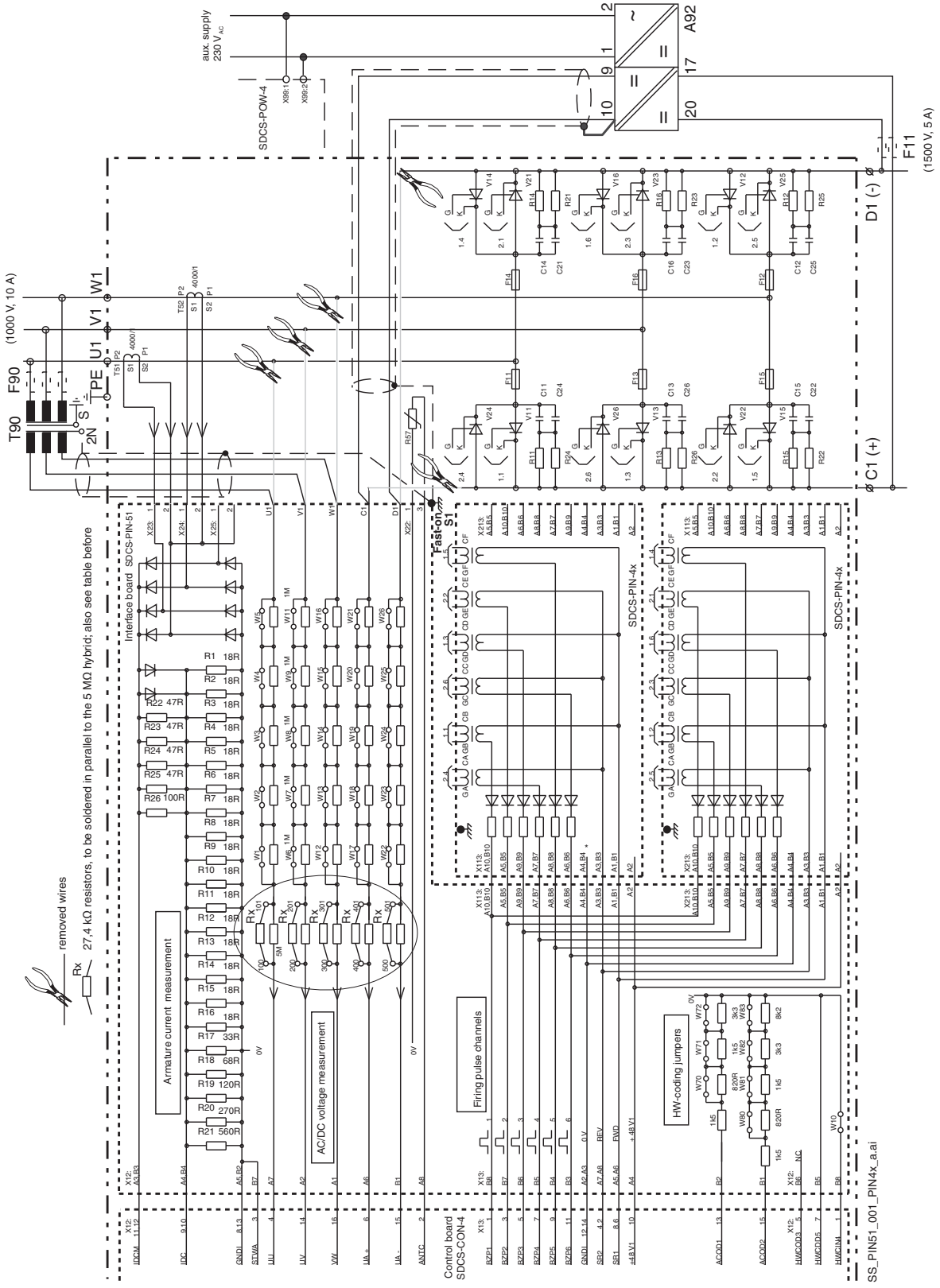
3ADT780007R0002

Hardware and firmware settings:

Voltage coding						
Size	**D5 / D6 / D7**					
Con. nom. voltage [V] U1 [V_{AC}] ①	Y = 4 (400 V) Y = 5 (500 V)	Y = 6 (600 V)	Y = 7 (690 V)	Y = 8 (800 V)	Y = 10 (1000 V)	Y = 12 (1200 V)
Rated mains voltage [V_{AC}]	230 - 500	270 - 600	315 - 690	360 - 800	450 - 1000	540 - 1200
Voltage measurement scaled by type code or parameter (97.03)	500	600	690	800	1000	1200
Measuring board	**SDCS-PIN-51-1190 (3ADT780007R0002)**					
Resistors **W1 - W26**						
Resistors **R_x** [kOhm]	27.4					
Galvanic isolation						
Fuse **F11**	1500 V, 5 A					
DC-DC transducer **A92** (1)	**P42000D3-0111 (3ADN260008P0001)**					
Switch position R_G	**0** (675 V)	**1** (810 V)	**2** (945 V)	**3** (1080 V)	**5** (1350 V)	**6** (1620 V)
DC-DC transducer **A92** (2)	**P42001D3 (3ADV050096P0007)**					
Switch position R_G	**-**	**-**	**-**	**-**	**A** (1400 V)	**B** (1600 V)
Fuse **F90**	1000 V, 10 A					
Transformer **T90**	**3ADT745047P0001**					
Secondary Terminals	2U1 2V1 2W1 2N	2U2 2V2 2W2 2N	2U3 2V3 2W3 2N	2U4 2V4 2W4 2N	2U5 2V5 2W5 2N	2U6 2V6 2W6 2N

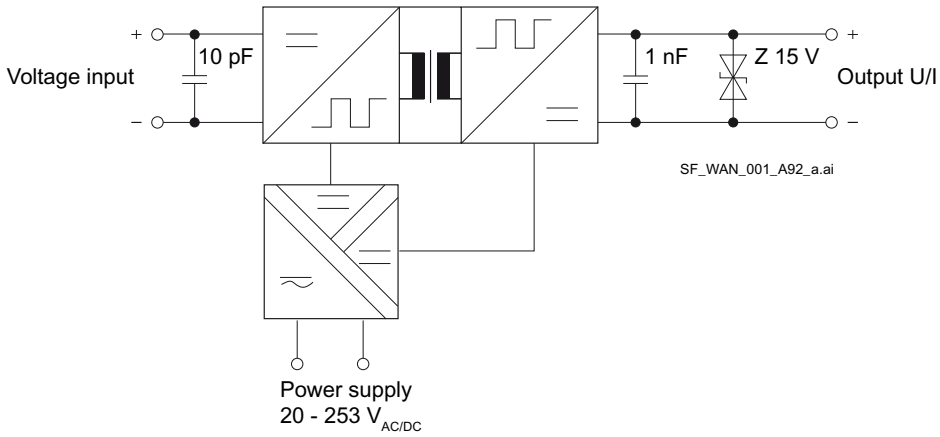
① Rated voltage see the name plate of the converter.
For 12-pulse configurations consult the *DCS800 12-pulse Manual*.

Typical armature circuit thyristor converter diagram with SDCS-PIN-51 and SDCS-PIN-4x for a 4-Q D5, D6, D7 converter with galvanic isolation.



DC-DC transducer A92 (1)

Principle circuit diagram of the DC-DC transducer A92 (1)



Data

Selectable voltage gains	675	810	945	1080	1350	1620	V_{DC}
Switch position	0	1	2	3	5	6	-

Output voltage:	20 mA; ±10 V; 4 - 20 mA
Auxiliary power:	20 - 253 $V_{AC/DC}$; 50/60 Hz; 3 W
Clearance in air:	Auxiliary power to Output: > 13 mm Input / Output to Auxiliary power: > 14 mm
Insulation voltage:	2200 V
Insulation test voltage:	10 kV_{AC}
Ambient temperature range:	-10 to +70°C
Weight:	appr. 500 g



(P42000D3-0111)

The voltage gain and frequency response is especially designed for DCS800 converters.

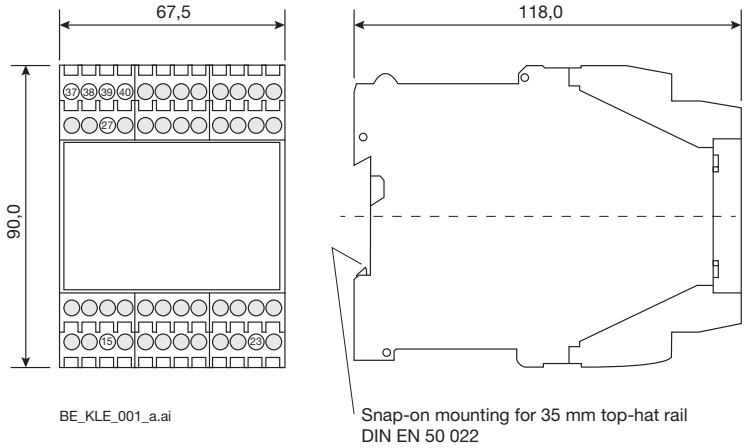
Dimensions in mm

Terminal assignments:

15 Voltage input -
23 Voltage input + (≤ 3600 V)

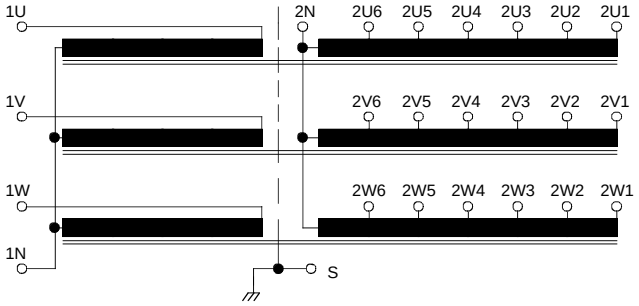
27 Power supply AC/DC
28 Power supply AC/DC

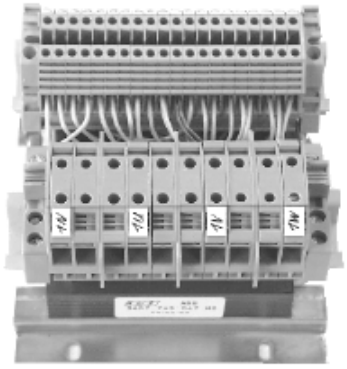
37 Current output +
38 Voltage output +
39 Current output -
40 Voltage output -



Transformer T90

Principle diagram of the transformer T90



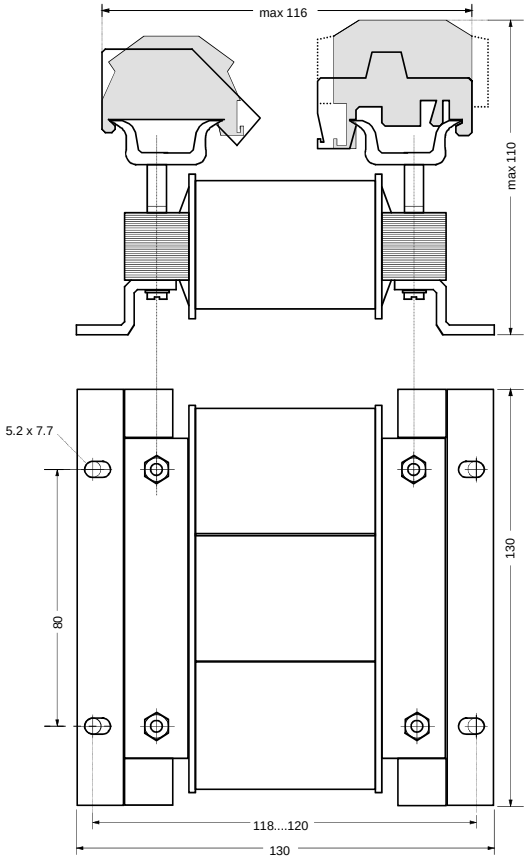


(3ADT745047)

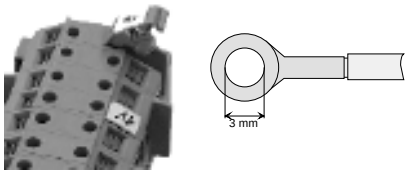
Data

Selectable transfer ratios U_{prim}:	500, 600, 690, 800,1000, 1200 V_{AC} rms
Output voltage:	7.3 V_{AC} rms
Insulation voltage:	1200 V
Isolation test voltage:	3500 V
Ambient temperature range:	- 10 to + 70 °C
Weight:	2.1 kg

Dimensions in mm



Note:
The terminals on the primary side of the transformer are a special lug terminal design.
Handling hints:
First turn the screw counter-clockwise to the end stop, then swing out the shrowding cover. Put in the cable lug, swing in the shrowding cover and fasten the connection by turning the screw clockwise.



Dimensions and weights

See the dimensional drawings of the DCS800 below. The dimensions are in milllimeters.

Size D1

DCS800-S01-0020
DCS800-S01-0045
DCS800-S01-0065
DCS800-S01-0090
DCS800-S01-0125

DCS800-S02-0025
DCS800-S02-0050
DCS800-S02-0075
DCS800-S02-0100
DCS800-S02-0140

Size D2

DCS800-S01-0180
DCS800-S01-0230

DCS800-S02-0200
DCS800-S02-0260

Size D3

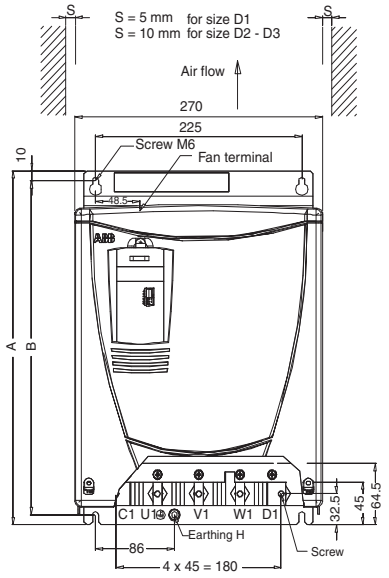
DCS800-S01-0315
DCS800-S01-0405
DCS800-S01-0470

DCS800-S02-0350
DCS800-S02-0450
DCS800-S02-0520

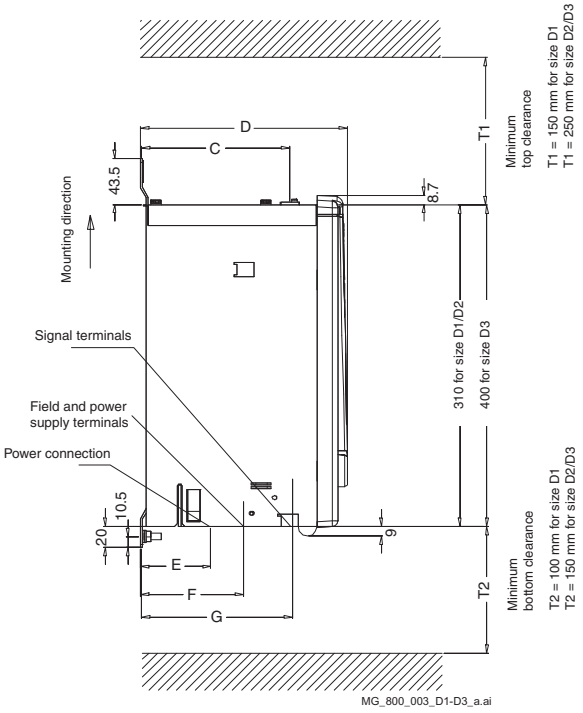
600 V Units

DCS800-S01-0290
DCS800-S02-0320

Size	h * w * d [mm]	h * w * d [inch]	weight [kg]	weight [lbs]
D1	370*270*200	14.56*10.65*7.90	11	25
D2	370*270*270	14.56*10.65*10.65	16	36
D3	459*270*310	18.07*10.65*12.25	25	56
D4	644*270*345	25.35*10.65*13.60	38	84
D4+	750*270*372	29.60*10.65*14.70	55	122
D5	1050*510*410	41.35*20.10*16.15	110	243
D6	1750*460*410	68.90*18.15*16.15	180	397
D7	1750*760*570	68.90*29.95*22.45	315	695



Size	A	B	C	D	E	F	G	H
D1	370	350	142	200	67	98	145	M6
D2	370	350	209	267	121,5	163,5	212	M10
D3	459	437,5	262,5	310	147,5	205	252	M10



Size D4

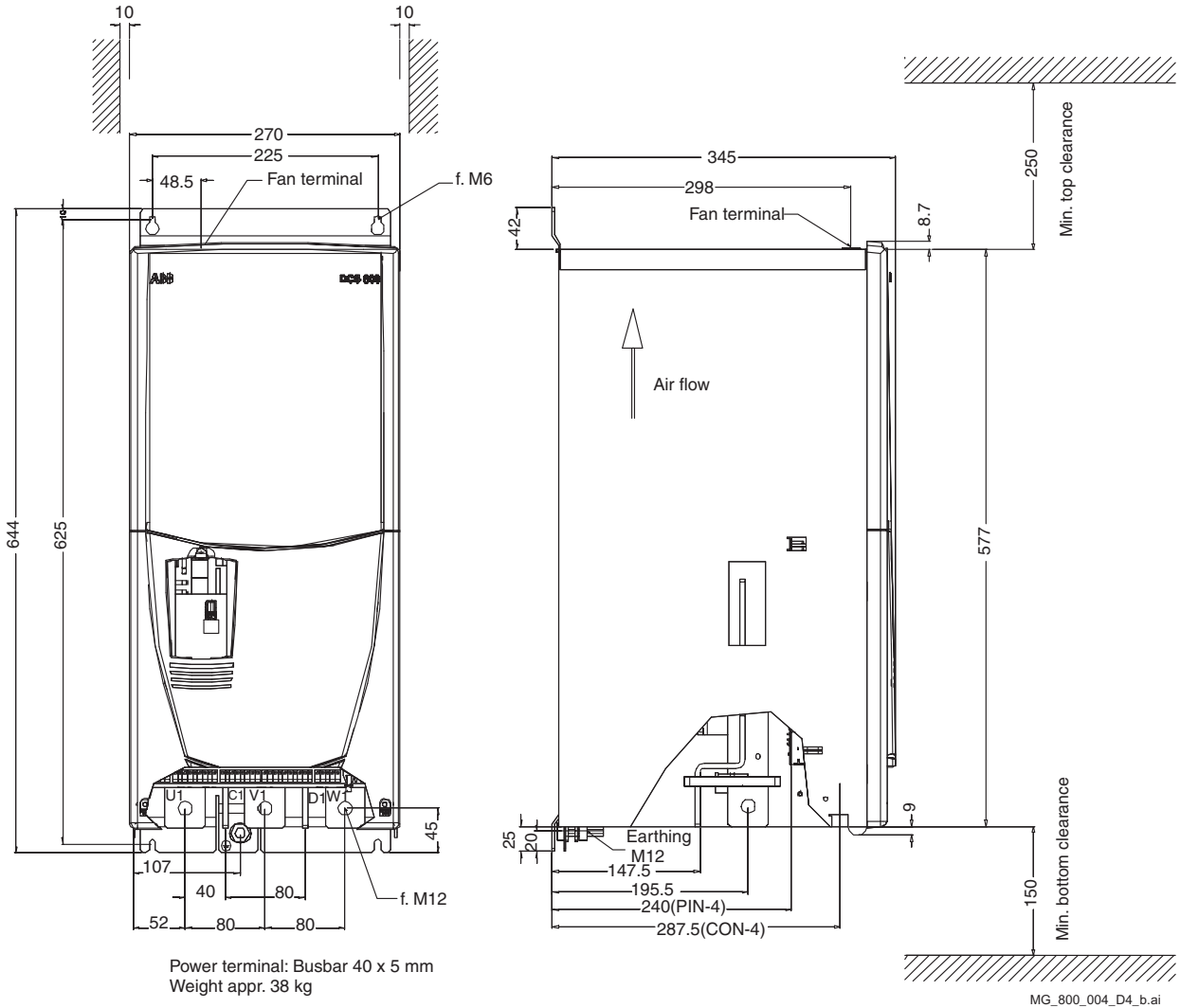
DCS800-S01-0610
DCS800-S01-0740
DCS800-S01-0900

DCS800-S02-0680
DCS800-S02-0820
DCS800-S02-1000

600 V Units

DCS800-S01-0590
DCS800-S02-0650

Weight appr. 38 kg



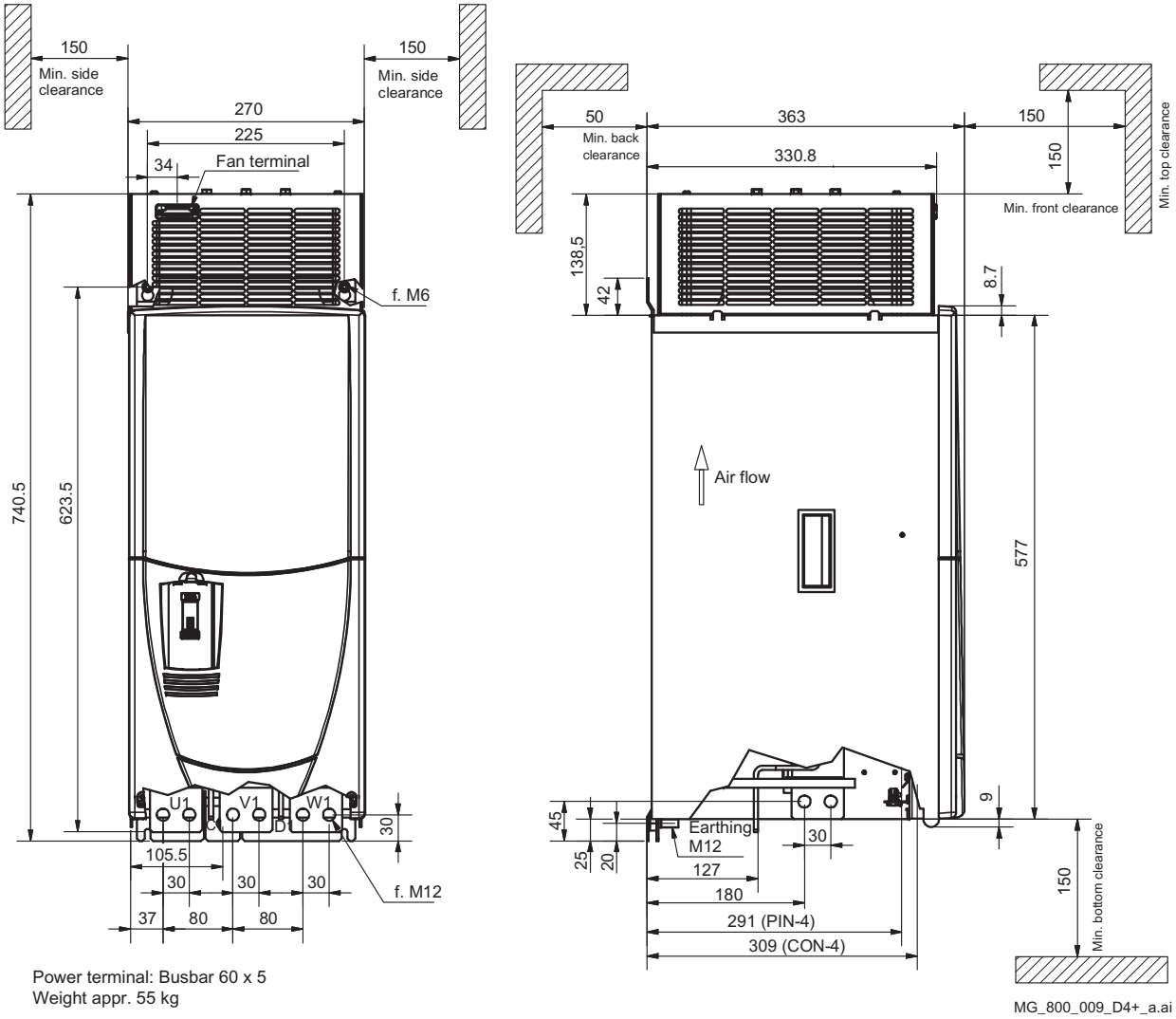
Power terminal: Busbar 40 x 5 mm
Weight appr. 38 kg

Size D4+

DCS800-S01-1190

DCS800-S02-1190

Weight appr. 55 kg



Power terminal: Busbar 60 x 5
Weight appr. 55 kg

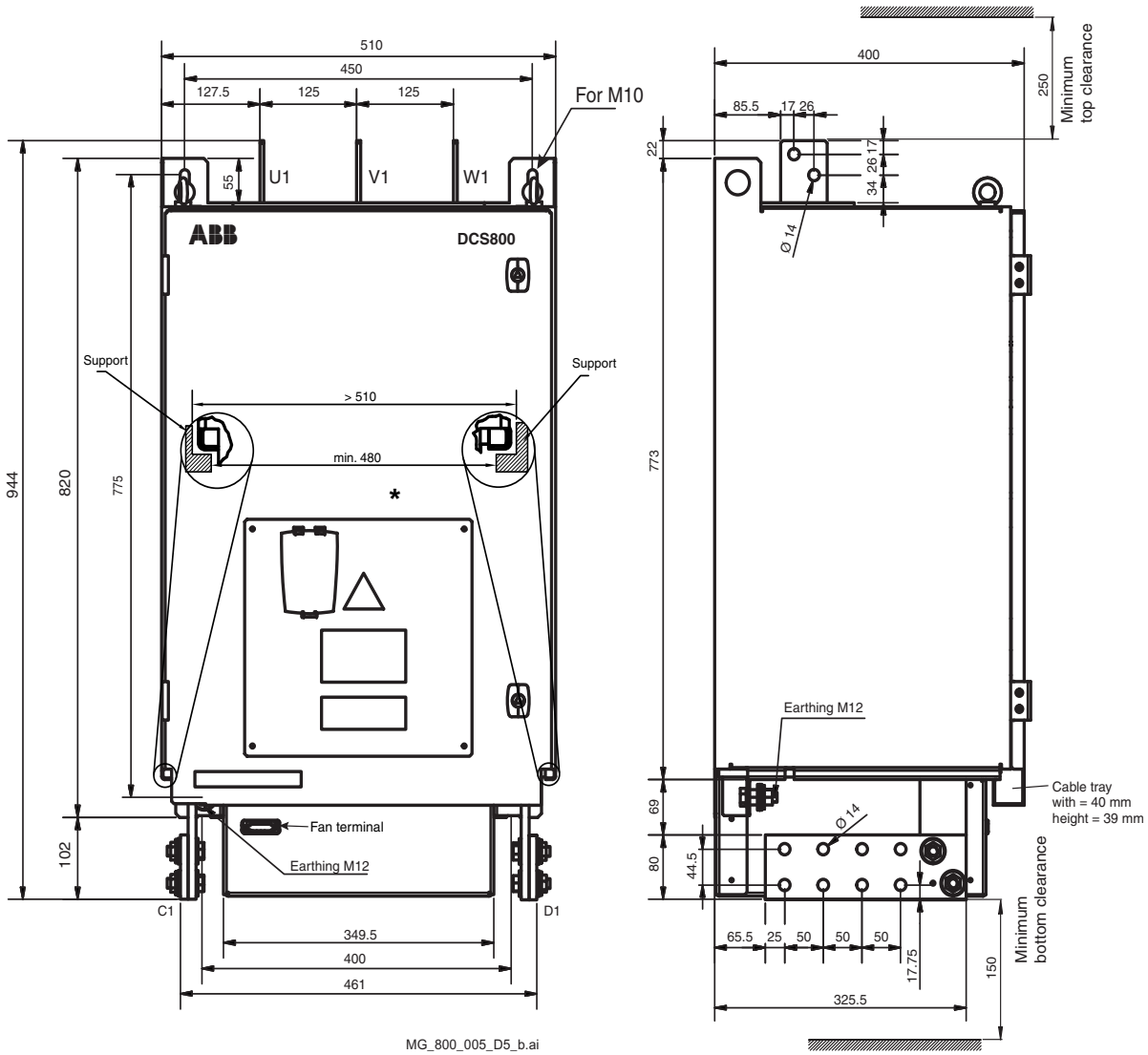
MG_800_009_D4+_a.ai

Size D5

DCS800-S0x-0900-xxb
DCS800-S0x-1200-xxb
DCS800-S0x-1500-xxb
DCS800-S0x-2000-xxb

Busbars in mm:
DC: 80 x 10
AC: 60 x 5

Weight appr. 110 kg



Mounting the converter module D5 inside cabinet

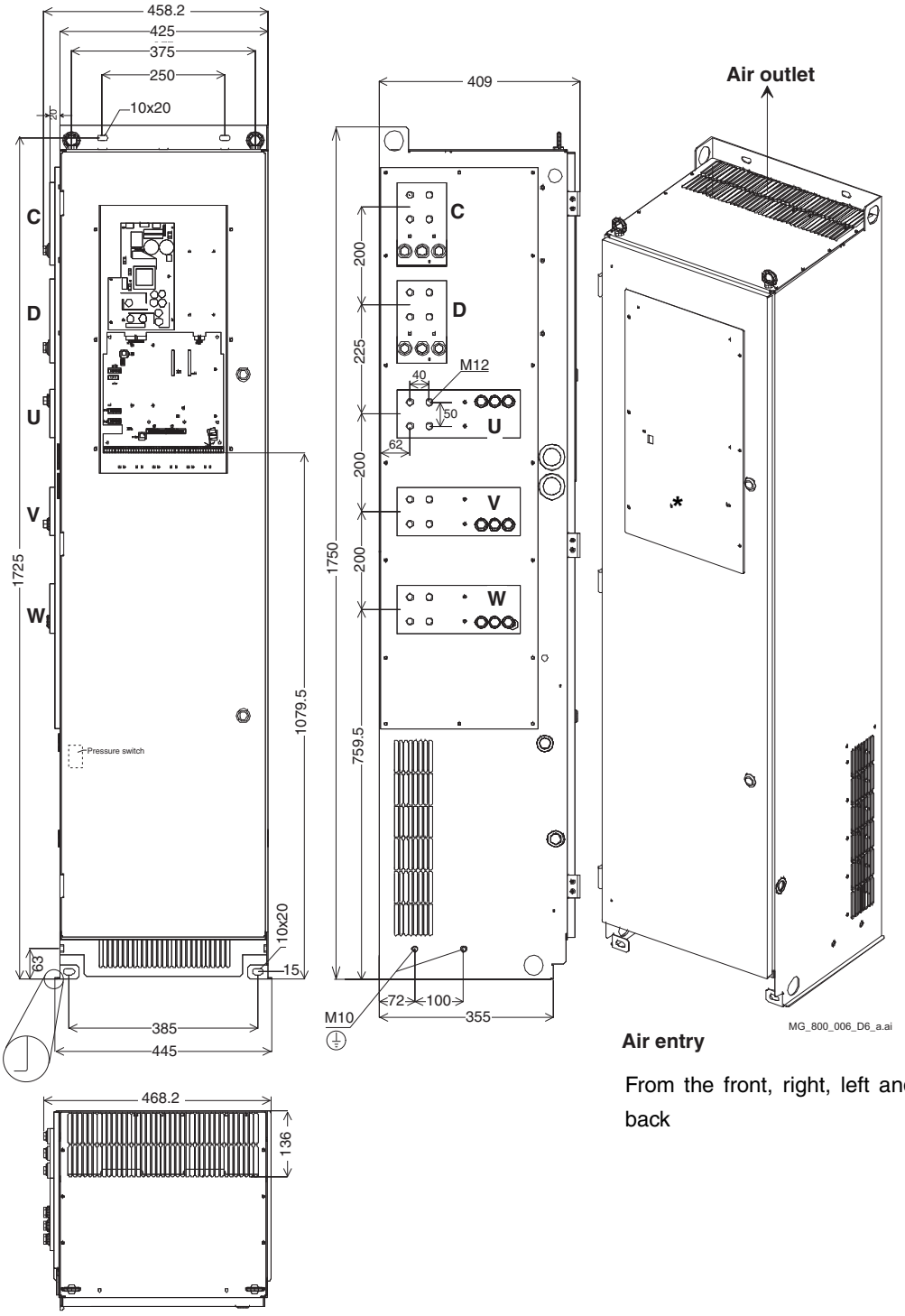
Two supports should be mounted inside the cabinet in such a way, that they can carry the converter's weight. The minimum distance between the supports should not be less than 480 mm because of electrical clearance (DC busbars).

A L-shape support as indicated will allow to place the converter temporarily close to the front end of the support (weight still taken by a lifting device) and then push it back to the back plate of the cabinet. The upper and lower holes in the back plate of the converter should be used to fix the converter in that position.

Size D6

DCS800-S0x-1900
DCS800-S0x-2050
DCS800-S0x-2500
DCS800-S0x-3000

Weight appr. 180 kg



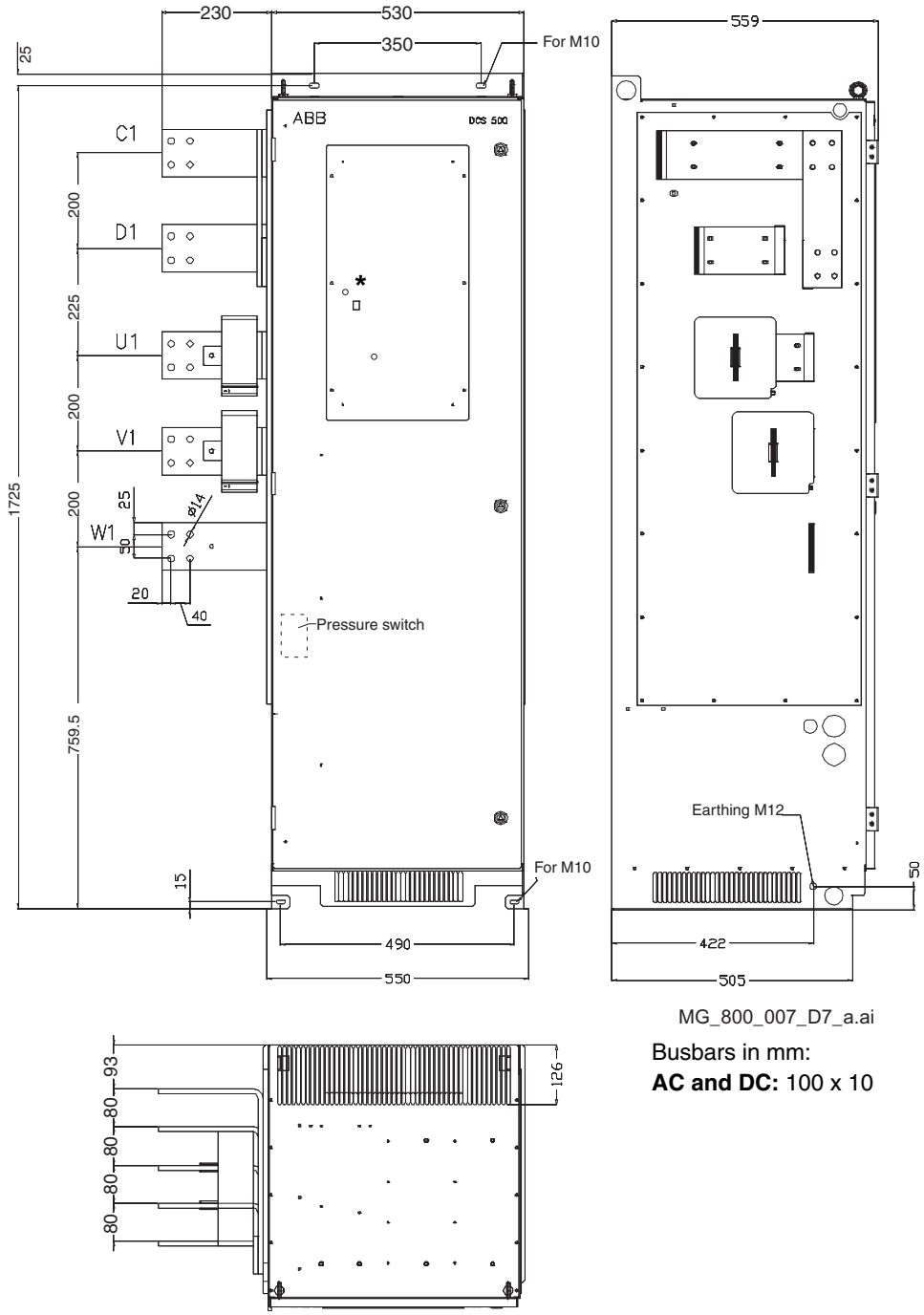
Air entry

From the front, right, left and back

Size D7 lefthand (+P905)

DCS800-S0x-2050-xxL
DCS800-S0x-2600-xxL
DCS800-S0x-3300-xxL
DCS800-S0x-4000-xxL
Electronics are located in the D7 module (+P905)

Weight appr. 315 kg



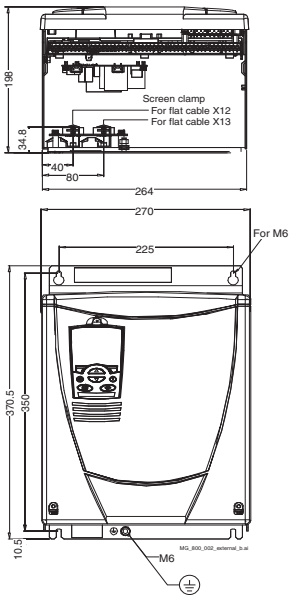
MG_800_007_D7_a.ai

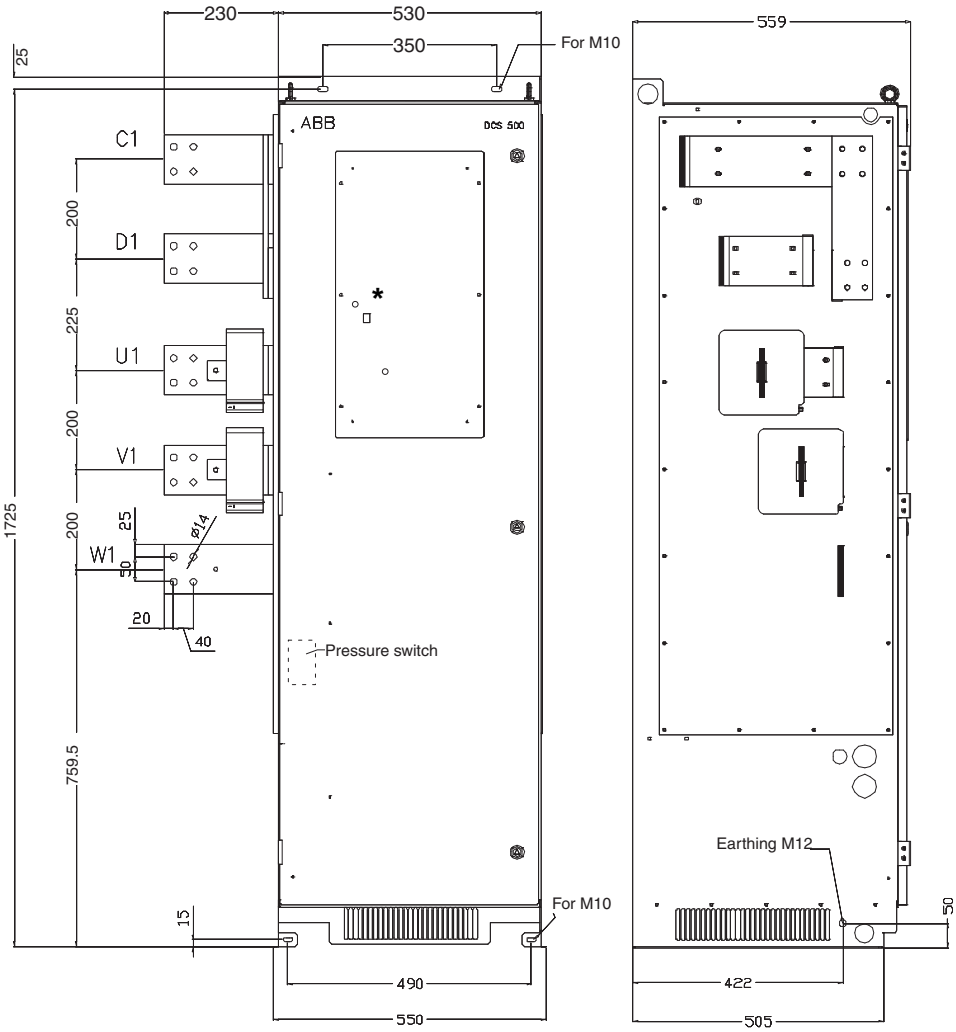
Busbars in mm:
AC and DC: 100 x 10

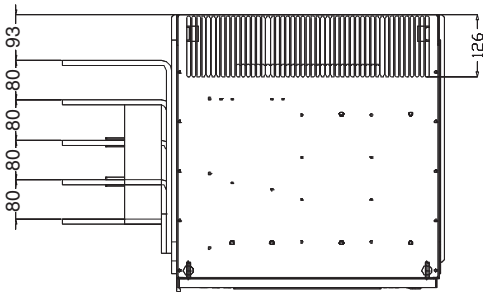
Size D7 lefthand (+P906)

DCS800-S0x-4800-xxL
DCS800-S0x-5200-xxL
With external control unit (+P906)

Weight appr. 315 kg







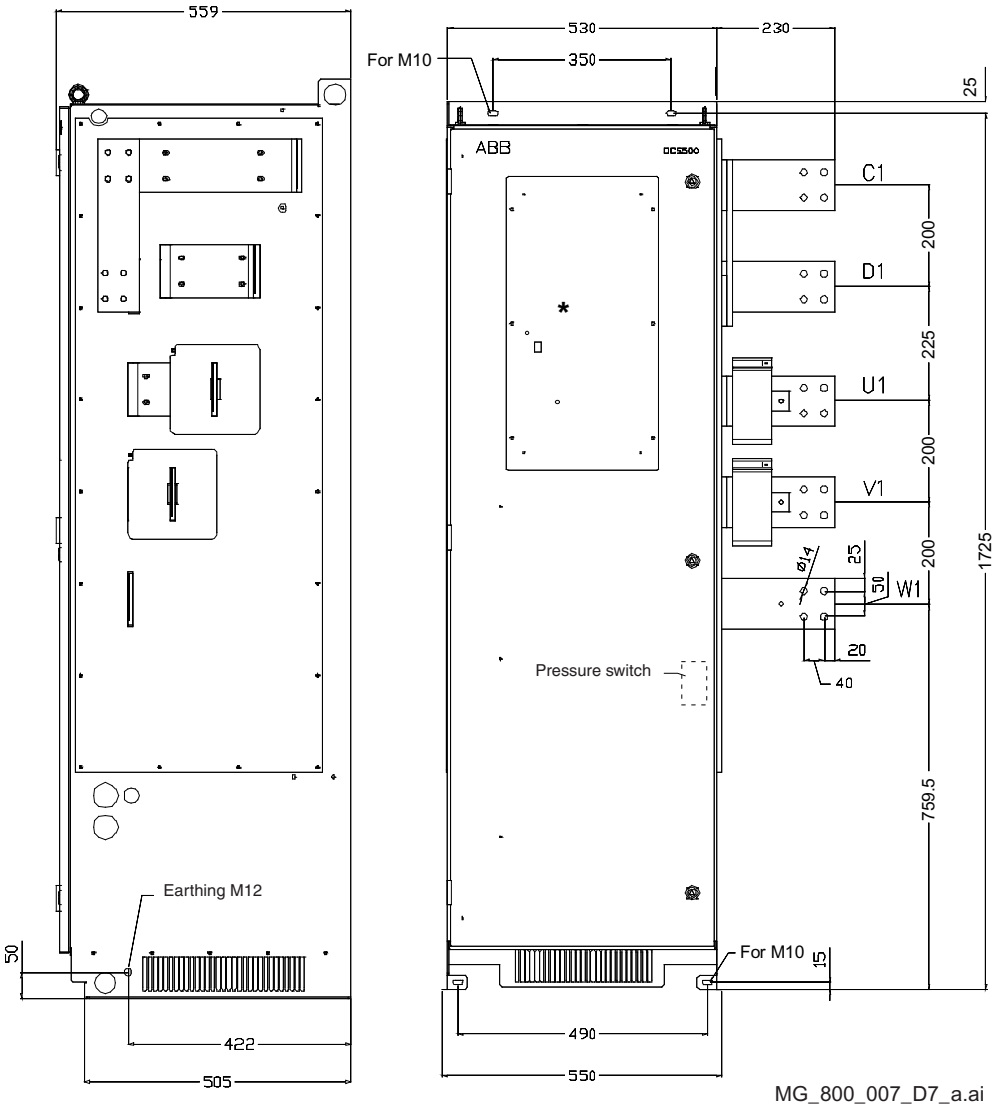
MG_800_007_D7_a.ai

Busbars in mm:
AC and DC: 100 x 10

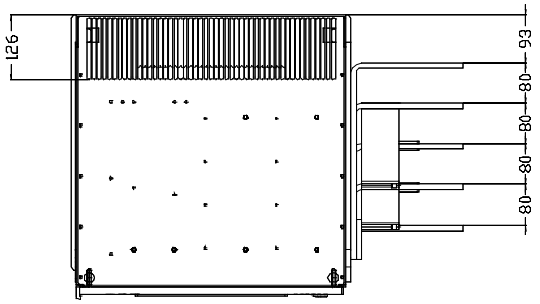
Size D7 righthand (+P905)

DCS800-S0x-2050-xxR
DCS800-S0x-2600-xxR
DCS800-S0x-3300-xxR
DCS800-S0x-4000-xxR
Electronics are located in the D7 module (+P905)

Weight appr. 315 kg



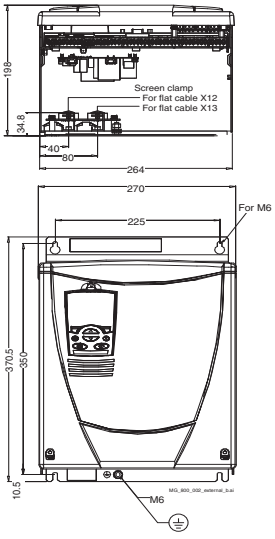
Busbars in mm:
AC and DC: 100 x 10

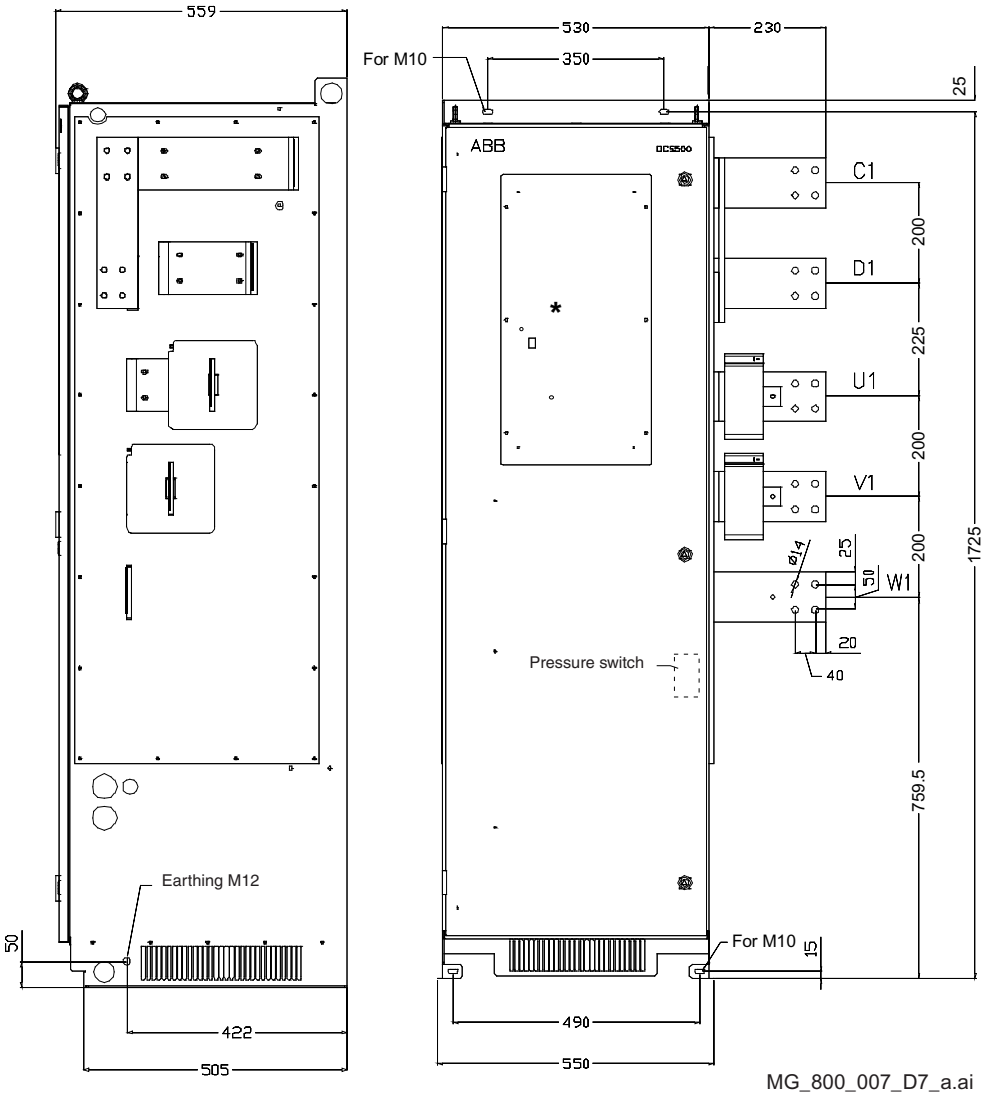


Size D7 righthand (+P906)

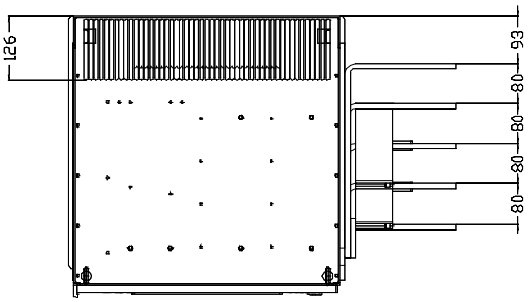
DCS800-S0x-4800-xxR
DCS800-S0x-5200-xxR
With external control unit (+P906)

Weight appr. 315 kg



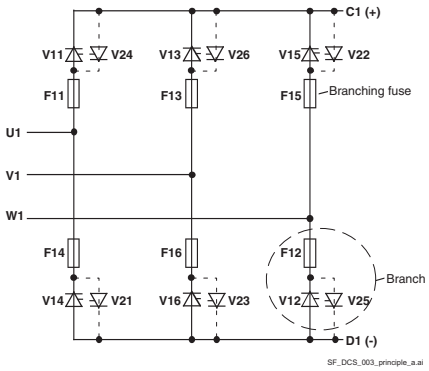


Busbars in mm:
AC and DC: 100 x 10



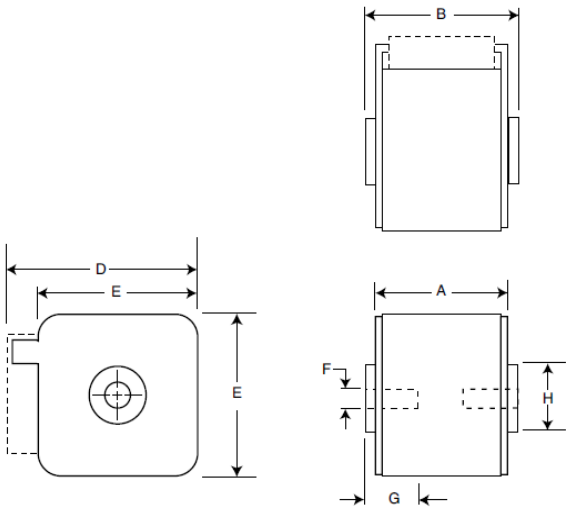
Branch fuses installed inside converter sizes D4+, D5, D6, D7

Size	Converter type	Fuse type	Fuse Size
	400 V / 500 V / 525 V		
D4+	DCS800-S0x-1190-04/05	UR 900 A / 690 V	2
D5	DCS800-S0x-1200-04/05	UR 800 A / 660 V	5
D5	DCS800-S0x-1500-04/05	UR 1250 A / 660 V	5
D5	DCS800-S0x-2000-04/05	UR 1600 A / 660 V	5
D6	DCS800-S0x-2050-05	UR 1500 A / 660 V	5
D6	DCS800-S0x-2500-04/05	UR 900 A / 660 V ①	5
D6	DCS800-S0x-3000-04/05	UR 1250 A / 660 V ①	5
D7	DCS800-S0x-3300-04/05	UR 2500 A / 660 V	7
D7	DCS800-S0x-4000-04/05	UR 3000 A / 660 V	7
D7	DCS800-S0x-5200-04/05	UR 3500 A / 690 V	7
	600 V / 690 V		
D5	DCS800-S0x-0900-06/07	UR 630 A / 1250 V	6
D5	DCS800-S0x-1500-06/07	UR 1100 A / 1250 V	6
D5	DCS800-S01-2000-06/07	UR 1400 A / 1100 V	6
D6	DCS800-S0x-2050-06/07	UR 700 A / 1250 V ①	6
D6	DCS800-S0x-2500-06/07	UR 1000 A / 1250 V ①	6
D6	DCS800-S0x-3000-06/07	UR 1100 A / 1250 V ①	6
D7	DCS800-S0x-3300-06/07	UR 2500 A / 1000 V	8
D7	DCS800-S0x-4000-06/07	UR 3000 A / 1000 V	8
D7	DCS800-S0x-4800-06/07	UR 3000 A / 1000 V	8
	800 V		
D6	DCS800-S0x-1900-08	UR 630 A / 1250 V ①	6
D6	DCS800-S0x-2500-08	UR 1000 A / 1250 V ①	6
D6	DCS800-S0x-3000-08	UR 1100 A / 1250 V ①	6
D7	DCS800-S0x-3300-08	UR 2500 A / 1000 V	8
D7	DCS800-S0x-4000-08	UR 3000 A / 1000 V	8
D7	DCS800-S0x-4800-08	UR 3000 A / 1000 V	8
	1000 V		
D7	DCS800-S0x-2050-10	UR 1800 A / 1250 V	9
D7	DCS800-S0x-2600-10	UR 1800 A / 1250 V	9
D7	DCS800-S0x-3300-10	UR 2500 A / 1250 V	9
D7	DCS800-S0x-4000-10	UR 2500 A / 1250 V	9
	1200 V		
D7	Data on request	-	-



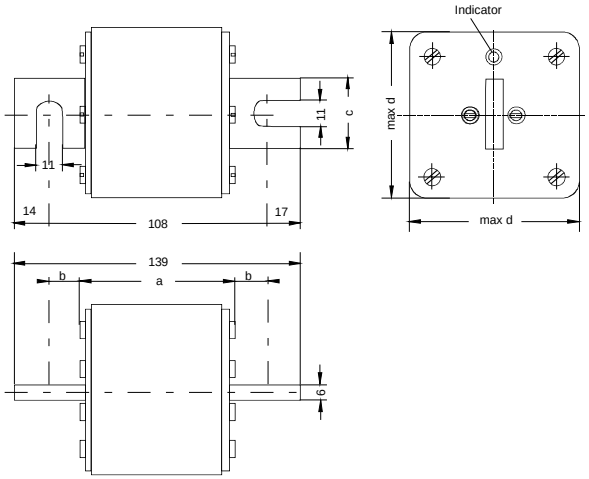
① Two fuses per thyristor (12 fuses per bridge)

Size 2



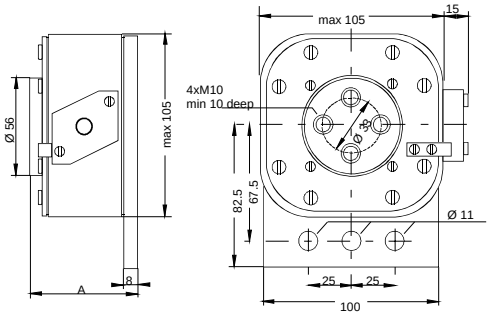
Size	A [mm]	B [mm]	D [mm]	E [mm]	F	G [mm]	H
2	50	51	77	61	M10	10	M24

Size 5, 6



Size	a [mm]	b [mm]	c [mm]	d [mm]
5	50	29	30	76
6	80	14	30	76

Size 7 - 9



Size	**A** [mm]
7	62
8	90
9	105

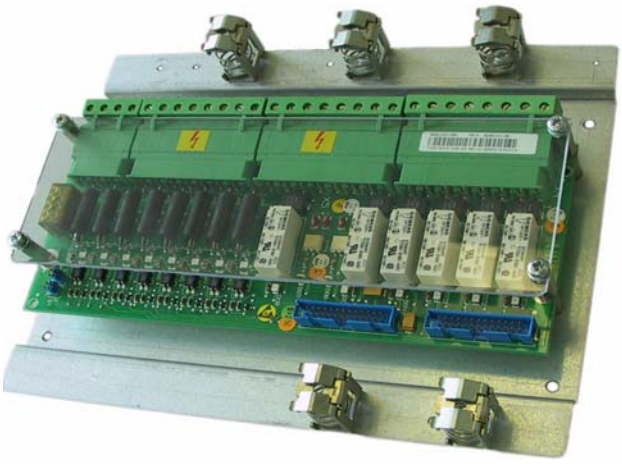
Note:
The given dimensions may be exceeded in some cases. Please take them only for information.

Card holder for SDCS-IOB-2/3

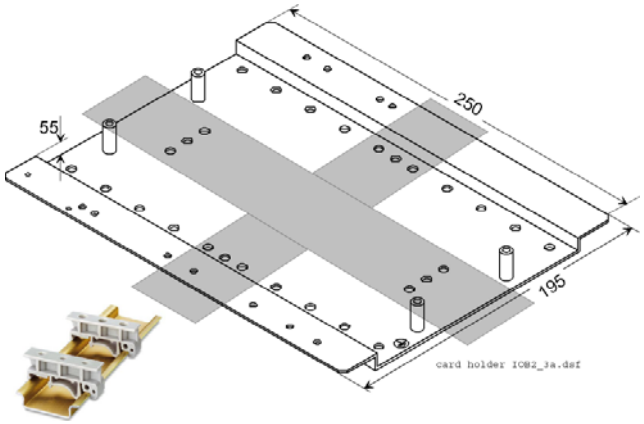
IOB assembly / mounting kit 3ADT783046 contains:

- Card holder (1x)
- Finger protection cover (1x)
- Screen clamp (6x)
- Stand-off (4x)
- Screw (4X)

Note:
SDCS-IOB-2/3 are not included.



By using universal Phoenix clamps 1202713 (2x) it is possible to mount the card holder on standard rail systems either horizontally or vertically. Phoenix clamps are not included.

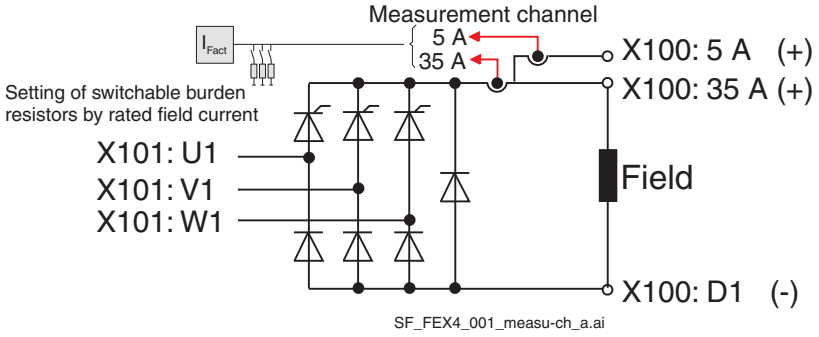


Accessories

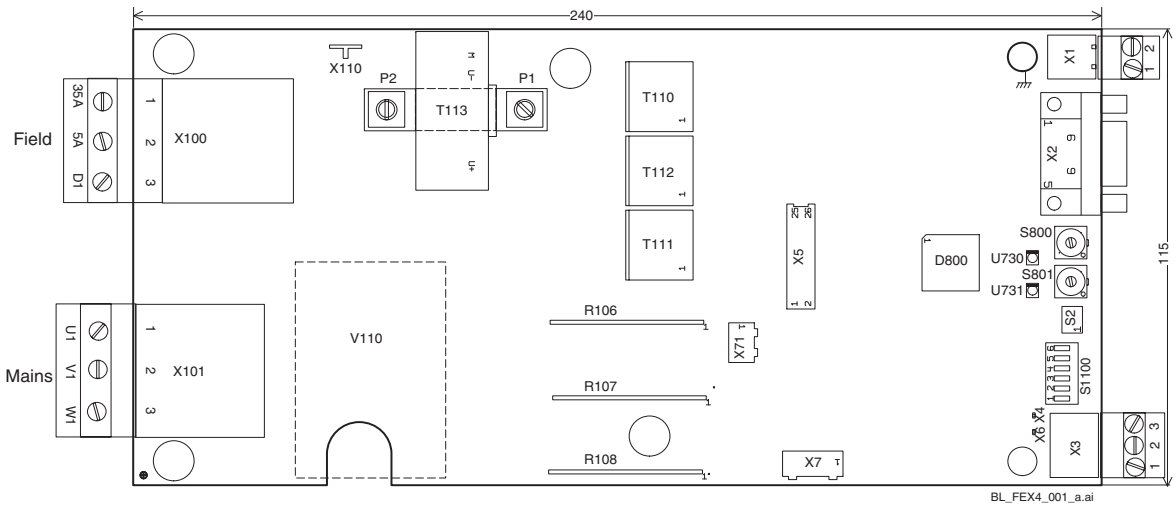
DCF803-0016, FEX-425-Int and DCF803-0035

The field exciters DCF803-0016, FEX-425-Int and DCF803-0035 are half controlled 3-phase converters. All field excitiers are based on the same control board SDCS-FEX-4. The board is equipped with its own synchronization and current control. The current measurement circuit is automatically scaled depending on the rated field current of the motor. The field exciter is fully controlled and monitored by the armature converter via drive-to-drive communication.

The field exciter is prepared to operate as 3-phase as well as single-phase converter. For single-phase operation connect terminals U and W.



Layout of the SDCS-FEX-4



X1:	24 V supply
X1:1	24 V_{DC}
X1:2	0 V_{DC}

X3:	DCSLink
X3:1	GND B
X3:2	CAN L
X3:3	CAN H

Electrical data

Power part	
AC input voltage	110 V -15% - 500 V +10%; single or 3-phase
AC input current	< DC output current
Frequency	Same as DCS converter
AC isolation voltage	600 V
Line reactor	External
Line fuses	KTK25 for FEX-425-Int; external for DCF803-0016 and DCF803-0035
DC output current *	0.3 A - 16 A = DCF803-0016 0.3 A - 25 A = FEX-425-Int 0.3 A - 35 A = DCF803-0035
Powerloss	< 130 W (at rated current)
Auxiliary supply	
DC input voltage	24 V_{DC}
DC input current	< 200 mA supplied via X51 of SDCS-DSL-4
Buffering	10 ms

* 3-phase or single-phase operation

Control unit

The control includes the following main blocks:

- Micro controller H8 for current control, synchronization and fault handling.
- 2 channel measurement of actual field current in the DC circuit.
- High ohmic measurement of AC voltage. Residual resistance to ground ≈ 1.6 MΩ
- H8 controller for drive-to-drive communication based on CAN standard.
- Driver circuit to fire the half control bridge.
- The firmware is stored in a flash memory and contains:
  The PI current controller for the field circuit.
  The fault and reset logic.
  The synchronization and PLL function.
  The setting of the current measurement channel.

All parameters are set from the armature converter via drive-to-drive communication. The field current reference, actual field current, current control and status bits are cyclic sent via drive-to-drive communication.

The field exciter is equipped with an autoscaling function of the burden resistors based on the nominal field current of the motor.

Power part

The power part is a 3-phase half controlled bridge with free-wheeling diode.

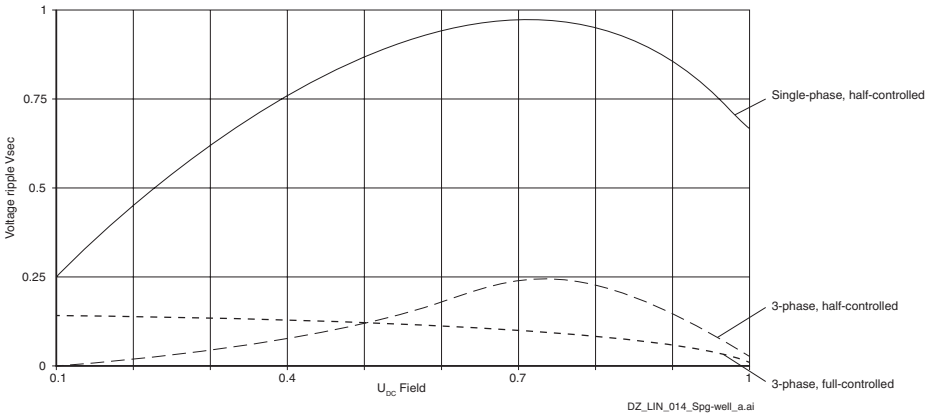
The external field exciter DCF803-0016 and DCF803-0035 are 3-phase half controlled bridges including snubbers based on the SDCS-FEX-4. Line fuses, line reactors and transformers are installed outside the housing.

The FEX-425-Int (internal field exciter) can be installed in D4+ and D5 converters. The unit is based on a SCDS-FEX-4. For a D4+ the supply must be connected via line reactors and fuses located outside of the module.
For a D5 the supply must be connected via line reactors outside of the module. The fuses are installed in the module.

For single-phase operation connect terminals U and W. For single-phase operation an autotransformer for voltage adaptation is recommended.

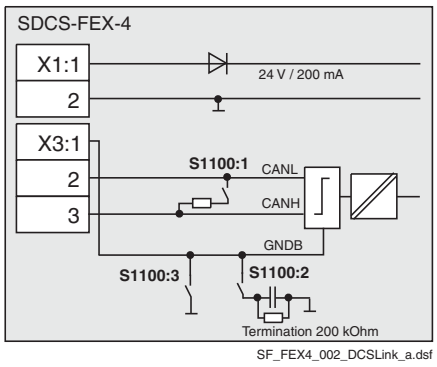
Please see comparison of output voltage ripple between single-phase and 3-phase operation.

Voltage ripple of U_{DC} voltage depending on operation modes



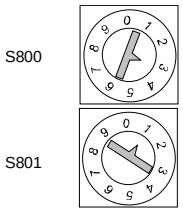
DCSLink communication

The field converter is controlled from armature converter via DCSLink based on CAN hardware.



Incoming power		Remarks
24 V	≤ 200 mA	24 V grounded via X51 of SDCS-DSL-4

DSL communication		Remarks
Bus termination		
S1100:	1 = ON	120 Ohm
	1 = OFF	No termination
Ground termination		
S1100:	2 = ON	200 kOhm R-C ground termination
	3 = ON	0 Ohm ground termination
	2, 3 = OFF	No termination



Node address is set by: S800 digit 0 (node address 00 is not possible!)
S801 digit 10

Same node address must be selected in the corresponding armature converter.

Example: Node address = 13 ==> S800 = 3 and S801 = 1

The communication speed is set by S1100

S1100:6	S1100:5	S1100:4	Baudrate [kBaud]	Selection in armature converter, parameter (94.02)
OFF	OFF	OFF	20	0
OFF	OFF	ON	50	1
OFF	ON	OFF	125	2
OFF	ON	ON	250	3
ON	OFF	OFF	500	4
ON	OFF	ON	800	5
ON	ON	OFF	888	6
ON	ON	ON	1000	7

RS232-Port

The RS232 interface is used for download the 'Field exciter firmware package'.
More information see *RS232 interface*.

The firmware download is activated by setting S2:1-2 before the auxiliary voltage is switched ON. Field exciter mode is S2:3-4 (default).

Diagnostics

All messages are sent to the armature converter and displayed in Signals (9.17) to (9.20). If communication is broken or node numbers are mixed up the simple fault display on the SDCS-FEX-4 can be used. Therefore the unit is equipped with two small LEDs.

V730 = Green

V731 = Yellow

Following messages are displayed:

Both OFF	No 24 V supply
Green and yellow continuous	No firmware
Green blinking	16 A / 25 A / 35 A output active, waiting for DCSLink communication
Green continuous	16 A / 25 A / 35 A output active, DCSLink communication OK
Yellow blinking	5 A output active (X100:2), waiting for DCSLink communication
Yellow continuous	5 A output active (X100:2), DCSLink communication OK

Green and yellow toggling:

X times yellow	Y times green	Warning or Fault	
X = 1	Y = 1	Warning	Phase missing, see parameter (45.22) / (45.23)
	Y = 2	Warning	Temperature heatsink
	Y = 6	Warning	Parameters added
	Y = 7	Warning	Parameter up- or download failed
	Y = 8	Warning	Compatibility
	Y = 9	Warning	Parameters restored
X = 2	Y = 1	Fault	DCSLink communication
	Y = 2	Fault	Supply voltage synchronization
	Y = 3	Fault	Overcurrent
	Y = 4	Fault	Fast voltage rise, see parameter (45.01) / (45.15)
	Y = 5	Fault	AC supply voltage < 30 V_{AC}
	Y = 6	Fault	AC supply voltage > 650 V_{AC}
	Y = 9	Fault	Temperature heatsink
	Y = 10	Fault	Parameter flash read
	Y = 11	Fault	Compatibility
	Y = 12	Fault	Auxiliary voltage
	Y = 14	Fault	General hardware (no reset possible)
	Y = 15	Fault	General firmware (no reset possible)

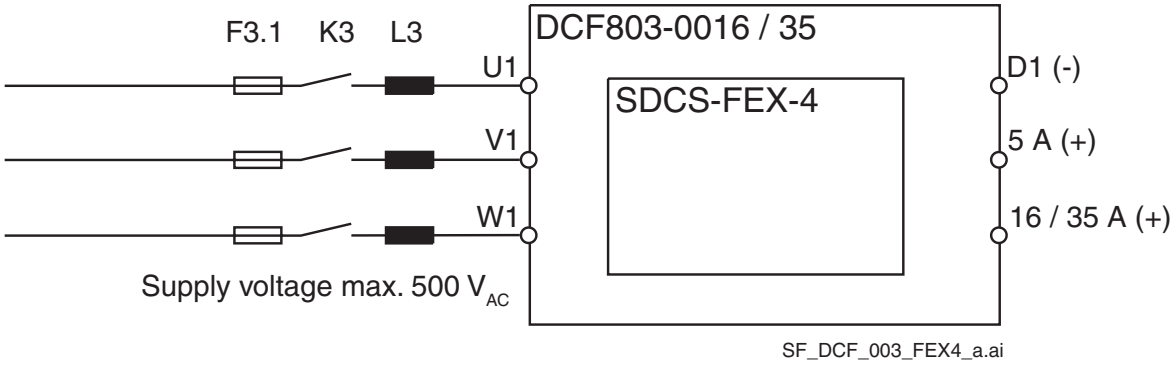
Line reactors (L3),

Autotransformer (T3),

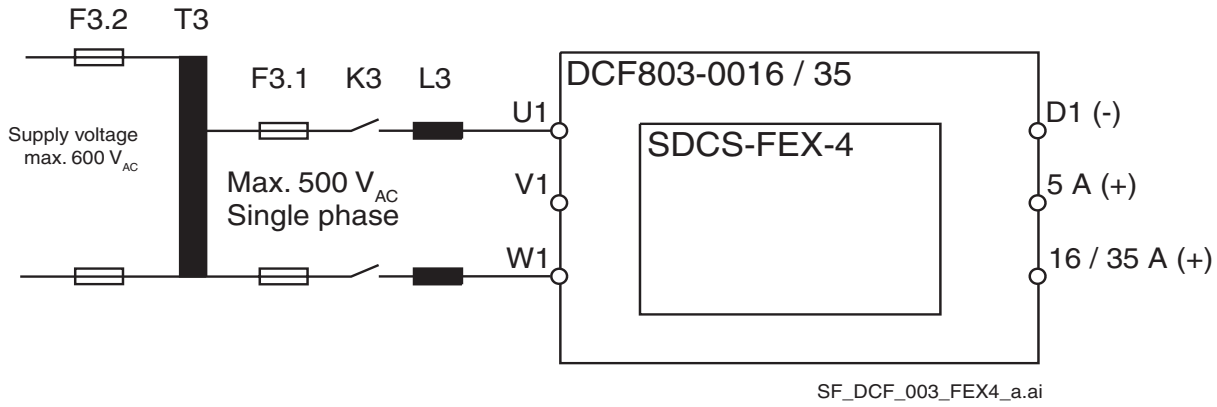
Fuses (F3.x).

DCF803-0016 and DCF803-0035 configuration

3-phase connection, see also parameters (45.22) and (45.23).



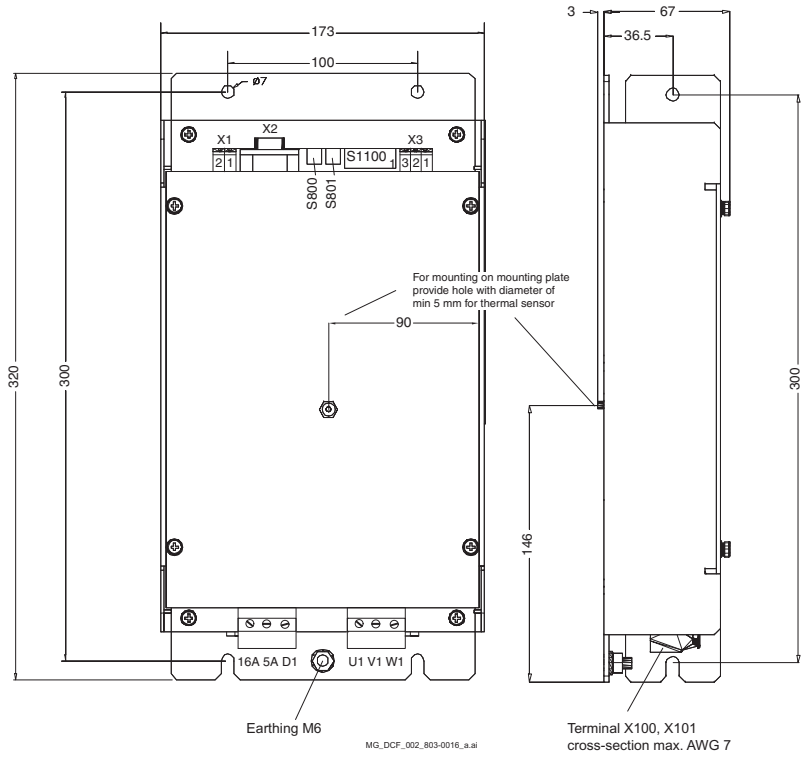
Single-phase connection, see also parameters (45.22) and (45.23).



Dimensions

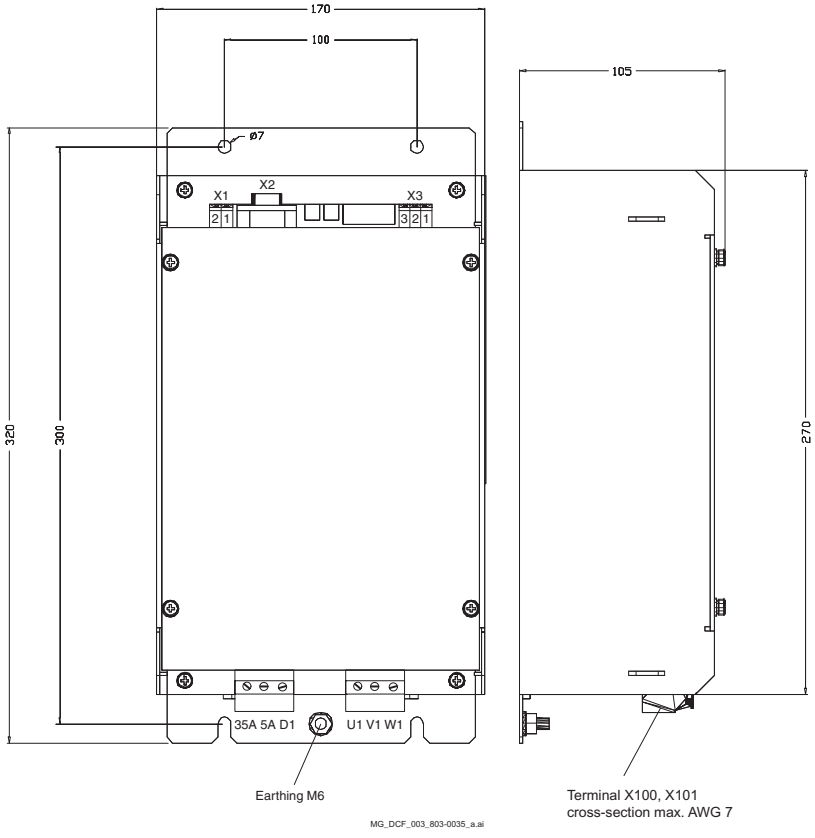
DCF803-0016

Dimensions in mm
Weight appr. 6 kg



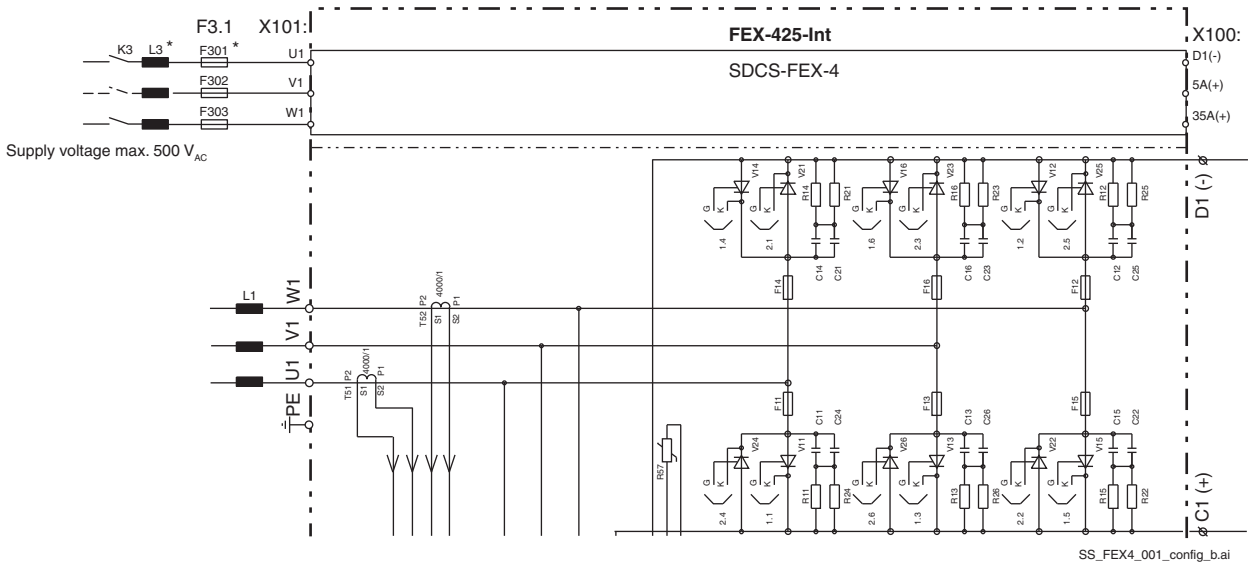
DCF803-0035

Dimensions in mm
Weight appr. 6 kg

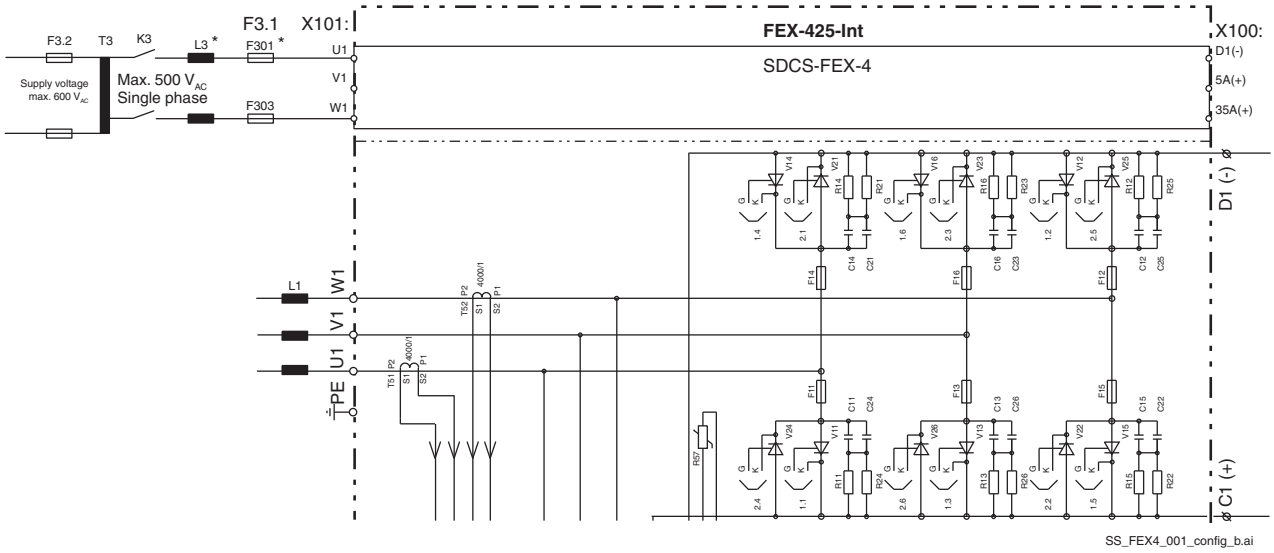


FEX-425-INT configuration (size D4+)

3-phase connection, see also parameters (45.22) and (45.23).



Single-phase connection, see also parameters (45.22) and (45.23).

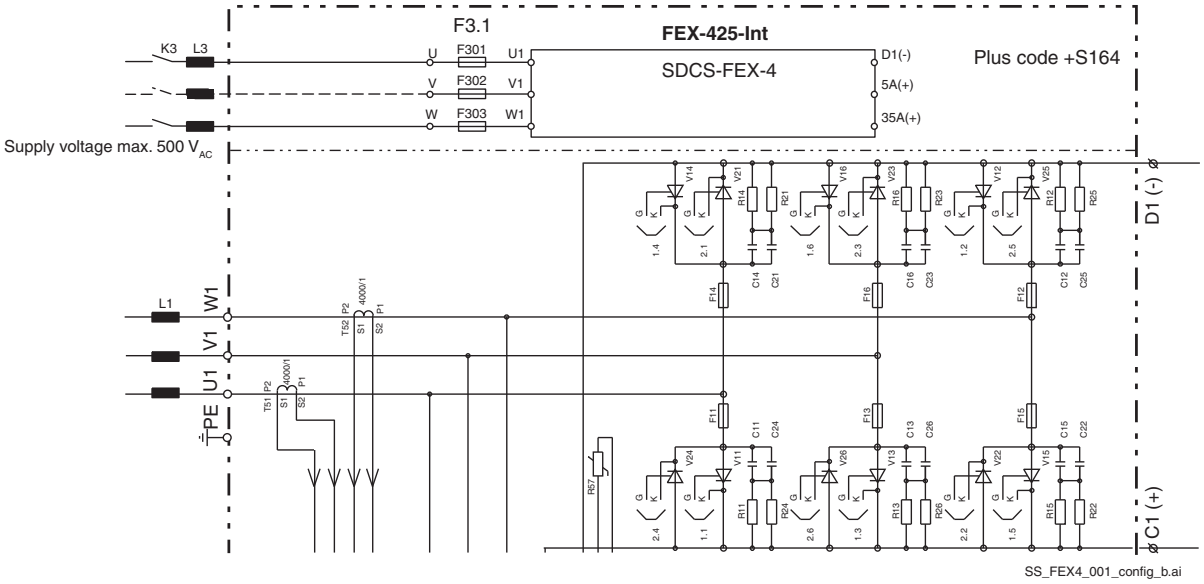


*** Note**: Field line reactor and field fuses are external!

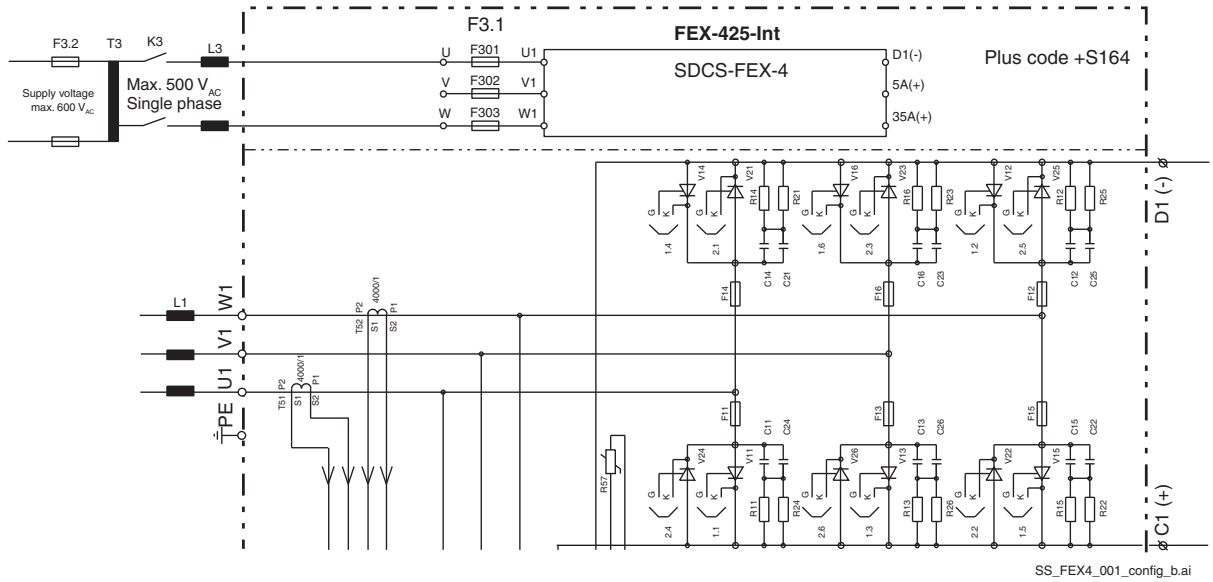
Further information about line reactors see sections *Line reactor (L3) (ND30)* and *Line reactors type ND401 - 413 (ND402)* in this chapter.

FEX-425-INT configuration (size D5)

3-phase connection, see also parameters (45.22) and (45.23).



Single-phase connection, see also parameters (45.22) and (45.23).



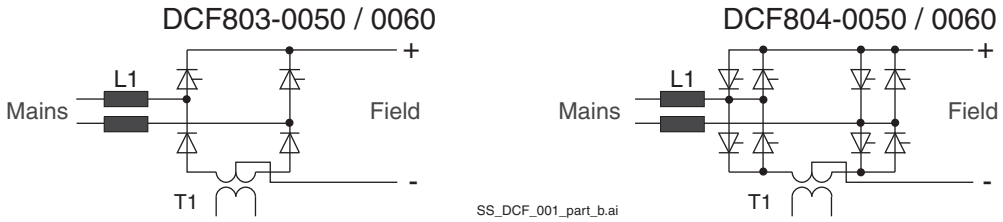
Further information about line reactors see sections *Line reactor (L3) (ND30)* and *Line reactors type ND401 - 413 (ND402)* in this chapter.

DCF803-0050, DCF804-0050, DCF803-0060 and DCF804-0060

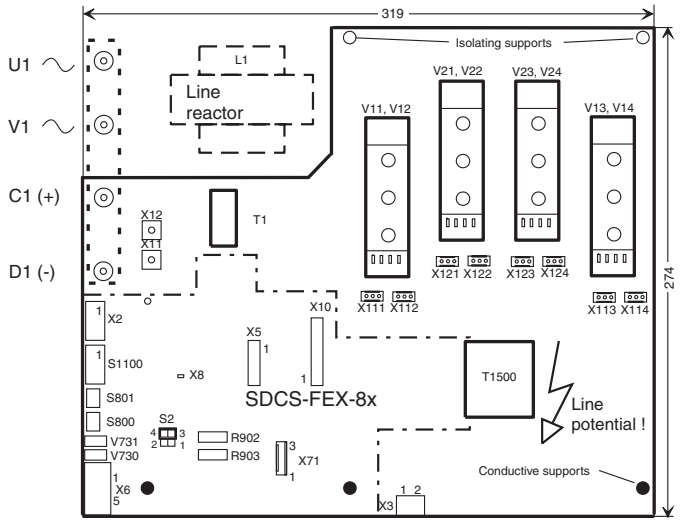
DCF803-0050 / 0060 and DCF804-0050 / 0060 are external single-phase field converters.

The **half controlled** (1-Q) field exciters DCF803-0050 / DCF803-0060 include the SDCS-FEX-82, two thyristor/diode power modules and auxiliaries (power supply, line reactor L1).
The **full controlled** (4-Q) field exciters DCF804-0050 / DCF804-0060 include the SDCS-FEX-81, four anti-parallel thyristor power modules and auxiliaries (power supply, line reactor L1).

The control structure is similar to the SDCS-FEX-4 in single-phase operation. A micro controller is used for controlling the field current and firing. The DC current is measured using an AC current transformer.



SS_DCF_001_part_b.ai



X2:1	Reserved	
X2:2	Reserved	
X2:3	GNDB	Ground of communcation interface
X2:4	CANL	DCSLink e.g. X52:2 or X53:2
X2:5	CANH	DCSLink e.g. X52:3 or X53:3
S1100:1	Termination	ON = 120 Ohm bus termination
S1100:2	Grounding	ON = GNDB to ground via 200 kOhm
S1100:3	Grounding	ON = GNDB to ground, hard.
S1100:4	Baudrate	Default = OFF (500 kBd)
S1100:5	Baudrate	Default = OFF (500 kBd)
S1100:6	Baudrate	Default = ON (500 kBd)
S1100:7	Bridge reversal	ON = extended bridge reversal (+20 ms)
S1100:8	Opermode	OFF = reserved; ON = DCS800
S801	node x10	DCSLink node address digit 10
S800	node 1-9	DCSLink node address digit 0
V730	Green	Fault and warning display, see chapter Diagnosis
V731	Yellow	Fault and warning display, see chapter Diagnosis

BL_FEX8_001_+Tab_a.ai

Electrical data

Power part	
AC input voltage	110 V -15% – 500 V +10%; single-phase
AC input current	< DC output current
Frequency	Same as DCS module
AC isolation voltage	690 V
Line reactor (L1)	160 μH; 45 – 65 Hz (inside)
DC output current ① 50 A	0.3 A – 50 A
DC output current ① 60 A	0.3 A – 60 A; forced cooling (2 x fan)
Power loss at $I_{F\ rated}$	< 180 W (at rated current)
Load condition	Always L/R > 100 ms (saturation)
X2 Serial communication	
X2: 1	Reserved
X2: 2	Reserved
X2: 3	GNDB, ground of commutation interface
X2: 4	CANL
X2: 5	CANH
X3 Auxiliary voltage	
AC input voltage	110 V -15% – 230 V +10%; single-phase
Frequency	45 – 65 Hz
AC input power	15 W; 30 VA
Inrush current	< 5 A / 20 ms
Mains buffering	Min. 30 ms
X4 Fan supply	Only 60 A units
AC input voltage	230 V_{AC}; single-phase
Frequency	45 – 65 Hz
AC input current	0.15 A

① If Field weakening is needed, the minimum field current of the motor at top speed must be higher than 0.3 A.

Electronic power supply

X3 is connected to a switch mode power supply with mains of 230 V_{AC} or 115 V_{AC}.

The power supply unit provides the galvanic isolated DC voltages 30 V, 15 V, 5 V and -15 V for the control electronics.

In addition the power supply generates galvanically isolated 5 V for the serial communication drivers. The voltages can be measured at following terminals:

Voltages	Terminals	Ground
+5 V	X10:18	X10:16 (GND)
+30 V	X10:20	X10:16 (GND)
+15 V	X10:19	X10:16 (GND)
-15 V	X10:17	X10:16 (GND)
+ 5 V	X7:1	X8:1 (GNDB)

Control unit

The control unit includes the following main blocks:

- Micro controller H8 for control and firing.
- Actual DC current measurement using an AC current transformer.
- High ohmic measurement of AC and DC voltage.
  Residual resistance to ground = 3.5 MΩ (DCF803)
  = 1.9 MΩ (DCF804)

- RS485 interface and DCSLink interface to the converter's controller board SDCS-CON-4.
- The firmware of the field exciter is stored in a flash memory and contains:
  - The PI current controller for the field circuit.
  - The fault and reset logic.
  - The synchronization and PLL function.
  - The bridge reversal function (only DCF804-0050 / 0060).

All control parameters are set from armature converter via drive-to-drive communication. The field current reference, actual field current, current control and status bit are cyclic sent via drive-to-drive communication.
The field exciter is equipped with an autoscaling function of the burden resistors based on the nominal field current of the motor.

Power part

The DCF803-0050 / 0060 is a half-controlled single-phase bridge. A half controlled bridge does not need a free wheeling circuit.
The DCF804-0050 / 0060 is a full-controlled single-phase bridge. During normal operation it is fired in half controlled mode to reduce the current ripple.
Full controlled bridges require separate freewheeling circuits. The firing control enables the freewheeling of a thyristor if the DC voltage increases. See also parameters (45.01) / (45.15) in the armature converter.
A MOV (Metal Oxide Varistor) protects the AC input against voltage spikes from the mains.
Another MOV protects the DC output against voltage surges which can be caused by the field winding of a DC machine.
The power section is equipped with a line reactor (L1). Thus an external line reactor is not needed.
Single-phase field exciters are typically supplied by autotransformers if the rated field voltage is less than 60 % of the AC supply voltage.
The AC input current can be estimated like this:
$I_{AC} = 1.1 * I_{DC} * U_{DC}$ field / U_{AC} supply.

R902

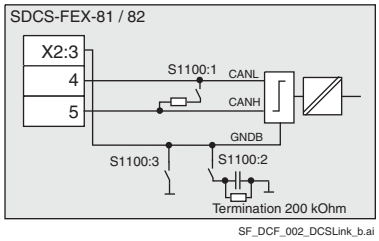
	SDCS-FEX-81	DCF804-0050 / 0060
X	SDCS-FEX-82	DCF803-0050 / 0060

R903

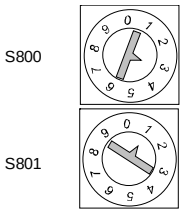
	50 A
X	60 A

DCSLink communication

The field converter is controlled from armature converter via DCSLink based on CAN hardware.



DSL communication		Remarks
Bus termination		
S1100:	1 = ON	120 Ohm
	1 = OFF	no termination
Ground termination		
S1100:	2 = ON	200 kOhm R-C ground termination
	3 = ON	0 Ohm ground termination
	2, 3 = OFF	no termination



Switch_0-9.dsf

Node address is set by: S800 digit 0 (node address 00 is not possible!)
S801 digit 10

Same node address must be selected in the corresponding armature converter.

Example: Node address = 13 ==> S800 = 3 and S801 = 1

The communication speed is set by S1100

S1100:6	S1100:5	S1100:4	Baudrate [kBaud]	Selection in armature converter, parameter (94.02)
OFF	OFF	OFF	20	0
OFF	OFF	ON	50	1
OFF	ON	OFF	125	2
OFF	ON	ON	250	3
ON	OFF	OFF	500	4
ON	OFF	ON	800	5
ON	ON	OFF	888	6
ON	ON	ON	1000	7

RS232-Port

The RS232 interface is used for download the 'Field exciter firmware package'.
More information see *RS232 interface*.
The firmware download is activated by setting S2:1-2 before the auxiliary voltage is switched ON.
Field exciter mode is S2:3-4 (default).

Diagnostics

All messages are sent to the armature converter and displayed in Signals (9.17) to (9.20). If communication is broken or node numbers are mixed up the simple fault display on the SDCS-FEX-81 / 82 can be used. Therefore the unit is equipped with two small LEDs.

V730 = Green

V731 = Yellow

Following messages are displayed:

Both OFF	No 24 V supply
Green and yellow continuous	No firmware
Green blinking	50 A / 60 A output active, waiting for DCSLink communication
Green continuous	50 A / 60 A output active, DCSLink communication OK

Green and yellow toggling:

X times yellow	Y times green	Warning or Fault	
X = 1	Y = 1	Warning	Phase missing, see parameter (45.22) / (45.23)
	Y = 2	Warning	Temperature heatsink
	Y = 6	Warning	Parameters added
	Y = 7	Warning	Parameter up- or download failed
	Y = 8	Warning	Compatibility
	Y = 9	Warning	Parameters restored
X = 2	Y = 1	Fault	DCSLink communication
	Y = 2	Fault	Supply voltage synchronization
	Y = 3	Fault	Overcurrent
	Y = 4	Fault	Fast voltage rise, see parameter (45.01) / (45.15)
	Y = 5	Fault	AC supply voltage < 30 V_{AC}
	Y = 6	Fault	AC supply voltage > 650 V_{AC}
	Y = 9	Fault	Temperature heatsink
	Y = 10	Fault	Parameter flash read
	Y = 11	Fault	Compatibility
	Y = 12	Fault	Auxiliary voltage
	Y = 14	Fault	General hardware (no reset possible)
	Y = 15	Fault	General firmware (no reset possible)

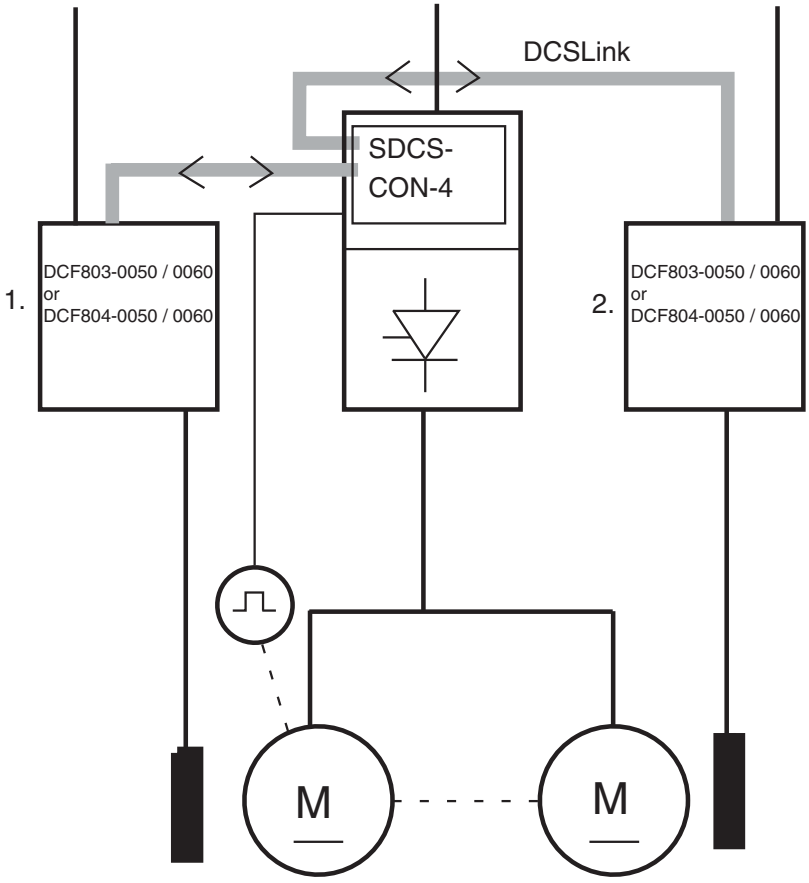
Autotransformer (T3),

Fuses (F3.x).

DCF803-0050 / 0060 and DCF804-0050 / 0060 configuration (e.g. 2 motors)

The data exchange between SDCS-CON-4 and DCF803-0050 / 0060 or DCF804-0050 / 0060 via serial communication is configured as a bus. This link is used to transfer references, actual values and settings for up to two field exciters.

The firmware on the SDCS-CON-4 provides two field exciter functions, one for motor 1 and one for motor 2. The communication works using a screened two-wire cable.
For distances see chapter *DCSLink wiring*.

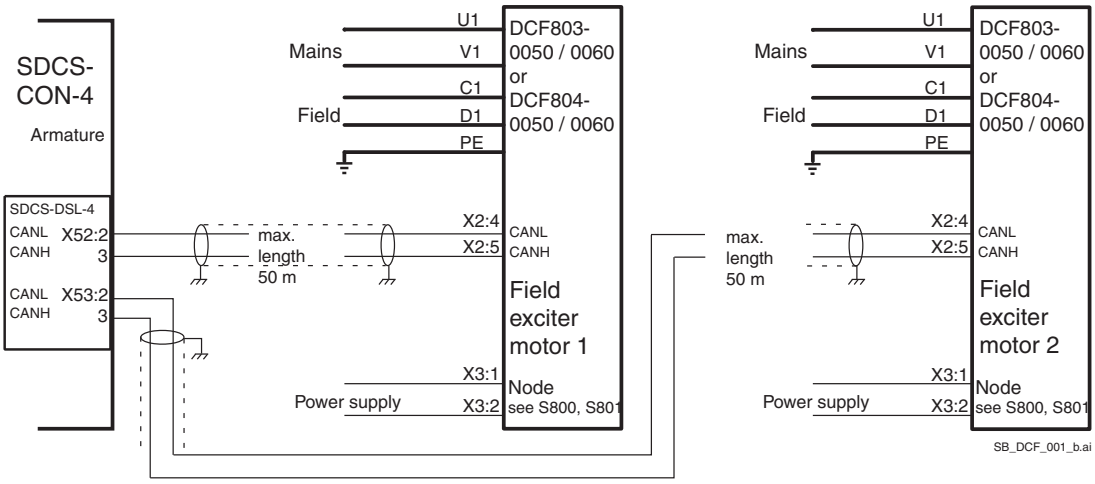


SB_DCF_002_b.ai

Connection example

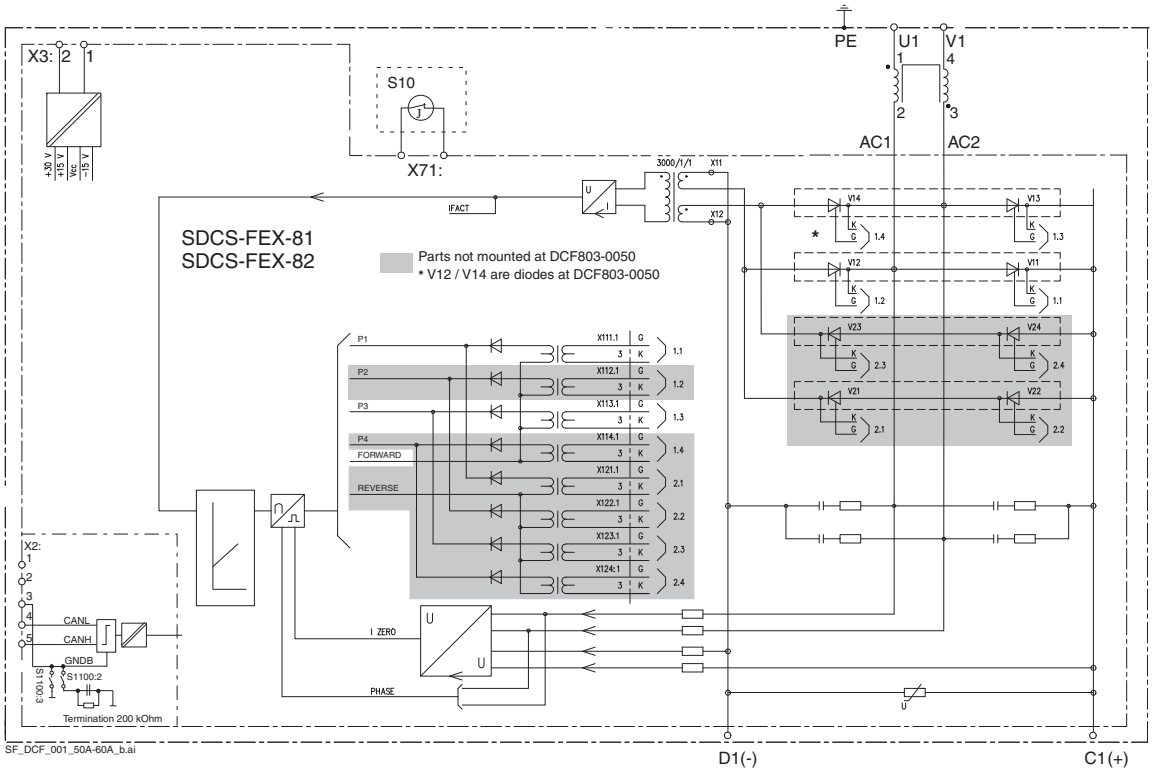
The DCSLink communication is activated by **S1100:8 = ON**
The bus setting is made using S1100. The node numbers are set using S800 and S801.
Procedure to change the node number:

- Switch off the electronics supply voltage
- Set the appropriate switch according to chapter *DCSLink communication*
- Switch on the electronics supply voltage

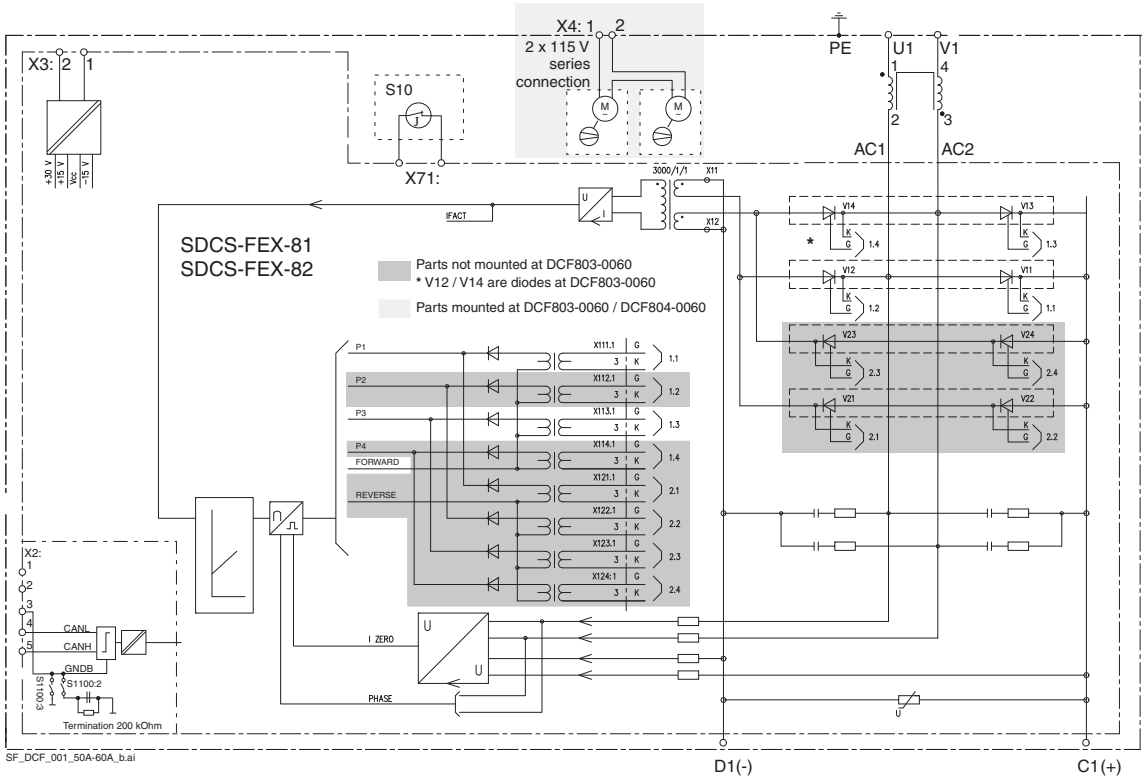


Note:
As standard maximum 2 field exciters can be controlled by one DCS800.

DCF803-0050 / DCF804-0050



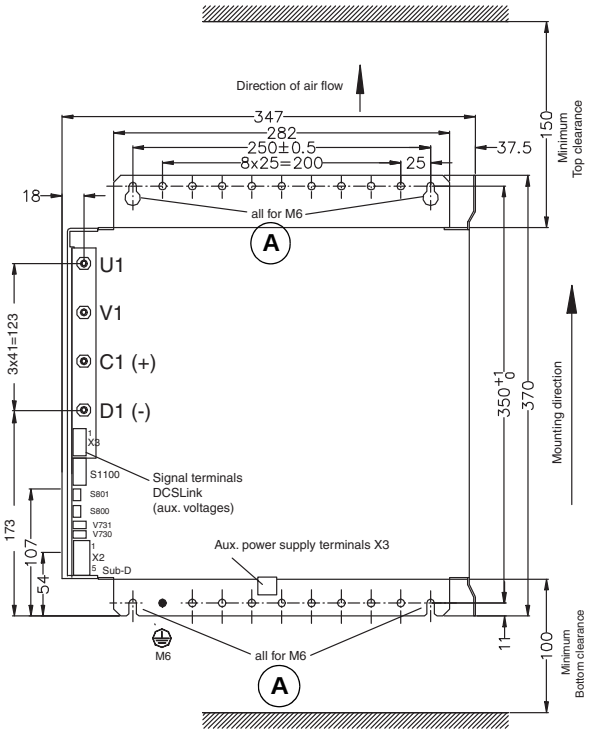
DCF803-0060 / DCF804-0060

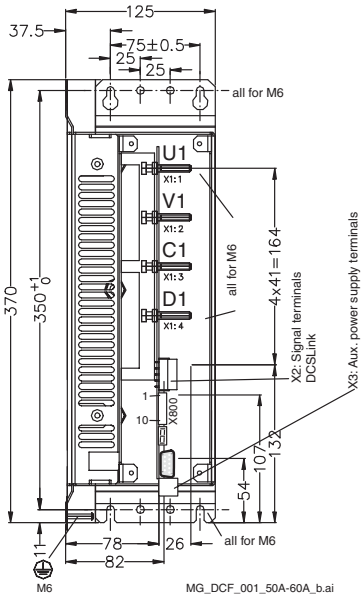


Dimensions

DCF803-0050
DCF804-0050

Dimensions in mm
Weight appr. 11 kg

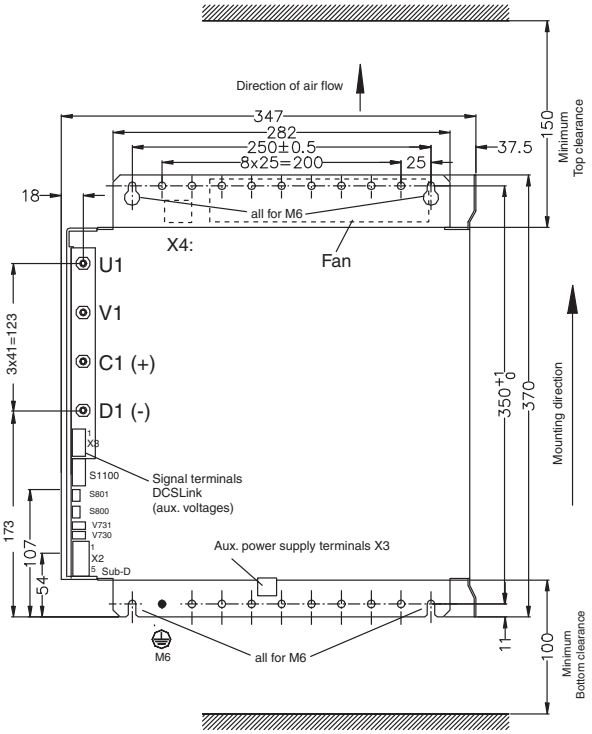


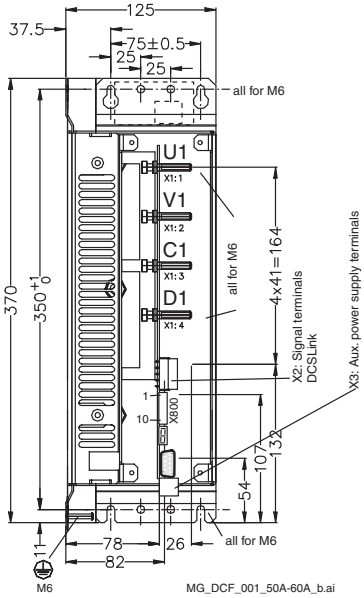


Note: In case of vibrating environments use fixing holes (A)

DCF803-0060
DCF804-0060

Dimensions in mm
Weight appr. 12 kg





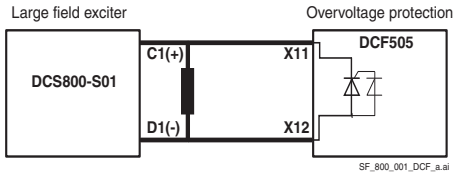
DCF505 / DCF506 Overvoltage Protection

Certain converter modules sizes D1 to D4 can be used as motor field supply. This operation needs separate active overvoltage protection DCF505 or DCF506. They protect the power part against inadmissibly high voltages.

The overvoltage protection activates a free-wheeling circuit between connectors F+ and F- if an overvoltage occurs. The DCF505 / 506 consists of a trigger unit (SDCS-FEP-x) and a free-wheeling thyristor (two anti-parallel thyristors in a DCF506). To connect, use the same size wire as the field exciter.

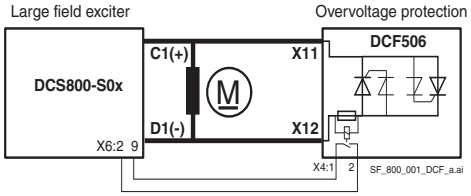
The DCF506 consists of a relay output to indicate a free-wheeling condition to the field converter. When the free-wheeling function is triggered, it will last until the DC current is less than 0.5 A. During this time the relay contacts are closed.

The overvoltage protection DCF505 is suitable for 2-Q units DCS800-S01 with simple non-motoric inductive load.



Simple inductive load connected to a DCS800-S01 and 2-Q overvoltage protection DCF505

For motor field supply from DCS800-S01 (2-Q) or DCS800-S02 (4-Q) the overvoltage protection DCF506 is always required.



Motor field supply with DCS800-S0x and 4-Q overvoltage protection DCF506

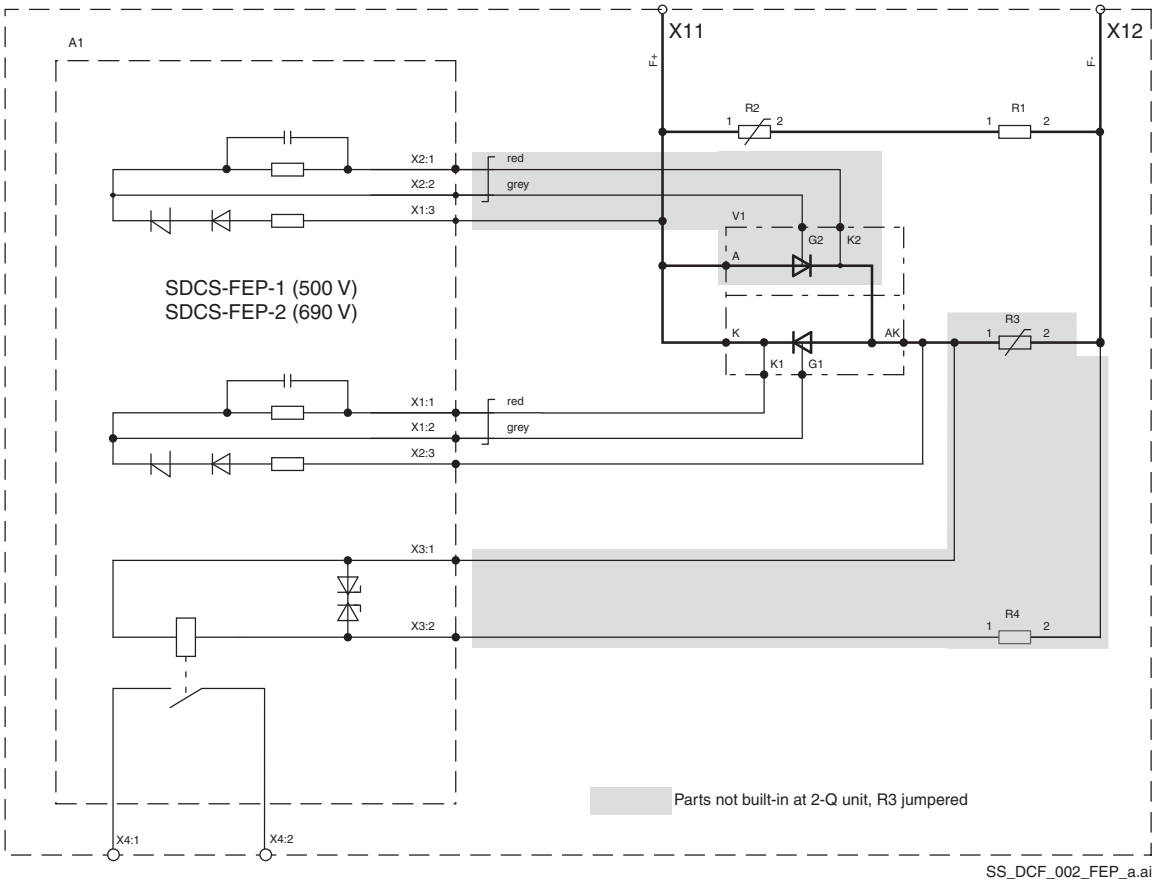
Assignment field supply converter, overvoltage protection and cross-sectional areas

Large field exciters for motor fields ①	**Size**	**Overvoltage Protection**	**Cross-sectional areas**		
			[mm²]		**[Nm]**
2-Q, 500 V					
DCS800-S01-0020-04/05	D1	DCF506-0140-51	1 x 4	1 x M8	13
DCS800-S01-0045-04/05					
DCS800-S01-0065-04/05					
DCS800-S01-0090-04/05					
DCS800-S01-0180-04/05	D2	DCF506-0520-51	1 x 10	1 x M8	13
DCS800-S01-0315-04/05	D3				
DCS800-S01-0405-04/05					
DCS800-S01-0610-04/05 ②	D4				
4-Q, 500V					
DCS800-S02-0025-04/05	D1	DCF506-0140-51	1 x 4	1 x M8	13
DCS800-S02-0050-04/05					
DCS800-S02-0075-04/05					
DCS800-S02-0100-04/05					
DCS800-S02-0200-04/05	D2	DCF506-0520-51	1 x 10	1 x M8	13
DCS800-S02-0350-04/05	D3				
DCS800-S02-0450-04/05					
DCS800-S02-0680-04/05 ②	D4				
Inductive load supply for other applications		**Overvoltage Protection**			
4-Q, 500V					
DCS800-S02-1200-04/05		DCF506-1200-51	1 x 25	1 x M8	13
DCS800-S02-1500-04/05					
4-Q, 690V					
DCS800-S02-0900-07		DCF506-1500-71	1 x 25	1 x M8	13
DCS800-S02-1500-07					

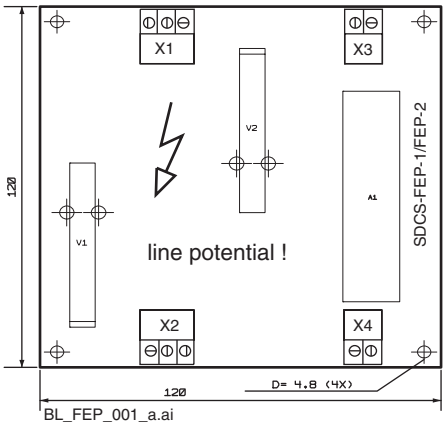
① Only these converter types are allowed to be used as large field exciters. A 10 % current de-rating is strongly recommended.

② Limited to 520 A due to overvoltage protection.

Diagram



Overvoltage Protection DCF505 / DCF506



Layout of SDCS-FEP-1 / FEP-2

Output X4:1-2

Potential isolated by relay (NO contact)
Contacts no protected
Contact rating: **AC**: ≤ 60 V~ / ≤ 50 mA~
DC: ≤ 60V- / ≤ 50 mA-

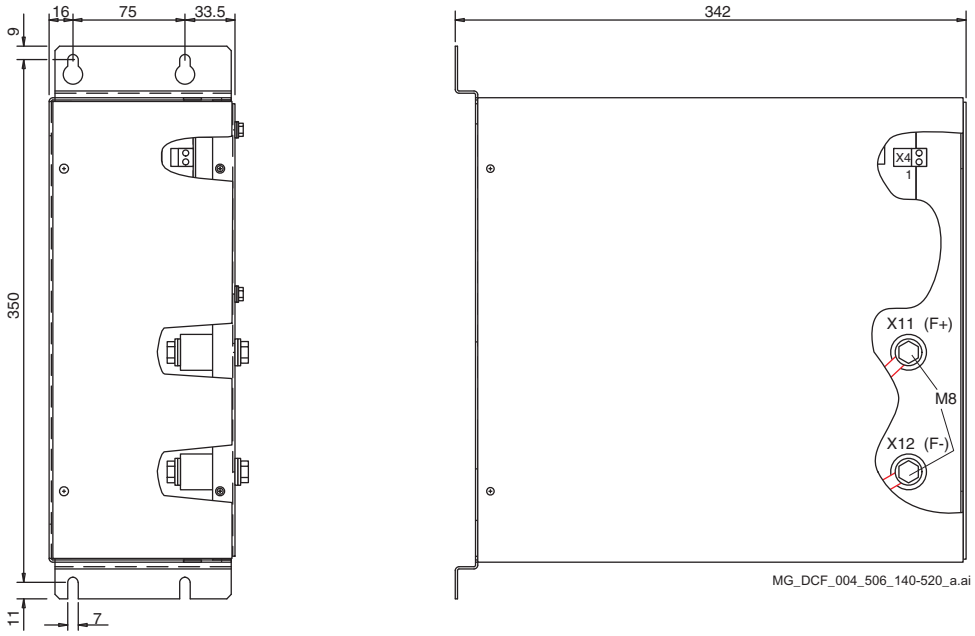
There are two trigger units in use:

- SDCS-FEP-1 for systems, used for mains up to 525 V. This board is equipped with a 1,400 V trigger diode.
- SDCS-FEP-2 for systems, used for mains up to 690 V. This board is equipped with a 1,800 V trigger diode.

Dimensions

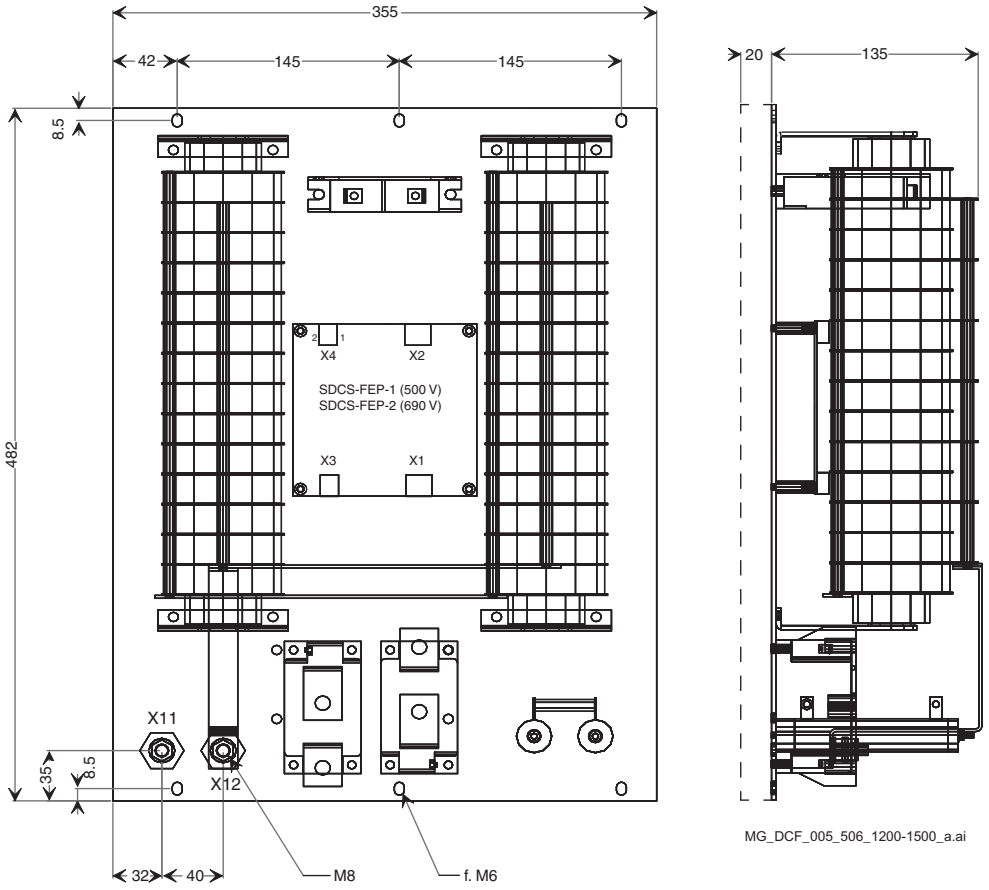
Overvoltage protection
DCF506-0140-51
DCF506-0520-51

Dimensions in mm
Weight appr. 8 kg



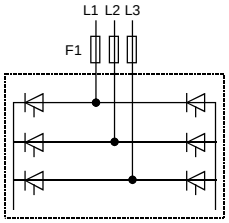
Overvoltage protection
DCF506-1200-51
DCF506-1500-71

Dimensions in mm
Weight appr. 20 kg



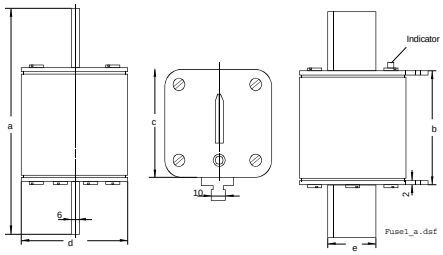
Fuses and fuse holders IEC

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
D1	DCS800-S01-0020-04/05	DCS800-S02-0025-04/05	50A 660V UR		6	OFAX 00 S3L
	DCS800-S01-0045-04/05	DCS800-S02-0050-04/05	80A 660V UR		3	OFAX 00 S3L
	DCS800-S01-0065-04/05	DCS800-S02-0075-04/05	125A 660V UR		1.8	OFAX 00 S3L
	DCS800-S01-0090-04/05	DCS800-S02-0100-04/05				OFAX 00 S3L
	DCS800-S01-0125-04/05	DCS800-S02-0140-04/05	200A 660V UR	1	0.87	OFAX 1 S3
D2	DCS800-S01-0180-04/05	DCS800-S02-0200-04/05	250A 600V UR		0.59	OFAX 1 S3
	DCS800-S01-0230-04/05	DCS800-S02-0260-04/05	315A 660V UR		0.47	OFAX 2 S3
D3	DCS800-S01-0315-04/05	DCS800-S02-0350-04/05	500A 660V UR	2	0.30	OFAX 3 S3
	DCS800-S01-0290-06	DCS800-S02-0320-06				OFAX 3 S3
	DCS800-S01-0405-04/05	DCS800-S02-0450-04/05	700A 660V UR	3	0.22	OFAX 3 S3
	DCS800-S01-0470-04/05	DCS800-S02-0520-04/05				OFAX 3 S3
D4	DCS800-S01-0590-06	DCS800-S02-0650-06	900A 660V UR	4	0.15	170H 3006
	DCS800-S01-0610-04/05	DCS800-S02-0680-04/05				170H 3006
	DCS800-S01-0740-04/05	DCS800-S02-0820-04/05				170H 3006
	DCS800-S01-0900-04/05	DCS800-S02-1000-04/05	1250A 660V UR		0.09	170H 3006



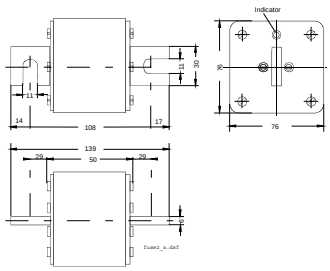
Dimensions of fuses

Size 0 - 3



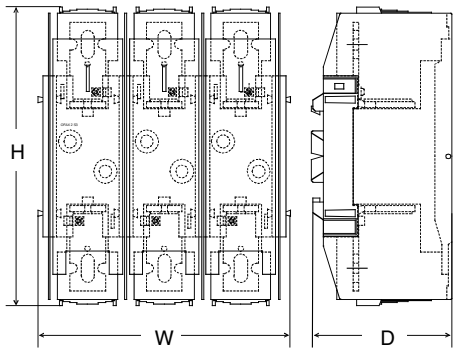
Size	a [mm]	b [mm]	c [mm]	d [mm]	e [mm]
0	78,5	50	35	21	15
1	135	69	45	45	20
2	150	69	55	55	26
3	150	68	76	76	33

Size 4



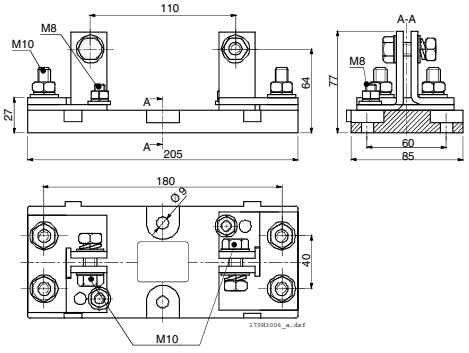
Dimensions of fuse holders

OFAX xx xxx



Fuse holder	HxWxD [mm]	Protection
OFAX 00 S3L	148x112x111	IP20
OFAX 1 S3	250x174x123	IP20
OFAX 2 S3	250x214x133	IP20
OFAX 3 S3	265x246x160	IP20

170H 3006 (IP00)



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.

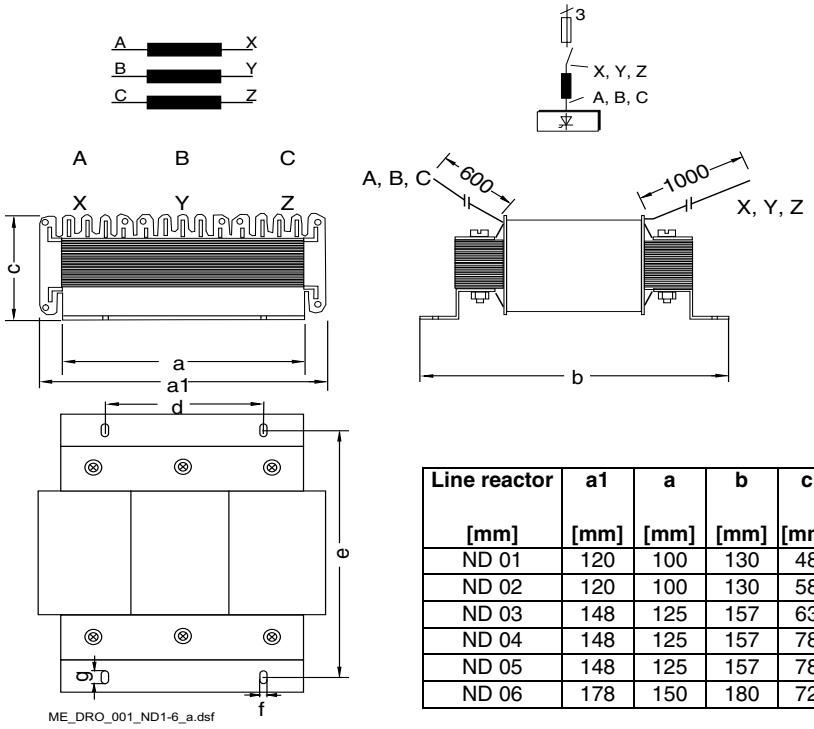
Line reactors ND01 to ND06 are equipped with cables. The larger ones ND07 to ND17 are equipped with busbars. When connecting them to other components, please consider relevant standards in case the busbar materials are different.

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

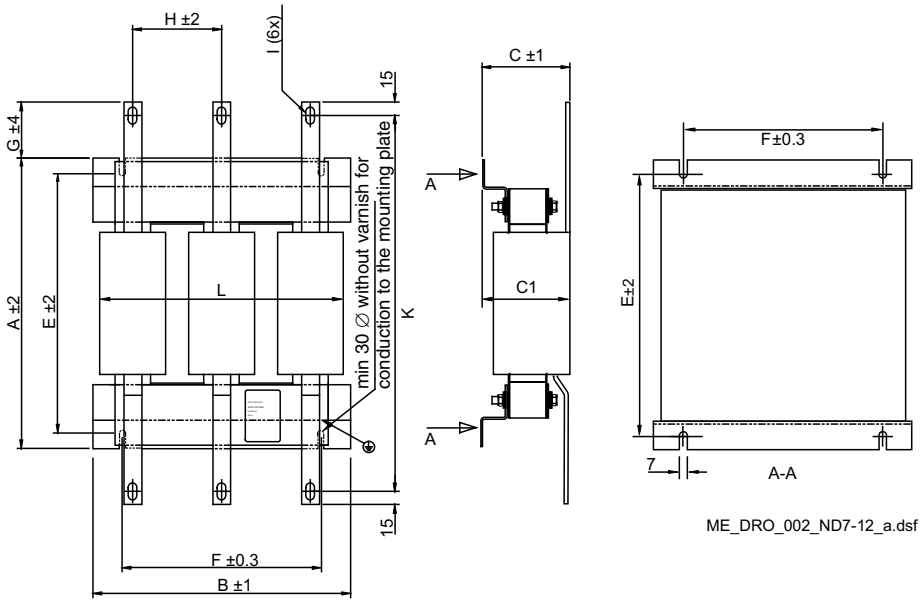
(...) not used for DCS800

Line reactors type ND01 to ND06



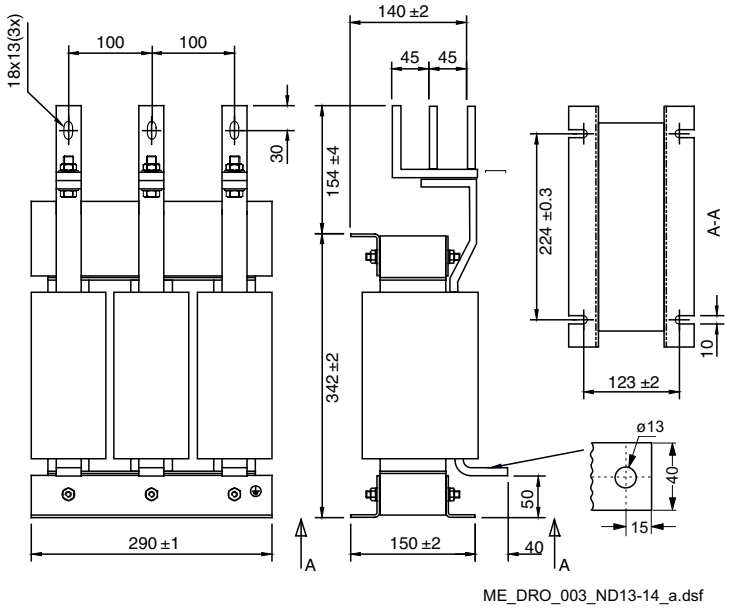
Line reactor [mm]	a1 [mm]	a [mm]	b [mm]	c [mm]	d [mm]	e [mm]	f [mm]	g [mm]	[mm^2]
ND 01	120	100	130	48	65	116	4	8	6
ND 02	120	100	130	58	65	116	4	8	10
ND 03	148	125	157	63	80	143	5	10	10
ND 04	148	125	157	78	80	143	5	10	16
ND 05	148	125	157	78	80	143	5	10	25
ND 06	178	150	180	72	90	170	5	10	35

Line reactors type ND07 to ND12

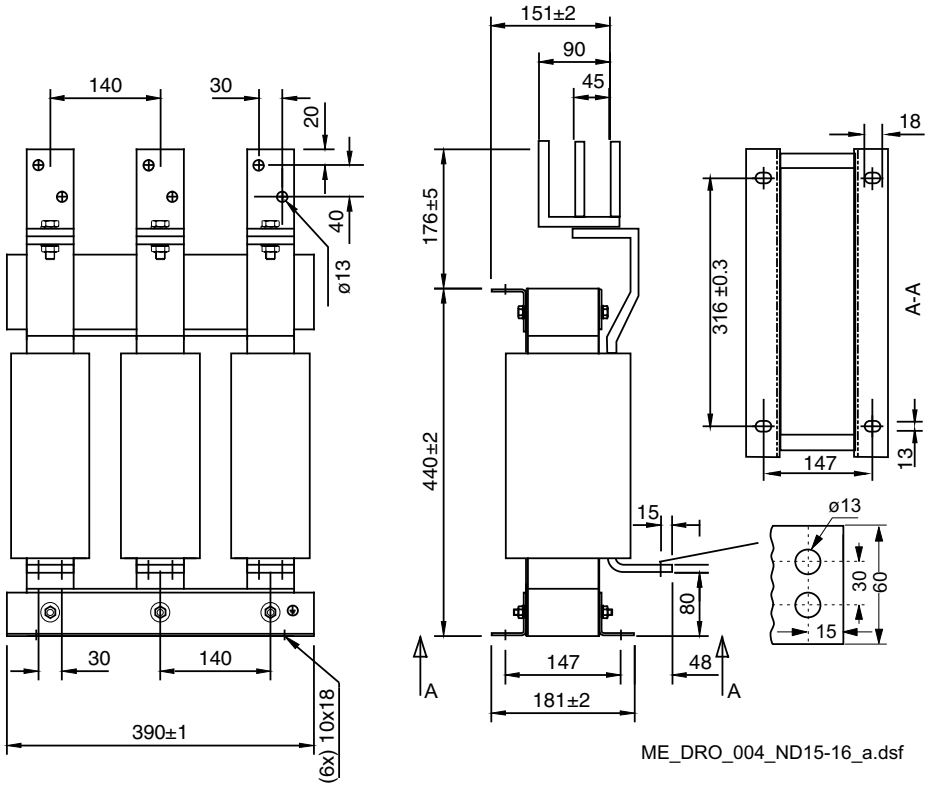


Line reactor (u_k = 1%)	A [mm]	B [mm]	C [mm]	C1 [mm]	E [mm]	F [mm]	G [mm]	H [mm]	I [mm]	K [mm]	L [mm]	busbar
ND07, 08	285	230	86	100	250	176	65	80	9 * 18	385	232	20 * 4
ND09	327	250	99	100	292	224	63	100	9 * 18	423	280	30 * 5
ND10, 11	408	250	99	100	374	224	63	100	11 * 18	504	280	30 * 6
ND12	458	250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

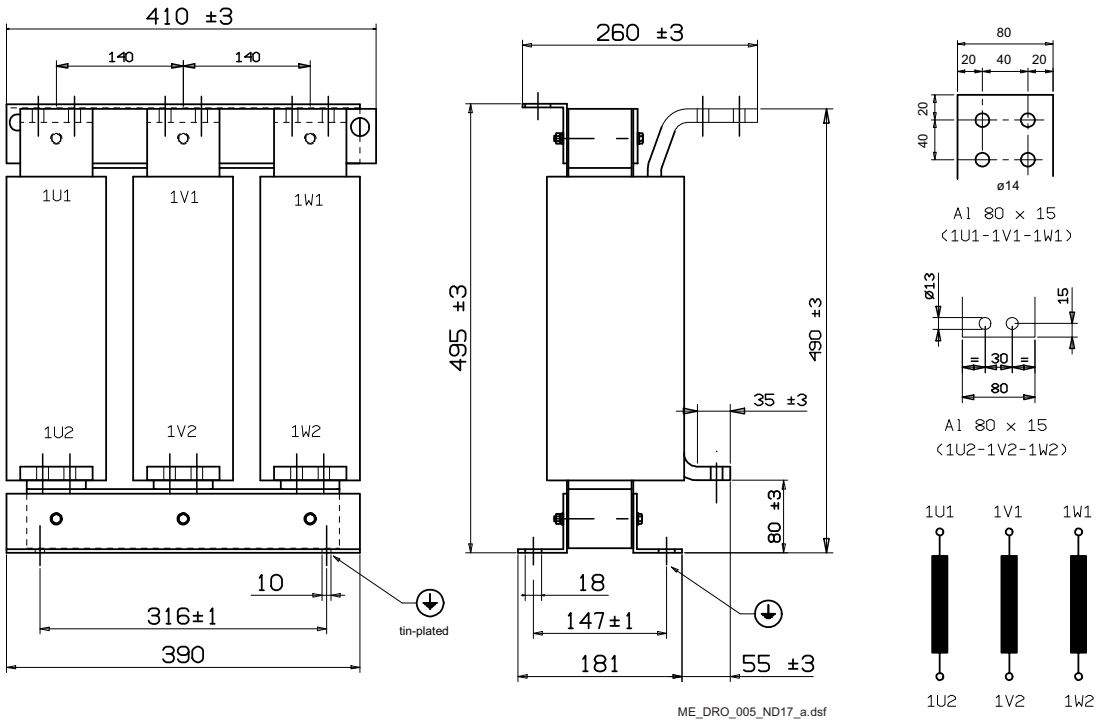
Line reactors type ND13, 14 all busbars are 40 x 10



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

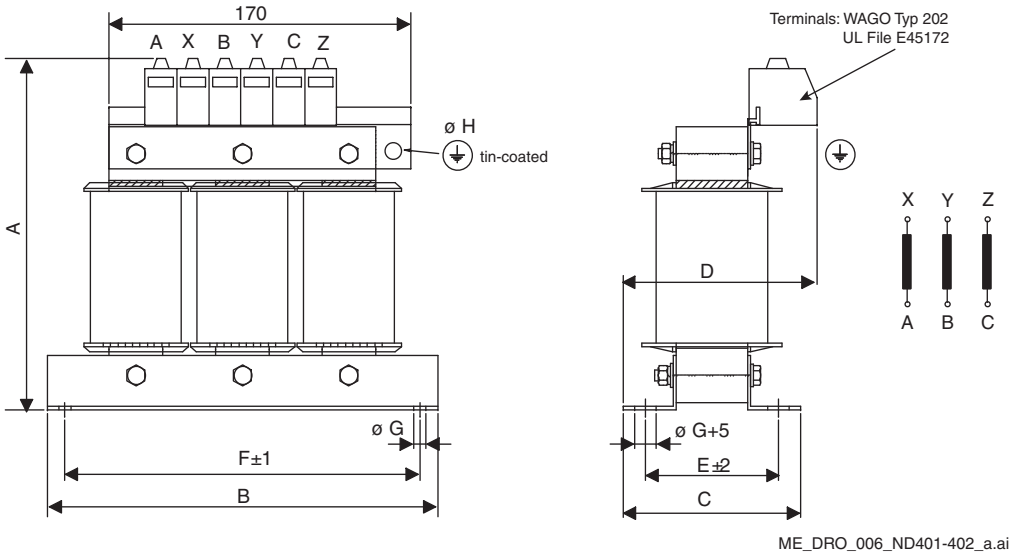
Line reactors ND401 to ND402 are equipped with terminals. The larger ones ND403 to ND413 are equipped with busbars. When connecting them to other components, please consider relevant standards in case the busbar materials are different.

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

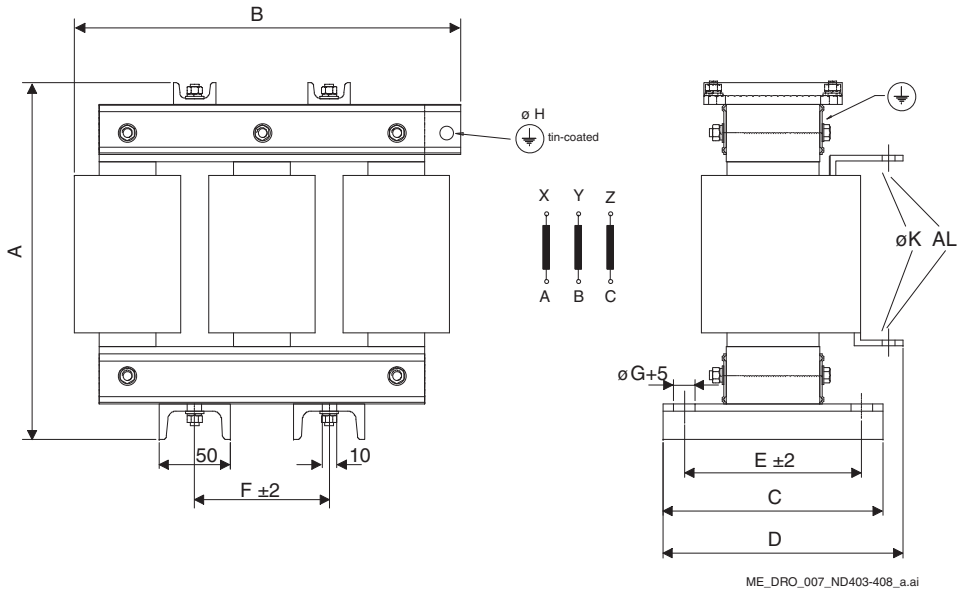
Line reactors type ND401, 402

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



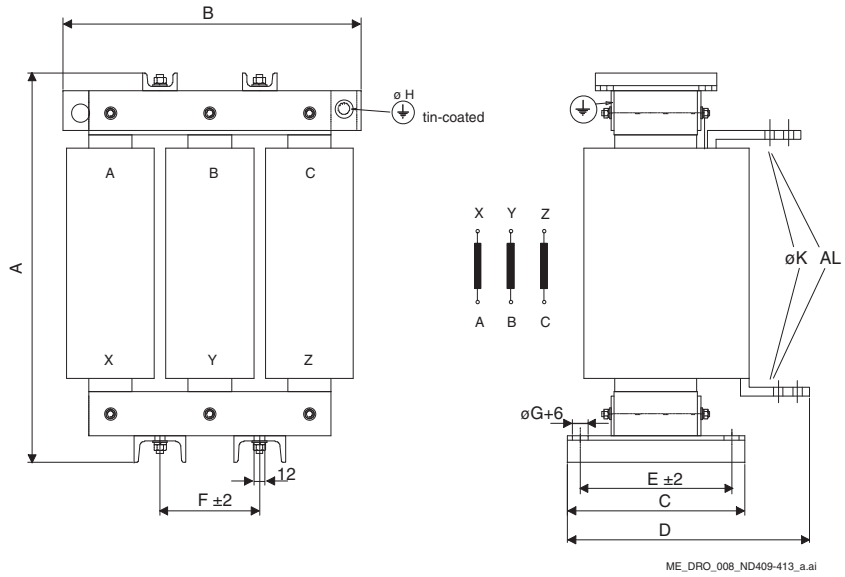
Line reactors type ND403 to ND408

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



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

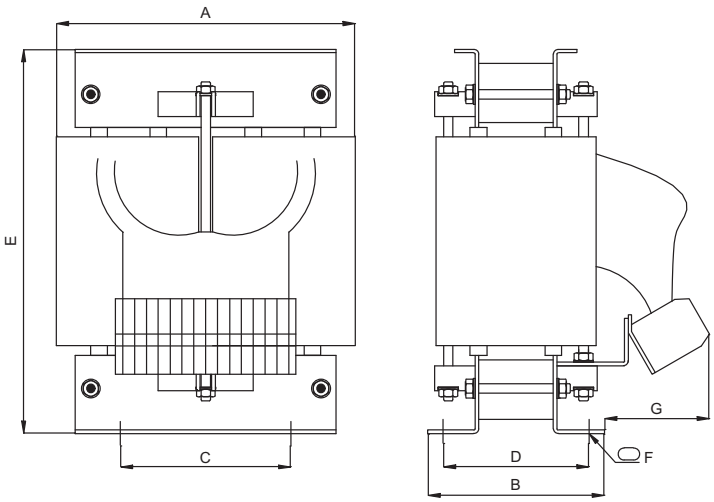


Autotransformer (T3)

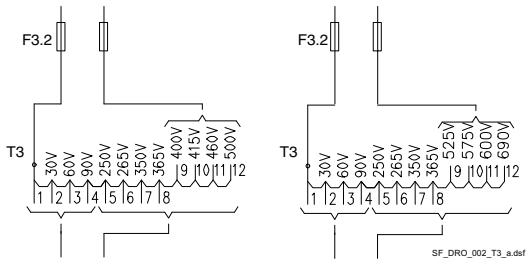
Autotransformer (T3)	Field current [A]	Secondary current [A]	Weight [kg]	Power losses [W]	Fuse F3.2 [A]
		U_1 = 500 V ± 10 %, 50 / 60 Hz			
T3, 01	$I_F \leq 6$	≤ 7	15	65	10
T3, 02	$I_F \leq 12$	≤ 13	20	100	16
T3, 03	$I_F \leq 16$	≤ 17	20	120	25
T3, 04	$I_F \leq 30$	≤ 33	36	180	50
T3, 05	$I_F \leq 50$	≤ 57	60	250	63
		U_1 = 690 V ± 10 %, 50 / 60 Hz			
T3, 11	$I_F \leq 6$	≤ 7 ①	15	80	10
T3, 12	$I_F \leq 12$	≤ 13 ①	20	125	16
T3, 13	$I_F \leq 16$	≤ 17 ①	30	150	20
T3, 14	$I_F \leq 30$	≤ 33 ①	60	230	50
T3, 15	$I_F \leq 50$	≤ 57	60	320	63



① The 690 V autotransformer input cannot be used for the field converters DCF803-0016, FEX-425-Int and DCF803-0035 (maximum isolation voltage is 600 V)



ME_TRA_001_T3_b.ai

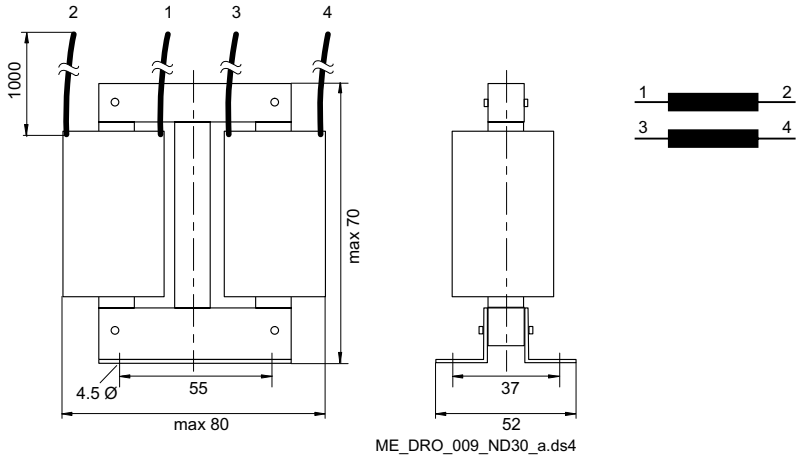


Autotransformer (T3)	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	Ø G [mm]
T3, 01 / T3, 11	210	110	112	75	240	10 * 18	95
T3, 02 / T3, 12 T3, 03	210	135	112	101	240	10 * 18	95
T3, 13	230	150	124	118	270	10 * 18	95
T3, 04	260	150	144	123	330	10 * 18	95
T3, 14 / T3, 05 T3, 15	295	175	176	141	380	12 * 18	95

Line reactor (L3)

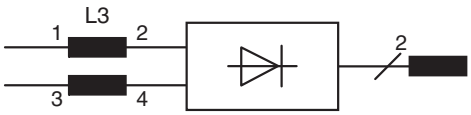
The ND30 is used for single-phase connection of DCF803-0016, FEX-425-Int and DCF803-0035 up to a field current of 16 A

Input voltage: max. 500 V
Frequency: 50 / 60 Hz



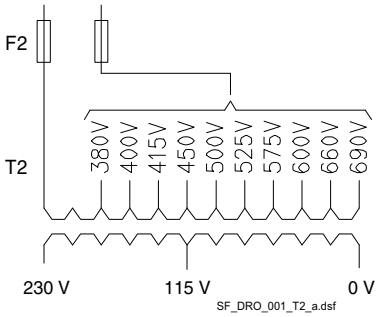
Line reactor (L3)	L3 [µH]	I_{RMS} [A]	I_{PEAK} [A]	Weight [kg]	Powerlosses [W]	 [mm²]
ND30	2 * > 500	16	16	1.1	8	2

Connection example



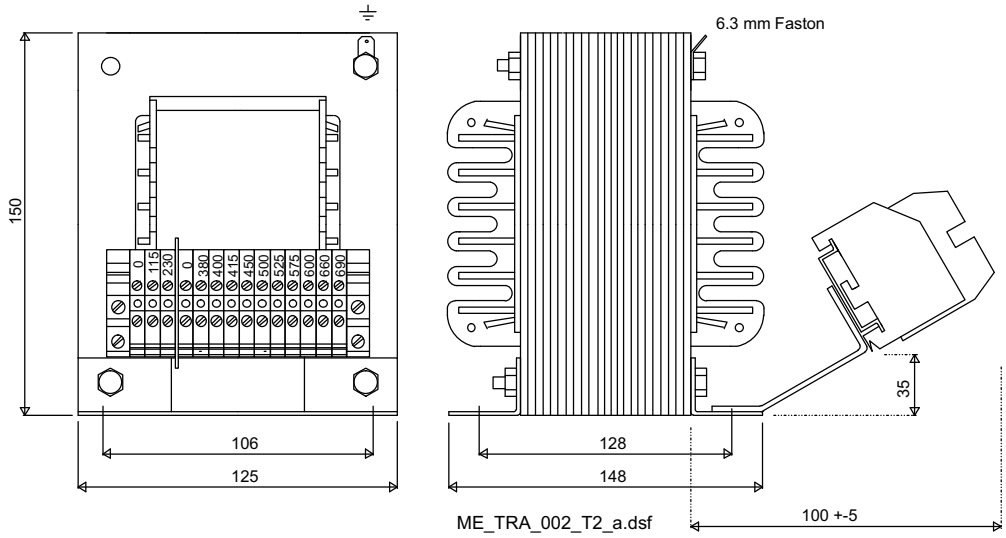
Auxiliary transformer (T2) for converter electronics and fans

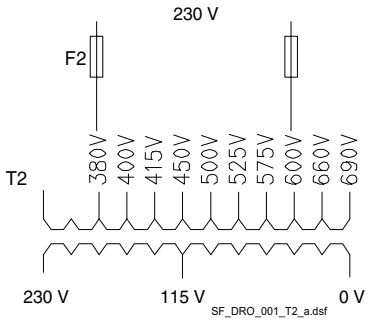
The auxiliary transformer (T2) is designed to supply the module‘s electronics and cooling fans. One transformers power and current allow supplying the single-phase fans and electronics of e.g. two D5 converters.



Input voltage: 230 / 380 to 690 V_{AC} ±10 %, single-phase
Input frequency: 50 to 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 @ 230V 12 @ 115 V

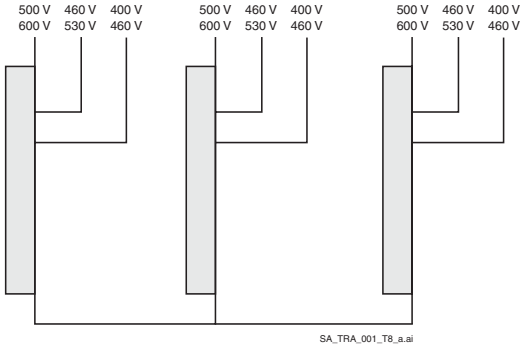




Commissioning hint:
T2 is designed to work as a 230 V_{AC} to 230 V_{AC} isolation transformer to open or avoid ground loops. Connect the 230 V_{AC} at the 380 V_{AC} and 600 V_{AC} tapings according to the drawing on the left hand side.

Supply transformer (T8) for cooling fan

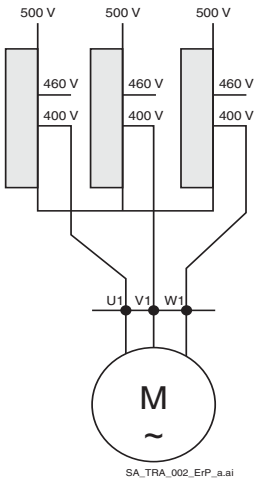
The three phase autotransformer (T8) is designed to supply the cooling fan in a D7 converter.
ErP compliant fan: 460 V or 500 V
Classic fan: 530 V or 600 V.



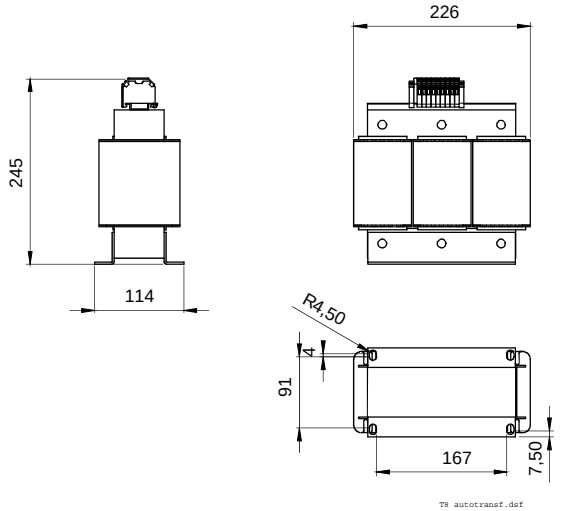
Input voltage: 500 / 460 V_{AC} or 600 / 530 V_{AC} ±15 %, 3-phase
Input frequency: 50 to 60 Hz
Output voltage: 400 V_{AC} or 460 V_{AC} 3-phase

Transformer (T8)	Power [VA]	Weight [kg]	Powerlosses [W]	Secondary current [A]
T8	5,580	20	16	7 @ 460 V

Connection example for ErP compliant fan for 500 V_{AC}

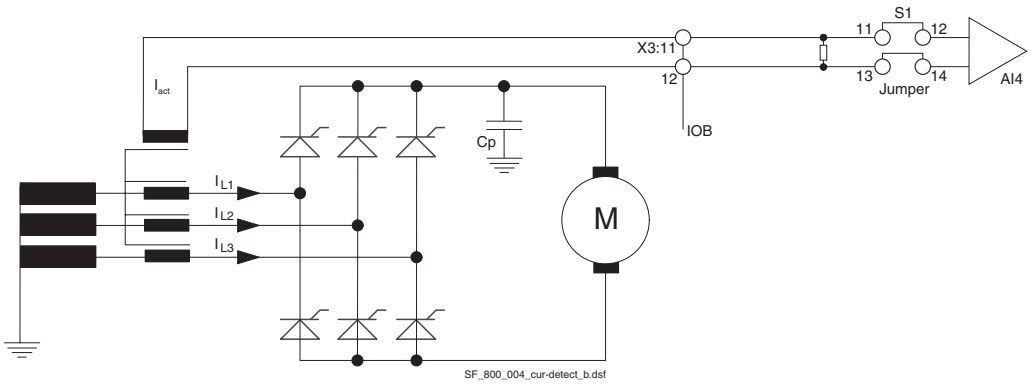


Dimensions



Residual current detection

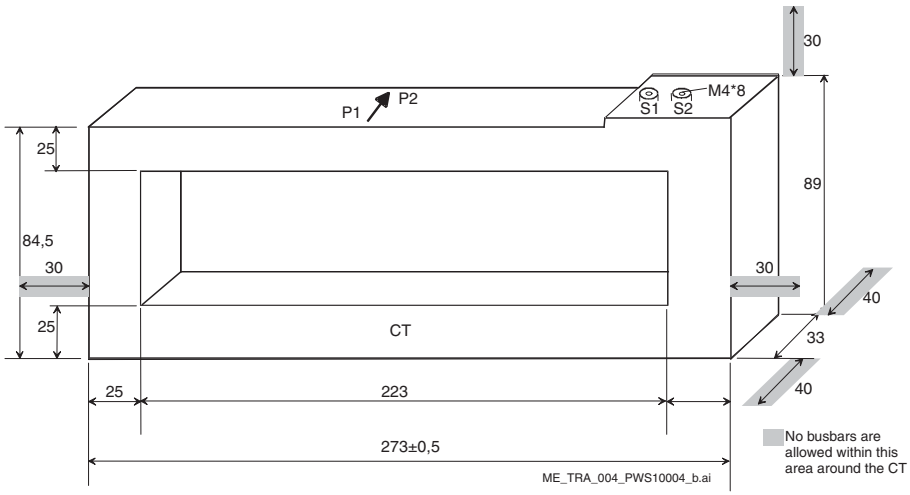
The DCS800 together with a SDCS-IOB-3 and a specially designed current transformer (CT), big enough to feed through all the cables / busbars of the three phases are prepared to detect residual current. This option can only be used at grounded networks.



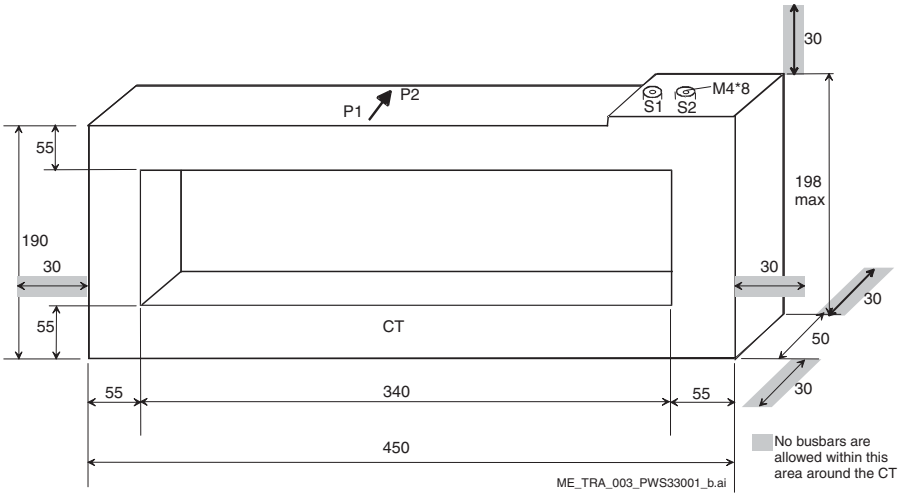
Electrical and mechanical data

There are 2 different current transformers available. Their physical dimensions are different. Consumers connected via cables will have a lower current and therefore monitored most often by the smaller CT, specified for 1500 A. Larger consumers or several drives monitored as a group and supplied via busbars use the larger one, specified for currents up to 3300 A.
When doing the final mechanical work, make sure the conductors are placed symmetrically within the available cross sectional area.
The current transformer has no built-in burden resistor. The CT‘s output has to be connected to the SDCS-IOB-3 X3:11 and X3:12 via a shielded twisted pair cable. The maximum length is 2 m.
For more details, see *Residual current detection*.

Current transformer PWS10004 (I ≤ 1500 A)



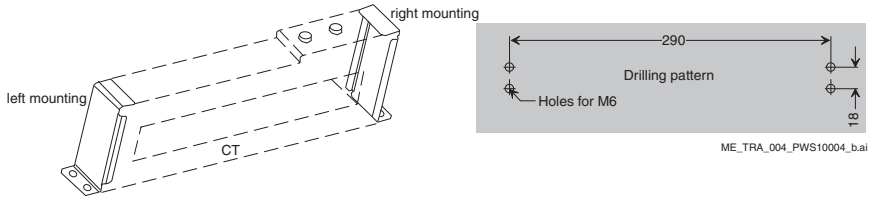
Current transformer PWS33001 (I ≤ 3300 A)



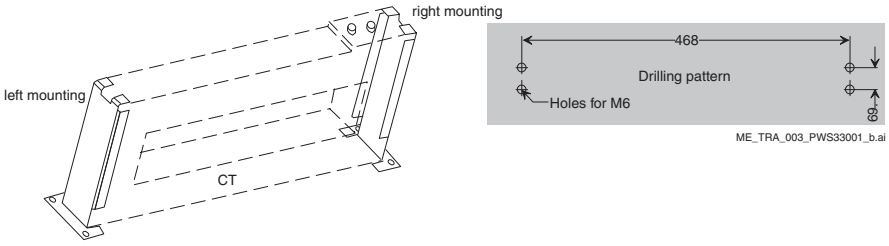
Mechanical mountings

The current transformers do not include mountings. There are mountings available for both types. Due to CT's constructions a left and a right mounting is necessary.

Current transformer type PWS10004 (I ≤ 1500 A)



Current transformer type PWS33001 (I ≤ 3300 A)



Comissioning hints

After all parts are installed, make sure:
- Jumper S1 on the SDCS-IOB-3 is in position 11 - 12 and 13 - 14.
- No cables are connected to terminals X3:9 and X3:10 on the SDCS-IOB-3.
- Select AI4 for this monitoring function via parameters.
- Activate the monitoring function via parameters.
- Define the threshold in amps via parameters.
- If necessary delay the fault message via parameters to avoid actions caused by disturbance or similar.

Optical cables

For the bus communication of the DCS converters there are different optical cables available.

Kind of cable	Connector	cable length	Ident. no.	Fig.
Plastic optic fibre single cable	plug	0.5 to 30 m	3ADT693324	1
Plastic optic fibre double cable	plug	0.5 to 30 m	3ADT693318	2
HCS silica (double) without plastic jacket	plug	30 to 50 m	3ADT693355	3
HCS silica (double) with plastic jacket	plug	50 to 200 m	3ADT693356	4

Figure 1

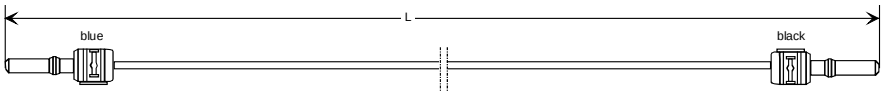


Figure 2

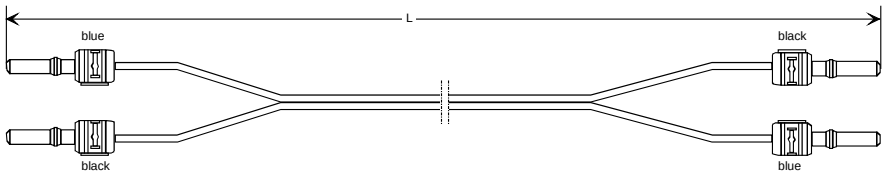


Figure 3

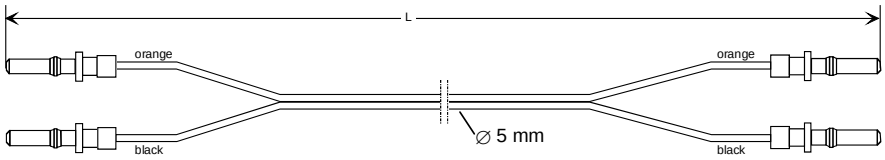
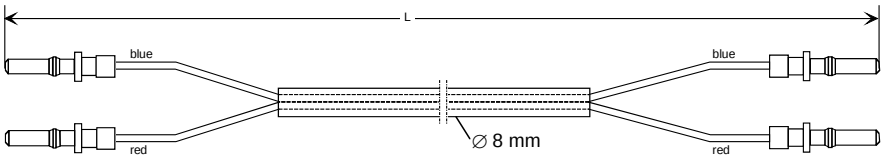
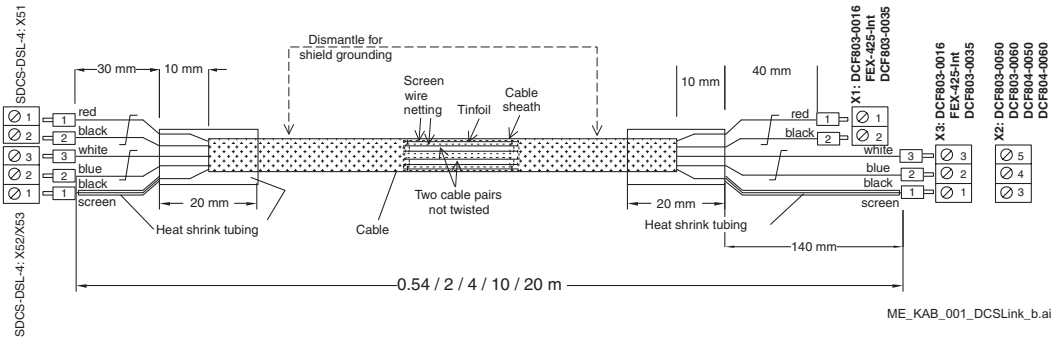


Figure 4

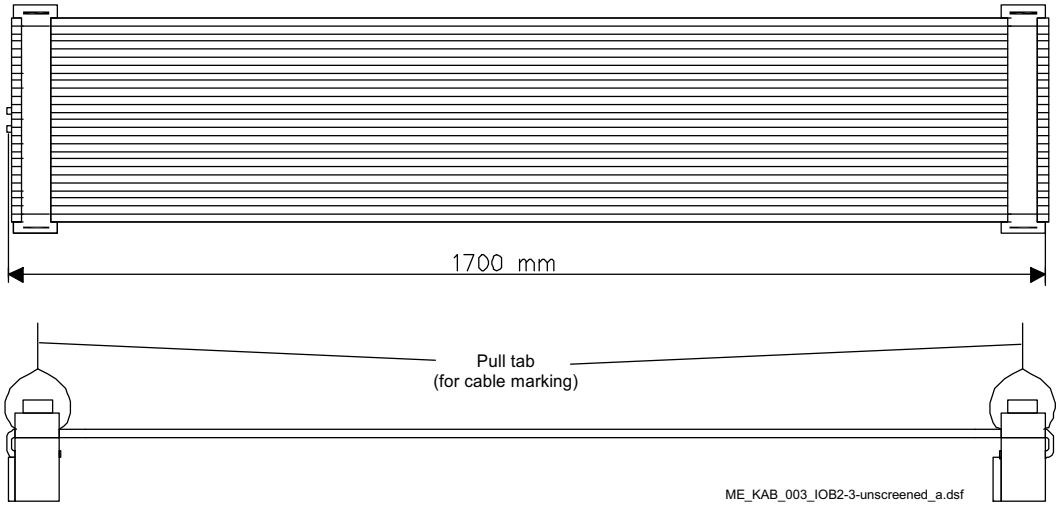


Other cables

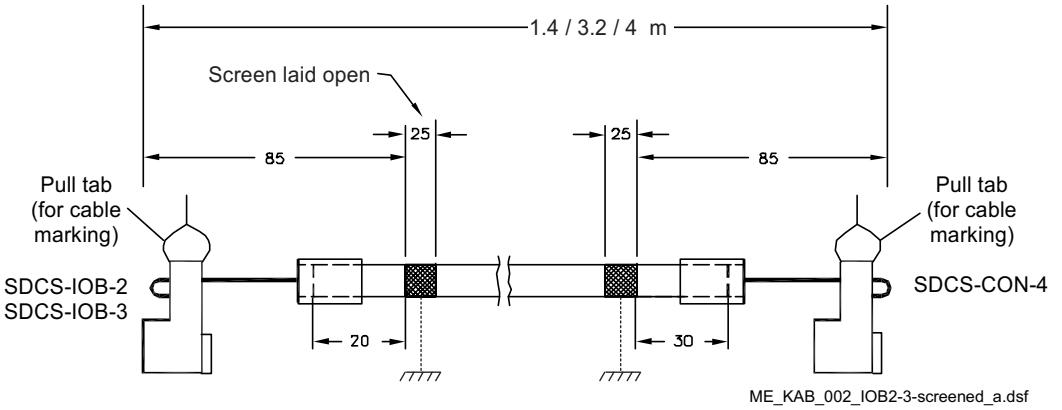
DCSLink cable



Unscreened flat cable for SDCS-CON-4 to SDCS-IOB-2 and SDCS-IOB-3



Screened flat cable for SDCS-CON-4 to SDCS-IOB-2 and SDCS-IOB-3



3ADW000194R0801_Rev H
11_2014

ABB Automation Products
Wallstadter Straße 59
D-68526 Ladenburg
Germany
Telefon: +49(0)6203-71-7608
Telefax: +49(0)6203-71-7609
www.abb.com/motors&drives

194R0801A4440000