Functional description | EN

TF5200 | TwinCAT 3 CNC

Measurement
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.

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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.

NOTE

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
The Measurement function permits the precise measurement of a workpiece using a measuring probe. Therefore, after the probe is triggered, the current axis position is saved.

Effectiveness
The measuring function is initialised and activated for the axes programmed in the measuring probe.

Programming
- G100 and G310 are used to measure a workpiece.
- G101 and G102 utilise the functions saved in the NC program.

Note that with different drives require different parameterisations.

Parametrisation
The axis and channel parameter lists must be parameterised accordingly in order to use the measuring function. These must also be parameterised depending on the drive type.

For more information on this function, see the chapter Parameters [44].

Links 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

Measuring with G100, G310

When measurement is executed using the NC command G100/G310, an axis position is saved (latched) and the measurement run may then be terminated.

By default the current position is latched in the drive hardware; alternatively the state of the measuring probe can be transferred to the CNC over the PLC interface. See [HLI/Control commands of an axis].

The measured results can be queried or included in the calculation in the NC program by means of appropriate variables.

The measurement movement may not be smoothed. If polynomial smoothing is selected, it must be deactivated before the measurement block G100.

Measuring with independent axes

When measurement types 1, 2 or 7 are used, a measurement run can also be executed with independent axes (see [PROG/Independent axes]). The measuring point is latched for each axis involved.

An independent measurement run is also possible in parallel to a path motion of a G100 measurement run.

Measurement with G100

```
%Meas_run
N10 G00 X0 Y0 Z0
N20 X5
N30 G100 X10 Y10 F500
N40 G01 X7
N50 M30
```

The figure shows a representation of the resulting path:

![Figure 1: Resulting path of the measurement run](image)

Measurement with independent axes

```
%Independent_measurement_path
N10 G0 X0 Y0
N20 X[INDP_SYN G100 G90 POS100 FEED500] \ Y[INDP_SYN G100 G90 POS100 FEED1000]
N30 M30
```
Figure 2: Resulting axis movements of the independent measurement run
Basic settings

Channel parameters, setting the default measurement type

After controller start-up, the default measurement type is valid; this is specified in the channel parameters via P-CHAN-00057 (measurement type).

For example, assign the value 1 in the channel parameter list P-CHAN-00057 (measurement type) to execute a measurement run in an NC channel with several axes at the measurement feed rate programmed via the F word.

The following measurement types are available:

<table>
<thead>
<tr>
<th>Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>1*</td>
<td>Measurement run (G100) with at least one axis, Measurement feed programmable by F word.</td>
</tr>
<tr>
<td>2*</td>
<td>Measurement run (G100) with precisely one axis. Measurement feed is specified in the axis data list. An error message is output if the probing signal is missing.</td>
</tr>
<tr>
<td>3</td>
<td>Measurement run (G100) with at least one axis, Measurement feed programmable by F word, optionally continue motion up to the target point.</td>
</tr>
<tr>
<td>4</td>
<td>Measurement run (G100) only with maximum 3 main axes, Measurement feed programmable by F word.</td>
</tr>
<tr>
<td>5</td>
<td>Interruptible measurement run (G210) with at least one axis, Skip GOTO Measurement feed programmable by F word.</td>
</tr>
<tr>
<td>6</td>
<td>Interruptible measurement run (G310) with at least one SERCOS axis, jump via GOTO Measurement feed programmable by F word.</td>
</tr>
<tr>
<td>7*</td>
<td>Measurement run (G100) by moving to a fixed stop with at least one axis, Measurement feed programmable by F word.</td>
</tr>
</tbody>
</table>

* Measurement run also possible with independent axes.

NC program, switching over the measurement type

In the NC program, use

```
#MEAS MODE [ [<expr>] ]
```

(modal)

At any time to select a new measurement type. When #MEAS MODE is programmed without parameters, the default measurement type specified in the channel parameter list is selected.

Axis parameters

The following parameters must be assigned in the axis parameters:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-AXIS-00118</td>
<td>Axis can be used as measurement axis.</td>
</tr>
<tr>
<td>P-AXIS-00086</td>
<td>Measuring probe stroke. Defines the maximum permitted deceleration distance for measurement.</td>
</tr>
<tr>
<td>P-AXIS-00215</td>
<td>Measurement feedrate for measuring (only with measurement type 2)</td>
</tr>
<tr>
<td>P-AXIS-00467</td>
<td>Permissible distance to target point if measuring probe was not operated. (as of CNC Build V2.11.2010.09, old parameter P-AXIS-00114)</td>
</tr>
</tbody>
</table>
### Parameterisation example

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>kenngr.messachse</td>
<td>1</td>
</tr>
<tr>
<td>kenngr.hub_messtaster</td>
<td>100000</td>
</tr>
<tr>
<td>kenngr.vb_messen</td>
<td>10000</td>
</tr>
<tr>
<td>kenngr.probing_offset</td>
<td>0</td>
</tr>
<tr>
<td>kenngr.measure.signal</td>
<td>PLC</td>
</tr>
<tr>
<td>kenngr.measure.input</td>
<td>1</td>
</tr>
<tr>
<td>kenngr.measure.edge</td>
<td>POS</td>
</tr>
</tbody>
</table>
4 Measure with one / several axes

Release axes
All axes in which measurements are to be taken or which could be moved by a measurement run must be enabled for this in the axis parameter list via P-AXIS-00118 and the measurement signal must be looped through to all measurement axes.

Wait for probing signal of moved and released axes

2.5D operation
All axes moved and released during the measuring run must report a measuring signal (latching of the measuring position). If the axis is not moved by G100, no measuring signal is generated in this axis.

Wait for probing signal

| kopf.achs_nr | 1 |
| kopf.log_achs_name | X |
| kenngr.messachse | 1 |
| kopf.achs_nr | 2 |
| kopf.log_achs_name | Y |
| kenngr.messachse | 1 |

%Measurement run
N10 G00 X0 Y1 Z0
N20 X5
N30 G100 X10 F500 (Wait for probing signal from X)
N40 G01 Y3
N50 G100 Y10 F500 (Wait for probing signal from Y)
N60 G01 X10 Y5
N70 G100 X15 Y10 F500 (Wait for probing signal from X & Y)
N100 M30

Figure 3: Programmed path

Cartesian transformation, #CS
For measuring during an active Cartesian transformation, all 3 main axes must be enabled as measuring axes. The measuring signal must be looped through in all measuring axes, regardless of whether the axis was actually moved.

In all Cartesian transformer axes, measurement values are laughed and mapped into corresponding ACS or PCS values.

Cartesian transformation

| kopf.achs_nr | 1 |
Measure with one / several axes

%Measurement run
N10 G00 X0 Y1 Z0

N20 ♭C$ ON[0,0,0,0,0,45]
N30 G100 X10 F500  (Wait for probing signal from X Y
N40 ♭C$ OFF

N50 ♭C$ ON[0,0,0,0,0,90]
N60 G100 X10 F500  (Wait for probing signal from X Y
N70 ♭C$ OFF

N100 M30

Figure 4: Programmed path 2

For measuring during an active kinematic transformation, all kinematic axes must be enabled as measuring axes. The measurement signal must be looped through in all measurement axes, regardless of whether the axis was actually moved.

In all kinematic transformer axes, measured values are latched and mapped into corresponding ACS or PCS values.
5 Programming

Measurement results, \text{V.A.MESS.<axis> V.A.MERF.<axis> V.A.MOFFS.<axis> V.A.MEIN.<axis>}

When a measurement is executed by the NC command G100/G310, an axis position is stored after a measuring probe is triggered. After the measurement interrupt is triggered, the current position is stored (latched) and the measurement run may then be ended.

The positions recorded by the measurement process can be used in the NC program by G101/G102 (calculation of the measurement offset) and special axis-specific variables.

Examples:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>\text{V.A.MESS.&lt;axis&gt;}</td>
<td>Measured value of axis X in the coordinate system in which the measurement took place, including all offsets.</td>
</tr>
<tr>
<td>\text{V.A.MERF.&lt;axis&gt;}</td>
<td>Measurement terminated (TRUE/FALSE). Indicates whether the measurement interrupt is received before the target position is reached.</td>
</tr>
<tr>
<td>\text{V.A.MOFFS.&lt;axis&gt;}</td>
<td>Distance between probing position and programmed target position.</td>
</tr>
<tr>
<td>\text{V.A.MEIN.&lt;axis&gt;}</td>
<td>The current measurement offset of the X axis including the calculation by G101. This acts as an additive offset of the programmed position: $\text{PCS'} = \text{PCS} + \text{measurement offset}_{\text{G101}}$.</td>
</tr>
<tr>
<td>\text{V.G.MEAS_TYPE}</td>
<td>Value of currently active measurement type [\text{as of Build V2.11.2022.03}]. For further information on the measurement function, refer to the program manual [PROG\ Chapter Measurement functions].</td>
</tr>
</tbody>
</table>

\text{V.A.MEAS.ACS.VALUE.<axis>} \text{V.A.MEAS.PCS.VALUE.<axis>}

As of Build V2.11.2020.07 the axis-specific variables \text{V.A.MEAS.ACS.VALUE} and \text{V.A.MEAS.PCS.VALUE} supplement the variable \text{V.A.MESS}. The additional variables supply the measured value both in the axis coordinate system including all offsets as well as the measured value in the programming coordinate system.

Examples:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>\text{V.A.MEAS.ACS.VALUE.&lt;axis&gt;}</td>
<td>Measured value of axis X in the axis coordinate system (ACS). The value contains all offsets.</td>
</tr>
<tr>
<td>\text{V.A.MEAS.PCS.VALUE.&lt;axis&gt;}</td>
<td>Measured value of axis X in the program coordinate system (PCS). The value includes no offsets in the calculation. The ball radius of the measuring probe includes the tool radius specification in the calculation of the PCS value (see example below). The inclusion of the ball radius in the calculation is controlled in the channel parameter P-CHAN-00311.</td>
</tr>
</tbody>
</table>
Measure with a measuring probe tool of 2mm diameter

```plaintext
%meas_example
:
;Measuring probe tool
;with 2mm radius
D1
:
G0 X150 Z200
G100 Z20
:
M30
```

![Diagram of measuring probe tool](image)

Figure 5: Measure with a measuring probe tool of 2mm diameter

**Include the measurement offset in calculations with G101, G102**

The

```
G101 <axisname><fact> { <axisname><fact> } (non-modal)
```

can include an offset in calculations in the NC program.

The measurement offset is the distance between the recorded probing position and the programmed target position. It is calculated as follows:

measurement offset = measuring point – target point

For programmed coordinates, the measurement offset determined from the measured values is included in the calculation of a further offset between programmed and absolute coordinates. An error message is output if no measured values were detected beforehand. The numeral after the axis designation represents the inclusion factor.

The offset caused by the measurement offset is valid until it is deselected by G102.

```
G102 { <axisname><dummy_expr> } (non-modal)
```
If several measurement runs are programmed in sequence, the axis-specific variable `V.A.MERF` when used considers that the values from the previous measurement are retained for non-programmed axes.

The following relationships apply to the calculation of `V.A.MESS.*`, `V.A.MEAS.*` and `V.A.MOFFS.*` (example for X axis):

<table>
<thead>
<tr>
<th>V.A.</th>
<th>Without transformation (2.5D)</th>
<th>With Cartesian transformation #CS ON</th>
<th>With kinematic transformation #TRAFO ON</th>
</tr>
</thead>
<tbody>
<tr>
<td>MESS.X</td>
<td>ACS position (includes all offsets)</td>
<td>Conversion of ACS position into active coordinate system (PCS) including offsets</td>
<td>Conversion of ACS position into active coordinate system (PCS) including offsets</td>
</tr>
<tr>
<td>MEAS.ACS.VALUE.X</td>
<td>ACS position (includes all offsets)</td>
<td>ACS position (includes all offsets)</td>
<td>ACS position (includes all offsets)</td>
</tr>
<tr>
<td>MEAS.PCS.VALUE.X</td>
<td>ACS position (without offsets)</td>
<td>Conversion of ACS position into active coordinate system (PCS) without offsets</td>
<td>Conversion of ACS position into active coordinate system (PCS) without offsets</td>
</tr>
</tbody>
</table>

**Measure in ACS without offsets.**

The programming examples below assume an ideal measuring probe with a ball radius of 0 mm. Assumption: Measuring probe is triggered at ACS position Z=100.
#meas1
N05  #MEAS MODE[1]
N10  G01 G90 Z200 F2000
N20  G100 Z20 F2000
N30  #MSG SYN["V.A.MESS.Z=%f", V.A.MESS.Z]
     -> V.A.MESS.Z = 100.0
N31  #MSG SYN["V.A.MEAS.ACS.VALUE.Z=%f", V.A.MEAS.ACS.VALUE.Z]
     -> V.A.MEAS.ACS.VALUE.Z = 100.0
N32  #MSG SYN["V.A.MEAS.PCS.VALUE.Z=%f", V.A.MEAS.PCS.VALUE.Z]
     -> V.A.MEAS.PCS.VALUE.Z = 100.0
N40  #MSG SYN["V.A.OFFS.Z=%f", V.A.OFFS.Z]
     -> V.A.OFFS.Z = 80.0
N50  #MSG SYN["V.A.MEIN.Z=%f", V.A.MEIN.Z]
     -> V.A.MEIN.Z = 0.0
N60  G101 Z1
N70  #MSG SYN["V.A.MEIN.Z=%f", V.A.MEIN.Z]
     -> V.A.MEIN.Z = 80.0
N80  G01 Z100 F1000
N90  #MSG SYN["V.A.ABS.Z=%f", V.A.ABS.Z]
     -> V.A.ABS.Z = 180.0
N100 G102 Z1
N110 #MSG SYN["V.A.MEIN.Z=%f", V.A.MEIN.Z]
     -> V.A.MEIN.Z = 0.0
N120 G01 Z100 F1000
N130 #MSG SYN["V.A.ABS.Z=%f", V.A.ABS.Z]
     -> V.A.ABS.Z = 100.0
N140 M30

Figure 7: Measure without offsets
Measure with reference point offset

Measure with reference point offset, G92

Assumption: Measuring probe is triggered at ACS position Z=100.

```
  %meas2
N05 #MEAS MODE[1]
N10  G92  Z33
N20  G01  G90  Z200  F2000
N30  G100  Z20  F2000
N40  #MSG SYN["V.A.MESS.Z=%f",  V.A.MESS.Z]
      -> V.A.MESS.Z = 100.0
N41  #MSG SYN["V.A.MEAS.ACS.VALUE.Z=%f",
              V.A.MEAS.ACS.VALUE.Z]
      -> V.A.MEAS.ACS.VALUE.Z = 100.0
N42  #MSG SYN["V.A.MEAS.PCS.VALUE.Z=%f",
              V.A.MEAS.PCS.VALUE.Z]
      -> V.A.MEAS.PCS.VALUE.Z = 67.0
N50  #MSG SYN["V.A.MOFFS.Z=%f",  V.A.MOFFS.Z]
      -> V.A.MOFFS.Z = 47.0
N60  #MSG SYN["V.A.MEIN.Z=%f",  V.A.MEIN.Z]
      -> V.A.MEIN.Z = 0.0
N70  G101  Z1
N80  #MSG SYN["V.A.MEIN.Z=%f",  V.A.MEIN.Z]
      -> V.A.MEIN.Z = 47.0
N90  G01  Z100  F1000
N100 #MSG SYN["V.A.ABS.Z=%f",  V.A.ABS.Z]
      -> V.A.ABS.Z = 180.0
N110 G102  Z1
N120 #MSG SYN["V.A.MEIN.Z=%f",  V.A.MEIN.Z]
      -> V.A.MEIN.Z = 0.0
N130 G01  Z100  F1000
N140 #MSG SYN["V.A.ABS.Z=%f",  V.A.ABS.Z]
      -> V.A.ABS.Z = 133.0
N150 M30
```

Figure 8: Measure with reference point offset
Measure with CS, offset only

Measure with machining coordinate system CS, offset. Assumption: Measuring probe is triggered at ACS position Z=100.

```gcode
%meas3
N05 #MEAS MODE[1]
N10 #CS ON[0,0,33,0,0,0]
N20 G01 G90 Z200 F2000
N30 G100 Z20 F2000
N40 MSG SYN["V.A.MESS.Z=%f", V.A.MESS.Z]
N41 MSG SYN["V.A.MEAS.ACS.VALUE.Z=%f", V.A.MEAS.ACS.VALUE.Z]
N42 MSG SYN["V.A.MEAS.PCS.VALUE.Z=%f", V.A.MEAS.PCS.VALUE.Z]
N50 MSG SYN["V.A.MOFFS.Z=%f", V.A.MOFFS.Z]
N60 MSG SYN["V.A.MEIN.Z=%f", V.A.MEIN.Z]
N70 G101 Z1
N80 MSG SYN["V.A.MEIN.Z=%f", V.A.MEIN.Z]
N90 G01 Z100 F1000
N100 MSG SYN["V.A.ABS.Z=%f", V.A.ABS.Z]
N110 G102 Z1
N120 MSG SYN["V.A.MEIN.Z=%f", V.A.MEIN.Z]
N130 G01 Z100 F1000
N140 MSG SYN["V.A.ABS.Z=%f", V.A.ABS.Z]
N150 #CS OFF
N160 M30
```

![Diagram](image)

Figure 9: Measure with CS, offset only
Measures with CS, offset and rotation

Measure with machining coordinate system CS, offset and rotation. Assumption: Measuring probe is triggered at Z ACS position 55.5mm.

```
m4
N05 #MEAS MODE[1]
N10  #CS ON[0,0,75,0,15,0]
N20  G01 G90 X150 Z100 F2000
N30  G100 Z-10 F1000
N40  #MSG SYN["V.A.MESS.Z=%f", V.A.MESS.Z]
     -> V.A.MESS.Z = 20.0
N41  #MSG SYN["V.A.MEAS.ACS.VALUE.Z=%f",
     V.A.MEAS.ACS.VALUE.Z]
     -> V.A.MEAS.ACS.VALUE.Z = 55.5
N42  #MSG SYN["V.A.MEAS.PCS.VALUE.Z=%f",
     V.A.MEAS.PCS.VALUE.Z]
     -> V.A.MEAS.PCS.VALUE.Z = 20.0
N50  #MSG SYN["V.A.MOFFS.Z=%f", V.A.MOFFS.Z]
     -> V.A.MOFFS.Z = 30.0
N60  #MSG SYN["V.A.MEIN.Z=%f", V.A.MEIN.Z]
     -> V.A.MEIN.Z = 0.0
N70  G101 Z1
N80  #MSG SYN["V.A.MEIN.Z=%f", V.A.MEIN.Z]
     -> V.A.MEIN.Z = 30.0
N90  G01 Z50 F1000
N100 #MSG SYN["V.A.ABS.Z=%f", V.A.ABS.Z]
     -> V.A.ABS.Z = 80.0
N110 G102 Z1
N120 #MSG SYN["V.A.MEIN.Z=%f", V.A.MEIN.Z]
     -> V.A.MEIN.Z = 0.0
N130 G01 Z50 F1000
N140 #MSG SYN["V.A.ABS.Z=%f", V.A.ABS.Z]
     -> V.A.ABS.Z = 50.0
N150 #CS OFF
N160 M30
```
Figure 10: Measure with CS, offset and rotation
6 Measured value detected in the drive hardware

6.1 SERCOS

Drive parameters

The following parameters must be set in the drive in order to use the measurement function:

- Real-time control and status bits used
- Measuring probe to be used
- Measuring probe control parameters
- Measured value in the cyclic telegram

Refer to the drive documentation for details of the parameters supported by the relevant drive.

In addition, a digital input of the drive amplifier may have to be parameterised as a measurement input. For details, refer to the drive amplifier documentation.

Real-time bits

The two real-time status bits and one real-time control bit are required for the measurement. The real-time status bits transfer the following information from the drive to the NC kernel:

- Edge occurred at measurement input (measurement completed)
- Measuring probe operated

In addition, a real-time control bit is required to activate the edge evaluation of the measurement input in the drive (enable measurement).

Assignment of the control and status bits used by the NC kernel is set in the NC kernel by the parameter P-AXIS-00060. In addition, parameters must be set accordingly in the drive amplifier.

The table below shows the assignment of P-AXIS-00060 in the NC kernel to the status and control bits used.

<table>
<thead>
<tr>
<th>P-AXIS-00060</th>
<th>Control bits</th>
<th>Status bits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Measurement</td>
<td>measurement</td>
</tr>
<tr>
<td></td>
<td>Enable</td>
<td>done</td>
</tr>
<tr>
<td>0, no entry</td>
<td>Real-time control bit 1</td>
<td>P-AXIS-00106</td>
</tr>
<tr>
<td>1</td>
<td>Real-time control bit 1</td>
<td>Real-time status bit 1</td>
</tr>
<tr>
<td>2</td>
<td>Real-time control bit 2</td>
<td>Real-time status bit 2</td>
</tr>
</tbody>
</table>

We recommend setting P-AXIS-00060 either to value 1 or 2. Value 0 is only present for reasons of backwards compatibility and requires additional settings in P-AXIS-00106.

Measuring probe control parameters

The measuring probe control parameter (S-0-0169) is used to configure which measuring probe and which edge of the probing signal is to be used in the drive. This parameter determines where the positions detected are stored in the various SERCOS IDs. The SERCOS IDs must then be transferred in the cyclic actual value telegram of the drive.

<table>
<thead>
<tr>
<th>Measuring probe/edge</th>
<th>Measuring probe control parameters S-0-0169</th>
<th>Measured value identification</th>
</tr>
</thead>
</table>
### Measured value detected in the drive hardware

| Measuring probe 1, positive edge | S-0-0169 = 1 | S-0-0130 |
| Measuring probe 1, negative edge | S-0-0169 = 2 | S-0-0131 |
| Measuring probe 2, positive edge | S-0-0169 = 4 | S-0-0132 |
| Measuring probe 2, negative edge | S-0-0169 = 8 | S-0-0133 |

### Parameterisation of the cyclic telegram

The measured value identification specified in the table above must be configured in the cyclic actual value telegram depending on the measuring probe control parameter.

### Axis parameters

For Lightbus drives, the following entries must be assigned in the axis parameter lists:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-AXIS-00516</td>
<td>Measuring by drive: kenngr.measure.signal DRIVE</td>
</tr>
<tr>
<td>(old: P-AXIS-00116)</td>
<td></td>
</tr>
<tr>
<td>P-AXIS-00518</td>
<td>Latch at positive or negative probing signal edge: kenngr.measure.edge POS / NEG</td>
</tr>
<tr>
<td>(old: P-AXIS-00113)</td>
<td></td>
</tr>
</tbody>
</table>
**Parameterise a SERCOS drive**

The steps required to parameterise a SERCOS drive are presented in a flowchart on the following pages.

**Configuration of SERCOS-Measurement**

Real time bit 1

- Axis parameter: kengr.messachse 1
- kengr.vc_messen 10000
- kengr.measurement.signal DRIVE
- kengr.mess_offset 0

- Real time bits 1,2

- Assignment of real time control bit 1:
  - S-0-0301 = 405 (Release of sensor 1)
  - Assignment of real time status bit 2
  - S-0-0307 = 401 (State of sensor 1)

- Assignment of real time bit 1:
  - S-0-0301 = 405 (Release of Sensor 2)
  - Assignment of real time status bit 2
  - S-0-0307 = 402 (State of sensor 2)

- Measurement of sensor

- Axis parameter:
  - kengr.schneid_bit_nr = 1

- Yes

  - S-0-0169 = 1 (Sensor 1, pos. edge)
  - Assignment of real time status bit 1:
    - S-0-0305 = 409 (Measuring value 1, positive acquisition)
    - Cyc. actual value: Configuration of S-0-0130 (Measuring value 1 pos.)
  - Axis parameter:
    - kengr.mess_neg_flanke = 0

- No

  - Measurement of pos. edge

  - S-0-0169 = 2 (Sensor 1, neg. edge)
  - Assignment of real time status bit 1:
    - S-0-0305 = 410 (Measuring value 1, negative acquisition)
    - Cyc. actual value: Configuration of S-0-0131 (Measuring value 1 neg.)
  - Axis parameter:
    - kengr.mess_neg_flanke = 1

- Yes

  - S-0-0169 = 4 (Sensor 2, pos. edge)
  - Assignment of real time status bit 1:
    - S-0-0305 = 411 (Measuring value 2, positive acquisition)
    - Cyc. actual value: Configuration of S-0-0132 (Measuring value 2 pos.)
  - Axis parameter:
    - kengr.mess_neg_flanke = 0

- No

  - Measurement of pos. edge

  - S-0-0169 = 8 (Sensor 2, neg. edge)
  - Assignment of real time status bit 1:
    - S-0-0305 = 412 (Measuring value 2, negative acquisition)
    - Cyc. actual value: Configuration of S-0-0133 (Measuring value 2 neg.)
  - Axis parameter:
    - kengr.mess_neg_flanke = 1

- End

Figure 11: Flowchart to parameterise a SERCOS drive
Figure 12: Configuration of SERCOS measurement real-time bit no. 2

Axis parameter

The following parameters are necessary in the drive and in the NC kernel to configure the measurement function of a SERCOS drive on the rising edge of measuring probe 1 using the real time and status bits 1.

- `kenngr.hub_messtaster` = 2000
- `kenngr.vb_measen` = 2000
- `kenngr.messachse` = 1
- `kenngr.measure.signal` = DRIVE
- `kenngr.echtzeit_bit_nr` = 1
Measured value detected in the drive hardware

Cyclic telegram

Identification S-0-0130 must also be configured when a cyclic telegram is configured:
Figure 14: ID S-0-0130 must also be configured:
Drive

The real time bits 1 and measuring probe 1 are used:

- S-0-0301 = 405 (real-time control bit 1 = measuring probe 1 enabled)
- S-0-0305 = 409 (real-time status bit 1 = measuring probe 1, positive detected)
- S-0-0307 = 401 (real-time status bit 2 = measuring probe 1)

Figure 15: Real-time bits in the Editor

Measuring probe control word

The value 1 must be entered in the measuring probe control word:

S-0-0169 = 1 (measuring probe 1 positive edge)
Measured value detected in the drive hardware

Figure 16: Probe control word with value 1
6.2 Lightbus

Drive parameters

Digital input 2 in the drive must be programmed as the probing input in order to use the measurement function. The value 26 must then be assigned to the drive parameter IN2MODE. Connect the measuring probe to the digital input 2 (X3 terminal 12).

Figure 17: Configure digital input 2 as probing input

Axis parameters

For Lightbus drives, the following entries must be assigned in the axis parameter lists:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latch at positive or negative probing signal edge:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>kenngr.measure.edge</td>
<td>POS / NEG</td>
<td></td>
</tr>
</tbody>
</table>
6.3 Terminal drives

Drive parameter / measuring probe terminal
Connect the measuring probe to terminal 4 of the incremental encoder interface KL5101.

Axis parameters
For terminal drives, assign the following entries in the axis parameter lists:

| P-AXIS-00518 (old P-AXIS-00113) | Latch at positive probing signal edge (measurement at negative edge is not supported by the Encoder Interface):
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>kenngr.measure.edge POS</td>
<td></td>
</tr>
</tbody>
</table>


6.4 EtherCAT

Drive parameters

In order to use the measurement function, the ‘position latch’ function must be assigned to a digital input in the drive.

1. The value 26 must then be assigned to the drive parameter IN1MODE or IN2MODE.
2. Connect the measuring probe to the digital input (X3 terminal 11 or 12) used in each case.
3. The value 6 must then be assigned to the drive parameter DRVCFG2.

**Figure 18:** Configure digital input 2 as probing input

**Parameterise the cyclic telegram**

When the measurement function is used in the cyclic actual value telegram, a telegram type must be configured by transmitting the following data:

- Latch status word
- Latch position

A telegram type must be configured in the cycle command value telegram by transmitting the latch control word.
Figure 19: Cyclic command value telegram for measuring
Figure 20: Cyclic actual value telegram for measuring
**Axis parameters**

Assign the following entries in the axis parameter lists for EtherCAT drives:

- Select probing signal edge by P-AXIS-00518
- Select probing input used on the drive (Digital Input 1 or 2) by the parameter P-AXIS-00517

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-AXIS-00518</td>
<td>Latch on positive or negative probing signal edge:</td>
</tr>
<tr>
<td>(old P-AXIS-00113)</td>
<td>kenngr.measure.edge POS / NEG</td>
</tr>
<tr>
<td>P-AXIS-00517</td>
<td>Select the number of the digital probing input in the drive (1/2):</td>
</tr>
<tr>
<td>(old P-AXIS-00295)</td>
<td>kenngr.measure.input 1 / 2</td>
</tr>
</tbody>
</table>
6.5 PROFIDRIVE

Drive parameters
In order to use the measurement function, the rapid digital input I0.0, or I0.X for a double-axis module, must be programmed.

1. The value 80 must then be assigned to the drive parameter P0660.
2. Connect the measuring probe to the digital input I0.0 or I0.X.

Axis parameters
For PROFIBUS drives, the following entries must be assigned in the axis parameter lists:

<table>
<thead>
<tr>
<th>P-AXIS-00518 (old P-AXIS-00113)</th>
<th>Latch at positive or negative probing signal edge:</th>
</tr>
</thead>
<tbody>
<tr>
<td>kenngr.measure.edge POS / NEG</td>
<td></td>
</tr>
</tbody>
</table>
7 Measured value detection in the CNC

For special applications or if the drive hardware used provides no latch function, the measured value can be detected in the CNC.

7.1 Measuring probe signal via PLC interface

CNC – SPS

The status of the measuring probe signal is then transmitted to the CNC via the PLC interface; the CNC assumes edge evaluation and measured value detection. The task of the PLC is to read in the measuring probe signal and supply the signal to the PLC interface. See also [HLl// Control commands of an axis].

The measured value is the actual value at the time of occurrence of the probing signal.

Axis parameters

To activate this function, assign the value PLC to the axis parameter P-AXIS-00516. Therefore, this parameter permits switchover only between probing signal detection modes via the drive or via probing signal detection via the PLC.

The accuracy of the measured values detected is dependent on the cycle time of the CNC and the PLC. The accuracy of the measured values detected in the drive is generally more precise since the position controller or the speed controller cycle time in the drive are used to evaluate the measured values.
7.2 Measurement run to fixed stop

Default setting
When a measurement run is executed with motion to a fixed stop, torque limitation must be activated in all drives involved and any drive-based position lag error monitor must be disabled.

Measurement on the path
The measurement run ends as soon as the fixed stop is detected in one of the axes involved in the measurement run.

Measurement with gantry axes
With gantry systems (soft and hard gantry), the master axis is always used for measuring. During the measurement run, the slave axes are also moved. For this reason, torque limitation must also be activated and position lag monitoring disabled for motions to a fixed stop in slave axis drives.

On TwinCAT systems, torque limitation or position lag monitoring disable in the drives can be alternatively enabled in the PLC (via ADS) instead of the NC program (#IDENT...).

Channel parameters
The following parameters must be assigned in the channel parameter list:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-CHAN-00057</td>
<td>Measurement type 7 for measurement by moving to a fixed stop:</td>
</tr>
<tr>
<td></td>
<td>measenc 7</td>
</tr>
<tr>
<td>P-CHAN-00266</td>
<td>Error response with measurement type 7</td>
</tr>
<tr>
<td></td>
<td>meas_fixed_stop_no_error</td>
</tr>
<tr>
<td></td>
<td>e.g. with value 1</td>
</tr>
</tbody>
</table>

Select measurement type in the NC program
Alternatively, the measurement type can be changed in the NC program by the command #MEAS MODE[7].
**Axis parameters**

The following entries must be assigned in the axis parameter lists:

<table>
<thead>
<tr>
<th>Axis Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-AXIS-00516 (old P-AXIS-00330)</td>
<td>Select the Fixed Stop probing signal source: kengr.measure.signal FIXED_STOP</td>
</tr>
<tr>
<td>P-AXIS-00331</td>
<td>Position lag limit: kengr.fixed_stop_pos_lag_limit e.g. with value 10000 [0.1µm or 0.0001°]</td>
</tr>
<tr>
<td>P-AXIS-00332</td>
<td>Number of position control cycles: kengr.fixed_stop_nbr_cycles e.g. with value 10</td>
</tr>
</tbody>
</table>

**Sequence of measurement run**

Measurement by motion to a fixed stop can be illustrated by the example of SERCOS drives as shown in the sequence below.

**NC program (user):**

1. Reduce bipolar torque limit S-0-0092 for all drives involved in the measurement run (e.g. by the NC command #IDENT WR SYN).
2. Disable position lag monitoring in the drives:
   ID S-0-0159 = 0
3. Start measurement run (G100).

**CNC:**

1. Disable position lag monitoring in the position controller for all axes involved in the measurement run.
2. Start of measurement run
3. Adopt actual position as measured value if the position lag exceeds the specified limit P-AXIS-00331. On gantry systems, only the master axis is monitored.
4. Reduce interpolation to measured value by axis position lag.
5. Enable position lag monitoring in the position controller.

**NC program (user):**

1. Move away from fixed stop (e.g. G01).
2. Enable position lag monitoring in the drives (set S-0-0159 to original value).
3. NC program: Disable torque limiting in the drives (set S-0-0092 to original value).
Measurement run to fixed stop with a gantry system
(Soft Gantry):

; enable SoftGantry
N010 G0 X100 Z2=0
N020 #SET AX LINK[1, [X2=X, G, 15, 20]]
N030 #ENABLE AX LINK[1]

; read values from drives
N040 #IDENT RD [AXNR 1 ID S=0-0092 P=P1092 TYP 2 DEC 0 SERC]
N050 #IDENT RD [AXNR 1 ID S=0-0159 P=P1159 TYP 4 DEC 0 SERC]
N060 #IDENT RD [AXNR 4 ID S=0-0092 P=P2092 TYP 2 DEC 0 SERC]
N070 #IDENT RD [AXNR 4 ID S=0-0159 P=P2159 TYP 4 DEC 0 SERC]

; enable torque limiting
N080 #IDENT WR SYN [AXNR 1 ID S=0-0092 VAL=100 TYP 2 DEC 0 SERC]
N090 #IDENT WR SYN [AXNR 4 ID S=0-0092 VAL=100 TYP 2 DEC 0 SERC]

; disable position lag monitoring in drives
N100 #IDENT WR SYN [AXNR 1 ID S=0-0159 VAL=0 TYP 4 DEC 0 SERC]
N110 #IDENT WR SYN [AXNR 4 ID S=0-0159 VAL=0 TYP 4 DEC 0 SERC]

; start measurement run
N120 G100 X1000 Y1000 Z1000 Z2=1000 F1000

; move away from fixed stop
N130 G01 X1000 F1000

; re-enable position lag monitoring
N140 #IDENT WR SYN [AXNR 1 ID S=0-0159 VAL=P1159 TYP 4 DEC 0 SERC]
N150 #IDENT WR SYN [AXNR 4 ID S=0-0159 VAL=P2159 TYP 4 DEC 0 SERC]

; disable torque limiting
N160 #IDENT WR SYN [AXNR 1 ID S=0-0092 VAL=P1092 TYP 2 DEC 0 SERC]
N170 #IDENT WR SYN [AXNR 4 ID S=0-0092 VAL=P2092 TYP 2 DEC 0 SERC]

N180 M30
7.3 Measure with external measuring hardware

Basics

If the control of an external measuring hardware required for the measurement run, the external measurement interface between the CNC and the PLC can be used. The CNC informs the PLC of the start and end of a measurement run so that the PLC can enable and disable the measuring hardware accordingly.

CNC – SPS

At the start of a measurement run, the CNC writes the task ‘Enable probe” containing the required parameter number of the probing input and the relevant edge in the task ‘Enable probe” and sets X_Please = TRUE.

After reading (X_Please = FALSE) and enabling the measuring hardware, the PLC acknowledges the task with X_Done = TRUE). Accordingly, if the position latch is successful or aborted, the CNC signals the end of the measurement run with a CNC reset. Please note that the PLC must always acknowledge these tasks.

For more information on the interface structure, refer to the HLI documentation ([HLI]).

After the measurement event occurs, the PLC writes the detected probing position to the control unit MCControlSGN32Unit_ProbingPosition and then signals the measurement event to the control unit MCControlBoolUnit_ProbingSignal (see [HLI//Control commands of an axis]).

When the external measuring interface is used, the probing signal of the control unit MCControl-BoolUnit_ProbingSignal is not dependent on the relevant measuring edge P-AXIS-00518. A positive edge always signals the successful detection of a measured value in the external measuring hardware.

If the control unit MCControlSGN32Unit_ProbingPosition is not enabled when the measurement event occurs, the actual value at the time stamp of the probing signal occurrence is used.

Axis parameters

The following axis parameters are required for measuring with the CNC-PLC interface:

| P-AXIS-00516 | Select the external measurement interface: kenngr.measure.signal PLC_EXT_LATCH_CONTROL |
| P-AXIS-00517 | Number of the probing input used kenngr.measure.input 4 |
| P-AXIS-00518 | Relevant measuring edge: kenngr.measure.edge NEG |

Alternatively, the measuring interface can also be enabled in the NC program by the #MEAS command (see [PROG//Extended programming]).
Figure 21: Time sequence of a measurement run with the external measuring interface
## 8 Parameter

### 8.1 Overview

<table>
<thead>
<tr>
<th>ID</th>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-CHAN-00057</td>
<td>mess_typ</td>
<td>Set the default measurement type</td>
</tr>
<tr>
<td>P-CHAN-00266</td>
<td>meas_fixed_stop_no_error</td>
<td>Error response with measurement type 7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ID</th>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-AXIS-00516</td>
<td>measure.signal</td>
<td>Probing signal</td>
</tr>
<tr>
<td>P-AXIS-00517</td>
<td>measure.input</td>
<td>Number of probing input</td>
</tr>
<tr>
<td>P-AXIS-00518</td>
<td>measure.edge</td>
<td>Relevant measuring edge</td>
</tr>
<tr>
<td>P-AXIS-00086</td>
<td>hub_messtaster</td>
<td>Measuring probe stroke</td>
</tr>
<tr>
<td>P-AXIS-00467</td>
<td>probing_offset</td>
<td>Permitted path after target point</td>
</tr>
<tr>
<td>P-AXIS-00118</td>
<td>messachse</td>
<td>Axis can be used as measurement axis.</td>
</tr>
<tr>
<td>P-AXIS-00215</td>
<td>vb_messen</td>
<td>Measurement feed rate in accordance with measurement type 2</td>
</tr>
<tr>
<td>P-AXIS-00060</td>
<td>echtzeit_bit_nr</td>
<td>Number of real-time bit used for SERCOS drives</td>
</tr>
<tr>
<td>P-AXIS-00331</td>
<td>fixed_stop_pos_lag_limit</td>
<td>Position lag limit</td>
</tr>
<tr>
<td>P-AXIS-00332</td>
<td>fixed_stop_nbr_cycles</td>
<td>Number of position control cycles</td>
</tr>
</tbody>
</table>

Old parameter up to CNC Build V.2.11.2019.14 (available for downward compatibility)

<table>
<thead>
<tr>
<th>ID</th>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-AXIS-00113</td>
<td>mess_neg_flanke</td>
<td>Probing signal edge</td>
</tr>
<tr>
<td>P-AXIS-00115</td>
<td>mess_signal_achs_steuer</td>
<td>Consider external probing signals</td>
</tr>
<tr>
<td>P-AXIS-00116</td>
<td>mess_signal_sercos</td>
<td>Read in the probing signal with SERCOS</td>
</tr>
<tr>
<td>P-AXIS-00117</td>
<td>mess_signal_taster</td>
<td>Measuring probe signal via hardware interface</td>
</tr>
<tr>
<td>P-AXIS-00257</td>
<td>probing_signal_via_plc</td>
<td>Measured value detection in the CNC</td>
</tr>
<tr>
<td>P-AXIS-00330</td>
<td>meas_signal_fixed_stop</td>
<td>Measurement with motion to a fixed stop</td>
</tr>
</tbody>
</table>
8.2 Description

8.2.1 Channel parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Predefine measurement type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Seven different measurement types are available. This element sets the required measurement type.</td>
</tr>
<tr>
<td>Parameter</td>
<td>messtyp</td>
</tr>
<tr>
<td>Data type</td>
<td>UNS16</td>
</tr>
<tr>
<td>Data range</td>
<td>1*: Measurement run with at least one axis, Measurement feed programmable by F word.</td>
</tr>
<tr>
<td></td>
<td>2*: Measurement run with exactly one axis. Measurement feed is specified in the axis data list.</td>
</tr>
<tr>
<td></td>
<td>3: Measurement run with at least one axis, Measurement feed programmable by F word, optionally continue motion up to the target point.</td>
</tr>
<tr>
<td></td>
<td>4: Measurement run only with the maximum of 3 main axes, Measurement feed programmable by F word.</td>
</tr>
<tr>
<td></td>
<td>5: Interruptible measurement run with at least one axis, Measurement feed programmable by F word.</td>
</tr>
<tr>
<td></td>
<td>6: Interruptible measurement run with at least one SERCOS axis, Measurement feed programmable by F word.</td>
</tr>
<tr>
<td></td>
<td>7*: Measurement run (G100) by moving to a fixed stop with at least one axis, Measurement feed programmable by F word.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dimension</th>
<th>----</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default value</td>
<td>1</td>
</tr>
<tr>
<td>Remarks</td>
<td>* for these measurement types a measurement run is also possible independent axes. This measurement type can be changed at any time in the NC program with #MEAS MODE or #MEAS [TYPE..]. Further information is described in detail in [PROG]. Parameterisation example: Select measurement type 3 for a measurement run with two axes and then continue motion up to the programmed target point. Measurement type 3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Error reaction with measurement type 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>With measurement type 7 (measuring with motion to fixed stop), this parameter influences the error response when the fixed stop is not detected in the measurement block. If no error message is output when the fixed stop is not found, the CNC still goes to the position of the current axis actual value at the end of the measurement run in order to eliminate a possible position lag (e.g. if the specified position lag is not reached completely).</td>
</tr>
<tr>
<td>Parameter</td>
<td>meas_fixed_stop_no_error</td>
</tr>
<tr>
<td>Data type</td>
<td>BOOLEAN</td>
</tr>
<tr>
<td>Data range</td>
<td>0: Output of an error message if the fixed stop is not detected (default). 1: No output of an error message if the fixed stop is not detected.</td>
</tr>
<tr>
<td>Dimension</td>
<td>----</td>
</tr>
<tr>
<td>Default value</td>
<td>0</td>
</tr>
</tbody>
</table>
### Axis parameters

#### P-AXIS-00516  
**Measurement methods**

| Description | The parameter defines the source of the measuring signal during a measuring traverse, e.g. the probing position can be latched in the drive or the measuring signal can be provided by the PLC. The measuring signal source can also be changed in the NC program with the #MEAS command (s. [PROG//Extended programming]).
| Data type | STRING
| Data range | DRIVE_TYPE_DEFAULT, PLC, FIXED_-STOP, DRIVE, PLC_EXT_LATCH_CONTROL, PLC_FIRST_EVENT
| Axis types | T, R, S
| Default value | -
| Drive types | ----

**Remarks**

For backward compatibility reasons, the settings resulting from the old parameters are used if the parameter P-AXIS-00516 is not defined.

#### P-AXIS-00517  
**Number of probing input**

| Description | The parameter defines the measuring channel, which is used during a measuring traverse. When the DRIVE measuring signal is set (see P-AXIS-00516) the selected measuring channel must also be parametrised in the drive (see @@[FCT-C4]).
| Parameter | kenngr.measure.input
| Data type | UNS08
### Measuring signal

<table>
<thead>
<tr>
<th>Measuring signal</th>
<th>Drive type</th>
<th>Measuring input</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLC_EXT_LATCH_CONTROL</td>
<td>all</td>
<td>1 to 255</td>
</tr>
<tr>
<td>DRIVE</td>
<td>SERCOS</td>
<td>1 to 2</td>
</tr>
<tr>
<td></td>
<td>CANopen</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PROFIDRIVE MC</td>
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<td></td>
<td>Conventional</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Beckhoff Lightbus</td>
<td></td>
</tr>
<tr>
<td></td>
<td>+-10V via field bus</td>
<td></td>
</tr>
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<td></td>
<td>Real-time (RT)-Ethernet</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CAN-Bus</td>
<td></td>
</tr>
</tbody>
</table>

### Axis types
- T, R, S

### Dimension
- T: ----
- R, S: ----

### Default value
- 0

### Drive types
- ----

### Remarks
- All measuring signals which are not shown above do not use the parameter 'Input' for the measuring channel!
- If P-AXIS-00517 is not specified, the CNC uses the old setting from the parameter P-AXIS-00430 due to backward compatibility.

---

### P-AXIS-00518 Pulse edge

**Description**
The axis parameter defines the edge of the measuring signal which is used to latch the position value. The parameter replaces the setting kenngr.mess_neg_flanke (P-AXIS-00113).

**Parameter**
kenngr.measure.edge

**Data type**
STRING

**Data range**
- POS: Latching if positive measured signal edge
- NEG: Latching if negative measured signal edge

**Axis types**
- T, R, S

**Dimension**
- T: ----
- R, S: ----

**Default value**
- "

**Drive types**
- ----

**Remarks**
- If P-AXIS-00518 is not specified, the CNC uses the old setting from the parameter P-AXIS-00113 due to backward compatibility.

---

### P-AXIS-00086 Probe stroke for measurement types 2 and 4

**Description**
Some types of mechanical probes have a limited stroke. After activating the probe, the axis continues to travel by the braking distance which is dependent on the axis speed and the allowed axis deceleration. In order to avoid damage to the probe, the maximum permitted stroke can be parametrised. This parameter is only effective for measurement types 2 and 4 (see P-CHAN-00057). When using these types the measurement speed is limited in such a way that the braking distance is less than the probe stroke. If measurement speed correction is executed, a warning is output.

**Parameter**
kenngr.hub_messtaster

**Data type**
UNS32

**Data range**
0 ≤ hub_messtaster ≤ MAX(UNS32)

**Axis types**
- T, R

**Dimension**
- T: 0.1µm
- R: 0.0001°

**Default value**
- 50000

**Drive types**
- ----
Remarks

A buffer exists between the interpolator and the position controller to calculate the parameters for feed forward control of axes. This results in a dead time between calculating a setpoint by the interpolator and its execution in the position controller. In the worst case, an error may occur during measurement travel because the interpolator, which monitors the stroke of the measuring probe, ignores the distance components in the buffer. This can be prevented by enlarging the actual measurement probe stroke.

P-AXIS-00467 Measurement travel offset for all measurement types

Description

The measurement travel offset defines how much further the axis is allowed to move past the programmed target position if the probe was not yet actuated and the destination point is already reached. This parameter is not effective in measurement mode 3 (see P-CHAN-00057) with optional movement to the destination point!

Parameter kenngr.probing_offset

Data type UNS32

Data range $0 \leq \text{probing}\_\text{offset} \leq \text{MAX(UNS32)}$

Axis types T, R

Dimension $T: 0.1\mu m$ $R: 0.0001^\circ$

Default value 0

Drive types ----

Remarks

From Version V2.11.2010.09 the parameter P-AXIS-00467 replaces the parameter P-AXIS-00114. For compatibility reasons, the parameter continues to be available, but it should not be used in new applications because it only has an influence on measurement traverses with measurement type 2 (see P-CHAN-00057).

The influence of P-AXIS-00467 is more general. It can be used for all measurement types P-CHAN-00057 except for type 3 (optional further traverse up to the destination point).

P-AXIS-00118 Define axis as measurement axis

Description

The parameter must be assigned to TRUE for all axes that participate in a measurement traverse.

Parameter kenngr.messachse

Data type BOOLEAN

Data range 0/1

Axis types T, R

Dimension $T: ----$ $R: ----$

Default value 0

Drive types ----

Remarks

P-AXIS-00215 Measurement speed for measurement type 2

Description

Depending on the application, measurement travel does not take place with the programmed feed, but with the feed defined by this parameter.

Parameter kenngr.vb\_messen

Data type UNS32

Data range $1 \leq \text{vb}\_\text{messen} \leq \text{P-AXIS-00212}$

Axis types T, R

Dimension $T: \mu m/s$ $R,S: 0.001^\circ/s$

Default value 16666

Drive types ----

Remarks

This parameter is only used for measurement type 2 [PROG], [CHAN].

P-AXIS-00060 SERCOS-status/control bit for measurement
<table>
<thead>
<tr>
<th>Description</th>
<th>This entry defines the real time state/control bits used for probing.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter</td>
<td>kenngr.echtzeit_bit_nr</td>
</tr>
<tr>
<td>Data type</td>
<td>UNS08</td>
</tr>
<tr>
<td>Data range</td>
<td>$0 \leq \text{echzeit_bit_nr} \leq 2$</td>
</tr>
<tr>
<td>Assignment</td>
<td>According to the table below:</td>
</tr>
<tr>
<td>P-AXIS-00060</td>
<td></td>
</tr>
<tr>
<td>Control bits</td>
<td></td>
</tr>
<tr>
<td>Status bits</td>
<td></td>
</tr>
<tr>
<td>Measurement</td>
<td></td>
</tr>
<tr>
<td>Enable</td>
<td>0, 1</td>
</tr>
<tr>
<td>Measuring</td>
<td>P-AXIS-00106</td>
</tr>
<tr>
<td>done</td>
<td>1, 2</td>
</tr>
<tr>
<td>Measuring probe activated</td>
<td>2, 1</td>
</tr>
<tr>
<td>Axis types</td>
<td>T, R</td>
</tr>
<tr>
<td>Dimension</td>
<td>T: ----</td>
</tr>
<tr>
<td></td>
<td>R: ----</td>
</tr>
<tr>
<td>Default value</td>
<td>0</td>
</tr>
<tr>
<td>Drive types</td>
<td>SERCOS</td>
</tr>
<tr>
<td>Remarks</td>
<td>It is recommended to set P-AXIS-00060 to either 1 or 2. The value 0 is just for backward compatibility with older versions of the NC-kernel and requires additional settings (P-AXIS-00106). If P-AXIS-00060 has a value of 1 or 2, the value in P-AXIS-00106 has no effect.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>P-AXIS-00331</th>
<th>Limit for position lag during movement on a fixed stop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>This parameter specifies the limit for the position lag. After exceeding this limit, the fixed stop is detected and the measuring position is taken over.</td>
</tr>
<tr>
<td>Parameter</td>
<td>kenngr.fixed_stop_pos_lag_limit</td>
</tr>
<tr>
<td>Data type</td>
<td>UNS32</td>
</tr>
<tr>
<td>Data range</td>
<td>$0 \leq \text{fixed_stop_pos_lag_limit} \leq \text{MAX(UNS32)}$</td>
</tr>
<tr>
<td>Axis types</td>
<td>T, R</td>
</tr>
<tr>
<td>Dimension</td>
<td>T: 0.1µm</td>
</tr>
<tr>
<td></td>
<td>R: 0.0001°</td>
</tr>
<tr>
<td>Default value</td>
<td>0</td>
</tr>
<tr>
<td>Drive types</td>
<td>Conventional, SERCOS, Terminal, Lightbus, Profidrive, CANopen</td>
</tr>
<tr>
<td>Remarks</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>P-AXIS-00332</th>
<th>Number of position control cycles during movement on a fixed stop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>This parameter defines the number of position control cycles for the waiting time after exceeding of the given position lag limit P-AXIS-00331 before the measurement value is determined. The counting is started again if the limit is undershot during this time.</td>
</tr>
<tr>
<td>Parameter</td>
<td>kenngr.fixed_stop_nbr_cycles</td>
</tr>
<tr>
<td>Data type</td>
<td>UNS16</td>
</tr>
<tr>
<td>Data range</td>
<td>$0 &lt; \text{fixed_stop_nbr_cycles} &lt; \text{MAX(UNS32)}$</td>
</tr>
<tr>
<td>Axis types</td>
<td>T, R</td>
</tr>
<tr>
<td>Dimension</td>
<td>T: Number of interpolation cycles R: Number of interpolation cycles</td>
</tr>
<tr>
<td>Default value</td>
<td>0</td>
</tr>
<tr>
<td>Drive types</td>
<td>Conventional, SERCOS, Terminal, Lightbus, Profidrive, CANopen</td>
</tr>
<tr>
<td>Remarks</td>
<td></td>
</tr>
</tbody>
</table>

Also see about this

Overview [8]
### 8.2.3 Old probing signal parameters (up to version V2.11.2019.14)

#### P-AXIS-00113 Pulse edge

**Description:** Setting of edge for measurement signal. The edge defines the latch point for the actual value counter.

**Parameter:** kenngr.mess_neg_flanke

**Data type:** BOOLEAN

**Data range:**
- 0: Latching if positive measured signal edge
- 1: Latching if negative measured signal edge

**Axis types:** T, R

**Default value:** 0

**Drive types:** ----

**Remarks:** ----

#### P-AXIS-00115 Measurement signal via axis specific control bit mask

**Description:** To make it possible to take external measured signals into account as well, one bit in the axis-specific control bit pattern is treated as the measured signal. This possibility is defined by this parameter.

**Parameter:** kenngr.mess_signal_achs_steuer

**Data type:** BOOLEAN

**Data range:** 0/1

**Axis types:** T, R

**Default value:** 0

**Drive types:** ----

**Remarks:** ----

#### P-AXIS-00116 Measurement with SERCOS drives

**Description:** Measurement with SERCOS drives can be performed with two different methods. The flag defines the measurement signal to be read in via the SERCOS interface.

**Parameter:** kenngr.mess_signal_sercos

**Data type:** BOOLEAN

**Data range:**
- 0: Request from a measurement probe
- 1: Usage of measurement function supplied by the drive (SERCOS measurement)

**Axis types:** T, R

**Default value:** 0

**Drive types:** SERCOS

**Remarks:** For the measurement with SERCOS drives, the parameters P-AXIS-00060 and P-AXIS-00106 are required in addition.

#### P-AXIS-00117 Measurement signal from hardware interface
### Description
The use of the NC kernel's hardware interface is defined by this flag.

### Parameter
kenngr.mess_signal_taster

### Data type
BOOLEAN

### Data range
0/1

### Axis types
T, R

### Dimension
T: ----  
R: ----

### Default value
0

### Drive types
----

### Remarks

**P-AXIS-00257**  
**Measurement signal via HLI Control Unit**

### Description
This parameter can determine that the probing signal is read from the HLI via the control unit MCControlBoolUnit_ProbingSignal and not via the cyclical drive interface. See also [HLI]. The probing value is the actual value at the moment of the occurrence of the probing signal.

### Parameter
kenngr.probing_signal_via_plc

### Data type
BOOLEAN

### Data range
0/1

### Axis types
T, R

### Dimension
T: ----  
R: ----

### Default value
0

### Drive types
----

### Remarks
Due to the scanning of the probing signal in the cycle time of the PLC, the accuracy of the probed value is less than the accuracy achieved by using drive internal probing latches.

**Dependent on the drive types, the following measurement methods are possible:**

<table>
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<th>Messing signal</th>
</tr>
</thead>
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</tr>
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<td>mess_signal_achs_steuer</td>
</tr>
<tr>
<td></td>
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<tr>
<td>SERCOS</td>
<td>X</td>
</tr>
</tbody>
</table>

**P-AXIS-00330**  
**Measurement with movement on a fixed stop**

### Description
This parameter enables the measurement signal source 'Fixed stop'.

### Parameter
kenngr.meas_signal_fixed_stop

### Data type
BOOLEAN

### Data range
0/1

### Axis types
T, R

### Dimension
T: ----  
R: ----

### Default value
0

### Drive types
Conventional, SERCOS, Terminal, Lightbus, Profidrive, CANopen

### Remarks
The user has to ensure that, during the movement on a fixed stop in the drives affected, a torque limitation is active and that the velocity is low enough.

All other measurement signal sources (e.g. P-AXIS-00116) must be deselected.

For the measurement with movement on a fixed stop, the parameters P-AXIS-00331 and P-AXIS-00332 are required in addition.
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Beckhoff Headquarters

Beckhoff Automation GmbH & Co. KG
Huelshorstweg 20
33415 Verl
Germany

Phone: +49 5246 963 0
Fax: +49 5246 963 198
e-mail: info@beckhoff.com
web: https://www.beckhoff.com
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