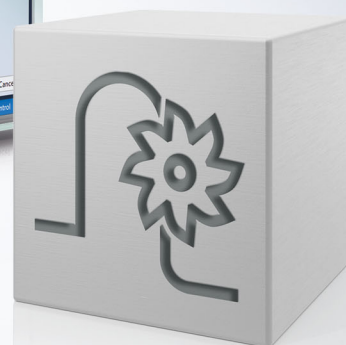
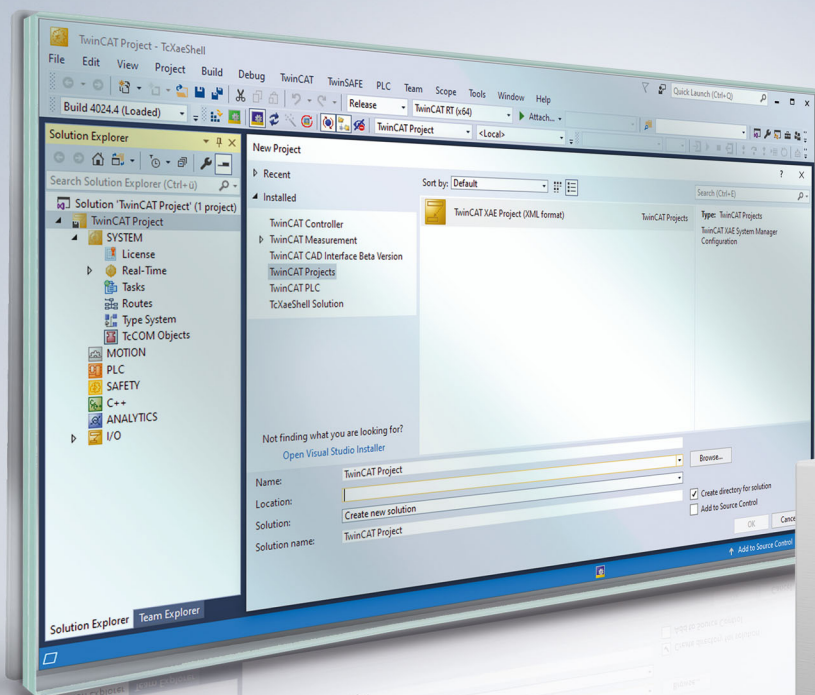


Functional description | EN

## TF5200 | TwinCAT 3 CNC

Skipping of NC blocks





## 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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The documentation has been prepared with care. The products described are, however, constantly under development.

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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

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.

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# 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.

## Properties

Skips are taken into account when a NC program is processed and the "Skip block"

- was activated on the operating console (HMI objects) before or after main program start or by the PLC (control units). A distinction is made between
- Standard Skipping (up to Build V3.01.3021.0) and
- Extended Skipping (as of V3.01.3021.1) depending on the version.

## Programming

Skipped NC block are marked by a preceding "/" character with or without indication of the skip levels.

## 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 Standard skipping

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

```
/ N3412 X100 ...
```

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

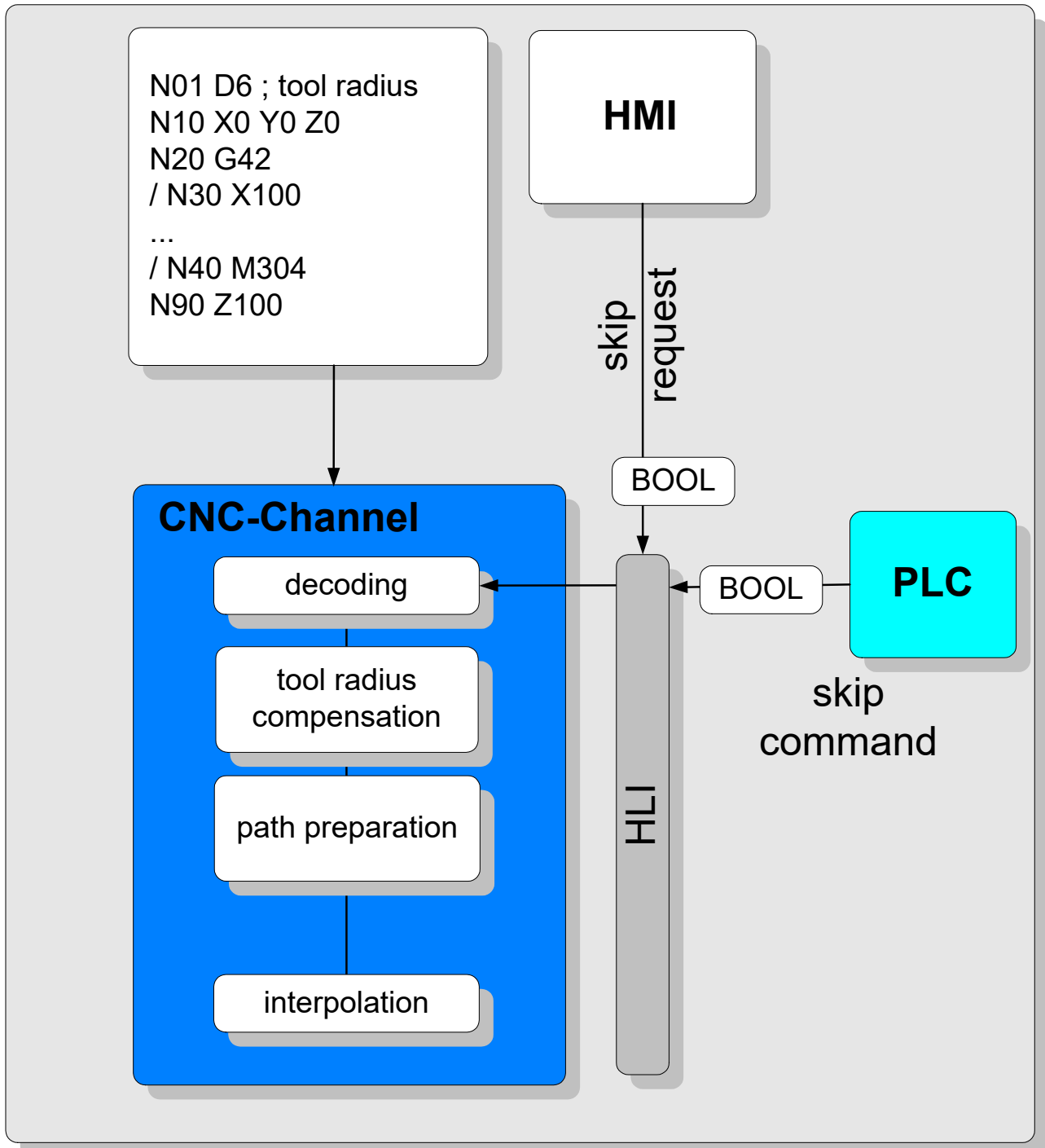


Fig. 1: Enabling/disabling Skip block via HMI or PLC



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

In builds up to V3.01.3021.01, the enable/disable status is switched by a BOOL command.. In later builds, enable/disable is switched by a 32-bit command. Extended skip levels are also available (Extended skipping [► 11]) and their effectiveness can be changed while an NC program is active.

## 2.2 Extended skipping (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 interface data type was changed to 32 bits (UNS32) for the skip levels.

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

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. The maximum number of skip levels is 10. This cannot be parameterised.

Syntax	Skip level	Hex value at interface	Decimal value at interface
/1	One	0x001	1
/2	Two	0x002	2
/3	Three	0x004	4
/4	Four	0x008	8
/5	Five	0x010	16
/6	Six	0x020	32
/7	Seven	0x040	64
/8	Eight	0x080	128
/9	Nine	0x100	256
/10	Ten	0x200	512

#### Example:

/5 N100 G00 X150 ;Block is skipped when skip level 5 (0x010) is set.

Skip levels which are active simultaneously are enabled by bitwise ORing.

#### Example:

Enable all skip levels by setting 0x3FF.

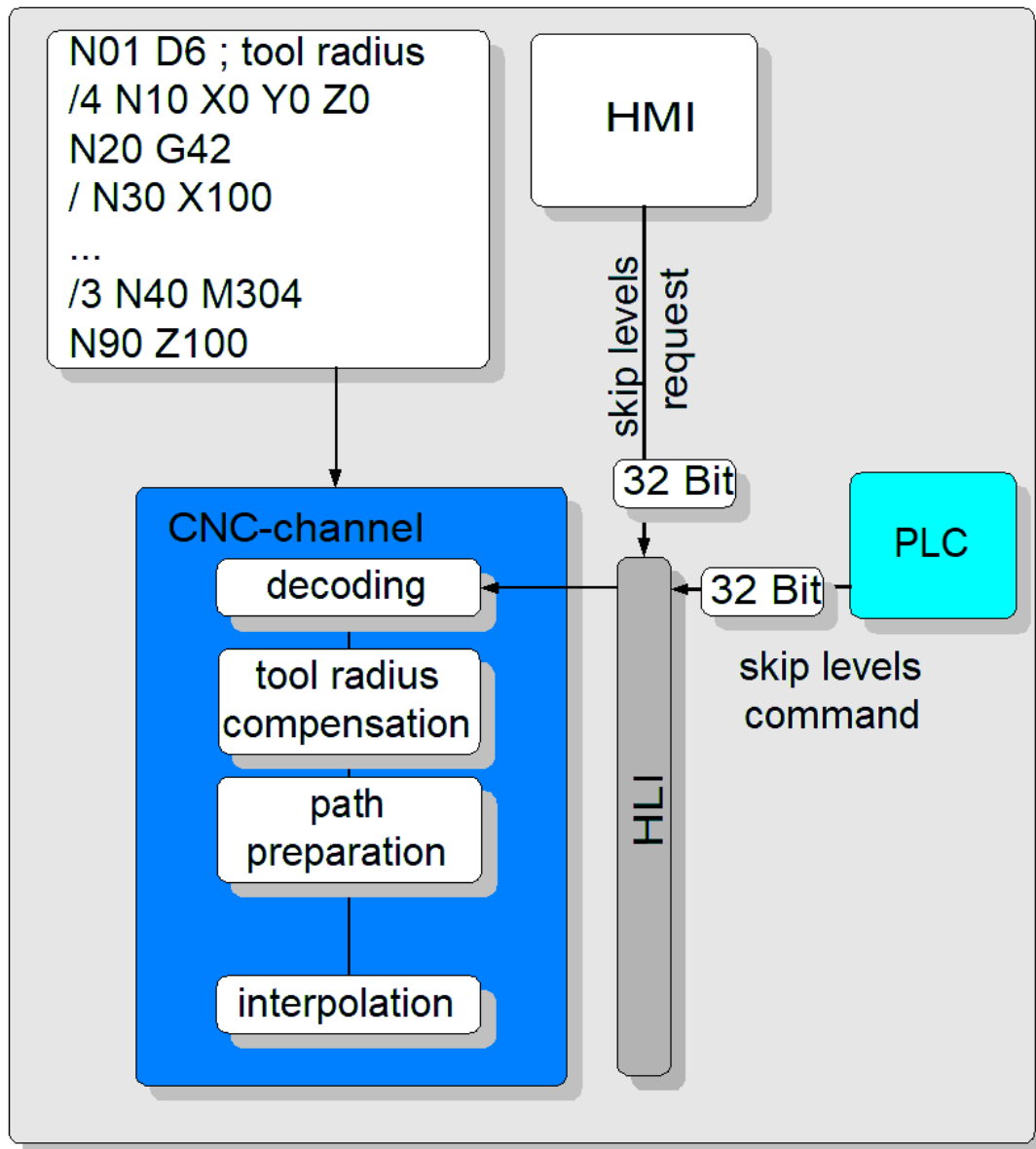


Fig. 2: Enabling/disabling skip levels via HMI or PLC

## Using skip levels

```
%skip_levels
N0 G0 X0 Y0 Z0
/1 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 ;Standard skipping
/10 N50 Y-2
/100 N60 Z-30 ;Error 21655
N999 M30
```

The valid range of skip level values is from 1 to 10. A value programmed outside this range generates error ID 21655.



For reasons of compatibility, skip levels ‘/’ and ‘/1’ are each addressed by the same bit 0x001 of the HMI/PLC control bit mask. However, the effect of the standard skip level ‘/’ can only be defined before main program start and remains constant until program end. In this case, changes to skip levels while the NC program is active only influence programmed ‘/1’ levels, if any. We recommend not to use ‘/’ and ‘/1’ in the same NC program for reasons of clarity.

## 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

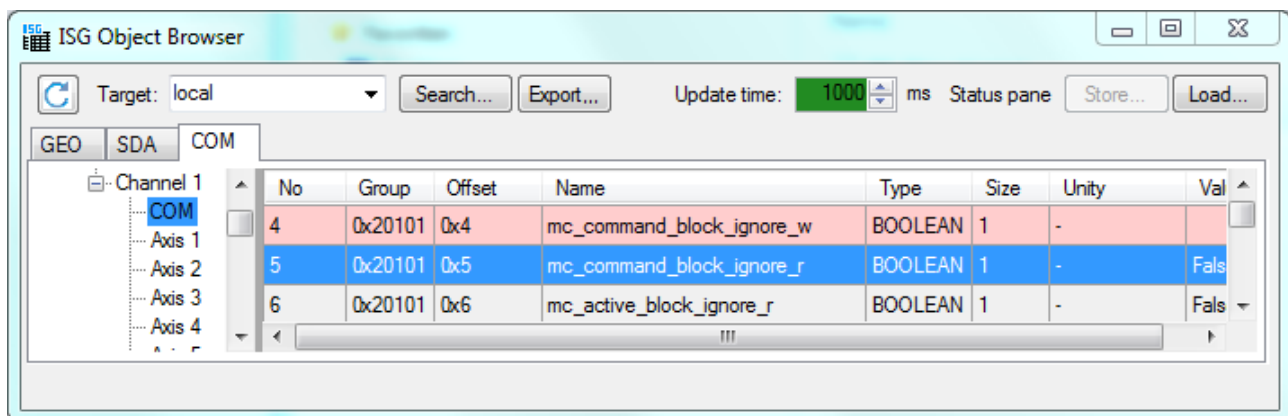


Fig. 3: Enabling a standard skip in the ISG Object Browser

Value range of `mc_command_block_ignore_w`: TRUE/FALSE

#### CNC Builds >= V3.01.3021.1

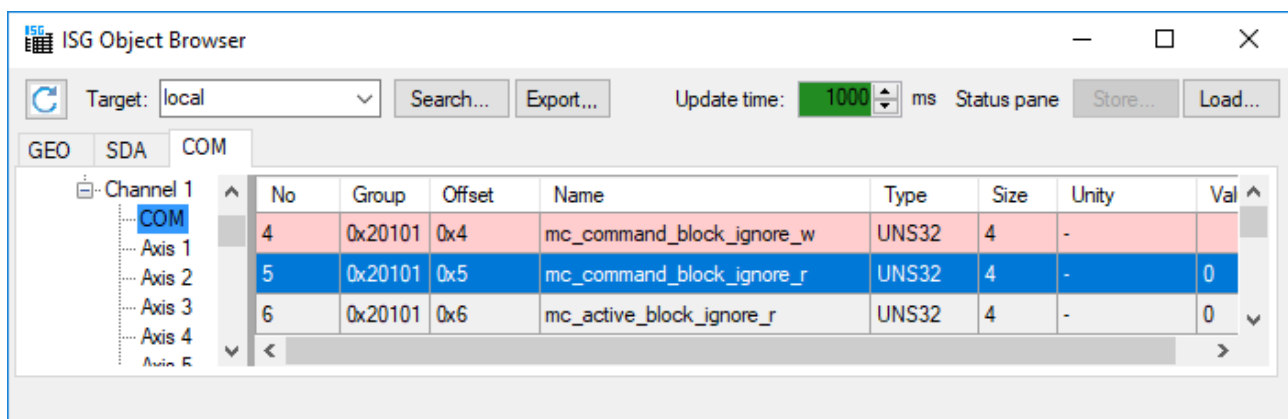


Fig. 4: Enabling skip levels in the ISG Object Browser

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

Any higher bits that are assigned have no effect and 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. Since skip levels /2, /3 and /5 were assigned to these lines in this example, 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 F1000
/1 N040 G1 X80 Y10
/2 N050 G1 X100 Y20 ;skipped
/3 N060 G1 X120 Y30 ;skipped
/4 N070 G1 X140 Y40
/5 N080 G1 X160 Y50 ;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

The control unit [► 17] **program\_block\_ignore** in the PLC can be commanded to enable or disable the skip block function.

In CNC Build < V3.01.3021.1 this is a control unit of type MC\_CONTROL\_BOOL\_UNIT. It can only control standard skipping. Enabling uses the following data item:

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
```



**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\_UN32\_UNIT.**

Enabling uses the following data item:

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

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



## 3 Parameter

### 3.1 CNC objects

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

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

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

### 3.2 PLC parameters

<b>Skip mode, NC block</b>	
<b>Description</b>	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.
<b>Data type</b>	MC_CONTROL_BOOL_UNIT, see description of Control unit Available as of CNC Build V3.01.3021.1 MC_CONTROL_UN32_UNIT
<b>Access</b>	PLC reads request_r + state_r and writes command_w + enable_w
<b>ST path</b>	gpCh[channel_idx]^decoder_mc_control.program_block_ignore
Commanded, requested and return values	
<b>ST element</b>	.command_w .request_r .state_r
<b>Data type</b>	BOOL or UNS32
<b>Value range</b>	[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	MCCControlBoolUnit, see description of Control Unit
Access	PLC reads Request + State and writes Command + Enable
ST Path	pMC[channel_idx]^^.addr^.MCCControlDecoder_Data.MCCControlBoolUnit_ProgramBlockIgnore
Commanded, requested and return values	
ST element	<b>.X_Command</b> <b>.X_Request</b> <b>.X_State</b>
Data type	BOOL
Value range	[TRUE = Skip mode NC block ON, FALSE = Skip mode NC block OFF, FALSE]
Redirection	
ST element	<b>.X_Enable</b>

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