

**SEW
EURODRIVE**

Manual



MOVIKIT® Positioning / Velocity Drive



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1 General information

1.1 About this documentation

This documentation is an integral part of the product. The documentation is intended for all employees who perform work on the product.

Make sure this documentation is accessible and legible. Ensure that persons responsible for the systems and their operation as well as persons who work with 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 if you require further information, contact SEW-EURODRIVE.

1.2 Content of the documentation

The descriptions in this documentation apply to the current software/firmware version at the time of publication. When new versions of software/firmware are installed, the descriptions may differ. In this case, contact SEW-EURODRIVE.

1.3 Other applicable documentation

Observe the corresponding documentation for all further components.

Always use the latest edition of documentation and software.

The SEW-EURODRIVE website (www.sew-eurodrive.com) provides a wide selection of documents for download in various languages. If required, you can also order printed and bound copies of the documentation from SEW-EURODRIVE.

1.4 Short designation

The following short designations are used in this documentation.

Type designation	Short designation
MOVIKIT® Positioning Drive	Software module
MOVIKIT® Velocity Drive	Software module

1.5 Structure of the warning notes

1.5.1 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

General information

Structure of the warning notes

Signal word	Meaning	Consequences if disregarded
INFORMATION	Useful information or tip: Simplifies handling of the product.	

1.5.2 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

1.5.3 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.

1.6 Decimal separator in numerical values

In this document, a period is used to indicate the decimal separator.

Example: 30.5 kg

1.7 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.

1.8 Product names and trademarks

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

1.9 Copyright notice

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2 Safety notes

2.1 Preliminary information

The following general safety notes serve the purpose of preventing injury to persons and damage to property. They primarily apply to the use of products described in this documentation. If you use additional components, also observe the relevant warning and safety notes.

2.2 Target group

- Software specialist Any work with the software may only be performed by a specialist with suitable training. A specialist in this context is someone who has the following qualifications:
- Appropriate training
 - Knowledge of this documentation and other applicable documentation
 - SEW-EURODRIVE recommends additional training for products that are operated using this software.

2.3 Designated use

The software modules are used for implementing positioning applications (MOVIKIT® Positioning Drive) and for applications with speed control (MOVIKIT® Velocity Drive).

Use the device-independent MOVISUITE® engineering software to start up and configure the axes and to download the complete configuration to a MOVI-C® CONTROLLER.

Unintended or improper use of the product may result in severe injury to persons and damage to property.

2.4 Network security and access protection

A bus system makes it possible to adapt electronic drive technology components to the particulars of the machinery within wide limits. There is a risk that a change of parameters that cannot be detected externally may result in unexpected but not uncontrolled system behavior and may have a negative impact on operational safety, system availability, or data security.

Ensure that unauthorized access is prevented, especially with respect to Ethernet-based networked systems and engineering interfaces.

Use IT-specific safety standards to increase access protection to the ports. For a port overview, refer to the respective technical data of the device in use.

3 System description

3.1 Module description

MOVIKIT® Velocity Drive is a software module for implementing applications with speed control and a permanently assigned fieldbus interface.

The MOVIKIT® Positioning Drive software module provides the scope of functions of the MOVIKIT® Velocity Drive software module and furthermore allows to implement positioning applications.

The software modules mainly use the basic functions of the application inverters in use by activating the respective function blocks (such as FCB 09 Position control) depending on the application. This means the scope of functions that can be used depends on the application inverter in use (for example encoder feedback available).

The software modules are integrated into the MOVISUITE® engineering software. No programming knowledge is required for startup and diagnostics.

3.2 Areas of application

The software modules are, among others, suited for the following areas of application:

Materials handling technology

- Trolleys
- Hoists
- Rail vehicles

Logistics

- Storage/retrieval systems
- Transverse carriage
- Rotary tables

3.3 Functions

The software modules offer the following scope of functions:

- Startup using a graphical user interface
- Own parameter tree with all parameters required for operation
- Operating modes: Jog mode, speed control, positioning mode (relative/absolute), referencing mode
- Diagnostic monitor for monitoring and controlling the axis
- Standardized process data interface

3.4 Scope of functions of the process data profiles

Profile	Scope of functions
5 PD	MOVIKIT® Velocity Drive – 5 process data words for speed-variable applications. Encoder feedback is not necessarily required.
8 PD	<p>MOVIKIT® Positioning Drive – 8 process data words for the following operating modes. Encoder feedback is necessary to being able to use the entire scope of functions.</p> <ul style="list-style-type: none"> • Jog mode (encoder feedback not necessarily required) • Speed control (encoder feedback not necessarily required) • Referencing • Positioning (linear and modulo) <p>For further information, refer to the chapter "Operating modes" (→  19).</p>

4 Configuration

4.1 Requirements

Correct project planning and proper installation of the devices are required for successful startup and operation.

For detailed project planning information, refer to the documentation of the respective devices.

4.2 Hardware

The software modules are compatible with the following hardware:

- MOVIDRIVE® technology
- MOVIGEAR® performance
- MOVIMOT® performance
- MOVIMOT® advanced
- MOVIMOT® flexible

4.3 Software

The following software is required for operating the software modules:

- MOVISUITE® engineering software

For more detailed information on the hardware requirements of the individual software components, see the documentation for the respective software.

4.4 Licensing

The following licenses are required for operating the software modules:

- MOVIKIT® Velocity Drive: Application level 0 (standard)
- MOVIKIT® Positioning Drive: Application level 1

For further information on licensing, refer to the document "MOVI-C® Software Components". You can download the document from the SEW-EURODRIVE website (www.sew-eurodrive.com).

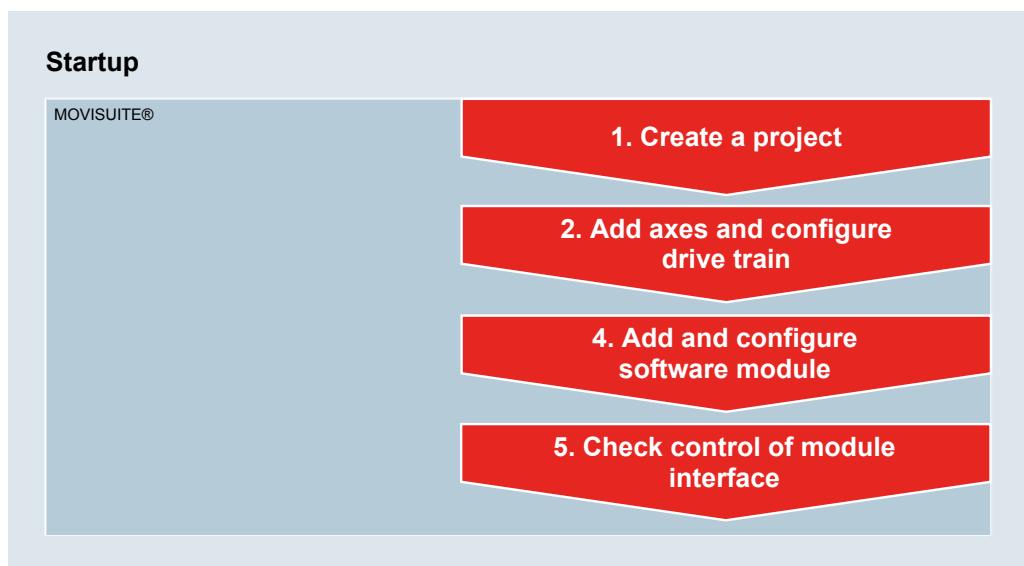
5 Startup

5.1 Requirements

- Check the installation of the inverters and, if installed, also check the encoder connection.
- Observe the installation notes in the documentation of the respective device and software components.
- The devices to be started up are shown in MOVISUITE®.

5.2 Startup procedure

The schematic diagram below shows the startup procedure:



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Only the startup procedures specific to these software modules are explained in detail in the following chapters of this manual. For startup, observe also the documentation of all the other components in use.

5.3 Adding axes

To add axes to the MOVISUITE® project, perform a network scan or add the required axes from the catalog. For further information, refer to the manual for the MOVISUITE® engineering software and to the manuals of the respective devices.

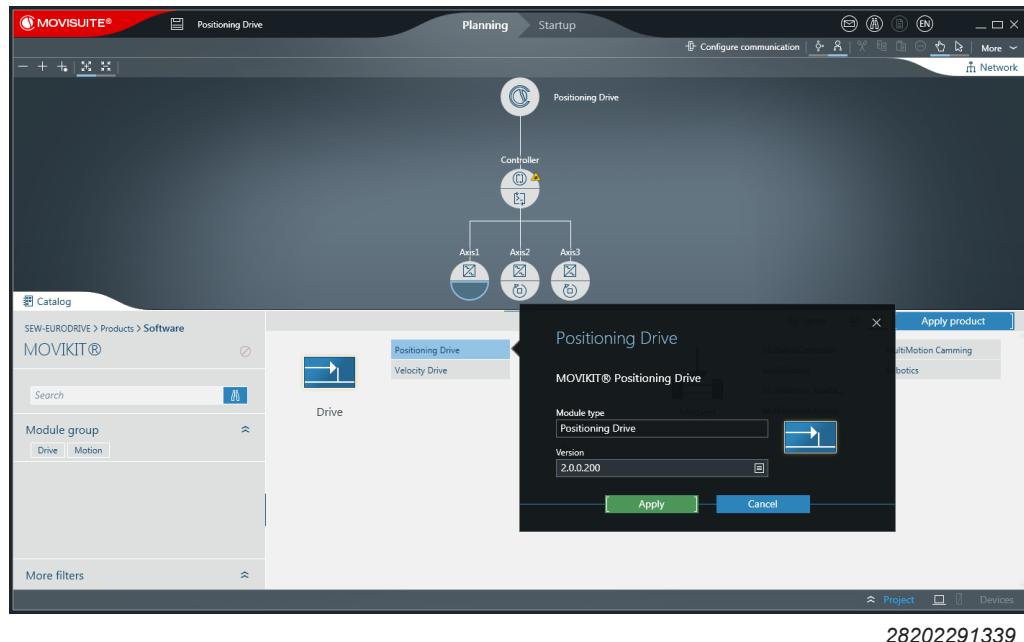
INFORMATION



If you add the software module to an axis for the first time or if you replace the software module of an axis, we recommend that you first reset the axis to its factory setting.

5.4 Inserting the software module

- ✓ A MOVISUITE® project with the node structure of your device structure has been created and is open.
- 1. Click the empty software module section of the node of the desired axis.
 - ⇒ The catalog opens and the available software modules are displayed.
- 2. In the catalog section, click on the desired software module.



- ⇒ Doing so opens the context menu of the selected software module.
- 3. Select the version of the software module from the context menu and confirm your selection using [Apply].
- ⇒ The software module is assigned to the axis, the configuration is created, and the basic settings are performed.

INFORMATION

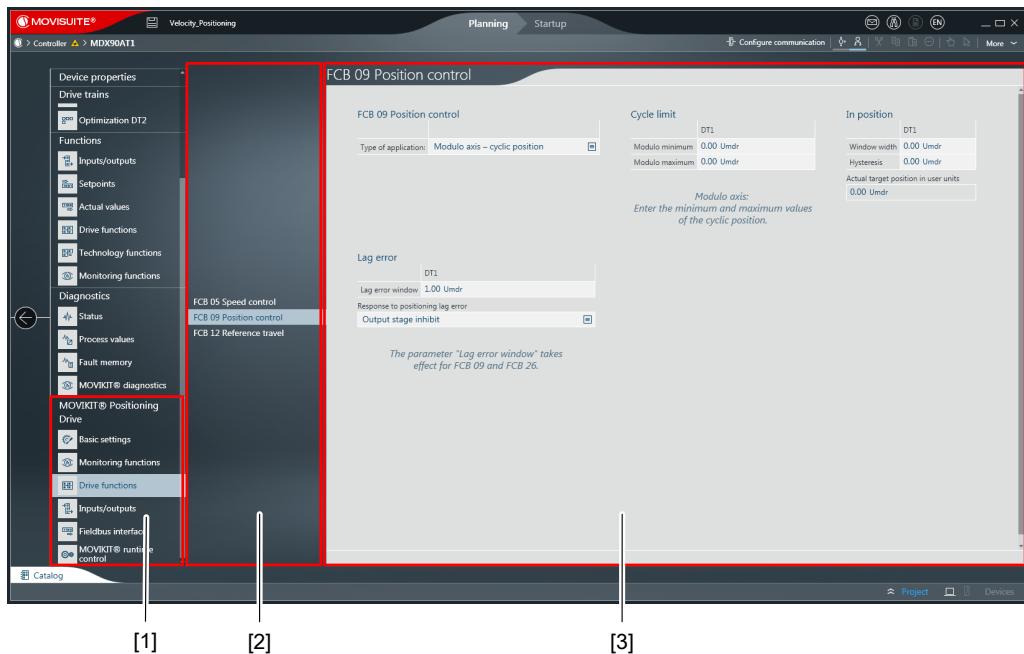


If the respective axes are enabled, you have to confirm that you are changing to startup state. Startup state will be disabled automatically once you have finished the steps described in this chapter.

5.5 Configuring the software module

- In the function view of MOVISUITE®, click on the software module.

⇒ The configuration menus of the software module are displayed.



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- [1] Main menu for configuring the software module
- [2] Submenus of the configuration
- [3] Configuration parameters of the respective submenus

INFORMATION



When using drives without encoders, the stop by setpoint function must be enabled in the submenu "FCB05 Speed control" of the "Drive functions" menu, and both the stop setpoint and the start offset must be set.

INFORMATION



When using drives with encoders, we recommend that you enable the setting "Position controlled" in the submenu "FCB 26 Stop at user-defined limits" in the "Drive functions" menu under "Functions" in the configuration menu of the axis.

5.5.1 Basic settings

Parameter group	Description
Control source	Selection of the control source (e.g. fieldbus or EtherCAT®/SBus ^{PLUS})
Drive train	Setting whether only drive train 1 or drive trains 1 and 2 are to be processed. NOTICE! Drive train 2 is only available with single-axis modules and can be used, for example, to implement emergency mode without encoder feedback. The user units and the speed window for the "Setpoint/actual speed comparison active" signal must be set identical with those of drive train 1.
Module identification	Displays the name of the module and the version ID

5.5.2 Monitoring functions

Reference signals

Parameter group	Description
Comparison of setpoint and actual speed values	Speed window for the "Setpoint/actual speed comparison active" signal (PI 1:11)

Limit values

Parameter group	Description
Application limits	The application limits are set using the following parameters: <ul style="list-style-type: none">• Speed, positive/negative• Acceleration/deceleration• Jerk time• Torque• Apparent output current• Emergency stop deceleration
Limit values from startup	The limit values from startup are set using the following parameters: <ul style="list-style-type: none">• Maximum speed at motor shaft• Maximum torque at motor shaft

Control functions**INFORMATION**

"Software limit switches" are only available when using MOVIKIT® Positioning Drive.

Parameter group	Description
Stop functions	<p>Setting of the stop function for drives with encoder. The following settings can be made for the behavior at standstill:</p> <ul style="list-style-type: none"> • Brake released/drive energized • Brake applied/drive not energized • No brake installed/drive not energized <p>The stop function is active if enable is revoked (stop with FCB 13/14), if no operating mode is selected (FCB 02), and if the stop by setpoint function is enabled.</p> <p>For drives without encoder, this setting is ignored, which means the brake function is always active.</p>
Speed monitoring	Settings for the behavior of speed monitoring
Limit switches	<ul style="list-style-type: none"> • Setting of limit switches (use limit switches from DT1 also in DT2) • Setting of software limit switches • Fault response of hardware limit switches • Fault response of software limit switches

5.5.3 Drive functions

FCB 05 Speed control

Parameter group	Description
Stop by setpoint function	Setting of stop by setpoint function For axes without encoder, the stop by setpoint function must be enabled and both the stop setpoint and the start offset must be set. The brake will then only release when "speed control" mode is selected and the specified setpoint speed is greater than the stop setpoint + start offset.

FCB 09 Position control

INFORMATION



The configuration is only available when using MOVIKIT® Positioning Drive.

Parameter group	Description
FCB 09 Position control	Selection of the type of application (linear axis or modulo axis)
Cycle limit (only visible if modulo axes are selected)	Minimum and maximum value of the cyclic position when using modulo axes
In position	Position window for the "In position active" signal (PI 1:7)
Lag error	Lag error window and monitoring response NOTICE! The setting applies to FCB 09 and FCB 26. For FCB 20 Jog mode, for example, a separate lag error window is available.

FCB 12 Reference travel

INFORMATION



The configuration is only available when using MOVIKIT® Positioning Drive.

Parameter group	Description
FCB 12 Reference travel	Setting of the reference travel type and associated parameters. Other setting windows are available depending on the selected reference travel type.
Advanced settings	Homing can be activated and set as option.

5.5.4 Inputs/outputs

Parameter group	Description
Digital inputs	Configuration of digital inputs We recommend that you set the default assignment of the input with or without HW limit switches.
Digital outputs	Configuration of digital outputs

5.5.5 Fieldbus interface

Parameter group	Description
Fieldbus interface	Representation of the process data profile with 8 process data and selection of the assignment of PI 4 (torque, relative apparent current or absolute apparent current)

5.5.6 MOVIKIT® runtime control

Parameter group	Description
Data Flexibility state	Information about the current operating state of the Date Flexibility level.
Data Flexibility control	Manual stopping, resetting and restarting the program

5.6 Checking control of the module interface

Use the diagnostic monitor to check control of the module interface. For further information on the diagnostic monitor, refer to the chapter "MOVIKIT® diagnostics" (→ 41).

6 Operation

6.1 Operating modes

INFORMATION



The MOVIKIT® Velocity Drive software module uses the speed control operating mode (200). The operating mode cannot be selected manually when using MOVIKIT® Velocity Drive.

6.1.1 Overview of operating modes

Operating modes of MOVIKIT® Positioning Drive and their areas of application:

Operating mode	Decimal	Description
Jog mode	100	Position-controlled jogging (FCB 20) Encoder feedback required
	101	Speed-controlled jogging (FCB 05) Encoder feedback not required
Speed control	200	Speed control (FCB 05) Encoder feedback not required
Referencing mode	300	Reference travel – offset via parameter (FCB 12)
	301	Reference travel – offset via fieldbus (FCB 12)
Positioning mode	400	Absolute position control (FCB 09)
	401	Relative position control (FCB 09)
	402	Modulo position control – positive (FCB 09)
	403	Modulo position control – negative (FCB 09)
	404	Modulo position control – shortest distance (FCB 09)

INFORMATION



The configurations performed in MOVISUITE® apply to operating the function blocks FCB 05, FCB 09, FCB 12, and FCB 20. Modulo operating modes can only be used if the following setting is made in the configuration of the software module in the "Drive functions" menu in the submenu "FCB 09 Position control" in the field "Type of application": "Modulo axis – cyclic position" is set as well as the cycle limit.

6.1.2 Requirements for cycle diagrams

The following chapters provide a cycle diagram for each operating mode to help you better understand the operating principle. They also provide a process sequence with a description of the signals to be set as well as of signal states. The following requirements apply:

Requirement	Process data	Signal state
Ready	PI 1:0	"1": Ready
STO inactive	PI 1:1	"1": STO inactive

Requirement	Process data	Signal state
No fault present	PI 1:8	"0": No fault
No warning present	PI 1:9	"0": No warning
Positioning mode: Axis is referenced	PI 1:5	"1": Axis referenced
Startup has been performed correctly		
Output stage enabled (DI00 = 1)		

6.1.3 Speed control

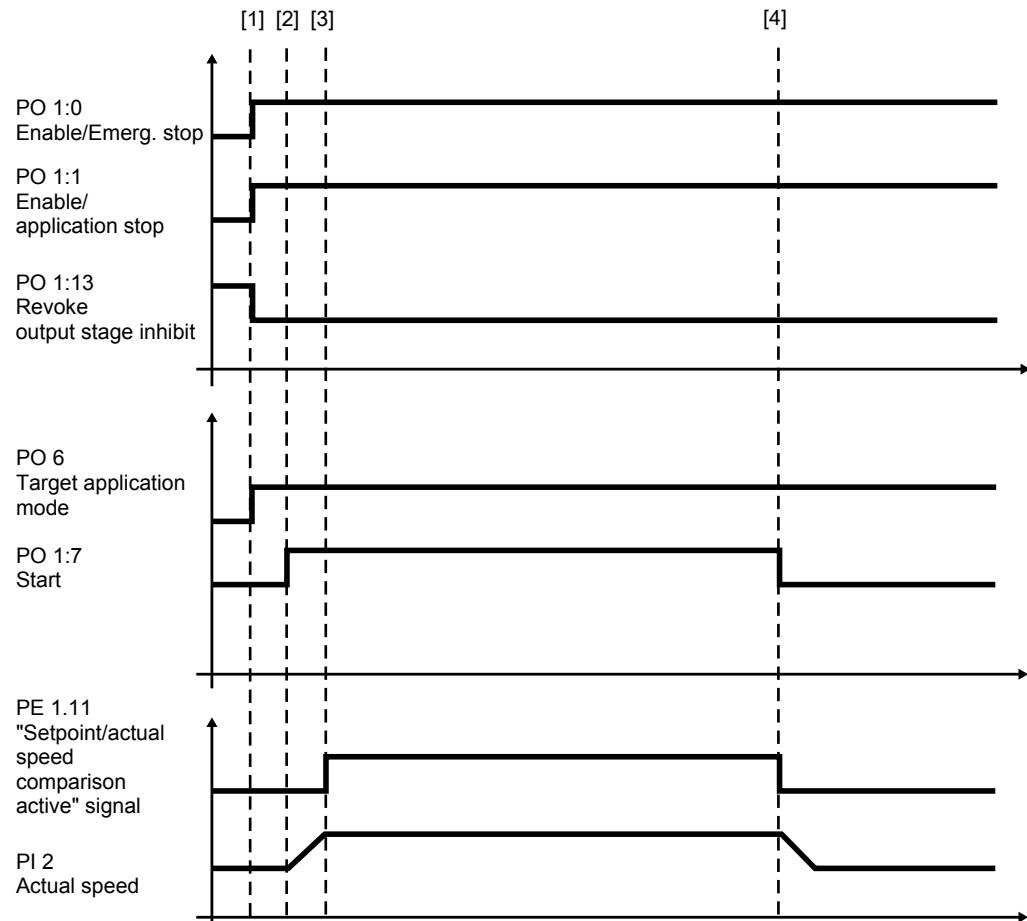
An axis is moved in a speed-controlled manner with or without encoder feedback. The direction depends on the sign of the speed setpoint. A positive setpoint corresponds to a positive motor direction of rotation.

INFORMATION



Monitoring of the software limit switches is disabled in operation without encoder.
Use hardware limit switches to monitor the travel range.

Cycle diagram



Process sequence and signal states

INFORMATION

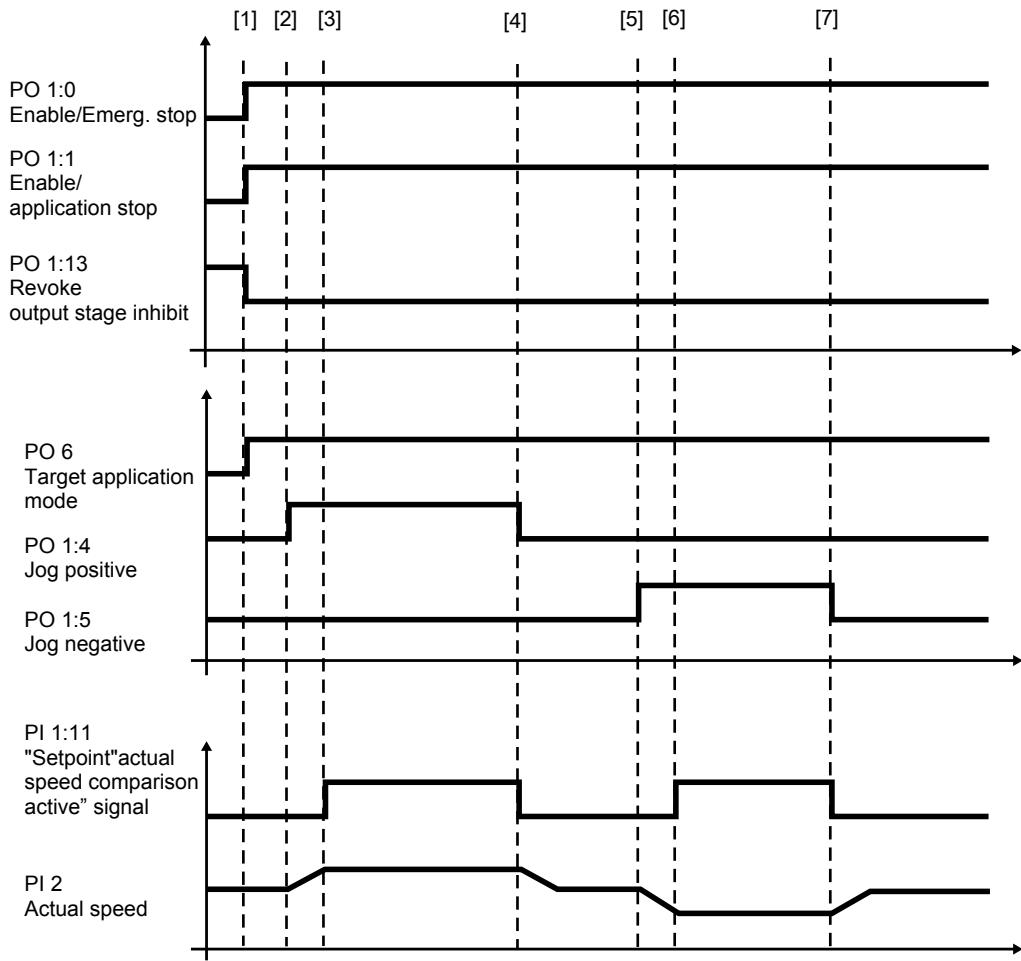
For the behavior of the drive at standstill, refer to the information in the chapter "Control functions" (→ 16) under "Stop functions".

No.	Sequence	PD	Signal states
[1] General enable	• PO 1:0 = "1" Enable/emergency stop	PO 1:0	• "1": Enable • "0": Deceleration with emergency stop ramp
	• PO 1:1 = "1" Enable/application stop	PO 1:1	• "1": Enable • "0": Deceleration according to application limit
	• PO 1:13 = "0" Output stage inhibit (signal with highest priority)	PO 1:13	• "0": Output stage enabled • "1": Output stage inhibited (the drive coasts to a stop or the brake is applied)
[1]	Dynamics parameters are accepted (also during ongoing movement)	PO 2 PO 3 PO 4	Setpoint speed (signed) Acceleration Deceleration
[2] to [4]	Start/stop of the axis	PO 1:7	• "1": The drive accelerates to the setpoint speed specified by means of PO 2 using the value specified by means of PO 3. • "0": Deceleration with the value specified by PO 4. Standstill behavior: The motor is held at speed 0 subject to speed control. For motors without encoder, the "Stop by setpoint function" (→ 17) must be used.
[3] to [4]	If the actual speed lies within the configured window width, the feedback "Setpoint/actual speed comparison active" is issued.	PI 1:11	• "1": "Setpoint/actual speed comparison active"

6.1.4 Jog mode

An axis is moved position controlled (100) or speed controlled (101) with activation of the direction of rotation. Selecting both directions of rotation or not selecting a direction of rotation at all will stop an ongoing movement.

Cycle diagram



Process sequence and signal states

INFORMATION



For the behavior of the drive at standstill, refer to the information in the chapter "Control functions" (→ 16) under "Stop functions".

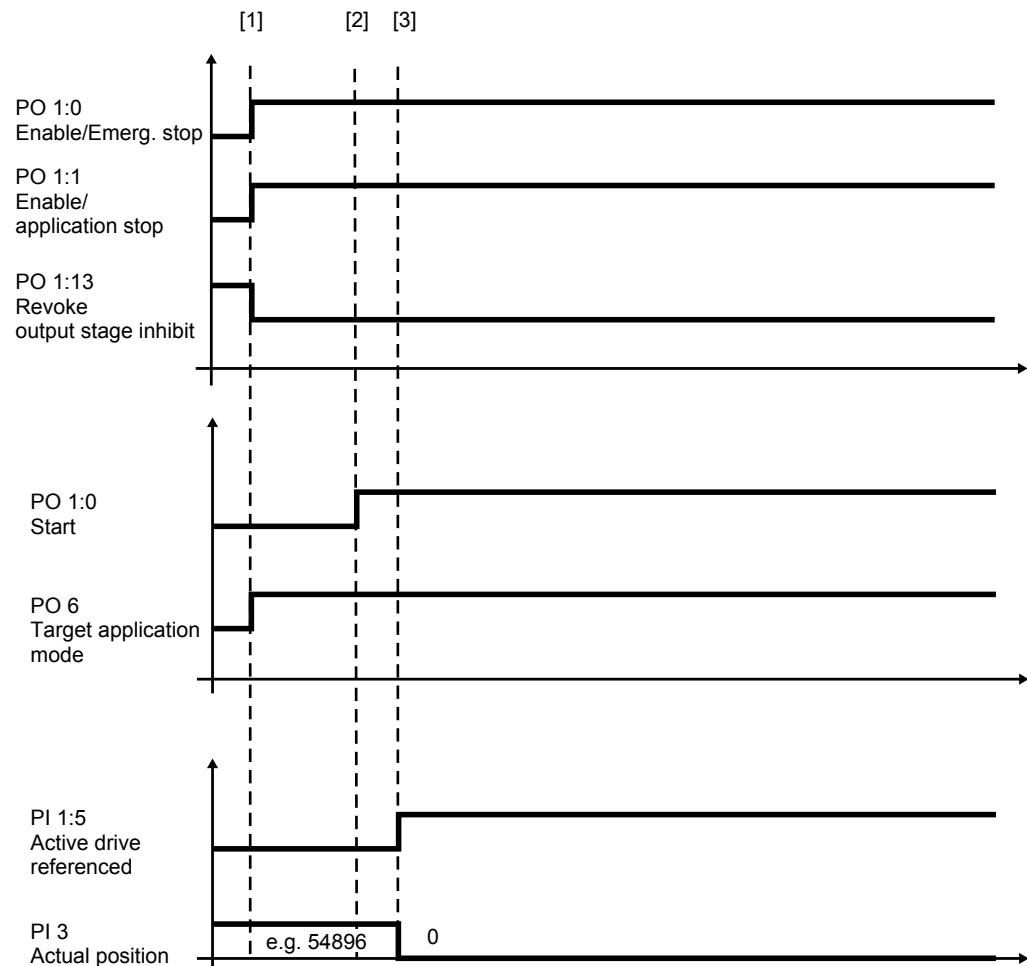
No.	Sequence	PD	Signal states
[1] General enable	• PO 1:0 = "1" Enable/emergency stop	PO 1:0	• "1": Enable • "0": Deceleration with emergency stop ramp
	• PO 1:1 = "1" Enable/application stop	PO 1:1	• "1": Enable • "0": Deceleration according to application limit
	• PO 1:13 = "0" Output stage inhibit (signal with highest priority)	PO 1:13	• "0": Output stage enabled • "1": Output stage inhibited (the drive coasts to a stop or the brake is applied)
[1]	"Jog mode" activated	PO 6	100/101 (decimal)
	Dynamics parameters are accepted (also during ongoing movement)	PO 2 PO 3 PO 4	Setpoint speed Acceleration Deceleration
[2] to [4]	Positive jog direction selected	PO 1:4	<ul style="list-style-type: none"> "1": The drive accelerates to the setpoint speed specified by means of PO 2 using the value specified by means of PO 3. "0": Deceleration with the value specified by PO 4. Operating mode 100: The motor is held at speed 0 subject to position control. Operating mode 101: The motor is held at speed 0 subject to speed control. For motors without encoder, the "Stop by setpoint function" (→ 17) must be used.

No.	Sequence	PD	Signal states
[5] to [7]	Negative jog direction selected	PO 1:5	<ul style="list-style-type: none"> "1": The drive accelerates to the setpoint speed specified by means of PO 2 using the value specified by means of PO 3. "0": Deceleration with the value specified by PO 4. <p>Operating mode 100: The motor is held at speed 0 subject to position control.</p> <p>Operating mode 101: The motor is held at speed 0 subject to speed control.</p> <p>For motors without encoder, the "Stop by setpoint function" (→ 17) must be used.</p>
[3] to [4] and [6] to [7]	If the actual speed lies within the configured window width, the feedback "Setpoint/actual speed comparison active" is issued.	PI 1:11	<ul style="list-style-type: none"> "1": "Setpoint/actual speed comparison active"

6.1.5 Referencing mode

Setting of the actual position dependent on the selected reference travel type (300 – Offset via parameter, 301 – Offset via fieldbus) to the specified reference offset. In referencing mode with offset via fieldbus, the reference offset is specified via PO7/PO8.

Cycle diagram (type – referencing without reference travel)



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Process sequence and signal states
INFORMATION


For the behavior of the drive at standstill, refer to the information in the chapter "Control functions" (→ 16) under "Stop functions".

No.	Sequence	PD	Signal states
[1] General enable	• PO 1:0 = "1" Enable/emergency stop	PO 1:0	• "1": Enable • "0": Deceleration with emergency stop ramp
	• PO 1:1 = "1" Enable/application stop	PO 1:1	• "1": Enable • "0": Deceleration according to application limit
	• PO 1:13 = "0" Output stage inhibit (signal with highest priority)	PO 1:13	• "0": Output stage enabled • "1": Output stage inhibited (the drive coasts to a stop or the brake is applied)
[1]	Selecting an operating mode "Referencing mode"	PO 6	300/301 (decimal)
[2]	Start/stop of reference travel	PO 1:7	• "1": Reference travel start • "0": Stop with drive function FCB 14 (Notstopp). Deceleration with the value specified by PO 4.
[3]	Message "Active drive referenced"	PI 1:5	• "1": "Active drive referenced"

6.1.6 Absolute positioning mode

Absolute positioning (400) of an axis with reference to machine zero (reference point). The setpoint position is processed with sign.

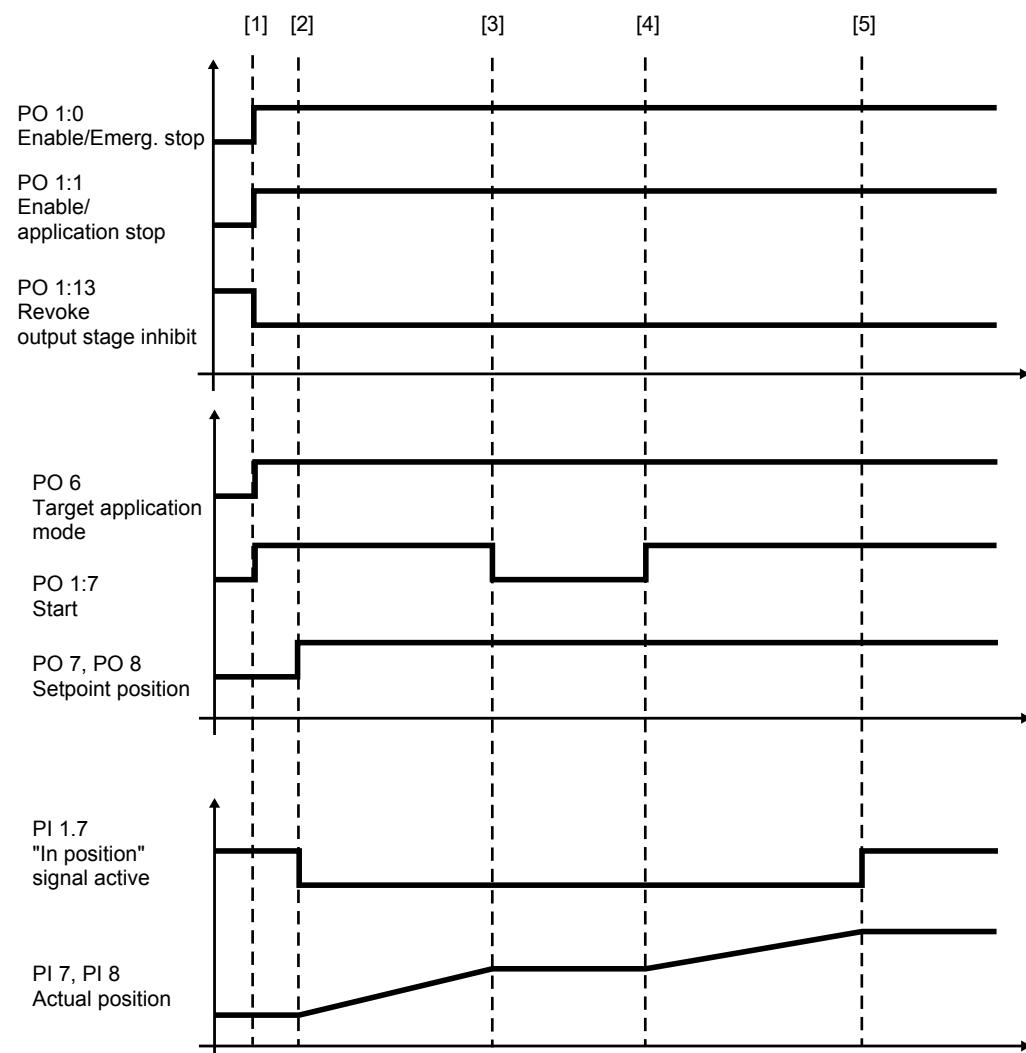
- "Linear" axis type: Setpoint position with processing of signs
- "Modulo" axis type: Setpoint position = $0 \leq \text{target position} < \text{modulo max}$.

NOTICE!

The specified setpoint position should be smaller than modulo max.

The required axis type is set in the configuration of the software module in the "Drive functions" menu in the submenu "FCB 09 Position control" in the field "Type of application".

Cycle diagram (type of application – linear axis)



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Process sequence and signal states
INFORMATION


For the behavior of the drive at standstill, refer to the information in the chapter "Control functions" (→ 16) under "Stop functions".

No.	Sequence	PD	Signal states
[1] General enable	• PO 1:0 = "1" Enable/emergency stop	PO 1:0	• "1": Enable • "0": Deceleration with emergency stop ramp
	• PO 1:1 = "1" Enable/application stop	PO 1:1	• "1": Enable • "0": Deceleration according to application limit
	• PO 1:13 = "0" Output stage inhibit (signal with highest priority)	PO 1:13	• "0": Output stage enabled • "1": Output stage inhibited (the drive coasts to a stop or the brake is applied).
[1]	Selecting an operating mode "Absolute positioning mode"	PO 6	400 (decimal)
	Dynamics parameters are accepted (also during ongoing movement)	PO 2 PO 3 PO 4	Setpoint speed Acceleration Deceleration
[1] to [3] and from [4]	Start/stop of the axis	PO 1:7	• "1": The drive accelerates to the setpoint speed specified by means of PO 2 using the value specified by means of PO 3. • "0": The motor is held at speed 0 subject to position control.
[2]	Specification of the setpoint position (a new setpoint position is also adopted during ongoing movement)	PO 7 PO 8	"Setpoint position" (high word) "Setpoint position" (low word)
Up to [2] and from [5]	If the actual position lies within the configured window width, the feedback "In position" is issued. The drive stops subject to position control.	PI 1:7	• "1": "In position" signal active.

6.1.7 Relative positioning mode

Positioning of a drive relative to the current position (401).

Example: Cyclical operation at a conveyor belt.

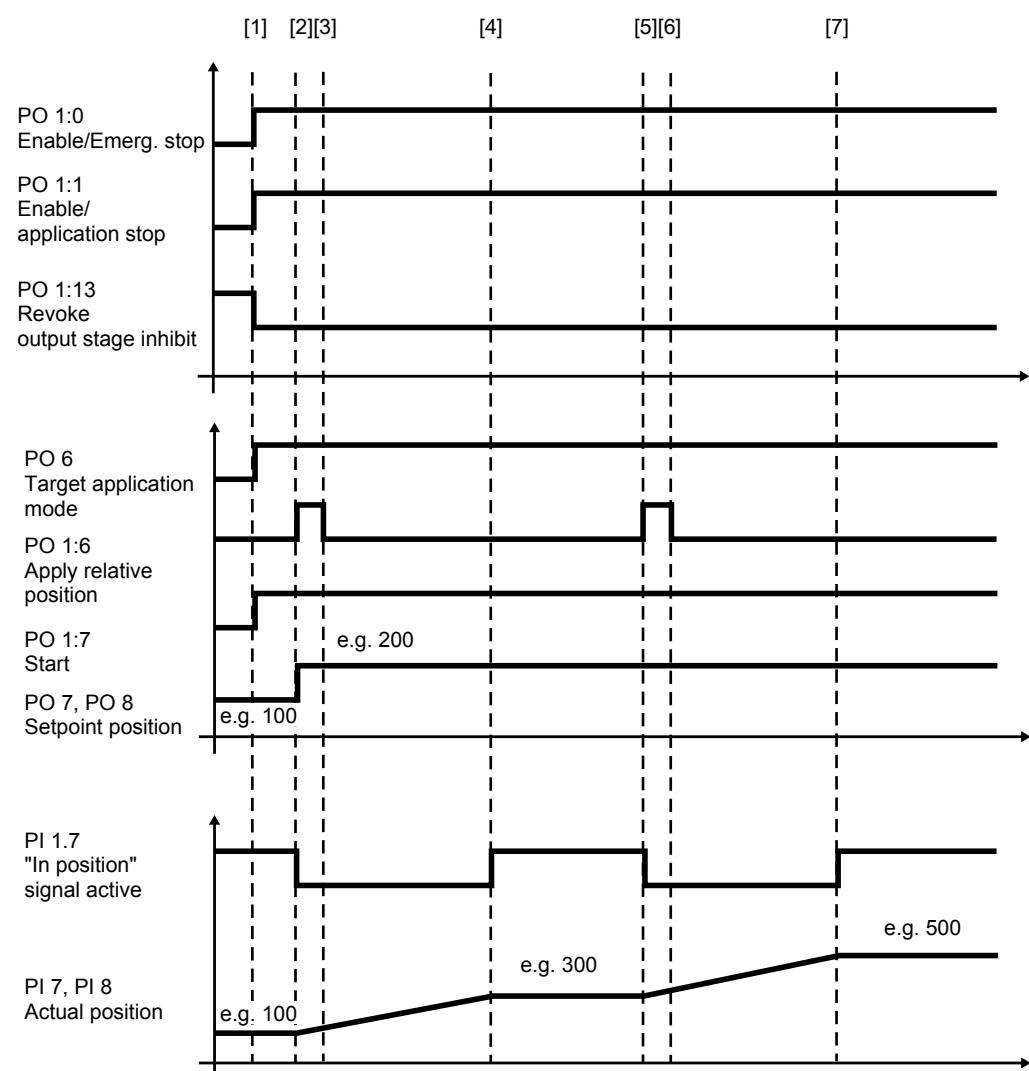
- "Linear" axis type: Setpoint position with processing of signs
- "Modulo" axis type: Setpoint position = $0 \leq \text{target position} < \text{modulo max}$.

NOTICE!

The specified setpoint position should be smaller than modulo max.

The required axis type is set in the configuration of the software module in the "Drive functions" menu in the submenu "FCB 09 Position control" in the field "Type of application".

Cycle diagram (type of application – linear axis)



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Process sequence and signal states

INFORMATION



For the behavior of the drive at standstill, refer to the information in the chapter "Control functions" (→ 16) under "Stop functions".

No.	Sequence	PD	Signal states
[1] General enable	• PO 1:0 = "1" Enable/emergency stop	PO 1:0	• "1": Enable • "0": Deceleration with emergency stop ramp
	• PO 1:1 = "1" Enable/application stop		• "1": Enable • "0": Deceleration according to application limit
	• PO 1:13 = "0" Output stage inhibit (signal with highest priority)	PO 1:13	• "0": Output stage enabled • "1": Output stage inhibited (the drive coasts to a stop or the brake is applied).
[1]	"Relative positioning mode" is activated	PO 6	401 (decimal)
	Dynamics parameters are accepted (also during ongoing movement)	PO 2 PO 3 PO 4	Setpoint speed Acceleration Deceleration
	Start/stop of the axis. If the "Start" signal is revoked during movement to the first target, the drive is stopped and continues to move to the original target if this signal is set again.	PI 1:7	• "1": The drive accelerates to the setpoint speed specified by means of PO 2 using the value specified by means of PO 3. • "0": The motor is held at speed 0 subject to position control.
[2]	Specification of the distance (relative position)	PO 7 PO 8	"Setpoint position" (high word) "Setpoint position" (low word)
[2] to [3] and [5] to [6]	Accept relative position Note: The relative position is calculated once with the rising edge of the signal, and is saved. With the next positive edge (also during movement to the first target), the travel distance can be extended or shortened by the specified relative position.	PO 1:6	• "1": Accept relative position

No.	Sequence	PD	Signal states
Up to [2], [4] to [5] and from [7]	If the actual position lies within the configured window width, the feedback "In position" is issued. The drive stops subject to position control.	PI 1:7	<ul style="list-style-type: none">"1": "In position" signal active

INFORMATION



If the motion sequence is interrupted by revoking the enable signals PO1:0, PO1:1 or PO1:13, the movement must be restarted by setting "Accept relative position". The target position is then recalculated and saved.

6.1.8 Modulo positive positioning mode

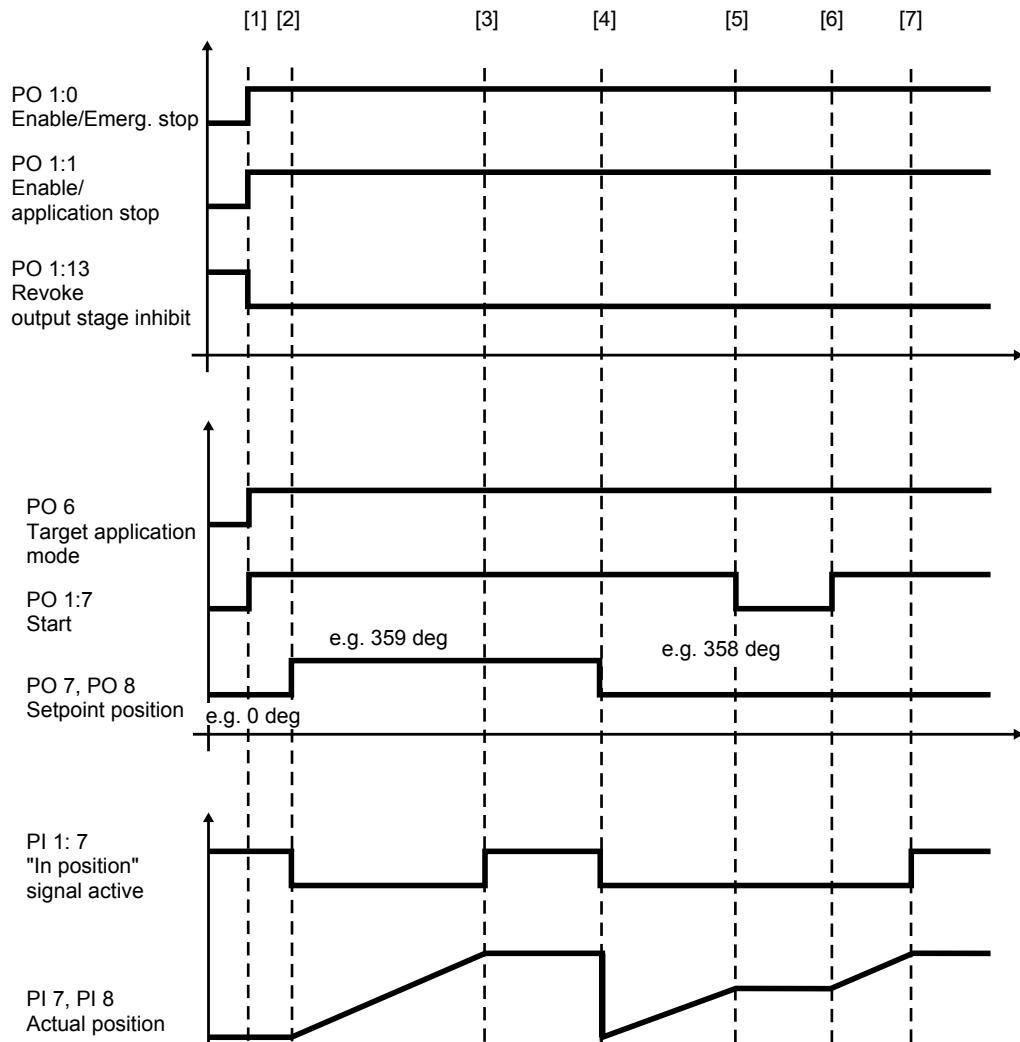
Absolute positioning (402) of a drive with reference to the modulo travel range. The modulo travel strategy is "positive".

"Modulo" axis type: Setpoint position = 0 ≤ target position < modulo max.

NOTICE!

The specified setpoint position should be smaller than modulo max.

Cycle diagram



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Process sequence and signal states

INFORMATION



For the behavior of the drive at standstill, refer to the information in the chapter "Control functions" (→ 16) under "Stop functions".

No.	Sequence	PD	Signal states
[1] General enable	• PO 1:0 = "1" Enable/emergency stop	PO 1:0	• "1": Enable • "0": Deceleration with emergency stop ramp
	• PO 1:1 = "1" Enable/application stop	PO 1:1	• "1": Enable • "0": Deceleration according to application limit
	• PO 1:13 = "0" Output stage inhibit (signal with highest priority)	PO 1:13	• "0": Output stage enabled • "1": Output stage inhibited (the drive coasts to a stop or the brake is applied).
[1]	"Modulo positive positioning mode" is activated.	PO 6	402 (decimal)
	Dynamics parameters are accepted (also during ongoing movement)	PO 2 PO 3 PO 4	Setpoint speed Acceleration Deceleration
[1] to [5] and from [6]	Start/stop of the axis	PO 1:7	• "1": The drive accelerates to the setpoint speed specified by means of PO 2 using the value specified by means of PO 3. • "0": The motor is held at speed 0 subject to position control.
[2], [4]	Specification of the setpoint position (a new setpoint position is also adopted during ongoing movement)	PO 7 PO 8	"Setpoint position" (high word) "Setpoint position" (low word)
Up to [2], [3] to [4] and from [7]	If the actual position lies within the configured window width, the feedback "In position" is issued. The drive stops subject to position control.	PI 1:7	• "1": "In position" signal active

6.1.9 Modulo negative positioning mode

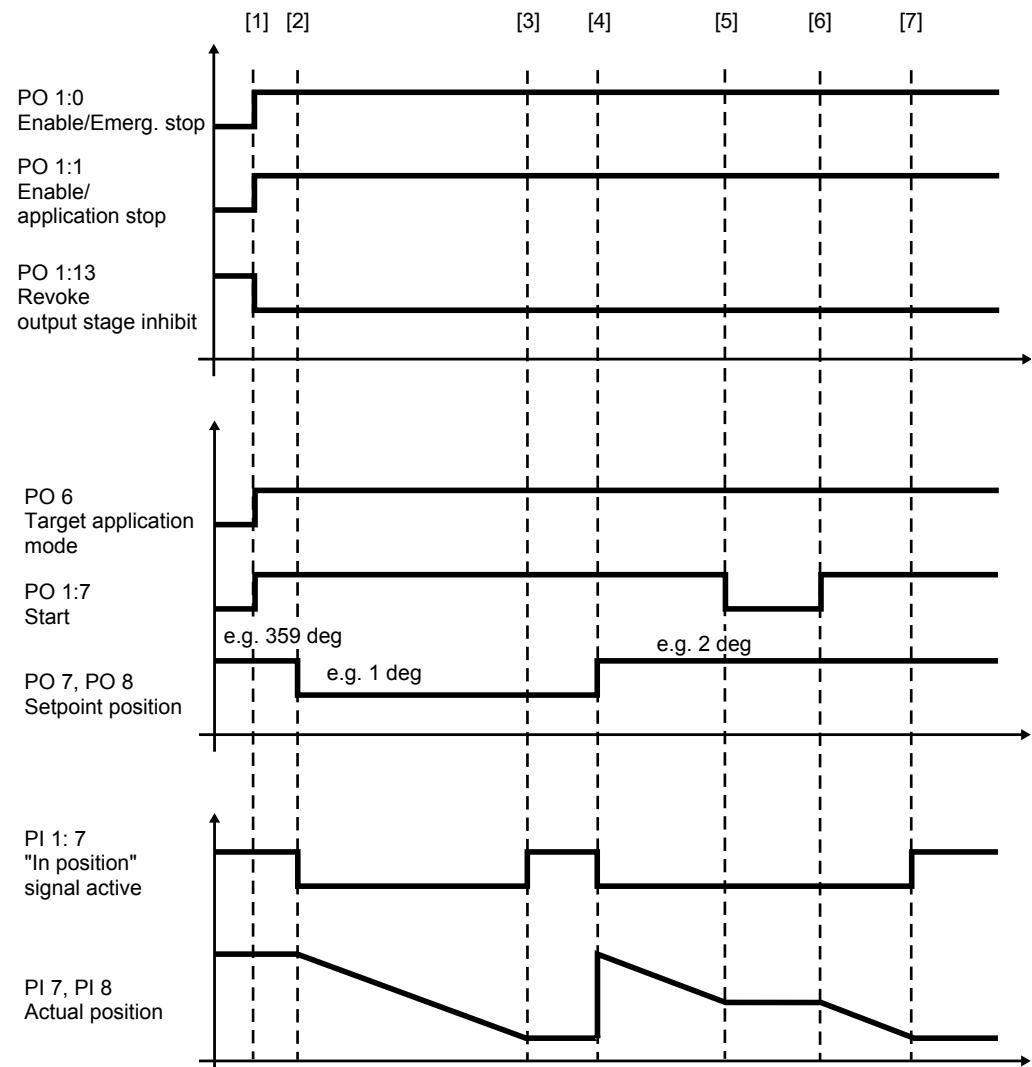
Absolute positioning (403) of a drive with reference to the modulo travel range. The modulo travel strategy is "negative".

"Modulo" axis type: Setpoint position = $0 \leq \text{target position} < \text{modulo max}$.

NOTICE!

The specified setpoint position should be smaller than modulo max.

Cycle diagram



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Process sequence and signal states

INFORMATION

For the behavior of the drive at standstill, refer to the information in the chapter "Control functions" (→ 16) under "Stop functions".

No.	Sequence	PD	Signal states
[1] General enable	• PO 1:0 = "1" Enable/emergency stop	PO 1:0	• "1": Enable • "0": Deceleration with emergency stop ramp
	• PO 1:1 = "1" Enable/application stop	PO 1:1	• "1": Enable • "0": Deceleration according to application limit
	• PO 1:13 = "0" Output stage inhibit (signal with highest priority)	PO 1:13	• "0": Output stage enabled • "1": Output stage inhibited (the drive coasts to a stop or the brake is applied).
[1]	"Modulo negative positioning mode" is activated.	PO 6	403 (decimal)
	Dynamics parameters are accepted (also during ongoing movement)	PO 2 PO 3 PO 4	Setpoint speed Acceleration Deceleration
[1] to [5] and from [6]	Start/stop of the axis	PO 1:7	• "1": The drive accelerates to the setpoint speed specified by means of PO 2 using the value specified by means of PO 3. • "0": The motor is held at speed 0 subject to position control.
[2] and [4]	Specification of the setpoint position (a new setpoint position is also adopted during ongoing movement)	PO 7 PO 8	"Setpoint position" (high word) "Setpoint position" (low word)
Up to [2], [3] to [4] and from [7]	If the actual position lies within the configured window width, the feedback "In position" is issued. The drive stops subject to position control.	PI 1:7	• "1": "In position" signal active

6.1.10 Modulo positioning mode – optimized direction

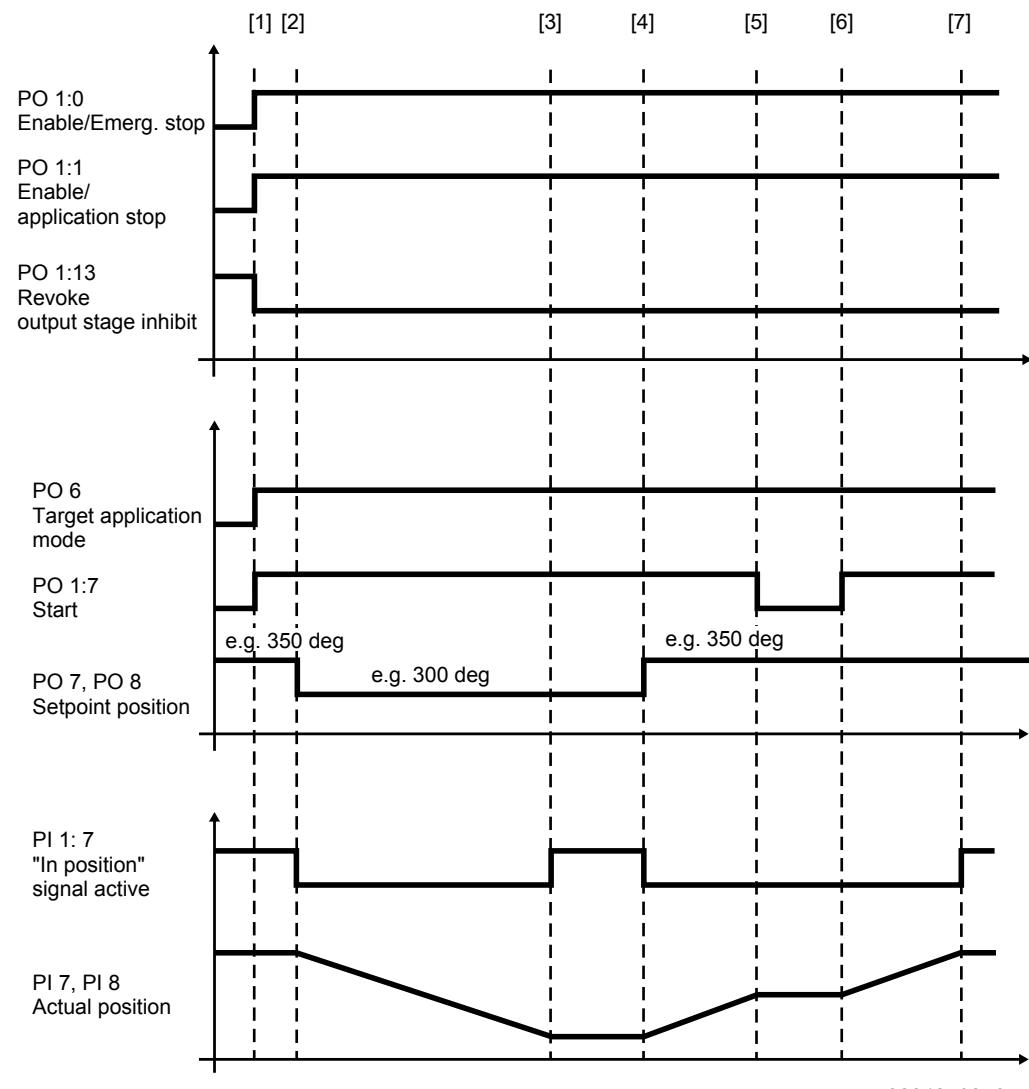
Absolute positioning (404) of a drive with reference to the modulo travel range. The modulo travel strategy is "shortest distance".

"Modulo" axis type: Setpoint position = $0 \leq \text{target position} < \text{modulo max}$.

NOTICE!

The specified setpoint position should be smaller than modulo max.

Cycle diagram



Process sequence and signal states**INFORMATION**

For the behavior of the drive at standstill, refer to the information in the chapter "Control functions" (→ 16) under "Stop functions".

INFORMATION

The direction of rotation in this operating mode results from the distance to the target position.

No.	Sequence	PD	Signal states
[1] General enable	• PO 1:0 = "1" Enable/emergency stop	PO 1:0	• "1": Enable • "0": Deceleration with emergency stop ramp
	• PO 1:1 = "1" Enable/application stop	PO 1:1	• "1": Enable • "0": Deceleration according to application limit
	• PO 1:13 = "0" Output stage inhibit (signal with highest priority)	PO 1:13	• "0": Output stage enabled • "1": Output stage inhibited (the drive coasts to a stop or the brake is applied).
[1]	"Modulo positioning shortest distance" is activated.	PO 6	404 (decimal)
	Dynamics parameters are accepted (also during ongoing movement)	PO 2 PO 3 PO 4	Setpoint speed Acceleration Deceleration
[1] to [5] and from [6]	Start/stop of the axis	PO 1:7	• "1": The drive accelerates to the setpoint speed specified by means of PO 2 using the value specified by means of PO 3. • "0": The motor is held at speed 0 subject to position control.
[2] and [4]	Specification of the setpoint position (a new setpoint position is also adopted during ongoing movement)	PO 7 PO 8	"Setpoint position" (high word) "Setpoint position" (low word)
Up to [2], [3] to [4] and from [7]	If the actual position lies within the configured window width, the feedback "In position" is issued. The drive stops subject to position control.	PI 1:7	• "1": "In position" signal active

6.2 Other functions

The functions described in the following complement the operating modes. The functions are activated by digital signals configured for this purpose.

6.2.1 Hardware limit switches

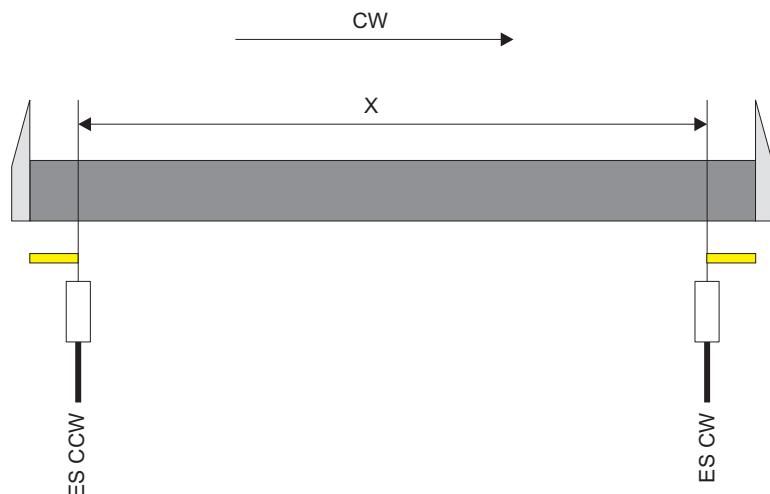
The hardware limit switches are connected to the digital outputs configured for this purpose. The digital inputs are configured in the configuration of the software module in the "Inputs/outputs" menu.

The cams of the hardware limit switches must cover the travel range up to the stop.

⚠ CAUTION



Only use hardware limit switches with normally closed contacts (low-active).



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[CW]	Drive inverter clockwise rotation
[X]	Travel distance
[ES CW]	Right hardware limit switch
[ES CCW]	Left hardware limit switch

INFORMATION



Make sure the hardware limit switch is assigned correctly. This means clockwise movement (CW) should be towards the clockwise hardware limit switch (LS CW) and counterclockwise movement (CCW) should be towards the counterclockwise hardware limit switch (LS CCW).

6.2.2 Software limit switches

INFORMATION



This function is only available when using MOVIKIT® Positioning Drive.

Software limit switches are used to limit the travel range of an axis. Monitoring of the software limit switches can be activated and configured in the configuration menu of the software module during startup. See the chapter "Monitoring functions" (→ 15). The drive must be referenced to allow for monitoring the software limit switches.

If software limit switch monitoring is enabled, the following response will be triggered depending on the active operating mode as soon as the configured negative or positive limit switch is exceeded:

- Jog mode, position controlled (100)

The drive stops at the software limit switch position using the deceleration specified via PO 4. If "Limit switch fault response" is enabled, the fault message E30.01/02 "Positive/negative limit switch hit" is issued.

- Jog mode, speed controlled (101) and with speed setpoint (200)

The drive stops along the configured emergency stop ramp if the respective "Limit switch fault response" is activated. The fault message E30.01/02 "Positive/negative limit switch hit" is issued.

- Positioning mode (400-404)

If a target position is specified that lies beyond the position of a limit switch, no travel job will be performed when the motor is at standstill. Else the drive stops with the deceleration set for the application limits. The fault message E19.02 "Position setpoint violation" is issued.

Fault messages can be reset using PO 1.8 "Fault reset". First specify a direction of rotation or a target position in the direction of the valid range of the software limit switches. If you want to move the drive outside the range limited by the software limit switches, you have to disable the software limit switches using the PO 1:12 signal.

6.2.3 Digital inputs/outputs



NOTICE

If communication between higher-level controller, MOVI-C® CONTROLLER and drive is interrupted, the digital outputs will be frozen. In this case, connected actuators (such as valves) could result in an unexpected behavior of the system.

Death, severe injuries or damage to property

- Make sure that the digital outputs control only those parts of the system that cannot give rise to hazardous situations.

The digital outputs of the connected inverter are controlled using the control bits in the PO 5 process data word if the option "Control via fieldbus" is enabled in the configuration under "Digital outputs" in the "Inputs/outputs" menu in the field "Digital outputs DO 00-DO 03". Also refer to chapter "Inputs/outputs" (→ 18).

The digital inputs are the image of the input terminals of the connected inverter and are provided by process data word PI 5.

For the assignment of bits to digital inputs/digital outputs, refer to the chapter "Process data assignment" (→ 44).

7 MOVIKIT® diagnostics

All MOVIKIT® software modules are equipped with a diagnostic monitor to allow for quick startup and checking the control as well as the application. In addition to monitor mode, the diagnostic monitor also provides a control mode that can be used to control the functions of the software module in MOVISUITE®.

⚠ WARNING



Risk of injury due to unexpected device behavior (such as movements of the drive) in control mode or when changing the operating mode. Limits and locking specified by the PLC might be ineffective in control mode.

Death, severe injuries or damage to property

- Make sure that the motor cannot be started in an uncontrolled manner in control mode or when changing the operating mode. Inhibit the inverter for this purpose.
- Block access to the potential hazard zone. Use available safety equipment.

7.1 Checking process data

Proceed as follows:

1. In MOVISUITE®, open the configuration of the application inverter. Next open the "MOVIKIT® diagnostics" menu under "Diagnostics".

PO 1: Control word	PJ 1: Status word
Bit Function	Function state
0 Enable/emergency stop	Ready
1 Enable/application stop	STO inactive
2 Reserved	Output stage enable
3 Release brake	Brake/DynaStop® released
4 Jog positive	Motor running
5 Jog negative	Active drive referenced
6 FCB 09 Relative – accept position	Setpoints active
7 Start/stop with fieldbus ramp	"In position" signal active
8 Fault reset	Fault
9 Reserved	Warning
10 Activate drive train 2	Drive train 2 active
11 Reserved	"Setpoint/actual speed comparison" signal active
12 Disable SW limit switches	SW limit switches inactive
13 Activate CONTROLLER INHIBIT	Reserved
14 Activate standby mode	Standby mode active
15 Reserved	MOVIKIT® heartbeat

Bit	Function
0	PI 1: Status word
1	PI 2: Actual speed
2	PI 3: Status/main fault - subfault
3	PI 4: Torque
4	PI 5...: DI 13 ... DI 10, DI 07 ... DI 00
5	PI 6: Actual application mode
6	PI 7/8: Actual position

Digital inputs basic unit	
DI00	Inhibit
DI01	No function
DI02	No function
DI03	No function
DI04	No function
DI05	No function
DI 06	No function
DI 07	No function

⇒ At the start, diagnostics is in monitor mode.

2. To toggle between control mode and monitor mode, click the [On/off] button.

⇒ In monitor mode, you can monitor the process data of the fieldbus interface.

- ⇒ In control mode (PC control), the process data via fieldbus interface are disabled which means the process data can be specified using the user interface of MOVIKIT® diagnostics. The data are sent to the application inverter automatically and continuously and take effect immediately.

7.2 Monitor mode

In monitor mode, the setpoints of the higher-level controller are visualized in the "PLC output data" section.

Process data overview		PLC output data		PLC input data		Drive
		>>>>		<<<<		
PO 1 Control word	0x0000	hex	0x0000	hex	PI 1: Status word	
PO 2: Setpoint speed	0	Umdr/min	0 Umdr/min		PI 2: Actual speed	
PO 3: Acceleration	0	Umdr/(min*s)	0x0000		PI 3: Status/main fault - subfault	
PO 4: Deceleration	0	Umdr/(min*s)	0.0 % nominal motor torque		PI 4: Torque	
PO 5: ... DO 03 ... DO 00	0000 0000		0000 0000 0000 0000		PI 5: ... DI 13 .. DI 10, DI 07 ... DI 00	
PO 6: Target application mode	0: Stop		0: Stop		PI 6: Actual application mode	
PO 7/8: Target position	0 /100	Umdr	0.00 Umdr		PI 7/8: Actual position	

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Control words and status words are shown in bit-wise notation in decoded view.

PO 1: Control word				PI 1: Status word		Bit
Bit	Function	Function state	Function state	Function		
0	Enable/emergency stop	<input checked="" type="radio"/>	<input checked="" type="radio"/>	Ready		0
1	Enable/application stop	<input checked="" type="radio"/>	<input checked="" type="radio"/>	STO inactive		1
2	Reserved	<input checked="" type="radio"/>	<input checked="" type="radio"/>	Output stage enable		2
3	Release brake	<input checked="" type="radio"/>	<input checked="" type="radio"/>	Brake/DynaStop® released		3
4	Reserved	<input checked="" type="radio"/>	<input checked="" type="radio"/>	Motor running		4
5	Reserved	<input checked="" type="radio"/>	<input checked="" type="radio"/>	Active drive referenced		5
6	Reserved	<input checked="" type="radio"/>	<input checked="" type="radio"/>	Setpoints active		6
7	Start/stop with fieldbus ramp	<input checked="" type="radio"/>	<input checked="" type="radio"/>	"In position" signal active		7
8	Fault reset	<input checked="" type="radio"/>	<input checked="" type="radio"/>	Fault		8
9	Reserved	<input checked="" type="radio"/>	<input checked="" type="radio"/>	Warning		9
10	Activate drive train 2	<input checked="" type="radio"/>	<input checked="" type="radio"/>	Drive train 2 active		10
11	Reserved	<input checked="" type="radio"/>	<input checked="" type="radio"/>	"Setpoint/actual speed comparison" signal active		11
12	Disable SW limit switches	<input checked="" type="radio"/>	<input checked="" type="radio"/>	SW limit switches inactive		12
13	Activate CONTROLLER INHIBIT	<input checked="" type="radio"/>	<input checked="" type="radio"/>	Reserved		13
14	Activate standby mode	<input checked="" type="radio"/>	<input checked="" type="radio"/>	Standby mode active		14
15	Reserved	<input checked="" type="radio"/>	<input checked="" type="radio"/>	MOVIKIT® heartbeat		15

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7.3 PC control

Activating "PC control" lets you move the drive without setpoints from the higher-level controller. In this state, you can specify the required values by means of the enabled setpoint fields.

INFORMATION



The active communication between PC and drive is monitored when "PC control" is enabled. If the drive does not obtain a setpoint for a period longer than set in the "PC control timeout" parameter, the drive stops automatically and generates the fault "F33-xy User Timeout". In the event of a slow communication connection, you can increase the default value of 2.0 seconds.

8 Process data assignment

8.1 Process output data

The following table shows the process output data from the PLC to the inverter for control via fieldbus with 8 process data words.

INFORMATION



The "V/P" column indicates whether the respective process data word or bit is only available when using MOVIKIT® Positioning Drive (P) or whether it is also available when using MOVIKIT® Velocity Drive (V/P).

Word		Bit	V/P	Function
PO 1	Control word	0	V/P	Enable/emergency stop
		1	V/P	Enable/application stop
		2	V/P	Reserved
		3	V/P	Brake release (without enable)
		4	P	Jog positive
		5	P	Jog negative
		6	P	Accept relative position
		7	V/P	Start/stop with fieldbus ramp
		8	V/P	Fault reset
		9	V/P	Reserved
		10	V/P	Activate drive train 2
		11	V/P	Reserved
		12	P	Disable software limit switches
		13	V/P	Activate output stage enable
		14	V/P	Activate standby mode
		15	V/P	MOVIKIT® Handshake In
PO 2	Setpoint speed	0 – 15	V/P	User unit
PO 3	Setpoint acceleration	0 – 15	V/P	User unit
PO 4	Setpoint deceleration	0 – 15	V/P	User unit
PO 5	Digital outputs	0	V/P	DO 00 / DIO 01 (output)
		1	V/P	DO 01 / DIO 02 (output)
		...	V/P	...
		3	V/P	DO 03
		...	V/P	...
PO 6	Target application mode	0 – 15	P	Operating mode. See the chapter "Overview of operating modes" (→ 19).
PO 7	Target position high word	0 – 15	P	User unit
PO 8	Target position low word	0 – 15	P	User unit

8.1.1 Control word

INFORMATION



For the behavior of the drive at standstill, refer to the information in the chapter "Control functions" (→ 16).

Bit	Function	PD	V/P	Description
0	Enable/emergency stop	PO 1.0	V/P	<ul style="list-style-type: none"> "1": Enable "0": Stop with drive function FCB 14 (emergency stop).
1	Enable/application stop	PO 1.1	V/P	<ul style="list-style-type: none"> "1": Enable "0": Stop with drive function FCB 13 (stop at application limits).
2	Reserved	PO 1.2	V/P	-
3	Release brake (without enable)	PO 1.3	V/P	If required, activate this function using parameter 8501.2 (Release brake/DynaStop® with FCB 01 – enable).
4	Jog positive	PO 1.4	P	Signal for moving the drive in positive direction in jog mode.
5	Jog negative	PO 1.5	P	Signal for moving the drive in negative direction in jog mode.
6	Accept relative position	PO 1.6	P	Apply relative target position in relative positioning mode (401). This signal is without effect for all the other operating modes.
7	Start/stop with fieldbus ramp	PO 1.7	V/P	<ul style="list-style-type: none"> "1": Start – Movement enabled in all operating modes except for jog mode. In referencing mode, "Start" is also needed for referencing without reference travel. "0": Referencing mode Stop with FCB 14 (emergency stop) "0": Other operating modes Deceleration to speed 0 with the value specified by PO 4. Standstill behavior: The motor is held at speed 0 subject to speed control or position control depending on the operating mode. For motors without encoder, the "Stop by setpoint function" (→ 17) must be used.
8	Fault reset	PO 1.8	V/P	Reset of fault messages with the positive edge of the signal.
9	Reserved	PO 1.9	V/P	-

Bit	Function	PD	V/P	Description
10	Activate drive train 2	PO 1.10	V/P	<ul style="list-style-type: none"> "0": Drive train 1 selected "1": Drive train 2 selected <p>NOTICE! Drive train 2 is only available with single-axis modules and can be used, for example, to implement emergency mode without encoder feedback.</p>
11	Reserved	PO 1.11	V/P	-
12	Disable SW limit switches	PO 1.12	P	<ul style="list-style-type: none"> "0": Monitoring of software limit switches enabled. "1": Monitoring of software limit switches disabled.
13	Activate output stage enable	PO 1.13	V/P	<ul style="list-style-type: none"> "1" Output stage inhibit activated – The brake is applied or (if no brake is installed) the motor coasts to a halt. "0" Output stage inhibit inactive – Output stage can be enabled
14	Activate standby mode	PO 1.14	V/P	<ul style="list-style-type: none"> "1" Standby mode activated. "0" Standby mode not activated. <p>Standby mode can only be activated when the output stage is inhibited.</p>
15	MOVIKIT® Handshake In	PO 1.15	V/P	This signal is copied internally to status word bit 15 (MOVIKIT® Handshake Out). If the copying operation fails ("Handshake Out" remains constant with changing "Handshake In" signal), the device-internal processing of the MOVIKIT® software module is disrupted.

8.2 Process input data

The following table shows the process input data from the inverter to the PLC for control via fieldbus with 8 process data words.

Word		Bit	Function
PI 1	Status word	0	"1": Ready
		1	"1": STO inactive
		2	"1": Output stage enable
		3	"1": Brake released
		4	"1": Motor running (motor standstill active)
		5	"1": Active drive referenced
		6	"1": New relative position applied
		7	"1": "In position" signal active
		8	"1": Fault
		9	"1": Warning "Warning" can be defined as response for certain faults. If a warning is signaled, both bit PI 1.9 and the associated fault code is indicated in PI 3. If a warning and a fault are active at the same time, only bit PI 1.8 is set and the respective fault code is indicated in PI 3.
		10	"1": Drive train 2 active
		11	"1": "Setpoint/actual speed comparison active" signal
		12	"1": Software limit switches inactive
		13	"1": Reserved (can be assigned individually using status word 2, bit 13)
		14	"1": Standby mode active
		15	MOVIKIT® Handshake Out (for details, see MOVIKIT® Handshake In)
PI 2	Actual speed	0 – 15	User unit
PI 3	Status Fault subfault	0 – 15	<ul style="list-style-type: none"> • No fault: Display of current FCB (low-byte) • Device fault: Display of device fault code • Fault in option: Display of option fault code <p>(High byte: fault, low-byte: subfault) For more information, refer to the product manual of the respective device.</p>

Word		Bit	Function
PI 4	Torque	0 – 15	<ul style="list-style-type: none"> • Current torque based on the nominal motor torque (unit: 0.1%) • Relative apparent current based on the nominal inverter current (unit: 0.1%) • Absolut apparent current (unit: 0.01 A)
PI 5	Digital inputs	0	DI 00
	
		7	DI 07
	
		9	DI 09 / DIO 01 (input)
		10	DI 10 / DIO 02 (input)
	
		13	DI 13
	
PI 6	Actual application mode (operating mode)	0 – 15	Operating mode. See the chapter "Overview of operating modes" (→ 19).
PI 7	Actual position (high word)	0 – 15	User unit
PI 8	Actual position (low word)	0 – 15	User unit

8.2.1 Status word

Bit	Function	Process data	Description
8	Fault	PI 1:8	<ul style="list-style-type: none"> "1": Fault present "0": No fault present <p>Active faults can be reset by setting the signal PI 1:8 "Fault reset".</p>
9	Warning	PI 1:9	<ul style="list-style-type: none"> "1": Warning present "0": No warning present <p>Warnings can be reset by setting the signal PI 1:8 "Fault reset" if the reason for the warning no longer exists. Warnings that are set as warnings with self reset will delete themselves even if the reason for the warning no longer exists. In this case, the warning need not be reset.</p> <p>For more information, refer to the product manual of the respective device.</p>
...
12	SW limit switch Inactive	PI 1:12	<p>This signal is active if one of the following conditions is met:</p> <ul style="list-style-type: none"> PO 1:12 is active Both software limit switches were set to the value "0".

9 Sample projects

9.1 EtherNet/IP™

You find a sample project for the "Studio 5000 Logix Designer" engineering tool at the homepage of SEW EURODRIVE → www.sew-eurodrive.com. Go to [Online Support] > [Data & Documents] > [Software] and search for "Movikit".

9.2 PROFINET

You find a sample project for the "TIA Portal" engineering tool at the homepage of SEW EURODRIVE → www.sew-eurodrive.com. Go to [Online Support] > [Data & Documents] > [Software] and search for "Movikit".

10 Troubleshooting

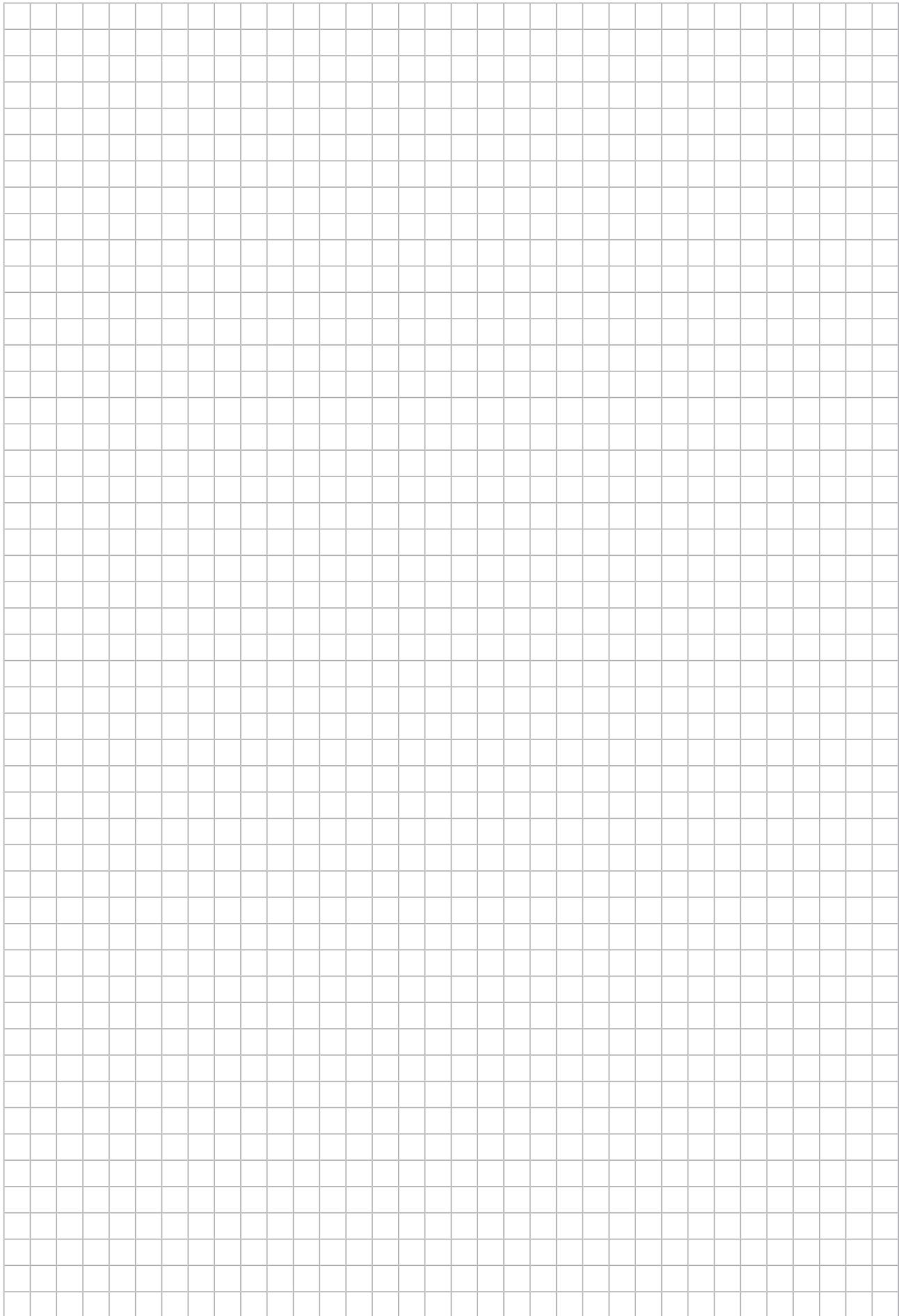
10.1 Fault 32.7: Communication during PC control interrupted

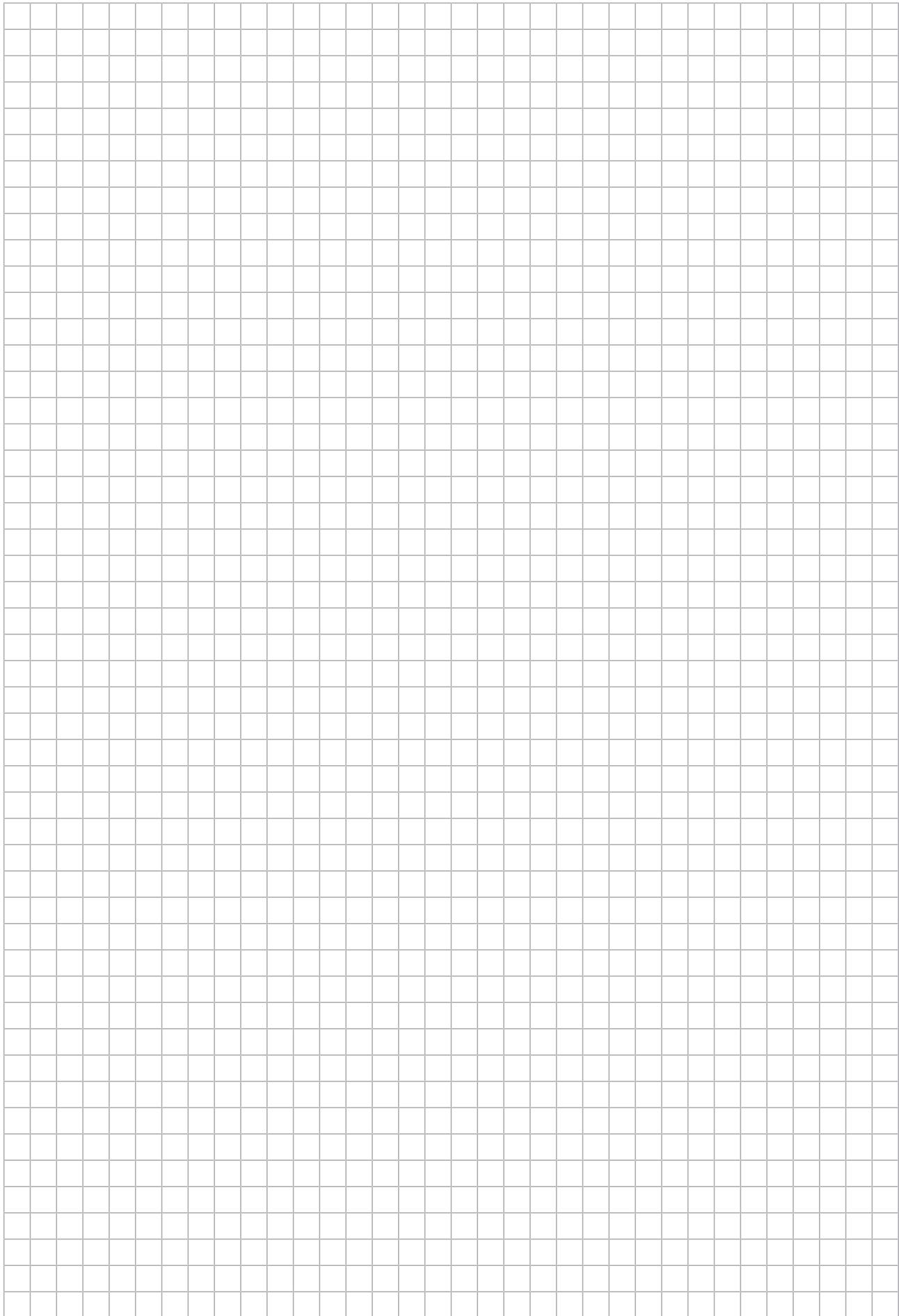
Problem

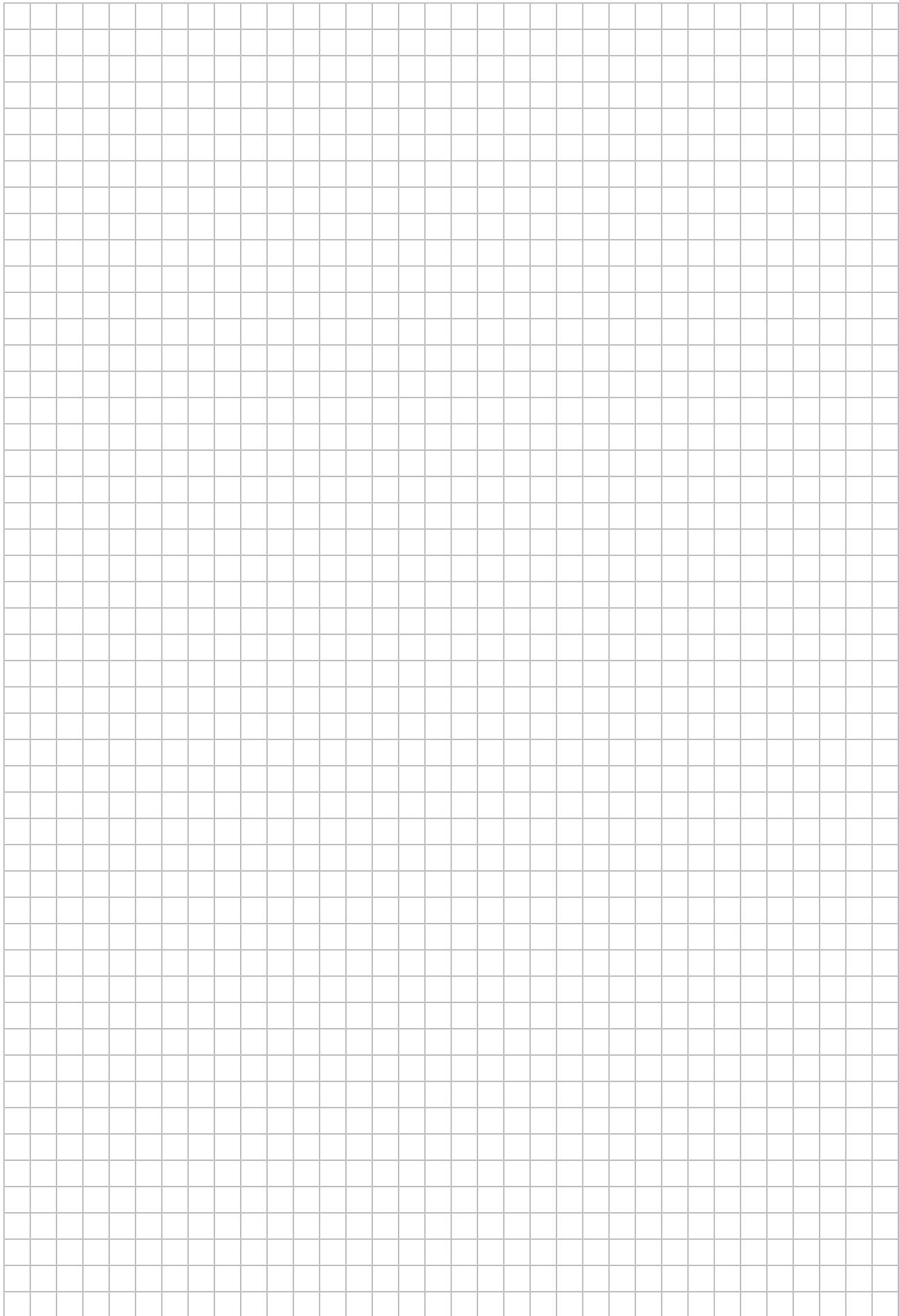
Communication is interrupted when using MOVIKIT® diagnostics in "PC control" mode.

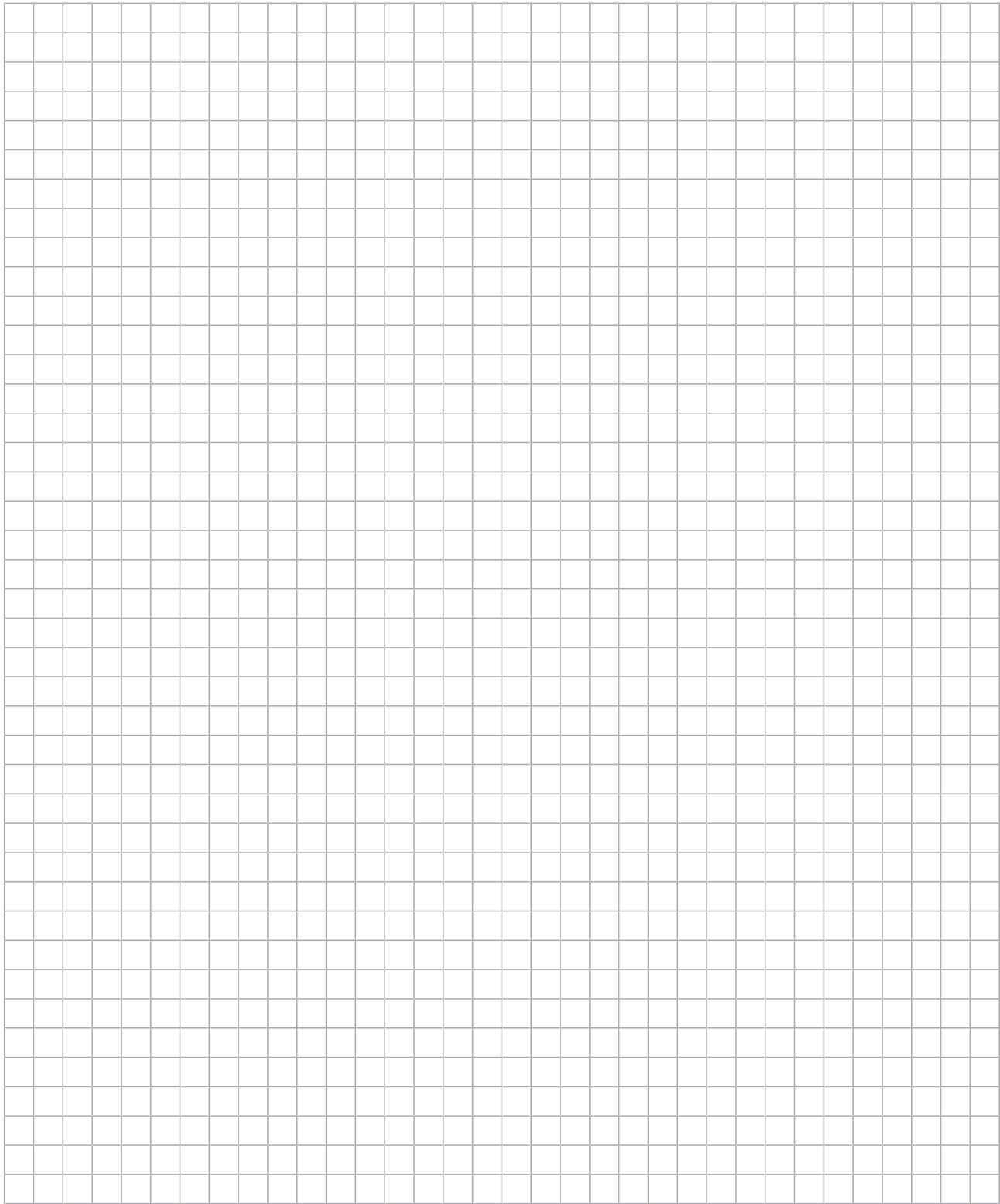
Remedy

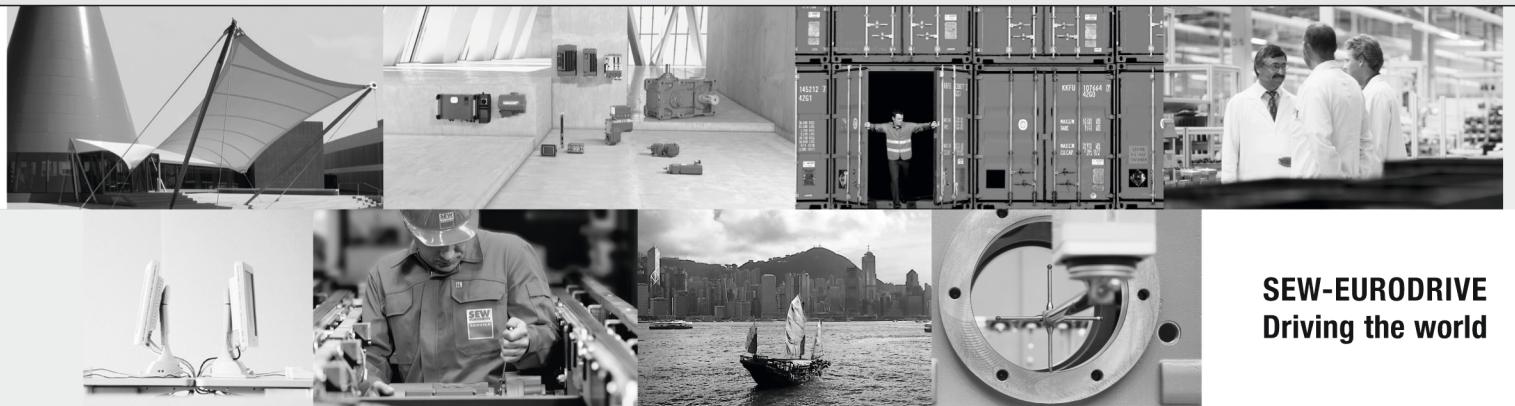
- Check the timeout time set for MOVIKIT® diagnostics and increase the timeout time, if required.











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