DOCUMENTATION ISG-kernel

Functional description
Direct data transfer HLI-Drive

Short description:
FCT-A13

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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

This link

https://www.isg-stuttgart.de/de/isg-kernel/kernel-downloads.html

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.

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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

➢ 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

1 Overview

Task

This functionality permits the cyclic transfer of drive data between the drive controller and the HLI.

Release Note

Function available as of V3.1.3135.0.

Properties

The functionality is available for drive types SERCOS, CANopen, PROFIdrive and Terminal.

Up to 4 data items per axis can be transferred cyclically in each direction.

Parameterisation

Parameterisation requires entering the axis parameters [▶ 12] in the relevant axis parameter list.

Mandatory note on references to other documents

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

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

2 Description

The functionality transfers drive data directly from the drive controller of the field bus to the HLI.

There are 2 options for this:

1. read and write access using lr_mc_control.uns32_1 [▶ 10] to lr_mc_control.uns32_4 [▶ 10]; here, the parameters from antr.plc_to_drive[i] are used for parameterisation.
2. data display only using lr_state.uns32_1 [▶ 11] to lr_state.uns32_4 [▶ 11]; here, the parameters from antr.drive_to_plc[i] are used for parameterisation.

4 data items can be transferred in each direction simultaneously, i.e. a total of 8.

Drive data to be transferred

Various data item types can be transferred. The data type must be specified by P-AXIS-00855 [▶ 13] or P-AXIS-00863 [▶ 19].

Starting with this parameterisation, the drive value is read into the CNC: The data is output on the HLI in a UNS32 variable (UDINT). If the parameterised data is an SGN data type, the sign is transferred to the HLI in bit 32 (counting from 0). It is also possible to read or write individual bits. The data types “BITARRAY_xx” are used for this purpose.

Notice

The functionality need not be enabled. Parameterisation in the axis parameter list is sufficient.

2.1 Read and write access

The data item is output to control units lr_mc_control.uns32_1 [▶ 10] to lr_mc_control.uns32_4 [▶ 10]. Read access is possible at all times. To ensure write access, the data item may not be used by the CNC. This includes both internal use as well as use by other drive functions, z.B. #DRIVE command or „Moving to a fixed stop“.

The following variants exist:

- read only □Data item is only parameterised in the input telegram
- write only □ Data item is only parameterised in the output telegram
- read and write □ Data item is parameterised in the input and output telegrams

Limitation of the output value

The value transferred to the drive can be configured with maximum (P-AXIS-00859 [▶ 16]) and minimum (P-AXIS-00860 [▶ 16]) values. When writing to the control unit, a check is made whether the value lies within the permissible parameterised value range. Limit values are automatically scaled using the scaling factor (P-AXIS-00858 [▶ 15]).

Initial value after controller start-up

Since this is a cyclically transferred value, a start value must be specified, otherwise the value 0 is transferred to the drive. The start value can be set in P-AXIS-00861 [▶ 17]. If a scaling factor (P-AXIS-00858 [▶ 15]) is parameterised, the start value is first scaled before it is written to the drive.

Example

Paramererisation for a CANopen drive data item

Objects for positive (60E0_00) and negative (60E0_01) torque limit values

```
antr.plc_to_drive[0].data_type          UNS16
antr.plc_to_drive[0].wr_ident           60E0_00
antr.plc_to_drive[0].min_limit          0
antr.plc_to_drive[0].max_limit          5000
antr.plc_to_drive[0].scaling_factor     2
antr.plc_to_drive[0].scaling_type       LINEAR
antr.plc_to_drive[0].startup_value      222

antr.plc_to_drive[1].data_type          UNS16
antr.plc_to_drive[1].wr_ident           60E0_01
antr.plc_to_drive[1].min_limit          0
antr.plc_to_drive[1].max_limit          5000
antr.plc_to_drive[1].scaling_factor     2
antr.plc_to_drive[1].scaling_type       LINEAR
antr.plc_to_drive[1].startup_value      222
```

2.2 Data display only

The data item is output by lr_state.uns32_1 [▶ 11] to lr_state.uns32_4 [▶ 11]. The data item must only be parameterised in the input telegram

Example

Parameterisation for reading a CANopen drive data item

Objects for the positive (60E0_00) torque limit value

```
antr.drive_to_plc[0].data_type          UNS16
antr.drive_to_plc[0].wr_ident           60E0_00
antr.drive_to_plc[0].scaling_factor     2
antr.drive_to_plc[0].scaling_type       LINEAR
```

3 Parameterisation

3.1 Overview of parameters

ID	Description
P-AXIS-00854	Name of the telegram element to be written
P-AXIS-00855	Data type of the data item to be transferred
P-AXIS-00856	Bit mask for drive value
P-AXIS-00857	Scaling of the data item to be transferred
P-AXIS-00858	Scaling of the output value
P-AXIS-00859	Maximum output value
P-AXIS-00860	Minimum output value
P-AXIS-00861	Initial value of the telegram element
P-AXIS-00862	Name of the telegram element to be read
P-AXIS-00863	Data type of the data item to be transferred
P-AXIS-00864	Bit mask for drive value
P-AXIS-00865	Scaling of the data item to be transferred
P-AXIS-00866	Scaling of the output value

3.2 HLI parameters

Read/write drive data cyclically	
Description	This control unit reads and writes a drive signal that is not used by the CNC. Parameterisation is executed using • Parameterising drive data from PLC to drive or • Parameterising drive data from PLC to drive. A **read access is always executed when an ID was parameterised for** P-AXIS-00854 [▶ 12]. A write access is only executed if the ID is not used by the CNC. The control unit can be used in read-only, write-only or both read and write modes. This is dependent on P-AXIS-00854 [▶ 12] and P-AXIS-00862 [▶ 18].
Data type	MC_CONTROL_UNS32_UNIT, see description of Control unit
Access	PLC reads request_r + state_r and writes command_w + enable_w
ST path	gpAx[*axis_idx*]^.lr_mc_control.**uns32_**<*i*> where i = [1, 4] e.g. gpAx[axis_idx]^.lr_mc_control.**uns32_2**
Commanded and requested values	
ST element	**.command_w** **.request_r**
Data type	UDINT
Return value	
ST path	**.state_r**
Data type	UDINT
Redirection	
ST path	.enable_w
Special feature	**Available as of Build V3.1.3081.21 or V3.1.3135.0** Is an SGN value was parameterised as data type in P-AXIS-00855 [▶ 13], the sign information is located at Bit 31 (counting from 0). These values can also be provided to the position controller interface. See Read drive data cyclically (gpAx[*axis_idx*]^.lr_state.**uns32_1**)

Read drive data	
Description	Data transferred by the drive to the NC kernel. The content is application-specific This data is also provided in parallel in the state of the control unit, see Read/write drive data cyclically
Signal flow	CNC → PLC
ST path	gpAx[axis_idx]^.lr_state.**uns32_**<i> where i = [1, 4] e.g. gpAx[axis_idx]^.lr_state.**uns32_2**
Data type	UDINT
Access	PLC is reading

Special features	Therefore, enable transfer of the value in the axis parameter list to the drive, e.g.:
	
	`# Cyclically read the 4 byte PLC value`
	`# uns32_3 to S-0-0819`
	`antr.drive_to_plc[2].wr_ident S_0_0092`
	`antr.drive_to_plc[2].scaling_type LINEAR`
	`antr.drive_to_plc[2].scaling_factor 10`

3.3 Axis parameters

P-AXIS-00854	Name of the telegram element to be written	
Description	This parameter defines which telegram element in the cyclic telegram is to be treated as control unit on the HLI. The index i + 1 corresponds to the relevant control unit. This is the assignment (0 ≤ i ≤ 3): antr.plc_to_drive[0].wr_ident -> gpAx[axis_idx]^.lr_mc_control.uns32_1 antr.plc_to_drive[1].wr_ident -> gpAx[axis_idx]^.lr_mc_control.uns32_2 antr.plc_to_drive[2].wr_ident -> gpAx[axis_idx]^.lr_mc_control.uns32_3 antr.plc_to_drive[3].wr_ident -> gpAx[axis_idx]^.lr_mc_control.uns32_4 The name of the ID must be identical with the drive reference configured in the axis parameter list.	
Parameter	antr.plc_to_drive[i].wr_ident (0 ≤ i ≤ 3)	
Data type	STRING	
Data range	Maximum of 29 characters	
Axis types	T, R, S	
Dimension	T: ----	R, S: ----
Default value		
Drive types	SERCOS, Profidrive, CANopen, Terminal	
Remarks	Available as of Build V3.1.3081.21 or V3.1.3135.0 Parameterisation example: The torque limit value for a SERCOS drive should be linked to the control unit in the HLI. antr.plc_to_drive[0].wr_ident S_0_0092	

P-AXIS-00855	**Data type of the data to be transferred**	
Description	This parameter defines the data type of the telegram element in the cyclic telegram that is to be treated as control unit on the HLI.	
Parameter	antr.plc_to_drive[i].data_type	
Data type	STRING	
Data range	SGN08: Signed 8 bit integer. UNS08: Unsigned 8 bit integer. SGN16: Signed 16 bit integer. UNS16: Unsigned 16 bit integer. SGN32: Signed 32 bit integer. UNS32: Unsigned 32 bit integer. BITARRAY_08: Bit array 8 bits. BITARRAY_16: Bit array 16 bits. BITARRAY_32: Bit array 32 bits.	
Axis types	T, R, S	
Dimension	T: ----	R, S: ----
Default value	SGN16	
Drive types	SERCOS, Profidrive, CANopen, Terminal	
Remarks	Available as of Build V3.1.3081.21 or V3.1.3135.0 The data item is transferred by a UNS32 value to the HLI; if it is an SGN data type, the sign is at bit 31 (0-based).	

P-AXIS-00856	**Writing of drive values by bit mask**	
Description	This parameter specifies the bit mask that must be used if bitwise writing is defined. If the value specified in the control unit is greater than zero, the bit mask are set. With a programmed value of zero, the bits in the bit mask are deleted from the value transferred to the drive. This value is only used if the data type configured in P-AXIS-00855 [▶ 13] has either the value 'BITARRAY_08', 'BITARRAY_16' or 'BITARRAY_32'. The value of this parameter must be less than or equal to the maximum values defined by the parameter in P-AXIS-00855 [▶ 13], otherwise error message ID 70403 is output.	
Parameter	antr.plc_to_drive[i].mask	
Data type	STRING	
Data range	Dependent on P-AXIS-00855: BITARRAY_08: Bit array 08 bit - 0 ... MAX(UNS08) BITARRAY_16: Bit array 16 bit - 0 ... MAX(UNS16) BITARRAY_32: Bit array 32 bit - 0 ... MAX(UNS32)	
Axis types	T, R, S	
Dimension	T: ----	R, S: ----
Default value	NOT USED	
Drive types	SERCOS, Profidrive, CANopen, Terminal	
Remarks	Available as of Build V3.1.3081.21 or V3.1.3135.0	

P-AXIS-00857	Scaling of the data item to be transferred	
Description	This parameter defines the scaling of the value that is transferred to the drive.	
Parameter	antr.plc_to_drive[i].scaling_type	
Data type	STRING	
Data range	UNSCALED	Unscaled output of the value programmed in the NC program; scaling factor = 1 (default).
	LINEAR	The value is weighted by a scaling factor (see P-AXIS-00858 [▶ 15])
	TORQUE_DRIVE_SIDE	The programmed value is a torque value related to the motor shaft and is scaled to the drive torque format by the parameters P-AXIS-00325, P-AXIS-00326 and P-AXIS-00392. The scaling factor does not change during gear change. The scaling factor is: $f = \frac{1}{P-AXIS-00392} * \frac{P-AXIS-00325}{P-AXIS-00326}$
Axis types	T, R, S	
Dimension	T: ----	R, S: ----
Default value	UNSCALED	
Drive types	SERCOS, Profidrive, CANopen, Terminal	

Remarks	Available as of Build V3.1.3081.21 or V3.1.3135.0
	Example:
	The torque limit in the SERCOS drive is specified in per mil units of the maximum motor torque. However, on the HLI, the torque should be specified in per cent:
	`antr.plc_to_drive[0].wr_ident S_0_0092`
	`antr.plc_to_drive[0].scaling_type LINEAR`
	`antr.plc_to_drive[0].scaling_factor 10`	

P-AXIS-00858	Scaling of the output value	
Description	This parameter executes a scaling for reading and writing the drive object. This parameter is only effective if the scaling type is specified with P-AXIS-00857. The parameters for the start value P-AXIS-00861 [▶ 17] and for the minimum and maximum permissible output values (P-AXIS-00860 [▶ 16] and P-AXIS-00859 [▶ 16]) are also scaled.	
Parameter	antr.plc_to_drive[i].scaling_factor	
Data type	REAL64	
Data range	REAL range, except value 0	
Axis types	T, R, S	
Dimension	T: ----	R, S: ----
Default value	1	
Drive types	SERCOS, Profidrive, CANopen, Terminal	
Remarks	Available as of Build V3.1.3081.21 or V3.1.3135.0	

P-AXIS-00859	Maximum permissible output value	
Description	This parameter defines the maximum permissible output value. If the value specified by the control unit exceeds the maximum value, the drive output value is corrected automatically to the maximum value. No error message is then output. If the parameter is greater than the maximum value of the specified data type defined in P-AXIS-00855 [▶ 13], the warning ID 70383 is output and the value of the parameter is corrected. If P-AXIS-00860 [▶ 16] is configured, P-AXIS-00860 must be smaller than this parameter. If this is not the case, the warning ID 70385 is output and the minimum and maximum values are exchanged. If this parameter is not configured, no limitation is executed.	
Parameter	antr.plc_to_drive[i].max_limit	
Data type	REAL64	
Data range	Dependent on P-AXIS-00855 [▶ 13] and P-AXIS-00858 [▶ 15]	
Axis types	T, R, S	
Dimension	T: ----	R, S: ----
Default value	1.000000e+199	
Drive types	SERCOS, Profidrive, CANopen, Terminal	
Remarks	Available as of Build V3.1.3081.21 or V3.1.3135.0	

P-AXIS-000860	Minimum permissible output value	
Description	This parameter defines the minimum permissible output value. If the value specified by the control unit exceeds the minimum value, the drive output value is corrected automatically to the minimum value. No error message is then output. If the parameter is smaller than the minimum value of the set data type defined by P-AXIS-00855 [▶ 13], the warning ID 70384 is output and the value of the parameter is corrected. If P-AXIS-00859 [▶ 16] is configured, P-AXIS-00859 must be greater than the value of P-AXIS-00860. If this is not the case, the warning ID 70385 is output and the values are exchanged. If these parameters are not configured, no limitation is executed.	
Parameter	antr.plc_to_drive[i].min_limit	
Data type	REAL64	
Data range	Dependent on P-AXIS-00855 [▶ 13] and P-AXIS-00858 [▶ 15]	
Axis types	T, R, S	
Dimension	T: ----	R, S: ----
Default value	1.000000e+199 **[Kommentar: Stimmt der Wert!??]**	
Drive types	SERCOS, Profidrive, CANopen, Terminal	
Remarks	Available as of Build V3.1.3081.21 or V3.1.3135.0	

P-AXIS-00861	**Value of data element after controller start-up**	
Description	This parameter defines the value of the cyclic telegram element after controller start-up. The scaling factor P-AXIS-00858 [▶ 15] is calculated using this value and written to the drive.	
Parameter	antr.plc_to_drive[i].startup_value	
Data type	REAL64	
Data range	When P-AXIS-00855 [▶ 13] = 'SGN16': MIN(SGN16) ≤ startup_value * scaling_factor ≤ MAX(SGN16) When P-AXIS-00855 [▶ 13] = 'SGN32': MIN(SGN32) ≤ startup_value * scaling_factor ≤ MAX(SGN32)	
Axis types	T, R, S	
Dimension	T: ----	R, S: ----
Default value	0	
Drive types	SERCOS, Profidrive, CANopen, Terminal	
Remarks	Available as of Build V3.1.3081.21 or V3.1.3135.0	

P-AXIS-00862	Name of the telegram element to be read	
Description	This parameter defines which telegram element in the cyclic telegram is to be treated as control unit on the HLI. The index i + 1 corresponds to the relevant control unit. This is the assignment (0 ≤ i ≤ 3): antr.drive_to_plc[0].wr_ident -> gpAx[axis_idx]^.lr_mc_control.uns32_1 antr.drive_to_plc[1].wr_ident -> gpAx[axis_idx]^.lr_mc_control.uns32_2 antr.drive_to_plc[2].wr_ident -> gpAx[axis_idx]^.lr_mc_control.uns32_3 antr.drive_to_plc[3].wr_ident -> gpAx[axis_idx]^.lr_mc_control.uns32_4 The name of the ID must be identical with the drive reference configured in the axis parameter list.	
Parameter	antr.drive_to_plc[i].wr_ident (0 ≤ i ≤ 3)	
Data type	STRING	
Data range	Maximum of 29 characters	
Axis types	T, R, S	
Dimension	T: ----	R, S: ----
Default value		
Drive types	SERCOS, Profidrive, CANopen, Terminal	
Remarks	Available as of Build V3.1.3081.21 or V3.1.3135.0 Parameterisation example: The torque limit value for a SERCOS drive should be linked to the control unit in the HLI. antr.drive_to_plc[0].wr_ident S_0_0092	

P-AXIS-00863	**Data type of the data to be transferred**	
Description	This parameter defines the data type of the telegram element in the cyclic telegram that is to be treated as control unit on the HLI.	
Parameter	antr.drive_to_plc[i].data_type	
Data type	STRING	
Data range	SGN08: Signed 8 bit integer. UNS08: Unsigned 8 bit integer. SGN16: Signed 16 bit integer. UNS16: Unsigned 16 bit integer. SGN32: Signed 32 bit integer. UNS32: Unsigned 32 bit integer. BITARRAY_08: Bit array 8 bits. BITARRAY_16: Bit array 16 bits. BITARRAY_32: Bit array 32 bits.	
Axis types	T, R, S	
Dimension	T: ----	R, S: ----
Default value	SGN16	
Drive types	SERCOS, Profidrive, CANopen, Terminal	
Remarks	Available as of Build V3.1.3081.21 or V3.1.3135.0 The data item is transferred by a UNS32 value to the HLI; if it is an SGN data type, the sign is at bit 31 (0-based).	

P-AXIS-00856	**Writing of drive values by bit mask**	
Description	This parameter specifies the bit mask that must be used if bitwise writing is defined. If the value specified by the control unit is greater than zero, the bit mask is set. With a programmed value of zero, the bits in the bit mask are deleted from the value to be transmitted to the drive. This value is only used if the data type configured in P-AXIS-00855 [▶ 13] has either the value 'BITARRAY_08', 'BITARRAY_16' or 'BITARRAY_32'. The value of this parameter must be less than or equal to the maximum values defined by the parameter in P-AXIS-00855 [▶ 13], otherwise error message ID 70403 is output.	
Parameter	antr.drive_to_plc[i].mask	
Data type	STRING	
Data range	Dependent on P-AXIS-00855: BITARRAY_08: Bit array 08 bit - 0 ... MAX(UNS08) BITARRAY_16: Bit array 16 bit - 0 ... MAX(UNS16) BITARRAY_32: Bit array 32 bit - 0 ... MAX(UNS32)	
Axis types	T, R, S	
Dimension	T: ----	R, S: ----
Default value	NOT USED	
Drive types	SERCOS, Profidrive, CANopen, Terminal	
Remarks	Available as of Build V3.1.3081.21 or V3.1.3135.0	

P-AXIS-00865	Scaling of the data to be transferred	
Description	This parameter defines the scaling of the value before transfer to the drive.	
Parameter	antr.drive_to_plc[i].scaling_type	
Data type	STRING	
Data range	UNSCALED	Unscaled output of the value programmed in the NC program; scaling factor = 1 (default).
	LINEAR	The value is weighted by a linear scaling factor (see P-AXIS-00866 [▶ 21])
	TORQUE_DRIVE_SIDE	The programmed value is a torque value related to the motor shaft and is scaled to the drive torque format by the parameters P-AXIS-00325, P-AXIS-00326 and P-AXIS-00392. The scaling factor does not change during gear change. The scaling factor is: $f = \frac{1}{P-AXIS-00392} * \frac{P-AXIS-00325}{P-AXIS-00326}$
Axis types	T, R, S	
Dimension	T: ----	R, S: ----
Default value	UNSCALED	
Drive types	SERCOS, Profidrive, CANopen, Terminal	

Remarks	Available as of Build V3.1.3081.21 or V3.1.3135.0
	Example:
	The torque limit in the SERCOS drive is specified in per mil units of the maximum motor torque. However, on the HLI, the torque should be specified in per cent:
	`antr.drive_to_plc[0].wr_ident S_0_0092`
	`antr.drive_to_plc[0].scaling_type LINEAR`
	`antr.drive_to_plc[0].scaling_factor 10`	

P-AXIS-00866	Scaling of the output value	
Description	This parameter executes a scaling for reading and writing the drive object. This parameter is only effective if the scaling type is specified in P-AXIS-00865 [▶ 21].	
Parameter	antr.drive_to_plc[i].scaling_factor	
Data type	REAL64	
Data range	REAL range, except value 0	
Axis types	T, R, S	
Dimension	T: ----	R, S: ----
Default value	1	
Drive types	SERCOS, Profidrive, CANopen, Terminal	
Remarks	Available as of Build V3.1.3081.21 or V3.1.3135.0	

4 Appendix

4.1 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.

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;

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

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Email: documentation@isg-stuttgart.de

Keyword index

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