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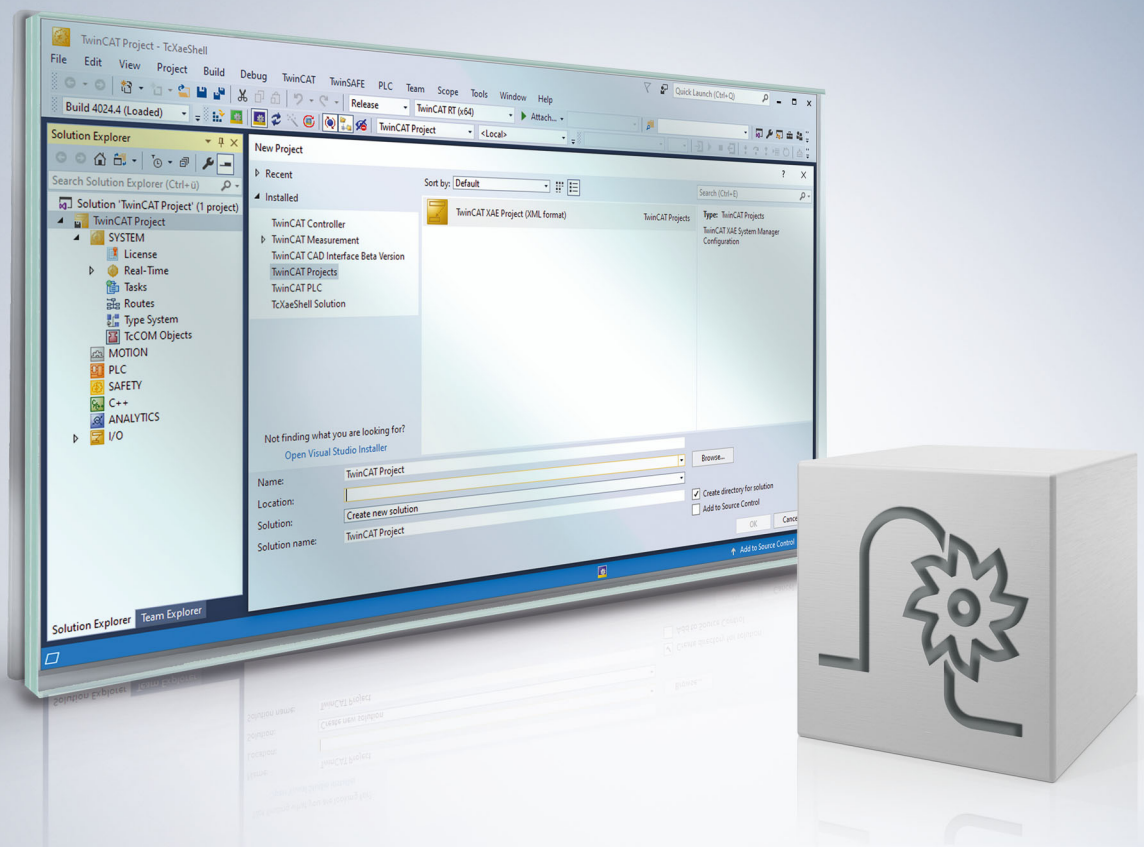
Functional description | EN

TF5200 | TwinCAT 3 CNC

Skipping of NC blocks



12/22/2023 | Version: 1.04

Notes on the documentation

This description is only intended for the use of trained specialists in control and automation engineering who are familiar with the applicable national standards.
It is essential that the documentation and the following notes and explanations are followed when installing and commissioning the components.
It is the duty of the technical personnel to use the documentation published at the respective time of each installation and commissioning.

The responsible staff must ensure that the application or use of the products described satisfy all the requirements for safety, including all the relevant laws, regulations, guidelines and standards.

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This documentation uses the following icons next to the safety instruction and the associated text. Please read the (safety) instructions carefully and comply with them at all times.

Icons in explanatory text

1. Indicates an action.

⇨ Indicates an action statement.

⚠ DANGER

Acute danger to life!

If you fail to comply with the safety instruction next to this icon, there is immediate danger to human life and health.

⚠ CAUTION

Personal injury and damage to machines!

If you fail to comply with the safety instruction next to this icon, it may result in personal injury or damage to machines.

NOTICE

Restriction or error

This icon describes restrictions or warns of errors.

Tips and other notes

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

General example

Example that clarifies the text.

NC programming example

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

Specific version information

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

Table of contents

List of figures

1 Overview

Task

Specific blocks can be skipped in the NC program. The “Skip block” function defines optional processing steps such as measuring loops, test blocks, dummy steps etc. within an NC program.

Characteristics

Skips are taken into account when a NC program is processed.

- If the “Skip block” function was activated on the operating console (HMI).
- When the PLC was activated by a BOOL command before the main program start.

Programming

The function is activated by a preceding “/” character.

Parameterisation

The following HMI objects are required to select and control the function.

- HMI mc_command_block_ignore_w
- HMI mc_command_block_ignore_r
- HMI mc_active_block_ignore_r

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 Skip NC blocks

2.1 Skip block / ignore block

Specific NC blocks can be skipped by prefixing them with a "/" character. The controller ignores NC blocks if the function "Skip block" is activated before main program start by a BOOL command on the operating console (HMI) or by the SPS.

```
/ N3412 X100 …
```

The function defines optional processing steps in an NC program such as measuring loops, test blocks, etc.

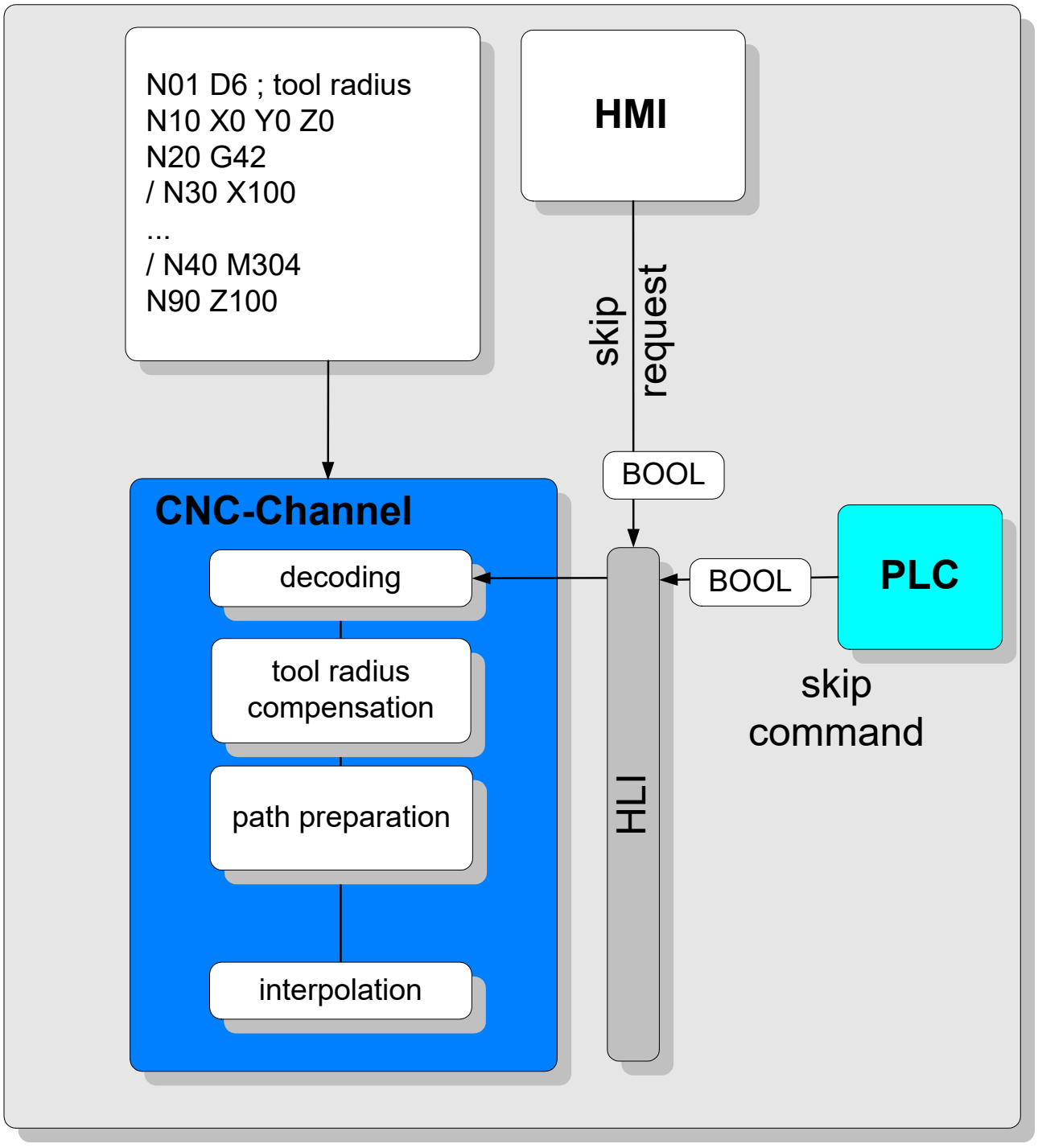

Fig. 1: Enabling/disabling Skip block via HMI or PLC

The enable/disable status of the Skip block function is taken over at program start and remains effective until program end.

In Builds up to V3.01.3021.01, any change in skip settings while an NC program is active only becomes effective at the next main program start. The extended skipping [▶ 11] function is then available in higher Builds.

2.2 Multiple skip levels

This function is available as from CNC Build V3.01.3021.1 and higher.

NOTICE

Changing the interface to HMI and PLC

The BOOL data type was changed to 32 bits for the skip levels.

You can now use up to 10 skip levels in the NC program using this extension. The different skip levels can be set either on the operating console (HMI) or in the PLC before the main program starts.

In the Extended Skipping function, changes in skipping settings take effect immediately while the NC program is active. Defined break points can be implemented, e.g. by M functions followed by #FLUSH WAIT, to ensure that these skipping setting changes are safely accepted and become effective in the NC program.

The syntax programming is a slash "/" followed by a number to define the skip level:

/1 Skip level one

/2 Skip level two

…

/10 Skip level ten

Example:

/5 N100 G00 X150 (block is ignored if level 5 is enabled)

The maximum number of skip levels is 10. This number is not parameterisable.

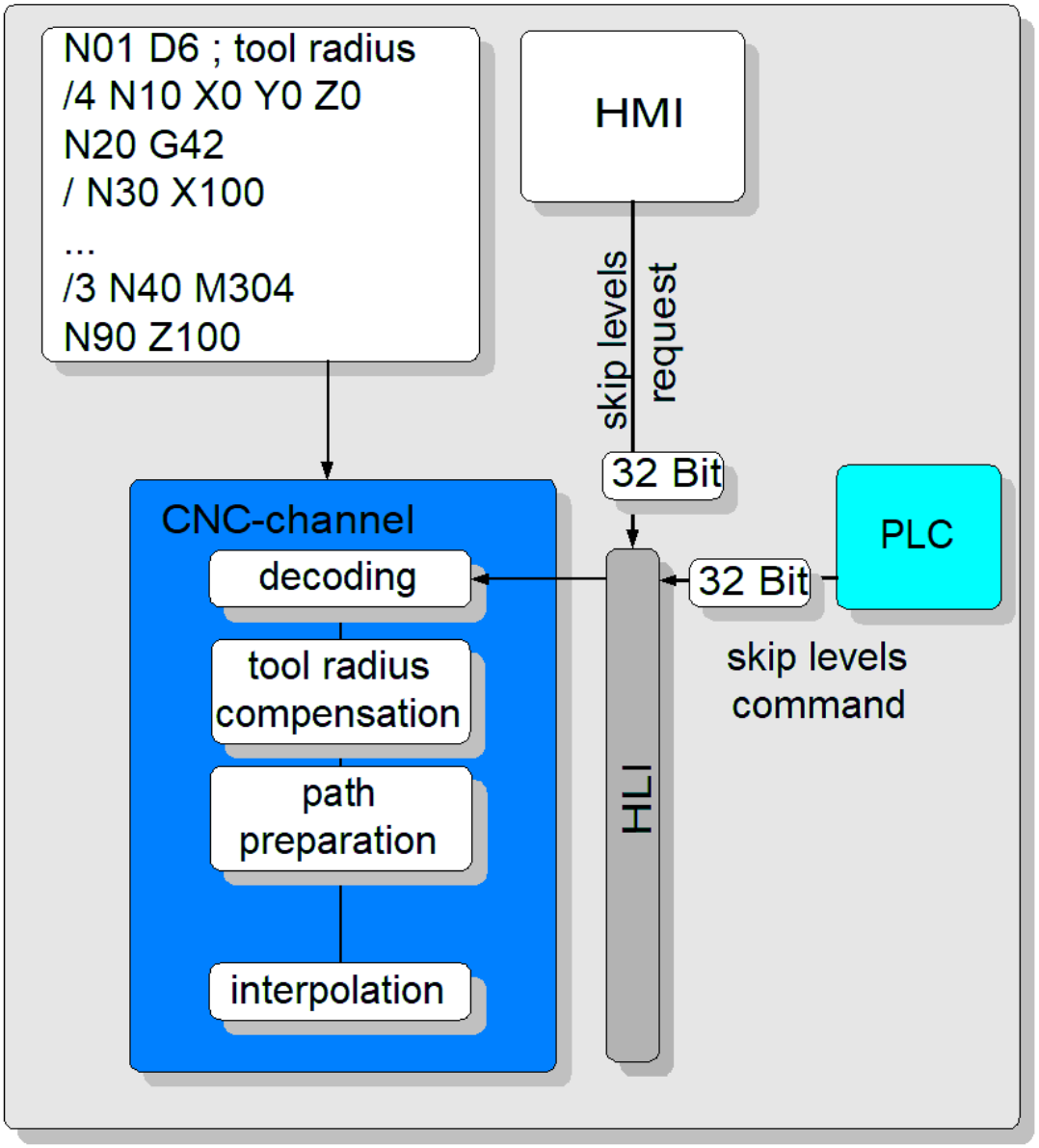

Fig. 2: Enabling/disabling skip levels via HMI or PLC

Using skip levels

```
%skip_levels
N0 G0 X0 Y0 Z0
/1 N10 X1       ;Alternative: / N10 X1
/2 N20 Y2
/2 N25 Y2.5
/3 N30 Z3
/4 N40 X-1
/4 N45 X-1.5
/  N47 X-1.8    ;Skip with no level definition
                ;Corresponds to level 1
/10 N50 Y-2
/100 N60 Z-30   ;Error 21655
/N99 X9
N999 M30
```

The valid range of skip level values is from 1 to 10. If a value is programmed outside this range, then “**error 21655**" is output.

For compatibility reasons the skip levels "/" and “/1” have the same meaning. They are each addressed by the first bit in the control bit string of HMI/PLC.

2.3 Enable/disable

2.3.1 Enabling/disabling via HMI

The "Skip block" function can be enabled and disabled with the CNC object object mc_command_block_ignore_w [▶ 17].

The state can be checked using the CNC objects

- mc_command_block_ignore_r [▶ 17]
- mc_active_block_ignore_r [▶ 17]

.

CNC Builds < V3.01.3021.1

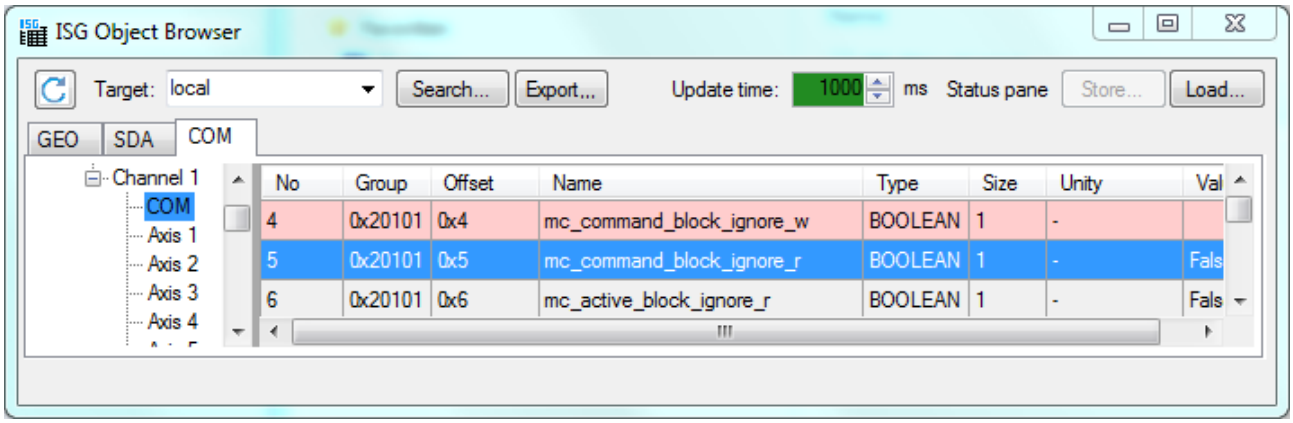

Fig. 3: Enabling a single skip in the ISG object browser

Value range of mc_command_block_ignore_w: TRUE/FALSE

CNC Builds >= V3.01.3021.1

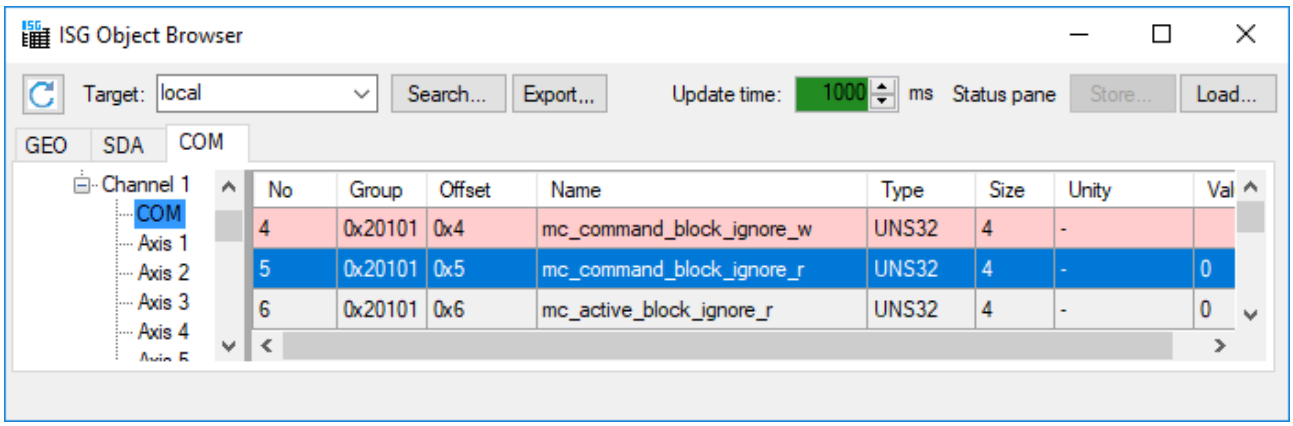

Fig. 4: Enabling skip level in ISG object browser

mc_command_block_ignore_w is a bit string in which the 10 lower bits are used to enable or disable skip levels.

If the remaining bits are assigned, there is no reaction. They are ignored.

Setting mc_command_block_ignore_w in the ISG object browser

In the following example, lines N050, N060 and N080 are to be skipped. In this example, since skip levels /2, /3 and /5 were assigned for these lines, the data item mc_command_block_ignore_w must be assigned 0x16 in the ISG Object Browser.

```
%skippingtest3.nc
N010 G00 X0 Y0 F500
N020 G1 X50
/  N030  G1 X60
/1 N040  G1 X80 Y10
/2 N050  G1 X100 Y20   ;is skipped
/3 N060  G1 X120 Y30   ;is skipped
/4 N070  G1 X140 Y40
/5 N080  G1 X160 Y50   ;is skipped
/6 N090  G1 X180 Y60
/7 N100  G1 X160 Y70
/8 N110  G1 X140 Y80
/9 N120  G1 X100 Y90
/10 N130 G1 X40 Y100
N140 G1 X0 F2000
N150 G1     Y0
N160 M30
```

2.3.2 Enabling/disabling via PLC

A control unit [▶ 17] in the PLC can be assigned to enable or disable the skip block **program_block_ignore** .

The expanded function for several skip levels is available as of Build V3.01.3021.1. The program_block_ignore control block is of type MC_CONTROL_UNS32_UNIT.

Enabling uses the following data item:

```
gpCh[nChanIdx]^.decoder_mc_control.program_block_ignore.command_w
```

The data item is a bit string in which the 10 lower bits are used to enable or disable skip levels.

Enabling uses the following single data:

for CNC Builds > V2.11.2800

```
pMC[channel_idx]^.addr^.MCControlDecoder_Data.MCControlBoolUnit_ProgramBlockIgnore
```

for CNC Builds > V2.11.2800

```
gpCh[nChanIdx]^.decoder_mc_control.program_block_ignore.command_w
```

This is a control unit of type MC_CONTROL_BOOL_UNIT.

3 Parameter

3.1 CNC objects

Name	mc_active_block_ignore_r		
Description	This object reads whether skip mode is active. As of Build V3.01.3021.1 a UNS32 data element is read.		
Task	COM (Port 553)		
Index group	0x120101	**Index offset**	0x6
Data type	UNS32	**Length/byte**	4
Attributes	read	**Unit**	-
Remarks	Up to Build V3.01.3021.1 this object reads whether skip mode is active. It is a BOOL data element.		

Name	mc_command_block_ignore_r		
Description	This object reads the bitmask for the skip level.		
Task	COM (Port 553)		
Index group	0x120101	**Index offset**	0x5
Data type	UNS32	**Length/byte**	4
Attributes	read	**Unit**	-
Remarks			

Name	mc_command_block_ignore_w		
Description	This object defines the bitmask for the skip level.		
Task	COM (Port 553)		
Index group	0x120101	**Index offset**	0x4
Data type	UNS32	**Length/byte**	4
Attributes	write	**Unit**	-
Remarks			

3.2 PLC parameters

Skip mode, NC block	
Description	Activates/deactivates skip mode at interpreter level for the NC program. The status of skip mode is only evaluated at the start of the NC program. Switchover during execution of an NC program has no effect.
Data type	MC_CONTROL_BOOL_UNIT, see description Control unit Available as of CNC Build V3.01.3021.1 MC_CONTROL_UNS32_UNIT
Access	PLC reads request_r + state_r and writes command_w + enable_w
ST Path	gpCh[*channel_idx*]^.decoder_mc_control.**program_block_ignore**
Commanded, requested and return values	
ST element	**.command_w** **.request_r** **.state_r**
Data type	BOOL or UNS32
Value range	[TRUE = Skip mode NC block ON, FALSE = Skip mode NC block OFF, default: FALSE]
	Available as of CNC Build V3.01.3021.1 for UNS32: 0x0 - Skip mode NC block OFF

	0x1 – Skip level 1 0x2 - Skip level 2 0x4 - Skip level 3 0x8 - Skip level 4 0x10 – Skip level 5 0x20 - Skip level 6 0x40 - Skip level 7 0x80 - Skip level 8 0x100 – Skip level 9 0x200 - Skip level 10 Skip levels active simultaneously are enabled by bitwise ORing. Example: Enable all skip levels by setting 0x3FF.
Redirection	
ST element	**.enable_w**

3.2.1 PLC parameters up to Build V2.11.20xx

Skip mode, NC block	
Description	Activates/deactivates skip mode at interpreter level for the NC program. The status of skip mode is only evaluated at the start of the NC program. Switchover during execution of an NC program has no effect.
Data type	MCControlBoolUnit, see description of Control Unit
Access	PLC reads Request + State and writes Command + Enable
ST Path	pMC[channel_idx]^.addr^.MCControlDecoder_Data.MCControlBoolUnit_ProgramBlockIgnore
Commanded, requested and return values	
ST element	**.X_Command** **.X_Request** **.X_State**
Data type	BOOL
Value range	[TRUE = Skip mode NC block ON, FALSE = Skip mode NC block OFF, FALSE]
Redirection	
ST element	**.X_Enable**

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