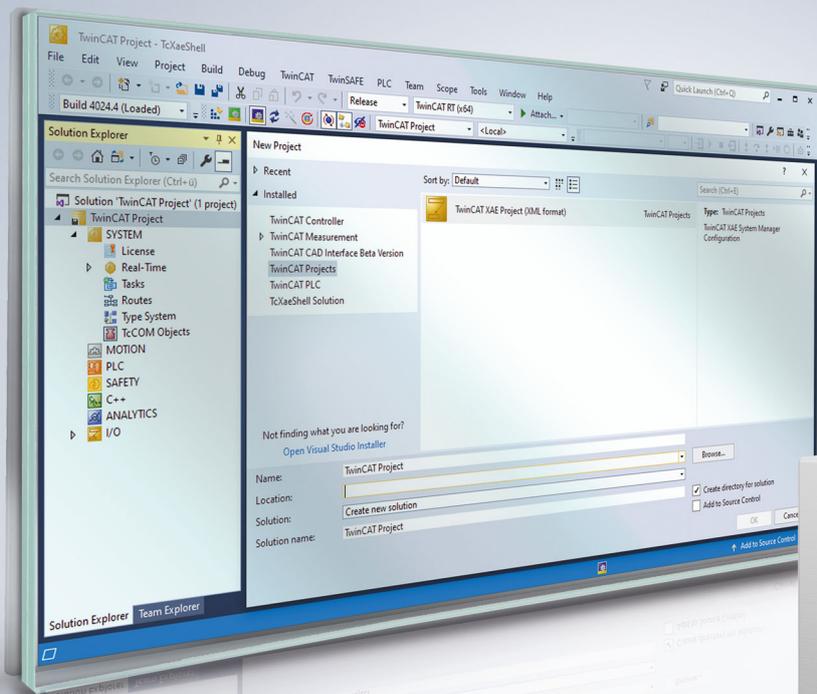


# BECKHOFF New Automation Technology

Functional description | EN

## TF5200 | TwinCAT 3 CNC

Software limit switch





# Notes on the documentation

This description is only intended for the use of trained specialists in control and automation engineering who are familiar with the applicable national standards.

It is essential that the documentation and the following notes and explanations are followed when installing and commissioning the components.

It is the duty of the technical personnel to use the documentation published at the respective time of each installation and commissioning.

The responsible staff must ensure that the application or use of the products described satisfy all the requirements for safety, including all the relevant laws, regulations, guidelines and standards.

## Disclaimer

The documentation has been prepared with care. The products described are, however, constantly under development.

We reserve the right to revise and change the documentation at any time and without prior announcement.

No claims for the modification of products that have already been supplied may be made on the basis of the data, diagrams and descriptions in this documentation.

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# General and safety instructions

## Icons used and their meanings

This documentation uses the following icons next to the safety instruction and the associated text. Please read the (safety) instructions carefully and comply with them at all times.

### Icons in explanatory text

1. Indicates an action.

⇒ Indicates an action statement.

#### **DANGER**

##### **Acute danger to life!**

If you fail to comply with the safety instruction next to this icon, there is immediate danger to human life and health.

#### **CAUTION**

##### **Personal injury and damage to machines!**

If you fail to comply with the safety instruction next to this icon, it may result in personal injury or damage to machines.

#### **NOTICE**

##### **Restriction or error**

This icon describes restrictions or warns of errors.

#### **Tips and other notes**

 This icon indicates information to assist in general understanding or to provide additional information.

### General example

Example that clarifies the text.

### NC programming example

Programming example (complete NC program or program sequence) of the described function or NC command.

#### **Specific version information**

 Optional or restricted function. The availability of this function depends on the configuration and the scope of the version.

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# 1 Overview

## Task

Software limit switches (SWE) limit the maximum travel distance of an axis.

## Properties

The positions of the SWE can be configured for the following axis types:

- Linear axes.
- Rotary axes that are not operated as modulo axes

SWE monitoring is only active if the axis

- is referenced or
- used with an absolute position measuring system (P-AXIS-00014).

## Parameterisation

The positions of the SWE must be configured for each axis with P-AXIS-00177 and P-AXIS-00178.

## Programming

The following applies concerning the validity of limit switch positions for all builds of V2.11.20xx and V2.11.28xx:

- The limit value can be further restricted in the NC program by programming but cannot be increased. In other words, the limit value defined in the axis parameter list cannot be increased by G98.
- In static axis constellations (without axis exchange) the limit value changed in the NC program first remains valid at program end and is also effective in the next NC program activated. Only after CNC reset followed by a program restart does the original default value become valid again.

As of Build V3.1.3077.0 the following applies:

- See description in Section “Supplements to G98 and G99”

## ***Mandatory note on references to other documents***

For the sake of clarity, links to other documents and parameters are abbreviated, e.g. [PROG] for the Programming Manual or P-AXIS-00001 for an axis parameter.

For technical reasons, these links only function in the Online Help (HTML5, CHM) but not in pdf files since pdfs do not support cross-linking.

## 2 Description

### Task

Software limit switch monitoring (SLS monitoring) is used to monitor the command and actual positions of an axis. A positive SLS (P-AXIS-00178) and a negative SLS (P-AXIS-00177) can be configured for each axis.

The positions of the SLS are always referred to the axis coordinate system.

### Condition

The monitored axis must be referenced (G74) or P-AXIS-00014 must be configured.

### Effectiveness

This is why a distinction is made between SLS monitoring based on the command value or actual value.

- Command positions are checked for exact compliance with the SLS.
- A tolerance of the actual position is configured for monitoring overshoots of SLS using P-AXIS-00179. This prevents the output of an error message in the event of negligible overshoots.

Command position related software limit switch monitoring is executed during path preparation.

In certain applications, the command position of axes is influenced by circumstances (e.g. gear coupling) that are unknown when planning contours. In these cases, the parameters P-AXIS-00520 and P-AXIS-00521 can be used in the position controller to activate the monitoring of command position values.

The actual positions are always monitored in the position controller.

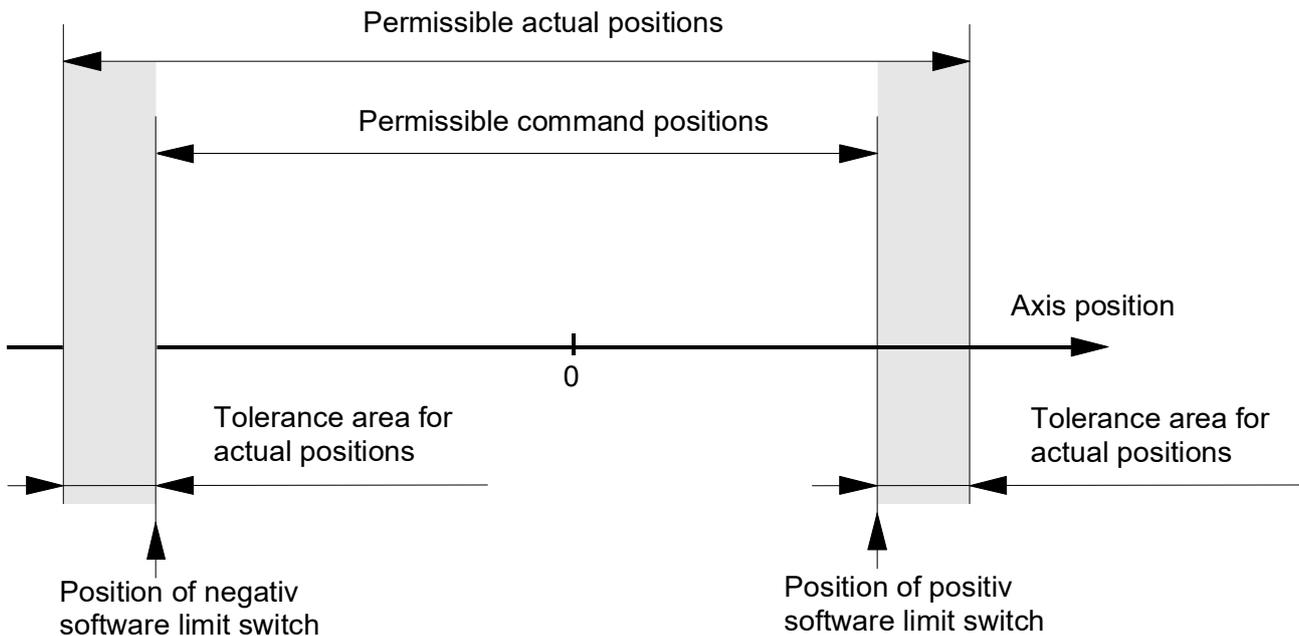


Fig. 1: Position and effectiveness of the software limit switch

### Activation

SLS monitoring of the command and actual positions of an axis is activated in all the operating modes available as soon as the axis is referenced.

As of Build V3.1.3037.11 the parameter P-AXIS-00705 can be used to switch on/off the SLS monitoring feature irrespective of axis type or axis mode.



SLS monitoring of the command and actual positions is not active for rotary axes that were configured as modulo axes.

### ⚠ CAUTION

Incorrectly configured SLS positions may cause personal injury and machine damage

### ⚠ DANGER

If axes are operated without software limit switches, the risk of personal injury and machine damage increases to a considerable extent.

## Warnings, errors and reactions

### Automatic mode and manual block, axis referenced

- Error message P-ERR-120002 or P-ERR-120003: A command position that overshoots an SLS is calculated by an NC block.

1. Interpolation is stopped.
2. The NC program is aborted at this NC block and the axes participating in the motion are stopped.
3. The NC block is not executed; the nominal contour is not violated.

⇒ Reset the controller.

- Error message P-ERR-70021 or P-ERR-70022: The actual value of the axis position overshoots an SLS.

1. Interpolation is stopped.
2. The affected axis is decelerated by a linear velocity profile. The nominal contour may be violated if several axes were involved in the motion.

⇒ Reset the controller.

### Manual mode (HB) with referenced axis (G200/G201)

- Warning P-ERR-50720: A software limit switch is reached in continuous jog mode. The warning is output only if P-MANU-00014 is configured accordingly.

1. The motion is stopped.

⇒ Move back within the valid range.

- Warning P-ERR-150008: In incremental jog mode, the step is no longer executed if it causes an overshoot of an SLS.

1. The motion is stopped.

⇒ Move back within the valid range.



The possible motion range in manual mode can be limited by P-AXIS-00137 and P-AXIS-00138.

### Manual mode (HB) with referenced axis (G200/G201)

Instead of the SLS, the HB offset limits (P-AXIS-00137 and P-AXIS-00138) are used.

- Warning P-ERR-50720: A HB offset limit is reached in continuous jog mode. The warning is output only if P-MANU-00014 is configured accordingly.

1. The motion is stopped.

⇒ Move back within the valid range.

- Warning P-ERR-150008: In incremental jog mode, the step is no longer executed if it causes an overshoot of an HB offset limit.

1. The motion is stopped.

⇒ Move back within the valid range.

**⚠ CAUTION**

If offset limit monitoring is inactive, no range monitoring takes place. This may cause machine damage.

## 2.1 Display motion path limiting

The parameter [P-CHAN-00489 \[▶ 19\]](#) activates the display of motion path limiting. This transforms the active software limit switches of the axis coordinate system (ACS) into the programming coordinate system (PCS) in order to display them.

All offsets are considered (e.g. zero point or tool offsets) and Cartesian transformations (#CS). The parameter [P-CHAN-00434](#) must also be activated to include mirroring.

A display of PCS limits is not possible for axes that are a component of an active kinematic transformation.



**The software limit switches continue to be monitoring at ACS level.**

The PCS data displayed provides information about the axis location relative to the software limit switch and the distance to go without reaching the software limit switch. This also applies to manual mode.

When the parameter [P-CHAN-00489 \[▶ 19\]](#) is set, the CNC objects

- [Positive PCS limit \[▶ 24\]](#)
- [Negative PCS limit \[▶ 24\]](#)

display the motion path limit in the PCS and the CNC objects

- [Distance to positive PCS limit \[▶ 24\]](#)
- [Distance to negative PCS limit \[▶ 24\]](#)

display the distance to go to each path limit.

## 3 Programming

### 3.1 Programming a negative software limit switch

#### Negative software limit switch

The G98 command sets negative SLS in the programmed axes.

- If G90 is active, the negative SLS is set absolute to the programmed value.
- If G91 is active, the programmed value is added relative to P-AXIS-00177.

**G98** is active in each block; the software limit switches programmed using it are active cross-block.



The positions for negative SLS programmed via G98 are stored in the axis-specific variables V.A. SWE.X, V.A. SWE.Y, V.A. SWE.Z, etc. [PROG].

The variables are pre-assigned the value of P-AXIS-00177 of each axis at a reset, mode change or axis change.

#### Negative software limit switch

##### (Example 1 – absolute)

```
%swe_abs.nc
N110 G00 X0 Y0 G90
N120 G00 X20 Y30
```

(Sets neg. SLS in X to -100 and Y to -200)

```
N130 G98 X-100 Y-200
```

( .... )

##### (Example 2 – relative)

```
%swe_rel.nc
N110 G00 X0 Y0 G90
N120 G00 X20 Y30
```

(Offsets neg. SLS in X by 10 and Y by 20)

```
N130 G98 G91 X10 Y20
```

( .... )

**Warnings, errors and reactions**

- Warning P-ERR-21648: The controller uses G98 to calculate a position for the negative SLS that is smaller than the position defined by P-AXIS-00177.
    1. The new position is not taken over.
    2. P-AXIS-00177 continues to define the negative SLS.
      - Error message P-ERR-21649: The controller uses G98 to calculate a position for the negative SLS that is equal to or greater than the position defined by P-AXIS-00178.
    3. The new position is not taken over.
- ⇒ Reset the controller.
- Error message P-ERR-70022: The current actual position of the axis with G98 is smaller than the new negative SLS.
    1. Interpolation is stopped.
    2. The new position of the SLS is taken over.
- ⇒ Reset the controller.
- ⇒ Move within the valid range.

## 3.2 Position of the positive software limit switch

### Positive software limit switch

The command G99 sets the positive SLS in the programmed axes.

- If G90 is active, the positive SLS is set absolute to the programmed value.
- If G91 is active, the programmed value is added relative to P-AXIS-00178.

**G99** is active in each block; the software limit switches programmed using it are active cross-block.



The positions programmed with G99 for the positive SLS are stored in the axis-specific variables V.A.+SWE.X, V.A.+SWE.Y, V.A.+SWE.Z, etc. [PROG].

The variables are pre-assigned the value of P-AXIS-00178 of each axis at a reset, mode change or axis change.

### Positive software limit switch

#### (Example 1 – absolute)

```
%swe_abs.nc
N110 G00 X0 Y0 G90
N120 G00 X20 Y30
```

(Sets pos. SLS in X to 100 and Y to 200)

```
N130 G99 X100 Y200
```

( ... )

#### (Example 2 – relative)

```
%swe_rel.nc
N110 G00 X0 Y0 G90
N120 G00 X20 Y30
```

(Offsets pos. SLS in X by -10 and Y by -20)

```
N130 G99 G91 X-10 Y-20
```

( ... )

**Warnings, errors and reactions**

- Warning P-ERR-21650: The controller uses G99 to calculate a position for the positive SLS that is greater than the position defined by P-AXIS-00178.
    1. The new position is not taken over.
    2. P-AXIS-00178 continues to define the positive SLS.
      - Error message P-ERR-21878: The controller uses G99 to calculate a position for the positive SLS that is equal to or smaller than the position defined by P-AXIS-00177.
    3. The new position is not taken over.
      - Error message P-ERR-70021: The current actual position of the axis with G99 is greater than the new positive SLS.
    4. Interpolation is stopped.
    5. The new position of the SLS is taken over.
- ⇒ Reset the controller.
- ⇒ Move within the valid range.

### 3.3 Extensions to G98 and G99

As of Build V3.1.3077.0, limit switch positions referenced to the limits specified in the axis parameter list can also be **extended** by G98 and G99. This permits a temporary change to an extended section within an NC program and back. The positive limits must continue to be greater than the negative limit. At the next NC program started or after a CNC reset, the configured default values will again apply.

The following applies in

- automatic mode: When G98/G99 are programmed before the motion movement, the limited section compared to the configured setting can also be enlarged.
- Manual mode: When G98/G99 are programmed before manual mode is activated, the limited section compared to the configured setting can be extended:
  - Relative offset limits P-AXIS-00137 and P-AXIS-00138. The new limit acts immediately when manual mode is activated.
  - Absolute offset limits P-AXIS-00492 and P-AXIS-00493: These values are effective if they are entered in the axis parameter list !=0. They can then be set to the maximum configured limit switch positions (P-AXIS-00177, P-AXIS-00178). In this way, the axis cannot move beyond these limits in manual mode, even if the limits are extended by G98 and G99. However, these absolute manual mode limits can be adapted towards the new limit switch positions using CNC objects.

The parameter P-CHAN-00498 [▶ [19](#)] (as of Build V3.1.3080.4) sets the limit behaviour. When P-CHAN-00498 [▶ [19](#)] is set, it is prohibited to extend the limit.

**Increase software limit switch range using G98 and G99**

```
;Assuming: Software limit switches are configured to +- 200 in X, Y
N10 G01 G90 X199
...
N100 G98 X-500 Y-500 ;neg. Software limit switches X and Y -> -500
N200 G99 X500 Y500 ;pos. Software limit switches X and Y -> +500
N300 G01 X450 Y450 ;Move within extended section
...
N400 G01 X100 Y100 ;Back to limited section
N500 G98 X-200 Y-200 ;neg. Software limit switches X and Y -> -200
N600 G99 X200 Y200 ;pos. Software limit switches X and Y -> 200
...
```

## 4 Parameter

### 4.1 Overview of parameters

ID	Description
P-CHAN-00489	Display motion range limits in PCS coordinate system
P-CHAN-00498 <a href="#">▶ 19</a>	Behaviour with programmed software limit switches

ID	Description
P-AXIS-00014	Identifier for absolute measuring system.
P-AXIS-00137	Relative negative offset limit in manual mode.
P-AXIS-00138	Relative positive offset limit in manual operation mode.
P-AXIS-00177	Position of the negative software limit switch
P-AXIS-00178	Position of the positive software limit switch
P-AXIS-00179	Tolerance range of the software limit switch position for actual positions
P-AXIS-00520	Activation of limit switch monitoring of the positive limit switch
P-AXIS-00521	Activation of limit switch monitoring of the negative limit switch
P-AXIS-00554	Behaviour of software limit switches
P-AXIS-00705	Switching software limit monitoring off / on
P-MANU-00014	Output a message at offset limit

### 4.2 Channel parameters

P-CHAN-00489	Display motion range limits in PCS coordinate system
Description	<p>This parameter enables a display of the software limits in the PCS coordinate system. All offsets are considered (e.g. zero point or tool offsets) and Cartesian transformations (#CS). In order to consider active mirroring functions (G21-G23, G351) the channel parameter P-CHAN-00434 must also be activated..</p> <p>A display of PCS limits is not possible for axes that are a component of an active kinematic transformation. In this case, the limits are set to +/-1E200.</p> <p>Offset limits for manual mode are not considered in this review.</p> <p>If the display of PCS motion range limits is activated, the limits can be requested by CNC objects in the data of the interpolator axes of the GEO task,</p> <ul style="list-style-type: none"> <li>• <a href="#">Positive PCS limit <a href="#">▶ 24</a></a></li> <li>• <a href="#">Negative PCS limit <a href="#">▶ 24</a></a></li> <li>• <a href="#">Distance to positive PCS limit <a href="#">▶ 24</a></a></li> <li>• <a href="#">Distance to negative PCS limit <a href="#">▶ 24</a></a></li> </ul>
Parameter	display_pcs_limits
Data type	BOOLEAN
Data range	0: The PCS display of motion range limits is disabled. 1: PCS motion range limits are calculated and supplied.
Dimension	---
Default value	0
Remarks	<p><b>NOTE:</b> A display of PCS limits is not possible for axes that are a component of an active kinematic transformation (#TRAFO) is not possible.</p> <p>This function is available as of CNC Build V3.1.3079.32.</p>

P-CHAN-00498	Behaviour with programmed software limit switches
--------------	---

Description	<p>This parameter defines the limitation behaviour for programming software limits switches in the NC program using G98 and G99.</p> <p>As of CNC Build V3.1.3077.0 it is permitted to increase the range of the software limits switches in the NC program.</p> <p>If this behaviour is not required, the limitation can be activated to the parameterised software limit switches of the corresponding axis parameter list.: (<a href="#">P-AXIS-00177 [▶ 21]</a> and <a href="#">P-AXIS-00178 [▶ 21]</a>)</p> <p>The programmed values for the software limit switches are then limited to the values in the corresponding axis parameter list and the warning ID 21648 or ID 21650 is output.</p> <p>For further information on software limit switches: <a href="#">Extensions to G98 and G99 [▶ 17]</a></p>
Parameter	range_check_prog_soft_limits
Data type	BOOLEAN
Data range	<p>0: No limitation of the programmed values</p> <p>1: Limitation of the programmed values to the range of the software limit switches</p>
Dimension	---
Default value	0
Remarks	Parameter available as of V3.1.3080.4

### 4.3 Axis parameters

<b>P-AXIS-00014</b>	<b>Identification code for absolute path measurement system</b>
Description	If an absolute path measurement system is used, then the parameter must be set to 1. So no homing is necessary.
Parameter	kenngr.abs_pos_gueltig
Data type	BOOLEAN
Data range	0/1
Axis types	T, R, S
Dimension	T: ----   R,S: ----
Default value	0
drive types.	Simulation, SERCOS,
Remarks	

<b>P-AXIS-00137</b>	<b>Relative negative offset limit in manual mode</b>
Description	The parameter defines the relative negative offset limit.
Parameter	handbetrieb.offsetgrenze_neg
Data type	SGN32
Data range	$\text{MIN}(\text{SGN32}) \leq \text{offsetgrenze\_neg} \leq 0$
Axis types	T, R
Dimension	T: 0.1µm   R: 0.0001 °
Default value	-1000000
drive types.	----
Remarks	If both parameters offsetgrenze_neg and offsetgrenze_pos are set to 0, offset monitoring is inactive!

<b>P-AXIS-00138</b>	<b>Relative positive offset limit in manual mode</b>
Description	The parameter defines the relative positive offset limit.
Parameter	handbetrieb.offsetgrenze_pos
Data type	SGN32
Data range	$0 \leq \text{offsetgrenze\_pos} \leq \text{MAX}(\text{SGN32})$

Axis types	T, R	
Dimension	T: 0.1µm	R: 0.0001 °
Default value	1000000	
drive types.	----	
Remarks	If both parameters offsetgrenze_neg and offsetgrenze_pos are set to 0, offset monitoring is inactive!	

<b>P-AXIS-00177</b>	<b>Negative software limit switch</b>	
Description	The parameter defines the possible traverse range in the negative direction (negative software limit switch position). The programmed command positions are always checked on 'kenngr.swe_neg', the actual positions on 'kenngr.swe_neg - kenngr.swe_toleranz'.	
Parameter	kenngr.swe_neg	
Data type	SGN32	
Data range	MIN(SGN32) < swe_neg < P-AXIS-00178	
Axis types	T, R	
Dimension	T: 0.1µm	R: 0.0001 °
Default value	-100000000	
drive types.	----	
Remarks	The value of the parameter is adopted on reset, mode change and axis replacement from the axis record.	

<b>P-AXIS-00178</b>	<b>Positive software limit switch</b>	
Description	The parameter defines the possible traverse range in the positive direction (positive software limit switch position). The programmed command positions are always checked on 'kenngr.swe_pos', the actual positions on 'kenngr.swe_pos + kenngr.swe_toleranz'.	
Parameter	kenngr.swe_pos	
Data type	SGN32	
Data range	P-AXIS-00177 < swe_pos < MAX(SGN32)	
Axis types	T, R	
Dimension	T: 0.1µm	R,S: 0.0001 °
Default value	100000000	
drive types.	----	
Remarks	The value of the parameter is adopted on reset, mode change and axis replacement from the axis record.	

<b>P-AXIS-00179</b>	<b>Tolerance range for software limit switch</b>	
Description	In order to prevent the actual value software limit switch monitoring in the position controller from responding when there is a slight oscillation of an axis (e.g. programmed command position = position of positive software limit switch, actual position > position of positive software limit switch), the software limit switch range in the positive and the negative directions is extended respectively by the parameter. The actual positions must lie within this extended range.	
Parameter	kenngr.swe_toleranz	
Data type	UNS32	
Data range	0 ≤ swe_toleranz ≤ MAX(UNS32)	
Axis types	T, R	
Dimension	T: 0.1µm	R: 0.0001 °
Default value	1000	
drive types.	Simulation, Conventional, Terminal, Lightbus, Profidrive	
Remarks		

<b>P-AXIS-00520</b>	<b>Activation of limit switch monitoring of the positive limit switch.</b>
---------------------	--

Description	<p>Command position related software limit switch monitoring is executed during path preparation. This ensures that a programmed movement that crosses a software limit switch is not executed.</p> <p>In certain situations the command position is influenced by circumstances that are not known in the path preparation process and can thus not be detected in the software limit switch operation of the path planning process. Examples of this are the use of the external command position interface on the HLI or axis couplings via the HLI (see HLI or [FCT-A9]).</p> <p>With both these parameters, a command side software limit switch monitoring can be activated. When monitoring is active it is checked in every interpolation cycle that the axis can stop from their current velocity before the software limit switch when it is decelerated with P-AXIS-00003.</p> <p>The software limits used are the actual values of the software limit switches without considering the software limit switch tolerance (P-AXIS-00179).</p> <p>If the software limit switch is crossed, error message P-ERR-70195 is output and the axis is stopped.</p>
Parameter	lr_param.check_pos_command_limit
Data type	BOOLEAN
Data range	0/1
Axis types	T
Dimension	T: ----
Default value	0
drive types.	----
Remarks	

<b>P-AXIS-00521</b>	<b>Monitoring of limit switch monitoring of the negative limit switch.</b>
Description	<p>Command position related software limit switch monitoring is executed during path preparation. This ensures that a programmed movement that crosses a software limit switch is not executed.</p> <p>In certain situations the command position is influenced by circumstances that are not known in the path preparation process and can thus not be detected in the software limit switch operation of the path planning process. Examples for this are the use of the external command position interface on the HLI or axis couplings via the HLI (see HLI or [FCT-A9]).</p> <p>With both these parameters, a command side software limit switch monitoring can be activated. When monitoring is active it is checked in every interpolation cycle that the axis can stop from their current velocity before the software limit switch when it is decelerated with P-AXIS-00003.</p> <p>The software limits used are the actual values of the software limit switches without considering the software limit switch tolerance (P-AXIS-00179).</p> <p>If the software limit switch is crossed, error message P-ERR-70195 is output and the axis is stopped.</p>
Parameter	lr_param.check_neg_command_limit
Data type	BOOLEAN
Data range	0/1
Axis types	T
Dimension	T: ----
Default value	0
drive types.	----
Remarks	

<b>P-AXIS-00554</b>	<b>Behaviour of software limit switches</b>
---------------------	---

Description	The axis parameter P-AXIS-00554 can influence the error response of the NC kernel if software limit switches are crossed. The software limit switch monitor can output only warnings instead of errors.	
Parameter	kenngr.swe_behaviour	
Data type	STRING	
Data range	ERROR	Crossing software limit switches results in an error already in path preparation.
	ERROR_LR	Crossing software limit switches results in a warning during path preparation. An error is output in the position controller when software limit switches are crossed and this triggers the associated error response.
	WARNING	When software limit switches are crossed, only warnings are output in path preparation and in the position controller.
Axis types	T, R	
Dimension	T: ----	R: ----
Default value	ERROR	
drive types.	----	
Remarks	Parameter available as of V3.01.3066	

<b>P-AXIS-00705</b>	<b>Switching software limit monitoring off / on</b>	
Description	By default, software limit monitoring is active for translatory axes after completion of homing. The same applies to a rotary axis if the bit ACHSMODE_MODULO is not set in the parameter axis mode (P-AXIS-00015) .  This parameter switches the software limit switch monitor on or off independent of the axis type (P-AXIS-00018) and axis mode . The software limit switches are defined by the parameters P-AXIS-00177 and P-AXIS-00178 .	
Parameter	kenngr.swe_check	
Data type	SGN08	
Data range	-1: The effectiveness of the software limit switch monitor is dependent on the axis type and axis mode (default) 0 : Switch off software limit monitoring 1 : Switch on software limit monitoring	
Axis types	T, R	
Dimension	T: ----	R: ----
Default value	-1	
Drive types	----	
Remarks	Parameter available as of V3.1.3066	

## 4.4 Manual mode parameters

<b>P-MANU-00014</b>	<b>Output a message at offset limit</b>	
Description	If this parameter is set to TRUE, the CNC generates a warning if a manual movement stops at a relative offset limit (P-AXIS-00137, P-AXIS-00138) or at an absolute offset limit (P-AXIS-00492, P-AXIS-00493).	
Parameter	move_limit_warning	
Data type	BOOLEAN	
Data range	0/1	
Dimension	----	
Default value	0	
Remarks	This parameter is available as of CNC Build <b>2.11.2804.12</b>	

## 4.5 CNC objects

<b>Name</b>	Positive PCS limit		
<b>Description</b>	This object reads the upper software limit switch in the PCS coordinate system. The precondition is that P-CHAN-00489 is set.		
<b>Task</b>	GEO (Port 551)		
<b>Index group</b>	0x121301	<b>Index offset</b>	0x10096
<b>Data type</b>	REAL64	<b>Length</b>	8
<b>Attributes</b>	read	<b>Unit</b>	[0.1 µm or 0.0001°]
<b>Remarks</b>	Available as of CNC Build V3.1.3079.32		

<b>Name</b>	Negative PCS limit		
<b>Description</b>	This object reads the lower software limit switch in the PCS coordinate system. The precondition is that <u>P-CHAN-00489</u> [ <a href="#">▶ 19</a> ] is set.		
<b>Task</b>	GEO (Port 551)		
<b>Index group</b>	0x121301	<b>Index offset</b>	0x10097
<b>Data type</b>	REAL64	<b>Length</b>	8
<b>Attributes</b>	read	<b>Unit</b>	[0.1 µm or 0.0001°]
<b>Remarks</b>	Available as of CNC Build V3.1.3079.32		

<b>Name</b>	Distance to positive PCS limit		
<b>Description</b>	This object reads the distance to the upper software limit switch in the PCS coordinate system. The precondition is that <u>P-CHAN-00489</u> [ <a href="#">▶ 19</a> ] is set.		
<b>Task</b>	GEO (Port 551)		
<b>Index group</b>	0x121301	<b>Index offset</b>	0x10098
<b>Data type</b>	REAL64	<b>Length</b>	8
<b>Attributes</b>	read	<b>Unit</b>	
<b>Remarks</b>	Available as of CNC Build V3.1.3079.32		

<b>Name</b>	Distance to negative PCS limit		
<b>Description</b>	This object reads the distance to the lower software limit switch in the PCS coordinate system. The precondition is that <u>P-CHAN-00489</u> [ <a href="#">▶ 19</a> ] is set.		
<b>Task</b>	GEO (Port 551)		
<b>Index group</b>	0x121301	<b>Index offset</b>	0x10096
<b>Data type</b>	REAL64	<b>Length</b>	8
<b>Attributes</b>	read	<b>Unit</b>	[0.1 µm or 0.0001°]
<b>Remarks</b>	Available as of CNC Build V3.1.3079.32		

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