DOCUMENTATION ISG-kernel

Functional description
Diagnosis upload

Short Description:
FCT-M09

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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.

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1 Overview

Task

The Diagnosis upload function is used to save the current system status of the CNC to a file. It can be executed at any time while the CNC is running.

The diagnosis data can then be used for a CNC analysis.

Possible applications

The upload of diagnosis data can be initiated by the PLC, an NC command or by CNC objects.

CNC diagnosis data is used for:

- error analysis
- remote diagnosis / remote support
- report on system state

Release Note

This function is available as of CNC Builds: V2.11.2054 ; V2.11.2825 ; V3.1.3079.38 ; V3.1.3107.27

Parameterisation

The upload can be parameterised by:

- NC command [▶ 16]
- start-up parameters [▶ 20]
- or CNC objects [▶ 22]

Programming

The upload of diagnosis data is requested by the NC command #DIAGNOSIS [▶ 16] and individual parameters can be set.

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

2.1 General

Diagnosis data is an important tool to analyse the state of the CNC. This data, especially error messages or an undesired malfunction, can be used to analyse the current state of the CNC.

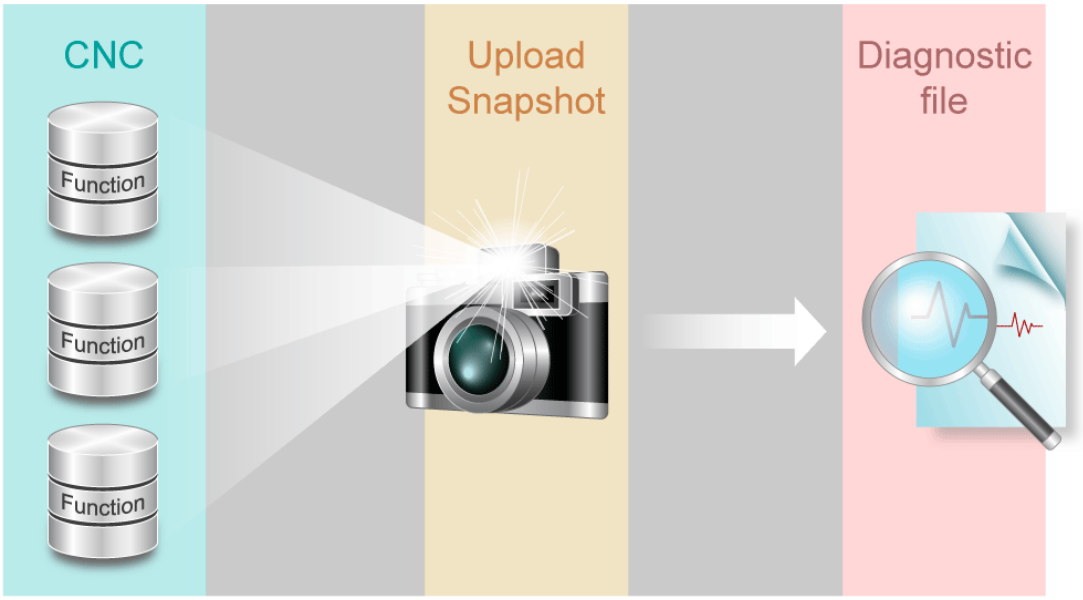


Fig. 1: Overview of Diagnosis upload function

From the viewpoint of the CNC, the term upload is the supply of all collected diagnosis data depending on the parameterisation.

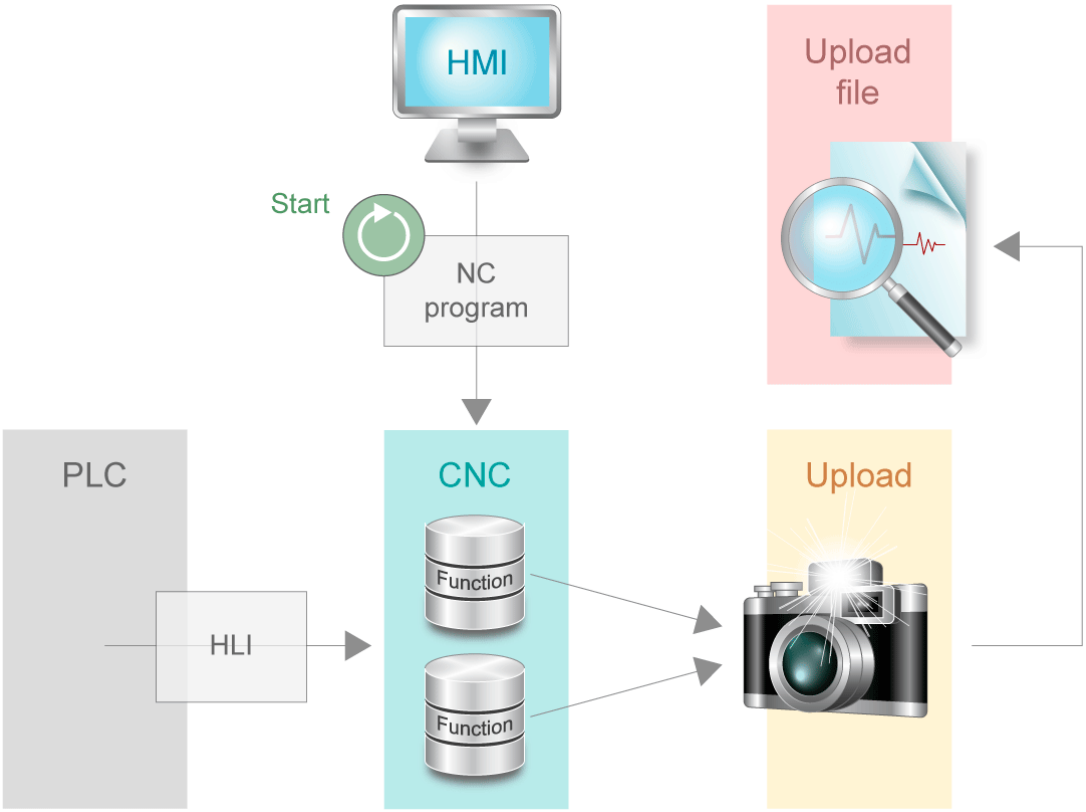


Fig. 2: Upload of diagnosis data

The following interfaces have an impact on the CNC:

- CNC parameters
- ISO program
- HMI
- PLC

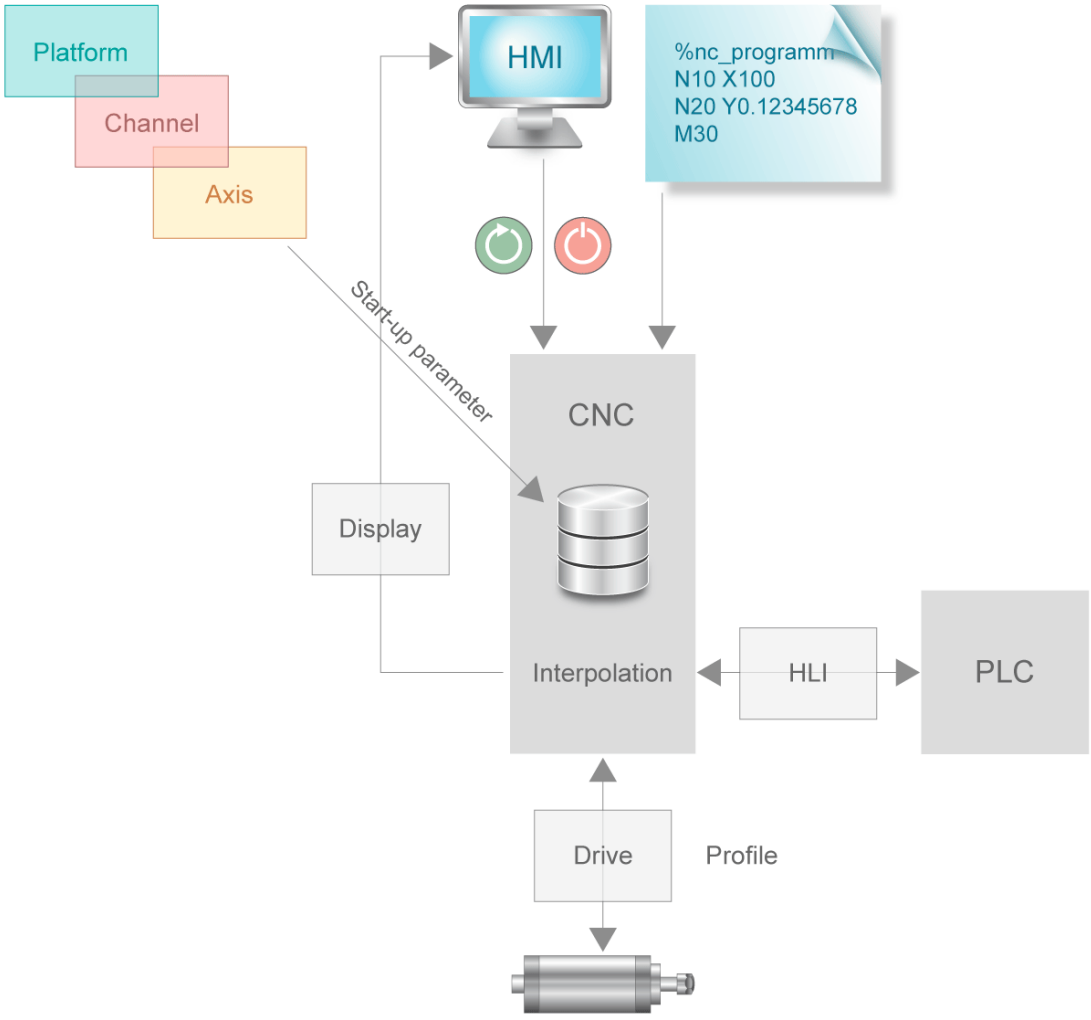


Fig. 3: CNC interfaces

When diagnosis data is uploaded, data relating to individual CNC functions is internally collected and logged to a file. The data can then be analysed after the write process is completed.

The ISG-kernel/Documents and downloads/tools page on the ISG website contains a Diag-data Browser which performs an analysis of diagnosis data.

2.2 Commanding the upload

The Diagnosis upload function can be commanded by the following interfaces

1. PLC via Control unit [▶ 25]
2. HMI via Object access [▶ 22]
3. NC command [▶ 16] in the NC program
   - a: Before processing, i.e. while the NC program is decoded
   - b: Simultaneously with processing (during interpolation)

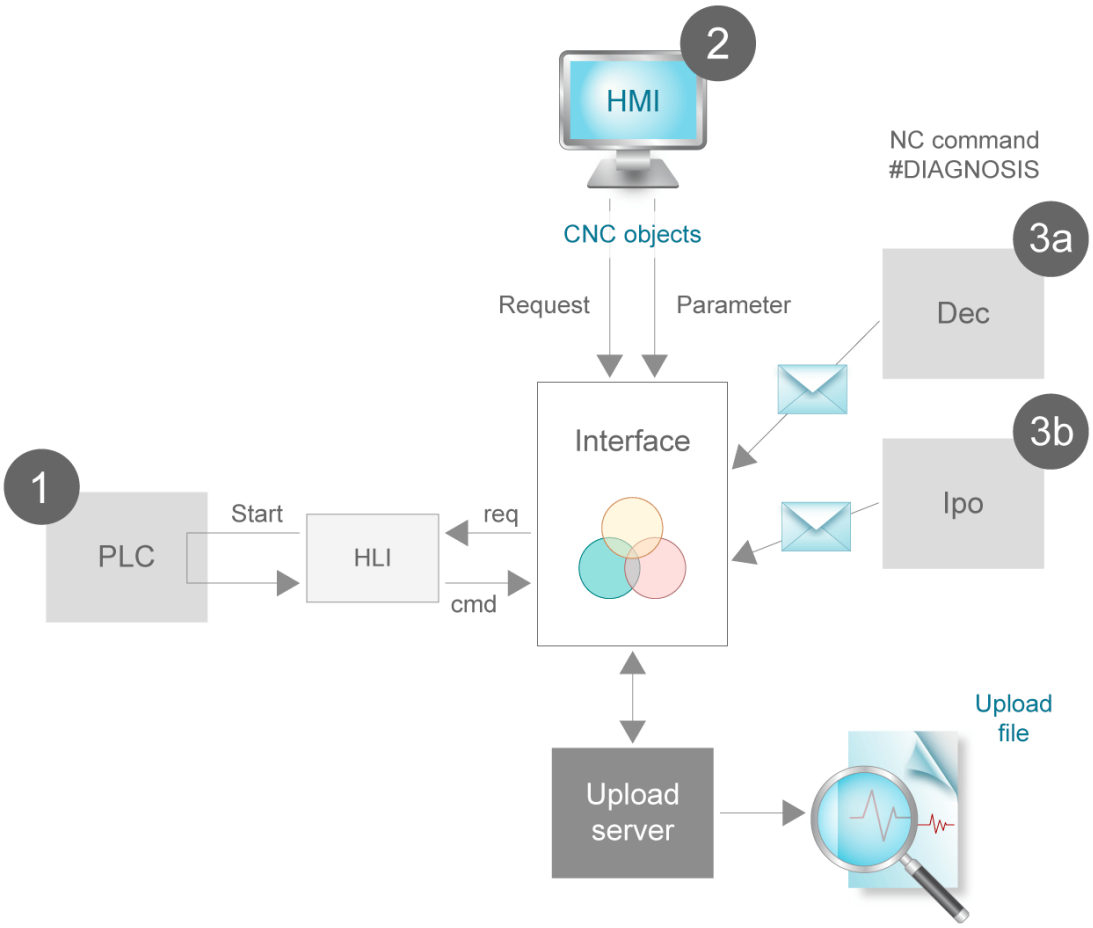


Fig. 4: Interfaces for commanding the upload

The upload process can be commanded in parallel via an interface. The individual commands are not sorted in a queue and processed one after the other. In other words, when a parallel task (multi-channel functionality, CNC objects, PLC) requests an upload, only the last upload request is considered. If necessary, each sequential upload must be synchronised at the application level with tasks running in parallel.

A distinction is made between parameterising the upload (filename, volume, etc.) and the upload start (command). The parameters previously set are adopted at every upload start.

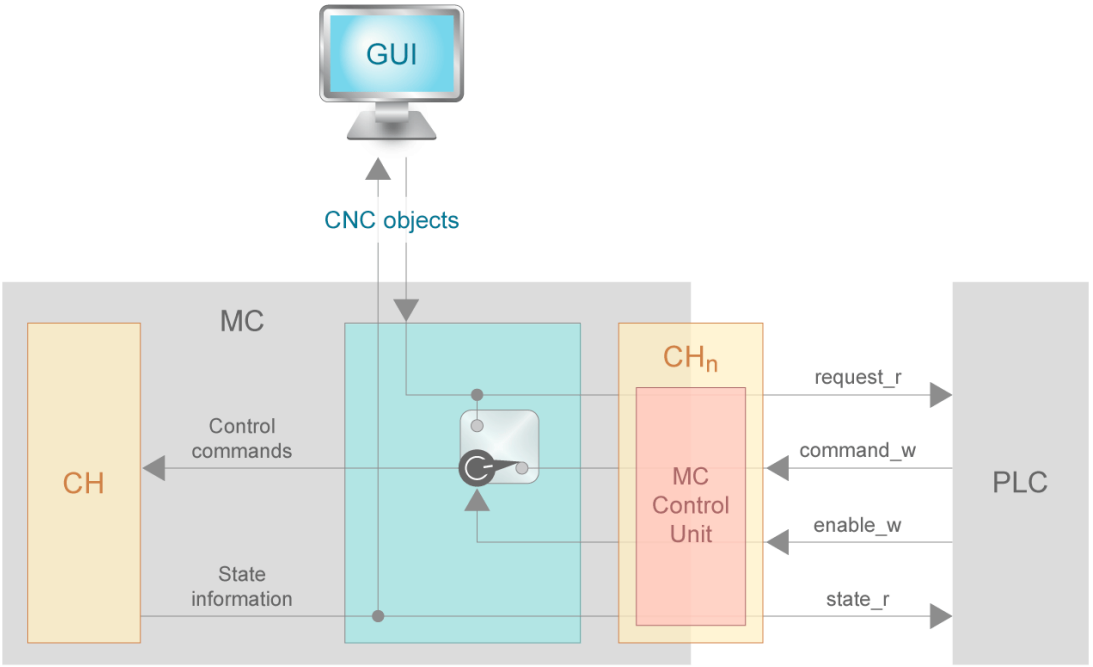
2.2.1 Commanding via the PLC

The PLC can control the upload start or trigger it itself via the control unit (CU) [▶ 25] on the PLC interface (HLI). To do this, the PLC must enable the control unit using the enable_w signal.

Notice

HLI syntax for CNC Builds as of V2.11.20xx

The explanations and graphics below are compiled for CNC Builds as of V2.11.28xx.
The behaviour in CNC Builds up to V2.11.20xx is analogous except for the related HLI syntax.



Starting point – control unit enabled

Every request is forwarded to the HLI. The data item request_r is set to TRUE on the CU. It is then possible to determine in the PLC whether the upload process is started. A start requires setting command_w to TRUE. As soon as state_r reverts to FALSE, the PLC must set command_w to FALSE. This completes writing of the diagnosis data.

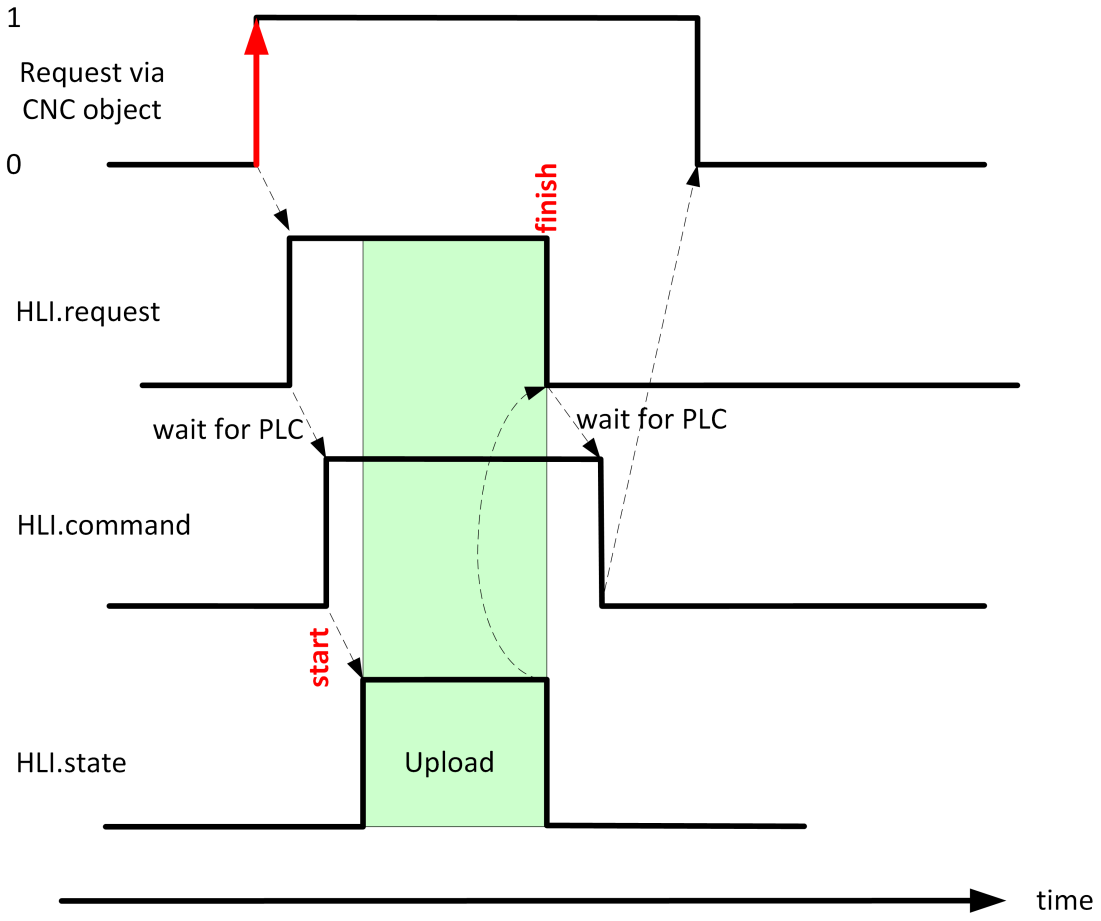


Fig. 5: Upload signal profile with control unit enabled

Starting point – control unit disabled

Every request commands the upload process directly, provided no other upload is active. The request command comes either via the NC command or via the CNC object.

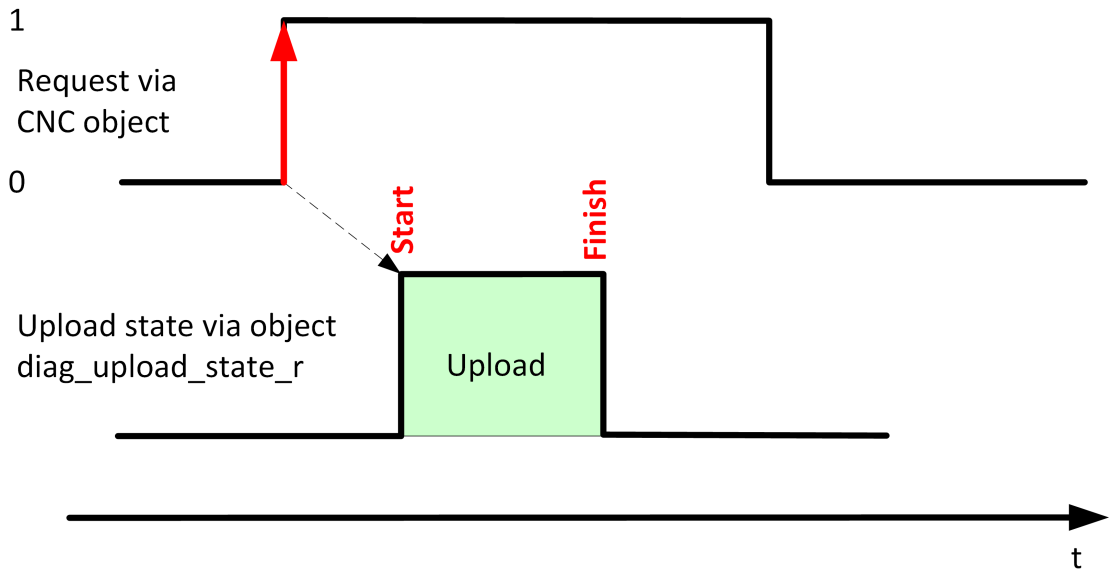


Fig. 6: Upload signal profile with control unit disabled

2.3 Parameterisation of an upload

The Diagnosis upload function can be parameterised by the following interfaces:

- NC command [▶ 16]
- start-up parameters [▶ 20]
- CNC objects [▶ 22]

The following options are available for parameterisation:

- one-off automatic upload after controller start-up
- filename and file path
- number of files to be saved
- upload synchronicity
- formatting
- scaling the upload

One-off automatic upload after controller start-up

The parameter P-STUP-00113 [▶ 20] can be used to specify the once-off filename for the diagnosis upload after controller startup. If this parameter is unassigned, no upload takes place.

Filename and file path

The user may define the name of the output file and the path where the output file is to be saved. It is also possible to program a relative path both in the name of the output file and the path. The programmed path is then relative to the current work directory.

Number of files to be saved

By default, the written file is overwritten every time an upload is commanded. The number of diagnosis files to be saved in parallel is defined by the NC command, the startup parameter P-STUP-00114 [▶ 21] or using the CNC object. If the number <n> is specified, the last <n> files are saved and numbered automatically.

Numbering starts with 0. The numbering syntax for the first element is *<filename>_0.<file suffix>*. An upload counter assigns the filename unambiguously to the corresponding upload using modulo calculation.

Synchronicity with NC program execution

The NC command #DIAGNOSIS defines whether execution takes place during decoding or synchronous with interpolation. In addition, a setting is provided to select whether NC program processing stops at the end of the upload (WAIT) or continues in parallel.

Upload mode

With regression tests on a machine, the same result is usually expected for all of the tests. The diagnosis data can be used to verify the state after each test. However, a comparison of two sets of diagnosis data generally shows many differences. This can be explained by the

numerous time stamps in the diagnosis data. This makes it difficult to search for relevant differences between diagnosis files and to verify the test. For this reason, use Mode to select a different formatting that is more suitable for regression tests.

By default, all messages sent to ISG_DIAG_BED via the #MSG command are read out at the start of the upload. This function can be disabled.

Scaling the upload

The data volume can be defined by what is referred to as Topics that describe individual aspects of the CNC. By default, all data are output. Depending on a particular case, it may be preferable to query only a specific part of the diagnostic data in order to increase performance, i.e. shorten the length of the upload process. The topics (see Topic table [▶ 17]) can be parameterised using the #DIAGNOSIS [▶ 16] command, the startup parameter P-STUP-00115 [▶ 21] or using the CNC objects [▶ 22].

2.4 Execute upload

Start the upload by the PLC

The PLC can start an upload with the current parameter settings via the [▶ 25] enabled control unit on the HLI.

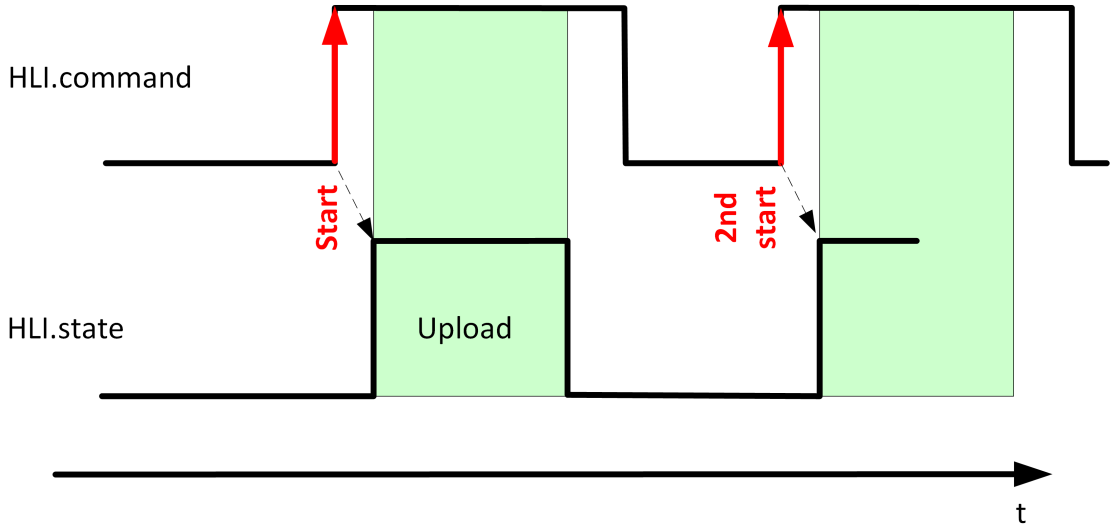


Fig. 7: Repeated start of an upload by the PLC with control unit enabled

Abort the upload by the PLC

The PLC has the option to abort a running upload process via the enabled control unit. The current upload is aborted by setting the data item command_w to FLASE on the control unit before the upload ends, The function will write the data of the current topic to the end. The remaining topics will not be loaded.

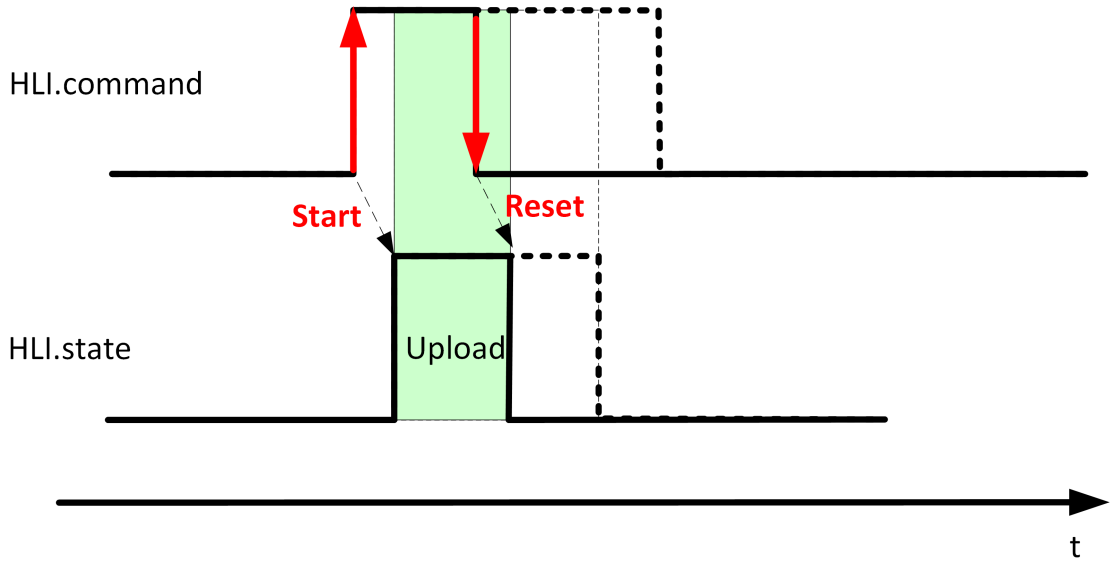


Fig. 8: Abort a current upload by the PLC with control unit enabled

3 Programming

Notice

Modality for this command refers to the complete runtime of the controller.

The individual parameters can be edited using CNC objects. The last value written is valid. This value is retained in the following uploads.

Syntax:

#DIAGNOSIS [SYN] [WAIT] [UPLOAD=.. **FILE =.. PATH** =.. **TOPICS** =.. **HISTORY_NBR** =.. **MODE** =..]

SYN	The NC command is executed synchronously with the processing time in the interpolator. Without SYN, the upload is already executed at the time the program is decoded.
WAIT	The NC program is interrupted until the upload ends. Wait may take place synchronously (SYN) in the interpolator or at the time the program is decoded.
UPLOAD=..	Command the upload (otherwise only new parameters are set): • TO_FILE (default) Output the diagnosis data to file. • TO_SCREEN Output the diagnosis data to screen. • TO_FILE | TO_SCREEN Output the diagnosis data to screen and to file.
FILE=..	Name of the diagnosis data output file: If FILE is unassigned, the value in P-STUP-00112 [▶ 20] is used or the last value that was written by the CNC object diag_upload_file_w. When the output file is specified with an absolute path, the path specified in P-STUP-00111 [▶ 20] is ignored.
PATH=..	Directory path for output file: If PATH is unassigned, the value in P-STUP-00111 [▶ 20] or the current path (default) is used.
HISTORY_NBR=..	Number of diagnosis data output files to be saved. The numbering has a value range from 0 to HISTORY_NBR - 1. The numbering syntax of the file for the first element is *<filename>_0.<file suffix>*. HISTORY_NBR = 1 (default) means that every file is overwritten at the next upload. If HISTORY_NBR is unassigned, the value in P-STUP-00114 [▶ 21] or the default value 1 or the last value written by the CNC object diag_upload_history_nbr_w is used.
MODE=.. (as of Build V2.11.2059)	Mode in the form of a string in order to modify each individual diagnosis upload. See Mode table [▶ 17]. If no identifier is specified for the mode, the entry in P-STUP-00117 [▶ 21] is used.
FORMAT=.. (compatibility)	Permitted identifiers: STANDARD, REGRESSION and PROTOCOL_INFO Replaced by MODE
TOPICS=..	Identifiers in the form of a string to specify each individual diagnosis upload. If no identifiers are specified, the identifiers in P-STUP-00115 [▶ 21] or all identifiers (default) or the last value written by the CNC object diag_upload_topics_w is used. For identifiers see the TOPICS table [▶ 17] below.

TOPICS table

Identifier	Meaning
MIN	Minimum upload
AX_DRVR	axes
IPO	Interpolation
IPO_BLCK	Interpolator function blocks
LOG	Logging the individual BFs of the CNC
AX_MGR	Axis management
DEC	Decoder
PPREP	Path preparation
HLI	PLC interface
MAN	Manual mode
SIG	Signal/Wait handshake
COM	Communication
VARS	External variables
SAI	Single-axis interpolation (spindle)
SAI_BLCK	SAI function blocks
TRC	Tool radius compensation
ERR	Error messages
ALL	All data (default)

Diagnosis upload mode	Meaning
STANDARD	Default upload with no further functions
REGRESSION	Formatting for regression test
PROTOCOL_INFO	Additional information about the upload procedure
MSG_FLUSH_OFF	Deactivate automatic flush for messages to ISG_DIAG_BED at the start of the diagnosis upload.

Programing Example

Using the #DIAGNOSIS command

```
N400 #DIAGNOSIS SYN WAIT [HISTORY_NBR=4]
N401 #DIAGNOSIS WAIT [FILE=diag_data_syn_wait.txt]
N402 #DIAGNOSIS SYN WAIT [TOPICS="IPO MAN DEC"]
N403 #DIAGNOSIS SYN WAIT [UPLOAD]
N404 #DIAGNOSIS SYN [UPLOAD PATH =D:\]
N405 #DIAGNOSIS SYN WAIT [UPLOAD=TO_FILE|TO_SCREEN
TOPICS=DEC+IPO FILE=diag_data_syn.txt]
N406 #DIAGNOSIS [MODE = REGRESSION HISTORY_NBR = 5]
N407 #DIAGNOSIS WAIT [UPLOAD]
N408 #DIAGNOSIS [MODE = STANDARD+REGRESSION+PROTOCOL_INFO]
N409 #DIAGNOSIS WAIT [UPLOAD=TO_SCREEN MODE = STANDARD TOPICS=" IPO MAN DEC "]
N410 #DIAGNOSIS SYN WAIT [UPLOAD=TO_FILE MODE = STANDARD|PROTOCOL_INFO|
MSG_FLUSH_OFF TOPICS=DEC|IPO]
```

The contents of the next 4 lines are identical

```
N411 #DIAGNOSIS WAIT [TOPICS="IPO MAN DEC"]
N412 #DIAGNOSIS WAIT [TOPICS= IPO+MAN+DEC]
N413 #DIAGNOSIS WAIT [TOPICS="IPO,MAN,DEC"]
N414 #DIAGNOSIS WAIT [TOPICS= IPO|MAN|DEC"]
```

When TOPICS, MODE and UPLOAD are programmed using | and +, there must be no blanks between the identifiers.

```
;N415 #DIAGNOSIS WAIT [TOPICS=IPO| MAN|DEC] -> Error 22150
;N416 #DIAGNOSIS WAIT [TOPICS=IPO+ MAN+DEC] -> Error 20392
```

(naming output files)

```
N430 #DIAGNOSIS WAIT [FILE=diag_out.txt HISTORY_NBR=3]
N431 #DIAGNOSIS SYN WAIT [UPLOAD]
N432 #DIAGNOSIS SYN WAIT [UPLOAD]
N433 #DIAGNOSIS SYN WAIT [UPLOAD]
```

The names of the 3 files created are:

- diag_out_0.txt
- diag_out_1.txt
- diag_out_2.txt

4 Parameter

4.1 Overview

start-up parameters

ID	Parameter	Description
P-STUP-00111	configuration.diagnosis_upload.path	File path for upload file of the diagnosis data
P-STUP-00112	configuration.diagnosis_upload.default_file	Name of the upload file of the diagnosis data
P-STUP-00113	configuration.diagnosis_upload.startup_file	File name for one-off diagnosis upload after controller start-up
P-STUP-00114	configuration.diagnosis_upload.history_nbr	Number of diagnosis data output files to be saved
P-STUP-00115	configuration.diagnosis_upload.topics	Identifier to specify the diagnosis upload
P-STUP-00117	configuration.diagnosis_upload.mode	Diagnosis upload mode

CNC objects

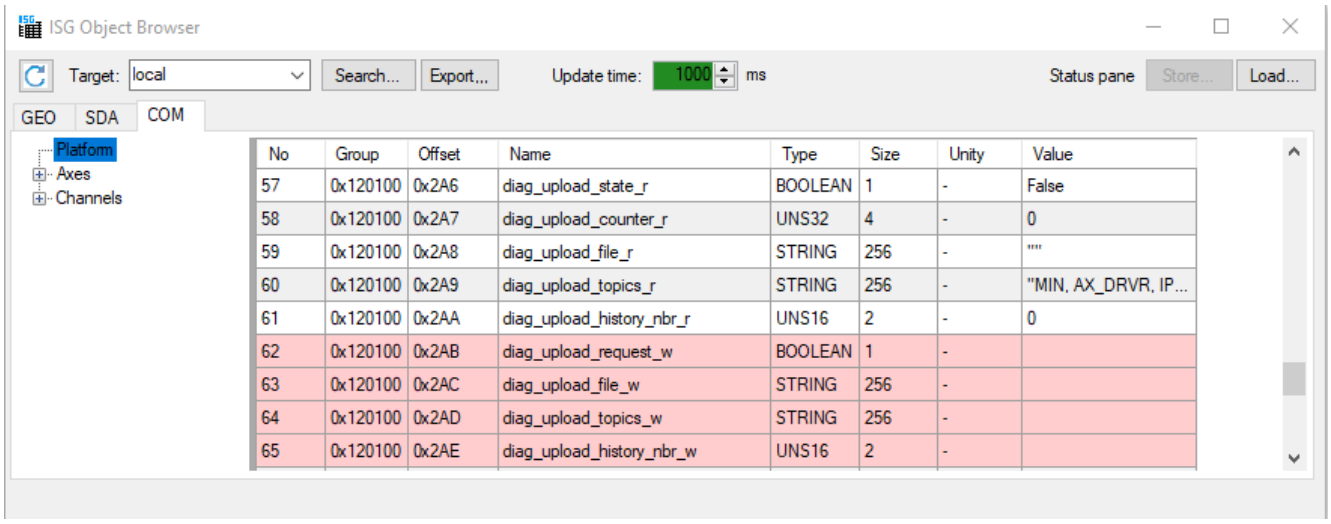


Fig. 9: CNC objects in the Object Browser

4.2 Start-up parameters

P-STUP-00111	File path for diagnosis upload
Description	This parameter defines the file path for writing the diagnosis data upload file.
Parameter	configuration.diagnosis_upload.path
Data type	STRING
Dimension	---
Default value	Standard CNC programme path, can be set via system manager -> CNC
Remarks	

P-STUP-00112	Filename for diagnosis upload
Description	This parameter specifies the filename of the diagnosis data upload file. The file path is defined by P-STUP-00111 [▶ 20] .
Parameter	configuration.diagnosis_upload.default_file
Data type	STRING
Dimension	---
Default value	diag_data.txt
Remarks	

P-STUP-00113	Name of the upload file of the diagnosis data at start-up
Description	This parameter specifies the name of the diagnosis data upload file at start-up. The file path is defined by P-STUP-00111 [▶ 20] .
Parameter	configuration.diagnosis_upload.startup_file
Data type	STRING
Dimension	---
Default value	
Remarks	**Note**: If P-STUP-00113 is unassigned, no diagnosis upload can be commanded at start-up.

P-STUP-00114	Number of diagnosis data output files to be saved
Description	This parameter defines the number of diagnosis data output files to be saved. The file path is defined by P-STUP-00111 [▶ 20] .
Parameter	configuration.diagnosis_upload.history_nbr
Data type	UNS16
Dimension	----
Default value	1
Remarks	

P-STUP-00115	Identifier to specify the diagnosis upload
Description	This parameter defines the identifiers to specify the diagnosis upload. For an overview of possible identifiers, see TOPICS table [▶ 17].
Parameter	configuration.diagnosis_upload.topics
Data type	STRING
Dimension	----
Default value	MAX
Remarks	

P-STUP-00117	Diagnosis upload mode
Description	This parameter defines the mode for a diagnosis upload. For an overview of the possible settings, see the Mode Table
Parameter	configuration.diagnosis_upload.mode
Data type	STRING
Dimension	---
Default value	STANDARD
Remarks	Parameter available as of CNC Build V2.11.2059, V2.11.2830, V3.1.3079.43 or V3.1.3107.33.

Diagnosis upload mode	Meaning
STANDARD	Default upload with no further functions
REGRESSION	Formatting for regression test
PROTOCOL_INFO	Additional information about the upload procedure
MSG_FLUSH_OFF	Deactivate automatic flush for messages to ISG_DIAG_BED at the start of the diagnosis upload.

4.3 CNC objects

Name	diag_upload_state_r		
Description	This object reads the state of the upload. 1 : upload active 0: upload inactive		
Task	COM (Port 553)		
Index group	0x120100	**Index offset**	0x2A6
Data type	BOOLEAN	**Length/byte**	1
Attributes	read	**Unit**	-
Remarks			

Name	diag_upload_counter_r		
Description	This object is used by the counter to read the number of times an upload was commanded. This is a continuous counter. The counter is reset at: • controller start-up • At the start of an upload when the entry HISTORY_NBR or the name of the output file was changed since the last upload. The counter is not reset at reset.		
Task	COM (Port 553)		
Index group	0x120100	**Index offset**	0x2A7
Data type	UNS32	**Length/byte**	4
Attributes	read	**Unit**	-
Remarks			

Name	diag_upload_file_r		
Description	This object reads the name of the diagnosis data output file.		
Task	COM (Port 553)		
Index group	0x120100	**Index offset**	0x2A8
Data type	STRING	**Length/byte**	256
Attributes	read	**Unit**	-
Remarks			

Name	diag_upload_topics_r		
Description	This object reads strings that specify the upload. The individual topics are separated by a comma.		
Task	COM (Port 553)		
Index group	0x120100	**Index offset**	0x2A9
Data type	STRING	**Length/byte**	256
Attributes	read	**Unit**	-
Remarks			

Name	diag_upload_history_nbr_r		
Description	This object reads the number of output files to be saved.		
Task	COM (Port 553)		
Index group	0x120100	**Index offset**	0x2AA
Data type	UNS16	**Length/byte**	2
Attributes	read	**Unit**	-
Remarks			

Name	diag_upload_request_w		
Description	This object triggers the upload. 1 : Trigger activated 0 : Trigger not activated		
Task	COM (Port 553)		
Index group	0x120100	**Index offset**	0x2AB
Data type	BOOLEAN	**Length/byte**	1
Attributes	write	**Unit**	-
Remarks			

Name	diag_upload_file_w		
Description	This object writes the name of the diagnosis data output file.		
Task	COM (Port 553)		
Index group	0x120100	**Index offset**	0x2AC
Data type	STRING	**Length/byte**	256
Attributes	write	**Unit**	-
Remarks			

Name	diag_upload_topics_w		
Description	This object defines strings to specify the upload. Separate the individual topics by a comma. See TOPICS table [▶ 17].		
Task	COM (Port 553)		
Index group	0x120100	**Index offset**	0x2AD
Data type	STRING	**Length/byte**	256
Attributes	write	**Unit**	-
Remarks	Example: COM, IPO You can restore the default case including all diagnostic settings using the keyword ALL A complete diagnostic file (ALL) is required to investigate an error.		

Name	diag_upload_history_nbr_w		
Description	This object defines the number of output files to be saved.		
Task	COM (Port 553)		
Index group	0x120100	**Index offset**	0x2AE
Data type	UNS16	**Length/byte**	2
Attributes	write	**Unit**	-
Remarks			

4.4 PLC parameters

Diagnosis upload	
Description	While the CNC is running, the PLC can command an upload of diagnosis data using this control unit. The control unit is enabled by enable_w = TRUE.
Data type	MC_CONTROL_BOOL_UNIT, see description Control unit
Access	PLC reads request_r + state_r and writes command_w + enable_w
ST Path	gpPform^.**diagnosis_upload**
Commanded, requested and return values	
ST Element	**.command_w** **.request_r** **.state_r**
Data type	BOOL
Value range	[TRUE = diagnosis upload activated, FALSE = diagnosis upload off]
Redirection	
ST Element	**.enable_w**
Special feature	**Note:** The data item command_w must remain at TRUE until state_r reverts to FALSE. Otherwise, the data is not complete since the diagnosis data upload is aborted.

Diagnosis upload state		
Description	State value for a diagnosis upload. If the diagnosis file cannot be opened, state 2 is retained and is reset in the next successful diagnosis upload. For more information on diagnosis upload, see Diagnose-Upload [FCT-M9// Diagnosis upload [▶ 6]]	
ST path	gpPform^.**diagnosis_upload_state**	
Data type	UDINT	
Value range	**Value**	**Constant**
	0	HLI_DIAG_STATE_IDLE: Basic state, diagnosis upload not active
	1	HLI_DIAG_STATE_ACTIVE: Diagnosis upload active
	2	HLI_DIAG_STATE_FILE_ERROR: File cannot be opened
	3	HLI_DIAG_STATE_WAIT_END_ACK: Wait for acknowledgement of the diagnosis upload from the PLC
Access	PLC is reading	
Note	Available as of CNC Builds V2.11.2844, V3.1.3081.4 or V3.1.3110.	

4.5 PLC parameter up to CNC Build V2.20xx

Diagnosis upload	
Description	While the CNC is running, the PLC can command an upload of diagnosis data using this control unit. The control unit is enabled by X_Enable = TRUE.
Data type	MCControlBoolUnit, see description of Control Unit
Data type	MCControlBoolUnit
Access	PLC reads Request + State and writes Command + Enable
ST Path	pMC[channel_idx]^.addr^.MCControlBahn_Data.**MCControlBoolUnit_DiagnosisUpload**
Commanded, requested and return values	
ST element	**.X_Command** **.X_Request** **.X_State**
Data type	BOOL
Value range	[TRUE = diagnosis upload activated, FALSE = diagnosis upload off]
Redirection	
ST element	**.X_Enable**
Special feature	**Note:** The data item X_Command must remain at TRUE until X_State reverts to FALSE. Otherwise, the data is not complete since the diagnosis data upload is aborted.

5 Appendix

5.1 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;

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:

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

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

E-Mail: documentation@isg-stuttgart.de

Keyword index

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