

DCS800

Installation Manual

DCS800-A Enclosed Converters (18 to 9800 A / 19600 A)



DCS800 Drive Manuals

	Public. number	Language						
		E	D	I	ES	F	CN	RU
DCS800 Quick Guide	3ADW000191	x	x	x	x	x		
DCS800 Tools & Documentation CD	3ADW000211	x						
DCS800 Converter module								
Flyer DCS800	3ADW000190	x	x	x	x	x	x	x
Technical Catalogue DCS800	3ADW000192	x	x	x	x	x	x	x
Hardware Manual DCS800	3ADW000194	x	x	p	x	x	x	x
Hardware Manual DCS800 update DCF503B/DCF504B	3ADW000194Z0301	x						
Firmware Manual DCS800	3ADW000193	x	x	p	x	p	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	p						
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 CoDeSys	CoDeSys_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 REVA	p						
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 Catalogue DCS800-A	3ADW000198	x						
Installation of DCS800-A	3ADW000091	p						
DCS800-R Rebuild System								
Flyer DCS800-R	3ADW000007	x	x					
DCS800-R Manual	3ADW000197	x						
DCS500/DCS600 Size A5...A7, C2b, C3 and C4 Upgrade Kits	3ADW000256	x						
Extension Modules								
RAIO-01 Analogue IO Extension	3AFE64484567	x						
RDIO-01 Digital IO Extension	3AFE64485733	x						
AIMA R-slot extension	3AFE64661442	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 10.2008								

DCS800-A Enclosed Converters

18 to 9800 A / 19600 A

Installation Manual

Code: 3ADW000352R0101 Rev.: A

DCS800-A Installation Manual e a.DOC

EFFECTIVE: January 2nd, 2009
SUPERSEDES: none

Safety Instructions

What this chapter contains

This chapter contains the safety instructions 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.

Usage of warnings and notes

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



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



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



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

Installation and maintenance work

These warnings are intended for all who work on the 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 system 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 \oplus).
- 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.

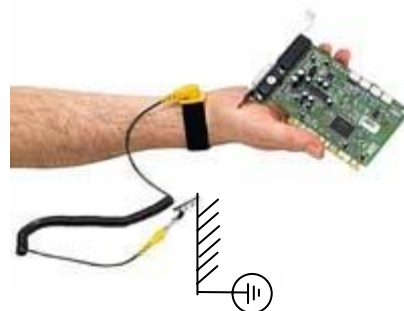


WARNING! The printed circuit boards contain components sensitive to electrostatic discharge. Wear a grounding wrist band when handling the boards. Do not touch the boards unnecessarily.

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 (1.38 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 and D5 only on its 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 intended for use in non-industrial installations - which may require stricter safety regulations (e.g. protection against contact by children or similar) - these additional safety measures for the installation must be provided by the customer during assembly.

Note:

- When the control location is not set to Local (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 .
-

EMC Standards

EMC requirements for plants and machines in the EU

The following standard must be complied with to meet the EMC requirements for plants and machines in the EU:

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 (**PowerDriveSystem**), 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!

In cases where the product standard is not applied, the generic standards EN 50081 and EN 50082 are sometimes adduced. For emitted interference, the following applies:

EN 50081-1:

Specialized basic standard for emissions in **light industry** can be satisfied with special features (mains filters, screened power cables) in the lower rating range.

EN 50081-2:

Specialized basic standard for emissions in **industry**.

For emitted interference, the following applies:

EN 50082-1:

Specialized basic standard for interference immunity in **residential areas**.

EN 50082-2:

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

For more information see *DCS800 Hardware Manual* (3ADW000194).

Conformity Procedure



The conformity procedure is a matter of responsibility of the machine manufacturers or the plant builders and of ABB Automation Products corresponding to their share of the extension of the electrical equipment!

Important instructions for plants with line filters



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 lines. According to EN 61800-3 filters are not needed in insulated industrial lines with own supply transformers. Furthermore they could cause safety risks in such floating lines (IT networks).

Residual current detection:

Together filters (with internal discharging resistors), cables, converter and motor have a considerable capacity to ground which can cause an increased capacitive residual current. The tripping threshold of an residual current detector which measures this current must be adapted to this higher value.

High voltage test:

Because of the capacitors of the line filter the high voltage test has to be done with DC voltage to protect the components.

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Introduction to this manual

How to use this manual

This Installation Manual about DCS800-A Enclosed Converters is to be used together with the associated publications.

Note:

If it is not mentioned explicitly all details given in this Installation Manual will be valid for DCS800-A Enclosed Converters.

Study the Safety Instructions / EMC Standards of this manual carefully before installing the DCS800-A Enclosed Converters.

Note:

For additional information, refer to below mentioned associated publications.

We expect that you have a basic knowledge of physical and electrical fundamentals, electrical wiring practices, electrical components and electrical schematic symbols.

Contents of this manual

The [Safety instructions](#) and [EMC Standards](#) can be found at the beginning of this manual.

[Introduction to this manual](#), the chapter you are currently reading, introduces you to this manual.

[Mechanical Installation](#), this chapter gives all mechanical information concerning the installation of the DC enclosed converters is provided. In this chapter, details such as moving the shipping splits, joining the units together, joining the busbars and fastening the cabinets to the floor are given.

[Electrical Installation](#), this chapter discusses the electrical installation.

[Installation Checklist](#), this chapter contains the installation checklist.

[Preventive Maintenance](#), this chapter introduces the preventive maintenance.

Associated publications

A list of associated publications is published on the inner page of this manual's cover, see [DCS800 Drive Manuals](#). Here is a list of the most important ones:

- The *DCS800 Hardware Manual* (3ADW000194) describes all hardware components of the DCS800 thyristor converters, their connections and settings (e.g. jumpers).
- The *DCS800 Firmware Manual* (3ADW000193) gives an overview of the DCS800 firmware, describes all parameters, describes the function of the DCS800 Control Panel, gives support in case of faults and alarms and gives information about communication.

The above listed documentation can be found on the CD-ROM being attached to the *DCS800 Quick Guide* (3ADW000191).

Inquiries

For inquiries about the product please address your local ABB representative, quoting type code and serial number of the unit. If the local ABB representative is not available, inquiries should be addressed to ABB Automation Products GmbH, Ladenburg in Germany.

Mechanical Installation

This chapter provides instructions for moving shipping splits (= complete drive systems divided into parts before shipping), fastening them to the floor and joining them together.

See *DCS800 Technical Catalogue* (3ADW000192) and *DCS800 Hardware Manual* (3ADW000194) for allowed operating conditions of the DC thyristor power converters. For sufficient room around the unit see [Working order installation](#). Room around the unit is required to enable cooling air flow, service and maintenance. Proper mechanical installation is an important element for a trouble free installation and should be followed closely.

The DC thyristor power converter cabinets should be installed in an upright vertical position.

The floor the unit is installed on should be of non-flammable material, as smooth as possible, and strong enough to support the weight of the unit. The floor flatness must be checked with a water level before fastening the cabinets into their final position. The maximum allowed deviation of the surface level must be < 5 mm for every 3 m of length. The installation area should be leveled, since the cabinet is not equipped with adjustable feet.

The wall behind the unit should be of non-flammable material.

Required Tools

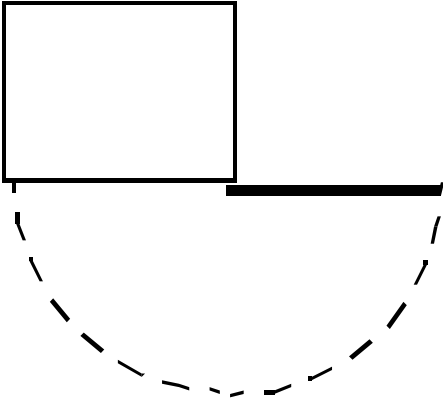
The tools required for moving the shipping splits to their final position, fastening to the floor and tightening the connections are listed below:

- 1.) Iron bar and roller tubes or similar tools to move the shipping splits;
- 2.) Torx (2.5 - 6 mm) screwdrivers for the tightening of the frame screws;
- 3.) Torque wrench;
- 4.) A 17 - 19 mm wrench set for tightening the AC horizontal busbars between the shipping splits;
- 5.) A 17 mm wrench set for tightening the PE busbars between shipping splits.

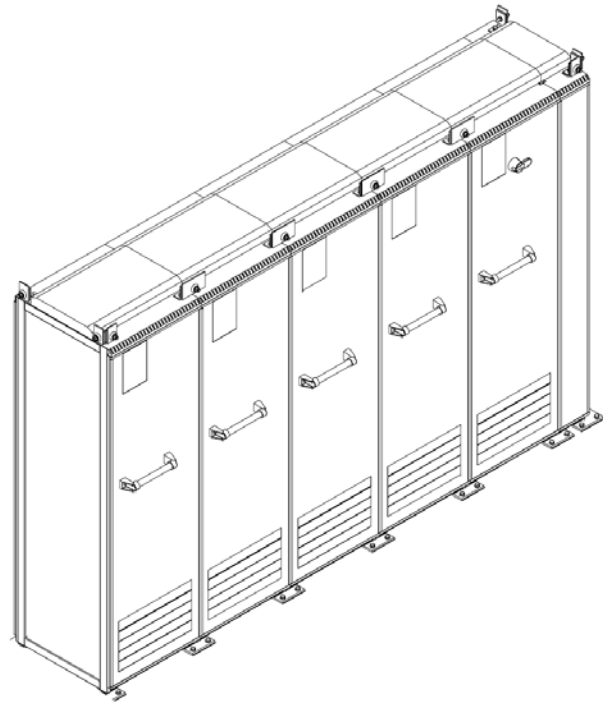
Cabinet Construction



DCS800-A enclosed converters

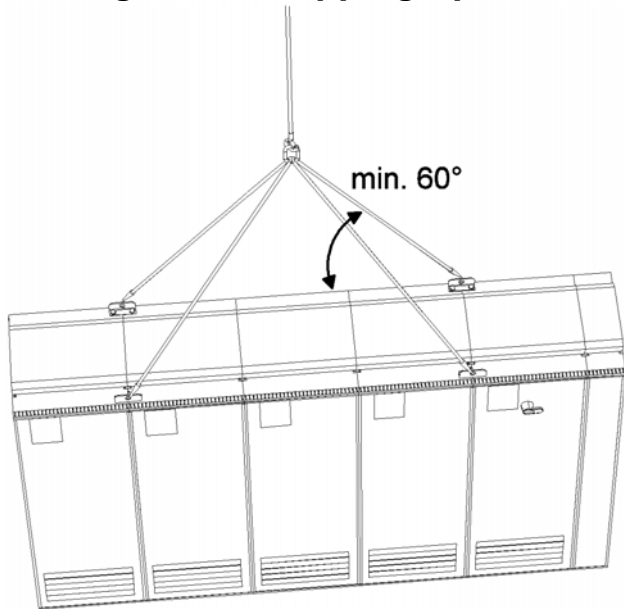


Cabinet door opening angle



Marine applications including handles and locking devices for open doors

Moving of the Shipping Splits



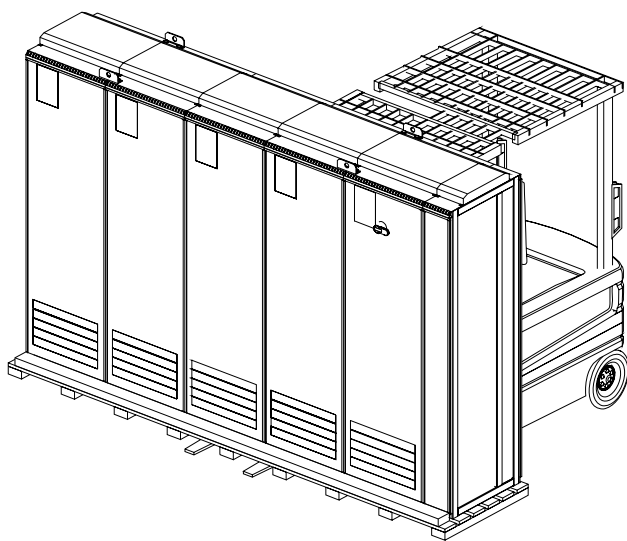
By crane

Use the steel lifting lugs attached to the top of the cabinets. Insert the lifting ropes or slings into the holes of the lifting lugs.

The lifting lugs can be removed (but not mandatory) once the cabinets are in their final position. If the lifting lug is removed, the bolts for each lug must be refastened to maintain the degree of protection of the cabinet.

Note:

Maximum length of one shipping split is 3.4 m. If required, the double roofs of all cabinets can be removed while placing the shipping split on its final position (see [Working order of Mechanical Installation](#) within this Chapter).



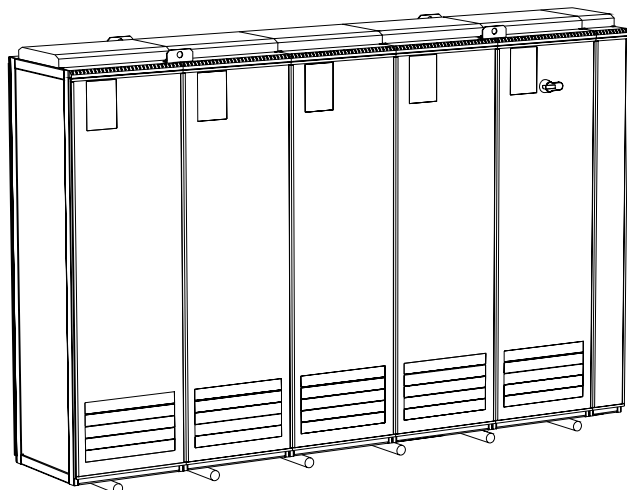
The center of gravity may be quite high, therefore caution should be used when transporting the shipping splits. Tilting of the cabinets must be avoided.

Moving of the shipping splits only with the cabinets in upright position.

Note:

The shipping split has to be placed on a suitable pallet for transportation by forklift!

By fork-lift

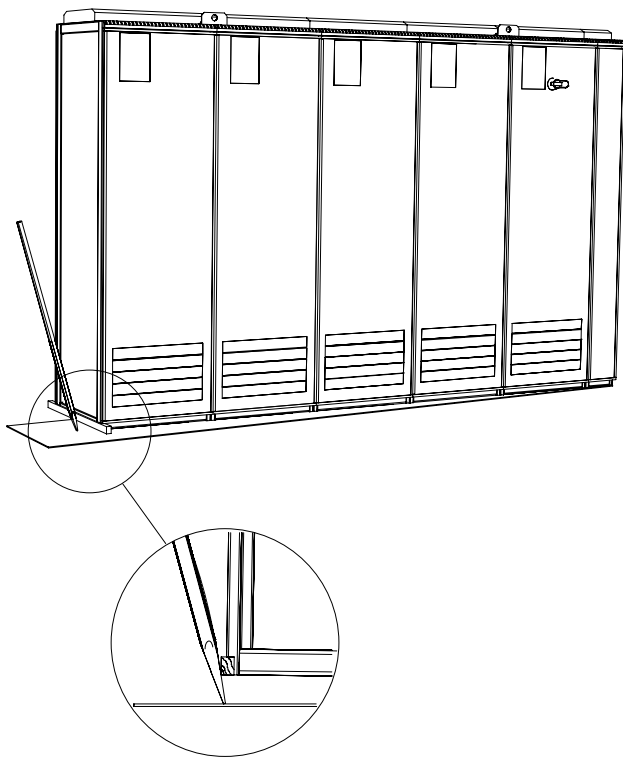


Remove the bottom wooden frame which is part of the shipment.

Place the shipping split on the rollers and move the unit carefully until it is close to its final position.

Remove the rollers by lifting the shipping split using a crane or fork-lift as described above.

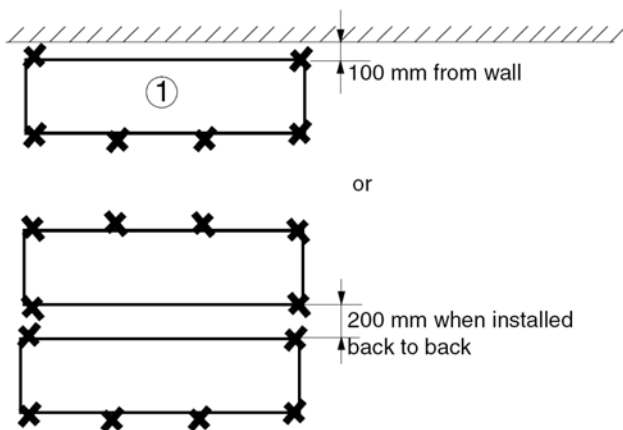
By rollers (Not allowed for marine versions)



The cabinets can be moved to their final position by using an iron bar and a piece of wood at the bottom edge of the cabinet. Take care and place the piece of wood properly to prevent damage the cabinet frame.

Final placement of shipping split (Not allowed for marine versions)

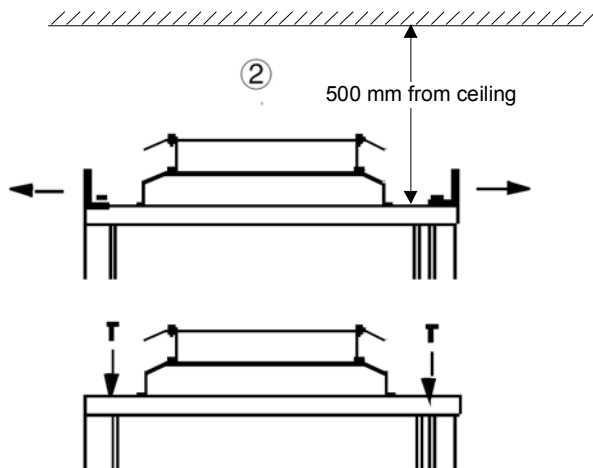
Working Order of the Mechanical Installation



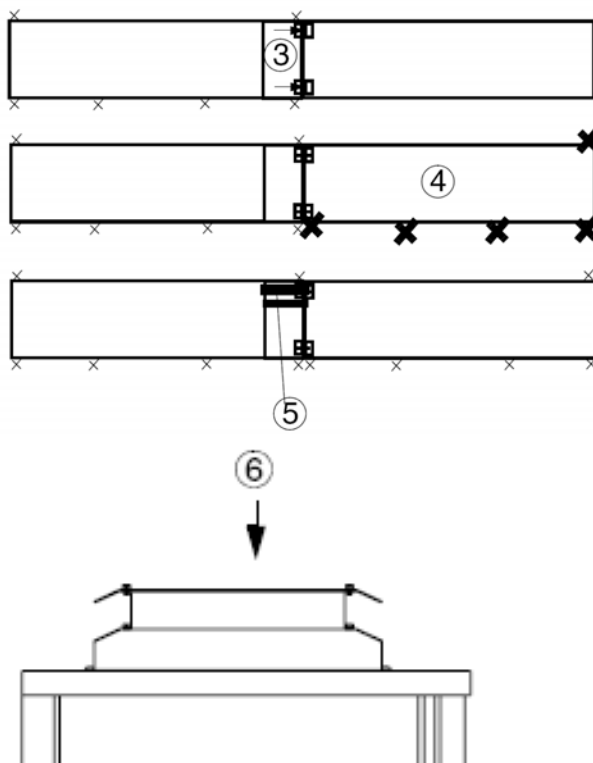
① Fasten the first shipping split to the floor with fastening clamps or through the holes inside the cabinet. See section [Fastening the Shipping Split to the Floor](#). In marine versions, fasten the first shipping split to the floor and roof/wall as described in section [Vibration Dampers \(Marine Versions\)](#).

Note:

Any height adjustment of the cabinets must be done before fastening the cabinets together. Height adjustment can be done by using metal shims between the bottom frame and floor.



② Remove the lifting bars (if used) and the lifting lugs (only for marine applications). Refasten the original bolts or upper vibration dampers (only for marine applications) in order to maintain the degree of protection of the cabinet.



③ Fasten the first shipping split to the next shipping split. See section [Joining the shipping splits](#). Each shipping split includes a 200 mm joining cabinet.

④ Fasten the second shipping split to the floor.

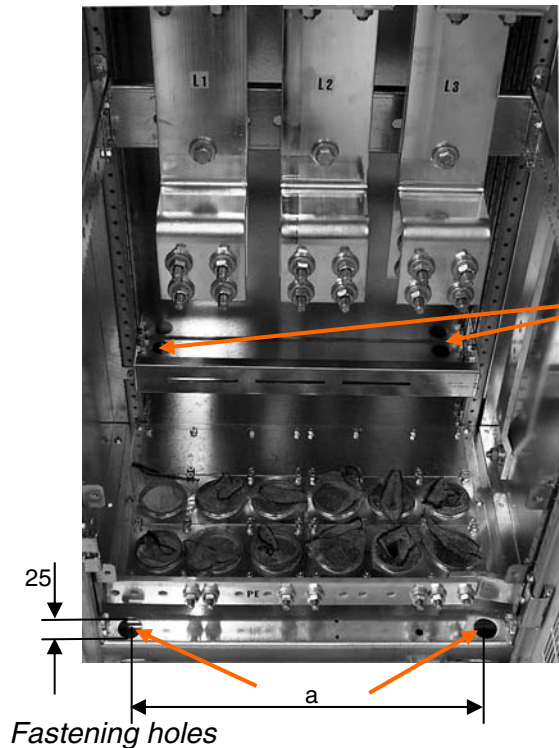
⑤ Connect the AC busbars and the PE busbar. See section [Connecting the AC Busbar and the PE Busbar](#).

⑥ Reinstall the roof if they have been removed. Attach each roof with 6 screws M6.

Working order installation

Holes inside the cabinet

The cabinet can be fastened to the floor using the fastening holes inside the cabinet, if they are available and accessible. Allowed maximum distance between the fastening points is 800 mm.



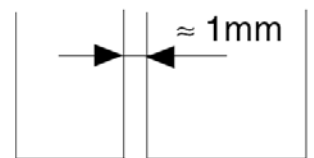
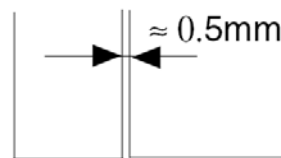
Fastening holes inside the cabinet

Side plates of the cabinet: 15 mm
Back plate of the cabinet: 10 mm

Small gap between the 200 mm, 400 mm, 600 mm, 800 mm, 1000 mm and 1500 mm cabinets:


IP 20...42

IP 54



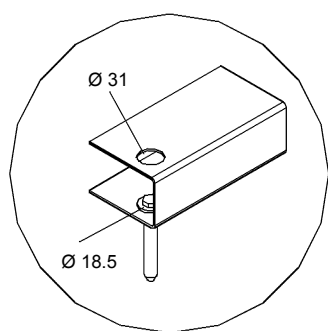
Gap between cabinets

Fastening hole distances for the common cabinet are given in [Hole distances](#).
Fastening bolt: M10 to M12 (3/8" to 1/2").

Cabinet Width (mm)	Hole Distance (mm)	
	 inner \varnothing 18.5 mm outer \varnothing 31 mm	
200	a: 50	
400	a: 250	
600	a: 450	
800	a: 650	
1000	a: 350, b: 150, a: 350	
1500	a: 350, b: 150, a: 350, b: 150, a: 350	

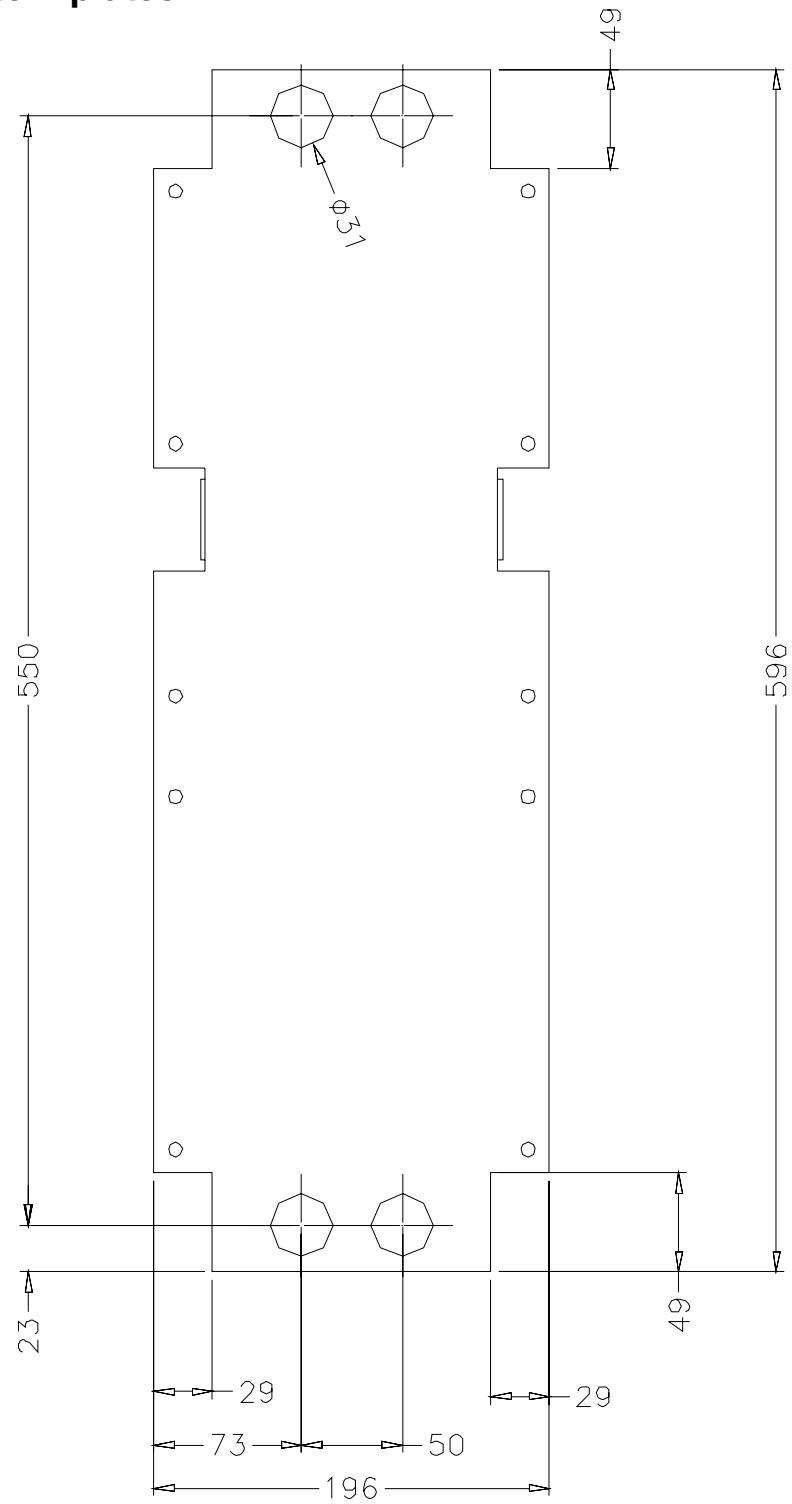
Hole distances

The bottom plate subassemblies / frames of most cabinets (layout see next pages) are equipped with mounting holes (\varnothing 18.5 mm) together with trough holes (\varnothing 31 mm).

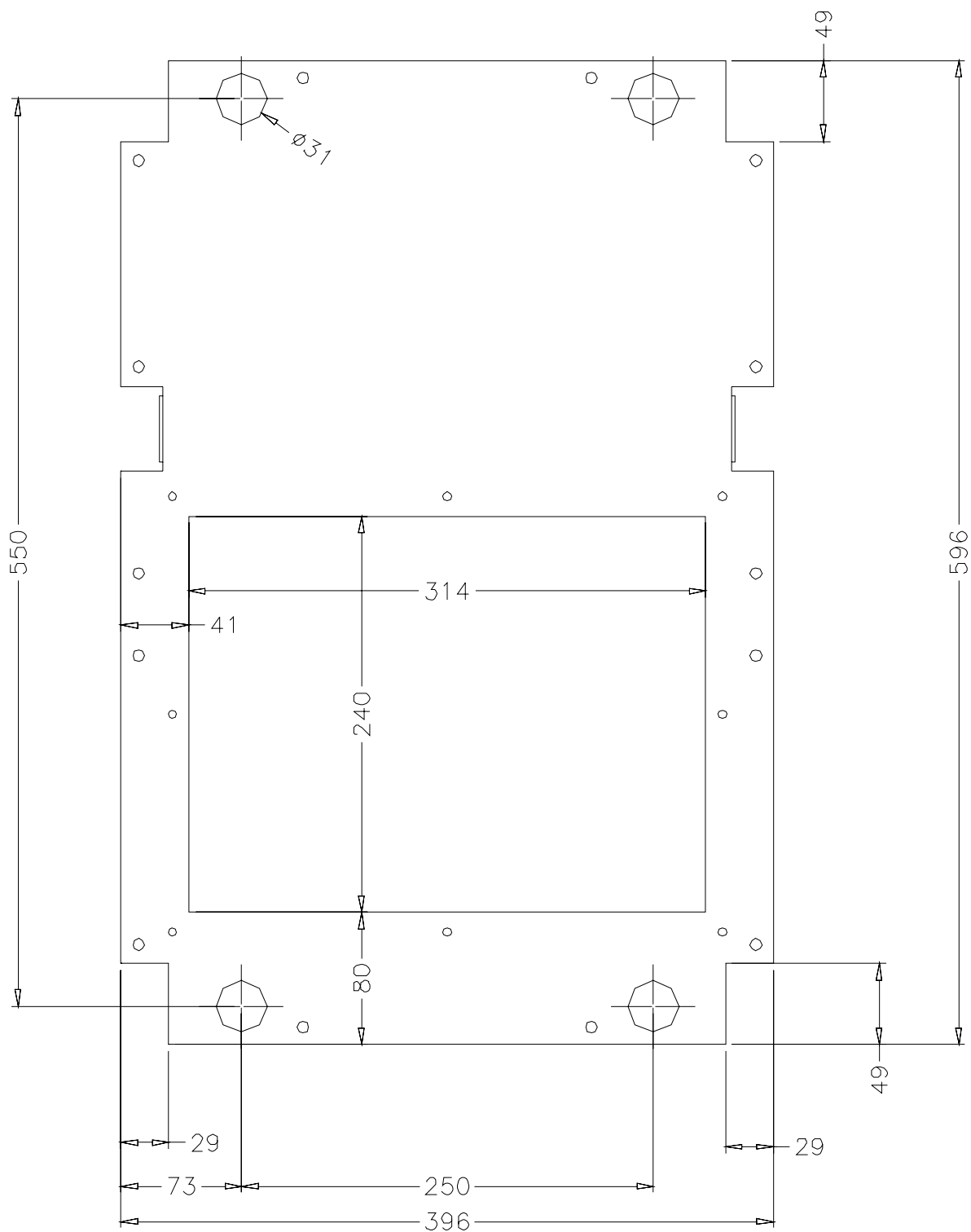


Mounting and through holes

Layout of bottom plates

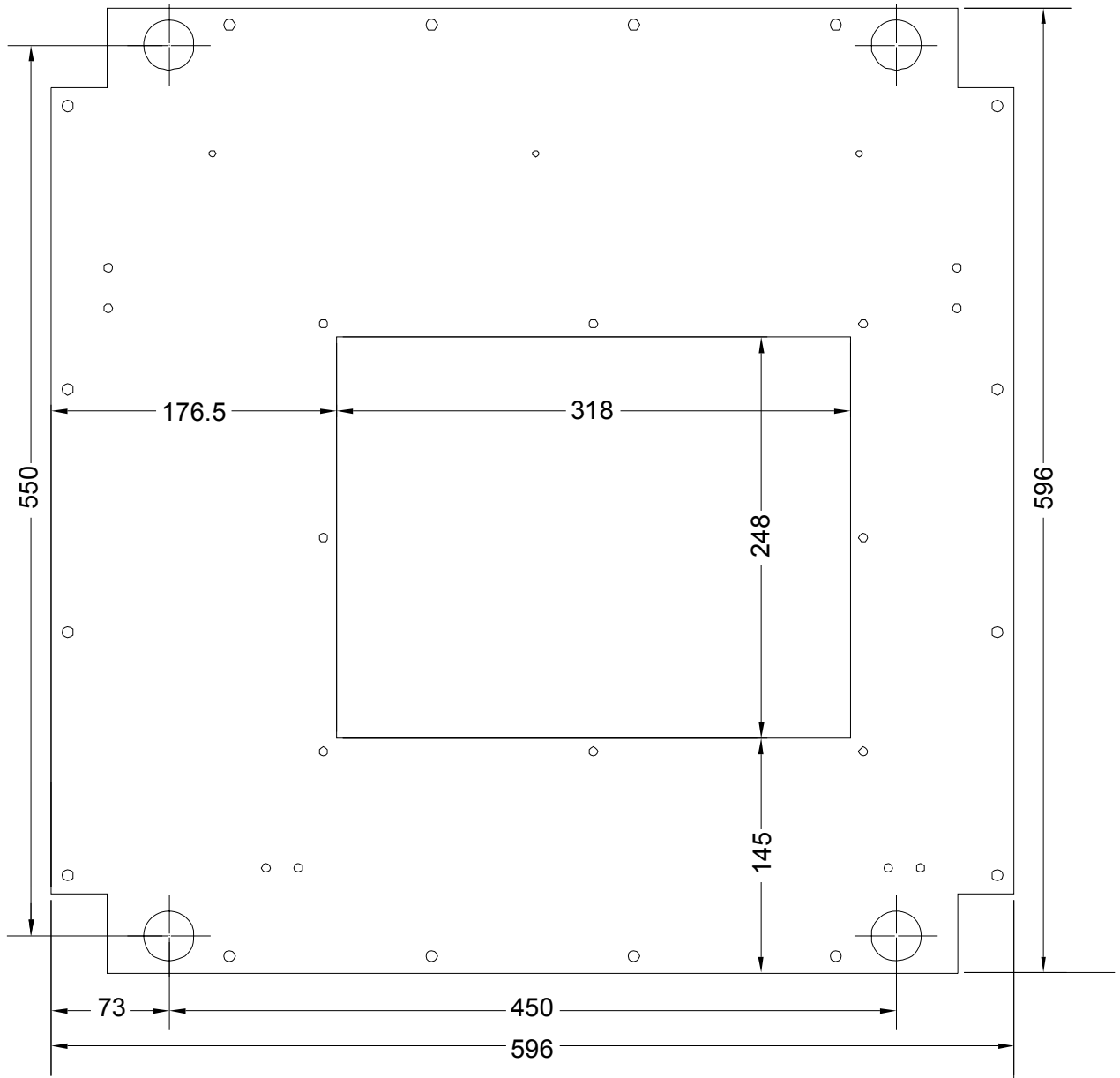


Cabinet 200 mm width, 600 mm depth

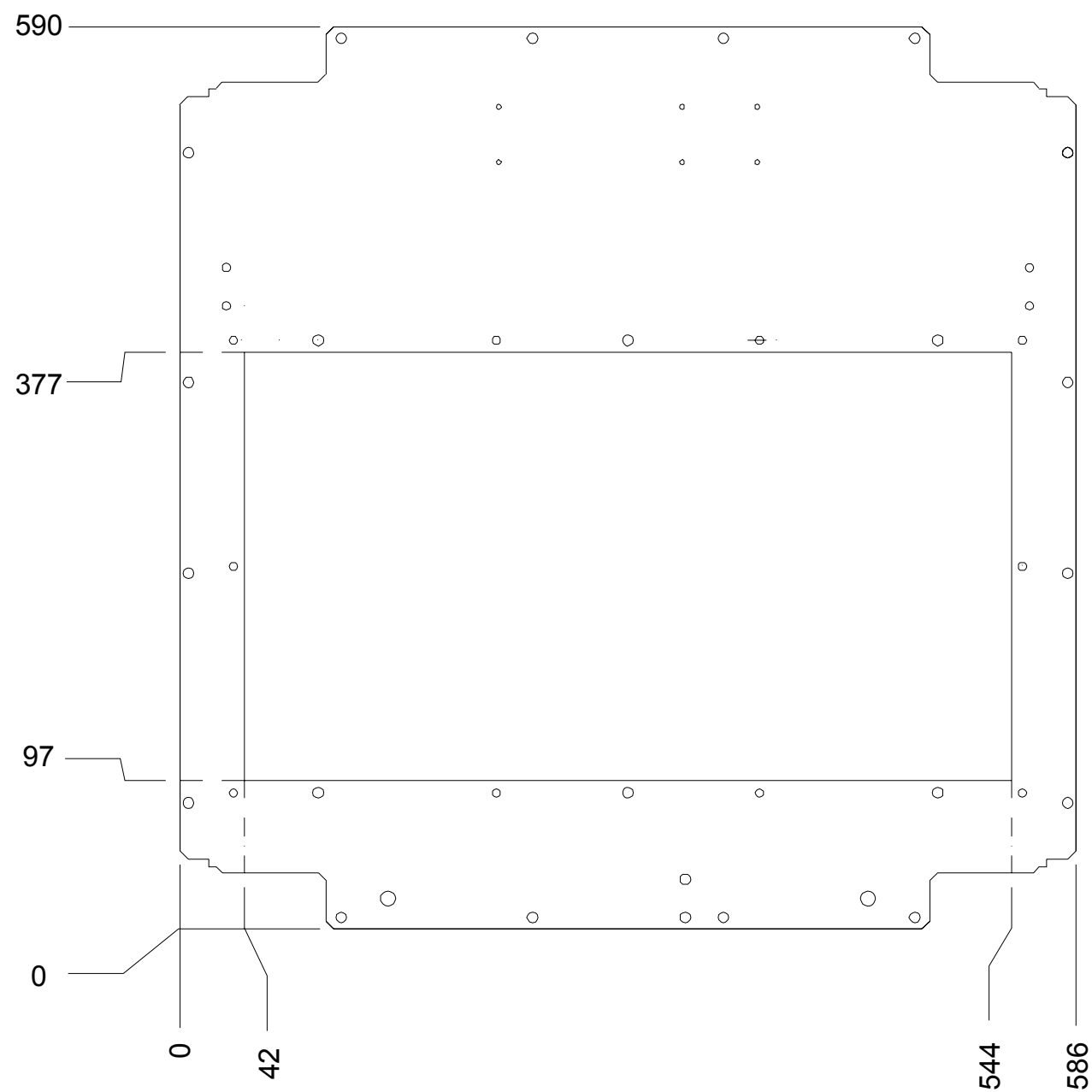


Cabinet 400 mm width, 600 mm depth

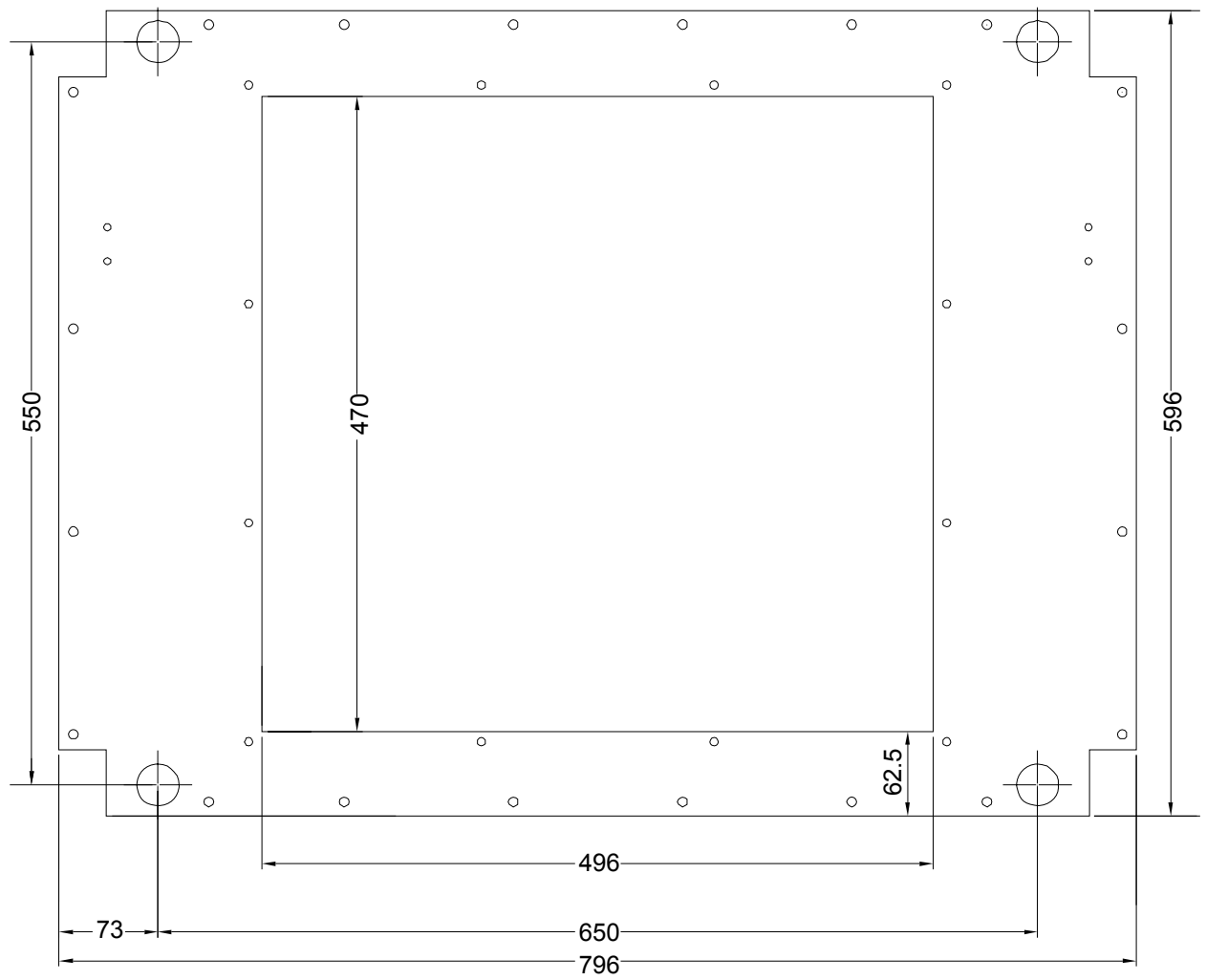
Mechanical Installation



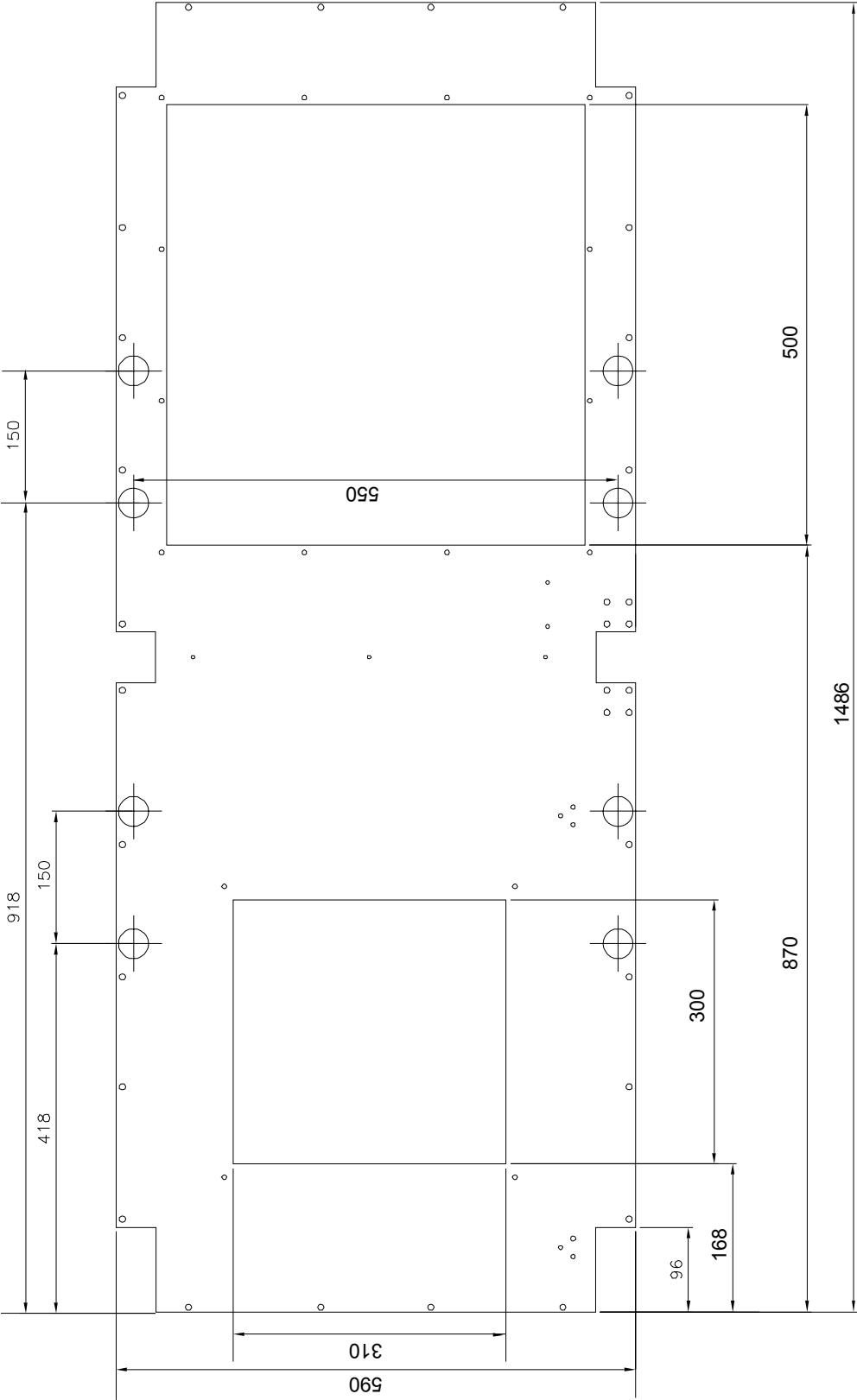
D6 cabinet 600 mm width, 600 mm depth



D6 / D7 cabinet 600 mm width, 600 mm depth



D6 / D7 cabinet 800 mm width, 600 mm depth

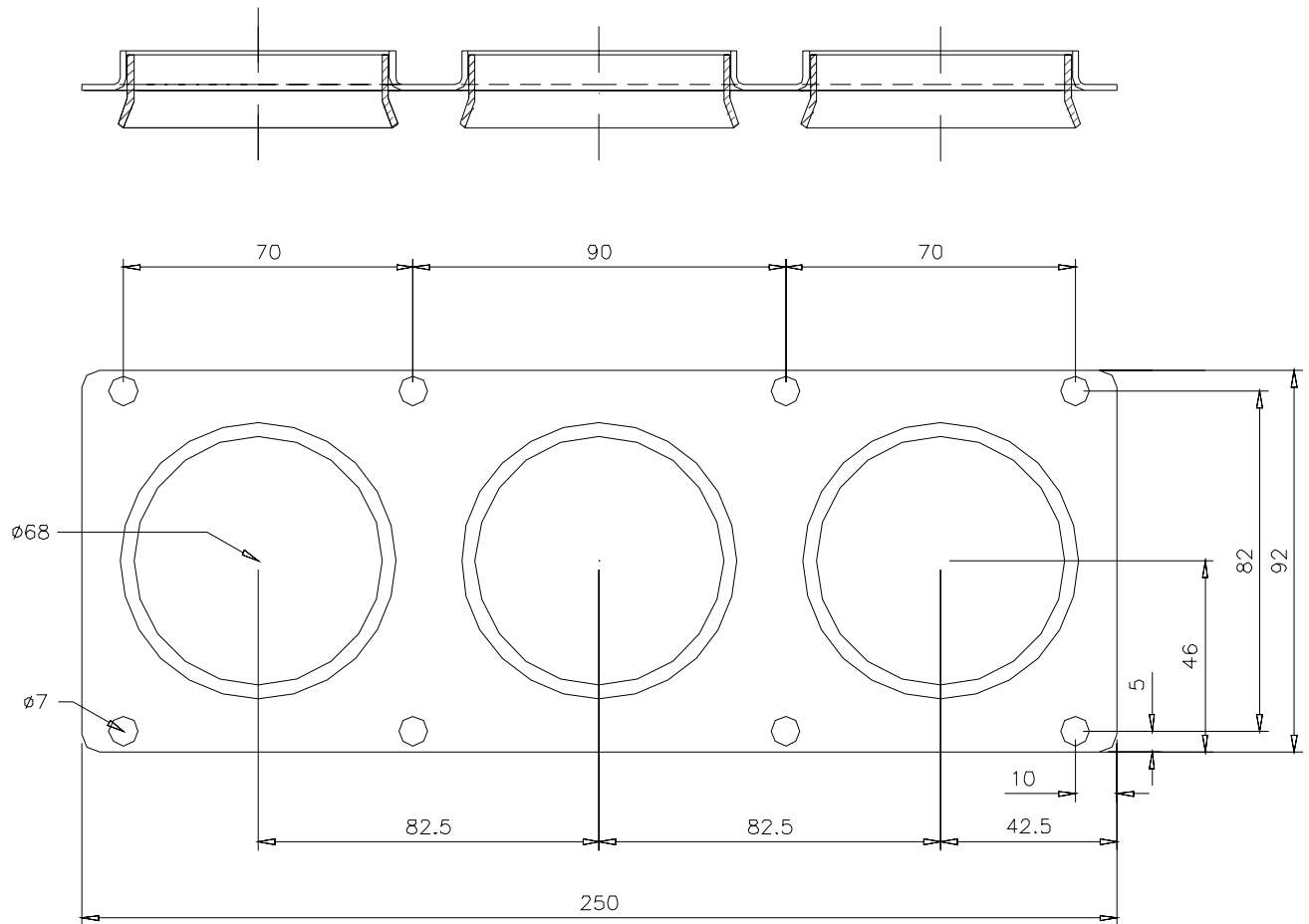


D7 cabinet 1500 mm width, 600 mm depth

Depending on the amount of cables several EMC-cable entry plates can be fastened over the cutout of the bottom plates. See also chapter [Cable Connections](#).

Note:

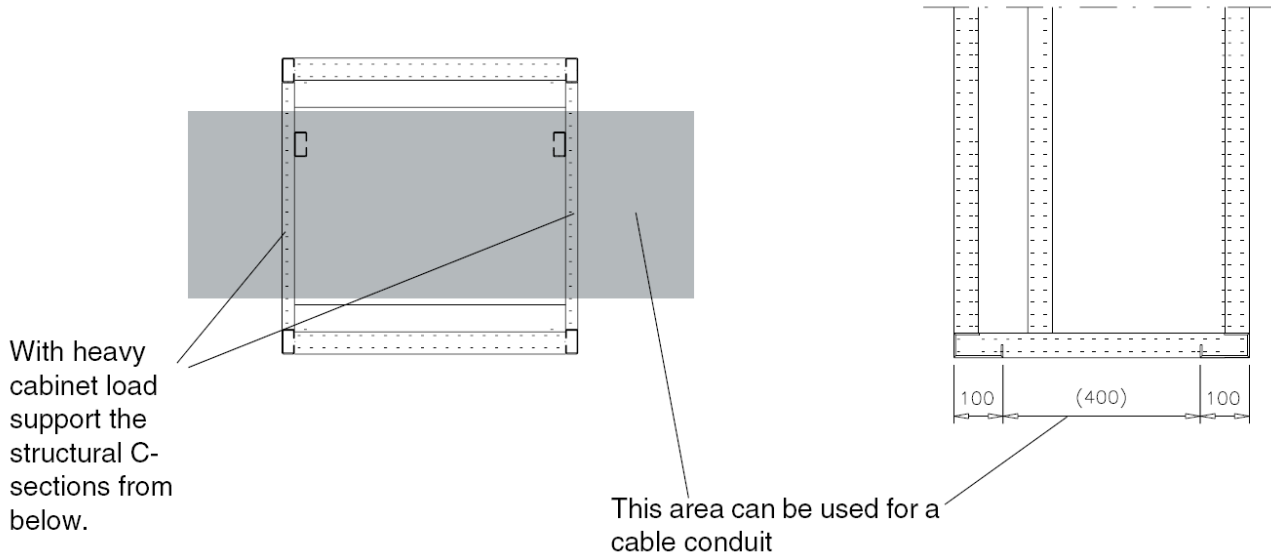
EMC-cable entry is only required for DCS800-A, when screened cables are used.



EMC-cable entry

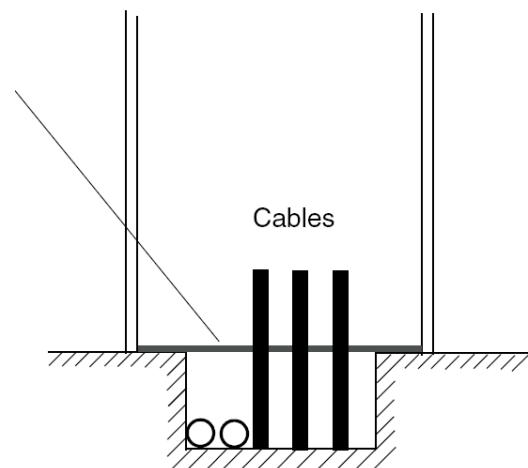
Cable Conduit below the Cabinet

A cable conduit can be constructed below the 400 mm wide middle part of the cabinet. The cabinet weight has to be carried by the two 100 mm wide transverse sections of the floor.



Top and side view

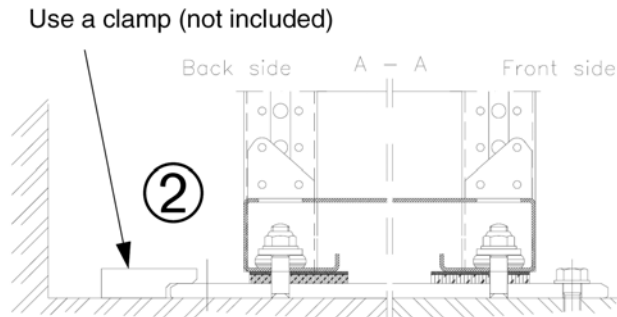
Prevent the cooling air flow from the cable conduit to the cabinet by using bottom plates. To ensure the degree of protection for the cabinet use the original bottom plates if delivered with the unit. User-defined cable entries take care of the degree of protection and fire protection.



Protection

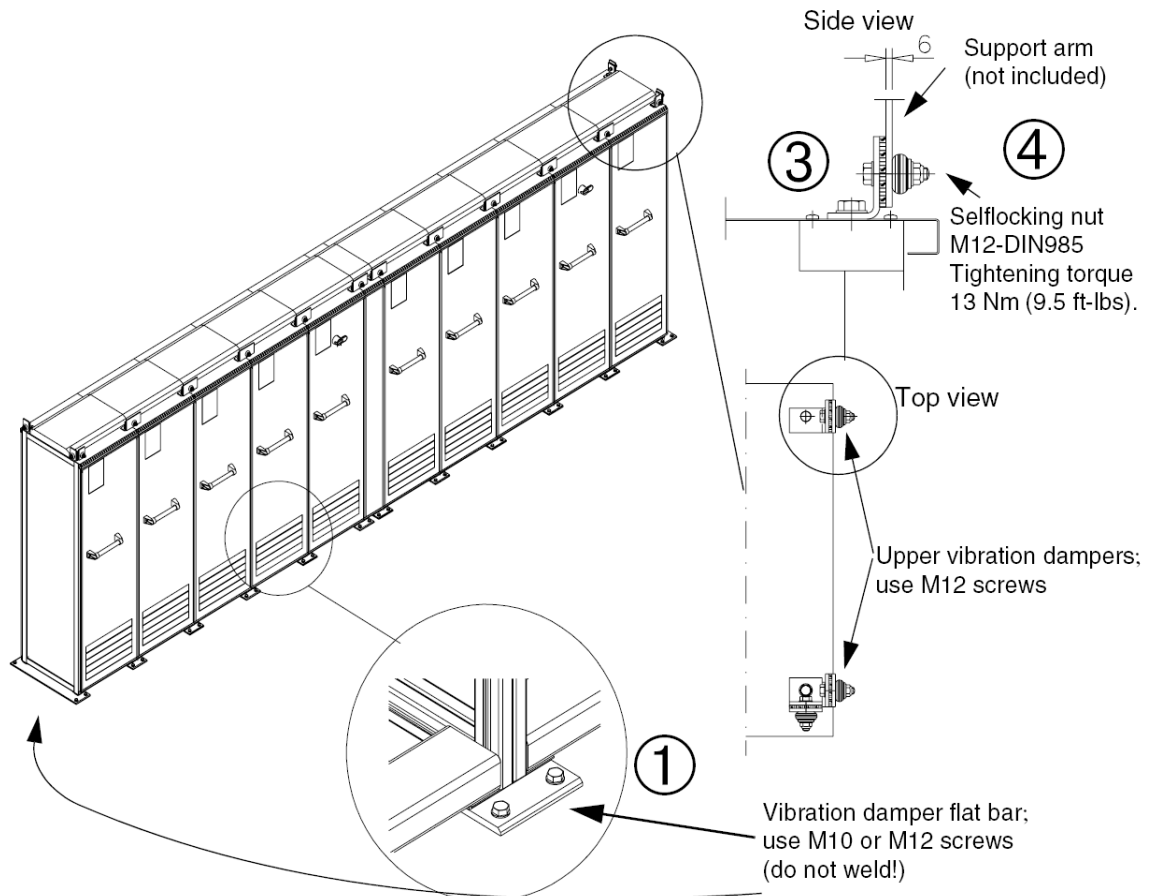
Vibration Dampers (Marine Versions)

The shipping split must be fastened to the floor and roof/wall in marine versions as follows:



Mounting with a clamp

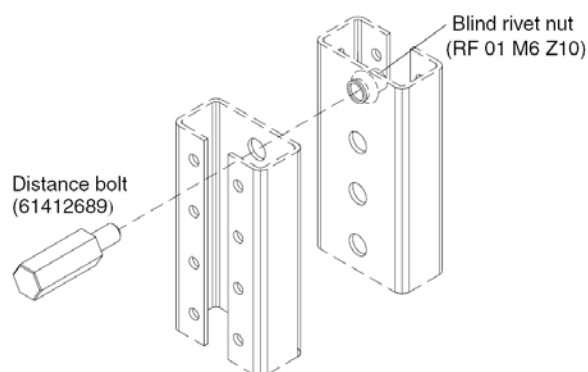
- ① Fasten the shipping split to the floor with M10 or M12 bolts through the holes in the vibration damper flat bar.
- ② If there is not enough room behind the cabinets for installation, use the fastening method shown in [Mounting with a clamp](#).
- ③ Fasten of the upper vibration dampers. For the positions of the upper vibration dampers, see the accompanying dimension drawing of the shipping split!
- ④ Fasten the support arms to the upper vibration dampers and roof/wall. Use a clamp (not included).



Vibration dampers details

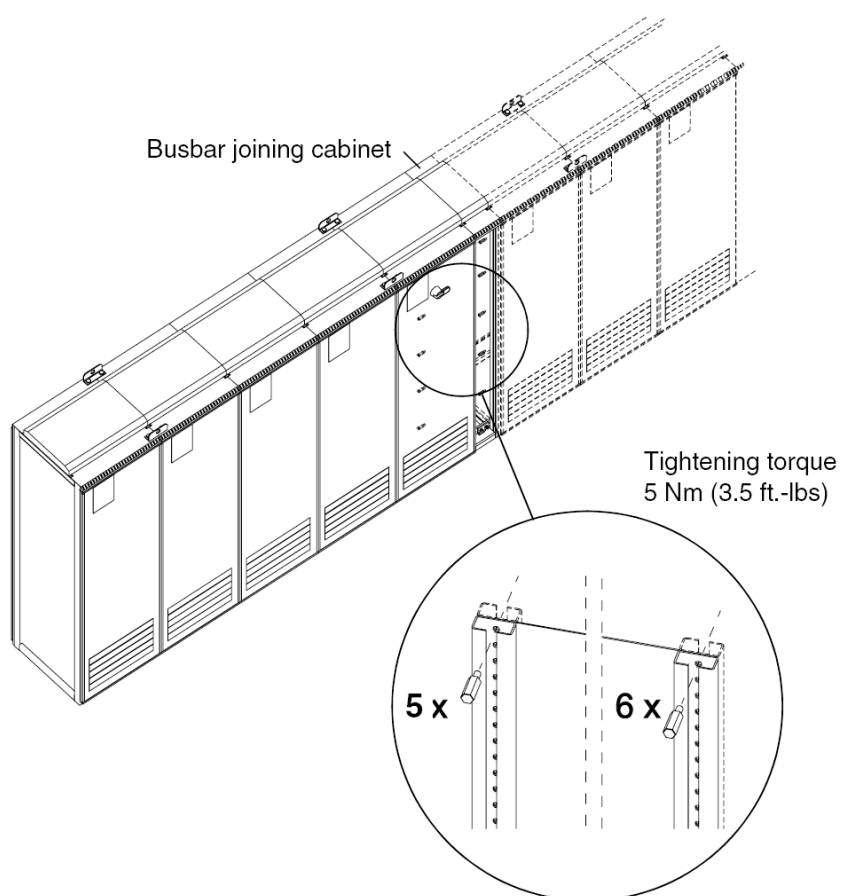
Joining the Shipping Splits

Shipping splits are joined in the busbar joining cabinet. Special distance bolts (M6) for fastening the cabinets together are enclosed in a plastic bag inside a cabinet of the shipping split. The blind rivet nuts are already installed in the post.



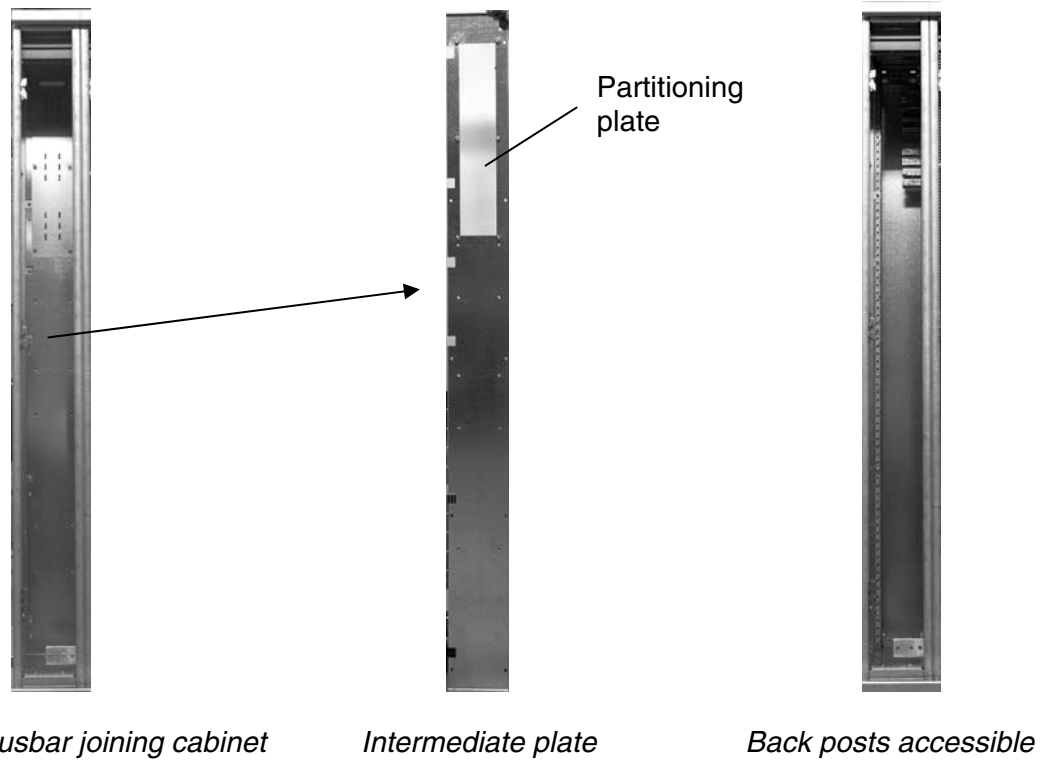
Detailed view

Working order



Overview

1. Fasten the front post of the joining section with six distance bolts to the front frame post of the next cabinet.
2. 200 mm wide joining cabinet: Remove the intermediate plate, hiding the back posts in the joining section.



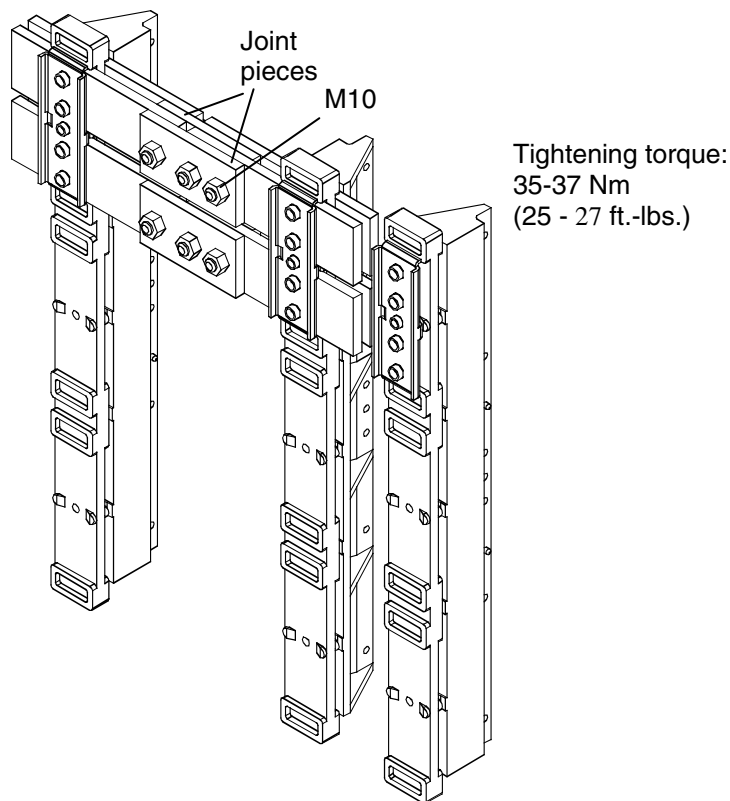
3. Fasten the back post of the joining cabinet with five screws (below the horizontal busbar joining part) to the post of the next cabinet.
4. Remount the intermediate plate and the partitioning plate(s) in the upper part after connecting the AC busbars.

Connecting the AC busbar and the PE busbar

The horizontal main AC busbars and the PE busbar are connected by access from the front of the 200 mm wide busbar joining cabinet. All necessary materials are located in the joining cabinet.

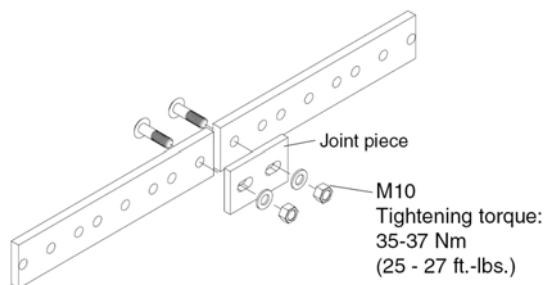
1. Remove the intermediate plate located in the busbar joining cabinet.
2. Unscrew the bolts of the joint pieces.
3. Connect the busbars with the joint pieces (see [AC busbar](#)).
4. Remount the intermediate plate into its original position due to safety of personnel.

AC busbar connection:



AC busbar

PE busbar connection:

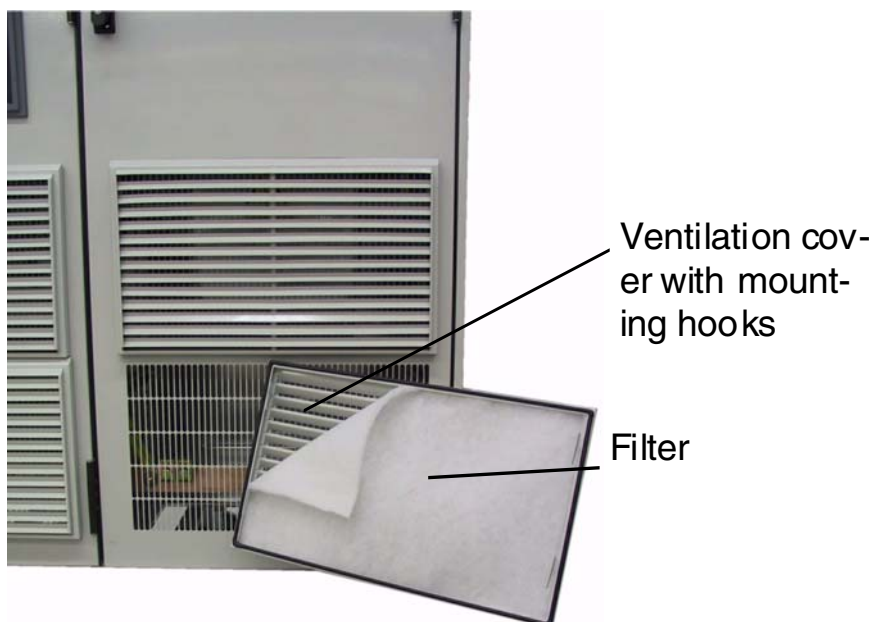


PE busbar

Filter and Ventilation

Filters

Fit the filter into the ventilation cover. Attach the ventilation cover by means of mounting hooks to the door of the cabinet.



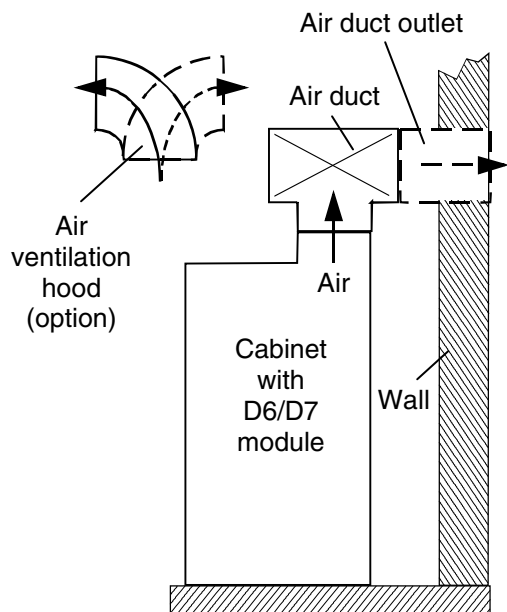
Door mounted filter

Replacement filters and brass screens can be ordered from ABB:

Cabinet width (mm)	Filter (Air-Tex G-150)	Brass screen
400	3AFE 1003 3616	3AFE 6152 5718
600	3AFE 1003 3721	3AFE 6152 5726
800	3ADV 262 037 P0001	3ADV 400 109 P0001
1000	3ADV 262 037 P0005	3AFE 6152 5734
1500	3AFE 1003 3730	3AFE 6152 5742

Order numbers for filters and screens

Air Duct Outlet for Enclosed Converters with D6 / D7 Modules



Converter modules size D6 / D7 installed in cabinets DCS800-A produce a considerable amount of power loss to be removed by air cooling. In most cases the switch room is not capable to absorb the heated air. That is why cabinets with converter modules sizes D6 / D7 are provided with an adapter for connection to an air duct (air duct to be supplied for by customer). In case there is no air duct, the option Air Ventilation Hood is required to meet protection class IP 21.

This option can also be used for connection to an existing air duct outlet (solution indicated by dashed lines).

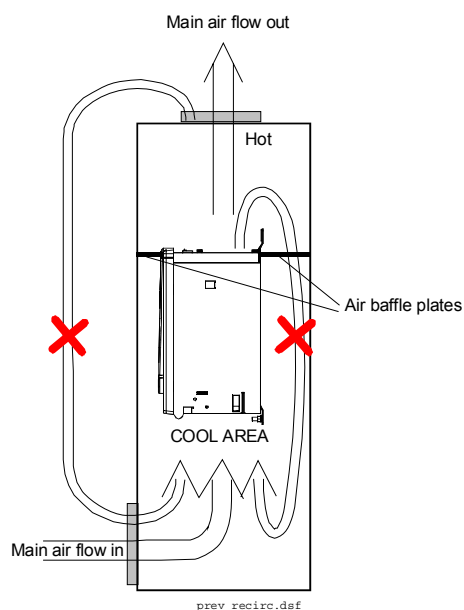
Air duct for D6 / D7 module

Air baffle plates

To keep the converter module as cool as possible cooling air re-circulation outside and inside the cabinet has to be prevented.

To prevent outside cooling air re-circulation external measures have to be made.

To prevent inside cooling air re-circulation air baffle plates are used:



Air baffle plates

Air baffle plates



D4 air baffle plate



D7 air baffle plate



Attention:

Before starting the air baffle plates of the converter modules have to be mounted properly!

Electrical Installation



WARNING!

The electrical installation described in this chapter should only be carried out by a qualified electrician. The [Safety Instructions](#) at the beginning of this manual must be followed.

Negligence of these instructions can cause injury or death.

Attention:

Additional information about this chapter especially regarding EMC can be found in the manual *Technical Guide* (3ADW000163).

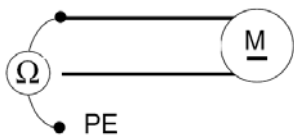
Insulation Checks

Every DCS800-A Enclosed Converter has been tested for insulation between main armature circuit and cabinet at the factory. Therefore there is no need to check the insulation of the unit again. When checking the insulation of the whole installation, proceed in the following manner:



WARNING!

Insulation checks must be performed before connecting the DCS800-A to the mains. Before proceeding with the insulation resistance measurements make sure that the DCS800-A is disconnected from the mains.



- 1.) Check that the motor cable is disconnected from the DCS800-A output terminals C1 and D1.
- 2.) Measure the insulation resistances of motor cable and the motor between each phase and Protective Earth (PE), using a measuring voltage at least equal to the mains voltage, but not higher than 500 VDC. The insulation resistance must be higher than 1 MΩ.

Mains Fuses

Fuses are needed to protect the DC converter in case of an internal short circuit. The DCS800-A Enclosed Converter is equipped with internal input fuses. For more information see manuals *DCS800 Technical Catalogue* (3ADW000192) and *DCS800 Hardware Manual* (3ADW000194). If a fuse is blown, it must be replaced with the proper ultra rapid fuse.

Cabling Instructions

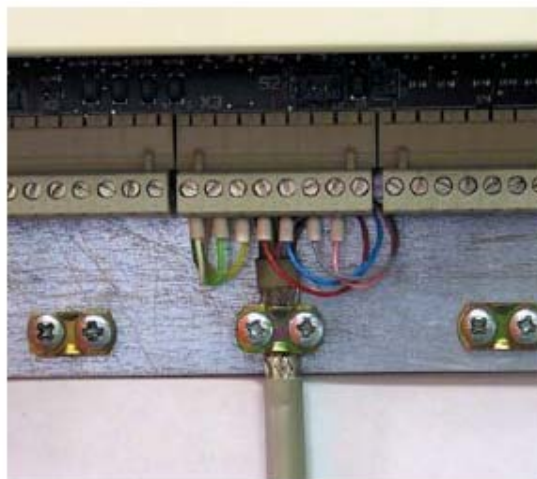
Power Cables

The mains and motor cables must be dimensioned according to local regulations and:

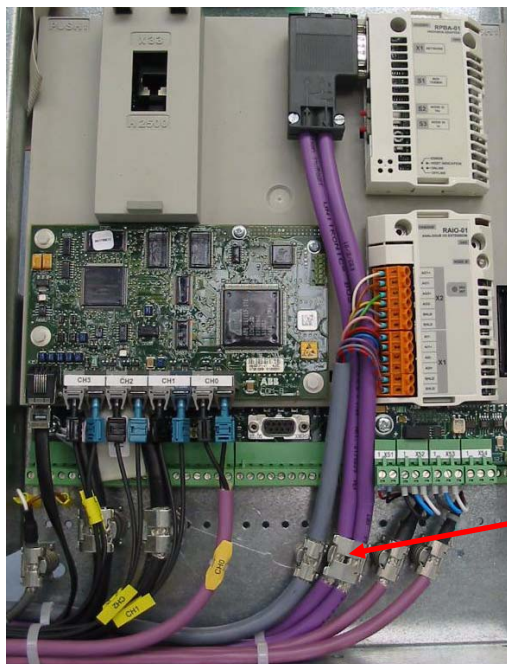
- 1.) to carry the DCS800-A load current.
- 2.) for at least 60°C (140°F).
- 3.) to fulfill short-circuit protection.
- 4.) the inductance and impedance of the cable must be rated according permissible touch voltage appearing under fault conditions (so that the fault point voltage will not rise too high when an earth fault occurs).
- 5.) the cable screens according to safety regulations.

Control / Signal Cables

The cables for digital signals, which are longer than 3 m and all cables for analogue signals, must be screened. Each screen must be connected at both ends by metal clamps (see [Connection of a cable screen with the aid of metal clamp to the metal surface](#)) or comparable means directly on clean metal surfaces, if both earthing points belong to the same earth line. Otherwise a capacitor (e.g. 3.3 nF / 3000 V) must be connected 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 (see [Connection example in accordance with EMC ③](#)) and if the cable comes from outside also on the PE bar (see [Connection example in accordance with EMC ④](#)). At the other end of the cable the screen must be well connected with the housing of the signal emitter or receiver.



Connection of a cable screen with the aid of metal clamp to the metal surface

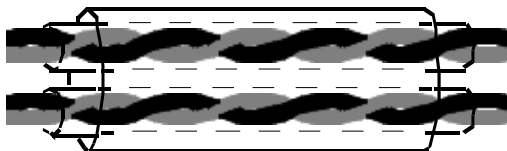


Connection of a cable screen with the aid of metal clamp to the metal surface of the PCB carrier at a DCS converter Size D6, D7
Screen connection

D6 / D7 grounding of cable screens

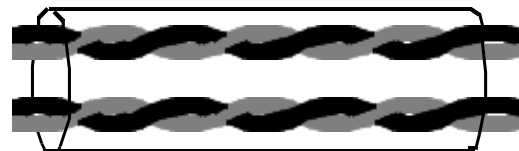
A double shielded twisted pair cable (see [Twisted pair cables a](#)), e.g. JAMAK by NK Cables, Finland) must be used for analogue signals and the pulse encoder signals. Employ one individually shielded pair for each signal. Do not use common return for different analogue signals.

A double shielded cable is the best alternative for low voltage digital signals but single shielded twisted multi pair cable (see [Twisted pair cables b](#)) is also usable.



a

A double shielded twisted pair cable



b

A single shielded twisted multi pair cable

Twisted pair cables

Pairs should be twisted as close to terminals as possible.

The analogue and digital signals should be run 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.



Caution:

Never mix 24 VDC and 115 / 230 VAC signals in the same cable!

Co-axial Cables

Recommendations for use with DCS800-A Enclosed Converters:

- 75 Ω type;
- RG59 cable with diameter 7 mm or RG11 cable 11 mm;
- The maximum cable length is 300 m.

Relay Cable

Cable types with braided metallic screens (e.g. ÖLFLEX, LAPPKABEL, Germany) has been tested and approved by ABB.

Control Panel Cable

The cable connecting the DCS800 Control Panel to the DCS800 converter module must not exceed 3 meters. The cable type tested and approved by ABB is included in the DCS800 Control Panel option kits.

Optical Cables

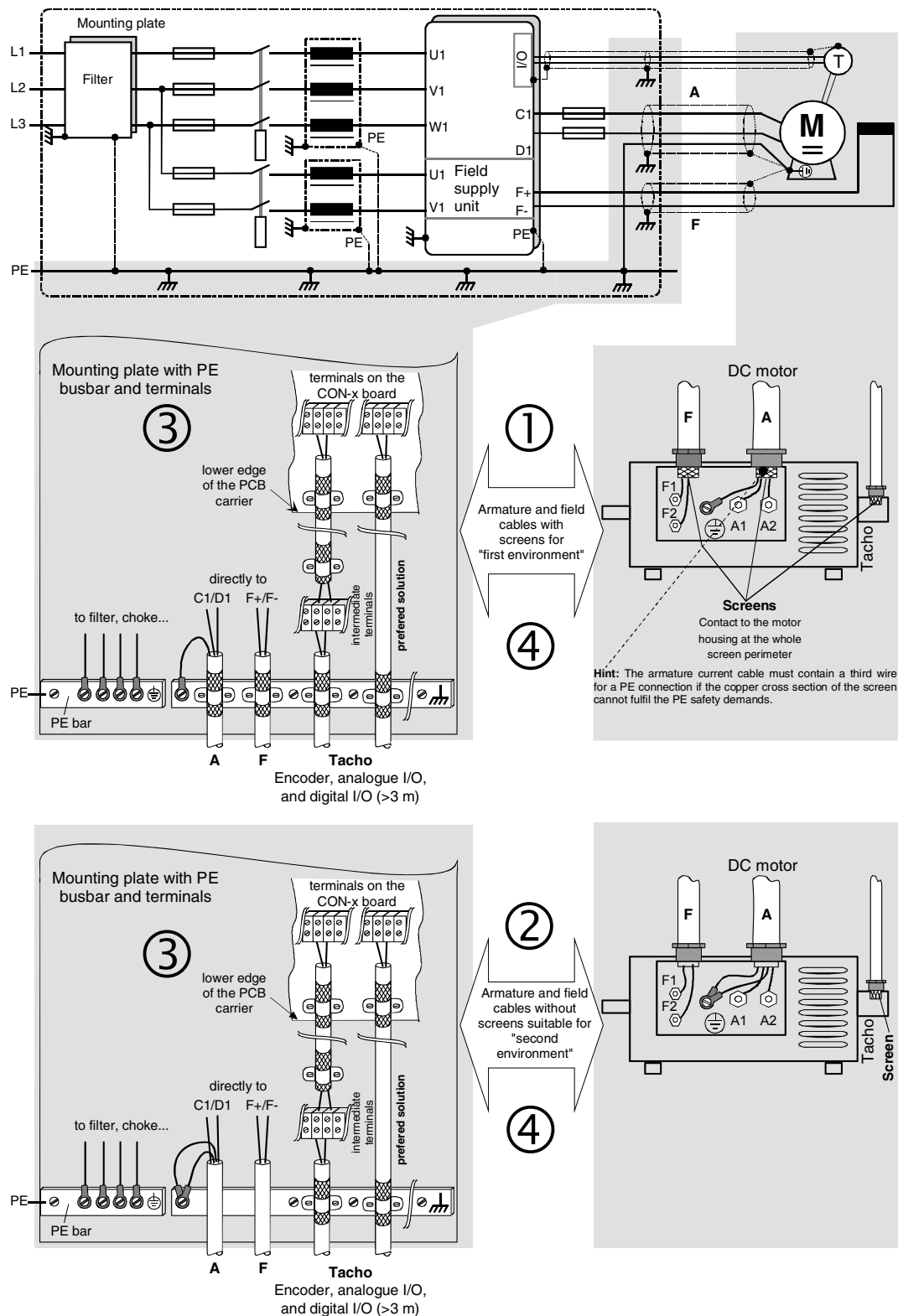
The max. cable length for optical cables depends on the type of optical cable selected (plastic fiber optic or HCS); for details please refer to the corresponding manual *DCS800 Hardware Manual* (3ADW000194). Moreover follow the instructions concerning the use of optical cables given by the cable suppliers.

Fieldbus Cables

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

- [control / signal cables](#) and
- [co-axial cables](#).

Connection example in accordance with EMC



Connection example in accordance with EMC

Important hint:

The example shows the principle structure of a DC drive and its connections. It is not a binding recommendation, and it cannot respect all conditions of a plant. Therefore each drive must be considered separately and with respect to the special application. Additionally the general installation and safety rules must be taken into account.

Cross-sectional areas -Tightening torques

Recommended cross-sectional area to **DINVDE 0276-1000** and **DINVDE 0100-540 (PE)** trefoil arrangement.

Recommended cross-sectional areas for AC-connection.

Unit type	AC - connection (U, V, W) + PE					Size	
		Amount of single cores and cross - sectional area connected per phase / PE (1*)	Amount of holes per phase for single drives ; Group drives are connected via incoming supply units; For sizes D1 - D3 terminals are used	Size of screws (2*); Not for UL	UL as per Nema 2 (3*): Amount of holes per phase for single drives; Group drives are connected via incoming supply units; For sizes D1 - D3 terminals are used		
	IAC [A~]	[mm²]					
400 V / 500 V / 525 V							
DCS800-A01-0020-04/05-D	15	1 * 6²	1 terminal (16-95 mm²)		1 terminal (16-95 mm²)	D1	
DCS800-A02-0025-04/05-D	18	1 * 6²	1 terminal (16-95 mm²)		1 terminal (16-95 mm²)		
DCS800-A01-0045-04/05-D	33	1 * 10²	1 terminal (16-95 mm²)		1 terminal (16-95 mm²)		
DCS800-A02-0050-04/05-D	37	1 * 10²	1 terminal (16-95 mm²)		1 terminal (16-95 mm²)		
DCS800-A01-0065-04/05-D	49	1 * 16²	1 terminal (16-95 mm²)		1 terminal (16-95 mm²)		
DCS800-A02-0075-04/05-D	55	1 * 16²	1 terminal (16-95 mm²)		1 terminal (16-95 mm²)		
DCS800-A01-0125-04/05-D	94	1 * 35²	1 terminal (16-95 mm²)		1 terminal (16-95 mm²)		
DCS800-A02-0140-04/05-D	103	1 * 35²	1 terminal (16-95 mm²)		1 terminal (16-95 mm²)	D2	
DCS800-A01-0230-04/05-D	164	1 * 95²	1 terminal (16-95 mm²)		1 terminal (16-95 mm²)		
DCS800-A02-0260-04/05-D	189	1 * 95²	1 terminal (16-95 mm²)		1 terminal (16-95 mm²)		
DCS800-A01-0315-04/05-D	234	1 * 120²	1 terminal (16-95 mm²)		1 terminal (16-95 mm²)	D3	
DCS800-A02-0350-04/05-D	246	1 * 120²	1 terminal (16-95 mm²)		1 terminal (16-95 mm²)		
DCS800-A01-0470-04/05-D	328	1 * 185²	2	M12	2	D4	
DCS800-A02-0520-04/05-D	369	1 * 185²	2	M12	2		
DCS800-A01-0610-04/05-D	443	2 * 150²	2	M12	4		
DCS800-A02-0680-04/05-D	492	2 * 150²	2	M12	4		
DCS800-A01-0740-04/05-D	558	2 * 185²	2	M12	4		
DCS800-A02-0820-04/05-D	615	2 * 185²	2	M12	4		
DCS800-A01-0900-04/05-D	664	2 * 240²	2	M12	4		
DCS800-A02-1000-04/05-D	738	2 * 240²	2	M12	4	on request	
DCS800-A0x-1200-04/05-D	935	4 * 150²	4	M12			
DCS800-A0x-1200T-04/05-D	935	4 * 150²	4	M12			
DCS800-A0x-1500-04/05-D	1169	4 * 185²	4	M12			
DCS800-A0x-2000-04/05-D	1517	6 * 150²	4	M12			
DCS800-A0x-2050-05-D	1599	6 * 185²	8	M12			
DCS800-A0x-2500-04/05-D	2009	8 * 185²	8	M12			
DCS800-A0x-3000-04/05-D	2460	10 * 185²	12	M12			
DCS800-A0x-3300-04/05-D	2706	10 * 185²	16	M12			
DCS800-A0x-4000-04/05-D	3280	10 * 240²	16	M12			
DCS800-A0x-5200-04/05-D	4182	14 * 240²	16	M12		D5	
DCS800-A0x-6600-04/05PD	5084	2 x 10 * 185²	request on				
DCS800-A0x-8000-04/05PD	6232	2 x 10 * 240²					
DCS800-A0x-10400-04/05PD	8036	2 x 14 * 240²					
600 V / 690 V							
DCS800-A01-0290-06-D	180	1 * 95²	1 terminal (16-95 mm²)		1 terminal (16-95 mm²)	D3	
DCS800-A02-0320-06-D	197	1 * 120²	1 terminal (16-95 mm²)		1 terminal (16-95 mm²)		
DCS800-A01-0590-06-D	303	2 * 150²	2	M12	2	D4	
DCS800-A02-0650-06-D	328	2 * 150²	2	M12	2		
DCS800-A0x-0900-06/07-D	701	4 * 95²	4	M12	on request	D5	
DCS800-A0x-1500-06/07-D	1169	4 * 185²	4	M12			
DCS800-A01-2000-06/07-D	1517	6 * 150²	4	M12			
DCS800-A0x-2050-06/07-D	1599	6 * 185²	8	M12			
DCS800-A0x-2500-06/07-D	2009	8 * 185²	8	M12			
DCS800-A0x-3000-06/07-D	2460	10 * 185²	12	M12			
DCS800-A0x-3300-06/07-D	2706	10 * 185²	16	M12		D7	
DCS800-A0x-4000-06/07-D	3280	10 * 240²	16	M12			
DCS800-A0x-4800-06/07-D	3854	12 * 240²	16	M12	on request	D7P	
DCS800-A0x-6600-06/07PD	5084	2 x 10 * 185²	request on				
DCS800-A0x-8000-06/07PD	6232	2 x 10 * 240²					
DCS800-A0x-9600-06/07PD	7380	2 x 12 * 240²					

Unit type	AC - connection (U, V, W) + PE					Size
		Amount of single cores and cross - sectional area connected per phase / PE (1*)	Amount of holes per phase for single drives ; Group drives are connected via incoming supply units; For sizes D1 - D3 terminals are used	Size of screws (2*); Not for UL	UL as per Nema 2 (3*): Amount of holes per phase for single drives; Group drives are connected via incoming supply units; For sizes D1 - D3 terminals are used	
	IAC [A~]	[mm²]				
400 V / 500 V / 525 V						
800 V						
DCS800-A0x-1900-08-D	1558	6 * 185²	8	M12	on request	D6
DCS800-A0x-2500-08-D	2050	8 * 185²	8	M12		
DCS800-A0x-3000-08-D	2460	10 * 185²	12	M12		
DCS800-A0x-3300-08-D	2706	10 * 185²	16	M12		D7
DCS800-A0x-4000-08-D	3280	10 * 240²	16	M12		
DCS800-A0x-4800-08-D	3854	12 * 240²	16	M12		
DCS800-A0x-6600-08PD	5084	2 x 10 * 185²	request on			D7P
DCS800-A0x-8000-08PD	6232	2 x 10 * 240²				
DCS800-A0x-9600-08PD	7380	2 x 12 * 240²				
990 V						
DCS800-A0x-2050-10-D	1681	6 * 185²	16	M12	on request	D7
DCS800-A0x-2600-10-D	2132	8 * 185²	16	M12		
DCS800-A0x-3300-10-D	2706	10 * 185²	16	M12		
DCS800-A0x-4000-10-D	3280	10 * 240²	16	M12		
DCS800-A0x-5200-10PD	4018	2 x 8 * 185²	request on			D7P
DCS800-A0x-6600-10PD	5084	2 x 10 * 185²				
DCS800-A0x-8000-10PD	6232	2 x 10 * 240²				
1200 V						
DCS800-A0x-2600-12-D	2132	8 * 185²	request on		request on	D7
DCS800-A0x-3300-12-D	2706	10 * 185²				
DCS800-A0x-4000-12-D	3116	10 * 240²				
Incoming Supply Sections						
DCA63u-1000-0x-D	1000	3 * 120²	8	M12	on request	
DCA63u-2000-0x-D	2000	7 * 185²	8	M12		
DCA63u-3000-0x-D	3000	9 * 240²	8	M12		
DCA63u-4000-0x-D	4000	12 * 240²	8	M12		
(1*) Recommended by ABB: - Use cable type VPE (90°C; 194°F) with 4 cores - AC - connection: U, V, W and PE - DC - connection: L+, L- and 2 * PE - Ambient temperature: 40°C; 104°F - Load: 100 %			(2*) Tightening torque: M10 = 25 Nm; 18.5 ft. - lbs. M12 = 50 Nm; 37 ft. - lbs.		(3*) Diameter of all holes: 14 mm	

Recommended cross-sectional areas - tightening torques AC-connection

Recommended cross-sectional areas for DC-connection

Unit type	DC - connection (U+, U-) + 2 * PE							Size
			With DC - fuses		Without DC - fuses			
		Amount of single cores and cross - sectional area connected per phase / PE (1*)	Amount of holes for connection per phase	Size of screws (2*)	Amount of holes for connection per phase; For size D1 - D3 terminals are used	Size of screws (2*); Not for UL	UL as per Nema 2 (3*): Amount of holes per phase for single drives; For size D1 - D3 terminals are used	
	DC I [A-]	[mm²]						
400 V / 500 V / 525 V								
DCS800-A01-0020-04/05-D	18	1 * 6²	2	M10	1 terminal (16-95 mm²)		1 terminal (16-95 mm²)	D1
DCS800-A02-0025-04/05-D	22	1 * 6²	2	M10	1 terminal (16-95 mm²)		1 terminal (16-95 mm²)	
DCS800-A01-0045-04/05-D	40	1 * 10²	2	M10	1 terminal (16-95 mm²)		1 terminal (16-95 mm²)	
DCS800-A02-0050-04/05-D	45	1 * 10²	2	M10	1 terminal (16-95 mm²)		1 terminal (16-95 mm²)	
DCS800-A01-0065-04/05-D	60	1 * 16²	2	M10	1 terminal (16-95 mm²)		1 terminal (16-95 mm²)	
DCS800-A02-0075-04/05-D	67	1 * 16²	2	M10	1 terminal (16-95 mm²)		1 terminal (16-95 mm²)	
DCS800-A01-0125-04/05-D	115	1 * 35²	2	M10	1 terminal (16-95 mm²)		1 terminal (16-95 mm²)	
DCS800-A02-0140-04/05-D	125	1 * 35²	2	M10	1 terminal (16-95 mm²)		1 terminal (16-95 mm²)	D2
DCS800-A01-0230-04/05-D	200	1 * 95²	2	M10	1 terminal (16-95 mm²)		1 terminal (16-95 mm²)	
DCS800-A02-0260-04/05-D	230	1 * 95²	2	M10	1 terminal (16-95 mm²)		1 terminal (16-95 mm²)	
DCS800-A01-0315-04/05-D	285	1 * 120²	2	M10	1 terminal (16-95 mm²)		1 terminal (16-95 mm²)	D3
DCS800-A02-0350-04/05-D	300	1 * 120²	2	M10	1 terminal (16-95 mm²)		1 terminal (16-95 mm²)	
DCS800-A01-0470-04/05-D	400	1 * 185²	2	M10	2	M12	2	D4
DCS800-A02-0520-04/05-D	450	1 * 185²	2	M10	2	M12	2	
DCS800-A01-0610-04/05-D	540	2 * 150²	2	M10	4	M12	4	
DCS800-A02-0680-04/05-D	600	2 * 150²	2	M10	4	M12	4	
DCS800-A01-0740-04/05-D	680	2 * 185²	2	M10	4	M12	4	
DCS800-A02-0820-04/05-D	750	2 * 185²	2	M10	4	M12	4	
DCS800-A01-0900-04/05-D	810	2 * 240²	2	M10	4	M12	4	
DCS800-A02-1000-04/05-D	900	2 * 240²	2	M10	4	M12	4	D5
DCS800-A0x-1200-04/05-D	1140	4 * 150²			8	M12	8	
DCS800-A0x-1200T-04/05-D	1140	4 * 150²			8	M12	8	
DCS800-A0x-1500-04/05-D	1425	5 * 185²			8	M12	8	
DCS800-A0x-2000-04/05-D	1850	6 * 185²			8	M12	8	
DCS800-A0x-2050-05-D	1950	7 * 185²			8	M12		D6
DCS800-A0x-2500-04/05-D	2450	8 * 185²			8	M12		
DCS800-A0x-3000-04/05-D	3000	11 * 185²			8	M12		
DCS800-A0x-3300-04/05-D	3300	11 * 185²			16	M12		
DCS800-A0x-4000-04/05-D	4000	12 * 240²			16	M12		
DCS800-A0x-5200-04/05-D	5100	15 * 240²			16	M12		D7P
DCS800-A0x-6600-04/05PD	6200	2 x 11 * 185²			request on			
DCS800-A0x-8000-04/05PD	7600	2 x 12 * 240²						
DCS800-A0x-10400-04/05PD	9800	2 x 15 * 240²						
600 V / 690 V								
DCS800-A01-0290-06-D	220	1 * 95²	2	M10	1 terminal (16-95mm²)		1 terminal (16-95mm²)	D3
DCS800-A02-0320-06-D	240	1 * 95²	2	M10	1 terminal (16-95mm²)		1 terminal (16-95mm²)	
DCS800-A01-0590-06-D	370	1 * 185²	2	M10	4	M12	4	D4
DCS800-A02-0650-06-D	400	1 * 185²	2	M10	4	M12	4	
DCS800-A0x-0900-06/07-D	855	4 * 95²			8	M12	8	D5
DCS800-A0x-1500-06/07-D	1425	5 * 185²			8	M12	8	
DCS800-A01-2000-06/07-D	1850	6 * 185²			8	M12	8	
DCS800-A0x-2050-06/07-D	1950	7 * 185²			8	M12		D6
DCS800-A0x-2500-06/07-D	2450	8 * 185²			8	M12		
DCS800-A0x-3000-06/07-D	3000	11 * 185²			8	M12		
DCS800-A0x-3300-06/07-D	3300	11 * 185²			16	M12		
DCS800-A0x-4000-06/07-D	4000	12 * 240²			16	M12		
DCS800-A0x-4800-06/07-D	4700	14 * 240²			16	M12		D7P
DCS800-A0x-6600-06/07PD	6200	2 x 11 * 185²			request on			
DCS800-A0x-8000-06/07PD	7600	2 x 12 * 240²						
DCS800-A0x-9600-06/07PD	9000	2 x 14 * 240²						

Unit type	DC - connection (U+, U-) + 2 * PE						Size	
			With DC - fuses		Without DC - fuses			
		Amount of single cores and cross - sectional area connected per phase / PE (1*)	Amount of holes for connection per phase	Size of screws (2*)	Amount of holes for connection per phase; For size D1 - D3 terminals are used	Size of screws (2*); Not for UL		UL as per Nema 2 (3*): Amount of holes per phase for single drives; For size D1 - D3 terminals are used
	DC I [A-]	[mm²]						
800 V								
DCS800-A0x-1900-08-D	1900	7 * 185²			8	M12	on request	D6
DCS800-A0x-2500-08-D	2500	8 * 185²			8	M12		
DCS800-A0x-3000-08-D	3000	11 * 185²			8	M12		
DCS800-A0x-3300-08-D	3300	11 * 185²			16	M12		D7
DCS800-A0x-4000-08-D	4000	12 * 240²			16	M12		
DCS800-A0x-4800-08-D	4700	14 * 240²			16	M12		
DCS800-A0x-6600-08PD	6200	2 x 11 * 185²			request on			D7P
DCS800-A0x-8000-08PD	7600	2 x 12 * 240²						
DCS800-A0x-9600-08PD	9000	2 x 14 * 240²						
990 V								
DCS800-A0x-2050-10-D	2050	7 * 185²			16	M12	on request	D7
DCS800-A0x-2600-10-D	2600	9 * 185²			16	M12		
DCS800-A0x-3300-10-D	3300	11 * 185²			16	M12		
DCS800-A0x-4000-10-D	4000	12 * 240²			16	M12		
DCS800-A0x-5200-10PD	4900	2 x 9 * 185²			request on			D7P
DCS800-A0x-6600-10PD	6200	2 x 11 * 185²						
DCS800-A0x-8000-10PD	7600	2 x 12 * 240²						
1190 V								
DCS800-A0x-2600-12-D	2600	9 * 185²			request on		request on	D7
DCS800-A0x-3300-12-D	3300	11 * 185²						
DCS800-A0x-4000-12-D	3800	12 * 240²						
(1*) Recommendation by ABB: - Use cable type VPE (90°C; 194°F) with 4 cores - AC - connection: U, V, W and PE - DC - connection: L+, L- and 2 * PE - Ambient temperature: 40°C; 104°F - Load: 100 %			(2*) Tightening torque: M10 = 25 Nm; 18.5 ft. - lbs. M12 = 50 Nm; 37 ft. - lbs.			(3*) Diameter of all holes: 14 mm		

Recommended cross-sectional areas - tightening torques DC-connection

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

Cable Connections



WARNING!

Make sure that the DCS800-A Enclosed Converter is disconnected from the mains network during installation and that the capacitors of the line filters are discharged.

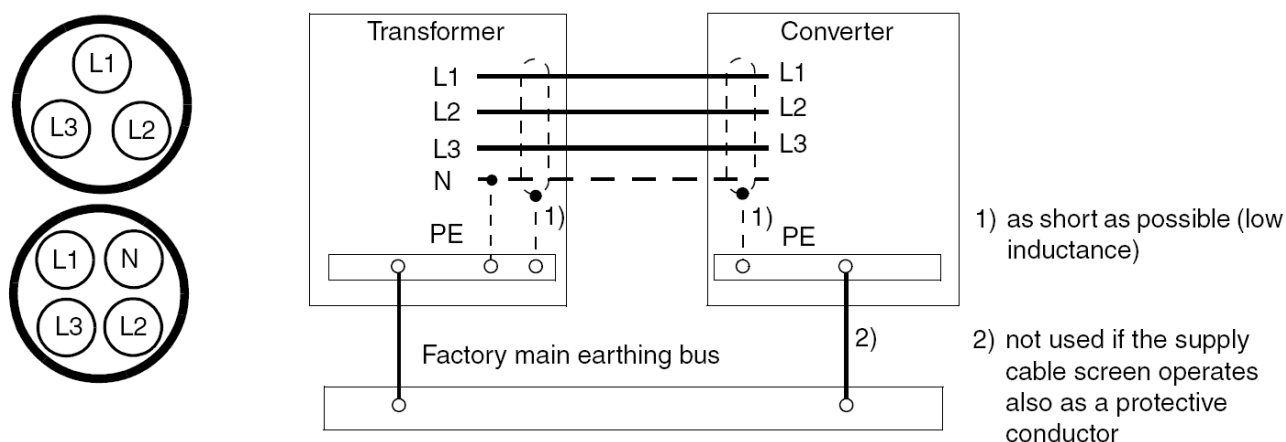
Mains Cable Connection

This section describes the mains connections of the DCS800-A enclosed converters.

The N conductor is not usually used although it is visible in the following diagrams.

Low Power Supply

Low current (< 300 A) cable connection when one cable is sufficient (see [Low-current connection](#)).

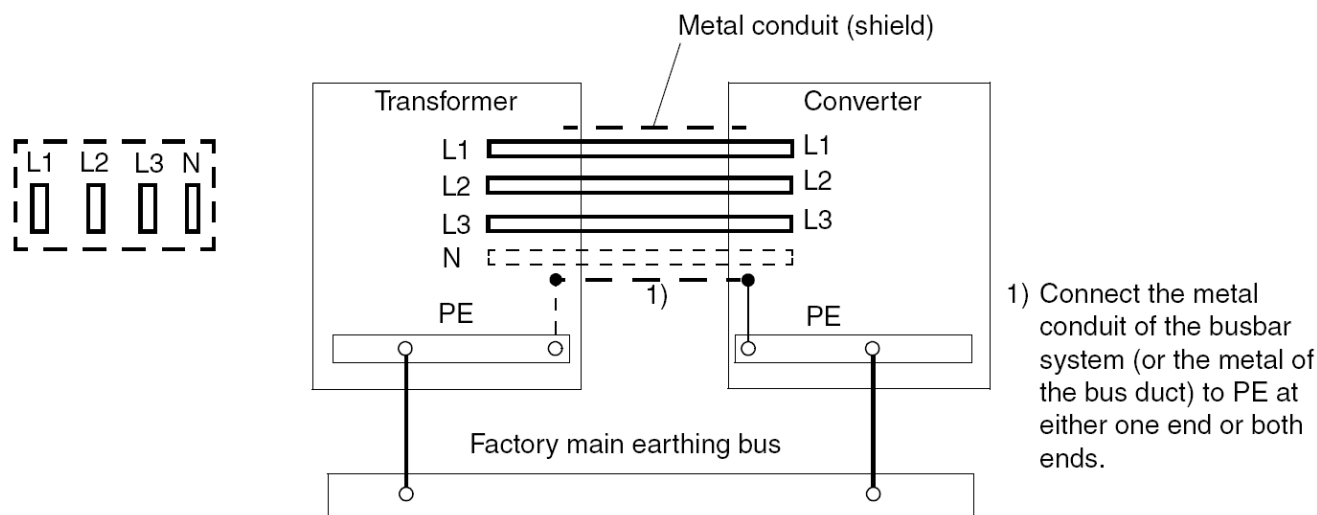


Low-current connection

High Power Supply

Busbar connection

High current (> 300 A) busbar connection (see [High-current busbar connection](#)).



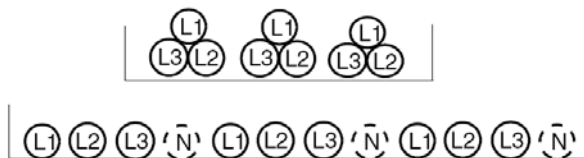
High-current busbar connection

Note:

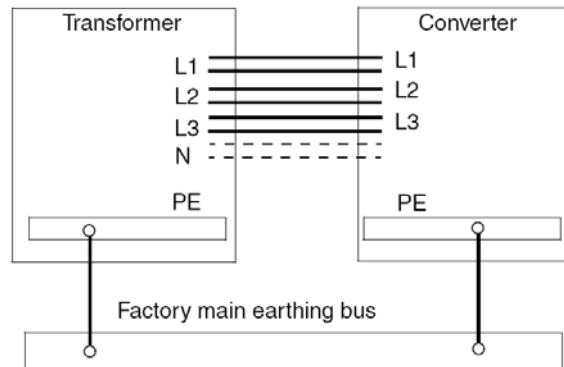
The paint should be removed to allow a good connection to the cabinet frames throughout the whole perimeter of the metal conduit (or a bus duct). The metal conduit (or the bus duct metal) should be electrically continuous throughout its complete length.

Cable Bus System

Connection of a high current (> 300 A) cable bus system that consists of several cables (see [High-current cable bus connection](#))

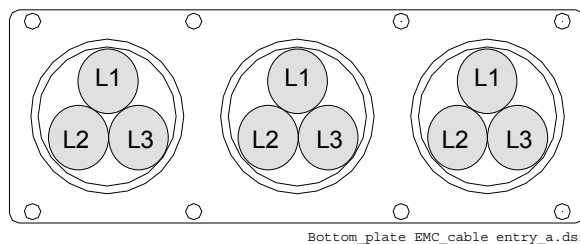
**Note:**

It is recommended to arrange the cables alongside as shown to achieve a current distribution as accurate as possible. Air between cables is required for cooling.

**High-current cable bus connection****Note:**

Current derating of the cables is required when installing the cables in a cable tray. This derating factor must be taken into account as per the local electrical safety codes.

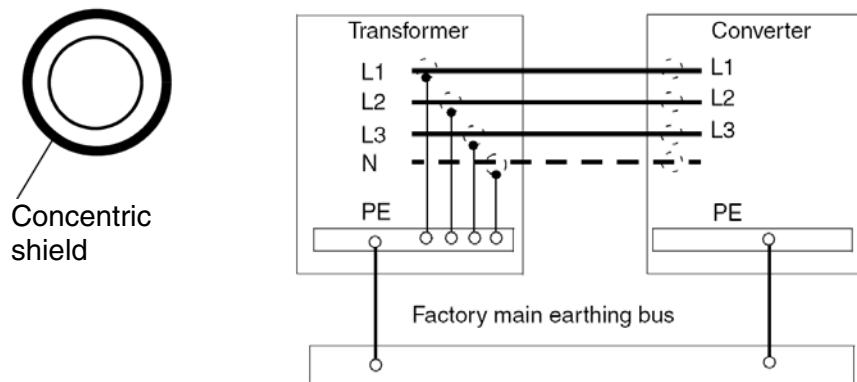
In case metallic cable entries (e.g. EMC-cable entry) are used all three phases (L1, L2, L3) have to be routed together through one single drilling hole:



If the phases are routed separately, means each phase uses its own drilling hole, then the metal will be heated due to circulating currents.

Single-core Cables with Concentric Protective Shields

When single-core cables equipped with concentric protective shields (metal) are used, the phase current will induce voltage to the cable shield. If the shields are connected to each other at both ends of the cable, current will flow in the cable shield. In order to prevent this and to ensure personal safety, the cable shield must be connected only to PE at the transformer side and insulated on the converter side (see [High-current single-core cable connection](#)).



High-current single-core cable connection

Motor Cable Connection

Motor cable connection should be performed as indicated in the manual *Technical Guide* (3ADW000163).

Cable Tray or Bus Duct

Current de-rating of the cables is required when installing the cables in a cable tray or bus duct. This de-rating factor must be taken into account as per the local electrical safety codes.

For some market areas and large power applications, a bus duct may be used to supply the DC thyristor power converter modules. The metal of the bus duct should be grounded at both ends of the complete system. The paint should be removed to allow a good connection to the cabinet frames throughout the whole perimeter of the bus duct. The bus duct should be electrically continuous throughout its complete length.

Mechanical Cable Connections

The following sections provide some basic instructions for the routing and mechanical connection of cables. The mechanical cable connections are basically the same whether they are for an incoming cabinet or a DC thyristor power converter module (what changes between the various types are the cabinet dimension and the location of the terminals for the cables). The cabling direction may also vary (from top or bottom).

If necessary, the same screw can be used to connect two cable lugs at the busbar (sometimes not allowed because of local regulations, e.g. in USA). Always use a torque wrench for tightening the busbar connections.

Location of Cable Connections within the Cabinet

DC thyristor power converter modules series DCS800 are used in DCS800-A Enclosed Converters. The standard version is equipped with a bottom entry for power and control cables. Basically all control cable connections are located on the left side of the cabinet.

Motor Cable Connection

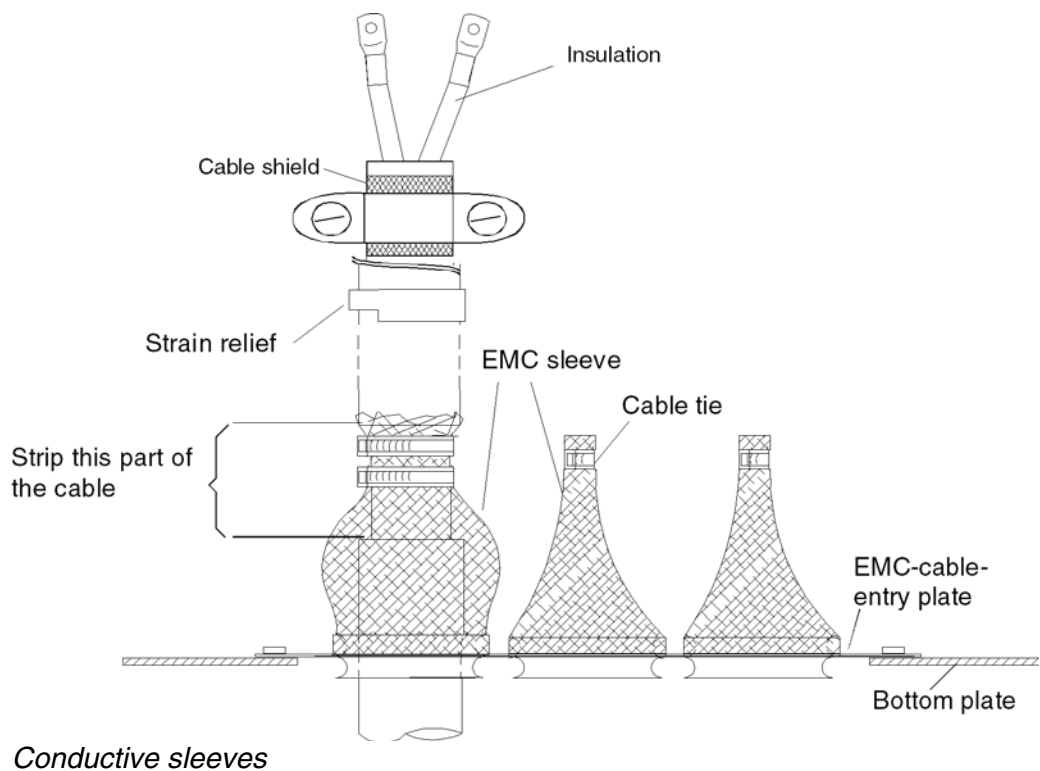
Conductive Sleeves

Conductive sleeves are supplied by ABB as option to provide 360° high frequency grounding for motor cables. Follow these instructions:

- 1) Pull cable into the cabinet through the conductive sleeve.
- 2) If a rubber grommet is used, slide it over the cable.
- 3) Connect phase conductors to terminals.
- 4) Twist the shield wires of the cable together and connect them to ground terminal or PE busbar.
- 5) Peel off 3 to 5 cm of the outer cover of the cable above the entry plate for the 360° high frequency grounding.
- 6) Fasten the conductive sleeve to the cable shield with cable ties.
- 7) Tie up the unused conductive sleeves with cable ties.

Cable Entry

[Conductive sleeves](#) shows a bottom cable entry for power cables of DCS800-A. Tighten the conductive sleeve on the stripped part of the cable with cable ties. For IP 54 units, add a rubber grommet on the cable under the EMC-cable-entry-plate.

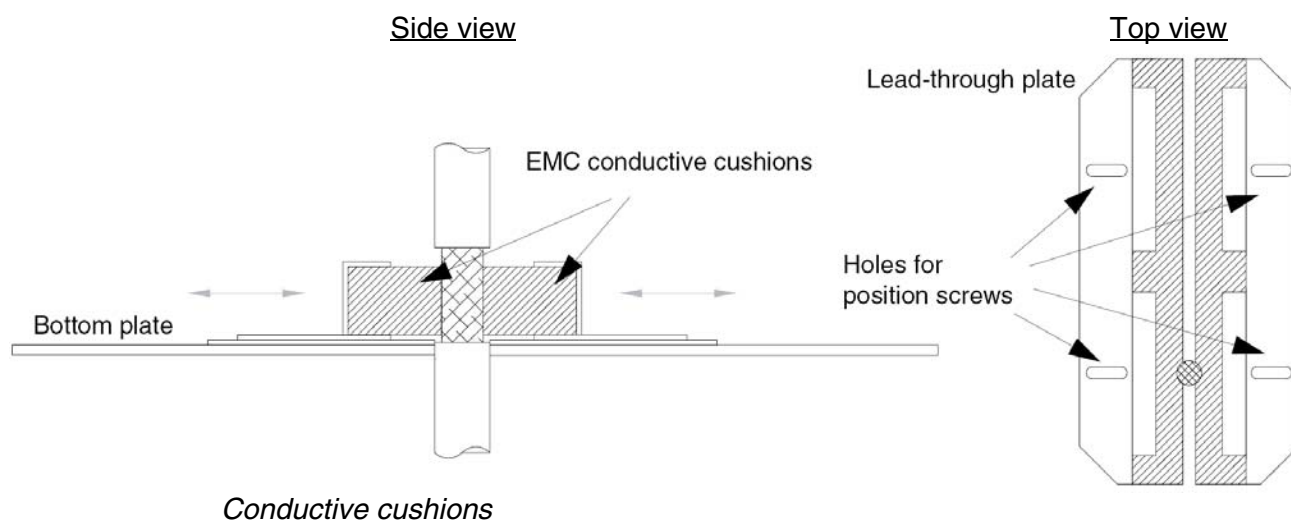


Control Cable Connection

Connect the control cables to the appropriate terminal block (or optional terminal block and other options on the DIN rail at the left side of the cabinet). Tighten the screw to secure the connection. Connect the twisted screen (as short as possible) to the earthing rail ⚡ of the terminal. See also [Connection of a cable screen with the aid of metal clamp to the metal surface](#) and [Connection example in accordance with EMC](#).

EMC Grounding at the Cable Entry

360° high frequency grounding of the control cable screen at the cable entry is available as an option from ABB (see [Conductive cushions](#)).



Special for Top Entry

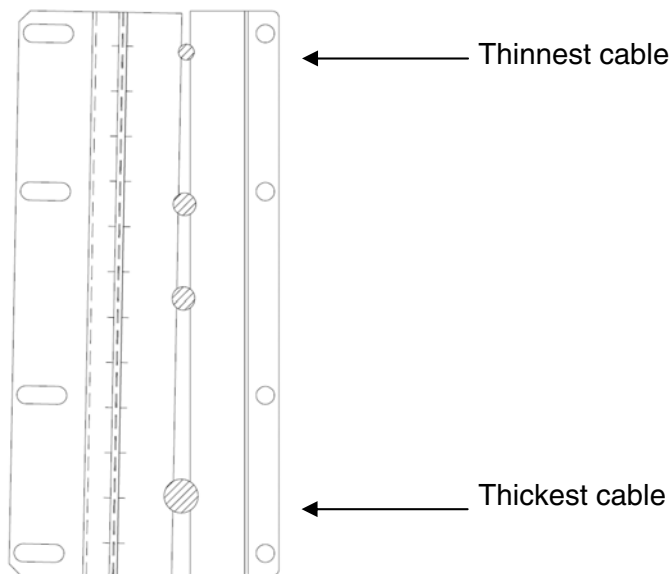
When each cable has its own rubber grommet, sufficient IP and EMC protection can be achieved. However, if lots of control cables are connected to one cabinet, plan the installation beforehand as follows:

- 1) Make a list of the cables to be connected to the cabinet.
- 2) Sort the cables connected to the left into one group and the cables connected to the right into another group to avoid unnecessary crossing of cables inside the cabinet.
- 3) Sort the cables in each group according to size.
- 4) Group the cables for each grommet as follows:

Cable diameter in mm	Max. number of cables per grommet
≤ 13	4
≤ 17	3
< 25	2
≥ 25	1

- 5) Divide the bunches so that cables will be arranged according to size between the conductive cushions.

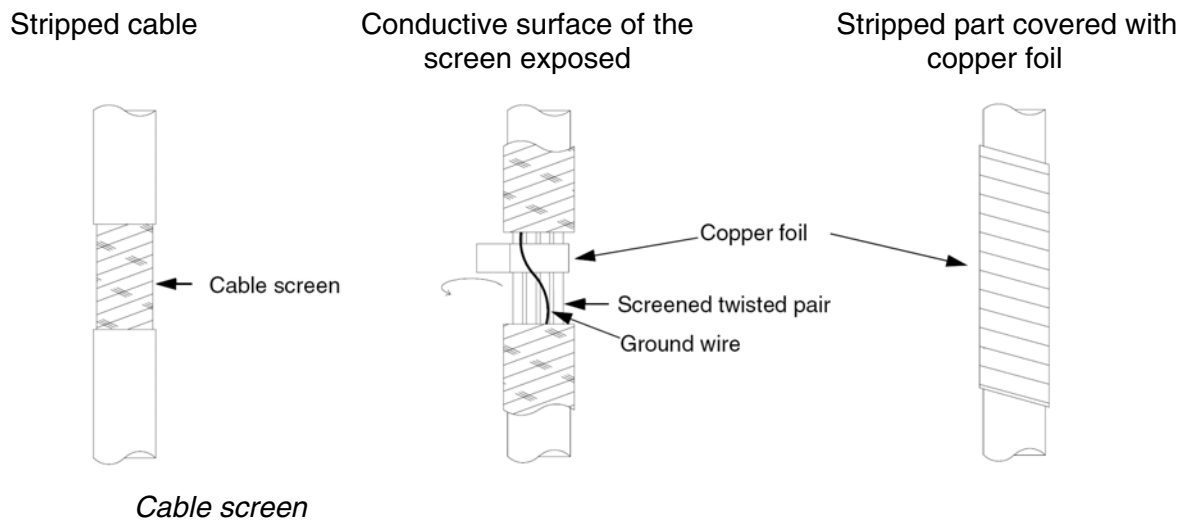
View from below



Lead-through plate

Bottom and Top Entry
Proceed as follows:

- 1) Loosen the lead-through plate position screws. Pull the two parts apart.
- 2) Bottom entry
Lead the cable inside the cabinet through the conductive cushions.
- Top entry
Lead the cable inside the cabinet through the grommet and the conductive cushions. If you have several cables, bunch them together at the grommet, but ensure that each cable has a proper contact to the cushions on both sides.
- 3) Strip off the cable plastic sheath above the base plate (just enough to ensure proper connection of the bare screen and the conductive cushions).
- 4) Earth the screen by means of the conductive cushions:
 - a. If the outer surface of the screen is conductive:
 - Push the two parts of the lead-through plate together so that the conductive cushions presses tightly around the bare screen.
 - b. If the outer surface of the screen is covered with non-conductive material:

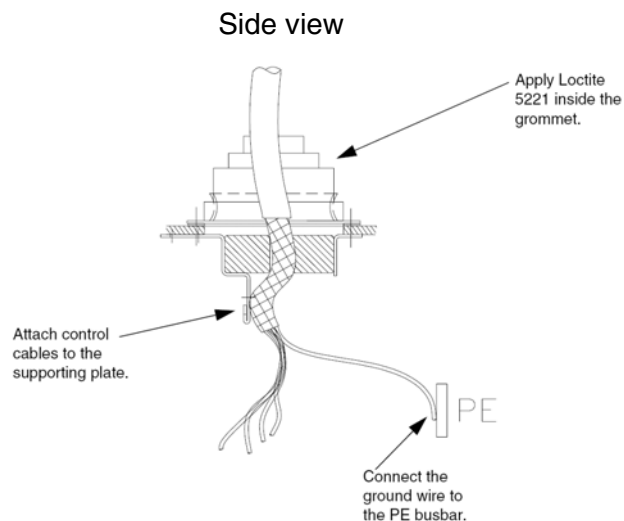


- Cut the screen at the midpoint of the bare part. Be careful not to cut the conductors.
- Turn the screen inside out to expose its conductive surface.
- Cover the turned screen and the stripped cable with copper foil to keep the shielding continuous.

Note:

The ground wire (if present) must not be cut.

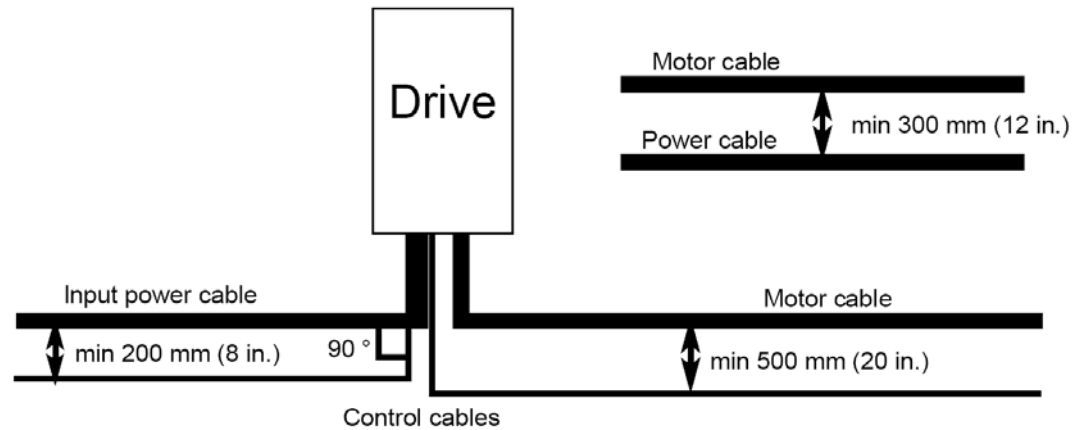
- Push the two parts of the lead-through plate together so that the conductive cushions press tightly round the foil covered screen.
5. Lock the two parts of the lead-through plate by tightening the positioning screws.
 6. Top entry: If more than one cable go through a single grommet, the grommet must be sealed by Loctite 5221 (catalogue number 25551).



Top entry

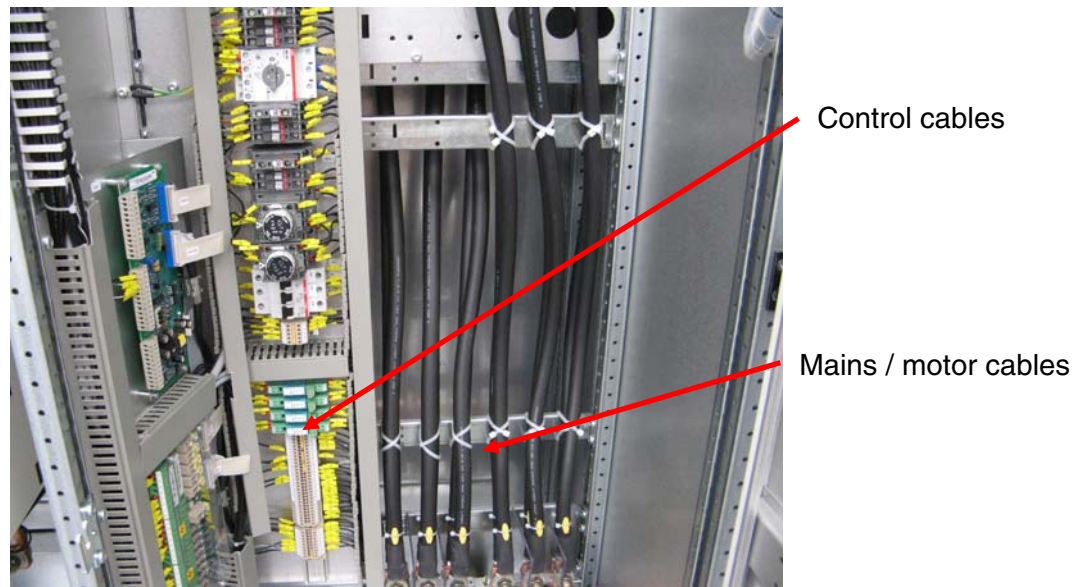
Routing the Cables

The cables that are sources of interference have to be separated from the cables that are sensitive to interference, thus follows:



Distances between different cable types

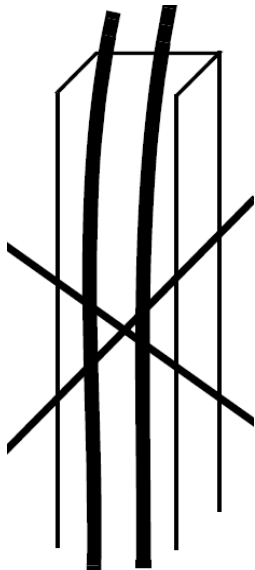
1. Route the motor cables (DC) away from all other cables.
2. It is recommended that the
 - mains cables (AC),
 - motor cables (DC) and
 - control cables
 be installed on separate trays.
3. Motor cables of several drives can be run in parallel on the same tray next to each other.



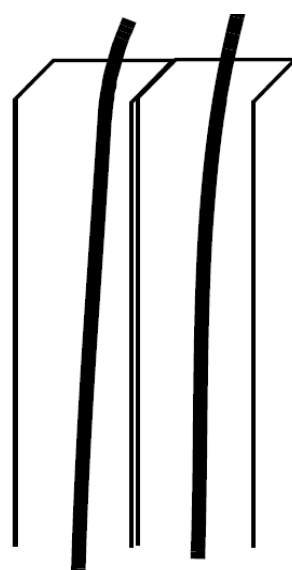
Routing of mains-, motor- and control cables

4. Separate 24 VDC and 115 / 230 VAC control cables.

24 VDC 115 / 230 VAC



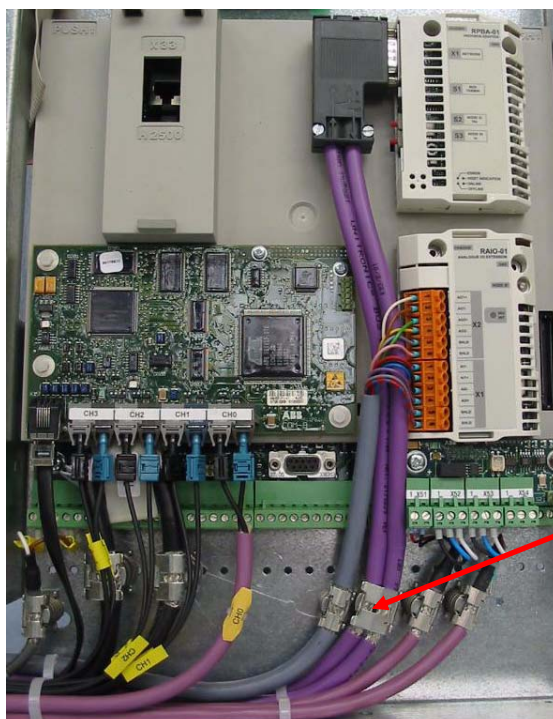
24 VDC 115 / 230 VAC



Not allowed unless the 24 VDC cable is insulated for 230 VAC or insulated with an insulation sleeve for 115 / 230 VAC.

Route 24 VAC and 115 / 230 VDC control cables in separate ducts inside the cabinet.

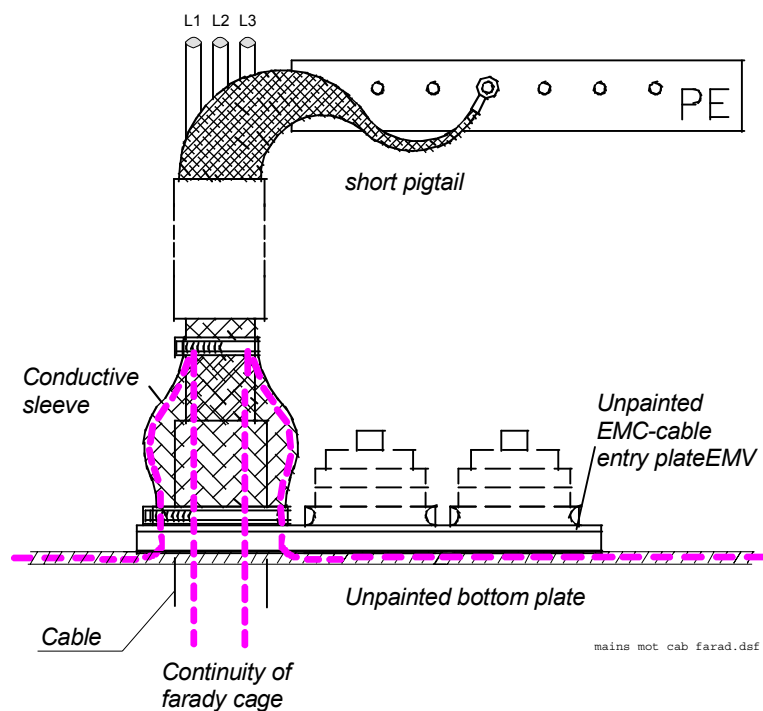
5. The cable screen grounding must be as near to the terminals as possible.



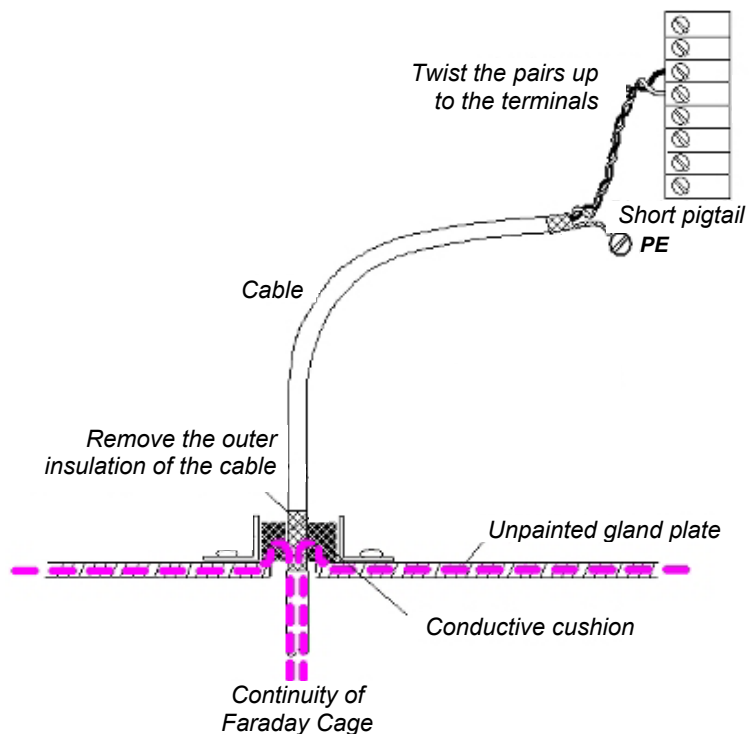
Connection of a cable screen with the aid of metal clamp to the metal surface of the PCB carrier at a DCS converter Size D6, D7
Screen connection

Grounding of cable screens

6. Ground the cable screens also at the cable entry.

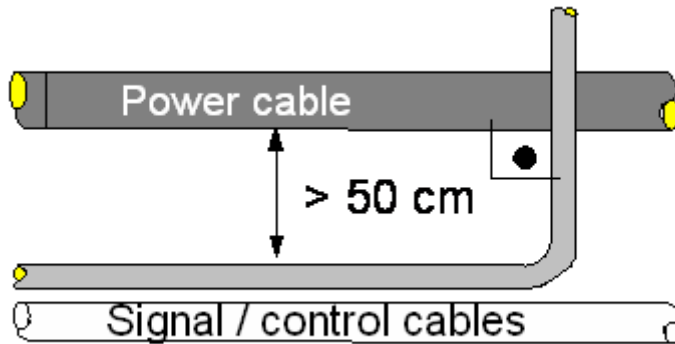


Mains- and motor cables



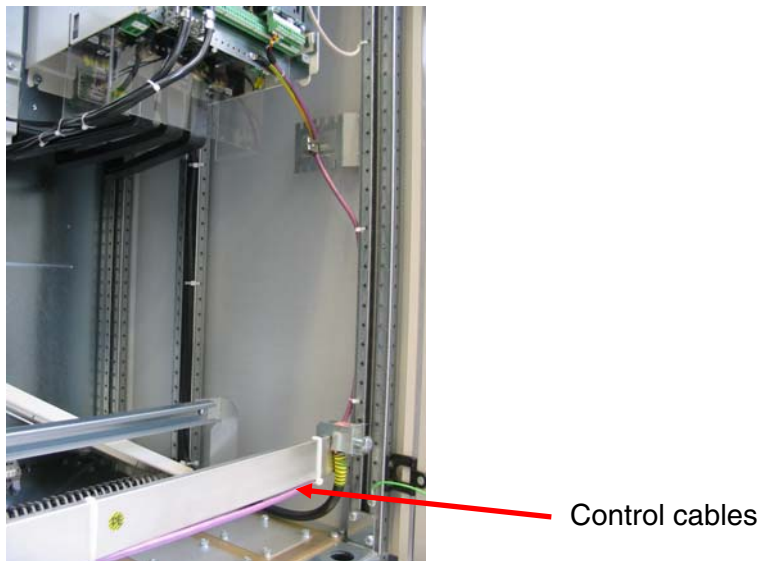
Control cables

7. Avoid long parallel runs of motor cables with other cables in order to decrease electromagnetic interference caused by the rapid changes in the drive output current.
8. Where control cables must cross mains- or motor cables make sure they are arranged at an angle as near to 90 degrees as possible.



Routing of control- and mains- or motor cables at 90 degrees

9. Route control- and other sensitive cables between different cubicles as close to the grounding busbar as possible.



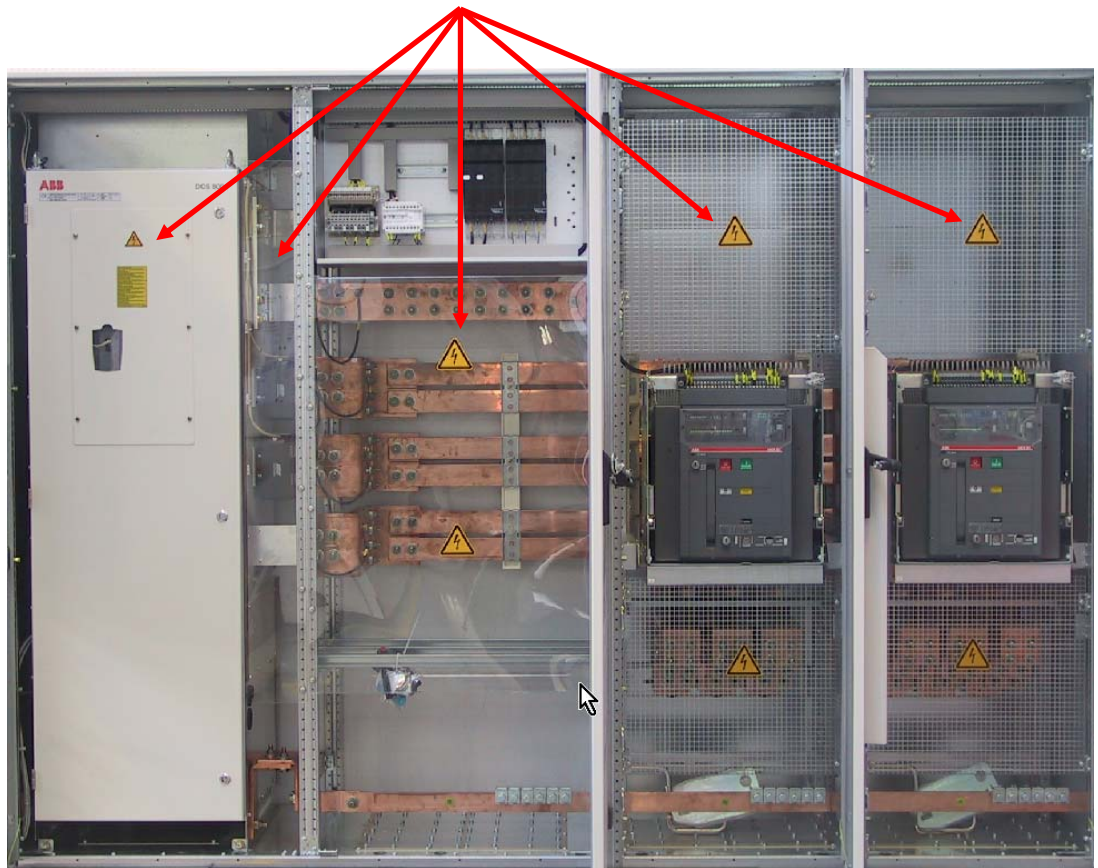
Routing of control cables at PE busbar

10. Do not run extra cables through the drive.
11. The cable trays must have good electrical connection with each other and to ground (PE).
12. Aluminum tray systems can be used to improve local equalizing of potential.

Finger protection

The finger protection is needed to prevent commissioning and service personnel from touching high voltage parts of the drives by mistake.

Finger protection



DCS800-A module size D7 finger protection



WARNING:

Before starting the finger protection covers of the DCS800-A enclosed converter have to be mounted properly!

Installation Checklist

The mechanical and electrical installation of the DCS800-A should be checked before start-up. It is advisable to go through the checklist below together with another person. Study carefully the [Safety Instructions](#) at the beginning of this manual before attempting any work on, or with, the unit.

Installation Checklist

MECHANICAL INSTALLATION (see chapter [Mechanical Installation](#))

- ☐ The ambient operating conditions are acceptable, e.g. environmental conditions and fan data in the *DCS800 Hardware Manual* (3ADW000194) and free space requirements in chapter [Mechanical Installation](#).
- ☐ The unit is mounted properly.
- ☐ Cooling air will flow freely:
 - the lifting bars (if used) are removed,
 - the cabinet roof is attached properly,
 - the filters (if used) are mounted properly,
 - the D6 / D7 modules (if used) air outlet is connected properly,
 - the air baffle plates of the converter modules are mounted properly.

ELECTRICAL INSTALLATION (see chapter [Electrical Installation](#))

- ☐ Joining of the shipping splits:
 - the AC busbars and PE busbars are properly connected (see chapter [Mechanical Installation](#)),
 - the internal control cables are properly connected.
- ☐ The converter units and cabinets are grounded properly.
- ☐ The mains voltage matches the DC converter nominal input voltage.
- ☐ The setting of the internal 220 VAC / 115 VAC transformer T2 corresponds to the supply voltage.
- ☐ The mains (input power) connections at U, V and W (L1, L2 and L3) are OK.
- ☐ The appropriate mains fuses are installed for units D1 to D4, see *DCS800 Hardware Manual* (3ADW000194).
- ☐ Motor cable routing (armature and excitation) is OK.
- ☐ Check that the screens are properly installed at the motor and in the drive cabinet.

- ☐ The connections L+, L-, F+ and F- at motor and drive are OK.
- ☐ The control connections are OK.
- ☐ If pulse encoder is used, check the encoder cables and correct direction of rotation, see *DCS800 Hardware Manual* (3ADW000194).
- ☐ PT 100, 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) cables.
- ☐ Check the emergency stop cables.
- ☐ For all external cables make sure that both ends of the cables are connected and the cables do not cause any damage or danger when power is being switched on.
- ☐ Cleanliness of the cabinets and surroundings, e.g.:
 - there are no tools or other foreign objects inside the cabinets or waste left from installation e.g. cable trimmings,
 - there is no garbage under the cabinets (the cooling air fan will draw the garbage inside the cabinets),
 - use a vacuum cleaner to remove any dirt. **Do not use compressed air!**
- ☐ Before start-up close all doors, covers, air baffle plates and check that the finger protection covers are mounted properly.

Preventive Maintenance



WARNING! Before performing any maintenance the chapter [Safety Instructions](#) at the beginning of this manual must be followed. Negligence of these instructions can cause injury or death.

Recommended regular maintenance

The DCS requires very little maintenance if installed in an appropriate environment. An annual check for dust accumulation and corrosion inside the module / cabinet is recommended.

Air Filters

When air filters are used, the filters should be checked regularly depending on environmental conditions. Clogged up filters prevent the proper cooling of the drive. Wash dirty filters with water (60°C) and detergent.

Cooling air pressure switch in converter modules type D5 / D6 / D7

The cooling air pressure switch must be checked regularly.

The following actions have to take place:

- Make sure electrical safety is performed.
- Open the module's door and hold it in position to prevent any movement.
- Repeat it with the cabinet's door.
- Start the drive.
- The air pressure switch is ok when the converter is switched off by **F527 ConvFanAck** - see *ConvFanAck* (10.30). Crosscheck this result with the module's door closed.

Attention: Do not reach into the fan. Negligence to this warning can cause injury.

Fan

The lifetime of the cooling fan is about 20.000 to 40.000 hours depending on the converter type. The actual lifetime depends on the usage of the DCS and the ambient temperature.

Fan failure can be predicted by means of increasing noise from its bearings and a gradual rise of the heatsink temperature. If the DCS operates in a critical part of the process it is recommended to replace the fan once the above mentioned symptoms appear.

Heatsink

The DCS will run into overtemperature faults if the heatsinks are not clean. In an appropriate environment the heatsinks should be checked and cleaned annually. Use compressed air to remove the dust from the heatsinks (the air flow must be from bottom to top). Fan rotation caused by the compressed air must be stopped in order to prevent damage.

Additionally use a vacuum cleaner to clean the dust from the air inlet and outlet.

Internal high current connections in converters type D7

The thyristors together with the heatsinks are stacked. Every single thyristor is connected to the DC+ and DC- busbars via flexible copper busbars. These

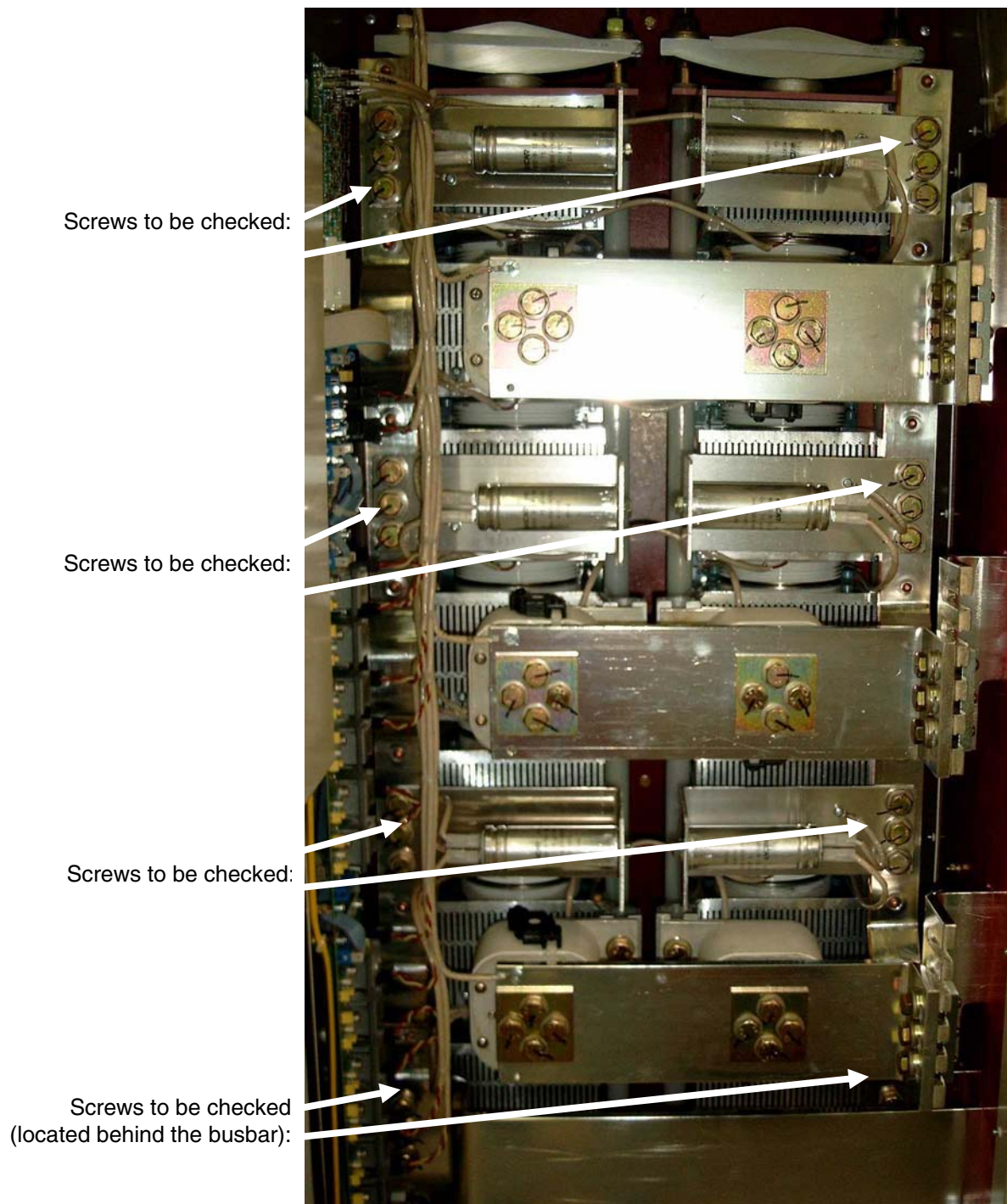
busbars consist of 10 layers of pre-shaped sheet copper. This construction is able to compensate for small changes in length caused by temperature rise when current is flowing. The screw fixings between heatsink and flexible copper busbar have to withstand different types of mechanical stress. Therefore each fixing needs to be checked for correct torque. This check should be done regularly, e.g. annually or together with all the other work to be done for preventive maintenance.

Actions:

- Make sure all supply voltages are switched off, most important the supply for the power part (armature), for the electronic power part (SDCS-POW-4 respectively SDCS-POW-1), for the converter fan and for other auxiliaries!
- Open the cabinet's and module's door; if needed secure them.
- Set a latching torque spanner to 25 Nm (18 lb-ft); a 17 mm nut is needed too.
- Check the torque of the screws marked within [Power part of a converter module type D7](#).
- Apply the torque spanner to the screw and turn right until the right torque is indicated.
- Don't loosen the screws by a left hand turn!
- Put on a new marking, if appropriate.

Relays and electrical connections

Relays should be checked for proper function and all connections should be inspected and checked for tightness. Any signs of corrosion, especially at ground components, must be removed.



Power part of a converter module type D7

DCS800 family



DCS800-S modules

The versatile drive for any application

20 ...	5,200 A _{DC}
0 ...	1,160 V _{DC}
230 ...	1,000 V _{AC}
IP00	

- Compact
- Highest power ability
- Simple operation
- Comfortable assistants, e.g. for commissioning or fault tracing
- Scalable to all applications
- Free programmable by means of integrated IEC61131-PLC



DCS800-A enclosed converters

Complete drive solutions

20 ...	20,000 A _{DC}
0 ...	1,500 V _{DC}
230 ...	1,200 V _{AC}
IP21 – IP54	

- Individually adaptable to customer requirements
- User-defined accessories like external PLC or automation systems can be included
- High power solutions in 6- and 12-pulse up to 20,000 A, 1,500 V
- In accordance to usual standards
- Individually factory load tested
- Detailed documentation



DCS800-E series

Pre-assembled drive-kits

20 ...	2,000 A _{DC}
0 ...	700 V _{DC}
230 ...	600 V _{AC}
IP00	

- DCS800 module with all necessary accessories mounted and fully cabled on a panel
- Very fast installation and commissioning
- Squeezes shut-down-times in revamp projects to a minimum
- Fits into Rittal cabinets
- Compact version up to 450 A and Vario version up to 2,000 A



DCS800-R Rebuild Kit

Digital control-kit for existing powerstacks

20 ...	20,000 A _{DC}
0 ...	1,160 V _{DC}
230 ...	1,200 V _{AC}
IP00	

- Proven long life components are re-used, such as power stacks, (main) contactors, cabinets and cabling / busbars, cooling systems
- Use of up-to-date communication facilities
- Increase of production and quality
- Very cost-effective solution
- Open Rebuild Kits for nearly all existing DC drives
- tailor-made solutions for...

- BBC PxD ■ BBC SZxD
- ASEA TYRAK ■ other manufacturers



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