ENGINEERING TOMORROW

Service Guide
VLT® OneGearDrive

vlt-drives.danfoss.com

Contents

1 Introduction

1.1 Purpose of this Service Guide

This service guide describes the servicing and maintenance of the *VLT® OneGearDrive*. This service guide contains information about:

- Safety.
- Maintenance.
- Repair.
- Troubleshooting.
- Assembly and disassembly.
- Spare parts.

NOTICE

For reasons of clarity, the service guide does not contain all information relating to all OneGearDrive types and cannot describe every conceivable case of installation, operation, or maintenance. The information is limited to that which is required for qualified personnel in normal working situations. Contact Danfoss for further assistance.

This service guide is intended for use by qualified personnel. Read this service guide in full to service the OneGearDrive safely and professionally. Pay particular attention to the safety instructions and general warnings.

Therefore, read these operating instructions before working on or with the OneGearDrive.

VLT® is a registered trademark.

1.2 Additional Resources

Additional resources about the VLT® OneGearDrive and the frequency converters it is compatible with include:

- *VLT® OneGearDrive Operating Instructions* provide information required to install, commission, and maintain the OneGearDrive.
- *VLT® AutomationDrive FC 301/FC 302 Operating Guide* provides information required to install and commission the frequency converter.
- *VLT® AutomationDrive FC 301/FC 302 Design Guide* provides detailed information about the design and applications of the frequency converter.
- *VLT® AutomationDrive FC 360 Quick Guide* provides information required to install, commission, and maintain the frequency converter.
- *VLT® AutomationDrive FC 360 Design Guide* provides detailed information about the design and applications of the frequency converter.
- *VLT® Decentral Drive FCD 302 Operating Guide* provides information required to install, commission, and maintain the frequency converter.
- *VLT® Decentral Drive FCD 302 Design Guide* provides detailed information about the design and applications of the frequency converter.
- *VLT® Midi Drive FC 280 Operating Guide* provides information required to install and commission the frequency converter.
- *VLT® Midi Drive FC 280 Design Guide* provides detailed information about the design and applications of the frequency converter.

Contact the local Danfoss supplier to obtain the documentation, or visit *drives.danfoss.com/knowledge-center/technical-documentation/*.

1.3 Abbreviations and Conventions

1.3.1 Abbreviations

°C	° Celsius
°F	° Fahrenheit
AC	Alternating current
AWG	American wire gauge
DC	Direct current
EMC	Electromagnetic compatibility
ETR	Electronic thermal relay
$f_{M,N}$	Nominal motor frequency
FC	Frequency converter
IP	Ingress protection
$I_{M,N}$	Nominal motor current
$I_{VLT,N}$	Rated output current supplied by the frequency converter
N.A.	Not applicable
$P_{M,N}$	Nominal motor power
PE	Protective earth
PELV	Protective extra low voltage
PM motor	Permanent magnet motor
RPM	Revolutions per minute
T_{LIM}	Torque limit
$U_{M,N}$	Nominal motor voltage

Table 1.1 Abbreviations

1

1.3.2 Conventions

- Numbered lists indicate procedures.
- Bulleted lists indicate other information and description of illustrations.
- Italicized text indicates:
  - Cross-reference.
  - Link.
  - Footnote.
  - Parameter name, parameter group name, or parameter option.
- All dimension drawings are in [mm (in)].

1.4 Due Diligence

The operator and/or fabricator must ensure that:

- The OneGearDrive is only used as intended.
- The OneGearDrive is only operated in a perfect operational condition.
- The operating instructions are always available near the OneGearDrive in complete and readable form.
- The OneGearDrive is only fitted, installed, commissioned, and maintained by adequately qualified and authorized personnel.
- Qualified personnel are regularly instructed on all relevant matters of occupational safety and environmental protection, as well as the contents of the operating instructions and in particular the instructions it contains.
- The product markings and identification markings applied to the OneGearDrive, as well as safety and warning instructions, are not removed and are always kept in a legible condition.
- The national and international regulations regarding the control of machinery and equipment, which are applicable at the place of use, are complied with.
- The users always have all current information relevant to their interests about the OneGearDrive and its use and operation.

1.5 Tools Required

The tools listed in *Table 1.2* are required for maintenance and servicing the VLT® OneGearDrive.

Tool	Size	Similar to
Allen (hex) wrench	5 mm	Wera 950 L-key series
Wrench (open and box)	10 mm	Stahlwille 13 series
Wrench (open and box)	17 mm	Stahlwille 13 series
Hex socket	10 mm	Wera 8790 series
Torque wrench	1–25 Nm (8.9–221.3 in-lb) adjustable in 0.1 Nm (0.9 in-lb) increments	Wera 7000 series

Table 1.2 Tools Required

1.6 General Torque Tightening Values

	Torque [Nm (in-lb)]
Hollow shaft cover	4.5 (39.8)
Terminal box cover	3 (26.6)
Torque arm	49 (433.7)

Table 1.3 Torque Values

2 Safety

2.1 Safety Symbols

The following symbols are used in this guide:

⚠WARNING

Indicates a potentially hazardous situation that could result in death or serious injury.

⚠CAUTION

Indicates a potentially hazardous situation that could result in minor or moderate injury. It can also be used to alert against unsafe practices.

NOTICE

Indicates important information, including situations that can result in damage to equipment or property.

2.2 Qualified Personnel

All necessary work on electric drive units must only be performed by adequately qualified personnel (for example electrical engineers as specified in draft EN 50 110-1/DIN VDE 0105). The operating instructions and other product documentation must be available during any corresponding work, and qualified personnel are obliged to abide by the instructions contained therein. Qualified personnel are persons who are authorized due to training, experience, and instruction as well as their knowledge of relevant standards, rules, accident-prevention regulations, and operating conditions. The person responsible for the safety of the installation must perform the activities required in each case and be able to recognize and avoid potential hazards.
Knowledge of first-aid measures and of the available life-saving equipment is also required.
Unqualified personnel are forbidden to work on the VLT® OneGearDrive.

2.3 Safety Precautions

⚠WARNING

HIGH VOLTAGE

High voltage, which can lead to death or serious injury, is present on the connectors.

- **Before working on the power connectors (disconnecting or connecting the cable to the VLT® OneGearDrive), disconnect the power supply to the frequency converter and wait for the discharge time to elapse (see the frequency converter *operating instructions*).**
- **Installation, start-up, maintenance, and decommissioning must only be performed by qualified personnel.**

⚠CAUTION

DANGER OF BURNS

The surface of the OneGearDrive and the oil in the OneGearDrive can reach high temperatures during operation.

- **Do not touch the OneGearDrive until it has cooled down.**
- **Do not carry out an oil change until the oil has cooled down sufficiently.**

3 Operation Interface and Control

3.1 User Interface

There is no interface on the VLT® OneGearDrive itself. The interface is via the frequency converter connected to the OneGearDrive. Refer to the relevant documentation for the frequency converter for further information.

3.2 Status Messages

Status messages in VLT® AutomationDrive FC 302 and VLT® AutomationDrive FC 360
Status messages appear at the bottom of the display. The left part of the status line indicates the active operation model of the frequency converter.

The center part of the status line indicates the references site. The last part of the status line gives the operation status, for example:

- Running.
- Stop.
- Standby.

Other status messages may appear and are related to the software version and frequency converter type.

Status messages in VLT® Decentral Drive FCD 302
On the FCD 302, the status messages are indicated with LEDs.

For further details on the FCD 302 status messages, refer to *chapter 6 Status Indication* in the *VLT® Decentral Drive FCD 302 Operating Guide*.

3.3 Service Functions

Service information for the frequency converter can be shown on display lines 3 and 4. Included in the data are counters that tabulate:

- Hours run.
- Power-ups and trips.
- Fault logs that store frequency converter status values present at the 20 most recent events that stopped the frequency converter.
- Frequency converter nameplate data.

The service information is accessed by showing items in the frequency converter's *parameter group 15-** Drive Information*.

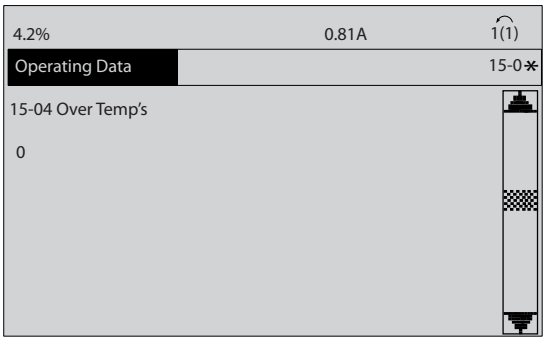

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Illustration 3.1 Service Information

Parameter settings are shown by pressing [Main Menu].

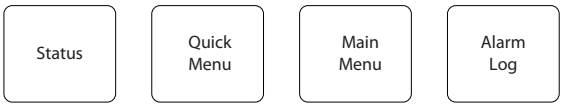

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Illustration 3.2 Keys on the LCP

Use the navigation keys [▲], [▼], [►] and [◄] to scroll through parameters.

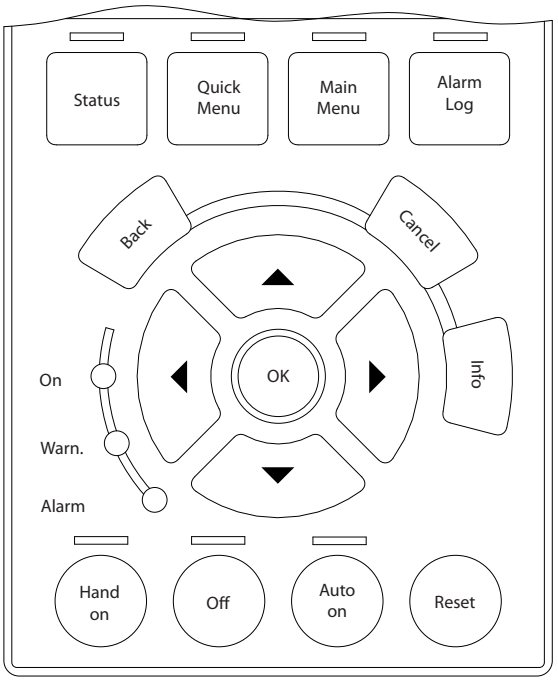

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Illustration 3.3 Navigation Keys on the LCP

See the frequency converter *programming guide* for detailed information on accessing and showing parameters and for descriptions and procedures for service information available in the *parameter group 15-** Drive Information*.

3.4 Power Terminals, Inputs, and Outputs

3.4.1 Inputs on Terminal Box

Connect cables to the terminal box to supply power to the VLT® OneGearDrive and the brake.

The terminal box includes inputs for:

- Motor.
- Protective earth.
- Motor thermistor.
- Brake.

See *chapter 3.4.4 Mechanical Brake Connections* for details on connecting to frequency converter and brake.

3.4.2 Cage Clamp Connection Diagram

Illustration 3.4 shows the VLT® OneGearDrive V210 with terminal box in Y-connection and the connection to the thermal protection.

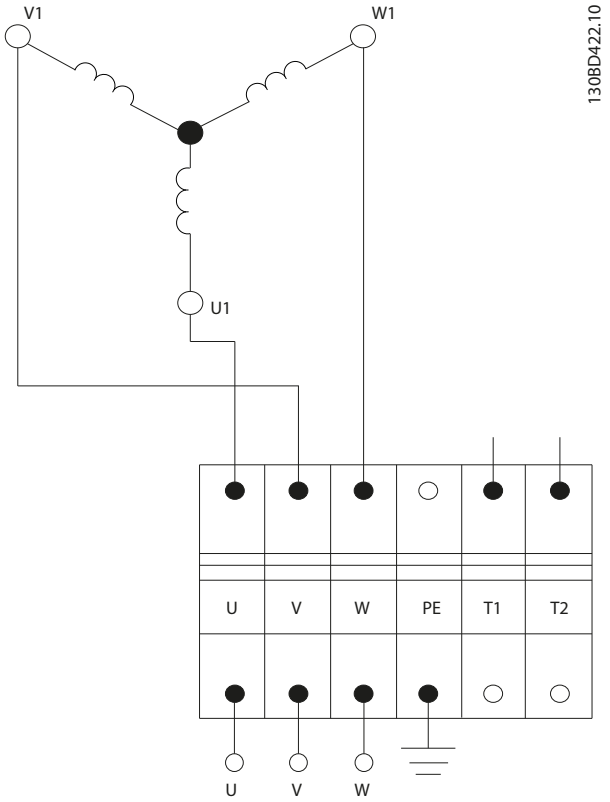


Illustration 3.4 Cage Clamp Connection Diagram

3

Description	Inverter output	Color	Typical cross-section [mm²(AWG)]	Maximum cross-section [mm²(AWG)]
Motor winding	U	Black	1.5 (16)	2.5 (14)
	V	Blue		
	W	Brown		
Protective earth	PE	Yellow/green	1.5 (16)	2.5 (14)
Temperature protection[1)] KTY 84-130	T1	White	0.75 (20)	1.5 (16)
	T2	Brown		

Table 3.1 Cage Clamp Connections

1) When connected to VLT® AutomationDrive FC 302 and VLT® Decentral Drive FCD 302, use analog input terminal 54, KTY sensor 1. For information about parameter setting and programming, refer to the corresponding operating instructions.

T1	KTY 84-130	VLT® AutomationDrive FC 302[1)]	VLT® Decentral Drive FCD 302[1)]
T2		KTY sensor 1 Analog input 54	

Table 3.2 Connections T1 and T2

1) Only if connected.

NOTICE

After connection, tighten all 4 screws on the terminal box cover. The tightening torque is 3 Nm (26.6 in-lb).

3.4.2.1 Power Extension - Stainless Steel

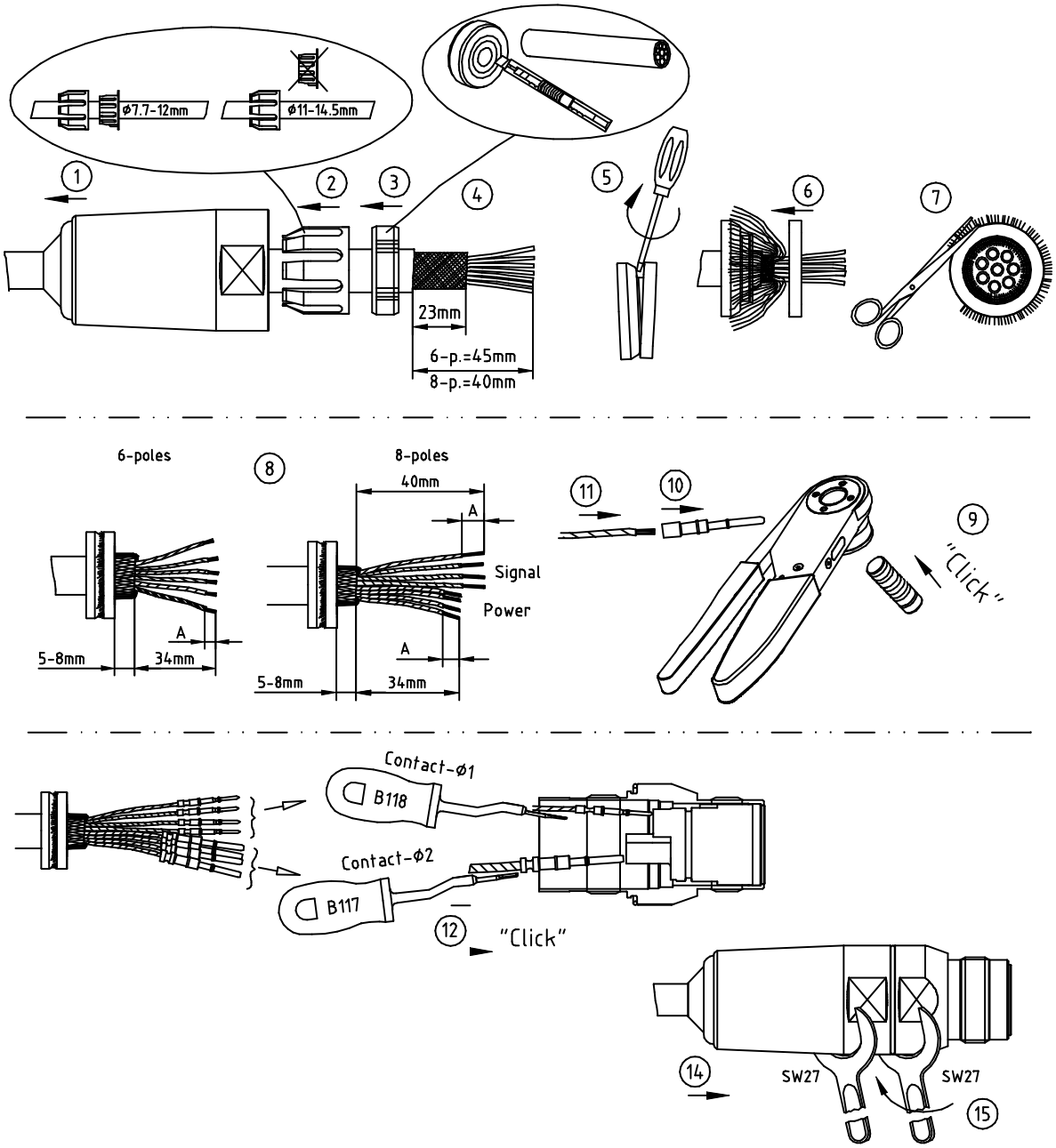


Illustration 3.5 Assembly

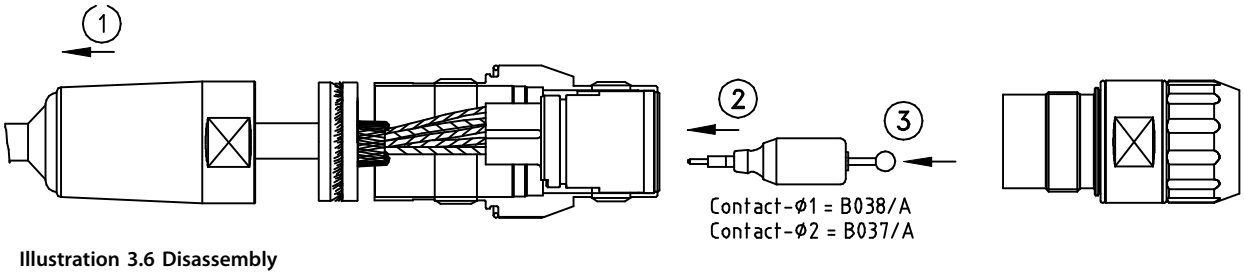
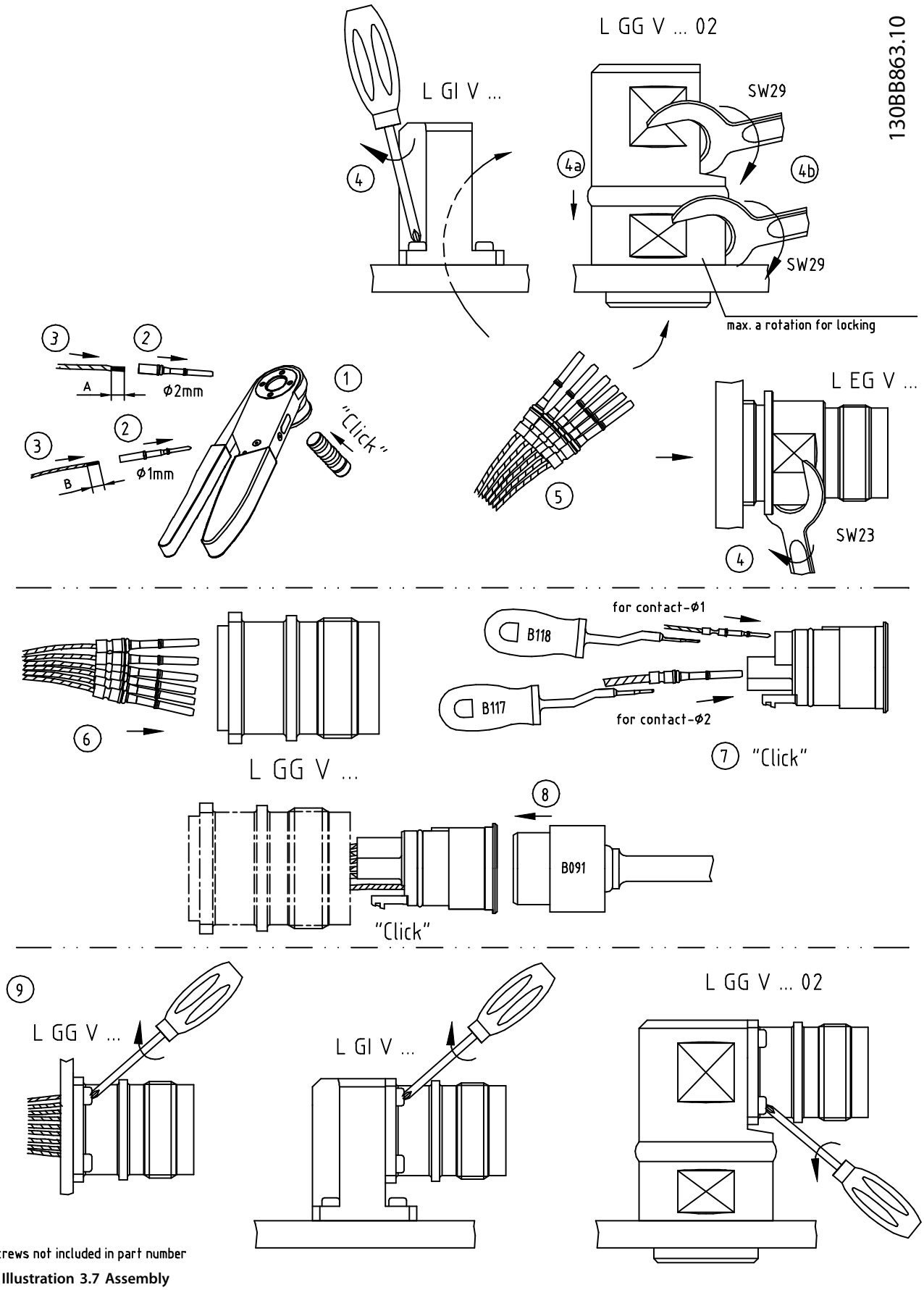


Illustration 3.6 Disassembly

Contact - ø [mm (in)]	Contact	Stripping length [mm (in)]	Termination cross-section [mm² (AWG)]	Crimping tool, B150		Crimping tool, B151		Latch retention
				Positioners	Tool setting	Positioners	Tool setting	
2 (0.08)	021.279.1020	A = 5 (0.2)	1.5 (16)	–	–	B165	7	>40 N
			2.5 (14)	–	–	B165	8	
1 (0.04)	021.129.1020	A = 7 (0.3)	–	–	–	–	–	
			0.24 (24)	B055/A	7	B156	4	>25 N
			0.34 (22)	B055/A	7	B156	4	
			0.5 (20)	B055/A	7	B156	4	
			0.75 (18)	B055/A	7	B156	5	
			1.0 (17)	B055/A	7	B156	5	

Table 3.3 Tools

3.4.2.2 Power Receptacles - Stainless Steel



screws not included in part number

Illustration 3.7 Assembly

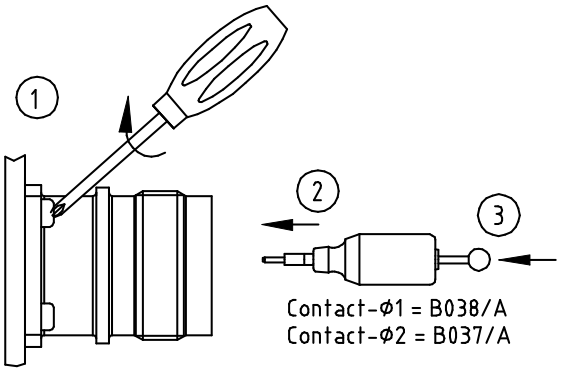


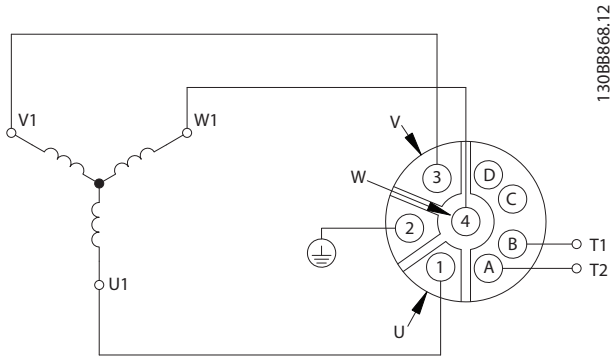
Illustration 3.8 Disassembly

Contact - ø [mm (in)]	Contact	Stripping length [mm]	Termination cross-section [mm² (AWG)]	Crimping tool, B150		Crimping tool, B179		Latch retention
				Positioners	Tool setting	Positioners	Tool setting	
2 (0.08)	021.101.2000	A = 6 (0.24)	0.5 (20)	B157	5	–	–	>40 N
			0.75 (18)	B157	6	–	–	
			1.0 (17)	B157	6	–	–	
			1.5 (16)	B157	6	–	–	
2 (0.08)	021.147.2000	A = 6.5 (0.26)	0.75 (18)	B157	7	B157	4	>40 N
			1.0 (17)	B157	7	B157	4	
			1.5 (16)	B157	7	B157	4	
			2.5 (14)	B157	8	B157	4	
						Crimping tool, B150		
1 (0.04)	021.129.1020	A = 6 (0.24)	0.24 (24)	B156	4	B055/A	7	>35 N
			0.34 (22)	B156	4	B055/A	7	
			0.5 (20)	B156	4	B055/A	7	
			0.75 (18)	B156	5	B055/A	7	
			1.0 (17)	B156	5	B055/A	7	

Table 3.4 Tools

3.4.3 CleanConnect® Connection Diagram

Illustration 3.9 shows the connection power plug for OneGearDrive Hygienic V210 in Y-connection with thermistors.



Description	Inverter output	Pin	Typical cross-section [mm² (AWG)]	Maximum cross-section [mm² (AWG)]
Motor winding	U	1	1.5 (16)	2.5 (14)
	V	3		
	W	4		
Protective earth	PE	2	1.5 (16)	2.5 (14)
Temperature protection[1)] KTY 84-130	T1	A	0.75 (20)	1.5 (16)
	T2	B		

Illustration 3.9 CleanConnect® OneGearDrive Connection

1) When connected to VLT® AutomationDrive FC 302 and VLT® Decentral Drive FCD 302, use analog input terminal 54, KTY sensor 1. For information about parameter setting and programming, refer to the corresponding operating instructions.

T1	KTY 84-130	VLT® AutomationDrive FC 302[1)]	VLT® Decentral Drive FCD 302[1)]
T2		KTY sensor 1 Analog input 54	

Table 3.5 Connections T1 and T2

1) Only if connected.

3

3.4.4 Mechanical Brake Connections

Illustration 3.10 shows the cage clamp and the connection to VLT® AutomationDrive FC 302.

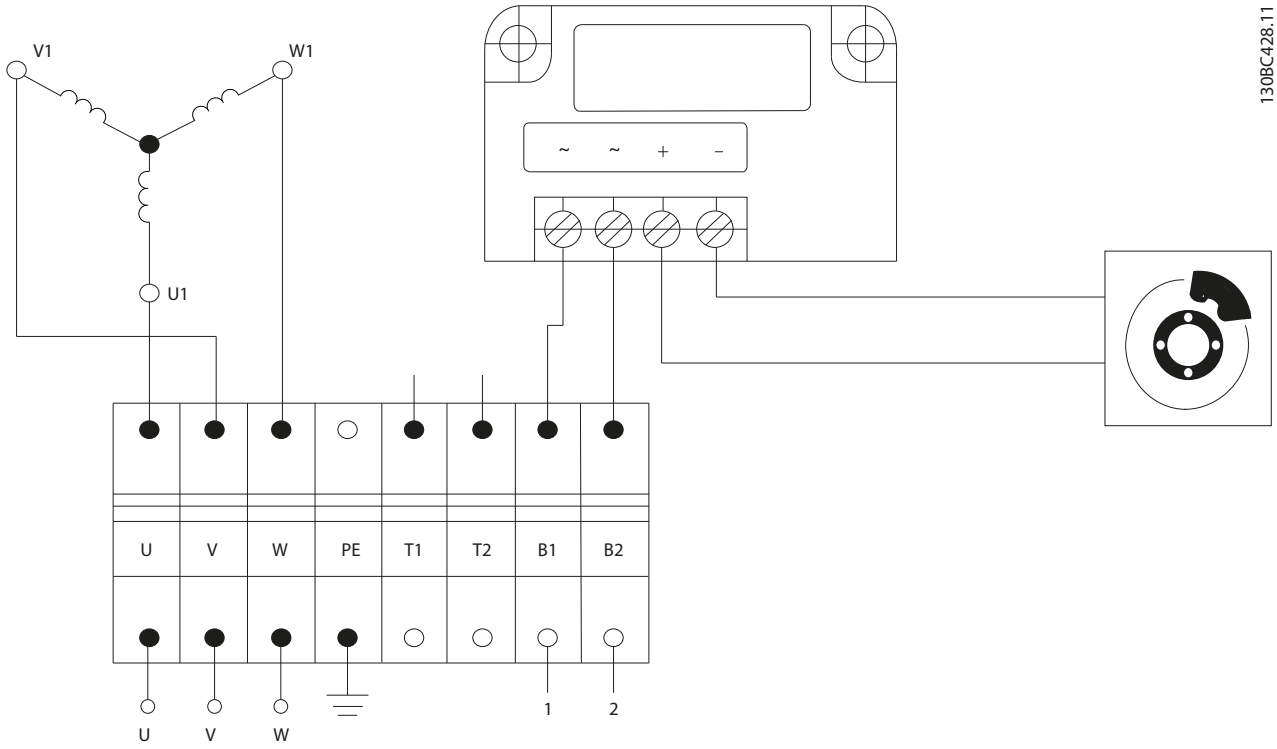


Illustration 3.10 Cage Clamp and Connection to VLT® AutomationDrive FC 302.

Description	Coding	Pin	Color	Typical cross-section [mm² (AWG)]	Maximum cross-section [mm² (AWG)]	VLT® AutomationDrive FC 302	VLT® Decentral Drive FCD 302	External DC supply
Brake supply	B1	1	Brown	0.75 (20)	2.5 (14)	See *Illustration 3.11*.	Terminal 122 (MBR+)	+
	B2	2	Black			See *Illustration 3.11*.	Terminal 123 (MBR–)	–

Table 3.6 Mechanical Brake Option Connections

An example of how to connect the OneGearDrive mechanical brake to the frequency converter is shown in *Illustration 3.11*.

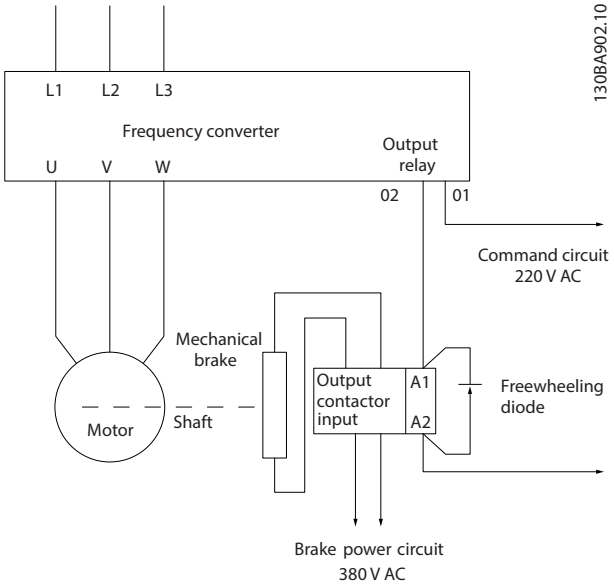


Illustration 3.11 Example of Connecting the Mechanical Brake to the Frequency Converter

The connection and use of the mechanical brake have been tested and released with VLT® AutomationDrive FC 302 and VLT® Decentral Drive FCD 302. Any other frequency converter may require a different connection. Contact Danfoss Service for further information.
For information about parameter setting and programming when using VLT® AutomationDrive FC 302 or VLT® Decentral Drive FCD 302, refer to the corresponding *operating guide*.

3.5 Cable Assembly

For cable assembly on VLT® OneGearDrive units without terminal box, follow the instructions in *chapter 3.4.2.1 Power Extension - Stainless Steel* to *chapter 3.4.2.2 Power Receptacles - Stainless Steel*.

4 Product Overview

4

4.1 Intended Use

The VLT® OneGearDrive is a highly efficient permanent-magnet 3-phase synchronous motor coupled to an optimized bevel gear box. As part of the Danfoss VLT® FlexConcept®, the drive is an energy-efficient drive system that helps to optimize plant productivity and reduce energy costs. The VLT® OneGearDrive comes in 2 versions:

- OneGearDrive Standard for use in dry and wet production areas.
- OneGearDrive Hygienic for use in wet areas, areas with high cleaning intensity, and aseptic and clean room production areas.

The OneGearDrive is compatible with the following frequency converters:

- VLT® AutomationDrive FC 302
- VLT® AutomationDrive FC 360
- VLT® Decentral Drive FCD 302
- VLT® Midi Drive FC 280

NOTICE

When connected to a frequency converter, any fault in the system is not necessarily a fault on the OneGearDrive. The fault could be on the frequency converter.

4.2 Service Report

State the serial number of the VLT® OneGearDrive when requesting support, or preparing the service report. The serial number is shown in the *Type* field on the nameplate. Refer to *Illustration 4.1* for an example.

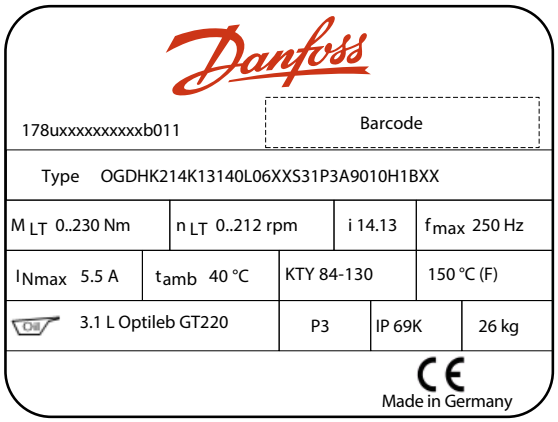
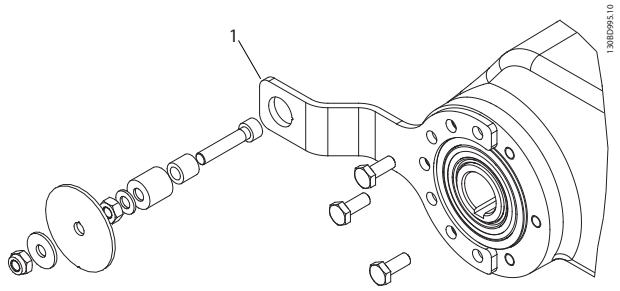


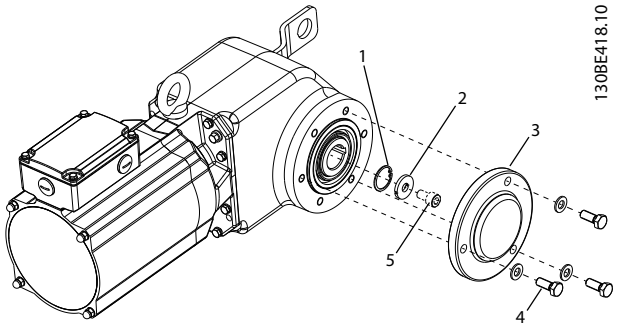
Illustration 4.1 Example OneGearDrive Nameplate

4.3 Exploded Views



1	Torque arm

Illustration 4.2 Assembly of the Torque Arm to the VLT® OneGearDrive



1	Retaining ring
2	Disk
3	Shaft cover
4	Shaft cover screws
5	Screw (not included)

Illustration 4.3 Assembly of the VLT® OneGearDrive to the Shaft

5 Troubleshooting

5.1 Exterior Fault Troubleshooting/Visual Inspection

5.1.1 Paint Repair

NOTICE

BEFORE SPRAYING WITH AEROSOL CANS

1. **Read the instructions on the cans.**
2. **Shake the cans for about 2 minutes before spraying.**

Repeat the procedure when changing between cans.

NOTICE

Use activated cans within 2 days.

1. Clean the surface using silicon remover.
2. Grind the surface using Scotch Brite 07447 (280) or similar.
3. Clean the surface again using silicon remover.
4. Spray the first layer lacquer (primer and activator).
5. Leave the sprayed item to dry for at least 60 minutes at +20 °C (68 °F).
6. Spray the second layer lacquer - RAL 9010 (2K structure top coat and activator).
7. Leave the sprayed item to dry for at least 60 minutes at +20 °C (68 °F).
8. Spray cover lacquer (coat and activator). This step is not required when using the paint-repair set Standard.

5.1.2 Inspection during Operation

Carry out regular inspections during operation. Check the VLT® OneGearDrive at regular intervals for anything unusual.

Pay particular attention to:

- Unusual noises.
- Overheated surfaces (temperatures up to 70 °C (158 °F) may occur in normal operation).
- Uneven running.
- Strong vibrations.
- Loose fastenings.
- Condition of electrical wiring and cables.
- Poor heat dispersion.

If irregularities or problems occur, contact Danfoss Service.

5.2 Fault Symptom Troubleshooting

Component	Possible cause	Instructions
Oil leakage at hollow shaft seal.	• Damage during installation. • Seal is worn out.	1. Clean the VLT® OneGearDrive and check for one-time leakages or grease from the shaft bearing. 2. Correct the position and check the seal according to *chapter 6.4 Hollow Shaft Seal*. 3. If the seal must be replaced, refer to *chapter 7.2 Oil Seal/Shaft Seal*. ***NOTICE*** **The original color for mild steel is blue. For stainless steel, the original color is brown.**
Unexpected/untypical vibrations or noises.	• Error in installation. • Worn-out bearing caused by conveyor.	1. Check that an original Danfoss torque arm set has been used. 1a If using an original Danfoss torque arm set does not solve the problem, replace the entire unit.
The OGD does not start, or the inverter keeps tripping.	• Wrong parameter settings. • Incorrect cable connections.	1. Check the parameter set-ups in the inverter, see *chapter 5.3.1 Parameter Overview*. 2. Check possible warnings and alarms, see *chapter 5.3 Warnings/Alarm Messages*.
OGD does not run (short circuit).	Water in the motor.	1. Check possible warnings and alarms, see *chapter 5.3 Warnings/Alarm Messages*. 2. Change *parameter 4-58 Missing Motor Phase Function*. If changing *parameter 4-58 Missing Motor Phase Function* does not solve the problem, exchange the OGD.

Table 5.1 Instructions for Troubleshooting

5.3 Warnings/Alarm Messages

Warning/alarm messages derive from faults appearing on either

- The VLT® OneGearDrive.
- The frequency converter connected to the OGD.
- The entire system.

The warnings and alarms are only valid for VLT® AutomationDrive FC 301/FC 302 and VLT® Decentral Drive FCD 302.

The following alarms relate to the OGD:

- Alarm 9, inverter overload
- Alarm 13, overcurrent
- Alarm 62, output frequency at maximum limit
- Alarm 63, mechanical brake failure
- Alarm 99/alarm 61, rotor locked/feedback error

If the fault is on the frequency converter, refer to either the *operating guide* or the *programming guide* for the specific frequency converter.

WARNING/ALARM 9, Inverter overload
The frequency converter has run with more than 100% overload for too long and is about to cut out. The counter for electronic thermal inverter protection issues a warning at 98% and trips at 100% with an alarm. The frequency converter cannot be reset until the counter is below 90%.

Troubleshooting

- Check that the value in *parameter 1-66 Min. Current at Low Speed* does not exceed the limit.
  - If the value is too high, correct it, and exit the parameter.
- If the value in *parameter 1-66 Min. Current at Low Speed* is correct:
  - Check the gearbox ratio.
  - Check the inverter size.
  - Check for application errors.

.

WARNING/ALARM 13, Over current
The inverter peak current limit (approximately 200% of the rated current) is exceeded. The warning lasts approximately 1.5 s. It is often caused by:

- Wrong inverter size or inverter ratio.
- Wrong parameter settings in *parameters 1-20* to *1-25*.

- Blocked conveyor.

Troubleshooting

- Check if the conveyor is blocked.
- Check if the warning/alarm appeared during start/stop.
  - If the warning/alarm did appear during start/stop, check that the ramp-up time is minimum 1 s.
- Check that the value in *parameter 1-66 Min. Current at Low Speed* does not exceed the limit.
- If the value in *parameter 1-66 Min. Current at Low Speed* is correct,
  - Check *parameter 1-53 Model Shift Frequency*.
  - Check *parameter group 30-2* High Starting Torque*.
  - Check *parameter group 7-0* PI Control*.
  - Check if the current limit is too high (*parameter 4-18 Current Limit* minimum 10% below maximum value).
- Check conveyor for pulling back rotor after stop.
  - Set *parameter 1-71 Start Delay*.
- Check *parameter 7-19 Current Controller Rise Time* and update software version to 7.25 or newer.
- Check *parameter 4-58 Missing Motor Phase Function* and adjust to 1000 ms. With motor switch, adjust *parameter 1-18 Min. Current at No Load*.

If none of the above solve the problem, check

- Gearbox ratio.
- Inverter size.
- Application errors.
- Electrical connection.

WARNING/ALARM 61, Feedback error
An error between calculated speed and speed measurement from feedback device.

Troubleshooting

- Check that the value in *parameter 1-66 Min. Current at Low Speed* does not exceed the limit.
- If the value in *parameter 1-66 Min. Current at Low Speed* is correct,
  - Check *parameter 1-53 Model Shift Frequency*.
  - Check *parameter group 30-2* High Starting Torque*.
  - Check *parameter group 7-0* PI Control*.
  - Check if the current limit is too high (*parameter 4-19 Max Output Frequency* minimum 10% below maximum value).

If none of the above solve the problem, check

- Gearbox ratio.
- Inverter size.
- Application errors.

WARNING 62, Output frequency at maximum limit
The output frequency has reached the value set in *parameter 4-19 Max Output Frequency*. Check the application for possible causes. Possibly increase the output frequency limit. Be sure that the system can operate safely at a higher output frequency. The warning clears when the output drops below the maximum limit.

Troubleshooting

- Check that the value in *parameter 1-66 Min. Current at Low Speed* does not exceed the limit.
- If the value in *parameter 1-66 Min. Current at Low Speed* is correct,
  - Check *parameter 1-53 Model Shift Frequency*.
  - Check *parameter group 30-2* High Starting Torque*.
  - Check *parameter group 7-0* PI Control*.
  - Check if the current limit is too high (*parameter 4-19 Max Output Frequency* minimum 10% below maximum value).

If none of the above solve the problem, check

- Gearbox ratio.
- Inverter size.
- Application errors.

ALARM 63, Mechanical brake low
The actual motor current has not exceeded the release brake current within the start delay time window.

Troubleshooting

- Check the start function and *parameter 1-70 PM Start Mode*, *parameter 1-73 Flying Start*, and in *Table 5.2*.

ALARM 99, Locked rotor
Rotor is blocked.

5.3.1 Parameter Overview

Parameter	LA10 Motor (code L09) FC(D) 302 1.5–3.0 kW (2.0–4.0 hp)	V210 Motor (code L06) FC(D) 302 0.75–2.2 kW (3.0 kW) (1.0–3.0 hp (4.0 hp))
Parameter 1-10 Motor Construction	*[1] PM, non-salient SPM, non-sat*	*[1] PM, non-salient SPM, non-sat*
Parameter 1-11 Motor Model	*[10] Danfoss OGD LA10*	*[11] Danfoss OGD V210*
Parameter 1-47 Torque Calibration	*[1] 1st start after pwr-up*	*[1] 1st start after pwr-up*
Parameter 1-71 Start Delay[1)]	0.3 s	0.3 s
Parameter 1-72 Start Function	*[2] Coast/delay time*	*[2] Coast/delay time*
Parameter 3-41 Ramp 1 Ramp Up Time[1)]	≥3 s	≥3 s
Parameter 3-42 Ramp 1 Ramp Down Time[1)]	≥3 s	≥3 s
Parameter 30-20 High Starting Torque Time [s][1)]	0–2 s	0–2 s
Parameter 30-21 High Starting Torque Current [%][1)]	1.5/2.2/3.0 kW 75%/100%/130%	0.75/1.1/1.5/2.2/3.0 kW 60%/75%/100%/120%/120%
Optional if *parameter 1-11 Motor Model* is not available		
Parameter 1-01 Motor Control Principle	*[2] Flux sensorless*	*[2] Flux sensorless*
Parameter 1-00 Configuration Mode	*[0] Open loop*	*[0] Open loop*
Parameter 1-53 Model Shift Frequency	≥25 Hz	≥25 Hz
Parameter 1-24 Motor Current	7.2 A	5.5 A
Parameter 1-25 Motor Nominal Speed	3.000 RPM	3.000 RPM
Parameter 1-26 Motor Cont. Rated Torque	12.6 Nm	13 Nm
Parameter 1-30 Stator Resistance (Rs)	0.5 Ω	1 Ω
Parameter 1-37 d-axis Inductance (Ld)	5 mH	13.5 mH
Parameter 1-39 Motor Poles	10	10
Parameter 1-40 Back EMF at 1000 RPM	120	155
Parameter 1-66 Min. Current at Low Speed[1)]	1.5/2.2/3.0 kW 57%/78%/100%	0.75/1.1/1.5/2.2/3.0 kW 42%/53%/73%/92%/100%
Parameter 4-18 Current Limit	1.5/2.2/3.0 kW 91%/125%/160%	0.75/1.1/1.5/2.2/3.0 kW 69%/87%/120%/130%/130%
Parameter 1-47 Torque Calibration	*[1] 1st start after pwr-up*	*[1] 1st start after pwr-up*
Parameter 3-89 Ramp Lowpass Filter Time[1)]		
Optional if KTY sensor is used		
Parameter 1-90 Motor Thermal Protection	*[4] ETR trip 1* or *[2] Thermistor trip*	*[4] ETR trip 1* or *[2] Thermistor trip*
Parameter 1-95 KTY Sensor Type	*[0] KTY Sensor 1*	*[0] KTY Sensor 1*
Parameter 1-96 KTY Thermistor Resource	*[2] Analog Input 54*	*[2] Analog Input 54*
Parameter 1-97 KTY Threshold level	125 °C (257 °F)	125 °C (257 °F)
Optional if mechanical brake is used		
Parameter 1-71 Start Delay[1)]	0.2 s ≤ maximum	0.2 s ≤ maximum
Parameter 1-72 Start Function	*[5] VVC+/Flux clockwise*	*[5] VVC+/Flux clockwise*
Parameter 1-74 Start Speed [RPM][1)]	0.1 RPM	0.1 RPM
Parameter 1-76 Start Current	3.0 A	3.0 A
Parameter 2-20 Release Brake Current[1)]	2.0 A	2.0 A
Parameter 2-21 Activate Brake Speed [RPM][1)]	10 RPM	10 RPM
Parameter 2-23 Activate Brake Delay[1)]	0.4 s	0.4 s
Parameter 5-40 Function Relay	*[32] Mech brake ctrl*	*[32] Mech brake ctrl*

Table 5.2 Parameters for VLT® OneGearDrive Used with VLT® AutomationDrive FC 302 and VLT® Decentral Drive FCD 302

1) Application-dependent.

Parameter	FC 360 1.5 kW (2.0 hp)	FC 360 2.2 kW (3.0 hp)	FC 360 3.0 kW (4.0 hp)	OneGearDrive function
	LA10 Motor			
Parameter 0-16 Application Selection	*[6] OGD Function*	*[6] OGD Function*	*[6] OGD Function*	Yes
Parameter 1-00 Configuration Mode	*[0] Open loop*	*[0] Open loop*	*[0] Open loop*	Yes
Parameter 1-01 Motor Control Principle	*[1] VVC+*	*[1] VVC+*	*[1] VVC+*	Yes
Parameter 1-08 Motor Control Bandwidth[1]	*[0] High*	*[0] High*	*[0] High*	Yes
Parameter 1-10 Motor Construction	*[1] PM, non-salient SPM, non-sat*	*[1] PM, non-salient SPM, non-sat*	*[1] PM, non-salient SPM, non-sat*	Yes
Parameter 1-14 Damping Gain	120%	120%	120%	No
Parameter 1-15 Low Speed Filter Time Const.	0.18	0.18	0.18	No
Parameter 1-16 High Speed Filter Time Const.	0.18	0.18	0.18	No
Parameter 1-17 Voltage filter time const.	0.04	0.04	0.04	No
Parameter 1-24 Motor Current	7.2	7.2	7.2	Yes
Parameter 1-25 Motor Nominal Speed	3000	3000	3000	Yes
Parameter 1-26 Motor Cont. Rated Torque	12.6	12.6	12.6	Yes
Parameter 1-29 Automatic Motor Adaption (AMA)[15]	*[1] Enable Complete AMA*	*[1] Enable Complete AMA*	*[1] Enable Complete AMA*	No
Parameter 1-30 Stator Resistance (Rs)[2]	0.5	0.5	0.5	Yes
Parameter 1-37 d-axis Inductance (Ld)[2]	5	5	5	Yes
Parameter 1-39 Motor Poles	10	10	10	Yes
Parameter 1-40 Back EMF at 1000 RPM	120	120	120	Yes
Parameter 1-42 Motor Cable Length[10]	50	50	50	No
Parameter 1-46 Position Detection Gain	100	100	100	No
Parameter 1-66 Min. Current at Low Speed[3]	50 ≤51.3 & <*parameter 4-18 Current Limit*	50 ≤73.6 & <*parameter 4-18 Current Limit*	50 ≤100 & <*parameter 4-18 Current Limit*	No
Parameter 1-70 PM Start Mode[13]	*[0] Rotor detection*	*[0] Rotor detection*	*[0] Rotor detection*	No
Parameter 1-73 Flying Start[4]	*[2] Enable always*	*[2] Enable always*	*[2] Enable always*	No
Parameter 1-90 Motor Thermal Protection	*[4] ETR trip 1* or *[2] Thermistor trip*	*[4] ETR trip 1* or *[2] Thermistor trip*	*[4] ETR trip 1* or *[2] Thermistor trip*	No
Parameter 1-93 Thermistor Source	*[2] Analog Input 54*	*[2] Analog Input 54*	*[2] Analog Input 54*	No
Parameter 2-06 Parking Current[5]	100%	100%	100%	No
Parameter 2-07 Parking Time[5]	0.5	0.5	0.5	No
Parameter 3-03 Maximum Reference	250	250	250	Yes
Parameter 3-41 Ramp 1 Ramp Up Time[6]	3	3	3	No
Parameter 3-42 Ramp 1 Ramp Down Time	3	3	3	No
Parameter 4-14 Motor Speed High Limit [Hz]	250	250	250	Yes
Parameter 4-18 Current Limit[11]	≤82	≤117.7	≤160	No
Parameter 4-19 Max Output Frequency	260	260	260	Yes
Parameter 14-01 Switching Frequency[7]	*[6] 6.0 kHz*	*[6] 6.0 kHz*	*[6] 6.0 kHz*	No
Parameter 14-03 Overmodulation	*[0] Off*	*[0] Off*	*[0] Off*	
Parameter 14-51 DC-Link Compensation[8]	*[0] Off*	*[0] Off*	*[0] Off*	Yes
Parameter 16-36 Inv. Nom. Current	3.7	5.3	7.2	No
Parameter 16-37 Inv. Max. Current	5.92	8.48	11.52	No
Parameter 30-20 High Starting Torque Time [s]	0–2	0–2	0–2	No
Parameter 30-21 High Starting Torque Current [%][12]	≤74	≤106	≤144	No

Parameter	FC 360 1.5 kW (2.0 hp)	FC 360 2.2 kW (3.0 hp)	FC 360 3.0 kW (4.0 hp)	OneGearDrive function
	LA10 Motor			
Parameter 30-22 Locked Rotor Protection[14]	*[0] Off*	*[0] Off*	*[0] Off*	No
Parameter 30-23 Locked Rotor Detection Time [s]	1	1	1	No
Parameter 38-94 Lsigma[9]	4.35	4.35	4.35	Yes
Parameter 1-71 Start Delay	0.2–<10 s	0.2–<10 s	0.2–<10 s	No
Parameter 1-72 Start Function[16]	*[2] Coast/delay time*	*[2] Coast/delay time*	*[2] Coast/delay time*	No
Parameter 1-75 Start Speed [Hz][17]	–	–	–	No
Parameter 1-76 Start Current[17]	–	–	–	No
Parameter 2-20 Release Brake Current	2.0 A	2.0 A	2.0 A	No
Parameter 2-22 Activate Brake Speed [Hz][18]	0.5 Hz	0.5 Hz	0.5 Hz	No
Parameter 2-23 Activate Brake Delay	0.4 s	0.4 s	0.4 s	No
Parameter 5-40 Function Relay	*[32] Mech brake ctrl*	*[32] Mech brake ctrl*	*[32] Mech brake ctrl*	No

Table 5.3 VLT® AutomationDrive FC 360 in VVC+

1) High bandwidth for coping with sudden load change if needed. Acoustic noise demands are not important. If required by the application, change to [1] Medium or [4] Adaptive 2.

2) Nameplate: R_s=0.5, L_d=5 mH. For AMA run on VLT® AutomationDrive FC 360 with 50 m (164 ft): R_s=1.441, L_d=5.589. Run AMA before first start to ensure the best starting performance.

3) Minimum current can be lower if the application runs at low speed for a long time.

4) It is not possible to disable flystart in all PM applications.

5) Increase parking time to ensure successful parking at high load and at high inertia.

6) Ramp time depends on the application.

7) Can be increased or decreased depending on the application. Less than 6 kHz is not recommended.

8) Disable this feature to keep the DC voltage ripple.

9) Special parameter for 1 current sensor drive. After running AMA, check that parameter 1-37 d-axis Inductance (Ld) = 1.15 x parameter 38-94 Lsigma. After this check, parameter 1-37 d-axis Inductance (Ld) can be changed.

10) Default is 50 m (164 ft). If the application uses a shorter cable, change this parameter.

11) Maximum value is limited to parameter 16-37 Inv. Max. Current/parameter 1-24 Motor Current x 100%.

12) Maximum value is limited to parameter 16-37 Inv. Max. Current/parameter 1-24 Motor Current x 90%.

13) This parameter is introduced in SW 1.4. If start problems occur for applications using long cables, change back to [1] Parking.

14) Default is [0] Off. If required, change to [1] On. Set a correct detection time.

15) Before running AMA, set parameter 1-24 Motor Current, parameter 1-25 Motor Nominal Speed, parameter 1-40 Back EMF at 1000 RPM, and parameter 1-42 Motor Cable Length. After a successful AMA, parameter 1-30 Stator Resistance (Rs), parameter 1-37 d-axis Inductance (Ld), parameter 1-15 Low Speed Filter Time Const., parameter 1-16 High Speed Filter Time Const., and parameter 1-17 Voltage filter time const. are updated.

16) FC 360 with PM motor only supports coast.

17) As parameter 1-72 Start Function = coast, parameter 1-76 Start Current is not relevant.

18) If an overcurrent alarm is issued or high instant current occurs, decrease parameter 2-22 Activate Brake Speed [Hz].

Parameter	FC 360 1.1 kW (1.5 hp)	FC 360 1.5 kW (2 hp)	FC 360 2.2 kW (3.0 hp)	FC 360 3.0 kW (4.0 hp)	OneGearDrive function
	V210 Motor				
Parameter 0-16 Application Selection	*[7] OGD Function, V210*	*[7] OGD Function, V210*	*[7] OGD Function, V210*	*[7] OGD Function, V210*	Yes
Parameter 1-00 Configuration Mode	*[0] Open loop*	*[0] Open loop*	*[0] Open loop*	*[0] Open loop*	Yes
Parameter 1-01 Motor Control Principle	*[1] VVC+*	*[1] VVC+*	*[1] VVC+*	*[1] VVC+*	Yes
Parameter 1-08 Motor Control Bandwidth[1)]	*[0] High*	*[0] High*	*[0] High*	*[0] High*	Yes
Parameter 1-10 Motor Construction	*[1] PM, non-salient SPM, non-sat*	*[1] PM, non-salient SPM, non-sat*	*[1] PM, non-salient SPM, non-sat*	*[1] PM, non-salient SPM, non-sat*	Yes
Parameter 1-14 Damping Gain	120%	120%	120%	120%	No
Parameter 1-15 Low Speed Filter Time Const.[16)]	0.24	0.24	0.24	0.24	No
Parameter 1-16 High Speed Filter Time Const.	0.24	0.24	0.24	0.24	No
Parameter 1-17 Voltage filter time const.[17)]	0.06	0.06	0.06	0.06	No
Parameter 1-24 Motor Current	5.5	5.5	5.5	5.5	Yes
Parameter 1-25 Motor Nominal Speed	3000	3000	3000	3000	Yes
Parameter 1-26 Motor Cont. Rated Torque	13	13	13	13	Yes
Parameter 1-29 Automatic Motor Adaption (AMA)[18)]	*[1] Enable Complete AMA*	*[1] Enable Complete AMA*	*[1] Enable Complete AMA*	*[1] Enable Complete AMA*	No
Parameter 1-30 Stator Resistance (Rs)[2)]	1.00	1.00	1.00	1.00	Yes
Parameter 1-37 d-axis Inductance (Ld)[2)]	13.8	13.8	13.8	13.8	Yes
Parameter 1-39 Motor Poles	10	10	10	10	Yes
Parameter 1-40 Back EMF at 1000 RPM	155	155	155	155	Yes
Parameter 1-42 Motor Cable Length[11)]	50	50	50	50	No
Parameter 1-46 Position Detection Gain	100	100	100	100	No
Parameter 1-66 Min. Current at Low Speed[3)]	50 ≤54.5 & <parameter 4-18 Current Limit	50 ≤67.3 & <parameter 4-18 Current Limit	50 ≤96.3 & <parameter 4-18 Current Limit	50 ≤130 & <parameter 4-18 Current Limit	No
Parameter 1-70 PM Start Mode[14)]	*[0] Rotor Detection*	*[0] Rotor Detection*	*[0] Rotor Detection*	*[0] Rotor Detection*	No
Parameter 1-73 Flying Start[4)]	*[2] Enable Always*	*[2] Enable Always*	*[2] Enable Always*	*[2] Enable Always*	No
Parameter 1-90 Motor Thermal Protection	*[4] ETR trip 1 or [2] Thermistor trip*	*[4] ETR trip 1 or [2] Thermistor trip*	*[4] ETR trip 1 or [2] Thermistor trip*	*[4] ETR trip 1 or [2] Thermistor trip*	No
Parameter 1-93 Thermistor Source	*[2] Analog Input 54*	*[2] Analog Input 54*	*[2] Analog Input 54*	*[2] Analog Input 54*	No
Parameter 2-06 Parking Current	100%	100%	100%	100%	No
Parameter 2-07 Parking Time[5)]	0.5	0.5	0.5	0.5	No
Parameter 3-03 Maximum Reference	250	250	250	250	Yes
Parameter 3-41 Ramp 1 Ramp Up Time[6)]	3	3	3	3	No

Parameter	FC 360 1.1 kW (1.5 hp)	FC 360 1.5 kW (2 hp)	FC 360 2.2 kW (3.0 hp)	FC 360 3.0 kW (4.0 hp)	OneGearDrive function
	V210 Motor				
Parameter 3-42 Ramp 1 Ramp Down Time	3	3	3	3	No
Parameter 4-14 Motor Speed High Limit [Hz]	250	250	250	250	Yes
Parameter 4-18 Current Limit[12)]	≤87.2	≤107	≤154.2	≤160	No
Parameter 4-19 Max Output Frequency	260	260	260	260	Yes
Parameter 14-01 Switching Frequency[7)]	*[6] 6.0 kHz*	*[6] 6.0 kHz*	*[6] 6.0 kHz*	*[6] 6.0 kHz*	No
Parameter 14-03 Overmodulation	*[0] Off*	*[0] Off*	*[0] Off*	*[0] Off*	Yes
Parameter 14-51 DC-Link Compensation[8)]	*[0] Off*	*[0] Off*	*[0] Off*	*[0] Off*	Yes
Parameter 16-36 Inv. Nom. Current	3.0	3.7	5.3	7.2	No
Parameter 16-37 Inv. Max. Current	4.8	5.92	8.48	11.52	No
Parameter 30-20 High Starting Torque Time [s][9)]	0–2	0–2	0–2	0–2	No
Parameter 30-21 High Starting Torque Current [%][13)]	≤78	≤97	≤110	≤110	No
Parameter 30-22 Locked Rotor Protection[15)]	*[0] Off*	*[0] Off*	*[0] Off*	*[0] Off*	No
Parameter 30-23 Locked Rotor Detection Time [s]	1	1	1	1	No
Parameter 38-94 Lsigma[10)]	12	12	12	12	Yes
Parameter 1-71 Start Delay	0.2–< 10 s	0.2–< 10 s	0.2–< 10 s	0.2–< 10 s	No
Parameter 1-72 Start Function[19)]	*[2] Coast/delay time*	*[2] Coast/delay time*	*[2] Coast/delay time*	*[2] Coast/delay time*	No
Parameter 1-75 Start Speed [Hz][20)]	–	–	–	–	No
Parameter 1-76 Start Current[20)]	–	–	–	–	No
Parameter 2-20 Release Brake Current	2.0 A	2.0 A	2.0 A	2.0 A	No
Parameter 2-22 Activate Brake Speed [Hz][21)]	0.5 Hz	0.5 Hz	0.5 Hz	0.5 Hz	No
Parameter 2-23 Activate Brake Delay	0.4 s	0.4 s	0.4 s	0.4 s	No
Parameter 5-40 Function Relay	*[32] Mech brake ctrl*	*[32] Mech brake ctrl*	*[32] Mech brake ctrl*	*[32] Mech brake ctrl*	No

Table 5.4 VLT® AutomationDrive FC 360 in VVC+

1) High bandwidth for coping with sudden load change if needed. Acoustic noise demands are not important. If required by the application, change to [1] Medium or [4] Adaptive 2.

2) Nameplate: R_s=1.0, L_d=13.8 mH. For AMA run on VLT® AutomationDrive FC 360 with 50 m (164 ft): R_s=1.95, L_d=15.9 mH. Run AMA before first start to ensure the best starting performance.

3) Minimum current can be lower if the application runs at low speed for a long time.

4) It is not possible to disable flystart in all PM applications.

5) Increase parking time to ensure successful parking at high load and at high inertia.

6) Ramp time depends on the application.

7) Can be increased or decreased depending on the application. Less than 6 kHz is not recommended.

8) Disable this feature helps in keeping the DC voltage stable.

9) Special parameter for 1 current sensor drive. After running AMA, check that parameter 1-37 d-axis Inductance (Ld) = 1.15 x parameter 38-94 Lsigma. After this check, parameter 1-37 d-axis Inductance (Ld) can be changed.

10) Default is 50 m (164 ft). If the application uses a shorter cable, change this parameter.

11) Maximum value is limited to parameter 16-37 Inv. Max. Current/parameter 1-24 Motor Current x 100%.

12) Maximum value is limited to parameter 16-37 Inv. Max. Current/parameter 1-24 Motor Current x 90%.

13) This parameter is introduced in SW 1.4. If start problems occur for applications using long cables, change back to [1] Parking.

14) Default is [0] Off. If required, change to [1] On. Set a correct detection time.

15) Default is 5 x 3.5 x L_d/R_s. The value changes after running AMA.

16) Default is 4 x L_d/R_s. The value changes after running AMA.

17) Before running AMA, set parameter 1-24 Motor Current, parameter 1-25 Motor Nominal Speed, parameter 1-40 Back EMF at 1000 RPM, and parameter 1-42 Motor Cable Length. After a successful AMA, parameter 1-30 Stator Resistance (Rs), parameter 1-37 d-axis Inductance (Ld), parameter 1-15 Low Speed Filter Time Const., parameter 1-16 High Speed Filter Time Const., and parameter 1-17 Voltage filter time const. are updated.

18) FC 360 with PM motor only supports coast.

19) As parameter 1-72 Start Function = coast, parameter 1-76 Start Current is not relevant.

20) If an overcurrent alarm is issued or high instant current occurs, decrease parameter 2-22 Activate Brake Speed [Hz]

6 Test Procedures

6.1 Motor and Gearbox

The motor and gearbox of the VLT® OneGearDrive are considered as being 1 unit. When testing, it is therefore not possible to test the items separately. However, some checks can be made on the motor and the gearbox before starting the test.

Checking the motor component
Measure the insulation resistance of the winding with a commercially available measuring tool (for example, megger) between all winding parts and between the winding and the enclosure.

Measured value	Action/state
>50 MΩ	No drying necessary, new condition
<5 MΩ	Drying advised
Approximately 50 MΩ	Lowest allowed threshold

Table 6.1 Insulation Measurement Values

Checking the gear unit component

- **Oil**
  Change the oil in the OneGearDrive if the storage period exceeds 5 years or the temperatures were harsh throughout a shorter storage period. For detailed instructions on oil change, see *chapter 7.3 Oil*.
- **Shaft seals**
  Lubricate the hollow shaft seal with grease if the storage period exceeds 2 years. When changing the oil, check the function of the shaft seals between the motor and gear unit and on the output shaft. Replace the shaft seals if any change in shape, color, hardness, or sealing effect is detected.

Testing motor and gearbox
The OneGearDrive can only be tested when it is connected to a frequency converter. If the OneGearDrive has been repaired, connect it to a frequency converter and check for warnings and alarms.

Test results

- No warnings or alarms occur on the frequency converter - the test is passed.
- Warnings or alarms occur on the frequency converter - the test has failed.

If the test fails, exchange the OneGearDrive.

6.2 Brake

6.2.1 Tools Required

- Rectifier, suitable for U = 150 V, I = 0.1 A.
- Frequency converter, minimum 3 kW (4 hp).
- Volt meter, suitable for 150 V DC.

6.2.2 Test Procedure

6.2.2.1 Activation and Deactivation of the Brake

NOTICE

Run this procedure twice.

1. Connect terminals B1 (+) and B2 (-) to 140 V supply.
2. Test the voltage with a volt meter.
   2a If the brake deactivates (a click is heard), the test is passed.
3. Disconnect the voltage supply.
   3a If the brake activates (a click is heard), the test is passed.

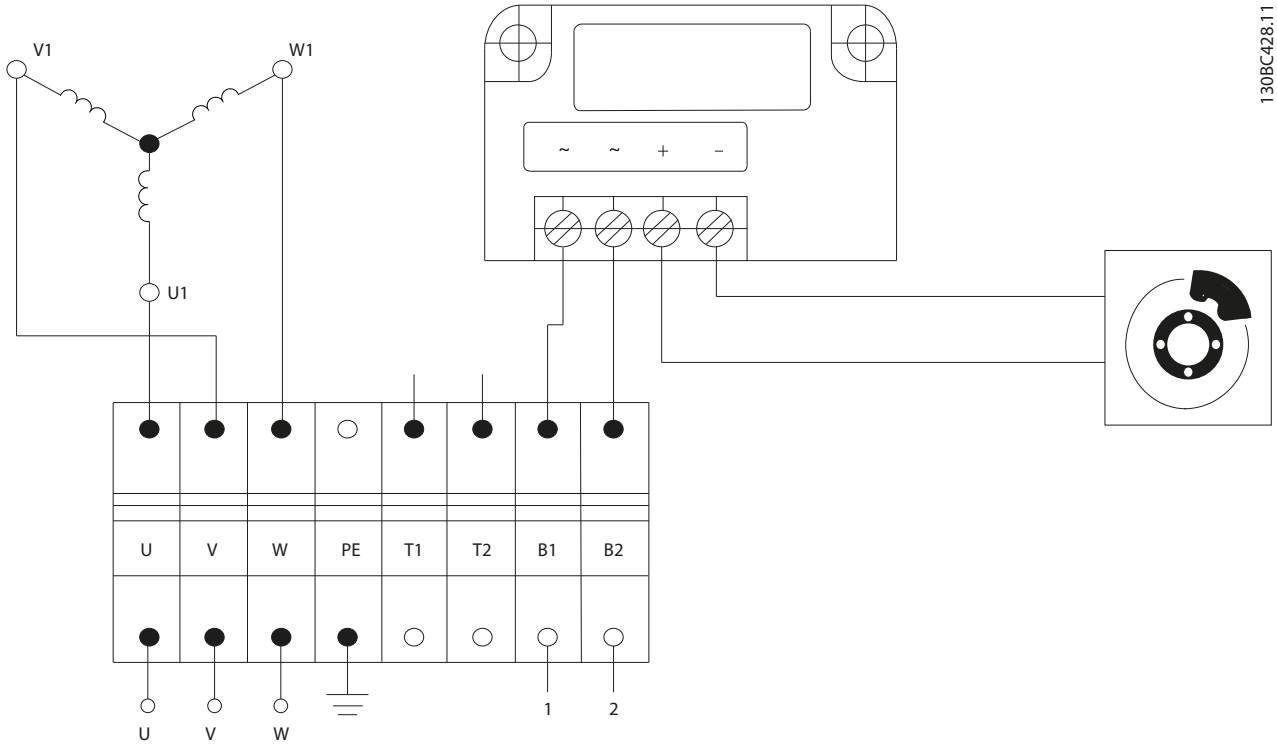


Illustration 6.1 Spring Clamp and Connection to a Frequency Converter

6

6.2.2.2 Noise from the Brake

NOTICE

To ease the evaluation of noise, it is helpful to compare the noise level to the level from a unit that has previously passed the test.

NOTICE

The brake cover may influence the noise level

1. Increase the motor speed to 500–3000 RPM in both directions.
2. Listen for unusual noise such as loud, jarring sounds. However, clicking sounds from the brake is normal when the motor runs.
   - 2a If loud, unusual noises are heard, the test has failed.

6.2.2.3 Dynamic Brake Test

1. Activate the brake at 1500 RPM motor speed.
   - 1a If the motor stops and the frequency converter shows an alarm, the test is passed.
   - 1b If the motor does not stop, the test has failed.

6.3 Oil

6.3.1 Checking the Oil Level

NOTICE

Danfoss provides an oil level gauge constructed for the values required by the VLT® OneGearDrive.
The oil level for P3 units has to be between T1 and T2.
The oil level for P2 units has to be between T3 and T4.

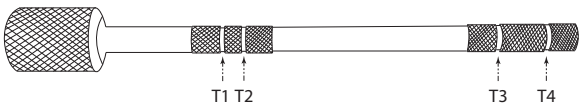


Illustration 6.2 Oil Level Gauge

1. Insert the oil level gauge into the screw hole.
2. Push the oil level gauge to the bottom of the gearbox housing.
3. Remove the oil level gauge and read out the oil level.

6.4 Hollow Shaft Seal

Oil and grease from the application system sometimes appear around the hollow shaft seal. Run the following test to check if the seal is damaged:

1. Remove the VLT® OneGearDrive from the system.
2. Clean all surfaces.
3. Run the OGD at 200 Hz in both directions for 24 hours.

If the seal leaks oil after this test, it is damaged and must be replaced.

7 Disassembly and Assembly Instructions

7.1 Complete VLT® OneGearDrive Unit

⚠WARNING

HIGH VOLTAGE

Potentially lethal voltage is present on the connectors, which can lead to death or serious injury.

- **Before working on the power connectors (disconnecting or connecting the cable to the VLT®OneGearDrive), disconnect the supply to the frequency converter and wait for the discharge time to elapse (see the frequency converter *operating instructions*).**
- **Installation, start-up, maintenance, and decommissioning must only be performed by qualified personnel.**

⚠CAUTION

DANGER OF BURNS

The surface of the OneGearDrive and the oil in the OneGearDrive can reach high temperatures during operation.

- **Do not touch the OneGearDrive until it has cooled down.**
- **Do not carry out an oil change until the oil has cooled sufficiently.**

1. Disconnect the supply to the frequency converter and wait for the discharge time to elapse (see the frequency converter *operating instructions*).
2. Remove the electrical cable from the frequency converter to the VLT® OneGearDrive.
3. Dismount the OneGearDrive.

7.1.1 Mounting Procedure

1. Fasten the VLT® OneGearDrive by its flange using the torque arm (see *chapter 7.6.1 Torque Arm Set*).
2. Attach the OneGearDrive on to the driven shaft using the means provided.

7.2 Oil Seal/Shaft Seal

NOTICE

Always use original spare parts from Danfoss.

NOTICE

EQUIPMENT DAMAGE

Damage to the paint coating destroys its protective function. Always use the original Danfoss paint repair set - Standard or Hygienic. See *chapter 5.1.1 Paint Repair*.

1. Remove the OneGearDrive from the shaft.
2. To avoid draining oil, fix the OneGearDrive in an upright position (vertical hollow shaft).
3. Carefully remove the hollow shaft seal with a screwdriver or a specific tool.

NOTICE

EQUIPMENT DAMAGE

Avoid scratching or damaging the hollow shaft with the screwdriver. Massive surface damage leads to irreversible leaking areas.

4. Clean the surface to remove oil and grease, and check for any loose parts or massive surface damage.
5. Grease the inner circle of the new seal and mount it on the hollow shaft.

If more than 50 ml oil has been drained during the leakage:

1. Check the oil level with the oil service kit (mounting position P3 only).
2. Exchange the oil and fill in the oil volume as shown on the nameplate.

7.3 Oil

7.3.1 Oil Changes

The VLT® OneGearDrive is supplied with oil ready for operation.

The oil change interval is based on normal operating conditions and an oil temperature of approximately 80 °C (176 °F). The oil change interval must be reduced at higher temperatures (halve it for each 10 K increase in the oil temperature).

The oil change period in part load is up to 35000 hours run (for motor characteristics at different loads, see *chapter Speed/Torque Characteristics* in the *operating instructions*).

The OneGearDrive has drain and filling plugs that make it possible to change the oil without disassembly.

When changing the oil, inspect the seals, and replace them if necessary.

Flush the OneGearDrive if the oil grade or oil type is changed.

Flushing the OneGearDrive
See *chapter 7.3.4 Changing the Oil*.

7.3.2 Oil Grade

The filled oil type is specified on the nameplate. Danfoss uses food grade oils that comply with NSF H1.

Do not mix different oil types as this may impair the characteristics of the oil.

Contact Danfoss for further information on oil types.

7.3.3 Oil Volume

The recommended oil quantity for the particular mounting position is indicated on the motor nameplate. When filling, ensure that the upper gear unit components are also lubricated.

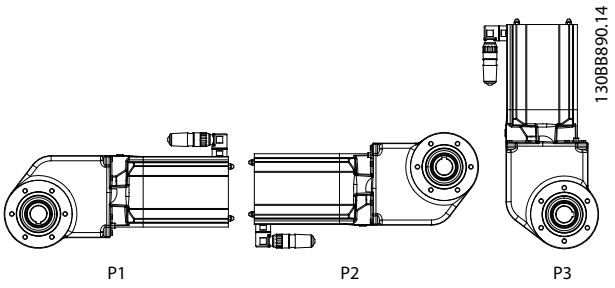


Illustration 7.1 Mounting Positions

	Mounting position		
	P1[1)]	P2	P3
Oil volume for OneGearDrive [l (fl oz)]	2.2 (74.4)		3.1 (105)

Table 7.1 Oil Volume in Litres

1) P1 is no longer available in the Danfoss DRIVECAT configurator. Use P2 also for P1 installations.

7.3.4 Changing the Oil

⚠CAUTION

DANGER OF BURNS

The surface of the OneGearDrive and the oil in the OneGearDrive can reach high temperatures during operation.

- **Do not touch the OneGearDrive until it has cooled down.**
- **Do not carry out an oil change until the oil has cooled down sufficiently.**

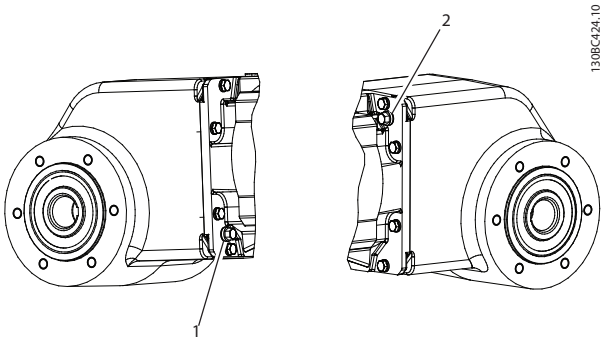


Illustration 7.2 OneGearDrive Oil Screws 1 and 2

Draining the oil

1. Once the OneGearDrive and the oil have cooled down, remove the OneGearDrive from your system.
2. Bring the OneGearDrive into a vertical position and remove oil screws (1) and (2).
3. Turn the OneGearDrive into a horizontal position and drain the oil through screw hole 1 into a suitable container.
4. Turn the OneGearDrive back into a vertical position.

Filling the oil

1. Fill the OneGearDrive with the appropriate amount of oil through screw hole (1).
2. Remove all traces of oil from the surface of the OneGearDrive using a soft cloth.
3. Reinsert and tighten oil screws (1) and (2).

NOTICE

The required oil quantities can be found on the nameplate and in *chapter 7.3.3 Oil Volume*.

NOTICE

The original Danfoss stainless steel oil screws can be reused. They do not require any additional seal.

7

NOTICE

The OneGearDrive does not require any breather vents. Never install a breather vent instead of the oil screws.

7.4 Changing the Mounting Position

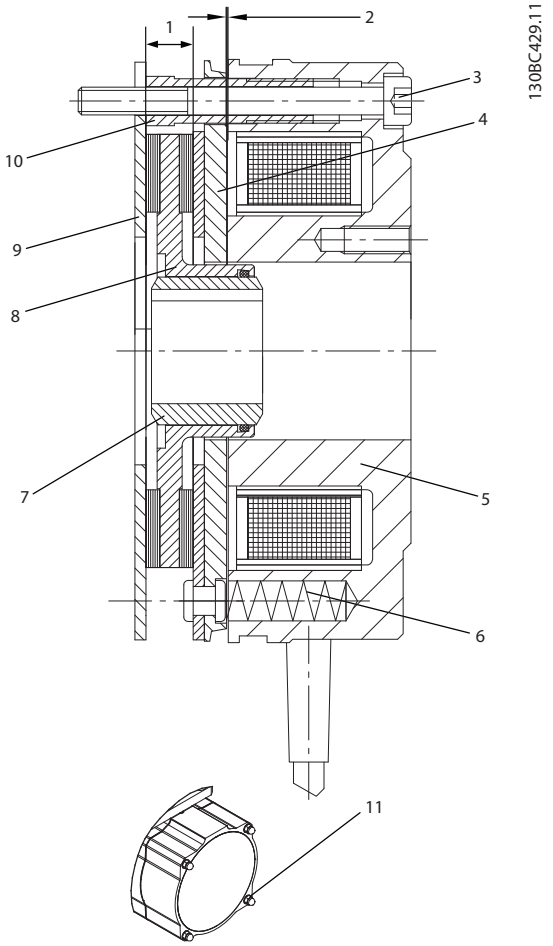
If the mounting position is changed, note the recommended oil quantity for the new mounting position. When filling, ensure that the upper gear unit components are also lubricated.

To adjust and check the oil level, refer to *chapter 6.3 Oil* and *chapter 7.3.3 Oil Volume*

7.5 Replacing the Brake and Rotor

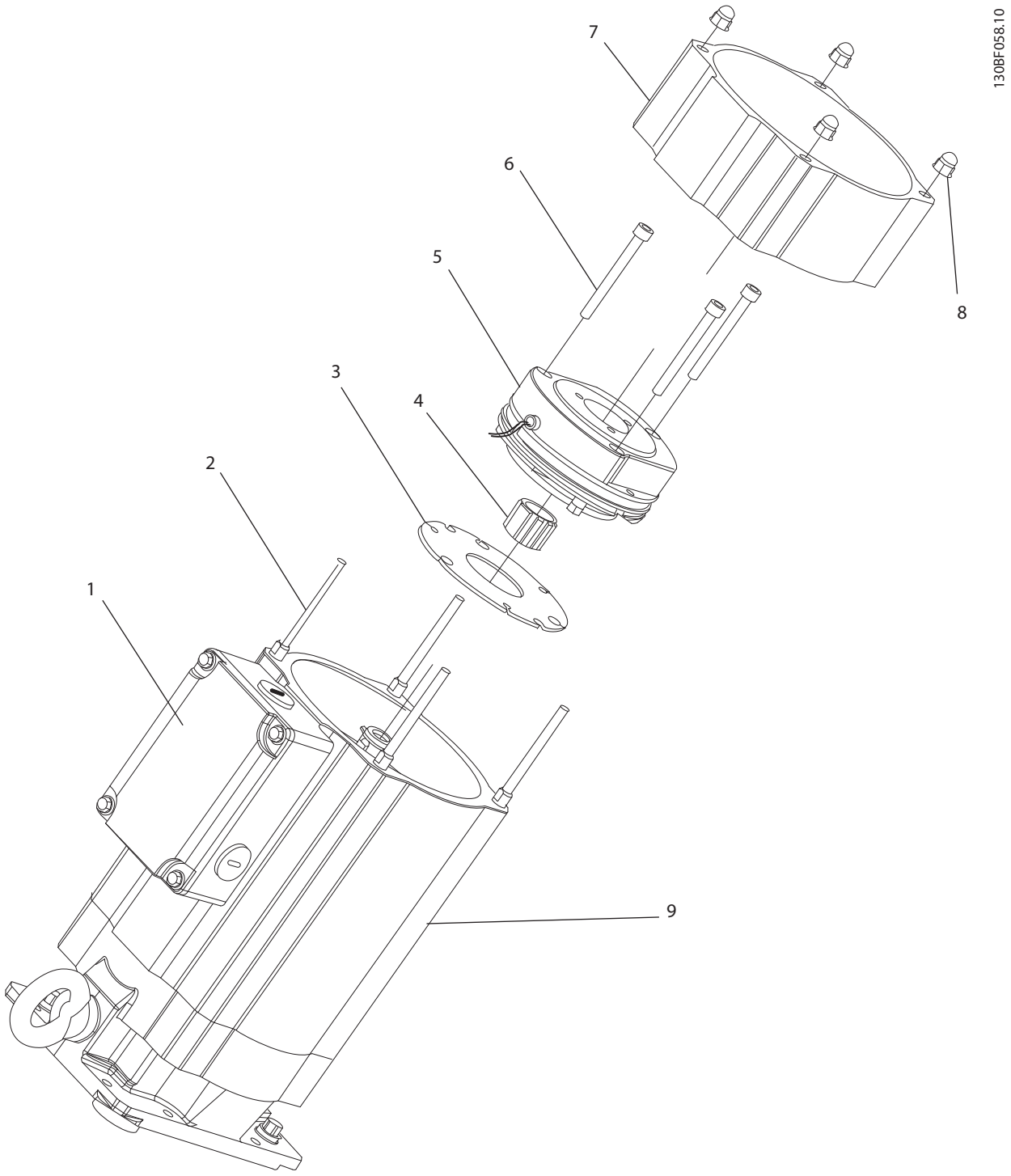
All work must only be carried out by qualified technical personnel on a stationary machine that has been protected against restarting. This also applies to auxiliary circuits.

7



1	Rotor width, minimum 5.5 mm (0.2 in)
2	Air gap, maximum 0.45 mm (0.02 in)
3	Fastening screws
4	Armature plate
5	Magnet
6	Springs
7	Hub for rotor
8	Rotor
9	Friction plate
10	Hollow screws
11	Brake cover and nuts

Illustration 7.3 Brake and Rotor



1	Terminal box	6	Brake screws
2	Bolts	7	Brake cover
3	Friction plate	8	Brake cover screws
4	Brake hub	9	VLT® OneGearDrive
5	Brake		

Illustration 7.4 Brake, Exploded View

1. Open the terminal box (1).
2. Disconnect the brake cables from the rectifier, see *chapter 3.4.4 Mechanical Brake Connections*.
3. Open the 4 screws on the back of the motor.
4. Remove the brake cover screws (8).
5. Remove the brake cover (7) from the OneGearDrive (9).
6. Loosen the 3 screws (6) from the brake (5).
7. Remove the brake and rotor from the rotor shaft.
8. Assemble the new brake and rotor (see also *chapter 9 Spare Parts and Accessories*).
9. Tighten the brake screws (6).
10. Connect the brake cable to the rectifier.
11. Check the function of the brake, see *chapter 6.2 Brake*.
    - 11a If the test is successful, proceed to step 12.
    - 11b If the test fails, replace the rectifier, see *chapter 9 Spare Parts and Accessories* for ordering numbers.
12. Place the brake cover (7) on the brake (5).
13. Tighten the brake cover screws (8).
14. Tighten the 4 screws on the back of the motor.
15. Close the terminal box.

NOTICE

After the rotor has been exchanged, the complete brake power is only effective after the brake linings at the rotor have been run in.
Check the brake cover seal before closing it and exchange the seal if any damage is detected.

7.6 Torque Arm

7.6.1 Torque Arm Set

Part number: 178H5006

The torque arm set consists of the torque arm (see *Illustration 7.5*) and the mounting set (see *Illustration 7.6*).

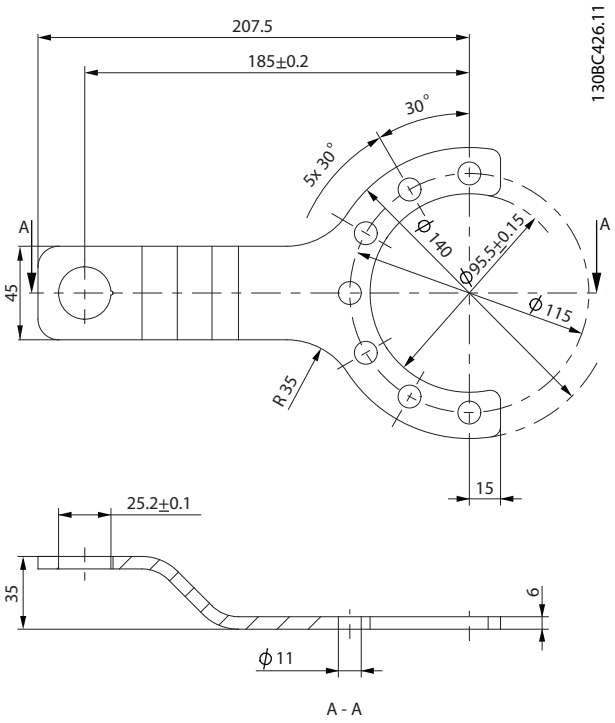
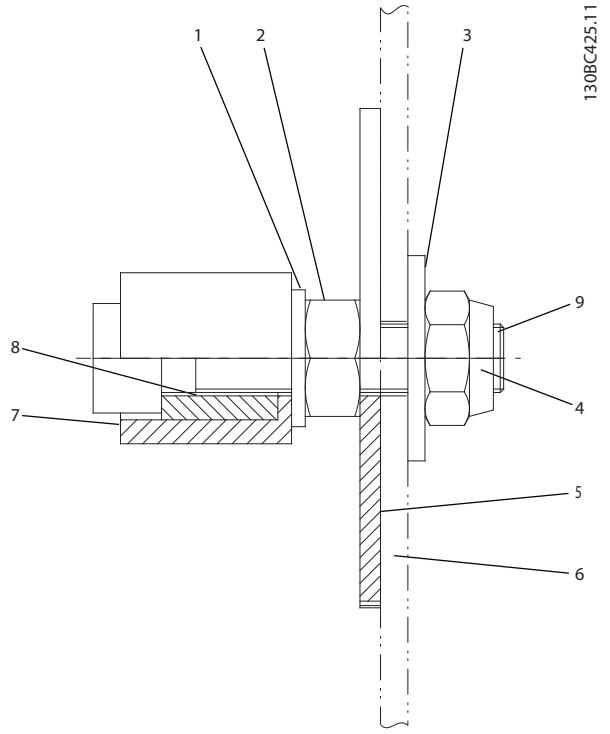


Illustration 7.5 Torque Arm



Position	Description	Specification
1	Disc	DIN 125-A10 5
2	Nut	DIN 934 M10
3	Disc	DIN 9021 10, 5x30x25
4	Nut	DIN 985 M10
5	Disc	Ø73x3 stainless steel
6	Customer frame	–
7	Barrel	POM-C white
8	Bushing	Stainless steel
9	Screw	Stainless steel

Illustration 7.6 Mounting Set

NOTICE

The set also contains 3xDIN 933, M10x25, 8.8, stainless steel screws. The tightening torque is 49 Nm (433.7 in-lb).

NOTICE

Only use the original Danfoss or comparable mounting set to mount the OneGearDrive to the conveyor. The mounting equipment used must ensure the same degree of flexibility as the original Danfoss mounting set. The torque arm cannot be screwed directly onto the conveyor frame.

8 After Repair Test

8.1 After Repair Tests

Perform after repair tests to ensure that:

- The seals are tight (see *chapter 6.4 Hollow Shaft Seal*).
- The oil level is correct (see *chapter 6.3 Oil*).
- The brake and rotor function correctly (see *chapter 6.2 Brake*).
- No unexpected noises come from the motor and gearbox and that there are no short circuits (see *chapter 5.2 Fault Symptom Troubleshooting* and *chapter 6.1 Motor and Gearbox*).

If the after repair tests indicate that there are problems in any of the above-listed areas, redo the relevant test as described in *chapter 6 Test Procedures*.

9 Spare Parts and Accessories

9.1 Spare Parts

Description	Ordering number
Brake 10, 180 V DC	178G1707
Brake rectifier 10, 180 V DC	178G1708
Hollow shaft seal NBR (steel shafts, 5-piece set)	178G5504
Hollow shaft seal Viton FPM (stainless steel shaft, 5-piece set)	178G5505
Hollow shaft cover (including 3 screws)	178G5011
Contact motor connector 2 mm (0.08 in) (25-piece set)	178G1042
Contact motor connector 1 mm (0.04 in) (25-piece set)	178G1043
Crimp tool set	178G1033
Service kit oil check	178G9935
Paint repair set standard (road delivery only, 3-piece set)	178G9004
Paint repair set hygienic (road delivery only, 2-piece set)	178G9005

Table 9.1 Descriptions and Ordering Numbers

9.2 Accessories

Description	Ordering number
Motor connector without cable	178H1613
Motor connector with 5 m (16.4 ft) cable	178H1630
Motor connector with 10 m (32.8 ft) cable	178H1631
Torque arm, stainless steel	178H5006
ExtensionBox	178G5193

Table 9.2 Descriptions and Ordering Numbers

10 Power-dependent Specifications

10.1 Power Sizes

Type code	Power size [kW (hp)]	
	With VLT® AutomationDrive FC 302 and VLT® Decentral Drive FCD 302	With VLT® AutomationDrive FC 360
L09 (7.2 A)	1.5–3.0 (2.0–4.0)	2.2–3.0 (3.0–4.0)
L06 (V 210 with 5.5 A)	0.75–2.2 (1.0–3.0)	1.1–.2. (1.5–3.0)

Table 10.1 Power Sizes

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Ulsnaes 1
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