DOCUMENTATION ISG-kernel

Functional description
Syntax check

Short Description:
FCT-C9

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Preface

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

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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

With very large, complex or manually created NC programs in particular, it is advisable to check the correctness of the syntax in advance. This is carried out by using the special “Syntax check mode”.

The syntax check can be executed

- either offline on a separate test system
- or directly on the machine controller.

Characteristics

Syntax errors detected in the NC program are displayed or optionally logged to a file so that the operator can then access them at a later date to correct the program.

NC program decoding is not aborted in the event of a syntax error. Instead, the check algorithm attempts to continue working on the next NC line.

To permit rapid processing of the NC program under test,

- the axes/drives are not moved during the syntax check.
- Technology functions (M, H and T functions) are not executed.

Since the entire NC channel (except for the position controller) participates in the syntax check, incorrect programming items are displayed, i.e. axis positions containing violations of software limit switches etc.. In these cases the syntax check is aborted and issues an error message.

Parametrisation

The syntax check can be run in 2 modes:

- Single step mode
- Automatic mode

The associated configuration is carried out in the channel parameter list.

Notice

After a syntax error message, a defined restart can be executed and largely avoids any follow-up errors.

The technology commands used in the NC program (M, H and T functions) must be specified for decoding by setting them in the channel parameter list accordingly.

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

Operation

The syntax check is run via the operating mode interface according to real program execution. The following can be evaluated:

- START, STOP, CONTINUE and RESET commands
- ERROR and HOLD display states

Display

In real program execution, the file position (filename and file offset, mc_active_file_offset_r and mc_active_file_name_r) is displayed synchronously with the real axis motion. It no longer has any timing reference to program decoding.

When the syntax check is active, the file position is automatically displayed synchronously to decoding.

Therefore, the operator need not consider any distinction to display the file.

The table below shows the various error scenarios and the possible error responses in syntax check mode:

Error type	Error category	Error response
Response to resource errors	e.g. stack overflow	Discard the NC line
Response to syntax error	Errors in $ and # commands	Discard the NC line
	Unexpected character/term after $ and # commands	Use of information pertaining to the current NC line
	Unexpected/invalid characters/ terms	Use of information pertaining to the current NC line
Response to semantic errors	Left-handed error in an allocation	Reposition after allocation
	Select NC commands that are not permitted simultaneously	Continued decoding **without** repositioning
	Overshoot/undershoot a limit	Continued decoding **without** repositioning
	Programmed value impractical	Continued decoding **without** repositioning
	Incomplete information	Continued decoding **without** repositioning

Programing Example

NC program with syntax errors

The example below contains various syntax errors which can be used for continued decoding. The program can be processed in the syntax check and individual errors are signalled.

```
;Test syntax check of decoder)
%check_syntax

; overflow error
N40 G01 X10 F111111111111111

( syntax error
N50 #COMMAND UNKNOWN [...]

( syntax error
N60 V.E.not_present = 1

( syntax error
N70 #CALL AX [X2, 11, 0]

(-> semantic error
N80 G00 G01 X100 F1000

N130 M30
```

Stop single step mode/decoding

- If configured accordingly (P-CHAN-00028) acts during the syntax check, **single-step mode** acts at decoder level.
- The program stops at the end of every NC line and this is indicated by the HOLD mode state.
- Decoding continues by one NC line when the START transition is commanded to the active mode. In this way, individual NC commands (parameter allocations, branches, loops, etc.) can be decoded to ensure that the program sequence can be viewed during decoding.
- The STOP / RESUME command also acts at the decoder level in the same way as the single step mode.
- In other words, decoding is interrupted by commanding the stop transition to the active mode.
- Decoding can be resumed with the RESUME command.

Automatic mode

- If configured accordingly (P-CHAN-00028) acts during the syntax check of theautomatic mode.
- The NC program runs without stopping.
- Errors detected are displayed.

Syntax check without drives (MACHINE_LOCK)

- The syntax check must always be selected in combination with MACHINE_LOCK. The following properties apply here:
- The NC program is decoded as normal.
- To ensure that the syntax check runs faster, axes and drives are not moved (dry run). Interpolation is limited to the output of the target points of the motion blocks.
- Technology information, spindle commands or waiting times are not executed.
- Certain real-time influences such as feedhold, override or axis-specific feed enables are not considered.
- If MACHINE_LOCK is not set, the message P-ERR-21309 is output. In this case MACHINE_LOCK is set implicitly and syntax check is started.

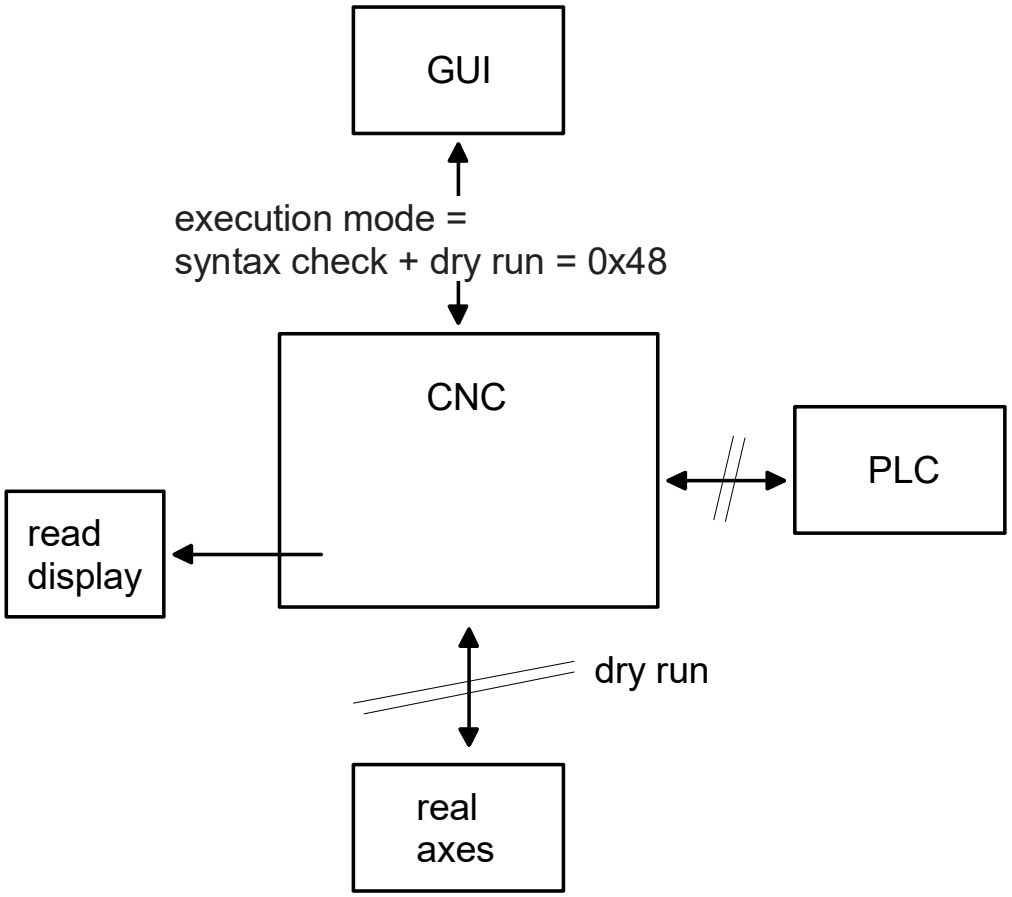

Fig. 1: Syntax check without drives

3 Interfacing

3.1 Selection via HMI interface

The operator sets the syntax check as an operating mode before starting the program. This setting is forwarded to the PLC via a control unit which the PLC can permit or reject.

The syntax check can be selected using the PLC without any previous request from the HMI.

Parameter	Description
mc_command_execution_mode_r, mc_command_execution_mode_w	Selecting syntax check
mc_active_file_offset_r, mc_active_file_name_r	Displays the current file position during the syntax check at the decoder level.
mc_command_single_block_w	This parameter selects the decoder single step mode in the syntax check.

Syntax check via HMI	
Description	A user interface can select the syntax check via this interface. At the same time, the dry run mode must always be selected together with the syntax check.
Type	32 Bit
Value range	0x0000 ISG_STANDARD Normal mode 0x0008 SYNCHK Syntax check simulation 0x0040 MACHINE_LOCK Dry run without axis motion
HMI elements	mc_command_execution_mode_r, mc_command_execution_mode_w
Access	Read, write
IndexOffset	0x40, 0x3f (IndexGroup = 0x000201<ii> where <ii> = channel)

3.2 Commands and display via PLC interface

Channel operation mode			
Description	Selects a special channel operation mode, e.g. syntax check or machining time calculation		
Data type	MC_CONTROL_SGN32_UNIT, see description of Control Unit		
Access	PLC reads request_r + state_r and writes command_w + enable_w		
ST path	gpCh[*channel_idx*]^.decoder_mc_control.**execution_mode**		
Commanded, requested and return values			
ST element	**.command_w** **.request_r** **.state_r**		
Data type	DINT		
Value range	**Value**	**Constant**	**Meaning**
	0x0000	ISG_STANDARD	Normal mode
	0x0001	SV	Block search
	0x0002	SOLLKON	Nominal contour visualisation simulation with output of visualisation data
	0x0802	SOLLKON_SUPRESS_OUT-PUT & SOLLKON	Nominal contour visualisation simulation without output of visualisation data
	0x0004	ON_LINE	Online visualisation simulation
	0x0008	SYNCHK	Syntax check simulation
	0x0010	PROD_TIME	Simulation machining time calculation (in TwinCAT without function)
	0x0020	ONLINE_PROD_TIME	Simulation online machining time calculation
	0x0040	MACHINE_LOCK	Dry run without axis motion
	0x0080	ADD_MDI_BLOCK	Extended manual block mode: the end of a manual block is not evaluated as a program end. It permits the commanding of further manual blocks.
	0x0100	KIN_TRAFO_OFF	Overwrites automatic enable for kinematic transformations by a characteristic parameter defined in the channel parameters (sda_mds*.lis).
	0x1000	BEARB_MODE_SCENE	When SCENE mode is enabled, the output of #SCENE commands is activated on the interface (see also [FCT-C17// Scene contour visualisation]). An additional client is linked to this output via DataFactory / CORBA.
	0x2000	SUPPRESS_TECHNO_OUT-PUT	Without output of technology functions (M/H/T). Set implicitly in connection with syntax check.
	0x10000	SUPPRESS_POSITION_RE-QUEST	Fast program start without position request at program start

	0x20000	SUP-PRESS_PROG_START_INIT	Suppress program start sequence for machining on the belt
Redirection			
ST element	**.enable_w**		

Display:

Parameter	Description
X_SyntaxCheck	Display: Syntax check active
X_WaitAfterError	Display: Decoder waits for enable to resume
X_SyntaxCheckWait-ContinueCleared	Display: Decoder waits for cancellation of enable to resume

Syntax check active	
Description	Decoder is currently in the syntax check
Signal flow	CNC → PLC
ST path	pMC[*channel_idx*]^.addr^.StateDecoder_Data.**X_SyntaxCheck**
Data type	BOOL
Value range	[TRUE = decoder operates in the syntax check, FALSE]
Access	PLC is reading
Special features	-

Error occurred during syntax check – waiting for external input	
Description	In syntax check mode, the decoder waits after an error for an external input (continue, abort)
Signal flow	CNC → PLC
ST path	pMC[*channel_idx*]^.addr^.StateDecoder_Data.**X_WaitAfterError**
Data type	BOOL
Value range	[TRUE = error occurred in the syntax check – decoder waits, FALSE]
Access	PLC is reading
Special features	-

Syntax check active	
Description	Decoder is currently operating in the syntax check and, after an error and enable, waits until enable is cancelled.
Signal flow	CNC → PLC
ST path	pMC[*channel_idx*]^.addr^.StateDecoder_Data.**X_SyntaxCheckReleaseNextBlock-Cleared**
Data type	BOOL
Value range	[TRUE = decoder waits for enable to be cancelled, FALSE]
Access	PLC is reading
Special features	-

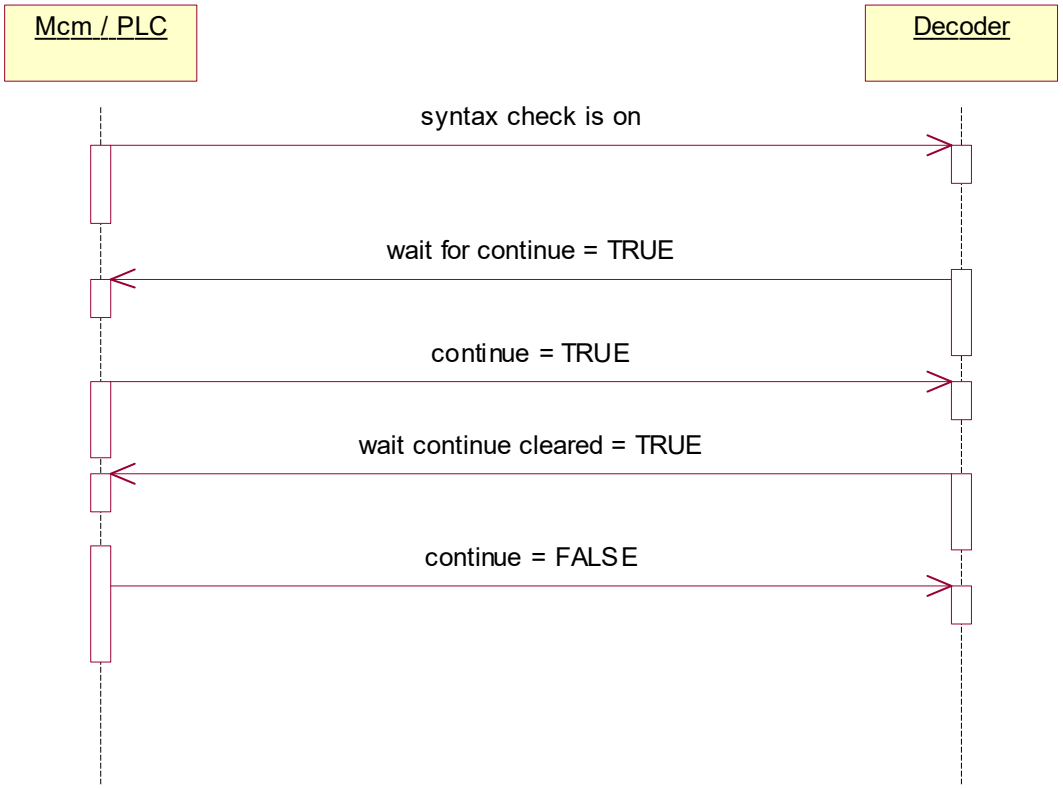

Fig. 2: Implicit handshake during interactive syntax check between decoder and Mcm/PLC

Decoding interrupted	
Description	Decoding was interrupted and waits for enable to continue.
Signal flow	CNC → PLC
ST path	pMC[*channel_idx*]^.addr^.StateDecoder_Data.**X_WaitContinue**
Data type	BOOL
Value range	[TRUE = decoder interrupted, FALSE]
Access	PLC is reading
Special features	-

Decoding interrupted	
Description	Decoding was interrupted and the decoder waits until enable is cancelled again resuming.
Signal flow	CNC → PLC
ST path	pMC[channel_idx]^.addr^.StateDecoder_Data.X_WaitReleaseNextBlockCleared
Data type	BOOL
Value range	[TRUE = decoder waits, FALSE]
Access	PLC is reading
Special features	-

3.2.1 HLI parameters up to CNC Build V2.20xx

Channel mode			
Description	Selection of a special channel mode such as syntax check or machining time calculation		
Data type	MCControlSGN32Unit, see description of Control Unit		
Access	PLC reads Request + State and writes Command + Enable		
ST Path	pMC[*channel_idx*]^.addr^.MCControlDecoder_Data.**MCControlSGN32Unit_Execution-Mode**		
Commanded, requested and return values			
ST Element	**.D_Command** **.D_Request** **.D_State**		
Data type	DINT		
Value range	**Value**	**Constant**	**Meaning**
	0x0000	ISG_STANDARD	Normal mode
	0x0001	SOLLKON	Block search
	0x0002	SOLLKON	Nominal contour visualisation simulation with output of visualisation data
	0x0802	SOLLKON_SUPRESS_OUTPUT & SOLLKON	Nominal contour visualisation simulation without output of visualisation data
	0x0004	ON_LINE	Online visualisation simulation
	0x0008	SYNCHK	Syntax check simulation
	0x0010	PROD_TIME	Simulation machining time calculation (No function with TwinCAT)
	0x0020	ONLINE_PROD_TIME	Simulation online machining time calculation
	0x0040	MACHINE_LOCK	Dry run without axis motion
	0x0080	ADD_MDI_BLOCK	Extended manual block mode: the end of a manual block is not evaluated as a program end. It permits the commanding of further manual blocks.
	0x0100	KIN_TRAFO_OFF	Overwrites automatic enable for kinematic transformations by a characteristic parameter defined in the channel parameters (sda_mds*.lis).
	0x1000	BEARB_MODE_SCENE	When SCENE mode is enabled, the output of #SCENE commands is activated on the interface (see also [FCT-C17// Scene contour visualisation]). An additional client is linked to this output via DataFactory / CORBA.
	0x2000	SUPPRESS_TECHNO_OUTPUT	Without output of technology functions (M/H/T). Set implicitly in connection with syntax check

Redirection	
ST element	**.X_Enable**

Display:

4 Parameter

Parametrisation

The operator sets the operation mode using P-CHAN-00028:

Single step mode: continues step by step over erroneous commands in the NC program and resumes decoding interactively

Automatic mode: checks the syntax in one run (without further manual intervention)

In addition, abort criteria can be configured for the syntax check using P-CHAN-00019 and P-CHAN-00020 for these two operation modes.

Release Note

Produce a log file as of CNC Build V2.11.2033.08

If P-CHAN-00416 is set, all checked NC blocks and reported errors are logged to a file.

The operator can then use the error log to review the NC program and make it executable if required.

The file is created in the controller root directory. The filename consists of the 'dec0' string and the NC channel number in which the syntax check was executed.

The file extension is '.sc'.

Example

Name of log file after a syntax check run in channel 1:

dec01.sc

Attention

The settings for **Program processing in the syntax check** are selected before program run. Changes to the settings during the syntax check do not take immediate effect. This only occurs after a program restart.

4.1 Overview

ID	Parameter	Description
P-CHAN-00019	errors_total	Total number of permissible errors
P-CHAN-00020	errors_per_block	Errors per NC line
P-CHAN-00028	interactive	Operating mode
P-CHAN-00416	record_result	Log detected errors to file

4.2 Description of channel parameters

P-CHAN-00019	**Number of errors in an NC program on syntax check**
Description	This parameter defines the number of errors after which NC program decoding is aborted.
Parameter	syn_chk.errors_total
Data type	UNS16
Data range	0 ... MAX(UNS16)
Dimension	----
Default value	0
Remarks	*syn_chk.fehler_gesamt (old syntax up to V2.11.2012.07)* Parameterisation example: After a maximum of 20 errors in the NC program the syntax check is aborted. *syn_chk.errors_total 20*

P-CHAN-00020	**Number of errors per row on syntax check**
Description	This parameter defines the number of errors after which the program skips to the next program row.
Parameter	syn_chk.errors_per_block
Data type	UNS16
Data range	0 ... MAX(UNS16)
Dimension	----
Default value	0
Remarks	*syn_chk.fehler_pro_zeile (old syntax up to V2.11.2012.07)* Parameterisation example: After a maximum of 2 errors the program skips to the next NC row. *syn_chk.errors_per_block 2*

P-CHAN-00028	Specify the operation mode on syntax check
Description	The parameter defines the operation mode of the syntax check. Mode 1 - Automatic operation (0): After an error, decoding continues automatically. Syntax check is only aborted when the corresponding limits described in P-CHAN-00019 and P-CHAN-00020 are reached. Mode 2 - Step (interactive) mode (1): After each error, decoding is stopped. The operator decides whether the syntax check should continue or decoding should be aborted. When the corresponding limits described in P-CHAN-00019 and P-CHAN-00020 are reached, decoding is also aborted automatically.
Parameter	syn_chk.interactive
Data type	BOOLEAN
Data range	0/1
Dimension	----
Default value	0
Remarks	*interactive (old syntax up to V2.11.2012.07)* Parameterisation example: The syntax check runs in automatic mode. *syn_chk.interactive 0*

P-CHAN-00416	Write results of syntax check to file
Description	If this parameter is set to 1, all NC blocks and reported errors checked during the syntax check are logged to a file. The file is created in the controller root directory.
Parameter	syn_chk.record_result
Data type	BOOLEAN
Data range	0/1
Dimension	----
Default value	0
Remarks	The filename consists of the 'dec0' string and the NC channel number in which the syntax check was executed. The file extension is '.sc'. Example: Name of log file after a syntax check run in channel 1: *dec01.sc*

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:

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Notice

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