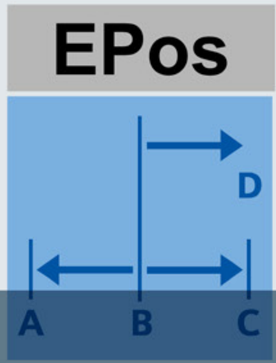

SINAMICS

SINAMICS G120 converters

CU250-2 Control Units

Basic Positioner (EPos) Function Manual

Edition 06/2013

Answers for industry.

SIEMENS

SINAMICS

SINAMICS G120
Function Manual Basic Positioner

Function Manual

Edition 06/2013, firmware V4.6

06/2013, FW V4.6

A5E31759509B AB

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Table of contents

1 Introduction

Who requires this manual and why?

This manual addresses machine and plant manufacturers and commissioning engineers. The manual describes the function "basic positioner" of the SINAMICS G120 inverter equipped with the CU250S-2 Control Unit.

What is described in this manual?

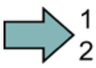
This manual covers all the information, procedures and operations required for the following scenarios:

- Controlling the basic positioner via the fieldbus.
- Commissioning the basic positioner.

What other information do you need?

This manual alone is not sufficient for installing or commissioning the standard inverter functions. An overview of the documentation available and the associated applications is provided in the sectionAdditional information on the converter (Page 87).

What is the meaning of the symbols in the manual?



An operating instruction starts here.

This concludes the operating instruction.

Basic positioner 2

2.1 Basic positioner and position control

Overview

Position control means controlling the position of an axis. An "axis" is a machine or system component that comprises the inverter with active position control and the driven mechanical system.

The basic positioner (EPos) calculates the traversing profile for the time-optimized traversing of the axis to the target position.

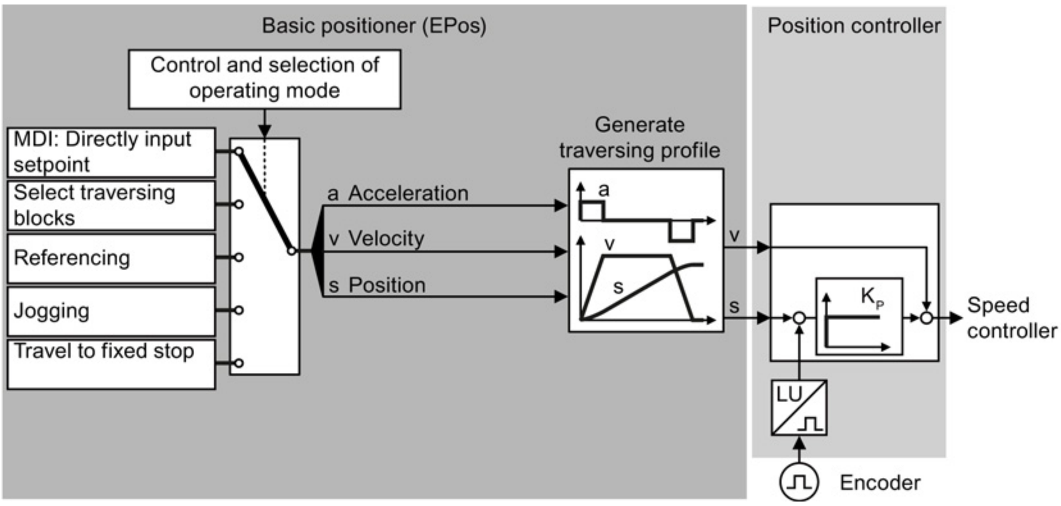


Figure 2-1 Basic positioner and position control

The basic positioner has the following operating modes:

- Direct setpoint input (MDI): The external control specifies the position setpoint for the axis.
- Traversing block selection: Position setpoints are saved in different traversing blocks in the inverter. The external control selects a traversing block.
- Referencing: Referencing establishes the reference of the position measurement in the inverter to the machine.
- Jogging: This function is used to incrementally traverse the axis (Set up).
- Travel to fixed stop: The inverter positions the axis with a defined torque against a mechanical fixed stop.

2.2 Permissible encoder combinations in the "Vector" control mode

Overview

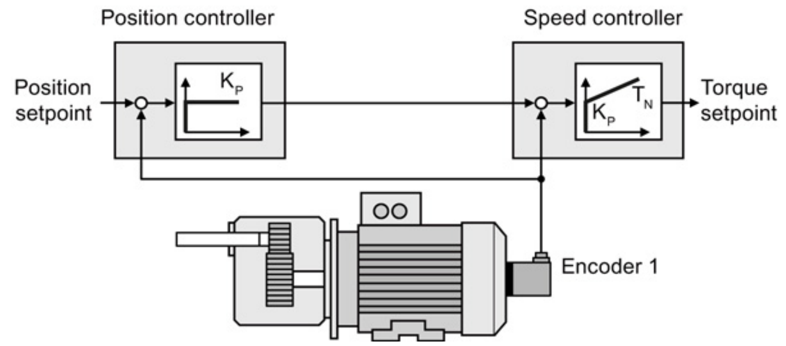
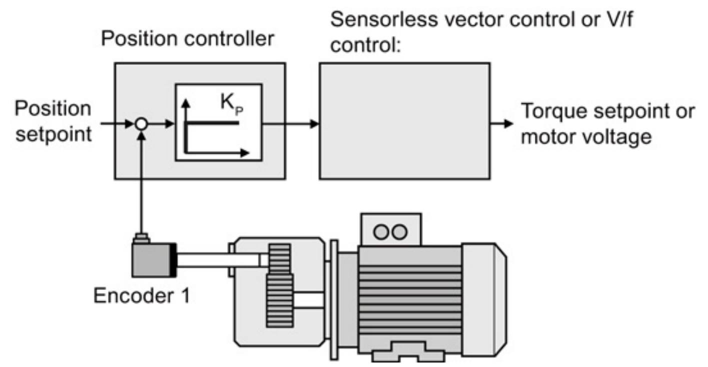
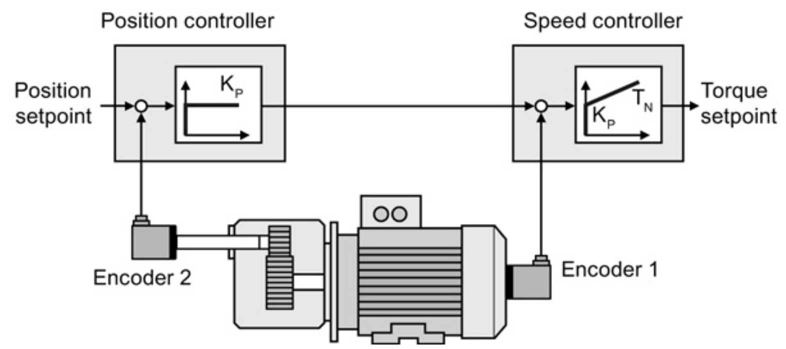
In the "Vector" control mode you are allowed to use two encoders per inverter. The encoder for the speed controller must be mounted on the motor shaft.

Table 2- 1 Encoder combinations

Encoders for the speed controller		**Encoders for the position controller**									
		SUB-D connector		Terminal strip		DRIVE-CLiQ interface					
		HTL or TTL encoder	SSI encoder	Resolver	HTL encoder	Connection via Sensor Module SMC or SME					DRIVE-CLiQ encoder
						HTL or TTL encoder	SSI encoder	Resolver	Endat 2.1	sin/cos encoder	
	Encoderless	②	②	②	②	②	②	②	②	②	②
	HTL or TTL encoder	①	---	---	③	③	③	③	③	③	③
	Resolver	---	---	①	---	---	---	---	---	---	---
	HTL encoder	③	③	---	①	③	③	③	③	③	③
	HTL or TTL encoder	③	③	---	③	①	---	---	---	---	---
	Resolver	③	③	---	③	---	---	①	---	---	---
	Endat 2.1	③	③	---	③	---	---	---	①	---	---
	DRIVE-CLiQ encoder	③	③	---	③	---	---	---	---	---	①
	sin/cos encoder	③	③	---	③	---	---	---	---	①	---

The symbols ---, ①, ② and ③ are explained in the table below.

Table 2- 2 Explanation regarding encoder combinations

---	This combination is not permissible.	
①	Position controllers and speed controllers use the same encoder on the motor shaft.	
		Advantage: Favorably-priced solution Disadvantages: • Depending on the gear ratio, restrictions regarding the accuracy of the position control. • Not suitable for position control in the case of mechanical slip on the load side
②	The position controller evaluates an encoder on the motor shaft or on the load side. The speed controller operates without an encoder.	
		Advantages: • You can use an encoder that is already present on the load side, e.g. an SSI encoder, for position control. • Favorably-priced solution Disadvantages: • Restrictions regarding the accuracy and dynamic performance of the position control • Not suitable for the position control of hoisting gear • The "Travel to fixed stop" EPos function is not possible.
③	The position controller evaluates an encoder on the load side. The speed controller evaluates an encoder on the motor shaft.	
		Compared to the other options of encoder assignment, this configuration provides the best control results.

Example

An HTL encoder is connected to the terminal strip.

You have the following options in this case:

- You use the HTL encoder for the speed controller and operate the drive without position control.
- You use the HTL encoder both for the speed controller and for the position controller ①.
- You operate the drive with encoderless speed control and use the encoder for the position controller ②.
- You use the HTL encoder at the terminal strip only for the speed controller and a second encoder for the position controller ③.

You can connect the second encoder for the position controller either to the SUB-D-connector or to the DRIVE-CLiQ interface.

2.3 Permissible encoders in the "Servo" control mode

In the "Servo" control mode you are only allowed to connect one encoder to the inverter. The encoder must be mounted on the motor shaft.

Table 2- 3 Permissible encoders for speed controller and position controller

<table>
<tr><td colspan="2">SUB-D connector
</td><td colspan="2">Terminal strip
</td><td colspan="6">DRIVE-CLiQ interface
</td></tr>
<tr><td rowspan="2">HTL or TTL encoder</td><td rowspan="2">SSI encoder</td><td rowspan="2">Resolver</td><td rowspan="2">HTL encoder</td><td colspan="5">Connection via Sensor Module SMC or SME</td><td rowspan="2">DRIVE-CLiQ encoder</td></tr>
<tr><td>HTL or TTL encoder</td><td>SSI encoder</td><td>Resolver</td><td>Endat 2.1</td><td>sin/cos encoder</td></tr>
</table>

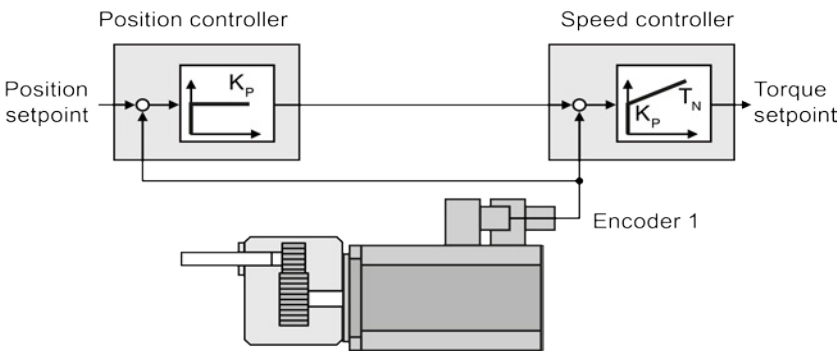


Figure 2-2 Position controllers and speed controllers evaluate the same encoder

2.4 PROFIdrive interfaces

The send and receive telegrams of the inverter for cyclic communication are structured as follows:

PZD01	PZD02	PZD03	PZD04	PZD05	PZD06	PZD07	PZD08	PZD09	PZD10	PZD11	PZD12

Telegram 7, positioning operation with block selection

STW1	SATZ ANW
ZSW1	AKT SATZ

Telegram 9, positioning operation with direct input

STW1	SATZ ANW	STW2	MDI_TARPOS	MDI_VELOCITY	MDI_ ACC	MDI_ DEC	MDI_ MOD
ZSW1	AKT SATZ	ZSW2	XIST_A				

Telegram 110, positioning operation with extended control and status functions

STW1	SATZ ANW	POS_ STW	STW2	OVER RIDE	MDI_TARPOS	MDI_VELOCITY	MDI_ ACC	MDI_ DEC	MDI_ MOD
ZSW1	AKT SATZ	POS_ ZSW	ZSW2	MELDW	XIST_A				

Telegram 111, positioning operation with extended functions

STW1	POS_ STW1	POS_ STW2	STW2	OVER RIDE	MDI_TARPOS	MDI_VELOCITY	MDI_ ACC	MDI_ DEC	Free
ZSW1	POS_ ZSW1	POS_ ZSW2	ZSW2	MELDW	XIST_A	NIST_B	WARN_ CODE	FAULT_ CODE	Free

Telegram 999, open interconnection

STW1	Telegram length is configurable for receive data
ZSW1	Telegram length is configurable for send data

Figure 2-3 Telegrams for cyclic communication - Position control

Table 2- 4 Explanation of the abbreviations

Abbreviation	Significance
STW1 ZSW1	Control word 1 Status word 1 see Control and status word 1 (Page 15)
STW2 ZSW2	Control word 2 Status word 2 see Control and status word 2 (Page 17)
SATZANW	Selection of traversing block see Control word block selection (Page 24)
AKTSATZ	Currently selected traversing block
MDI_TARPOS	Position setpoint for direct setpoint input (MDI)
XIST_A	Actual position value (32 bits)
OVERRIDE	Speed setpoint
MELDW	Status word for messages see Status word messages (Page 26)
NIST_B	Actual speed value (32 bits)
frei	Freely interconnectable
MDI_VELOCITY	MDI velocity
MDI_ACC	MDI acceleration
MDI_DEC	MDI deceleration
MDI_MOD	Selection of positioning mode with direct setpoint input (MDI) see Control word MDI mode (Page 25)
POS_STW	Control word for basic positioner
POS_ZSW	Status word for basic positioner see Control and status word for the positioner (Page 18)
POS_STW1	Control word 1 for basic positioner
POS_ZSW1	Status word 1 for basic positioner see Control and status word 1 for the positioner (Page 20)
POS_STW2	Control word 2 for basic positioner
POS_ZSW2	Status word 2 for basic positioner see Control and status word 2 for the positioner (Page 22)
WARN_CODE	Number of the actual alarm
FAULT_CODE	Number of the actual fault

2.4.1 Control and status word 1

Control word 1 (STW1)

Table 2- 5 Control word 1 for active basic positioner

Bit	Meaning	Comments	P No.
0	0 = OFF1	The motor brakes with the ramp-down time p1121 of the ramp-function generator. The converter switches off the motor at standstill.	p0840[0] = r2090.0
	0 → 1 = ON	The converter goes into the "ready" state. If, in addition, bit 3 = 1, the converter switches on the motor.	
1	0 = OFF2	Switch off motor immediately, then the motor coasts to a standstill.	p0844[0] = r2090.1
	1 = No OFF2	It is possible to switch on the motor (ON command).	
2	0 = Quick stop (OFF3)	Quick stop: the motor brakes with the OFF3 ramp-down time p1135 down to standstill.	p0848[0] = r2090.2
	1 = No quick stop (OFF3)	It is possible to switch on the motor (ON command).	
3	0 = Inhibit operation	Immediately switch-off motor (cancel pulses).	p0852[0] = r2090.3
	1 = Enable operation	Switch-on motor (pulses can be enabled).	
4	0 = Reject traversing job	Axis brakes down to standstill with the maximum deceleration. Converter rejects the actual traversing block.	p2641 = r2090.4
	1 = Do not reject traversing task	Axis can be started or travel to position setpoint.	
5	0 = Intermediate stop	Axis brakes down to standstill with the specified deceleration override. Converter remains in the actual traversing block.	p2640 = r2090.5
	1 = No intermediate stop	Axis can be started or continue to travel to position setpoint.	
6	0 → 1: Activate traversing job	The converter starts axis travel to the setpoint position.	p2631 = r2090.6
	0 → 1: Setpoint transfer MDI		p2650 = r2090.6
7	0 → 1: = Acknowledge faults	Acknowledge fault in the converter. If the ON command is still active, the converter switches to "closing lockout" state.	p2103[0] = r2090.7
8	1 = jogging bit 0	Jogging 1	p2589 = r2090.7
9	1 = jogging bit 1	Jogging 2	p2590 = r2090.7
10	0 = No control via PLC	Converter ignores the process data from the fieldbus.	p0854[0] = r2090.10
	1 = Control via PLC	Control via fieldbus, converter accepts the process data from the fieldbus.	
11	0 = Stop referencing	---	p2595 = r2090.11
	1 = Start referencing	The converter does not start referencing.	
12	Reserved		
13	0 → 1: External block change	The axis goes to the next traversing block.	p2633 = r2090.13
14, 15	Reserved		

Status word 1 (ZSW1)

Table 2- 6 Status word 1 when the basic positioner is active

Bit	Meaning		Comments	P No.
	Telegram 110	Telegram 111		
0	1 = Ready to start		Power supply is switched on; electronics initialized; pulses are inhibited.	p2080[0] = r0899.0
1	1 = Ready		Motor is switched on (ON command = 1); no fault is active. With the command "Enable operation" (STW1.3) the converter switches on the motor.	p2080[1] = r0899.1
2	1 = Operation enabled		Motor follows setpoint. See control word 1, bit 3.	p2080[2] = r0899.2
3	1 = Fault present		The converter has a fault. Acknowledge fault using STW1.7.	p2080[3] = r2139.3
4	1 = OFF2 inactive		Coast down to standstill is not active.	p2080[4] = r0899.4
5	1 = OFF3 inactive		Quick stop is not active.	p2080[5] = r0899.5
6	1 = Closing lockout active		It is only possible to switch on the motor after an OFF1 command and an additional ON command.	p2080[6] = r0899.6
7	1 = Alarm present		Motor remains switched on; no acknowledgment necessary.	p2080[7] = r2139.7
8	1 = Following error in tolerance		The actual difference between the actual position and the position setpoint is within the permissible tolerance p2546.	p2080[8] = r2684.8
9	1 = Control requested		The automation system is requested to accept the control from the converter.	p2080[9] = r0899.9
10	1 = Position setpoint reached		The axis has reached the position setpoint.	p2080[10] = r2684.10
11	1 = Reference point set		The axis is referenced.	p2080[11] = r2684.11
12	0 → 1 = Acknowledgement, traversing block active		---	p2080[12] = r2684.12
13	1 = Axis is at a standstill		The absolute speed is less than p2161.	p2080[13] = r2199.0
14	Reserved	1 = Axis accelerates	---	p2080[14] = r2684.4
15	Reserved	1 = Axis brakes	---	p2080[15] = r2684.5

2.4.2 Control and status word 2

Control word 2 (STW2)

Table 2- 7 Control word 2 and interconnection in the converter

Bit	Meaning	Comments	Interconnection	
			Telegram 9	Telegrams 110, 111
0	Drive data set selection DDS, bit 0		p0820[0] = r2092.0	p0820[0] = r2093.0
1	Drive data set selection DDS, bit 1		p0821[0] = r2092.1	p0821[0] = r2093.1
1 to 6	Reserved			
7	1 = Parking axis selection		p0897 = r2092.7	p0897 = r2093.7
8	1 = Travel to fixed stop		p1545[0] = r2092.8	p1545[0] = r2093.8
9 to 15	Reserved			

Status word 2 (ZSW2)

Table 2- 8 Control word 2 and interconnection in the converter

Bit	Meaning	Description	Interconnection
0	1 = Drive data set DDS effective, bit 0		p2081[0] = r0051.0
1	1 = Drive data set DDS effective, bit 1		p2081[1] = r0051.1
2 to 4	Reserved	---	
5	1 = Alarm class bit 0	Only for internal diagnostics when using a SIMOTION control.	p2081[5] = r2139.11
6	1 = Alarm class bit 1		p2081[6] = r2139.12
7	1 = Parking axis active	---	p2081[7] = r0896.0
8	1 = Travel to fixed stop	---	p2081[8] = r1406.8
9	Reserved	---	
10	1 = Pulses enabled	Motor switched on	p2081[10] = r0899.11
11 to 15	Reserved	---	p2081[11] = r0835.0

2.4.3 Control and status word for the positioner

Positioning control word (POS_STW)

Table 2- 9 POS_STW and interconnection with parameters in the converter

Bit	Meaning	Comments	P No.
0	1 = Follow-up mode	The converter continuously corrects the position setpoint to follow the position actual value.	p2655[0] = r2092.0
1	1 = Set reference point	The converter accepts the reference point coordinate in its position actual value and setpoint.	p2596 = r2092.1
2	1 = Reference cam active	The load is currently on the reference cam.	p2612 = r2092.2
3	Reserved	---	---
4			
5	1 = Incremental jogging active	If the jogging command is active, the converter positions the load by the specified traversing path in a positive or negative direction.	p2591 = r2092.5
	0 = Jogging velocity active	If the jogging command is active, the converter positions the load with the jog velocity in the direction of the beginning or end of the traversing range.	
6…15	Reserved	---	---

Positioning status word (POS_ZSW)

Table 2- 10 POS_ZSW and interconnection with parameters in the converter

Bit	Meaning	Comments	P No.
0	1 = Follow-up mode active	The converter is in the follow-up mode.	p2084[0] = r2683.0
1	1 = Velocity limiting is active	The converter limits the velocity of the axis.	p2084[1] = r2683.1
2	1 = Setpoint is stationary	During a positioning operation, the setpoint no longer changes.	p2084[2] = r2683.2
3	1 = Position setpoint reached	The axis position is within the positioning window.	p2084[3] = r2684.3
4	1 = Axis traverses forwards	The axis traverses in the positive direction.	p2084[4] = r2683.4
	0 = Axis is stationary or traverses backwards	---	
5	1 = Axis traverses backwards	The axis traverses in the negative direction.	p2084[5] = r2683.5
	0 = Axis is stationary or traverses forwards	---	
6	1 = Software limit switch, minus actuated	The load is outside the permitted traversing range.	p2084[6] = r2683.6
7	1 = Software limit switch, plus actuated		p2084[7] = r2683.7
8	1 = Position actual value ≤ cam switching position 1	Feedback of the software cams in the converter.	p2084[8] = r2683.8
	0 = Cam switching position 1 passed		
9	1 = Position actual value ≤ cam switching position 2		p2084[9] = r2683.9
	0 = Cam switching position 2 passed		
10	1 = Direct output 1 active	The converter sets these signals in the actual traversing block.	p2084[10] = r2683.10
11	1 = Direct output 2 active	See also Section: Traversing blocks (Page 69)	p2084[11] = r2683.11
12	1 = Fixed stop reached	The axis is at the fixed stop	p2084[12] = r2683.12
13	1 = Fixed stop clamping torque reached	The axis is at the fixed stop and has reached the clamping torque.	p2084[13] = r2683.13
14	1 = Travel to fixed stop active	The converter moves the axis to a fixed stop.	p2084[14] = r2683.14
15	Reserved	---	---

2.4.4 Control and status word 1 for the positioner

Positioning control word 1 (POS_STW1)

Table 2- 11 POS_STW1 and interconnection in the converter

Bit	Meaning	Comments	P No.
0	Traversing block selection, bit 0	Selecting the traversing block	p2625 = r2091.0
1	Traversing block selection, bit 1		p2626 = r2091.1
2	Traversing block selection, bit 2		p2627 = r2091.2
3	Traversing block selection, bit 3		p2628 = r2091.3
4 to 7	Reserved	---	---
8	0 = Relative positioning is selected	The converter interprets the position setpoint as the position setpoint relative to the start position.	p2648 = r2091.8
	1 = Absolute positioning is selected	The converter interprets the position setpoint as absolute position setpoint relative to machine zero point.	
9	01 = Absolute positioning for rotary axis in the positive direction	Selection of the positioning type for a rotary axis.	p2651 = r2091.9
10	10 = Absolute positioning for rotary axes in negative direction		p2652 = r2091.10
	00, 11 = Absolute positioning for a rotary axis through the shortest distance		
11	Reserved	---	---
12	1 = Continuous acceptance	The converter accepts position setpoint changes immediately.	p2649 = r2091.12
	0 = MDI block change with control word 1, bit 6	The converter accepts a changed position setpoint with the signal change 0 → 1 of control word 1, bit 6. See also Section: Control and status word 1 (Page 15).	
13	Reserved	---	---
14	1 = Select Set up	Toggling the axis operating mode between "Set up" and "Positioning", see also Section: Direct setpoint input (MDI) (Page 82).	p2653 = r2091.14
	0 = Select positioning		
15	1 = Activate MDI	The converter receives its position setpoint from an external control.	p2647 = r2091.15
	0 = Deactivate MDI		

Positioning status word 1 (POS_ZSW1)

Table 2- 12 POS_ZSW1 and interconnection in the converter

Bit	Meaning	Comments	P No.
0	Active traversing block bit 0 (2^0)	Number of the currently selected traversing block.	p2083[0] = r2670[0]
1	Active traversing block bit 1 (2^1)		p2083[1] = r2670[1]
2	Active traversing block bit 2 (2^2)		p2083[2] = r2670[2]
3	Active traversing block bit 3 (2^3)		p2083[3] = r2670[3]
4	Active traversing block bit 4 (2^4)		p2083[4] = r2670[4]
5	Active traversing block bit 5 (2^5)		p2083[5] = r2670[5]
6	Reserved	---	---
7			
8	1 = STOP cam minus active	The axis is currently located at a STOP cam.	p2083[08] = r2684[13]
9	1 = STOP cam plus active		p2083[09] = r2684[14]
10	1 = Jogging active	The converter is in the jogging mode.	p2083[10] = r2094[0]
11	1 = Reference point approach active	The converter is presently executing a reference point approach.	p2083[11] = r2094[1]
12	1 = Flying referencing active	The converter references when passing the reference cam.	p2083[12] = r2684[1]
13	1 = Traversing block active	The converter receives its position setpoint from a traversing block.	p2083[13] = r2094[2]
14	1 = Set up active	The axis is in the "Set up" operating mode.	p2083[14] = r2094[4]
15	1 = MDI active 0 = MDI inactive	The converter receives its position setpoint from an external control.	p2083[15] = r2670[15]

2.4.5 Control and status word 2 for the positioner

Positioning control word 2 (POS_STW2)

Table 2- 13 POS_STW2 and interconnection with parameters in the converter

Bit	Meaning	Comments	P No.
0	1 = Activate follow-up mode	The converter continuously corrects the position setpoint to follow the position actual value.	p2655[0] = r2092.0
1	1 = Set reference point	The converter accepts the reference point coordinate in its position actual value and setpoint.	p2596 = r2092.1
2	1 = Reference cam active	The axes is currently located at the reference cam.	p2612 = r2092.2
3	Reserved	---	---
4			
5	1 = Incremental jogging active	If the jogging command is active, the converter positions the axis by the specified traversing path in a positive or negative direction.	p2591 = r2092.5
	0 = Jogging velocity active	If the jogging command is active, the converter positions the axis with the jog velocity in the direction of the beginning or end of the traversing range.	
6	Reserved	---	---
7			
8	1 = Selects referencing using flying referencing	Select the referencing type.	p2597 = r2092.8
	0 = Selects referencing via the reference point approach		
9	1 = Starts reference point approach in negative direction	Select the start direction for automatic referencing.	p2604 = r2092.9
	0 = Starts reference point approach in positive direction		
10	1 = Selects probe 2	Edge of the probe input, with which the converter references its actual position value.	p2510[0] = r2092.10
	0 = Selects probe 1		
11	1 = Probe falling edge	Select the edge of the probe input, with which the converter references its actual position value.	p2511[0] = r2092.11
	0 = Probe, rising edge		
12	Reserved	---	---
13			
14	1 = Software limit switch active	The converter evaluates its software limit switch.	p2582 = r2092.14
15	1 = STOP cams active	Converter evaluates the stop cams.	p2568 = r2092.15

Positioning status word 2 (POS_ZSW2)

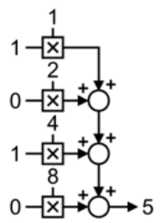
Table 2- 14 POS_ZSW2 and interconnection with parameters in the converter

Bit	Meaning	Comments	P No.
0	1 = Follow-up mode active	The converter is in the follow-up mode.	p2084[0] = r2683.0
1	1 = Velocity limiting is active	The converter limits the velocity of the axis.	p2084[1] = r2683.1
2	1 = Setpoint is stationary	During a positioning operation, the setpoint no longer changes.	p2084[2] = r2683.2
3	1 = Print index outside outer window	The discrepancy between the actual position and the reference point was greater than permitted during flying referencing.	p2084[3] = r2684.3
4	1 = Axis traverses forwards	The axis traverses in the positive direction.	p2084[4] = r2683.4
	0 = Axis is stationary or traverses backwards	---	
5	1 = Axis traverses backwards	The axis traverses in the negative direction.	p2084[5] = r2683.5
	0 = Axis is stationary or traverses forwards	---	
6	1 = Software limit switch, minus actuated	The axis is outside the permitted traversing range.	p2084[6] = r2683.6
7	1 = Software limit switch, plus actuated		p2084[7] = r2683.7
8	1 = Position actual value ≤ cam switching position 1	Feedback of the cam sequencer in the converter.	p2084[8] = r2683.8
	0 = Cam switching position 1 passed		
9	1 = Position actual value ≤ cam switching position 2		p2084[9] = r2683.9
	0 = Cam switching position 2 passed		
10	1 = Direct output 1 active	The converter sets these signals in the actual traversing block.	p2084[10] = r2683.10
11	1 = Direct output 2 active	See also paragraph: Traversing blocks (Page 69)	p2084[11] = r2683.11
12	1 = Fixed stop reached	The axis is at the fixed stop	p2084[12] = r2683.12
13	1 = Fixed stop clamping torque reached	The axis is at the fixed stop and has reached the clamping torque.	p2084[13] = r2683.13
14	1 = Travel to fixed stop active	The converter moves the axis to a fixed stop.	p2084[14] = r2683.14
15	1 = Traversing command active	Feedback signal indicating as to whether the converter is currently moving the axis.	p2084[15] = r2684.15
	0 = Axis stationary		

2.4.6 Control word block selection

Block selection

Table 2- 15 Block selection and interconnection in the converter

Bit	Meaning	Comments	P No.
0	Block selection, bit 0	Example for selecting traversing block number 5: 	p2625 = r2091.0
1	Block selection, bit 1		p2626 = r2091.1
2	Block selection, bit 2		p2627 = r2091.2
3	Block selection, bit 3		p2628 = r2091.3
4…14	Reserved		
15	0 = Deactivate MDI	Switching from traversing blocks to direct setpoint input.	p2647 = r2091.15
	1 = Activate MDI		

Actual traversing block

Table 2- 16 Feedback signal of the actual traversing block

Bit	Meaning	Comments	P No.
0	Actual traversing block, bit 0	---	p2081[0] = r2670.0
1	Actual traversing block, bit 1		p2081[1] = r2670.1
2	Actual traversing block, bit 2		p2081[2] = r2670.2
3	Actual traversing block, bit 3		p2081[3] = r2670.3
4…14	Reserved		
15	0 = MDI active	---	p2081[15] = r2670.15
	1 = MDI not active		

2.4.7 Control word MDI mode

MDI mode

Table 2- 17 Selection of the MDI mode and interconnection with parameters in the converter

Bit	Meaning	Comments	P No.
0	0 = Relative positioning is selected	The converter interprets the position setpoint as the position setpoint relative to the start position.	p2648 = r2094.0
	1 = Absolute positioning is selected	The converter interprets the position setpoint as absolute position setpoint relative to machine zero point.	
1	01 = Absolute positioning for rotary axis in the positive direction	Selection of the positioning type for a rotary axis.	p2651 = r2094.1
2	10 = Absolute positioning for rotary axes in negative direction		p2652 = r2094.2
	00, 11 = Absolute positioning for a rotary axis through the shortest distance		
3…15	Reserved		

2.4.8 Status word messages

Status word messages (MELDW)

Table 2- 18 Status word for messages and interconnection with parameters in the converter

<table>
<tr><th>Bit</th><th>Meaning</th><th>Description</th><th>P No.</th></tr>
<tr><td rowspan="2">0</td><td>0 = Ramp-function generator active</td><td>The motor is presently accelerating or braking</td><td rowspan="2">p2082[0] = r2199.5</td></tr>
<tr><td>1 = Ramp-up/ramp-down completed</td><td>Speed setpoint and actual speed are the same.</td></tr>
<tr><td>1</td><td>1 = Torque utilization [%] < torque threshold value 2 (p2194)</td><td>---</td><td>p2082[1] = r2199.11</td></tr>
<tr><td>2</td><td>1 = |n_act| < speed threshold value 3 (p2161)</td><td>---</td><td>p2082[2] = r2199.0</td></tr>
<tr><td>3</td><td>1 = |n_act| speed threshold value 2 (p2155)</td><td>---</td><td>p2082[3] = r2197.1</td></tr>
<tr><td>4, 5</td><td colspan="3">Reserved</td></tr>
<tr><td>6</td><td>1 = No motor overtemperature alarm</td><td>The motor temperature is within the permissible range.</td><td>p2082[6] = r2135.14</td></tr>
<tr><td>7</td><td>1 = No alarm, thermal power unit overload</td><td>The converter temperature is within the permissible range.</td><td>p2082[7] = r2135.15</td></tr>
<tr><td>8</td><td>1 = Speed setpoint - actual value deviation within tolerance t_on</td><td>Speed setpoint and actual speed are within the permissible tolerance range p2163.</td><td>p2082[8] = r2199.4</td></tr>
<tr><td>9, 10</td><td colspan="3">Reserved</td></tr>
<tr><td>11</td><td>1 = Controller enable</td><td>The speed controller is enabled.</td><td>p2082[11] = r0899.8</td></tr>
<tr><td>12</td><td>1 = Drive ready</td><td>The converter is ready to be switched on.</td><td>p2082[12] = r0899.7</td></tr>
<tr><td>13</td><td>1 = Pulses enabled</td><td>The motor is switched on.</td><td>p2082[13] = r0899.11</td></tr>
<tr><td>14, 15</td><td colspan="3">Reserved</td></tr>
</table>

2.4.9 Function block FB283

Overview

The function block FB283 is an interface block that connects an inverter with basic positioner to a SIMATIC S7 controller via PROFIBUS/PROFINET.

The block FB283 transfers all of the required process data to and from the drive. It is suitable for both controlling the basic positioner and for a pure speed-controlled drive.

The FB283 additionally provides the following functions:

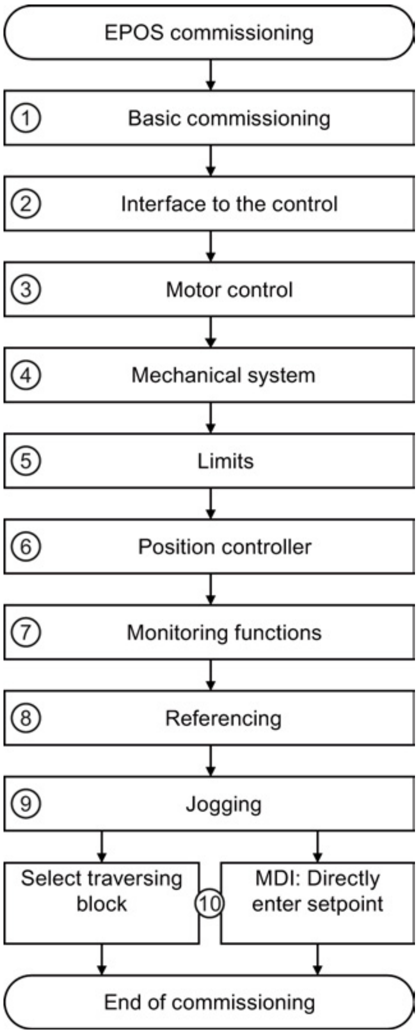
- Reading and writing parameters in the inverter.
- Reading out the fault buffer of the inverter.
- Transferring up to 16 traversing blocks when a function is initiated.
- Reading or writing a maximum of any 10 parameters with one job, e.g. for product adaptation.

A configuration example and a description of the FB283 can be found on the Internet: FB283 (http://support.automation.siemens.com/WW/view/en/25166781).

2.5 Commissioning

2.5.1 Commissioning sequence

We recommend that you commission the basic positioner using the "STARTER" tool.
Downloading: STARTER
(http://support.automation.siemens.com/WW/view/en/10804985/133200).



① Assign encoders to the axes.
→ Operating instructions

② Set the communication via the fieldbus.
→ Operating instructions
→ PROFIdrive interfaces (Page 13)

③ Optimize the speed control
→ Operating instructions

④ → Scale the encoder signal (Page 29)

⑤ → Set the axis traversing range (Page 36)

⑥ → Optimize the position controller (Page 38)

⑦ → Set the positioning accuracy (Page 44)

⑧ → Establish the reference to the machine zero point (Page 49)

⑨ → Set up the axis (Page 66)

⑩ → Save and call the traversing blocks in the inverter (Page 69)
or
→ Enter a position setpoint from the external control via fieldbus (Page 82)

2.5.2 Normalizing the encoder signal

2.5.2.1 Define the resolution

Distance unit (LU): the resolution of the position actual value in the converter

The converter calculates the position actual value of the axis using the neutral position unit LU (Length Unit). The distance unit LU is independent of whether the converter controls e.g. the position of an elevating platform or the angle of rotary table.

Firstly, for your application define the required resolution. In other words: Which distance or angle corresponds to the length unit (LU)?

The following rules apply when selecting the distance unit LU:

1. The higher the resolution of the distance unit LU, the higher the accuracy of the position control.
2. If you select a resolution that is too high, then the converter cannot represent the position actual value over the complete axis traversing range. The converter responds with a fault in the case of an overflow when representing the number.
3. The resolution of the distance unit LU should be less than the maximum resolution that is obtained from the resolution of the distance-encoder.

Normalize the encoder signal

Preconditions

- You are online with the STARTER .
- You have selected the "Mechanical system" screen.
- You have defined the required resolution for your particular application (e.g. 1 LU ≙ 1 μm or 1 LU ≙ 1/1,000° (1 millidegree).

Procedure

To normalize the encoder signal, proceed as follows:

1. Enable the settings so they can be edited.
2. Enter the gear ratio of the axis. Load revolutions.
3. Motor revolutions

   Unknown gear ratio
   If you do not know the gear ratio, then you must measure the ratio, for example by manually rotating the motor and counting the load revolutions.
   Example: After 5 motor revolutions, the load has turned through 37 °. The ratio is therefore 37 ° / (5 × 360 °). You must then enter the following values into STARTER:

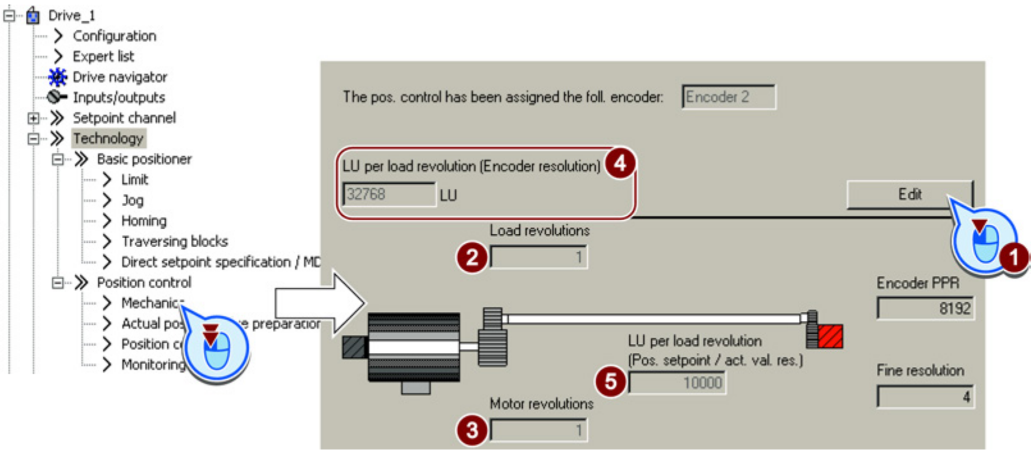
   – ② 37 [load revolution]

   – ③ 1800 [motor revolution]

4. Check the maximum resolution based on your encoder data.

   With SSI encoders, the STARTER displays an excessive value. Encoder resolution = ¼ × displayed value.

5. Calculate:
   Value = 360 ° / required resolution, e.g. 360 °/ 0.1 ° = 3600.
   Enter this value into STARTER.



You have normalized the encoder signal.

Parameter	Meaning	
p2502	**Encoder assignment**	
	0	No encoder
	1	Encoder 1
	2	Encoder 2
p2503	**Length unit LU per 10 mm**	
p2504	**Motor/load motor revolutions**	
p2505	**Motor/load load revolutions**	
p2506	**Length unit LU per load revolution**	

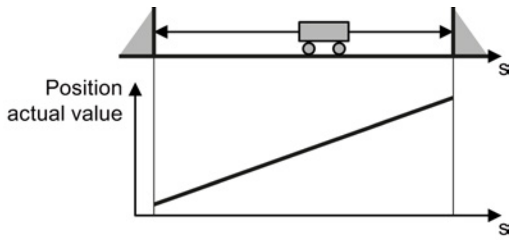
2.5.2.2 Modulo range setting

Description

Linear axis

A linear axis is an axis whose traversing range is limited in both motor directions of rotation by the mechanical system of the machine, e.g.:

- Stacker crane
- Elevating platform
- Tilting station
- Gate/door drive

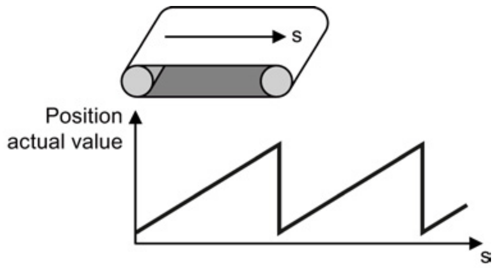


The converter maps the complete traversing range to the position actual value.

Modulo axis

A modulo axis is an axis with an infinite traversing range, e.g.:

- Rotary table
- Conveyor belt
- Roller conveyor



The converter maps the modulo range on the position actual value. If the load position leaves the modulo range, then the value range of the position actual value repeats in the converter.

Setting the modulo range

Preconditions

- You are online with the STARTER .
- You have selected the "Mechanical system" screen.

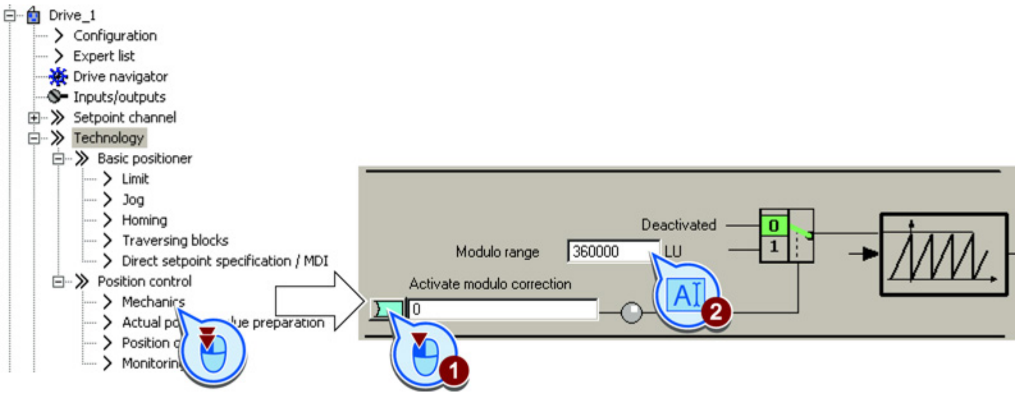
Procedure

To set the modulo range, proceed as follows:

1. Enable the modulo correction.
2. Define the modulo range.

   Example 1: In the case of a rotary table, one load revolution corresponds to 3600 LU. In this case, the modulo correction is also 3600.

   Example 2: For a roller conveyor, 100 motor revolutions corresponds to one production cycle. For a resolution of 3600 LU per motor revolution, the modulo range is 360000 LU.



You have now set the modulo range.

Parameter	Meaning
p2576	Modulo offset, modulo range
p2577	Modulo correction activation (signal = 1)
r2685	Offset value

2.5.2.3 Checking the actual position value

After normalization of the encoder signal you should check the actual position value.

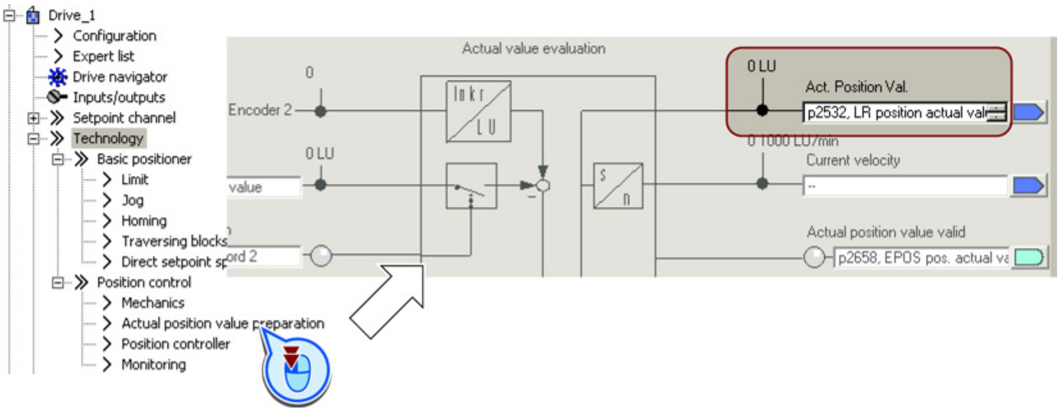
Preconditions

- You are online with the STARTER .
- You have selected the screen for "Actual value processing".

Procedure

To ensure that the converter calculates the actual position value correctly, you must check the following:

- There must be no overflow of the actual position value in the entire traverse range. The converter can show as a maximum the value range of -2147483648 … 2147483647. If this maximum value is exceeded, the converter reports fault F07493.
- If you have defined a modulo range, the converter resets the actual position value after passing through the range.



You have now checked the calculation for the actual position value.

Parameter	Meaning
r2521[0]	Position actual value for position control

2.5.2.4 Setting the backlash

Description

Backlash (also called play, dead travel on reversing etc.) is the distance or the angle that a motor must travel through when the direction of rotation reverses until the axis actually moves in the other direction.

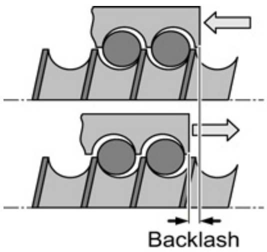


Figure 2-4 Backlash in a spindle

With the appropriate setting, the converter corrects the positioning error caused by the backlash when reversing.

The converter corrects the backlash under the following condition:

- For an incremental encoder, the axis must be referenced.
  See also section: Referencing (Page 49).
- For an absolute encoder, the axis must be adjusted.
  See also section: Absolute encoder adjustment (Page 64).

Measuring backlash

Procedure

To measure the backlash, proceed as follows:

1. Move the axis to position A in the machine. Mark this position in the machine and note down the actual position value in the converter, see also Section: Checking the actual position value (Page 33).
2. Move the axis a little bit more in the same direction.
3. Move the axis in the opposite direction until the actual position value in the converter shows the same value as at position A. Due to the backlash when reversing, the axis is now at position B.

4. Measure the position difference Δ = A - B in the machine.

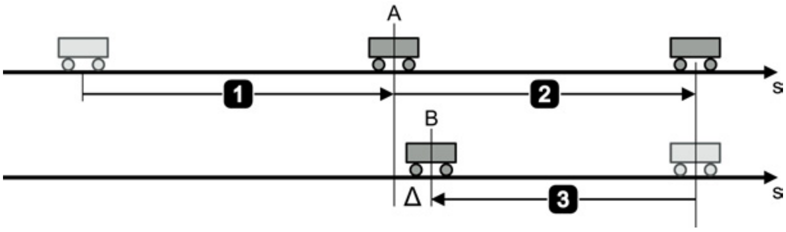


Figure 2-5 Measuring backlash

You have measured the backlash.

Correcting backlash

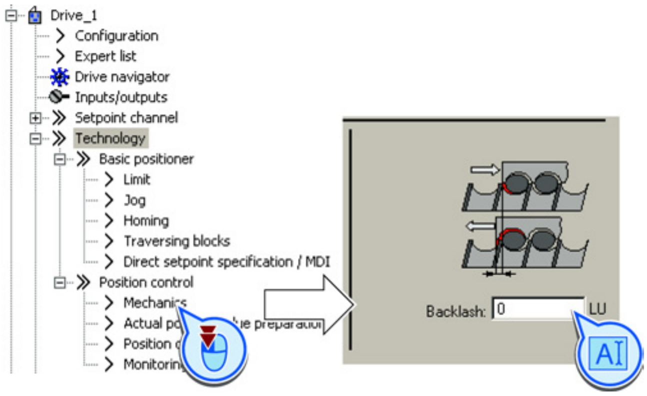
Requirements

You have selected the "Mechanical system" screen.

Procedure

To correct the measured backlash, set the following:

- If the axis has not traveled far enough, then set a positive backlash.
- If the axis has traveled too far, then set a negative backlash.



You have corrected the backlash.

Parameter	Meaning
p2583	**Backlash compensation**
r2685	**Offset value**

2.5.3 Limiting the positioning range

Description

Positioning range for linear axes

The converter limits the positioning range of a linear axis using a software limit switch. The converter only accepts position setpoints that lie within the software limit switches.

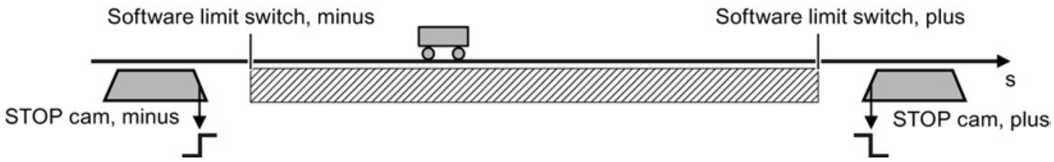


Figure 2-6 Limiting the positioning range of a linear axis

In addition, using its digital inputs, the converter evaluates signals from stop cams. When passing a STOP cam, the converter responds – depending on the setting – either with a fault or an alarm.

Fault as response

When passing the STOP cam, the inverter brakes the axis with the OFF3 ramp-down time, switches the motor off, and reports the fault F07491 or. F07492. To switch the motor on again, you must do the following:

- Switch the motor off (OFF1).
- Acknowledge the fault.
- Move the axis away from the STOP cam, e.g. using the jogging function.

Alarm as response

When passing the STOP cam, the converter brakes the axis with the maximum deceleration (see Section: Limiting the traversing profile (Page 42)), maintains the axis in closed-loop control and outputs alarm A07491 or A07492. In order to bring the axis back into the valid traversing range, you must move the axis from the STOP cam, e.g. using the jogging function.

Setting the limits of the positioning range

Precondition

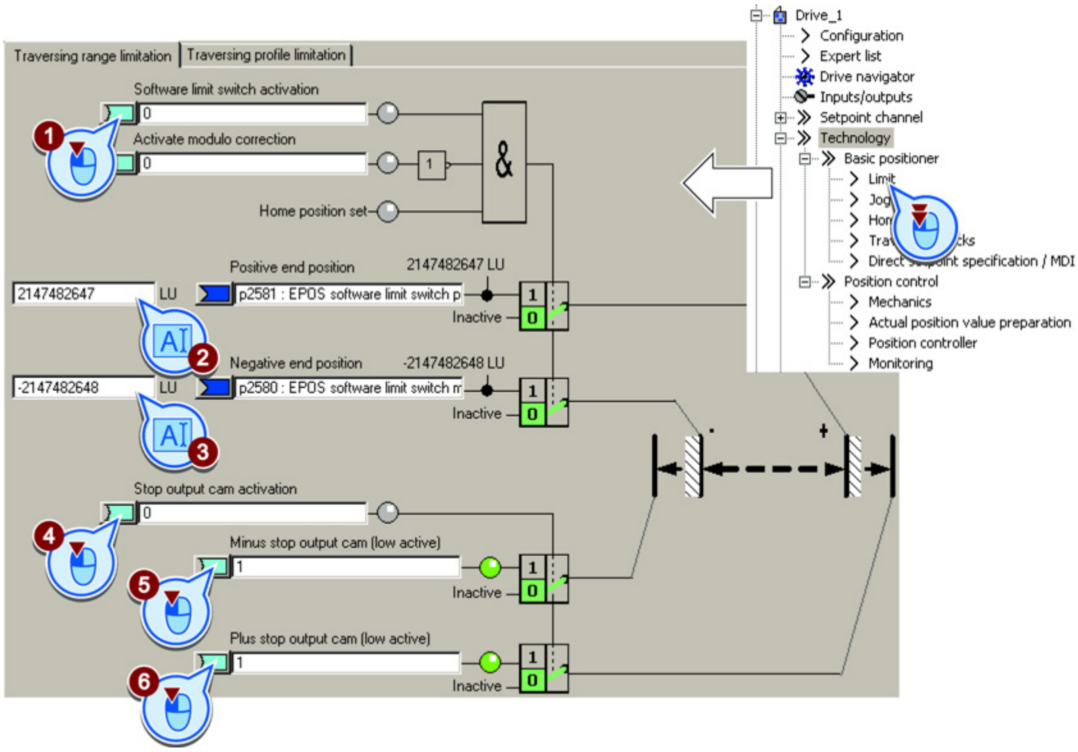
You have selected the "Limit" screen.

Procedure

To set the limits of the positioning range, proceed as follows:

1. Enable the software limit switch.
2. Move the axis to the positive limit position in your machine. Set the position of the software limit switches to the actual position value.

3. Move the axis to the negative limit position in your machine. Set the position of the software limit switches to the actual position value.
4. Enable the STOP cams.
5. Interconnect the signal of the STOP cam minus with the corresponding signal of your machine.
   Signal = 0 means an active STOP cam.
6. Interconnect the signal of the STOP cam plus with the corresponding signal of your machine.



You have now set the limits of the positioning range.

Parameter	Meaning
p2568	STOP cam activation
p2569	STOP cam, minus
p2570	STOP cam, plus
p2578	Software limit switch, minus signal source
p2579	Software limit switch, plus signal source
p2580	Software limit switch, minus
p2581	Software limit switch, plus
p2582	Software limit switch activation
r2683.6	Software limit switch, minus actuated
r2683.7	Software limit switch, plus actuated
r2684.13	STOP cam minus active
r2684.14	STOP cam plus active

2.5.4 Setting the position controller

2.5.4.1 Precontrol and gain

Preconditions and constraints

Before you optimize the position controller, the closed-loop drive speed control must be optimally set.

Dynamic response and accuracy of the closed-loop position control depend heavily on the lower-level closed-loop or open-loop control or the motor speed:

- Position control in connection with an optimally set vector control with speed encoder provides the best results.
- Position control with encoderless vector control (sensorless vector control, SLVC) provides satisfactory results for most applications. Hoisting/lifting applications require a speed controller.
- If you operate the position control with the U/f control of drive, then you must take into account some significant reduction in closed-loop control performance and precision.

Position controllers in hoisting gear

U/f control is not suitable for vertical axes, such as elevating platforms or hoisting gear used in high-bay racking units, as the axis generally cannot reach the target position as a result of the limited precision of the U/f control.

Description

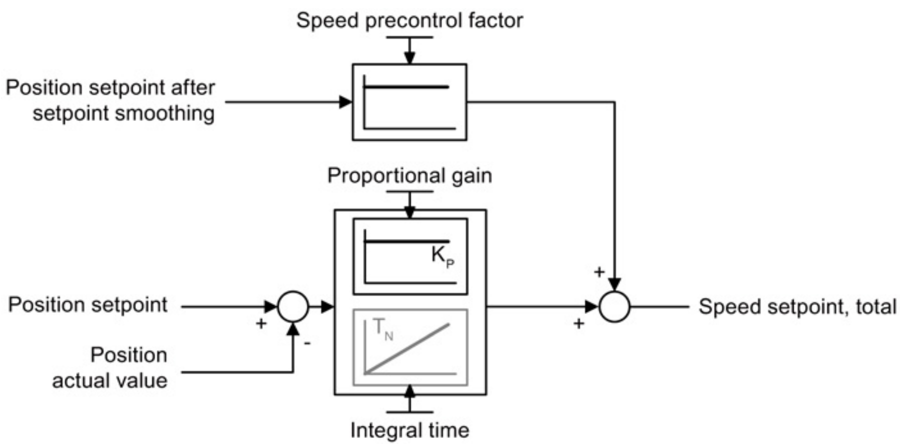


Figure 2-7 Position controller with precontrol

If the speed control of the converter has an encoder to feedback the actual speed, then deactivate the integral component T_N of the position controller.

If you use the position control together with the encoderless vector control (SLVC, SensorLess Vector Control), the positioning accuracy may be inadequate. With active integral time, positioning accuracy improves.

2.5.4.2 Optimizing the position controller

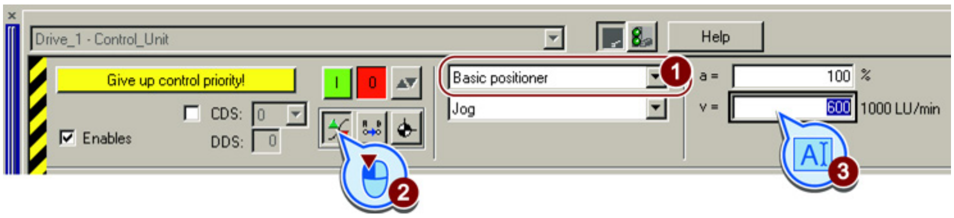
To optimize the position controller, you must move the axis with the position control and assess the control performance. How you move an axis using the STARTER is described below.

Optimizing the position controller

Procedure

To optimize the position controller, proceed as follows:

1. In the control panel, select the operating mode "Basic positioner".
2. Click the "Jog" button.
3. Enter a speed setpoint.



4. Adjust the proportional gain.

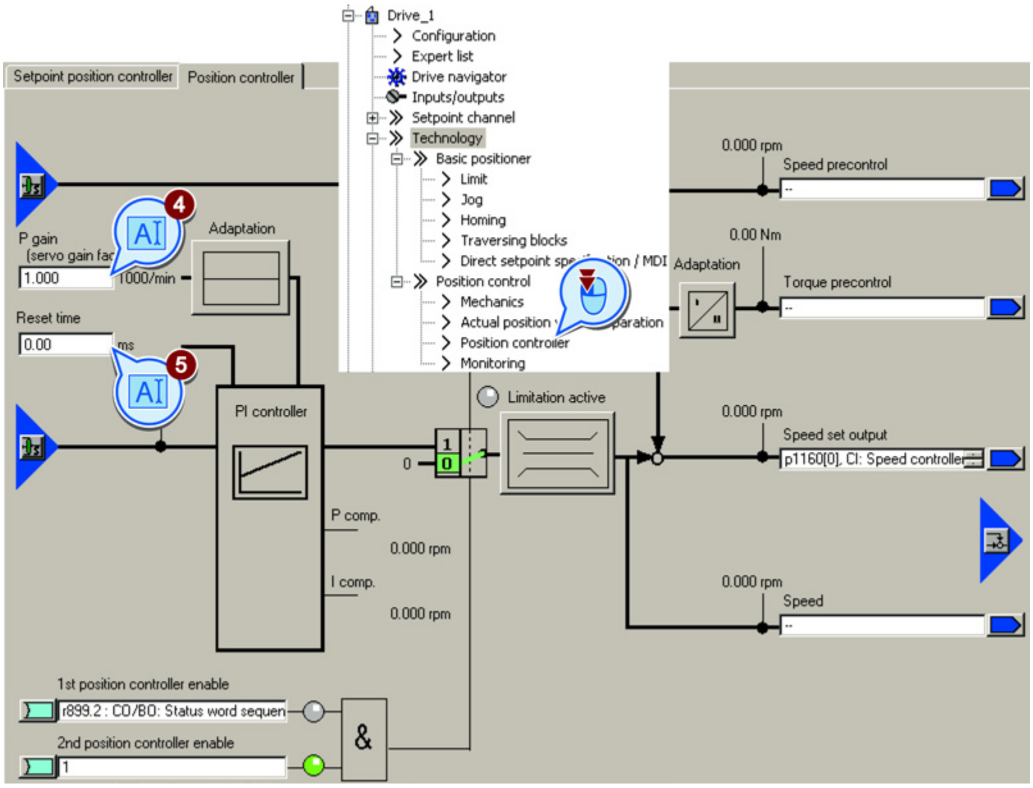
   Assess the controller characteristics:

   – If the motor is running unevenly, the controller is unstable. In this case, reduce the proportional gain ④ of the position controller.

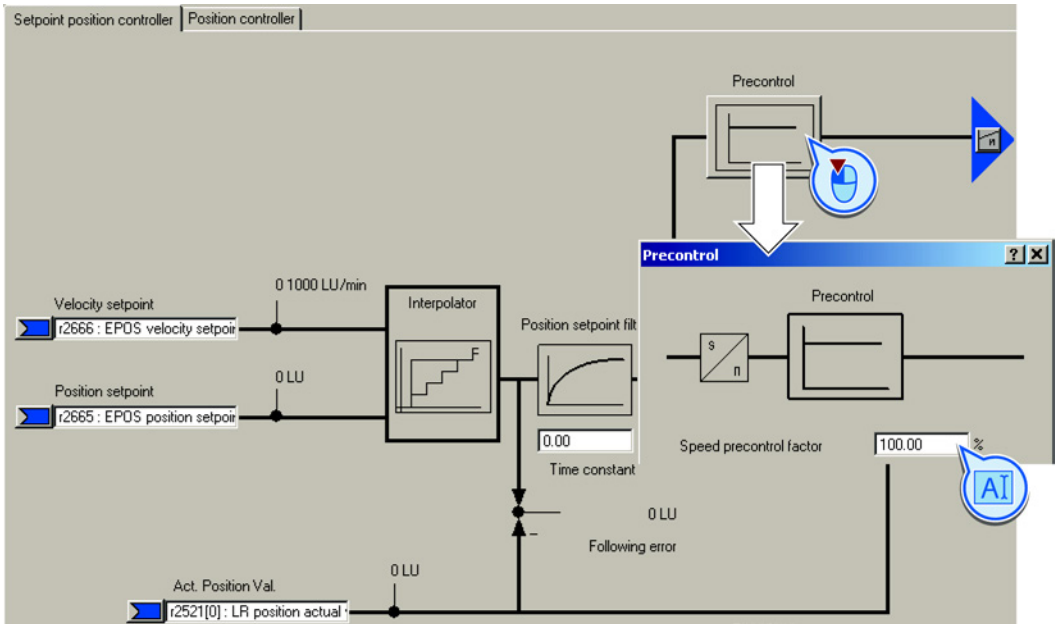
     If the closed-loop control is stable, but you are still dissatisfied with the control dynamics, then increase the position controller proportional gain. Then check the stability of the controller.

5. Adjust the integral time.

   Start with an integral time of 100 ms, and test your setting by traversing the axis with the active position controller using the "jog" function.
   Lower integral times increase the control dynamics but can, however, result in unstable controller characteristics.



6. Following controller optimization, set the precontrol of the position controller to 100%.



7. Check the controller characteristics again.

You have optimized the position controller.

Parameter	Meaning
p2534	Speed precontrol factor
p2538	Proportional gain / Kp
p2539	Integral time / Tn
p2731	Signal = 0: activate position controller

Advanced settings

If you permanently activate the integral time of the position controller, the characteristics of the position control change as follows:

- The following error while positioning goes to zero.
- When positioning the axis, it tends to overshoot; this means that the axis briefly moves beyond the target position.

2.5.4.3 Limiting the traversing profile

Description

The converter calculates the traversing profile when positioning from specified values for velocity, acceleration and jerk (= acceleration change with respect to time).

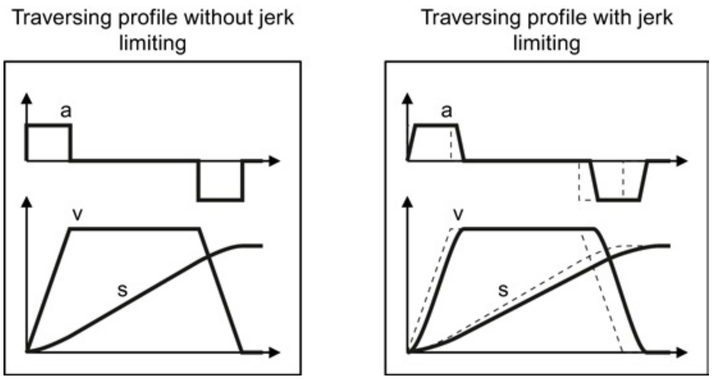


Figure 2-8 Example: Effect of jerk limiting

If the axis must traverse more slowly or must accelerate at a lower rate or "softly", then you must set the relevant limits to lower values. The lower that one of the limits is, the longer the converter needs to position the axis.

Setting the traversing profile limitation

Precondition

You have selected the "Limit" screen and the "Traversing profile limitation" tab.

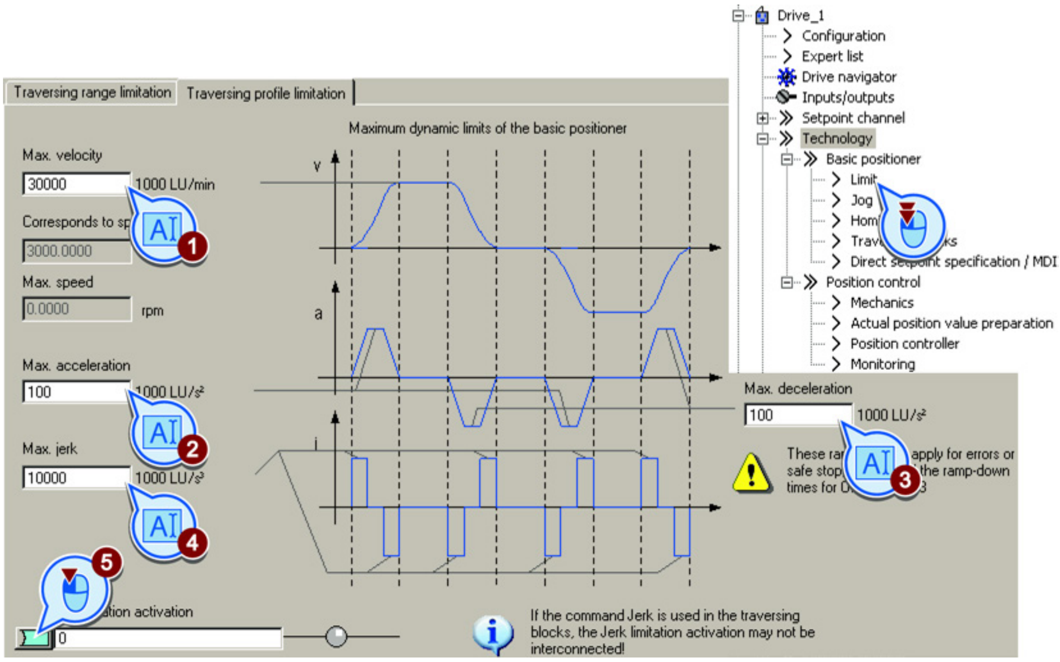
Procedure

To set the limitation of the traversing profile, proceed as follows:

1. Set the maximum velocity with which the converter may position the axis.
2. Set the maximum acceleration.
3. Set the maximum delay.

   The "override" in the traversing blocks or for the direct setpoint input refers to the values ② and ③.

4. Reduce the maximum jerk, if you require softer acceleration and braking.
5. For permanent jerk limiting, set this signal to 1.



You have now set the limitation of the traversing profile.

Parameter	Meaning
p2571	**Maximum velocity**
p2572	**Maximum acceleration**
p2573	**Maximum deceleration**
p2574	**Jerk limiting**
p2575	**Activating jerk limiting** 1 signal: Jerk limiting is active

2.5.5 Setting the monitoring functions

2.5.5.1 Standstill and positioning monitoring

Description

As soon as the setpoint for the position within a positioning operation no longer changes, then the converter sets the "Setpoint stationary" signal to 1. With this signal, the converter starts to monitor the position actual value:

- As soon as the axis has reached the positioning window, the converter signals that the target has been reached, and maintains the axis in closed-loop control.
- If the axis does not come to a standstill within the standstill monitoring time, the converter reports fault F07450.
- If the axis does not enter the positioning window within the positioning monitoring time, the converter reports fault F07451.

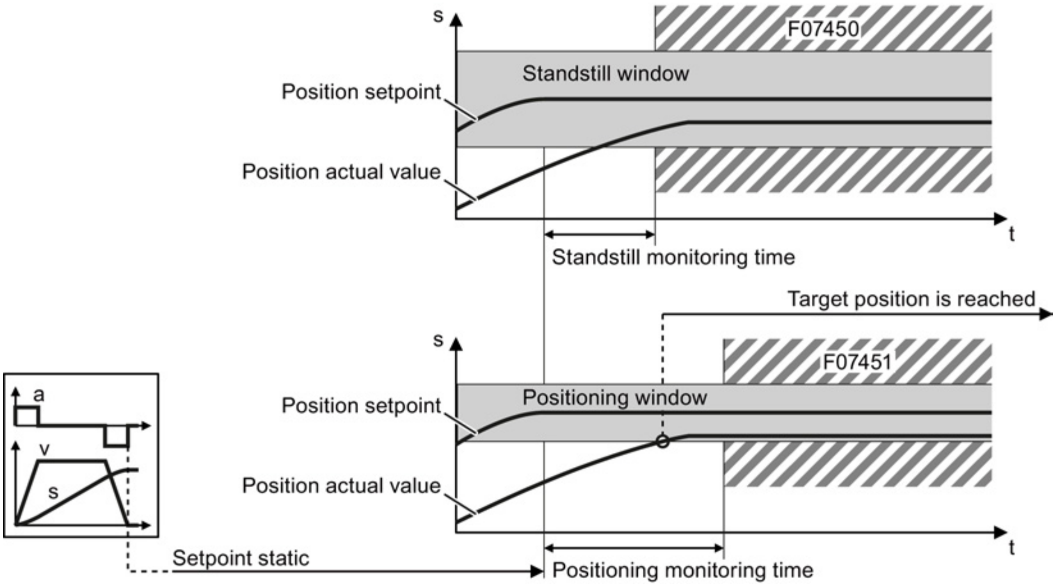


Figure 2-9 Standstill monitoring and positioning monitoring

Setting standstill monitoring and positioning monitoring

Precondition

You have selected the "Monitoring" screen and the "Position monitoring" tab.

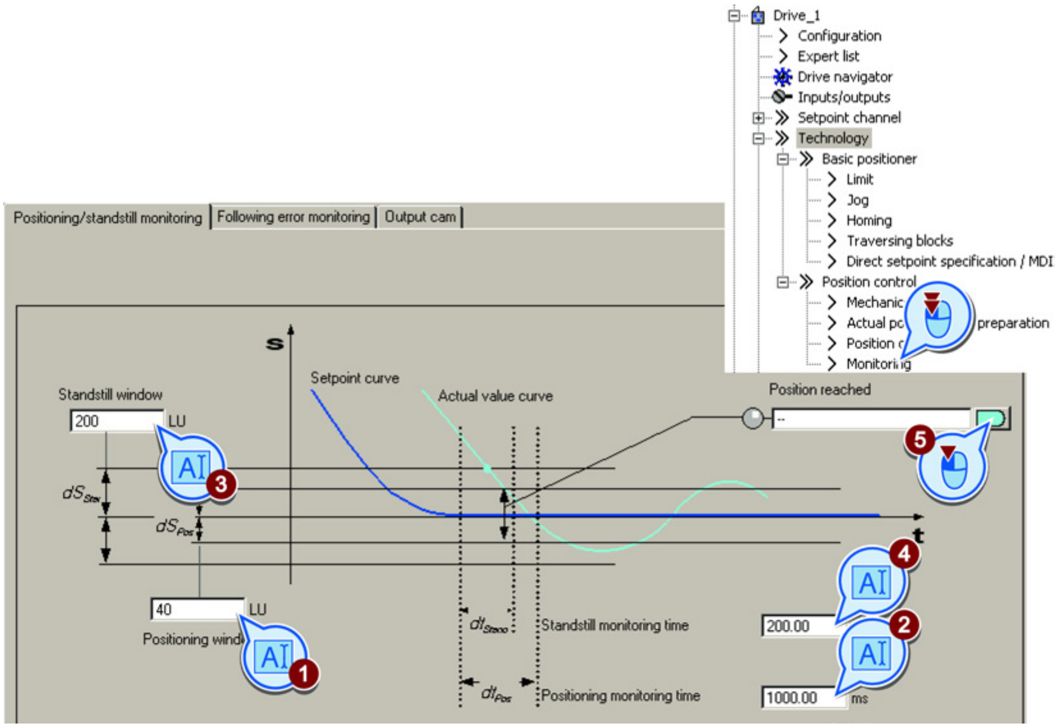
Procedure

To set the standstill and positioning monitoring, proceed as follows:

1. Set the required positioning accuracy.
2. Set the time within which the axis must be positioned.

3. Set the required standstill window.

   The standstill window must be larger than the positioning window.
4. Set the time within which the axis must be at standstill.
5. Define the signal "Target position reached" as a message to a higher-level control.



You have now set the standstill and position monitoring.

Parameter	Meaning
p2542	Standstill window (target position ±p2542)
p2543	Standstill monitoring time
p2544	Positioning window (target position ±p2544)
p2545	Positioning monitoring time

2.5.5.2 Following error monitoring

Description

The following error is the deviation between the position setpoint and the position actual value while the converter is positioning the axis.

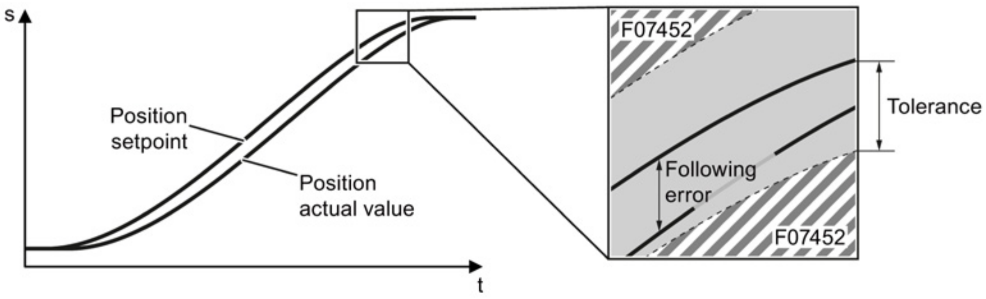


Figure 2-10 Monitoring the following error

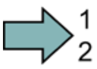
The converter reports fault F07452 if the following error is too high. If you set the tolerance to 0, monitoring is deactivated.

Setting following error monitoring

Precondition

You have selected the "Monitoring" screen and the "Following error monitoring" tab.

Procedure



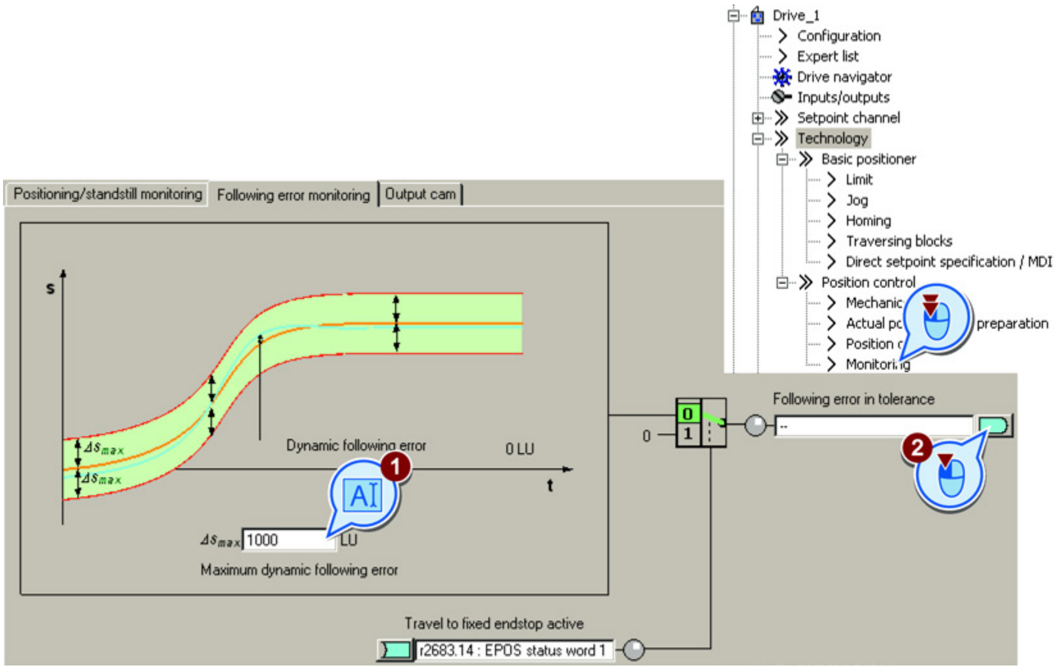
To set the monitoring of the following error, proceed as follows:

1. Set the monitoring window.

   Start with the factory setting value.

   Test your setting by positioning the axis at maximum velocity, e.g. from the control panel. If the converter stops the travel with fault F07452 , you will need to either increase the monitoring window or increase the dynamics of the position controller.

2. If you want to evaluate the message in your higher-level control, interconnect this signal with, for example, a status bit in the fieldbus telegram.



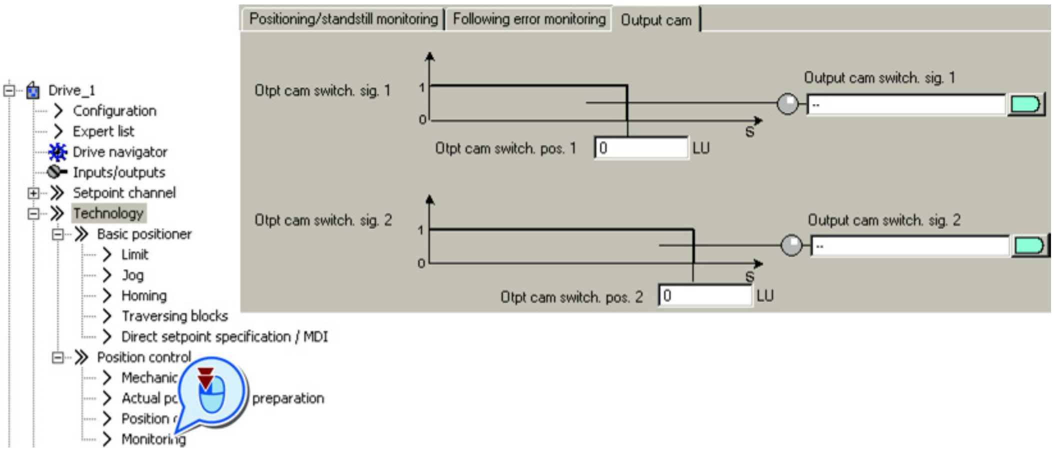
You have now set the monitoring of the following error.

Parameter	Meaning
p2546	Dynamic following error monitoring tolerance
r2563	Following error, dynamic model

2.5.5.3 Cam sequencer

Description

The converter compares the position actual value with two different positions and therefore simulates two independent cam switching signals.



If you need this function, set the cam switching position to match your particular application and appropriately interconnect the cam switching signal.

Parameter	Meaning
p2547	Cam switching position 1
p2548	Cam switching position 2
r2683.8	Position actual value <= cam switching position 1
r2683.9	Position actual value <= cam switching position 2

2.5.6 Referencing

2.5.6.1 Referencing methods

Overview

If you are using an incremental encoder for the position actual value, after the supply voltage is switched off, the converter loses its valid position actual value. After the supply voltage is switched on again, the converter no longer knows the reference of the axis position to the machine.

Referencing re-establishes the reference between the zero point of the position calculated in the converter and the machine zero point.

Absolute encoders retain their position information, even after the supply has been switched off.

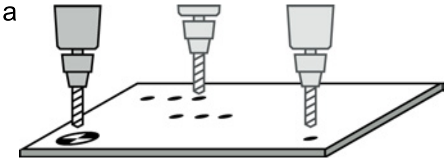
The converter offers various ways of referencing the axis:

- Reference point approach - only with incremental encoders
- Flying referencing - with all encoder types
- Set reference point - with all encoder types
- Absolute encoder adjustment - with absolute encoders

Reference point approach

The converter automatically traverses the axis to a defined reference point.

Example: A workpiece must be positioned at a starting point before machining starts.



Flying referencing

The converter corrects its position actual value while traversing and reduces errors, e.g. caused by wheel slip or a gear ratio that has not been precisely set.

Example: A pallet on a roller conveyor must be stopped at a specific position. However, the exact position of the pallet on the conveyor is only known when a sensor is passed.

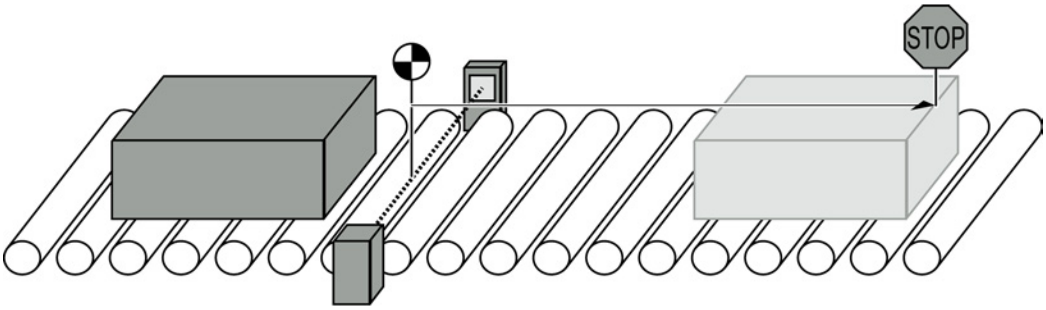


Figure 2-11 Positioning an item to be transported on a roller conveyor

Set the reference point and adjust the absolute encoder

The converter takes the reference point coordinate as the new axis position.

2.5.6.2 Setting the reference point approach

Description

A reference point approach generally consists of the following three steps:

1. Travel to reference cam.
   When it receives a signal, the axis searches in a specified direction for the reference cam.
2. Travel to zero mark.
   After reaching the reference cam, the axis changes the traversing direction and evaluates the zero mark of the encoder.
3. Travel to reference point.
   After the zero mark is reached, the axis traverses to the reference point and synchronizes the actual position value in the converter with the machine.

Step 1: Travel to reference cam

The converter accelerates the axis in the start direction to the "Approach velocity". Once the axis has reached the reference cam, in step 2, the converter switches to the reference point approach.

Reversing cams make sense if the reference cam does not extend up to the end of the traversing range. After reaching a reversing cam, the converter continues to search for the reference cam in the opposite direction.

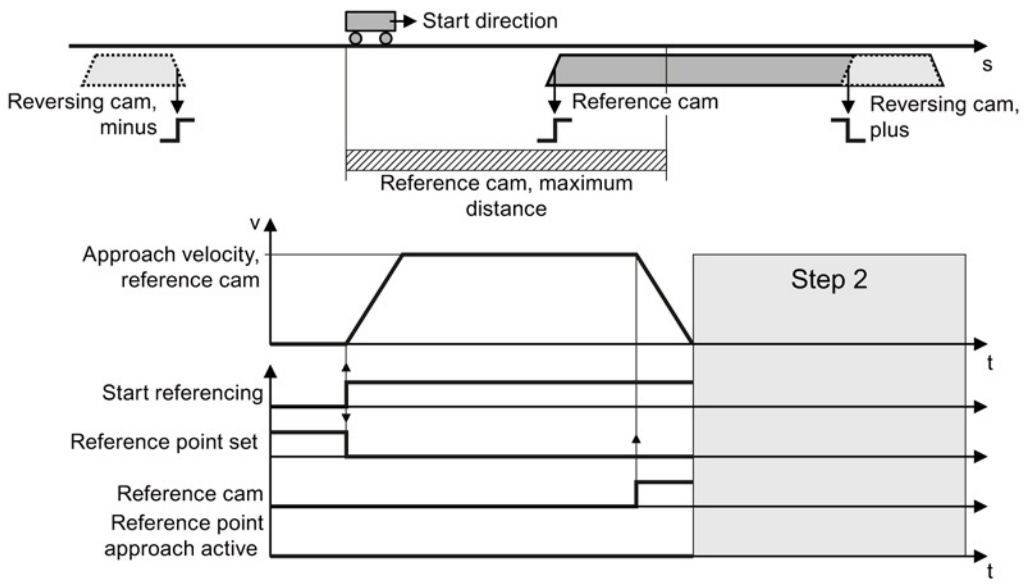


Figure 2-12 Step 1: Travel to reference cam

Under one of the following conditions, the converter skips the first step and starts with step 2:

- The axis is already at the reference cam.
- There is no reference cam available.

Step 2: Travel to zero mark

The behavior of the axis in step 2 depends on whether a reference cam is available:

- Reference cam available: When the converter reaches the reference cam, the axis accelerates *in the opposite direction to the start direction* , to the "approach velocity zero mark".
- No reference cam is available: The converter accelerates the axis *in the start direction* to the "approach velocity zero mark".

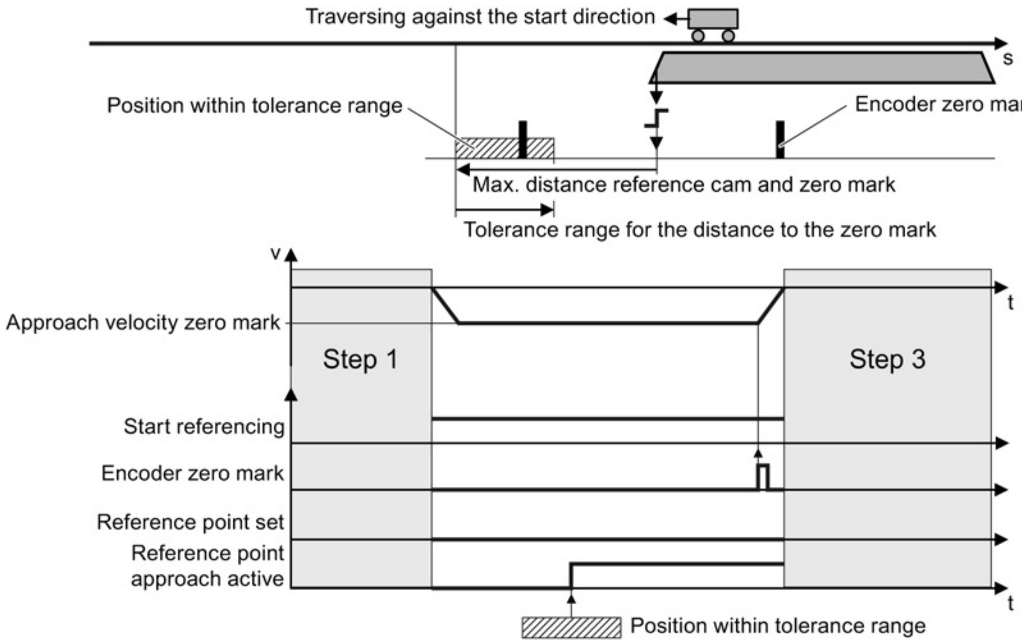


Figure 2-13 Step 2: Travel to zero mark if a reference cam is available

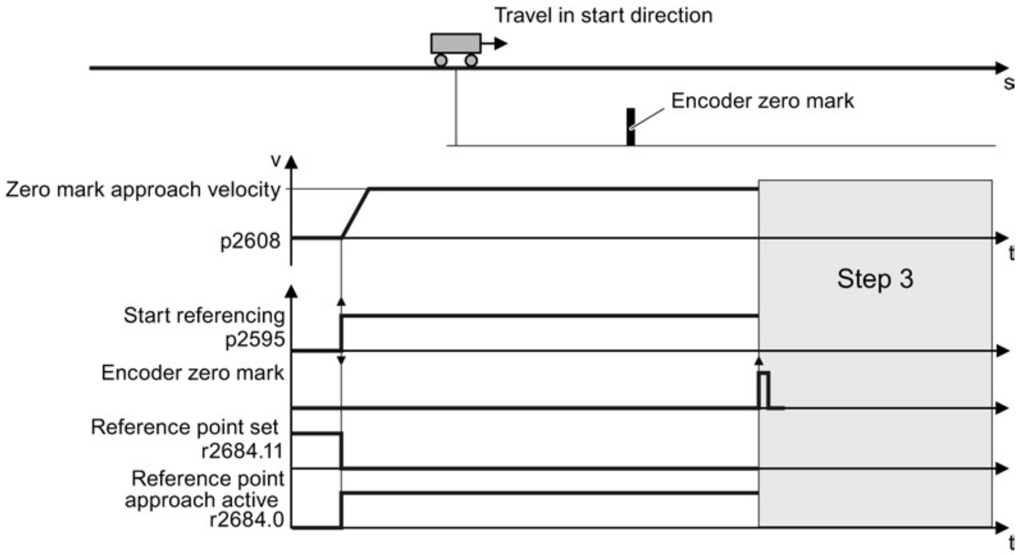


Figure 2-14 Travel to the zero mark if a reference cam is not available

Step 3: Travel to reference point

After the converter has detected a zero mark, the axis moves with the "approach velocity reference point" to the reference point coordinate.

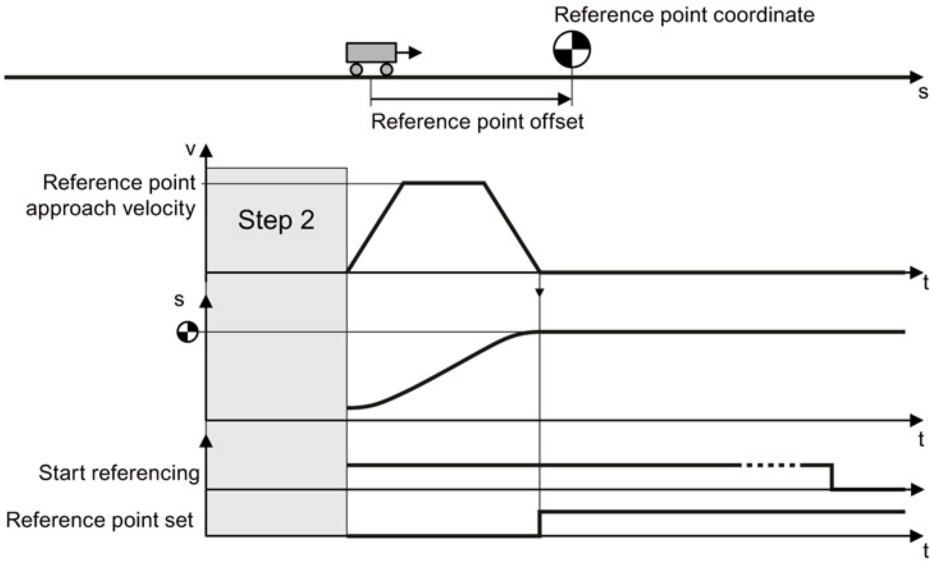


Figure 2-15 Step 3: Travel to reference point

After the load has reached the reference point coordinate, the converter sets its position setpoint and actual value to this value.

Setting the reference point approach

Preconditions

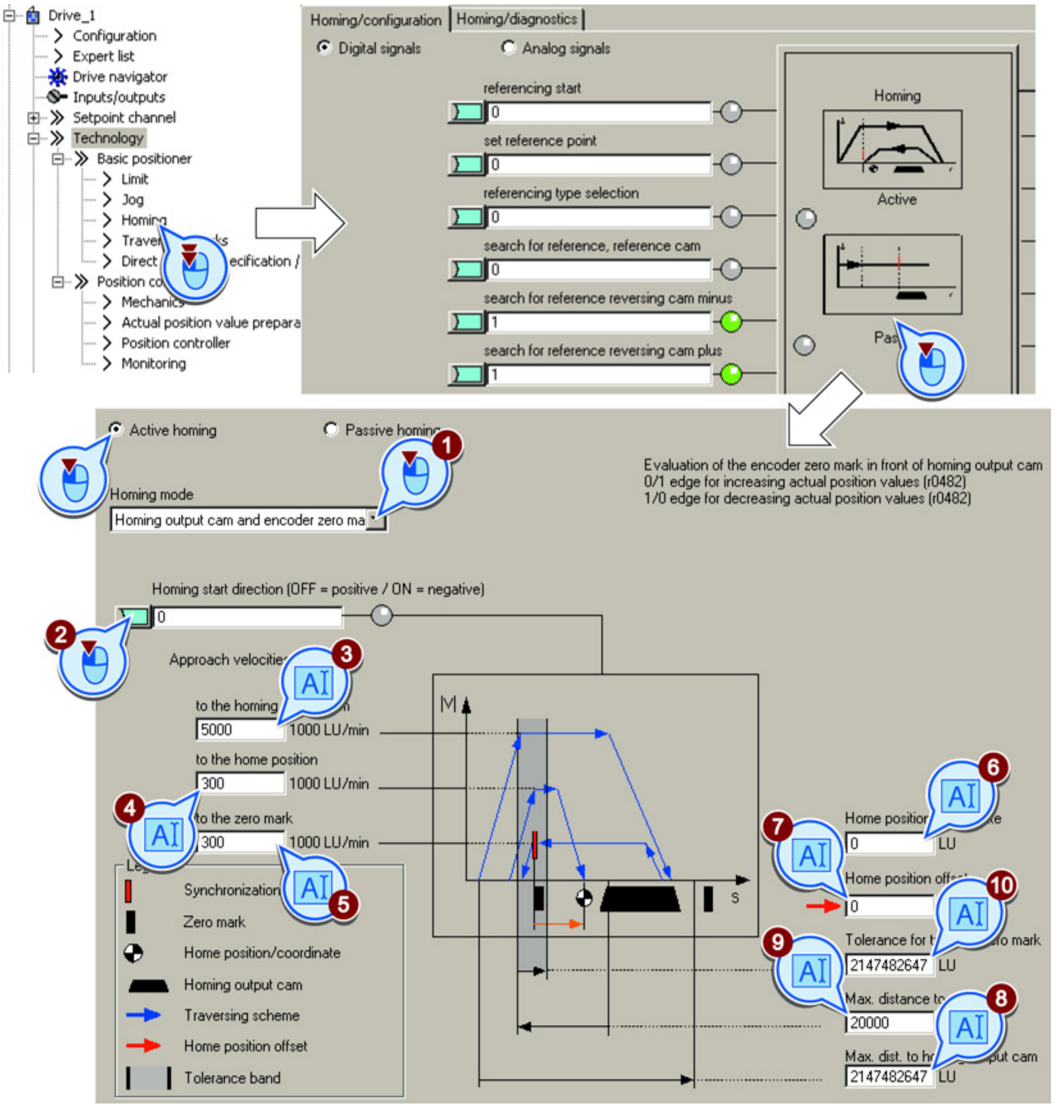
1. You have selected the "Homing" screen.
2. You have come to the settings via the button on the screen.
3. You have selected "Active homing".

Procedure

To set the reference point approach, proceed as follows:

1. You specify the referencing mode:
   - Only using the encoder zero mark
   - With external zero mark
   - With reference cam and encoder zero mark
2. Specify the start direction.
3. Set the approach velocity to the reference cam.
4. Set the approach velocity to the reference point.
5. Set the approach velocity to the zero mark.

6. Specify the reference point coordinate.
7. Specify the reference point offset.
8. Specify the max. permissible distance to the reference cam in step 1 of active referencing.
9. If a reference cam is available: Define the maximum permitted distance to the zero mark.
10. If no reference cam is available: Define the tolerance for travel to the zero mark.
11. Close the screen form.



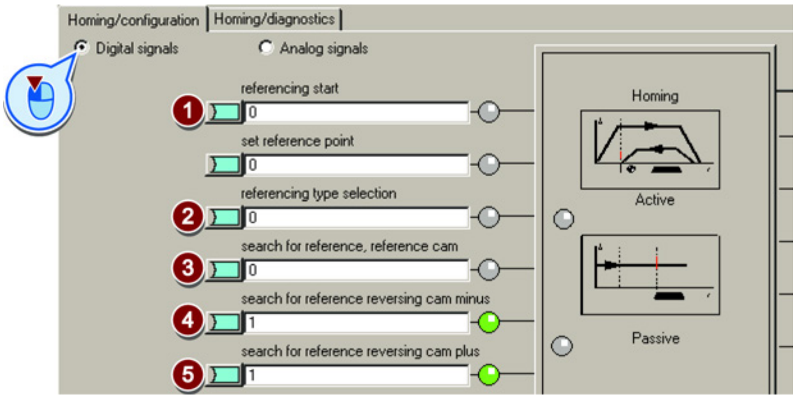
You have set the USB reference point approach.

Defining the digital signals for controlling referencing

Procedure

To define the digital signals for controlling, proceed as follows:

1. This signal starts the reference point approach.
2. This signal must be 0 for the reference point approach.
3. Interconnect the signal of the reference cam with the corresponding signal of your machine.
4. If you use the reversing cam minus, interconnect the reversing cam with the corresponding signal, e.g. with the fieldbus.
   0 = Reversing cams active.
5. If you use the reversing cam plus, interconnect the reversing cam with the corresponding signal, e.g. with the fieldbus.
   0 = Reversing cams active.



You have now defined the digital signals for controlling.

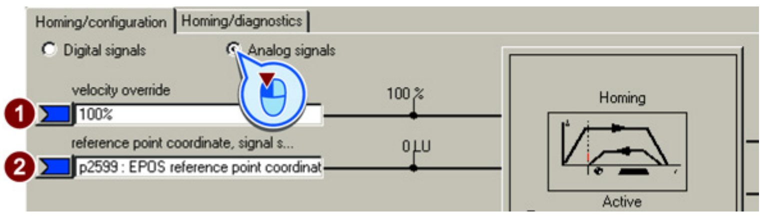
Defining the analog signals for controlling referencing

Procedure

To define the analog signals for controlling, proceed as follows:

1. Define the signal source for the velocity override.

   See also section: Direct setpoint input (MDI) (Page 82).
2. Change the source for the reference point coordinate, if necessary.



You have now defined the analog signals for controlling.

Parameter	Meaning
p2595	Start referencing
p2598	Reference point coordinate, signal source
p2599	Reference point coordinate value
p2600	Reference point approach, reference point offset
p2604	Reference point approach, start direction
p2605	Reference point approach, approach velocity, reference cam
p2606	Reference point approach reference cam, maximum distance
p2607	Reference point approach reference cam available
p2608	Reference point approach, approach velocity, zero mark
p2609	Reference point approach, max distance reference cam and zero mark
p2610	Reference point approach, tolerance band for the distance to the zero mark
p2611	Reference point approach, approach velocity, reference point
p2612	Reference point approach, reference cam
p2613	Reference point approach reversing cam, minus
p2614	Reference point approach reversing cam, plus
r2684.0	Reference point approach active
r2684.11	Reference point set

2.5.6.3 Setting the flying referencing

Description

During motion, the load passes a reference cam. The converter evaluates the reference cam signal via a suitable fast digital input, and corrects its calculated position during travel. The fast digital inputs of the converter used for flying referencing are also called probe inputs.

For flying referencing, the converter corrects the position setpoint and actual value simultaneously.

If the position actual value correction means that the axis has already passed the point where it should start braking, then the axis travels beyond the target and approaches the target from the opposite direction.

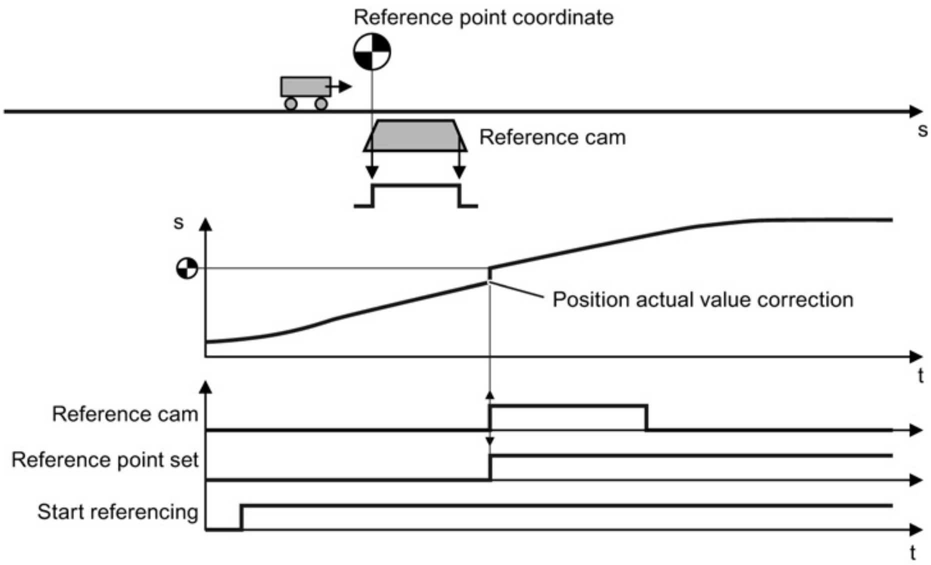


Figure 2-16 Flying referencing

The converter sets the "Reference point set" signal back to zero after its supply voltage is switched off and switched on again. The converter only corrects its position actual value for a 1 signal from "Start referencing". In this way, you can define, for example, the direction of travel when the converter is referencing.

Setting flying referencing

Precondition

1. You have selected the "Homing" screen.
2. You have come to the settings via the button on the screen.
3. You have selected "Passive homing".

Procedure

To set the flying referencing, proceed as follows:

1. Set with which edge of the reference cam signal the converter references its position actual value:
   0: Rising edge
   1: Falling edge
2. Interconnect the switchover of reference cams 1 and 2 with a signal of your choice.
3. Select the digital input with which reference cam 1 is interconnected.
4. Select the digital input with which reference cam 2 is interconnected.

   Several reference points:
   If you require several reference points for an axis, then you must do the following:

   – Assign the corresponding digital input to the respective reference point.

   – Change the reference point coordinate during operation, e.g. using the non-cyclic communication of the fieldbus.
5. Set the inner window for referencing. You deactivate the inner window with the value 0.
6. Set the outer window for referencing. You deactivate the outer window with the value 0.

   Referencing can be suppressed depending on the deviation of the actual position value:

   Inner window: For excessively small deviations, the converter does not correct its position actual value.

   Outer window: The converter signals an excessive deviation, but does not correct its position actual value.

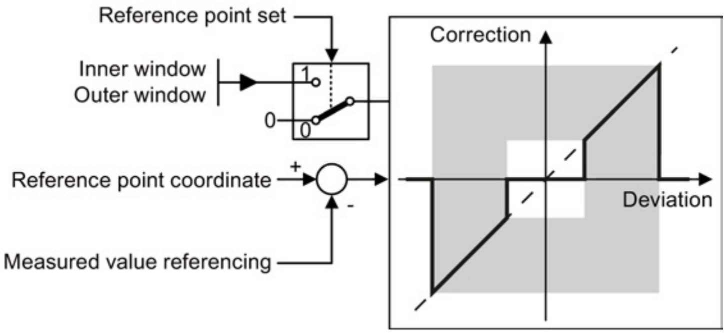


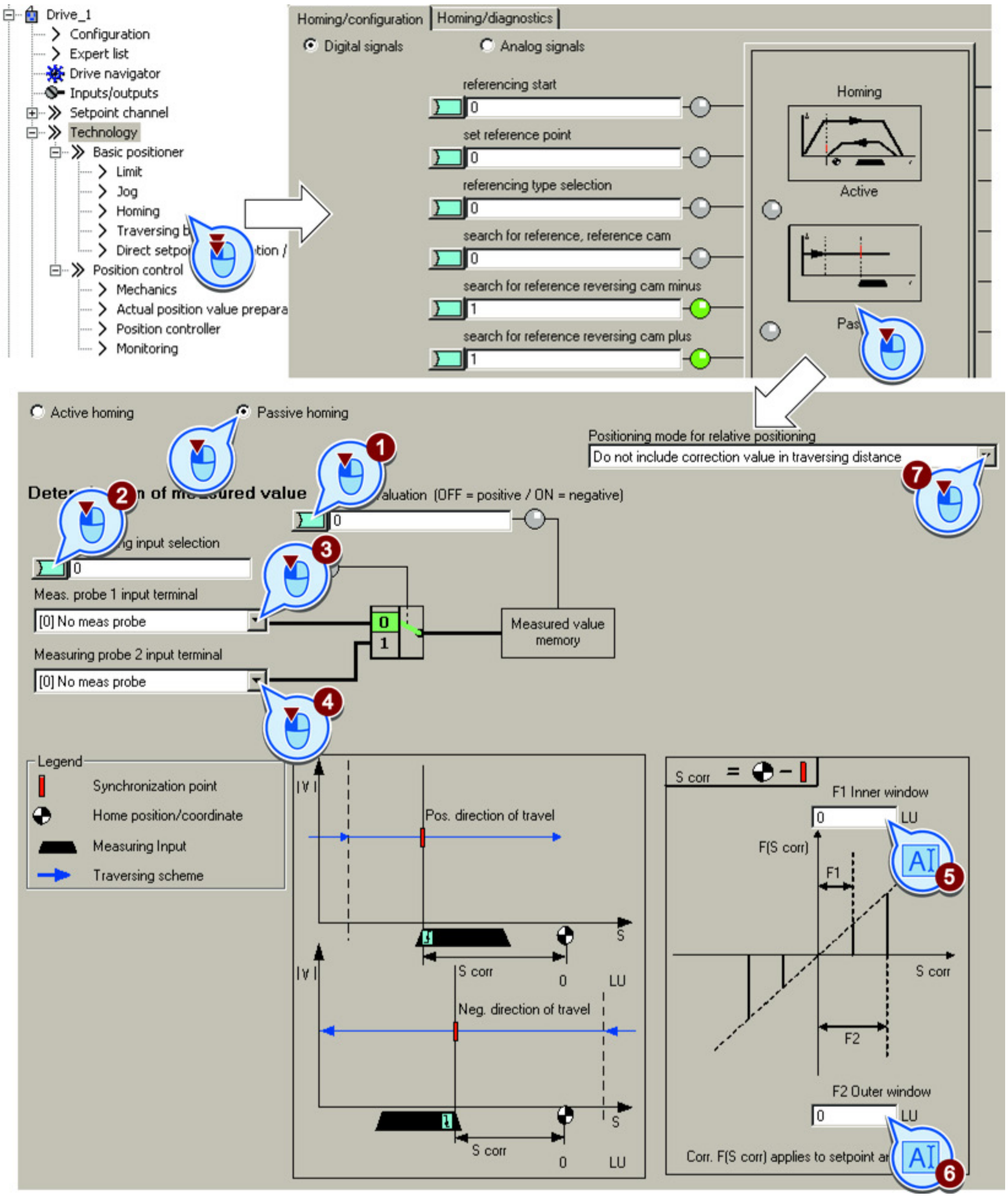
Figure 2-17 Outer and inner window for flying referencing

7. Specify the following:

   – Taking into account the offset in traversing distance: The converter corrects both the actual position as well as the setpoint. The relative traversing distance is shorter or longer by the value of the correction.
   Example: 500 LU is the axis start position. The axis should travel relatively through 1000 LU. The converter corrects the reference point during travel by 2 LU, and travels to the corrected target position 1498 LU.

– Not taking into account the correction in the traversing distance: The converter corrects both the actual position as well as the setpoint. The relative travel distance remains unchanged.
  Example: 500 LU is the axis start position. The axis should travel relatively through 1000 LU. The converter corrects the reference point during travel by 2 LU, however, moves to the old target position 1500 LU.

8. Set the reference point coordinate p2599 via the expert list in the STARTER.
9. Close the screen form.



You have now set flying referencing.

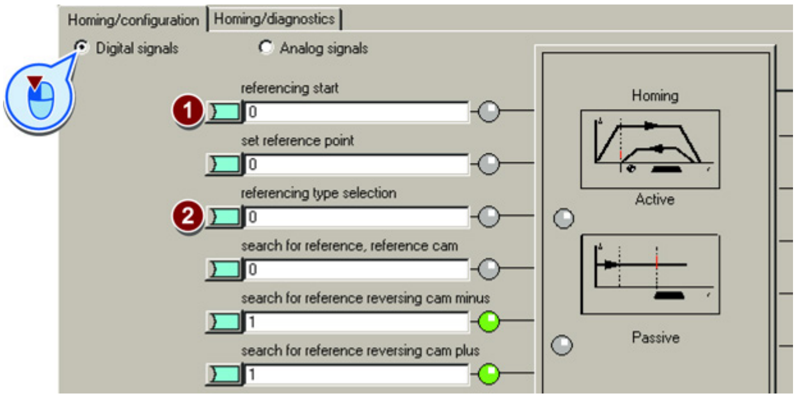
Defining the digital signals for controlling referencing

Procedure

To define the digital signals for controlling, proceed as follows:

1. This signal starts flying referencing.
2. For flying referencing, this signal must be 1.

   The other signals are of no significance for flying referencing.



You have now defined the digital signals for controlling.

Defining the analog signals for controlling referencing

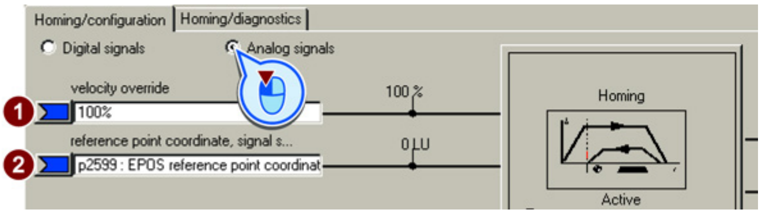
Procedure

To define the analog signals for controlling, proceed as follows:

1. Define the signal source for the velocity override.

   See also section: Direct setpoint input (MDI) (Page 82).

2. Change the source for the reference point coordinate, if necessary.



You have now defined the analog signals for controlling.

Parameter	Meaning
p2595	Start referencing
p2598	Reference point coordinate, signal source
p2599	Reference point coordinate value
p2601	Flying referencing, inner window
p2602	Flying referencing, outer window
p2603	Flying referencing, relative positioning mode
p2612	Reference point approach, reference cam
r2684.11	Reference point set
p2660	Measured value referencing

2.5.6.4 Set reference point

Description

Position the load, e.g. using the "jog" function, at the reference position in the machine.

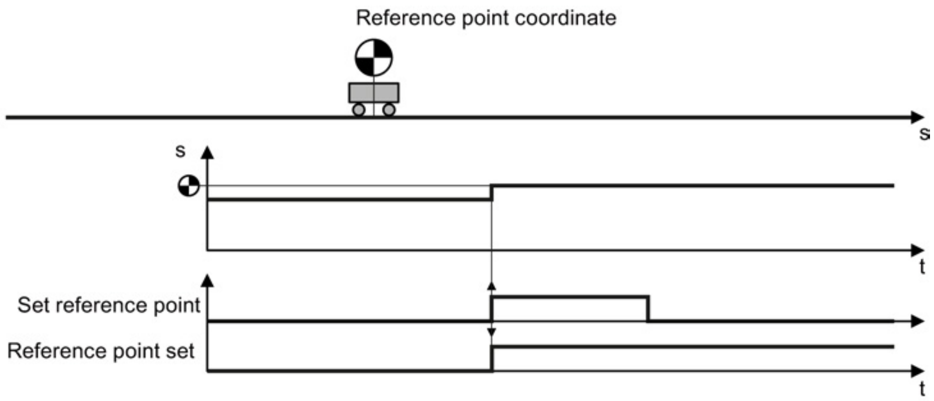


Figure 2-18 Set reference point

Activate 'set home position'

Precondition

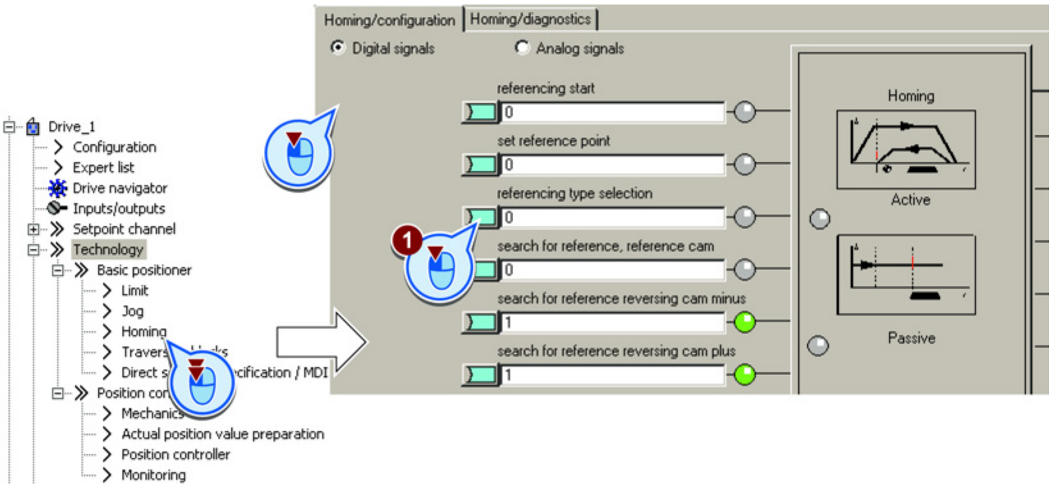
You have selected the "Homing" screen.

Procedure

To activate 'set home position', proceed as follows:

1. Interconnect this bit with the corresponding signal of your machine.
   If the axis is stationary, with the signal change 0 → 1, the inverter sets its actual position value to the reference point coordinate.
   For this function, all of the other signals are of no significance.

2. In STARTER, proceed in the expert list and set p2599 to the reference point coordinate.



You have now activated 'set home position'.

Parameter	Meaning
p2596	Set reference point
p2598	Reference point coordinate, signal source
p2599	Reference point coordinate value
r2684.11	Reference point set

2.5.6.5 Absolute encoder adjustment

Absolute encoder adjustment

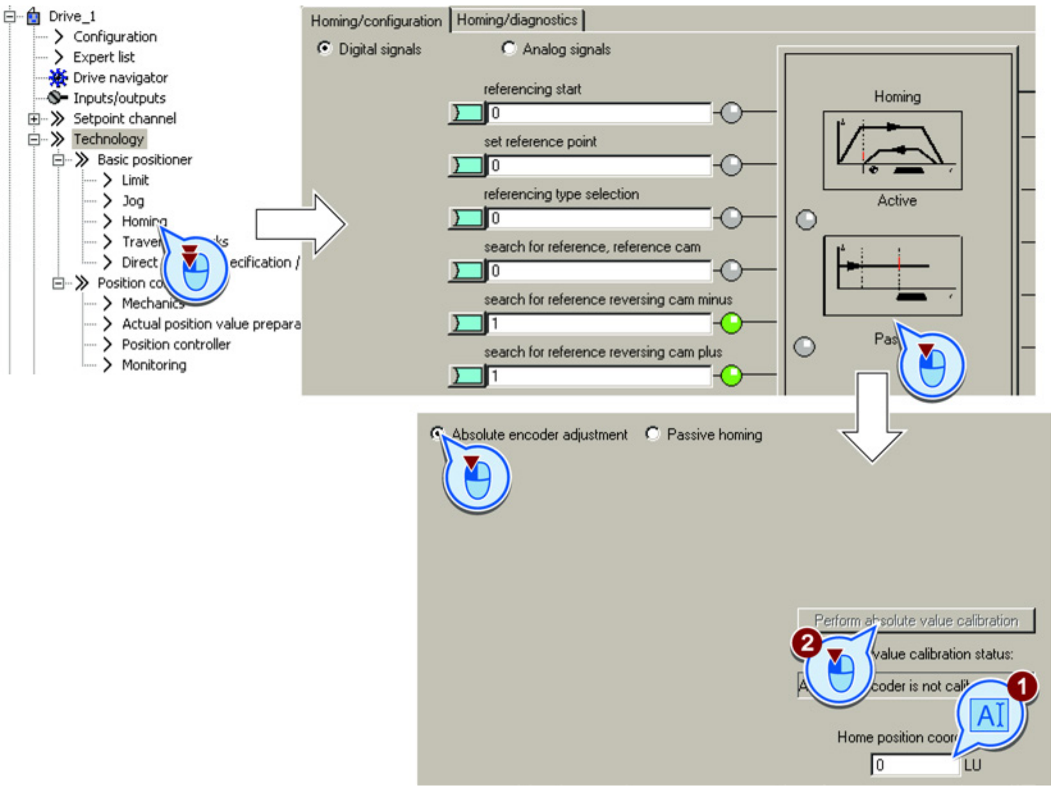
Precondition

1. You have positioned the axis (e.g. using the "jog" function) to the reference position in the machine.
2. You have selected the "Homing" screen.
3. You have come to the settings via the button on the screen.
4. You have selected "Absolute encoder adjustment".

Procedure

To adjust the absolute encoder, proceed as follows:

1. Specify the reference point coordinate.
2. Accept the reference point coordinate in the position actual value.



You have now adjusted the absolute encoder.

Parameter	Meaning	
p2598	**Reference point coordinate, signal source**	
p2599	**Reference point coordinate value**	
p2507	**Absolute encoder adjustment status**	
	0	Error has occurred in the adjustment
	1	Absolute encoder was not adjusted
	2	Absolute encoder was not adjusted and encoder adjustment was initiated
	3	Absolute encoder adjusted

2.5.7 Jogging

2.5.7.1 Jog velocity

Description

Only input a setpoint velocity for the converter for velocity jog. With the signal "Jogging 1" or "Jogging 2", the converter accelerates the axis to the relevant setpoint velocity. The converter stops the axis when the respective "Jog" signal returns to zero.

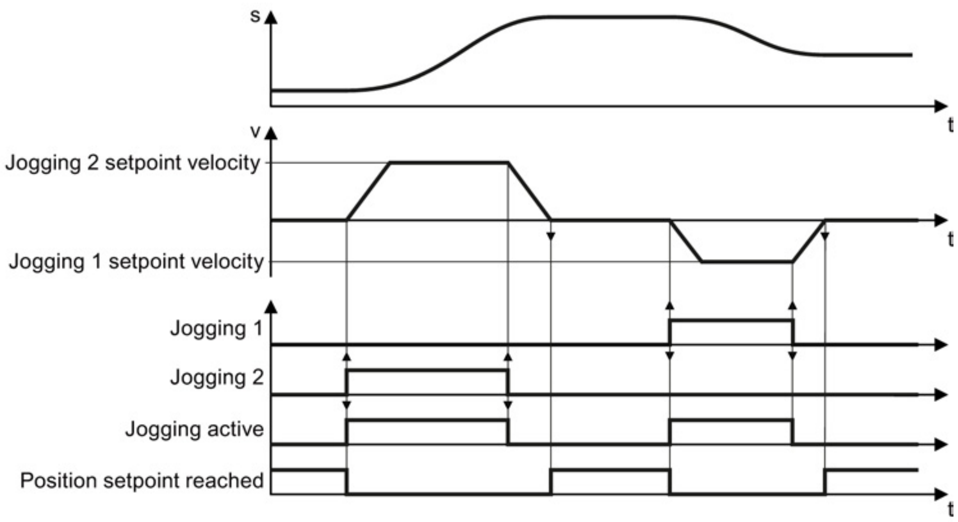


Figure 2-19 Jog velocity

2.5.7.2 Incremental jogging

Description

In the case of incremental jogging, input a relative traversing distance and a velocity setpoint into the converter. With the signals "Jogging 1" or "Jogging 2" the converter positions the axis by the respective travel path.

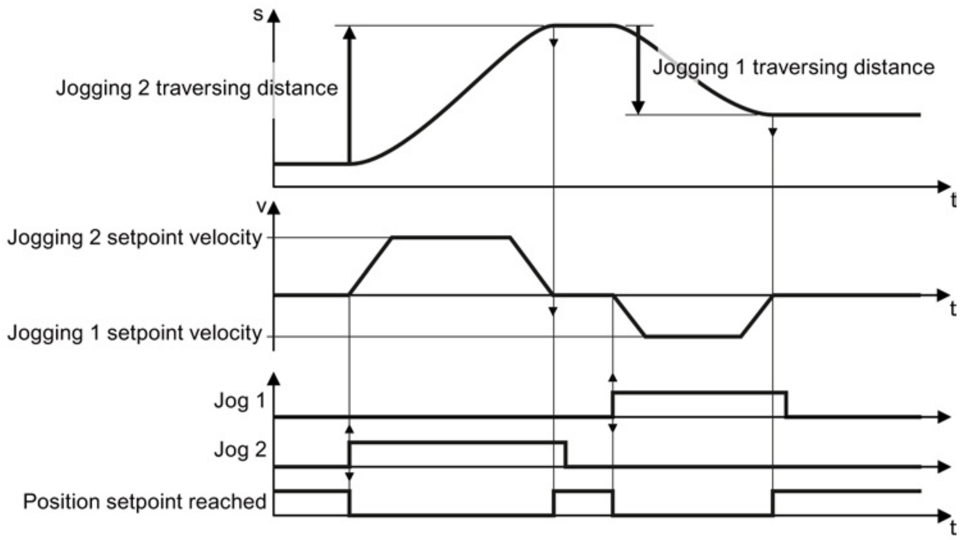


Figure 2-20 Incremental jogging

2.5.7.3 Setting jogging

Precondition

You have selected the "Jog" screen.

Procedure

To set the "jog" function, proceed as follows:

1. Interconnect the signal that defines the mode for the "jog" function.

   0: Velocity jogging

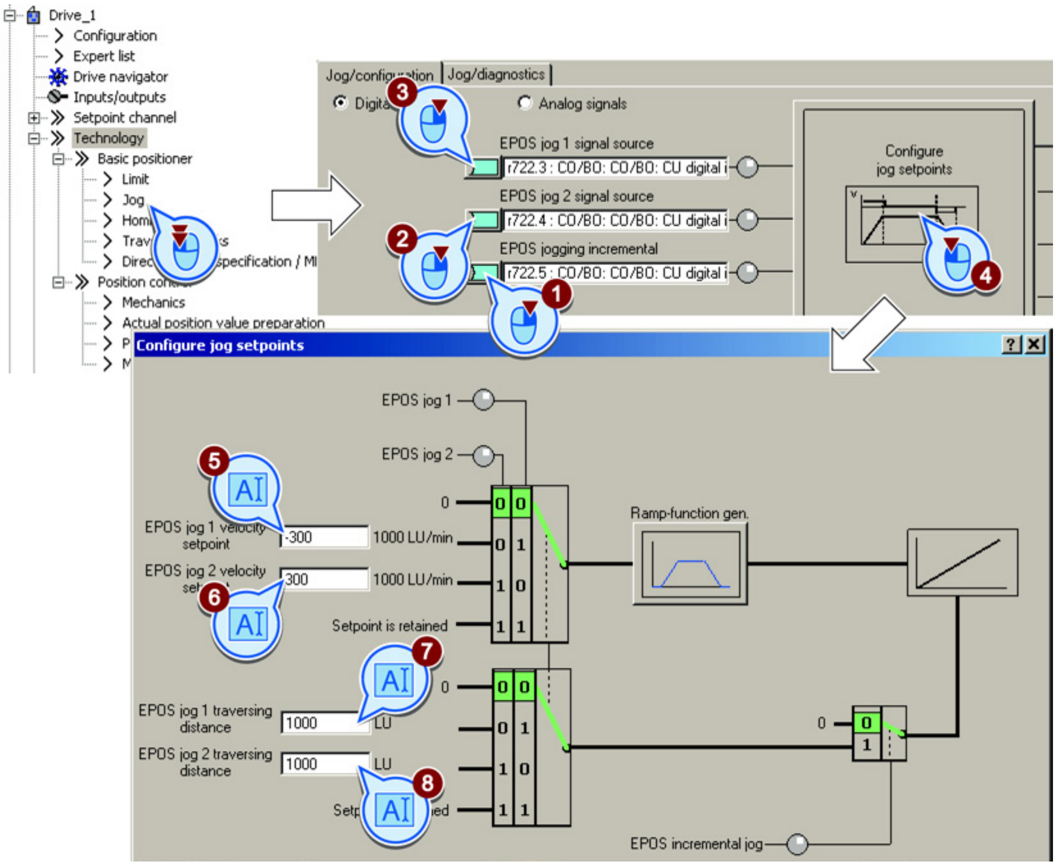
   1: Incremental jogging
2. Interconnect the signal for jogging 1.
3. Interconnect the signal for jogging 2.
4. Select the button for the other settings.
5. Set the velocities for the "jogging 1" function.
6. Set the velocities for the "jogging 2" function.

7. If you use the incremental jog, set the relative position setpoint for the "jogging 1" function.

   This value has no significance for velocity jogging.

8. If you use the incremental jog, set the relative position setpoint for the "jogging 2" function.

   This value has no significance for velocity jogging.



You have set the "jog" function.

Parameter	Meaning
p2585	Jogging 1 setpoint velocity
p2586	Jogging 2 setpoint velocity
p2587	Jogging 1 traversing distance
p2588	Jogging 2 traversing distance
p2589	Jogging 1 signal source
p2590	Jogging 2 signal source
p2591	Incremental jogging

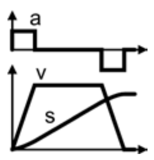
2.5.8 Traversing blocks

Description

A traversing block describes a positioning instruction for the drive.

The converter saves 16 different traversing blocks, which it normally executes one after the other. However, you can also directly select a specific traversing block or skip traversing blocks.

Table 2- 19 Components of a traversing block

Element	Meaning		
Number	With this number in the range 0 to 15, every traversing block can be selected using binary-coded control signals.		
Job	Positioning command: You can give the converter various commands. For some jobs, you must also specify a parameter. See the table below.		
Parameter			
Mode	Positioning mode: Positioning relative to the start position or absolute to the machine zero point.		
Position	Target position		
Velocity	v		Setpoints for the traversing profile.
Acceleration	a		
Braking	-a		
Advance	Jump condition to the next traversing block. See the table below.		

Job and parameters

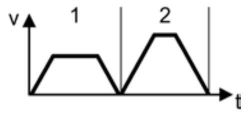
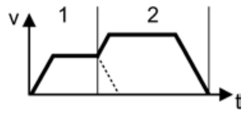
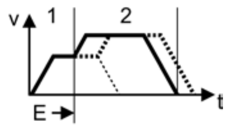
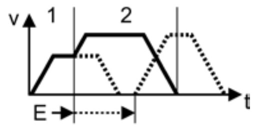
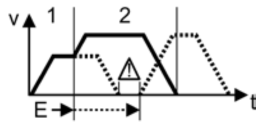
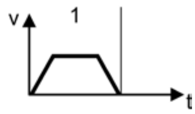
Table 2- 20 Job and parameters

Job	Parameter		Meaning
Positioning	---		• Axis absolute or relative positioning. • Rotary axis with modulo correction in a positive or negative direction, absolute positioning.
Travel to fixed stop	Force [N] or torque [0.01 Nm]		Traverse axis to a fixed stop: • Linear axis with reduced force. • Rotary axis with reduced torque. See also the section: Travel to fixed stop (Page 76).
Endless travel	---		Traverse the axis at the specified velocity to the positive or negative end of the traversing range.
Wait	Time [ms]		Wait the specified time.
Go to	Number		The converter then executes the next traversing block with the specified number.
Set, reset	1	Set output 1	Set or reset internal signals in the converter:
	2	Set output 2	

Job	Parameter		Meaning
	3	Set outputs 1 and 2	• Output 1: r2683.10 • Output 2: r2683.11 You can interconnect the signals with digital outputs of the converter or with bit 10 and 11 of the positioning status word of the fieldbus. See also the sections: Control and status word for the positioner (Page 18) , Control and status word 2 for the positioner (Page 22)
Jerk	0	Inactive	Activate or deactivate jerk limiting. See also the section: Limiting the traversing profile (Page 42).
	1	active	

Conditions for advance

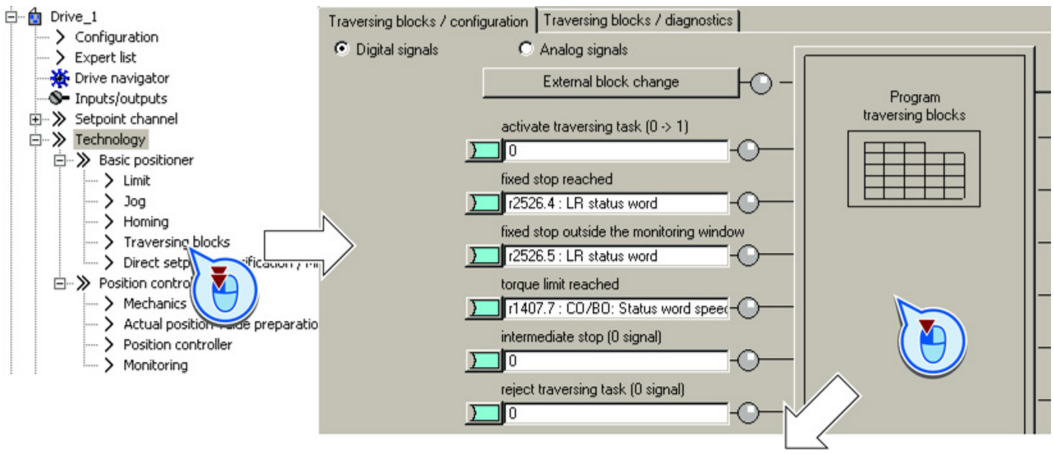
Table 2- 21 Advance: Jump condition to the next traversing block

<table>
<tr><th>Condition</th><th colspan="3">Meaning</th><th>Traversing block</th></tr>
<tr><td>CONTINUE WITH STOP</td><td colspan="3">If the axis has reached the setpoint position and has come to a standstill, the converter executes the next traversing block.</td><td>
</td></tr>
<tr><td>CONTINUE FLYING</td><td colspan="3">The converter goes to next traversing block at the braking instant.</td><td>
</td></tr>
<tr><td>CONTINUE EXTERNAL</td><td rowspan="3">At the external E signal, the converter goes to the next traversing block.</td><td colspan="2">If the E signal is not present, the drive behaves just the same as for "CONTINUE FLYING".</td><td>
</td></tr>
<tr><td>CONTINUE EXTERNAL WAIT</td><td rowspan="2">If the E signal is not present, the converter exits the actual traversing block and continues to wait for the signal.</td><td>---</td><td>
</td></tr>
<tr><td>CONTINUE EXTERNAL ALARM</td><td>As long as the axis is at a standstill, the converter signals alarm A07463.</td><td>
</td></tr>
<tr><td>END</td><td colspan="3">The converter exits the actual traversing block if the target position has been reached. The converter does not go to the next traversing block.</td><td>
</td></tr>
</table>

Programming traversing blocks

Precondition

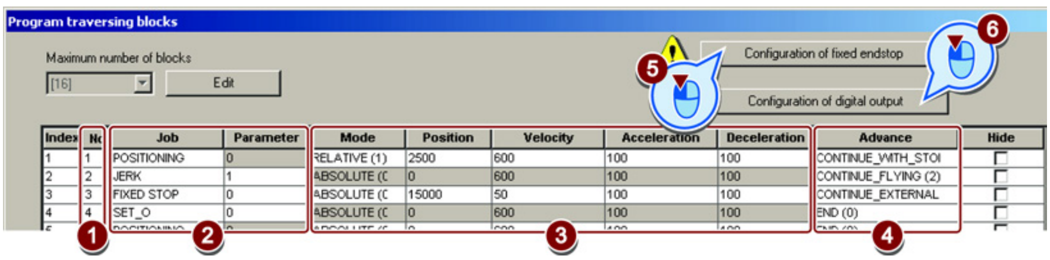
1. You have selected the "Traversing blocks" screen.
2. You select the "Program traversing blocks" button.



Procedure

To program the traversing blocks, proceed as follows:

1. Assign a unique number for each traversing block.
2. Define the command and the corresponding parameters.
3. Set the job-specific values.
4. Define the step enabling condition for the next job.
5. If you travel to a fixed stop, a button appears to make additional settings for this function. See also section: Travel to fixed stop (Page 76).
6. Click this button to interconnect the status signals of the traversing blocks, for example, with bit 10 and 11 of the positioner status word with the fieldbus.
7. When you have programmed all traversing blocks, close the screen.



You have programmed the traversing blocks.

Define digital signals for controlling

Procedure

To define the digital signals for controlling the traversing blocks, proceed as follows:

1. Define the signal for the start of the traversing block.

   The signal change 0 → 1 starts the currently selected traversing block.

2. In the factory setting, this signal is interconnected with the appropriate internal signals of the converter. We recommend that you do not change this setting.

3. See ②.

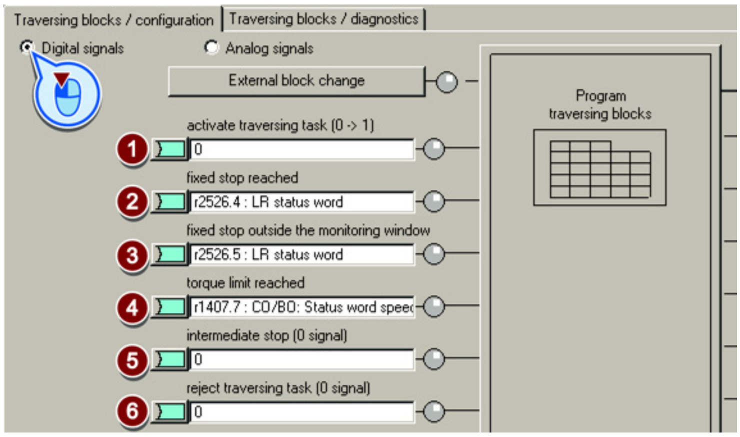
4. See ②.

5. Define the signal for the settings for the intermediate stop.

   The axis temporarily stops for the "intermediate stop" = 0 signal. The axis continues its travel with "intermediate stop" = 1. The same traversing block as before the stop is active. See also section: Examples (Page 80).

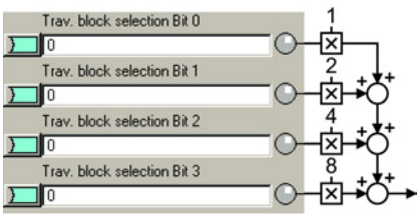
6. Define the signal for "reject signaling task".

   For the signal "reject traversing task" = 0, the converter stops the axis with the maximum deceleration (p2573). If you start the axis again with "Activate traversing request" = 0 → 1, the converter starts again with the currently selected traversing block.



7. Interconnect the signals for selecting the traversing block number.

   The converter reads the traversing block number as binary code.



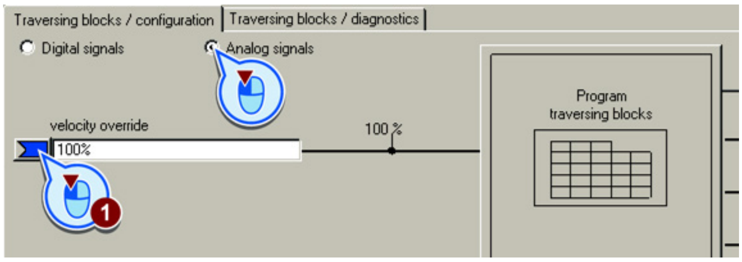
You have now defined the digital signals for controlling the traversing blocks.

Define analog signals for controlling

Procedure

To define the analog signals for controlling the traversing blocks, proceed as follows:

1. Change the signal source for the velocity override, if required.
   The velocity override refers to the velocity values you have set in the screen for programming the traversing blocks.



You have now defined the analog signals for controlling the traversing blocks.

Define an external signal for block change

Precondition

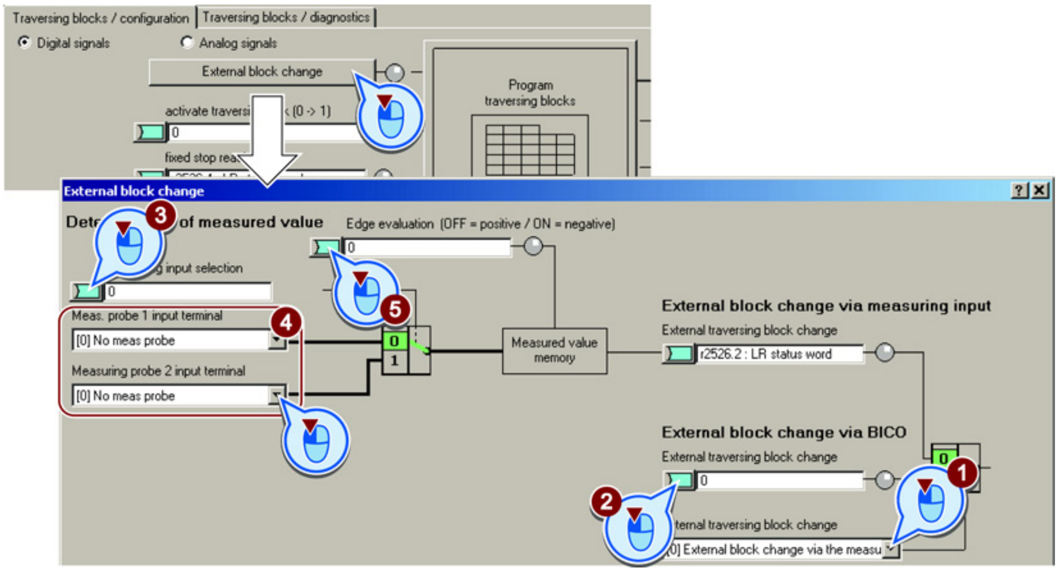
You have selected the "External block change" button.

Procedure

To define an external signal for the block change, proceed as follows:

1. Specify whether the external signal is received via a fast digital input (probe) or from another source, e.g. via the fieldbus.
2. To initiate a block change via the machine control system, you must interconnect this signal with a signal of your choice.
3. Select the input with which cam signal 1 is interconnected.
4. Select the input with which cam signal 2 is interconnected.

5. Specify the edge with which the inverter jumps to the next traversing block:
   0: Rising edge
   1: Falling edge



■ You have now defined an external signal for the block change.

Parameter	Meaning			
p0488	Probe 1, input terminal			
p0489	Probe 2, input terminal			
p0581	Probe edge			
	0	Positive edge 0 → 1		
	1	Negative edge 1 → 0		
p2615	Maximum number of traversing blocks			
p2616[0…n]	Traversing block, block number			
p2617[0…n]	Traversing block, position			
p2618[0…n]	Traversing block, velocity			
p2619[0…n]	Traversing block, acceleration override			
p2620[0…n]	Traversing block, deceleration override			
p2621[0…n]	Traversing block, job			
	1	POSITIONING	6	GOTO
	2	FIXED STOP	7	SET_O
	3	ENDLESS_POS	8	RESET_O
	4	ENDLESS_NEG	9	JERK
	5	WAIT		
p2622[0…n]	Traversing block, job parameter			

<table>
<tr><th>Parameter</th><th colspan="3">Meaning</th></tr>
<tr><td rowspan="12">p2623[0…n]</td><td colspan="3">Traversing block, job mode
Value = 0000 cccc bbbb aaaa</td></tr>
<tr><td>cccc = 0000</td><td rowspan="4">Positioning mode</td><td>Absolute</td></tr>
<tr><td>cccc = 0001</td><td>Relative</td></tr>
<tr><td>cccc = 0010</td><td>Absolute positive (only for rotary axis with modulo correction)</td></tr>
<tr><td>cccc = 0011</td><td>Absolute negative (only for rotary axis with modulo correction)</td></tr>
<tr><td>bbbb = 0000</td><td rowspan="7">Advance condition</td><td>End</td></tr>
<tr><td>bbbb = 0001</td><td>Continue with stop</td></tr>
<tr><td>bbbb = 0010</td><td>Continue flying</td></tr>
<tr><td>bbbb = 0011</td><td>Continue external</td></tr>
<tr><td>bbbb = 0100</td><td>Continue external wait</td></tr>
<tr><td>bbbb = 0101</td><td>Continue external alarm</td></tr>
<tr><td>aaaa = 0001</td><td>Identifiers: Skip block</td></tr>
<tr><td>p2624</td><td colspan="3">Sort traversing block
To sort the traversing blocks according to their block number: p2624 = 0 → 1.</td></tr>
<tr><td>p2625</td><td colspan="3">Traversing block selection, bit 0</td></tr>
<tr><td>p2626</td><td colspan="3">Traversing block selection, bit 1</td></tr>
<tr><td>p2627</td><td colspan="3">Traversing block selection, bit 2</td></tr>
<tr><td>p2628</td><td colspan="3">Traversing block selection, bit 3</td></tr>
<tr><td>p2631</td><td colspan="3">Activate traversing block (0 → 1)</td></tr>
<tr><td rowspan="3">p2632</td><td colspan="3">External block change evaluation</td></tr>
<tr><td>0</td><td colspan="2">External block change via probe</td></tr>
<tr><td>1</td><td colspan="2">External block change via BI: p2633</td></tr>
<tr><td>p2633</td><td colspan="3">External block change (0 → 1)</td></tr>
<tr><td>p2640</td><td colspan="3">Intermediate stop (0 signal)</td></tr>
<tr><td>p2641</td><td colspan="3">Reject traversing job (0 signal)</td></tr>
<tr><td>p2646</td><td colspan="3">Velocity override</td></tr>
</table>

2.5.8.1 Travel to fixed stop

Preconditions

The "Travel to fixed stop" function is only possible with the control type vector control with encoder (VC):

"Travel to fixed stop" is not possible with the following types of control:

- V/f control
- Vector control without encoder (SLVC)

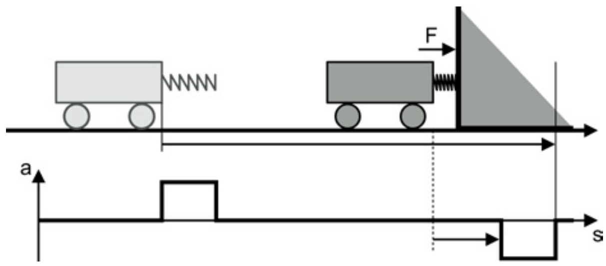
Description

With this function, the converter positions a machine part to another machine part with force locking – and presses both machine parts together with an adjustable force.

Examples:

1. A door is pressed against a frame so that it is reliably closed.
2. A rotary table is pressed against a mechanical fixed stop, in order to secure a specific alignment.

When traveling to a fixed stop, the following applies:



- You must specify the position setpoint far enough behind the mechanical fixed stop. The load must reach the mechanical fixed stop before the converter brakes the axis.
- If the start of braking point is located in front of the mechanical fixed stop, the converter cancels the travel and outputs fault F07485.
- Before starting the travel, the converter calculates the traversing profile for accelerating and braking the axis. The selected torque limit for the fixed stop has no influence on this calculation. However, the torque limit for the fixed stop reduces the available drive torque for the complete traversing distance. If the torque available for the predicted acceleration is not sufficient, then the following error is higher.
  If the following error monitoring for travel to fixed stop responds, then you must reduce the acceleration override.

Fixed stop has been reached

You have two options to define when the fixed stop is reached:

1. Fixed stop via an external sensor:
   At the fixed stop, the load actuates an external sensor. The sensor signals the converter that the fixed stop has been reached. Depending on the advance condition, the converter maintains the axis at the position with the set torque or goes to the next traversing block.
2. Fixed stop using maximum following error:
   If the axis comes into contact with the mechanical fixed stop, then the actual position value remains stationary. However, the converter still increases its position setpoint. The converter detects the fixed stop from a settable difference between the position setpoint and position actual value. Depending on the advance condition, the converter maintains the axis at the position with the set torque or goes to the next traversing block.

Example: Fixed stop using maximum following error

Table 2- 22 Traversing blocks

Ind.	No.	Job	Par.	Mode	s	v	a	-a	Advance
1	1	TRAVEL TO FIXED STOP	5	RELATIVE	10,000	10	100	100	CONTINUE WITH STOP
2	2	POSITIONING	0	ABSOLUTE	0	500	100	100	END

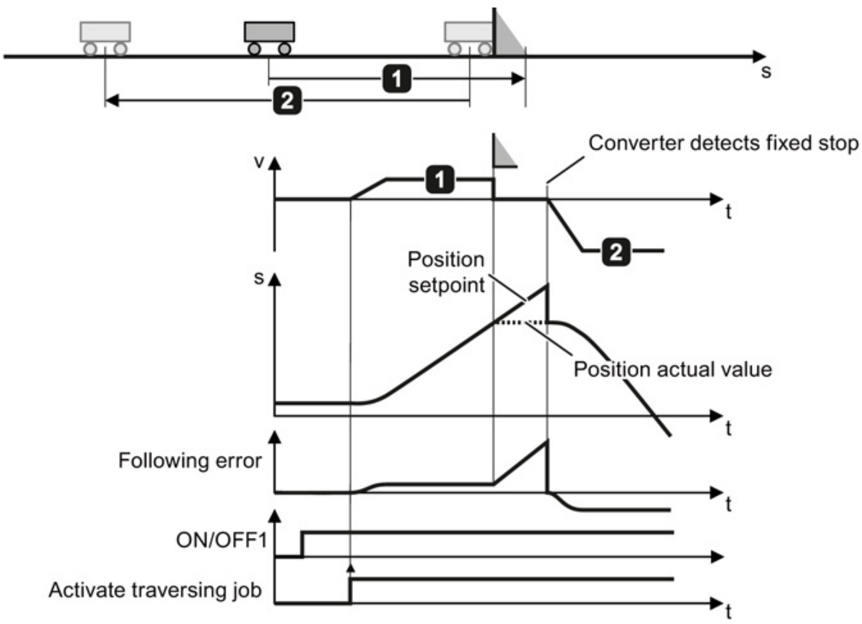
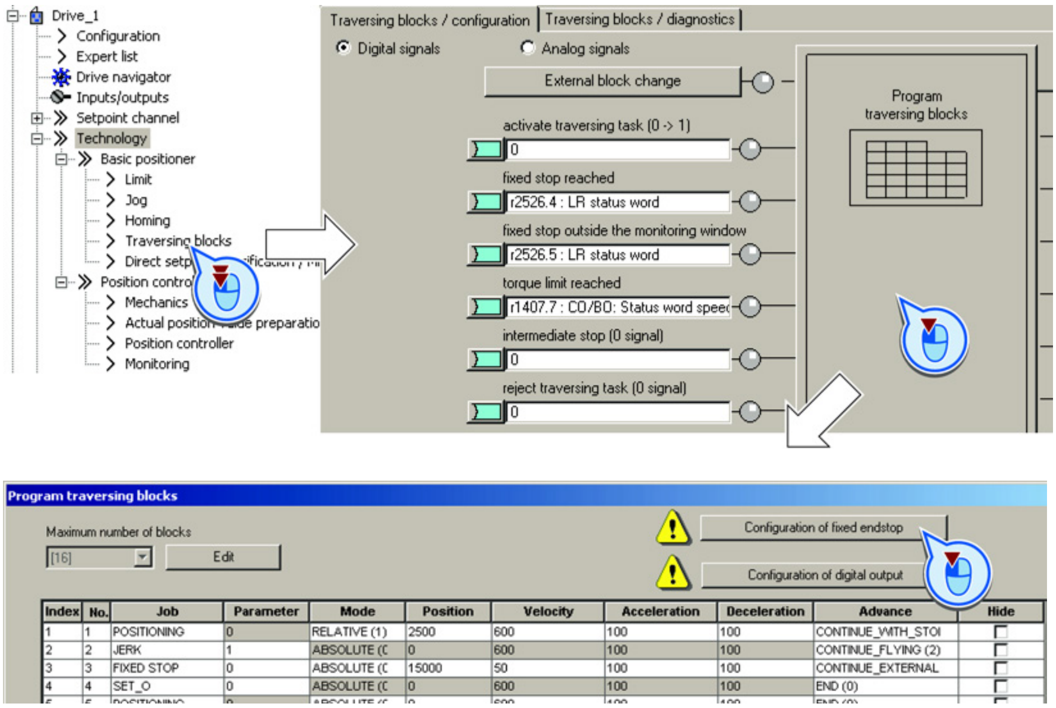


Figure 2-21 Converter detects the fixed stop using the following error

Set travel to fixed stop

Precondition

1. You have programmed "Travel to fixed stop" as traversing block.
   See also section: Traversing blocks (Page 69).
2. If you select the "Programming traversing blocks" button, the "Configuration of fixed stop" button appears.

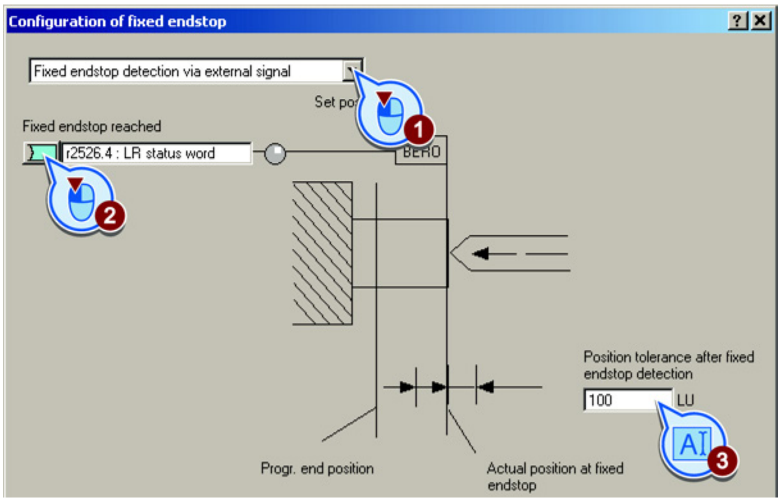


Procedure: Fixed stop using an external signal

To set "Travel to fixed stop" using an external signal, proceed as follows:

1. Select "Fixed stop using an external signal".
2. Interconnect the sensor that signals when the fixed stop is reached with this signal.
3. Set the tolerance.

After the fixed stop is detected, the inverter monitors the actual position of the axis. If the position actual value changes by more than this distance, then the converter stops the axis and outputs fault F07484. Therefore, the converter detects that the fixed stop has "broken away"



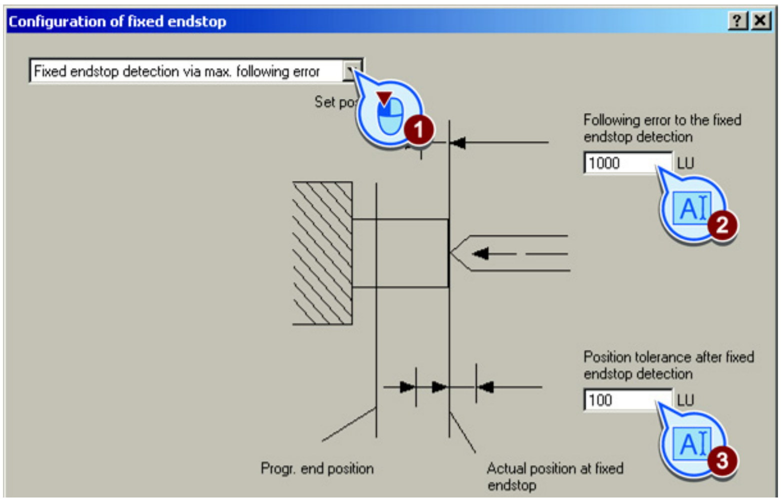
You have now set "Travel to fixed stop" using an external signal.

Procedure: Fixed stop using maximum following error

To set "Travel to fixed stop" using maximum following error, proceed as follows:

1. Select "Fixed stop using maximum following error":
2. Set the following error that the inverter uses to detect the fixed stop.
3. Set the tolerance.

   After the fixed stop is detected, the inverter monitors the actual position of the axis. If the actual position value changes by more than this distance, then the converter stops the axis and outputs fault F07484. Therefore, the converter detects that the fixed stop has "broken away"



You have now set "Travel to fixed stop" using maximum following error.

Parameter	Meaning	
p2634	**Fixed stop, maximum following error**	
p2635	**Fixed stop, monitoring window**	
p2637	**Fixed stop reached**	
	0	Fixed stop has not been reached.
	1	Fixed stop has been reached.
p2638	**Fixed stop outside the monitoring window**	
p2639	**Torque limit reached**	
	0	Torque limit has not been reached.
	1	Torque limit has been reached.

2.5.8.2 Examples

1. Example

Table 2- 23 Traversing blocks

Ind.	No.	Job	Par.	Mode	s	v	a	-a	Advance
1	1	POSITIONING	0	RELATIVE	10000	5000	100	100	CONTINUE WITH STOP
2	2	POSITIONING	0	ABSOLUTE	0	5000	100	100	END

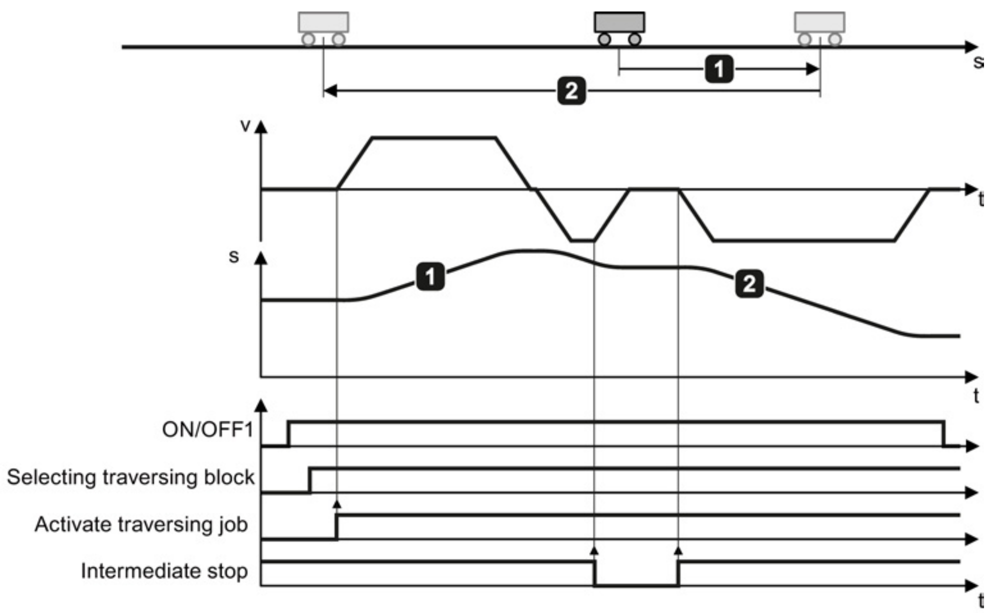


Figure 2-22 Positioning an axis using traversing blocks

2. Example

Table 2- 24 Traversing blocks

Ind.	No.	Job	Par.	Mode	s	v	a	-a	Advance
1	1	POSITIONING	0	RELATIVE	10000	2000	100	100	CONTINUE EXTERNAL ALARM
2	2	POSITIONING	0	RELATIVE	10000	5000	100	100	CONTINUE EXTERNAL ALARM
3	3	POSITIONING	0	ABSOLUTE	0	5000	100	100	END

The converter only goes to the next traversing block for the 0 → 1 change of the "External block selection" signal.

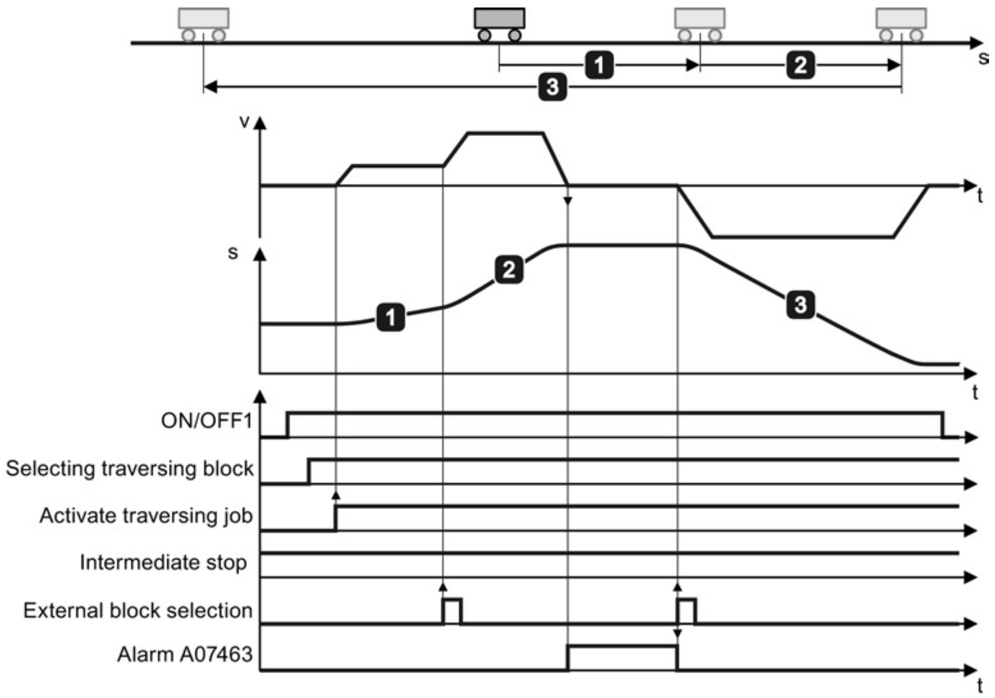


Figure 2-23 Positioning an axis using traversing blocks

2.5.9 Direct setpoint input (MDI)

Description

For direct setpoint input (MDI, Manual Data Input), a higher-level control provides the converter with the position setpoint and traversing profile.

Example 1

The higher-level control specifies the value of the setpoint either as a relative or an absolute position setpoint:

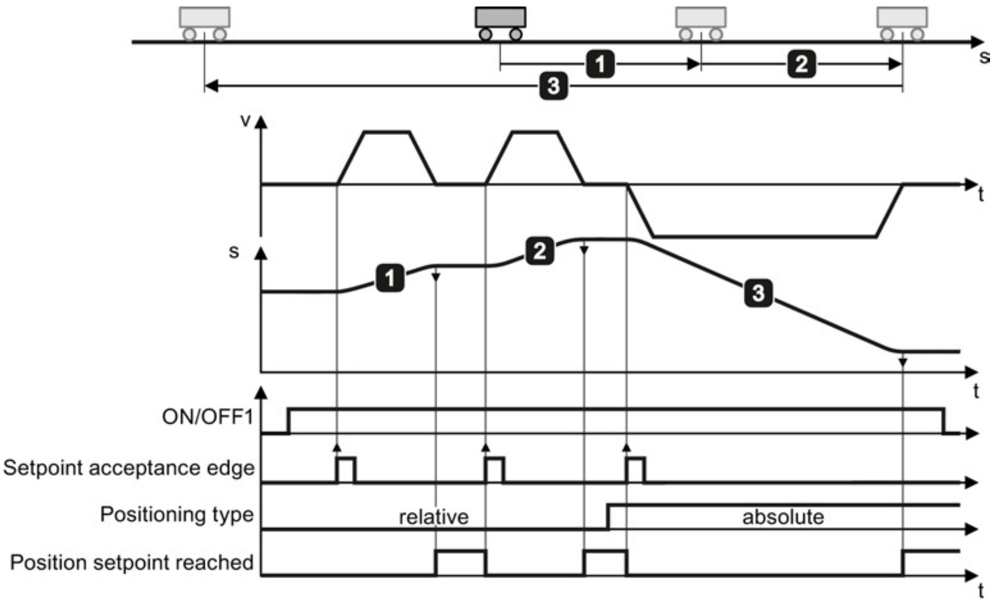


Figure 2-24 Axis with direct setpoint input (MDI) positioning

Example 2

The higher-level control selects the mode "Set-up":

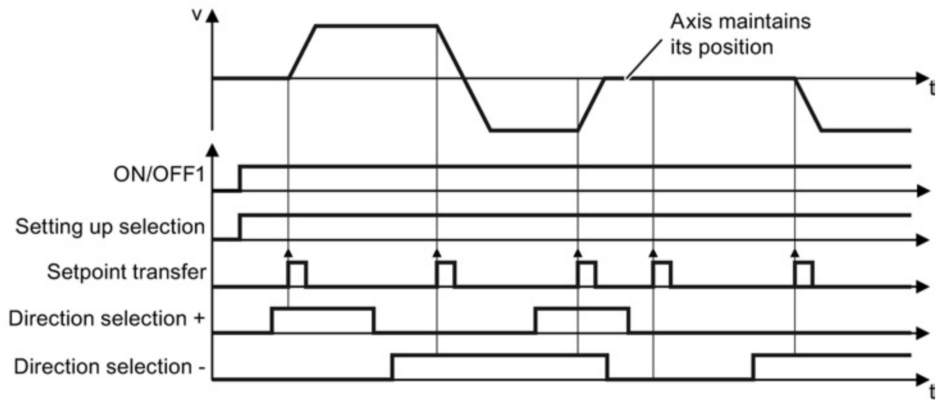


Figure 2-25 Set up axis with direct setpoint input (MDI)

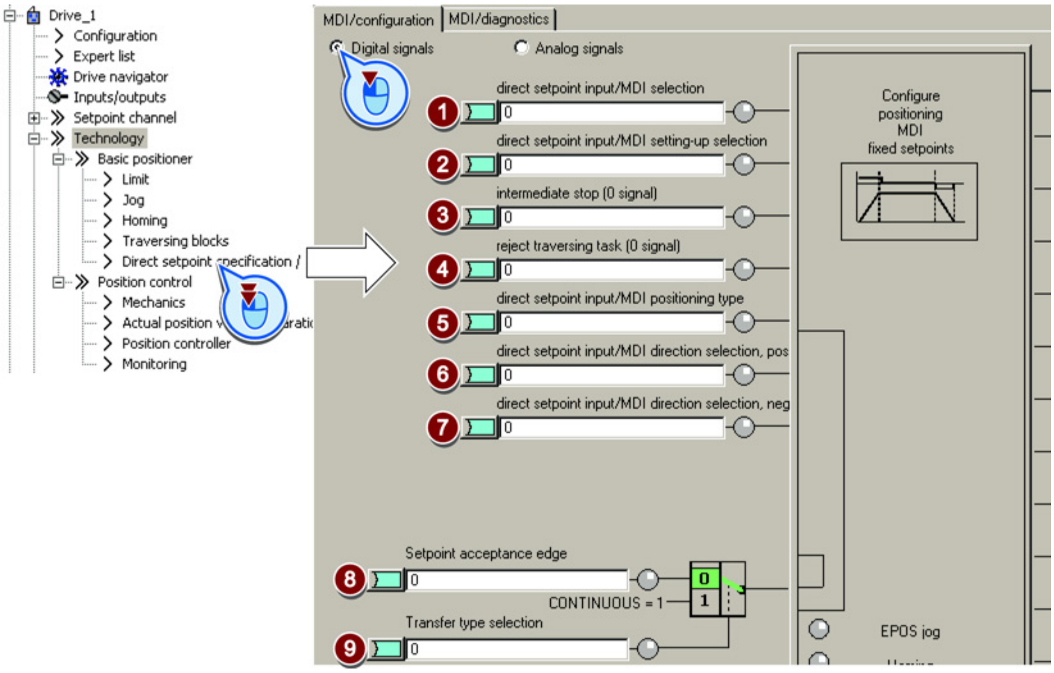
Defining the digital signals for controlling direct setpoint input

Precondition

You have selected the "Direct setpoint input (MDI)" screen.

Procedure

Interconnect the signals to control the direct setpoint input using the appropriate signals from your machine control.



① Enables MDI. This bit must be = 1 if you control the converter using MDI.

② Specifies the MDI mode:
0: Positioning: Traverse the axis with position control using the target position.
1: Set up: Traverse the axis position-controlled using velocity input

While operational, the axis operating mode can be switched over from "Set up" to "Positioning".

If "Set up" is active, then the two bits ⑥ and ⑦ define the direction of travel.

③ Intermediate stop:
0: The converter stops the axis and maintains the axis in position after standstill. The actual traversing block still remains valid.
1: The axis continues the interrupted traversing block.

④ Reject traversing block:
0: The converter stops the axis and maintains the axis in position after standstill. The converter can no longer continue the actual traversing block.
1: Axis waits for a new start command.

⑤ Positioning mode:
0: Relative (see also bit ⑨).
1: Absolute (the axis must be referenced).

These signals are only effective if, in the interface for analog signals, the value ⑥ is not interconnected. See also the table below.

⑥ Direction selection for "Set up" (Bit ② = 1):
⑦ Bit ⑥ = 1: Positive direction.
Bit ⑦ = 1: Negative direction.
If both bits are the same, the axis stops.

⑧ Accept setpoint:
0 → 1: Start axis
Is only active, if bit ⑨ = 0.

⑨ 1: Continuous mode:
The converter continually accepts changes to the position setpoint. In this mode, relative positioning is not permitted (see bit ⑤).

0: The converter starts using bit ⑧.

You have now interconnected the digital signals for controlling the direct setpoint input.

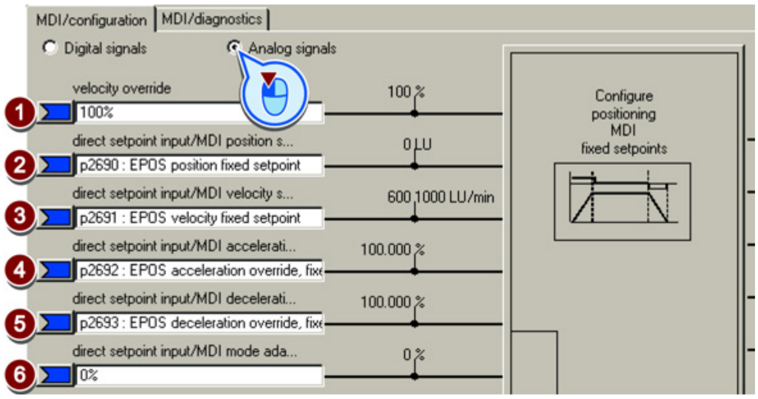
Defining the analog signals for controlling direct setpoint input

Precondition

You have selected the "Direct setpoint input (MDI)" screen.

Procedure

Interconnect the signals to control the direct setpoint input using the appropriate signals from your machine control:



① Override velocity, referred to ③

② Position setpoint

③ Velocity setpoint for the traversing profile.

④ ⑤ Acceleration override and deceleration, referred to the values of the traversing profile limitation. See also section: Limiting the traversing profile (Page 42).

⑥ **"Mode adaptation" is interconnected with a signal:**

xx0x hex	Absolute positioning.
xx1x hex	Relative positioning.
xx2x hex	Position the rotary axis in the positive direction.
xx3x hex	Position the rotary axis in the negative direction.

"Mode adaptation" is not interconnected (=0):

The signals ⑤, ⑥ and ⑦ of the upper table are effective.

You have now interconnected the analog signals for controlling the direct setpoint input.

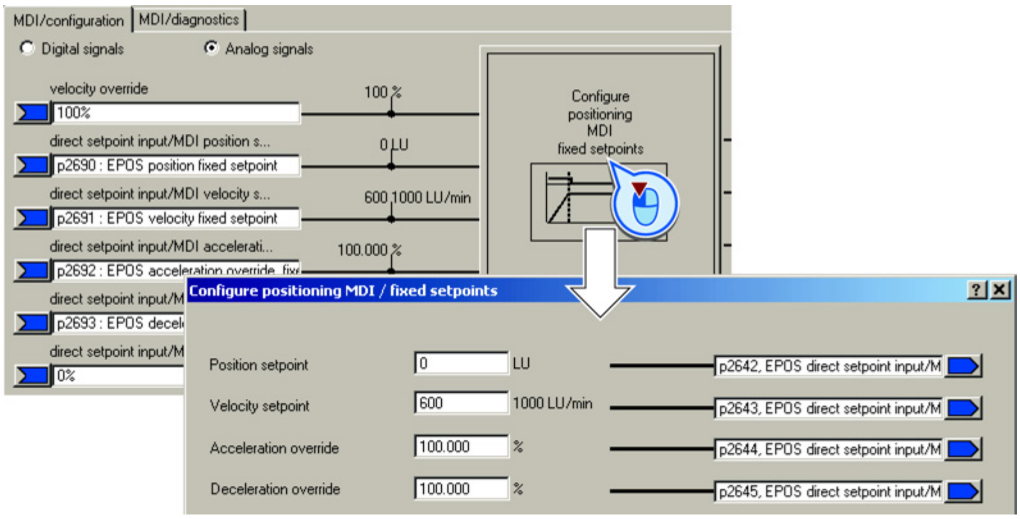
Set fixed setpoint

In some applications it is sufficient if the inverter moves the axis for each task in the same way, absolute or relative to the position setpoint. This approach can be achieved with fixed setpoints.

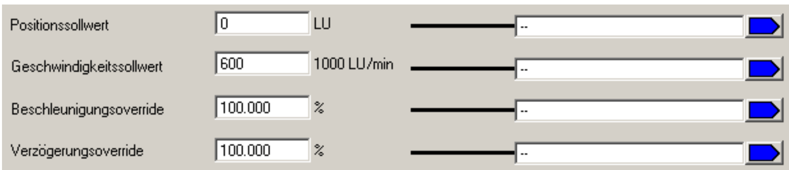
Procedure

To set the fixed setpoints, proceed as follows:

1. Select the button for configuring the fixed setpoint:



2. Set the values suitable to your application:



You have set the fixed setpoints.

Parameter	Meaning	
p2640	**Intermediate stop (0 signal)**	
p2641	**Reject traversing job (0 signal)**	
p2642	**Direct setpoint input/MDI, position setpoint**	
p2643	**Direct setpoint input/MDI, velocity setpoint**	
p2644	**Direct setpoint input/MDI, acceleration override**	
p2645	**Direct setpoint input/MDI, deceleration override**	
p2646	**Velocity override**	
p2647	**Direct setpoint input/MDI selection**	
p2648	**Direct setpoint input/MDI, positioning type**	
	0	Absolute positioning is selected
	1	Relative positioning is selected
p2649	**Direct setpoint input/MDI, acceptance method selection**	
	0	Values are accepted when p2650 = 0 → 1
	1	Continuous acceptance of values
p2650	**Direct setpoint input/MDI, setpoint acceptance, signal edge** p2650 = 0 → 1 and p2649 = 0 signal	
p2651	**Direct setpoint input/MDI, positive direction selection**	
p2652	**Direct setpoint input/MDI, negative direction selection**	
p2653	**Direct setpoint input/MDI, set up selection** Signal = 1: Set up is selected.	
p2654	**Direct setpoint input/MDI, mode adaptation**	
p2690	**Position fixed setpoint** Interconnect fixed setpoint: p2642 = 2690	
p2691	**Velocity fixed setpoint** Interconnect fixed setpoint: p2643 = 2691	
p2692	**Acceleration override fixed setpoint** Interconnect fixed setpoint: p2644 = 2692	
p2693	**Deceleration override fixed setpoint** Interconnect fixed setpoint: p2645 = 2693	

Appendix A

A.1 Additional information on the converter

A.1.1 Manuals for your converter

Information depth	Manual	Contents	Available languages	Download or order number
++	**Getting Started Guide**	Installing the converter and commissioning.	English, German, Italian, French, Spanish, Chinese	Download manuals (http://support.automation.siemens.com/WW/view/en/22339653/133300) **SINAMICS Manual Collection** Documentation on DVD, order number 6SL3097-4CA00-0YG0
+++	**Operating Instructions** for the SINAMICS G120 converter with the CU250S-2 Control Unit	Installing the converter and commissioning. Description of the converter functions.		
+++	**Function Manual Basic Positioner**	(this manual)	English, German	
+++	**Function Manual for Safety Integrated** for the SINAMICS G120, G120C and G120D converters	Configuring PROFIsafe. Installing, commissioning and operating fail-safe functions of the converter.	English, German, Chinese	
+++	**List Manual**	Complete list of all parameters, alarms and faults. Graphic function diagrams.	English, German, Chinese	
+	**Getting Started Guide** for the following SINAMICS G120 Power Modules: • PM240, PM250 and PM260 • PM240-2	Installing the Power Module	English	
+	**Installation Instructions** for reactors, filters and braking resistors	Installing components		
+++	**Hardware Installation Manual** for the following SINAMICS G120 Power Modules: • PM240 • PM240-2 • PM250 • PM260	Installing power modules, reactors and filters. Maintaining power modules.	English, German	
+++	**Operating Instructions** for the following Operator Panels: • BOP-2 • IOP	Operating Operator Panels, door mounting kit for mounting of IOP.		

A.1.2 Configuring support

Table A- 1 Support when configuring and selecting the converter

Manual or tool	Contents	Available languages	Download or order number
Catalog D 31	Ordering data and technical information for the standard SINAMICS G converters	English, German, Italian, French, Spanish	Everything about SINAMICS G120 (www.siemens.en/sinamics-g120)
Online catalog (Industry Mall)	Ordering data and technical information for all SIEMENS products	English, German	
SIZER	The overall configuration tool for SINAMICS, MICROMASTER and DYNAVERT T drives, motor starters, as well as SINUMERIK, SIMOTION controls and SIMATIC Technology	English, German, Italian, French	You obtain SIZER on a DVD (Order number: 6SL3070-0AA00-0AG0) and in the Internet: Download SIZER (http://support.automation.siemens.com/WW/view/en/10804987/130000)
Configuration Manual	Selecting geared motors, motors, converters and braking resistor based on calculation examples	English, German	Configuration Manual (http://support.automation.siemens.com/WW/view/en/37728795)

A.1.3 Product Support

If you have further questions

You can find additional information on the product and more in the Internet under: Product support (http://support.automation.siemens.com/WW/view/en/4000024).

In addition to our documentation, under this address we offer our complete knowledge base online: You can find the following information:

- Actual product information (Update), FAQ (frequently asked questions), downloads.
- The Newsletter contains the latest information on the products you use.
- The Knowledge Manager (Intelligent Search) helps you find the documents you need.
- Users and specialists from around the world share their experience and knowledge in the Forum.
- You can find your local representative for Automation & Drives via our contact database under "Contact & Partner".
- Information about local service, repair, spare parts and much more can be found under "Services".

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Further information

SINAMICS inverters:
www.siemens.com/sinamics

Safety Integrated:
www.siemens.com/safety-integrated

PROFINET:
www.siemens.com/profinet

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Scan the QR code for further information on SINAMICS G120.

www.siemens.com/drives