Danfoss

Quick Guide
VLT® Compressor Drive CDS 803

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VLT®
THE REAL DRIVE

Contents

1

1 Quick Guide

1.1 Safety

1.1.1 Warnings

⚠WARNING

HIGH-VOLTAGE WARNING

The voltage of the frequency converter is dangerous whenever it is connected to mains. Incorrect installation of the compressor or frequency converter may cause death, serious injury, or equipment damage. To avoid death, serious injury, or equipment damage:

- Comply with the instruction in this manual as well as local and national rules and safety regulations.

⚠WARNING

DISCHARGE TIME!

Frequency converters contain DC-link capacitors that can remain charged even when the frequency converter is not powered. To avoid electrical hazards, disconnect AC mains, any permanent magnet type compressors, and any remote DC-link power supplies, including battery back-ups, UPS, and DC-link connections to other frequency converters. Wait for the capacitors to fully discharge before performing any service or repair work. The waiting time is listed in *Table 1.1*. Failure to wait the specified time after power has been removed before doing service or repair could result in death or serious injury.

Voltage [V]	Cooling capacity [TR]	Minimum waiting time (minutes)
3x200	4–6.5	15
3x400	4–5	4
3x400	6.5	15

Table 1.1 Discharge Time

⚠CAUTION

Leakage Current

The ground leakage current from the frequency converter exceeds 3.5 mA. According to IEC 61800-5-1 a reinforced protective earth connection must be ensured with a minimum 10 mm^2 Cu or an extra PE wire with the same cable cross-section as the mains wiring. Terminate the PE connection separately.

Residual Current Device

This product can cause a DC current in the protective conductor. Where a residual current device (RCD) is used for extra protection, only an RCD of Type B (time delayed) shall be used on the supply side of this product. See also *Danfoss Application Note on RCD*. Protective earthing of the frequency converter and the use of RCDs must always follow national and local regulations.

NOTICE

INSTALLATION AT HIGH ALTITUDES

For altitudes above 2000 m, contact Danfoss regarding PELV.

1.1.2 Safety Instructions

- Make sure that the frequency converter is properly connected to ground.

- Do not remove mains connections, compressor connections, or other power connections while the frequency converter is connected to power.

- Protect users against supply voltage.

- Protect the compressor against overloading according to national and local regulations.

- The ground leakage current exceeds 3.5 mA.

- The [Off/Reset] key is not a safety switch. It does not disconnect the frequency converter from mains.

1.2 Introduction

1.2.1 Available Literature

This *quick guide* contains basic information necessary for installing and running the frequency converter. Supplementary publications and manuals are available from Danfoss. See *www.danfoss.com/BusinessAreas/DrivesSolutions/ Documentations/VLT+Technical+Documentation.htm* for listings.

2   MG18M202

1.2.2 Approvals

Certification		IP20
EC Declaration of Conformity	$C\epsilon$	✓
UL Listed	c ⓊⓁ US	✓
C-tick		✓

Table 1.2 Approvals

The frequency converter complies with UL 508C thermal memory retention requirements. For more information, refer to the section *Motor Thermal Protection* in the product-specific *design guide*.
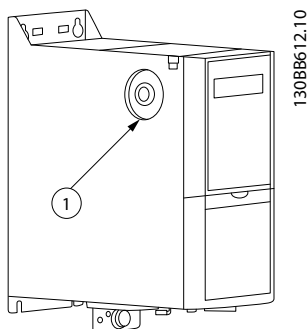
1.2.3 IT Mains

⚠CAUTION

IT MAINS
Installation on isolated mains source, that is, IT mains. Maximum supply voltage allowed when connected to mains: 440 V (3x380–480 V units).

Open the RFI switch by removing the screw on the side of the frequency converter when at IT grid.

130BB612.10

1	RFI switch

Illustration 1.1 IP20

⚠CAUTION

If reinserted, only use M3x12 screw.

1.2.4 Avoid Unintended Start

While the frequency converter is connected to mains, the compressor can be started/stopped using digital commands, bus commands, references or via the LCP.

- Disconnect the frequency converter from mains whenever personal safety considerations make it necessary to avoid unintended start of any compressors.

- To avoid unintended start, always press [Off/Reset] before changing parameters.

Equipment containing electrical components must not be disposed of together with domestic waste.
It must be separately collected with electrical and electronic waste according to local and currently valid legislation.

1.3 Installation

1.3.1 Before Starting Repair Work

1. Disconnect from mains (and external DC supply, if present).

2. Wait as stated in *Table 1.1* for discharge of the DC-link.

3. Remove the compressor cable.

1.3.2 Enclosure Types

Cooling capacity	400 V IP20 enclosure
4 TR/VZH028	H3
5 TR/VZH035	H3
6.5 TR/VZH044	H4

Table 1.3 H3–H4, 400 V

Cooling capacity	200 V IP20 enclosure
4 TR/VZH028	H4
5 TR/VZH035	H4
6.5 TR/VZH044	H5

Table 1.4 H4–H5, 200 V

1

1.3.3 Side-by-side Installation

The frequency converter can be mounted side-by-side and requires the clearance above and below for cooling.

Enclosure	IP class	Clearance above/below [mm/(in)]
H3	IP20	100/(4)
H4	IP20	100/(4)
H5	IP20	100/(4)
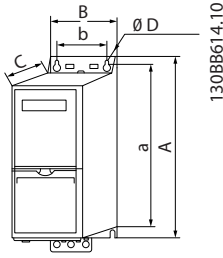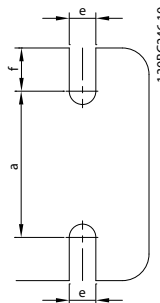
Table 1.5 Clearance

NOTICE

With IP21/NEMA Type1 option kit mounted, a distance of 50 mm (2 in) between the units is required.

NOTICE

The illustration in *Table 1.6* is with LCP, but all dimensions are the same without LCP.

Enclosure		Height [mm/(in)]			Width [mm/(in)]		Depth [mm/ (in)]	Mounting hole [mm/(in)]			Maximum weight
Enclosure	IP class	A	A[1]	a	B	b	C	d	e	f	[kg/(lb)]
H3	IP20	255 (10.0)	329 (13.0)	240 (9.4)	100 (3.9)	74 (2.9)	206 (8.1)	11 (0.4)	5.5 (0.2)	8.1 (0.3)	4.5 (9.9)
H4	IP20	296 (11.7)	359 (14.1)	275 (10.8)	135 (5.3)	105 (4.1)	241 (9.5)	12.6 (0.5)	7 (0.3)	8.4 (0.3)	7.9 (17.4)
H5	IP20	334 (13.1)	402 (15.8)	314 (12.4)	150 (5.9)	120 (4.7)	255 (10.0)	12.6 (0.5)	7 (0.3)	8.5 (0.3)	9.5 (20.9)

Table 1.6 Dimensions

1) Including decoupling plate

The dimensions are only for the physical units, but when installing in an application, it is necessary to add space for free air passage both above and below the units. The amount of space for free air passage is listed in *Table 1.5*.

1.3.4 Electrical Installation in General

All cabling must comply with national and local regulations on cable cross-sections and ambient temperature. Copper conductors required, (75 °C/167 °F) recommended.

Enclosure		Torque [Nm(in-lb)]					
Enclosure	IP class	Line	Compressor connection	DC connection	Control terminals	Ground	Relay
H3	IP20	1.4 (12.4)	0.8 (7.1)	0.8 (7.1)	0.5 (4.4)	0.8 (7.1)	0.5 (4.4)
H4	IP20	1.2 (10.6)	1.2 (10.6)	1.2 (10.6)	0.5 (4.4)	0.8 (7.1)	0.5 (4.4)
H5	IP20	1.2 (10.6)	1.2 (10.6)	1.2 (10.6)	0.5 (4.4)	0.8 (7.1)	0.5 (4.4)

Table 1.7 Enclosure H3–H5

1.3.5 Connecting to Mains and Compressor

The frequency converter is designed to operate Danfoss VZH Compressors. For maximum cross-section on wires, see *chapter 1.7 General Specifications*.

- To comply with EMC emission specifications, use a shielded/armored compressor cable and connect this cable to both the decoupling plate and the compressor metal.

- Keep compressor cable as short as possible to reduce the noise level and leakage currents.

- For further details on mounting of the decoupling plate, see *VLT® Compressor Drive CDS 803 Decoupling Plate Installation Instructions*.

- Also see *EMC-Correct Installation in the VLT® Compressor Drive CDS 803 Design Guide*.

1. Mount the ground wires to ground terminal.

2. Connect compressor to terminals U, V, and W, see *Table 1.8*.

U	T1
V	T2
W	T3

Table 1.8 Connection of Compressor to Terminals

3. Mount mains supply to terminals L1, L2, and L3 and tighten.
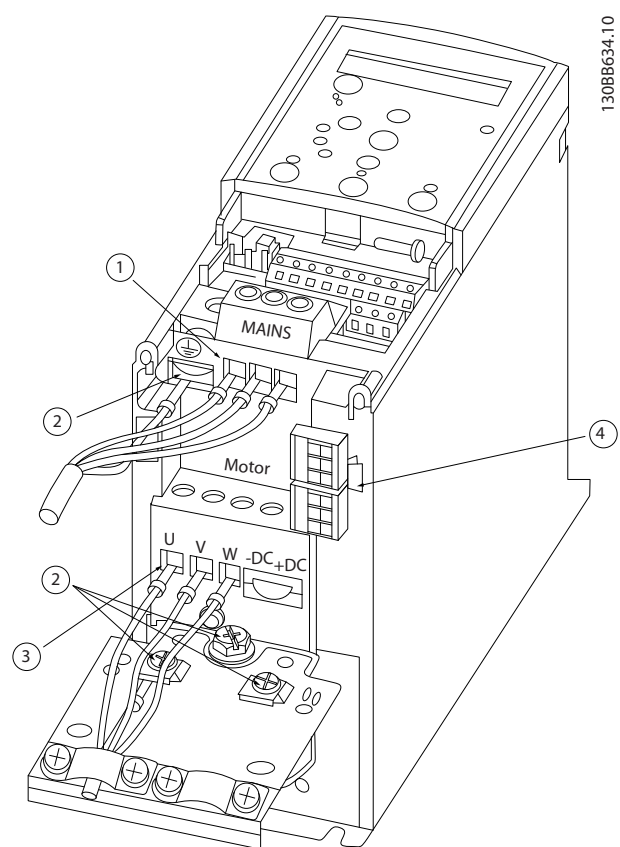
1	Line
2	Ground
3	Compressor
4	Relays

Illustration 1.2 H3–H5 Enclosure
IP20 200–240 V 4–6.5 tons
IP20 380–480 V 4–6.5 tons

1
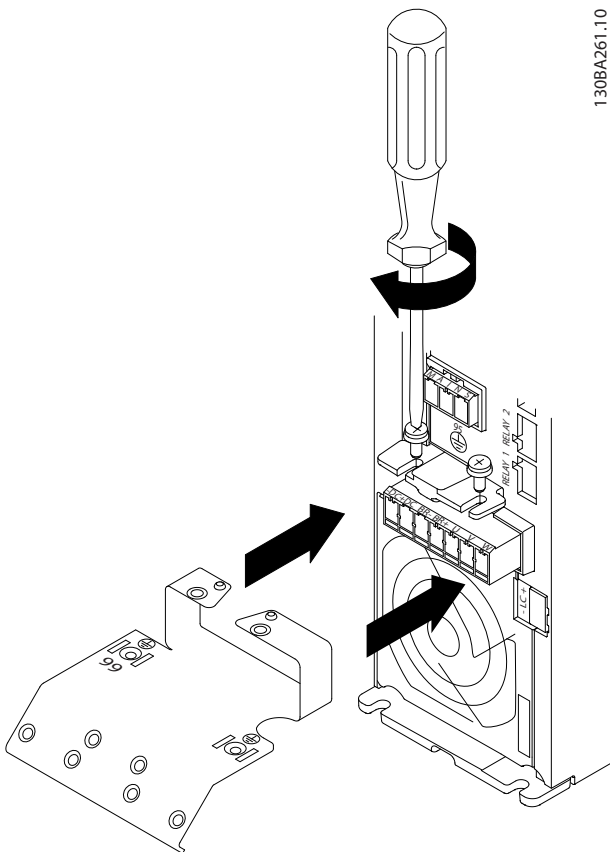
130BA261.10

Illustration 1.3 Mount the 2 screws in the mounting plate, slide it into place and tighten fully.

130BT302.12

MOTOR

MOTOR
U V W

99

Illustration 1.4 H3–H5 Enclosure

130BA262.10

RELAY 2

RELAY 1

95
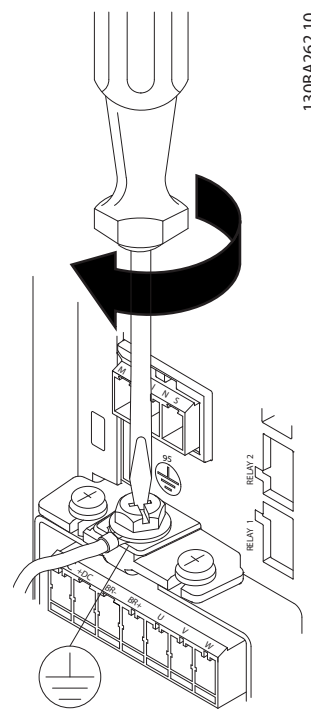
Illustration 1.5 When mounting cables, first mount and tighten the ground cable.

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M A I N S

RELAY 2

RELAY 1

95

L1 L2 L3
91 92 93

+DC BR- BR+ U V W
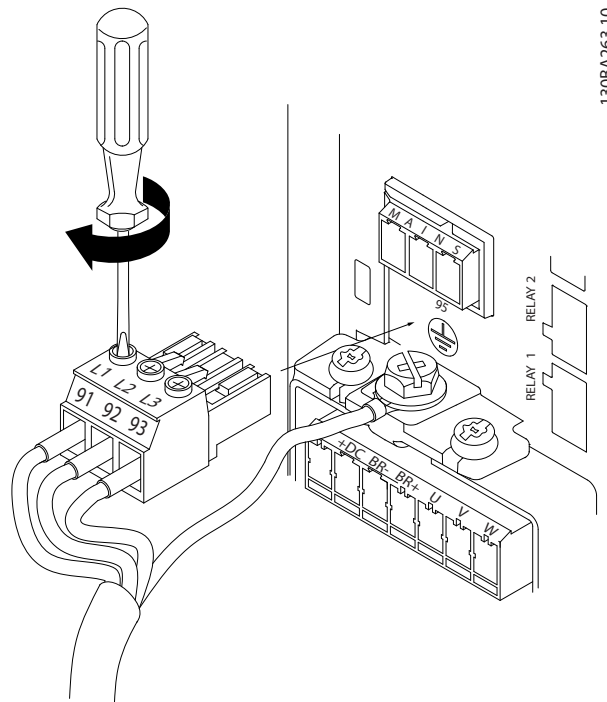
Illustration 1.6 Mount mains plug and tighten wires.
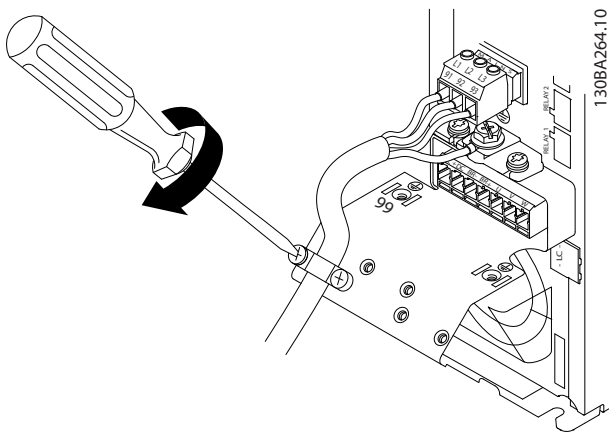
Illustration 1.7 Tighten support bracket on mains wires.

1.3.6 Fuses

Branch circuit protection
To protect the installation against electrical and fire hazard, all branch circuits in an installation, switch gear, machines, and so on, must be short circuit and overcurrent protected according to national and local regulations.

Short-circuit protection
Danfoss recommends using the fuses listed in *Table 1.9* to protect service personnel or equipment if there is an internal failure in the unit or a short circuit on the DC-link. The frequency converter provides full short-circuit protection if there is a short circuit on the compressor.

Overcurrent protection
To avoid overheating of the cables in the installation, provide overload protection. Overcurrent protection must always be carried out according to local and national regulations. Design circuit breakers and fuses for protection in a circuit capable of supplying a maximum of 100000 A_{rms} (symmetrical), 480 V maximum.

UL/Non UL compliance
To ensure compliance with UL or IEC 61800-5-1, use the fuses listed in *Table 1.9*.

NOTICE

In the event of malfunction, failure to follow the protection recommendation may result in damage to the frequency converter.

	Fuse				
	UL				Non-UL
CDS 803	**Bussmann Type RK5**	**Bussmann Type RK1**	**Bussmann Type J**	**Bussmann Type T**	**Maximum fuse Type G**
3x200–240 V IP20					
4 TR/VZH028	FRS-R-50	KTN-R50	JKS-50	JJN-50	50
5 TR/VZH035	FRS-R-50	KTN-R50	JKS-50	JJN-50	50
6.5 TR/VZH044	FRS-R-80	KTN-R80	JKS-80	JJN-80	65
3x380–480 V IP20					
4 TR/VZH028	FRS-R-25	KTS-R25	JKS-25	JJS-25	25
5 TR/VZH035	FRS-R-25	KTS-R25	JKS-25	JJS-25	25
6.5 TR/VZH044	FRS-R-50	KTS-R50	JKS-50	JJS-50	50

Table 1.9 Fuses

1

1.3.7 EMC-Correct Electrical Installation

General points to be observed to ensure EMC-correct electrical installation.

- Use only screened/armoured motor cables and screened/armoured control cables.

- Connect the screen to ground at both ends.

- Avoid installation with twisted screen ends (pigtails), since this ruins the screening effect at high frequencies. Use the cable clamps provided instead.

- Ensure the same potential between frequency converter and ground potential of the PLC.

- Use star washers and galvanically conductive installation plates.
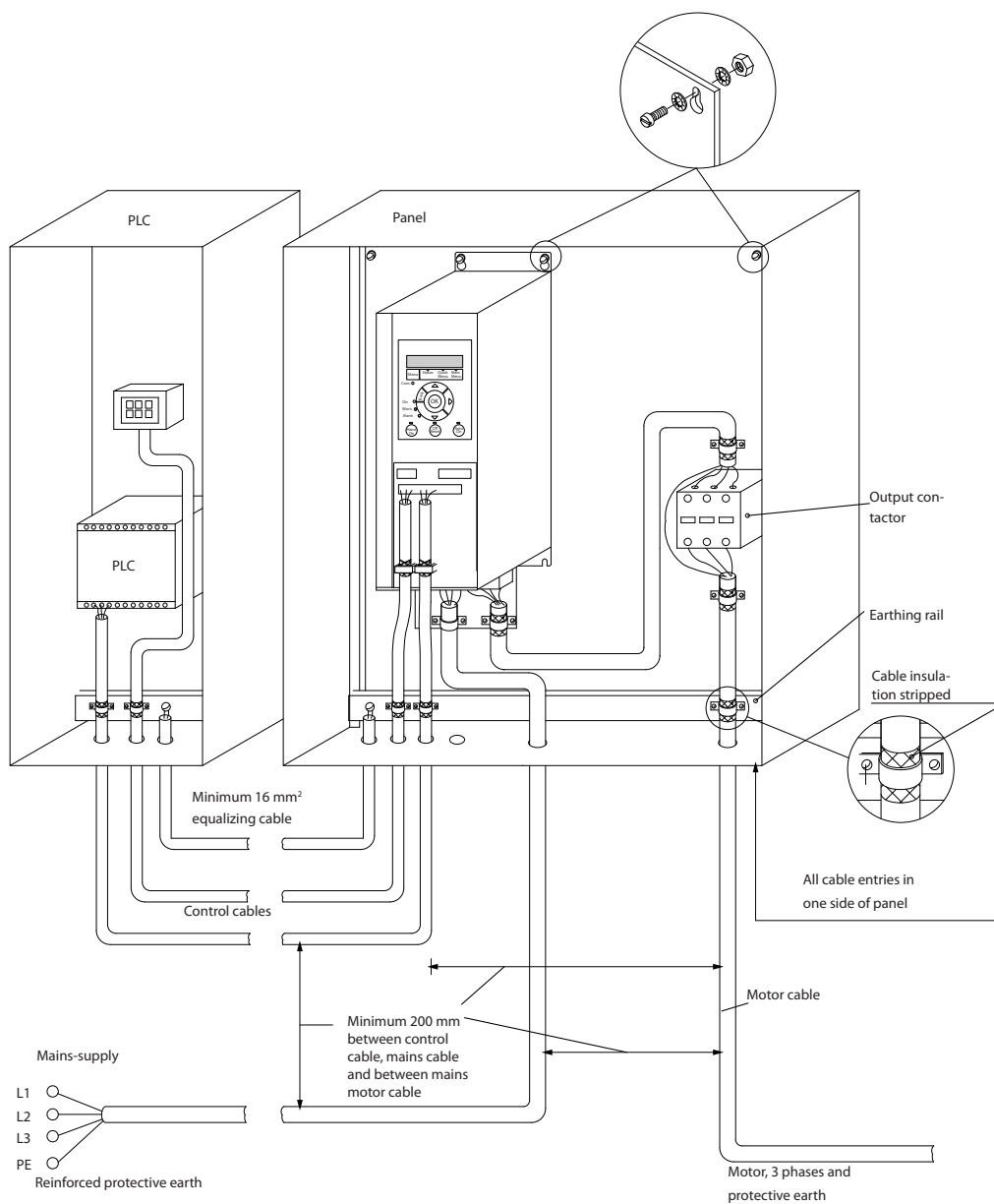
Illustration 1.8 EMC-correct Electrical Installation

1.3.8 Control Terminals
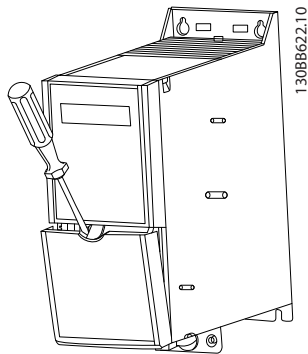
Illustration 1.9 Location of Control Terminals

1. To activate the snap, place a screwdriver behind the terminal cover.

2. Tilt the screwdriver outwards to open the cover.

Control terminals

To make the compressor run:

1. Apply start signal on terminal 18.

2. Connect terminals 12, 27, and terminal 53, 54, or 55.
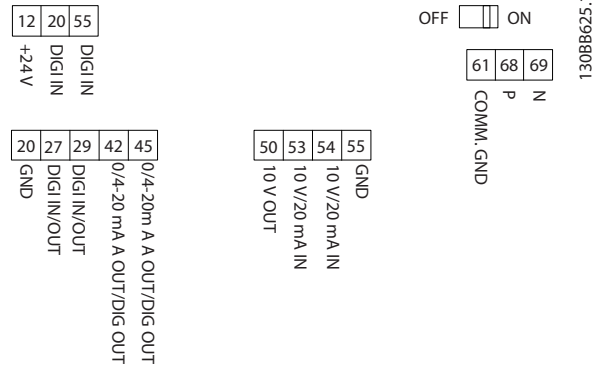
Illustration 1.10 Control Terminals

Set the functions of digital input 18, 19, and 27 in *parameter 5-00 Digital Input Mode* (PNP is default value).
Set the function of digital input 29 in *parameter 5-03 Digital Input 29 Mode* (PNP is default value).

1

1.3.9 Electrical Overview
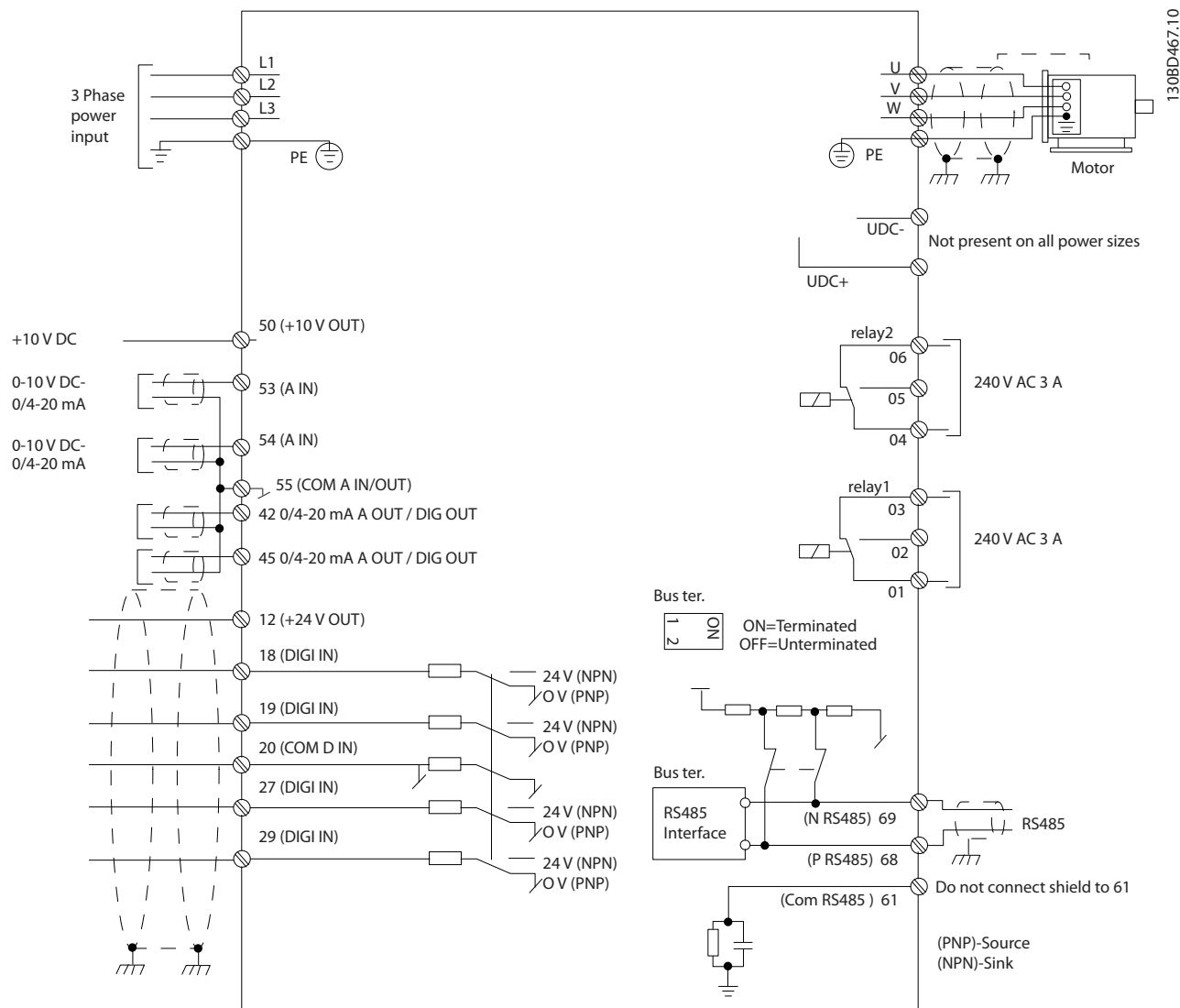
Illustration 1.11 Basic Wiring Schematic Drawing

1.4 Programming

1.4.1 Local Control Panel (LCP)

NOTICE

LCP is NOT supported in SW 1.0X!

The LCP is divided into 4 functional sections.

  A. Display

  B. Menu key

  C. Navigation keys and indicator lights (LEDs)

  D. Operation keys and indicator lights (LEDs)
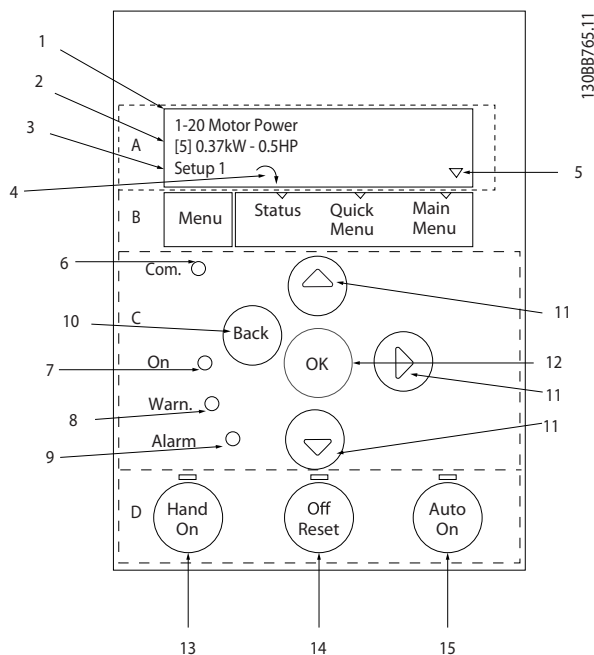
Illustration 1.12 Local Control Panel (LCP)

A. Display
The LCD-display is back-lit with 2 alphanumeric lines. All data is displayed on the LCP.

Information can be read from the display.

1	Parameter number and name.
2	Parameter value.
3	Set-up number shows the active set-up and the edit set-up. If the same set-up acts as both active and edit set-up, only that set-up number is shown (factory setting). When active and edit set-ups differ, both numbers are shown in the display (set-up 12). The number flashing, indicates the edit set-up.
4	Compressor direction is shown to the bottom left of the display – indicated by a small arrow pointing either clockwise or counterclockwise.
5	The triangle indicates if the LCP is in Status, Quick Menu, or Main Menu.

Table 1.10 Legend to *Illustration 1.12*

B. Menu key
Press [Menu] to select between Status, Quick Menu, or Main Menu.

C. Navigation keys and indicator lights (LEDs)

| 6	Com LED: Flashes when bus communication is communicating.
7	Green LED/On: Control section is working.
8	Yellow LED/Warn.: Indicates a warning.
9	Flashing Red LED/Alarm: Indicates an alarm.
10	[Back]: For moving to the previous step or layer in the navigation structure.
11	[▲] [▼] [►]: For maneuvering between parameter groups, parameters and within parameters. Can also be used for setting local reference.
12	[OK]: For selecting a parameter and for accepting changes to parameter settings.

Table 1.11 Legend to *Illustration 1.12*

D. Operation keys and indicator lights (LEDs)

13	[Hand On]: Starts the compressor and enables control of the frequency converter via the LCP. ***NOTICE*** **Terminal 27 Digital Input (*parameter 5-12 Terminal 27 Digital Input*) has stop inverse as default setting. This means that [Hand On] does not start the compressor if there is no 24 V to terminal 27. Connect terminal 12 to terminal 27.**
14	[Off/Reset]: Stops the compressor (Off). If in alarm mode, the alarm is reset.
15	[Auto On]: Frequency converter is controlled either via control terminals or serial communication.

Table 1.12 Legend to *Illustration 1.12*

1

130BD873.13

... the CDS 803 Quick Menu starts

At power-up the user is
asked to choose the
prefered laguage.

1

Select language
[1] English
Setup 1

Menu | Status | Quick Menu | Main Menu
Com. ○
Back
On ○ | OK
Warn. ○
Alarm ○
Hand On | Off Reset | Auto On

Power-up screen

OK
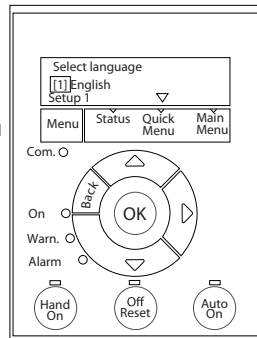
The next screen will be

the quick guide screen.

2

Press OK to start Quick Guide
Press Back to skip it
Setup 1

Menu | Status | Quick Menu | Main Menu
Com. ○
Back
On ○ | OK
Warn. ○
Alarm ○
Hand On | Off Reset | Auto On

Quick guide screen

if Back

if OK

Select Language [0] English Setup 1		4
Select Grid Type Size related Setup 1		5
Select Main Menu Password [0] Setup 1		6
Select Compressor Selection Size related Setup 1		7
Select Max. reference 200 Hz Setup 1		8
Select Reference 1 Source [1] Analog in 53 Setup 1		9
Select Ramp 1 Ramp Up Time 30 s Setup 1		10
Select Ramp 1 Ramp Down Time 30 s Setup 1		11
Select Terminal 27 Digital In [6] Stop inverse Setup 1		12
Select Relay 1 [9] Alarm Setup 1		13
Select Relay 2 [5] Drive Running Setup 1		14
Select Terminal 53 Low Voltage 0.07 V Setup 1		15
Select Terminal 53 High Voltage 10 V Setup 1		16
Select Control Site [0] Digital and ctrl.word Setup 1		17
Select Protocol [0] FC Setup 1		18
Select Address 1 Setup 1		19

3

0.0 Hz
0.0 kW
Setup 1

Menu | Status | Quick Menu | Main Menu
Com. ○
Back
On ○ | OK
Warn. ○
Alarm ○
Hand On | Off Reset | Auto On

Status Screen

The quick guide can always be
entered via the Quick Menu!

Illustration 1.13 Open-Loop Applications

1

The Start-up quick guide for open-loop applications

Parameter	Option	Default	Function
Parameter 0-01 Language	[0] English [1] Deutsch [2] Francais [3] Dansk [4] Spanish [5] Italiano [28] Bras.port	[0] English	Select the language for the display.
Parameter 0-06 GridType	[0] 200–240 V/50 Hz/IT-grid [1] 200–240 V/50 Hz/Delta [2] 200–240 V/50 Hz [10] 380–440 V/50 Hz/IT-grid [11] 380–440 V/50 Hz/Delta [12] 380–440 V/50 Hz [20] 440–480 V/50 Hz/IT-grid [21] 440–480 V/50 Hz/Delta [22] 440–480 V/50 Hz [30] 525–600 V/50 Hz/IT-grid [31] 525–600 V/50 Hz/Delta [32] 525–600 V/50 Hz [100] 200–240 V/60 Hz/IT-grid [101] 200–240 V/60 Hz/Delta [102] 200–240 V/60 Hz [110] 380–440 V/60 Hz/IT-grid [111] 380–440 V/60 Hz/Delta [112] 380–440 V/60 Hz [120] 440–480 V/60 Hz/IT-grid [121] 440–480 V/60 Hz/Delta [122] 440–480 V/60 Hz [130] 525–600 V/60 Hz/IT-grid [131] 525–600 V/60 Hz/Delta [132] 525–600 V/60 Hz	Size related	Select operating mode for restart after reconnection of the frequency converter to mains voltage after power-down.
Parameter 0-60 Main Menu Password	0–999	0	Define the password for access to the LCP.
Parameter 1-13 Compressor Selection	[24] VZH028-R410A [25] VZH035-R410A [26] VZH044-R410A	Size related	Select which compressor to use.
Parameter 3-03 Maximum Reference	0–200 Hz	200 Hz	The maximum reference is the highest obtainable by summing all references.
Parameter 3-15 Reference 1 Source	[0] No function [1] Analog in 53 [2] Analog in 54 [7] Pulse input 29 [11] Local bus reference	[1] Analog in 53	Select the input to be used for the reference signal.
Parameter 3-41 Ramp 1 Ramp Up Time	0.05–3600.0 s	30.00 s	Ramp-up time from 0 to *parameter 1-25 Motor Nominal Speed*.
Parameter 3-42 Ramp 1 Ramp Down Time	0.05–3600.0 s	30.00 s	Ramp-down time from nominal motor speed to 0.

1

Parameter	Option	Default	Function
Parameter 5-12 Terminal 27 Digital Input	[0] No operation [1] Reset [2] Coast inverse [3] Coast and reset inverse [4] Quick stop inverse [5] DC-brake inverse [6] Stop inverse [7] External Interlock [8] Start [9] Latched start [10] Reversing [11] Start reversing [14] Jog [16] Preset ref bit 0 [17] Preset ref bit 1 [18] Preset ref bit 2 [19] Freeze reference [20] Speed up [22] Speed down [23] Set-up select bit 0 [34] Ramp bit 0 [52] Run permissive [53] Hand start [54] Auto start [60] Counter A (up) [61] Counter A (down) [62] Reset Counter A [63] Counter B (up) [64] Counter B (down) [65] Reset Counter B	[6] Stop inverse	Select the input function for terminal 27.
Parameter 5-40 Function Relay [0] Function relay	See *parameter 5-40 Function Relay*	Alarm	Select the function to control output relay 1.
Parameter 5-40 Function Relay [1] Function relay	See *parameter 5-40 Function Relay*	Drive running	Select the function to control output relay 2.
Parameter 6-10 Terminal 53 Low Voltage	0–10 V	0.07 V	Enter the voltage that corresponds to the low reference value.
Parameter 6-11 Terminal 53 High Voltage	0–10 V	10 V	Enter the voltage that corresponds to the high reference value.
Parameter 8-01 Control Site	[0] Digital and ctrl.word [1] Digital only [2] Controlword only	[0] Digital and ctrl. word	Select if digital, bus, or a combination of both should control the frequency converter.
Parameter 8-30 Protocol	[0] FC [2] Modbus RTU	[0] FC	Select the protocol for the integrated RS485 port.
Parameter 8-32 Baud Rate	[0] 2400 Baud [1] 4800 Baud *[2] 9600 Baud [3] 19200 Baud 4] 38400 Baud 5] 57600 Baud [6] 76800 Baud [7] 115200 Baud	9600	Select the baud rate for the RS485 port.

Table 1.13 Open-loop Applications Set-up

1

The Start-up quick guide for compressor functions

1	28-00 Short Cycle Protection [1] Enabled
2	28-01 Interval between Starts 300 s
3	28-02 Minimum Run Time 60 s
4	28-10 Oil Return Management [1] On
5	28-13 Boost Duration 60 s
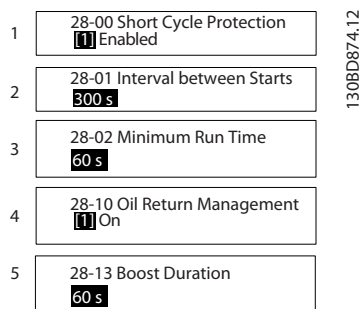
Illustration 1.14 Compressor Function Quick Guide

Compressor function quick guide

Parameter	Option	Default	Function
Parameter 28-00 Short Cycle Protection	[0] Disabled [1] Enabled	[1] Enabled	Select if short cycle protection is to be used.
Parameter 28-01 Interval between Starts	0–3600 s	300 s	Enter the minimum allowed time between starts.
Parameter 28-02 Minimum Run Time	10–3600 s	60 s	Enter the minimum allowed time to run before stop.
Parameter 28-10 Oil Return Management	[0] Off [1] On	[1] On	Select if oil return management is to be used.
Parameter 28-13 Boost Duration	0–300 s	60 s	Enter the boost duration for the oil return.

Table 1.14 Compressor Function

1

The Start-up quick guide for compressor closed-loop applications

130BD875.12

1	0-01 Language [0] English
2	0-06 Grid Type Size related
3	0-60 Main Menu Password [0]
4	1-00 Configuration Mode [0] Size related
5	1-13 Compressor Selection [1] Closed loop
6	3-02 Minimum Reference 0 Hz
7	3-03 Maximum Reference 200 Hz
8	3-10 Preset Reference 0%
9	3-15 Reference 1 Source [1] Analog in 53
10	3-41 Ramp 1 Ramp Up Time 30.00 s
11	3-42 Ramp 1 Ramp Down Time 30.00 s
12	5-12 Terminal 27 Digital Input [6] Stop inverse
13	5-40 Function Relay 1 Alarm
14	5-40 Function Relay 2 Drive running
15	6-10 Terminal 53 Low Voltage 0.07 V
16	6-11 Terminal 53 High Voltage 10 V
17	6-14 Terminal 53 Low Ref./Feedb. 30.000 Hz
18	6-15 Terminal 53 High Ref./Feedb. 200.000 Hz
19	6-22 Terminal 54 Low Current 4.00 mA
20	6-23 Terminal 54 High Current 20.00 mA
21	6-24 Terminal 54 Low Ref./Feedb. 0.000
22	6-25 Terminal 54 High Ref./Feedb. 4999.000
23	20-00 Feedback 1 Source [2] Analog input 54
24	20-04 Feedback 2 Conversion [0] Linear
25	8-01 Control Site [0] Digital and ctrl.word
26	8-30 Protocol [0] FC
27	8-31 Address 1

Illustration 1.15 Closed-loop Quick Guide

Closed-loop quick guide

Parameter	Option	Default	Function
Parameter 0-01 Language	[0] English [1] Deutsch [2] Francais [3] Dansk [4] Spanish [5] Italiano [28] Bras.port	0	Select the language for the display.
Parameter 0-06 GridType	[0] 200–240 V/50 Hz/IT-grid [1] 200–240 V/50 Hz/Delta [2] 200–240 V/50 Hz [10] 380–440 V/50 Hz/IT-grid [11] 380–440 V/50 Hz/Delta [12] 380–440 V/50 Hz [20] 440–480 V/50 Hz/IT-grid [21] 440–480 V/50 Hz/Delta [22] 440–480 V/50 Hz [30] 525–600 V/50 Hz/IT-grid [31] 525–600 V/50 Hz/Delta [32] 525–600 V/50 Hz [100] 200–240 V/60 Hz/IT-grid [101] 200–240 V/60 Hz/Delta [102] 200–240 V/60 Hz [110] 380–440 V/60 Hz/IT-grid [111] 380–440 V/60 Hz/Delta [112] 380–440 V/60 Hz [120] 440–480 V/60 Hz/IT-grid [121] 440–480 V/60 Hz/Delta [122] 440–480 V/60 Hz [130] 525–600 V/60 Hz/IT-grid [131] 525–600 V/60 Hz/Delta [132] 525–600 V/60 Hz	Size related	Select the operating mode for restart after reconnection of the frequency converter to mains voltage after power-down.
Parameter 0-60 Main Menu Password	0–999	0	Define the password for access to the LCP.
Parameter 1-00 Configuration Mode	[0] Open loop [3] Closed loop	[0] Open loop	Select closed loop.
Parameter 1-13 Compressor Selection	[24] VZH028-R410A [25] VZH035-R410A [26] VZH044-R410A	Size related	Select the used compressor.
Parameter 3-02 Minimum Reference	-4999.0 – 200 Hz	0 Hz	The minimum reference is the lowest value obtainable by summing all references.
Parameter 3-03 Maximum Reference	0–200 Hz	200 Hz	The maximum reference is the highest obtainable by summing all references.
Parameter 3-10 Preset Reference	-100 – 100 %	0%	Set up a fix setpoint in preset reference [0].
Parameter 3-15 Reference 1 Source	[0] No function [1] Analog in 53 [2] Analog in 54 [7] Pulse input 29 [11] Local bus reference	[1] Analog in 53	Select the input to be used for the reference signal.
Parameter 3-41 Ramp 1 Ramp Up Time	0.05–3600.0 s	30.00 s	Ramp-up time from 0 to *parameter 1-25 Motor Nominal Speed*.
Parameter 3-42 Ramp 1 Ramp Down Time	0.05–3600.0 s	30.00 s	Ramp-down time from nominal motor speed to 0.

1

Parameter	Option	Default	Function
Parameter 5-12 Terminal 27 Digital Input	[0] No operation [1] Reset [2] Coast inverse [3] Coast and reset inverse [4] Quick stop inverse [5] DC-brake inverse [6] Stop inverse [7] External Interlock [8] Start [9] Latched start [10] Reversing [11] Start reversing [14] Jog [16] Preset ref bit 0 [17] Preset ref bit 1 [18] Preset ref bit 2 [19] Freeze reference [20] Speed up [22] Speed down [23] Set-up select bit 0 [34] Ramp bit 0 [52] Run permissive [53] Hand start [54] Auto start [60] Counter A (up) [61] Counter A (down) [62] Reset Counter A [63] Counter B (up) [64] Counter B (down) [65] Reset Counter B	[6] Stop inverse	Select the input function for terminal 27.
Parameter 5-40 Function Relay [0] Function relay	See *parameter 5-40 Function Relay*	Alarm	Select the function to control output relay 1.
Parameter 5-40 Function Relay [1] Function relay	See *parameter 5-40 Function Relay*	Drive running	Select the function to control output relay 2.
Parameter 6-10 Terminal 53 Low Voltage	0–10 V	0.07 V	Enter the voltage that corresponds to the low reference value.
Parameter 6-11 Terminal 53 High Voltage	0–10 V	10 V	Enter the voltage that corresponds to the high reference value.
Parameter 6-14 Terminal 53 Low Ref./ Feedb. Value	-4999 – 4999	30	Enter the reference value that corresponds to the voltage set in *parameter 6-10 Terminal 53 Low Voltage*.
Parameter 6-15 Terminal 53 High Ref./ Feedb. Value	-4999 – 4999	200	Enter the reference value that corresponds to the voltage set in *parameter 6-11 Terminal 53 High Voltage*.
Parameter 6-22 Terminal 54 Low Current	0.00–20.00 mA	4.00 mA	Enter the current that corresponds to the low reference value.
Parameter 6-23 Terminal 54 High Current	0–10 V	10 V	Enter the current that corresponds to the high reference value.
Parameter 6-24 Terminal 54 Low Ref./ Feedb. Value	-0.00–20.00 mA	20.00 mA	Enter the reference value that corresponds to the current set in *parameter 6-20 Terminal 54 Low Voltage*.
Parameter 6-25 Terminal 54 High Ref./ Feedb. Value	-4999 – 4999	Size related	Enter the reference value that corresponds to the current set in *parameter 6-21 Terminal 54 High Voltage*.

1

Parameter	Option	Default	Function
Parameter 8-01 Control Site	[0] Digital and ctrl.word [1] Digital only [2] Controlword only	[0] Digital and ctrl.word	Select if digital, bus, or a combination of both should control the frequency converter.
Parameter 8-30 Protocol	[0] FC [2] Modbus RTU	[0] FC	Select the protocol for the integrated RS485 port.
Parameter 8-32 Baud Rate	[0] 2400 Baud [1] 4800 Baud [2] 9600 Baud [3] 19200 Baud [4] 38400 Baud [5] 57600 Baud [6] 76800 Baud [7] 115200 Baud	[2] 9600 Baud	Select the baud rate for the RS485 port.
Parameter 20-00 Feedback 1 Source	[0] No function [1] Analog Input 53 [2] Analog Input 54 [3] Pulse input 29 [100] Bus Feedback 1 [101] Bus Feedback 2	[0] No function	Select which input to use as the source of the feedback signal.
Parameter 20-01 Feedback 1 Conversion	[0] Linear [1] Square root	[0] Linear	Select how to calculate the feedback.

Table 1.15 Closed-loop Applications Set-up

Changes made

Changes Made lists all parameters changed from default settings.

- The list shows only parameters which have been changed in the current edit set-up.

- Parameters which have been reset to default values are not listed.

- The message *Empty* indicates that no parameters have been changed.

To change parameter settings

1. To enter the *Quick Menu*, press [Menu] until indicator in display is placed above *Quick Menu*.

2. Press [▲] [▼] to select quick guide, closed-loop set-up, compressor set-up, or changes made, then press [OK].

3. Press [▲] [▼] to browse through the parameters in the *Quick Menu*.

4. Press [OK] to select a parameter.

5. Press [▲] [▼] to change the value of a parameter setting.

6. Press [OK] to accept the change.

7. Press either [Back] twice to enter *Status*, or press [Menu] once to enter *Main Menu*.

The *Main Menu* accesses all parameters

1. Press [Menu] until indicator in display is placed above *Main Menu*.

2. Press [▲] [▼] to browse through the parameter groups.

3. Press [OK] to select a parameter group.

4. Press [▲] [▼] to browse through the parameters in the specific group.

5. Press [OK] to select the parameter.

6. Press [▲] [▼] to set/change the parameter value.

1.4.2 Main Menu Structure

0- Operation / Display**
0-0* Basic Settings
0-01 Language
0-03 Regional Settings
0-04 Operating State at Power-up
0-06 GridType
0-07 Auto DC Braking
0-1* Set-up Operations
0-10 Active Set-up
0-11 Programming Set-up
0-12 Link Setups
0-3* LCP Custom Readout
0-30 Custom Readout Unit
0-31 Custom Readout Min Value
0-32 Custom Readout Max Value
0-4* LCP Keypad
0-40 [Hand on] Key on LCP
0-42 [Auto on] Key on LCP
0-44 [Off/Reset] Key on LCP
0-5* Copy/Save
0-50 LCP Copy
0-51 Set-up Copy
0-6* Password
0-60 Main Menu Password
1- Load and Motor**
1-1* Motor Selection
1-10 Motor Construction
1-13 Compressor Selection
1-9* Motor Temperature
1-90 Motor Thermal Protection
1-93 Thermistor Source
3- Reference / Ramps**
3-0* Reference Limits
3-02 Minimum Reference
3-03 Maximum Reference
3-1* References
3-10 Preset Reference
3-11 Jog Speed [Hz]
3-14 Preset Relative Reference
3-15 Reference 1 Source
3-16 Reference 2 Source
3-17 Reference 3 Source
3-4* Ramp 1
3-41 Ramp 1 Ramp Up Time
3-42 Ramp 1 Ramp Down Time
3-5* Ramp 2
3-51 Ramp 2 Ramp Up Time
3-52 Ramp 2 Ramp Down Time
3-8* Other Ramps
3-80 Jog Ramp Time
3-81 Quick Stop Ramp Time
4- Limits / Warnings**
4-1* Motor Limits
4-14 Motor Speed High Limit [Hz]
4-18 Current Limit

4-19 Max Output Frequency
4-4* Adj. Warnings 2
4-40 Warning Freq. Low
4-41 Warning Freq. High
4-5* Adj. Warnings
4-50 Warning Current Low
4-51 Warning Current High
4-54 Warning Reference Low
4-55 Warning Reference High
4-56 Warning Feedback Low
4-57 Warning Feedback High
4-58 Missing Motor Phase Function
4-6* Speed Bypass
4-61 Bypass Speed From [Hz]
4-63 Bypass Speed To [Hz]
4-64 Semi-Auto Bypass Set-up
5- Digital In/Out**
5-0* Digital I/O mode
5-00 Digital Input Mode
5-1* Digital Inputs
5-10 Terminal 18 Digital Input
5-11 Terminal 19 Digital Input
5-12 Terminal 27 Digital Input
5-13 Terminal 29 Digital Input
5-3* Digital Outputs
5-34 On Delay, Digital Output
5-35 Off Delay, Digital Output
5-4* Relays
5-40 Function Relay
5-41 On Delay, Relay
5-42 Off Delay, Relay
5-5* Pulse Input
5-50 Term. 29 Low Frequency
5-51 Term. 29 High Frequency
5-52 Term. 29 Low Ref./Feedb. Value
5-53 Term. 29 High Ref./Feedb. Value
5-9* Bus Controlled
5-90 Digital & Relay Bus Control
6- Analog In/Out**
6-0* Analog I/O Mode
6-00 Live Zero Timeout Time
6-01 Live Zero Timeout Function
6-1* Analog Input 53
6-10 Terminal 53 Low Voltage
6-11 Terminal 53 High Voltage
6-12 Terminal 53 Low Current
6-13 Terminal 53 High Current
6-14 Terminal 53 Low Ref./Feedb. Value
6-15 Terminal 53 High Ref./Feedb. Value
6-16 Terminal 53 Filter Time Constant
6-19 Terminal 53 mode
6-2* Analog Input 54
6-20 Terminal 54 Low Voltage
6-21 Terminal 54 High Voltage
6-22 Terminal 54 Low Current
6-23 Terminal 54 High Current
6-24 Terminal 54 Low Ref./Feedb. Value
6-25 Terminal 54 High Ref./Feedb. Value
6-26 Terminal 54 Filter Time Constant

6-29 Terminal 54 mode
6-7* Analog/Digital Output 45
6-70 Terminal 45 Mode
6-71 Terminal 45 Analog Output
6-72 Terminal 45 Digital Output
6-73 Terminal 45 Output Min Scale
6-74 Terminal 45 Output Max Scale
6-76 Terminal 45 Output Bus Control
6-9* Analog/Digital Output 42
6-90 Terminal 42 Mode
6-91 Terminal 42 Analog Output
6-92 Terminal 42 Digital Output
6-93 Terminal 42 Output Min Scale
6-94 Terminal 42 Output Max Scale
6-96 Terminal 42 Output Bus Control
8- Comm. and Options**
8-0* General Settings
8-01 Control Site
8-02 Control Source
8-03 Control Timeout Time
8-04 Control Timeout Function
8-3* FC Port Settings
8-30 Protocol
8-31 Address
8-32 Baud Rate
8-33 Parity / Stop Bits
8-35 Minimum Response Delay
8-36 Maximum Response Delay
8-37 Maximum Inter-char delay
8-4* FC MC protocol set
8-42 PCD Write Configuration
8-43 PCD Read Configuration
8-5* Digital/Bus
8-50 Coasting Select
8-51 Quick Stop Select
8-52 DC Brake Select
8-53 Start Select
8-54 Reversing Select
8-55 Set-up Select
8-56 Preset Reference Select
8-8* FC Port Diagnostics
8-80 Bus Message Count
8-81 Bus Error Count
8-82 Slave Messages Rcvd
8-83 Slave Error Count
8-84 Slave Messages Sent
8-85 Slave Timeout Errors
8-88 Reset FC port Diagnostics
8-9* Bus Jog / Feedback
8-94 Bus Feedback 1
8-95 Bus Feedback 2
13- Smart Logic**
13-0* SLC Settings
13-00 SL Controller Mode
13-01 Start Event
13-02 Stop Event
13-03 Reset SLC
13-1* Comparators
13-10 Comparator Operand

13-11 Comparator Operator
13-12 Comparator Value
13-2* Timers
13-20 SL Controller Timer
13-4* Logic Rules
13-40 Logic Rule Boolean 1
13-41 Logic Rule Operator 1
13-42 Logic Rule Boolean 2
13-43 Logic Rule Operator 2
13-44 Logic Rule Boolean 3
13-5* States
13-51 SL Controller Event
13-52 SL Controller Action
14- Special Functions**
14-0* Inverter Switching
14-01 Switching Frequency
14-03 Overmodulation
14-1* Mains On/Off
14-12 Function at Mains Imbalance
14-2* Reset Functions
14-20 Reset Mode
14-21 Automatic Restart Time
14-22 Operation Mode
14-23 Typecode Setting
14-29 Service Code
14-5* Environment
14-50 RFI Filter
14-6* Auto Derate
14-65 Speed Derate Dead Time Compensation
14-9* Fault Settings
14-90 Fault Level
15- Drive Information**
15-0* Operating Data
15-00 Operating hours
15-01 Running Hours
15-03 Power Up's
15-04 Over Temp's
15-05 Over Volt's
15-06 Reset kWh Counter
15-07 Reset Running Hours Counter
15-08 Number of Starts
15-09 Number of Auto Resets
15-3* Alarm Log
15-30 Alarm Log: Error Code
15-31 InternalFaultReason
15-4* Drive Identification
15-40 FC Type
15-41 Power Section
15-42 Voltage
15-43 Software Version
15-44 Ordered TypeCode
15-45 Actual Typecode String
15-46 Drive Ordering No
15-48 LCP Id No
15-49 SW ID Control Card
15-50 SW ID Power Card
15-51 Drive Serial Number
15-53 Power Card Serial Number

15-59 File name
15-9* Parameter Info
15-92 Defined Parameters
15-97 Application Type
15-98 Drive Identification
16- Data Readouts**
16-0* General Status
16-00 Control Word
16-01 Reference [Unit]
16-02 Reference [%]
16-03 Status Word
16-05 Main Actual Value [%]
16-09 Custom Readout
16-1* Motor Status
16-10 Power [kW]
16-11 Power [hp]
16-12 Motor Voltage
16-13 Frequency
16-14 Motor current
16-15 Frequency [%]
16-16 Torque [Nm]
16-18 Motor Thermal
16-22 Torque [%]
16-3* Drive Status
16-30 DC Link Voltage
16-34 Heatsink Temp.
16-35 Inverter Thermal
16-36 Inv. Nom. Current
16-37 Inv. Max. Current
16-38 SL Controller State
16-5* Ref. & Feedb.
16-50 External Reference
16-52 Feedback[Unit]
16-54 Feedback 1 [Unit]
16-55 Feedback 2 [Unit]
16-6* Inputs & Outputs
16-60 Digital Input
16-61 Terminal 53 Setting
16-62 Analog Input AI53
16-63 Terminal 54 Setting
16-64 Analog Input AI54
16-65 Analog Output AO42 [mA]
16-66 Digital Output
16-67 Pulse Input #29 [Hz]
16-71 Relay Output [bin]
16-72 Counter A
16-73 Counter B
16-79 Analog Output AO45
16-8* Fieldbus & FC Port
16-86 FC Port REF 1
16-9* Diagnosis Readouts
16-90 Alarm Word
16-91 Alarm Word 2
16-92 Warning Word
16-93 Warning Word 2
16-94 Ext. Status Word
16-95 Ext. Status Word 2

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1.5 Acoustic Noise or Vibration

If the compressor is making noise or vibrations at certain frequencies, try the following:

- Speed bypass, parameter group *4-6* Speed Bypass*

1.6 Warnings and Alarms

Fault number	Alarm/ Warning bit number	Fault text	Warning	Alarm	Trip locked	Cause of problem
2	16	Live zero error	X	X		Signal on terminal 53 or 54 is less than 50% of the value set in *parameter 6-10 Terminal 53 Low Voltage*, *parameter 6-12 Terminal 53 Low Current*, *parameter 6-20 Terminal 54 Low Voltage*, or *parameter 6-22 Terminal 54 Low Current*. See also parameter group *6-0* Analog I/O Mode*.
4	14	Mains ph. loss	X	X	X	Missing phase on the supply side or too high voltage imbalance. Check the supply voltage. See *parameter 14-12 Function at Mains Imbalance*.
7	11	DC over volt	X	X		DC-link voltage exceeds limit.
8	10	DC under volt	X	X		DC-link voltage drops below *voltage warning low* limit.
9	9	Inverter overload	X	X		More than 100% load for too long.
10	8	Motor ETR over	X	X		The motor is too hot due to more than 100% load for too long. See *parameter 1-90 Motor Thermal Protection*.
11	7	Motor th over	X	X		The thermistor or the thermistor connection is disconnected. See *parameter 1-90 Motor Thermal Protection*.
13	5	Overcurrent	X	X	X	Inverter peak current limit is exceeded.
14	2	Earth Fault		X	X	Discharge from output phases to ground.
16	12	Short Circuit		X	X	Short circuit in the compressor or on the compressor terminals.
17	4	Ctrl. word TO	X	X		No communication to the frequency converter. See parameter group *8-0* General Settings*.
18	10 (*parameter 1 6-91 Alarm Word 2*)	Start failed		X		The speed has not been able to exceed *parameter 1-78 Compressor Start Min Speed [Hz]* during start within the allowed time.
30	19	U phase loss		X	X	Motor phase U is missing. Check the phase. See *parameter 4-58 Missing Motor Phase Function*.
31	20	V phase loss		X	X	Motor phase V is missing. Check the phase. See *parameter 4-58 Missing Motor Phase Function*.
32	21	W phase loss		X	X	Motor phase W is missing. Check the phase. See *parameter 4-58 Missing Motor Phase Function*.
38	17	Internal fault		X	X	Contact the local Danfoss supplier.
44	28	Earth Fault		X	X	Discharge from output phases to ground, using the value of *parameter 15-31 Alarm Log Value* if possible.
47	23	Control Voltage Fault	X	X	X	24 V DC may be overloaded.
48	25	VDD1 supply low		X	X	Control voltages low. Contact the local Danfoss supplier
49	11 (*parameter 1 6-91 Alarm Word 2*)			X		The speed is below the specified limit in *parameter 1-87 Compressor Min. Speed for Trip [Hz]*.
58		AMA internal	X	X		Contact the local Danfoss supplier.

Fault number	Alarm/ Warning bit number	Fault text	Warning	Alarm	Trip locked	Cause of problem
59	25	Current limit	X			The current is higher than the value in *parameter 4-18 Current Limit*.
60	44	External Interlock		X		External interlock has been activated. To resume normal operation, apply 24 V DC to the terminal programmed for external interlock and reset the frequency converter (via serial communication, digital I/O, or by pressing [Off/Reset]).
69	1	Pwr. Card Temp	X	X	X	The temperature sensor on the power card is either too hot or too cold.
79		Illegal power section configu-ration	X	X		Internal fault. Contact the local Danfoss supplier.
80	29	Drive initialised		X		All parameter settings are initialized to default settings.
87	47	Auto DC Braking	X			The frequency converter is auto DC braking.
126		Motor Rotating		X		High back EMF voltage. Stop the rotor of the PM motor.
208	4 (in *parameter 16 -97 Alarm Word 3*)	ORM Fault		X		Running in hand mode with low speed for too long time

Table 1.16 Warnings and Alarms

1.7 General Specifications

1.7.1 Mains Supply 3x200–240 V AC

Frequency converter	4 TR/VZH028	5 TR/VZH035	6.5 TR/VZH044
Typical shaft output [kW]	6.0	7.5	10
IP20 enclosure protection rating	H4	H4	H5
Maximum cable size in terminals (mains, compressor) [mm²/AWG]	16/6	16/6	16/6
Output current			
Continuous (3x200–240 V) [A]	20.7	25.9	33.7
Intermittent (3x200–240 V) [A]	–	–	37.1
Maximum input current			
Continuous 3x200–240 V) [A]	23.0	28.3	37.0
Intermittent (3x200–240 V) [A]	–	–	41.5
Maximum mains fuses, see *Table 1.9*			
Estimated power loss [W], Best case/typical[1]	182/ 204	229/ 268	369/ 386
Weight enclosure protection P20 [kg/(lb)]	7.9 (17.4)	7.9 (17.4)	9.5 (21)
Efficiency [%], best case/ typical[1]	97.3/ 97.0	98.5/ 97.1	97.2/ 97.1

Table 1.17 3x200–240 V AC

1) At rated load conditions.

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1.7.2 Mains Supply 3x380–480 V AC

Frequency converter	4 TR/VZH028	5 TR/VZH035	6.5 TR/VZH044
Typical shaft output [kW]	6.0	7.5	10
IP20 enclosure protection rating	H3	H3	H4
Maximum cable size in terminals (mains, compressor) [mm²/AWG]	4/10	4/10	16/6
Output current			
Continuous (3x380–440 V) [A]	11.6	14.3	16.4
Intermittent (3x380–440 V) [A]	–	–	18.0
Continuous (3x440–480 V) [A]	9.8	12.3	15.5
Intermittent (3x440–480 V) [A]	–	–	17.0
Maximum input current			
Continuous (3x380–440 V) [A]	12.7	15.1	18.0
Intermittent (3x380–440 V) [A]	–	–	19.8
Continuous (3x440–480 V) [A]	10.8	12.6	17.0
Intermittent (3x440–480 V) [A]	–	–	18.7
Maximum mains fuses			
Estimated power loss [W], best case/typical[1]	104/131	159/198	248/274
Weight enclosure protection IP20 [kg/(lb)]	4.3 (9.5)	4.5 (9.9)	7.9 (17.4)
Efficiency [%], best case/typical[1]	98.4/98.0	98.2/97.8	98.1/97.9

Table 1.18 3x380–480 V AC

1) At rated load conditions.

1.7.3 EMC Test Results

The following test results have been obtained using a system with a frequency converter, a screened control cable, a control box with potentiometer, and a motor screened cable.

RFI filter type	Conduct emission. Maximum screened cable length [m]						Radiated emission			
	Industrial environment				Housing, trades, and light industries		Industrial environment		Housing, trades, and light industries	
	EN 55011 Class A2		EN 55011 Class A1		EN 55011 Class B		EN 55011 Class A1		EN 55011 Class B	
	Without external filter	With external filter	Without external filter	With external filter	Without external filter	With external filter	Without external filter	With external filter	Without external filter	With external filter
H4 RFI filter (Class A1)										
CDS 803 IP20	–	–	25	50	–	20	Yes	Yes	–	No

Table 1.19 Test Results

1.7.4 General Technical Data

Protection and features

- Electronic thermal compressor protection against overload.

- Temperature monitoring of the heat sink ensures that the frequency converter trips if there is overtemperature.

- The frequency converter is protected against short circuits between compressor terminals U, V, W.

- When a compressor phase is missing, the frequency converter trips and issues an alarm.

- When a mains phase is missing, the frequency converter trips or issues a warning (depending on the load).

- Monitoring of the DC-link voltage ensures that the frequency converter trips, when the DC-link voltage is too low or too high.

- The frequency converter is protected against ground faults on compressor terminals U, V, W.

Mains supply (L1, L2, L3)

Supply voltage	200–240 V ±10%
Supply voltage	380–480 V ±10%
Supply frequency	50/60 Hz
Maximum imbalance temporary between mains phases	3.0% of rated supply voltage
True power factor (λ)	≥0.9 nominal at rated load
Displacement power factor ($\cos\varphi$) near unity	(>0.98)
Switching on the input supply L1, L2, L3 (power-ups)	Maximum 2 times/minute
Environment according to EN 60664-1	Overvoltage category III/pollution degree 2
The unit is suitable for use on a circuit capable of delivering not more than 100000 RMS symmetrical Amperes, 240/480 V maximum.	

Compressor output (U, V, W)

Output voltage	0–100% of supply voltage
Output frequency	0–200 Hz (VVC[+]), 0–400 Hz (u/f)
Switching on output	Unlimited
Ramp times	0.05–3600 s

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Cable lengths and cross-sections

Maximum compressor cable length, screened/armoured (EMC-correct installation)	See *chapter 1.7.3 EMC Test Results*
Maximum compressor cable length, unscreened/unarmoured	50 m (164 ft)
Maximum cross-section to compressor, mains[1]	
Cross-section DC terminals for filter feedback on enclosure sizes H1–H3, I2, I3, I4	4 mm²/11 AWG
Cross-section DC terminals for filter feedback on enclosure sizes H4–H5	16 mm²/6 AWG
Maximum cross-section to control terminals, rigid wire	2.5 mm²/14 AWG)
Maximum cross-section to control terminals, flexible cable	2.5 mm²/14 AWG)
Minimum cross-section to control terminals	0.05 mm²/30 AWG

1) See chapter 1.7.2 Mains Supply 3x380–480 V AC for more information.

Digital inputs

Programmable digital inputs	4
Terminal number	18, 19, 27, 29
Logic	PNP or NPN
Voltage level	0–24 V DC
Voltage level, logic 0 PNP	<5 V DC
Voltage level, logic 1 PNP	>10 V DC
Voltage level, logic 0 NPN	>19 V DC
Voltage level, logic 1 NPN	<14 V DC
Maximum voltage on input	28 V DC
Input resistance, R_i	Approximately 4 kΩ
Digital input 29 as thermistor input	Fault: >2.9 kΩ and no fault: <800 Ω
Digital input 29 as pulse input	Maximum frequency 32 kHz push-pull-driven & 5 kHz (O.C.)

Analog inputs

Number of analog inputs	2
Terminal number	53, 54
Terminal 53 mode	*Parameter 6-19 Terminal 53 mode*: 1=voltage, 0=current
Terminal 54 mode	*Parameter 6-29 Terminal 54 mode*: 1=voltage, 0=current
Voltage level	0–10 V
Input resistance, R_i	Approximately 10 kΩ
Maximum voltage	20 V
Current level	0/4–20 mA (scalable)
Input resistance, R_i	<500 Ω
Maximum current	29 mA
Resolution on analog input	10 bit

Analog output

Number of programmable analog outputs	2
Terminal number	42, 45[1]
Current range at analog output	0/4–20 mA
Maximum load to common at analog output	500 Ω
Maximum voltage at analog output	17 V
Accuracy on analog output	Maximum error: 0.4% of full scale
Resolution on analog output	10 bit

1) Terminals 42 and 45 can also be programmed as digital outputs.

Digital output

Number of digital outputs	4
Terminals 27 and 29	
Terminal number	27, 29[1]
Voltage level at digital output	0–24 V
Maximum output current (sink and source)	40 mA
Terminals 42 and 45	
Terminal number	42, 45[2]

1

Voltage level at digital output	17 V
Maximum output current at digital output	20 mA
Maximum load at digital output	1 kΩ

1) Terminals 27 and 29 can also be programmed as input.

2) Terminals 42 and 45 can also be programmed as analog output.

The digital outputs are galvanically isolated from the supply voltage (PELV) and other high-voltage terminals.

Control card, RS485 serial communication

Terminal number	68 (P, TX+, RX+), 69 (N, TX-, RX-)
Terminal number	61 common for terminals 68 and 69

Control card, 24 V DC output

Terminal number	12
Maximum load	80 mA

Relay output

Programmable relay output	2
Relay 01 and 02	01–03 (NC), 01–02 (NO), 04–06 (NC), 04–05 (NO)
Maximum terminal load (AC-1)[1] on 01–02/04–05 (NO) (Resistive load)	250 V AC, 3 A
Maximum terminal load (AC-15)[1] on 01–02/04–05 (NO) (Inductive load @ cosφ 0.4)	250 V AC, 0.2 A
Maximum terminal load (DC-1)[1] on 01–02/04–05 (NO) (Resistive load)	30 V DC, 2 A
Maximum terminal load (DC-13)[1] on 01–02/04–05 (NO) (Inductive load)	24 V DC, 0.1 A
Maximum terminal load (AC-1)[1] on 01–03/04–06 (NC) (Resistive load)	250 V AC, 3 A
Maximum terminal load (AC-15)[1] on 01–03/04–06 (NC) (Inductive load @ cosφ 0.4)	250 V AC, 0.2 A
Maximum terminal load (DC-1)[1] on 01–03/04–06 (NC) (Resistive load)	30 V DC, 2 A
Minimum terminal load on 01–03 (NC), 01–02 (NO)	24 V DC 10 mA, 24 V AC 20 mA
Environment according to EN 60664-1	Overvoltage category III/pollution degree 2

1) IEC 60947 parts 4 and 5.

Control card, 10 V DC output

Terminal number	50
Output voltage	10.5 V ±0.5 V
Maximum load	25 mA

Surroundings

Enclosure	IP20
Enclosure kit available	IP21, TYPE 1
Vibration test	1.0 g
Maximum relative humidity	5–95% (IEC 60721-3-3; Class 3K3 (non-condensing) during operation
Aggressive environment (IEC 60721-3-3), coated (standard)	Class 3C3
Test method according to IEC 60068-2-43 H2S (10 days)	
Ambient temperature	50 °C (122 °F)

Derating for high ambient temperature, see *chapter 1.8 Special Conditions*.

Minimum ambient temperature during full-scale operation	0 °C (32 °F)
Minimum ambient temperature at reduced performance	-20 °C (-4 °F)
Temperature during storage/transport	-30 to +65/70 °C (-22 to +149/158 °F)
Maximum altitude above sea level without derating	1000 m (3280 ft)
Maximum altitude above sea level with derating	3000 m (9843 ft)
Derating for high altitude, see *chapter 1.8 Special Conditions*.	
Safety standards	EN/IEC 61800-5-1, UL 508C
EMC standards, Emission	EN 61800-3, EN 61000-6-3/4, EN 55011, IEC 61800-3
EMC standards, Immunity	EN 61800-3, EN 61000-3-12, EN 61000-6-1/2, EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6

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1.8 Special Conditions

1.8.1 Derating for Ambient Temperature and Switching Frequency

The ambient temperature measured over 24 hours should be at least 5 °C (41 °F) lower than the maximum ambient temperature. If the frequency converter is operated at high ambient temperature, the continuous output current should be decreased. For derating curves, see *VLT® Compressor Drive CDS 803 Design Guide*.

1.8.2 Derating for Low Air Pressure and High Altitudes

The cooling capability of air is decreased at low air pressure. For altitudes above 2000 m (6562 ft), contact Danfoss regarding PELV. Below 1000 m (3281 ft) altitude, no derating is necessary. For altitudes above 1000 m (3281 ft), decrease the ambient temperature or the maximum output current. Decrease the output by 1% per 100 m (328 ft) altitude above 1000 m (3281 ft) or reduce the maximum ambient temperature by 1 °C per 200 m (656 ft).

1.9 Options for VLT® Compressor Drive CDS 803

For options, see the *VLT® Compressor Drive CDS 803 Design Guide*.