SEW EURODRIVE

Compact Operating Instructions

MOVIDRIVE® MDX60B/61B

Edition 11/2017

24770531/EN

Contents

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1 General information

1.1 About this documentation

The current version of the documentation is the original.

This documentation is an integral part of the product. The documentation is written for all employees who assemble, install, start up, and service this product.

Make sure this documentation is accessible and legible. Ensure that persons responsible for the machinery and its operation as well as persons who work on the product independently have read through the documentation carefully and understood it. If you are unclear about any of the information in this documentation or require further information, contact SEW-EURODRIVE.

1.2 Structure of the safety notes

1.2.1 Meaning of signal words

The following table shows the grading and meaning of the signal words for safety notes.

Signal word	Meaning	Consequences if disregarded
⚠ **DANGER**	Imminent hazard	Severe or fatal injuries
⚠ **WARNING**	Possible dangerous situation	Severe or fatal injuries
⚠ **CAUTION**	Possible dangerous situation	Minor injuries
NOTICE	Possible damage to property	Damage to the product or its environment
INFORMATION	Useful information or tip: Simplifies handling of the product.	

1.2.2 Structure of section-related safety notes

Section-related safety notes do not apply to a specific action but to several actions pertaining to one subject. The hazard symbols used either indicate a general hazard or a specific hazard.

This is the formal structure of a safety note for a specific section:

SIGNAL WORD

Type and source of hazard.

Possible consequence(s) if disregarded.

- Measure(s) to prevent the hazard.

Meaning of the hazard symbols

The hazard symbols in the safety notes have the following meaning:

Hazard symbol	Meaning
	General hazard

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Hazard symbol	Meaning
	Warning of dangerous electrical voltage
	Warning of hot surfaces
	Warning of risk of crushing
	Warning of suspended load
	Warning of automatic restart

1.2.3 Structure of embedded safety notes

Embedded safety notes are directly integrated into the instructions just before the description of the dangerous action.

This is the formal structure of an embedded safety note:

⚠ **SIGNAL WORD** Type and source of hazard. Possible consequence(s) if disregarded. Measure(s) to prevent the hazard.

1.3 Rights to claim under limited warranty

Read the information in this documentation. This is essential for fault-free operation and fulfillment of any rights to claim under limited warranty. Read the documentation before you start working with the product.

1.4 Exclusion of liability

Read the information in this documentation, otherwise safe operation is impossible. You must comply with the information contained in this documentation to achieve the specified product characteristics and performance features. SEW-EURODRIVE assumes no liability for injury to persons or damage to equipment or property resulting from non-observance of these operating instructions. In such cases, SEW-EURODRIVE assumes no liability for defects.

1.5 Other applicable documentation

Observe the corresponding documentation for all further components.

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1.6 Product names and trademarks

The brands and product names in this documentation are trademarks or registered trademarks of their respective titleholders.

1.7 Copyright notice

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2 Safety notes

The following basic safety notes must be read carefully to prevent injury to persons and damage to property. The operator must ensure that the basic safety notes are read and adhered to. Make sure that persons responsible for the plant and its operation, as well as persons who work independently on the device, have read through the operating instructions carefully and understood them. If you are unclear about any of the information in this documentation, or if you require further information, please contact SEW-EURODRIVE.

2.1 General

Never install damaged products or take them into operation. Submit a complaint to the shipping company immediately in the event of damage.

During operation, inverters can have live, bare and movable or rotating parts as well as hot surfaces, depending on their degree of protection.

Removing covers without authorization, improper use, or incorrect installation and operation may result in severe injuries to persons or damage to machinery.

Refer to the documentation for additional information.

2.2 Target group

Only qualified electricians are authorized to install, start up or service the units or correct device faults (observing IEC 60364 or CENELEC HD 384 or DIN VDE 0100 and IEC 60664 or DIN VDE 0110 as well as national accident prevention guidelines).

Skilled persons (electrically) in the context of these basic safety notes are all persons familiar with the installation, assembly, startup and operation of the product who possess the necessary qualifications.

All persons involved in any other work, such as transportation, storage, operation and waste disposal, must be trained appropriately.

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2.3 Designated use

Drive inverters are components intended for installation in electrical systems or machines.

In case of installation in machines, startup of the inverters (meaning the start of designated use) is prohibited until it is determined that the machine meets the requirements stipulated in the Machinery Directive 2006/42/EC; EN 60204 must be observed.

Startup (i.e. the start of designated use) is only permitted under observance of the EMC Directive (2014/30/EU).

The drive inverters meet the requirements stipulated in low voltage guideline 2014/35/EU. The harmonized standards of the EN 61800-5-1/DIN VDE T105 series in connection with EN 60439-1/VDE 0660 part 500 and EN 60146/VDE 0558 are applied to these inverters.

Adhere to the technical data and information on the connection requirements as provided on the nameplate and in the documentation.

2.3.1 Safety Functions

MOVIDRIVE® MDX60/61B drive inverters may not perform safety functions without higher-level safety systems. Use higher-level safety systems to ensure protection of equipment and personnel.

For safety applications, observe the specifications in the "MOVIDRIVE® MDX60B/61B Functional Safety" manual.

2.4 Transportation and storage

Observe the notes on transportation, storage and proper handling. Observe the climatic conditions as stated in the section "General technical data".

2.5 Setup

The units must be installed and cooled according to the regulations and specifications in the corresponding documentation.

Protect the drive inverters from excessive strain. Ensure that elements are not deformed and/or insulation spaces are maintained, particularly during transportation. Avoid contact with electronic elements and contacts.

Drive inverters contain components that can be damaged by electrostatic energy and improper handling. Prevent mechanical damage or destruction of electric components (may pose health risk).

The following applications are prohibited unless the device is explicitly designed for such use:

- Use in potentially explosive atmospheres.
- Use in areas exposed to harmful oils, acids, gases, vapors, dust, radiation, etc.
- Use in non-stationary applications which are subject to mechanical vibration and impact loads in excess of the requirements in EN 61800-5-1.

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2.6 Electrical connection

Observe the applicable national accident prevention guidelines when working on live inverters (e.g. BGV A3).

Electrical installation must be carried out in compliance with pertinent regulations (e.g. cable cross sections, fusing, protective conductor connection). For any additional information, refer to the applicable documentation.

⚠ WARNING

Electric shock due to charged capacitors. Dangerous voltage levels may still be present inside the device and at the terminals up to 10 minutes after disconnection from the power supply.

Severe or fatal injuries.

- Wait for 10 minutes after the frequency inverter has been separated from the voltage supply. Make sure that the device is de-energized. Only then must you commence any work on the device.
- Observe the corresponding information signs on the frequency inverter.

You will find notes on EMC compliant installation, such as shielding, grounding, arrangement of filters and routing of lines, in the documentation of the drive inverters. Always observe these notes even with inverters bearing the CE marking. The manufacturer of the system or machine is responsible for maintaining the limits established by EMC legislation.

Preventive measures and protection devices must correspond to the regulations in force (e.g. EN 60204 or EN 61800-5-1).

Required preventive measure: Grounding the device.

MOVIDRIVE® B in size 7 is equipped with an additional indicator LED under the lower front cover. If the indicator LED is lit up, DC link voltage is present. Do not touch power connections. Check that there is no voltage present before touching power connections even if the LED display indicates that there is no voltage.

2.7 Protective separation

The device meets all requirements for reliable isolation of power and electronics connections in accordance with EN 61800-5-1. All connected circuits must also satisfy the requirements for safe disconnection to ensure reliable isolation.

2.8 Operation

Systems into which the drive inverters are installed must be equipped with additional monitoring and protection devices, if necessary, according to applicable safety regulations; e.g. the German law governing technical equipment (Gesetz über technische Arbeitsmittel), accident prevention regulations, etc. The operating software may be used to make changes to the drive inverter.

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⚠ WARNING

Electric shock due to charged capacitors. Dangerous voltage levels may still be present inside the device and at the terminals up to 10 minutes after disconnection from the power supply.

Severe or fatal injuries.

- Wait for 10 minutes after the frequency inverter has been separated from the voltage supply. Make sure that the device is de-energized. Only then must you commence any work on the device.
- Observe the corresponding information signs on the frequency inverter.

Keep all covers and doors closed during operation.

The fact that the status LED and other display elements (such as the display LED on size 7 units) are no longer illuminated does not indicate that the device has been disconnected from the power supply and no longer carries any voltage.

Check that there is no voltage present before touching power connections even if the LED display indicates that there is no voltage.

Mechanical blocking or internal safety functions of the device can cause a motor standstill. Eliminating the cause of the problem or performing a reset may result in the drive re-starting automatically. If, for safety reasons, this is not permitted for the drive-controlled machine, disconnect the device from the supply system before you start troubleshooting.

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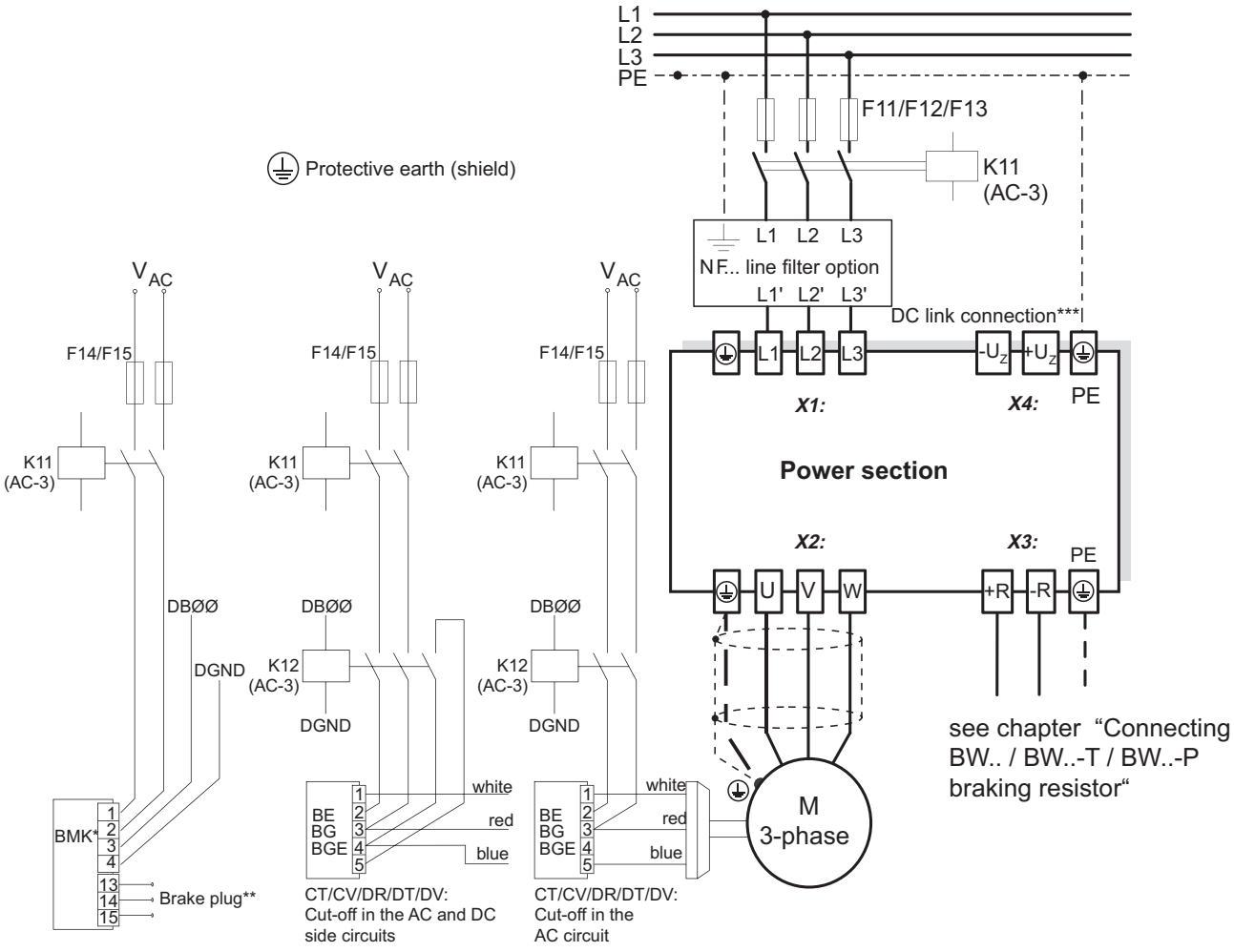
3 Installation

MOVIDRIVE® B application inverters are exclusively suitable for control cabinet installation according to the degree of protection.

3.1 Wiring diagrams for basic device

3.1.1 Power section (sizes 0 – 6) and brake



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** **Strictly adhere to the connection sequence of the brake connector.** Incorrect connection will cause irreparable damage to the brake. **Observe the operating instructions of the used motors** when connecting the brake using the terminal box.

*** With sizes 1, 2 and 2S, there is no PE connection next to the supply system connection terminals and motor connection terminals (X1, X2). In this case, use the PE terminal next to the DC link connection (X4).

INFORMATION

Folgen

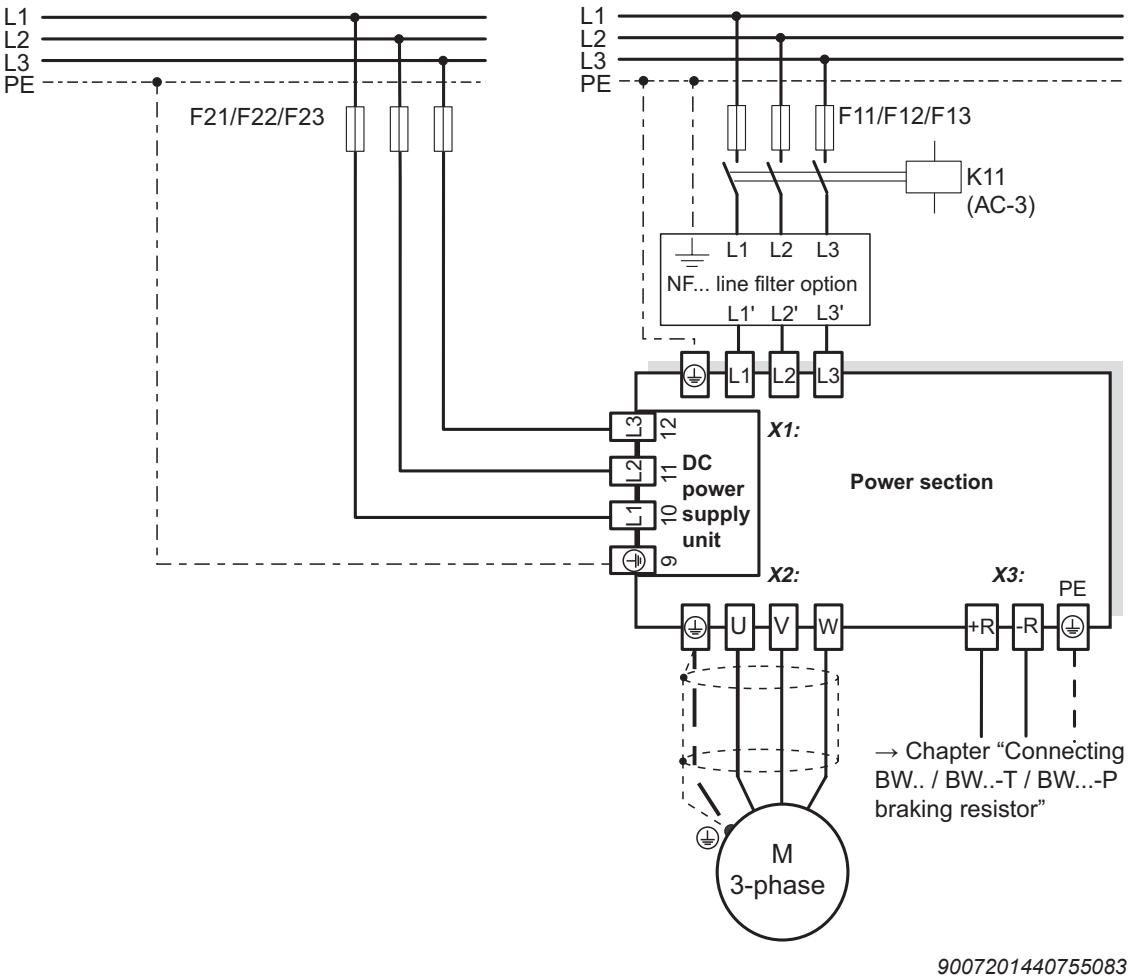
- Connect the brake rectifier using a separate supply system lead.
- **Supply via the motor voltage is not permitted.**

Always switch off the brake on the DC and AC sides with:

- All lifting applications,
- Drives that require a rapid brake response time
- CFC and SERVO operating modes.

3.1.2 Power section and DC power supply unit (size 7)

For connecting the brake, refer to the wiring diagram of size 1 – 6.



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Technical data of DC power supply unit:

- Nominal line current: AC 2.4 A
- Inrush current AC 30 A / AC 380 - 500 V

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INFORMATION

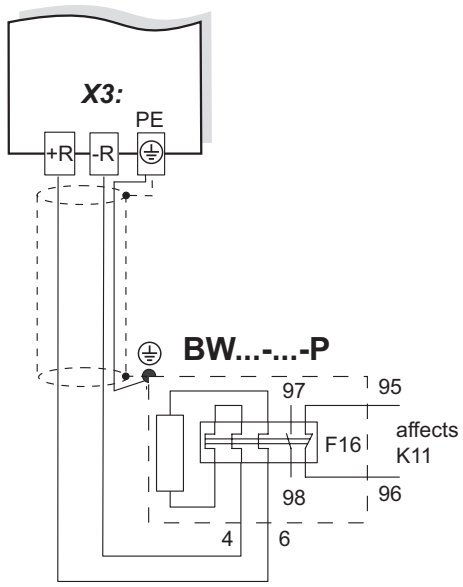
Note that the connection of external +24 V power supply units to the X10:9 control terminal is not permitted in backup mode via power supply unit. Incorrect connection prompts an error message.

3.1.3 Brake rectifier in control cabinet

Install the connection cables between the brake rectifier and the brake separately from other power cables when installing the brake rectifier in the control cabinet. Joint installation is only permitted with shielded power cables.

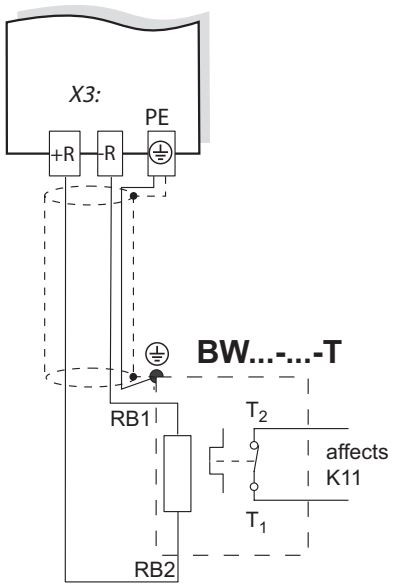
3.1.4 Braking resistor BW... / BW...-...-T /BW...-...-P

Power section



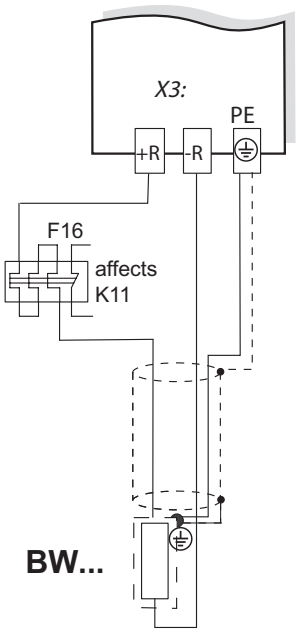
When the signal contact F16 trips, K11 must be opened and DIØØ/"controller inhibit" must receive a "0" signal. The resistor circuit must not be interrupted.

Power section



When the internal temperature switch trips, K11 must be opened and DIØØ/"controller inhibit" must receive a "0" signal. The resistor circuit must not be interrupted.

Power section



When the external bimetallic relay (F16) trips, K11 must be opened and DIØØ/"controller inhibit" must receive a "0" signal. The resistor circuit must not be interrupted.

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	Overload protection		
Braking resistor type	**Design specified**	**Internal temperature switch (..T), (..P)**	**External bimetallic relay (F16)**
BW...	-	-	Required
BW...-...-T / P	-	One of the 2 options must be selected (internal temperature switch / external bimetallic relay).	
BW...-003 / BW...-005	Adequate	-	Permitted
BW090-P52B	Adequate	-	-

3.1.5 Description of terminal functions on the basic device (power section and control unit)

Terminal		Function
X1:1/2/3	L1/L2/L3 (PE)	Line connection
X2:4/5/6	U/V/W (PE)	Motor connection

Terminal		Function	
X3:8/9	+R/-R (PE)	Braking resistor connection	
X4:	$+U_Z$/$-U_Z$ (PE)	DC link connection	
9,10,11,12	**L1/L2/L3/PE**	Connection of switched-mode power supply (only for size 7)	
S11:		Changeover I signal DC(0(4) – 20 mA) ↔ U signal DC(-10 V – 0 – 10 V, 0 – 10 V), factory set to U signal.	
S12:		Switching system bus terminating resistor on/off; factory setting: OFF.	
S13:		Set baud rate for the RS485 interface XT. Either 9.6 or 57.6 baud, factory set to 57.6 baud.	
S14:		Switch frequency input on or off, factory setting: switched off.	
X12:1	DGND	Reference potential system bus	
X12:2	SC11	System bus high	
X12:3	SC12	System bus low	
X11:1	REF1	DC+10 V (max. DC 3 mA) for setpoint potentiometer	
X11:2/3	AI11/12	Setpoint input n1 (differential input or input with AGND reference potential), signal form → P11_/ S11	
X11:4	AGND	Reference potential for analog signals (REF1, REF2, AI.., AO..)	
X11:5	REF2	DC–10 V (max. DC 3 mA) for setpoint potentiometer	
X13:1	DIØØ	Digital , with fixed assignment "/Controller inhibit"	• The digital inputs are electrically isolated by opto-couplers. • Selection options for digital inputs 2 – 6 (DIØ1 – DIØ5) → Parameter menu P60_
X13:2	DIØ1	Digital input 2, factory set to "CW/stop"	
X13:3	DIØ2	Digital input 3, factory set to "CCW/stop"	
X13:4	DIØ3	Digital input 4, factory set to "Enable/stop"	
X13:5	DIØ4	Digital input 5, factory set to "n11/n21"	
X13:6	DIØ5	Digital input 6, factory set to "n12/n22"	
X13:7	DCOM	Reference for digital inputs X13:1 – X13:6 (DIØØ – DIØ5) and X16:1/X16:2 (DIØ6 – DIØ7) • Switching digital inputs with DC+24 V external voltage: Connection X13:7 (DCOM) must be connected to the reference potential of the external voltage. – Without jumper X13:7-X13:9 (DCOM-DGND) → Isolated digital inputs – With jumper X13:7-X13:9 (DCOM-DGND) → Non-isolated digital inputs • The digital inputs must be switched with DC+24 V from X13:8 or X10:8 (VO24) → Jumper required X13:7-X13:9 (DCOM-DGND).	
X13:8	VO24	Auxiliary voltage output DC+24 V (max. load X13:8 **and** X10:8 = 400 mA) for external command switches	
X13:9	DGND	Reference potential for binary signals	
X13:10	ST11	RS485+ (baud rate has a fixed setting of 9.6 kBaud)	
X13:11	ST12	RS485-	
X16:1	DIØ6	Digital input 7, factory set to "No function"	• The digital inputs are electrically isolated by opto-couplers. • Selection options for digital inputs 7 to 8 (DIØ6/ DIØ7) → Parameter menu P60_ • Selection options for digital outputs 3 to 5 (DOØ3 – DOØ5) → Parameter menu P62_
X16:2	DIØ7	Digital input 8, factory set to "No function"	
X16:3	DOØ3	Digital output 3, factory set to "IPOS output"	
X16:4	DOØ4	Digital output 4, factory set to "IPOS output"	
X16:5	DOØ5	Digital output 5, factory set to "IPOS output" **Do not connect external voltage to digital outputs X16:3 (DOØ3) and X16:5 (DOØ5)!**	
X16:6	DGND	Reference potential for binary signals	
X10:1	TF1	KTY+/TF-/TH connection (connect to X10:2 via TF/TH), factory set to "No response" (→ P835)	
X10:2	DGND	Reference potential for binary signals / KTY–	
X10:3	DBØØ	Digital output DBØØ with fixed assignment "/Brake", load capacity max DC 150 mA (short-circuit proof, protected against external voltage to DC 30 V)	
X10:4	DOØ1-C	Shared contact digital output 1, factory set to "Ready"	
X10:5	DOØ1-NO	Normally open contact digital output 1, max. load capacity of relay contacts DC 30 V and DC 0.8 A	
X10:6	DOØ1-NC	NC contact digital output 1	
X10:7	DOØ2	Digital output DBØ2, factory set to "/Fault", max. load capacity DC 50 mA (short-circuit proof, protected against external voltage to DC 30 V). Selection options for digital outputs 1 and 2 (DOØ1 and DOØ2) → Parameter menu P62_. Do not apply external voltage to digital outputs X10:3 (DBØØ) and X10:7 (DOØ2).	
X10:8	VO24	Auxiliary voltage output DC+24 V (max. additional load X13:8 **and** X10:8 = 400 mA) for external command switches	
X10:9	VI24	Input DC+24 V voltage supply (backup voltage depending on options, unit diagnosis when supply system off)	

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Terminal		Function
X10:10	DGND	Reference potential for binary signals **Information on X:10.9: Only connect external backup voltage DC +24 V to sizes 0 – 6. With size 7, the DC power supply unit must be connected to the supply system. Refer to chapter** "Power section and DC power supply unit (size 7)" (→ 12)**.**
X17:1	DGND	Reference potential for X17:2
X17:2	VO24	Auxiliary voltage output DC+24 V, **only to supply X17:4 on the same device. Maximally 1 additional BST may be connected**
X17:3	SOV24	Reference potential for DC +24 V "STO" input (safety contact)
X17:4	SVI24	DC+24 V "STO" input (safety contact)
XT		Only service interface. Option slot: DBG60B / UWS21B / USB11A

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4 Startup

4.1 General startup instructions

⚠ WARNING

Uncovered power connections.

Severe or fatal injuries from electric shock.

- Install the touch guard according to the regulations.
- Never start the device if the touch guard is not installed.

4.1.1 Prerequisite

The drive must be configured correctly to ensure that startup is successful. Refer to the MOVIDRIVE® MDX60/61B system manual for detailed project planning notes and an explanation of the parameters.

4.2 Operation of MOVITOOLS® MotionStudio

4.2.1 About MOVITOOLS® MotionStudio

Jobs

The software package enables you to perform the following tasks with consistency:

- Establishing communication with devices
- Executing functions of the devices

Establishing communication with devices

The SEW Communication Server is integrated into the MOVITOOLS® MotionStudio software package for establishing communication with the units.

The SEW Communication Server allows you to create **communication channels**. Once the channels are established, the devices communicate via these communication channels using their communication options. You can operate up to four communication channels at the same time.

MOVITOOLS® MotionStudio supports the following types of communication channels:

- Serial (RS485) via interface adapters
- System bus (SBus) via interface adapters
- Ethernet
- EtherCAT®
- Fieldbus (PROFIBUS DP/DP-V1)
- Tool Calling Interface

The available channels can vary depending on the device and its communication options.

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Executing functions of the devices

The software package enables you to perform the following functions with consistency:

- Parameterization (e. g. in the parameter tree of the device)
- Startup
- Visualization and diagnostics
- Programming

The following basic components are integrated into the MOVITOOLS® MotionStudio software package, allowing you to use the devices to execute functions:

- MotionStudio
- MOVITOOLS®

All functions communicate using **tools**. MOVITOOLS® MotionStudio provides the right tools for every device type.

Technical support

SEW-EURODRIVE offers a 24-hour service hotline.

Simply dial **(+49) 0 18 05** and then enter the letters **SEWHELP** via the telephone keypad. Of course, you can also dial **(+49) 0 18 05 - 7 39 43 57**.

Online help

After installation, the following types of help are available to you:

- The documentation is displayed in a help window after you start the software.

  If the help window does not appear at the start, deactivate the "Display" check box, in the menu under [Settings] / [Options] / [Help].

  If the help window appears again, activate the "Display" check box, in the menu under [Settings] / [Options] / [Help].
- Context-sensitive help is available for the fields which require you to enter values. For example, you can use the <F1> key to display the ranges of values for the device parameters.

4.2.2 First steps

Starting the software and creating the project

To start MOVITOOLS® MotionStudio and create a project, proceed as follows:

1. Start the MOVITOOLS® MotionStudio from the Windows start menu via:

   [Start] / [Programs] / [SEW] / [MOVITOOLS MotionStudio] / [MOVITOOLS MotionStudio]
2. Create a project with a name and directory.

Establishing communication and scanning the network

To establish communication with MOVITOOLS® MotionStudio and to scan the network, proceed as follows:

1. Set up a communication channel to communicate with your units.

   For detailed information on how to configure a communication channel, see the section regarding the relevant communication type.

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2. Scan your network (unit scan). Press the [Start network scan] button [1] in the toolbar.
3. Select the unit you want to configure.
4. Right-click to open the context menu.

   This will display unit-specific tools used for executing functions with the units.
5. Select the unit you want to configure.
6. Right-click to open the context menu.

   This will display unit-specific tools used for executing functions with the units.

Starting up the devices (online)

Do the following to start up the devices (online):

1. Switch to the network view.
2. In the toolbar, click on "Switch to online mode" [1].

[1] "Switch to online mode" icon

3. Select the unit you want to startup.
4. Open the context menu and select the [Startup] / [Startup] command.

   The Startup wizard opens.
5. Follow the instructions of the startup wizard and then load the startup data into your unit.

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5 Operation

5.1 Operating Displays

5.1.1 7-segment display

The 7-segment display shows the operating condition of MOVIDRIVE® and, in the event of an error, an error or warning code.

7-segment display	Device status (high byte in status word 1)	Meaning
0	0	24 V operation (inverter not ready)
1	1	Controller inhibit active
2	2	No enable
3	3	Standstill current
4	4	Approval
5	5	n-control (speed control)
6	6	M-control (torque control)
7	7	Position hold control
8	8	Factory setting
9	9	Limit switch hit
A	10	Technology option
c	12	IPOS$^{PLUS®}$ reference travel
d	13	Flying start
E	14	Calibrate encoder
F	Error number	Fault indication (flashing)
H	Status display	Manual mode
t	16	Inverter is waiting for data
rev	17	"STO" active
• (blinking dot)	-	IPOS$^{PLUS®}$ program is running
Flashing display	-	STOP via DBG60B
ꟻ	-	RAM defective

⚠ WARNING

Incorrect interpretation of display U = "STO" active.

Severe or fatal injuries.

- The display U = "STO" is not safety-related and must not be used as a safety function.

5.1.2 DC link voltage display of size 7

INFORMATION

The DC link voltage display goes out about 20 seconds after the power off.

5.1.3 DBG60B keypad

Basic displays:

0.00rpm 0.000Amp CONTROLLER IN-HIBIT	Display when X13:1 (DIØØ "/controller inhibit") = "0".
0.00rpm 0.000Amp NO ENABLE	Display when X13:1 (DIØØ "/controller inhibit") = "1" and inverter is not enabled ("enable/stop" = "0").
950.00rpm 0.990Amp ENABLE (VFC)	Display for enabled inverter.
INFORMATION 6: VALUE TOO HIGH	Information message
(DEL)=Quit ERROR 9 STARTUP	Error info

5.2 Information messages

Information messages on the DBG60B (ca. 2 s in duration) or in MOVITOOLS® MotionStudio (message that can be acknowledged):

No.	Text DBG60B/ MotionStudio	Description
1	ILLEGAL INDEX	Index addressed via interface not available.
2	NOT IMPLEMENT.	• Attempt to execute a non-implemented function. • An incorrect communication service has been selected. • Manual operation selected via invalid interface (e.g. fieldbus).
3	READ ONLY VALUE	Attempt to edit a read-only value.
4	PARAM. INHIB-ITED	Parameter lock P 803 = "ON", parameter cannot be altered.
5	SETUP ACTIVE	Attempt to alter parameters during active factory setting.

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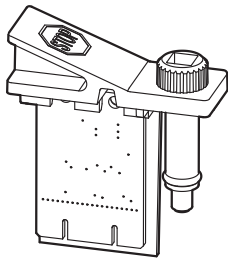
No.	Text DBG60B/ MotionStudio	Description
6	VALUE TOO HIGH	Attempt to enter a value that is too high.
7	VALUE TOO LOW	Attempt to enter a value that is too low.
8	REQ. CARD MISSING	The option card required for the selected function is missing.
10	ONLY VIA ST1	Manual mode must be completed using X13:ST11/ST12 (RS485).
11	ONLY TERMINAL	Manual operation must be exited via TERMINAL (DBG60B or USB11/UWS21B).
12	NO ACCESS	Access to selected parameter denied.
13	REG. INHIBIT MISSING	Set terminal DIØØ "/Controller inhibit" = "0" for the selected function.
14	INVALID VALUE	Attempt to enter an invalid value.
16	PARAM. NOT SAVED	Overflow of EEPROM buffer, e.g. through cyclic write access. Parameter not stored in non-volatile EEPROM.
17	INVERTER ENABLED	• Parameter to be changed can only be set in the state "CONTROLLER INHIBIT". • You tried to change to manual mode during live operation.

5.3 Memory card

The pluggable memory card is installed in the basic unit. The basic data is stored on the memory card and is always up-to-date. If a unit has to be replaced, the system/ machine can be operated again quickly without a PC and data backup simply by replugging the memory card. You can install as many option cards as required.

The following figure shows the MDX60B/61B memory card.



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Part number: 08248834

5.3.1 Notes for replacing the memory card

- Only plug or remove in the memory card when the MOVIDRIVE® B is switched off.
- You can install the memory card from the original unit in a new inverter. The following combinations are permitted:

Original device MOVIDRIVE® MDX60B/61B...	New inverter MOVIDRIVE® MDX60B/61B...
00	00 or 0T
0T	0T

- The same options that were available in the original unit must be installed in the new inverter.

  If this is not the case, the error message "79 HW configuration" (hardware configuration) is displayed. You can remedy the error by calling up the "DELIVERY CONDITION" menu item from the context menu (P802 factory setting). This resets the unit to its initial delivery state. You must then restart the unit.
- The counter status of the DRS11B option and the data of the DH..1B and DCS21B/22B/31B/32B options are not stored on the memory card. When you replace the memory card, you have to install the DRS11B, DH..1B and DCS21B/22B/31B/32B option cards from the original unit in the new inverter.

  If the original unit was a MOVIDRIVE® B size 0 unit with the option DHP11, you have to use a new DHP11B option card with the configuration data set (file name.sewcopy) that you saved previously.
- If an absolute encoder is used as a motor or distance encoder, you must reference the encoder after you have replaced the unit.
- When replacing an absolute encoder, you have to reference it again.

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6 Service

6.1 Fault information

6.1.1 Fault memory

The fault memory (P080) stores the last 5 fault messages (faults t-0 – t-4). The oldest fault message is deleted whenever more than 5 fault messages have occurred. The following information is stored when a fault occurs:

Fault that has occurred · Status of digital inputs/outputs · Operating state of the inverter · Inverter status · Heat sink temperature · Speed · Output current · Active current · Unit utilization · DC link voltage · ON hours · Enable hours · Parameter set · Motor utilization.

6.1.2 Switch-off responses

There are 3 switch-off responses depending on the fault; the inverter remains blocked during a failure:

Immediate disconnection

The unit can no longer brake the drive; the output stage goes to high resistance in the event of a fault and the brake is applied immediately (DBØØ "/Brake" = "0").

Rapid stop

The drive is braked with the stop ramp t13/t23. Once the stop speed is reached, the brake is applied (DBØØ "/Brake" = "0"). The output stage goes to high resistance after the brake application time has elapsed (P732 / P735).

Emergency stop

The drive is braked with the emergency stop ramp t14/t24. Once the stop speed is reached, the brake is applied (DBØØ "/Brake" = "0"). The output stage goes to high resistance after the brake application time has elapsed (P732 / P735).

6.1.3 Reset

A fault message can be acknowledged as follows:

- Switch the supply system off and on again
  - Observe a minimum switch-off time of 10 s for the line contactor K11
- Reset via input terminals, i.e. via an appropriately assigned digital input (DIØ1 – DIØ7 with the basic device, DI1Ø – DI17 with the DIO11B option)
- Manual reset in MOVITOOLS® MotionStudio (P840 = "YES").
- Manual reset using the DBG60B.
- Auto reset performs up to 5 device resets with an adjustable restart time.

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⚠ WARNING

Risk of crushing if the motor starts up automatically after an auto reset.

Severe or fatal injuries.

- Do not use auto reset with drives where an automatic restart represents a danger to people or units.
- Perform a manual reset.

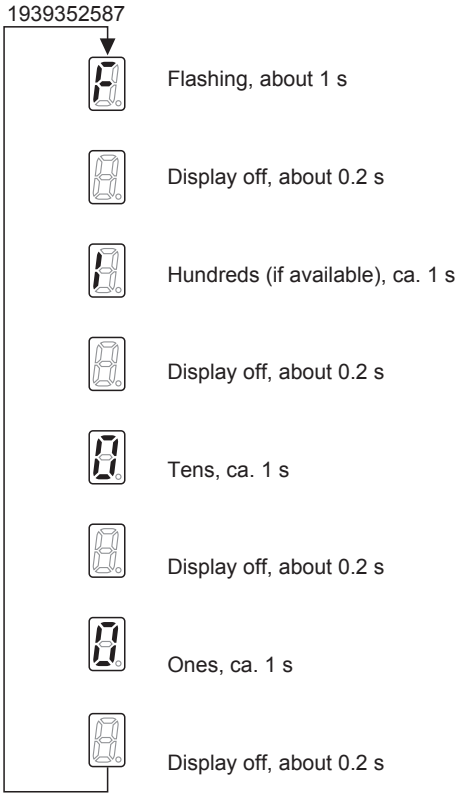
6.1.4 Inverter is waiting for data

If the inverter is controlled via a communication interface (fieldbus, RS485 or SBus) and the power was switched off and back on again or a fault reset was performed, then the enable remains ineffective until the inverter receives valid data again via the interface, which is monitored with a timeout.

6.2 Fault messages and list of faults

6.2.1 Fault message via 7-segment display

The fault code is shown in a 7-segment display. The following display sequence is used (e.g. fault code 100):



Following a reset or if the fault code resumes the value "0", the display switches to the operating display.

6.2.2 Subfault code display

The subfault code is displayed in MOVITOOLS® MotionStudio or in the DBG60B keypad.

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6.2.3 Fault list

The factory set fault response is listed in the "Response P" column. (P) indicates that the response is programmable (via *P83_fault response* or with IPOS$^{PLUS®}$). In the event of fault 108, (P) indicates that the response can be programmed via *P555 DCS fault response*. In the event of fault 109, (P) indicates that the response can be programmed via *P556 DCS alarm response*.

Fault			Subfault			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
00	No fault					
01	Overcurrent	Immediate stop	0	Output stage	• Short circuit at output • Motor too large • Defective output stage • Current supply for current transformer • Ramp limit is deactivated and set ramp time is too short • Defective phase module • Supply voltage 24 V or 24 V generated from it is instable • Interruption or short circuit on the signal lines from the phase modules	• Rectify the short circuit • Connect a smaller motor • Contact the SEW Service if the output stage is defective • Activate P 138 and/or increase ramp time
			1	V_{CE} monitoring or undervoltage monitoring of the gate driver		
			5	Inverter remains in hardware current limit		
			6	V_{CE} monitoring or undervoltage monitoring of the gate driver or overcurrent of the current transformer. ..Phase U		
			7	..Phase V		
			8	..Phase W		
			9	..Phases U and V		
			10	..Phases U and W		
			11	..Phases V and W		
			12	..Phases U and V and W		
			13	Voltage supply of current transformer in line operation		
			14	MFE signal lines		
03	Ground fault	Immediate stop	0	Ground fault	Ground fault • in the motor lead • in the inverter • in the motor	• Eliminate ground fault • Consult SEW Service
04	Brake chopper	Immediate stop	0	DC link voltage too high in 4Q operation	• Too much regenerative power • Braking resistor circuit interrupted • Short circuit in the braking resistor circuit • Braking resistance too high • Brake chopper is defective	• Extend deceleration ramps • Check supply cable to braking resistor • Check technical data of braking resistor • Install a new MOVIDRIVE® if the brake chopper is defective
			1			
06	Line phase failure	Immediate stop	0	Voltage for adapting DC link is periodically too low	• Phase failure • Inadequate line voltage quality	• Check the supply system cable • Check configuration of the supply system • Check supply (fuses, contactor)
			3	Line voltage failure		
			4	Line frequency fault		
07	DC link overvoltage	Immediate stop	0	DC link voltage too high in 2Q operation	DC link voltage too high	• Extend deceleration ramps • Check supply cable to the braking resistor • Check technical data of braking resistor
			1			
			2	DC link voltage too high in 4Q operation .. ..Phase U		
			3	..Phase V		
			4	..Phase W		

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Fault			Subfault			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
08	Speed monitoring	Immediate stop (P)	0	Inverter in current limiting or in slip limit	• Speed controller or current controller (in VFC operating mode without encoder) operating at setting limit due to mechanical overload or phase failure in the power supply or motor • Encoder not connected correctly or incorrect direction of rotation • n_{max} is exceeded during torque control • In operating mode VFC: Output frequency ≥ 150 Hz • In operating mode V/f: Output frequency ≥ 599 Hz	• Reduce load • Increase deceleration time setting (P501 or P503) • Check encoder connection, swap A/A and B/B pairs if necessary • Check encoder voltage supply • Check current limiting • Extend ramps if necessary • Check motor cable and motor • Check line phases
			3	System limit "actual speed" exceeded. Speed difference between ramp setpoint and actual value for 2 × ramp time higher than expected slip		
			4	Maximum rotating field speed exceeded Maximum rotating field frequency (with VFC max 150 Hz and V/f max 599 Hz) exceeded		
09	Startup	Immediate stop	0	Startup missing	The inverter has not been taken into operation for the selected operating mode	Perform startup for the required operating mode
			1	Wrong operating mode selected		
			2	Wrong encoder type or defective encoder card		
10	IPOS-ILLOP	Emergency stop	0	Invalid IPOS$^{PLUS®}$ command	• Incorrect command detected during execution of the IPOS$^{PLUS®}$ program • Incorrect conditions during command execution	• Check the content of the program memory and, if necessary, correct • Load the correct program into the program memory • Check program sequence (→ IPOS$^{PLUS®}$ manual)
11	Overtemperature	Emergency stop (P)	0	Heat sink temperature too high or temperature sensor defective	• Thermal overload of inverter • Temperature sensor of a phase module faulty (size 7)	• Reduce load and/or ensure adequate cooling • Check fan • If F-11 is issued even though the temperatures is obviously not too high, this indicates a faulty temperature sensor of the phase module. Replace the phase module (size 7)
			3	Overtemperature switched-mode power supply		
			6	Heat sink temperature too high or temperature sensor defective.. ..Phase U (size 7)		
			7	..Phase V (size 7)		
			8	..Phase W (size 7)		
13	Control signal source	Immediate stop	0	Control signal source not available, e.g. control signal source fieldbus without fieldbus interface	Control signal source not defined or defined incorrectly	Set correct control signal source (P101)

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Fault			Subfault			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
14	Encoder	Immediate stop	0	Encoder not connected, defective encoder, defective encoder cable	• Encoder cable or shield not connected correctly. • Short circuit / broken wire in encoder cable • Encoder is defective. • When 2 inverters are connected via X14 and P505 is set to YES F14 SubC 27.	• Check encoder cable and shield for correct connection, short circuit and broken wire
			25	Encoder fault X15 – Speed range exceeded Encoder exceeds 6542 min^{-1}		
			26	Encoder fault X15 – Card is defective Fault in the quadrant evaluation.		
			27	Encoder fault – encoder connection or encoder is defective		
			28	Encoder fault X15 – Communication fault RS485 channel		
			29	Encoder fault X14 – Communication fault RS485 channel	• Encoder cable or shield not connected correctly. • Short circuit / broken wire in encoder cable • Encoder is defective. • When 2 inverters are connected via X14 and P505 is set to YES F14 SubC 27.	• Check encoder cable and shield for correct connection, short circuit and broken wire
			30	Unknown encoder type at X14/X15		
			31	Plausibility monitoring fault Hiperface® X14/X15 Increments have been lost		
			32	Encoder fault X15 Hiperface® Hiperface® encoder at X15 signals a fault		
			33	Encoder fault X14 Hiperface® Hiperface® encoder at X14 signals a fault		
			34	Encoder fault X15 resolver – Encoder connection or encoder is faulty		
17	System fault	Immediate stop	0	"Stack overflow" fault	Inverter electronics disrupted, possibly due to EMC influences	• Check grounding and shielding and improve, if necessary • Consult SEW Service if the fault occurs again.
18				"Stack underflow" fault		
19				"External NMI" fault		
20				"Undefined opcode" fault		
21				"Protection fault"		
22				"Illegal word operand access" fault		
23				"Illegal instruction access" fault		
24				"Illegal external bus access" fault		
25	EEPROM	for rapid stop	0	Read or write fault on EEPROM power section	Access to the EEPROM of the memory card has failed	• Restore factory settings, perform reset and reset parameters. • Consult SEW service if the fault reoccurs • Replace memory card
			11	NV memory read fault NV-RAM inside the unit		
			13	NV memory chip card memory module defective		
			14	NV memory chip card memory card defective		
			16	NV memory initialization fault		
26	External terminal	Emergency stop (P)	0	External terminal	Read external fault signal via programmable input	Eliminate respective cause; reprogram terminal if necessary

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Fault			Subfault			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
27	No limit switches	Emergency stop	0	Limit switches missing or wire break	• Wire break/both limit switches missing • Limit switches are swapped over in relation to direction of rotation of motor	• Check wiring of limit switches • Replace limit switch connections • Reprogram terminals
			2	Limit switches reversed		
			3	Both limit switches are active simultaneously		
28	Fieldbus timeout	Rapid stop (P)	0	"Fieldbus timeout" fault	No communication between master and slave within the configured response monitoring	• Check communications routine of the master • Extend fieldbus timeout time (P819)/deactivate monitoring
			2	Fieldbus interface does not boot		
29	Limit switch hit	Emergency stop	0	Hardware limit switch hit	A limit switch was hit in IPOS$^{PLUS®}$ operating mode	• Check travel range • Correct operator program
30	Emergency stop timeout	Immediate stop	0	Timeout stop emergency stop ramp	• Drive overloaded • Emergency stop ramp too short	• Project planning check • Extend emergency stop ramp
31	TF/TH trigger	No response (P)	0	Thermal motor protection fault	• Motor too hot, TF/TH has triggered • TF/TH of the motor not connected or connected incorrectly • Connection between MOVIDRIVE® and TF/TH on motor interrupted	• The motor **must** cool off, then reset the fault • Check connections/link between MOVIDRIVE® and TF/TH • If no TF/TH is connected: Jumper X10:1 with X10:2 • Set P835 to "No response".
32	IPOS index overflow	Emergency stop	0	IPOS program defective	Programming principles violated leading to system-internal stack overflow	Check and correct the IPOS$^{PLUS®}$ user program (→ IPOS$^{PLUS®}$ manual)
33	Setpoint source	Immediate stop	0	"Setpoint source not available" For example, fieldbus control signal source without fieldbus interface	Setpoint source not defined or defined incorrectly	Set correct setpoint source (P100)
34	Ramp timeout	Immediate stop	0	Time violation rapid stop ramp	Downward ramps timeout, e.g. due to overload	• Extend the downwards ramps • Eliminate overload
35	Operating mode	Immediate stop	0	Operating mode not available	• Operating mode not defined or defined incorrectly • P916 was used to set a ramp type that requires a MOVIDRIVE® device in technology version • P916 was used to set a ramp type that does not match the selected technology function • P916 was used to set a ramp type that does not match the selected synchronization time (P888)	• Use P700 or P701 to set correct operating mode. • Use MOVIDRIVE® in technology version (..OT) • From the "Startup → Select technology function..." menu, select the technology function that matches P916 • Check the settings of P916 and P888
			1	Wrong assignment operating mode - hardware		
			2	Wrong assignment operating mode - technology function		
36	Option missing	Immediate stop	0	Hardware is missing or not permitted	• Type of option card not allowed • Setpoint source, control signal source or operating mode not permitted for this option card • Incorrect encoder type set for DIP11B	• Use correct option card • Set correct setpoint source (P100) • Set correct control signal source (P101) • Set correct operating mode (P700 or P701) • Set the correct encoder type
37	System watchdog	Immediate stop	0	"System watchdog overflow" fault	Fault while executing system software	Consult SEW Service
38	System software	Immediate stop	0	"System software" fault	System fault	Consult SEW Service

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Fault			Subfault			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
39	Reference travel	Immediate stop (P)	0	"Reference travel" fault	• The reference cam is missing or does not switch • Limit switches are connected incorrectly • Reference travel type was changed during reference travel	• Check reference cam • Check limit switch connection • Check reference travel type setting and required parameters.
40	Boot synchronization	Immediate stop	0	Timeout at boot synchronization with option	• Fault during boot synchronization between inverter and option • Synchronization ID not/incorrectly transmitted	Install a new option card if this fault reoccurs
41	Watchdog option	Immediate stop	0	Fault – Watchdog timer from/to option	• Fault in communication between system software and option software • Watchdog in the IPOS$^{PLUS®}$ program	• Consult SEW Service
			17	Watchdog IPOS fault	• An application module has been loaded in a MOVIDRIVE® B unit without technology version • The wrong technology function has been set if an application module is used	• Check IPOS program • Check whether the unit has been activated for the application version (P079) • Check the selected technology function (P078)
42	Lag fault	Immediate stop (P)	0	Positioning lag fault	• Rotary encoder connected incorrectly • Acceleration ramps too short • P component of positioning controller too small • Incorrect speed controller parameters • Value of lag fault tolerance too small	• Check rotary encoder connection • Extend ramps • Set P component to higher value • Reset speed controller parameters • Increase lag fault tolerance • Check wiring of encoder, motor and line phase. • Check whether mechanical system components can move freely or if they are blocked
43	RS485 timeout	Rapid stop (P)	0	Communication timeout at RS485 interface	Fault during communication via interface RS485	Check RS485 connection (e.g. inverter – PC, inverter –– DBG60B). Contact SEW Service for advice if necessary
43	RS485 timeout	Rapid stop (P)	3	Manual mode timeout	Communication to source that controls manual operation interrupted. (Independent of the used user interface)	Check connection to control signal source
44	Device utilization	Immediate stop	0	Unit utilization fault	• Device utilization (I × t value) > 125%	• Decrease power output • Extend ramps • If suggested actions not possible, use larger inverter • Reduce load
			8	UL monitoring fault		

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Fault			Subfault			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
45	Initialization	Immediate stop	0	General fault during initialization	• No parameters set for EEPROM in power section set incorrectly • Option card not in contact with backplane bus	• Restore the factory settings. Contact the SEW Service for advice if the fault still cannot be reset • Insert the option card correctly
			3	Data bus fault during RAM check		
			6	CPU clock fault		
			7	Fault in the current detection		
			10	Fault when setting flash protection		
			11	Data bus fault during RAM check		
			12	Parameter setting fault synchronous operation (internal synchronous operation)		
46	System bus 2 timeout	Rapid stop (P)	0	Timeout system bus CAN2	Fault during communication via system bus 2	Check system bus connection
47	System bus 1 timeout	Rapid stop (P)	0	Timeout system bus CAN1	Fault during communication via system bus 1	Check system bus connection
48	Hardware DRS	Immediate stop	0	Hardware synchronous operation	Only with DRS11B: • Encoder signal from master/distance encoder faulty • Hardware required for synchronous operation is faulty	• Check encoder signals of master/distance encoder • Check encoder wiring • Install a new synchronous operation card
57	"TTL encoder"	Immediate stop	512	X15: Fault in amplitude control	• Encoder cable or shield not connected correctly • Short circuit / broken wire in encoder cable • Encoder defective • EMC interference	• Check encoder cable and shield for correct connection, short circuit and broken wire • Replace encoder • Providing for EMC measures
			16896	X14: Fault in amplitude control		
			514	X15: Incorrectly set numerator/denominator values	Incorrect numerator/denominator values	Correct the numerator/denominator values
			16898	X14: Incorrectly set numerator/denominator values		
58	"Sine-cosine encoder"	Immediate stop	512	X15: Fault in amplitude control	• Encoder cable or shield not connected correctly • Short circuit / broken wire in encoder cable • Encoder defective • EMC interference	• Check encoder cable and shield for correct connection, short circuit and broken wire • Replace encoder • Providing for EMC measures
			514	X15: Track signal fault		
			16896	X14: Fault in amplitude control		
			16897	X14: Initialization		
			16898	X14: Track signal fault		
			513	X15: Initialization	Encoder defective	Replace encoder
			515	C15: Incorrectly set numerator/denominator values	Incorrect numerator/denominator values	Correct the numerator/denominator values
			16899	X14: Incorrectly set numerator/denominator values		

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Fault			Subfault			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
59	"Encoder communication"	for rapid stop	1	X15: Track signal fault	• Encoder cable or shield not connected correctly • Short circuit / broken wire in encoder cable • Encoder defective • EMC interference	• Check encoder cable and shield for correct connection and broken wire • Replace encoder • Providing for EMC measures
			16	Data line fault		
			64 – 576	X15: RS485 communication		
			1088 – 1388	X15: EnDat communication		
			16385	X14: Track signal fault		
			16400	X14: Data line fault		
			16448 – 16832	X14: RS485 communication		
			17472 – 17772	X14: EnDat communication		
			2	X15: Incorrect calibration of encoder	Incorrect encoder calibration or mechanical offset to motor	Delivery state + new startup
			16386	X15: Incorrect calibration of encoder		
			1024	X15: Clocking and/or data line not connected	Clocking and/or data line not connected	Connect clocking and/or data line
			17408	X14: Clocking and/or data line not connected		
77	IPOS control word	No response (P)	0	Invalid control word IPOS	Only in IPOS$^{PLUS®}$ mode: • Attempt was made to set an invalid automatic mode (via external control) • P916 = BUS RAMP is set	• Check serial connection to external controller • Check write values of external controller • Set correct value for P916
78	IPOS SW limit switch	No response (P)	0	Software limit switch hit	Only in IPOS$^{PLUS®}$ mode: Programmed target position is outside travel range delimited by software limit switches	• Check user program • Check position of the software limit switches
79	Hardware configuration	Immediate stop	0	Deviating hardware configuration when replacing the memory card	The following values no longer match after memory card replacement: • Power • Nominal voltage • Variant ID • Device family • Design as Technology/ Standard unit • Option cards	Ensure identical hardware or restore delivery state (parameter = factory setting)
80	RAM test	Immediate stop	0	"RAM test" fault	Internal device fault, RAM defective.	Consult SEW Service
81	Start condition	Immediate stop	0	Start condition fault with VFC hoist	Only in "VFC hoist" mode: The motor could not be supplied with the correct amount of current during the pre-magnetizing time: • Nominal motor power too small in relation to rated inverter power • Motor cable cross section too small. Only for operation with a linear motor (as of firmware 18): • The drive has been set to "Enable" although the commutation offset between linear motor and linear encoder is not known. This means that the inverter cannot set the current indicator correctly.	• Check startup data and perform new startup, if necessary. • Check connection between inverter and motor • Check cross section of motor cable and increase if necessary • Perform commutation travel in the "No enable" state and then switch to "Enable" once the inverter has acknowledged in status word bit 25 that commutation was successful.

Fault			Subfault			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
82	Open output	Immediate stop	0	Output open with "VFC hoist"	Only in "VFC hoist" mode: • Two or all output phases are interrupted. • Nominal motor power too small in relation to rated inverter power	• Check connection between inverter and motor • Check startup data and perform new startup, if necessary.
84	Motor protection	Emergency stop (P)	0	"Motor temperature emulation" fault	• Motor utilization too high. • I_N-U_L monitoring triggered • P530 set later to "KTY"	• The motor **must** cool off, then reset the fault • Reduce load • Extend ramps • Observe longer pause times • Check P345/346 • Select a larger motor
			2	Temperature sensor wire break		
			3	No thermal motor model available		
			4	UL monitoring fault		
			11	Temperature sensor short circuit		
86	Memory module	Immediate stop	0	Fault in connection with memory module	• No memory card • Memory card defective	• Tighten knurled screw • Insert and secure memory card • Replace memory card • Load delivery status and parameter set
87	Technology function	Immediate stop	0	Technology function selected with standard unit	A technology function was activated in a standard device	Disable technology function
88	Flying start	Immediate stop	0	"Flying start" fault	Only in VFC n-CTRL operating mode: Actual speed > 6000 rpm when inverter enabled	Only enable a actual speed ≤ 6000 min^{-1}
92	DIP encoder problem	Fault display (P)	1	Stahl WCS3 dirt problem	Encoder signals a fault	Possible cause: Encoder is dirty → clean encoder
93	DIP encoder fault	Emergency stop (P)	0	"Absolute encoder" fault	The encoder signals a fault, e.g. power failure • Connection cable between the encoder and DIP11B does not meet the requirements (twisted pair, shielded) • Clock frequency too high for cable length • Permitted max. speed/acceleration of encoder exceeded • Encoder defective	• Check absolute encoder connection • Check connection cables • Set correct clock frequency • Reduce maximum travel speed or ramp • Replacing absolute encoders.
94	EEPROM checksum	Immediate stop	0	Power section parameters	Inverter electronics disrupted. Possibly due to EMC influence or defect.	Sending in a device for repair
			5	Control unit data		
			6	Power section data		
			7	Invalid version of the configuration data set		
95	DIP plausibility fault	Emergency stop (P)	0	Plausibility monitoring of absolute position	No plausible position could be determined • Incorrect encoder type set • IPOS$^{PLUS®}$ travel parameter set incorrectly • Numerator/denominator factor set incorrectly • Zero adjustment performed • Encoder defective	• Set the correct encoder type • Check IPOS$^{PLUS®}$ travel parameters. • Check travel speed. • Correct numerator/denominator factor • Reset after zero adjustment • Replacing absolute encoders.
97	Copy fault	Immediate stop	0	Parameter set upload is/was faulty	• Memory card cannot be written or read • Fault during data transmission	• Repeat copying process • Restore delivery state (P802) and repeat copying process
			1	Download of parameter set to unit canceled.		
			2	Not possible to adopt parameters Not possible to adopt parameters from memory card		

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Fault			Subfault			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
98	CRC fault	Immediate stop	0	"CRC via internal flash" fault	Internal device fault flash memory defective.	Sending in a device for repair
99	IPOS ramp calculation	Immediate stop	0	"Ramp calculation" fault	Only in IPOS$^{PLUS®}$ mode: Positioning ramp is sinusoidal or square and an attempt is made to change ramp times and traveling velocities with enabled inverter.	Rewrite the IPOS$^{PLUS®}$ program so that ramp times and traveling velocities can only be altered when the inverter is inhibited.
100	Vibration – warning	Display fault (P)	0	Vibrations diagnostics warning	Vibration sensor warning (→ "DUV10A" operating instructions)	Determine cause of vibrations. Continue operation until F101 occurs.
101	Vibration fault	Rapid stop (P)	0	Vibration diagnostics fault	Vibration sensor signals fault	SEW-EURODRIVE recommends that you remedy the cause of the vibrations immediately
102	Oil aging warning	Display fault (P)	0	Oil aging warning	Warning signal from the oil aging sensor	Schedule oil change
103	Oil aging fault	Display fault (P)	0	Oil aging fault	Fault message from the oil aging sensor	SEW-EURODRIVE recommends that you change the gear unit oil immediately.
104	Oil aging – overtemperature	Display fault (P)	0	Oil aging overtemperature	Overtemperature signal from the oil aging sensor	• Let oil cool down • Check if the gear unit cools properly
105	Oil aging ready signal	Display fault (P)	0	Oil aging ready signal	Oil aging sensor is not ready for operation	• Check voltage supply of oil aging sensor • Check and, if necessary, replace the oil aging sensor
106	Brake wear	Display fault (P)	0	Brake wear fault	Brake lining worn	Replace brake lining (→ "Motors" operating instructions).
107	Line components	Immediate stop	1	For regenerative power supply only: No feedback signal from main contactor	Main contactor defective	• Check main contactor • Check control cables.
108	DCS fault	Display fault	0	DCS fault		
			1	Configuration data not loaded correctly to DCS..B option.	Connection interrupted while loading the program to the DCS..B option.	• Reload the configuration files. • Then switch the DCS..B option off and on again.
			2	Invalid configuration data for software version of the DCS..B option.	DCS..B option configured using a wrong software version.	• Configure the DCS..B option with the permitted MOVISAFE® software version. • Then switch the DCS..B option off and on again.
			3	Unit was programmed with incorrect software interface.	Program or configuration data was loaded into the unit with an incorrect MOVISAFE® software.	• Check the DCS..B version and parameterize it again using a valid MOVISAFE® software. • Then switch the DCS..B option off and on again.
			4	Incorrect reference voltage	• Incorrect reference voltage • Faulty supply voltage of the DCS..B option • Faulty component on the DCS..B option	• Check supply voltage of DCS..B option. • Switch DCS..B option off and on again.
			5			
			6	Faulty system voltage	• Faulty supply voltage of the DCS..B option • Faulty component on the DCS..B option	• Check supply voltage of DCS..B option. • Switch DCS..B option off and on again.
			7			
			10	Incorrect supply voltage.	• DC 24 V supply voltage of the DCS..B option is faulty. • Faulty component on the DCS..B option	• Check supply voltage of DCS..B option. • Switch DCS..B option off and on again.

Fault			Subfault			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
108	DCS fault	Display fault	11	The unit's ambient temperature is not in the defined range	Temperature at the place of operation is not in the permitted range	Check the ambient temperature
			12	Plausibility fault for position changeover	For the position changeover, ZSC, JSS or DMC is permanently activated	• Check ZSC activation • Check JSS activation • Check DMC activation (only for monitoring via position)
			13	Faulty switching of the LOSIDE driver DO02_P / DO02_M	Short circuit of the output	Check wiring at output
			14	Faulty switching of the HISIDE driver DO02_P / DO02_M		
			15	Faulty switching of the LOSIDE driver DO0_M		
			16	Faulty switching of the HISIDE driver DO0_P		
			17	Faulty switching of the LOSIDE driver DO01_M		
			18	Faulty switching of the HISIDE driver DO01_P		
			19	Unit was programmed with incorrect software interface.	Program or configuration data was loaded into the unit with an incorrect MOVISAFE® software.	• Check the DCS..B version and parameterize it again using a valid MOVISAFE® software. • Then switch the DCS..B option off and on again.
			20			
			21	CRC of configuration data invalid.	Configuration data have not been uploaded correctly.	Upload configuration data into unit again.
			22			
108	DCS fault	Display fault	23	Fault during internal transmission of configuration data.	-	• Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.
			24			
			25	Fault while calculating firmware configuration data.	-	• Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.
			26			
			27	CRC of firmware configuration data invalid.	-	• Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.
			28			
			29	Fault during internal transmission of firmware configuration data.	-	• Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.
			30			
			31	The range check of the device description is faulty.	Faulty configuration data of the device description.	• Reload the configuration data. Next switch the DCS..B option off and on again. • If the fault occurs again, contact SEW-EURODRIVE Service for the proper MOVISAFE® software version.

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Fault			Subfault			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
108	DCS fault	Display fault	32	The range check of the access data is faulty.	Faulty configuration data of the device description.	• Reload the configuration data. Next switch the DCS..B option off and on again. • If the fault occurs again, contact SEW-EURODRIVE Service for the proper MOVISAFE® software version.
			33	EMU range check is faulty.	Faulty configuration data of the EMU function.	• Undo the changes in the EMU configuration or enter new values. • Reload the configuration data. Next switch the DCS..B option off and on again. • If the fault occurs again, contact SEW-EURODRIVE Service for the proper MOVISAFE® software version.
			34	PSC range check is faulty.	Faulty configuration data of the PSC function.	• Undo the changes in the PSC configuration or enter new values. • Reload the configuration data. Next switch the DCS..B option off and on again. • If the fault occurs again, contact SEW-EURODRIVE Service for the proper MOVISAFE® software version.

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Fault			Subfault			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
108	DCS fault	Display fault	35	ESS range check is faulty.	Faulty configuration data of the ESS function.	• Undo the changes in the ESS configuration or enter new values. • Reload the configuration data. Next switch the DCS..B option off and on again. • If the fault occurs again, contact SEW-EURODRIVE Service for the proper MOVISAFE® software version.
			36	ELC range check is faulty.	Faulty configuration data of the ELC function.	• Undo the changes in the ELC configuration or enter new values. • Reload the configuration data. Next switch the DCS..B option off and on again. • If the fault occurs again, contact SEW-EURODRIVE Service for the proper MOVISAFE® software version.
			37	OLC range check is faulty.	Faulty configuration data of the OLC function.	• Undo the changes in the OLC configuration or enter new values. • Reload the configuration data. Next switch the DCS..B option off and on again. • If the fault occurs again, contact SEW-EURODRIVE Service for the proper MOVISAFE® software version.

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Fault			Subfault			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
108	DCS fault	Display fault	38	ZSC range check is faulty.	Faulty configuration data of the ZSC function.	• Undo the changes in the ZSC configuration or enter new values. • Reload the configuration data. Next switch the DCS..B option off and on again. • If the fault occurs again, contact SEW-EURODRIVE Service for the proper MOVISAFE® software version.
			39	MSC range check is faulty.	Faulty configuration data of the MSC function.	• Undo the changes in the MSC configuration or enter new values. • Reload the configuration data. Next switch the DCS..B option off and on again. • If the fault occurs again, contact SEW-EURODRIVE Service for the proper MOVISAFE® software version.
			40	DMC range check is faulty.	Faulty configuration data of the DMC function.	• Undo the changes in the DMC configuration or enter new values. • Reload the configuration data. Next switch the DCS..B option off and on again. • If the fault occurs again, contact SEW-EURODRIVE Service for the proper MOVISAFE® software version.

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Fault			Subfault			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
108	DCS fault	Display fault	41	JSS range check is faulty.	Faulty configuration data of the JSS function.	• Undo the changes in the JSS configuration or enter new values. • Reload the configuration data. Next switch the DCS..B option off and on again. • If the fault occurs again, contact SEW-EURODRIVE Service for the proper MOVISAFE® software version.
			42	PLC range check is faulty.	Incorrect IL application program.	• Compile the application program again, load it, and switch the DCS..B option off and on again. • If the fault occurs again, contact SEW-EURODRIVE Service for the proper MOVISAFE® software version.
			43	Shutdown channel range check is faulty.	Internal configuration data fault.	• Undo the changes in the disconnection (configuration) or enter new values. • Reload the configuration data. Next switch the DCS..B option off and on again. • If the fault occurs again, contact SEW-EURODRIVE Service for the proper MOVISAFE® software version.

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Fault			Subfault			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
108	DCS fault	Display fault	44	Digital output range check is faulty.	Faulty configuration data of digital outputs.	• Undo the changes in the disconnection matrix of the digital outputs or enter new values. • Reload the configuration data. Next switch the DCS..B option off and on again. • If the fault occurs again, contact SEW-EURODRIVE Service for the proper MOVISAFE® software version.
			45	Digital output range check is faulty.	Faulty configuration data of digital outputs.	• Undo the changes in the disconnection matrix of the digital outputs or enter new values. • Reload the configuration data. Next switch the DCS..B option off and on again. • If the fault occurs again, contact SEW-EURODRIVE Service for the proper MOVISAFE® software version.
			46	Encoder type range check is faulty.	Incorrectly configured encoder type.	• Undo the changes in the encoder configuration or enter new values. • Reload the configuration data. Next switch the DCS..B option off and on again. • If the fault occurs again, contact SEW-EURODRIVE Service for the proper MOVISAFE® software version.

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Fault			Subfault			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
108	DCS fault	Display fault	47	Encoder scaling range check is faulty.	Incorrectly configured encoder distance.	• Undo changes made to the encoder distance (measuring length, resolution or max. speed) or enter new values. • Reload the configuration data. Next switch the DCS..B option off and on again. • If the fault occurs again, contact SEW-EURODRIVE Service for the proper MOVISAFE® software version.
			48	Encoder position range check is faulty.	Incorrectly configured encoder distance.	• Undo changes made to the encoder distance (measuring length, resolution or max. speed) or enter new values. • Reload the configuration data. Next switch the DCS..B option off and on again. • If the fault occurs again, contact SEW-EURODRIVE Service for the proper MOVISAFE® software version.
			49	PDM range check is faulty.	Faulty configuration of the PDM function.	• Undo the changes in the PDM configuration or enter new values. • Reload the configuration data. Next switch the DCS..B option off and on again. • If the fault occurs again, contact SEW-EURODRIVE Service for the proper MOVISAFE® software version.

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Fault			Subfault			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
108	DCS fault	Display fault	50 51	Fault during internal data transmission.	-	• Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.
			52 53	Fault during internal data transmission.	-	• Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.
			54 55	Internal program fault.	-	• Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.
			56 57	Faulty watchdog test.	Faulty feedback of internal shutdown channel of the digital outputs.	• Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.
			58 59	Faulty process data.	-	• Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.
			62 63	Internal processing fault in user program.	-	• Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.
108	DCS fault	Display fault	64 65	Internal processing fault in user program.	-	• Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.
			66 67	Internal processing fault in user program.	-	• Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.
			68 69	Internal processing fault of input element	-	• Reload the configuration data. Next switch the DCS..B option off and on again. • If the fault occurs again, contact SEW-EURODRIVE Service for the proper MOVISAFE® software version.
			70 71	Internal processing fault of input element	-	• Reload the configuration data. Next switch the DCS..B option off and on again. • If the fault occurs again, contact SEW-EURODRIVE Service for the proper MOVISAFE® software version.
			72 73	Internal processing fault in user program	-	• Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.

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Fault			Subfault			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
108	DCS fault	Display fault	74 75	Runtime fault.	-	• Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.
			80	Runtime fault	-	• Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.
			82 83	Interrupt fault during time monitoring.	-	• Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.
			85 86	Runtime fault.	-	• Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.
			87 88	Program fault.	-	• Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.
			89 90	Internal CPU fault.	-	• Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.
108	DCS fault	Display fault	91 92	Internal CPU fault.	-	• Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.
			93 94	Internal CPU fault.	-	• Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.
			95 96	Internal RAM fault.	-	• Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.
			97 98	Internal flash fault.	-	• Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.
			99 100	Internal CPU fault	-	• Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.
			101 102	Internal processing fault PROFIsafe.	-	• Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.

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Fault			Subfault			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
108	DCS fault	Display fault	103 104	Internal processing fault PROFIsafe.	-	• Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.
			105 106	Internal processing fault PROFIsafe.	-	• Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.
			107 108	Fault during internal data transmission.	-	• Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.
			109 110	Fault during internal data transmission.	-	• Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.
			111 112	Fault during internal data transmission.	-	• Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.
108	DCS fault	Display fault	113 114	Fault during internal data transmission.	-	• Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.
			117 118	Fault during internal data transmission.	-	• Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.
			119	Fault during internal data transmission.	-	• Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.
			140 141	Faulty core voltage DMP1.	• Incorrect core voltage of the DCS..B option. • Faulty component on the DCS..B option	• Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.
			142 143	Faulty core voltage DMPM.	• Incorrect core voltage of the DCS..B option. • Faulty component on the DCS..B option	• Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.
			156 157	Faulty RAM test.	-	• Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.
108	DCS fault	Display fault	160 161	Faulty test of static registers.	-	• Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.

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Fault			Subfault			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
109	DCS alarm	Display fault	0	DCS alarm		
			1	Communication fault backplane bus MOVIDRIVE® B.	The DCS..B option does not receive any valid data from MOVIDRIVE® B.	• Check hardware connection to MOVIDRIVE® B. • Check firmware version of MOVIDRIVE® B. • Apply braided shield of encoder cable, motor cable, and TF cable over a large area. • Establish equipotential bonding.
			2 3	Pulse 1 plausibility fault at digital input DI1.	The configured pulse 1 voltage is not present at digital input DI1 (X81:2).	• Check configuration of the DI1 digital input according to configuration and wiring diagram. • Check the wiring.
			4 5	Pulse 1 plausibility fault at digital input DI2.	The configured pulse 1 voltage is not present at digital input DI2 (X81:3).	• Check configuration of the DI2 digital input according to configuration and wiring diagram. • Check the wiring.
			6 7	Pulse 1 plausibility fault at digital input DI3.	The configured pulse 1 voltage is not present at digital input DI3 (X81:4).	• Check configuration of the DI3 digital input according to configuration and wiring diagram. • Check the wiring.
			8 9	Pulse 1 plausibility fault at digital input DI4.	The configured pulse 1 voltage is not present at digital input DI4 (X81:5).	• Check configuration of the DI4 digital input according to configuration and wiring diagram. • Check the wiring.

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Fault			Subfault			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
109	DCS alarm	Display fault	10 11	Pulse 1 plausibility fault at digital input DI5.	The configured pulse 1 voltage is not present at digital input DI5 (X81:7).	• Check configuration of the DI5 digital input according to configuration and wiring diagram. • Check the wiring.
			12 13	Pulse 1 plausibility fault at digital input DI6.	The configured pulse 1 voltage is not present at digital input DI6 (X81:8).	• Check configuration digital input DI6 according to configuration and wiring diagram. • Check the wiring.
			14 15	Pulse 1 plausibility fault at digital input DI7.	The configured pulse 1 voltage is not present at digital input DI7 (X81:9).	• Check configuration of the DI7 digital input according to configuration and wiring diagram. • Check the wiring.
			16 17	Pulse 1 plausibility fault at digital input DI8.	The configured pulse 1 voltage is not present at digital input DI8 (X81:10).	• Check configuration of digital input DI8 according to configuration and wiring diagram. • Check the wiring.
			18 19	Pulse 2 plausibility fault at digital input DI1.	The configured pulse 2 voltage is not present at digital input DI1 (X81:2).	• Check configuration of the DI1 digital input according to configuration and wiring diagram. • Check the wiring.
			20 21	Pulse 2 plausibility fault at digital input DI2.	The configured pulse 2 voltage is not present at digital input DI2 (X81:3).	• Check configuration of the DI2 digital input according to configuration and wiring diagram. • Check the wiring.
			22 23	Pulse 2 plausibility fault at digital input DI3.	The configured pulse 2 voltage is not present at digital input DI3 (X81:4).	• Check configuration of the DI3 digital input according to configuration and wiring diagram. • Check the wiring.
			24 25	Pulse 2 plausibility fault at digital input DI4.	The configured pulse 2 voltage is not present at digital input DI4 (X81:5).	• Check configuration of the DI4 digital input according to configuration and wiring diagram. • Check the wiring.

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Fault			Subfault			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
109	DCS alarm	Display fault	26 27	Pulse 2 plausibility fault at digital input DI5.	The configured pulse 2 voltage is not present at digital input DI5 (X81:7).	• Check configuration of the DI5 digital input according to configuration and wiring diagram. • Check the wiring.
			28 29	Pulse 2 plausibility fault at digital input DI6.	The configured pulse 2 voltage is not present at digital input DI6 (X81:8).	• Check configuration digital input DI6 according to configuration and wiring diagram. • Check the wiring.
			30 31	Pulse 2 plausibility fault at digital input DI7.	The configured pulse 2 voltage is not present at digital input DI7 (X81:9).	• Check configuration of the DI7 digital input according to configuration and wiring diagram. • Check the wiring.
			32 33	Pulse 2 plausibility fault at digital input DI8.	The configured pulse 2 voltage is not present at digital input DI8 (X81:10).	• Check configuration of digital input DI8 according to configuration and wiring diagram. • Check the wiring.
			34 35	Plausibility fault in the speed detection.	The difference between the two speed sensors is higher than the configured speed switch-off threshold.	• Check track again with the set data in the encoder configuration. • Check speed sensor. • Use the SCOPE function to set speed signals so that they are congruent.
109	DCS alarm	Display fault	36 37	Plausibility fault in the position detection.	The difference between the two position signals is higher than the configured increment switch-off threshold.	• Check track with the configured data of the encoder setting. • Check position signal. • Are all signals connected to the 9-pin encoder connector? • Check the encoder connector for correct connection. • Use the SCOPE function to set positions signals so that they are congruent. • If the absolute value is to be used via the backplane bus, it may be necessary to adapt the *Switch-off Threshold Incr.* parameter.
			38 39	Plausibility fault incorrect position range.	The current position is outside the configured measurement range.	• Check track with the configured data of the encoder setting. • Check position signal, correct offset if necessary. • Use the SCOPE function to set positions signals so that they are congruent.
			40 41	Plausibility fault incorrect speed.	The current speed exceeds the configured maximum speed.	• The drive moves outside the permitted and configured speed range. • Check the configuration (encoder screen: max. set speed). • Analyze the speed profile using the SCOPE function.

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Fault			Subfault			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
109	DCS alarm	Display fault	42 43	Plausibility fault incorrect acceleration.	The current acceleration exceeds the configured maximum acceleration.	• Check the configuration (encoder screen: max. set speed). • Analyze the speed/acceleration profile using the SCOPE function.
			44 45	Plausibility fault in encoder interface (A3401 = encoder 1 and A3402 = encoder 2).	The encoder interface does not match the configured data	• Check encoder type and configuration (SSI/incremental) • Check the encoder connection/wiring • Check the polarity of the encoder data • Check function of the encoder
			46 47	Voltage supply of encoder faulty (A3403 = encoder 1 and A3404 = encoder 2).	Encoder voltage supply not within defined range (min. DC 20 V / max. DC 29 V).	• Overload in the supply voltage of the encoder; internal polyswitch fuse has tripped. • Check supply voltage of DCS..B option.
			48 49	Fault in reference voltage	Reference voltage input of the encoder system is outside of the defined range	Check the reference voltage input of the encoder system
			50 51	Difference level RS485 driver 1. Fault Faulty "B" or "Cycle" signal.	• No encoder connection. • Incorrect encoder type connected.	• Check encoder connection. • Check encoder cabling.
			52 53	Difference level RS485 driver 2. Fault Faulty "A" or "DATA" signal.		
			54 55	Difference in incremental counter		
109	DCS alarm	Display fault	56 57	Plausibility fault in encoder interface (A3401 = encoder 1 and A3402 = encoder 2)	The encoder interface does not match the configured data	• Check encoder type and configuration (SSI/incremental) • Check the encoder connection/wiring • Check the polarity of the encoder data • Check function of the encoder
			58 59	Plausibility fault SIN/COS encoder connection.	Incorrect encoder type connected.	Check encoder connection and cabling.
			60 61 62 63	Plausibility fault in the incremental encoder connection	Phase fault of the incremental or SIN/COS encoder.	• Check encoder connection • Replace defective encoder
			64 65	Plausibility fault - SSI encoder connection (master mode).	Connected encoder type does not correspond to the configuration.	• Check configuration. • Check connected encoder.
			66 67	Plausibility fault SSI encoder connection (slave mode).	Connected encoder type does not correspond to the configuration.	• Check configuration. • Check connected encoder.
			68 69	Faulty switching behavior of the high-side driver DO0_P.	DC 24 V short circuit at digital output DO0_P (X82:1).	Check wiring at digital output.
			70 71	Faulty switching behavior of the low-side driver DO0_M.	DC 0 V short circuit at digital output DO0_M (X82:2).	Check wiring at digital output.
			72 73	Faulty switching behavior of the high-side driver DO1_P.	DC 24 V short circuit at digital output DO1_P (X82:3).	Check wiring at digital output.

Fault			Subfault			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
109	DCS alarm	Display fault	74 75	Faulty switching behavior of the low-side driver DO1_M.	DC 0 V short circuit at digital output DO1_M (X82:4).	Check wiring at digital output.
			76 77	CCW and CW monitoring of DMC safety function activated simultaneously.	Multiple activation of the DMC safety function.	Make sure to activate only one "enable" in the control of the DMC safety function.
			78 79	CCW and CW monitoring range of the OLC safety function activated simultaneously.	Multiple activation of the OLC safety function.	Make sure to activate only one "enable" in the control of the OLC safety function.
			80 81	CCW and CW monitoring of JSS safety function activated simultaneously.	Multiple activation of the JSS safety function.	Make sure to activate only one "enable" in the control of the JSS safety function.
			82 83	Timeout fault MET.	Input element with time monitoring is faulty.	Check input element wiring.
			84 85	Timeout fault MEZ.	Two-hand control with time monitoring is faulty.	Check input element wiring.
			86 87	EMU1 monitoring fault.	• Faulty output control • Faulty feedback	Check wiring at digital output.
			88 89	EMU2 monitoring fault		
			90 91	Plausibility fault position changeover.	Position changeover during ZSC, JSS or DMC is permanently activated.	• Check ZSC (SOS) activation. • Check JSS (SDI) activation. • Check DMC (SDI) activation only for monitoring the position.
109	DCS alarm	Display fault	92 93	SSI encoder fault.	Encoder step SSI value within one cycle is too large.	• Check encoder configuration. • Check encoder cabling.
			94 95	SSI encoder fault.	Plausibility fault for position adjustment.	• Check encoder configuration. • Check encoder cabling.
			96 97	Plausibility fault of incremental encoder tracks.	• Different counting signals on A/B encoder tracks. • Defective component at RS485 interface. • Encoder operates outside tolerances of encoder interface.	• Check encoder configuration. • Check encoder cabling. • Check encoder signal levels. • Check maximum counting frequency of incremental encoder.
			98 99	Plausibility fault analog/digital comparison at Schmitt trigger output – encoder input X84.	• Connected encoder type does not correspond to the configuration. • Faulty encoder signals • Hardware defective	• Check configuration. • Check connected encoder. • Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.
			100 101	Plausibility fault analog/digital comparison at Schmitt trigger output – encoder input X85.	• Connected encoder type does not correspond to the configuration. • Faulty encoder signals • Hardware defective	• Check configuration. • Check connected encoder. • Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.
			110 111	Position processing range check for DCS22B/32B.	Position processing activated for DCS22B/32B options.	• Check configuration data. • Deactivate position processing.
			112 113	Faulty OSSD input check.	Faulty OSSD test.	• Check DC 24 V input voltage of all OSSD inputs. • Switch DCS..B option off and on again.

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Fault			Subfault			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
109	DCS alarm	Display fault	114 115	Faulty switching behavior of the high-side driver DO2_P.	DC 24 V short circuit at digital output DO2_P (X83:1).	Check wiring at digital output.
			116 117	Faulty switching behavior of the low-side driver DO2_M.	DC 0 V short circuit at digital output DO2_M (X83:2).	Check wiring at digital output.
			118	Dynamic test for high-side driver DO0_P.	DC 24 V short circuit at digital output DO0_P.	Check wiring at digital output.
			119	Dynamic test for low-side driver DO0_M.	DC 0 V short circuit at digital output DO0_M.	Check wiring at digital output.
			120	Dynamic test for high-side driver DO1_P.	DC 24 V short circuit at digital output DO1_P.	Check wiring at digital output.
			121	Dynamic test for low-side driver DO1_M.	DC 0 V short circuit at digital output DO1_M.	Check wiring at digital output.
			122	Dynamic test for high-side driver DO2_P.	DC 24 V short circuit at digital output DO2_P.	Check wiring at digital output.
			123	Dynamic test for low-side driver DO2_M.	DC 0 V short circuit at digital output DO2_M.	Check wiring at digital output.
			124 125	Deactivation of digital input test faulty	Digital inputs are still active after deactivation.	• Check digital input wiring. • Switch DCS..B option off and on again. • Replace DCS..B option.
			134 135	Plausibility fault in the speed recording	The difference between the two speed sensors is higher than the configured speed switch-off threshold.	• Check track again with the set data in the encoder configuration. • Check speed sensor. • Use the SCOPE function to set speed signals so that they are congruent.
109	DCS alarm	Display fault	136 137	Plausibility fault in the position detection.	The difference between the two position signals is higher than the configured increment switch-off threshold.	• Check track with the configured data of the encoder setting. • Check position signal. • Are all signals connected correctly to the 9-pin encoder connector? • Check encoder connector for correct connection. • Use the SCOPE function to set positions signals so that they are congruent.
			138 139	Plausibility fault incorrect position range.	The current position is outside the configured measurement range.	• Check track with the configured data of the encoder setting. • Check position signal, correct offset if necessary. • Use the SCOPE function to set positions signals so that they are congruent.
			140 141	Plausibility fault incorrect speed.	The current speed exceeds the configured maximum speed.	• The drive moves outside the permitted and configured speed range. • Check the configuration (encoder screen: max. set speed). • Analyze the speed profile using the SCOPE function.
			142 143	Plausibility fault incorrect acceleration.	The current acceleration is outside the configured acceleration range. The drive has exceeded the permitted acceleration range	• Check the configuration (encoder screen: max. set speed). • Analyze the speed/acceleration profile using the SCOPE function.

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Fault			Subfault			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
109	DCS alarm	Display fault	146 147	Voltage supply of encoder faulty (E3405 = encoder 1 and E3406 = encoder 2).	The voltage supply of the encoder is not within the defined range (min. DC 20 V / max. DC 29 V).	• Overload in the supply voltage of the encoder; internal polyswitch fuse has tripped. • Check supply voltage of DCS..B option.
			150 151	Difference level RS485 driver. Fault Faulty "B" or "Cycle" signal.	• No encoder connection. • Incorrect encoder type connected.	• Check encoder connection. • Check encoder cabling.
			152 153	Difference level RS485 driver. Fault Faulty "A" or "DATA" signal.	• No encoder connection. • Incorrect encoder type connected.	• Check encoder connection. • Check encoder cabling.
			158 159	Plausibility fault SIN/COS encoder connection.	Incorrect encoder type connected.	Check encoder connection and cabling.
			164 165	Plausibility fault - SSI encoder connection (master mode).	Connected encoder type does not correspond to the configuration.	• Check encoder connection and cabling. • Check encoder.
			166 167	Plausibility fault SSI encoder connection (slave mode).	Connected encoder type does not correspond to the configuration	• Check encoder connection and cabling. • Check encoder.
			186 187	EMU1 monitoring fault.	Faulty monitoring of the external shutdown channel.	• Check hardware connections. • Pick-up or release time too short. • Check switch contacts.
			188 189	EMU2 monitoring fault.	Faulty monitoring of the external shutdown channel.	• Check hardware connections. • Pick-up or release time too short. • Check switch contacts.
109	DCS alarm	Display fault	190 191	Plausibility fault position changeover.	Position changeover during ZSC, JSS or DMC is permanently activated.	• Check ZSC (SOS) activation. • Check JSS (SDI) activation. • Check DMC (SDI) activation only for monitoring the position.
			192 193	SSI encoder fault.	Encoder step SSI value within one cycle is too large.	• Check encoder configuration. • Check encoder cabling.
			194 195	SSI encoder fault.	Plausibility fault for position adjustment.	• Check encoder configuration. • Check encoder cabling.
			196 197	Plausibility fault of incremental encoder tracks.	• Different counting signals on A/B encoder tracks. • Defective component at RS485 interface. • Encoder operates outside tolerances of encoder interface.	• Check encoder configuration. • Check encoder cabling. • Check encoder signal levels. • Check maximum counting frequency of incremental encoder.
			198 199	Plausibility fault analog/digital comparison at Schmitt trigger output – encoder input X84.	• Connected encoder type does not correspond to the configuration. • Faulty encoder signals • Hardware defective	• Check configuration. • Check connected encoder. • Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.
			200 201	Plausibility fault analog/digital comparison at Schmitt trigger output – encoder input X85.	• Connected encoder type does not correspond to the configuration. • Faulty encoder signals • Hardware defective	• Check configuration. • Check connected encoder. • Replace DCS..B option. • Send faulty DCS..B option with fault number to SEW-EURODRIVE for fault diagnostics.

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Fault			Subfault			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
110	"Ex-e protection" fault	Emergency stop	0	Duration of operation below 5 Hz exceeded	Duration of operation below 5 Hz exceeded	• Check configuration • Shorten duration of operation below 5 Hz
113	Analog input wire break	No response (P)	0	AI1 analog input wire break	AI1 analog input wire break	Check wiring
116	"Timeout MOVI-PLC" fault	Rapid stop/ warning	0	MOVI-PLC® communication timeout		• Check startup • Check wiring
122	"Absolute encoder option"	Immediate stop	2	X15: Unknown encoder type	Connected encoder type unknown	Replace encoder
			16386	X14: Unknown encoder type		
			1	X15: Plausibility monitoring	• Encoder cable or shield not connected correctly • Short circuit / broken wire in encoder cable • Encoder defective • EMC interference	• Check encoder cable and shield for correct connection, short circuit and broken wire • Replace encoder • Providing for EMC measures
			33	X15: Analog voltages not within tolerance		
			41 – 45	X15: RS485 communication		
			60	X15: Analog voltages not within tolerance		
			63	X15: Position fault, excessive speed, unable to generate position	• Encoder cable or shield not connected correctly • Short circuit / broken wire in encoder cable • Encoder defective • EMC interference	• Check encoder cable and shield for correct connection, short circuit and broken wire • Replace encoder • Providing for EMC measures
			256	X15: Voltage dip		
			257	X15: Interrupted clock or data line		
			258	X15: Change of position		
			261	X15: No high level present	• Encoder cable or shield not connected correctly • Short circuit / broken wire in encoder cable • Encoder defective • EMC interference	• Check encoder cable and shield for correct connection, short circuit and broken wire • Replace encoder • Providing for EMC measures
			513	X15: Plausibility monitoring		
			768	X15: PDO timeout		
			770	X15: Change of position		

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Fault			Subfault			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
122	"Absolute encoder option"	Immediate stop	16385	X14: Plausibility monitoring	• Encoder cable or shield not connected correctly • Short circuit / broken wire in encoder cable • Encoder defective • EMC interference	• Check encoder cable and shield for correct connection, short circuit and broken wire • Replace encoder • Providing for EMC measures
			16417	X14: Analog voltages not within tolerance		
			16444	X14: Analog voltages not within tolerance		
			16447	X14: Position fault, excessive speed, unable to generate position		
			16425 – 16429	X14: RS485 communication	• Encoder cable or shield not connected correctly • Short circuit / broken wire in encoder cable • Encoder defective • EMC interference	• Check encoder cable and shield for correct connection, short circuit and broken wire • Replace encoder • Providing for EMC measures
			16640	X14: Encoder's fault bit is set		
			16641	X14: Interrupted clock or data line		
			16642	X14: Change of position		
			16645	X14: No high level present	• Encoder cable or shield not connected correctly • Short circuit / broken wire in encoder cable • Encoder defective • EMC interference	• Check encoder cable and shield for correct connection, short circuit and broken wire • Replace encoder • Providing for EMC measures
			16897	X14: Plausibility monitoring		
			17152	X14: PDO timeout		
			17154	X14: Change of position		
			34 – 40	X15: Internal encoder fault	Internal encoder fault	Replace encoder
			46 – 50			
			64 – 67			
			514 – 544			
			772 – 774			
122	"Absolute encoder option"	Immediate stop	16418 – 16424	X14: Internal encoder fault	Internal encoder fault	Replace encoder
			16430 – 16434	X14: Internal encoder fault		
			16448 – 16451	X14: Internal encoder fault		
			16898 – 16928	X14: Internal encoder fault		
			17156 – 17158	X14: Internal encoder fault		

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Fault			Subfault			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
122	"Absolute encoder option"	Immediate stop	61	X15: Critical transmitter current	Soiled, transmitter broken	Replace encoder
			16445	X14: Critical transmitter current		
			62	X15: Critical encoder temperature	Encoder temperature too high	Reduce motor and ambient temperature
			16446	X14: Critical encoder temperature		
			259	X15: Insufficient clock frequency	Incorrect encoder parameterization	Check encoder parameterization
			260	X15: Encoder signals programmable fault		
			576	X15: Internal encoder warning		
			769	X15: Encoder signals programmable fault		
			16643	X14: Insufficient clock frequency		
			16644	X14: Encoder signals programmable fault		
			16960	X14: Internal encoder warning		
			17153	X14: Encoder signals programmable fault		
			771	X15: Emergency signal		
			17155	X14: Emergency signal		
123	Positioning interruption	Emergency stop (P)	0	Fault "Positioning/Positioning interruption"	Target monitoring when interrupted positioning process is resumed. Target would be overrun.	Perform positioning process without interruption until it is complete
124	Ambient condition	Emergency stop (P)	1	Permitted ambient temperature exceeded	Ambient temperature > 60 °C	• Improve ventilation and cooling conditions • Improve air supply to the control cabinet; check filter mats

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Fault			Subfault			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
196	Power section	Immediate stop	1	Discharge resistor	Discharge resistor overload	Observe waiting time for power on/off
			2	Hardware ID precharge/ discharge control	Incorrect precharge/discharge controller variant	• Consult SEW Service • Replace precharge/discharge control
			3	Inverter coupling	Defective inverter coupling	• Consult SEW Service • Replace inverter coupling
			4	Inverter coupling reference voltage	Defective inverter coupling	• Consult SEW Service • Replace inverter coupling
			5	Power sections configuration	Different phase modules installed in the unit	• Inform the SEW Service • Check and replace phase modules
			6	Control unit configuration	Control unit line inverter or motor inverter incorrect	Replace or correctly assign the control unit of line and motor inverter
			7	Communication power section control unit	No communication	Check control unit installation
			8	Communication precharge/discharge control inverter coupling	No communication	• Check the cabling. • Consult SEW Service
			10	Communication power section control unit	The inverter coupling does not support protocol	Replace inverter coupling
			11	Communication power section control unit	Faulty communication with inverter coupling at power-up (CRC fault)	Replace inverter coupling
			12	Communication power section control unit	Inverter coupling uses protocol that does not match control unit	Replace inverter coupling
			13	Communication power section control unit	Faulty communication with inverter coupling during operation: more than 1 CRC fault per second	Replace inverter coupling
196	Power section	Immediate stop	14	Control unit configuration	Missing PLD functionality for EEPROM data set size 7	Replace control unit
			15	Inverter coupling fault	Inverter coupling processor has signaled internal fault	• Consult SEW Service if the fault occurs again. • Replace inverter coupling
			16	Inverter coupling fault: PLD version incompatible		Replace inverter coupling
			17	Precharge/discharge control fault	Precharge/discharge control processor has signaled internal fault	• Consult SEW Service if the fault occurs again. • Replace precharge/discharge controller
			18	Defective DC link fan	Faulty DC link fan	• Consult SEW Service • Check whether DC link choke fan is connected or faulty
			19	Communication power section control unit	Faulty communication with inverter coupling during operation: more than 1 internal fault per second	• Consult SEW Service if the fault occurs again. • Replace inverter coupling
			20	Communication power section control unit	The control unit has not sent any messages to the inverter coupling for a while	• Consult SEW Service if the fault occurs again. • Replace inverter coupling
			21	Uz measurement not plausible Phase R	Defective phase module	Consult SEW Service if the fault occurs again.
			22	Ur measurement not plausible Phase S		
			23	Uz measurement not plausible Phase T		

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Fault			Subfault			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
197	Supply system	Immediate stop	1	Line overvoltage (motor inverter only at start of precharging process)	Inadequate line voltage quality	• Check supply (fuses, contactor) • Check configuration of the supply system
			2	Line undervoltage (only with line inverter)		
199	DC link charging	Immediate stop	4	Precharging was aborted	Unable to charge DC link	• Precontrol overload • Connected DC link capacity too high • Short circuit in the DC link; check DC link connection in case of several units

6.3 SEW-EURODRIVE electronics service

6.3.1 Sending a device in for repair

Please contact the SEW-EURODRIVE electronics service if a fault cannot be rectified (→ "Customer and spare parts service").

When you contact the SEW-EURODRIVE electronics service, always quote the digits on the status label so that our service personnel can assist you more effectively.

Provide the following information when sending the device in for repair:

- Serial number (→ nameplate)
- Type designation
- Standard version or application version
- Digits on the status label
- Short description of application (drive application, control via terminals or serial)
- Connected motor (motor type, motor voltage, ⅄ or ⅄ connection)
- Nature of the fault
- Accompanying circumstances
- Your own presumptions as to what has happened
- Any unusual events preceding the problem, etc.

6.4 Extended storage

If the device is stored for a long time, connect it to the power supply for at least 5 minutes every 2 years. Otherwise, the device's service life may be reduced.

Procedure when maintenance has been neglected:

Electrolytic capacitors are used in the inverters. They are subject to aging effects when de-energized. This effect can damage the capacitors if the device is connected using the rated voltage after a longer period of storage.

If you have not performed maintenance regularly, SEW-EURODRIVE recommends that you increase the line voltage slowly up to the maximum voltage. This can be done, for example, by using a variable transformer for which the output voltage has been set according to the following overview.

The following stages are recommended:

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AC 400/500 V devices:

- Stage 1: AC 0 V to AC 350 V within a few seconds
- Stage 2: AC 350 V for 15 minutes
- Stage 3: AC 420 V for 15 minutes
- Stage 4: AC 500 V for 1 hour

AC 230 V devices:

- Stage 1: AC 170 V for 15 minutes
- Stage 2: AC 200 V for 15 minutes
- Stage 3: AC 240 V for 1 hour

After you have completed the regeneration process, the device can be used immediately or stored again for an extended period with maintenance.

6.5 Waste disposal

Please follow the current instructions. Dispose of the following materials in accordance with the regulations in force:

- Electronics scrap (printed circuit boards)
- Plastic (housing)
- Sheet metal
- Copper

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7 Declarations of conformity

7.1 MOVIDRIVE®

7.1.1 Declaration of conformity

EU Declaration of Conformity

SEW EURODRIVE

Translation of the original text **900230310/EN**

SEW-EURODRIVE GmbH & Co. KG
Ernst-Blickle-Straße 42, D-76646 Bruchsal
declares under sole responsibility that the following products

Frequency inverters of the product family	**MOVIDRIVE® MDX6.B....-...-.-../.**
in accordance with	
Machinery Directive	**2006/42/EC** **(L 157, 09.06.2006, 24-86)**

This includes the fulfillment of the protection targets for "electrical power supply" in accordance with annex I No. 1.5.1 according to the Low Voltage Directive 73/23/EEC -- Note: 2014/35/EU is currently valid

EMC Directive	**2014/30/EU** **(L 96, March 29, 2014, 79-106)**	**4)**
RoHS Directive	**2011/65/EU** **(L 174, July 1, 2011, 88-110)**	
Applied harmonized standards:	**EN ISO 13849-1:2008/AC:2009** **EN 61800-5-1:2007** **EN 61800-3:2004/A1:2012** **EN 50581:2012**	

4) According to the EMC Directive, the listed products are not independently operable products. EMC assessment is only possible after these products have been integrated in an overall system. For the assessment, the product was installed in a typical plant configuration.

Bruchsal	**21.06.2017**		
Place	Date	Johann Soder Managing Director Technology	a) b)

a) Authorized representative for issuing this declaration on behalf of the manufacturer
b) Authorized representative for compiling the technical documents

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7.2 MOVIDRIVE® with DFS11B/DFS21B

7.2.1 Declaration of conformity

EU Declaration of Conformity

SEW EURODRIVE

Translation of the original text **900010510/EN**

SEW-EURODRIVE GmbH & Co. KG
Ernst-Blickle-Straße 42, D-76646 Bruchsal
declares under sole responsibility that the following products

Frequency inverters of the product family	**MOVIDRIVE® MDX6.B....-..3-.-../.**
with built-in	**DFS11B PROFIBUS-DP-V1 with PROFIsafe** **DFS21B PROFINET IO with PROFIsafe**
in accordance with	
Machinery Directive	**2006/42/EC** **(L 157, 09.06.2006, 24-86)**

This includes the fulfillment of the protection targets for "electrical power supply" in accordance with annex I No. 1.5.1 according to the Low Voltage Directive 73/23/EEC -- Note: 2014/35/EU is currently valid.

EMC Directive	**2014/30/EU** **(L 96, March 29, 2014, 79-106)**	**4)**
RoHS Directive	**2011/65/EU** **(L 174, July 1, 2011, 88-110)**	
Applied harmonized standards:	**EN ISO 13849-1:2008/AC:2009** **EN 61800-5-1:2007** **EN 61800-3:2004/A1:2012** **EN 50581:2012**	
Other applied standards:	**EN 61508:2001 (part 1-7)** **EN 62061:2005**	

4) According to the EMC Directive, the listed products are not independently operable products. EMC assessment is only possible after these products have been integrated in an overall system. For the assessment, the product was installed in a typical plant configuration.

Bruchsal	**19.06.2017**	Johann Soder	
Place	Date	Managing Director Technology	a) b)

a) Authorized representative for issuing this declaration on behalf of the manufacturer
b) Authorized representative for compiling the technical documents

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7.3 MOVIDRIVE® with DCS2.B/DCS3.B

7.3.1 Declaration of conformity

EU Declaration of Conformity

SEW EURODRIVE

Translation of the original text **901920513/EN**

SEW-EURODRIVE GmbH & Co. KG
Ernst-Blickle-Straße 42, D-76646 Bruchsal
declares under sole responsibility that the following products

Frequency inverters of the product family	**MOVIDRIVE® MDX6.B....-..3-.-../.**
with built-in	**DCS2.B with DFS12B PROFIBUS-DP-V1 with PROFIsafe** **DCS2.B with DFS22B PROFINET IO with PROFIsafe** **DCS3.B**
in accordance with	
Machinery Directive	**2006/42/EC** **(L 157, 09.06.2006, 24-86)**

This includes the fulfillment of the protection targets for "electrical power supply" in accordance with annex I No. 1.5.1 according to the Low Voltage Directive 73/23/EEC -- Note: 2014/35/EU is currently valid

EMC Directive	**2014/30/EU** **(L 96, March 29, 2014, 79-106)**	**4)**
RoHS Directive	**2011/65/EU** **(L 174, July 1, 2011, 88-110)**	
Applied harmonized standards:	**EN ISO 13849-1:2008/AC:2009** **EN 61800-3:2004/A1:2012** **EN 61800-5-1:2007** **EN 61800-5-2:2007** **EN 50581:2012**	
Other applied standards:	**EN 61508:2001 (part 1-7)** **EN 62061:2005**	

4) According to the EMC Directive, the listed products are not independently operable products. EMC assessment is only possible after these products have been integrated in an overall system. For the assessment, the product was installed in a typical plant configuration.

Freely programmable safety controller for monitoring drive systems, suitable for SIL 3 IEC 61508:2010 and PL e according to EN ISO 13849-1:2008. An EC type examination was carried out for the safety module by the following testing institute: TÜV Rheinland Industrie Service GmbH, Alboinstr. 56, 12103 Berlin, Germany. ID of notified body NB 0035

Bruchsal	**23.06.2017**	Johann Soder	
Place	Date	Managing Director Technology	a) b)

a) Authorized representative for issuing this declaration on behalf of the manufacturer
b) Authorized representative for compiling the technical documents

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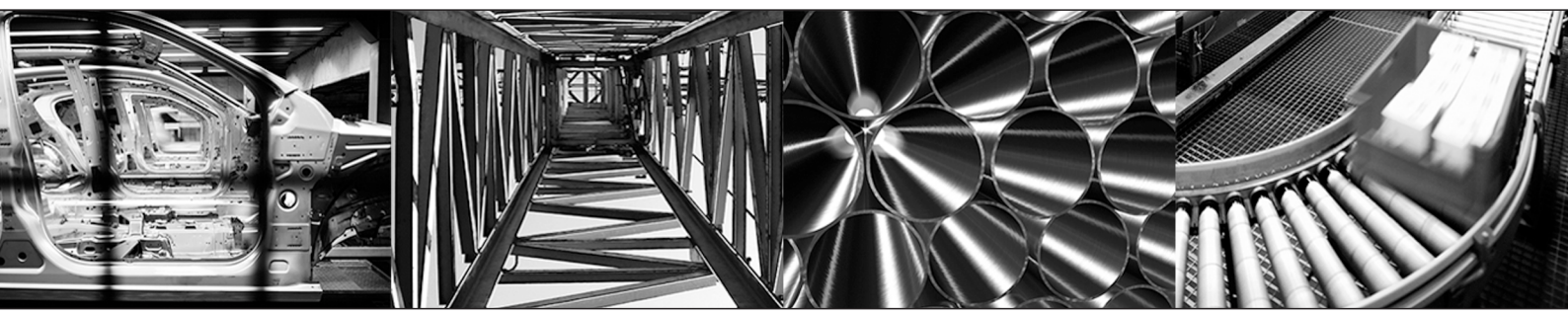

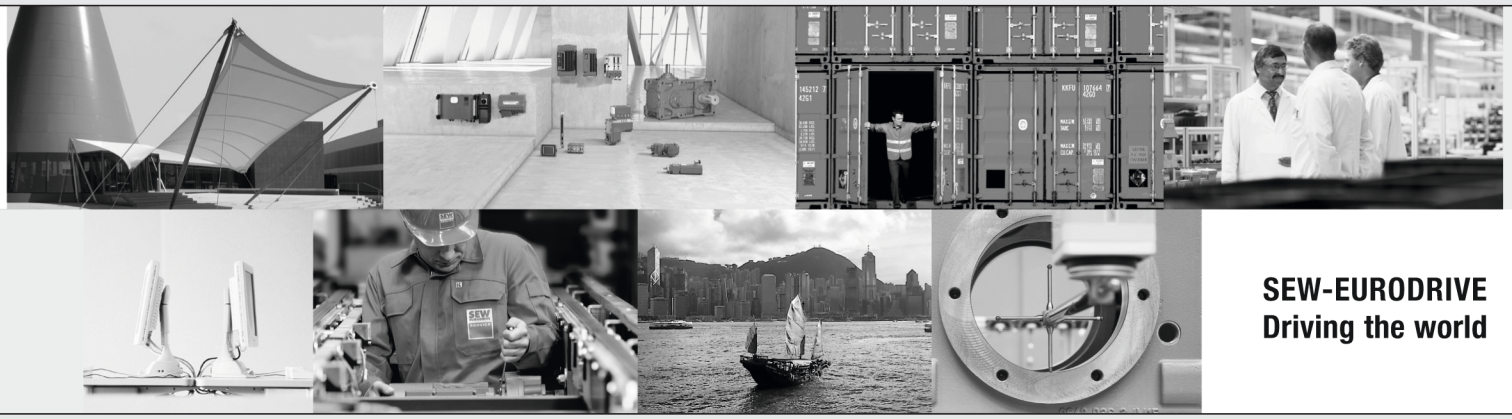

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Driving the world

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