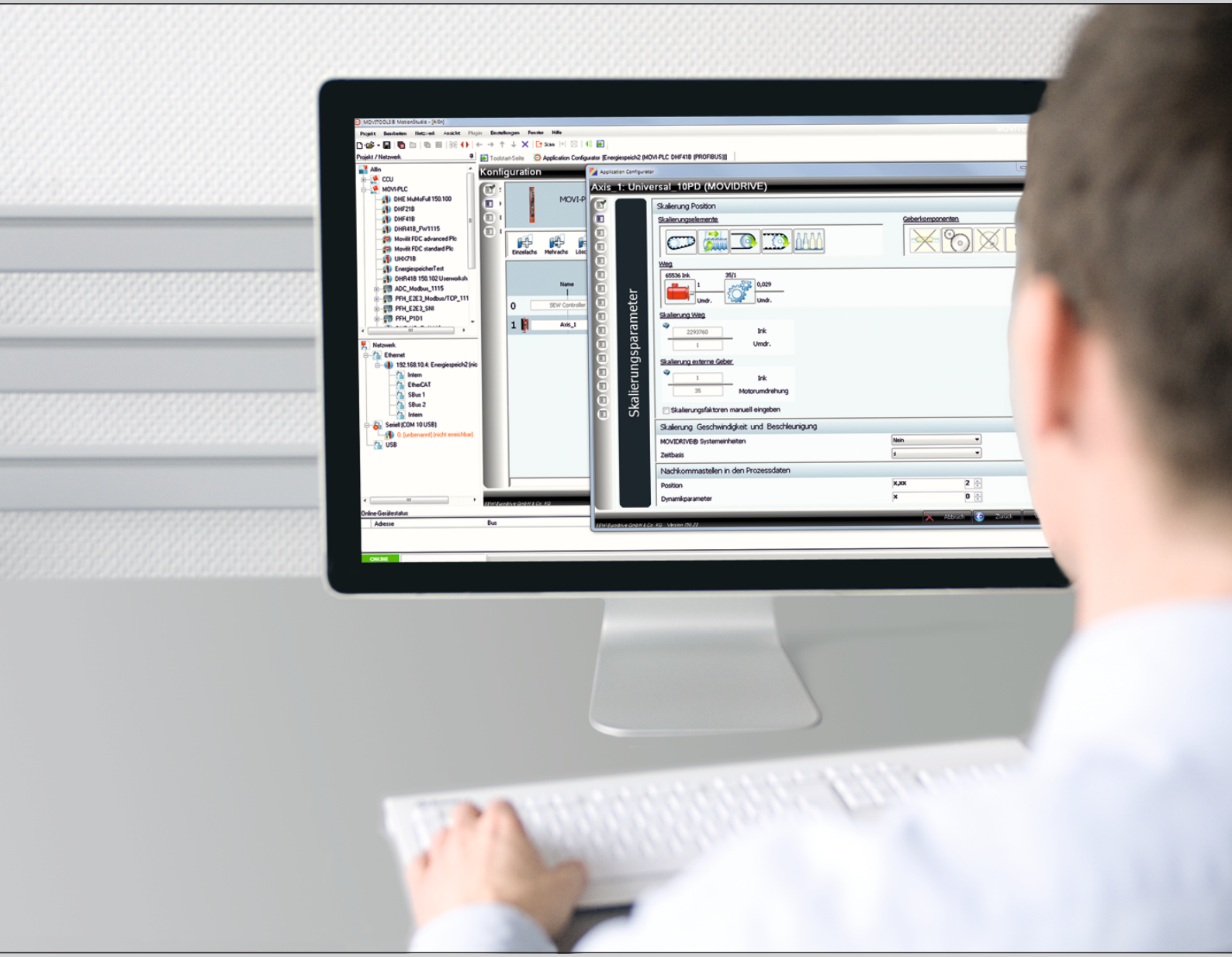
SEW EURODRIVE

Manual



CCU "Universal Module" Application Module

Edition 01/2016

22138218/EN

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1 General information

1.1 About this documentation

The documentation is part of the product and contains important information. The documentation is for everyone who works with this product.

The documentation must be accessible and legible. Make sure that persons responsible for the system and its operation as well as persons who work independently with the software and the connected units of SEW-EURODRIVE have read through the manual carefully and understood it. If you are unclear about any of the information in this documentation or if you require further information, please 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 drive system or its environment.
INFORMATION	Useful information or tip: Simplifies handling of the drive system.	

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 Right to claim under warranty

A requirement of fault-free operation and fulfillment of any rights to claim under limited warranty is that you adhere to the information in the documentation at hand. Therefore, read the documentation before you start working with the software and the connected units from SEW-EURODRIVE.

Make sure that the documentation is available to persons responsible for the machinery and its operation as well as to persons who work independently on the units. Also ensure that the documentation is legible.

1.4 Exclusion of liability

Please observe this documentation as well as the documentation for the software used and the SEW-EURODRIVE devices connected. This documentation must be observed to ensure that the devices operate safely and that the specified product properties and performance characteristics are achieved.

SEW-EURODRIVE assumes no liability for injury to persons or damage to equipment or property resulting from non-observance of the documentation. In such cases, SEW-EURODRIVE assumes no liability for defects.

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1.5 Copyright notice

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 Other applicable documentation

The "applicable documentation" is listed in the documentation for the configuration software "Application Configurator for CCU".

Always use the latest edition of the documentation and software.

Our documentation is available in various languages for download from the website (www.sew-eurodrive.com). If you are unclear about any of the information in this documentation or if you require further information, consult SEW-EURODRIVE.

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2 Safety notes

2.1 General

The following basic safety notes are intended to prevent injury to persons and damage to property. The user must ensure that the basic safety notes are read and observed.

Ensure that persons responsible for the machinery and its operation as well as persons who work 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, please contact SEW-EURODRIVE.

The following safety notes refer to the use of the software. Also observe the supplementary safety notes in this documentation and in the documentation for the connected units from SEW-EURODRIVE.

This document does not replace the detailed documentation for the connected units. This documentation assumes that the user has access to and is familiar with the documentation for all connected units from SEW-EURODRIVE.

Never install or operate damaged products. Report any damage to the shipping company immediately.

Depending on the degree of protection, units may have live, uninsulated, and sometimes moving or rotating parts, as well as hot surfaces during operation.

Removing required covers without authorization, improper use or incorrect installation and operation may result in severe injury to persons, or damage to machinery. Consult the documentation for further information.

2.2 Target group

Work with the software in this solution may only be performed by adequately qualified personnel. Qualified personnel in this context are persons who have the following qualifications:

- Appropriate training in their relevant field.
- Knowledge of this documentation and other applicable documentation.
- SEW-EURODRIVE recommends additional product training for products that are operated using this software.

All mechanical work on connected units is to be performed exclusively by adequately qualified personnel. Qualified personnel in the context of this documentation are persons familiar with the design, mechanical installation, troubleshooting and servicing of the product, who possess the following qualifications:

- Training in mechanical engineering, e.g. as a mechanic or mechatronics technician (final examinations must have been passed).
- Knowledge of this documentation and other applicable documentation.

All electrical work on connected units is to be performed exclusively by adequately qualified electricians. Qualified electricians in the context of this documentation are persons familiar with electrical installation, startup, troubleshooting and servicing of the product, who possess the following qualifications:

- Training in electrical engineering, e.g. as an electrician or mechatronics technician (final examinations must have been passed).
- Knowledge of this documentation and other applicable documentation.

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- Knowledge of the relevant safety regulations and laws.
- Knowledge of all other standards, directives and laws named in this documentation.

The above-mentioned persons must have the express authorization of the company to operate, program, configure, label and ground units, systems and circuits in accordance with the standards of safety technology.

All work in the areas of transportation, storage, operation and waste disposal must be carried out by persons who are trained appropriately.

2.3 Designated use

The "Universal module" application module is a single-axis module used for speed-controlled and positioning applications.

Use the device-independent "Application Configurator" configuration software to start up and configure the axes for the application module and to download the complete configuration to the controller.

2.4 Bus systems

A bus system makes it possible to adapt frequency inverters and/or motor starters to the particulars of the machinery within wide limits. This results in the risk that a change of parameters that cannot be detected externally can result in unexpected, though not uncontrolled, system behavior.

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3 Project planning information

3.1 Requirements

Correct configuration and proper installation of the units are required for successfully starting up and operating the application modules with the Application Configurator.

You find detailed configuration information in the documentation of the respective units (see chapter "Other applicable documentation").

3.2 PC and software

The application module is part of the "Application Configurator" configuration software. For this reason, the system requirements of the Application Configurator apply. They are listed in the documentation for the "Application Configurator for CCU" configuration software.

3.3 Approved unit combination

The assignment of inverters to the respective CCU controller (performance class: standard or advanced) is listed in the documentation for the configuration software "Application Configurator for CCU".

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4 System description

4.1 Area of application

The "Universal module" application module is used for all speed-controlled and positioning applications in user units. Functional extensions such as synchronization or Touchprobe evaluation allow for a wide range of possible applications.

The application module is equipped with a consistent process data interface that is simply extended with increasing functionality. Thus the profiles of the universal module are downward compatible.

INFORMATION

If you use this application module for positioning tasks, you require a drive with encoder.

4.2 Scope of functions of process data profiles

The "Universal module" application module has the following interrelated process data profiles.

Profile	Scope of functions
4 PD	Operating modes: • Speed mode • Jog mode Functions: • Speed and dynamics parameters in user units • **INFORMATION:** Motors without encoder are only supported in this profile.
6 PD	Operating modes (in addition to 4 PD profile): • Referencing mode • Absolute positioning mode – linear and modulo
7 PD	Operating modes (in addition to 6 PD profile): • Synchronism • Relative positioning mode – linear and modulo
10 PD	Operating modes (in addition to 7 PD profile): • Positioning mode – Touchprobe (TP) with sensor-based positioning – linear and modulo • Speed synchronism Functions: • Torque limitation • Reading the Touchprobe position • Digital inputs and digital outputs

The process data assignment for the profiles is listed in chapter "Process data assignment" (→ 🗎 67).

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5 Operating mode

5.1 Scope of functions of the process data profiles

The combination of main operating mode and submode you can use depends on the process data profile you have chosen.

INFORMATION

You select a submode via sub control word I7 (SubMode). This means that submodes can only be used with a profile including at least 7 process data. Via fieldbus, submode "0" always corresponds to the first submode of the selected main operating mode.

The following tables show the operating modes of the process data profiles.

5.1.1 4 PD profile

Operating mode	Submode
1: Speed control	–
2: Jog mode	–

5.1.2 6 PD profile

Operating mode	Submode[1)]
1: Speed control	-
2: Jog mode	–
3: Referencing mode	Static (configured) reference offset
4: Positioning mode	Absolute positioning

1) The submode is fixed and therefore cannot be changed.

5.1.3 7 PD profile

Operating mode	Submode[1)]
1: Speed control	–
2: Jog mode	–
3: Referencing mode	0/30: Static (configured) reference offset (default) 31: Variable reference offset (via process data I5/I6 *Setpoint position*)
4: Positioning mode	0/40: Absolute positioning (default) 41: Relative positioning, positive 42: Relative positioning, negative
6: Synchronism	0/60: Speed synchronism 61: Speed synchronism with fieldbus setpoint as speed source
7: Emergency mode	0/70: Emergency mode without external encoder

1) A submode is selected using sub control word I7 (SubMode).

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5.1.4 10 PD profile

Operating mode	Submode[1)]
1: Speed control	–
2: Jog mode	–
3: Referencing mode	0/30: Static (configured) reference offset (default) 31: Variable reference offset (via process data I5/I6 *Setpoint position*)
4: Positioning mode	0/40: Absolute positioning (default) 41: Relative positioning, positive 42: Relative positioning, negative
5: Positioning mode – Touchprobe	0/50: Positions specified as absolute positions with remaining travel processing 51: Endless movement positive with remaining travel processing 52: Endless movement negative with remaining travel processing
6: Speed synchronism	0/60: Speed synchronism 61: Speed synchronism with fieldbus setpoint as speed source
7: Emergency mode	0/70: Emergency mode without external encoder

1) A submode is selected using sub control word I7 (SubMode).

5.2 Requirements for the cycle diagrams

The operating principle is illustrated by a typical cycle diagram for every operating mode. You will also find a description of the sequence relating to the cycle diagram. For information on the requirements for the cycle diagram and sequence, see the following table:

Requirements	Process data/signal states
Ready for operation	O1:1 *FI ready* = "1"
No fault	O1:5 *FI fault* = "0" O1:6 *FI warning* = "0" O1:7 *Application fault* = "0"
Inverter enabled (the inverter is currently in position control)	I1:2 *Enable/stop* = "1" or I1:2 *Enable/rapid stop* = "1" O1:8 – O1:15 *Status* = "5" or "10"
The axis must be referenced in certain cases (for positioning movements).	O1:2 *Axis referenced* = "1"
Startup has been performed correctly	
Hardware terminals enabled	

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5.3 Operating mode 1: Speed control

Once you have selected the direction of rotation, the single axis can be moved subject to speed control. Selecting both directions of rotation or not selecting a direction of rotation at all will stop an ongoing movement. Once the specified speed is reached, "setpoint reached" is signaled back.

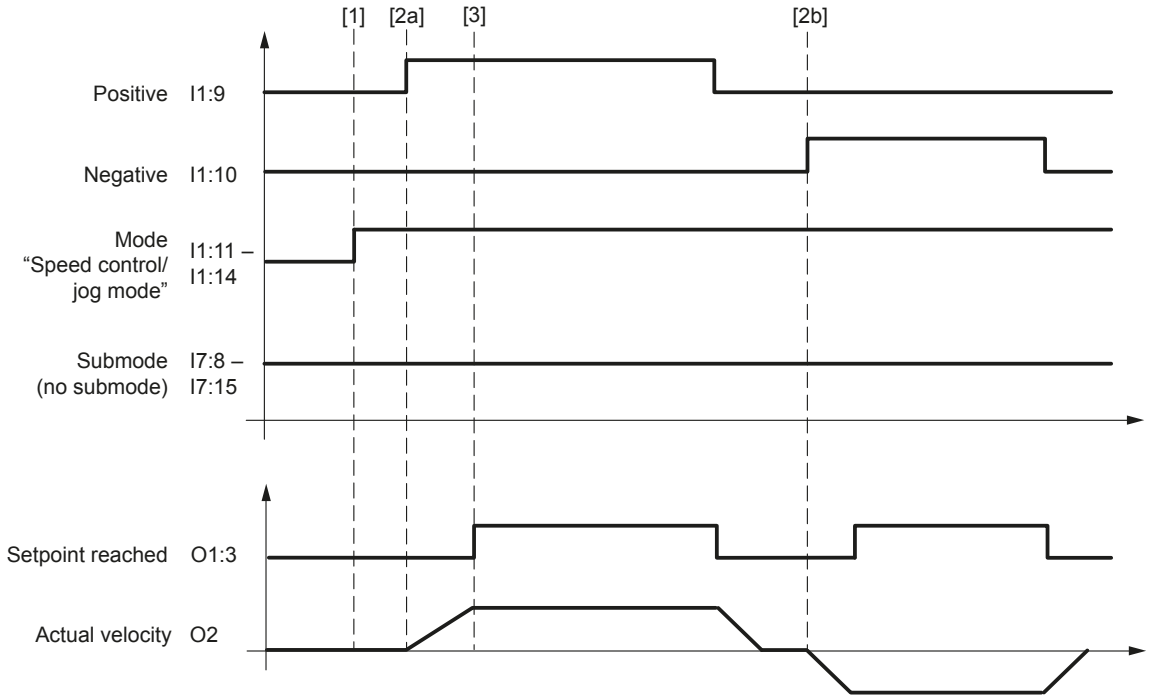
Note that software limit switch monitoring is disabled in "speed control" operating mode.

You can use this operating mode to move asynchronous motors without encoder feedback, for example.

No submodes available.

5.3.1 Sample sequence: Speed control

Cycle diagram



Process sequence and signal states [1] – [3]

No.	Sequence	Process data/signal states
[1]	Operating mode "speed control/jog mode" selected, no submode	I1:11 – I1:14 *Mode* 2^0 – 2^3 = "1/2"
	Dynamic parameters accepted (also during the travel process)	I2 *Setpoint speed* I3 *Acceleration* I4 *Deceleration*
[2a] [2b]	Start axis by selecting the jog direction	I1:9 *Positive* = "1" I1:10 *Negative* = "1"
[3]	*Setpoint reached* feedback signal is set when the setpoint speed has been reached	O1:3 *Setpoint reached* = "1"

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You find detailed information about process data assignment in chapter "Process data assignment" (→ 🗎 67).

5.4 Operating mode 2: Jog mode

Once you have selected the direction of rotation, the single axis can be moved subject to position control. The travel range can be safeguarded by software limit switches. Selecting both directions of rotation or not selecting a direction of rotation at all will stop an ongoing movement. Once the specified speed is reached, "speed reached" is signaled back.

No submodes available.

5.4.1 Sample sequence: Jog mode

Except for selecting the operating mode, control is performed as described in "Operating mode 1: Speed control" (→ 🗎 15).

5.5 Operating mode 3: Referencing mode

The actual position is set to the specified reference offset depending on the selected reference travel type.

The following table lists the features of the various submodes:

Submode	Characteristics
0/30: Static reference offset	The reference offset is adopted from the startup parameters. Changing the reference offset requires that you change the configuration on the user interface of the Application Configurator.
31: Variable reference offset	In this submode, you can specify a variable reference offset using process data word I5/I6 *Setpoint position*. Specifying a variable reference offset will not change the configuration value for the static reference offset (see submode 30). Set the values for the operating mode, submode, and the variable reference offset before the positive edge of the start signal because the values are applied with this edge.

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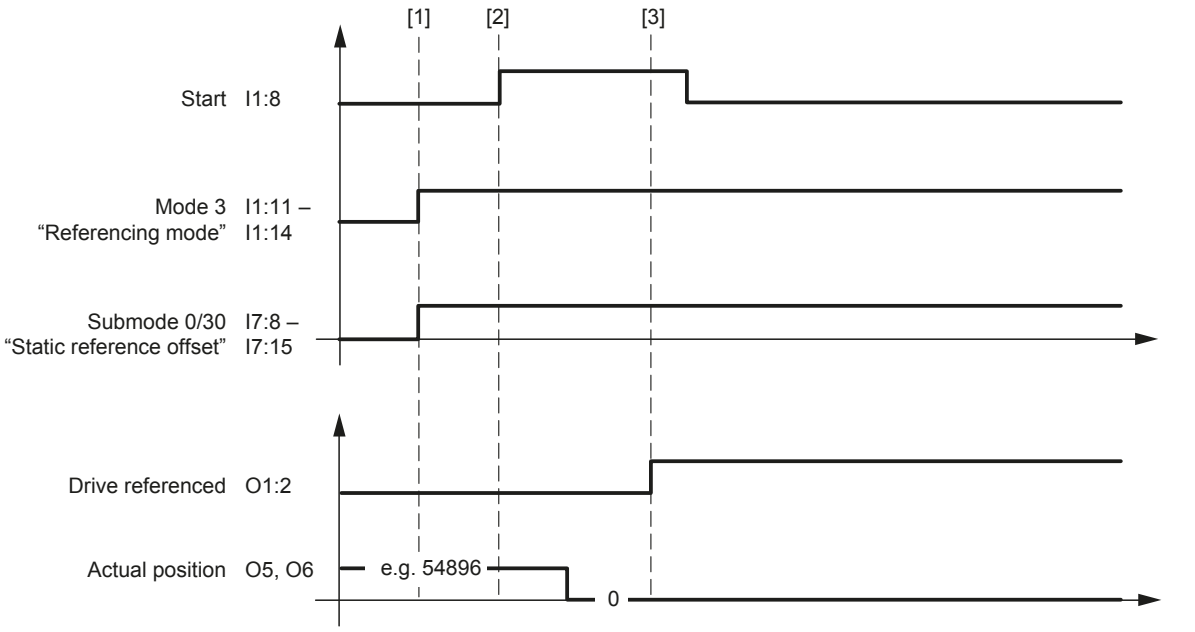
5.5.1 Sample sequence: Submode 30 static reference offset

Cycle diagram



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Process sequence and signal states [1] – [3]

No.	Sequence	Process data/signal states
[1]	Select the "referencing mode" operating mode	I1:11 – I1:14 *Mode* 2^0 – 2^3 = "3"
	Submode "static reference offset" is selected	I7:8 – I7:15 *SubMode* = "0/30"
[2]	The start signal is selected	I1:8 *Start* = "1"
[3]	*Drive referenced* is signaled back	O1:2 *Drive referenced* = "1" O5, O6 *Actual position* = "0" (unless another static reference offset has been configured)

For detailed information about process data assignment, refer to chapter "Process data assignment" (→ 🗎 67).

5.5.2 Sample sequence: Submode 31 variable reference offset

For "variable reference offset" mode, the value of the reference offset must be sent at the moment at which the start signal is set via I5/I6 *Setpoint position* process data. When the drive signals *Drive referenced* (O1:2), then this value indicates the *actual position* (O5/O6). Referencing is now completed.

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5.6 Operating mode 4: Positioning mode

Depending on the submode, the drive is positioned either absolutely with reference to machine zero (reference point) or relative to the current position.

The following table lists the features of the various submodes:

Submode		Feature
0/40:	Absolute positioning	• "Linear" axis type: Setpoint position with sign processing • "Modulo" axis type: Actual setpoint position **0 ≤ target position < ModuloMax**[1)]
41:	Relative positioning, positive	The setpoint position is processed as value and is added relatively to the actual position. Prior reference travel is not required. A **target position ≥ ModuloMax**[1)] can only be specified on MOVIAXIS®, MOVITRAC® LTP-B/ LTX or in the Technology 10 PD universal module.
42:	Relative positioning, negative	The setpoint position is processed as value and is subtracted relatively to the actual position. Prior reference travel is not required. A **target position ≥ ModuloMax**[1)] can only be specified on MOVIAXIS®, MOVITRAC® LTP-B/ LTX or in the Technology 10 PD universal module.

1) ModuloMax = maximum value in modulo travel strategy.

For details on submodes, refer to the following chapters:

5.6.1 Sub mode 40: Absolute position control

In this submode, the drive can be positioned absolutely based on the machine zero point (reference point).

Modulo travel strategy

Select the modulo travel strategy using control bits I1:9 *Positive* and I1:10 *Negative* according to the following table.

I1:9 *Positive*	I1:10 *Negative*	Modulo travel strategy
0	0	Short distance
1	0	Positive
0	1	Negative
1	1	Short distance

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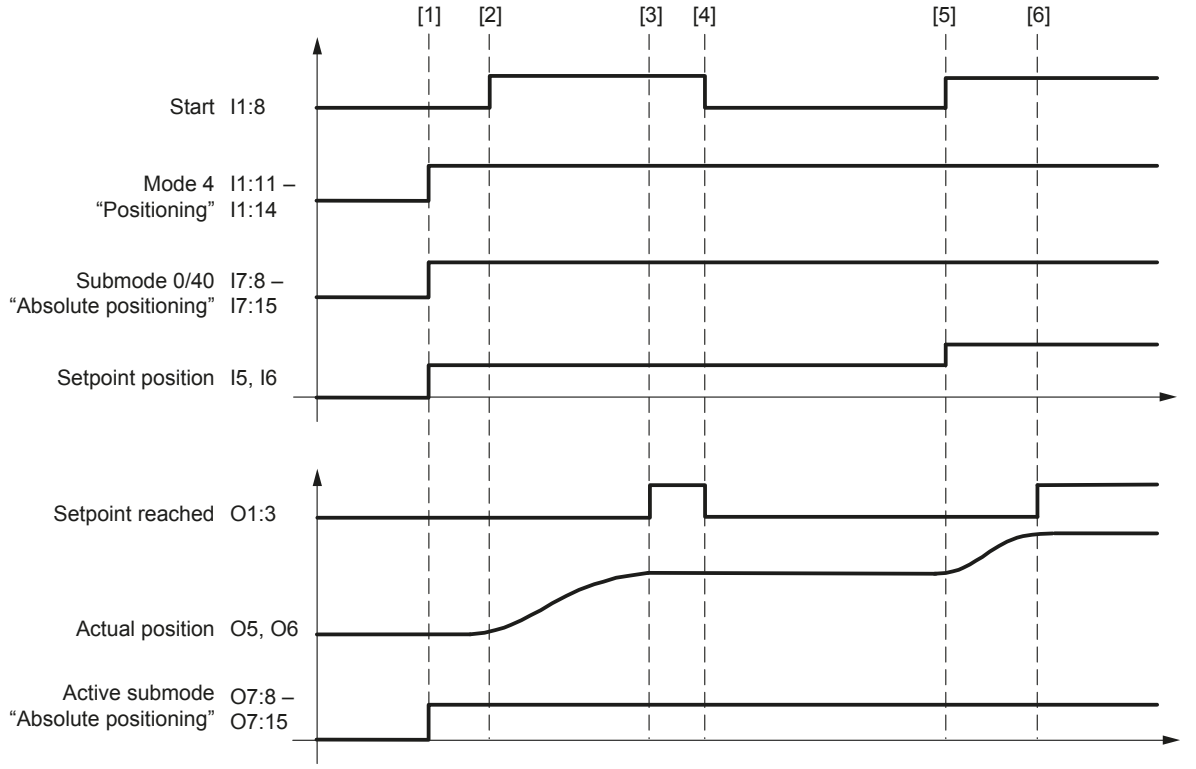
Sample sequence: Submode 40 Absolute position control

Cycle diagram



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Process sequence and signal states [1] – [6]

No.	Sequence	Process data/signal states
[1]	"Positioning mode" is selected	I1:11 – I1:14 *Mode* 2^0 – 2^3 = "4"
	"Absolute position control" submode is selected	I7:8 – I7:15 *SubMode* = "0/40"
	Status word is queried to obtain feedback on the activated submode	O7:8 – O7:15 *SubMode* = "40"
	Dynamic parameters are accepted cyclically (also during travel movement)	I2 *Setpoint speed* I3 *Acceleration* I4 *Deceleration*
	Setpoint position is specified	I5:High word *setpoint position* I6:Low word *setpoint position*
[2] [5]	The start signal is selected **INFORMATION:** A new setpoint position is accepted immediately when the start signal is set.	I1:8 *Start* = "1"
[3] [6]	*Setpoint reached* feedback signal is set when the setpoint position has been reached. The drive comes to a standstill subject to position control.	O1:3 *Setpoint reached* = "1"
[4]	Start is reset once positioning is completed.	I1:8 *Start* = "0"

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Stopping

Sequence	Process data/signal states
During stopping, the following ramps occur with increasing priority depending on the selected signal:	
• Positioning ramp	I1:8 *Start* = "0"
• Stop ramp/ rapid stop ramp	I1:1 *Enable/stop* = "0"/ I1:2 *Enable/rapid stop* = "0"
When changing the operating mode, the last travel job is cleared and the target is calculated anew.	O7:8 – O7:15 *SubMode*

For detailed information about process data assignment, refer to chapter "Process data assignment" (→ 🗎 67).

5.6.2 Submode 41/42: Relative position control positive/negative

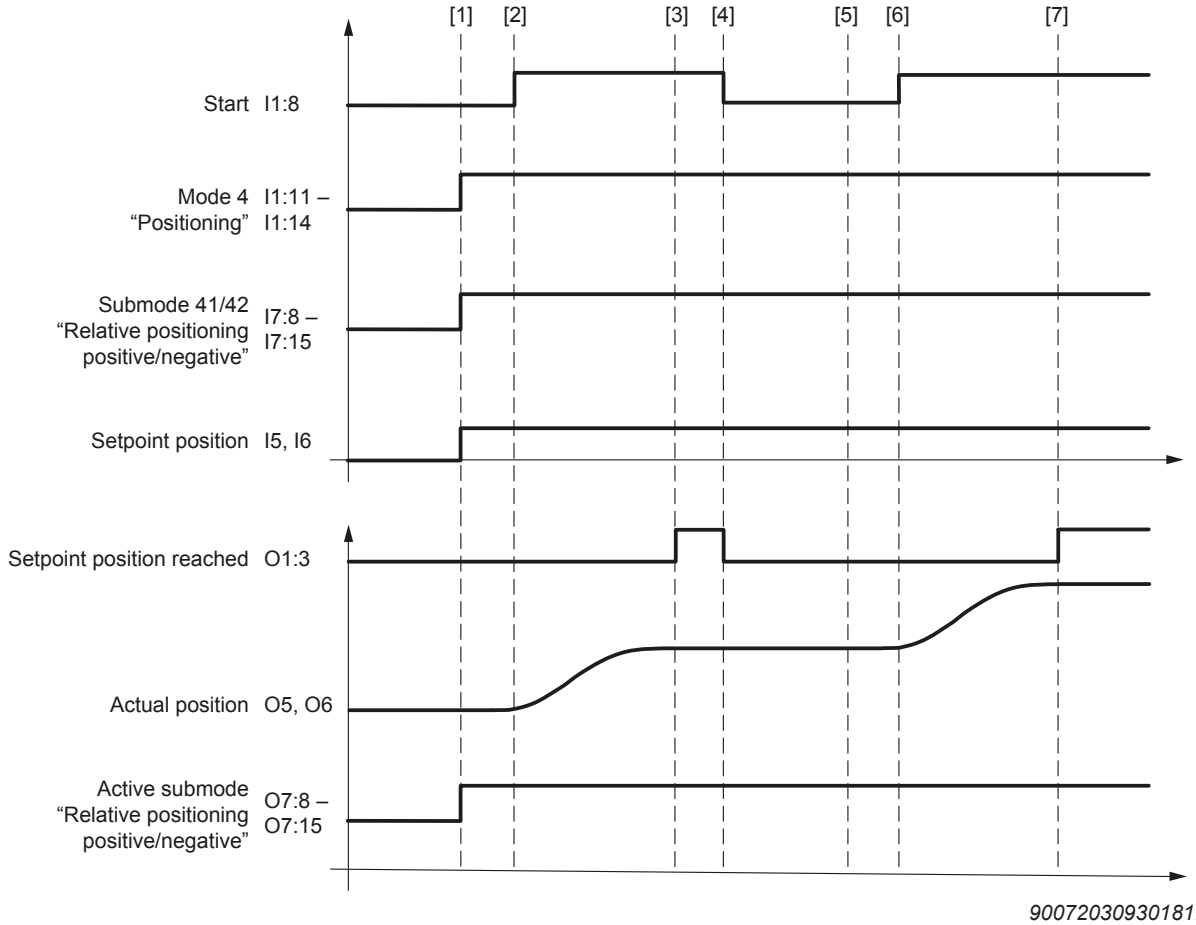
In this submode, the drive can be moved relatively to the present position (example: cyclical operation with a conveyor belt).

Modulo travel strategy

The direction of the modulo travel strategy is selected by means of the submode.

Sample sequence: Submode 41/42 Relative positioning positive/negative

Cycle diagram



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Process sequence and signal states [1] – [7]

No.	Sequence	Process data/signal states
[1]	"Positioning mode" is selected	I1:11 – I1:14 *Mode* 2^0 – 2^3 = "4"
	"Relative positioning positive/negative" submode is selected	I7:8 – I7:15 *SubMode* = "41/42"
	Dynamic parameters are accepted cyclically (also during travel movement)	I2 *Setpoint speed* I3 *Acceleration* I4 *Deceleration*
	Status word is queried to obtain feedback on the activated submode	O7:8 – O7:15 *Submode* = "41/42"
	The relative position is specified	I5:High word *setpoint position* I6:Low word *setpoint position*
[2] [6]	The start signal is selected **INFORMATION:** The relative position is calculated once and stored with the rising edge of the start signal.	I1:8 *Start* = "1"
[3]	*Setpoint reached* feedback signal is set when relative positioning is completed. The drive comes to a standstill subject to position control. A new cycle is triggered with the next rising edge of the start signal.	O1:3 *Setpoint reached* = "1"
[7]	*Setpoint reached* feedback signal is set when relative positioning is completed. The drive comes to a standstill subject to position control.	O1:3 *Setpoint reached* = "1"

Stopping

No.	Sequence	Process data/signal states
[4]	During stopping, the following ramps occur with increasing priority depending on the selected signal:	
	• Positioning ramp	I1:8 *Start* = "0"
	• Stop ramp/ rapid stop ramp	I1:1 *Enable/stop* = "0"/ I1:2 *Enable/rapid stop* = "0"
[5]	When changing the operating mode, the last travel job is cleared and the target is calculated anew.	O7:8 – O7:15 *Submode*

For detailed information about process data assignment, refer to chapter "Process data assignment" (→ 🗎 67).

5.7 Operating mode 5: Positioning mode – Touchprobe (TP)

In this operating mode, positioning begins once a sensor trips (Touchprobe event). The length of the travel distance (remaining travel) is specified via fieldbus. You can use every Touchprobe event only once for sensor-based positioning each time you set signal I7:0 *Enable Touchprobe*.

Enabling or disabling the sensor lets you limit Touchprobe processing to certain areas of the travel distance.

The remaining travel is specified according to the travel direction. This means that if you specify a positive remaining travel in negative travel direction, then the direction of rotation of the drive changes after the Touchprobe event.

INFORMATION

Overlapping of functions

Touchprobe input DI02 might overlap with other functions depending on the frequency inverter. To prevent this from happening, disable the default input assignment (→ 🗎 71).

INFORMATION

Touchprobe function always assigned to DI02

The Touchprobe function for all units is assigned to digital input DI02. This is also the case when an option card is used.

INFORMATION

No torque limitation in "positioning mode – Touchprobe" operating mode

The "torque limitation" function cannot be used for "positioning mode – Touchprobe" operating mode.

5.7.1 Submodes

The following table lists the features of the various submodes:

Submode		Characteristic
0/50:	Positions specified as absolute positions with remaining travel processing	The axis stops when the target position is reached. The target position is specified in process data word I5:High word *Setpoint position* und I6:Low word *Setpoint position*. Select the modulo travel strategy using control bits I1:9 *Positive* and I1:10 *Negative*, see section "Modulo travel strategy" (→ 🗎 23). **0 < target position < ModuloMax**[1)]
51/52	Endless movement positive/negative with remaining travel processing	The axis moves "endlessly" in positive/negative direction of travel. In this submode, the travel strategy for modulo using control word I1 is disabled. Prior reference travel is not required.

1) ModuloMax = maximum value in modulo travel strategy.

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For details on submodes, refer to the following chapters:

5.7.2 Submode 50: Absolute positioning with remaining travel processing

The axis positions to an absolute position. If a Touchprobe event is triggered on the way to the absolute position, the axis will position to the remaining travel specified via fieldbus.

Modulo travel strategy

Select the modulo travel strategy using control bits I1:9 *Positive* and I1:10 *Negative* according to the following table.

I1:9 *Positive*	I1:10 *Negative*	Modulo travel strategy
0	0	Short distance
1	0	Positive
0	1	Negative
1	1	Short distance

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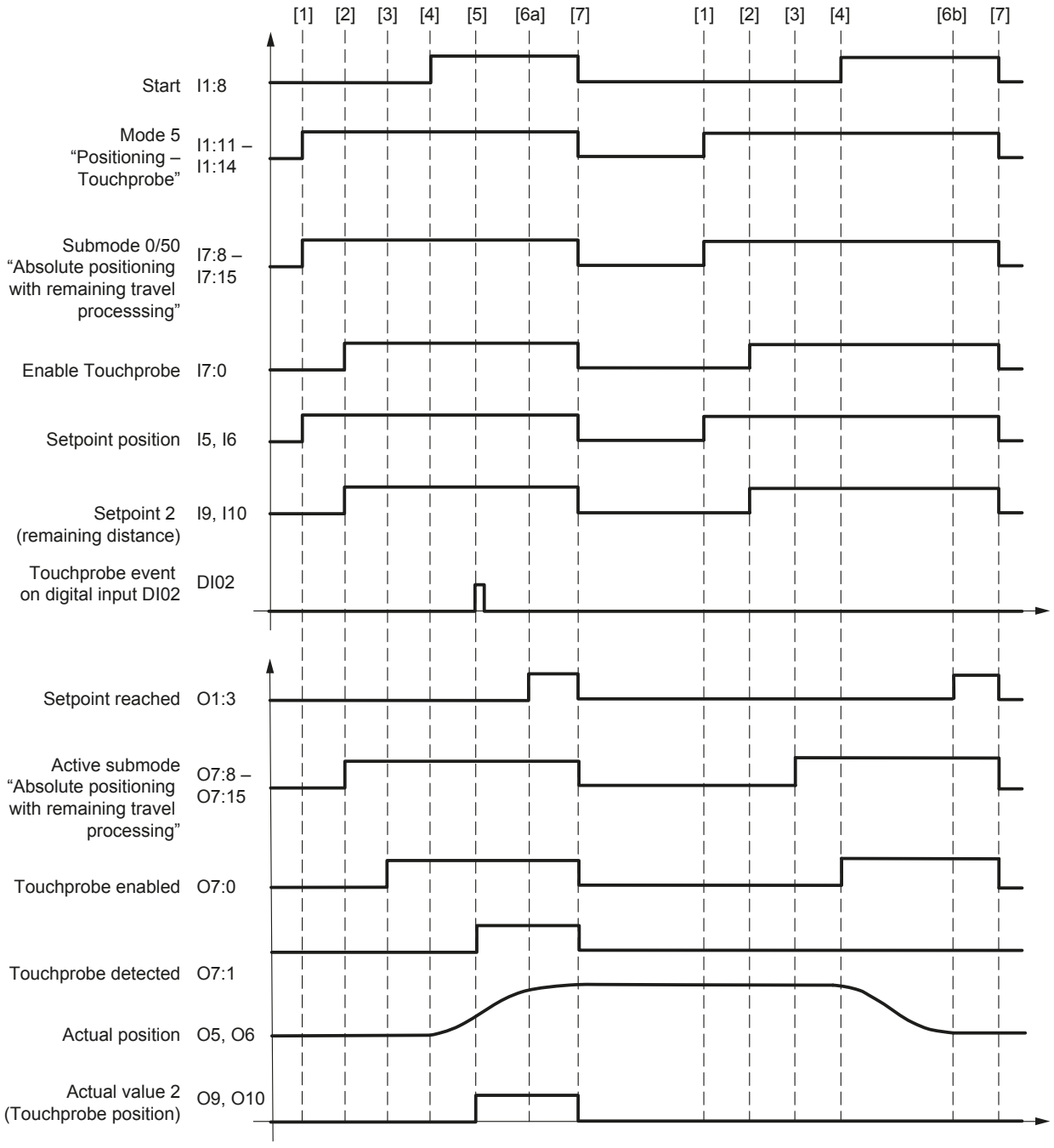
Sample sequence: Submode 50 Absolute positioning with remaining travel processing

Cycle diagram



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Process sequence and signal states [1] – [7]

No.	Sequence	Process data/signal states
[1]	"Positioning mode – Touchprobe" operating mode is selected	I1:11 – I1:14 *Mode* 2^0 – 2^3 = "5"
	The "absolute positioning with remaining travel processing" submode is selected	I7:8 – I7:15 *SubMode* = "0/50"
	Dynamic parameters are accepted cyclically (also during travel movement)	I2 *Setpoint speed* I3 *Acceleration* I4 *Deceleration*
	The status word is queried to obtain feedback on the activated operating mode	O7:8 – O7:15 *SubMode* "50"
	The absolute setpoint position is specified (if no Touchprobe event is triggered)	I5, I6 *Setpoint position*
[2]	*Enable Touchprobe* Transfer setpoint 2 (remaining travel)	I7:0 *Enable Touchprobe* = "1" I9:High word *setpoint 2* I10:Low word *setpoint 2*
[3]	The status word is queried to obtain feedback for the *Touchprobe enabled* signal.	O7:0 *Touchprobe enabled* = "1"
[4]	The start signal is selected The absolute setpoint position is calculated once and stored with the rising edge of the start signal.	I1:8 *Start* = "1"
[5]	*Touchprobe detected* feedback The Touchprobe position is sent in *actual value 2*. The following applies: *Remaining travel position = actual value 2 + setpoint 2*	O7:1 *Touchprobe detected* = "1" O9, O10 *Actual value 2*
[6]	*Setpoint reached* feedback signal is set when the "remaining travel position" (6a) / "setpoint position" (6b) has been reached. The drive comes to a standstill subject to position control.	O1:3 *Setpoint reached* = "1"
[7]	All process data/signals are reset.	

Stopping

Sequence	Process data/signal states
When stopping, the following ramps occur with increasing priority depending on the selected signal:	
• Positioning ramp	I1:8 *Start* = "0"
– *Touchprobe not detected*: Setting the start signal again continues endless movement.	
– *Touchprobe detected*: The drive moves to the calculated remaining travel position and remains there subject to position control.	
• Stop ramp/ rapid stop ramp When you set the enable again, Touchprobe positioning is initialized.	I1:1 *Enable/stop* = "0"/ I1:2 *Enable/rapid stop* = "0"

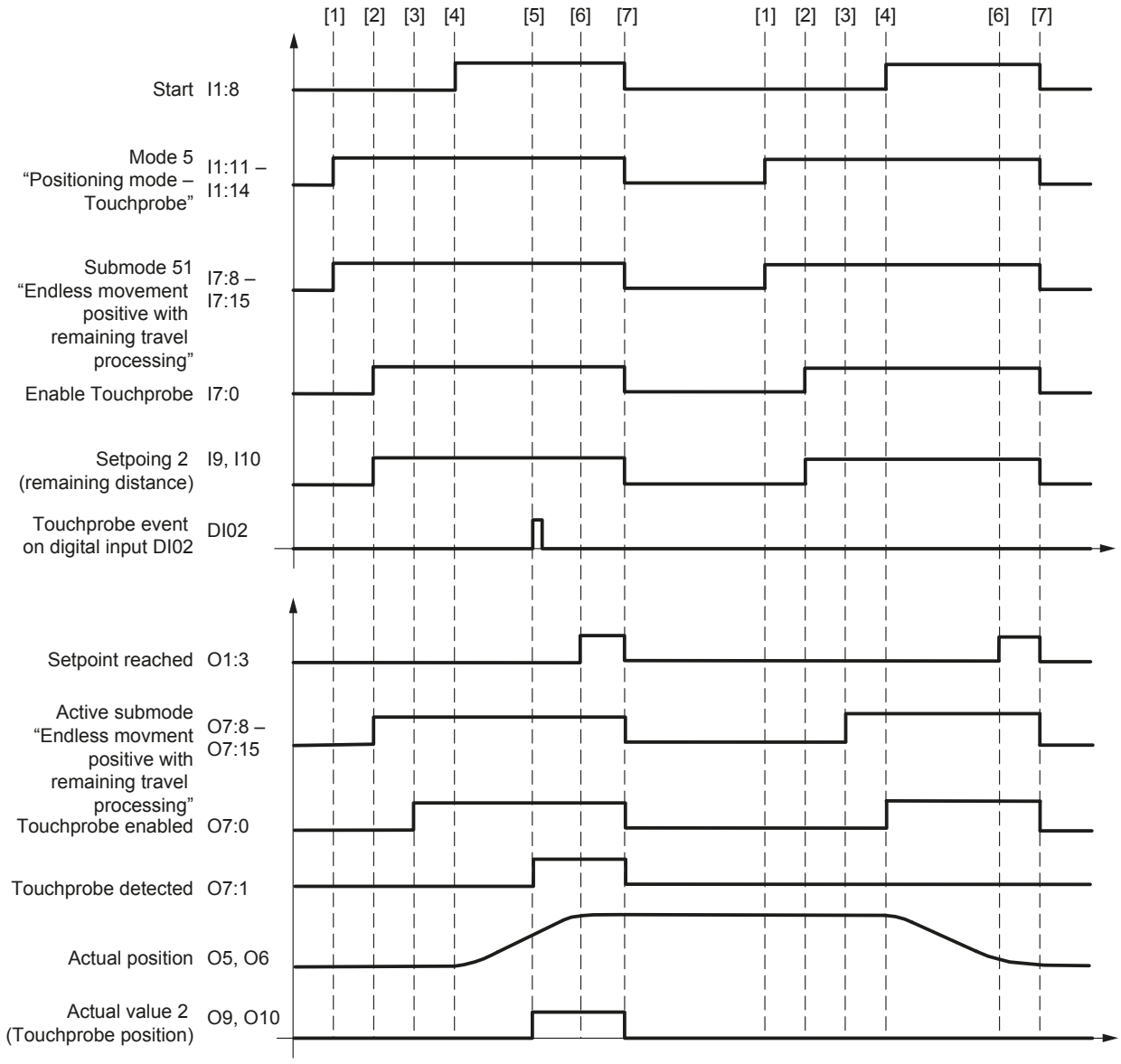
For detailed information about process data assignment, refer to chapter "Process data assignment" (→ 🗎 67).

5.7.3 Submode 51/52: Endless movement positive/negative with remaining travel processing

The axis moves "endlessly" in positive/negative direction of travel. On occurrence of the Touchprobe event, the axis positions the remaining travel in the direction of travel.

Sample sequence: Submode 51/52 Endless movement positive/negative with remaining travel processing

Cycle diagram



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Process sequence and signal states [1] – [7]

No.	Sequence	Process data/signal states
[1]	"Positioning mode – Touchprobe" operating mode is selected	I1:11 – I1:14 *Mode* 2^0 – 2^3 = "5"
	"Endless movement positive/negative with remaining travel processing" submode is selected	I7:8 – I7:15 *SubMode* = "51/52"
	Dynamic parameters are accepted cyclically (also during travel movement)	I2 *Setpoint speed* I3 *Acceleration* I4 *Deceleration*
	The status word is queried to obtain feedback on the activated operating mode	O7:8 – O7:15 *SubMode* = "51/52"
[2]	*Enable Touchprobe* Transfer setpoint 2 (remaining travel)	I7:0 *Enable Touchprobe* = "1" I9:High word *setpoint 2* I10:Low word *setpoint 2*
[3]	*Touchprobe enabled* feedback signal	O7:0 *Touchprobe enabled* = "1"
[4]	The start signal is selected	I1:8 *Start* = "1"
[5]	The status word is queried to obtain feedback for the *Touchprobe enabled* signal. The Touchprobe position is transferred in *actual value 2*. The following applies: *Remaining distance position = actual value 2 + setpoint 2*	O7:1 *Touchprobe detected* = "1" O9, O10 *Actual value 2*
[6]	The *setpoint reached* feedback signal is set when the remaining travel position has been reached. The drive comes to a standstill subject to position control.	O1:3 *Setpoint reached* = "1"
[7]	All process data/signals are reset	

Stopping

Sequence	Process data/signal states
When stopping, the following ramps occur with increasing priority depending on the selected signal:	
• Positioning ramp	I1:8 *Start* = "0"
– *Touchprobe not detected*: Setting the start signal again continues endless movement.	
– *Touchprobe detected*: The drive moves to the calculated remaining travel position and then remains stopped with position control.	
• Stop ramp/ rapid stop ramp When you set the enable again, Touchprobe positioning is initialized.	I1:1 *Enable/stop* = "0"/ I1:2 *Enable/rapid stop* = "0"

For detailed information about process data assignment, refer to chapter "Process data assignment" (→ 🗎 67).

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5.8 Operating mode 6: Synchronism

Speed synchronism to the master value specified at startup begins with the start signal. The following master values are possible:

- Configured master axis
- Analog input signal that is interpreted as speed setpoint:
  - Analog voltage input
  - Analog current input
  - Frequency input (available only for MOVIGEAR® B / DRC.. with GIO13B option card)
- Fieldbus setpoint

The master value is interpreted as speed setpoint. The following configured system limits define the quality of the synchronism. These limits must be 10% higher than the master value.

- Maximum acceleration
- Maximum deceleration
- Maximum velocity

The "setpoint reached" signal is issued as soon as the actual velocity in the speed window has reached a value around the speed setpoint. A position deviation from the master value is not compensated.

5.8.1 Direction of rotation reversal

Some applications require the dynamic change of the reference direction based on the master setpoint.

The table below shows how you can invert the reference direction using control bits I1:9 *Positive* and I1:10 *Negative*.

I1:9 *Positive*	I1:10 *Negative*	Effect
0	0	No effect
1	0	No effect
0	1	The speed setpoint is multiplied by "-1".
1	1	No effect

5.8.2 Submodes

The following table lists the features of the various submodes:

Submode	Characteristics
0/60: Speed synchronism	You can activate the following function at startup: • **Stop master if slave error occurs** When "Start" is selected, the following events will stop the master axis immediately: – The synchronized slave axis is no longer subject to position control – The synchronized slave axis signals a fault – The synchronized slave axis is no longer synchronized

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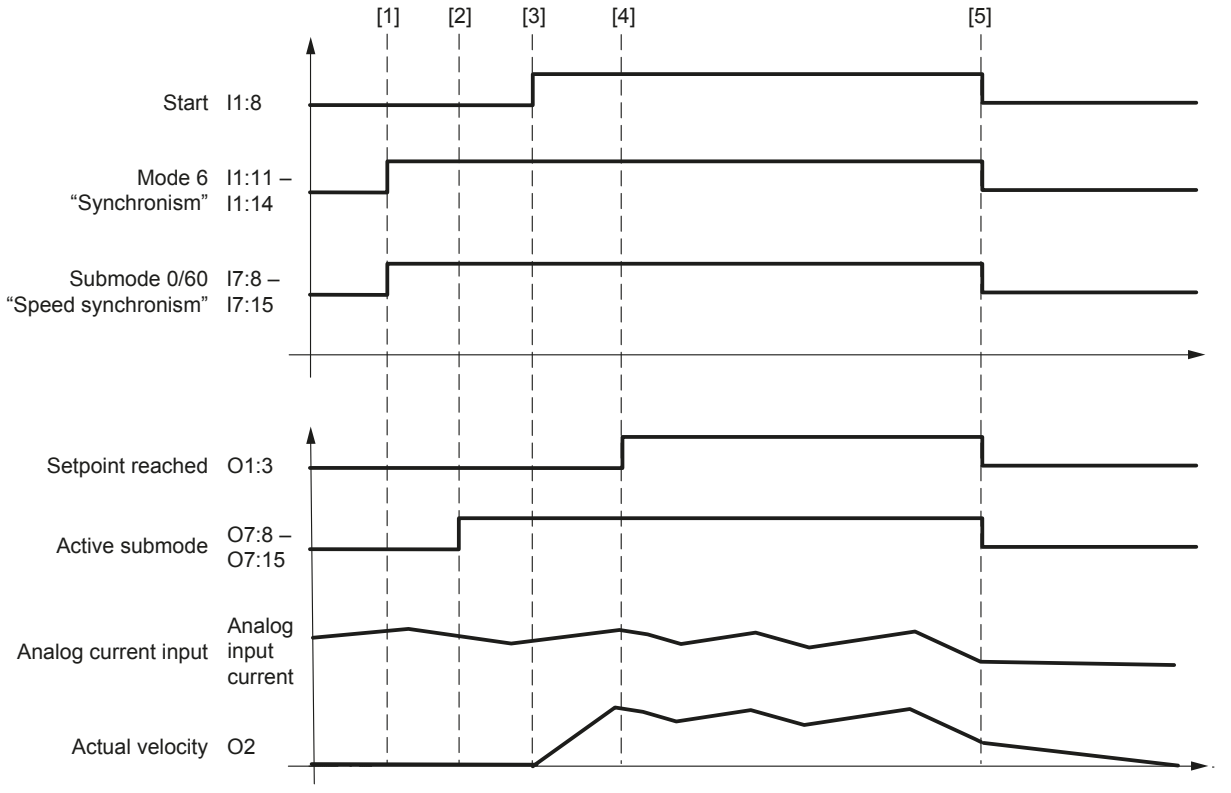
Submode	Characteristics
61: Speed synchronism with fieldbus setpoint as speed source	• **Principle** This submode allows for on-the-fly changing of an analog speed setpoint (submode 60, for example analog voltage value) to a speed setpoint (submode 61) that is specified variably via fieldbus. The setpoint is processed without jerks at the moment of the changeover. • **Requirement** The operating mode as well as the start signal must remain selected.

Sample sequence: Submode 60 Speed synchronism

Cycle diagram



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Process sequence and signal states [1] – [5]

No.	Sequence	Process data/signal states
[1]	"Synchronism" operating mode is selected	I1:11 – I1:14 *Mode* 2^0 – 2^3 = "6"
	"Speed synchronism" submode is selected	I7:8 – I7:15 *SubMode* = "0/60"
	Dynamic parameters are accepted cyclically	I3 *Acceleration* I4 *Deceleration*
	Only in submode 61 "Speed synchronism with fieldbus setpoint as speed source": the setpoint speed is accepted cyclically	I2 *Setpoint speed*

No.	Sequence	Process data/signal states
[2]	The status word is queried to obtain feedback on the activated operating mode	O7:8 – O7:15 *SubMode* = "60"
[3]	The start signal is selected	I1:8 *Start* = "1"
[4]	*Setpoint reached* feedback signal is set when the slave axis follows the specified speed setpoint within the specified speed window.	O1:3 *Setpoint reached* = "1"
[5]	Deselecting the operating mode exits speed synchronism. The axis stops with the specified deceleration in process data word I4.	I1:11 – I1:14 *Mode* 7:8 – I7:15 *SubMode*

You find detailed information about process data assignment in chapter "Process data assignment" (→ 🗎 67). Also observe the information regarding the function "stop master if slave error occurs".

5.9 Operating mode 7: Emergency mode

In this operating mode, the external encoder is disabled. The drive is moved via motor encoder in "speed control" operating mode (→ 🗎 15).

INFORMATION

- Note that software limit switch monitoring is disabled in "emergency mode".
- Note that "emergency mode" can only be used in combination with the following units:
  - MOVIDRIVE® B
  - MOVIAXIS® B
  - MOVIPRO® with internal power section

5.9.1 Submode

The following table lists the features of the submode:

Submode	Characteristics
0/70: Emergency mode ext. encoder	Selecting this submode saves the following actual values: • Absolute encoder type • External encoder monitoring Next, "speed control" mode is enabled, see chapter "Speed control" (→ 🗎 15). Deselecting the submode writes back the saved data.

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6 Functions

The functions described in the following chapters complement the operating modes. The functions are selected by means of digital signals available for this purpose.

INFORMATION

Double assignment of process data ranges

Conflicts/misinterpretations might occur when activating the functions described in the following sections.

- The functions "torque limitation" and "Touchprobe" cannot be used at the same time.

6.1 Software limit switches

Software limit switches are used to limit the travel range. They are enabled using the startup wizard.

The travel range is monitored when the software limit switches are enabled (condition: positive limit switch position > negative limit switch position). If the actual position exceeds the set limit value, the drive stops along the configured rapid stop ramp.

To exit the travel range, disable the software limit switch using control bit I1:15 */SWLS*.

6.2 Torque limitation

Using the *setpoint 2* signal, you can specify a limit value for the motor current or the torque. Sequences, such as "movement to fixed stop" are possible in this way.

Startup data are saved with the rising edge of signal I7:2 *Activate torque limitation*. Both the actual value and the setpoint value of the current are scaled in the unit [0.1 % × I_n]. A requirement for proper functioning is that the Touchprobe function is disabled.

The following startup data are saved:

- Current limit (VFC speed control)
- Torque limit (CFC/servo)
- Speed monitoring
- Lag error limit

Next, speed monitoring and lag error limit are disabled, and the drive adopts the fieldbus setpoint value for torque limitation. Signal O7:2 *Torque limitation active* is set. Deselecting the function writes back the saved data.

INFORMATION

Deselecting torque limitation

A lag error can occur when deselecting torque limitation in "position control" axis condition.

- Disable torque limitation only when the axis is inhibited

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INFORMATION

No torque limitation in "positioning mode – Touchprobe" operating mode

The "torque limitation" function cannot be used in "positioning mode – Touchprobe" operating mode.

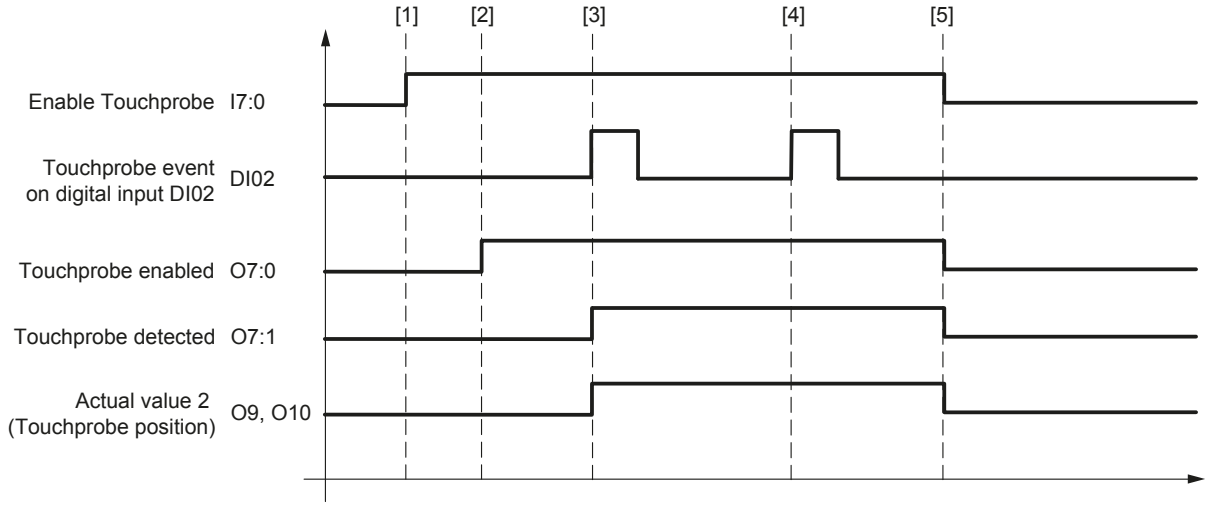
6.3 Touchprobe function

The purpose of the Touchprobe function is to detect the actual position of the drive. This position is detected via digital input (Touchprobe input of the drive). The function is enabled with the rising edge of input I7:0 *Enable Touchprobe.*

Signal O7:0 *Touchprobe enabled* indicates that the Touchprobe input is evaluated. When a Touchprobe event is triggered, the current (Touchprobe) position is copied to O9/O10 *Actual value 2* and signal O7:1 *Touchprobe detected* is set additionally. Further Touchprobe processing is inhibited. The Touchprobe input can be evaluated again with another rising edge of O7:0 *Touchprobe enabled*.

The activated Touchprobe function is disabled by setting signal I7:0 *Enable Touchprobe* to "0". In this case, signals O7:0 *Touchprobe enabled* and O7:1 *Touchprobe detected* as well as the indicated Touchprobe position O9/O10 *Actual value 2* are set to "0".

Cycle diagram



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No.	Sequence	Process data/signal states
[1]	The Touchprobe function is enabled.	I7:0 *Enable Touchprobe* = "1"
[2]	The Touchprobe function is active.	O7:0 *Touchprobe active* = "1"
[3]	The Touchprobe event is triggered. The current position is saved, and is output via process data.	DI02 = "1" O7:1 *Touchprobe detected* = "1" O9 *Actual value 2* = "1" Actual (Touchprobe) position
[4]	Another Touchprobe event is not evaluated. It can only be evaluated with the next rising edge of signal I7:0 *Enable Touchprobe*.	–

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No.	Sequence	Process data/signal states
[5]	The Touchprobe function is disabled. The outputs are reset.	I7:0 *Enable Touchprobe* = "0" O7:0 *Touchprobe active* = "0" O7:1 *Touchprobe detected* = "0" O9 *Actual value 2* = "0"

6.4 Digital inputs and digital outputs

6.4.1 Digital inputs

The digital inputs are the image of the input terminals of the connected inverter and are signaled back via process data word O8.

6.4.2 Digital outputs

The digital outputs of the connected inverter are activated using the control bits in process data word I8.

⚠ WARNING

When resetting a fault, the digital outputs are set to "0" (default value).

This means that auxiliary axes, which are controlled via the digital outputs, are switched off unintentionally.

- Do **not** control auxiliary axes using the digital outputs of the inverter.
- Make sure that the machine is in a safe state.

6.5 Stop master if slave error occurs

This monitoring function is used in operating mode 6 "speed synchronism" to monitor the device status of the connected slave axes of the axis system. This means that movements of the master are only possible when the slave axes are synchronized and no error is present.

When an error is detected in the axis system, the master stops using a rapid stop ramp. The master continues to move as soon as the slave errors are reset.

INFORMATION

You might have to re-adjust the slaves and synchronize them again.

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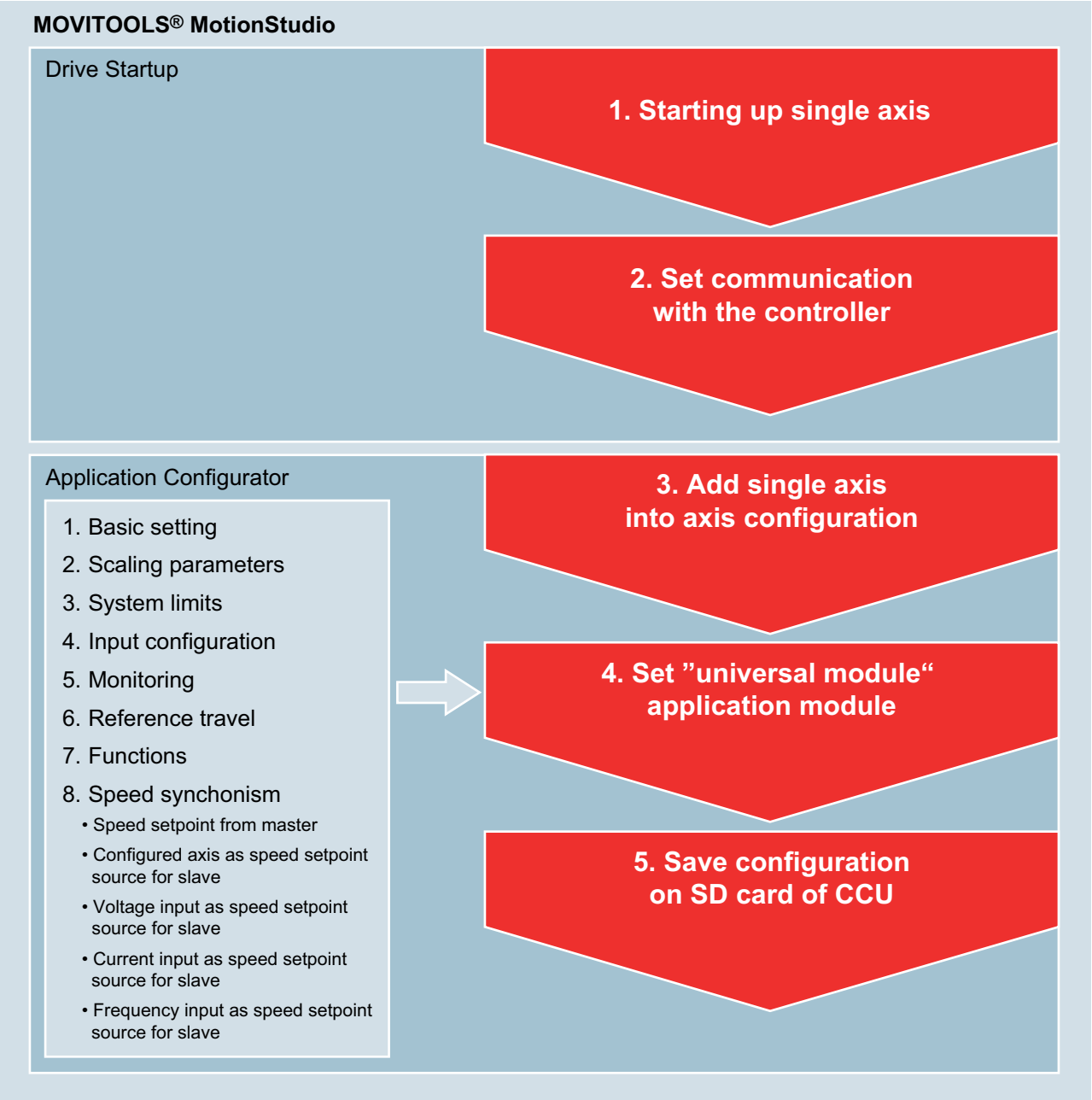
7 Startup

7.1 Startup procedure



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INFORMATION

Before performing steps 3 to 5 in the *Application Configurator*, perform single-axis startup for each axis of the corresponding controller using "Drive Startup for MOVI-PLC®" (steps 1 to 2).

"Drive Startup for MOVI-PLC®" resets the device to its factory setting and writes the required parameters of the frequency inverter to correctly control the drive.

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7.1.1 Regarding steps 1 to 2

1. Select the **inverter** you want to start up in the network view of MOVITOOLS® MotionStudio.
2. Right-click to open the context menu of the inverter.
3. Select the menu command [Technology editor] > [Drive Startup for MOVI-PLC®/CCU].
   ⇨ Drive Startup for MOVI-PLC®/CCU is started.
4. Follow the instructions of the wizard.

7.1.2 Regarding steps 3 to 5:

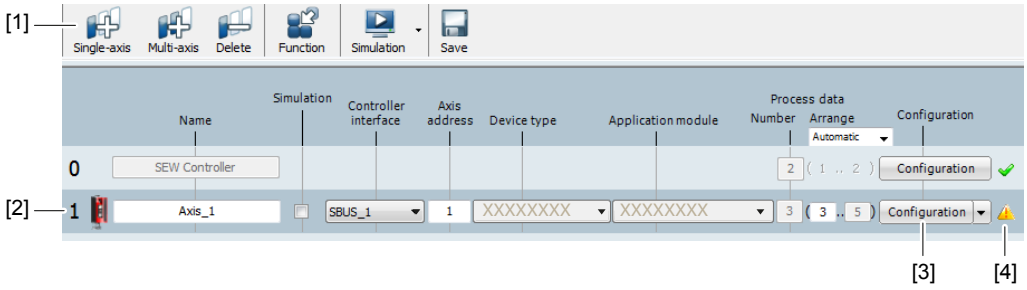
1. Select the **controller** in the network view of MOVITOOLS® MotionStudio.
2. Right-click to open the context menu of the controller.
3. Choose [Application modules] > [Application Configurator] from the menu.
   ⇨ The Application Configurator opens.
4. To create a new configuration, click [Configuration].

Steps 3 to 5 are described in detail below.

7.2 Adding a single axis in the axis configuration

Proceed as follows:

1. Click the button [1] in the configuration interface of the Application Configurator.



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   ⇨ A new line appears in the axis section [2].
2. Configure the axis according to your requirements:
   ⇨ Name of the axis
   ⇨ Simulation mode (on or off)
   ⇨ Controller interface
   ⇨ Address
   ⇨ Device type
3. Select the required application module with a suitable profile.
4. Click the button [3].
   ⇨ A software wizard for setting the application module appears.

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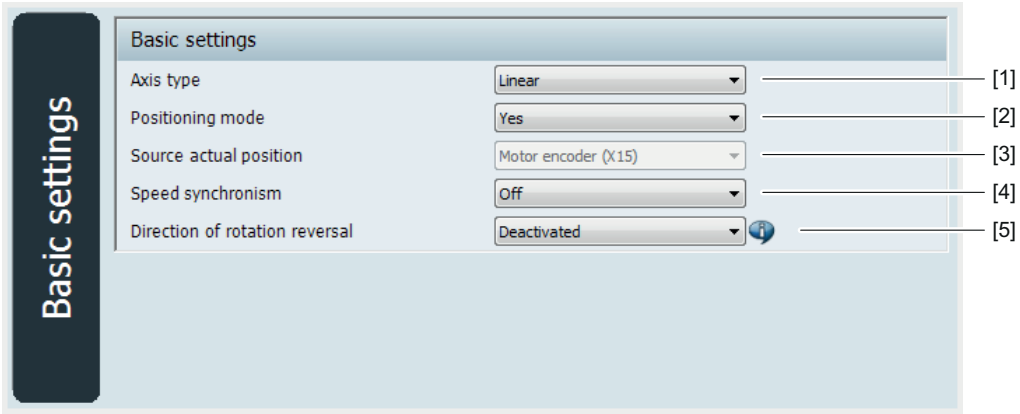
5. Follow the instructions of the wizard as described in the following chapter "Setting the application module".
   ⇨ Once you have completed the instructions of the software wizard, the yellow warning symbol [4] turns into a green check.
6. Click [Next].
   ⇨ The "Download" window is displayed (see "Application Configurator for CCU" manual).

7.3 Configuring the application module

The wizard for configuring the Application Configurator guides you through the following configuration windows of the application module.

7.3.1 Basic setting

In this window, you make the following basic settings:



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No.	Description
[1]	Here you choose the axis type: • **Linear** Linear positioning means the travel range is limited to 2^{31} user units. You can additionally limit this travel range using hardware and software limit switches. • **Modulo** With modulo positioning, the travel range is endless. Hardware and software limit switch processing is disabled.
[2]	Here you activate positioning mode: • **Yes** Activates positioning mode. • **No** Deactivates positioning mode. This setting shortens the startup procedure because some functions are not needed and the respective windows will be skipped.

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No.	Description
[3]	Here you choose the source of the actual position (depending on the device). You can choose between motor encoder and distance encoder. A distance encoder is managed directly by the axis. This means you merely have to specify to which port/slot the encoder is connected. • **MOVIAXIS®** Encoder 1: Motor encoder (default) Encoder 2: Encoder card in option card slot 2 Encoder 3: Encoder card in option card slot 3 • **MOVIDRIVE® B** Encoder 1: X15 Motor encoder (default) Encoder 2: X14 External encoder Encoder 3: X62 Absolute encoder
[4]	Here you choose the speed synchronism type: • **Off** Deactivates synchronism. This setting shortens the startup procedure because some functions are not needed and the respective windows will be skipped. • **Master** Activates speed synchronism with the master axis. You can configure the "speed window" in the further startup procedure. • **Configured axis as speed setpoint source for the slave** Activates speed synchronism of the slave axis based on a configured axis. • **Voltage input as speed setpoint source for the slave** Activates speed synchronism of the slave axis based on an analog voltage input. • **Current input as speed setpoint source for the slave** Activates speed synchronism of the slave axis based on an analog current input. • **Frequency input as speed setpoint source for the slave (only available for MOVIGEAR® B / DRC..)** Activates speed synchronism of the slave axis based on a frequency input.
[5]	Here you activate or deactivate direction of rotation reversal of the axis **(only available for MOVIGEAR® B / DRC..)**.

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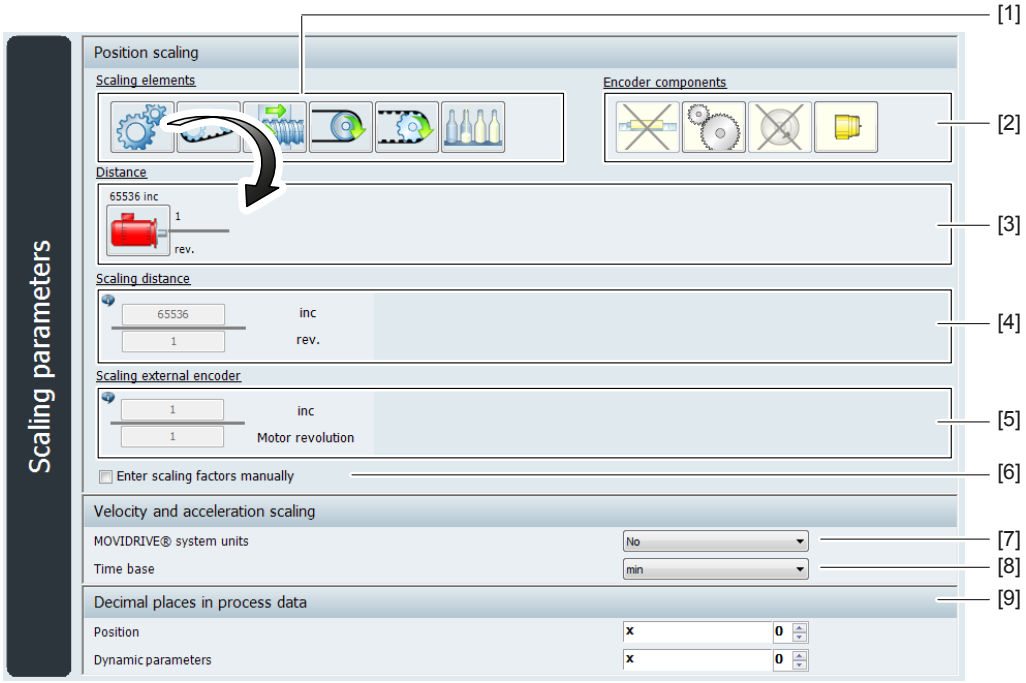
7.3.2 Scaling parameters

In this window, you set the scaling for the distance, and if used, for the external encoder.



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No.	Description
[1]	Here you can choose between the following scaling elements: • **Gear unit** • **Additional gear** • **Spindle** • **Drive wheel** • **Toothed belt pulley** • **User units**
[2]	You can choose between the following encoder components: • **Linear encoder** • **Encoder gear unit** • **Measuring wheel** • **Drive wheel** • **Rotary encoder** **INFORMATION:** The most common linear encoders with resolution are listed in a drop-down list. For rotative encoders, you have to enter the resolution manually, see section "Resolution of rotative external encoders" (→ 🗎 40).

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No.	Description
[3]	Here you can combine the scaling elements and encoder components into a mechanically coupled chain. This chain should look like the real constellation of the mechanics. The scalings for the distance [4] and, if required, for the external encoder [5] are calculated based on this chain. 1. Use drag and drop to place the required scaling elements [1] and encoder components [2] one after the other into this area in the correct order. 2. Bear in mind that not all combinations are reasonable. This is the reason why some elements and components cannot be selected. 3. Finally you can configure the properties of the selected component by double-clicking the respective icon. **INFORMATION:** A motor revolution is mapped to 65536 increments regardless of the physical encoder resolution.
[4]	This area shows the scaling of the distance in user units or in revolutions. The distance scaling indicates the number of increments that the encoder increments when the axis moves along a certain distance. The scaling can be set manually if [6] is enabled.
[5]	If you have set an external encoder for "Actual position source", then the scaling of the external encoder is displayed here. The external encoder indicates the ratio of external encoder increments to motor revolutions. The scaling can be set manually if [6] is enabled.
[6]	Enabling this check box lets you directly enter the scaling factors for [4] and [5]. They are independent of the mechanical chain in area [3].
[7]	Here you set whether you want to use the system units of MOVIDRIVE® B: • **No** The system units of MOVIDRIVE® B are not used. • **Yes** The following system units are used: – Unit of speed: 1 rpm – Unit of the time for acceleration and deceleration for a speed difference of 3000 rpm: 1 ms
[8]	Here you choose the time base: • **Minutes [min]** The following units are derived from the time base: – Speed: [distance/min] – Acceleration: [distance/min×s] • **Seconds [s]** The following units are derived from the time base: – Speed: [distance/s] – Acceleration: [distance/s^2]
[9]	Here you enter the decimal places for the following values: • **Position** • **Dynamics parameters** (acceleration, deceleration) **INFORMATION:** The decimal places specified here affect only the fieldbus interface.

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Resolution of rotative external encoders

For rotary external encoders, observe the following convention for entering the resolution:

Device	Interface	Resolution	Sample encoder type
MOVIAXIS®	All	Resolution of the single-turn encoder	AV1Y (Heidenhain ROQ424), 512 inc/revolution
MOVIDRIVE® B	X62 on DIP11B or DEH21B	Resolution of the absolute encoder	T&R CE65M, 4096 inc/revolution
	X14 on DEU21B	Resolution of the single-turn encoder	AV1Y (Heidenhain ROQ424), 512 inc/revolution
	X14 on DEH11B	Four times the resolution of the single-turn encoder	AV1Y (Heidenhain ROQ424), 2048 inc/revolution

Example: Scaling parameters

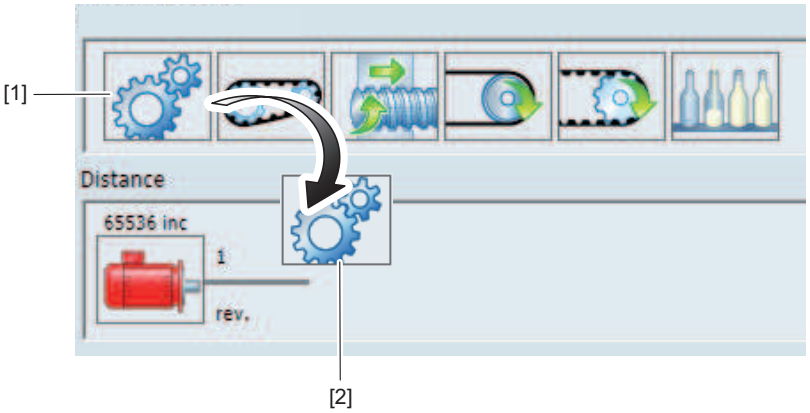
The following example illustrates how to compile and parameterize scaling elements and encoder components.

The example is based on the following conditions:

Scaling parameter	Input value
Gear unit reduction ratio (i)	13.52
Carrying wheel diameter	350 mm
Linear distance encoder	Type: DME5000-0.1 Resolution: 10 increments per mm

Proceed as follows:

1. Use drag and drop to place the "gear unit" scaling element into the "distance" area [2].



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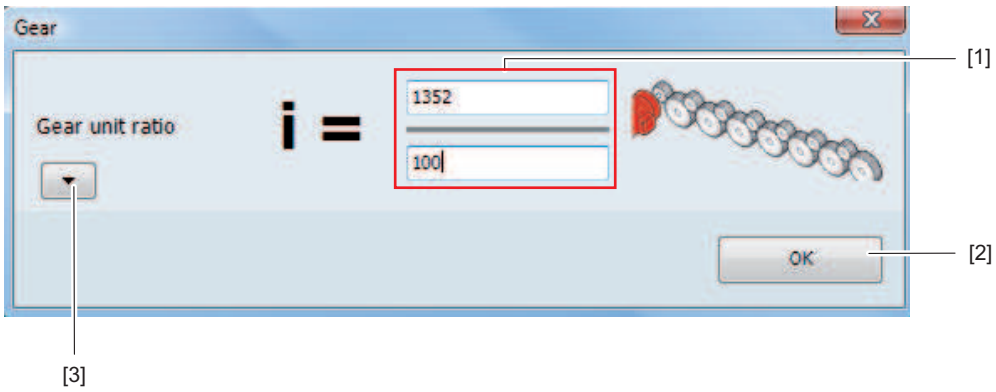
2. Double-click "gear unit".
3. Enter the value (13.52) for the gear unit ratio (i). Use numerator and denominator [1].



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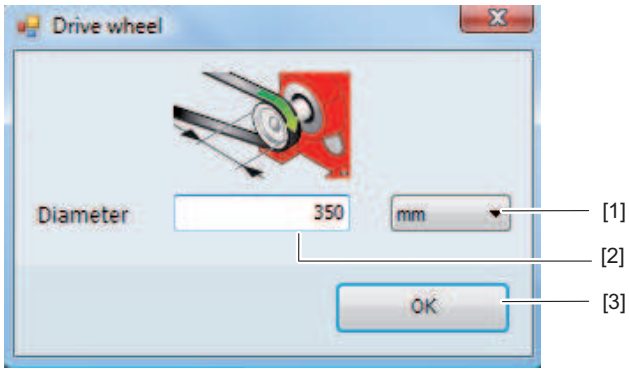
INFORMATION: If you have several gear unit stages, you can enter the respective ratio in the expanded view [3]. The value "13.52" in the example is rounded. For modulo applications, we recommend that you request the exact value from SEW-EURODRIVE.

4. Click [OK].
5. Use drag and drop to place the "drive wheel diameter" scaling element into the "distance" area [2].
6. Double-click the "drive wheel diameter" scaling element.
7. Enter the value (350) in [2] and choose the unit [mm] from [1]:



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8. Click [OK].
9. Use drag and drop to place the "linear encoder" component into the "distance" area [2] (second to last figure above).

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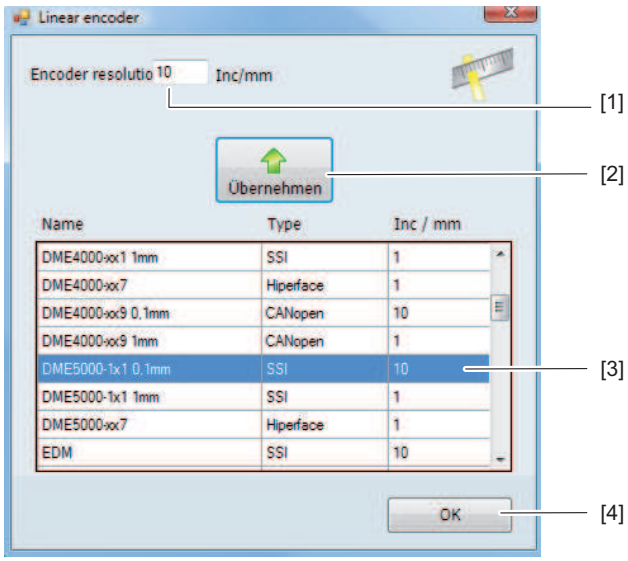
10. Double-click "linear encoder" and select the encoder type (DME5000-1×1 0.1 mm) [3].



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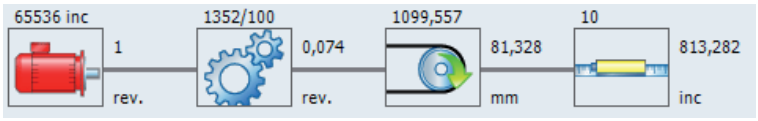
11. Click button [2] to enter the value of the encoder resolution (10 increments) in the text field [1].
12. Click [OK].
    ⇨ The result of your selection with the values you have entered is illustrated below:



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13. Choose the time base for speed and acceleration (minute [min], second [s]).

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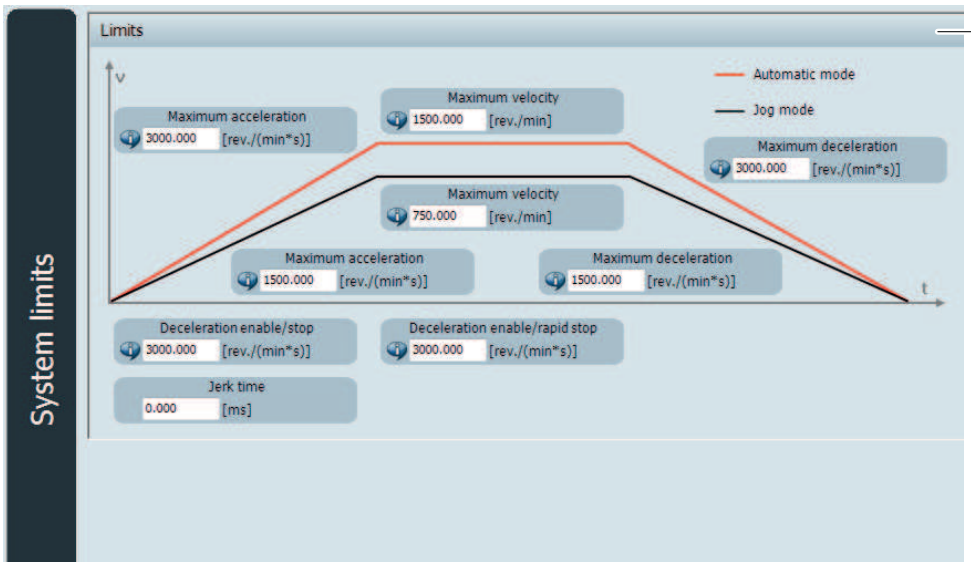
7.3.3 System limits

In this window, you set the system limits of the axis.



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No.	Description
[1]	Here you set the following limits for the dynamic properties: • **Maximum acceleration** (automatic mode) • **Maximum velocity** (automatic mode) • **Maximum deceleration** (automatic mode) • **Maximum acceleration** (jog mode) • **Maximum velocity** (jog mode) • **Maximum deceleration** (jog mode) **INFORMATION:** You can set these three values (maximum acceleration/velocity/deceleration) independently for jog mode as well as for automatic mode. They limit the dynamics parameters that are specified via fieldbus. • **Jerk** Jerk limitation (> 0 ms) protects the mechanical components with smoother acceleration and deceleration behavior. • **Deceleration enable/stop** The set stop ramp is active if signal I1:2 *Enable/stop* = "0". • **Deceleration enable/rapid stop** The set rapid stop ramp is active if signal I1:1 *Enable/rapid stop* = "0", or if a fault occurs.

INFORMATION

Make sure that values ≠ 0 are assigned to the maximum acceleration, maximum velocity, and maximum deceleration. Also make sure that these values have a control tolerance for the maximum dynamics of the required travel profile of +10% for example.

7.3.4 Input configuration (only available for MOVIGEAR® B / DRC..)

This window offers the following function:

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No.	Description
[1]	Here you choose the digital inputs of MOVIGEAR® B / DRC.. you want to evaluate: • **Onboard** Digital inputs of the MOVIGEAR® B / DRC.. basic unit. • **GIO** Digital inputs of option card GIO12B/GIO13B of MOVIGEAR® B / DRC..

For the process data assignment of the digital inputs, refer to chapter "Process data assignment of input/output terminals of MOVIGEAR® B / DRC.." (→ 🗎 71).

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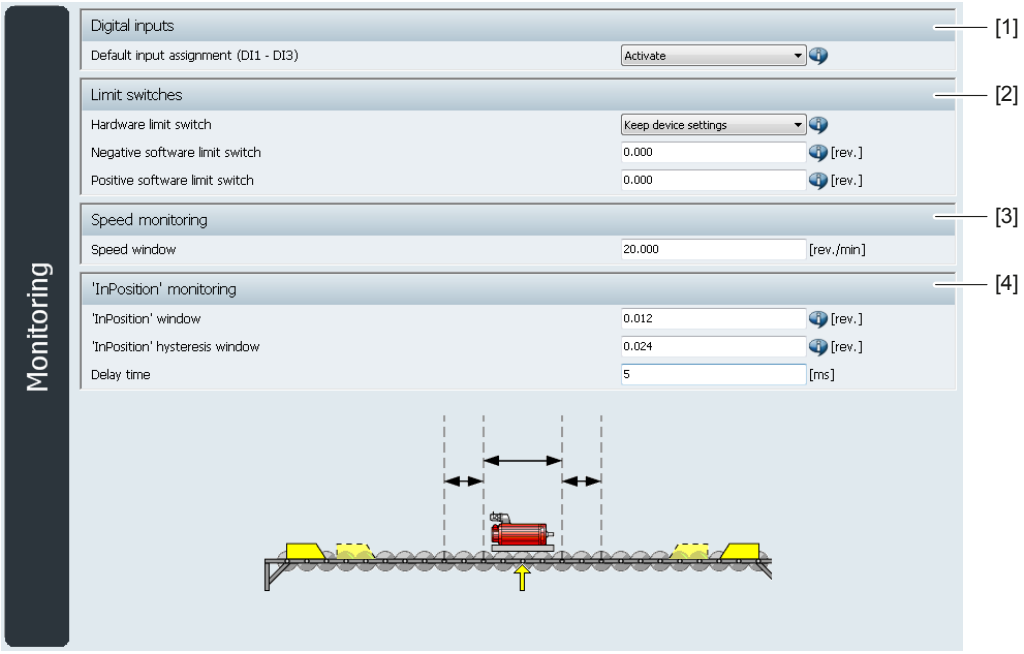
7.3.5 Monitoring

In this window, you make the monitoring settings.



27021601345078155

No.	Description
[1]	Here you set whether you want to use the default input assignment for the digital inputs (DI01 to DI03): • **Keep device settings** The settings according to the parameter tree of the device apply. The controller does not change these settings. If you want to change the device settings, you have to edit the relevant parameter group in the parameter tree in MOVITOOLS® MotionStudio. • **Activate** The default input assignment of the digital inputs for the respective inverter apply, see chapter "Default input assignment" (→ 🗎 71). • **Deactivate** Digital inputs with default values assigned to them are now set to "IPOS input" or "No function" depending on the device type, see chapter "Default input assignment" (→ 🗎 71). Digital inputs without "default input assignment" (→ 🗎 71) remain unchanged.

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No.	Description
[2]	Here you set the following limit switches: • **Hardware limit switches** – Keep device settings – Activate – Deactivate • **Software limit switches** – Positive position – Negative position The following pages contain detailed information on the setting options.
[3]	Here you enter the speed for the speed window.
[4]	Here you set the two windows for "in position" monitoring and the delay time for the "setpoint reached" signal in positioning mode. The following pages contain detailed information on the setting options.

Hardware limit switches

- **Keep device settings**

  The settings according to the parameter tree of the device apply. The controller does not change these settings. If you want to change the device settings, you have to edit the relevant parameter group in MOVITOOLS® MotionStudio.

- **Activate**

  Activates the monitoring of positive and negative limits implemented through hardware limit switches. For assignment information, refer to chapter "Default input assignment" (→ 🗎 71).

- **Deactivate**

  Deactivates monitoring.

  Depending on the device type, digital inputs with default input assignment are set to "IPOS input" or "No function". Digital inputs without "default input assignment" (→ 🗎 71) remain unchanged.

When using hardware limit switches, they have to be designed as **NC contacts** for wire-break protection reasons. In the travel range, the hardware limit switches are located **after** the software limit switches if such are used.

Response when a hardware limit switch is hit

The axis decelerates based on the value set for "enable/rapid stop". The inverter signals the fault "Hardware limit switch hit" (F29). After a fault reset, the drive moves clear of the hardware limit switch with the retraction speed (reference velocity 2), and the fault is cleared. The retraction speed is decelerated and accelerated with the value for "enable/rapid stop".

Software limit switches

A value ≠ 0 in the respective field activates monitoring of the positive and negative limits using software limit switches. The permitted travel range is defined by the positive and negative limits. In the travel range, the software limit switches are located **before** the hardware limit switches if such are used.

Response when a software limit switch is hit

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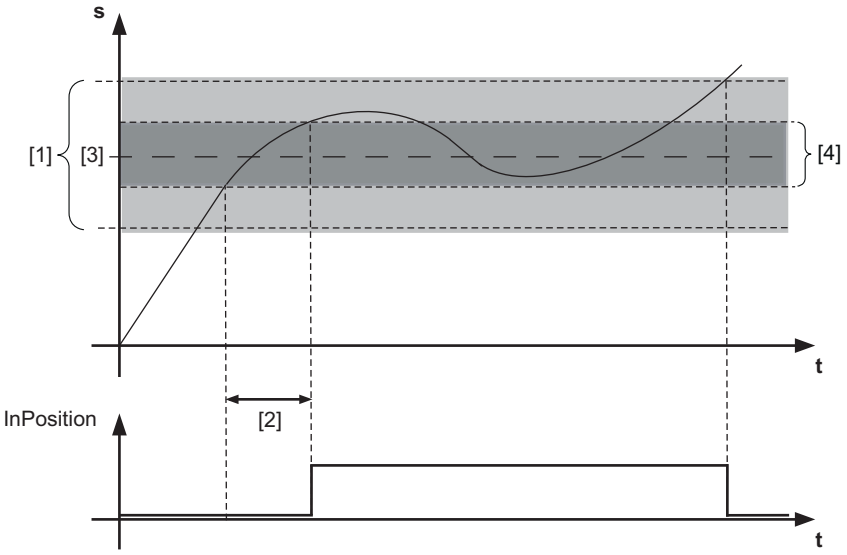
When the drive moves past a software limit switch in "jog" or "positioning" mode, the axis stops with the deceleration value set in "enable/rapid stop". The application fault "Positive software limit switch hit" (F32) or "Negative software limit switch hit" (F33) is issued. To clear the software limit switch and clear the fault, you have to reset the fault and initiate axis movement in the direction of the permitted travel range. The velocity, acceleration, and deceleration values of the selected operating mode apply.

"In position" monitoring

The following figure illustrates the meaning of the parameters:



9007202588681739

[1]	"In position" hysteresis window	In position	"In position" signal
[2]	Deceleration time	s	Distance
[3]	Target position	t	Time
[4]	"In position" window		

"In position" monitoring uses 2 windows for switching on and off the "in position" signal.

If the actual position is in the position window indicated in dark gray in the figure [4] when monitoring is active, then this "in position" signal is issued. The signal is not revoked until the drive leaves the outer "in position" hysteresis window indicated in light gray in the figure [1].

If the drive enters the inner "in position" window [4] again with the same target position, then the "in position" signal is activated again. The hysteresis allows for using a relatively small window for activating the "in position" signal even if the drive overshoots the actual position. The delay time and the "in position" hysteresis window prevent the "in position" signal from bouncing.

The "in position" signal is reset immediately with the rising edge of the start signal.

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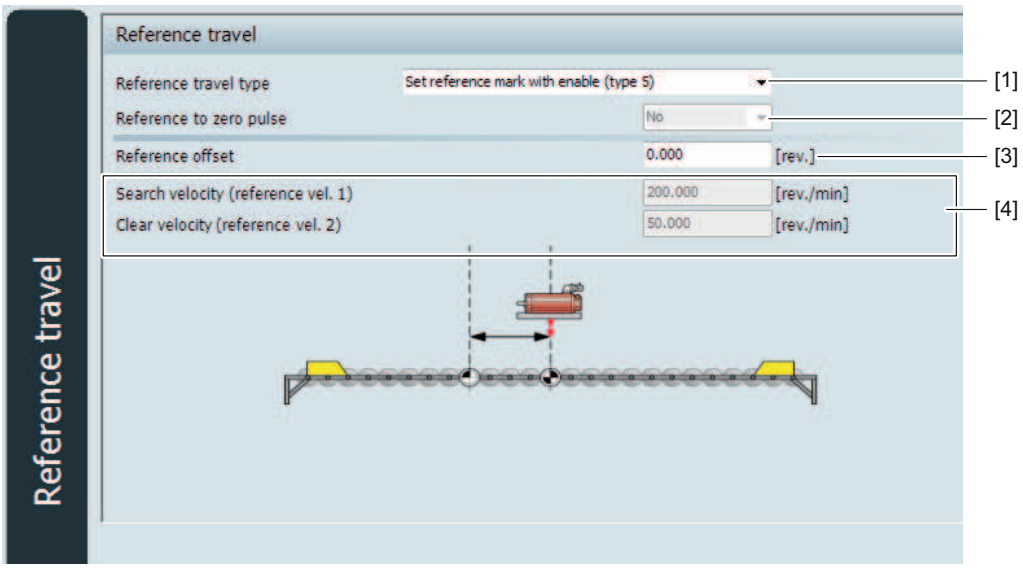
7.3.6 Reference travel

In this window, you set the reference travel parameters.



18014402090349451

No.	Description
[1]	Her you choose the reference travel type. The reference travel type defines how reference travel is performed. There are different reference travel types available depending on the device that is used. For detailed information, refer to the documentation of the respective device. The following options can be set depending on the selected reference type.
[2]	Here you set whether reference travel takes place at an edge change of the reference cam or at the next zero pulse of the encoder. • **Yes:** 0 pulse • **No:** Edge change
[3]	Here you enter the reference offset. Based on the reference point determined during reference travel, the axis zero can be changed using the reference offset. The new axis zero is calculated according to the following equation: **Axis zero = reference point - reference offset** The reference offset is specified in user units.
[4]	Here you enter the values for the search velocity and the clear velocity. If a reference cam is used for reference travel, the drive moves toward the reference cam with the search velocity and away from the reference cam with the clear velocity. The axis accelerates and decelerates with the value set for "enable/rapid stop". The velocities are specified in user units.

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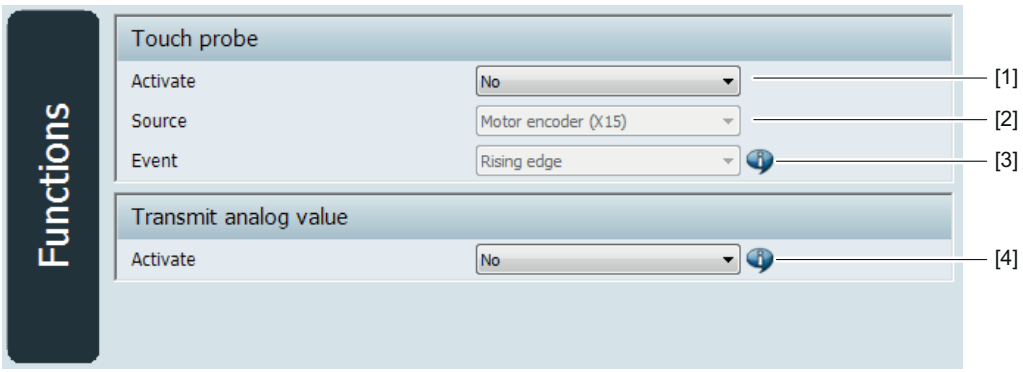
7.3.7 Functions

This window offers the following functions:



18014402090362123

No.	Description
[1]	Here you activate the Touchprobe function: • **No**: Deactivates the Touchprobe function (default) • **Yes**: Activates the Touchprobe function.
[2]	Here you choose the source for the activated Touchprobe function. You can choose between motor encoder and distance encoder. A distance encoder is managed directly by the axis. This means you merely have to specify to which port/slot the encoder is connected. • **MOVIAXIS®** Encoder 1: Motor encoder (default) Encoder 2: Encoder card in option card slot 2 Encoder 3: Encoder card in option card slot 3 • **MOVIDRIVE® B** Encoder 1: X15 Motor encoder (default) Encoder 2: X14 External encoder Encoder 3: X62 Absolute encoder
[3]	Here you choose the edge of the Touchprobe signal at the interrupt input: • **Rising edge** (default) • **Falling edge** • **Rising or falling edge** Depending on the device, the following terminals are assigned to digital input DI02: • MOVIAXIS®: Terminal X10:13 • MOVIDRIVE® B: Terminal X13:3 • MOVIGEAR® B / DRC..: Terminal X5131:2 For more terminal assignments, refer to the corresponding documentation for the device.

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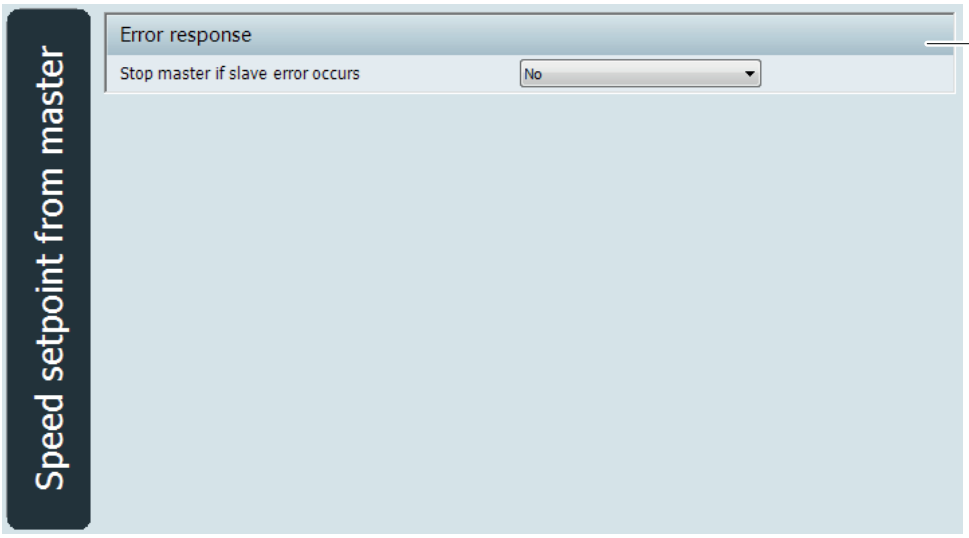
No.	Description
[4]	Here you activate or deactivate the transfer of analog values **(only available for MOVIGEAR® B / DRC..)**. • **No**: Deactivates the transfer of analog values of the GIO13B option card (default). • **Analog input/analog output:** The analog output is activated using setpoint 2. The analog input is output using actual value 2. • **Frequency input/analog output:** The analog output is activated using setpoint 2. The frequency input is output using actual value 2. **INFORMATION:** The Touchprobe function cannot be used when analog values are transferred.

7.3.8 Speed setpoint from master

In this window, you activate the "Stop master if slave error occurs" function.

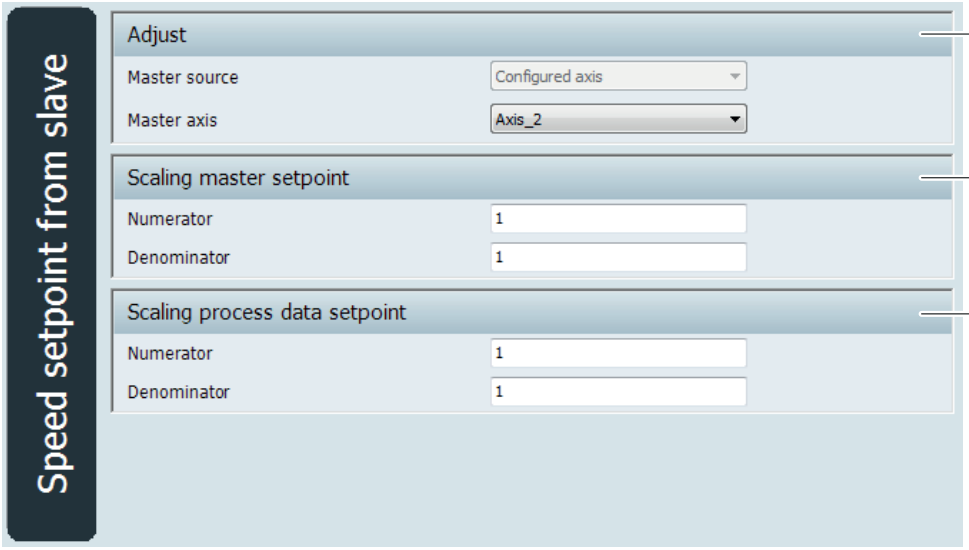


18014402090375179

No.	Description
[1]	Here you activate the function that the master axis stops when an error occurs in the slave axis: • **No** Deactivates slave axis monitoring. • **Yes** Activates slave axis monitoring. With this setting, the master is stopped when an error occurs in a synchronized slave.

7.3.9 Speed synchronism – Configured axis as speed setpoint for the slave

This window offers the following functions:



27021601345129611

No.	Description
[1]	Here you choose the master axis. Permitted value range: 1 to 16
[2]	Here you enter the speed ratio between master axis and slave axis. **INFORMATION:** You can use the numerator/denominator ratio to compensate different gear unit factors between master and slave axis, for example.
[3]	Here you enter the values for numerator and denominator of your required scaling of the process data setpoint. The setpoint speed specified via fieldbus is transferred to the axis with the scaling you have specified in this window.

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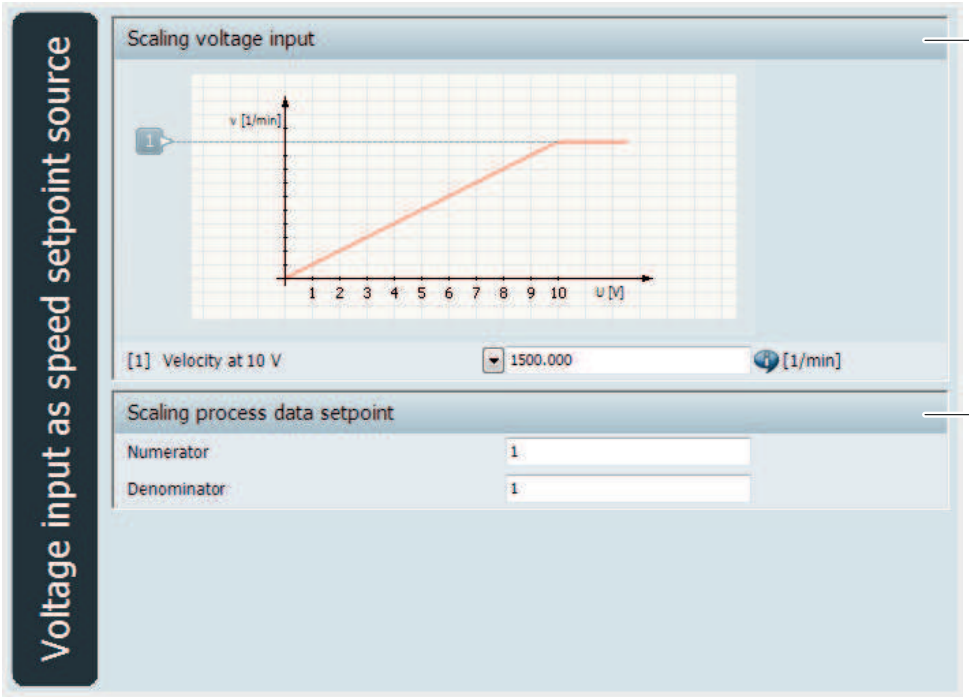
7.3.10 Speed synchronism – Voltage input as speed setpoint source for the slave

This window offers the following functions:



27021601345157643

No.	Description
[1]	Here you enter the speed for a voltage of 10 V. Optionally, you can enter the speed depending on a variable voltage value. **Normalization:** With a voltage range of 0 to 10 V, you cover the speed range from 0 rpm up to maximum speed (1000 digits internal resolution).
[2]	Here you enter the values for numerator and denominator of your required scaling of the process data setpoint.

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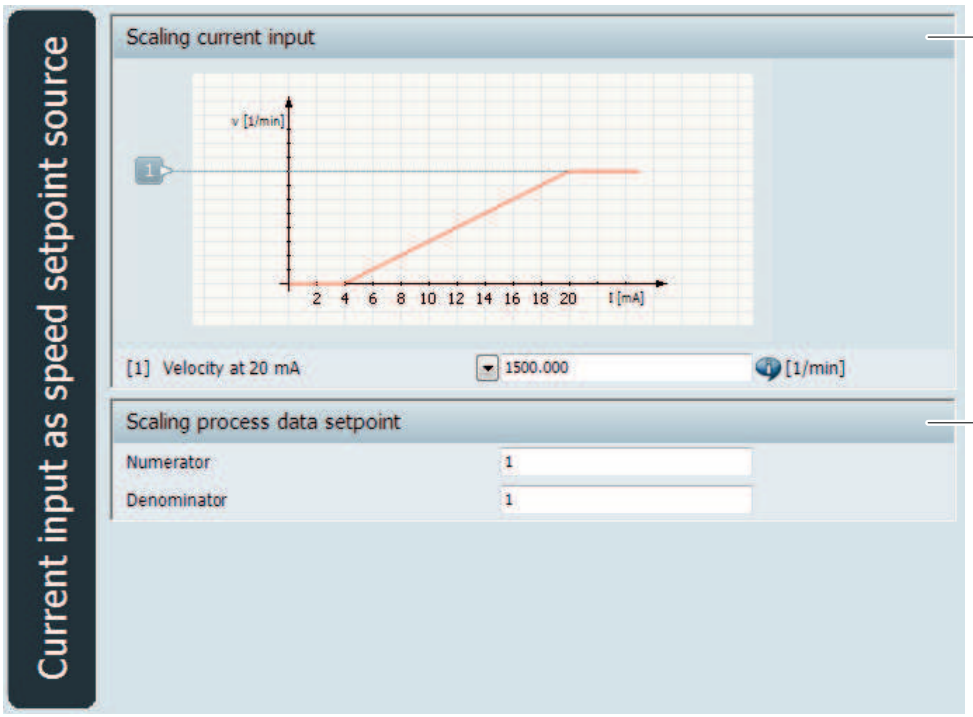
7.3.11 Speed synchronism – Analog current input as speed setpoint source for the slave

This window offers the following functions:



27021601504738315

No.	Description
[1]	Here you set the speed for a current of 20 mA. Optionally, you can enter the speed depending on a variable current value. **Normalization:** With a range of 0 to 20 mA, you cover the speed range from 0 rpm up to maximum speed (1000 digits internal resolution).
[2]	Here you enter the values for numerator and denominator of your required scaling of the process data setpoint.

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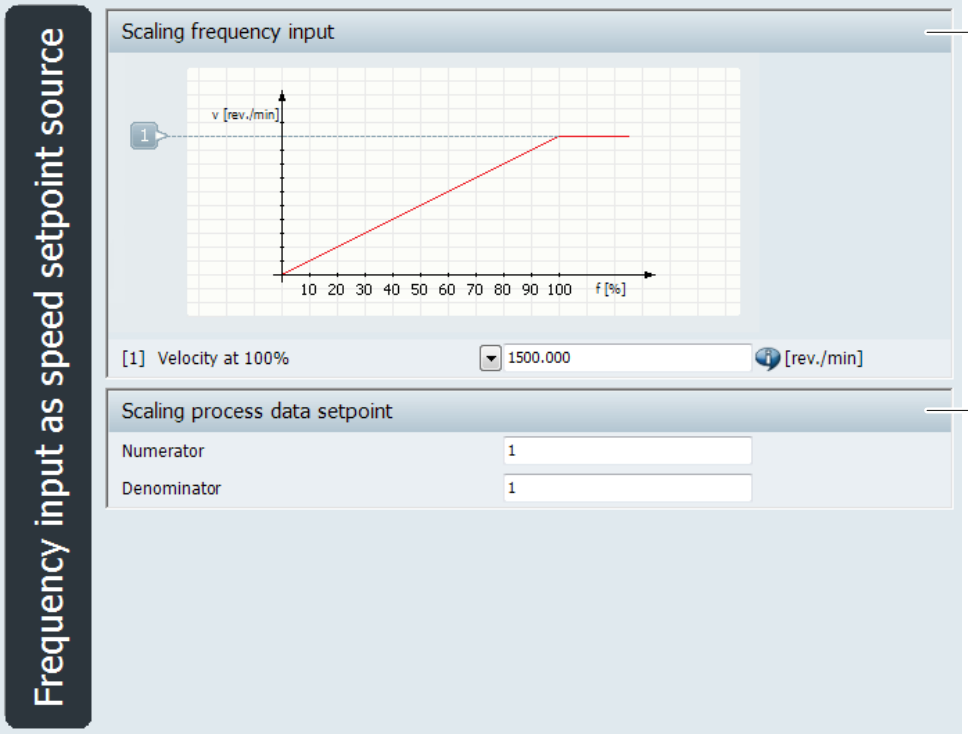
7.3.12 Speed synchronism – Frequency input as speed setpoint source for the slave (only available for MOVIGEAR® B / DRC..)

This window offers the following functions:



27021601505139083

No.	Description
[1]	Here you set the speed in relation to 100%. Optionally, you can enter the speed depending on a variable frequency value. **Normalization:** With a range of 0 to 100%, you cover the speed range from 0 rpm up to maximum speed (10000 digits internal resolution).
[2]	Here you enter the values for numerator and denominator of your required scaling of the process data setpoint.

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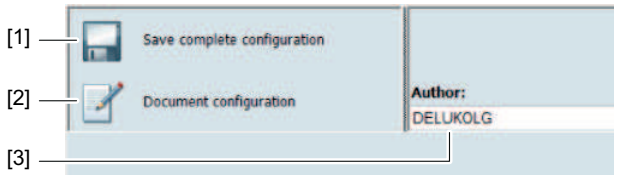
7.4 Saving the configuration on the SD card of the controller

7.4.1 Completing the axis configuration

After successful axis configuration, the following functions are available in the displayed window.



14794534795

No.	Description
[1]	Click this button to save the configuration to a configuration file (*.AppConfig.zip) on your computer. You can then use the values to start up more application modules, see chapter "Initial screen" in the "Application Configurator for CCU" documentation.
[2]	Click this button to create a PDF file with a configuration report.
[3]	If you enter a name into this edit box, it will be shown in the report.

Saving the entire configuration to a configuration file (*.AppConfig.zip)

Proceed as follows:

1. Click button [1].
   ⇨ A window opens with the directory structure of your computer.
2. Search the desired storage location in the directory structure.
3. Enter a random name for the configuration.
4. To close the dialog, click [Save].

⇨ You have now saved the configuration.

Finishing the configuration

Proceed as follows:

1. To exit the wizard, click [Finish].

⇨ You have now completed the configuration.

⇨ The screen of the Application Configurator is displayed again.

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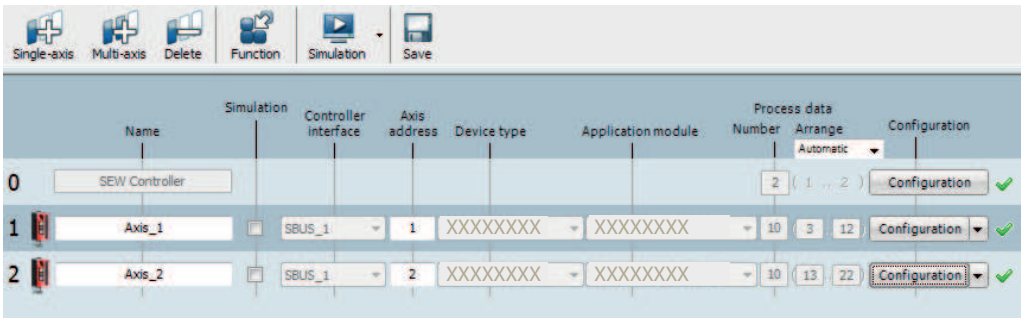
7.4.2 Finishing the configuration

The following window shows the complete configuration.



9007214493540747

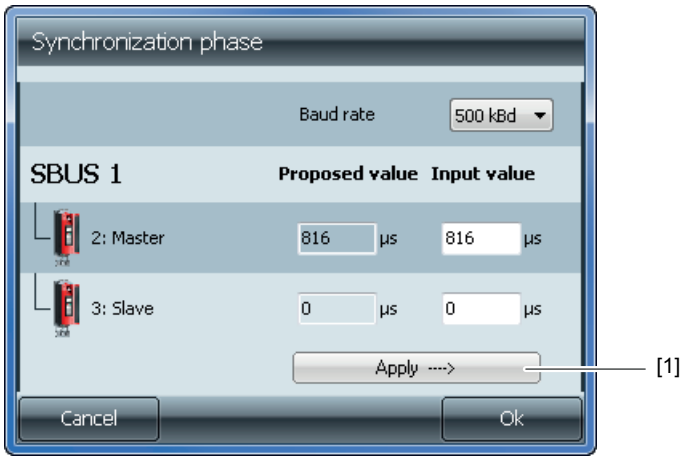
To finish the complete configuration, click [Next].

If you **use MOVIDRIVE® B**, the window for setting the synchronization phase opens depending on the configuration, see the next chapter.

If you **DO NOT use MOVIDRIVE® B**, skip the next chapter and go directly to chapter "Downloading the configuration".

7.4.3 Setting the synchronization phase on MOVIDRIVE® B

Once you have completed the configuration, the following window opens depending on the configuration.



13678964491

INFORMATION

SEW-EURODRIVE recommends that you set a baud rate of 1 MBaud on the devices and in the software interface.

1. To accept the suggested values, click [1].
   ⇨ The values are applied.
2. To finish the configuration, click [OK].
   ⇨ Configuration is now finished.

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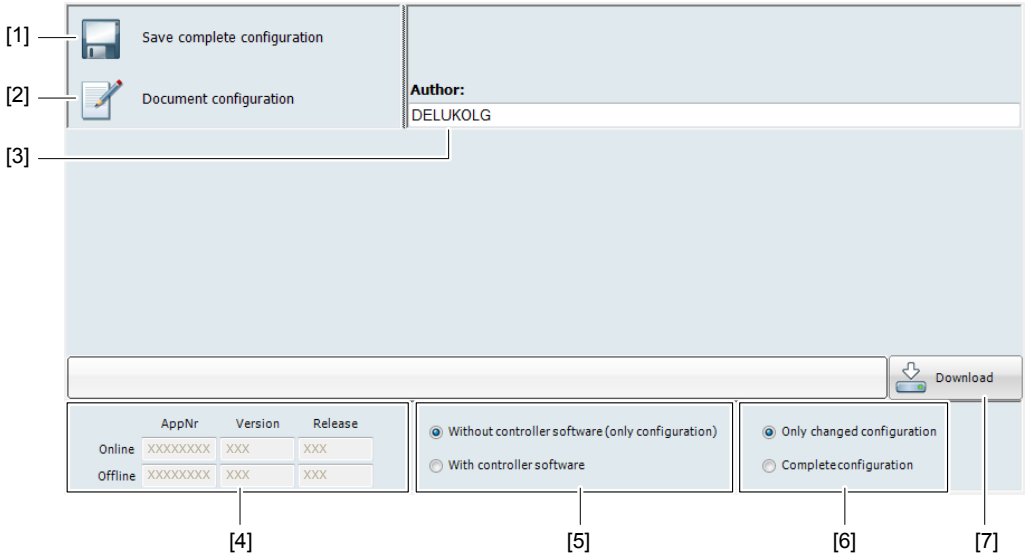
7.4.4 Downloading the configuration

When you have configured the application module, the following data is available under "Download".



9007212935349131

No.	Description
[1]	Click this button to save the configuration to a configuration file (*.AppConfig.zip) on your computer. You can then use the values to start up more application modules. Refer to the "Application Configurator for CCU" documentation for more information.
[2]	Click this button to generate a report of the configuration as a PDF file.
[3]	If you enter a name into this edit box, it will be shown in the report.
[4]	In this section, you see the information on the application module that is installed offline on your computer and online on the controller: • Part number • Version • Release
[5]	Use the radio buttons to choose if you want to download the configuration with or without controller software.
[6]	These radio buttons let you choose between downloading the modified configuration or the complete configuration.
[7]	Click this button to download the configuration.

1. Make the required settings.
2. Click this button [7] to download the configuration.

⇨ The configuration is downloaded.

⇨ The controller is ready for operation.

⇨ Click [Next] to get back to the configuration interface of the Application Configurator.

⇨ You can start operation or the test run in diagnostics (see following chapter).

8 Operation and diagnostics

The Application Configurator provides the following functions for testing the functions of the application modules and for error diagnostics:

- Overview of module diagnostics
- Process data monitor
- Trace
- Extended diagnostics

You can open the listed functions by clicking button [1] on the initial screen of the Application Configurator.

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The individual diagnostics options are described in the following chapters. For detailed information on the individual functions of the Application Configurator, refer to the documentation of the "Application Configurator for CCU" configuration software.

Observe the following warning note:

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⚠ DANGER

Unexpected movement of the machine.

Severe or fatal injuries.

Unexpected movement of the machine is possible in the following situations:

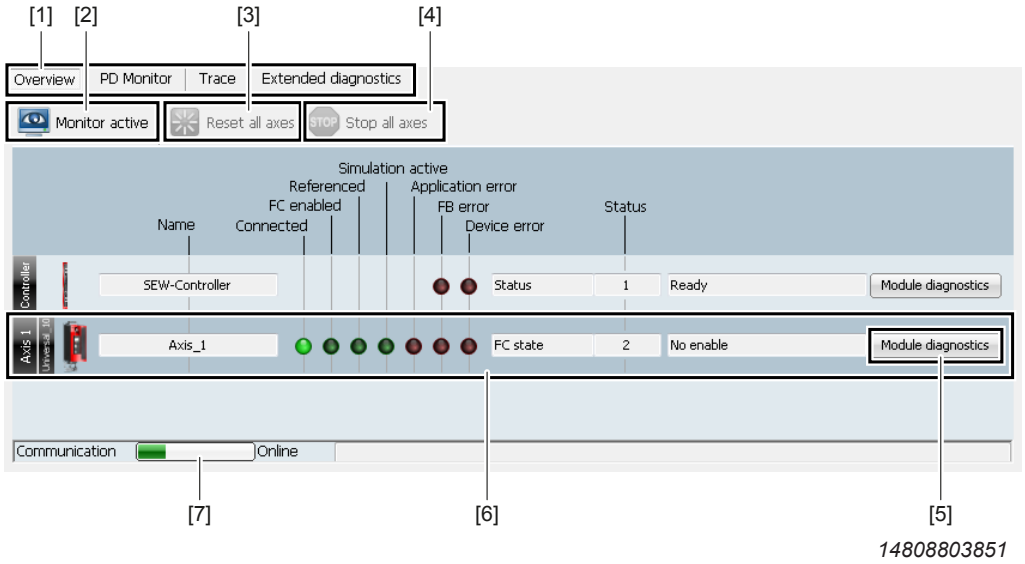
- When switching from monitor mode [Monitor active] to control mode [Control active] and vice versa.
- After clearing the fieldbus input data.

→ Make sure that an automatic restart or stop of the machine represents no danger to people or equipment.

→ Make sure that the machine is in a safe state.

8.1 Overview of diagnostics

The following window opens once you change to diagnostics in the Application Configurator. Here you can open the detailed diagnostics of the various application modules. The information displayed in this window is based on the respective variables of the controller.



14808803851

No.	Description
[1]	These buttons let you access the following functions: • **Overview** (initial screen of diagnostics) • **PD monitor** (process data monitor) • **Trace** • **Extended diagnostics** These functions are described in detail in the subsequent chapters.

No.	Description
[2]	Click this button to change to monitor mode or control mode. • In **monitor mode** you monitor the functions of the application module. • In **control mode**, you control the functions of the application module. **INFORMATION:** Observe the warning note in chapter "Operation and diagnostics" (→ 🗎 58). **INFORMATION:** The control mode of the PD monitor must not be activated simultaneously with the control mode.
[3]	Click this button to acknowledge the faults of all axes.
[4]	Click this button to stop all configured axes (for example in case of a hazard). Deceleration is carried out via the emergency stop ramps.
[5]	Click this button to acknowledge the module diagnostics of the application module.
[6]	This area displays the individual axes. The application module is shown as axis group.
[7]	This area displays the communication status of the controller. For successful diagnostics and control, the status "online" must be displayed and the green progress bar must be completed.

8.2 Module diagnostics

Module diagnostics provides you with module-specific diagnostics information regarding the process data interface, the operating states, and faults.

To open module diagnostics, click [Module diagnostics] on the "Overview" tab, see chapter "Overview of diagnostics" (→ 🗎 59).

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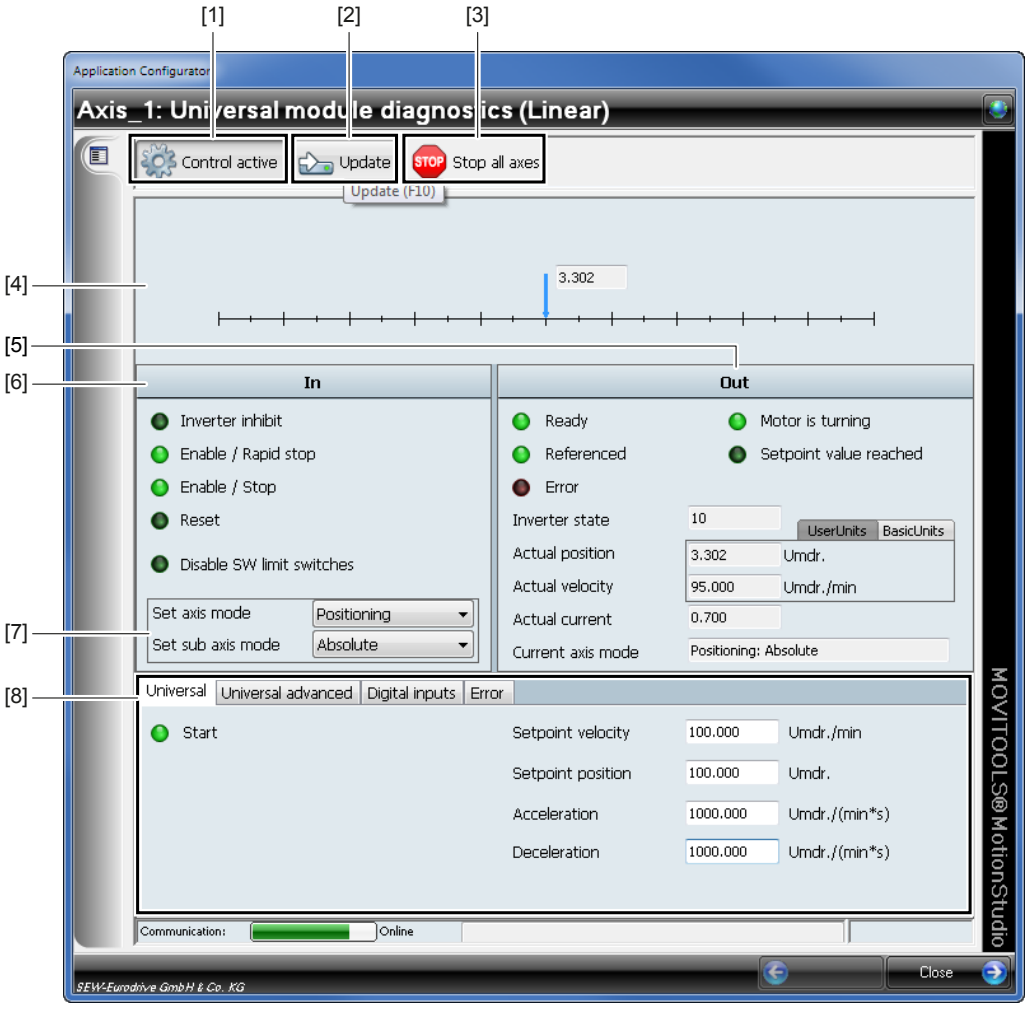
The basis for module diagnostics are all input and output data of the process data interface. The data is grouped according to subjects, and is displayed graphically. Unlike the PD monitor, not a direct image of the fieldbus data is displayed but the actual variables of the application module are visualized.



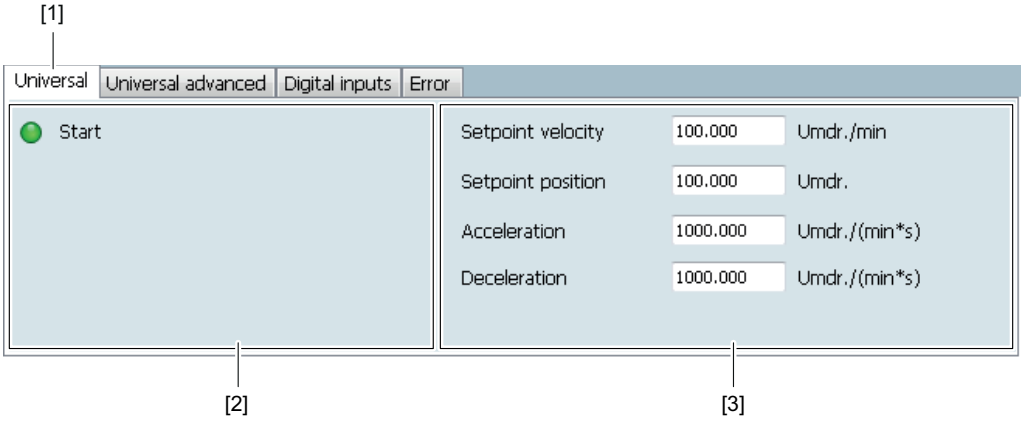
14809503243

No.	Description
[1]	Click this button to change to monitor mode or control mode. • In **monitor mode** you monitor the functions of the application module. • In **control mode**, you control the functions of the application module. **INFORMATION:** Observe the warning note in the chapter "Operation and diagnostics" (→ 🗎 58). **INFORMATION:** The control mode of the PD monitor cannot be activated simultaneously with the control mode of module diagnostics.
[2]	Click this button to transfer the input data to the controller. The button is only enabled in control mode. **INFORMATION:** In the configuration settings of the controller, you can adjust the settings in such a way that the button is no longer displayed. This way, each change of input data in control mode is transmitted directly to the controller.

No.	Description
[3]	Click this button to stop all configured axes (for example in case of a hazard). Deceleration is carried out based on emergency stop ramps.
[4]	In this area, you monitor the operation of the selected operating mode.
[5]	This area displays general output data that are independent of operating mode and function.
[6]	This area displays the following input data that are independent of operating mode and function.
[7]	In this area, you select the operating mode and the submode.
[8]	These tabs provide more input and output information: • **Universal:** Basic functions of an operating mode • **Universal advanced:** Additional functions of the universal module – Torque limitation – Touchprobe • **Digital inputs** • **Error** For details on the tabs, refer to the next chapters.

8.2.1 Tab: Universal

The information on the tab varies depending on the selected operating mode. The following information is shown on the tab.



15344758923

No.	Description
[1]	The "Universal" tab is selected.
[2]	This area displays the control bit, for example "Start".
[3]	This area displays control values, such as velocity, position, acceleration, deceleration.

8.2.2 Tab: Universal advanced

This tab shows the following additional functions of the universal module.

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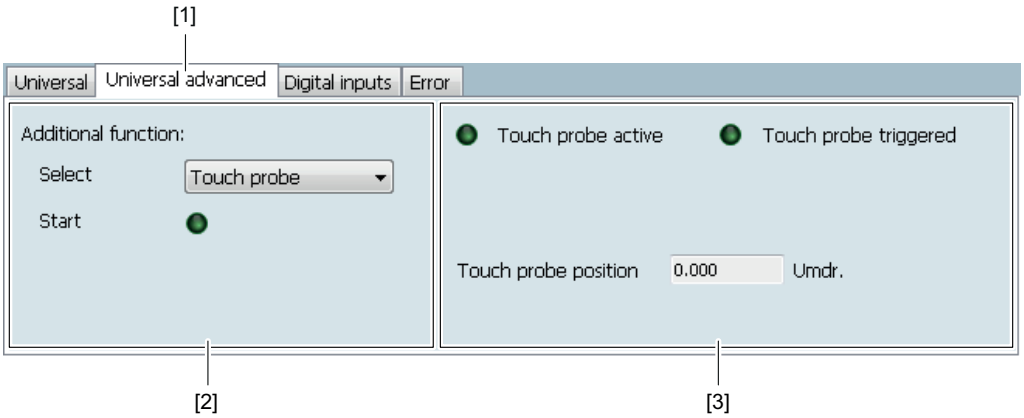
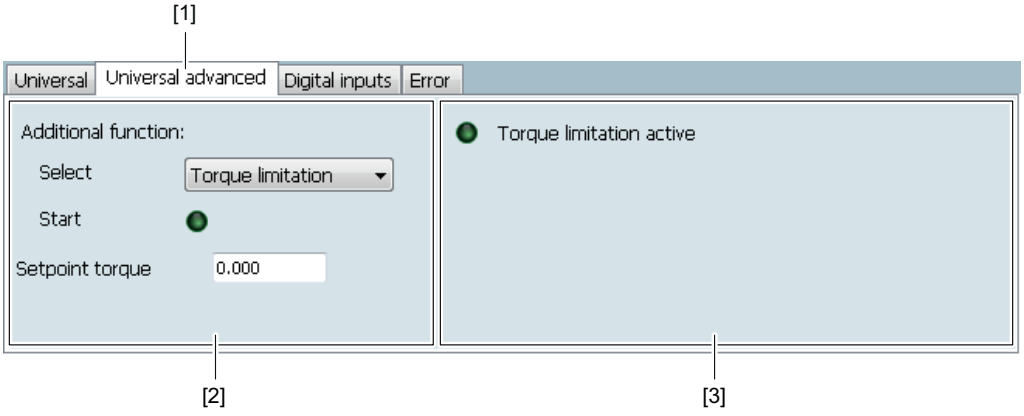
Touchprobe



15345259275

No.	Description
[1]	The "Universal advanced" tab is selected.
[2]	In this area, you activate the Touchprobe function.
[3]	This area displays the following status information of the Touchprobe function: • Touchprobe enabled • Touchprobe triggered • Touchprobe position

Torque limitation

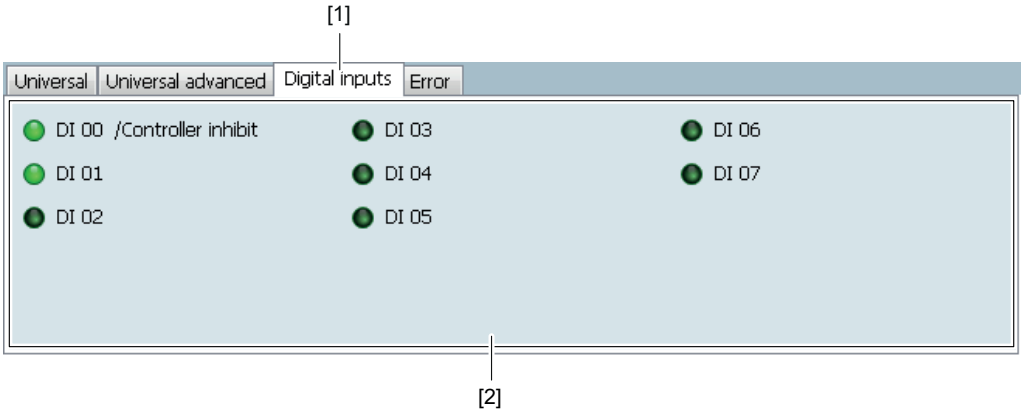


15345254667

No.	Description
[1]	The "Universal advanced" tab is selected.
[2]	In this area, you activate torque limitation and specify the setpoint torque.
[3]	This area displays the status.

8.2.3 Tab: Digital inputs

This tab shows the following information.

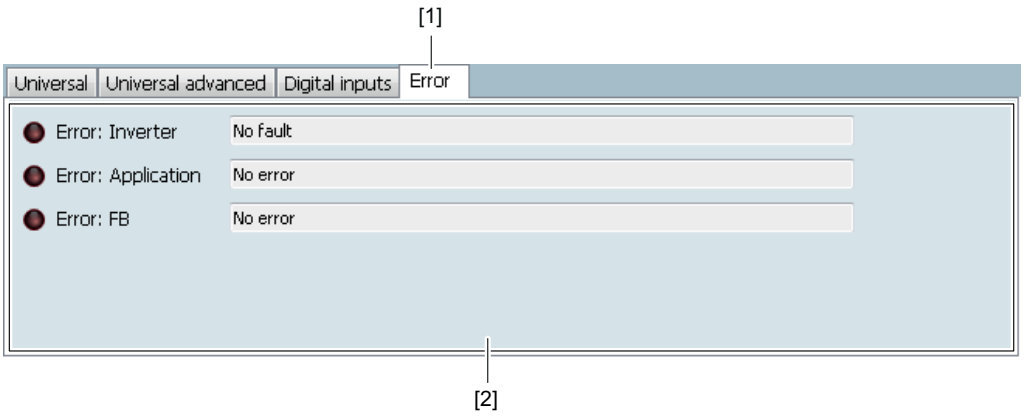


15345263115

No.	Description
[1]	The "Digital inputs" tab is selected.
[2]	This area displays the digital inputs of the inverter.

8.2.4 Tab: Error

This tab shows the following information.



15345753355

No.	Description
[1]	The "Error" tab is selected.
[2]	This area displays faults that have occurred: • Inverter fault • Application fault • Function block fault

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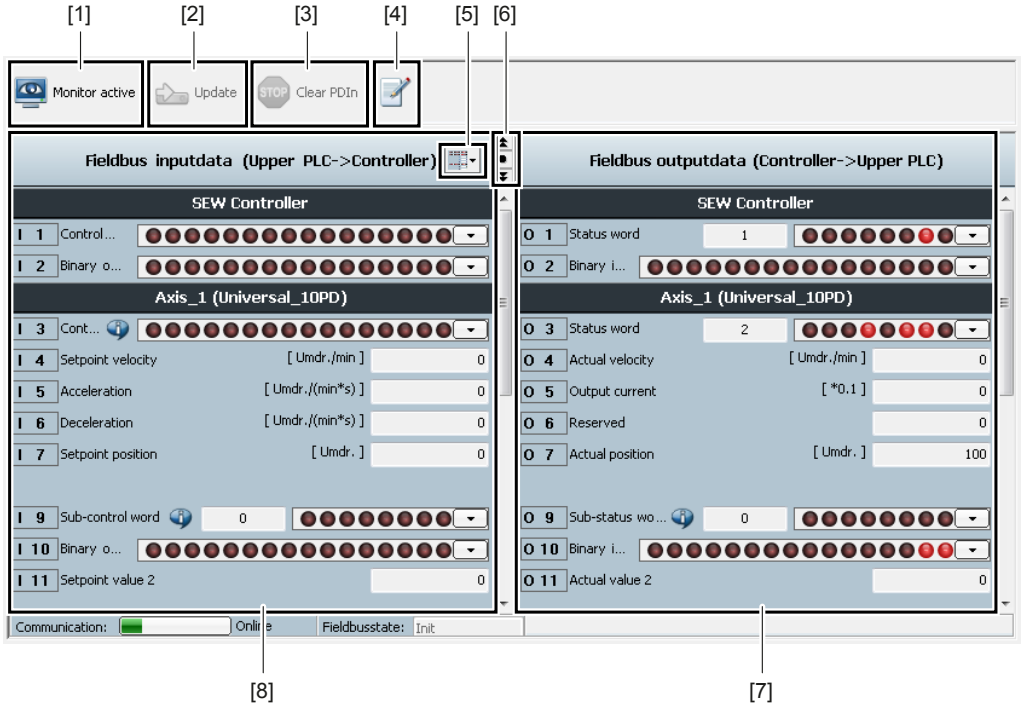
8.3 PD monitor

The PD monitor is used for diagnostics and for introduction of the fieldbus interface. The content of the PD monitor is based on the data from the SEW controller and the configured application module. The PD monitor only accesses data of the fieldbus interface and displays fieldbus input data and output data that are exchanged between the controller and the higher-level controller.



15321799179

No.	Description
[1]	Click this button to change to monitor mode or control mode. • In **monitor mode**, you monitor the functions of the application module. • In **control mode**, you control the functions of the application module. **INFORMATION:** Observe the warning note in chapter "Operation and diagnostics" (→ 🗎 58). **INFORMATION:** The control mode of the PD monitor must not be activated simultaneously with the control mode.
[2]	Click this button to send the input data to the controller. The button is only enabled in control mode. **INFORMATION:** In the configuration settings of the controller, you can adjust the settings in such a way that the button is no longer displayed. This way, each change of input data in control mode is sent directly to the controller.
[3]	Click this button to reset all input data or set all input data to zero.
[4]	Click this button to create a PDF file with the process data (for example for the programmer of the PLC).
[5]	Clicking this icon lets you save or download the current input data assignment for later use. Click the icon and select the required option.

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No.	Description
[6]	Use these icons to navigate between the axes: •  : Navigate to the previous axis •  : Navigate to the next axis •  : Drop-down list to directly go to a specific axis
[7]	This area displays the output data. **INFORMATION:** The output data are only displayed and cannot be changed in the user interface.
[8]	This area displays the input data. **INFORMATION:** In control mode you can change the input data.

For more detailed information about individual fieldbus data, refer to the respective info field or to chapter "Process data assignment" (→ 67).

8.4 Trace

Using trace lets you record various process signals (velocities, axis positions, etc.) of individual axes. You can record up to 4 channels at the same time.

For detailed information, refer to the documentation of the Application Configurator.

8.5 Extended diagnostics

Extended diagnostics is used for expert diagnostics. Here you find the variable structures of the public global controller variables.

For detailed information, refer to the documentation of the Application Configurator.

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9 Process data assignment

9.1 Overview

The following table lists the process data assignment depending on the selected profile.

Profile	Process data			
	Process input data		Process output data	
4 PD	I1	= Control word	O1	= Status word
	I2	= Setpoint speed	O2	= Actual velocity
	I3	= Acceleration	O3	= Output current (× 0.1)
	I4	= Deceleration	O4	= Reserved
6 PD	I5	= Setpoint position (high word)	O5	= Actual position (high word)
	I6	= Setpoint position (low word)	O6	= Actual position (low word)
7 PD	I7	= Sub control word	O7	= Sub status word
10 PD	I8	= Digital outputs	O8	= Digital inputs[1)]
	I9	= Setpoint 2 (high word)	O9	= Actual value 2 (high word)
	I10	= Setpoint 2 (low word)	O10	= Actual value 2 (low word)

[1)] The default input assignment is described in the Appendix.

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9.2 Process input data

The following table shows the process input data from the PLC to the inverter for fieldbus control with 10 process data words.

Word		Bit	Function	
I1	Control word	0	/Controller inhibit	0 = Enable 1 = Controller inhibit
		1	Enable/Rapid stop	0 = Rapid stop 1 = Enable
		2	Enable/stop	0 = Stop 1 = Enable
		3	Reserved	
		4	Reserved	
		5	Reserved	
		6	Reset fault	
		7	Reserved	
		8	Start	
		9	Positive	
		10	Negative	
		11	Mode 2^0	0000 = Reserved
		12	Mode 2^1	0001 = Operating mode 1: Speed control
		13	Mode 2^2	0010 = Operating mode 2: Jog mode
		14	Mode 2^3	0011 = Operating mode 3: Referencing mode 0100 = Operating mode 4: Positioning mode 0101 = Operating mode 5: Positioning mode – Touchprobe 0110 = Operating mode 6: Synchronism 0111 = Operating mode 7: Emergency mode
		15	/SWLS	0 = Software limit switch enabled 1 = Software limit switch disabled
I2	Setpoint speed	0 – 15	[User unit]	
I3	Acceleration	0 – 15	[User unit]	
I4	Deceleration	0 – 15	[User unit]	
I5	Setpoint position (high word)	0 – 15	[User unit]	
I6	Setpoint position (low word)	0 – 15	[User unit]	

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Word		Bit	Function		
I7	Sub control word	0	Enable Touchprobe		
		1	Reserved		
		2	Enable torque limitation		
		3	Reserved		
		4	Reserved		
		5	Reserved		
		6	Reserved		
		7	Reserved		
		8 – 15	SubMode	Operating mode: Speed control	No submode available
				Operating mode: Jog mode	No submode available
				Operating mode: Referencing mode	0/30: Static (configured) reference offset (default) 31: Variable reference offset (via process data I5/I6 *Setpoint position*)
				Operating mode: Positioning mode	0/40: Absolute positioning (default) 41: Relative positioning, positive 42: Relative positioning, negative
				Operating mode: Positioning mode – Touchprobe	0/50: Absolute positioning 51: Relative positioning, positive 52: Relative positioning, negative
				Operating mode: Speed synchronism	0/60: Speed synchronism 61: Speed synchronism with fieldbus setpoint as speed source
				Operating mode: Emergency mode	0/70: Emergency mode without external encoder
I8	Digital outputs	0 – 7	Function DO00 – DO07		
		8 – 15	Function DO10 – DO17		
I9	Setpoint 2 (high word)	0 – 15	[User unit]		
I10	Setpoint 2 (low word)	0 – 15	[User unit]		

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9.3 Process output data

The following table shows the process output data from the inverter to the PLC for fieldbus control with 10 process data words.

Word		Bit	Function
O1	Status word	0	Motor is running
		1	Frequency inverter ready for operation
		2	Drive referenced
		3	Setpoint reached
		4	Brake released
		5	Frequency inverter fault
		6	Frequency inverter warning
		7	Application fault
		8 – 15	Code for status/warning/error of the FU[1] Application error codes[2]
O2	Actual velocity	0 – 15	[User unit]
O3	Output current	0 – 15	[User unit] × 0.1
O4	Reserved	0 – 15	Reserved
O5	Actual position (high word)	0 – 15	[User unit]
O6	Actual position (low word)	0 – 15	[User unit]
O7	Sub status word	0	Touchprobe enabled
		1	Touchprobe detected
		2	Torque limitation active
		3	Reserved
		4	Reserved
		5	Reserved
		6	HWLS positive
		7	HWLS negative
		8 – 15	SubMode (see I7)
O8	Digital inputs	0 – 7	Function DI00 – DI07
		8 – 15	Function DI10 – DI17
O9	Actual value 2 (high word)	0 – 15	[User unit]
O10	Actual value 2 (low word)	0 – 15	[User unit]

1) For a detailed description, refer to the applicable documentation of the unit.

2) For a detailed description, refer to the applicable documentation of the Application Configurator.

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10 Appendix

10.1 Default input assignment

The following table shows the terminal assignment of the respective device with activated default assignment and activated hardware limit switches.

Digital input	Default input assignment				
	MOVIDRIVE® B MOVIAXIS® B MOVITRAC® LTP-B/LTX	**MOVIPRO® ADC**	**MOVIGEAR® DSC-B / SNI-B / DRC..**	**MOVIGEAR® DSC-B / SNI-B / DRC.. with GIO12B/GIO13B**	**MOVITRAC® B (in preparation)**
DI00	/Controller inhibit				/HWLS positive
DI01	Enable/stop				CW/stop
DI02	Fault reset[1)]	Fault reset[1)]	Reference cam[1)]	[1)]	/HWLS negative
DI03	Reference cam	Reference cam	/HWLS positive		
DI04	/HWLS positive	/HWLS positive	/HWLS negative		
DI05	/HWLS negative	/HWLS negative			
DI11				Reference cam	
DI12				/HWLS positive	
DI13				/HWLS negative	

1) When using the Touchprobe function, set digital input DI02 to "No function" or "IPOS input".

You find detailed information on how to configure digital inputs in chapter "Monitoring" (→ 🗎 45).

10.2 Process data assignment of input/output terminals of MOVIGEAR® B / DRC..

The following table shows the process data assignment of input/output terminals of MOVIGEAR® B / DRC..

Process data	Input/output	Hardware
I8:8 – I8:9	DO10 – DO11	Option cards GIO12B, GIO13B
O8:1 – O8:4	DI01 – DI04	Basic unit MOVIGEAR® B/ DRC..[1)]
O8:8 – O8:11	DI10 – DI13	Option cards GIO12B, GIO13B

1) The basic unit is not equipped with digital outputs.

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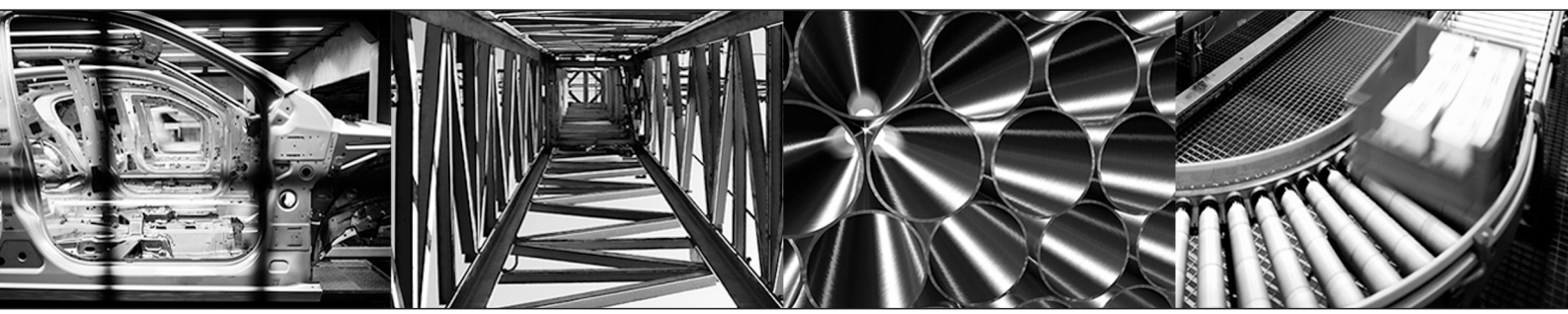

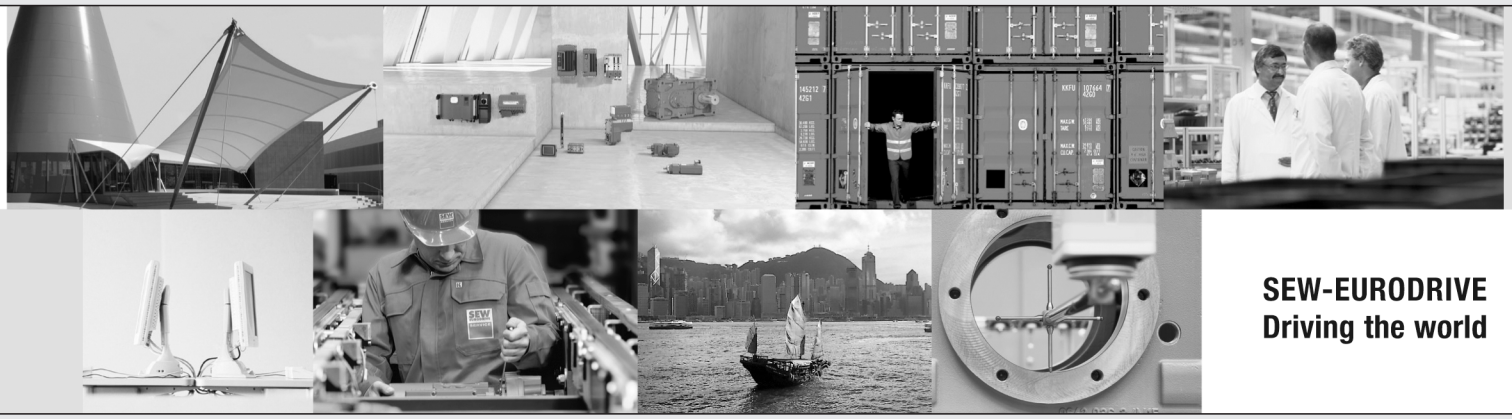

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