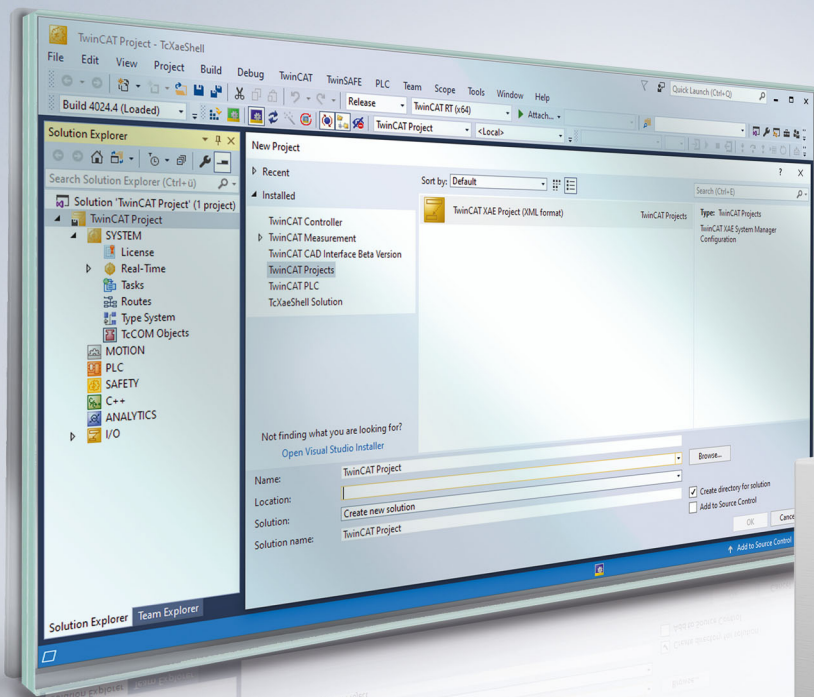


Manual | EN

## TF5200 | TwinCAT 3 CNC

Manual mode parameter





## 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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# Overview of manual mode parameter

The overview of real-time parameters is sorted into a 4-column table.

- Column 1 contains the unambiguous identifier of the real-time parameter called the “ID” which consists of the prefix “P-MANU” and a unique 5-digit number, e.g. P-MANU-00002.
- Column 2 represents the data structure which defines the parameter, e.g. hr\_data[i].  
The structure is a categorisation aid and is described in the following section. If an entry is missing in ‘structure’, this is not an error. The parameter in column 3 is then only valid on its own.
- Column 3 contains the “parameter” with its exact name, e.g. log\_hr\_nr  
The important thing is that “structure”+”parameter” always belong together and must be configured in exactly the same way in the manual mode parameter list, e.g. hr\_data[i].log\_hr\_nr
- Column 4 contains the “functionality” in a summarised term/short description, e.g. Logical handwheel number.

| ID                                  | Structure       | Parameter                | Functionality/short description      |
|-------------------------------------|-----------------|--------------------------|--------------------------------------|
| P-MANU-00001 <a href="#">[▶ 11]</a> |                 | hr_anzahl                | Number of physical handwheels        |
| P-MANU-00002 <a href="#">[▶ 12]</a> | hr_data[i].     | log_hr_nr                | Logical handwheel number             |
| P-MANU-00003 <a href="#">[▶ 12]</a> | hr_data[i].     | hr_zaebler_direct_access | Access to handwheel counter address  |
| P-MANU-00004 <a href="#">[▶ 13]</a> | hr_data[i].     | adr_hr_zaebler           | Handwheel counter address            |
| P-MANU-00005 <a href="#">[▶ 14]</a> | hr_data[i].     | hr_aufl_z                | Handwheel resolution numerator       |
| P-MANU-00006 <a href="#">[▶ 14]</a> | hr_data[i].     | hr_aufl_n                | Handwheel resolution denominator     |
| P-MANU-00007 <a href="#">[▶ 14]</a> | hr_data[i].     | max_inkr_pro_takt        | Upper limit for handwheel increments |
| P-MANU-00008 <a href="#">[▶ 16]</a> |                 | tasten_anzahl            | Number of inching key pairs          |
| P-MANU-00009 <a href="#">[▶ 16]</a> | tasten_data[i]. | log_tasten_nr            | Logical key number                   |
| P-MANU-00010 <a href="#">[▶ 17]</a> | feedhold        | hr_inkr_verwerfen        | Handwheel mode                       |
| P-MANU-00011 <a href="#">[▶ 17]</a> | feedhold        | .jog_inkr_verwerfen      | Jogging mode                         |
| P-MANU-00012 <a href="#">[▶ 15]</a> | hr_data[i].     | hr_abs_pos_init          | Offset on activation                 |
| P-MANU-00013 <a href="#">[▶ 15]</a> | hr_data[i].     | mode                     | Processing handwheel increments      |
| P-MANU-00014 <a href="#">[▶ 17]</a> |                 | move_limit_warning       | Output a message at offset limit     |

# 1 General description

## 1.1 Links 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.

## 1.2 Structure and classification of manual mode parameters

The parameters of the **MachineDataBlock** contain configuration data for manual mode.

The list assigns hardware information of physical handwheels and inching keys required for manual mode to logical manual mode elements. For example, the hardware addresses of physical handwheels are assigned to logical handwheels. It also defines the number of handwheels and inching key pairs and general configuration data for manual mode.

The parameters are structured as follows:

- Number of configured handwheels
- Parameterisation data of individual handwheels
- Number of configured inching keys
- Parameterisation data of individual inching keys
- Processing manual mode motion paths during a feedhold



The field indices to be specified in the list correspond to the internal manual mode indexing of axis and manual mode elements.

---

The value ranges of parameters are also defined if necessary by specifying a limit arising from the data format, e.g. MAX(UNS32) etc.



## 1.3 Syntax and interpretation of ASCII list file

An interpreter copies the entries in the ASCII list file into identical internal structures which are then checked for plausibility. To ensure reliable controller start-up every time, defective entries found by the plausibility check are replaced by default values.

Unknown entries are not taken over. These irregularities are displayed by warning messages. We advise you to investigate the cause for these warning messages and remove defective entries from the ASCII list file.



The following agreement applies to BOOLEAN data:

---

| Value | Meaning             |
|-------|---------------------|
| 0     | Definition of FALSE |
| 1     | Definition of TRUE  |

## 1.4 Comments in the ASCII list file

Comments can be in an entire line or can be added at the end of a line.

With a comment spanning an entire line, the comment character "#" must be placed at the start of the line and followed by a blank.

If a comment is to be inserted at the end of a line, only a blank is required before the comment. However, if a string was defined in the line, the comment must be preceded by the comment character "(".

Blank lines are also possible.

### Comments in the ASCII list file

```
# *****
# Data
# *****
#
# Listing

dummy[1] 1 Comment
dummy[2] 1 # Comment
dummy[3] 1 ( Comment
dummy[4] 1 /* Comment
...
...
beispiel[0].bezeichnung STRING_2 (Comment: comment brackets required!)
```

## 2 Description of elements

### 2.1 Settings for handwheels

#### 2.1.1 Number of physical handwheels (P-MANU-00001)

|                     |   |
|---------------------|---|
| <b>P-MANU-00001</b> | <b>Number of physical handwheels</b>  |
| Description         | This parameter defines the handwheel number.  |
| Parameter           | hr_anzahl   |
| Data type           | UNS16   |
| Data range          | 0 ... 6 (maximum number of handwheels, application-specific)  |
| Dimension           | ----  |
| Default value       | 0   |
| Remarks             | The number of handwheels must correspond to the handwheels assigned in the handwheel data list 'hr_data[i]'.<br>Parameterisation example: Two physical handwheels are to be configured.<br><i>hr_anzahl 2</i> |

## 2.1.2 Handwheel data (hr\_data[i].\*)

The configuration data for existing handwheels are stored in the structure 'hr\_data[i]'.

| Structure name | Index   |
|----------------|---|
| hr_data[i]     | i = 0 ... 5 (number of handwheels: 6, application-specific) |

### 2.1.2.1 Logical handwheel number (P-MANU-00002)

| P-MANU-00002  | Logical handwheel number   |
|---------------|--|
| Description   | This parameter defines the logical handwheel number of a handwheel. The logical handwheel number is unique throughout the entire system. The logical handwheel number is used to assign activation and deactivation jobs by software to a physical handwheel. The logical handwheel number is also used to assign a physical handwheel to a logical axis.  |
| Parameter     | hr_data[i].log_hr_nr   |
| Data type     | UNS16  |
| Data range    | 1 ... MAX(UNS16)   |
| Dimension     | ----   |
| Default value | 0  |
| Remarks       | <p>A logical handwheel number may not be assigned several times. If this is the case, the data plausibility check generates an error message. The logical handwheel number '0' is not permitted.</p> <p>Activating and deactivating manual modes is described in [PROG].</p> <p>Parameterisation example: Two physical handwheels are configured. They are identified by logical handwheel numbers '1' and '2'.</p> <pre>hr_data[0].log_hr_nr 1 #logical handwheel number Handwheel 1 ..... hr_data[1].log_hr_nr 2 #logical handwheel number Handwheel 2 .....</pre> |

### 2.1.2.2 Access to handwheel counter address (P-MANU-00003)

| P-MANU-00003  | Access to handwheel counter address   |
|---------------|---|
| Description   | This parameter defines whether the handwheel increments are read in from a counter module or via the High Level Interface (HLI).  |
| Parameter     | hr_data[i].hr_zaeher_direct_access  |
| Data type     | BOOLEAN   |
| Data range    | <p>0: Handwheel counter address is located on High Level Interface (HLI). Always with operating systems with virtual address space (e.g. RTWin, NT).</p> <p>1: Handwheel counter address is located on the hardware (HW). At present, only implemented for operating systems with absolute address space (e.g. VxWorks, OS9).</p> |
| Dimension     | ----  |
| Default value | 0   |
| Remarks       | <p>Parameterisation example: Handwheel increments are read directly by a counter module.</p> <pre>hr_data[0].hr_zaeher_direct_access 1 #Direct hardware access Handwheel1.</pre>  |

**2.1.2.3 Handwheel counter address (P-MANU-00004)**

|                     |  |
|---------------------|--|
| <b>P-MANU-00004</b> | <b>Handwheel counter address</b>   |
| Description         | Depending on the element <a href="#">P-MANU-00003 [► 12]</a> the parameter here defines either the index in the HLI array to read in the increments or the physical handwheel counter address.   |
| Parameter           | hr_data[i].adr_hr_zaeher   |
| Data type           | UNS16  |
| Data range          | 0 ... 5: Array index in the High Level Interface (HLI) where <a href="#">P-MANU-00003 [► 12]</a> = 0<br>>0: Physical address of a counter module where <a href="#">P-MANU-00003 [► 12]</a> = 1   |
| Dimension           | ----   |
| Default value       | 0  |
| Remarks             | <p>Parameterisation example 1: Increments for handwheels '1' and '2' are read in via the HLI interface.</p> <pre>hr_data[0].log_hr_nr 1 #logical handwheel number Handwheel 1 hr_data[0].hr_zaeher_direct_access 0 #HLI access Handwheel 1 hr_data[0].adr_hr_zaeher 0 #Index in HLI array Handwheel 1 ..... hr_data[1].log_hr_nr 2 #logical handwheel number Handwheel 2 hr_data[0].hr_zaeher_direct_access 0 #HLI access Handwheel 2 hr_data[1].adr_hr_zaeher 1 #Index in HLI array Handwheel 2</pre> <p>Parameterisation example 2: Increments for handwheels '1' and '2' are read in by direct hardware access.</p> <pre>hr_data[0].log_hr_nr 1 #logical handwheel number Handwheel 1 hr_data[0].hr_zaeher_direct_access 1 #Hardware access Handwheel 1 hr_data[0].adr_hr_zaeher 0x0030 #Address Handwheel 1 .... hr_data[1].log_hr_nr 2 #logical handwheel number Handwheel 2 hr_data[1].hr_zaeher_direct_access 1 #Hardware access Handwheel 1 hr_data[1].adr_hr_zaeher 0x0080 #Address Handwheel 2</pre> |

### 2.1.2.4 Handwheel resolution

The number of handwheel increments per handwheel revolution is entered as the handwheel resolution. This parameter must be specified by a numerator and a denominator.

#### NOTICE

Handwheel resolution = numerator / denominator =  $hr\_aufl\_z / hr\_aufl\_n$

Handwheel resolution unit: [increments/revolution]

Do not confuse this handwheel-specific resolution with the axis-specific resolution for handwheel mode [PROG].

#### 2.1.2.4.1 Handwheel resolution numerator (P-MANU-00005)

| P-MANU-00005  | Handwheel resolution numerator                             |
|---------------|--|
| Description   | This parameter defines the handwheel resolution numerator. |
| Parameter     | $hr\_data[i].hr\_aufl\_z$                                  |
| Data type     | UNS32  |
| Data range    | 1 ... MAX(UNS32)   |
| Dimension     | increments   |
| Default value | 0  |
| Remarks       |  |

#### 2.1.2.4.2 Handwheel resolution denominator (P-MANU-00006).

| P-MANU-00006  | Handwheel resolution denominator   |
|---------------|--|
| Description   | The parameter defines the handwheel resolution denominator.  |
| Parameter     | $hr\_data[i].hr\_aufl\_n$  |
| Data type     | UNS32  |
| Data range    | 1 ... MAX(UNS32)   |
| Dimension     | U  |
| Default value | 0  |
| Remarks       | <p>Parameterisation example: Resolution 100 increments/resolution applies to handwheel '1' and resolution 2700 increments/14 revolutions to handwheel '2'.</p> <pre> hr_data[0].log_hr_nr 1 #logical handwheel number Handwheel 1 hr_data[0].hr_auf_l_z 100 #Handwheel resolution numerator Handwheel 1 hr_data[0].hr_auf_l_n 1 # Handwheel resolution denominator Handwheel 1 ..... hr_data[1].log_hr_nr 2 #logical handwheel number Handwheel 2 hr_data[1].hr_auf_l_z 2700 #Handwheel resolution numerator Handwheel 2 hr_data[1].hr_auf_l_n 14 #Handwheel resolution denominator Handwheel 2 </pre> |

#### 2.1.2.5 Upper limit for handwheel increments (P-MANU-00007)

| P-MANU-00007 | Upper limit for handwheel increments  |
|--------------|---|
| Description  | This parameter defines the upper limit for the number of handwheel increments read in per cycle. It is a plausibility limit for the handwheel hardware. |
| Parameter    | $hr\_data[i].max\_inkr\_pro\_takt$  |
| Data type    | UNS32   |
| Data range   | < MAX(UNS32)  |
| Dimension    | increments  |

|               |   |
|---------------|---|
| Default value | 0   |
| Remarks       | Parameterisation example: The maximum number of handwheel increments read in per cycle is 1000.<br><i>hr_data[0].max_inkr_pro_takt 1000 #Upper limit for handwheel increments</i> |

**2.1.2.6 Offset on activation (P-MANU-00012)**

|                     |  |
|---------------------|--|
| <b>P-MANU-00012</b> | <b>Offset on activation</b>  |
| Description         | This parameter defines whether adoption on the handwheel counter status is absolute or relative when handwheel mode is activated.  |
| Parameter           | hr_data[i].hr_abs_pos_init   |
| Data type           | BOOLEAN  |
| Data range          | 0: Relative adoption of handwheel counter status when handwheel mode is activated.<br>1: Absolute adoption of handwheel counter status when handwheel mode is activated. |
| Dimension           | ----   |
| Default value       | 0  |
| Remarks             | Relative mode is practical for typical handwheel mode, i.e. there is no path motion, even if the handwheel counter status is not 0 when handwheel mode is activated.     |

**2.1.2.7 Processing handwheel increments (P-MANU-00013)**

|                     |   |
|---------------------|---|
| <b>P-MANU-00013</b> | <b>Processing handwheel increments</b>  |
| Description         | This parameter influences the behaviour of handwheel mode when increments (path) are processed.   |
| Parameter           | hr_data[i].mode   |
| Data type           | UNS32   |
| Data range          | 0: True-path handwheel; all increments generated are carried out. Axis motion may run on depending on the dynamic setting<br>1: Non true-path handwheel; all generated handwheel increments are cancelled after the handwheel rotation stops (see inching key mode). Axis motion also stops immediately.<br>2: Conditional true-path handwheel, generated handwheel increments are cancelled if the command velocity of the handwheel was reached before handwheel rotation stops.<br>Note: The maximum velocity of the handwheel (P-AXIS-00213) is weighted with feed override depending on P-CHAN-00186 .<br>(Mode available as of V3.1.3074) |
| Dimension           | ----  |
| Default value       | 0   |
| Remarks             |   |

## 2.2 Inching key settings

### 2.2.1 Number of inching key pairs (P-MANU-00008)

|                     |   |
|---------------------|---|
| <b>P-MANU-00008</b> | <b>Number of inching key pairs</b>  |
| Description         | This parameter defines the number of inching key pairs.   |
| Parameter           | tasten_anzahl   |
| Data type           | UNS16   |
| Data range          | 0 ... 9 (maximum number of inching key pairs, application-specific)   |
| Dimension           | ----  |
| Default value       | 0   |
| Remarks             | The number of inching keys must correspond to the elements assigned in the inching key data list 'tasten_data[i]'.<br>Parameterisation example: Two inching key pairs are configured.<br><i>tasten_anzahl 2</i> |

### 2.2.2 Inching key data (tasten\_data[i].\*)

The structure 'tasten\_data[i]' defines the configuration data of existing inching key pairs.

| Structure name | Index  |
|----------------|--|
| tasten_data[i] | i = 0 ... 8 (Number of inching key pairs: 9, application-specific) |

#### 2.2.2.1 Logical key number (P-MANU-00009)

|                     |   |
|---------------------|---|
| <b>P-MANU-00009</b> | <b>Logical key number</b>   |
| Description         | This parameter defines the logical key number of an inching key pair. The logical key number is unique throughout the entire system. The logical key number is used to assign an activation or deactivation job to the physical inching key pair. The logical key number is also used to assign a physical key pair to a logical axis.  |
| Parameter           | tasten_data[i].log_tasten_nr  |
| Data type           | UNS16   |
| Data range          | 1 ... MAX(UNS16)  |
| Dimension           | ----  |
| Default value       | 0   |
| Remarks             | A logical key number may not be assigned several times. If this is the case, the plausibility check of the manual mode data generates an error message. The logical key number '0' is not permitted.<br>Activating and deactivating manual modes is described in [PROG].<br>Parameterisation example: Two physical inching key pairs are configured. These are the logical key numbers '1' and '2'.<br><i>tasten_data[0].log_tasten_nr 1 #logical key number Key pair 1</i><br>.....<br><i>tasten_data[1].log_tasten_nr 2 #logical key number Key pair 2</i><br>..... |



## 2.3 Processing feedhold (feedhold.\*)

The 'feedhold' structure defines the processing of read-in handwheel increments and jogging mode motion paths during a feedhold.

### 2.3.1 Handwheel mode (P-MANU-00010)

| <b>P-MANU-00010</b> | <b>Handwheel mode</b>  |
|---------------------|--|
| Description         | If the parameter is set to TRUE, the handwheel increments read in during a feedhold are skipped. Otherwise, these handwheel increments are output after feedhold is removed. |
| Parameter           | feedhold.hr_inkr_verwerfen   |
| Data type           | BOOLEAN  |
| Data range          | 0/1  |
| Dimension           | ----   |
| Default value       | 0  |
| Remarks             | Parameterisation example: Handwheel increments read in during a feedhold should not be skipped.<br><i>feedhold.hr_inkr_verwerfen 0 #Skip handwheel increments</i>            |

### 2.3.2 Jogging mode (P-MANU-00011)

| <b>P-MANU-00011</b> | <b>Jogging mode</b>  |
|---------------------|--|
| Description         | If the parameter is set to TRUE, jogging mode motion paths generated during feedhold are skipped. Otherwise, these motion paths are output after feedhold is removed.    |
| Parameter           | feedhold.jog_inkr_verwerfen  |
| Data type           | BOOLEAN  |
| Data range          | 0/1  |
| Dimension           | ----   |
| Default value       | 0  |
| Remarks             | Parameterisation example: Jogging mode path motions read in during a feedhold should be skipped.<br><i>feedhold.jog_inkr_verwerfen 1 #Skip jogging mode motion paths</i> |

## 2.4 Messages at offset limits (P-MANU-00014)

| <b>P-MANU-00014</b> | <b>Output a message at offset limit</b>   |
|---------------------|---|
| Description         | If this parameter is set to TRUE, the CNC generates a warning if a manual movement stops at a relative offset limit (P-AXIS-00137, P-AXIS-00138) or at an absolute offset limit (P-AXIS-00492, P-AXIS-00493). |
| Parameter           | move_limit_warning  |
| Data type           | BOOLEAN   |
| Data range          | 0/1   |
| Dimension           | ----  |
| Default value       | 0   |
| Remarks             | This parameter is available as of CNC Build <b>2.11.2804.12</b>   |

### 3 Example of assigning manual mode parameters

```

# *****
# Manual mode data
# *****
# Important note : Behind the comment character '#'
# a blank (space) must be added
# *****
# Number of handwheels
*****
hr_anzahl 2
*****
# Number of inching key pairs
*****
tasten_anzahl 3
*****
# Handwheel data
*****
hr_data[0].log_hr_nr 1
hr_data[0].hr_aufl_z 100
hr_data[0].hr_aufl_n 1
hr_data[0].hr_zaebler_direct_access 1
hr_data[0].adr_hr_zaebler 0x8a0a0030
hr_data[0].max_inkr_pro_takt 1000
hr_data[0].hr_abs_pos_init 0
#
hr_data[1].log_hr_nr 2
hr_data[1].hr_aufl_z 180
hr_data[1].hr_aufl_n 1
hr_data[1].hr_zaebler_direct_access 1
hr_data[1].adr_hr_zaebler 0x8a0a0080
hr_data[1].max_inkr_pro_takt 1000
hr_data[1].hr_abs_pos_init 0

*****
# Inching key data
*****
tasten_data[0].log_tasten_nr 1
#
tasten_data[1].log_tasten_nr 2
#
tasten_data[2].log_tasten_nr 3
*****
# Feedhold processing
*****
feedhold.hr_inkr_verwerfen 0
feedhold.jog_inkr_verwerfen 1

```

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