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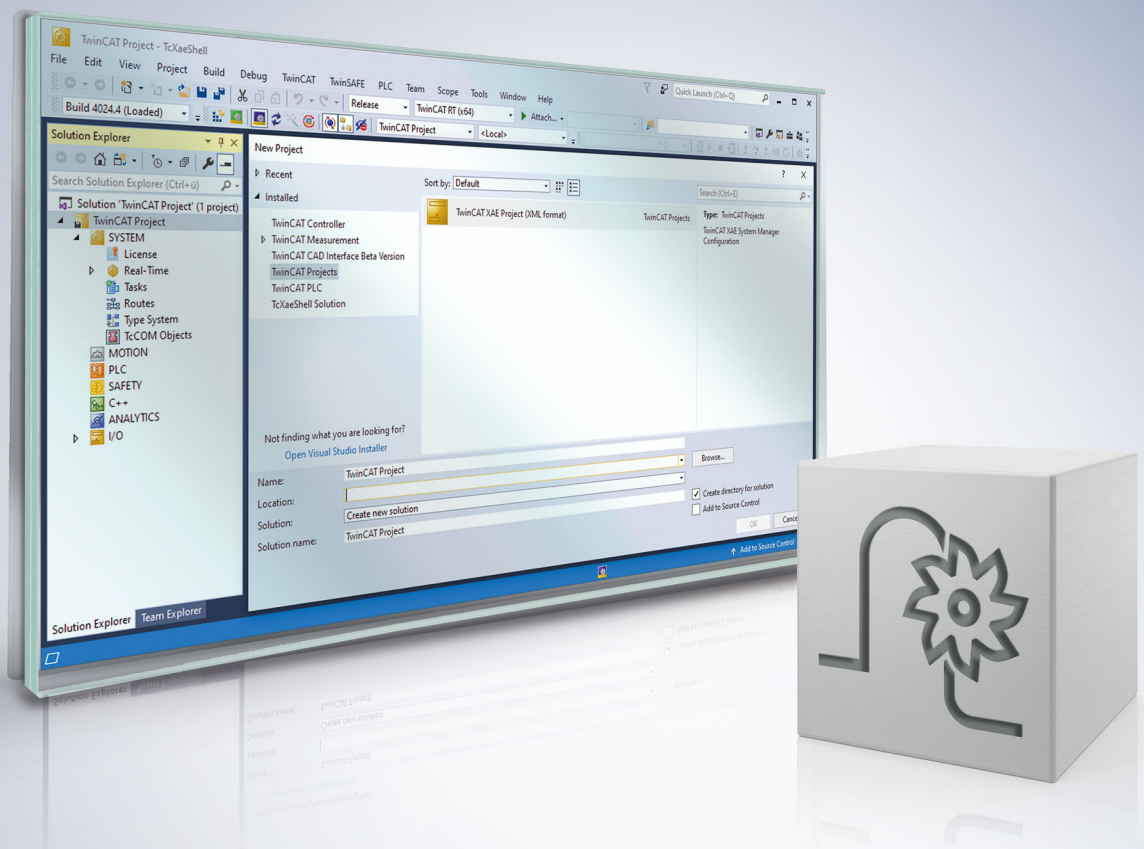
Manual | EN

TF5200 | TwinCAT 3 CNC

Volumetric compensation parameters



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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.

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Icons in explanatory text

1. Indicates an action.

⇨ Indicates an action statement.

⚠ DANGER

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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

Overview of compensation parameters

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

- Column 1 contains the unambiguous identifier of the axis parameter called the “ID”. which consists of the prefix “P-VOLC” and a unique 5-digit number,
  e.g. P-VOLC-00001.
- Column 2 represents the data structure which defines the parameter
  The structure is a categorisation aid and is described in the following section (irrelevant for compensation parameters). If an entry is missing in ‘structure’, this is not an error. The parameter in column 3 “parameter” is then only valid on its own.
- Column 3 contains the “parameter” with its exact description,
  e.g. x
- Column 4 contains the “functionality” in a summarised term/short description
  e.g. Logical axis number of the participating X axis

ID	Structure	Parameter	Functionality/short description
P-VOLC-00001 [▶ 11]		x	Logical axis number of the participating X axis
P-VOLC-00002 [▶ 11]		y	Logical axis number of the participating Y axis
P-VOLC-00003 [▶ 11]		z	Logical axis number of the participating Z axis
P-VOLC-00004 [▶ 11]		a	Logical axis number of the participating A axis
P-VOLC-00005 [▶ 12]		b	Logical axis number of the participating B axis
P-VOLC-00006 [▶ 12]		c	Logical axis number of the participating C axis
P-VOLC-00007 [▶ 13]		Chain	Type of kinematic chain
P-VOLC-00008 [▶ 13]		workpiece_axes	Number of workpiece axes
P-VOLC-00009 [▶ 13]		negate	Negate compensation values
P-VOLC-00010 [▶ 13]		set_to_zero	Setting the compensation values to zero
P-VOLC-00011 [▶ 14]		alternative_model	Alternative calculation rule
P-VOLC-00012 [▶ 14]		file[j]	Paths and names of parameter files
P-VOLC-00013 [▶ 14]		file_format[j]	Parameter file formats
P-VOLC-00014 [▶ 15]		interpolation	Interpolation method for error parameters
P-VOLC-00015 [▶ 15]		enable_splicing	Adaptation of error parameters
P-VOLC-00016		diagnosis_file	Path to the diagnosis file
P-VOLC-00017 [▶ 15]		manual_activation	Manual activation
P-VOLC-00018 [▶ 16]		filter_steps	Number of steps in the compensation value list.
P-VOLC-00019 [▶ 16]		associate_to_channel	Associate compensation to channel
P-VOLC-00020 [▶ 16]		use_axis_offsets	Consider axis offsets

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 configuration data

A maximum of 5 volumetric compensations can be configured on the controller. Configuration of the ith volumetric compensation is split between a startup list and the list file:

- 2 parameters are listed in the controller startup list ('hochlauf.lis'):
  1. The parameter "vol_comp[i].max_records" (P-STUP-00100) specifies an upper limit for the expected error parameter blocks.
  2. The parameter "vol_comp[i].file_name" (P-STUP-00101) refers to the list file in which the related volumetric compensation is configured as detailed below. This means that there are maximum 5 list files containing the assigned configuration data.
- The file which is named in the start-up parameter "vol_comp[i].file_name" (P-STUP-00101) contains all the configuration data for the ith volumetric compensation with the exception of “max_records”. These parameters are explained in this documentation.

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 here!)
```

2 Description of elements

2.1 Logical axis numbers of the participating axes (P-VOLC-00001 to P-VOLC-00006)

P-VOLC-00001	Logical axis number of the participating X axis
Description	This parameter defines the X axis participating in this Volumetric Compensation. The axis is identified by its logical axis number.
Parameter	x
Data type	UNS16
Data range	0 … MAX(UNS16)
Dimension	----
Default value	-
Remarks	Parameterisation example: The row x 1 defines that the axis with the logical axis number 1 is to be interpreted as the X axis (as specified in the ISO 230 model).

P-VOLC-00002	Logical axis number of the participating Y axis
Description	This parameter defines the Y axis participating in this Volumetric Compensation. The axis is identified by its logical axis number.
Parameter	y
Data type	UNS16
Data range	0 … MAX(UNS16)
Dimension	----
Default value	-
Remarks	Parameterisation example: The row y 2 defines that the axis with the logical axis number 2 is to be interpreted as the Y axis (as specified in the ISO 230 model).

P-VOLC-00003	Logical axis number of the participating Z axis
Description	This parameter defines the Z axis participating in this Volumetric Compensation. The axis is identified by its logical axis number.
Parameter	z
Data type	UNS16
Data range	0 … MAX(UNS16)
Dimension	----
Default value	-
Remarks	Parameterisation example: The row z 3 defines that the axis with the logical axis number 3 is to be interpreted as the Z axis (as specified in the ISO 230 model).

P-VOLC-00004	Logical axis number of the participating A axis
Description	This parameter defines the A axis participating in this Volumetric Compensation. The axis is identified by its logical axis number.
Parameter	a
Data type	UNS16

Data range	0 … MAX(UNS16)
Dimension	----
Default value	-
Remarks	Parameterisation example: The row a 4 defines that the axis with the logical axis number 4 is to be interpreted as the A axis (as specified in the ISO 230 model).

P-VOLC-00005	**Logical axis number of the participating B axis**
Description	This parameter defines the B axis participating in this Volumetric Compensation. The axis is identified by its logical axis number.
Parameter	b
Data type	UNS16
Data range	0 … MAX(UNS16)
Dimension	----
Default value	-
Remarks	Parameterisation example: The row b 5 defines that the axis with the logical axis number 5 is to be interpreted as the B axis (as specified in the ISO 230 model).

P-VOLC-00006	**Logical axis number of the participating C axis**
Description	This parameter defines the C axis participating in this Volumetric Compensation. The axis is identified by its logical axis number.
Parameter	c
Data type	UNS16
Data range	0 … MAX(UNS16)
Dimension	----
Default value	-
Remarks	Parameterisation example: The row c 6 defines that the axis with the logical axis number 6 is to be interpreted as the C axis (as specified in the ISO 230 model).

2.2 Type of kinematic chain (P-VOLC-00007)

P-VOLC-00007	Type of kinematic chain
Description	This parameter specifies the kinematic chain to be used. For details of how to define the kinematic chain, see [FCT-C26]. The 6 axes available X, Y, Z, A, B and C can be used in any order.
Parameter	chain
Data type	STRING
Data range	*<Order of axis names in the chain>*
Dimension	----
Default value	XYZ
Remarks	Parameterisation example: The row chain XYZCA defines the kinematic chain for a conventional CA machine.

2.3 Number of workpiece axes (P-VOLC-00008)

P-VOLC-00008	Number of workpiece axes
Description	This parameter specifies how many axes in the kinematic chain lie on the workpiece side. Use of this parameter depends on the measurement strategy. See [FCT-C26].
Parameter	workpiece_axes
Data type	UNS16
Data range	0 ≤ workpiece_axes < 6*
Dimension	----
Default value	0
Remarks	* Volumetric compensation is possible for maximum 6 axes

2.4 Negating compensation values (P-VOLC-00009)

P-VOLC-00009	Negate compensation values
Description	This parameter specifies the Cartesian axes for which the compensation value is to be negated. See [FCT-C26]. A notation based on sets is used. For example, the value "XY" means that the compensation values for X and Y are to be negated, but not for Z.
Parameter	negate
Data type	STRING
Data range	*<Name of the axes to be negated>*
Dimension	----
Default value	-
Remarks	Parameterisation example: The row negate XY specifies that the compensation values are to be negated for the X axis and Y axis.

2.5 Setting compensation values to zero (P-VOLC-00010)

P-VOLC-00010	Setting the compensation values to zero
Description	This parameter specifies the Cartesian axes in which the compensation value is to be zeroed. See [FCT-C26]. A notation based on sets is used.
Parameter	set_to_zero
Data type	STRING

Data range	*<Names of the axes to be zeroed>*
Dimension	----
Default value	-
Remarks	Parameterisation example: The row set_to_zero Z specifies that the compensation value are to be zeroed for the Z axis.

2.6 Alternative calculation rule (P-VOLC-00011)

P-VOLC-00011	**Alternative calculation rule**
Description	This parameter enables use of an alternative calculation rule for the ISO 230 error model. Use of this parameter depends on the interpretation of the measurement strategy which is possibly used. See [FCT-C26].
Parameter	alternative_model
Data type	BOOLEAN
Data range	0/1
Dimension	----
Default value	0
Remarks	

2.7 Paths and names of parameter files (P-VOLC-00012)

P-VOLC-00012	**Paths and names of parameter files**
Description	This parameter contains the paths and names of the error parameter files which are read in for the Volumetric Compensation The corresponding parameter P-VOLC-00013 [▶ 14] (file_format[j]) should be configured for every entry in file[j].
Parameter	file[j] where 0 ≤ j < 10 (application-specific)
Data type	STRING
Data range	*<Paths and names of parameter files>*
Dimension	----
Default value	-
Remarks	Parameterisation example: The rows file[0] C:\volcomp\vc_001.csv file[1] C:\volcomp\vc_002.csv specify the error parameters from which the two specified CVS files should be read.

2.8 Parameter file formats (P-VOLC-00013)

P-VOLC-00013	**Parameter file formats**
Description	This parameter defines the formats of the error parameter files P-VOLC-00012 [▶ 14] (file[j]). An incorrect file format setting results in a syntax error when the file is read in.
Parameter	file_format[j] where 0 ≤ j < 10 (application-specific)
Data type	STRING
Data range	{ISG_CSV, ETALON_EXCHANGE}
Dimension	----
Default value	ISG_CSV

Remarks	Parameterisation example: The rows file[0] C:\volcomp\vc_001.csv file_format[0] ISG_CSV file[1] C:\volcomp\vc_002.exc file_format[1] ETALON_EXCHANGE specify that an error parameter file is to be read in in CVS format and a file in Etalon Exchange Format.

2.9 Interpolation method for error parameters (P-VOLC-00014)

P-VOLC-00014	**Interpolation method for error parameters**
Description	This parameter specifies the interpolation method to be used for the error parameters. See [FCT-C26].
Parameter	interpolation
Data type	STRING
Data range	GRID: The data is given on a grid, linear interpolation. An error is issued if the GRID mode is configured, but the data in the parameter files is not given on a grid. SCATTER: The data is specified irregularly by means of Shepard interpolation. AUTO: If the data is specified on a grid, linear interpolation is used. If not, Shepard interpolation is applied. PATH: Error parameters are specified at the corner points of a polygon. Interpolation takes place in linear sections along the polygon. PATH_XY: Error parameters are specified at the corner points of a polygon in the XY plane.
Dimension	----
Default value	GRID
Remarks	

2.10 Adaptation of error parameters (P-VOLC-00015)

P-VOLC-00015	**Adaptation of error parameters**
Description	This parameter specifies whether error parameters are to be adjusted for rotary axes to avoid jumps in the compensation values in the event of modulo passages (e.g. 360°). See [FCT-C26].
Parameter	enable_splicing
Data type	BOOLEAN
Data range	0/1
Dimension	----
Default value	0
Remarks	

2.11 Manual activation (P-VOLC-00017)

P-VOLC-00017	**Manual activation**

Description	By default, Volumetric Compensation is automatically enabled on start-up or reset as soon as the participating axes meet all the necessary conditions. See [FCT-C26]. This parameter can prevent this automated feature. In this case, Volumetric Compensation can only be enabled by the NC command **#VOLCOMP ON** / **OFF**.
Parameter	manual_activation
Data type	BOOLEAN
Data range	0: Volumetric Compensation is enabled either automatically on start-up or reset or manually, i.e. with #VOLCOMP ON/OFF. 1: Volumetric Compensation can be enabled only manually, i.e. with #VOLCOMP ON/OFF.
Unit	----
Default value	0
Remarks	

2.12 Filter size (P-VOLC-00018)

P-VOLC-00018	**Number of steps in the compensation value list.**
Description	If compensation with axis motion is enabled or disabled (NOT via position controller setpoint correction), the correction value is built up and reduced by a filer to move the axis with jerk limiting. This parameter defines the number of steps/cycles.
Parameter	filter_steps
Data type	UNS32
Data range	0 … MAX(UNS32)
Dimension	----
Default value	20
Remarks	

2.13 Associate compensation to channel (P-VOLC-00019)

P-VOLC-00019	**Associate compensation to channel**
Description	This parameter specifies whether compensation is to be linked to the channel in which it was enabled. This flag impacts on the behaviour of the compensation at the end of the program, among other things. See [FCT-C26].
Parameter	associate_to_channel
Data type	BOOLEAN
Data range	0/1
Dimension	----
Default value	0
Remarks	

2.14 Consider axis offsets (P-VOLC-00020)

P-VOLC-00020	**Consider axis offsets**
Description	This parameter specifies whether compensation should consider axis offsets when the correction values are defined.
Parameter	use_axis_offsets
Data type	BOOLEAN
Data range	0/1
Dimension	----
Default value	0

Remarks	

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