Technology Template
“Simple 3D interpolation using cam discs”

Technology CPU

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Foreword

The technology template

A technology template is a software object or a code block with defined interfaces, which can easily be integrated into other software projects without extra work and which performs a precisely defined task in these projects.

Support for the technology template

Support services in the scope of the Customer Support can only be provided for the unaltered technology template.

If the code is changed it is no longer possible to provide support for the technology template.

Reference to Automation and Drives Service & Support

This entry is from the internet application portal of Automation and Drives Service & Support. Clicking the link below directly displays the download page of this document.

http://support.automation.siemens.com/WW/view/en/21364022

Table of Contents

1 Preconditions

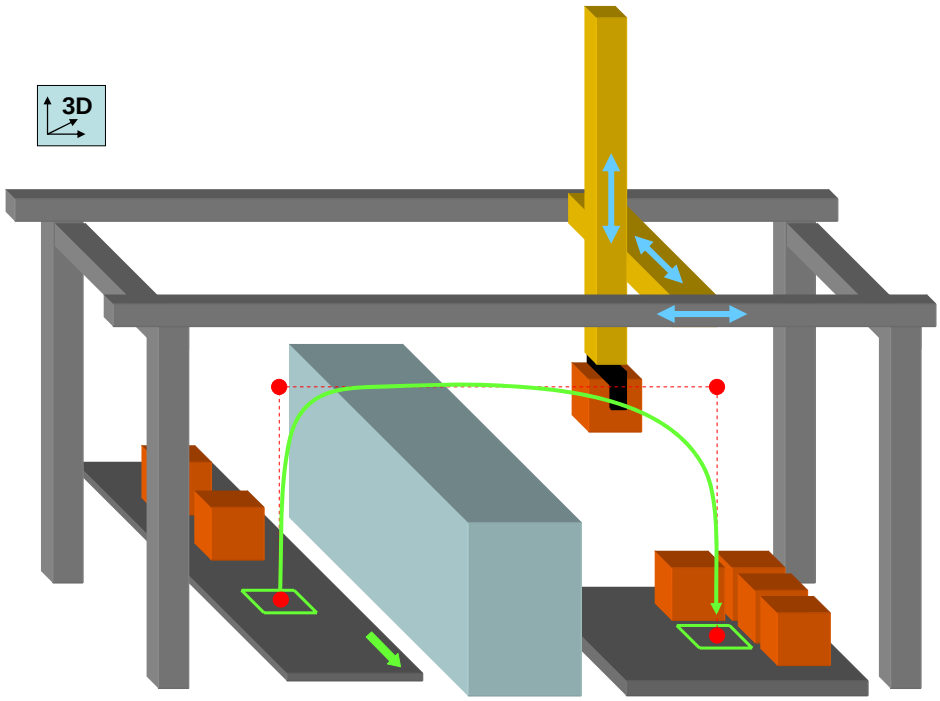
1.1 Target group

The technology template is intended for all programmers and users of the technology CPU who easily and quickly want to execute an interpolated motion with up to three axes with constant path velocity, the path velocity being specified via an interpolation table.

1.2 Objective and purpose of this technology template

A simple three-dimensional spatial motion with constant path velocity is to be executed with the technology CPU, the trajectory is specified via an interpolation table.

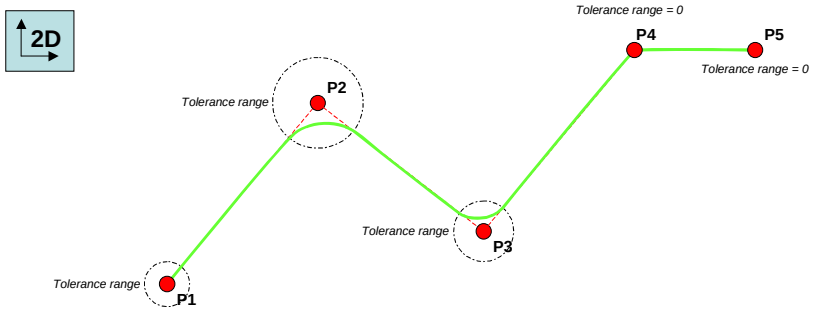
Figure 1-1 Example of a three-dimensional spatial motion



The motion of the axes is to be generated via a cam disc synchronism. The required cam discs are to be generated from a specified interpolation table. This requires that the interpolation table is available prior to the start of the motion.

The trajectory between two interpolation points is to be in a straight line. A tolerance range can be defined around the interpolation points within which the trajectory may deviate from the straight line.

Figure 1-2 Trajectory defined via interpolation points



1.3 Properties of this technology template

The properties listed below were considered during the realization of the technology template:

- **Processing of up to 32 interpolation points**
  Via the interpolation table, trajectories with up to 32 interpolation points can be defined for each interpolating motion. An individual tolerance range can be defined for each interpolation point.
- **Processing of sections of the interpolation table**
  The start and the end of the interpolation section in the interpolation table can be specified by a start and an end index in the interpolation table.
- **Free definition of the axes involved in the interpolation**
  The axes involved in the interpolation can be freely defined. Up to three axes can be used for the interpolation.
- **Interpolated path with and without acceleration limitation**
  The interpolated trajectory can be followed with and without acceleration limitation.
- **Checking the current axis position before the start of the motion**
  For the start of the interpolated motion, a tolerance limit can be defined within which the current position of the axes has to be located to start the interpolated motion. If the axes are outside this tolerance range, a message is output and the axes have to be moved to the also displayed starting position outside the technology template.
- **Option of stopping the interpolated motion**
  Following an interpolated trajectory can be stopped via an input at the function block of the template at any time. The axes are decelerated to standstill on the trajectory on a defined basis. Then the axes can be manually moved independently of one another without interrupting the execution of the template. The interpolated travel motion can then be continued via a further input of the template.

- **Changing direction on the trajectory**
  Before starting the interpolated travel motion as well as after stopping the motion, the direction of motion of the axes on the trajectory can be newly specified. Consequently, the option exists to pass the interpolation table in ascending and descending order.

1.4 Constraints of this technology template

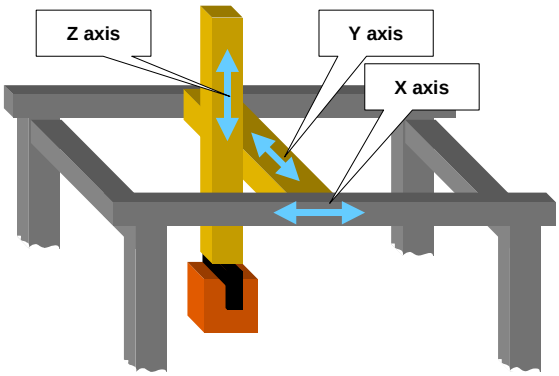
The properties listed below were not considered during the realization of the template:

- **No ensuring and monitoring of the path accuracy**
  The technology template does not monitor the compliance with the specified trajectory during the travel motion. Particularly when the dynamic restrictions of the axes are not complied with, deviations from the specified trajectory may occur.
- **No following of specific contours**
  With the technology template, it is not possible to follow contours composed of circular arcs and straight lines as known from the field of CNC-machines. The trajectory for the technology template is exclusively specified via an interpolation table.
- **No tool offset**
  Active tool offset during the generation of the interpolated trajectory and automatic consideration of this offset in the travel motion of the cam is also not possible.

1.5 Environment of this technology template

The technology template was especially developed for use with Cartesian kinematics, i.e. three orthogonal linear axes X, Y, Z can be controlled.

Figure 1-3 Example of Cartesian kinematics



All axes used for the technology template must use the same system of units and the Cartesian axes have to be designed in such a way that the set limits are not reached by the motion.

Table 1-1 Possible systems of units

Variable	System of units 1	System of units 2
Position	mm	m
Velocity	mm/s	m/s
Acceleration	mm/s^2	m/s^2

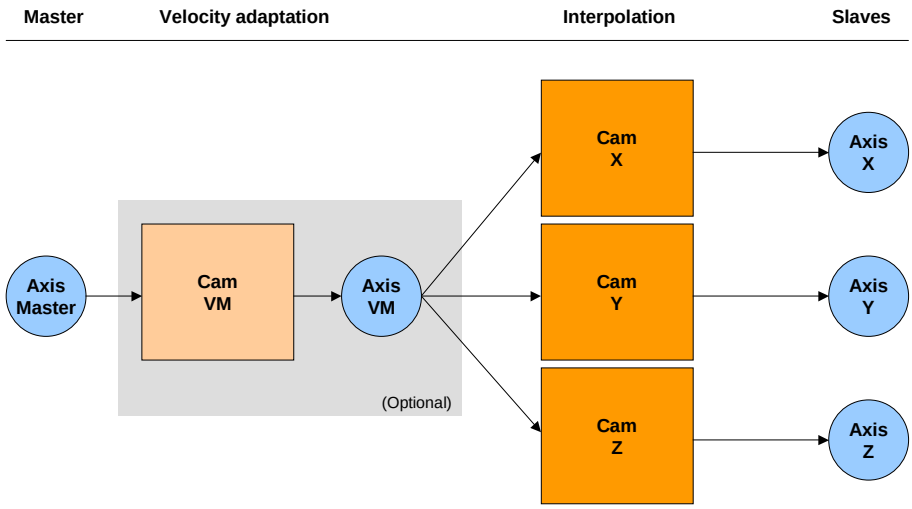
2 Function Principle

2.1 Structure of the technology template

The technology template is based on a unique synchronization of axes and cam discs in the technology CPU.

Three real axes, the three Cartesian axes X, Y and Z of the machine and two virtual axes, as master axes for the cam disc synchronization, as well as up to four cam discs are required.

Figure 2-1 Configuration of the axis synchronization via cam discs



The Cartesian axes **Axis X**, **Axis Y** and **Axis Z** of the machine are controlled via a corresponding cam disc **Cam X**, **Cam Y** and **Cam Z** in which the part of the Cartesian axis in the desired interpolated motion is stored. A virtual axis is used as master for the cam discs.

The virtual axis **Axis Master** is the master for the three-dimensional interpolated motion. It is moved from a starting point to an end point at constant velocity and consequently provides the necessary input value for the cam discs.

If it is not required to limit the acceleration of the axes during the interpolated motion, **Axis Master** can be synchronized directly to the cam discs **Cam X**, **Cam Y** and **Cam Z**.
If, however, a motion with limited acceleration is desired, an additional cam disc and an additional virtual axis have to be included in the cam disc

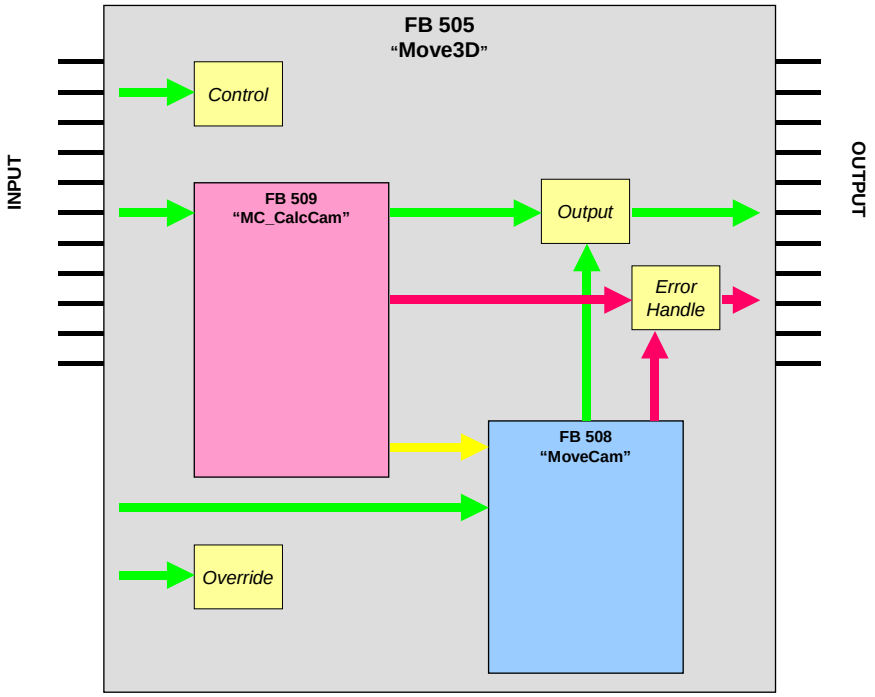
synchronization. Cam disc **Cam VM** is responsible for adapting the input values specified by **Axis Master** and provides these values to the cam discs **Cam X**, **Cam Y** and **Cam Z** via the virtual axis **Axis VM** for the interpolated motion.

2.2 Structure of the function block for the technology template

All functions for executing an interpolated motion with limited acceleration are integrated in block **FB 505 “Move3D”**.

Block **FB 505 “Move3D”** is responsible for the complete function process, initiates the generation of the cam discs and subsequently starts the travel motion using the generated cam discs.

Figure 2-2 General structure of block FB 505 “Move3D”

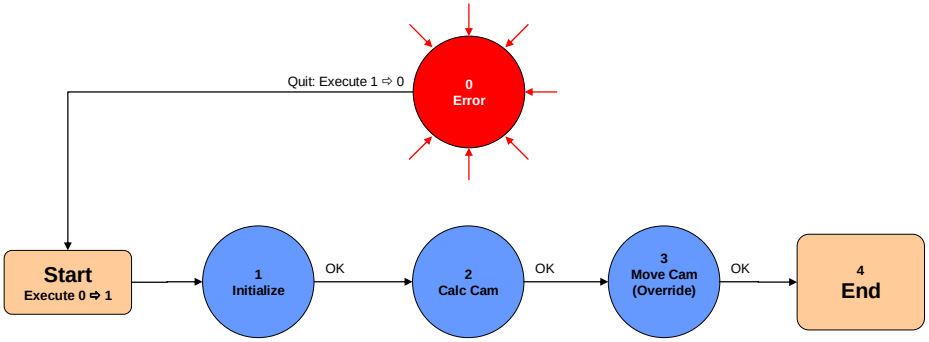


FB 505 “Move3D” uses additional functions realized in independent function blocks. **FB 509 “MC_CalcCam”** generates the required cam discs from the interpolation table and **FB 508 “MoveCam”** executes the axis motion using the generated cam discs.

2.3 Possible statuses

To execute an interpolated motion, **FB 505 “Move3D”** gradually executes several functions successively:

Figure 2-3 Possible statuses of FB 505 “Move3D”



The individual steps of the block have the following function:

Table 2-1 Description of the statuses of FB 505 “Move3D”

Step / Status	Function
0 – Error	If an error occurs during executing the functions of the block, the block branches into this status and outputs an error code for exact localization of the cause of the error.
1 – Initialize	During this step the internal variables of the block and the functions called in the block are set to defined values and the input parameters of the block are checked.
2 – Calc Cam	During this step the required cam discs are generated from the interpolation table.
3 – Move Cam (Override)	During this step the real and virtual axes are synchronized via the cam discs and the travel motion is executed.
4 – End	After successful processing of all functions and execution of all travel motions, the block branches into this step and no longer executes functions in this step until the block is terminated or called again.

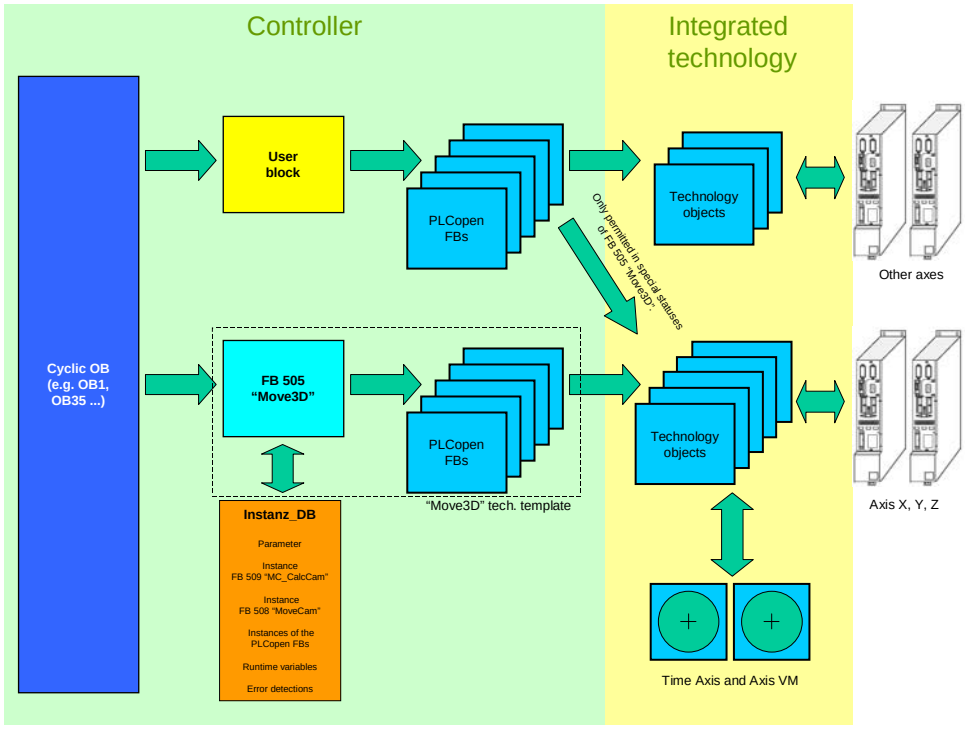
Block **FB 505 “Move3D”** is completely processed for each interpolated motion.

3 Program Environment and Interfaces

3.1 Call environment

Block **FB 505 “Move3D”** of the technology template has to be called cyclically in the user program. It can be called directly in an OB or within a cyclically processed FB.

Figure 3-1 Call environment of the technology template



While **FB 505 "Move3D"** is active, the technology objects influenced by block **FB 505 "Move3D"** must only be influenced by the user program in the following status:

- **Position out of Tolerance**
- **Master stopped**

3.2 Interfaces

3.2.1 Structure of the interfaces

Block **FB 505 "Move3D"** can be parameterized and influenced via several parameters and interfaces:

- **Block interface**
  Input and output variables of block **FB 505 "Move3D"**.
- **User interface of the instance data block**
  Via a special area of the instance data block for block **FB 505 "Move3D"**, mainly parameters are set which do not change during the entire operation of the block.
- **Parameterization of the technology objects**
  The basic settings of the technology objects required for block **FB 505 "Move3D"** have to be preset via the S7T-Config configuration software in STEP 7 when creating the technology objects.

3.2.2 Block interface

For the control of the interpolated motion by block **FB 505 “Move3D”**, the following interfaces are available at the block:

Danger

The “Master_Stop” input is only used for the interruption of an <u>already active</u> motion.

If the input is set before block FB 505 “Move3D” is started, an axis motion may still occur during the cam disc synchronization!

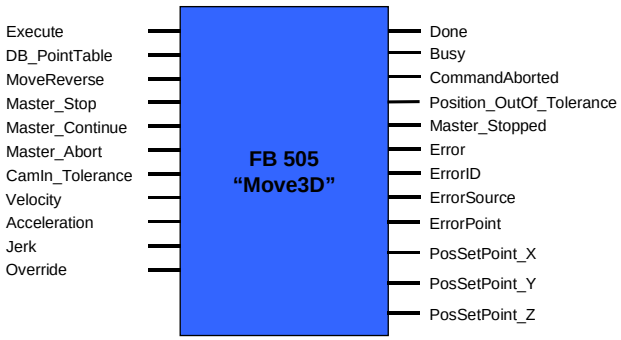


Table 3-1 Block interface

Parameter	Data type	Initial value	Description
Input parameter			
Execute	BOOL	False	Initiation of a new interpolated motion, from generating the cam discs from the interpolation table to executing the motion. If **Execute** is reset, no output signals are output at the block.
DB_PointTable	INT	0	Number of the data block containing the interpolation table. The DB has to be structured according to **UDT 509**.
MoveReverse	BOOL	False	Reversal of the direction of motion. If the signal is set, the interpolation table is processed from end to start. The signal is newly interpreted before the start of the block or after stopping the travel motion.

Parameter	Data type	Initial value	Description
Master_Stop	BOOL	False	If the signal is set during the travel motion, the axes are decelerated on the contour and the cam disc synchronization of the axes is released after stopping the axes.
Master_Continue	BOOL	False	Continuation of the template if the **CamIn_Tolerance** tolerance range is exceeded or after stopping the travel motion. This requires that the **Master_Stop** input is no longer set.
Master_Abort	BOOL	False	Terminating the block if the **CamIn_Tolerance** tolerance range is exceeded or after stopping the travel motion.
CamIn_Tolerance	REAL	0.000	Tolerance range (spherical in 3D) in which the axes X, Y and Z have to be located around the starting point of the contour for starting the block. The parameter is processed as absolute value without observing the sign.
Velocity	REAL	0.000	Maximum velocity. An exact assignment of this parameter is available at the end of the table.
Acceleration	REAL	0.000	Maximum acceleration. An exact assignment of this parameter is available at the end of the table.
Jerk	REAL	0.000	Maximum jerk. An exact assignment of this parameter is available at the end of the table.
Override	REAL	100.000	Percentage value on the influencing of the traversing velocity (0…200%).
Output parameter			
Done	BOOL	False	Processing the block is completed.
Busy	BOOL	False	The block is being processed.

Parameter	Data type	Initial value	Description
CommandAborted	BOOL	False	The technology functions used in the block and thus the block itself were replaced by a technology function outside the block. Consequently, the block no longer controls the axes provided for the interpolated motion!
Position_OutOf_ Tolerance	BOOL	False	The position of the axes X, Y and Z is outside the defined tolerance range during the start of the block or during the continuation of a stopped travel motion.
Master_Stopped	BOOL	False	The travel motion was stopped using **Master_Stop** and the cam disc synchronization was released.
Error	BOOL	False	An error has occurred during processing the block.
ErrorID	WORD	0	Error code of the block or of an internally called technology function.
ErrorSource	WORD	0	Indication of an additional error code for localization of the cause of the error in the block.
ErrorPoint	INT	0	Index of the incorrect interpolation point during generation of the cam discs.
PosSetPoint_X	REAL	0.000	If the position of the axes X, Y and Z is outside the tolerance range, the required position is output.
PosSetPoint_Y	REAL	0.000	If the position of the axes X, Y and Z is outside the tolerance range, the required position is output.
PosSetPoint_Z	REAL	0.000	If the position of the axes X, Y and Z is outside the tolerance range, the required position is output.

Assignment of the parameters “Velocity”, “Acceleration” and “Jerk”

The parameters “Velocity”, “Acceleration” and “Jerk” are used differently in the subordinate blocks **FB 509 “MC_CalcCam”** and **FB 508 “MoveCam”**.

Table 3-2 Parameter assignment “Velocity”, “Acceleration” and “Jerk”

Function block	Description / Function
“Velocity”	
FB 509 “MC_CalcCam”	Maximum path velocity of the interpolated motion which is considered during the generation of the cam discs.
FB 508 “MoveCam”	Maximum velocity of the individual axes during the compensation of the position tolerance when synchronizing the axes within the tolerance range. Maximum velocity of **Axis Master** for setpoint generation for the interpolated motion.
“Acceleration”	
FB 509 “MC_CalcCam”	Maximum acceleration of the interpolated motion which is considered during the generation of the cam discs. The compliance with the acceleration is only considered if **Axis VM** and **Cam VM** are activated for the interpolated motion and if **Axis Master** is not moved quicker than specified at **Velocity** for the cam disc calculation.
FB 508 “MoveCam”	Maximum acceleration of the individual axes during the compensation of the position tolerance when synchronizing the axes within the tolerance range. Maximum acceleration of **Axis Master** for setpoint generation for the interpolated motion. Maximum deceleration of **Axis Master** in case of an interruption of the interpolated motion.
“Jerk”	
FB 509 “MC_CalcCam”	The maximum jerk is not considered during the generation of the cam discs.
FB 508 “MoveCam”	Maximum jerk of the individual axes during the compensation of the position tolerance when synchronizing the axes within the tolerance range. Maximum jerk of **Axis Master** for setpoint generation for the interpolated motion. Maximum jerk when stopping **Axis Master** in case of an interruption of the interpolated motion.

Note If values larger than 100% are set for the Override parameter, the maximum values listed here may be exceeded.

3.2.3 Structure of the instance data block

The structure of the instance data block is described below, the user may only change the data block in specific areas.

Setting the axes involved in the interpolation

The axes involved in the interpolating motion are set via the user interface of the instance data block of **FB 505 "Move3D"**.

Note

For an interpolating motion via the **FB 505 "Move3D"** technology template, at least two Cartesian axes have to be activated.

Figure 3-2 Structure of the instance data block

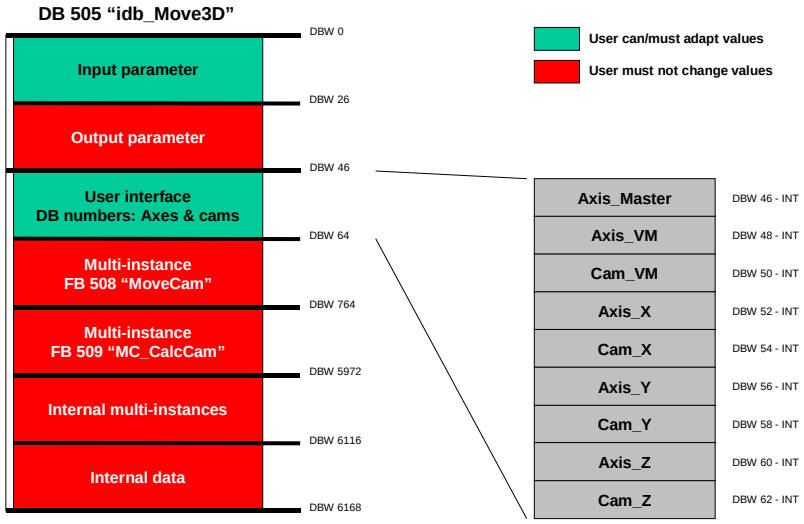


Table 3-3 Parameters of the instance data block – user interface

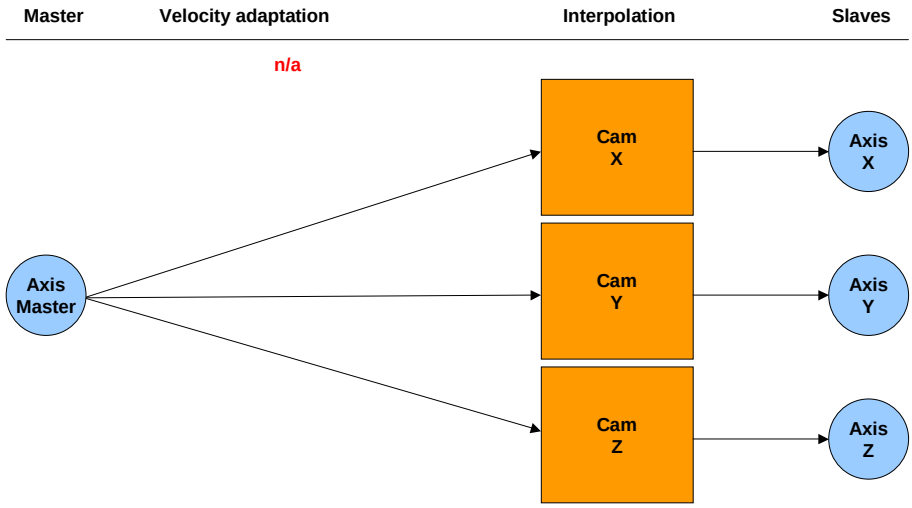
Parameter	Data type	Initial value	Description
Axis_Master	INT	0	Virtual master axis for generating the setpoints for the control of the cam discs.
Axis_VM	INT	0	Virtual slave for considering the velocity adaptation in the setpoints for the cam discs.
Cam_VM	INT	0	Cam disc for velocity adaptation.
Axis_X	INT	0	Real Cartesian axis of the machine in X direction.
Cam_X	INT	0	Cam disc with the part of the motion in X.
Axis_Y	INT	0	Real Cartesian axis of the machine in Y direction.

Parameter	Data type	Initial value	Description
Cam_Y	INT	0	Cam disc with the part of the motion in Y.
Axis_Z	INT	0	Real Cartesian axis of the machine in Z direction.
Cam_Z	INT	0	Cam disc with the part of the motion in Z.

Deactivating the velocity adaptation

If the velocity adaptation is not to be activated, the value **0** is to be assigned to the **Axis_VM** parameter. The assignment of the cam disc **Cam_VM** is not relevant.

Figure 3-3 Axis synchronization **without** velocity adaptation



3.2.4 Structure of the interpolation table

In the interpolation table, up to 32 spatial points can be stored for defining a trajectory. It is created according to **UDT 509**.

Structure of UDT 509

Figure 3-4 Structure of UDT 509

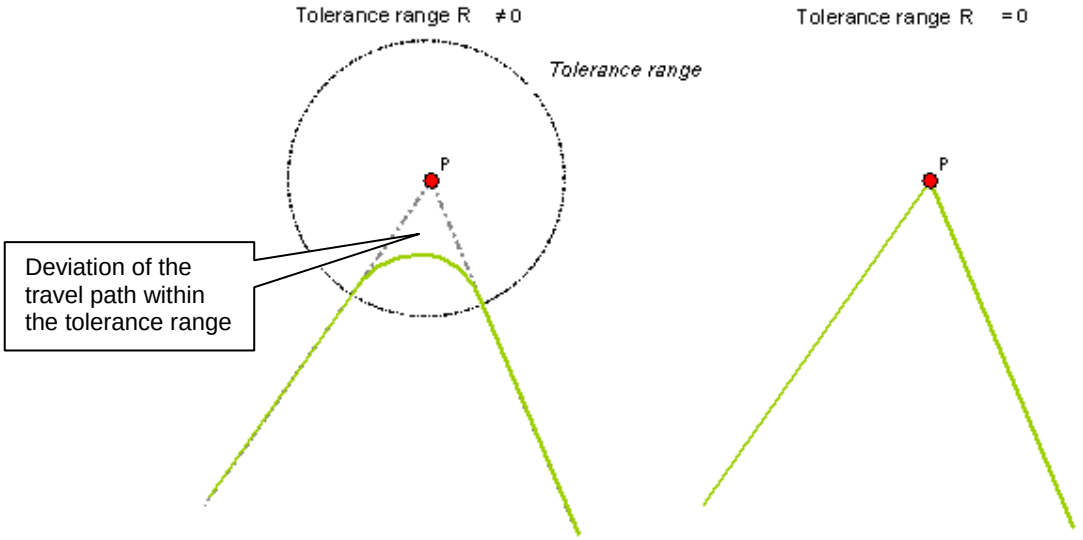
Adresse	Name	Typ	Anfangswert	Kommentar
0.0		STRUCT		
+0.0	StartIndex	INT	1	index of the first valid point
+2.0	EndIndex	INT	32	index of the last valid point
+4.0	Point	ARRAY[1..32]		points with radius
*0.0		STRUCT		
+0.0	X	REAL	0.000000e+000	X-Axis
+4.0	Y	REAL	0.000000e+000	Y-Axis
+8.0	Z	REAL	0.000000e+000	Z-Axis
+12.0	R	REAL	0.000000e+000	radius
=16.0		END_STRUCT		
=516.0		END_STRUCT		

Data block of the interpolation table according to UDT 509

The structure of the interpolation table according to **UDT 509** is as follows:

- One array element exists for each spatial point.
- Each spatial point is defined by the coordinates X, Y and Z.
- For each spatial point, a tolerance range R can be defined within which the interpolated trajectory may be adapted in such a way that smooth motion control without standstill of individual axes or without exceeding dynamic limits is enabled. The specified tolerance range is ignored for the starting point and the end point of the trajectory since these points always have to be approached very exactly.

Figure 3-5 Cam control in the tolerance range R



- **Start index** and **end index** of the interpolation table enable the selection of sections of the interpolation table for interpolation. The following has to apply to start index and end index:

1 ≤ start index < end index ≤ 32

Figure 3-6 Structure of the data block of the interpolation table (according to UDT 509)

	Adresse	Name	Typ	Anfangswert	Aktualwert	Kommentar
1	0.0	StartIndex	INT	1	1	index of the first valid point
2	2.0	EndIndex	INT	32	5	index of the last valid point
3	4.0	Point[1].X	REAL	0.000000e+000	0.000000e+000	X-Axis
4	8.0	Point[1].Y	REAL	0.000000e+000	0.000000e+000	Y-Axis
5	12.0	Point[1].Z	REAL	0.000000e+000	0.000000e+000	Z-Axis
6	16.0	Point[1].R	REAL	0.000000e+000	0.000000e+000	radius
7	20.0	Point[2].X	REAL	0.000000e+000	0.000000e+000	X-Axis
8	24.0	Point[2].Y	REAL	0.000000e+000	0.000000e+000	Y-Axis
9	28.0	Point[2].Z	REAL	0.000000e+000	1.000000e+002	Z-Axis
10	32.0	Point[2].R	REAL	0.000000e+000	3.000000e+001	radius
11	36.0	Point[3].X	REAL	0.000000e+000	2.000000e+002	X-Axis
12	40.0	Point[3].Y	REAL	0.000000e+000	2.000000e+002	Y-Axis
13	44.0	Point[3].Z	REAL	0.000000e+000	1.000000e+002	Z-Axis
14	48.0	Point[3].R	REAL	0.000000e+000	3.000000e+001	radius
15	52.0	Point[4].X	REAL	0.000000e+000	2.000000e+002	X-Axis

3.3 Creating the required technology objects

3.3.1 Axis technologies and synchronization relationships

To integrate the technology template into your STEP 7 project, it is required to create the following axis technologies and synchronization relationships in S7T-Config.

Table 3-4 Setting of the axis technologies

Axis	Axis technology			Axis type	Modulo	Drive	
	Speed	Position	Synchronism			Real	Virtual
Master	-	✓	✓	Linear	-	-	✓
VM	-	-	✓	Linear	-	-	✓
X	-	-	✓	Linear	-	✓	✓
Y	-	-	✓	Linear	-	✓	✓
Z	-	-	✓	Linear	-	✓	✓

The synchronization of the axes via cam discs requires that the following relationships are defined:

Table 3-5 Synchronization relationships between axes and cam discs

Axis	Possible cam discs				Possible master values (axes)				
	VM	X	Y	Z	Master	VM	X	Y	Z
Master	-	-	-	-	-	-	-	-	-
VM	✓	-	-	-	✓	-	-	-	-
X	-	✓	-	-	✓	✓	-	-	-
Y	-	-	✓	-	✓	✓	-	-	-
Z	-	-	-	✓	✓	✓	-	-	-

3.3.2 Configuration of the axes

Table 3-6 Configuration of the axes

Section	Configuration
"Axis_Master"	
Presetting	• Velocity profile: Smooth acceleration characteristic
Limitation	• Velocity ≥ Maximum path velocity • Acceleration ≥ Maximum path velocity / 1ms • Jerk ≥ 10 000 s-1 * acceleration

Virtual axis for velocity adaptation “Axis_VM”	
Presetting	Standard values of S7T-Config can be kept.
Limitation	• Velocity ≥ Maximum path velocity • Acceleration ≥ Maximum path velocity / 1ms • Jerk ≥ 10 000 s-1 * acceleration
Real Cartesian axes “Axis_X”, “Axis_Y” and “Axis_Z”	
Presetting	Values are to be set depending on the application. These values are used for decelerating the axes when calling FB 505 “Move3D” and do not influence the interpolated motion.
Limitation	The settings for the limitations of acceleration and jerk are, provided that the mechanical conditions allow it, to be selected at least twice as large as the maximum acceleration and the maximum jerk during the interpolated motion.

Danger

If the motion of at least one axis is limited, the interpolated travel path can be left. For this reason, it should be ensured that the limitations of the Cartesian axes are not reached during the interpolated motion.

3.3.3 Creating the cam discs

The cam discs only have to be created via S7T-Config. The actual cam discs are defined “online” via **FB 509 “MC_CalcCam”** using the interpolation table.

Table 3-7 Configuration of the cam discs

Parameter	Setting	Note
Type	Interpolation table or polynomial	The cam disc is generated by block FB 509 “MC_CalcCam”.

3.3.4 Parameterization of the synchronism conditions of the axes

Table 3-8 Parameterization of the synchronism conditions of the axes

Section	Configuration
Presetting synchronization cam	• Synchronization: Effective immediately • Desynchronization: Effective immediately
Presetting dynamics	• Synchronization profile: Time-related synchronization profile • Velocity profile: Trapezoidal velocity profile

4 Warning and Error Messages

4.1 Error codes at the “ErrorID” output

The ErrorIDs **00**xx_{HEX} and **8**xxx_{HEX} correspond to the warning and error messages of the technology functions and are not further explained in this table.

Table 4-1 Error codes at the “ErrorID” output

ErrorID [HEX]	Meaning	Note
0000	No error	
FB 509 “MC_CalcCam”		
9001	Invalid start or end index in the interpolation table for definition of the trajectory.	The following applies to start and end index: 1 ≤ start index ≤ end index ≤ 32
9002	The tolerance radius of an interpolation point is less than 0.	The index of the incorrect interpolation point can be read at **ErrorPoint**.
9003	Two neighboring points of the interpolation table are identical or too close to each other.	The following has to apply to the distance between two points: Distance ≥ MinDist
9004	The tolerance ranges of two neighboring interpolation points touch or overlap.	This error can be avoided with the **autoCorrect** = *true* setting since the tolerance ranges are then automatically reduced.
9005	The DB number of one or several cam discs required for the cam disc generation was defined ≤ 0.	
9006	Minimum distance between points **MinDist** invalid.	The following has to apply to **MinDist**: **MinDist** > 0
9007	Maximum path velocity for interpolation invalid.	The following has to apply to **vMaxMaster**: **vMaxMaster** > 0
9008	Maximum acceleration for interpolation invalid.	The following has to apply to **Acceleration**: **Acceleration** > 0
9009	Internal error. The required dynamics limitation cannot be complied with.	The point in the interpolation table is affected which can be read at **ErrorPoint** and its successor.

ErrorID [HEX]	Meaning	Note
900A	The data block of the interpolation table is invalid.	The data block of the interpolation has to comply with the **UDT 509** template.
FB 508 "MoveCam"		
9030	Internal error of block FB 508	See error code at **ErrorSource** output for a detailed error analysis.
FB 505 "Move3D"		
9031	Internal error of block FB 505	See error code at **ErrorSource** output for a detailed error analysis.

4.2 Error codes at the "ErrorSource" output

Table 4-2 Error codes at the "ErrorSource" output

ErrorSource [HEX]	Meaning	Note
0000	No error	
FB 509 "MC_CalcCam"		
0001	General error during clearing the cams from the cam discs	FB 581 "CamClear"
0002	Error during clearing the cam from cam disc **Cam X**.	FB 581 "CamClear"
0003	Error during clearing the cam from cam disc **Cam Y**.	FB 581 "CamClear"
0004	Error during clearing the cam from cam disc **Cam Z**.	FB 581 "CamClear"
0005	Error during clearing the cam from cam disc **Cam VM**.	FB 581 "CamClear"
0006	General error during inserting cam segments into the cam discs.	FB 583 "CamSectorAdd"
0007	Error during inserting cam segments into cam disc **Cam X**.	FB 583 "CamSectorAdd"
0008	Error during inserting cam segments into cam disc **Cam Y**.	FB 583 "CamSectorAdd"
0009	Error during inserting cam segments into cam disc **Cam Z**.	FB 583 "CamSectorAdd"
000A	Error during inserting cam segments into cam disc **Cam VM**.	FB 583 "CamSectorAdd"

ErrorSource [HEX]	Meaning	Note
000B	Error during interpolating the cam of cam disc **Cam X**.	FB 582 “CamInterpolate“
000C	Error during interpolating the cam of cam disc **Cam Y**.	FB 582 “CamInterpolate“
000D	Error during interpolating the cam of cam disc **Cam Z**.	FB 582 “CamInterpolate“
000E	Error during interpolating the cam of cam disc **Cam VM**.	FB 582 “CamInterpolate“
000F	Error during plausibility check or calculation of the cams.	
FB 508 “MoveCam” – Axis X		
0101	**Axis X** activated (DB number ≠ 0) but no cam disc **Cam X** defined for **Axis X**.	
0108	Error during disabling the cam disc synchronization of **Axis X**.	MC_Halt
0109	The technology function for disabling the cam disc synchronization of **Axis X** was replaced. (CommandAborted)	MC_Halt
010A	Error during interrupting the travel motion of **Axis X**.	MC_Halt
010B	The technology function for interrupting the travel motion of **Axis X** was replaced. (CommandAborted)	MC_Halt
010C	Error during stopping **Axis X**.	MC_Halt
010D	The technology function for stopping **Axis X** was replaced. (CommandAborted)	MC_Halt
FB 508 “MoveCam” – Axis Y		
0201	**Axis Y** activated (DB number ≠ 0) but no cam disc **Cam Y** defined for **Axis Y**.	
0208	Error during disabling the cam disc synchronization of **Axis Y**.	MC_Halt
0209	The technology function for disabling the cam disc synchronization of **Axis Y** was replaced. (CommandAborted)	MC_Halt
020A	Error during interrupting the travel motion of **Axis Y**.	MC_Halt
020B	The technology function for interrupting the travel motion of **Axis Y** was replaced. (CommandAborted)	MC_Halt
020C	Error during stopping **Axis Y**.	MC_Halt

ErrorSource [HEX]	Meaning	Note
020D	The technology function for stopping **Axis Y** was replaced. (CommandAborted)	MC_Halt
FB 508 "MoveCam" – Axis Z		
0301	**Axis Z** activated (DB number ≠ 0) but no cam disc **Cam Z** defined for **Axis Z**.	
0308	Error during disabling the cam disc synchronization of **Axis Z**.	MC_Halt
0309	The technology function for disabling the cam disc synchronization of **Axis Z** was replaced. (CommandAborted)	MC_Halt
030A	Error during interrupting the travel motion of **Axis Z**.	MC_Halt
030B	The technology function for interrupting the travel motion of **Axis Z** was replaced. (CommandAborted)	MC_Halt
030C	Error during stopping **Axis Z**.	MC_Halt
030D	The technology function for stopping **Axis Z** was replaced. (CommandAborted)	MC_Halt
FB 508 "MoveCam" – Axis VM		
0401	**Axis VM** activated (DB number ≠ 0) but no cam disc **Cam VM** defined for **Axis VM**.	
0404	Error during homing **Axis VM**.	MC_Home
0405	The technology function for homing **Axis VM** was replaced. (CommandAborted)	MC_Home
0408	Error during disabling the cam disc synchronization of **Axis VM**.	MC_Halt
0409	The technology function for disabling the cam disc synchronization of **Axis VM** was replaced. (CommandAborted)	MC_Halt
040A	Error during interrupting the travel motion of **Axis VM**.	MC_Halt
040B	The technology function for interrupting the travel motion of **Axis VM** was replaced. (CommandAborted)	MC_Halt
040C	Error during stopping **Axis VM**.	MC_Halt
040D	The technology function for stopping **Axis VM** was replaced. (CommandAborted)	MC_Halt

ErrorSource [HEX]	Meaning	Note
FB 508 “MoveCam” – Axis Master		
0501	**Axis Master** not activated (DB number = 0)	
0504	Error during homing **Axis Master**.	MC_Home
0505	The technology function for homing **Axis Master** was replaced. (CommandAborted)	MC_Home
0506	Error during moving **Axis Master**.	MC_MoveAbsolute
0507	The technology function for moving **Axis Master** was replaced. (CommandAborted)	MC_MoveAbsolute
050A	Error during interrupting the travel motion of **Axis Master**.	MC_Halt
050B	The technology function for interrupting the travel motion of **Axis Master** was replaced. (CommandAborted)	MC_Halt
050C	Error during stopping **Axis Master**.	MC_Halt
050D	The technology function for stopping **Axis Master** was replaced. (CommandAborted)	MC_Halt
FB 508 “MoveCam” – Cam X		
0604	Cam disc point in **Cam X** could not be determined.	MC_GetCamPoint
0605	**Cam X** is not interpolated and cannot be used.	
0606	Error during synchronizing cam disc **Cam X**.	MC_CamIn
0607	The technology function for synchronizing cam disc **Cam X** was replaced. (CommandAborted)	MC_CamIn
FB 508 “MoveCam” – Cam Y		
0704	Cam disc point in **Cam Y** could not be determined.	MC_GetCamPoint
0705	**Cam Y** is not interpolated and cannot be used.	
0706	Error during synchronizing cam disc **Cam Y**.	MC_CamIn
0707	The technology function for synchronizing cam disc **Cam Y** was replaced. (CommandAborted)	MC_CamIn

ErrorSource [HEX]	Meaning	Note
FB 508 “MoveCam” – Cam Z		
0804	Cam disc point in **Cam Z** could not be determined.	MC_GetCamPoint
0805	**Cam Z** is not interpolated and cannot be used.	
0806	Error during synchronizing cam disc **Cam Z**.	MC_CamIn
0807	The technology function for synchronizing cam disc **Cam Z** was replaced. (CommandAborted)	MC_CamIn
FB 508 “MoveCam” – Cam VM		
0904	Cam disc point in **Cam VM** could not be determined.	MC_GetCamPoint
0905	**Cam VM** is not interpolated and cannot be used.	
0906	Error during synchronizing cam disc **Cam VM**.	MC_CamIn
0907	The technology function for synchronizing cam disc **Cam VM** was replaced. (CommandAborted)	MC_CamIn
FB 508 “MoveCam” – general errors		
0A01	**PathLength** parameter incorrect	The following has to apply: PathLength ≥ 0
0A02	**PathLenMaster** parameter incorrect	The following has to apply: PathLenMaster ≥ 0
0A03	Error during exponentiation (SQR) and root extraction (SQRT).	
FB 505 “Move3D”		
FF01	Error during writing the set override value for **Axis Master.**	MC_WriteParameter
FF11	Error during stopping **Axis Master**.	MC_Halt
FF12	The technology function for stopping **Axis Master** was replaced. (CommandAborted)	MC_Halt
FF13	Error during stopping **Axis VM**.	MC_Halt
FF14	The technology function for stopping **Axis VM** was replaced. (CommandAborted)	MC_Halt
FF15	Error during stopping **Axis X**.	MC_Halt

ErrorSource [HEX]	Meaning	Note
FF16	The technology function for stopping **Axis X** was replaced. (CommandAborted)	MC_Halt
FF17	Error during stopping **Axis Y**.	MC_Halt
FF18	The technology function for stopping **Axis Y** was replaced. (CommandAborted)	MC_Halt
FF19	Error during stopping **Axis Z**.	MC_Halt
FF1A	The technology function for stopping **Axis Z** was replaced. (CommandAborted)	MC_Halt