



SYSTEM DRIVE HARDWARE MANUAL



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Document ID: DPD01365 Revision: C Revision release date: 23.06.2020

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1. INTRODUCTION

The VACON[®] NXP System Drive is a comprehensive configured common DC bus drive line up for heavy-industry needs where round-the-clock activity is required leaving little time for maintenance.

All sections are grouped depending on their functionality, making it possible to plan each installation phase according to your requirements. The engineered sections slot in alongside each other allowing you to arrange integrated transport splits to save space. Alternatively, you can add extra transport sections to speed up installation. All larger modules have slide-out mechanics for easier set-up and maintenance.

The VACON[®] NXP System Drive is built to last. Items such as busbar systems and high/low power devices are separated into individual compartments away from each other. This means that, if an issue occurs, it is compartmentalized and doesn't cause widespread failure helping to reduce lifetime and maintenance costs.

1.1 REVISION HISTORY

This manual is regularly reviewed and updated. All suggestions for improvement are welcome.

The original language of this manual is English.

Rev.	Release date	Changes/updates
А	17.12.2013	First version
В	07.01.2015	Updated Chapter 2 "Available sections". Updated Chapter 4.3 "Removing the drives from the cabinet".
С	C 23.06.2020 Added Chapter 4.6.4 "Installation procedure". Added Chapter 4.6.3 "EMC grounding". Added Chapter 4.6.4 "Installation of ferrite rings (+0CM) on the motor cable" Added Chapter 4.6.6 "Auxiliary low-voltage connections". Added Chapter 4.7 "Screw tightening torgues".	

Table 1. Manual revision history

1.2 SCOPE OF SUPPLY

The scope of supply is limited to the drives listed in this manual. Process, machine or drive control systems are not part of the scope of supply.

1.3 RELATED BROCHURES AND MANUALS

VACON[®] NX user manuals and brochures are available in PDF format on the Danfoss website at www.danfoss.com.

- VACON[®] NXP Common DC Bus Selection Guide
- VACON[®] NXN NFE User manual
- VACON[®] NX Active Front End User Manual
- VACON[®] NX Inverters FI4-FI8 Operating Guide
- VACON[®] NX Inverters FI9-FI14 Operating Guide

Also manuals for different applications and option boards are available on the Danfoss website at www.danfoss.com.

ADS	Auxiliary Device Section
AFS	Active Front-end Section
DBS	Dynamic Brake Section
DRL	Drive List
IUS	Inverter Unit Section
LV	Low Voltage
MIS	Main Incoming Section
NFS	Non-regenerative Front-end Section
SLD	Single Line Diagram
TSU	Transport Split Unit

1.4 DEFINITIONS AND ABBREVIATIONS

1.5 **PROJECT SPECIFICATIONS**

1.5.1 PARAMETERS

Project parameters are selected with the line-up configuration tool. Table 2 shows an example of parameters selected with the configuration tool.

Parameter	Selection
Mains network type	ІТ
Mains voltage	690 V AC
Frequency	50 Hz
Mains maximum current	2500 A
Busbar system	DC+, DC-, PE
Busbar system voltage	1100 V DC
Busbar system maximum current	2500 A
I _{cw} , 1 s	50 kA
PE design	50%
Busbars and flexibars	Tinned
Cabinet type	Rittal TS8
Height	2000 mm
Depth	600 mm
Cabinet material	Powder coated steel
Sheet steel parts within the enclosure	Without coating
Colour	RAL 7035
Ingress protection of enclosure	Protection against accidental touching of live parts
Protection barriers and covers	IP 21
Ambient temperature	35°C
Halogen free wires and ducts	No
Mimic diagram	No
Type of packing	Sea freight box
Application	Industry

Table 2. Example of parameters selected from the configuration tool

1.5.2 Sections and options

Sections and options are selected using the line-up configuration tool. The available sections and options are introduced in Chapter 3.

#	Section type	Section category	Options
1	ADS_600	Control	+PES
2	MIS_2500	Incoming power	+ICB
3	AFS_13	Incoming power	-
4	IUS_4	Outgoing power	+0DU
5	IUS_10	Outgoing power	+0DU
6	IUS_10	Outgoing power	+ODU
7	IUS_12	Outgoing power	+ISC, +ODU
8	IUS_7	Outgoing power	+ODU
9	IUS_12	Outgoing power	+ISC, +ODU

Table 3. Example of selected sections and options from the configuration tool

1.5.3 System layout and footprint drawings

System layout and footprint drawings are created based on the sections and options selected with the line-up configuration tool.

1.6 SUPPLIED DOCUMENTATION

Danfoss delivers technical documentation for the switchgear assembled AC drives according to the Danfoss design standard. The documentation is provided in english.

The scope of supply regarding documentation does not include:

- Special requirements
- Delivery specific requirements
- Customer specific requirements (e.g. marking, naming, coding etc.)

Document type	Electronic format	Paper copies
Cable connection table	dwg, dxf or pdf	3 sets
Parts list	dwg, dxf or pdf	3 sets
Wiring list	dwg, dxf or pdf	3 sets
Circuit diagram	dwg, dxf or pdf	3 sets
Switchgear layout drawing	dwg, dxf or pdf	3 sets
Device layout drawing	dwg, dxf or pdf	3 sets
$VACON^{ extsf{B}}$ manuals (as applicable)	pdf	3 sets

Table 4. Supplied documentation

1.7 STORAGE

If the system drive is to be kept in store before use, make sure that the ambient conditions are acceptable:

- Storing temperature -40...+70 °C
- Relative humidity <95%, no condensation

The environment should also be free from dust. If there is dust in the air, the drive should be well protected to make sure dust does not get into the drive.

If the drive is to be stored during longer periods, the power should be connected to the drive once in 24 months and kept on for at least 2 hours. If the storage time exceeds 24 months the electrolytic DC capacitors need to be charged with caution. Therefore, such a long storage time is not recommended.

If the storing time is much longer than 24 months, the recharging of the capacitors has to be carried out so that the possible high leakage current through the capacitors is limited. The best alternative is to use a DC power supply with adjustable current limit. The current limit has to be set for example to 300-500 mA and the DC power supply has to be connected to the B+/B- terminals (DC supply terminals).

DC voltage must be adjusted to nominal DC voltage level of the unit $(1.35 \times U_n AC)$ and supplied at least for 1 hour.

If DC voltage is not available and the unit has been stored de-energized much longer than 1 year, consult factory before connecting power.

1.8 LIFTING AND MOVING THE CABINET SECTIONS

For transport, the system drive is split into smaller sections. The cabinet sections are delivered either in a wooden box or a wooden cage. The cabinets are transported vertically. Always refer to shipping marks for more detailed information. To lift the cabinet sections, use lifting equipment capable of handling the weight of the cabinets.

There are lifting beams on the top of the cabinets. Use the beams to lift and to move the cabinets to the required location.



Figure 1. Lifting the cabinet sections

Moving of the cabinets on site can be carried out as follows by a forklift truck, a hoist or on rollers:

- Lower the package onto a level base
- Remove the package covering only at the site of installation
- Low, narrow or convoluted transport routes may require removal of the pallet prior to movement
- Move packages in the upright position only



Figure 2. Moving the cabinet sections



Switchgear parts can easily topple backwards when manoeuvring on rollers or manual trolleys because their centre of gravity is typically located high up at the rear of the unit.

2. SAFETY

NOTE! You can download the English and French product manuals with applicable safety, warning and caution information from https://www.danfoss.com/en/service-and-support/.

REMARQUE Vous pouvez télécharger les versions anglaise et française des manuels produit contenant l'ensemble des informations de sécurité, avertissements et mises en garde applicables sur le site https://www.danfoss.com/en/service-and-support/.

Please, read the information in cautions and warnings carefully.

The cautions and warnings are marked as follows:

= WARNING, dangerous voltage!
= CAUTION, possible damage to equipment!



Installation is only permitted to be carried out by a competent electrician!

2.1 WARNINGS



The components of the power unit and all cabinet mounted devices are live when the drive is connected to mains potential. Coming into contact with this voltage is **extremely dangerous** and may cause death or severe injury.



The motor terminals U, V, W, the DC bus/brake resistor terminals and all other mains devices are potentially live when the drive is connected to mains, even if the motor is not running.



After disconnecting the AC drive from the mains, wait until the fan stops and the indicators on the keypad go out (if no keypad is attached see the indicators on the cover). Wait 5 more minutes before doing any work on the connections of the drive. Do not open the cabinet door before this time has expired. After expiration of this time, use measuring equipment to absolutely ensure that no voltage is present. Always ensure the absence of voltage before starting any electrical work!



The control I/O-terminals are isolated from the mains potential. However, the **relay outputs and other I/O-terminals may have a dangerous control voltage** present even when the drive is disconnected from mains.



Before connecting the drive to mains make sure that the drive front and cable covers as well as the cabinet doors are closed.



Wear protective gloves when you do mounting, cabling or maintenance operations. There can be sharp edges in the AC drive that can cause cuts.

2.2	CAUTIONS
	VACON [®] AC drives are meant for fixed installations only .
\wedge	Do not perform any measurements when the AC drive is connected to mains.
	The touch current of VACON [®] AC drives exceeds 3.5 mA _{AC} . According to standard EN61800-5-1, a reinforced protective ground connection must be ensured. See Chapter 2.3.
	If the drive is used as a part of a machine, the machine manufacturer is responsible for providing the machine with a supply disconnecting device (EN60204-1).
	Only spare parts delivered by Danfoss can be used.
	At power-up, power brake or fault reset the motor will start immediately if the start signal is active, unless the pulse control for Start/Stop logic has been selected. Futhermore, the I/O functionalities (including start inputs) may change if parameters, applications or software are changed. Disconnect, therefore, the motor if an unexpected start can cause danger.
	The motor starts automatically after automatic fault reset if the autoreset function is activated. See the Application Manual for more detailed information.
	Prior to measurements on the motor or the motor cable , disconnect the motor cable from the drive.
	Do not touch the components on the circuit boards . Static voltage disharge may damage the components.
	Check that the EMC level of the AC drive corresponds to the requirements of the supply network.
	Make sure that the cooling is sufficient. If the AC drive becomes frequently too hot, the lifetime of the drive will be shorter than usually.

2.3 GROUNDING AND GROUND FAULT PROTECTION



CAUTION!

The AC drive must always be grounded with a grounding conductor connected to the grounding terminal marked with:



The touch current of the AC drive exceeds 3.5 mA AC. According to EN61800-5-1, one or more of the following conditions for the associated protective circuit shall be satisfied:

A fixed connection and

- the protective grounding conductor shall have a cross-sectional area of at least 10 mm² Cu or 16 mm² Al, or
- an automatic disconnection of the supply in case of discontinuity of the **protective grounding conductor**, or
- provision of an additional terminal for a second **protective grounding conductor** of the same cross-sectional area as the original **protective grounding conductor**.

Cross-sectional area of phase conductors (<i>S</i>) [mm ²]	Minimum cross-sectional area of the corre- sponding protective grounding conductor [mm ²]	
<i>S</i> ≤16 16< <i>S</i> ≤35 35< <i>S</i>	S 16 S/2	
The values above are valid only if the protective grounding conductor is made of the same metal as the phase conductors. If this is not so, the cross-sectional area of the protective grounding conductor shall be determined in a manner which produces a conductance equivalent to that which results from the application of this table		

Table 5. Protective grounding conductor cross-section

The cross-sectional area of every protective grounding conductor which does not form part of the supply cable enclosure shall, in any case, be no less than:

- 2.5 mm² if mechanical protection is provided or
- 4 mm² if mechanical protection is not provided. For cord-connected equipment, provisions shall be made so that the protective grounding conductor in the cord shall, in the case of failure of the strain-relief mechanism, be the last conductor to be interrupted.

However, always follow the local regulations for the minimum size of the protective grounding conductor.

NOTE! Due to the high capacitive currents present in the AC drive, fault current protective switches may not function properly.



Do not perform any voltage withstand tests on any part of the AC drive. There is a certain procedure according to which the test shall be performed. Ignoring this procedure may result in a damaged product.

3. AVAILABLE SECTIONS

3.1 AUXILIARY DEVICE SECTION

The auxiliary device section (ADS) includes the common line-up controls. This section can be customized for all application and segment needs. There are three ADS sizes available.

ADS type	Width x Height x Depth (mm)
ADS_400	400 x 2000 x 605
ADS_600	600 x 2000 x 605
ADS_800	800 x 2000 x 605

Table 6. ADS section size

As standard the ADS section has the following equipment:

- 1. Control for the circuit breaker with +ICB selected
- 2. Indication of the mains status (fault, pre-charging and ON)
- 3. Auxiliary power supply 24 V, 5 A
- 4. Auxiliary Transformer, 2500 VA 1-phase supply (in bottom of cabinet)
- 5. Terminals for control and monitoring

As pre-engineered standard options, we can provide the following:

- Emergency stop CAT0 (+PES)
- Emergency stop CAT1 (+PED)
- Insulation fault sensor (+PIF)
- Arc protection relay (+PAP)
- Cabinet heater (+ACH)
- Cabinet light (+ACL)
- Auxiliary voltage transformer 4000 VA (+AT4)
- Auxiliary voltage 110 V AC (+AT1)
- Auxiliary power supply 24 V, 10 A (+ADC)
- Cabling from the top (+CIT)
- Empty auxiliary 600 mm cabinet with door (+G60)
- UL approved design and components (+NAR)
- Customer specific option (+CSO)

+PAP will have sub units in selected sections if needed, please refer to the circuit diagrams.

3.2 MAIN INCOMING SECTION

The main incoming section (MIS) includes the main incoming device. The main incoming device and size is dependent on the required current of the complete line-up.

MIS type	Input current	Width x Height x Depth (mm)
MIS_630	630 A	400 x 2000 x 605
MIS_800	800 A	600 x 2000 x 605
MIS_1000	1000 A	600 x 2000 x 605
MIS_1250	1250 A	600 x 2000 x 605
MIS_1600	1600 A	600 x 2000 x 605
MIS_2000	2000 A	600 x 2000 x 605
MIS_2500	2500 A	600 x 2000 x 605
MIS_3200	3200 A	800 x 2000 x 605
MIS_4000	4000 A	800 x 2000 x 605
MIS_5000	5000 A	800 x 2000 x 605

Table 7. Available MIS sizes

As standard the MIS section has the following equipment (see Figure 3):

- 1. Air circuit breaker
- 2. Mains connections
- 3. Digital multi instrument with field bus connection
- 4. Pre-charging components for AFE

As pre-engineered standard options we can provide the following:

- Cabling from the top (+CIT)
- Ground Switch (+ILE)
- Current transducers (+ITR)
- UL approved design and components (+NAR)
- Arc detection (+ADU)
- Cabinet heater (+ACH)
- Cabinet light (+ACL)

+ILE requires an additional section.



Figure 3. Example of main incoming section MIS_1600

3.3 NON-REGENERATIVE FRONT-END SECTION

The non-regenerative front-end section (NFS) includes one or multiple NXN units from the VACON[®] NXP product series. The NXN is a non-regenerative supply unit that can be utilized in 6-pulse, 12-pulse, 18-pulse and 24-pulse systems.

Table 8. Available NFS sections

NFS type	Number of NXN units	Width x Height x Depth (mm)
NFS_1x*	1	800 x 2100 x 605
NFS_2x*	2	800 x 2100 x 605

* _M selection for mirrored design.

As standard the NFS section includes the following (see Figure 4):

- 1. The NXN unit(s)
- 2. Chokes
- 3. Terminals for control and indication signals (installed in MIS or ADS section)
- 4. DC fuses for the Supply Unit
- 5. AC fuses for the filter

- UL approved design and components (+NAR)
- Arc detection (+ADU)
- Cabinet heater (+ACH)
- Cabinet light (+ACL)



Figure 4. Example of non-regenerative front-end section NFS_2x

3.4 ACTIVE FRONT-END SECTION

The active front-end section (AFS) includes an LCL-filter and an NXA unit from the VACON[®] NXP product series. The active front-end provides low THD(I) and several units can be connected in parallel providing full or reduced redundancy.

Table 9. Available AFS sections

AFS type	Drive size	Width x Height x Depth (mm)
AFS_9*/**	F19	800 x 2100 x 605***
AFS_10* [/] **	FI10	800 x 2100 x 605***
AFS_13* [/] **	FI13	1400 x 2100 x 605***
AFS_13_2x*/**	FI13	3200 x 2100 x 605***

* _M selection for mirrored design.

** +AC, AC busbars for two or more AFS sections after the MIS section, limited to 2600 A per side of the MIS.

*** Dimensions including LCL.

As standard the AFS sections include the following (see Figure 5):

- 1. LCL Filter
- 2. The NXA unit
- 3. Control unit
- 4. Pre-charging components (installed in MIS section)
- 5. Terminals for control and indication signals (installed in MIS or ADS section)
- 6. DC fuses for the Supply Unit
- 7. AC fuses for the filter (installed in MIS section)

- UL approved design and components (+NAR)
- Arc detection (+ADU)
- Cabinet heater (+ACH)
- Cabinet light (+ACL)



Figure 5. Example of active front-end section AFS_9

3.5 INVERTER UNIT SECTION

3.5.1 DRIVE SIZES FR4-FR8

The inverter unit section (IUS) includes one or several smaller NXI drives from the VACON[®] NXP product series. The inverter units are all VACON[®] NXP premium drives.

IUS type	Drive size	Number of drives/ section	Width x Height x Depth (mm)
IUS_4_x	FR4*	1-3	400 x 2100 x 605**
		4-14	1200 x 2100 x 605**
IUS_6_x	FR6	1-2	400 x 2100 x 605**
IUS_7	FR7	1	400 x 2100 x 605**
IUS_8	FR8	1	400 x 2100 x 605**
COT_4-8***	-	-	400 x 2000 x 605

Table 10. Available IUS section sizes FR4-FR8

* Only option board and fieldbus options

**Top exit +400 mm can be shared between two sections

*** Section for cabling with top cabling option (+COT)

As standard the IUS section includes the following (see Figure 6):

- 1. Input fuses (DC fuses)
- 2. Fuse switch (IEC FR4-FR6)
- 3. The NXI drive(s)
- 4. Control box (integrated into the module)
- 5. Terminals for control and indication signals

- dU/dt (+0DU)
- Input Switch, DC disconnect (+ISD)
- Arc detection (+ADU)
- Motor fan control (+AMF)
- Motor heater feeder (+AMH)
- Mechanical break control (+AMB)
- Top cabling (+COT)
- UL approved design and components (+NAR)
- Cabinet heater (+ACH)
- Cabinet light (+ACL)



Figure 6. Example of inverter unit IUS_4



Figure 7. Example of inverter unit IUS_6



Figure 8. Example of inverter unit IUS_8

3.5.2 DRIVE SIZES FI9-FI14

The inverter unit section (IUS) includes the largest NXI drives from the VACON $^{\textcircled{R}}$ product series. The inverter units are all VACON $^{\textcircled{R}}$ NXP premium drives.

IUS type	Drive size	Width x Height x Depth (mm)	Width x Height x Depth (mm), with +0DU
IUS_9	FI9	800 x 2100 x 605	800 x 2100 x 605
IUS_9_2x	FI9	1200 x 2100 x 605	1200 x 2100 x 605
IUS_10	FI10	800 x 2100 x 605	800 x 2100 x 605
IUS_10_2x	FI10	1200 x 2100 x 605	1200 x 2100 x 605
IUS_12	FI12	1000 x 2100 x 605	1000 x 2100 x 605
IUS_12_2x	FI12	1800 x 2100 x 605	Not available
IUS_13	FI13	1400 x 2100 x 605	1400 x 2100 x 605
IUS_14	FI14	2800 x 2100 x 605	2800 x 2100 x 605

Table 11. Available IUS section sizes FI9-FI14

As standard the IUS section includes the following (see Figure 9):

- 1. Input fuses (DC fuses)
- 2. The NXI drive
- 3. Service platform/module removal
- 4. Control section and fixed external terminals, 70 pcs

- dU/dt (+0DU)
- Common mode filter (+0CM)
- Input Switch with charging (+ISC)
- Arc detection (+ADU)
- Motor fan control (+AMF)
- Motor heater feeder (+AMH)
- Mechanical break control (+AMB)
- Top cabling (+COT)
- UL approved design and components (+NAR)
- Cabinet heater (+ACH)
- Cabinet light (+ACL)



Figure 9. Example of inverter unit IUS_9



Figure 10. Example of inverter unit IUS_12



Figure 11. Example of inverter unit IUS_13

3.6 DYNAMIC BRAKE SECTION

The dynamic brake section (DBS) includes the largest NXI drives from the VACON[®] NXP product series. The brake units are all VACON[®] NXP premium drives.

As standard the DBS section includes the following:

- 1. Input fuses (DC fuses)
- 2. The NXI brake chopper
- 3. Service platform/module removal
- 4. Control section and fixed external terminals, 70 pcs

As pre-engineered standard options we can provide the following:

- Input Switch (with charging) (+ISC)
- Input Switch (DC-disconnect) (+ISD)
- Arc detection (+ADU)
- Top cabling (+COT)
- UL approved design and components (+NAR)
- Cabinet heater (+ACH)
- Cabinet light (+ACL)

The dynamic brake sections are similar to the inverter unit sections. See the dimensions and example figures in Chapter 3.5.2.

3.7 TRANSPORT SPLIT UNIT

Transport Split Units are available for easy access to main bus joints between sections.

TSU type	Width x Height x Depth (mm)
TSU_200	200 x 2000 x 605
TSU_300	300 x 2000 x 605

Tahle	12	Available	TSU	section	sizes
Table	12.	Available	150	Section	51265

4. INSTALLATION

4.1 INSTALLATION PROCEDURE

Each VACON[®] NXP System Drive delivery is project specific. The following installation sequence is a general description of the process of connecting the cabinet sections and installing the system drive.

As each installation is project specific, the instructions and illustrations in the following chapters are general examples. More detailed instructions, such as layout drawings, dimensions and wiring diagrams, are included in the project delivery.

1	Before starting the installation, read the safety instructions in Chapter 2 carefully.
2	Make sure that the ambient conditions at the installation site are according to the specifications. See the specifications in Chapter 6.3.
2	Remove the package covering from the product only at the installation site and in the specified ambient conditions.
3	Before moving the cabinets to the installation site, make sure that the space is properly prepared for the installation. See Chapter 4.2.
4	Move the cabinets to the installation site. See the instructions in Chapter 1.8.
5	Make sure that there is enough free space around the cabinets. See Chapter 4.2.1.
6	Lift the first cabinet section into the desired installation location. See Chapter 4.3.
7	Fix the first cabinet section to the floor or wall. See Chapter 4.3.
8	Lift the second cabinet section next to the first section, in a position from which it can be pushed into place.
9	Before pushing the cabinets together, loosen the nuts and bolts on the ends of the busbars to be connected. See Chapter 4.4.
10	Push the cabinets together, make sure that the busbars come together properly.
11	Connect the busbars by tightening the nuts and bolts on the busbars. See Chapter 4.4.
12	Mount the cabinet frames to each other. See Chapter 4.5.
13	Mount the second section to the floor or wall.
14	Install the rest of the sections following the same procedure.
15	Once all the cabinets are connected, remove the lifting beams from the top of the cabinets, so that they do not block the air flow. After the beams are removed, mount the bolts back on the cabinet roof.
16	Do the cabling between cabinets (auxiliary low-voltage connections, fiber connections, etc.). See the project specific wiring diagrams, which are included in the delivery.
17	Connect the motor and mains cables to the system drive. Pay attention to grounding of the cables. See Chapter 4.6.

4.2 PREPARING THE INSTALLATION SITE

Before starting the installation work make sure that the level of the floor is within acceptable limits. The maximum deviation from the basic level can be no more than 5 mm over a 3 m distance. The maximum acceptable height difference between cabinet front and rear edges should be within +2/-0 mm limit.

4.2.1 FREE SPACE AROUND THE CABINET

Enough space must be left above and in front of the cabinet to ensure sufficient cooling and space for maintenance.

It is recommended to leave at least 200 mm above and 1000 mm in front of the cabinets.

Also make sure that the temperature of the cooling air does not exceed the maximum ambient temperature of the drives.



Figure 12. Required space around the cabinet

4.3 MOUNTING THE CABINETS

The cabinet should always be fixed to the floor or to the wall. Depending on installation conditions, the cabinet sections can be fixed in different ways. There are holes in the front and back corners which can be used for fixing. Additionally, the rails on the top of the cabinet have fixing lugs for fixing the cabinet to the wall or to another cabinet.

4.3.1 FIXING THE CABINET TO THE FLOOR AND WALL

If the cabinet is installed against a wall, fix the top of the cabinet to the wall (1) and the front corners to the floor (2) with bolts.

If bottom-only fixing is used, fix the cabinet to the floor in the front (2) and in the back (3) with bolts.

Fix all the cabinet sections in the same way.



Figure 13. Fixing the cabinet to the wall and floor

4.3.2 BACK-TO-BACK INSTALLATION

The sections can also be installed back-to-back. In this case, fix the top parts of the cabinets together (1) and the front corners to the floor (2) with bolts.

Leave a gap between the backs of the cabinets. Check the correct dimensions from the documents included in the delivery.



Figure 14. Fixing the cabinets back-to-back

4.4 CONNECTING THE BUSBARS

The busbars are located in the back of the cabinets. To access them, it might be necessary to take out the drives. See the instructions in Chapter 5.3.

Join together the DC, AC and PE busbars by bolting them together with baying brackets. The mounting bolts, nuts and washers are delivered in place.

The busbars, size of the nuts and bolts differ case-by-case. See the correct tightening torque values for different size bolts and different types of connections in Chapter 4.7.

4.4.1 SIDE-BY-SIDE CONNECTION



Figure 15. Connecting the common DC, AC and PE busbars



Figure 16. Connecting the common AC busbars in UL cabinets

4.4.2 BACK-TO-BACK CONNECTION



Figure 17. Connecting the common DC and PE busbars in back-to-back cabinet installation

4.5 FIXING THE CABINET FRAMES TO EACH OTHER

All the necessary parts for fixing the cabinet frames to each other are included in the delivery.

To join two cabinet sections to each other you need six quick-fit baying clamps (1 in figure below) and four angular baying brackets (2 in figure). The four angular baying brackets are installed in the top and bottom corners on the inside of the cabinet. Three of the quick-fit baying brackets are installed in the front and three in the back on the outside of the cabinet.



Figure 18. Quick-fit baying clamps

4.6 CABLING



Before connecting any cables, use a multimeter to check that the cables to be connected are not live.

4.6.1 GROUNDING

PE conductors are connected to the PE busbar. The PE busbars in each section are connected (see Figure 15 on page 34) and the PE busbars must be connected to ground.

See the grounding and ground fault protection instructions in Chapter 2.3.

4.6.2 MAINS AND MOTOR CONNECTION

The power supply terminals can be reached through the bottom part of the cabinet. The mains cables are connected to terminals L1, L2 and L3 on the main input section (see Figure 19 on page 38). The motor cables are connected to inverter section terminals marked with U, V and W. Make openings for the cables in the grommets on the bottom of the cabinet and lead through the cables. Use cable clamps to fix the cables.

Use cables with a temperature rating of at least +70°C. As a rule of thumb, cables and fuses can be dimensioned according to the frequency converter nominal output current, which you can find on the rating plate. Dimensioning according to the output current is recommended because the frequency converter input current never significantly exceeds the output current.

Cable type	Level L (2 nd environment)	Level T
Mains cable	1	1
Motor cable	2	1/2*
Control cable	4	4

Table 13. Cable types required to meet standards

* Recommended

Level L = EN61800-3, 2nd environment

- Level T = For IT networks
 - 1 = Power cable intended for fixed installation and the specific mains voltage. Shielded cable not required (DRAKA NK CABLES MCMK or similar recommended).
 - Symmetrical power cable equipped with concentric protection wire and intended
 a for the specific mains voltage (DRAKA NK CABLES MCMK or similar recommended).
 - 4 = Screened cable equipped with compact low-impedance shield (DRAKA NKCABLES JAMAK, SAB/ÖZCuY-0 or similar).

See the more detailed cabling and fuse selection instructions in the corresponding user manual (see Chapter 1.5).



Figure 19. Cabling of the main incoming section (MIS)



Figure 20. Cabling of inverter section IUS_4



Figure 21. Cabling of inverter section IUS_6



Figure 22. Cabling of inverter section IUS_8



Figure 23. Cabling of inverter sections IUS_9 and IUS_10



Figure 24. Cabling of inverter section IUS_12



Figure 25. Cabling of inverter section IUS_13

4.6.3 EMC GROUNDING

For the EMC levels C1 and C2, it is necessary to have a 360° grounding of the shield on both ends of the motor cable. The EMC grounding clamps must be suited to the output cable diameter to give a 360° contact with the cables. To make a 360° connection with the grounding clamp, expose the shield of the motor cables.



Figure 26. 360° grounding

4.6.4 INSTALLATION OF FERRITE RINGS (+0CM) ON THE MOTOR CABLE

Route only the motor phase conductors through the ferrite rings. Do not route the PE/ground wire through the ferrite rings. Leave the cable screen below and outside the rings. Mount the PE/ground wire or pigtail on the ground busbar.

In case of parallel motor cables, reserve an equal amount of ferrite ring sets for each cable. Route all the phase conductors of one cable through one set of rings.

The delivery consists of fixed sets of ferrite rings (option). When ferrite rings are used to attenuate the risk of bearing damage, always use two ferrite ring sets per motor cable.

NOTE! The ferrite rings are only additional protection. The basic protection against bearing currents is an insulated bearing.



Figure 27. Installation of ferrite rings on motor cables