



# DOCUMENTATION ISG-kernel

## Functional description Moving to fixed stop

Short Description:  
FCT-M8

© Copyright  
ISG Industrielle Steuerungstechnik GmbH  
STEP, Gropiusplatz 10  
D-70563 Stuttgart  
All rights reserved  
[www.isg-stuttgart.de](http://www.isg-stuttgart.de)  
[support@isg-stuttgart.de](mailto:support@isg-stuttgart.de)

Documentation version: 1.02  
Release: 07/03/2023

# Preface

## Legal information

---

This documentation was produced with utmost care. The products and scope of functions described are under continuous development. We reserve the right to revise and amend the documentation at any time and without prior notice.

No claims may be made for products which have already been delivered if such claims are based on the specifications, figures and descriptions contained in this documentation.

## Personnel qualifications

---

This description is solely intended for skilled technicians who were trained in control, automation and drive systems and who are familiar with the applicable standards, the relevant documentation and the machining application.

It is absolutely vital to refer to this documentation, the instructions below and the explanations to carry out installation and commissioning work. Skilled technicians are under the obligation to use the documentation duly published for every installation and commissioning operation.

Skilled technicians must ensure that the application or use of the products described fulfil all safety requirements including all applicable laws, regulations, provisions and standards.

## Further information

---

Links below (DE)

<https://www.isg-stuttgart.de/produkte/softwareprodukte/isg-kernel/dokumente-und-downloads>

or (EN)

<https://www.isg-stuttgart.de/en/products/softwareproducts/isg-kernel/documents-and-downloads>

contains further information on messages generated in the NC kernel, online help, PLC libraries, tools, etc. in addition to the current documentation.

## Disclaimer

---

It is forbidden to make any changes to the software configuration which are not contained in the options described in this documentation.

## Trade marks and patents

---

The name ISG®, ISG kernel®, ISG virtuos®, ISG dirigent® and the associated logos are registered and licensed trade marks of ISG Industrielle Steuerungstechnik GmbH.

The use of other trade marks or logos contained in this documentation by third parties may result in a violation of the rights of the respective trade mark owners.

## Copyright

---

© ISG Industrielle Steuerungstechnik GmbH, Stuttgart, Germany.

No parts of this document may be reproduced, transmitted or exploited in any form without prior consent. Non-compliance may result in liability for damages. All rights reserved with regard to the registration of patents, utility models or industrial designs.

# 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

➤ 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.



### **Attention**

#### **Restriction or error**

This icon describes restrictions or warns of errors.



### **Notice**

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

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



### **Example**

#### **General example**

Example that clarifies the text.



### **Programing Example**

#### **NC programming example**

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



### **Release Note**

#### **Specific version information**

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

# Table of contents

<b>Preface</b> .....	<b>2</b>
<b>General and safety instructions</b> .....	<b>3</b>
<b>1 Overview</b> .....	<b>6</b>
<b>2 Description</b> .....	<b>7</b>
<b>3 Programming</b> .....	<b>9</b>
<b>4 Examples</b> .....	<b>14</b>
4.1 “Move to fixed stop” with one axis.....	14
4.2 “Move to fixed stop” with an independent axis .....	14
4.3 Text for fixed stop detected.....	15
4.4 “Move to fixed stop” with several axes .....	15
<b>5 Parameter</b> .....	<b>16</b>
5.1 Default initialisation at controller start .....	17
5.1.1 Default assignment for a SERCOS drive .....	18
5.1.2 Default assignment for a CANopen drive.....	19
5.2 Overview .....	20
5.2.1 Start-up parameters .....	20
5.2.2 Axis parameters .....	21
5.3 Description .....	22
5.3.1 Start-up parameters .....	22
5.3.2 Axis parameters .....	22
<b>Keyword index</b> .....	<b>34</b>
<b>6 Appendix</b> .....	<b>35</b>
6.1 Suggestions, corrections and the latest documentation.....	35

## List of figures

Fig. 1:	Deleting distance to go .....	12
Fig. 2:	Circular motion converted to linear motion .....	13

# 1 Overview

## Tasks

---

The “Move to fixed stop” function moves the drive to a fixed obstacle. During the move to the fixed stop a torque limit is active in the drive.

As soon as the CNC detects the fixed stop, the axis is stopped and machining continues in the next NC line.

## Characteristics

---

“Move to fixed stop” can be used in the following applications:

- Clamping workpieces
- Simple measurement processes without measuring probe
- Applying a defined force

## Parametrisation

---

“Move to fixed stop” is configured for each axis in the axis parameter list.

In addition the forward/backward controller must be switched on in the channel parameter list.

## 2 Description

The “Move to fixed stop” function can move an axis to a fixed stop and exert a defined contact pressure on the fixed stop.

The function is selected by an axis-specific command in the NC program. In addition, the axis must be moved by a path motion or a single axis motion (see [PROG//Independent axes]). Motion to the fixed stop is referred below as ‘approach block’.

After the “Move to fixed stop” function is activated:

- the CNC reduces the permitted torque in the drive and
- also switches off other monitoring functions such as the position lag monitor (see [FCT-A1]) in the CNC and in the drive.

The motion to approach the fixed stop is executed at reduced torque. The CNC then automatically reduces axis acceleration. During the approach motion the CNC monitors the position lag of the axis and increases it when the stop is reached. As soon as the specified limit is overshoot:

- the CNC stops the axis,
- discards the block distance to go and
- changes to the next NC line.

As long as the axis is stationary at the fixed stop, the drive continues to apply the specified torque on the fixed stop. While the axis is moving towards the fixed stop or when it reaches the fixed stop, it may not be reprogrammed in the NC program. However, the parameters may be changed at any time, e.g. torque limit.

While the axis is stationary at the fixed stop, the CNC monitors the actual position. As soon as the actual value leaves a specified tolerance window, the CNC issues error message P-ERR-70548.

When the “Move to fixed stop” is **switched off**, the setpoint is tracked on the actual position of the axis. At the same time, the torque limit is cancelled and the monitoring functions are re-activated, e.g. position lag monitor. Together with the switch-off command, a path motion should always be specified for the axis to move away from the fixed stop.

If the fixed stop was not detected at the end of the motion block, the CNC issues error message P-ERR-50886. Output of the error message can be suppressed by the axis parameter P-AXIS-00716 or by the keyword ERR\_NOT\_DETECTED.

### Prerequisites

“Move to fixed stop” can be used:

- For SERCOS and CANopen drives which support a maximum torque limit. Normally they are the drive objects S-0-0092 for SERCOS and 0x6072 for CANopen.
- For path or spindle axes which were replaced in the path compound.
- If the backward motion memory is not switched off in the controller, i.e. a value greater than 0 is specified for the NC channel in the start-up parameter P-STUP-00033.

---

## Restrictions

---

If the "Move to fixed stop" function is active for an axis, the following commands and actions are not permitted for this axis:

- The axis may not be reprogrammed in the NC program.  
Otherwise the CNC issues error message P-ERR-21967.
- The axis may not be released.  
Otherwise the CNC issues error message P-ERR-21970.
- No actual position may be requested for the axis.  
#CHANNEL INIT [ACTPOS].  
Otherwise the CNC issues error message P-ERR-21964.
- Tracking mode may not be activated for the axis.  
Otherwise the CNC issues error message P-ERR-70549.
- Drive releases may not be reset for the axis.  
Otherwise the CNC issues error message P-ERR-70546.

---

## Behaviour at CNC reset

---

After a reset the CNC issues error message P-ERR-70549 if:

- moving to fixed stop was interrupted by a CNC reset,
- the fixed stop is not detected and
- the parameter P-AXIS-00715 has the value 1.

The "Move to fixed stop" is then deselected.

However, if the fixed stop was already detected at CNC rest, the function "Move to fixed stop" remains active. If the parameter P-AXIS-00717 is set with the value 1, the CNC issues the warning message P-ERR-70550 during the CNC reset.

---

## Behaviour at program end

---

If the function "Move to fixed stop" is not deselected before the end of the NC program, the function remains active after program end. No automatic deselection takes place.



### 3 Programming

Programming is based on the syntax for independent axes. When the function is activated, the required parameter settings can be defined. The settings are applied until program end. After this, the default settings in the axis parameter list are re-applied. The setting last specified in the NC program is used for non-specified parameters. If the parameter was not previously specified in the NC program, the default setting in the axis parameter list applies.

When the function is activated, motion information must always be specified for the axis. This may be a path or independent axis motion. Otherwise the controller outputs error message P-ERR-21966.

Any number of axes may participate in the motion in the approach block and be monitored at a fixed stop. It is also possible to move axes without monitoring. The approach motion stops as soon as all axes monitored at the fixed stop detect the fixed stop. The controller then discards the distance to go of the approach block and continues machining with the next NC block.

```
<Achsname> [ FIXED_STOP [ ON | OFF ] [ TORQUE_LIMIT=.. ] [ POS_LAG_LIMIT=.. ]  
           [ CYCLES=.. ] [ WINDOW=.. ] [ START=.. ] [ END=.. ]  
           [ ERR_NOT_DETECTED=.. ] { \ } ]
```

<Achsname>	Name of the axis to be used with the “Move to fixed stop” function.
ON	Activate the “Move to fixed stop” function for this axis. Motion information must also be specified for the axis.
OFF	Deactivate the “Move to fixed stop” function. In addition a motion should be programmed for the axis to move away from the fixed stop.
TORQUE_LIMIT=<expr>	Specifying the torque limit with “Move to fixed stop”. Scaling is determined by parameterising the “Move to fixed stop” function from the axis parameters (see P-AXIS-00724). Normally this is given in percent (%) of the drive nominal torque. If no torque is specified for the axis in the NC program, the default value in the axis parameter P-AXIS-00729 is used for the torque limit.
POS_LAG_LIMIT=<expr>	Limit for position lag If this limit is overshoot, the CNC reverts to the “Fixed stop reached” state after the LR cycles specified in CYCLES. If no position lag limit is specified for the axis in the NC program, the default value in the axis parameter P-AXIS-00712 is used.
CYCLES=<expr>	Number of position controller cycles in which the position lag must be above the specified POS_LAG_LIMIT limit before the controller reverts to the “Fixed stop reached” state. If the number of position controller cycles is not specified for the axis in the NC program, the default value from the axis parameter P-AXIS-00714 [▶ 23] is used.
WINDOW=<expr>	Tolerance window for fixed stop position After the fixed stop is reached, the controller checks whether the actual position of the drive leaves the specified tolerance window to detect a breakaway of the fixed stop. If no tolerance window is specified for the axis in the NC program, the default value value in the axis parameter P-AXIS-00713 is used. The monitor is disabled with a value of 0.
START=<expr>	This parameter can delay the monitoring function for when the fixed stop is reached by one percent (%) referred to the path distance in order to prevent the incorrect detection of a fixed stop due to friction etc. when the axis starts off. If this parameter is not specified in the NC program, the start of the motion is always monitored (START = 0%).
END=<expr>	This parameter can prematurely end the monitoring function for when the fixed stop is reached by one percent referred to the path distance in order to prevent the incorrect detection of a fixed stop when the axis is decelerated on approaching the target point. If this parameter is not specified in the NC program, monitoring always takes place up to the target point of the motion block (END = 100%).
ERR_NOT_DETECTED=<expr>	This parameter suppresses the output of error message P-ERR-50886 if the fixed stop is not detected in the approach motion. This permits the execution of simple measurement processes, e.g. with “Move to fixed stop”.



### Attention

A motion for the axis should always be programmed together with deactivation of the “Move to fixed stop” function. This movement **must** be away from the fixed stop. Otherwise it may result in damage to the machine if the motion continues towards the fixed stop.

## V.RTA variables

State information about the “Move to fixed stop” function of an axis can be requested in the NC program. Since V.RTA variables originate from the interpolator context, an advance stop is required on access.

V.RTAs are axis-specific variables. So, when you access them, you must specify an axis instance in the form of the axis name or the axis index in the axis group of the NC channel.

Example for the Y axis on axis index 1:

```
V.RTA.FIXED_STOP.DETECTED.Y
V.RTA.FIXED_STOP.DETECTED[1]
```

When the “Move to fixed stop” function is activated, the information in the V.RTA.FIXED\_STOP variables is reset.

Variable name	Meaning	Data type	Unit	Permitted access	
				Decoder	Real-time cycle
V.RTA.FIXED_STOP.ACTIVE.X	Move to fixed stop active	Boolean	-	L	L
V.RTA.FIXED_STOP.DETECTED.X	Move to fixed stop detected	Boolean	-	L	L
V.RTA.FIXED_STOP.ACS.POS.X	Fixed stop position recorded in axis coordinate system	SGN64	[mm, inch]	L	L

## Delete distance to do in the approach block with non-participating path axes

The “Move to fixed stop” function can be active simultaneously in any number of axes. In addition other axes can be moved together in the approach block even if they do not move to the fixed stop.

If all axes in the approach block detected the fixed stop, the block distance to go is discarded. If other axes participate in the motion but do not move to the fixed stop, these axes continue to move towards the target point of the next motion block starting at the abort motion.

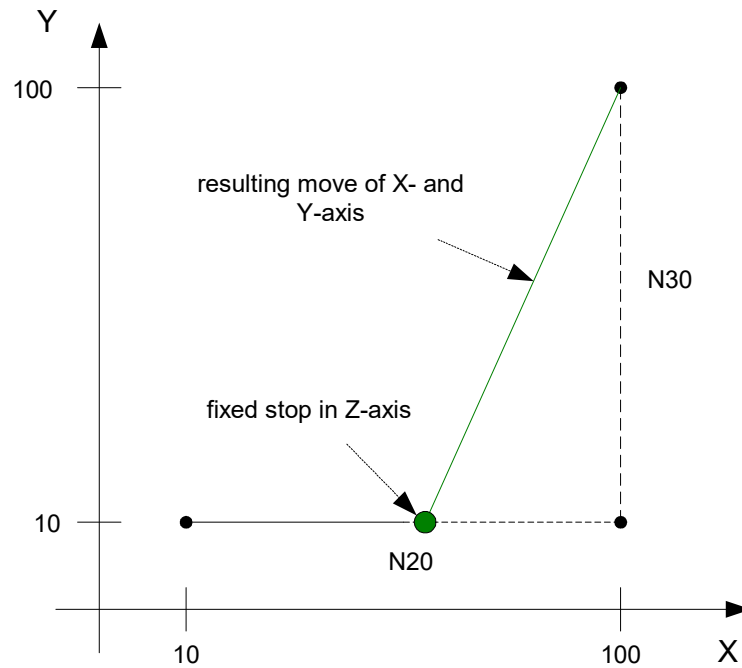


## Programming Example

### Discard distance to go

```

N10 G01 X10 Y10 Z0 F1000
N20 G01 X100 Z100 Z[FIXED_STOP ON TORQUE_LIMIT10]
N30 G01 Y100
    
```



**Fig. 1: Deleting distance to go**

A circular motion following the approach block is converted to a linear motion; the axes approach the target point of the original circular segment directly, as shown in the example below.

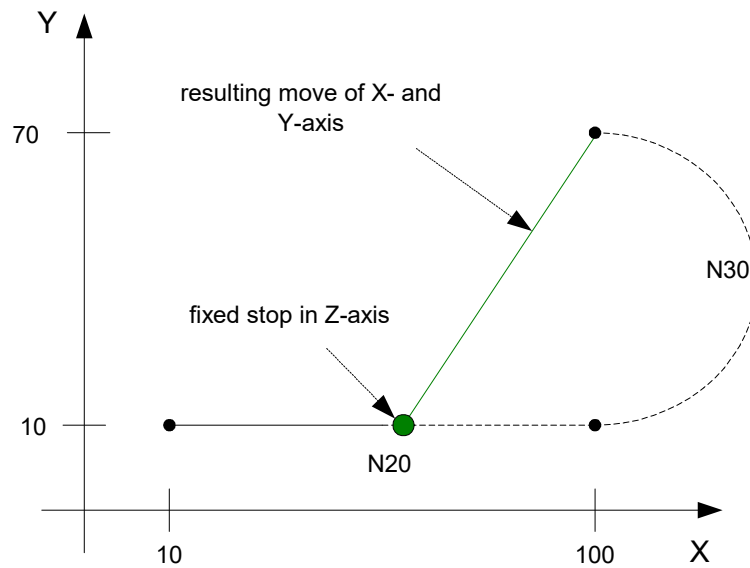


## Programming Example

### Circular motion converted to linear motion

```

N10 G01 X10 Y10 Z0 F1000
N20 G01 X100 Z100 Z[FIXED_STOP ON TORQUE_LIMIT10]
N30 G03 Y70 J+30
    
```



**Fig. 2: Circular motion converted to linear motion**

Axes which move towards the fixed stop with an independent path motion (INDP\_SYN / INDP\_ASYN) have no influence on the path motion of other axes.

## 4 Examples

### 4.1 “Move to fixed stop” with one axis

In the test program below the X axis moves towards a fixed stop:

```
N010 G0 X0 Y0
```

(\* Approach motion \*)

```
N020 G01 X100 F10 X[FIXED_STOP ON TORQUE_LIMIT = 10]
```

```
N030 G01 Y100 F1000
```

(\* Withdrawal motion away from the fixed stop \*)

```
N040 G01 X0 X[FIXED_STOP OFF]
```

```
N050 M30
```

### 4.2 “Move to fixed stop” with an independent axis

In the test program below the X axis moves towards a fixed stop:

```
N010 G0 X0 Y0 F1000
```

(\* Independent approach motion \*)

```
N020 G01 Y100 X[INDP_ASYN G01 POS100 FEED10] \
```

```
X[FIXED_STOP ON TORQUE_LIMIT = 10]
```

```
N030 G01 Y200 F1000
```

(\* Withdrawal motion away from the fixed stop \*)

```
N040 G01 X0 X[FIXED_STOP OFF]
```

```
N050 M30
```

### 4.3 Text for fixed stop detected

In the test program below the result of the “Move to fixed stop” function is forwarded to the PLC by external variables:

```

N010 G0 X0 Y0 F1000 V.E.FS_DETECTED = FALSE

(* Parameterisation *)
X[FIXED_STOP TORQUE_LIMIT = 5 ERR_NOT_DETECTED = 0]

(* Approach motion *)
N020 G01 X100 X[FIXED_STOP ON TORQUE_LIMIT = 10]
N030 $IF V.RTA.FIXED_STOP.DETECTED.X = TRUE
N040 V.E.FS_DETECTED = TRUE
N050 V.E.FS_POSITION = V.RTA.FIXED_STOP.ACS.POS.X
N050 $ENDIF

(* Withdrawal motion away from the fixed stop *)
N040 G01 X0 X[FIXED_STOP OFF]
N050 M30
  
```

### 4.4 “Move to fixed stop” with several axes

In the test program below the X, Y and Z axes move towards a fixed stop:

```

N010 G0 X0 Y0

(* Parameterisation *)
N020 X[FIXED_STOP TORQUE_LIMIT = 10 WINDOW = 5]
N030 Y[FIXED_STOP TORQUE_LIMIT = 10 WINDOW = 10]
N040 Z[FIXED_STOP TORQUE_LIMIT = 20 WINDOW = 2]
N050 G01 X100 F1000

(* Approach motion *)
N060 X100 Z200 X2=100 F10 X[FIXED_STOP ON] Z[FIXED_STOP ON]
N070 Y100 F1000

(* Independent approach motion *)
N080 Y[INDP_ASYN G01 POS200 FEED200] Y[FIXED_STOP ON]

(* Change torque and monitoring window *)
N090 X[FIXED_STOP TORQUE_LIMIT = 15]
N100 Y[FIXED_STOP WINDOW = 5]
N110 X2 = 200

(* Independent motion of Y axis away from the fixed stop *)
N120 Y[INDP_ASYN G01 POS0 FEED1000 Y[FIXED_STOP OFF]
N130 X2 = 100 F1000

(* Move X and Z axes away from the fixed stop *)
N140 Z0 Z[FIXED_STOP OFF]
N150 X0 Z-100 X[FIXED_STOP OFF]
N160 M30
  
```

## 5 Parameter

### Drive object for torque limitation

---

The drive torque must be reduced for the “Move to fixed stop” function. An appropriate entry must therefore be made in the drive objects. If the controller finds no object with the name 'TORQUE\_LIMIT' (see P-AXIS-00719), the error message P-ERR-70541 is issued when the function is activated.

If no torque limit is programmed in the NC program, the controller uses the value in the parameter P-AXIS-00729 of the 'TORQUE\_LIMIT' torque object.

### Reloading parameters

---

While the controller is running, the following parameter settings can be changed by updating the axis parameter list or by using the #MACHINE DATA command:

- position lag limit P-AXIS-00712
- monitoring window P-AXIS-00713
- number of position lag cycles P-AXIS-00714 [▶ 23]
- error response if function aborted P-AXIS-00715
- error response if fixed stop not detected P-AXIS-00716
- reset warning message if fixed stop detected P-AXIS-00717
- maximum torque P-AXIS-00718

For all other parameters of the “Move to fixed stop” function, new parameter values are not accepted when the controller is running. The controller must then be restarted for these parameters.



## 5.1 Default initialisation at controller start

When the controller is started, a default initialisation takes places for the drive objects depending on the drive type. Entries specified in the default axis parameter list are overwritten by this default initialisation. If this is not desired, the default initialisation can be disabled for the drive object using the parameter P-AXIS-00746.



### Notice

To be able to assign drive objects for the “Move to fixed stop” in the default axis parameter list, the automatic default initialisation must be disabled for the objects (see P-AXIS-00746)



### Notice

If the automatic default initialisation is used, the parameters described in the sections “Default assignment for a SERCOS drive [▶ 19]” and “Default assignment for a CAN-open drive” [▶ 19] must be checked for plausibility before the “Move to fixed stop” function, in particular the stored torque limit.

## 5.1.1 Default assignment for a SERCOS drive

### #Disable position lag monitor

```
antr.fixed_stop.drive_ident[0].id          MON_WINDOW
antr.fixed_stop.drive_ident[0].wr_ident    S_0_0159
antr.fixed_stop.drive_ident[0].commu      ACYCLIC
antr.fixed_stop.drive_ident[0].data_type  UNS32
antr.fixed_stop.drive_ident[0].mask       NOT_USED
antr.fixed_stop.drive_ident[0].scaling_type UNSCALED
antr.fixed_stop.drive_ident[0].scaling_factor 1.0
antr.fixed_stop.drive_ident[0].min_limit    0.0
antr.fixed_stop.drive_ident[0].max_limit    1.0e+199
antr.fixed_stop.drive_ident[0].startup_value 1048575
antr.fixed_stop.drive_ident[0].rd_ident    ""
antr.fixed_stop.drive_ident[0].active_value 0
antr.fixed_stop.drive_ident[0].use_startup_value 0
```

### #Torque limit

```
antr.fixed_stop.drive_ident[1].id          TORQUE_LIMIT
antr.fixed_stop.drive_ident[1].wr_ident    S_0_0092
antr.fixed_stop.drive_ident[1].commu      ACYCLIC
antr.fixed_stop.drive_ident[1].data_type  UNS16
antr.fixed_stop.drive_ident[1].mask       NOT_USED
antr.fixed_stop.drive_ident[1].scaling_type LINEAR
antr.fixed_stop.drive_ident[1].scaling_factor 10.0
antr.fixed_stop.drive_ident[1].min_limit  0.0
antr.fixed_stop.drive_ident[1].max_limit  100.0
antr.fixed_stop.drive_ident[1].startup_value 100.0
antr.fixed_stop.drive_ident[1].rd_ident    ""
antr.fixed_stop.drive_ident[1].active_value 1.0
antr.fixed_stop.drive_ident[1].use_startup_value 0
```

## 5.1.2 Default assignment for a CANopen drive

### #Disable position lag monitor

```
antr.fixed_stop.drive_ident[0].id          MON_WINDOW
antr.fixed_stop.drive_ident[0].wr_ident    6065_00
antr.fixed_stop.drive_ident[0].commu      ACYCLIC
antr.fixed_stop.drive_ident[0].data_type   UNS32
antr.fixed_stop.drive_ident[0].mask       NOT_USED
antr.fixed_stop.drive_ident[0].scaling_type UNSCALED
antr.fixed_stop.drive_ident[0].scaling_factor 1.0
antr.fixed_stop.drive_ident[0].min_limit   0.0
antr.fixed_stop.drive_ident[0].max_limit   1.0e+199
antr.fixed_stop.drive_ident[0].startup_value 1048575
antr.fixed_stop.drive_ident[0].rd_ident    ""
antr.fixed_stop.drive_ident[0].active_value 4294967295
antr.fixed_stop.drive_ident[0].use_startup_value 0
```

### #Torque limit

```
antr.fixed_stop.drive_ident[1].id          TORQUE_LIMIT
antr.fixed_stop.drive_ident[1].wr_ident    6072_00
antr.fixed_stop.drive_ident[1].commu      ACYCLIC
antr.fixed_stop.drive_ident[1].data_type   UNS16
antr.fixed_stop.drive_ident[1].mask       NOT_USED
antr.fixed_stop.drive_ident[1].scaling_type LINEAR
antr.fixed_stop.drive_ident[1].scaling_factor 10.0
antr.fixed_stop.drive_ident[1].min_limit   0.0
antr.fixed_stop.drive_ident[1].max_limit   500.0
antr.fixed_stop.drive_ident[1].startup_value 500.0
antr.fixed_stop.drive_ident[1].rd_ident    ""
antr.fixed_stop.drive_ident[1].active_value 1.0
antr.fixed_stop.drive_ident[1].use_startup_value 0
```

## 5.2 Overview

### 5.2.1 Start-up parameters

ID	Parameter	Description
P-STUP-00033	fb_storage_size[i]	Memory size for backward motion

## 5.2.2 Axis parameters

ID	Parameter	Description
P-AXIS-00712	antr.fixed_stop.pos_lag_limit	Position lag limit to detect the fixed stop
P-AXIS-00713	antr.fixed_stop.window	Monitoring window for the fixed stop
P-AXIS-00714	Antr.fixed_stop.nbr_cycles	Number of position controller cycles to detect the fixed stop
P-AXIS-00715	Antr.fixed_stop.error_on_abort	Error output on abort by reset
P-AXIS-00716	Antr.fixed_stop.error_not_detected	Error output if fixed stop is not detected
P-AXIS-00717	antr.fixed_stop.warning_reset_while_detected	Warning message on reset and detected fixed stop
P-AXIS-00718	antr.fixed_stop.max_torque	Motor torque at maximum axis acceleration
P-AXIS-00719	antr.fixed_stop.drive_ident[i].id	CNC-internal identifier for the drive object
P-AXIS-00720	antr.fixed_stop.drive_ident[i].commu	Type of communication with drive controller
P-AXIS-00721	antr.fixed_stop.drive_ident[i].wr_ident	Name of the drive object in the driver amplifier
P-AXIS-00722	antr.fixed_stop.drive_ident[i].data_type	Data type of the data to be transmitted
P-AXIS-00723	antr.fixed_stop.drive_ident[i].startup_value	Default value of data element after controller start-up
P-AXIS-00724	antr.fixed_stop.drive_ident[i].scaling_type	Scaling type of the data element
P-AXIS-00725	antr.fixed_stop.drive_ident[i].max_limit	Maximum permissible output value
P-AXIS-00726	antr.fixed_stop.drive_ident[i].min_limit	Minimum permissible output value
P-AXIS-00727	antr.fixed_stop.drive_ident[i].mask	Write/read by bit mask
P-AXIS-00728	antr.fixed_stop.drive_ident[i].scaling_factor	Scaling factor
P-AXIS-00729	antr.fixed_stop.drive_ident[i].active_value	Value of data element during "Move to fixed stop"
P-AXIS-00730	antr.fixed_stop.drive_ident[i].use_startup_value	Use of default value
P-AXIS-00731	antr.fixed_stop.drive_ident[i].rd_ident	Name of the drive object to be read in the driver amplifier
P-AXIS-00746	antr.fixed_stop.drive_ident[i].default	Use of default parameters for the drive type
P-AXIS-00762	antr.fixed_stop.quick_stop_after_detection	<b>Quick stop after detecting the fixed stop</b>
P-AXIS-00763	antr.fixed_stop.error_missing_drive_releases	<b>Error reaction for missing drive releases.</b>

## 5.3 Description

### 5.3.1 Start-up parameters

<b>P-STUP-00033</b>	<b>Memory size for backward motion</b>
Description	This parameter defines the memory size in bytes used for backward motion on the path. During start-up, the NC checks whether the required minimum size is available. If this is not the case, a warning is output and the memory size is set to the required minimum value. If the size is set to 0, the “forward/ backward motion on the path” function is not available. The maximum size is only limited by the resources available on the PC.
Parameter	fb_storage_size[i] where i = 0 to 11 (maximum number of channels: 12, application-specific)
Data type	UNS32
Data range	0 ... MAX(UNS32)
Dimension	----
Default value	0
Remarks	

### 5.3.2 Axis parameters

<b>P-AXIS-00712</b>	<b>Position lag limit to detect the fixed stop</b>	
Description	This parameter defines this limit for the position lag for the “Move to fixed stop” function after which an overshoot of the fixed stop is detected. Finally, the CNC stops the axis and discards the distance to go of the NC block.	
Parameter	antr.fixed_stop.pos_lag_limit	
Data type	UNS32	
Data range	$0 \leq \text{pos\_lag\_limit} \leq \text{MAX(UNS32)}$	
Axis types	T, R	
Dimension	T: 0.1 $\mu\text{m}$	R: 0.0001°
Default value	20000	
Drive types	SERCOS, CANopen	
Remarks	The measurement (G100, measurement type 7) with motion to a stop is also subject to the limit in the parameter P-AXIS-00331	

<b>P-AXIS-00713</b>	<b>Monitoring window for the fixed stop.</b>	
Description	<p>This parameter defines a tolerance window for the fixed stop. If the actual position of the axis leaves the tolerance window after the fixed stop is detected, the CNC issues the error message P-ERR-70548.</p> <p>If this parameter is changed after the fixed stop is detected, the CNC assumes the current fixed stop position as the centre of the new tolerance window.</p>	
Parameter	antr.fixed_stop.window	
Data type	UNS32	
Data range	$0 \leq \text{pos\_lag\_limit} \leq \text{MAX}(\text{UNS32})$	
Axis types	T, R	
Dimension	T: 0.1 $\mu\text{m}$	R: 0.0001°
Default value	0	
Drive types	SERCOS, CANopen	
Remarks	The monitor is disabled with the value 0.	

<b>P-AXIS-00714</b>	<b>Number of position controller cycles to detect the fixed stop</b>	
Description	<p>This parameter defines the number of position controller cycles which the position lag of the axis must overshoot the specified position lag limit P-AXIS-00712 before the fixed stop is detected. If the limit is again exceeded after this time, counting starts from the beginning.</p>	
Parameter	antr.fixed_stop.nbr_cycles	
Data type	UNS16	
Data range	$0 < \text{nbr\_cycles} < \text{MAX}(\text{UNS32})$	
Axis types	T, R	
Dimension	T: Number of interpolation cycles	R: Number of interpolation cycles
Default value	10	
Drive types	SECOS, CANopen	
Remarks	The measurement (G100, measurement type 7) with motion to a stop is also subject to the limit in the parameter P-AXIS-00332	

<b>P-AXIS-00715</b>	<b>Error output on abort by reset</b>	
Description	This parameter defines whether the error message P-ERR-70549 is output if a CNC reset occurs while moving to the fixed stop.	
Parameter	antr.fixed_stop.error_on_abort	
Data type	BOOLEAN	
Data range	0 / 1	
Axis types	T, R	
Dimension	T: -	R: -
Default value	1	
Drive types	SERCOS, CANopen	
Remarks		

<b>P-AXIS-00716</b>	<b>Error message if fixed stop is not detected</b>	
Description	This parameter defines whether the error message P-ERR-50886 is output while moving to the fixed stop if the fixed stop was not detected in the approach block.	
Parameter	antr.fixed_stop.error_not_detected	
Data type	BOOLEAN	
Data range	0 / 1	
Axis types	T, R	
Dimension	T: -	R: -
Default value	1	
Drive types	SERCOS, CANopen	
Remarks		

<b>P-AXIS-00717</b>	<b>Warning message on reset and detected fixed stop</b>	
Description	This parameter defines whether the warning message P-ERR-70550 is output at a CNC reset if the axis is stationary at the fixed stop.	
Parameter	antr.fixed_stop.warning_reset_while_detected	
Data type	BOOLEAN	
Data range	0 / 1	
Axis types	T, R	
Dimension	T: -	R: -
Default value	1	
Drive types	SERCOS, CANopen	
Remarks		



<b>P-AXIS-00718</b>	<b>Motor torque at maximum axis acceleration</b>	
Description	This parameter defines the motor torque which the drive requires to accelerate at maximum axis acceleration P-AXIS-00008. This parameter uses the controller to compensate axis acceleration to the reduced drive torque when moving to fixed stop.	
Parameter	antr.fixed_stop.max_torque	
Data type	REAL64	
Data range	0 / 1	
Axis types	T, R	
Dimension	T: Scaling dependent on P-AXIS-00724	R: Scaling dependent on P-AXIS-00724
Default value	P-AXIS-00726 maximum torque limit if P-AXIS-00726 is specified; otherwise 0.0 (acceleration reduction disabled)	
Drive types	SERCOS, CANopen	
Remarks	The value 0.0 disables acceleration reduction when moving to the fixed stop.	

Up to 4 drive objects can be configured for moving to the fixed stop and can be changed when the function is activated or deactivated in the drive:

Structure name	Permitted range
drive_ident[i]	$0 \leq i \leq 3$ (Number of drive functions: 4, application-specific)

<b>P-AXIS-00719</b>	<b>CNC-internal identifier for the drive object</b>	
Description	This parameter specifies a name for the drive object. The keyword TORQUE_LIMIT is reserved for the torque limit. When moving to the fixed stop, the controller checks whether a drive object is configured with the name TORQUE_LIMIT. Otherwise, the controller issues the error message P-ERR-70541is output.	
Parameter	antr.fixed_stop.drive_ident[i].id	
Data type	STRING	
Data range	Maximum of 29 characters	
Axis types	T, R	
Dimension	T: ----	R: ----
Default value	*	
Drive types	SERCOS, CANopen	
Remarks	<p><b>Example:</b></p> <p>Defining the torque limit for a SERCOS drive:</p> <pre>antr.fixed_stop.drive_ident[0].id          TORQUE_LIMI T antr.fixed_stop.drive_ident[0].wr_ident    S_0_0092</pre> <p>* Note: The default value of variables is a blank string.</p>	

<b>P-AXIS-00720</b>	<b>Type of communication with drive controller</b>	
Description	This parameter defines the type of communication by which the function in the drive is addressed. The value can be transferred both in the cyclic process data and in the service channel with SERCOS or SDO communication with CANopen.	
Parameter	antr.fixed_stop.drive_ident[i].commu	
Data type	STRING	
Data range	<p>CYCLIC: The drive object is switched by a telegram element that is configured in the cyclic drive telegram. The name of the telegram element is defined in P-AXIS-00721 . The telegram element must be configured in the cyclic process data.</p> <p>ACYCLIC: The drive function is addressed by writing a drive parameter through the parameter channel. The name of the telegram element is defined in P-AXIS-00721 .</p> <p>IGNORE: No value is exchanged with the drive.</p>	
Axis types	T, R	
Dimension	T: ----	R: ----
Default value	ACYCLIC	
Drive types	SERCOS, CANopen	
Remarks		

<b>P-AXIS-00721</b>	<b>Name of the drive object in the driver amplifier</b>	
Description	This parameter defines which drive parameter or which telegram element is to be changed on moving to fixed stop [▶ 7] .	
Parameter	antr.fixed_stop.drive_ident[i].wr_ident	
Data type	STRING	
Data range	Maximum of 29 characters	
Axis types	T, R	
Dimension	T: ----	R: ----
Default value	*	
Drive types	SERCOS, CANopen	
Remarks	<p>Example:</p> <p>Defining the torque limit for a SERCOS drive:</p> <pre>antr.fixed_stop.drive_ident[0].id          TORQUE_LIMIT antr.fixed_stop.drive_ident[0]wr_ident    S_0_0092</pre> <p>* Note: The default value of variables is a blank string.</p>	

<b>P-AXIS-00722</b>	<b>Data type of the data to be transmitted</b>	
Description	This parameter defines the data type of the drive parameter or telegram element.	
Parameter	antr.fixed_stop.drive_ident[i].data_type	
Data type	STRING	
Data range	SGN16: Signed 16 bit integer SGN32: Signed 32 bit integer UNS16: Unsigned 16-bit integer UNS32: Unsigned 32-bit integer BITARRAY_16: Bit array 16 bit BITARRAY_32: Bit array 32 bit	
Axis types	T, R	
Dimension	T: ----	R: ----
Default value	SGN16	
Drive types	SERCOS, CANopen	
Remarks		

<b>P-AXIS-00723</b>	<b>Default value of data element after controller start-up</b>	
Description	When cyclic communication is used (see P-AXIS-00720), this parameter defines the value of the telegram element after controller start-up.  This parameter is also used if reading the current value at the start of moving to fixed stop is not required (see P-AXIS-00730). At the end of the move to fixed stop function, the controller writes this value back to the drive.	
Parameter	antr.fixed_stop.drive_ident[i].startup_value	
Data type	REAL64	
Data range	Dependent on the data type P-AXIS-00722 of the drive object SGN16: $\text{MIN}(\text{SGN16}) \leq \text{startup\_value} \leq \text{MAX}(\text{SGN16})$ SGN32: $\text{MIN}(\text{SGN32}) \leq \text{startup\_value} \leq \text{MAX}(\text{SGN32})$ UNS16: $\text{MIN}(\text{UNS16}) \leq \text{startup\_value} \leq \text{MAX}(\text{UNS16})$ SGN32: $\text{MIN}(\text{SGN32}) \leq \text{startup\_value} \leq \text{MAX}(\text{SGN32})$	
Axis types	T, R	
Dimension	T: ----	R: ----
Default value	0	
Drive types	SERCOS, CANopen	
Remarks	This parameter must be assigned if the data item is transferred cyclically, i.e. the parameter P-AXIS-00720 has the value CYCLIC or reading the active parameter value is suppressed, i.e. P-AXIS-00730 has the value 1.	

P-AXIS-00724	Scaling type of the data element	
Description	<p>This parameter scales the transferred value before it is transferred to the drive or after the value was read by the drive. This parameter sets the unit of the data item in the NC program independently of the drive.</p> <p>The scaling type influences the values of the following parameters:</p> <ul style="list-style-type: none"> <li>• Torque at maximum acceleration P-AXIS-00718</li> <li>• Default value P-AXIS-00723</li> <li>• Maximum permissible value P-AXIS-00725</li> <li>• Minimum permissible value P-AXIS-00726</li> <li>• Drive value while moving to fixed stop P-AXIS-00729</li> </ul>	
Parameter	antr.fixed_stop.drive_ident[i].scaling_type	
Data type	STRING	
Data range	UNSCALED.	The value is not scaled, i.e. the value in the NC program directly corresponds to the value in the drive
	LINEAR.	The value is weighted by a linear scaling factor (see P-AXIS-00728)
	TORQUE_DRIVE_SIDE.	<p>The programmed value is a torque value referred to the motor shaft and is converted by the parameters P-AXIS-00325, P-AXIS-00326 and P-AXIS-00392 to the drive torque format.</p> <p>The scaling factor does not change during gear change.</p> <p>The conversion factor is:</p> $f = \frac{1}{P-AXIS-00392} * \frac{P-AXIS-00325}{P-AXIS-00326}$
Axis types	T, R	
Dimension	T: ----	R: ----
Default value	UNSCALED	
Drive types	SERCOS, CANopen	
Remarks	<p>Example:</p> <p>The torque limit in the SERCOS drive is specified in per mil of the maximum motor torque. However, the torque should be specified in percent in the NC program:</p> <pre> antr.fixed_stop.drive_ident[0].id           TORQUE_LIMIT antr.fixed_stop.drive_ident[0].wr_ident     S_0_0092 antr.fixed_stop.drive_ident[0].scaling_type LINEAR antr.fixed_stop.drive_ident[0].scaling_factor 10           </pre>	

<b>P-AXIS-00725</b>	<b>Maximum permissible output value</b>	
Description	<p>This parameter defines the maximum permissible output value. If the value specified in the configuration lists or in the NC program overshoots the set limit, it is automatically limited to the maximum value. No error message is then output.</p> <p>If P-AXIS-00725 is configured, P-AXIS-00726 must be less than this parameter, otherwise the warning P-ERR-70385 is output and the values are swapped.</p> <p>No value limit takes place by default.</p> <p>Irrespective of this parameter setting, a value range check always takes place with the specified data type P-AXIS-00722. If an overflow is detected, the controller outputs the error message P-ERR-70384 .</p>	
Parameter	antr.fixed_stop.drive_ident[i].max_limit	
Data type	REAL64	
Data range	Depending on P-AXIS-00722 and P-AXIS-00724	
Axis types	T, R	
Dimension	T: ----	R: ----
Default value	1.000000e+199	
Drive types	SERCOS, CANopen	
Remarks	By default no limit is active; the limit is disabled at a value of 1.000000e+199.	

<b>P-AXIS-00726</b>	<b>Minimum permissible output value</b>	
Description	<p>This parameter defines the minimum permissible output value. If the value specified in the configuration lists or in the NC program undershoots the set limit, it is automatically limited to the minimum value. No error message is then output.</p> <p>If P-AXIS-00726 is configured, the parameter must be less than P-AXIS-00725 otherwise the warning P-ERR-70385 is output and the values are swapped.</p> <p>No value limit takes place by default.</p> <p>Irrespective of this parameter setting, a value range check always takes place with the specified data type P-AXIS-00722. If an overflow is detected, the controller outputs the error message P-ERR-70384 .</p>	
Parameter	antr.fixed_stop.drive_ident[i].min_limit	
Data type	REAL64	
Data range	Depending on P-AXIS-00722 and P-AXIS-00724	
Axis types	T, R	
Dimension	T: ----	R: ----
Default value	1.000000e+199	
Drive types	SERCOS, CANopen	
Remarks	By default no limit is active; the limit is disabled at a value of 1.000000e+199.	

<b>P-AXIS-00727</b>	<b>Writing/reading drive values by bit mask</b>	
Description	<p>This parameter defines the bit mask to be used to read and write drive values bitwise. If the writing value (default value P-AXIS-00726 or the value when motion to the fixed stop is active P-AXIS-00729) is greater than zero, the bit mask is set; when the value is zero, the bits in the bit mask are deleted from the value transferred to the drive.</p> <p>When read, the value of a bit is returned if all the bits in the bit mask are set in the read drive object. Otherwise the return value is 0.</p> <p>This value is only used if the data type configured in P-AXIS-00722 has the value 'BITARRAY_16' or 'BITARRAY_32'.</p> <p>The value of the bit mask must fit in the data type of the drive object P-AXIS-00722, otherwise the controller outputs error message P-ERR-70403.</p>	
Parameter	antr.fixed_stop.drive_ident[i].mask	
Data type	STRING	
Data range	Depending on P-AXIS-00722: BITARRAY_16: Bit mask 16 Bit - 0 ... MAX(UNS16) BITARRAY_32: Bit mask 32 Bit - 0 ... MAX(UNS32)	
Axis types	T, R	
Dimension	T: ----	R: ----
Default value	NOT_USED	
Drive types	SERCOS, CANopen	
Remarks		

<b>P-AXIS-00728</b>	<b>Scaling factor</b>	
Description	<p>This parameter executes a scaling for reading and writing the drive object. This parameter only acts if the scaling type P-AXIS-00724 is set to 'LINEAR'.</p>	
Parameter	antr.fixed_stop.drive_ident[i].scaling_factor	
Data type	REAL64	
Data range	Unequal to 0	
Axis types	T, R	
Dimension	T: -	R: -
Default value	1.0	
Drive types	SERCOS, CANopen	
Remarks	<p><b>Example:</b></p> <p>The torque limit in the SERCOS drive is specified in per mil of the maximum motor torque. However, the torque should be specified in percent in the NC program:</p> <pre> antr.fixed_stop.drive_ident[0].id TORQUE_LIMIT antr.fixed_stop.drive_ident[0].wr_ident S_0_0092 antr.fixed_stop.drive_ident[0].scaling_type LINEAR antr.fixed_stop.drive_ident[0].scaling_factor 10           </pre>	

P-AXIS-00729	Value of data element during Move to fixed stop	
Description	This parameter specifies the value which the drive object must assume while moving to fixed stop. The specified value may also be scaled before output to the drive (see P-AXIS-00728).	
Parameter	antr.fixed_stop.drive_ident[i].active_value	
Data type	REAL64	
Data range	Unequal to 0	
Axis types	T, R	
Dimension	T: -, dependent on P-AXIS-00728	R: -, dependent on P-AXIS-00728
Default value	0.0	
Drive types	SERCOS, CANopen	
Remarks	<p><b>Example:</b></p> <p>When moving to fixed stop, the torque should be limited to 10% of the maximum torque:</p> <pre> antr.fixed_stop.drive_ident[0].id           TORQUE_LIMIT antr.fixed_stop.drive_ident[0].wr_ident     S_0_0092 antr.fixed_stop.drive_ident[0].scaling_type LINEAR antr.fixed_stop.drive_ident[0].scaling_factor 10 antr.fixed_stop.drive_ident[0].active_value 10           </pre>	

P-AXIS-00730	Use of default value	
Description	<p>Normally, when moving to fixed stop is activated, the value of the drive object is read out before the object is changed by activating the function. After the function ends, the original settings are restored.</p> <p>If this parameter is set to 1, the start value P-AXIS-00723 is transferred to the drive instead of at the end of motion to fixed stop. The read process on activation can then be omitted.</p>	
Parameter	antr.fixed_stop.drive_ident[i].use_startup_value	
Data type	BOOLEAN	
Data range	0 / 1	
Axis types	T, R	
Dimension	T: -	R: -
Default value	0	
Drive types	SERCOS, CANopen	
Remarks	If the object is communicated in the cyclic process data (P-AXIS-00720 = 'CYCLIC'), it is advisable to set this parameter to the value 1 since the start value in P-AXIS-00723 is already transferred cyclically to the drive.	

<b>P-AXIS-00731</b>	<b>Name of the drive object to be read in the driver amplifier</b>	
Description	If the name of the drive object is different for read and write access, the name of the drive object to be read can also be specified here. If no value is specified here, the controller uses the name of the object in P-AXIS-00721 for read and write.	
Parameter	antr.fixed_stop.drive_ident[i].rd_ident	
Data type	STRING	
Data range	Maximum of 29 characters	
Axis types	T, R	
Dimension	T: -	R: -
Default value	*	
Drive types	SERCOS, CANopen	
Remarks	* Note: The default value of variables is a blank string.	

<b>P-AXIS-00746</b>	<b>Use default parameters for the drive type</b>	
Description	<p>By default the drive objects for moving to fixed stop are preconfigured for each drive type when the controller starts and this overwrites any assignment made in the default axis parameter list. All parameters required to change the drive objects are affected by pre-initialisation, i.e. the parameters assigned in the structure antr.fixed_stop.drive_ident[i].*</p> <p>However, if a parameterisation is used from the default list, this parameter can be set to the value 0. In this case, no default initialisation of the drive object takes place.</p>	
Parameter	antr.fixed_stop.drive_ident[i].default	
Data type	BOOLEAN	
Data range	0 / 1	
Axis types	T, R	
Dimension	T: -	R: -
Default value	1	
Drive types	SERCOS, CANopen	
Remarks		



<b>P-AXIS-00762</b>	<b>Quick stop after detecting the fixed stop.</b>	
Description	<p>This parameter is used to force an immediate stop when the fixed stop is detected.</p> <p>Normally, after the fixed stop is detected, the axes are stopped at the feedhold acceleration P-AXIS-00024 set for this axis. For time reasons, an immediate stop can be forced by the axis parameter "quick_stop_after_detection".</p> <p>The condition for this is that all axes involved in the approach movement detected a stop as, in this case, all moving axes are already at a standstill due to the stop. If other axes are also involved in the approach movement, the CNC therefore stops the axes at their normal deceleration rates P-AXIS-00024 despite the fact that the "quick_stop_after_detection" parameter is set.</p>	
Parameter	antr.fixed_stop.quick_stop_after_detection	
Data type	BOOLEAN	
Data range	0 / 1	
Axis types	T, R	
Dimension	T: ----	R: ----
Default value	0	
Drive types	SERCOS, CANopen	
Remarks		

<b>P-AXIS-00763</b>	<b>Error reaction for missing drive releases.</b>	
Description	<p>If the drive releases are reset after the fixed stop is detected, the CNC generates the error message P-ERR-70546 and aborts the function "Move to fixed stop". This behaviour can be changed by the parameter "error_missing_drive_releases".</p> <p>In any case, missing releases result in the abortion of the function "Move to fixed stop".</p>	
Parameter	antr.fixed_stop.error_missing_drive_releases	
Data type	STRING	
Data range	<p>ERROR: Output of error message P-ERR-70546 and the Move to fixed stop function is aborted</p> <p>WARNING: Output of warning P-ERR-70546 and the Move to fixed stop function is aborted</p> <p>NONE: Abort the Move to fixed stop function</p>	
Axis types	T, R	
Dimension	T: ----	R: ----
Default value	ERROR	
Drive types	SERCOS, CANopen	
Remarks	Check the motion range of the axis before you set each release again. The stop obstacle must be removed.	

## Keyword index

### P

---

P-AXIS-00712 .....	22
P-AXIS-00713 .....	23
P-AXIS-00714 .....	23
P-AXIS-00715 .....	24
P-AXIS-00716 .....	24
P-AXIS-00717 .....	24
P-AXIS-00718 .....	25
P-AXIS-00719 .....	25
P-AXIS-00720 .....	26
P-AXIS-00721 .....	26
P-AXIS-00722 .....	27
P-AXIS-00723 .....	27
P-AXIS-00724 .....	28
P-AXIS-00725 .....	29
P-AXIS-00726 .....	29
P-AXIS-00727 .....	30
P-AXIS-00728 .....	30
P-AXIS-00729 .....	31
P-AXIS-00730 .....	31
P-AXIS-00731 .....	32
P-AXIS-00746 .....	32
P-AXIS-00762 .....	33
P-AXIS-00763 .....	33
P-STUP-00033 .....	22

## 6 Appendix

### 6.1 Suggestions, corrections and the latest documentation

Did you find any errors? Do you have any suggestions or constructive criticism? Then please contact us at [documentation@isg-stuttgart.de](mailto:documentation@isg-stuttgart.de). The latest documentation is posted in our Online Help (DE/EN):



QR code link: <https://www.isg-stuttgart.de/documentation-kernel/>

The link above forwards you to:

<https://www.isg-stuttgart.de/fileadmin/kernel/kernel-html/index.html>



#### Notice

##### Change options for favourite links in your browser;

Technical changes to the website layout concerning folder paths or a change in the HTML framework and therefore the link structure cannot be excluded.

We recommend you to save the above "QR code link" as your primary favourite link.

##### PDFs for download:

PDFs DE:

<https://www.isg-stuttgart.de/produkte/softwareprodukte/isg-kernel/dokumente-und-downloads>

PDFs EN:

<https://www.isg-stuttgart.de/en/products/softwareproducts/isg-kernel/documents-and-downloads>

E-Mail:

[documentation@isg-stuttgart.de](mailto:documentation@isg-stuttgart.de)



© Copyright  
ISG Industrielle Steuerungstechnik GmbH  
STEP, Gropiusplatz 10  
D-70563 Stuttgart  
All rights reserved  
[www.isg-stuttgart.de](http://www.isg-stuttgart.de)  
[support@isg-stuttgart.de](mailto:support@isg-stuttgart.de)

