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# Automation of Form, Fill and Seal machines with SIMATIC S7-1500T

LFSS for SIMATIC

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# Table of contents

<b>Legal information</b> .....	<b>2</b>
<b>1 Introduction</b> .....	<b>5</b>
1.1 Overview .....	5
1.2 Mode of operation .....	5
1.3 Components used .....	6
<b>2 Engineering</b> .....	<b>7</b>
2.1 Description of interface .....	7
2.1.1 FB LFFS_MachineMasterGear (FB 31509) .....	9
2.1.2 FB LFFS_MachineMasterPos (FB 31519) .....	14
2.1.3 FB LFFS_NPNBMasterCam (FB 31510) .....	15
2.1.4 FB LFFS_TappetChainGear (FB 31515) .....	23
2.1.5 FB LFFS_FoilFeedGear (FB 31506) .....	28
2.1.6 FB LFFS_FoilFeedCam (FB 31521) .....	32
2.1.7 FB LFFS_PrintmarkHoming (FB 31512) .....	38
2.1.8 FB LFFS_FoilGuide (FB 31507) .....	42
2.1.9 FB LFFS_AnalogDancerControl (FB 31500) .....	46
2.1.10 FB LFFS_BoxMotCrossSealerCam (FB 31501) .....	48
2.1.11 FB LFFS_CylCrossSealerCam (FB 31505) .....	58
2.1.12 FB LFFS_ProductInSealDetection (FB 31522) .....	68
2.1.13 FB LFFS_RotationToTranslation (FB 31513) .....	71
2.1.14 FB LFFS_TranslationToRotation (FB 31516) .....	73
2.1.15 FB LFFS_VFFSMachineMasterPos (FB 31517) .....	75
2.1.16 PLC data types .....	85
LFFS_typeMachineMasterGearParameters .....	85
LFFS_typeMachineMasterGearDynamics .....	86
LFFS_typeMachineMasterPosParameters .....	87
LFFS_typeMachineMasterPosDynamics .....	88
LFFS_typeDiagnostics .....	89
LFFS_typeNPNBMasterCamParameters .....	89
LFFS_typeNPNBMasterCamDynamics .....	90
LFFS_typeDynamics .....	91
LFFS_typeTappetChainGearParameters .....	91
LFFS_typeTappetChainGearDynamics .....	92
LFFS_typeFoilFeedGearParameters .....	93
LFFS_typeFoilFeedCamParameters .....	94
LFFS_typeFoilFeedDynamics .....	94
LFFS_typeFoilGuideParameters .....	95
LFFS_typeAnalogDancerControlParameters .....	95
LFFS_typeBoxMotCrossSealerCamParameters .....	96
LFFS_typeCrossSealerCamDynamics .....	97
LFFS_typeCylCrossSealerCamParameters .....	98
LFFS_typeProductInSealDetectionValue .....	99
LFFS_typeProductInSealDetectionParameters .....	100
LFFS_typeVFFSMachineMasterPosDynamics .....	100
LFFS_typeVFFSMachineMasterPosParameters .....	101
2.2 Project integration .....	106
2.2.1 Integrating the library blocks into STEP 7 .....	106
<b>3 Application Examples</b> .....	<b>108</b>
3.1 Continuous HFFS machine (flow wrapper) .....	108
3.2 Continuous and intermittent VFFS machine .....	112
<b>4 Appendix</b> .....	<b>117</b>
4.1 Service and support .....	117

## Table of contents

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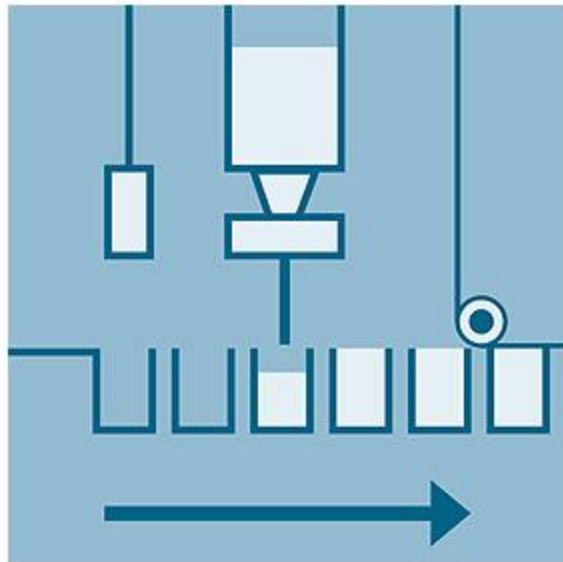
4.2	Application support.....	118
4.3	Links and literature .....	118
4.4	Change documentation .....	118

# 1 Introduction

## 1.1 Overview

The SIMATIC S7-1500T LFFS library, together with prepared call examples helps in creating an own motion control application for form, fill and seal machines.

Figure 1-1



The SIMATIC LFFS library provides PLCopen-compliant function blocks for common use cases in form, fill and seal machines.

## 1.2 Mode of operation

Functionalities for the following technological tasks of horizontal and vertical form, fill and seal machines are included in the library and the call examples:

- Machine master incl. "No Product No Bag"
- Product supply and dosing control
- Foil transport incl. auxiliary functions like print mark correction, dancer control, ...
- Sealing (rotary, box motion) incl. "suspend/pause" functionality for "No Gap No Seal"
- Auxiliary functions like "product in seal detection", "parameter change on-the-fly" (only HFFS), ...

## 1.3 Components used

This application example has been created with the following hardware and software components:

Table 1-1

Component	Number	Article number	Note
CPU 1515T-2 PN	1	6ES7515-2TM01-0AB0	Other S7-1500T CPU with FW V2.5
STEP 7 Professional V15	2	6ES7822-1..05-..	

This application example consists of the following components:

Table 1-2

Component	File name	Note
LFFS library	LFFS_V1_0_0.zip	
LFFS example	LFFS_Example_ContinuousHFFS_V1_0_0.zip	prepared for SINAMICS S210 training case with SIMATIC S7-1515TF
LFFS example	LFFS_Example_ContinuousAndIntermittentVFFS_V1_0_0.zip	prepared for SINAMICS S210 training case with SIMATIC S7-1515TF
LFFS manual	LFFS_SIMATIC_V1_0_en.pdf	

## 2 Engineering

### 2.1 Description of interface

The interfaces and the controlling of the LFFS library are based on the PLCopen standard with considering the behavior of *execute* and *enable* inputs.

The function blocks are implemented in Structured Control Language (SCL). They are programmed for use in a cyclic task.

#### NOTE

Some of the LFFS blocks internally use blocks of other libraries -> see description of each block.

To save memory resources of the PLC, it is recommended to only integrate the required blocks of the other libraries.

#### List of blocks

The following table lists all blocks of the LFFS library.

Table 2-1: List of blocks

Block	Symbol	Note
FB 31509	LFFS_MachineMasterGear	
FB 31519	LFFS_MachineMasterPos	
FB 31510	LFFS_NPNBMasterCam	
FB 31515	LFFS_TappetChainGear	
FB 31506	LFFS_FoilFeedGear	
FB 31521	LFFS_FoilFeedCam	
FB 31512	LFFS_PrintmarkHoming	
FB 31507	LFFS_FoilGuide	
FB 31500	LFFS_AnalogDancerControl	
FB 31501	LFFS_BoxMotCrossSealerCam	
FB 31505	LFFS_CylCrossSealerCam	
FB 31522	LFFS_ProductInSealDetection	
FB 31513	LFFS_RotationToTranslation	
FB 31516	LFFS_TranslationToRotation	
FB 31517	LFFS_VFFSMachineMasterPos	

## Size of the individual blocks

Table 2-2: Size of the blocks<sup>1</sup>

Block	Symbol	Size in code work-memory [Kbytes]	Size in data work-memory [Kbytes]	Size in load memory [Kbytes]
FB 31509	LFFS_MachineMasterGear	12		159
FB 31519	LFFS_MachineMasterPos	6		101
FB 31510	LFFS_NPNBMasterCam	11		159
FB 31515	LFFS_TappetChainGear	7		122
FB 31506	LFFS_FoilFeedGear	5		92
FB 31521	LFFS_FoilFeedCam	8		125
FB 31512	LFFS_PrintmarkHoming	2		48
FB 31507	LFFS_FoilGuide	1		37
FB 31500	LFFS_AnalogDancerControl	1		29
FB 31501	LFFS_BoxMotCrossSealerCam	11		162
FB 31505	LFFS_CylCrossSealerCam	12		164
FB 31522	LFFS_ProductInSealDetection	2		49
FB 31513	LFFS_RotationToTranslation	1		20
FB 31516	LFFS_TranslationToRotation	1		24
FB 31517	LFFS_VFFSMachineMasterPos	22		375

Table 2-3: Size of the individual block instances

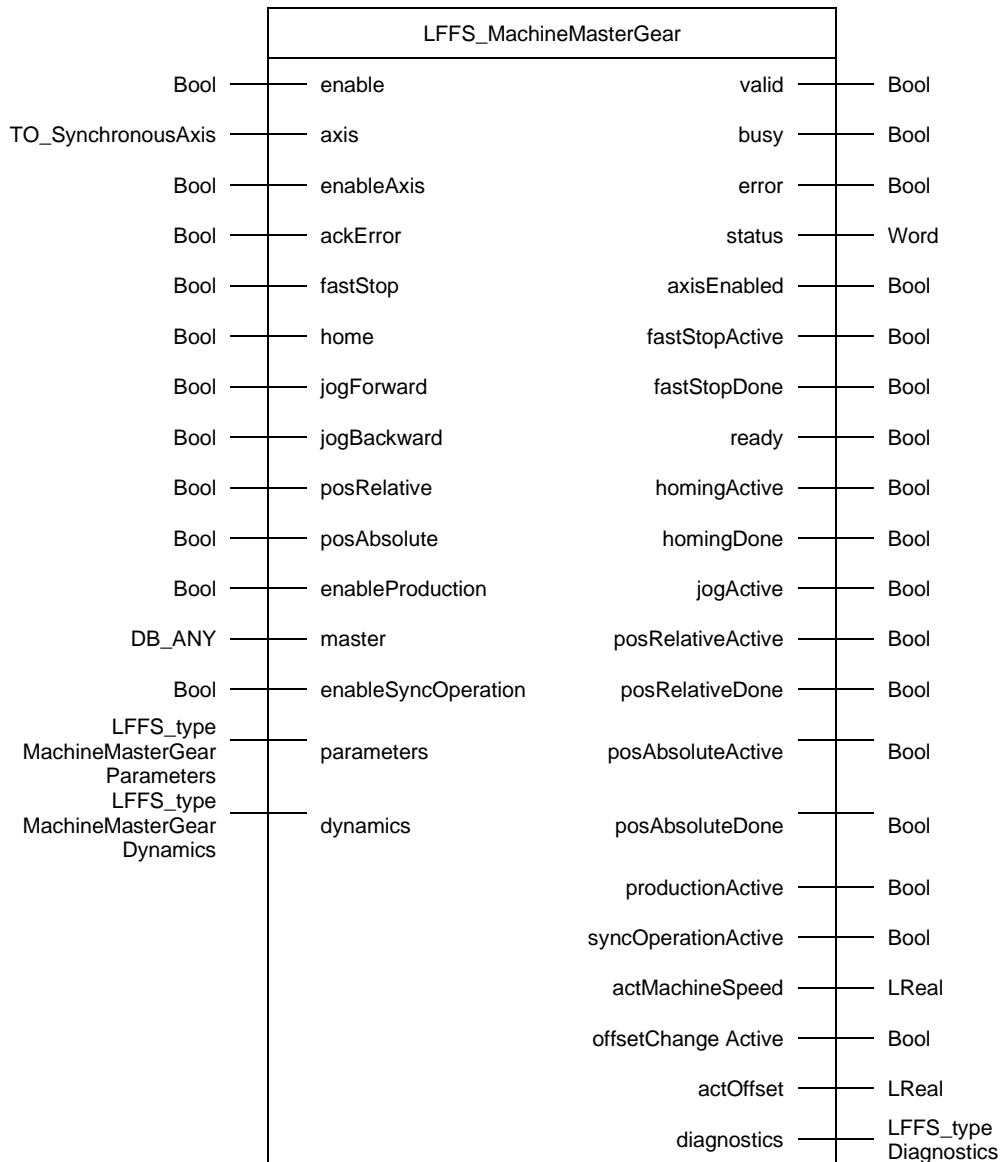
Symbol	Size in data work memory [Kbytes]	Size in load memory [Kbytes]
InstLFFS_MachineMasterGear	1	9
InstLFFS_MachineMasterPos	1	7
InstLFFS_NPNBMasterCam	8	21
InstLFFS_TappetChainGear	1	8
InstLFFS_FoilFeedGear	1	7
InstLFFS_FoilFeedCam	7	19
InstLFFS_PrintmarkHoming	1	4
InstLFFS_FoilGuide	1	3
InstLFFS_AnalogDancerControl	1	4
InstLFFS_BoxMotCrossSealerCam	8	23
InstLFFS_CylCrossSealerCam	8	22
InstLFFS_ProductInSealDetection	2	6
InstLFFS_RotationToTranslation	1	2
InstLFFS_TranslationToRotation	1	2
InstLFFS_VFFSMachineMasterPos	3	16

<sup>1</sup> Instance data blocks (prefix InstLFFS\_) are not delivered with the library. They will be generated automatically with the call of a function block.



### 2.1.1 FB LFFS\_MachineMasterGear (FB 31509)

Figure



#### Principle of operation

The LFFS\_MachineMasterGear block controls the (virtual) machine master axis of a continuous FFS machine. Typically, this axis is with modulo function (e.g. 0..360°) and the modulo length represents one bag length.

#### Supported functionalities

- Enable / disable axis
- Reset errors and acknowledge technology alarms of the axis
- Fast stop
- Manual homing
- Jog forward / backward

- Relative positioning
- Absolute positioning
- Two modes of operation for production
- *enableProduction* (stand-alone) -> MC\_MoveVelocity is triggered internally
- *enableSyncOperation* (synchronous to upstream machine) -> MC\_GearIn is triggered internally

Only one functionality that results in an active axis movement can be active at the same time. Input *fastStop* has the highest priority. No other axis movement can be started via the block while input *fastStop* is set.

### Input parameters

Table 2-4 LFFS\_MachineMasterGear input parameters

Parameter	Data type	Comment
enable	Bool	TRUE: enable functionality of FB (default: FALSE)
axis	TO_SynchronousAxis	Reference to the axis to be controlled (typically rotary axis type with modulo; start = 0°; length = 360°)
enableAxis	Bool	TRUE: set axis enable; FALSE: remove axis enable (default: FALSE)
ackError	Bool	Rising edge: acknowledge errors of FB and alarms of axis (technology object) (default: FALSE)
fastStop	Bool	TRUE: enable fast stop, axis will be stopped (with fastStop dynamics) (default: FALSE)
home	Bool	Rising edge: home axis according to the selected 'parameters.home.mode' (default: FALSE)
jogForward	Bool	Rising edge: move axis in jog mode (forward); falling edge: stop axis (default: FALSE)
jogBackward	Bool	Rising edge: move axis in jog mode (backward); falling edge: stop axis (default: FALSE)
posRelative	Bool	Rising edge: move axis relative to its position (default: FALSE)
posAbsolute	Bool	Rising edge: move axis to an absolute position (default: FALSE)
enableProduction	Bool	TRUE: start production (move axis continuously); FALSE: stop production (stop axis at defined position -> 'parameters.production.stopPositionFactor') (default: FALSE)
master	DB_ANY	Optional: reference to the leading axis (positioning axis, synchronous axis or external encoder) for synchronous operation (typically rotary axis type with modulo; start = 0°; length = 360°) (default: 0)

Parameter	Data type	Comment
enableSyncOperation	Bool	Optional: TRUE: enable synchronous operation (move axis to corresponding synchronous position, activate synchronous operation in standstill); FALSE: disable synchronous operation (default: FALSE)
parameters	LFFS_type MachineMasterGear Parameters	Parameters (e.g. home position, ...)
dynamics	LFFS_type MachineMasterGear Dynamics	Dynamics (e.g. jog velocity, ...)

### Output parameters

Table 2-5 LFFS\_MachineMasterGear output parameters

Parameter	Data type	Comment
valid	Bool	TRUE: valid set of output values available at the FB (default: FALSE)
busy	Bool	TRUE: FB is not finished and new output values can be expected (default: FALSE)
error	Bool	TRUE: an error occurred during the execution of the FB (default: FALSE)
status	Word	16#0000 - 16#7FFF: status of the FB, 16#8000 - 16#FFFF: error identification (default: 16#7000, STATUS_NO_CALL)
axisEnabled	Bool	TRUE: axis enabled (default: FALSE)
fastStopActive	Bool	TRUE: fast stop is active (default: FALSE)
fastStopDone	Bool	TRUE: fast stop is done (default: FALSE)
ready	Bool	TRUE: FB is ready for start of a new functionality (active homing, jog, pos, ...) (default: FALSE)
homingActive	Bool	TRUE: homing is active (default: FALSE)
homingDone	Bool	TRUE: homing is done (default: FALSE)
jogActive	Bool	TRUE: jogging is active (default: FALSE)
posRelativeActive	Bool	TRUE: relative positioning is active (default: FALSE)
posRelativeDone	Bool	TRUE: relative positioning is done (default: FALSE)
posAbsoluteActive	Bool	TRUE: absolute positioning is active (default: FALSE)

Parameter	Data type	Comment
posAbsoluteDone	Bool	TRUE: absolute positioning is done (default: FALSE)
productionActive	Bool	TRUE: machine is producing (axis is moving) (default: FALSE)
syncOperationActive	Bool	TRUE: synchronous operation is active (default: FALSE)
actMachineSpeed	LReal	Actual machine speed (machine cycles per minute) [ppm] (valid if 'productionActive' = TRUE or 'syncOperationActive' = TRUE) (default: 0.0)
offsetChangeActive	Bool	TRUE: phase shifting (offset adjustment) is active (default: FALSE)
actOffset	LReal	Actual (active) absolute phase shift for offset adjustment (valid if 'syncOperationActive' = TRUE and 'offsetChangeActive' = FALSE) (default: 0.0)
diagnostics	LFFS_typeDiagnostics	Diagnostics information of FB

### Status and error displays

Table 2-6 LFFS\_MachineMasterGear status and error displays

Status	Meaning	Comment
16#7000	STATUS_NO_CALL	No call of FB
16#7001	STATUS_FIRST_CALL	First call of FB after enabling
16#7002	STATUS_SUBSEQUENT_CALL	Subsequent call of FB
16#7003	WARN_AXIS_NOT_ENABLED	Axis is not enabled, requested functionality requires an enabled axis
16#7004	WARN_AXIS_NOT_HOMED	Axis is not homed, requested functionality requires a homed axis
16#7005	WARN_AXIS_ACTIVE	A motion job is in progress or the axis control panel is activated
16#7006	WARN_AXIS_NOT_STANDSTILL	Axis is not at a standstill, requested functionality requires an axis at a standstill
16#7009	WARN_AXIS_HOMING_ACTIVE	Homing command active at axis
16#700A	WARN_MASTER_NOT_ENABLED	Master is not enabled, requested functionality requires an enabled master
16#700B	WARN_MASTER_NOT_HOMED	Master is not homed, requested functionality requires a homed master
16#700D	WARN_MASTER_NOT_STANDSTILL	Master is not at a standstill, requested functionality requires a master at a standstill
16#700E	WARN_MASTER_HOMING_ACTIVE	Homing command active at master
16#7012	WARN_MACHINE_SPEED_IGNORED	New machine speed setpoint is ignored while production is active
16#7016	WARN_AXIS_VELOCITY_LIMITED	Axis configuration: Maximum velocity (<TO>.DynamicLimits.MaxVelocity, <TO>.DynamicLimits.Velocity) limits the calculated setpoint velocity

Status	Meaning	Comment
16#8201	ERR_MACHINE_SPEED_INVALID	Input parameter 'parameters.production.machineSpeed' must be > 0.0
16#8208	ERR_STOP_POSITION_INVALID	Input parameter 'parameters.production.stopPositionFactor' must be >= 0.0 and <= 1.0
16#8213	ERR_AXIS_MODULO_DISABLED	Axis configuration: Modulo function (<TO>.Modulo.Enable) is not enabled at axis
16#8214	ERR_AXIS_MODULO_STARTVALUE_INVALID	Axis configuration: Modulo start value (<TO>.Modulo.StartValue) not equal to 0.0
16#8215	ERR_MASTER_MODULO_DISABLED	Master configuration: Modulo function (<TO>.Modulo.Enable) is not enabled at master
16#8216	ERR_MASTER_MODULO_STARTVALUE_INVALID	Master configuration: Modulo start value (<TO>.Modulo.StartValue) not equal to 0.0
16#8217	ERR_MASTER_TYPE_INVALID	The data type of the DB addressed by input parameter 'master' must be TO_PositioningAxis, TO_SynchronousAxis or TO_ExternalEncoder
16#8218	ERR_GEAR_FACT_NUM_INVALID	Input parameter 'parameters.syncOperation.additionalGearFactors.numerator' is invalid (e.g. value 0 is not permitted) or rather the resulting gear ratio numerator exceeds the permitted range
16#8219	ERR_GEAR_FACT_DENOM_INVALID	Input parameter 'parameters.syncOperation.additionalGearFactors.denominator' is invalid (e.g. value 0 and negative values are not permitted) or rather the resulting gear ratio denominator exceeds the permitted range
16#8600	ERR_MC_POWER	Internally called function block MC_Power returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8602	ERR_MC_HOME	Internally called function block MC_Home returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8622	ERR_MC_HOME_ABORTED	Internally called function block MC_Home returned CommandAborted
16#8604	ERR_MC_HALT	Internally called function block MC_Halt returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8624	ERR_MC_HALT_ABORTED	Internally called function block MC_Halt returned CommandAborted
16#8605	ERR_MC_MOVEJOG	Internally called function block MC_MoveJog (continuous jogging) returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8625	ERR_MC_MOVEJOG_ABORTED	Internally called function block MC_MoveJog returned CommandAborted
16#8606	ERR_MC_MOVEVELOCITY	Internally called function block MC_MoveVelocity returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8626	ERR_MC_MOVEVELOCITY_ABORTED	Internally called function block MC_MoveVelocity returned CommandAborted
16#8607	ERR_MC_MOVERELATIVE	Internally called function block MC_MoveRelative returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8627	ERR_MC_MOVERELATIVE_ABORTED	Internally called function block MC_MoveRelative returned CommandAborted

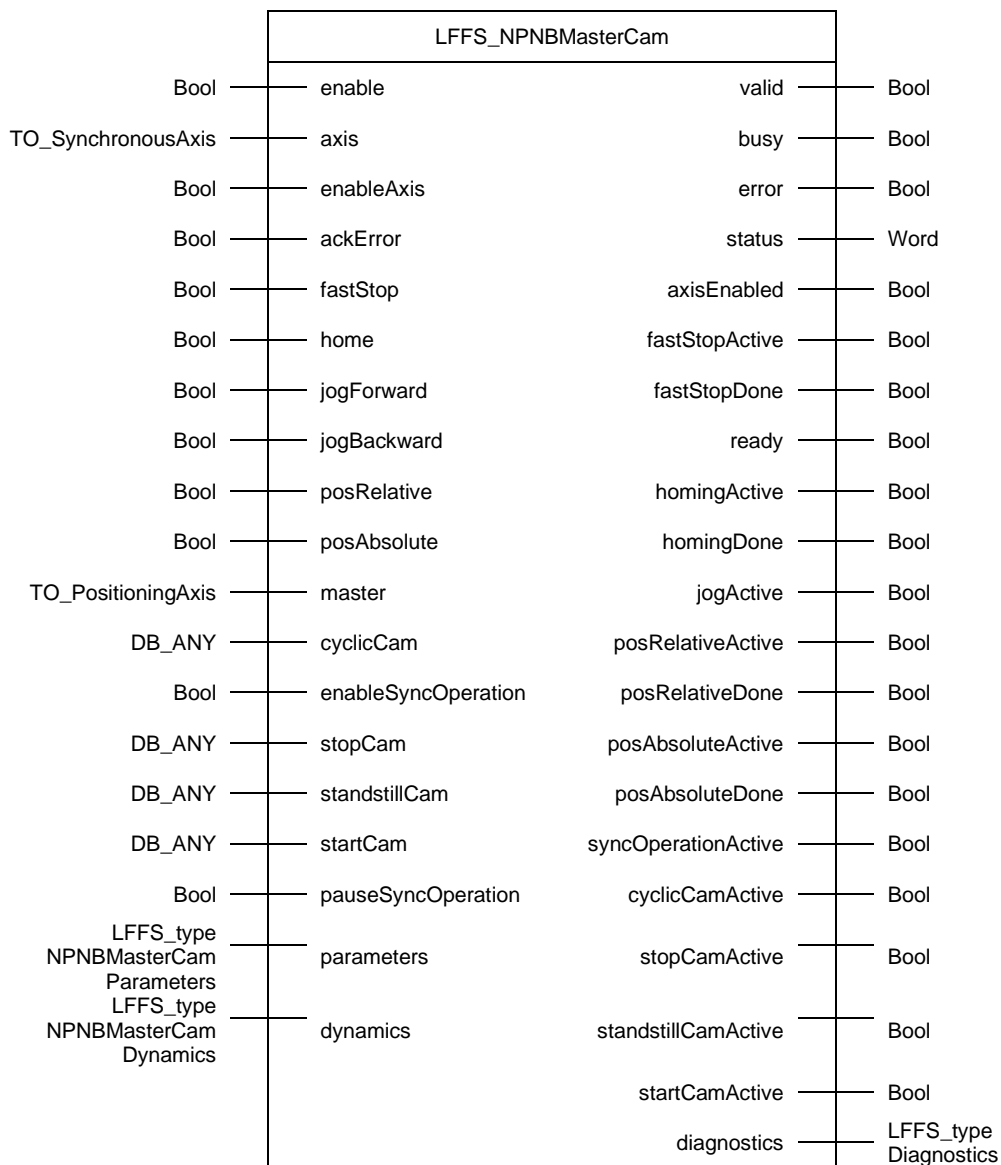
Status	Meaning	Comment
16#8608	ERR_MC_MOVEABSOLUTE	Internally called function block MC_MoveAbsolute returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8628	ERR_MC_MOVEABSOLUTE_ABORTED	Internally called function block MC_MoveAbsolute returned CommandAborted
16#8609	ERR_MC_MOVESUPERIMPOSED	Internally called function block MC_MoveSuperimposed returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8629	ERR_MC_MOVESUPERIMPOSED_ABORTED	Internally called function block MC_MoveSuperimposed returned CommandAborted
16#860A	ERR_MC_GEARIN	Internally called function block MC_GearIn returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#862A	ERR_MC_GEARIN_ABORTED	Internally called function block MC_GearIn returned CommandAborted
16#8700	ERR_UNDEFINED_STATE	Error due to an undefined state in state machine
16#8701	ERR_UNDEFINED_SUB_STATE	Error due to an undefined state in subsidiary state machine

### 2.1.2 FB LFFS\_MachineMasterPos (FB 31519)

The function block LFFS\_MachineMasterPos is a copy of the function block LFFS\_MachineMasterGear without the "enableSyncOperation (synchronous to upstream machine)" functionality. The data type of input axis is TO\_PositioningAxis instead of TO\_SynchronousAxis. Therefore, a positioning axis can be used as machine master. Motion Control resources are saved as a result.

### 2.1.3 FB LFFS\_NPNBMasterCam (FB 31510)

Figure



#### Principle of operation

The LFFS\_NPNBMasterCam block controls the NPNB ("no product no bag") master that operates in synchronous operation (camming) of a continuous FFS machine. The NPNB master is an intermediate virtual axis between the machine master axis and the foil feed axis and cross sealer axis.

#### Supported functionalities

- Enable / disable axis
- Reset errors and acknowledge technology alarms of the axis
- Fast stop
- Manual homing

- Jog forward / backward
- Relative positioning
- Absolute positioning
- Enable synchronous operation (for production)

Only one functionality that results in an active axis movement can be active at the same time. Input *fastStop* has the highest priority. No other axis movement can be started via the block while input *fastStop* is set.

### NOTE

For the creation of cam disks at runtime, the blocks LCamHdl\_CreateCamAdvanced and LCamHdl\_GetCamFollowingMinMax are used internally, i.e. the LCamHdl library \4\ is required.

### Calculated cam disks

The following figures show the at runtime calculated cam disks (modulo length of master and slave is 360.0°). The modulo lengths of the master axis and the slave axis that are used for cam disk calculation are only read once when input *enable* of the LFFS\_NPNBMasterCam block is set. The calculation and creation of the cam disks is started when input *enableSyncOperation* is set.

Figure 2-1 cyclicCam





Figure 2-2 stopCam

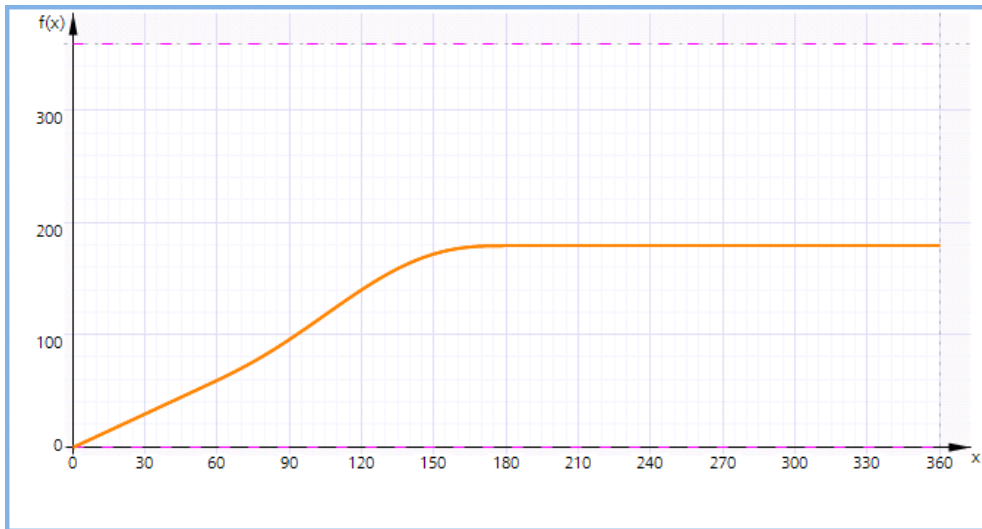
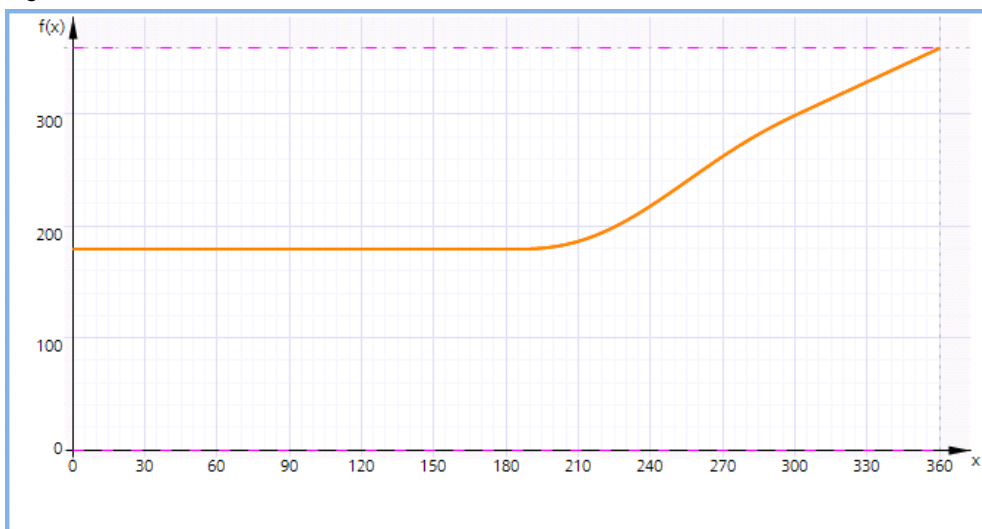


Figure 2-3 standstillCam



Figure 2-4 startCam



**Input parameters**

Table 2-7 LFFS\_NPNBMasterCam input parameters

Parameter	Data type	Comment
enable	Bool	TRUE: enable functionality of FB (default: FALSE)
axis	TO_SynchronousAxis	Reference to the axis to be controlled (typically same axis type and modulo setting as master)
enableAxis	Bool	TRUE: set axis enable; FALSE: remove axis enable (default: FALSE)
ackError	Bool	Rising edge: acknowledge errors of FB and alarms of axis (technology object) (default: FALSE)
fastStop	Bool	TRUE: enable fast stop, axis will be stopped (with fastStop dynamics) (default: FALSE)
home	Bool	Rising edge: home axis according to the selected 'parameters.home.mode' (default: FALSE)
jogForward	Bool	Rising edge: move axis in jog mode (forward); falling edge: stop axis (default: FALSE)
jogBackward	Bool	Rising edge: move axis in jog mode (backward); falling edge: stop axis (default: FALSE)
posRelative	Bool	Rising edge: move axis relative to its position (default: FALSE)
posAbsolute	Bool	Rising edge: move axis to an absolute position (default: FALSE)
master	TO_PositioningAxis	Reference to the leading axis (machine master) for synchronous operation (typically rotary axis type with modulo; start = 0°; length = 360°)
cyclicCam	DB_ANY	Reference to the cyclic cam disk (no configuration necessary, is created at runtime) (default: 0)
enableSyncOperation	Bool	TRUE: enable synchronous operation (calculate/interpolate cams, move axis to corresponding synchronous position in cyclicCam or rather standstillCam if 'pauseSyncOperation' = TRUE, activate synchronous operation in standstill); FALSE: disable synchronous operation (default: FALSE)
stopCam	DB_ANY	Reference to the stop cam disk (no configuration necessary, is created at runtime) (default: 0)
standstillCam	DB_ANY	Reference to the standstill cam disk (no configuration necessary, is created at runtime) (default: 0)
startCam	DB_ANY	Reference to the start cam disk (no configuration necessary, is created at runtime) (default: 0)

Parameter	Data type	Comment
pauseSyncOperation	Bool	TRUE: startCam/cyclicCam -> stopCam -> standstillCam; FALSE: stopCam/standstillCam -> startCam -> cyclicCam Note: parameter <i>pauseSyncOperationCheckPos</i> defines when this input is being evaluated. (default: FALSE)
parameters	LFFS_type NPNBMasterCam Parameters	Parameters (e.g. home position, ...)
dynamics	LFFS_type NPNBMasterCam Dynamics	Dynamics (e.g. jog velocity, ...)

### Output parameters

Table 2-8 LFFS\_NPNBMasterCam output parameters

Parameter	Data type	Comment
valid	Bool	TRUE: valid set of output values available at the FB (default: FALSE)
busy	Bool	TRUE: FB is not finished and new output values can be expected (default: FALSE)
error	Bool	TRUE: an error occurred during the execution of the FB (default: FALSE)
status	Word	16#0000 - 16#7FFF: status of the FB, 16#8000 - 16#FFFF: error identification (default: 16#7000, STATUS_NO_CALL)
axisEnabled	Bool	TRUE: axis enabled (default: FALSE)
fastStopActive	Bool	TRUE: fast stop is active (default: FALSE)
fastStopDone	Bool	TRUE: fast stop is done (default: FALSE)
ready	Bool	TRUE: FB is ready for start of a new functionality (active homing, jog, pos, ...) (default: FALSE)
homingActive	Bool	TRUE: homing is active (default: FALSE)
homingDone	Bool	TRUE: homing is done (default: FALSE)
jogActive	Bool	TRUE: jogging is active (default: FALSE)
posRelativeActive	Bool	TRUE: relative positioning is active (default: FALSE)
posRelativeDone	Bool	TRUE: relative positioning is done (default: FALSE)
posAbsoluteActive	Bool	TRUE: absolute positioning is active (default: FALSE)

Parameter	Data type	Comment
posAbsoluteDone	Bool	TRUE: absolute positioning is done (default: FALSE)
syncOperationActive	Bool	TRUE: synchronous operation is active (default: FALSE)
cyclicCamActive	Bool	TRUE: cyclic cam disk is currently being used for camming (default: FALSE)
stopCamActive	Bool	TRUE: stop cam disk is currently being used for camming (default: FALSE)
standstillCamActive	Bool	TRUE: standstill cam disk is currently being used for camming (default: FALSE)
startCamActive	Bool	TRUE: start cam disk is currently being used for camming (default: FALSE)
diagnostics	LFFS_typeDiagnostics	Diagnostics information of FB

### Status and error displays

Table 2-9 LFFS\_NPNBMasterCam status and error displays

Status	Meaning	Comment
16#7000	STATUS_NO_CALL	No call of FB
16#7001	STATUS_FIRST_CALL	First call of FB after enabling
16#7002	STATUS_SUBSEQUENT_CALL	Subsequent call of FB
16#7003	WARN_AXIS_NOT_ENABLED	Axis is not enabled, requested functionality requires an enabled axis
16#7004	WARN_AXIS_NOT_HOMED	Axis is not homed, requested functionality requires a homed axis
16#700A	WARN_MASTER_NOT_ENABLED	Master is not enabled, requested functionality requires an enabled master
16#700B	WARN_MASTER_NOT_HOMED	Master is not homed, requested functionality requires a homed master
16#700D	WARN_MASTER_NOT_STANDSTILL	Master is not at a standstill, requested functionality requires a master at a standstill
16#700E	WARN_MASTER_HOMING_ACTIVE	Homing command active at master
16#820F	ERR_START_CAM_TYPE_INVALID	The data type of the DB addressed by input parameter 'startCam' must be TO_Cam
16#8210	ERR_CYCLIC_CAM_TYPE_INVALID	The data type of the DB addressed by input parameter 'cyclicCam' must be TO_Cam
16#8211	ERR_STOP_CAM_TYPE_INVALID	The data type of the DB addressed by input parameter 'stopCam' must be TO_Cam
16#8212	ERR_STANDSTILL_CAM_TYPE_INVALID	The data type of the DB addressed by input parameter 'standstillCam' must be TO_Cam
16#8213	ERR_AXIS_MODULO_DISABLED	Axis configuration: Modulo function (<TO>.Modulo.Enable) is not enabled at axis
16#8214	ERR_AXIS_MODULO_STARTVALUE_INVALID	Axis configuration: Modulo start value (<TO>.Modulo.StartValue) not equal to 0.0

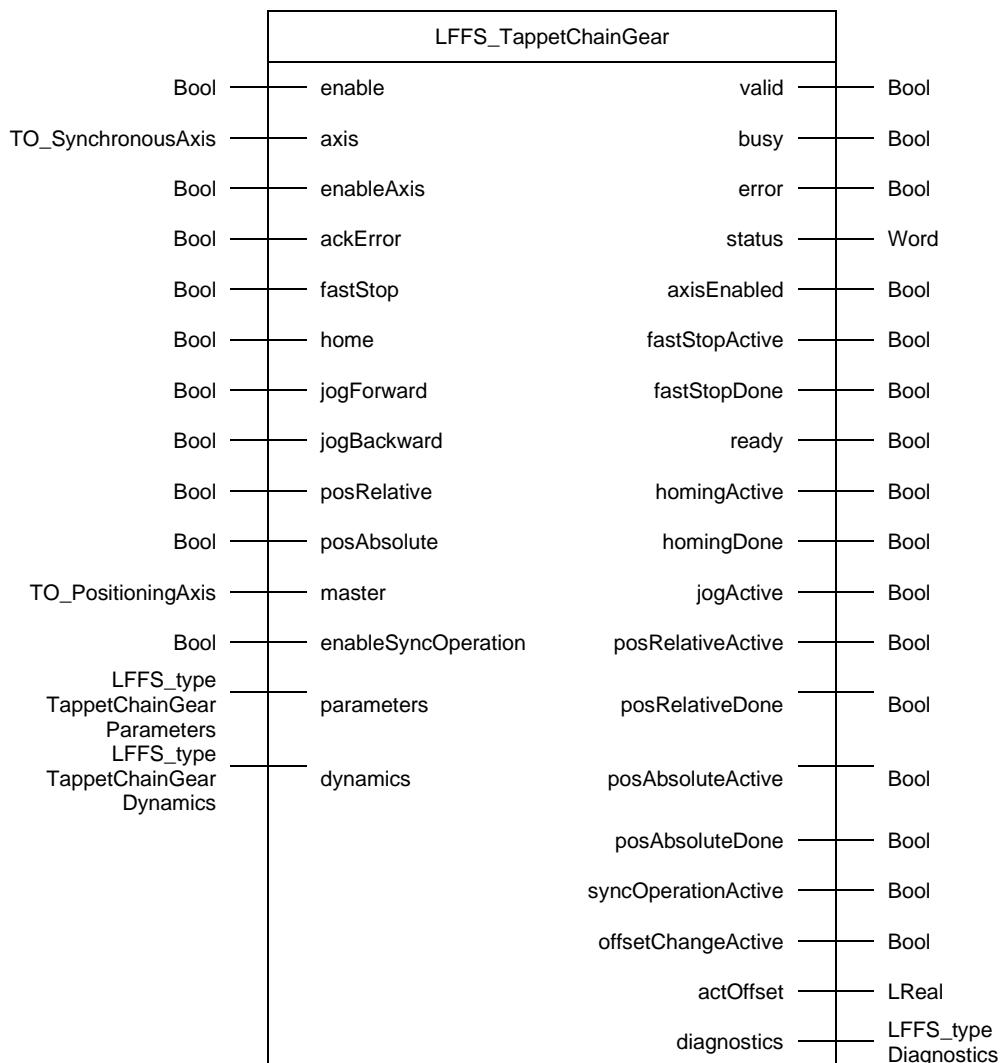
Status	Meaning	Comment
16#8215	ERR_MASTER_MODULO_DISABLED	Master configuration: Modulo function (<TO>.Modulo.Enable) is not enabled at master
16#8216	ERR_MASTER_MODULO_STARTVALUE_INVALID	Master configuration: Modulo start value (<TO>.Modulo.StartValue) not equal to 0.0
16#8600	ERR_MC_POWER	Internally called function block MC_Power returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8602	ERR_MC_HOME	Internally called function block MC_Home returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8622	ERR_MC_HOME_ABORTED	Internally called function block MC_Home returned CommandAborted
16#8604	ERR_MC_HALT	Internally called function block MC_Halt returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8624	ERR_MC_HALT_ABORTED	Internally called function block MC_Halt returned CommandAborted
16#8605	ERR_MC_MOVEJOG	Internally called function block MC_MoveJog (continuous jogging) returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8625	ERR_MC_MOVEJOG_ABORTED	Internally called function block MC_MoveJog returned CommandAborted
16#8607	ERR_MC_MOVERELATIVE	Internally called function block MC_MoveRelative returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8627	ERR_MC_MOVERELATIVE_ABORTED	Internally called function block MC_MoveRelative returned CommandAborted
16#8608	ERR_MC_MOVEABSOLUTE	Internally called function block MC_MoveAbsolute returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8628	ERR_MC_MOVEABSOLUTE_ABORTED	Internally called function block MC_MoveAbsolute returned CommandAborted
16#860A	ERR_MC_GEARIN	Internally called function block MC_GearIn returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#860D	ERR_MC_CAMIN	Internally called function block MC_CamIn returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#862D	ERR_MC_CAMIN_ABORTED	Internally called function block MC_CamIn returned CommandAborted
16#8612	ERR_MC_GETCAMFOLLOWINGVALUE	Internally called function block MC_GetCamFollowingValue returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8640	ERR_CREATECAMS	Internally called function block LFFS_UnpubCreateCamsNPNBMasterCam returned an error (errorID -> diagnostics.subfunctionStatus)
16#8700	ERR_UNDEFINED_STATE	Error due to an undefined state in state machine
16#8701	ERR_UNDEFINED_SUB_STATE	Error due to an undefined state in subsidiary state machine

Table 2-10 LFFS\_UnpubCreateCamsNPNBMasterCam error displays

Status	Meaning	Comment
16#8203	ERR_MODULO_LENGTH_INVALID	Input parameters 'moduloLength' and 'moduloLengthMaster' must be > 0.0
16#8601	ERR_CREATE_START_CAM	Internally called function block LCamHdl_CreateCamAdvanced returned an error (errorID -> diagnostics.subfunctionStatus) when creating the start cam disk
16#8602	ERR_CREATE_CYCLIC_CAM	Internally called function block LCamHdl_CreateCamAdvanced returned an error (errorID -> diagnostics.subfunctionStatus) when creating the cyclic cam disk
16#8603	ERR_CREATE_STOP_CAM	Internally called function block LCamHdl_CreateCamAdvanced returned an error (errorID -> diagnostics.subfunctionStatus) when creating the stop cam disk
16#8604	ERR_CREATE_STANDSTILL_CAM	Internally called function block LCamHdl_CreateCamAdvanced returned an error (errorID -> diagnostics.subfunctionStatus) when creating the standstill cam disk
16#8605	ERR_GET_MIN_MAX_START_CAM	Internally called function block LCamHdl_GetCamFollowingMinMax returned an error (errorID -> diagnostics.subfunctionStatus) when determining the minima and maxima of the start cam disk
16#8607	ERR_GET_MIN_MAX_STOP_CAM	Internally called function block LCamHdl_GetCamFollowingMinMax returned an error (errorID -> diagnostics.subfunctionStatus) when determining the minima and maxima of the stop cam disk
16#8608	ERR_REVERSE_MOTION	The calculated cam disk results in a reverse motion of the slave axis -> Input parameters have to be checked and adapted
16#8700	ERR_UNDEFINED_STATE	Error due to an undefined state in state machine

## 2.1.4 FB LFFS\_TappetChainGear (FB 31515)

Figure



### Principle of operation

The LFFS\_TappetChainGear block controls the tappet chain axis that operates in synchronous operation (gearing with MC\_GearIn) of a horizontal FFS machine. Typically, this axis is a linear axis with modulo function and the modulo length represents the pocket length. Therefore, the parameter pocket length is compared with the modulo length of the axis at block enable. The modulo length of the axis is adjusted in case of inequality.

### Supported functionalities

- Enable / disable axis
- Reset errors and acknowledge technology alarms of the axis
- Fast stop
- Manual homing
- Jog forward / backward

- Relative positioning
- Absolute positioning
- Enable synchronous operation (for production)

Only one functionality that results in an active axis movement can be active at the same time. Input *fastStop* has the highest priority. No other axis movement can be started via the block while input *fastStop* is set.

### Input parameters

Table 2-11 LFFS\_TappetChainGear input parameters

Parameter	Data type	Comment
enable	Bool	TRUE: enable functionality of FB (default: FALSE)
axis	TO_SynchronousAxis	Reference to the axis to be controlled (typically linear axis type with modulo; start = 0mm; length = pocket length)
enableAxis	Bool	TRUE: set axis enable; FALSE: remove axis enable (default: FALSE)
ackError	Bool	Rising edge: acknowledge errors of FB and alarms of axis (technology object) (default: FALSE)
fastStop	Bool	TRUE: enable fast stop, axis will be stopped (with fastStop dynamics) (default: FALSE)
home	Bool	Rising edge: home axis according to the selected 'parameters.home.mode' (default: FALSE)
jogForward	Bool	Rising edge: move axis in jog mode (forward); falling edge: stop axis (default: FALSE)
jogBackward	Bool	Rising edge: move axis in jog mode (backward); falling edge: stop axis (default: FALSE)
posRelative	Bool	Rising edge: move axis relative to its position (default: FALSE)
posAbsolute	Bool	Rising edge: move axis to an absolute position (default: FALSE)
master	TO_PositioningAxis	Reference to the leading axis for synchronous operation (typically rotary axis type with modulo; start = 0°; length = 360°)
enableSyncOperation	Bool	TRUE: enable synchronous operation (move axis to corresponding synchronous position, activate synchronous operation in standstill); FALSE: disable synchronous operation (default: FALSE)
parameters	LFFS_type TappetChainGear Parameters	Parameters (e.g. home position, ...)
dynamics	LFFS_type TappetChainGear Dynamics	Dynamics (e.g. jog velocity, ...)



**Output parameters**

Table 2-12 LFFS\_TappetChainGear output parameters

Parameter	Data type	Comment
valid	Bool	TRUE: valid set of output values available at the FB (default: FALSE)
busy	Bool	TRUE: FB is not finished and new output values can be expected (default: FALSE)
error	Bool	TRUE: an error occurred during the execution of the FB (default: FALSE)
status	Word	16#0000 - 16#7FFF: status of the FB, 16#8000 - 16#FFFF: error identification (default: 16#7000, STATUS_NO_CALL)
axisEnabled	Bool	TRUE: axis enabled (default: FALSE)
fastStopActive	Bool	TRUE: fast stop is active (default: FALSE)
fastStopDone	Bool	TRUE: fast stop is done (default: FALSE)
ready	Bool	TRUE: FB is ready for start of a new functionality (active homing, jog, pos, ...) (default: FALSE)
homingActive	Bool	TRUE: homing is active (default: FALSE)
homingDone	Bool	TRUE: homing is done (default: FALSE)
jogActive	Bool	TRUE: jogging is active (default: FALSE)
posRelativeActive	Bool	TRUE: relative positioning is active (default: FALSE)
posRelativeDone	Bool	TRUE: relative positioning is done (default: FALSE)
posAbsoluteActive	Bool	TRUE: absolute positioning is active (default: FALSE)
posAbsoluteDone	Bool	TRUE: absolute positioning is done (default: FALSE)
syncOperationActive	Bool	TRUE: synchronous operation is active (default: FALSE)
offsetChangeActive	Bool	TRUE: phase shifting (offset adjustment) is active (default: FALSE)
actOffset	LReal	Actual (active) absolute phase shift for offset adjustment (valid if 'syncOperationActive' = TRUE and 'offsetChangeActive' = FALSE) (default: 0.0)
diagnostics	LFFS_typeDiagnostics	Diagnostics information of FB

**Status and error displays**

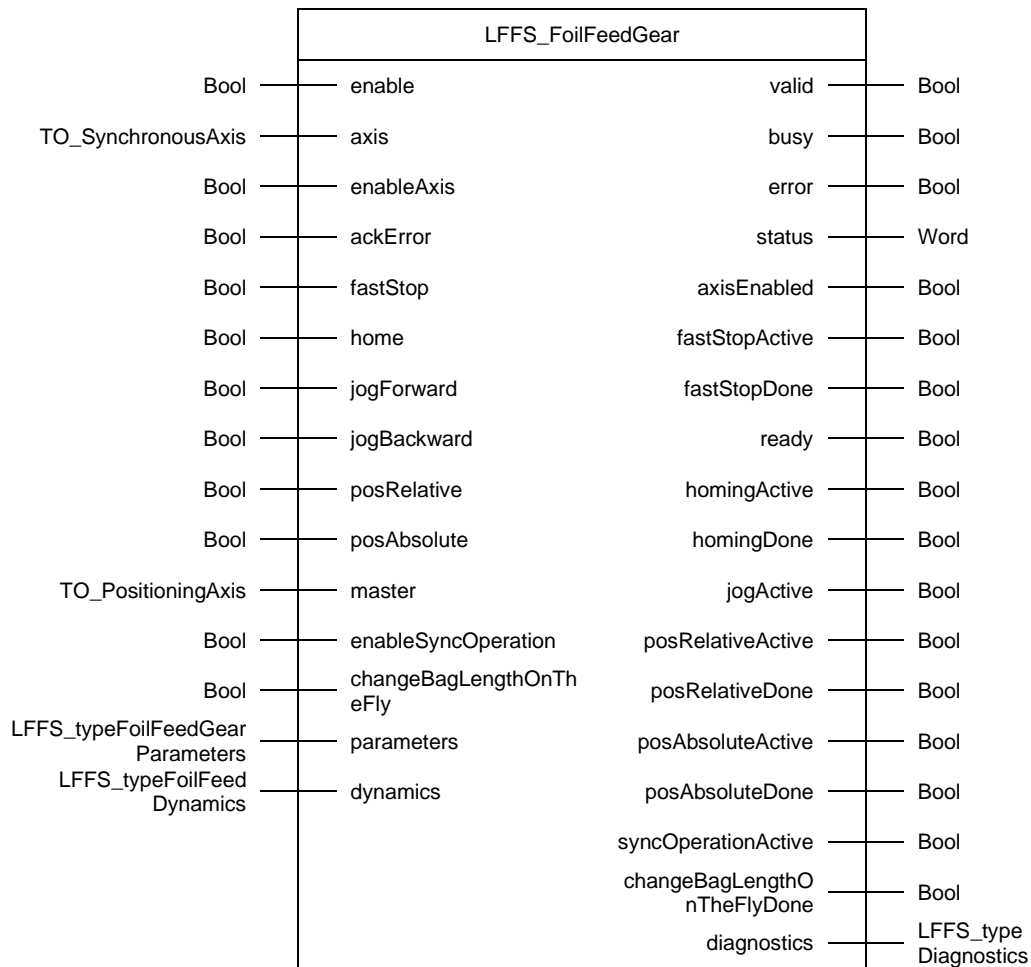
Table 2-13 LFFS\_TappetChainGear status and error displays

Status	Meaning	Comment
16#7000	STATUS_NO_CALL	No call of FB
16#7001	STATUS_FIRST_CALL	First call of FB after enabling
16#7002	STATUS_SUBSEQUENT_CALL	Subsequent call of FB
16#7003	WARN_AXIS_NOT_ENABLED	Axis is not enabled, requested functionality requires an enabled axis
16#7004	WARN_AXIS_NOT_HOMED	Axis is not homed, requested functionality requires a homed axis
16#700A	WARN_MASTER_NOT_ENABLED	Master is not enabled, requested functionality requires an enabled master
16#700B	WARN_MASTER_NOT_HOMED	Master is not homed, requested functionality requires a homed master
16#700D	WARN_MASTER_NOT_STANDSTILL	Master is not at a standstill, requested functionality requires a master at a standstill
16#700E	WARN_MASTER_HOMING_ACTIVE	Homing command active at master
16#8202	ERR_POCKET_LENGTH_INVALID	Input parameter 'parameters.pocketLength' must be > 0.0
16#8213	ERR_AXIS_MODULO_DISABLED	Axis configuration: Modulo function (<TO>.Modulo.Enable) is not enabled at axis
16#8214	ERR_AXIS_MODULO_STARTVALUE_INVALID	Axis configuration: Modulo start value (<TO>.Modulo.StartValue) not equal to 0.0
16#8215	ERR_MASTER_MODULO_DISABLED	Master configuration: Modulo function (<TO>.Modulo.Enable) is not enabled at master
16#8216	ERR_MASTER_MODULO_STARTVALUE_INVALID	Master configuration: Modulo start value (<TO>.Modulo.StartValue) not equal to 0.0
16#8600	ERR_MC_POWER	Internally called function block MC_Power returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8601	ERR_MC_RESET	Internally called function block MC_Reset returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8621	ERR_MC_RESET_ABORTED	Internally called function block MC_Reset returned CommandAborted
16#8602	ERR_MC_HOME	Internally called function block MC_Home returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8622	ERR_MC_HOME_ABORTED	Internally called function block MC_Home returned CommandAborted
16#8604	ERR_MC_HALT	Internally called function block MC_Halt returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8624	ERR_MC_HALT_ABORTED	Internally called function block MC_Halt returned CommandAborted
16#8605	ERR_MC_MOVEJOG	Internally called function block MC_MoveJog (continuous jogging) returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8625	ERR_MC_MOVEJOG_ABORTED	Internally called function block MC_MoveJog returned CommandAborted
16#8607	ERR_MC_MOVERELATIVE	Internally called function block MC_MoveRelative returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8627	ERR_MC_MOVERELATIVE_ABORTED	Internally called function block MC_MoveRelative returned CommandAborted

Status	Meaning	Comment
16#8608	ERR_MC_MOVEABSOLUTE	Internally called function block MC_MoveAbsolute returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8628	ERR_MC_MOVEABSOLUTE_ABORTED	Internally called function block MC_MoveAbsolute returned CommandAborted
16#8609	ERR_MC_MOVESUPERIMPOSED	Internally called function block MC_MoveSuperimposed returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8629	ERR_MC_MOVESUPERIMPOSED_ABORTED	Internally called function block MC_MoveSuperimposed returned CommandAborted
16#860A	ERR_MC_GEARIN	Internally called function block MC_GearIn returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#862A	ERR_MC_GEARIN_ABORTED	Internally called function block MC_GearIn returned CommandAborted
16#8613	ERR_WRIT_DBL	Internally called instruction WRIT_DBL returned an error (RET_VAL -> diagnostics.subfunctionStatus)
16#8700	ERR_UNDEFINED_STATE	Error due to an undefined state in state machine
16#8701	ERR_UNDEFINED_SUB_STATE	Error due to an undefined state in subsidiary state machine

## 2.1.5 FB LFFS\_FoilFeedGear (FB 31506)

Figure



### Principle of operation

The LFFS\_FoilFeedGear block controls the foil feed axis that operates in synchronous operation (gearing with MC\_GearIn) of a continuous FFS machine. Input parameter *parameters.syncOperation.bagLength* is used for the gear ratio between master and the foil feed axis (ratio = bag length / modulo length master).

### Supported functionalities

- Enable / disable axis
- Reset errors and acknowledge technology alarms of the axis
- Fast stop
- Manual homing
- Jog forward / backward
- Relative positioning
- Absolute positioning
- Enable synchronous operation (for production)

Only one functionality that results in an active axis movement can be active at the same time. Input *fastStop* has the highest priority. No other axis movement can be started via the block while input *fastStop* is set.

### Input parameters

Table 2-14 LFFS\_FoilFeedGear input parameters

Parameter	Data type	Comment
enable	Bool	TRUE: enable functionality of FB (default: FALSE)
axis	TO_SynchronousAxis	Reference to the axis to be controlled (typically linear axis type without modulo)
enableAxis	Bool	TRUE: set axis enable; FALSE: remove axis enable (default: FALSE)
ackError	Bool	Rising edge: acknowledge errors of FB and alarms of axis (technology object) (default: FALSE)
fastStop	Bool	TRUE: enable fast stop, axis will be stopped (with fastStop dynamics) (default: FALSE)
home	Bool	Rising edge: home axis according to the selected 'parameters.home.mode' (default: FALSE)
jogForward	Bool	Rising edge: move axis in jog mode (forward); falling edge: stop axis (default: FALSE)
jogBackward	Bool	Rising edge: move axis in jog mode (backward); falling edge: stop axis (default: FALSE)
posRelative	Bool	Rising edge: move axis relative to its position (default: FALSE)
posAbsolute	Bool	Rising edge: move axis to an absolute position (default: FALSE)
master	TO_PositioningAxis	Reference to the leading axis for synchronous operation (typically rotary axis type with modulo; start = 0°; length = 360°)
enableSyncOperation	Bool	TRUE: enable synchronous operation (activate synchronous operation in standstill); FALSE: disable synchronous operation (default: FALSE)
changeBagLengthOnTheFly	Bool	TRUE: a new "MC_GearIn" job is triggered internally if synchronous operation is already active and if 'parameters.syncOperation.bagLength' has been changed (default: FALSE)
parameters	LFFS_typeFoilFeedGear Parameters	Parameters (e.g. home position, ...)
dynamics	LFFS_typeFoilFeed Dynamics	Dynamics (e.g. jog velocity, ...)

**Output parameters**

Table 2-15 LFFS\_FoilFeedGear output parameters

Parameter	Data type	Comment
valid	Bool	TRUE: valid set of output values available at the FB (default: FALSE)
busy	Bool	TRUE: FB is not finished and new output values can be expected (default: FALSE)
error	Bool	TRUE: an error occurred during the execution of the FB (default: FALSE)
status	Word	16#0000 - 16#7FFF: status of the FB, 16#8000 - 16#FFFF: error identification (default: 16#7000, STATUS_NO_CALL)
axisEnabled	Bool	TRUE: axis enabled (default: FALSE)
fastStopActive	Bool	TRUE: fast stop is active (default: FALSE)
fastStopDone	Bool	TRUE: fast stop is done (default: FALSE)
ready	Bool	TRUE: FB is ready for start of a new functionality (active homing, jog, pos, ...) (default: FALSE)
homingActive	Bool	TRUE: homing is active (default: FALSE)
homingDone	Bool	TRUE: homing is done (default: FALSE)
jogActive	Bool	TRUE: jogging is active (default: FALSE)
posRelativeActive	Bool	TRUE: relative positioning is active (default: FALSE)
posRelativeDone	Bool	TRUE: relative positioning is done (default: FALSE)
posAbsoluteActive	Bool	TRUE: absolute positioning is active (default: FALSE)
posAbsoluteDone	Bool	TRUE: absolute positioning is done (default: FALSE)
syncOperationActive	Bool	TRUE: synchronous operation is active (default: FALSE)
changeBagLengthOnTheFlyDone	Bool	TRUE: bag length has been changed on-the-fly. Note: signal is only present for one block call (default: FALSE)
diagnostics	LFFS_typeDiagnostics	Diagnostics information of FB

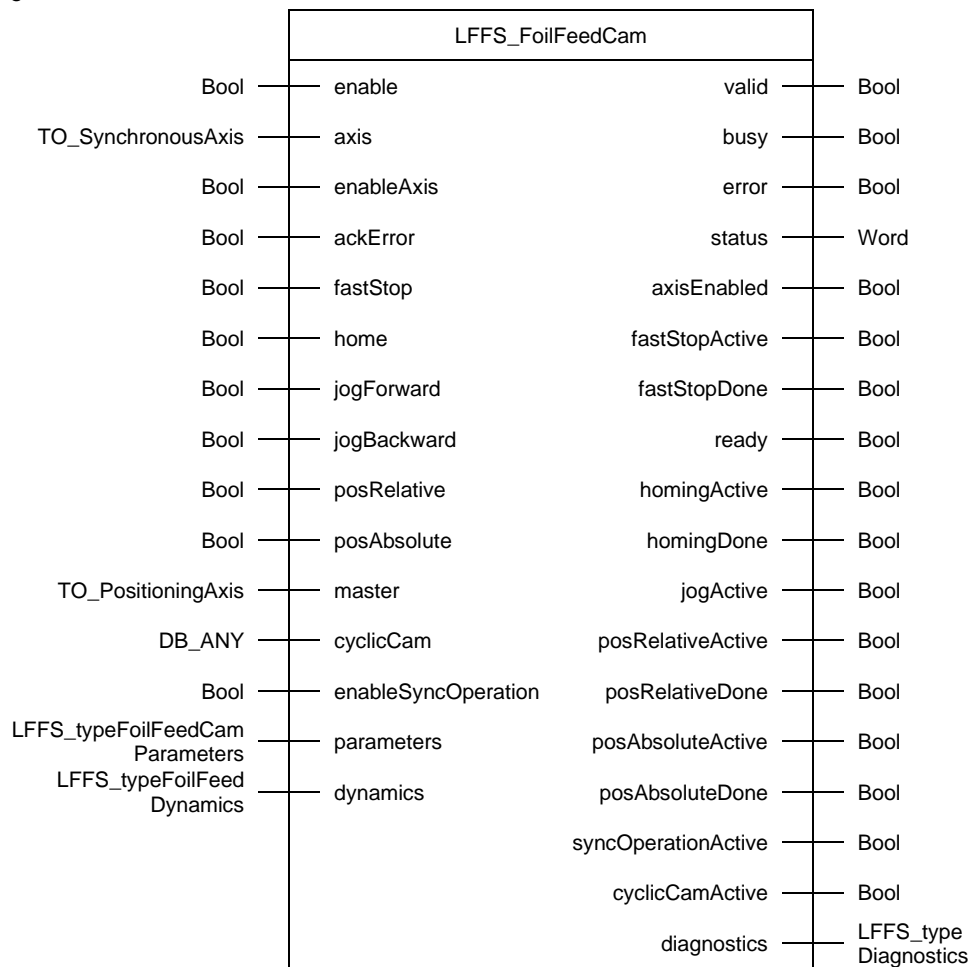
**Status and error displays**

Table 2-16 LFFS\_FoilFeedGear status and error displays

Status	Meaning	Comment
16#7000	STATUS_NO_CALL	No call of FB
16#7001	STATUS_FIRST_CALL	First call of FB after enabling
16#7002	STATUS_SUBSEQUENT_CALL	Subsequent call of FB
16#7003	WARN_AXIS_NOT_ENABLED	Axis is not enabled, requested functionality requires an enabled axis
16#700A	WARN_MASTER_NOT_ENABLED	Master is not enabled, requested functionality requires an enabled master
16#700D	WARN_MASTER_NOT_STANDSTILL	Master is not at a standstill, requested functionality requires a master at a standstill
16#700E	WARN_MASTER_HOMING_ACTIVE	Homing command active at master
16#8214	ERR_BAG_LENGTH_INVALID	Input parameter 'parameters.syncOperation.bagLength' must be <> 0.0
16#8215	ERR_MASTER_MODULO_DISABLED	Master configuration: Modulo function (<TO>.Modulo.Enable) is not enabled at master
16#8216	ERR_MASTER_MODULO_STARTVALUE_INVALID	Master configuration: Modulo start value (<TO>.Modulo.StartValue) not equal to 0.0
16#8600	ERR_MC_POWER	Internally called function block MC_Power returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8602	ERR_MC_HOME	Internally called function block MC_Home returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8622	ERR_MC_HOME_ABORTED	Internally called function block MC_Home returned CommandAborted
16#8604	ERR_MC_HALT	Internally called function block MC_Halt returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8624	ERR_MC_HALT_ABORTED	Internally called function block MC_Halt returned CommandAborted
16#8605	ERR_MC_MOVEJOG	Internally called function block MC_MoveJog (continuous jogging) returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8625	ERR_MC_MOVEJOG_ABORTED	Internally called function block MC_MoveJog returned CommandAborted
16#8607	ERR_MC_MOVERELATIVE	Internally called function block MC_MoveRelative returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8627	ERR_MC_MOVERELATIVE_ABORTED	Internally called function block MC_MoveRelative returned CommandAborted
16#8608	ERR_MC_MOVEABSOLUTE	Internally called function block MC_MoveAbsolute returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8628	ERR_MC_MOVEABSOLUTE_ABORTED	Internally called function block MC_MoveAbsolute returned CommandAborted
16#860A	ERR_MC_GEARIN	Internally called function block MC_GearIn returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#862A	ERR_MC_GEARIN_ABORTED	Internally called function block MC_GearIn returned CommandAborted
16#8700	ERR_UNDEFINED_STATE	Error due to an undefined state in state machine
16#8701	ERR_UNDEFINED_SUB_STATE	Error due to an undefined state in subsidiary state machine

## 2.1.6 FB LFFS\_FoilFeedCam (FB 31521)

Figure



### Principle of operation

The LFFS\_FoilFeedCam block controls the foil feed axis that operates in synchronous operation (camming with MC\_CamIn) of a vertical FFS machine. Input parameter *parameters.syncOperation.camProfile* specifies whether to operate the foil feed in continuous or intermittent mode.

### Supported functionalities

- Enable / disable axis
- Reset errors and acknowledge technology alarms of the axis
- Fast stop
- Manual homing
- Jog forward / backward
- Relative positioning
- Absolute positioning
- Enable synchronous operation (for production)



Only one functionality that results in an active axis movement can be active at the same time. Input *fastStop* has the highest priority. No other axis movement can be started via the block while input *fastStop* is set.

**Calculated cam disk**

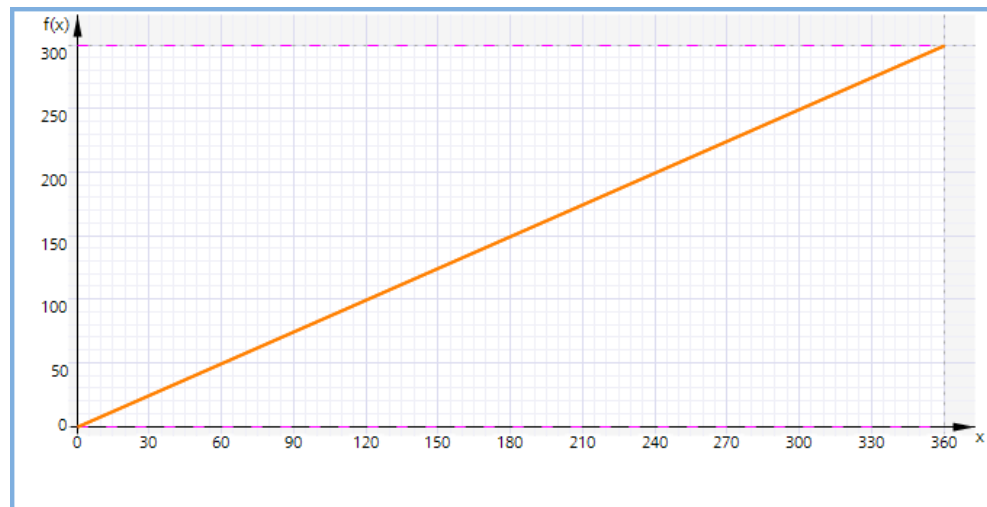
The following figures show the at runtime calculated cam disk for continuous and intermittent foil feeding. The modulo length of the master axis that is used for cam disk calculation is only read once when input *enable* of the LFFS\_FoilFeedCam block is set. The calculation and creation of the cam disk is started when input *enableSyncOperation* is set. The relevant parameters are located in *parameters.syncOperation*.

Example set of parameters used for cam disk calculation for continuous mode (*parameters.syncOperation.camProfile := 0*):

Table 2-17

Parameter	Value
bagLength	300.0 mm
moduloLengthMaster	360.0 °

Figure 2-5 created cam disk consists of one segment: constant velocity

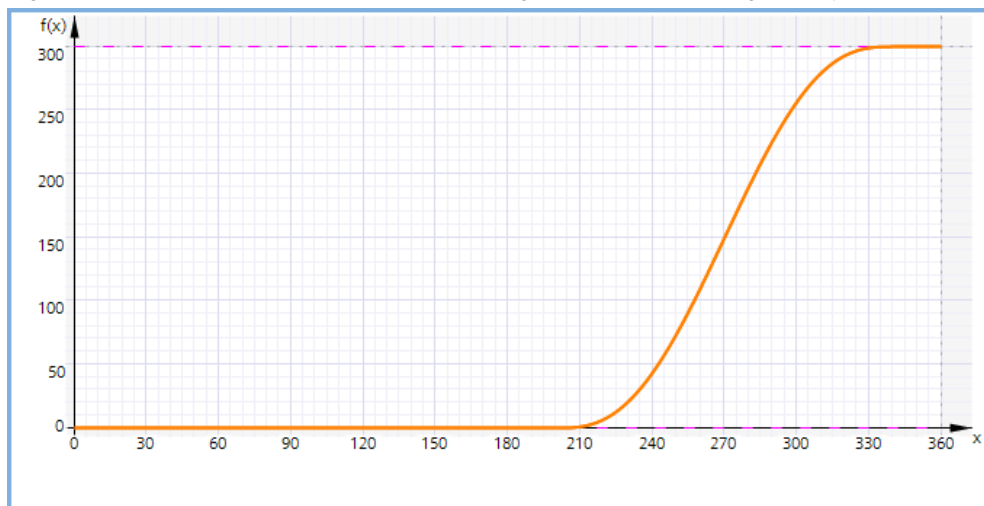


Example set of parameters used for cam disk calculation for intermittent mode (*parameters.syncOperation.camProfile := 1*):

Table 2-18

Parameter	Value
bagLength	300.0 mm
masterPosStartFeeding	200.0 °
masterPosEndFeeding	325.0 °
moduloLengthMaster	360.0 °

Figure 2-6 created cam disk consists of three segments: dwell, 5th degree polynomial, dwell



### Input parameters

Table 2-19 LFFS\_FoilFeedCam input parameters

Parameter	Data type	Comment
enable	Bool	TRUE: enable functionality of FB (default: FALSE)
axis	TO_SynchronousAxis	Reference to the axis to be controlled (typically linear axis type without modulo)
enableAxis	Bool	TRUE: set axis enable; FALSE: remove axis enable (default: FALSE)
ackError	Bool	Rising edge: acknowledge errors of FB and alarms of axis (technology object) (default: FALSE)
fastStop	Bool	TRUE: enable fast stop, axis will be stopped (with fastStop dynamics) (default: FALSE)
home	Bool	Rising edge: home axis according to the selected 'parameters.home.mode' (default: FALSE)
jogForward	Bool	Rising edge: move axis in jog mode (forward); falling edge: stop axis (default: FALSE)
jogBackward	Bool	Rising edge: move axis in jog mode (backward); falling edge: stop axis (default: FALSE)
posRelative	Bool	Rising edge: move axis relative to its position (default: FALSE)
posAbsolute	Bool	Rising edge: move axis to an absolute position (default: FALSE)
master	TO_PositioningAxis	Reference to the leading axis for synchronous operation (typically rotary axis type with modulo; start = 0°; length = 360°)
cyclicCam	DB_ANY	Reference to the cyclic cam disk (no configuration necessary, is created at runtime) (default: 0)

Parameter	Data type	Comment
enableSyncOperation	Bool	TRUE: enable synchronous operation (calculate/interpolate cam, set axis position to corresponding synchronous position in cam, activate synchronous operation in standstill); FALSE: disable synchronous operation (default: FALSE)
parameters	LFFS_typeFoilFeedCam Parameters	Parameters (e.g. home position, ...)
dynamics	LFFS_typeFoilFeed Dynamics	Dynamics (e.g. jog velocity, ...)

### Output parameters

Table 2-20 LFFS\_FoilFeedCam output parameters

Parameter	Data type	Comment
valid	Bool	TRUE: valid set of output values available at the FB (default: FALSE)
busy	Bool	TRUE: FB is not finished and new output values can be expected (default: FALSE)
error	Bool	TRUE: an error occurred during the execution of the FB (default: FALSE)
status	Word	16#0000 - 16#7FFF: status of the FB, 16#8000 - 16#FFFF: error identification (default: 16#7000, STATUS_NO_CALL)
axisEnabled	Bool	TRUE: axis enabled (default: FALSE)
fastStopActive	Bool	TRUE: fast stop is active (default: FALSE)
fastStopDone	Bool	TRUE: fast stop is done (default: FALSE)
ready	Bool	TRUE: FB is ready for start of a new functionality (active homing, jog, pos, ...) (default: FALSE)
homingActive	Bool	TRUE: homing is active (default: FALSE)
homingDone	Bool	TRUE: homing is done (default: FALSE)
jogActive	Bool	TRUE: jogging is active (default: FALSE)
posRelativeActive	Bool	TRUE: relative positioning is active (default: FALSE)
posRelativeDone	Bool	TRUE: relative positioning is done (default: FALSE)
posAbsoluteActive	Bool	TRUE: absolute positioning is active (default: FALSE)
posAbsoluteDone	Bool	TRUE: absolute positioning is done (default: FALSE)

Parameter	Data type	Comment
syncOperationActive	Bool	TRUE: synchronous operation is active (default: FALSE)
cyclicCamActive	Bool	TRUE: cyclic cam disk is currently being used for camming (default: FALSE)
diagnostics	LFFS_typeDiagnostics	Diagnostics information of FB

### Status and error displays

Table 2-21 LFFS\_FoilFeedCam status and error displays

Status	Meaning	Comment
16#7000	STATUS_NO_CALL	No call of FB
16#7001	STATUS_FIRST_CALL	First call of FB after enabling
16#7002	STATUS_SUBSEQUENT_CALL	Subsequent call of FB
16#7003	WARN_AXIS_NOT_ENABLED	Axis is not enabled, requested functionality requires an enabled axis
16#700A	WARN_MASTER_NOT_ENABLED	Master is not enabled, requested functionality requires an enabled master
16#700B	WARN_MASTER_NOT_HOMED	Master is not homed, requested functionality requires a homed master
16#700D	WARN_MASTER_NOT_STANDSTILL	Master is not at a standstill, requested functionality requires a master at a standstill
16#700E	WARN_MASTER_HOMING_ACTIVE	Homing command active at master
16#8212	ERR_CYCLIC_CAM_TYPE_INVALID	The data type of the DB addressed by input parameter 'cyclicCam' must be TO_Cam
16#8215	ERR_MASTER_MODULO_DISABLED	Master configuration: Modulo function (<TO>.Modulo.Enable) is not enabled at master
16#8216	ERR_MASTER_MODULO_START_VALUE_INVALID	Master configuration: Modulo start value (<TO>.Modulo.StartValue) not equal to 0.0
16#8600	ERR_MC_POWER	Internally called function block MC_Power returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8602	ERR_MC_HOME	Internally called function block MC_Home returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8622	ERR_MC_HOME_ABORTED	Internally called function block MC_Home returned CommandAborted
16#8604	ERR_MC_HALT	Internally called function block MC_Halt returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8624	ERR_MC_HALT_ABORTED	Internally called function block MC_Halt returned CommandAborted
16#8605	ERR_MC_MOVEJOG	Internally called function block MC_MoveJog (continuous jogging) returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8625	ERR_MC_MOVEJOG_ABORTED	Internally called function block MC_MoveJog returned CommandAborted
16#8607	ERR_MC_MOVERELATIVE	Internally called function block MC_MoveRelative returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8627	ERR_MC_MOVERELATIVE_ABORTED	Internally called function block MC_MoveRelative returned CommandAborted

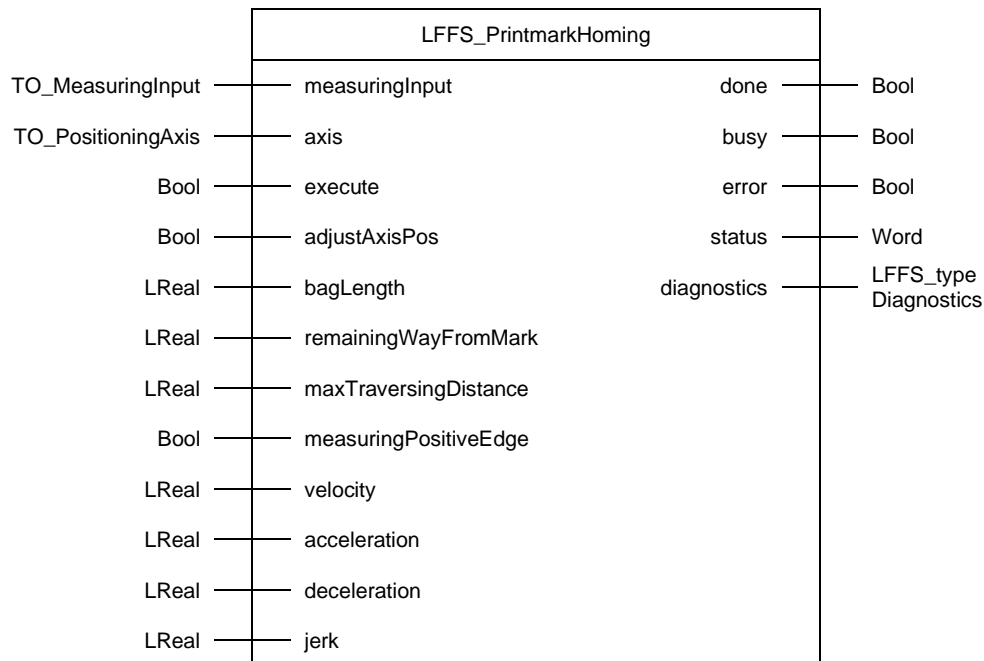
Status	Meaning	Comment
16#8608	ERR_MC_MOVEABSOLUTE	Internally called function block MC_MoveAbsolute returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8628	ERR_MC_MOVEABSOLUTE_ABORTED	Internally called function block MC_MoveAbsolute returned CommandAborted
16#860A	ERR_MC_GEARIN	Internally called function block MC_GearIn returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#860D	ERR_MC_CAMIN	Internally called function block MC_CamIn returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#862D	ERR_MC_CAMIN_ABORTED	Internally called function block MC_CamIn returned CommandAborted
16#8640	ERR_CREATECAMS	Internally called function block LFFS_UnpubCreateCamFoilFeedCam returned an error (errorID -> diagnostics.subfunctionStatus)
16#8700	ERR_UNDEFINED_STATE	Error due to an undefined state in state machine
16#8701	ERR_UNDEFINED_SUB_STATE	Error due to an undefined state in subsidiary state machine

Table 2-22 LFFS\_UnpubCreateCamFoilFeedCam error displays

Status	Meaning	Comment
16#8202	ERR_BAG_LENGTH_INVALID	Input parameter 'bagLength' must be > 0.0
16#8203	ERR_MODULO_LENGTH_INVALID	Input parameter 'moduloLengthMaster' must be > 0.0
16#8209	ERR_CAM_PROFILE_INVALID	Input parameter 'camProfile' invalid
16#820A	ERR_MASTER_POS_START_FEEDING_INVALID	Input parameter 'masterPosStartFeeding' must be > 0.0 and < 'masterPosEndFeeding'
16#820B	ERR_MASTER_POS_END_FEEDING_INVALID	Input parameter 'masterPosEndFeeding' must be greater than 'masterPosStartFeeding' and less than 'moduloLengthMaster'
16#8602	ERR_CREATE_CYCLIC_CAM	Internally called function block LCamHdl_CreateCamAdvanced returned an error (errorID -> diagnostics.subfunctionStatus) when creating the cyclic cam disk
16#8700	ERR_UNDEFINED_STATE	Error due to an undefined state in state machine
16#7000	STATUS_NO_CALL	No job being currently processed

## 2.1.7 FB LFFS\_PrintmarkHoming (FB 31512)

Figure



### Principle of operation

The LFFS\_PrintmarkHoming block can be used to move the foil with print marks to an initial position before production is started.

➔ Avoid faulty products due to print mark errors at the beginning of production, i.e. the print mark is already in the expected range for the first product.

With a rising edge at the *execute* input, the position of the axis is initially set to 0.0 (*adjustAxisPos* := TRUE) and a one-time measuring (without measuring range) is started. Afterwards the axis is moved until the first mark is detected. An error is thrown if no mark is detected within *maxTraversingDistance*. The determined mark position is increased by *remainingWayFromMark*. The axis is then moved to this absolute position. Finally, the axis position is set to 0.0 (*adjustAxisPos* := TRUE).

**NOTE** The velocity of the foil feed axis and the call interval of this block determine the positioning accuracy for the "print mark homing" process.

**NOTE** For the calculation of motion profile details, the block LCalcMC\_MoveVelocityDistance is used internally, i.e. the LCalcMC library \3\ is required.

**Input parameters**

Table 2-23 LFFS\_PrintmarkHoming input parameters

Parameter	Data type	Comment
measuringInput	TO_MeasuringInput	Measuring input which is used for print mark acquisition
axis	TO_PositioningAxis	Reference to the axis to be controlled (typically linear axis type without modulo)
execute	Bool	Rising edge: start functionality once (default: FALSE)
adjustAxisPos	Bool	TRUE: adjust position of axis (set to 0.0) at start and end of the sequence (default: TRUE)
bagLength	LReal	Bag length (or rather distance between two print marks) [mm] (default: 0.0)
remainingWayFromMark	LReal	Distance to be traversed after first measuring event has occurred. Note: value is increased by one bag length if axis is not able to stop at the resulting target position without any backward movement (default: 0.0)
maxTraversingDistance	LReal	Maximum traversing distance if no measuring event has occurred (default: 0.0)
measuringPositiveEdge	Bool	FALSE: measurement of next negative edge; TRUE: measurement of next positive edge (default: TRUE)
velocity	LReal	Velocity setpoint (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Velocity' configured at the technology object is used) (default: -1.0)
acceleration	LReal	Acceleration setpoint (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Acceleration' configured at the technology object is used) (default: -1.0)
deceleration	LReal	Deceleration setpoint (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Deceleration' configured at the technology object is used) (default: -1.0)
jerk	LReal	Jerk setpoint (value > 0.0: smooth velocity profile, the specified value is used; value = 0.0: trapezoidal velocity profile; value < 0.0: value 'DynamicDefaults.Jerk' configured at the technology object is used) (default: -1.0)

**Output parameters**

Table 2-24 LFFS\_PrintmarkHoming output parameters

Parameter	Data type	Comment
done	Bool	TRUE: commanded functionality has been completed successfully (default: FALSE)
busy	Bool	TRUE: FB is not finished and new output values can be expected (default: FALSE)
error	Bool	TRUE: an error occurred during the execution of the FB (default: FALSE)
status	Word	16#0000 - 16#7FFF: status of the FB, 16#8000 - 16#FFFF: error identification (default: 16#7000, STATUS_NO_CALL)
diagnostics	LFFS_typeDiagnostics	Diagnostics information of FB

**Status and error displays**

Table 2-25 LFFS\_PrintmarkHoming status and error displays

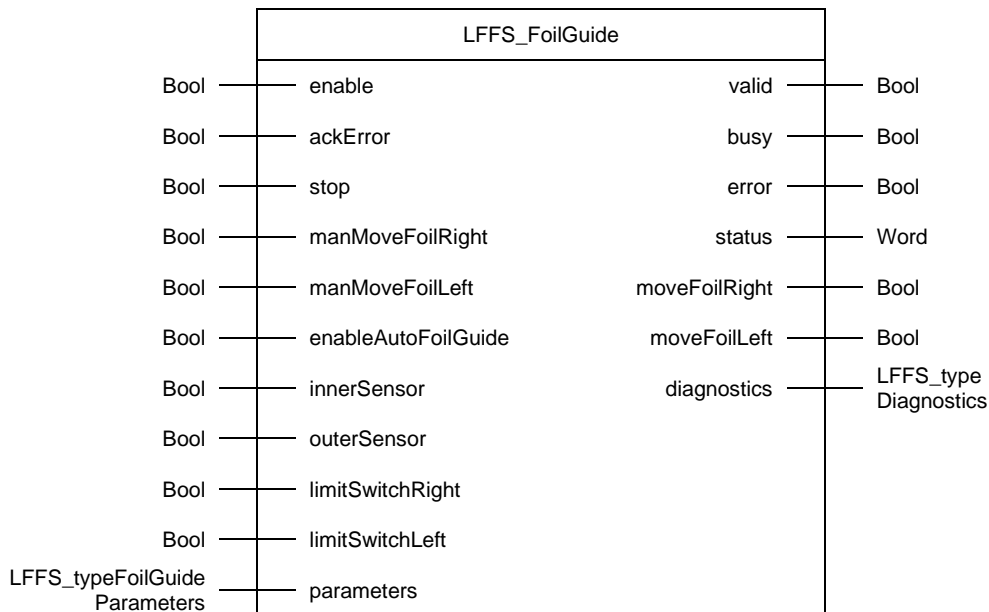
Status	Meaning	Comment
16#0000	STATUS_EXECUTION_FINISHED	Execution finished without errors
16#7000	STATUS_NO_CALL	No job being currently processed
16#7001	STATUS_FIRST_CALL	First call after incoming new job (rising edge 'execute')
16#7002	STATUS_SUBSEQUENT_CALL	Subsequent call during active processing without further details
16#8200	ERR_BAG_LENGTH_INVALID	Input parameter 'bagLength' must be > 0.0
16#8201	ERR_REMAINING_WAY_INVALID	Input parameter 'remainingWayFromMark' must be >= 0.0
16#8202	ERR_MAX_TRAVERSING_DIST_INVALID	Input parameter 'maxTraversingDistance' must be > 0.0
16#8602	ERR_MC_HOME	Internally called function block MC_Home returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8622	ERR_MC_HOME_ABORTED	Internally called function block MC_Home returned CommandAborted
16#8608	ERR_MC_MOVEABSOLUTE	Internally called function block MC_MoveAbsolute returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8628	ERR_MC_MOVEABSOLUTE_ABORTED	Internally called function block MC_MoveAbsolute returned CommandAborted
16#8610	ERR_MC_MEASURINGINPUT	Internally called function block MC_MeasuringInput returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8630	ERR_MC_MEASURINGINPUT_ABORTED	Internally called function block MC_MeasuringInput returned CommandAborted
16#8646	ERR_MOVE_VELO_DIST	Internally called function LCalcMC_MoveVelocityDistance returned an error (errorID -> diagnostics.subfunctionStatus -> see tag table LCalcMC_ErrorIDs) when calculating the distance needed to stop the axis



Status	Meaning	Comment
16#8647	ERR_NO_MARK_DETECTED	No measuring event has occurred while axis moved 'maxTraversingDistance'
16#8700	ERR_UNDEFINED_STATE	Error due to an undefined state in state machine

## 2.1.8 FB LFFS\_FoilGuide (FB 31507)

Figure



### Principle of operation

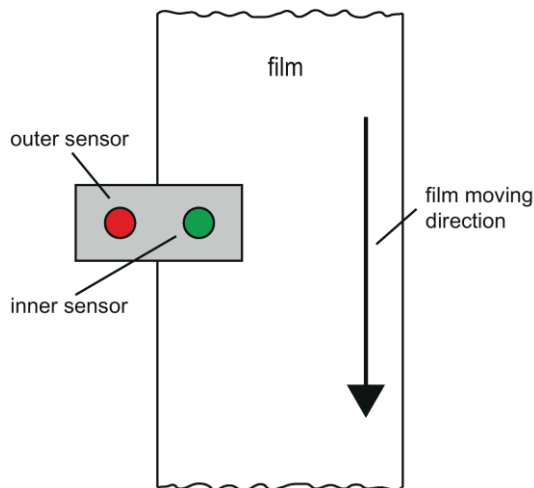
A simple web edge guide control can be implemented with the LFFS\_FoilGuide block.

The control is made by determining the web edge position using two sensors. If the web edge runs exactly between the two sensors (*innerSensor* and *outerSensor*), the position is correct and will not be corrected. If, however, both sensors are switched or not switched, the position of the web edge is no longer correct and must be corrected. The sensor signals are passed to the two *innerSensor* and *outerSensor* inputs. Both a manual and an automatic controlling of the web edge is supported. The two *manMoveFoilRight* and *manMoveFoilLeft* inputs can be used at any time to manually move the web edge to the right or to the left, respectively. If both inputs are set simultaneously, the traversing motion is stopped.

The *enableAutoFoilGuide* input activates the automatic control of the web edge that corrects the position of the foil automatically. The manual correction can also be activated during the automatic web edge control so that the foil can also be traversed manually.

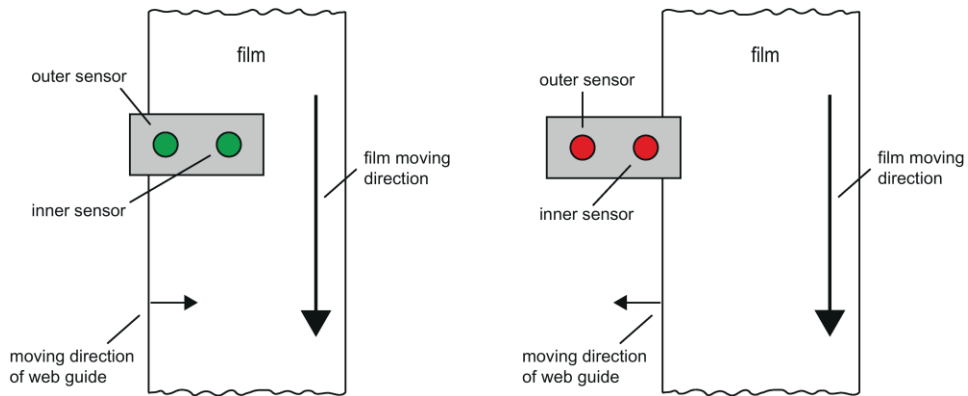
Correct position of the web edge:

Figure 2-7



Incorrect positions of the web edge i.e. foil has to be moved.

Figure 2-8



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### Input parameters

Table 2-26 LFFS\_FoilGuide input parameters

Parameter	Data type	Comment
enable	Bool	TRUE: enable functionality of FB (default: FALSE)
ackError	Bool	Rising edge: acknowledge errors of FB (default: FALSE)
stop	Bool	TRUE: stop foil movement (right, left). Input shall be set if foil is not being moved by the foil feed (default: FALSE)
manMoveFoilRight	Bool	TRUE: move foil manually right (requirements: 'stop' = FALSE, 'manMoveFoilLeft' = FALSE) (default: FALSE)
manMoveFoilLeft	Bool	TRUE: move foil manually left (requirements: 'stop' = FALSE, 'manMoveFoilRight' = FALSE) (default: FALSE)

Parameter	Data type	Comment
enableAutoFoilGuide	Bool	TRUE: enable automatic foil guide (requirements: 'stop' = FALSE, 'manMoveFoilRight' = FALSE, 'manMoveFoilLeft' = FALSE) (default: FALSE)
innerSensor	Bool	TRUE: foil present (default: FALSE)
outerSensor	Bool	TRUE: foil present (default: FALSE)
limitSwitchRight	Bool	TRUE: limit switch active (default: FALSE)
limitSwitchLeft	Bool	TRUE: limit switch active (default: FALSE)
parameters	LFFS_typeFoilGuide Parameters	Parameters for foil guide

### Output parameters

Table 2-27 LFFS\_FoilGuide output parameters

Parameter	Data type	Comment
valid	Bool	TRUE: valid set of output values available at the FB (default: FALSE)
busy	Bool	TRUE: FB is not finished and new output values can be expected (default: FALSE)
error	Bool	TRUE: an error occurred during the execution of the FB (default: FALSE)
status	Word	16#0000 - 16#7FFF: status of the FB, 16#8000 - 16#FFFF: error identification (default: 16#7000, STATUS_NO_CALL)
moveFoilRight	Bool	TRUE: move foil right (time response can be configured in parameters structure) (default: FALSE)
moveFoilLeft	Bool	TRUE: move foil left (time response can be configured in parameters structure) (default: FALSE)
diagnostics	LFFS_typeDiagnostics	Diagnostics information of FB

### Status and error displays

Table 2-28 LFFS\_FoilGuide status and error displays

Status	Meaning	Comment
16#7000	STATUS_NO_CALL	No call of FB
16#7001	STATUS_FIRST_CALL	First call of FB after enabling
16#7002	STATUS_SUBSEQUENT_CALL	Subsequent call of FB
16#8400	ERR_INVALID_SENSOR_STATE_COMBI	Sensor state combination invalid (innerSensor = FALSE AND outerSensor = TRUE)

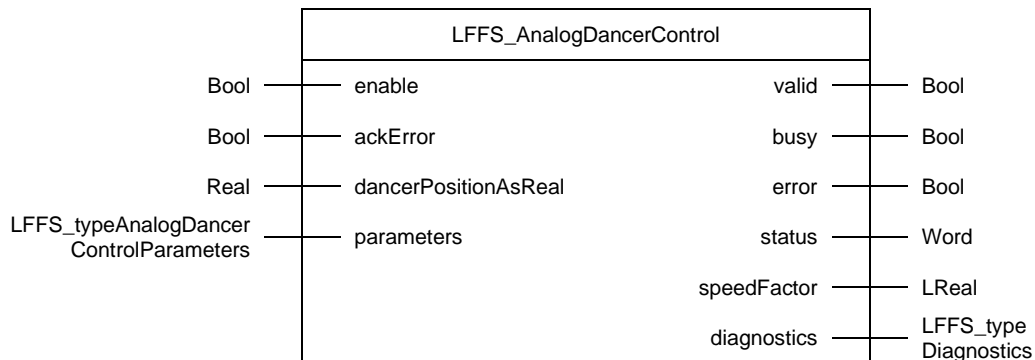
## 2 Engineering

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Status	Meaning	Comment
16#8401	ERR_NO_FOIL_MOVEMENT	No foil movement (right, left) within parameterized monitoring time (parameters.maxOnMonitoringMoveFoilOutputs)
16#8700	ERR_UNDEFINED_STATE	Error due to an undefined state in state machine

### 2.1.9 FB LFFS\_AnalogDancerControl (FB 31500)

Figure



#### Principle of operation

A simple tension control with an analog dancer and a speed controlled preliminary foil feed axis can be implemented with the LFFS\_AnalogDancerControl block.

The actual dancer position must be applied as analog value (-100.0 .. 100.0) at input *dancerPositionAsReal*. Internally the CONT\_C instruction from the PID basic functions is used as PI controller. Setpoint, gain and the integrationTime can be adapted via the parameters structure of the LFFS\_AnalogDancerControl block.

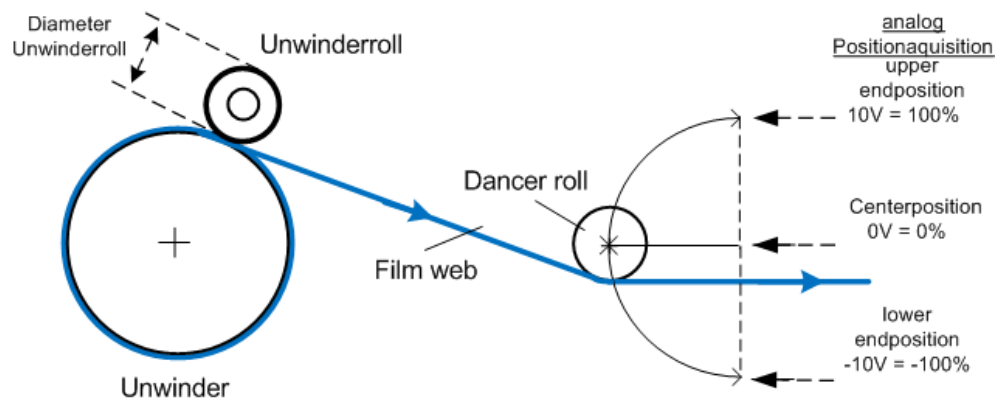
To influence the setpoint speed of the preliminary foil feed axis, a *speedFactor* is output in the range 0.0 ... 2.0. At the dancer center position, the output factor is 1.0 = 100%.

#### NOTE

The calculation of the values in the internally called control block (CONT\_C) is only correct if the LFFS\_AnalogDancerControl block is called at regular intervals.

The following figure below shows the foil unwinder with dancer roll:

Figure 2-9



**Input parameters**

Table 2-29 LFFS\_AnalogDancerControl input parameters

Parameter	Data type	Comment
enable	Bool	TRUE: enable functionality of FB (default: FALSE)
ackError	Bool	Rising edge: acknowledge errors of FB (default: FALSE)
dancerPositionAsReal	Real	Dancer position -100.0% (lower end position) to 100.0% (upper end position) (default: 0.0)
parameters	LFFS_type AnalogDancerControl Parameters	Parameters for analog dancer control

**Output parameters**

Table 2-30 LFFS\_AnalogDancerControl output parameters

Parameter	Data type	Comment
valid	Bool	TRUE: valid set of output values available at the FB (default: FALSE)
busy	Bool	TRUE: FB is not finished and new output values can be expected (default: FALSE)
error	Bool	TRUE: an error occurred during the execution of the FB (default: FALSE)
status	Word	16#0000 - 16#7FFF: status of the FB, 16#8000 - 16#FFFF: error identification (default: 16#7000, STATUS_NO_CALL)
speedFactor	LReal	Speed factor (override) for the preliminary foil feed (0.0 to 2.0; 1.0 means nominal speed) (default: 1.0)
diagnostics	LFFS_typeDiagnostics	Diagnostics information of FB

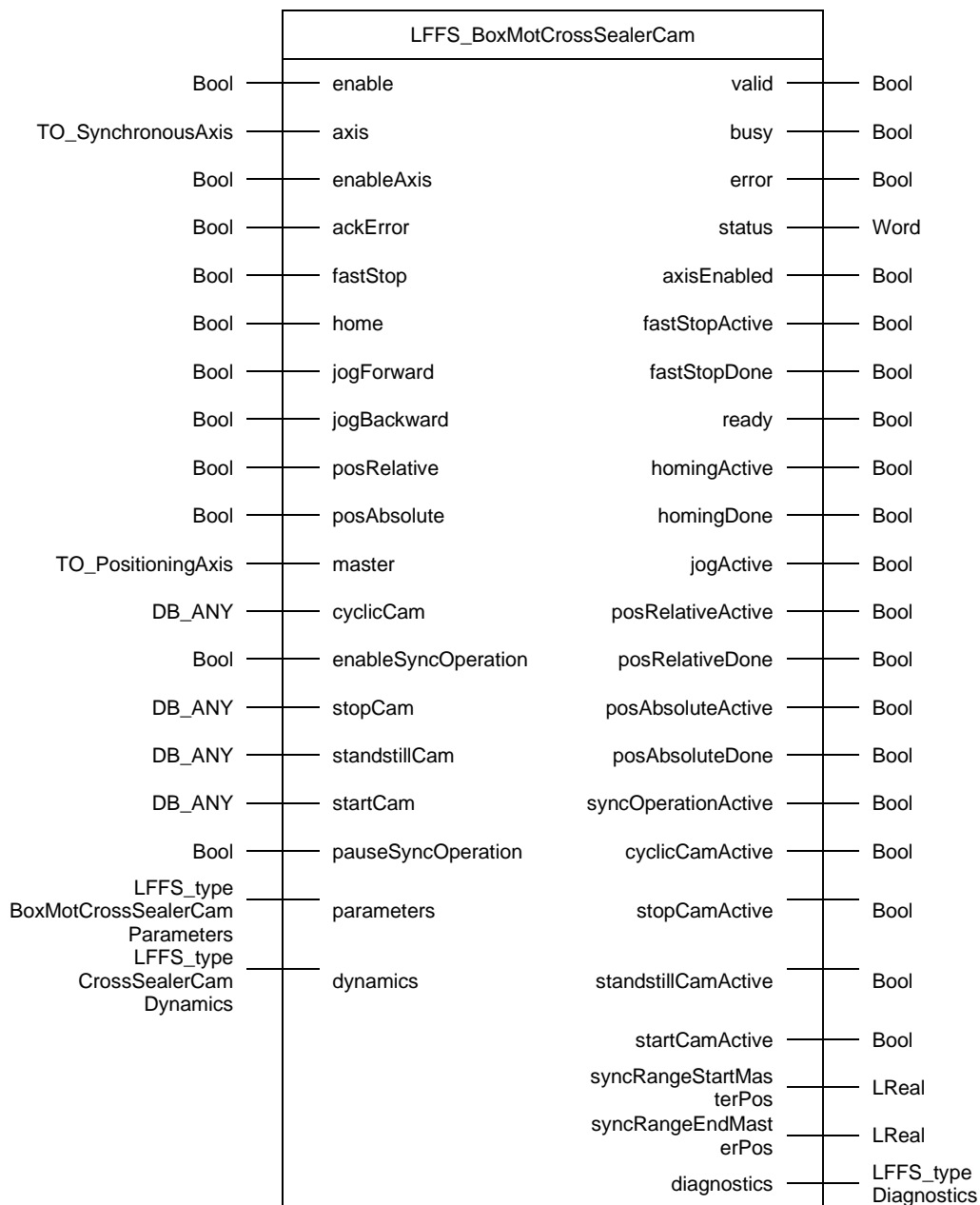
**Status and error displays**

Table 2-31 LFFS\_AnalogDancerControl status and error displays

Status	Meaning	Comment
16#7000	STATUS_NO_CALL	No call of FB
16#7001	STATUS_FIRST_CALL	First call of FB after enabling
16#7002	STATUS_SUBSEQUENT_CALL	Subsequent call of FB
16#8400	ERR_DWELL_TIME_EXP_UPPER _END_POS	Maximum dwell time (parameters.maxDwellTimeEndPositions) for "dancer in upper end position" expired
16#8401	ERR_DWELL_TIME_EXP_LOWER _END_POS	Maximum dwell time (parameters.maxDwellTimeEndPositions) for "dancer in lower end position" expired
16#8700	ERR_UNDEFINED_STATE	Error due to an undefined state in state machine

### 2.1.10 FB LFFS\_BoxMotCrossSealerCam (FB 31501)

Figure

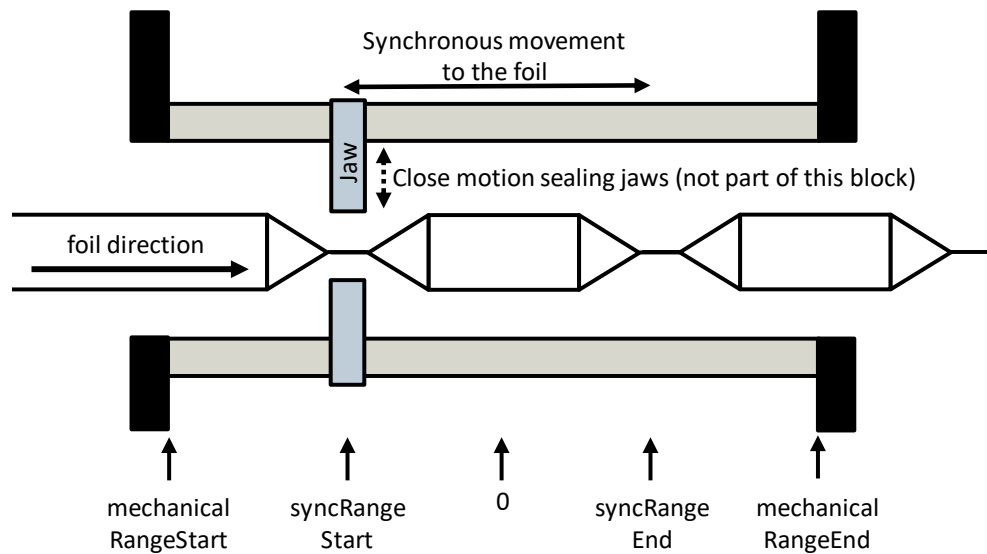


#### Principle of operation

The LFFS\_BoxMotCrossSealerCam block controls a traversing (box motion) cross sealer axis that operates in synchronous operation (camming) of a continuous FFS machine.



Figure 2-10 horizontal application (can also be vertical)



### Supported functionalities

- Enable / disable axis
- Reset errors and acknowledge technology alarms of the axis
- Fast stop
- Manual homing
- Jog forward / backward
- Relative positioning
- Absolute positioning
- Enable synchronous operation (for production)

Only one functionality that results in an active axis movement can be active at the same time. Input *fastStop* has the highest priority. No other axis movement can be started via the block while input *fastStop* is set.

### NOTE

For the creation of cam disks at runtime, the blocks LCamHdl\_CreateCamAdvanced and LCamHdl\_GetCamFollowingMinMax are used internally, i.e. the LCamHdl library \4\ is required.

**Calculated cam disks**

The following figures show the at runtime calculated cam disks. The modulo length of the master axis that is used for cam disk calculation is only read once when input *enable* of the LFFS\_BoxMotCrossSealerCam block is set. The calculation and creation of the cam disks is started when input *enableSyncOperation* is set. The relevant parameters are located in *parameters.syncOperation*.

Example set of parameters used for cam disk calculation (horizontal application):

Table 2-32

Parameter	Value
bagLength	360.0 mm
mechanicalRangeStart	-300.0 mm
syncRangeStart	-100.0 mm
syncRangeScaling	1.0
syncRangeEnd	100.0 mm
mechanicalRangeEnd	300.0 mm
moduloLengthMaster	360.0 °

Figure 2-11 cyclicCam

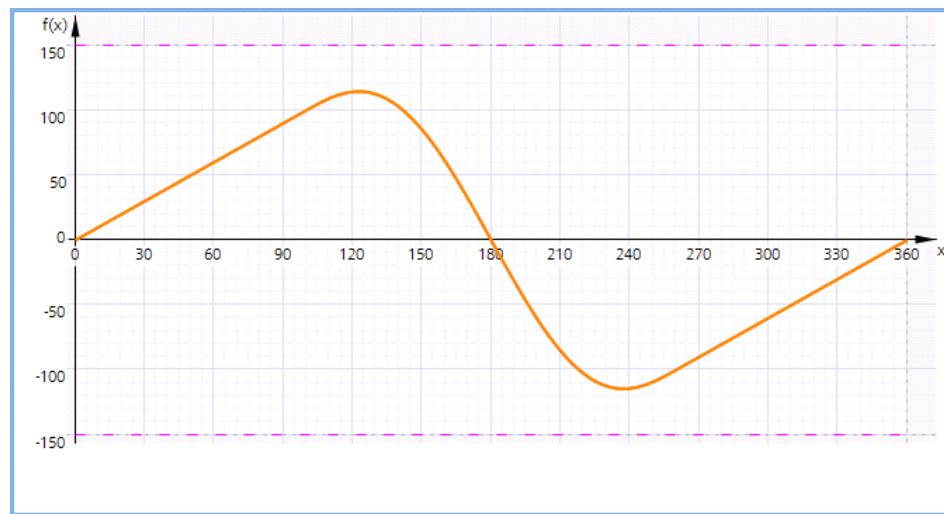


Figure 2-12 stopCam

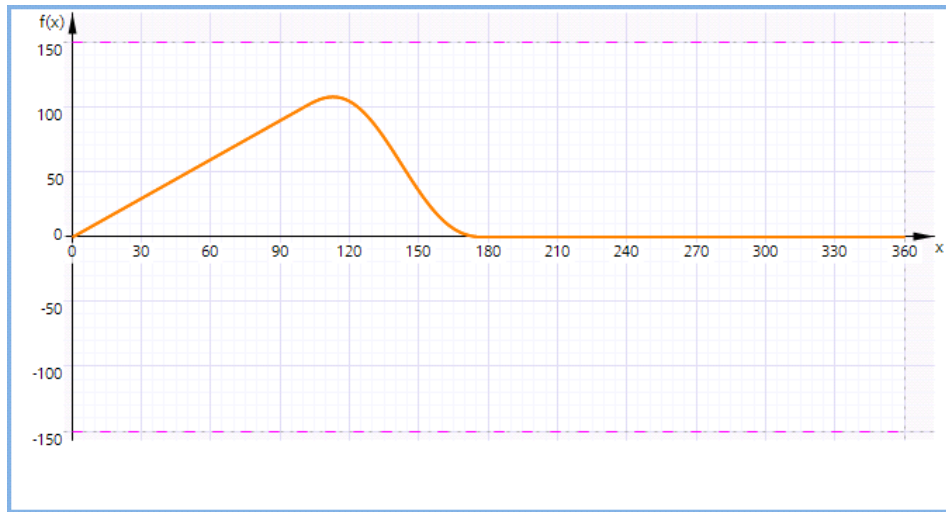


Figure 2-13 standstillCam

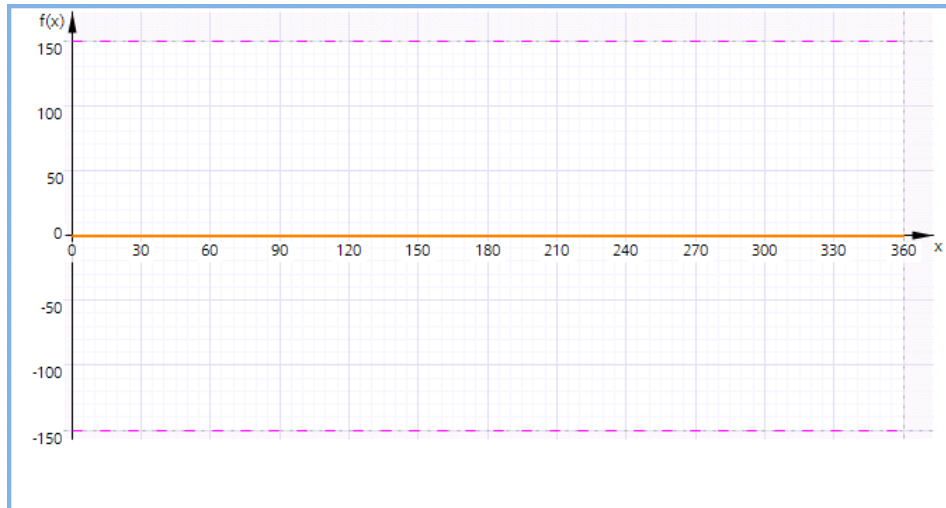
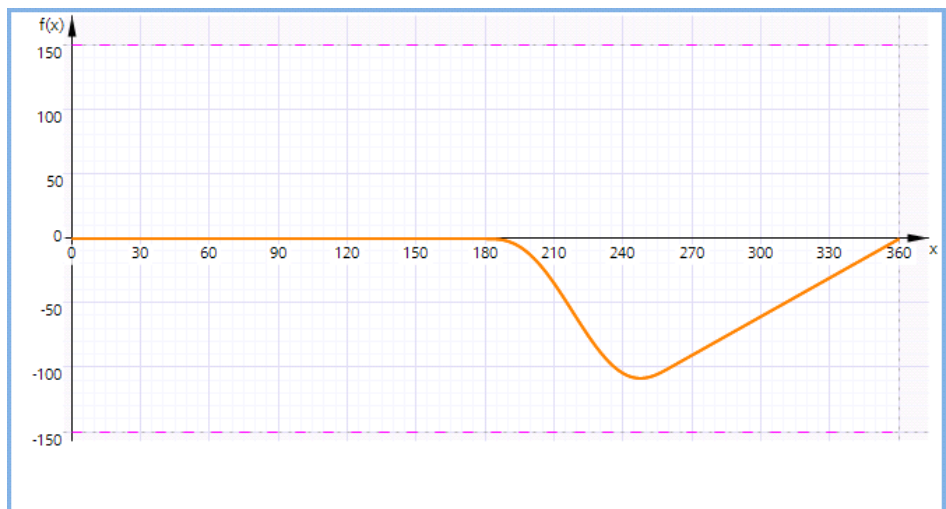


Figure 2-14 startCam

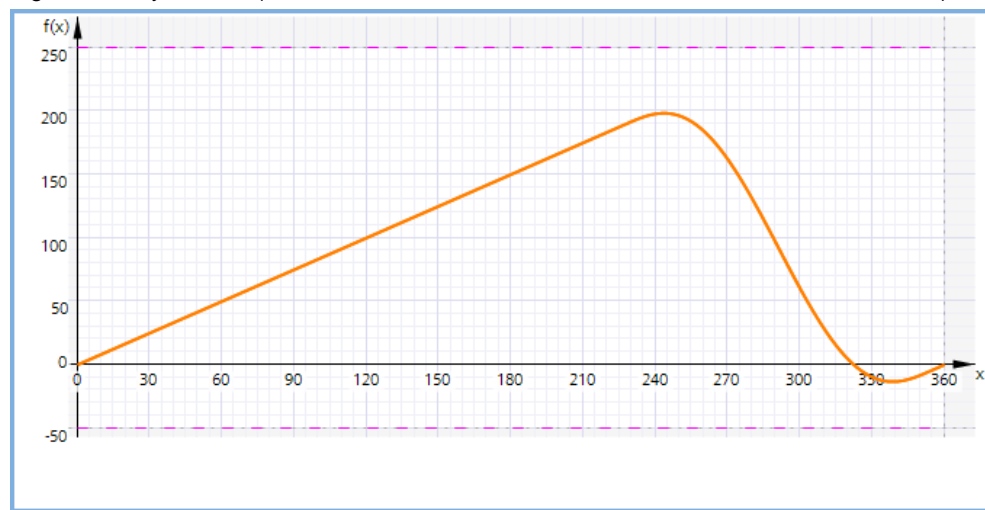


Example set of parameters used for cam disk calculation (vertical application, stop/standstill/start cam disks are not used):

Table 2-33

Parameter	Value
bagLength	300.0 mm
mechanicalRangeStart	-50.0 mm
syncRangeStart	-5.0 mm
syncRangeScaling	1.0
syncRangeEnd	190.0 mm
mechanicalRangeEnd	250.0 mm
moduloLengthMaster	360.0 °

Figure 2-15 cyclicCam (used for the cross sealer lift axis at a continuous VFFS machine)



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**Input parameters**

Table 2-34 LFFS\_BoxMotCrossSealerCam input parameters

Parameter	Data type	Comment
enable	Bool	TRUE: enable functionality of FB (default: FALSE)
axis	TO_SynchronousAxis	Reference to the axis to be controlled (typically linear axis type without modulo)
enableAxis	Bool	TRUE: set axis enable; FALSE: remove axis enable (default: FALSE)
ackError	Bool	Rising edge: acknowledge errors of FB and alarms of axis (technology object) (default: FALSE)
fastStop	Bool	TRUE: enable fast stop, axis will be stopped (with fastStop dynamics) (default: FALSE)
home	Bool	Rising edge: home axis according to the selected 'parameters.home.mode' (default: FALSE)

Parameter	Data type	Comment
jogForward	Bool	Rising edge: move axis in jog mode (forward); falling edge: stop axis (default: FALSE)
jogBackward	Bool	Rising edge: move axis in jog mode (backward); falling edge: stop axis (default: FALSE)
posRelative	Bool	Rising edge: move axis relative to its position (default: FALSE)
posAbsolute	Bool	Rising edge: move axis to an absolute position (default: FALSE)
master	TO_PositioningAxis	Reference to the leading axis for synchronous operation (typically rotary axis type with modulo; start = 0°; length = 360°)
cyclicCam	DB_ANY	Reference to the cyclic cam disk (no configuration necessary, is created at runtime) (default: 0)
enableSyncOperation	Bool	TRUE: enable sealing (calculate/interpolate cams, move axis to corresponding synchronous position in cyclicCam or rather standstillCam if 'pauseSyncOperation' = TRUE, activate synchronous operation in standstill); FALSE: disable sealing (deactivate synchronous operation) (default: FALSE)
stopCam	DB_ANY	Optional (needed if pauseSyncOperation functionality shall be used): reference to the stop cam disk (no configuration necessary, is created at runtime) (default: 0)
standstillCam	DB_ANY	Optional (needed if pauseSyncOperation functionality shall be used): reference to the standstill cam disk (no configuration necessary, is created at runtime) (default: 0)
startCam	DB_ANY	Optional (needed if pauseSyncOperation functionality shall be used): reference to the start cam disk (no configuration necessary, is created at runtime) (default: 0)
pauseSyncOperation	Bool	Optional: TRUE: suspend/pause sealing (startCam/cyclicCam -> stopCam -> standstillCam); FALSE: continue sealing (stopCam/standstillCam -> startCam -> cyclicCam) Note: parameter <i>pauseSyncOperationCheckPos</i> defines when this input is being evaluated. (default: FALSE)
parameters	LFFS_type BoxMotCrossSealerCam Parameters	Parameters (e.g. home position, ...)
dynamics	LFFS_type CrossSealerCam Dynamics	Dynamics (e.g. jog velocity, ...)

**Output parameters**

Table 2-35 LFFS\_BoxMotCrossSealerCam output parameters

Parameter	Data type	Comment
valid	Bool	TRUE: valid set of output values available at the FB (default: FALSE)
busy	Bool	TRUE: FB is not finished and new output values can be expected (default: FALSE)
error	Bool	TRUE: an error occurred during the execution of the FB (default: FALSE)
status	Word	16#0000 - 16#7FFF: status of the FB, 16#8000 - 16#FFFF: error identification (default: 16#7000, STATUS_NO_CALL)
axisEnabled	Bool	TRUE: axis enabled (default: FALSE)
fastStopActive	Bool	TRUE: fast stop is active (default: FALSE)
fastStopDone	Bool	TRUE: fast stop is done (default: FALSE)
ready	Bool	TRUE: FB is ready for start of a new functionality (active homing, jog, pos, ...) (default: FALSE)
homingActive	Bool	TRUE: homing is active (default: FALSE)
homingDone	Bool	TRUE: homing is done (default: FALSE)
jogActive	Bool	TRUE: jogging is active (default: FALSE)
posRelativeActive	Bool	TRUE: relative positioning is active (default: FALSE)
posRelativeDone	Bool	TRUE: relative positioning is done (default: FALSE)
posAbsoluteActive	Bool	TRUE: absolute positioning is active (default: FALSE)
posAbsoluteDone	Bool	TRUE: absolute positioning is done (default: FALSE)
syncOperationActive	Bool	TRUE: synchronous operation is active (default: FALSE)
cyclicCamActive	Bool	TRUE: cyclic cam disk is currently being used for camming (default: FALSE)
stopCamActive	Bool	TRUE: stop cam disk is currently being used for camming (default: FALSE)
standstillCamActive	Bool	TRUE: standstill cam disk is currently being used for camming (default: FALSE)

Parameter	Data type	Comment
startCamActive	Bool	TRUE: start cam disk is currently being used for camming (default: FALSE)
syncRangeStartMasterPos	LReal	Corresponding master position to 'parameters.syncOperation.syncRangeStart' position (valid when 'syncOperationActive' = TRUE) (default: 0.0)
syncRangeEndMasterPos	LReal	Corresponding master position to 'parameters.syncOperation.syncRangeEnd' position (valid when 'syncOperationActive' = TRUE) (default: 0.0)
diagnostics	LFFS_typeDiagnostics	Diagnostics information of FB

### Status and error displays

Table 2-36 LFFS\_BoxMotCrossSealerCam status and error displays

Status	Meaning	Comment
16#7000	STATUS_NO_CALL	No call of FB
16#7001	STATUS_FIRST_CALL	First call of FB after enabling
16#7002	STATUS_SUBSEQUENT_CALL	Subsequent call of FB
16#7003	WARN_AXIS_NOT_ENABLED	Axis is not enabled, requested functionality requires an enabled axis
16#7004	WARN_AXIS_NOT_HOMED	Axis is not homed, requested functionality requires a homed axis
16#700A	WARN_MASTER_NOT_ENABLED	Master is not enabled, requested functionality requires an enabled master
16#700B	WARN_MASTER_NOT_HOMED	Master is not homed, requested functionality requires a homed master
16#700D	WARN_MASTER_NOT_STANDSTILL	Master is not at a standstill, requested functionality requires a master at a standstill
16#700E	WARN_MASTER_HOMING_ACTIVE	Homing command active at master
16#7013	WARN_PAUSE_SYNC_OP_NOT_POSSIBLE	Cam disk references (startCam, stopCam, standstillCam) for pauseSyncOperation functionality not available or not valid (data type of the DB addressed by corresponding input parameter must be TO_Cam)
16#8212	ERR_CYCLIC_CAM_TYPE_INVALID	The data type of the DB addressed by input parameter 'cyclicCam' must be TO_Cam
16#8215	ERR_MASTER_MODULO_DISABLED	Master configuration: Modulo function (<TO>.Modulo.Enable) is not enabled at master
16#8216	ERR_MASTER_MODULO_START_VALUE_INVALID	Master configuration: Modulo start value (<TO>.Modulo.StartValue) not equal to 0.0
16#8600	ERR_MC_POWER	Internally called function block MC_Power returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8602	ERR_MC_HOME	Internally called function block MC_Home returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8622	ERR_MC_HOME_ABORTED	Internally called function block MC_Home returned CommandAborted

Status	Meaning	Comment
16#8604	ERR_MC_HALT	Internally called function block MC_Halt returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8624	ERR_MC_HALT_ABORTED	Internally called function block MC_Halt returned CommandAborted
16#8605	ERR_MC_MOVEJOG	Internally called function block MC_MoveJog (continuous jogging) returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8625	ERR_MC_MOVEJOG_ABORTED	Internally called function block MC_MoveJog returned CommandAborted
16#8607	ERR_MC_MOVERELATIVE	Internally called function block MC_MoveRelative returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8627	ERR_MC_MOVERELATIVE_ABORTED	Internally called function block MC_MoveRelative returned CommandAborted
16#8608	ERR_MC_MOVEABSOLUTE	Internally called function block MC_MoveAbsolute returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8628	ERR_MC_MOVEABSOLUTE_ABORTED	Internally called function block MC_MoveAbsolute returned CommandAborted
16#860A	ERR_MC_GEARIN	Internally called function block MC_GearIn returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#860D	ERR_MC_CAMIN	Internally called function block MC_CamIn returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#862D	ERR_MC_CAMIN_ABORTED	Internally called function block MC_CamIn returned CommandAborted
16#8612	ERR_MC_GETCAMFOLLOWINGVALUE	Internally called function block MC_GetCamFollowingValue returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8640	ERR_CREATECAMS	Internally called function block LFFS_UnpubCreateCamsBoxMotCrossSealerCam returned an error (errorID -> diagnostics.subfunctionStatus)
16#8700	ERR_UNDEFINED_STATE	Error due to an undefined state in state machine
16#8701	ERR_UNDEFINED_SUB_STATE	Error due to an undefined state in subsidiary state machine

Table 2-37 LFFS\_UnpubCreateCamsBoxMotCrossSealerCam error displays

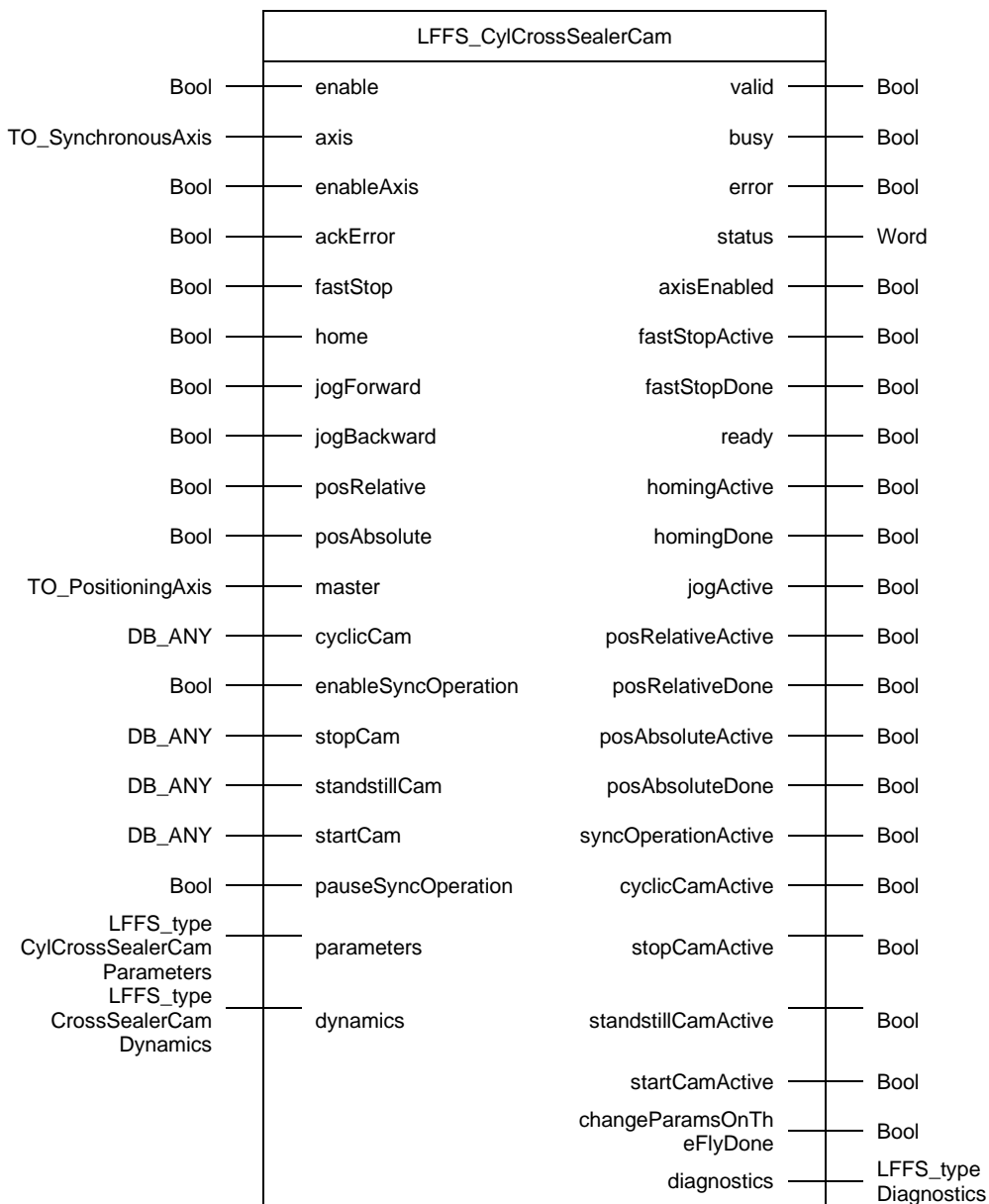
Status	Meaning	Comment
16#8202	ERR_BAG_LENGTH_INVALID	Input parameter 'bagLength' must be > 0.0
16#8203	ERR_MODULO_LENGTH_INVALID	Input parameter 'moduloLengthMaster' must be > 0.0
16#8204	ERR_SYNC_RANGE_INVALID	Resulting synchronous range ('syncRangeEnd' - 'syncRangeStart') must be less than input parameter 'bagLength'
16#8205	ERR_SCALING_FACTOR_INVALID	Input parameter 'syncRangeScaling' must be $\geq 0.5$ and $\leq 2.0$
16#8207	ERR_SYNC_RANGE_START_INVALID	Input parameter 'syncRangeStart' must be > 'mechanicalRangeStart' and < 0.0
16#8208	ERR_SYNC_RANGE_END_INVALID	Input parameter 'syncRangeEnd' must be > 0.0 and < 'mechanicalRangeEnd'



Status	Meaning	Comment
16#8601	ERR_CREATE_START_CAM	Internally called function block LCamHdl_CreateCamAdvanced returned an error (errorID -> diagnostics.subfunctionStatus) when creating the start cam disk
16#8602	ERR_CREATE_CYCLIC_CAM	Internally called function block LCamHdl_CreateCamAdvanced returned an error (errorID -> diagnostics.subfunctionStatus) when creating the cyclic cam disk
16#8603	ERR_CREATE_STOP_CAM	Internally called function block LCamHdl_CreateCamAdvanced returned an error (errorID -> diagnostics.subfunctionStatus) when creating the stop cam disk
16#8604	ERR_CREATE_STANDSTILL_CAM	Internally called function block LCamHdl_CreateCamAdvanced returned an error (errorID -> diagnostics.subfunctionStatus) when creating the standstill cam disk
16#8605	ERR_GET_MIN_MAX_START_CAM	Internally called function block LCamHdl_GetCamFollowingMinMax returned an error (errorID -> diagnostics.subfunctionStatus) when determining the minima and maxima of the start cam disk
16#8606	ERR_GET_MIN_MAX_CYCLIC_CAM	Internally called function block LCamHdl_GetCamFollowingMinMax returned an error (errorID -> diagnostics.subfunctionStatus) when determining the minima and maxima of the cyclic cam disk
16#8607	ERR_GET_MIN_MAX_STOP_CAM	Internally called function block LCamHdl_GetCamFollowingMinMax returned an error (errorID -> diagnostics.subfunctionStatus) when determining the minima and maxima of the stop cam disk
16#8609	ERR_FOLL_VALUE_OUT_OF_MECH_RANGE	Due to actual set of input parameters the following value of the created cams exceeds the mechanical traversing range -> Input parameters have to be checked and adapted
16#8700	ERR_UNDEFINED_STATE	Error due to an undefined state in state machine

### 2.1.11 FB LFFS\_CylCrossSealerCam (FB 31505)

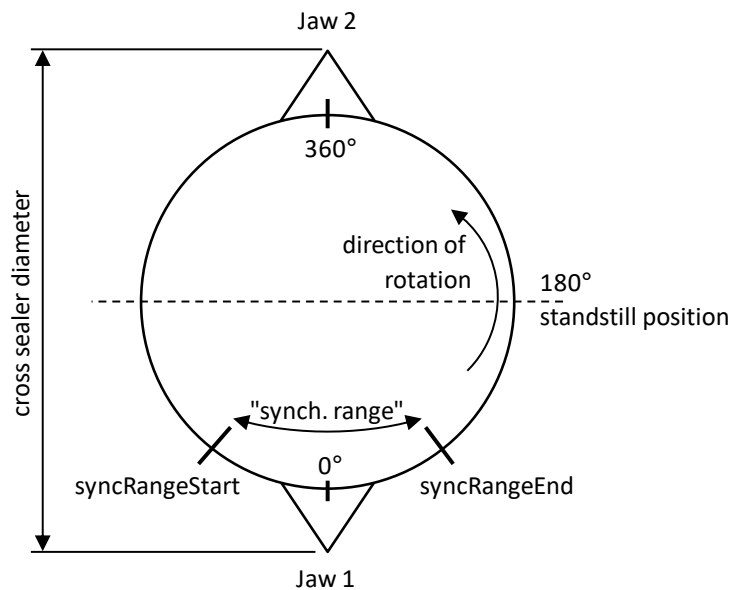
Figure



#### Principle of operation

The LFFS\_CylCrossSealerCam block controls a cylindrical, rotating cross sealer axis that operates in synchronous operation (camming) of a continuous FFS machine.

Figure 2-16



**NOTE** The modulo length of the corresponding axis technology object must elapse between two sealing blades/jaws.

### Supported functionalities

- Enable / disable axis
- Reset errors and acknowledge technology alarms of the axis
- Fast stop
- Manual homing
- Jog forward / backward
- Relative positioning
- Absolute positioning
- Enable synchronous operation (for production)

Only one functionality that results in an active axis movement can be active at the same time. Input *fastStop* has the highest priority. No other axis movement can be started via the block while input *fastStop* is set.

**NOTE** For the creation of cam disks at runtime, the blocks LCamHdl\_CreateCamAdvanced and LCamHdl\_GetCamFollowingMinMax are used internally, i.e. the LCamHdl library \4\ is required.

**Calculated cam disks**

The following figures show the at runtime calculated cam disks. The modulo lengths of the master axis and the slave axis that are used for cam disk calculation are only read once when input *enable* of the LFFS\_CylCrossSealerCam block is set. The calculation and creation of the cam disks is started when input *enableSyncOperation* is set. The relevant parameters are located in *parameters.syncOperation*.

Example set of parameters used for cam disk calculation:

Table 2-38

Parameter	Value
bagLength	300.0 mm
diameter	120.0 mm
syncRangeStart	340.0 °
syncRangeScaling	1.0
syncRangeEnd	20.0 °
numberOfJaws	1
moduloLength	360.0 °
moduloLengthMaster	360.0 °

Figure 2-17 cyclicCam

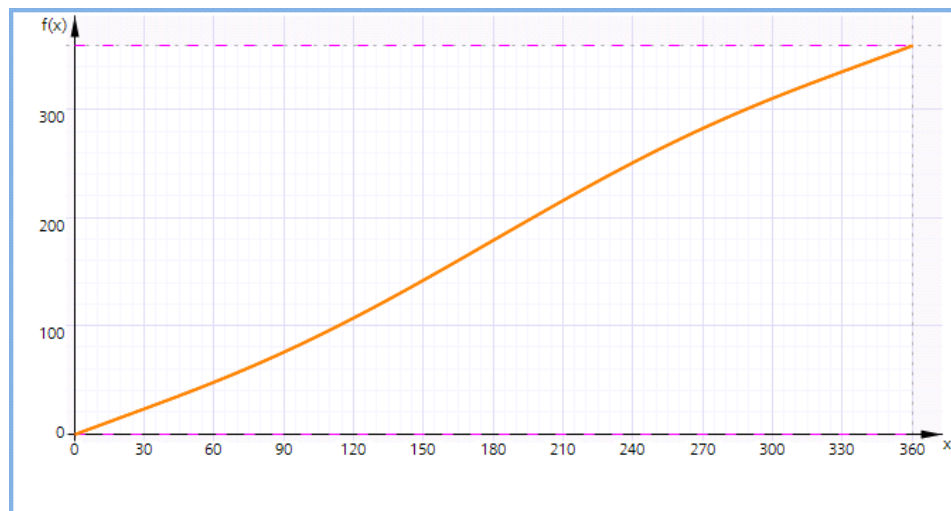


Figure 2-18 stopCam

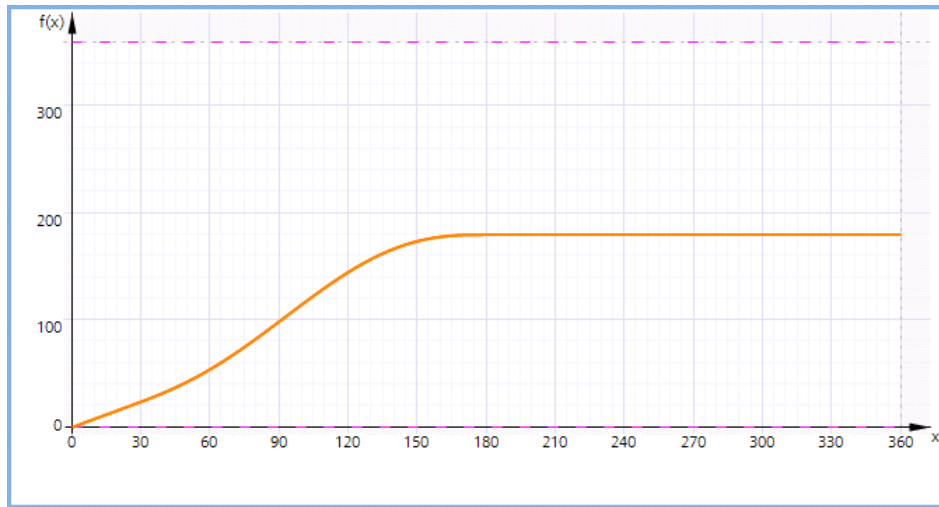


Figure 2-19 standstillCam

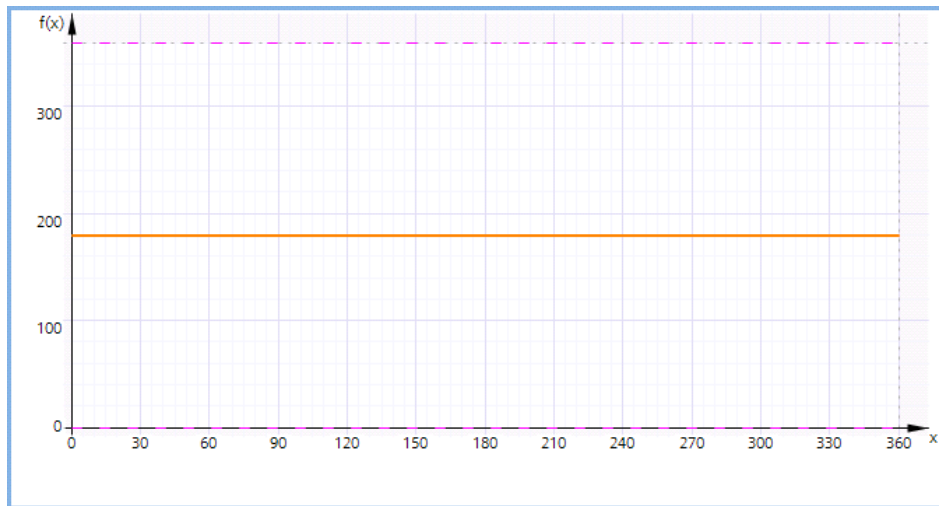
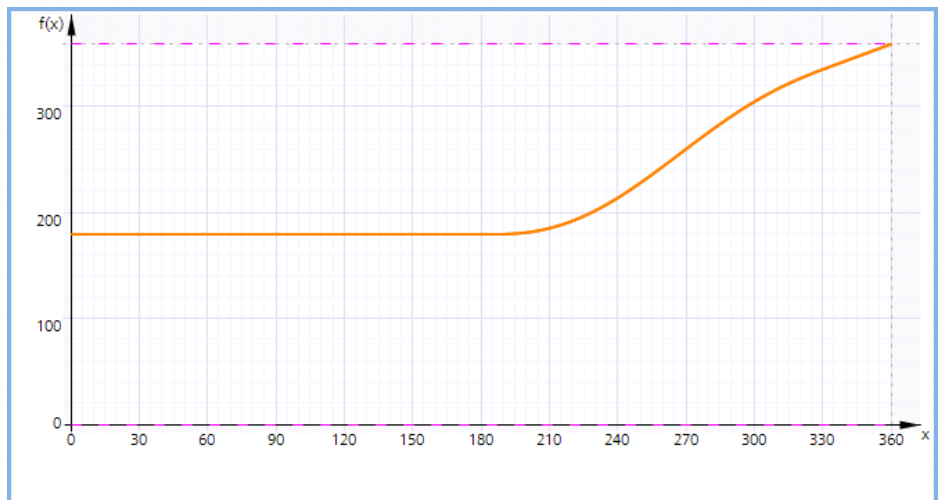


Figure 2-20 startCam



**Input parameters**

Table 2-39 LFFS\_CylCrossSealerCam input parameters

Parameter	Data type	Comment
enable	Bool	TRUE: enable functionality of FB (default: FALSE)
axis	TO_SynchronousAxis	Reference to the axis to be controlled (typically rotary axis type with modulo; start = 0°; length = 360°; length must elapse between two jaws)
enableAxis	Bool	TRUE: set axis enable; FALSE: remove axis enable (default: FALSE)
ackError	Bool	Rising edge: acknowledge errors of FB and alarms of axis (technology object) (default: FALSE)
fastStop	Bool	TRUE: enable fast stop, axis will be stopped (with fastStop dynamics) (default: FALSE)
home	Bool	Rising edge: home axis according to the selected 'parameters.home.mode' (default: FALSE)
jogForward	Bool	Rising edge: move axis in jog mode (forward); falling edge: stop axis (default: FALSE)
jogBackward	Bool	Rising edge: move axis in jog mode (backward); falling edge: stop axis (default: FALSE)
posRelative	Bool	Rising edge: move axis relative to its position (default: FALSE)
posAbsolute	Bool	Rising edge: move axis to an absolute position (e.g. open position 180°) (default: FALSE)
master	TO_PositioningAxis	Reference to the leading axis for synchronous operation (typically rotary axis type with modulo; start = 0°; length = 360°)
cyclicCam	DB_ANY	Reference to the cyclic cam disk (no configuration necessary, is created at runtime) (default: 0)
enableSyncOperation	Bool	TRUE: enable sealing (calculate/interpolate cams, move axis to corresponding synchronous position in cyclicCam or rather standstillCam if 'pauseSyncOperation' = TRUE, activate synchronous operation in standstill); FALSE: disable sealing (deactivate synchronous operation) (default: FALSE)
stopCam	DB_ANY	Optional (needed if pauseSyncOperation functionality shall be used): reference to the stop cam disk (no configuration necessary, is created at runtime) (default: 0)
standstillCam	DB_ANY	Optional (needed if pauseSyncOperation functionality shall be used): reference to the standstill cam disk (no configuration necessary, is created at runtime) (default: 0)

Parameter	Data type	Comment
startCam	DB_ANY	Optional (needed if pauseSyncOperation functionality shall be used): reference to the start cam disk (no configuration necessary, is created at runtime) (default: 0)
pauseSyncOperation	Bool	Optional: TRUE: suspend/pause sealing (startCam/cyclicCam -> stopCam -> standstillCam); FALSE: continue sealing (stopCam/standstillCam -> startCam -> cyclicCam) Note: parameter <i>pauseSyncOperationCheckPos</i> defines when this input is being evaluated. (default: FALSE)
parameters	LFFS_type CylCrossSealerCam Parameters	Parameters (e.g. home position, ...)
dynamics	LFFS_type CrossSealerCam Dynamics	Dynamics (e.g. jog velocity, ...)

### Output parameters

Table 2-40 LFFS\_CylCrossSealerCam output parameters

Parameter	Data type	Comment
valid	Bool	TRUE: valid set of output values available at the FB (default: FALSE)
busy	Bool	TRUE: FB is not finished and new output values can be expected (default: FALSE)
error	Bool	TRUE: an error occurred during the execution of the FB (default: FALSE)
status	Word	16#0000 - 16#7FFF: status of the FB, 16#8000 - 16#FFFF: error identification (default: 16#7000, STATUS_NO_CALL)
axisEnabled	Bool	TRUE: axis enabled (default: FALSE)
fastStopActive	Bool	TRUE: fast stop is active (default: FALSE)
fastStopDone	Bool	TRUE: fast stop is done (default: FALSE)
ready	Bool	TRUE: FB is ready for start of a new functionality (active homing, jog, pos, ...) (default: FALSE)
homingActive	Bool	TRUE: homing is active (default: FALSE)
homingDone	Bool	TRUE: homing is done (default: FALSE)
jogActive	Bool	TRUE: jogging is active (default: FALSE)

Parameter	Data type	Comment
posRelativeActive	Bool	TRUE: relative positioning is active (default: FALSE)
posRelativeDone	Bool	TRUE: relative positioning is done (default: FALSE)
posAbsoluteActive	Bool	TRUE: absolute positioning is active (default: FALSE)
posAbsoluteDone	Bool	TRUE: absolute positioning is done (default: FALSE)
syncOperationActive	Bool	TRUE: synchronous operation is active (default: FALSE)
cyclicCamActive	Bool	TRUE: cyclic cam disk is currently being used for camming (default: FALSE)
stopCamActive	Bool	TRUE: stop cam disk is currently being used for camming (default: FALSE)
standstillCamActive	Bool	TRUE: standstill cam disk is currently being used for camming (default: FALSE)
startCamActive	Bool	TRUE: start cam disk is currently being used for camming (default: FALSE)
changeParamsOnTheFlyDone	Bool	TRUE: cam disk relevant parameters (bag length, scaling factor) have been changed on-the-fly. Note: signal is only present for one block call (default: FALSE)
diagnostics	LFFS_typeDiagnostics	Diagnostics information of FB

### Status and error displays

Table 2-41 LFFS\_CylCrossSealerCam status and error displays

Status	Meaning	Comment
16#7000	STATUS_NO_CALL	No call of FB
16#7001	STATUS_FIRST_CALL	First call of FB after enabling
16#7002	STATUS_SUBSEQUENT_CALL	Subsequent call of FB
16#7003	WARN_AXIS_NOT_ENABLED	Axis is not enabled, requested functionality requires an enabled axis
16#7004	WARN_AXIS_NOT_HOMED	Axis is not homed, requested functionality requires a homed axis
16#700A	WARN_MASTER_NOT_ENABLED	Master is not enabled, requested functionality requires an enabled master
16#700B	WARN_MASTER_NOT_HOMED	Master is not homed, requested functionality requires a homed master
16#700D	WARN_MASTER_NOT_STANDSTILL	Master is not at a standstill, requested functionality requires a master at a standstill
16#700E	WARN_MASTER_HOMING_ACTIVE	Homing command active at master



Status	Meaning	Comment
16#7013	WARN_PAUSE_SYNC_OP_NOT_POSSIBLE	Cam disk references (startCam, stopCam, standstillCam) for pauseSyncOperation functionality not available or not valid (data type of the DB addressed by corresponding input parameter must be TO_Cam)
16#8212	ERR_CYCLIC_CAM_TYPE_INVALID	The data type of the DB addressed by input parameter 'cyclicCam' must be TO_Cam
16#8213	ERR_AXIS_MODULO_DISABLED	Axis configuration: Modulo function (<TO>.Modulo.Enable) is not enabled at axis
16#8214	ERR_AXIS_MODULO_STARTVALUE_INVALID	Axis configuration: Modulo start value (<TO>.Modulo.StartValue) not equal to 0.0
16#8215	ERR_MASTER_MODULO_DISABLED	Master configuration: Modulo function (<TO>.Modulo.Enable) is not enabled at master
16#8216	ERR_MASTER_MODULO_STARTVALUE_INVALID	Master configuration: Modulo start value (<TO>.Modulo.StartValue) not equal to 0.0
16#8600	ERR_MC_POWER	Internally called function block MC_Power returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8602	ERR_MC_HOME	Internally called function block MC_Home returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8622	ERR_MC_HOME_ABORTED	Internally called function block MC_Home returned CommandAborted
16#8604	ERR_MC_HALT	Internally called function block MC_Halt returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8624	ERR_MC_HALT_ABORTED	Internally called function block MC_Halt returned CommandAborted
16#8605	ERR_MC_MOVEJOG	Internally called function block MC_MoveJog (continuous jogging) returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8625	ERR_MC_MOVEJOG_ABORTED	Internally called function block MC_MoveJog returned CommandAborted
16#8607	ERR_MC_MOVERELATIVE	Internally called function block MC_MoveRelative returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8627	ERR_MC_MOVERELATIVE_ABORTED	Internally called function block MC_MoveRelative returned CommandAborted
16#8608	ERR_MC_MOVEABSOLUTE	Internally called function block MC_MoveAbsolute returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8628	ERR_MC_MOVEABSOLUTE_ABORTED	Internally called function block MC_MoveAbsolute returned CommandAborted
16#860A	ERR_MC_GEARIN	Internally called function block MC_GearIn returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#860D	ERR_MC_CAMIN	Internally called function block MC_CamIn returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#862D	ERR_MC_CAMIN_ABORTED	Internally called function block MC_CamIn returned CommandAborted
16#8612	ERR_MC_GETCAMFOLLOWINGVALUE	Internally called function block MC_GetCamFollowingValue returned an error (ErrorID -> diagnostics.subfunctionStatus)

Status	Meaning	Comment
16#8640	ERR_CREATECAMS	Internally called function block LFFS_UnpubCreateCamsCylCrossSealerCam returned an error (errorID -> diagnostics.subfunctionStatus)
16#8700	ERR_UNDEFINED_STATE	Error due to an undefined state in state machine
16#8701	ERR_UNDEFINED_SUB_STATE	Error due to an undefined state in subsidiary state machine

Table 2-42 LFFS\_UnpubCreateCamsCylCrossSealerCam error displays

Status	Meaning	Comment
16#8200	ERR_NUMBER_OF_JAWS_INVALID	Input parameter 'numberOfJaws' must be > 0
16#8201	ERR_DIAMETER_INVALID	Input parameter 'diameter' must be > 0.0
16#8202	ERR_BAG_LENGTH_INVALID	Input parameter 'bagLength' must be > 0.0
16#8203	ERR_MODULO_LENGTH_INVALID	Input parameters 'moduloLength' and 'moduloLengthMaster' must be > 0.0
16#8205	ERR_SCALING_FACTOR_INVALID	Input parameter 'syncRangeScaling' must be >= 0.5 and <= 2.0
16#8206	ERR_SYNC_RUN_TOO_LONG	Synchronous run longer than 95% of the bag length
16#8207	ERR_SYNC_RANGE_START_INVALID	Input parameter 'syncRangeStart' must be > (0.5*'moduloLength') and < 'moduloLength'
16#8208	ERR_SYNC_RANGE_END_INVALID	Input parameter 'syncRangeEnd' must be > 0.0 and < (0.5*'moduloLength')
16#8601	ERR_CREATE_START_CAM	Internally called function block LCamHdl_CreateCamAdvanced returned an error (errorID -> diagnostics.subfunctionStatus) when creating the start cam disk
16#8602	ERR_CREATE_CYCLIC_CAM	Internally called function block LCamHdl_CreateCamAdvanced returned an error (errorID -> diagnostics.subfunctionStatus) when creating the cyclic cam disk
16#8603	ERR_CREATE_STOP_CAM	Internally called function block LCamHdl_CreateCamAdvanced returned an error (errorID -> diagnostics.subfunctionStatus) when creating the stop cam disk
16#8604	ERR_CREATE_STANDSTILL_CAM	Internally called function block LCamHdl_CreateCamAdvanced returned an error (errorID -> diagnostics.subfunctionStatus) when creating the standstill cam disk
16#8605	ERR_GET_MIN_MAX_START_CAM	Internally called function block LCamHdl_GetCamFollowingMinMax returned an error (errorID -> diagnostics.subfunctionStatus) when determining the minima and maxima of the start cam disk
16#8606	ERR_GET_MIN_MAX_CYCLIC_CAM	Internally called function block LCamHdl_GetCamFollowingMinMax returned an error (errorID -> diagnostics.subfunctionStatus) when determining the minima and maxima of the cyclic cam disk
16#8607	ERR_GET_MIN_MAX_STOP_CAM	Internally called function block LCamHdl_GetCamFollowingMinMax returned an error (errorID -> diagnostics.subfunctionStatus) when determining the minima and maxima of the stop cam disk

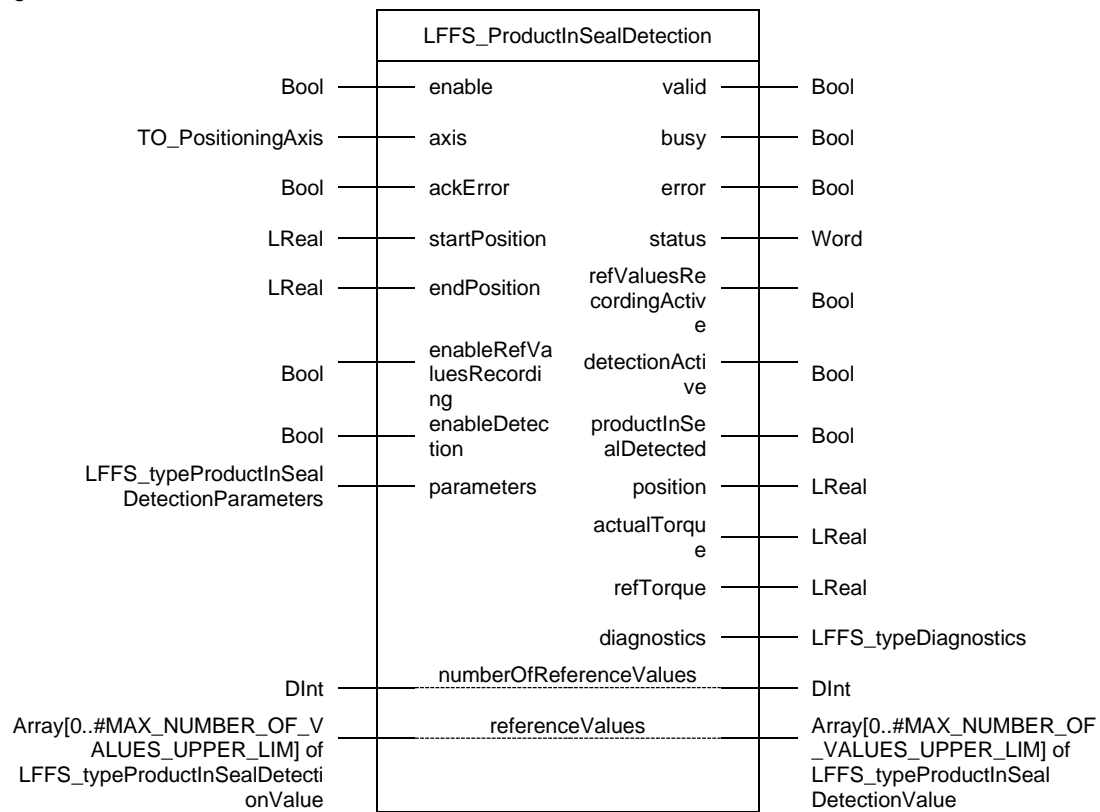
## 2 Engineering

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Status	Meaning	Comment
16#8608	ERR_REVERSE_MOTION	The calculated cam disk results in a reverse motion of the slave axis -> Input parameters have to be checked and adapted
16#8700	ERR_UNDEFINED_STATE	Error due to an undefined state in state machine

### 2.1.12 FB LFFS\_ProductInSealDetection (FB 31522)

Figure



#### Principle of operation

This block can be used for product inclusion detection at the cross sealer.

Within a definable position range ('startPosition', 'endPosition'), the actual torque value of the cross sealer axis is compared with a corresponding reference value. If the permissible difference (+/-) of the actual torque value to the reference value is exceeded, the output 'productInSealDetected' is set. The position based set of reference torque values can also be recorded with this block (input 'enableRefValuesRecording').

**NOTE** SIEMENS supplementary telegram 750 for transmitting the torque data of the drive to the axis technology object must be configured.  
It is recommended to call this block in MC-PostServo.

#### Input parameters

Table 2-43 LFFS\_ProductInSealDetection input parameters

Parameter	Data type	Comment
enable	Bool	TRUE: enable functionality of FB (default: FALSE)
axis	TO_PositioningAxis	Reference to the axis

Parameter	Data type	Comment
ackError	Bool	Rising edge: acknowledge errors of FB (default: FALSE)
startPosition	LReal	Start position of the position range where the detection shall be active (value must be within modulo range if axis is a modulo axis) (default: 0.0)
endPosition	LReal	End position of the position range where the detection shall be active (value must be within modulo range if axis is a modulo axis) (default: 0.0)
enableRefValuesRecording	Bool	TRUE: start acquiring of reference values if axis position gets between 'startPosition' and 'endPosition'; FALSE: disable acquiring of reference values if axis position is not between 'startPosition' and 'endPosition' (default: FALSE)
enableDetection	Bool	TRUE: enable monitoring of actual torque (default: FALSE)
parameters	LFFS_typeProductInSeal DetectionParameters	Parameters

### Output parameters

Table 2-44 LFFS\_ProductInSealDetection output parameters

Parameter	Data type	Comment
valid	Bool	TRUE: valid set of output values available at the FB (default: FALSE)
busy	Bool	TRUE: FB is not finished and new output values can be expected (default: FALSE)
error	Bool	TRUE: an error occurred during the execution of the FB (default: FALSE)
status	Word	16#0000 - 16#7FFF: status of the FB, 16#8000 - 16#FFFF: error identification (default: 16#7000, STATUS_NO_CALL)
refValuesRecordingActive	Bool	TRUE: acquiring of reference values is active (default: FALSE)
detectionActive	Bool	TRUE: monitoring of actual torque is active (default: FALSE)
productInSealDetected	Bool	TRUE: permissible difference (+/-) of the actual torque value to the reference value exceeded (default: FALSE)
position	LReal	Position of the axis (<TO>.Position) (default: 0.0)
actualTorque	LReal	Actual torque of the axis (<TO>.StatusTorqueData.ActualTorque) (default: 0.0)

Parameter	Data type	Comment
refTorque	LReal	Corresponding torque from 'referenceValues' (valid when 'detectionActive' = TRUE) (default: 0.0)
diagnostics	LFFS_typeDiagnostics	Diagnostics information of FB

### InOut parameters

Table 2-45 LFFS\_ProductInSealDetection InOut parameters

Parameter	Data type	Comment
numberOfReferenceValues	DInt	Number of elements of array 'referenceValues' used for torque monitoring
referenceValues	Array[0..#MAX_NUMBER_OF_VALUES_UPPER_LIM] of LFFS_typeProductInSealDetectionValue	Active set of reference values used for torque monitoring. Note: Do not change while detection is active (output 'detectionActive' = TRUE)

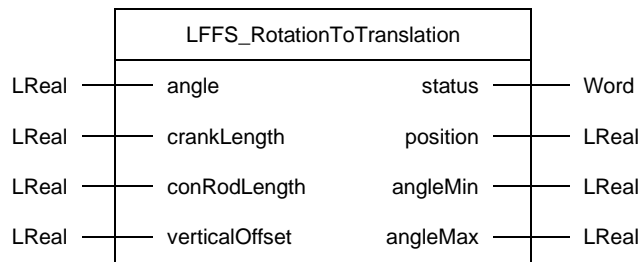
### Status and error displays

Table 2-46 LFFS\_ProductInSealDetection status and error displays

Status	Meaning	Comment
16#7000	STATUS_NO_CALL	No call of FB
16#7001	STATUS_FIRST_CALL	First call of FB after enabling
16#7002	STATUS_SUBSEQUENT_CALL	Subsequent call of FB
16#8214	ERR_AXIS_MODULO_STARTVALUE_INVALID	Axis configuration: modulo start value (<TO>.Modulo.StartValue) not equal to 0.0
16#8650	ERR_REF_VALUES_ARRAY_TOO_SMALL	Recording has stopped because the internal reference values array is full. Increase local constant MAX_NUMBER_OF_VALUES_UPPER_LIM
16#8651	ERR_REF_VALUES_ARRAY_EMPTY	Detection is not possible because the active reference values array (InOut 'referenceValues') is empty or InOut 'numberOfReferenceValues' is <= 0
16#8700	ERR_UNDEFINED_STATE	Error due to an undefined state in state machine

### 2.1.13 FB LFFS\_RotationToTranslation (FB 31513)

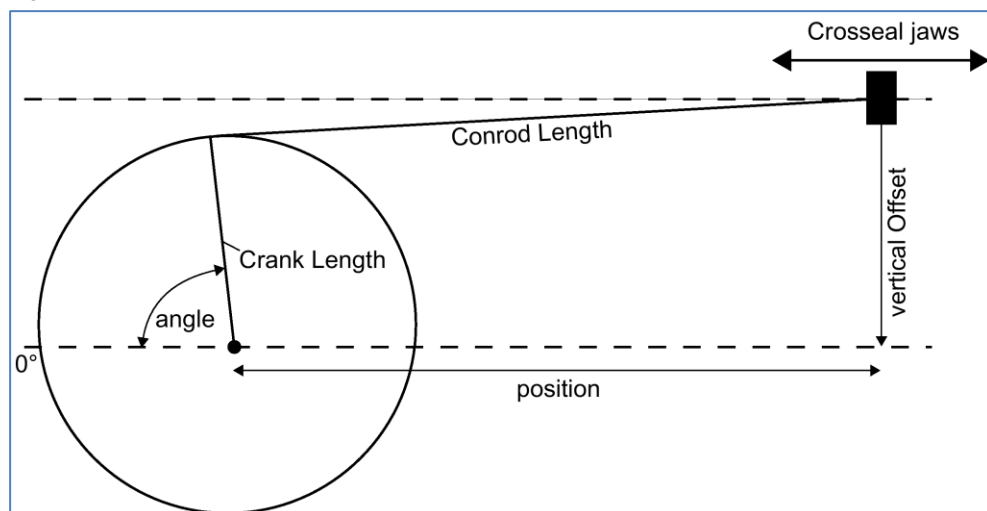
Figure



#### Principle of operation

The LFFS\_RotationToTranslation block transforms the angle of a rotary axis (crank angle) into the linear position (position of the con-rod end point) of a slider-crank mechanical system.

Figure 2-21



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#### Input parameters

Table 2-47 LFFS\_RotationToTranslation input parameters

Parameter	Data type	Comment
angle	LReal	Angle of the crank to be converted [°] (default: 0.0)
crankLength	LReal	Crank length [mm] (default: 0.0)
conRodLength	LReal	Con-rod length [mm] (default: 0.0)
verticalOffset	LReal	Vertical offset [mm] (default: 0.0)

## Output parameters

Table 2-48 LFFS\_RotationToTranslation output parameters

Parameter	Data type	Comment
status	Word	Status of the function; 16#0000: calculation finished successfully; 16#8000 - 16#FFFF: error identification (default: 16#0000, CALCULATION_CORRECT)
position	LReal	Result of transformation angle to position [mm] (default: 0.0)
angleMin	LReal	Minimum angle [°] (default: 0.0)
angleMax	LReal	Maximum angle [°] (default: 0.0)

## Status and error displays

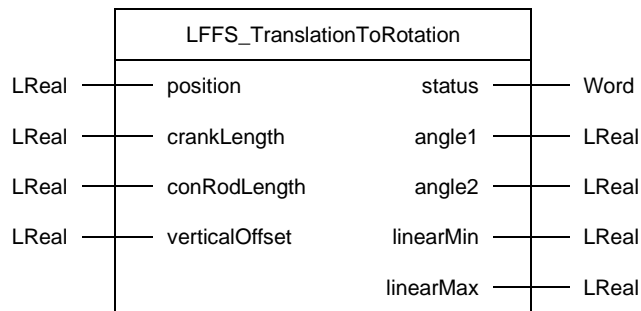
Table 2-49 LFFS\_RotationToTranslation status and error displays

Status	Meaning	Comment
16#0000	CALCULATION_CORRECT	Calculation finished successfully
16#8200	ERR_CRANK_OR_CONROD_LENGTH_INVALID	Input parameters 'crankLength' and 'conRodLength' must be > 0.0
16#8201	ERR_VERTICAL_OFFSET_INVALID	Input parameter 'verticalOffset' has to be checked -> ABS(verticalOffset) must be less than or equal to (crankLength + conRodLength)
16#8202	ERR_SET_OF_INPUT_PARAMETERS_INVALID	Set of input parameters has to be checked
16#8203	ERR_ANGLE_EXCEEDS_CALCULATED_MIN_MAX	Input parameter 'angle' must be greater than or equal to the calculated output parameter 'angleMin' and less than or equal to the calculated output parameter 'angleMax'



### 2.1.14 FB LFFS\_TranslationToRotation (FB 31516)

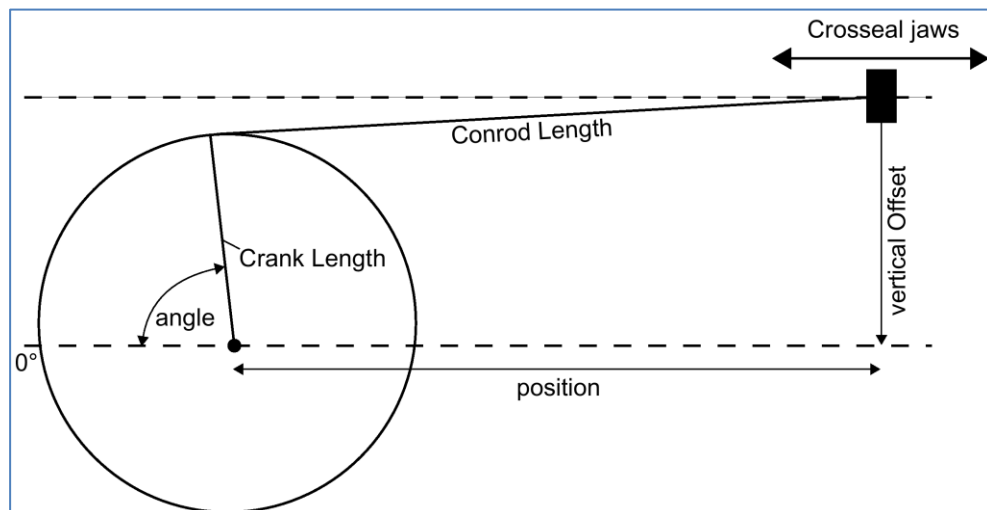
Figure



#### Principle of operation

The LFFS\_TranslationToRotation block transforms the linear position (position of the con-rod end point) of a slider-crank mechanical system into the angle of a rotary axis (crank angle).

Figure 2-22



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#### Input parameters

Table 2-50 LFFS\_TranslationToRotation input parameters

Parameter	Data type	Comment
position	LReal	Linear position of the con-rod to be converted [mm] (default: 0.0)
crankLength	LReal	Crank length [mm] (default: 0.0)
conRodLength	LReal	Con-rod length [mm] (default: 0.0)
verticalOffset	LReal	Vertical offset [mm] (default: 0.0)

## Output parameters

Table 2-51 LFFS\_TranslationToRotation output parameters

Parameter	Data type	Comment
Status	Word	Status of the function; 16#0000: calculation finished successfully; 16#8000 - 16#FFFF: error identification (default: 16#0000, CALCULATION_CORRECT)
angle1	LReal	First result of transformation position to angle [°] (default: 0.0)
angle2	LReal	Second result of transformation position to angle [°] (default: 0.0)
linearMin	LReal	Minimum linear position [mm] (default: 0.0)
linearMax	LReal	Maximum linear position [mm] (default: 0.0)

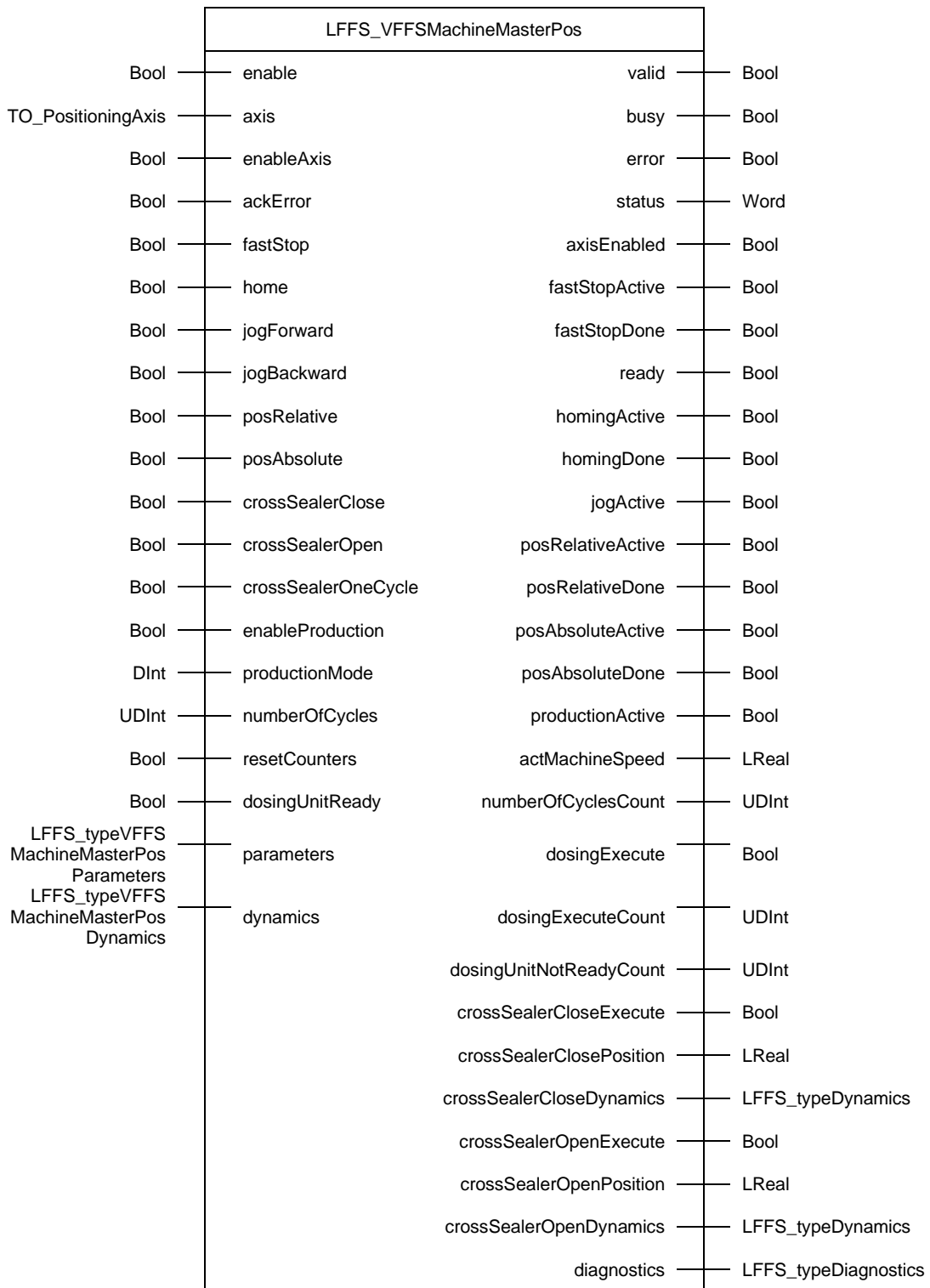
## Status and error displays

Table 2-52 LFFS\_TranslationToRotation status and error displays

Status	Meaning	Comment
16#0000	CALCULATION_CORRECT	Calculation finished successfully
16#8200	ERR_CRANK_OR_CONROD_LENGTH_INVALID	Input parameters 'crankLength' and 'conRodLength' must be > 0.0
16#8201	ERR_VERTICAL_OFFSET_INVALID	Input parameter 'verticalOffset' has to be checked -> ABS(verticalOffset) must be less than or equal to (crankLength + conRodLength)
16#8202	ERR_SET_OF_INPUT_PARAMETERS_INVALID	Set of input parameters has to be checked
16#8204	ERR_POSITION_EXCEEDS_CALCULATED_MIN_MAX	Input parameter 'position' must be greater than or equal to the calculated output parameter 'linearMin' and less than or equal to the calculated output parameter 'linearMax'

### 2.1.15 FB LFFS\_VFFSMachineMasterPos (FB 31517)

Figure



#### Principle of operation

The LFFS\_VFFSMachineMasterPos block controls the (virtual) machine master axis of a vertical FFS machine incl. activation of the dosing unit (dump signal) and

cross sealer (start positioning). Typically, this axis is with modulo function (e.g. 0..360°) and the modulo length represents one bag length. The machine master start/stop position for production is 0.0. Ramp up/down is always done within one master modulo cycle. The output dosingExecute is given in such a way that the master axis passes through its modulo transition after the dosing activation time has elapsed. The output crossSealerCloseExecute is given in such a way that the cross sealer reaches the close position when the master axis passes through its modulo transition.

**NOTE** The call interval of this block determines the switching accuracy of output dosingExecute, ... .

**NOTE** For the calculation of motion profile details, the blocks LCalcMC\_MoveVelocityDistance, LCalcMC\_MoveVelocityTime and LCalcMC\_PositioningTime are used internally, i.e. the LCalcMC library \3\ is required.

**Supported functionalities**

- Enable / disable axis
- Reset errors and acknowledge technology alarms of the axis
- Fast stop
- Manual homing
- Jog forward / backward
- Relative positioning
- Absolute positioning
- Production mode

Only one functionality that results in an active axis movement can be active at the same time. Input *fastStop* has the highest priority. No other axis movement can be started via the block while input *fastStop* is set.

**Input parameters**

Table 2-53 LFFS\_VFFSMachineMasterPos input parameters

Parameter	Data type	Comment
enable	Bool	TRUE: enable functionality of FB (default: FALSE)
axis	TO_PositioningAxis	Reference to the virtual machine master axis to be controlled (typically rotary axis type with modulo; start = 0°; length = 360°)
enableAxis	Bool	TRUE: set axis enable; FALSE: remove axis enable (default: FALSE)
ackError	Bool	Rising edge: acknowledge errors of FB and alarms of axis (technology object) (default: FALSE)

Parameter	Data type	Comment
fastStop	Bool	TRUE: enable fast stop, axis will be stopped (with fastStop dynamics) (default: FALSE)
home	Bool	Rising edge: home axis according to the selected 'parameters.home.mode' (default: FALSE)
jogForward	Bool	Rising edge: move axis in jog mode (forward); falling edge: stop axis (default: FALSE)
jogBackward	Bool	Rising edge: move axis in jog mode (backward); falling edge: stop axis (default: FALSE)
posRelative	Bool	Rising edge: move axis relative to its position (default: FALSE)
posAbsolute	Bool	Rising edge: move axis to an absolute position (default: FALSE)
crossSealerClose	Bool	Rising edge: close cross sealer manually (default: FALSE)
crossSealerOpen	Bool	Rising edge: open cross sealer manually (default: FALSE)
crossSealerOneCycle	Bool	Rising edge: start one cross sealer cycle manually (close, seal, open) (default: FALSE)
enableProduction	Bool	TRUE: start production; FALSE: stop production (default: FALSE)
productionMode	DInt	0: continuous (endless production) 1: counting (produce until a defined number of cycles is reached, two cycles minimum) 2: single cycle (produce one cycle) Note: one cycle means one master modulo cycle (default: 0)
numberOfCycles	UDInt	Target number of cycles (two cycles minimum, only relevant if 'productionMode' = 1), i.e. production is executed until 'numberOfCyclesCount' >= 'numberOfCycles'. Note: the resulting actual number of cycles can vary, if production is interrupted by 'dosingUnitReady' = FALSE (default: 2)
resetCounters	Bool	Rising edge: reset counter outputs (only possible if output 'productionActive' = FALSE) (default: FALSE)

Parameter	Data type	Comment
dosingUnitReady	Bool	TRUE: dosing unit ready to drop Note: signal is checked at start of production and during production when the 'dosingExecute' signal is to be given (default: FALSE)
parameters	LFFS_typeVFFSMachineMasterPos Parameters	Parameters (e.g. home position, ...)
dynamics	LFFS_typeVFFSMachineMasterPos Dynamics	Dynamics (e.g. jog velocity, ...)

### Output parameters

Table 2-54 LFFS\_VFFSMachineMasterPos output parameters

Parameter	Data type	Comment
valid	Bool	TRUE: valid set of output values available at the FB (default: FALSE)
busy	Bool	TRUE: FB is not finished and new output values can be expected (default: FALSE)
error	Bool	TRUE: an error occurred during the execution of the FB (default: FALSE)
status	Word	16#0000 - 16#7FFF: status of the FB, 16#8000 - 16#FFFF: error identification (default: 16#7000, STATUS_NO_CALL)
axisEnabled	Bool	TRUE: axis enabled (default: FALSE)
fastStopActive	Bool	TRUE: fast stop is active (default: FALSE)
fastStopDone	Bool	TRUE: fast stop is done (default: FALSE)
ready	Bool	TRUE: FB is ready for start of a new functionality (active homing, jog, pos, ...) (default: FALSE)
homingActive	Bool	TRUE: homing is active (default: FALSE)
homingDone	Bool	TRUE: homing is done (default: FALSE)
jogActive	Bool	TRUE: jogging is active (default: FALSE)
posRelativeActive	Bool	TRUE: relative positioning is active (default: FALSE)
posRelativeDone	Bool	TRUE: relative positioning is done (default: FALSE)
posAbsoluteActive	Bool	TRUE: absolute positioning is active (default: FALSE)
posAbsoluteDone	Bool	TRUE: absolute positioning is done (default: FALSE)

Parameter	Data type	Comment
productionActive	Bool	TRUE: machine is producing (default: FALSE)
actMachineSpeed	LReal	Actual machine speed (machine cycles per minute) [ppm] (valid if 'productionActive' = TRUE) (default: 0.0)
numberOfCyclesCount	UDInt	Actual number of cycles since last counter reset (input 'resetCounters'). Note: Value is incremented at the modulo transition of the master axis (at the end of the modulo cycle) (default: 0)
dosingExecute	Bool	Rising edge: execute signal for dosing (e.g. dump signal). Note: signal is only present for one block call (default: FALSE)
dosingExecuteCount	UDInt	Number of 'dosingExecute' times where the dosingUnit signaled ready ('dosingUnitReady' = TRUE) since last counter reset (input 'resetCounters') (default: 0)
dosingUnitNotReadyCount	UDInt	Number of 'dosingExecute' times where the dosingUnit signaled not ready ('dosingUnitReady' = FALSE) since last counter reset (input 'resetCounters') (default: 0)
crossSealerCloseExecute	Bool	Rising edge: execute signal for the MC_MoveAbsolute instruction for cross sealer closing. Note: signal is only present for one block call (default: FALSE)
crossSealerClosePosition	LReal	Position for the MC_MoveAbsolute instruction for cross sealer closing [mm] ([°] in case of slider-crank) (default: 0.0)
crossSealerCloseDynamics	LFFS_typeDynamics	Dynamics for the MC_MoveAbsolute instruction for cross sealer closing
crossSealerOpenExecute	Bool	Rising edge: execute signal for the MC_MoveAbsolute instruction for cross sealer opening. Note: signal is only present for one block call (default: FALSE)
crossSealerOpenPosition	LReal	Position for the MC_MoveAbsolute instruction for cross sealer opening [mm] ([°] in case of slider-crank) (default: 0.0)
crossSealerOpenDynamics	LFFS_typeDynamics	Dynamics for the MC_MoveAbsolute instruction for cross sealer opening
diagnostics	LFFS_typeDiagnostics	Diagnostics information of FB

**Status and error displays**

Table 2-55 LFFS\_VFFSMachineMasterPos status and error displays

Status	Meaning	Comment
16#7000	STATUS_NO_CALL	No call of FB
16#7001	STATUS_FIRST_CALL	First call of FB after enabling
16#7002	STATUS_SUBSEQUENT_CALL	Subsequent call of FB
16#7003	WARN_AXIS_NOT_ENABLED	Axis is not enabled, requested functionality requires an enabled axis
16#7004	WARN_AXIS_NOT_HOMED	Axis is not homed, requested functionality requires a homed axis
16#7005	WARN_AXIS_ACTIVE	A motion job is in progress or the axis control panel is activated
16#7006	WARN_AXIS_NOT_STANDSTILL	Axis is not at a standstill, requested functionality requires an axis at a standstill
16#7009	WARN_AXIS_HOMING_ACTIVE	Homing command active at axis
16#7010	WARN_DOSING_NOT_READY_S USPEND	Dosing unit not ready to drop (input parameter 'dosingUnitReady' = FALSE). Production is suspended until dosing unit signals ready.
16#7011	WARN_DOSING_NOT_READY_E MPTY_BAG	Dosing unit not ready to drop (input parameter 'dosingUnitReady' = FALSE). Empty bag is produced because suspending is not possible.
16#7017	WARN_MACHINE_SPEED_LIMITE D	Machine speed is limited due to a long seal time -> 'parameters.production.crossSealer.sealTime'. Note: The input parameters 'parameters.production.crossSealer.close*/open*' and 'parameters.production.crossSealer.masterPosSealEnd' also influence the remaining time for the sealing process.
16#7018	WARN_AXIS_NOT_IN_START_PO SITION	Axis is not in start position (PRODUCTION_START_POSITION - MAX_POS_DIFF <= axis.Position <= PRODUCTION_START_POSITION + MAX_POS_DIFF), see local constants
16#7020	STATUS_PRODUCTION_DONE	Single cycle or defined number of cycles done (release input 'enableProduction')
16#8200	ERR_PRODUCTION_MODE_INVA LID	Input parameter 'productionMode' invalid
16#8201	ERR_MACHINE_SPEED_INVALID	Input parameter 'parameters.production.machineSpeed' must be > 0.0
16#8203	ERR_SEAL_TIME_INVALID	Input parameter 'parameters.production.crossSealer.sealTime' must be > 0.0
16#8213	ERR_AXIS_MODULO_DISABLED	Axis configuration: modulo function (<TO>.Modulo.Enable) is not enabled at axis
16#8214	ERR_AXIS_MODULO_STARTVAL UE_INVALID	Axis configuration: modulo start value (<TO>.Modulo.StartValue) not equal to 0.0
16#8220	ERR_DOSING_ACT_TIME_INVALI D	Absolute value of input parameter 'parameters.dosingActivationTime' must be less than the calculated machine cycle time (calculated value -> diagnostics.additionalValue_1)
16#8221	ERR_CLOSE_TIME_INVALID	Input parameter 'parameters.production.crossSealer.closeByTime.time' must be > 0.0



Status	Meaning	Comment
16#8222	ERR_OPEN_TIME_INVALID	Input parameter 'parameters.production.crossSealer.openByTime.time' must be > 0.0
16#8223	ERR_AXIS_VELOCITY_OVERRIDE_INVALID	Axis configuration: velocity override (<TO>.Override.Velocity) not equal to 100.0
16#8224	ERR_AXIS_VELOCITY_LIMITED	Axis configuration: maximum velocity (<TO>.DynamicLimits.MaxVelocity, <TO>.DynamicLimits.Velocity) limits the calculated setpoint velocity (calculated value -> diagnostics.additionalValue_1)
16#8225	ERR_AXIS_ACCELERATION_LIMITED	Axis configuration: maximum acc/dec (<TO>.DynamicLimits.MaxAcceleration, <TO>.DynamicLimits.MaxDeceleration) limits the set acceleration/deceleration (dynamics.production.acceleration, dynamics.production.deceleration)
16#8226	ERR_AXIS_JERK_LIMITED	Axis configuration: maximum jerk (<TO>.DynamicLimits.MaxJerk) limits the set jerk (dynamics.production.jerk)
16#8227	ERR_PRODUCTION_DYNAMICS_TOO_SMALL	Set of input parameters 'dynamics.production' is too small to accelerate at least within half the modulo (bag) length from standstill to the calculated setpoint velocity
16#8228	ERR_NUMBER_OF_CYCLES_NOT_POSSIBLE	Set number of cycles for production mode counting is not possible with the current configuration (input 'numberOfCycles' must be greater than or equal to output 'numberOfCyclesCount' + 'diagnostics.additionalValue_1')
16#8229	ERR_STOPOVER_CLOSE_MOVE_TOPOS_TIME_INVALID	Input parameter 'parameters.production.crossSealer.closeByTime.stopover.moveToPosTime' must be > 0.0
16#822A	ERR_STOPOVER_CLOSE_DWELL_TIME_INVALID	Input parameter 'parameters.production.crossSealer.closeByTime.stopover.dwellTime' must be >= 0.0
16#822B	ERR_STOPOVER_CLOSE_SUM_OF_TIMES_INVALID	Sum of input parameters 'parameters.production.crossSealer.closeByTime.stopover.moveToPosTime' + 'parameters.production.crossSealer.closeByTime.stopover.dwellTime' must be less than 'parameters.production.crossSealer.closeByTime.time'
16#822C	ERR_STOPOVER_OPEN_MOVE_TOPOS_TIME_INVALID	Input parameter 'parameters.production.crossSealer.openByTime.stopover.moveToPosTime' must be > 0.0
16#822D	ERR_STOPOVER_OPEN_DWELL_TIME_INVALID	Input parameter 'parameters.production.crossSealer.openByTime.stopover.dwellTime' must be >= 0.0
16#822E	ERR_STOPOVER_OPEN_SUM_OF_TIMES_INVALID	Sum of input parameters 'parameters.production.crossSealer.openByTime.stopover.moveToPosTime' + 'parameters.production.crossSealer.openByTime.stopover.dwellTime' must be less than 'parameters.production.crossSealer.openByTime.time'

Status	Meaning	Comment
16#822F	ERR_MOVE_TO_CLOSE_DYNAMIC CS_INVALID	Set of dynamic parameters (velocity, acceleration, deceleration, jerk) in 'parameters.production.crossSealer.closeByDynamics' has to be checked
16#8230	ERR_MOVE_TO_STOPOVER_CLOSE_DYNAMIC DYNAMICS_INVALID	Set of dynamic parameters (velocity, acceleration, deceleration, jerk) in 'parameters.production.crossSealer.closeByDynamics.stopOver' has to be checked
16#8231	ERR_MOVE_TO_OPEN_DYNAMIC S_INVALID	Set of dynamic parameters (velocity, acceleration, deceleration, jerk) in 'parameters.production.crossSealer.openByDynamics' has to be checked
16#8232	ERR_MOVE_TO_STOPOVER_OPEN_DYNAMIC DYNAMICS_INVALID	Set of dynamic parameters (velocity, acceleration, deceleration, jerk) in 'parameters.production.crossSealer.openByDynamics.stopOver' has to be checked
16#8233	ERR_STOPOVER_CLOSE_BY_DYNAMIC DWELL_TIME_INVALID	Input parameter 'parameters.production.crossSealer.closeByDynamics.stopover.dwellTime' must be >= 0.0
16#8234	ERR_STOPOVER_OPEN_BY_DYNAMIC DWELL_TIME_INVALID	Input parameter 'parameters.production.crossSealer.openByDynamics.stopover.dwellTime' must be >= 0.0
16#8600	ERR_MC_POWER	Internally called function block MC_Power returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8602	ERR_MC_HOME	Internally called function block MC_Home returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8622	ERR_MC_HOME_ABORTED	Internally called function block MC_Home returned CommandAborted
16#8604	ERR_MC_HALT	Internally called function block MC_Halt returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8624	ERR_MC_HALT_ABORTED	Internally called function block MC_Halt returned CommandAborted
16#8605	ERR_MC_MOVEJOG	Internally called function block MC_MoveJog (continuous jogging) returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8625	ERR_MC_MOVEJOG_ABORTED	Internally called function block MC_MoveJog returned CommandAborted
16#8606	ERR_MC_MOVEVELOCITY	Internally called function block MC_MoveVelocity returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8626	ERR_MC_MOVEVELOCITY_ABORTED	Internally called function block MC_MoveVelocity returned CommandAborted
16#8607	ERR_MC_MOVERELATIVE	Internally called function block MC_MoveRelative returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8627	ERR_MC_MOVERELATIVE_ABORTED	Internally called function block MC_MoveRelative returned CommandAborted
16#8608	ERR_MC_MOVEABSOLUTE	Internally called function block MC_MoveAbsolute returned an error (ErrorID -> diagnostics.subfunctionStatus)
16#8628	ERR_MC_MOVEABSOLUTE_ABORTED	Internally called function block MC_MoveAbsolute returned CommandAborted

Status	Meaning	Comment
16#8643	ERR_MOVE_VELO_DIST_RAMP	Internally called function LCalcMC_MoveVelocityDistance returned an error (errorID -> diagnostics.subfunctionStatus -> see tag table LCalcMC_ErrorIDs) when calculating the ramp up/down distance
16#8644	ERR_MOVE_VELO_TIME_RAMP	Internally called function LCalcMC_MoveVelocityTime returned an error (errorID -> diagnostics.subfunctionStatus -> see tag table LCalcMC_ErrorIDs) when calculating the ramp up/down time
16#8645	ERR_NOT_ENOUGH_RESOURCES	Not enough resources (e.g. timers) for ramp up (increase local constant RAMP_UP_RESOURCES_UPPER_LIM, 'diagnostics.additionalValue_1' shows the required value)
16#8649	ERR_TRANSLATION_TO_ROTATION_1	Internally called function block LFFS_TranslationToRotation returned an error (errorID -> diagnostics.subfunctionStatus) when transforming the linear cross sealer open position into an angle (slider-crank)
16#864A	ERR_TRANSLATION_TO_ROTATION_2	Internally called function block LFFS_TranslationToRotation returned an error (errorID -> diagnostics.subfunctionStatus) when transforming the linear cross sealer close position into an angle (slider-crank)
16#864B	ERR_POSITIONING_JERK_1	Internally called function LCalcMC_PositioningJerk returned an error (errorID -> diagnostics.subfunctionStatus -> see tag table LCalcMC_ErrorIDs) when calculating the jerk for cross sealer closing
16#864C	ERR_POSITIONING_JERK_2	Internally called function LCalcMC_PositioningJerk returned an error (errorID -> diagnostics.subfunctionStatus -> see tag table LCalcMC_ErrorIDs) when calculating the jerk for cross sealer opening
16#864D	ERR_CALC_JERK_EXCEEDS_MAX_1	Calculated jerk for cross sealer closing (diagnostics.additionalValue_1) exceeds the specified maximum value ('parameters.production.crossSealer.closeByTime.maxJerk')
16#864E	ERR_CALC_JERK_EXCEEDS_MAX_2	Calculated jerk for cross sealer opening (diagnostics.additionalValue_1) exceeds the specified maximum value ('parameters.production.crossSealer.openByTime.maxJerk')
16#864F	ERR_POSITIONING_TIME_SINGLE_CYCLE	Internally called function LCalcMC_PositioningTime returned an error (errorID -> diagnostics.subfunctionStatus -> see tag table LCalcMC_ErrorIDs) when calculating the time for positioning the master axis one modulo length
16#8652	ERR_TRANSLATION_TO_ROTATION_3	Internally called function block LFFS_TranslationToRotation returned an error (errorID -> diagnostics.subfunctionStatus) when transforming the linear cross sealer open stopover position into an angle (slider-crank)

Status	Meaning	Comment
16#8653	ERR_TRANSLATION_TO_ROTATION_4	Internally called function block LFFS_TranslationToRotation returned an error (errorID -> diagnostics.subfunctionStatus) when transforming the linear cross sealer close stopover position into an angle (slider-crank)
16#8655	ERR_POSITIONING_TIME_MOVE_TO_CLOSE	Internally called function LCalcMC_PositioningTime returned an error (errorID -> diagnostics.subfunctionStatus -> see tag table LCalcMC_ErrorIDs). Set of dynamic parameters (velocity, acceleration, deceleration, jerk) in 'parameters.production.crossSealer.closeByDynamics' has to be checked
16#8656	ERR_POSITIONING_TIME_MOVE_TO_STOPOVER_CLOSE	Internally called function LCalcMC_PositioningTime returned an error (errorID -> diagnostics.subfunctionStatus -> see tag table LCalcMC_ErrorIDs). Set of dynamic parameters (velocity, acceleration, deceleration, jerk) in 'parameters.production.crossSealer.closeByDynamics.stopOver' has to be checked
16#8657	ERR_POSITIONING_TIME_MOVE_TO_OPEN	Internally called function LCalcMC_PositioningTime returned an error (errorID -> diagnostics.subfunctionStatus -> see tag table LCalcMC_ErrorIDs). Set of dynamic parameters (velocity, acceleration, deceleration, jerk) in 'parameters.production.crossSealer.openByDynamics' has to be checked
16#8658	ERR_POSITIONING_TIME_MOVE_TO_STOPOVER_OPEN	Internally called function LCalcMC_PositioningTime returned an error (errorID -> diagnostics.subfunctionStatus -> see tag table LCalcMC_ErrorIDs). Set of dynamic parameters (velocity, acceleration, deceleration, jerk) in 'parameters.production.crossSealer.openByDynamics.stopOver' has to be checked
16#8700	ERR_UNDEFINED_STATE	Error due to an undefined state in state machine
16#8701	ERR_UNDEFINED_SUB_STATE	Error due to an undefined state in subsidiary state machine

## 2.1.16 PLC data types

### LFFS\_typeMachineMasterGearParameters

Table 2-56: LFFS\_typeMachineMasterGearParameters

Name	Data type	Default value	Comment
home	Struct		Parameters for homing
position	LReal	0.0	The specified value is used according to the selected 'mode'
mode	Int	0	0: direct homing (absolute) 1: direct homing (relative) 3: active homing 5: active homing (Position parameter has no effect) 6: absolute encoder adjustment (relative) 7: absolute encoder adjustment (absolute)
posRelative	Struct		Parameters for relative positioning
distance	LReal	0.0	Distance for positioning process
posAbsolute	Struct		Parameters for absolute positioning
position	LReal	0.0	Absolute target position
direction	Int	1	Motion direction of the axis 1: Positive direction 2: Negative direction 3: Shortest way
production	Struct		Parameters for production
machineSpeed	LReal	0.0	Machine speed (machine cycles per minute) [ppm]. Note: value change is also taken into account if production is active
stopPositionFactor	LReal	0.5	Machine stop position factor (permitted range $\geq 0.0$ and $\leq 1.0$ ). Resulting stop position = 0..100% of bag length or rather modulo length
syncOperation	Struct		Parameters for synchronous operation (gearing) with additional master, e.g. ext. encoder of upstream machine
posToSyncPos Direction	Int	1	Motion direction of the axis 1: positive direction 2: negative direction 3: shortest way for positioning the axis (slave) to the synchronous position
additionalGearFactors	Struct		Additional factors for gearing ratio
numerator	DInt	1	Factor numerator (value 0 not permitted)
denominator	DInt	1	Factor denominator (only positive values are permitted)
offset	LReal	0.0	Absolute phase shift for offset adjustment (offset in slave value range), value is limited internally to +/- half modulo length, actual/active value -> see output 'actOffset'. Note: value change is also taken into account if syncOperation is active
masterStandstillWindow	LReal	1.0	The velocity of the master must be within this window when input 'enableSyncOperation' is given (only relevant if data type of input 'master' is TO_ExternalEncoder). Note: the standstill signal <TO>.StatusWord.X7 is used in case of TO_PositioningAxis or TO_SynchronousAxis

**LFFS\_typeMachineMasterGearDynamics**

Table 2-57: LFFS\_typeMachineMasterGearDynamics

Name	Data type	Default value	Comment
general	Struct		Dynamics for jog, positioning, "pos axis to synchronous position"
posRelativeVelocity	LReal	-1.0	Velocity setpoint for relative positioning (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Velocity' configured at the technology object is used)
posAbsoluteVelocity	LReal	-1.0	Velocity setpoint for absolute positioning (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Velocity' configured at the technology object is used)
posToSyncPos Velocity	LReal	-1.0	Velocity setpoint for positioning the axis to the synchronous position (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Velocity' configured at the technology object is used)
jogVelocity	LReal	20.0	Velocity setpoint for jog mode (value >= 0.0: the specified value is used; value < 0.0: not permitted)
acceleration	LReal	-1.0	Acceleration setpoint (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Acceleration' configured at the technology object is used)
deceleration	LReal	-1.0	Deceleration setpoint (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Deceleration' configured at the technology object is used)
jerk	LReal	-1.0	Jerk setpoint (value > 0.0: smooth velocity profile, the specified value is used; value = 0.0: trapezoidal velocity profile; value < 0.0: value 'DynamicDefaults.Jerk' configured at the technology object is used)
fastStop	Struct		Dynamics for fast stop (have to be faster than other dynamics)
deceleration	LReal	-1.0	Deceleration setpoint for fast stop (value > 0.0: the specified value is used; value <= 0.0: value 'DynamicDefaults.EmergencyDeceleration' configured at the technology object is used)
jerk	LReal	-1.0	Jerk setpoint for fast stop (value > 0.0: smooth velocity profile, the specified value is used; value = 0.0: trapezoidal velocity profile; value < 0.0: value 'DynamicDefaults.Jerk' configured at the technology object is used)
offsetChange	Struct		Dynamics for phase shifting (offset adjustment via MC_MoveSuperimposed)
velocityDiff	LReal	-1.0	Maximum velocity deviation compared to the active motion (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Velocity' configured at the technology object is used)
acceleration	LReal	-1.0	Acceleration setpoint (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Acceleration' configured at the technology object is used)

Name	Data type	Default value	Comment
deceleration	LReal	-1.0	Deceleration setpoint (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Deceleration' configured at the technology object is used)
jerk	LReal	-1.0	Jerk setpoint (value > 0.0: smooth velocity profile, the specified value is used; value = 0.0: trapezoidal velocity profile; value < 0.0: value 'DynamicDefaults.Jerk' configured at the technology object is used)
production	Struct		Dynamics for production (Note: Velocity is calculated from parameter machineSpeed, see corresponding parameters structure)
acceleration	LReal	-1.0	Acceleration setpoint for production (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Acceleration' configured at the technology object is used)
deceleration	LReal	-1.0	Deceleration setpoint for production (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Deceleration' configured at the technology object is used)
jerk	LReal	-1.0	Jerk setpoint for production (value > 0.0: smooth velocity profile, the specified value is used; value = 0.0: trapezoidal velocity profile; value < 0.0: value 'DynamicDefaults.Jerk' configured at the technology object is used)

### LFFS\_typeMachineMasterPosParameters

Table 2-58: LFFS\_typeMachineMasterPosParameters

Name	Data type	Default value	Comment
home	Struct		Parameters for homing
position	LReal	0.0	The specified value is used according to the selected 'mode'
mode	Int	0	0: direct homing (absolute) 1: direct homing (relative) 3: active homing 5: active homing (Position parameter has no effect) 6: absolute encoder adjustment (relative) 7: absolute encoder adjustment (absolute)
posRelative	Struct		Parameters for relative positioning
distance	LReal	0.0	Distance for positioning process
posAbsolute	Struct		Parameters for absolute positioning
position	LReal	0.0	Absolute target position
direction	Int	1	Motion direction of the axis 1: Positive direction 2: Negative direction 3: Shortest way
production	Struct		Parameters for production
machineSpeed	LReal	0.0	Machine speed (machine cycles per minute) [ppm]. Note: value change is also taken into account if production is active

Name	Data type	Default value	Comment
stopPositionFactor	LReal	0.5	Machine stop position factor (permitted range $\geq 0.0$ and $\leq 1.0$ ). Resulting stop position = 0..100% of bag length or rather modulo length

### LFFS\_typeMachineMasterPosDynamics

Table 2-59: LFFS\_typeMachineMasterPosDynamics

Name	Data type	Default value	Comment
general	Struct		Dynamics for jog, positioning
posRelativeVelocity	LReal	-1.0	Velocity setpoint for relative positioning (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Velocity' configured at the technology object is used)
posAbsoluteVelocity	LReal	-1.0	Velocity setpoint for absolute positioning (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Velocity' configured at the technology object is used)
jogVelocity	LReal	20.0	Velocity setpoint for jog mode (value $\geq 0.0$ : the specified value is used; value < 0.0: not permitted)
acceleration	LReal	-1.0	Acceleration setpoint (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Acceleration' configured at the technology object is used)
deceleration	LReal	-1.0	Deceleration setpoint (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Deceleration' configured at the technology object is used)
jerk	LReal	-1.0	Jerk setpoint (value > 0.0: smooth velocity profile, the specified value is used; value = 0.0: trapezoidal velocity profile; value < 0.0: value 'DynamicDefaults.Jerk' configured at the technology object is used)
fastStop	Struct		Dynamics for fast stop (have to be faster than other dynamics)
deceleration	LReal	-1.0	Deceleration setpoint for fast stop (value > 0.0: the specified value is used; value $\leq 0.0$ : value 'DynamicDefaults.EmergencyDeceleration' configured at the technology object is used)
jerk	LReal	-1.0	Jerk setpoint for fast stop (value > 0.0: smooth velocity profile, the specified value is used; value = 0.0: trapezoidal velocity profile; value < 0.0: value 'DynamicDefaults.Jerk' configured at the technology object is used)
production	Struct		Dynamics for production (Note: Velocity is calculated from parameter machineSpeed, see corresponding parameters structure)
acceleration	LReal	-1.0	Acceleration setpoint for production (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Acceleration' configured at the technology object is used)
deceleration	LReal	-1.0	Deceleration setpoint for production (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Deceleration' configured at the technology object is used)



Name	Data type	Default value	Comment
jerk	LReal	-1.0	Jerk setpoint for production (value > 0.0: smooth velocity profile, the specified value is used; value = 0.0: trapezoidal velocity profile; value < 0.0: value 'DynamicDefaults.Jerk' configured at the technology object is used)

### LFFS\_typeDiagnostics

Table 2-60: LFFS\_typeDiagnostics

Name	Data type	Default value	Comment
status	Word	16#0000	Status of the FB or error identification when error occurred
subfunctionStatus	Word	16#0000	Status or return value of called FBs, FCs and system blocks
additionalValue	Word	16#0000	Additional error value (subfunctionStatus of subfunction)
additionalValue_1	LReal	0.0	Additional error value
stateNumber	DInt	0	State in the state machine of the FB when the error occurred

### LFFS\_typeNPNBMasterCamParameters

Table 2-61: LFFS\_typeNPNBMasterCamParameters

Name	Data type	Default value	Comment
home	Struct		Parameters for homing
position	LReal	0.0	The specified value is used according to the selected 'mode'
mode	Int	0	0: direct homing (absolute) 1: direct homing (relative) 3: active homing 5: active homing (Position parameter has no effect) 6: absolute encoder adjustment (relative) 7: absolute encoder adjustment (absolute)
posRelative	Struct		Parameters for relative positioning
distance	LReal	0.0	Distance for positioning process
posAbsolute	Struct		Parameters for absolute positioning
position	LReal	0.0	Absolute target position
direction	Int	1	Motion direction of the axis 1: Positive direction 2: Negative direction 3: Shortest way
syncOperation	Struct		Parameters for synchronous operation
posToSyncPos Direction	Int	1	Motion direction of the axis 1: positive direction 2: negative direction 3: shortest way for positioning the axis (slave) to the synchronous position

Name	Data type	Default value	Comment
camCheck	Struct		Parameters for cam profile verification
totalNumberOfSamples	Int	361	Total number of samples per complete leading value range (definition range) of the cam disk for MC_GetCamFollowingValue functionality. Use of 721 samples for leading value range 360° means every 0.5° one sample
numberOfSamplesPerCall	Int	14	Number of samples ("MC_GetCamFollowingValue calls") per block call. The higher the value, the higher the OB runtime, but less OB calls necessary
pauseSyncOperation CheckPos	LReal	0.8	"value" * "modulo length of master axis" -> input 'pauseSyncOperation' is checked at this master position and the subsequent MC_CamIn command for cam exchange functionality (e.g. from cyclicCam to stopCam) is executed

### LFFS\_typeNPNBMasterCamDynamics

Table 2-62: LFFS\_typeNPNBMasterCamDynamics

Name	Data type	Default value	Comment
general	Struct		Dynamics for jog, positioning, "pos axis to synchronous position"
posRelativeVelocity	LReal	-1.0	Velocity setpoint for relative positioning (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Velocity' configured at the technology object is used)
posAbsoluteVelocity	LReal	-1.0	Velocity setpoint for absolute positioning (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Velocity' configured at the technology object is used)
posToSyncPos Velocity	LReal	-1.0	Velocity setpoint for positioning the axis to the synchronous position (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Velocity' configured at the technology object is used)
jogVelocity	LReal	20.0	Velocity setpoint for jog mode (value >= 0.0: the specified value is used; value < 0.0: not permitted)
acceleration	LReal	-1.0	Acceleration setpoint (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Acceleration' configured at the technology object is used)
deceleration	LReal	-1.0	Deceleration setpoint (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Deceleration' configured at the technology object is used)
jerk	LReal	-1.0	Jerk setpoint (value > 0.0: smooth velocity profile, the specified value is used; value = 0.0: trapezoidal velocity profile; value < 0.0: value 'DynamicDefaults.Jerk' configured at the technology object is used)
fastStop	Struct		Dynamics for fast stop (have to be faster than other dynamics)

Name	Data type	Default value	Comment
deceleration	LReal	-1.0	Deceleration setpoint for fast stop (value > 0.0: the specified value is used; value <= 0.0: value 'DynamicDefaults.EmergencyDeceleration' configured at the technology object is used)
jerk	LReal	-1.0	Jerk setpoint for fast stop (value > 0.0: smooth velocity profile, the specified value is used; value = 0.0: trapezoidal velocity profile; value < 0.0: value 'DynamicDefaults.Jerk' configured at the technology object is used)

### LFFS\_typeDynamics

Table 2-63: LFFS\_typeDynamics

Name	Data type	Default value	Comment
velocity	LReal	0.0	Velocity
acceleration	LReal	0.0	Acceleration
deceleration	LReal	0.0	Deceleration
jerk	LReal	0.0	Jerk

### LFFS\_typeTappetChainGearParameters

Table 2-64: LFFS\_typeTappetChainGearParameters

Name	Data type	Default value	Comment
home	Struct		Parameters for homing
position	LReal	0.0	The specified value is used according to the selected 'mode'
mode	Int	0	0: direct homing (absolute) 1: direct homing (relative) 3: active homing 5: active homing (Position parameter has no effect) 6: absolute encoder adjustment (relative) 7: absolute encoder adjustment (absolute)
posRelative	Struct		Parameters for relative positioning
distance	LReal	0.0	Distance for positioning process
posAbsolute	Struct		Parameters for absolute positioning
position	LReal	0.0	Absolute target position
direction	Int	1	Motion direction of the axis 1: Positive direction 2: Negative direction 3: Shortest way
syncOperation	Struct		Parameters for synchronous operation
posToSyncPos Direction	Int	1	Motion direction of the axis 1: positive direction 2: negative direction 3: shortest way for positioning the axis (slave) to the synchronous position

Name	Data type	Default value	Comment
offset	LReal	0.0	Absolute phase shift for offset adjustment (offset in slave value range), value is limited internally to +/- half modulo length, actual/active value -> see output 'actOffset'. Note: value change is also taken into account if syncOperation is active
pocketLength	LReal	0.0	Length of one pocket [mm] (value is compared with modulo length of axis at block enable, modulo length of axis is adjusted in case of inequality)
continuousHoming	Bool	FALSE	TRUE: home axis with incremental encoder continuously via passive homing when axis is moved (see passive homing configuration at the technology object, the home position is taken from 'parameters.home.position')

### LFFS\_typeTappetChainGearDynamics

Table 2-65: LFFS\_typeTappetChainGearDynamics

Name	Data type	Default value	Comment
general	Struct		Dynamics for jog, positioning, "pos axis to synchronous position"
posRelativeVelocity	LReal	-1.0	Velocity setpoint for relative positioning (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Velocity' configured at the technology object is used)
posAbsoluteVelocity	LReal	-1.0	Velocity setpoint for absolute positioning (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Velocity' configured at the technology object is used)
posToSyncPos Velocity	LReal	-1.0	Velocity setpoint for positioning the axis to the synchronous position (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Velocity' configured at the technology object is used)
jogVelocity	LReal	20.0	Velocity setpoint for jog mode (value >= 0.0: the specified value is used; value < 0.0: not permitted)
acceleration	LReal	-1.0	Acceleration setpoint (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Acceleration' configured at the technology object is used)
deceleration	LReal	-1.0	Deceleration setpoint (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Deceleration' configured at the technology object is used)
jerk	LReal	-1.0	Jerk setpoint (value > 0.0: smooth velocity profile, the specified value is used; value = 0.0: trapezoidal velocity profile; value < 0.0: value 'DynamicDefaults.Jerk' configured at the technology object is used)
fastStop	Struct		Dynamics for fast stop (have to be faster than other dynamics)
deceleration	LReal	-1.0	Deceleration setpoint for fast stop (value > 0.0: the specified value is used; value <= 0.0: value 'DynamicDefaults.EmergencyDeceleration' configured at the technology object is used)

Name	Data type	Default value	Comment
jerk	LReal	-1.0	Jerk setpoint for fast stop (value > 0.0: smooth velocity profile, the specified value is used; value = 0.0: trapezoidal velocity profile; value < 0.0: value 'DynamicDefaults.Jerk' configured at the technology object is used)
offsetChange	Struct		Dynamics for phase shifting (offset adjustment via MC_MoveSuperimposed)
velocityDiff	LReal	-1.0	Maximum velocity deviation compared to the active motion (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Velocity' configured at the technology object is used)
acceleration	LReal	-1.0	Acceleration setpoint (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Acceleration' configured at the technology object is used)
deceleration	LReal	-1.0	Deceleration setpoint (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Deceleration' configured at the technology object is used)
jerk	LReal	-1.0	Jerk setpoint (value > 0.0: smooth velocity profile, the specified value is used; value = 0.0: trapezoidal velocity profile; value < 0.0: value 'DynamicDefaults.Jerk' configured at the technology object is used)

### LFFS\_typeFoilFeedGearParameters

Table 2-66: LFFS\_typeFoilFeedGearParameters

Name	Data type	Default value	Comment
home	Struct		Parameters for homing
position	LReal	0.0	The specified value is used according to the selected 'mode'
mode	Int	0	0: direct homing (absolute) 1: direct homing (relative) 3: active homing 5: active homing (Position parameter has no effect) 6: absolute encoder adjustment (relative) 7: absolute encoder adjustment (absolute)
posRelative	Struct		Parameters for relative positioning
distance	LReal	0.0	Distance for positioning process
posAbsolute	Struct		Parameters for absolute positioning
position	LReal	0.0	Absolute target position
syncOperation	Struct		Parameters for synchronous operation
bagLength	LReal	0.0	Bag length [mm] -> used for gear ratio between master and foil feed axis (ratio = "bag length" / "modulo length master")
gearRatioNumerator	DInt	0	Value = 0: value is ignored. The gear ratio between master and foil feed axis = "bag length" / "modulo length master"; value <> 0: the specified value is used as gear ratio numerator

Name	Data type	Default value	Comment
gearRatioDenominator	DInt	1	If 'gearRatioNumerator' $\neq$ 0: the specified value is used as gear ratio denominator (only positive values are permitted)

### LFFS\_typeFoilFeedCamParameters

Table 2-67: LFFS\_typeFoilFeedCamParameters

Name	Data type	Default value	Comment
home	Struct		Parameters for homing
position	LReal	0.0	The specified value is used according to the selected 'mode'
mode	Int	0	0: direct homing (absolute) 1: direct homing (relative) 3: active homing 5: active homing (Position parameter has no effect) 6: absolute encoder adjustment (relative) 7: absolute encoder adjustment (absolute)
posRelative	Struct		Parameters for relative positioning
distance	LReal	0.0	Distance for positioning process
posAbsolute	Struct		Parameters for absolute positioning
position	LReal	0.0	Absolute target position
syncOperation	Struct		Parameters for synchronous operation
bagLength	LReal	0.0	Bag length [mm]
camProfile	DInt	0	0: continuous feeding (created cam disk consists of one segment: constant velocity) 1: intermittent feeding (created cam disk consists of three segments: dwell, 5th degree polynomial, dwell)
masterPosStartFeeding	LReal	0.0	Start point for feeding (only relevant if 'camProfile' = 1)
masterPosEndFeeding	LReal	0.0	End point for feeding (only relevant if 'camProfile' = 1)

### LFFS\_typeFoilFeedDynamics

Table 2-68: LFFS\_typeFoilFeedDynamics

Name	Data type	Default value	Comment
general	Struct		Dynamics for jog, positioning
posRelativeVelocity	LReal	-1.0	Velocity setpoint for relative positioning (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Velocity' configured at the technology object is used)
posAbsoluteVelocity	LReal	-1.0	Velocity setpoint for absolute positioning (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Velocity' configured at the technology object is used)
jogVelocity	LReal	20.0	Velocity setpoint for jog mode (value $\geq$ 0.0: the specified value is used; value < 0.0: not permitted)

Name	Data type	Default value	Comment
acceleration	LReal	-1.0	Acceleration setpoint (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Acceleration' configured at the technology object is used)
deceleration	LReal	-1.0	Deceleration setpoint (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Deceleration' configured at the technology object is used)
jerk	LReal	-1.0	Jerk setpoint (value > 0.0: smooth velocity profile, the specified value is used; value = 0.0: trapezoidal velocity profile; value < 0.0: value 'DynamicDefaults.Jerk' configured at the technology object is used)
fastStop	Struct		Dynamics for fast stop (have to be faster than other dynamics)
deceleration	LReal	-1.0	Deceleration setpoint for fast stop (value > 0.0: the specified value is used; value <= 0.0: value 'DynamicDefaults.EmergencyDeceleration' configured at the technology object is used)
jerk	LReal	-1.0	Jerk setpoint for fast stop (value > 0.0: smooth velocity profile, the specified value is used; value = 0.0: trapezoidal velocity profile; value < 0.0: value 'DynamicDefaults.Jerk' configured at the technology object is used)

### LFFS\_typeFoilGuideParameters

Table 2-69: LFFS\_typeFoilGuideParameters

Name	Data type	Default value	Comment
leftHandSideMounted	Bool	FALSE	TRUE: sensors are mounted on left-hand side in foil moving direction; FALSE: sensors are mounted on right-hand side in foil moving direction
minOnMoveFoilOutputs	Time	T#1s	Minimum on-time for outputs 'moveFoilRight' and 'moveFoilLeft' (negative values are not permitted)
maxOnMonitoring MoveFoilOutputs	Time	T#10s	Monitoring time (max on-time) for outputs 'moveFoilRight' and 'moveFoilLeft' (negative values are not permitted)

### LFFS\_typeAnalogDancerControlParameters

Table 2-70: LFFS\_typeAnalogDancerControlParameters

Name	Data type	Default value	Comment
setpoint	Real	0.0	Setpoint for dancer position (permissible values: -100.0% to 100.0%)
gain	Real	2.0	Proportional gain
enableIntegralAction	Bool	FALSE	TRUE: integral action is on
integrationTime	Time	T#12ms	Time response of the integral action ('enableIntegralAction' = TRUE)
maxDwellTimeEnd Positions	Time	T#100ms	Maximum dwell time for dancer in upper/lower end position (negative values are not permitted) -> end position monitoring

Name	Data type	Default value	Comment
upperEndPosition	Real	95.0	Upper dancer end position (permissible values: -100.0% to 100.0%) -> end position monitoring
lowerEndPosition	Real	-95.0	Lower dancer end position (permissible values: -100.0% to 100.0%) -> end position monitoring

### LFFS\_typeBoxMotCrossSealerCamParameters

Table 2-71: LFFS\_typeBoxMotCrossSealerCamParameters

Name	Data type	Default value	Comment
home	Struct		Parameters for homing
position	LReal	0.0	The specified value is used according to the selected 'mode'
mode	Int	0	0: direct homing (absolute) 1: direct homing (relative) 3: active homing 5: active homing (Position parameter has no effect) 6: absolute encoder adjustment (relative) 7: absolute encoder adjustment (absolute)
posRelative	Struct		Parameters for relative positioning
distance	LReal	0.0	Distance for positioning process
posAbsolute	Struct		Parameters for absolute positioning
position	LReal	0.0	Absolute target position
syncOperation	Struct		Parameters for synchronous operation
bagLength	LReal	0.0	Bag length [mm]
mechanicalRangeStart	LReal	0.0	Start point of the mechanical traversing range of the slave [mm] (only negative values are permitted)
syncRangeStart	LReal	0.0	Start point of the synchronous range of the slave (cross sealer moves synchronous to the foil) [mm] (only negative values are permitted)
syncRangeScaling	LReal	1.0	Scaling factor (permitted range $\geq 0.5$ and $\leq 2.0$ ) for the synchronous range (value = 1.0: no scaling; value > 1.0: sealer faster than foil; value < 1.0: sealer slower than foil)
syncRangeEnd	LReal	0.0	End point of the synchronous range of the slave (cross sealer moves synchronous to the foil) [mm] (only positive values are permitted)
mechanicalRangeEnd	LReal	0.0	End point of the mechanical traversing range of the slave [mm] (only positive values are permitted)
camCheck	Struct		Parameters for cam profile verification
totalNumberOfSamples	Int	361	Total number of samples per complete leading value range (definition range) of the cam disk for MC_GetCamFollowingValue functionality. Use of 721 samples for leading value range 360° means every 0.5° one sample
numberOfSamplesPerCall	Int	14	Number of samples ("MC_GetCamFollowingValue calls") per block call. The higher the value, the higher the OB runtime, but less OB calls necessary



Name	Data type	Default value	Comment
pauseSyncOperation CheckPos	LReal	0.8	"value" * "modulo length of master axis" -> input 'pauseSyncOperation' is checked at this master position and the subsequent MC_CamIn command for cam exchange functionality (e.g. from cyclicCam to stopCam) is executed

### LFFS\_typeCrossSealerCamDynamics

Table 2-72: LFFS\_typeCrossSealerCamDynamics

Name	Data type	Default value	Comment
general	Struct		Dynamics for jog, positioning, "pos axis to synchronous position"
posRelativeVelocity	LReal	-1.0	Velocity setpoint for relative positioning (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Velocity' configured at the technology object is used)
posAbsoluteVelocity	LReal	-1.0	Velocity setpoint for absolute positioning (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Velocity' configured at the technology object is used)
posToSyncPos Velocity	LReal	-1.0	Velocity setpoint for positioning the axis to the synchronous position (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Velocity' configured at the technology object is used)
jogVelocity	LReal	20.0	Velocity setpoint for jog mode (value >= 0.0: the specified value is used; value < 0.0: not permitted)
acceleration	LReal	-1.0	Acceleration setpoint (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Acceleration' configured at the technology object is used)
deceleration	LReal	-1.0	Deceleration setpoint (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Deceleration' configured at the technology object is used)
jerk	LReal	-1.0	Jerk setpoint (value > 0.0: smooth velocity profile, the specified value is used; value = 0.0: trapezoidal velocity profile; value < 0.0: value 'DynamicDefaults.Jerk' configured at the technology object is used)
fastStop	Struct		Dynamics for fast stop (have to be faster than other dynamics)
deceleration	LReal	-1.0	Deceleration setpoint for fast stop (value > 0.0: the specified value is used; value <= 0.0: value 'DynamicDefaults.EmergencyDeceleration' configured at the technology object is used)
jerk	LReal	-1.0	Jerk setpoint for fast stop (value > 0.0: smooth velocity profile, the specified value is used; value = 0.0: trapezoidal velocity profile; value < 0.0: value 'DynamicDefaults.Jerk' configured at the technology object is used)

**LFFS\_typeCylCrossSealerCamParameters**

Table 2-73: LFFS\_typeCylCrossSealerCamParameters

Name	Data type	Default value	Comment
home	Struct		Parameters for homing
position	LReal	0.0	The specified value is used according to the selected 'mode'
mode	Int	0	0: direct homing (absolute) 1: direct homing (relative) 3: active homing 5: active homing (Position parameter has no effect) 6: absolute encoder adjustment (relative) 7: absolute encoder adjustment (absolute)
posRelative	Struct		Parameters for relative positioning
distance	LReal	0.0	Distance for positioning process
posAbsolute	Struct		Parameters for absolute positioning
position	LReal	180.0	Absolute target position (e.g. open position 180°)
direction	Int	3	Motion direction of the axis 1: Positive direction 2: Negative direction 3: Shortest way
syncOperation	Struct		Parameters for synchronous operation
posToSyncPos Direction	Int	3	Motion direction of the axis 1: positive direction 2: negative direction 3: shortest way for positioning the axis (slave) to the synchronous position
bagLength	LReal	0.0	Bag length [mm]
diameter	LReal	0.0	Cylindrical sealer diameter including jaws [mm]
syncRangeStart	LReal	345.0	Start point of the synchronous range of the slave (cross sealer moves synchronously to the foil) [°] (permitted range > 0.5*modulo length of cross sealer and < modulo length of cross sealer)
syncRangeScaling	LReal	1.0	Scaling factor (permitted range >= 0.5 and <= 2.0) for the synchronous range (value = 1.0: no scaling; value > 1.0: sealer faster than foil; value < 1.0: sealer slower than foil)
syncRangeEnd	LReal	15.0	End point of the synchronous range of the slave (cross sealer moves synchronously to the foil) [°] (permitted range > 0.0 and < 0.5*modulo length of cross sealer)
numberOfJaws	UInt	1	Number of sealing jaws on the cross sealer (only for cam disk calculation; mechanical settings, e.g. gear ratio, of the axis must be adjusted separately -> modulo length of cross sealer must elapse between two jaws)
camCheck	Struct		Parameters for cam profile verification

Name	Data type	Default value	Comment
totalNumberOfSamples	Int	361	Total number of samples per complete leading value range (definition range) of the cam disk for MC_GetCamFollowingValue functionality. Use of 721 samples for leading value range 360° means every 0.5° one sample
numberOfSamplesPerCall	Int	14	Number of samples ("MC_GetCamFollowingValue calls") per block call. The higher the value, the higher the OB runtime, but less OB calls necessary
changeParamsOnTheFly			Optional: second set of cam disk references needed for changing cam disk relevant parameters ('bagLength', 'syncRangeStart', 'syncRangeScaling', 'syncRangeEnd') on-the-fly, i.e. while synchronous operation is active
cyclicCam	DB_ANY	0	Reference to the second cyclic cam disk (no configuration necessary, is created at runtime). (value = 0: no valid reference, changing parameters on-the-fly not possible)
stopCam	DB_ANY	0	Reference to the second stop cam disk (no configuration necessary, is created at runtime). Note: this second cam disk reference is only needed if block input 'stopCam' <> 0
startCam	DB_ANY	0	Reference to the second start cam disk (no configuration necessary, is created at runtime). Note: this second cam disk reference is only needed if block input 'startCam' <> 0
pauseSyncOperation CheckPos	LReal	0.8	"value" * "modulo length of master axis" -> input 'pauseSyncOperation' is checked at this master position and the subsequent MC_CamIn command for cam exchange functionality (e.g. from cyclicCam to stopCam) is executed

**LFFS\_typeProductInSealDetectionValue**

Table 2-74: LFFS\_typeProductInSealDetectionValue

Name	Data type	Default value	Comment
position	LReal	0.0	
torque	LReal	0.0	

**LFFS\_typeProductInSealDetectionParameters**

Table 2-75: LFFS\_typeProductInSealDetectionParameters

Name	Data type	Default value	Comment
maxTorqueDifference	LReal	0.1	Permissible difference (+/-) of the actual torque value to the reference value [Nm]
direction	DInt	3	Start recording or detection only if the position range is entered in a specific direction 1: positive direction 2: negative direction 3: direction is ignored

**LFFS\_typeVFFSMachineMasterPosDynamics**

Table 2-76: LFFS\_typeVFFSMachineMasterPosDynamics

Name	Data type	Default value	Comment
general	Struct		Dynamics for jog, positioning
posRelativeVelocity	LReal	-1.0	Velocity setpoint for relative positioning (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Velocity' configured at the technology object is used)
posAbsoluteVelocity	LReal	-1.0	Velocity setpoint for absolute positioning (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Velocity' configured at the technology object is used)
jogVelocity	LReal	20.0	Velocity setpoint for jog mode (value >= 0.0: the specified value is used; value < 0.0: not permitted)
acceleration	LReal	-1.0	Acceleration setpoint (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Acceleration' configured at the technology object is used)
deceleration	LReal	-1.0	Deceleration setpoint (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Deceleration' configured at the technology object is used)
jerk	LReal	-1.0	Jerk setpoint (value > 0.0: smooth velocity profile, the specified value is used; value = 0.0: trapezoidal velocity profile; value < 0.0: value 'DynamicDefaults.Jerk' configured at the technology object is used)
fastStop	Struct		Dynamics for fast stop (have to be faster than other dynamics)
deceleration	LReal	-1.0	Deceleration setpoint for fast stop (value > 0.0: the specified value is used; value <= 0.0: value 'DynamicDefaults.EmergencyDeceleration' configured at the technology object is used)
jerk	LReal	-1.0	Jerk setpoint for fast stop (value > 0.0: smooth velocity profile, the specified value is used; value = 0.0: trapezoidal velocity profile; value < 0.0: value 'DynamicDefaults.Jerk' configured at the technology object is used)
production	Struct		Dynamics for production. Note: velocity is calculated from parameter machineSpeed, see corresponding parameters structure
acceleration	LReal	-1.0	Acceleration setpoint for production (value > 0.0: the

Name	Data type	Default value	Comment
			specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Acceleration' configured at the technology object is used)
deceleration	LReal	-1.0	Deceleration setpoint for production (value > 0.0: the specified value is used; value = 0.0: not permitted; value < 0.0: value 'DynamicDefaults.Deceleration' configured at the technology object is used)
jerk	LReal	-1.0	Jerk setpoint for production (value > 0.0: smooth velocity profile, the specified value is used; value = 0.0: trapezoidal velocity profile; value < 0.0: value 'DynamicDefaults.Jerk' configured at the technology object is used)

### LFFS\_typeVFFSMachineMasterPosParameters

Table 2-77: LFFS\_typeVFFSMachineMasterPosParameters

Name	Data type	Default value	Comment
home	Struct		Parameters for homing
position	LReal	0.0	The specified value is used according to the selected 'mode'
mode	Int	0	0: direct homing (absolute) 1: direct homing (relative) 3: active homing 5: active homing (position parameter has no effect) 6: absolute encoder adjustment (relative) 7: absolute encoder adjustment (absolute)
posRelative	Struct		Parameters for relative positioning
distance	LReal	0.0	Distance for positioning process
posAbsolute	Struct		Parameters for absolute positioning
position	LReal	0.0	Absolute target position
direction	Int	1	Motion direction of the axis 1: positive direction 2: negative direction 3: shortest way
production	Struct		Parameters for production. Note: value changes of the following parameters are also taken into account if machine is producing (output 'productionActive' = TRUE) -> 'machineSpeed', 'dosingActivationTime', 'crossSealer.sealTime', 'crossSealer.close/open.position', 'crossSealer.close/open.timeFactor'
machineSpeed	LReal	0.0	Machine speed (machine cycles per minute) [ppm]
dosingActivationTime	LReal	0.0	Time between dosing execute signal and cross sealer reaches its close position [s] (value > 0.0 means dosing signal is given in advance; value = "fall time" -> "dropped product falls onto the closed cross sealer")
dosingRecoveryTime	LReal	0.0	Dosing unit must become ready again within this time interval after the 'dosingExecute' signal has been given [s] (only relevant if 'stopDosingUnitNotReady' = TRUE, value > 0.0 means the additional check is activated)

Name	Data type	Default value	Comment
stopDosingUnitNotReady	Bool	TRUE	TRUE: suspend production (stop master axis) if dosing unit is not ready to drop
doNotFillLastBag	Bool	FALSE	TRUE: execute signal for dosing (e.g. dump signal) is not given for the last cycle of production (only relevant if 'startCycleWithCrossSealer' = FALSE)
startCycleWithCrossSealer	Bool	TRUE	TRUE: machine cycle is started with cross sealing
sealLastBag	Bool	FALSE	TRUE: cross sealing is triggered in the last cycle of production to seal and cut last bag (only relevant if 'startCycleWithCrossSealer' = TRUE)
crossSealer	Struct		Cross sealer (jaws axis) parameters
sealTime	LReal	0.0	Seal time [s]
masterPosSealEnd	LReal	0.0	Position of master axis until sealing (cross sealer closed, i.e. jaws in contact with foil) is allowed (value > 0.0: value is taken into account, can result in a reduction of the machine speed; value <= 0.0: not used)
sliderCrank	Struct		Optional: slider-crank parameters
crankLength	LReal	0.0	Optional: crank length [mm] (value must be > 0.0 in case of slider-crank)
conRodLength	LReal	0.0	Optional: con-rod length [mm] (value must be > 0.0 in case of slider-crank)
verticalOffset	LReal	0.0	Optional: vertical offset [mm] (only relevant in case of slider-crank)
useByTimeParams	Bool	TRUE	TRUE: 'closeByTime' and 'openByTime' parameters are used; FALSE: 'closeByDynamics' and 'openByDynamics' parameters are used
closeByTime	Struct		Closing movement is specified by time (minimum jerk that is needed to move a specified distance in a given time is calculated internally)
position	LReal	0.0	Close position cross sealer [mm] (linear position)
maxVelo	LReal	0.0	Maximum velocity for cross sealer closing movement [mm/s] ([°/s] in case of slider-crank)
maxAcc	LReal	0.0	Maximum acceleration/deceleration for cross sealer closing movement [mm/s²] ([°/s²] in case of slider-crank)
maxJerk	LReal	0.0	Maximum jerk for cross sealer closing movement [mm/s³] ([°/s³] in case of slider-crank)
time	LReal	0.0	Cross sealer closing time [s] Note: output 'crossSealerCloseExecute' is given in such a way that the cross sealer reaches the close position when the master axis passes through its modulo transition
stopOver	Struct		Optional: closing movement is divided into two parts - 1st movement is from open position to a stopover position, 2nd movement is from stopover position to close position
enable	Bool	FALSE	TRUE: enable stopover functionality
moveToPosTime	LReal	0.0	Time between start of cross sealer closing and reaching the stopover position [s]
position	LReal	0.0	Stopover position [mm] (linear position)
dwellTime	LReal	0.0	Cross sealer remains in the stopover position for this time [s]

Name	Data type	Default value	Comment
openByTime	Struct		Opening movement is specified by time (minimum jerk that is needed to move a specified distance in a given time is calculated internally)
position	LReal	0.0	Open position cross sealer [mm] (linear position)
maxVelo	LReal	0.0	Maximum velocity for cross sealer opening movement [mm/s] ([°/s] in case of slider-crank)
maxAcc	LReal	0.0	Maximum acceleration/deceleration for cross sealer opening movement [mm/s <sup>2</sup> ] ([°/s <sup>2</sup> ] in case of slider-crank)
maxJerk	LReal	0.0	Maximum jerk for cross sealer opening movement [mm/s <sup>3</sup> ] ([°/s <sup>3</sup> ] in case of slider-crank)
time	LReal	0.0	Cross sealer opening time [s]
stopOver	Struct		Optional: opening movement is divided into two parts - 1st movement is from close position to a stopover position, 2nd movement is from stopover position to open position
enable	Bool	FALSE	TRUE: enable stopover functionality
moveToPosTime	LReal	0.0	Time between start of cross sealer opening and reaching the stopover position [s]
position	LReal	0.0	Stopover position [mm] (linear position)
dwellTime	LReal	0.0	Cross sealer remains in the stopover position for this time [s]
closeByDynamics	Struct		Optional: closing movement is specified by a given set of dynamic parameters (velocity, acceleration, deceleration, jerk)
position	LReal	0.0	Close position cross sealer [mm] (linear position)
velocity	LReal	0.0	Velocity setpoint for cross sealer movement to the close position (value > 0.0: the specified value is used; value <= 0.0: not permitted) [mm/s] ([°/s] in case of slider-crank)
acceleration	LReal	0.0	Acceleration setpoint for cross sealer movement to the close position (value > 0.0: the specified value is used; value <= 0.0: not permitted) [mm/s <sup>2</sup> ] ([°/s <sup>2</sup> ] in case of slider-crank)
deceleration	LReal	0.0	Deceleration setpoint for cross sealer movement to the close position (value > 0.0: the specified value is used; value <= 0.0: not permitted) [mm/s <sup>2</sup> ] ([°/s <sup>2</sup> ] in case of slider-crank)
jerk	LReal	0.0	Jerk setpoint for cross sealer movement to the close position (value > 0.0: smooth velocity profile, the specified value is used; value = 0.0: trapezoidal velocity profile; value < 0.0: not permitted) [mm/s <sup>3</sup> ] ([°/s <sup>3</sup> ] in case of slider-crank)
stopOver	Struct		Optional: closing movement is divided into two parts - 1st movement is from open position to a stopover position, 2nd movement is from stopover position to close position
enable	Bool	FALSE	TRUE: enable stopover functionality
position	LReal	0.0	Stopover position [mm] (linear position)
velocity	LReal	0.0	Velocity setpoint for cross sealer movement to the stopover position (value > 0.0: the specified value is used; value <= 0.0: not permitted) [mm/s] ([°/s] in case of slider-crank)

Name	Data type	Default value	Comment
acceleration	LReal	0.0	Acceleration setpoint for cross sealer movement to the stopover position (value > 0.0: the specified value is used; value <= 0.0: not permitted) [mm/s <sup>2</sup> ] ([°/s <sup>2</sup> ] in case of slider-crank)
deceleration	LReal	0.0	Deceleration setpoint for cross sealer movement to the stopover position (value > 0.0: the specified value is used; value <= 0.0: not permitted) [mm/s <sup>2</sup> ] ([°/s <sup>2</sup> ] in case of slider-crank)
jerk	LReal	0.0	Jerk setpoint for cross sealer movement to the stopover position (value > 0.0: smooth velocity profile, the specified value is used; value = 0.0: trapezoidal velocity profile; value < 0.0: not permitted) [mm/s <sup>3</sup> ] ([°/s <sup>3</sup> ] in case of slider-crank)
dwelTime	LReal	0.0	Cross sealer remains in the stopover position for this time [s]
openByDynamics	Struct		Optional: opening movement is specified by a given set of dynamic parameters (velocity, acceleration, deceleration, jerk)
position	LReal	0.0	Open position cross sealer [mm] (linear position)
velocity	LReal	0.0	Velocity setpoint for cross sealer movement to the open position (value > 0.0: the specified value is used; value <= 0.0: not permitted) [mm/s] ([°/s] in case of slider-crank)
acceleration	LReal	0.0	Acceleration setpoint for cross sealer movement to the open position (value > 0.0: the specified value is used; value <= 0.0: not permitted) [mm/s <sup>2</sup> ] ([°/s <sup>2</sup> ] in case of slider-crank)
deceleration	LReal	0.0	Deceleration setpoint for cross sealer movement to the open position (value > 0.0: the specified value is used; value <= 0.0: not permitted) [mm/s <sup>2</sup> ] ([°/s <sup>2</sup> ] in case of slider-crank)
jerk	LReal	0.0	Jerk setpoint for cross sealer movement to the open position (value > 0.0: smooth velocity profile, the specified value is used; value = 0.0: trapezoidal velocity profile; value < 0.0: not permitted) [mm/s <sup>3</sup> ] ([°/s <sup>3</sup> ] in case of slider-crank)
stopOver	Struct		Optional: opening movement is divided into two parts - 1st movement is from close position to a stopover position, 2nd movement is from stopover position to open position
enable	Bool	FALSE	TRUE: enable stopover functionality
position	LReal	0.0	Stopover position [mm] (linear position)
velocity	LReal	0.0	Velocity setpoint for cross sealer movement to the stopover position (value > 0.0: the specified value is used; value <= 0.0: not permitted) [mm/s] ([°/s] in case of slider-crank)
acceleration	LReal	0.0	Acceleration setpoint for cross sealer movement to the stopover position (value > 0.0: the specified value is used; value <= 0.0: not permitted) [mm/s <sup>2</sup> ] ([°/s <sup>2</sup> ] in case of slider-crank)
deceleration	LReal	0.0	Deceleration setpoint for cross sealer movement to the stopover position (value > 0.0: the specified value is used; value <= 0.0: not permitted) [mm/s <sup>2</sup> ] ([°/s <sup>2</sup> ] in case of slider-crank)
jerk	LReal	0.0	Jerk setpoint for cross sealer movement to the



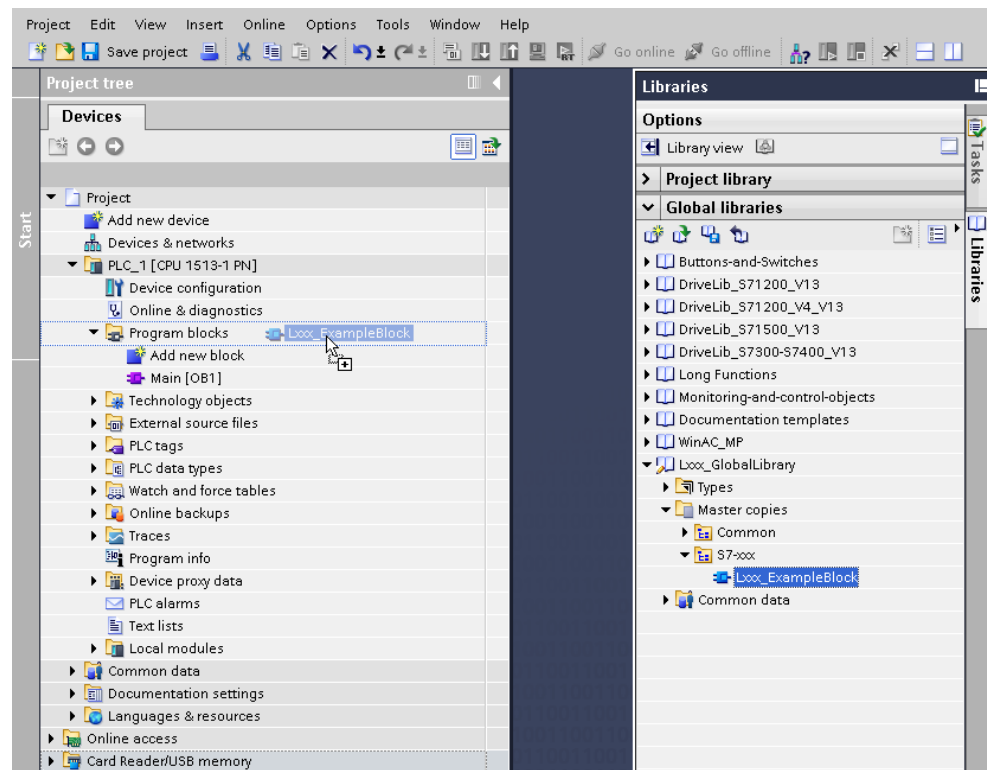
Name				Data type	Default value	Comment
						stopover position (value > 0.0: smooth velocity profile, the specified value is used; value = 0.0: trapezoidal velocity profile; value < 0.0: not permitted) [mm/s <sup>3</sup> ] ([°/s <sup>3</sup> ] in case of slider-crank)
			dwelTime	LReal	0.0	Cross sealer remains in the stopover position for this time [s]

## 2.2 Project integration

### 2.2.1 Integrating the library blocks into STEP 7

The table below lists the steps for integrating the blocks of the LFFS library into your STEP 7 program.

Figure 2-23: Integrating the library blocks into STEP 7



**NOTE** Please follow the sequence of inserting the folders.

Table 2-78: Integrating the library blocks into STEP 7

No.	Action
1.	Copy the data types, according to the requested functionality, from folder " S7-1500T → LFFS_Types" with Drag & Drop into the "PLC data types" in the PLC (Note: The data types from subfolder "General" are always needed). Alternatively you can copy the whole LFFS_Types folder.
2.	Copy the blocks, according to the requested functionality, from folder " S7-1500T → LFFS_Blocks" with Drag & Drop into the "Program blocks" in the PLC (Note: The blocks from subfolder "General" are always needed). Alternatively you can copy the whole LFFS_Blocks folder.
3.	Now the blocks can be configured and called in the user program.

**NOTE** Some of the LFFS blocks internally use blocks of other libraries -> see description of each block.

To save memory resources of the PLC, it is recommended to only integrate the required blocks of the other libraries.

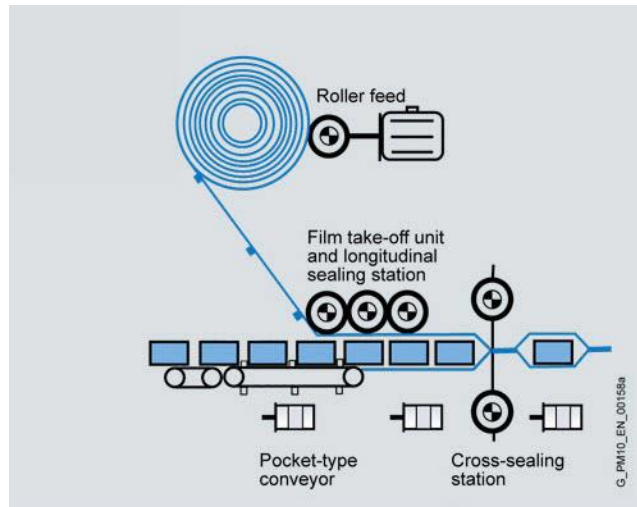
**NOTE** Parameter comments in the programming editor are only available in language 'English (United States)'

## 3 Application Examples

### 3.1 Continuous HFFS machine (flow wrapper)

The basic motion control part of a horizontal flow wrapper is described as example below. The example corresponds to the LFFS example project "LFFS\_Example\_ContinuousHFFS\_V1\_x\_x.zip". Note that not all interconnections are shown. Other required general functions, such as operating mode management, recipe management, alarm handling, ... are also not shown and at the moment not implemented in the example project.

Figure 3-1



#### Description of the technology objects / axes / synchronous operations

Table 3-1

MachineMaster axis controlled with LFFS_MachineMasterGear block	
Task:	The axis serves as central master value encoder for the machine. The axis runs either in "stand-alone" operation with the specified machine speed or in coupled operation e.g. with an external encoder as master value source for coupling to an upstream machine.
Technology:	Synchronous axis
Axis type:	Virtual axis, Rotary
Modulo length:	360°
Leading axis:	External encoder (optional)
Coupling:	Gearing ("modulo length master" / "modulo length encoder")
Functions:	Parameter offset can be used to adjust the phase between the machine master axis and the external encoder on-the-fly.

**NOTE** LAxisCtrl\_ExtEncoder block can be used for controlling the upstream encoder.

### 3 Application Examples

Table 3-2

TappetChain axis controlled with LFFS_TappetChainGear block	
Task:	Insert the product in the foil tube
Technology:	Synchronous axis
Axis type:	Real axis, Linear
Modulo length:	Pocket length
Leading axis:	MachineMaster
Coupling:	Gearing ("pocket length" / "modulo length master")
Functions:	Parameter offset can be used to adjust the position of the product in foil tube on-the-fly. Parameter continuousHoming can be used to home the tappet chain axis with incremental encoder continuously via passive homing when the axis is moved.

Table 3-3

NPNBMaster axis controlled with LFFS_NPNBMasterCam block	
Task:	Coupled axis for the common synchronous stopping/starting of the foil feed and the cross sealer to implement the "No Product No Bag" function. Whereby, a sensor (e.g. light scanner) normally mounted on the tappet chain senses whether a product is present in each pocket. If a product is missing, a shift register outputs a signal for stopping the cross sealer and the foil feed. Both axes then stop within half a product cycle by cam disk exchange at the NPNBMaster. If a product is present, the two axes start again to traverse synchronously to the MachineMaster axis in the next cycle, i.e. the two axes "suspend" the product cycle. This allows the production to be inhibited for so-called "empty bags".
Technology:	Synchronous axis
Axis type:	Virtual axis, Rotary
Modulo length:	360°
Leading axis:	MachineMaster
Coupling:	Camming (cyclic cam disk corresponds to a 1:1 gearing)
Functions:	

**NOTE**

Note that for the use of the "No Product No Bag" functionality, the coupled axes must be able to stop or accelerate from or to the maximum production speed within half a product cycle.

Table 3-4

PrelimFoilFeed axis controlled with LAxisCtrl_SpeedAxis block	
Task:	Foil unwinder
Technology:	Speed axis
Axis type:	Real axis
Modulo length:	Without modulo function
Coupling:	Setpoint velocity of foil feed $v_{\text{foil}}$ is the basis for the setpoint speed of the preliminary foil feed $n_{\text{prelim}}$ $n_{\text{prelim}} = \frac{v_{\text{foil}} * 60}{d_{\text{prelim}} * \pi}$ $d_{\text{prelim}}$ : diameter of unwinder roll of preliminary foil feed -> moveVelocity functionality of LAxisCtrl_SpeedAxis block is to be used (configuration.moveVelocity.velocityChangeOnTheFly := TRUE)
Functions:	Dancer control with LFFS_AnalogDancerControl (simple tension control)

Table 3-5

FoilFeed axis controlled with LFFS_FoilFeedGear block	
Task:	Foil feeding
Technology:	Synchronous axis
Axis type:	Real axis, Linear
Modulo length:	Without modulo function
Leading axis:	NPNBMaster
Coupling:	Gearing ("bag length" / "modulo length master")
Functions:	<p>Print mark correction (printed design shall be adjusted or rather centered to the sealing position of the cross sealer) -&gt; see separate program FB PrintmarkProgram</p> <ul style="list-style-type: none"> <li>• Leading axis of the cross sealer is the NPNBMaster (one modulo length represents one bag length)</li> <li>• Measuring input is assigned to the NPNBMaster (virtual axis), i.e. measurement using Timer DI or SINAMICS (central probe) is only possible (the TO_MeasuringInput is handled via block LPrintMark_HandleMeasuringInput)</li> <li>• Measured value is compared with a specified targetPosition (expected position of the print mark)</li> <li>• Difference is corrected via superimposed motion (MC_MoveSuperimposed) at the foil feed axis</li> </ul> <p>Note: the correction is always started after the sealing is done, i.e. the cross sealer isn't anymore in contact with the foil</p>

**NOTE**

A constant film tension is required for perfect functioning of the print mark correction. Otherwise it is not possible to detect the exact position of the print mark using a light scanner.

Table 3-6

CrossSealer axis controlled with LFFS_CylCrossSealerCam block	
Task:	Rotating cross sealer
Technology:	Synchronous axis
Axis type:	Real axis, Rotary
Modulo length:	360° (modulo length must elapse between two jaws)
Leading axis:	NPNBMaster
Coupling:	Camming
Functions:	<p>No Gap No Seal: For this purpose, the cross sealer is stopped in the open position if no gap was created between two successive products in the foil tube. This function prevents the product from being "crushed" by the cross sealer if no gap was created between two successive products.</p> <p>Input <i>pauseSyncOperation</i> := TRUE -&gt; "suspend/pause" sealing (startCam or cyclicCam -&gt; stopCam -&gt; standstillCam)</p> <p>Input <i>pauseSyncOperation</i> := FALSE -&gt; "continue" sealing (stopCam or standstillCam -&gt; startCam -&gt; cyclicCam)</p>

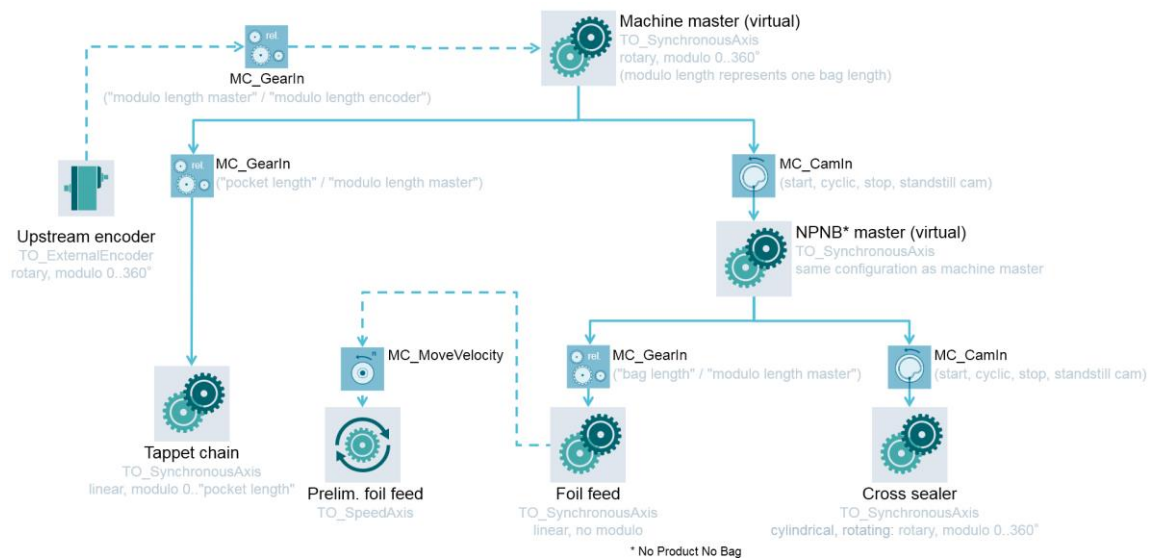
**NOTE** An internally calculated position (see *LFFS\_CylCrossSealerCam.parameters.syncOperation.pauseSyncOperationCheckPos*, default 80% of master modulo length) is used for the evaluation of input *pauseSyncOperation* and therefore for executing a new *MC\_CamIn* command with the corresponding cam disk reference for cam exchange functionality.

**NOTE** Temperature control is not part of the LFFS application. Standard system functionality is to be used (PID control).

Nevertheless, note that *PID\_Compact* is sufficient in most cases (instead of *PID\_Temp*, which supports cascade, heating and cooling, ...). *PID\_Compact* needs less memory and less CPU processing time.

**Overview of the technology objects / axes / synchronous operations**

Figure 3-2

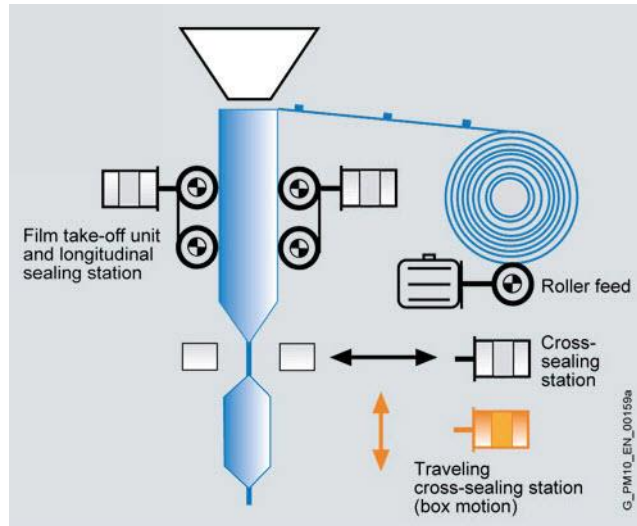


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### 3.2 Continuous and intermittent VFFS machine

The basic motion control part of a continuous and intermittent vertical FFS machine is described as example below. The example corresponds to the LFFS example project "LFFS\_Example\_ContinuousAndIntermittentVFFS\_V1\_x\_x.zip". Note that not all interconnections are shown. Other required general functions, such as operating mode management, recipe management, alarm handling, ... are also not shown and at the moment not implemented in the example project.

Figure 3-3



#### Description of the technology objects / axes / synchronous operations

Table 3-7

MachineMaster axis controlled with LFFS_VFFSMachineMasterPos block	
Task:	The axis serves as central master value encoder for the machine. The LFFS_VFFSMachineMasterPos block triggers also the positioning motions of the cross-sealer jaws axis with a time-controlled execution sequence and binary output signals. It also ensures the coordination with the external dosing unit. This is also coordinated via a binary interface.
Technology:	Positioning axis
Axis type:	Virtual axis, Rotary
Modulo length:	360°
Functions:	



Table 3-8

PrelimFoilFeed axis controlled with LAxisCtrl_SpeedAxis block	
Task:	Foil unwinder
Technology:	Speed axis
Axis type:	Real axis
Modulo length:	Without modulo function
Coupling:	<p>Setpoint velocity of foil feed <math>v_{\text{foil}}</math> is the basis for the setpoint speed of the preliminary foil feed <math>n_{\text{prelim}}</math></p> $n_{\text{prelim}} = \frac{v_{\text{foil}} * 60}{d_{\text{prelim}} * \pi}$ <p><math>d_{\text{prelim}}</math>: diameter of unwinder roll of preliminary foil feed</p> <p>-&gt; moveVelocity functionality of LAxisCtrl_SpeedAxis block is to be used (configuration.moveVelocity.velocityChangeOnTheFly := TRUE)</p>
Functions:	Dancer control with LFFS_AnalogDancerControl (simple tension control)

Table 3-9

FoilFeed axis controlled with LFFS_FoilFeedCam block	
Task:	Foil feeding
Technology:	Synchronous axis
Axis type:	Real axis, Linear
Modulo length:	Without modulo function
Leading axis:	MachineMaster
Coupling:	<p><u>Continuous mode:</u>                      Camming (cam disk consists of one segment: "bag length" / "modulo length master", i.e. constant velocity)                      Note: the block parameter <i>parameters.syncOperation.camProfile</i> of the LFFS_FoilFeedCam block is set to 0 for this use case</p> <p><u>Intermittent mode:</u>                      Camming (cam disk consists of three segments: dwell, 5th degree polynomial, dwell)                      Note: the block parameter <i>parameters.syncOperation.camProfile</i> of the LFFS_FoilFeedCam block is set to 1 for this use case</p>

<b>FoilFeed axis controlled with LFFS_FoilFeedCam block</b>	
Functions:	<p>Print mark correction (printed design shall be adjusted or rather centered to the sealing position of the cross sealer) -&gt; see separate program FB PrintmarkProgram</p> <p><u>Continuous mode:</u></p> <ul style="list-style-type: none"> <li>• Leading axis is the MachineMaster (one modulo length represents one bag length). Cross sealing starts, when the MachineMaster passes through its modulo transition (0.0 °).</li> <li>• Measuring input is assigned to the MachineMaster (virtual axis), i.e. measurement using Timer DI or SINAMICS (central probe) is only possible (the TO_MeasuringInput is handled via block LPrintMark_HandleMeasuringInput)</li> <li>• Measured value is compared with a specified targetPosition (expected position of the print mark)</li> <li>• Difference is corrected via superimposed motion (MC_MoveSuperimposed) at the foil feed axis</li> </ul> <p><u>Intermittent mode:</u></p> <ul style="list-style-type: none"> <li>• Measuring input is assigned to the FoilFeed axis (real axis), i.e. measurement using Timer DI, SINAMICS (central probe) or PROFIdrive telegram is possible (the TO_MeasuringInput is handled via block LPrintMark_HandleMeasuringInput)</li> <li>• Measured value is compared with a specified targetPosition (expected position of the print mark)</li> <li>• Difference is corrected via superimposed motion (MC_MoveSuperimposed) at the foil feed axis</li> </ul> <p>Note: the correction is always started after the sealing is done, i.e. the cross sealer isn't anymore in contact with the foil</p>

**NOTE**

A constant film tension is required for perfect functioning of the print mark correction. Otherwise it is not possible to detect the exact position of the print mark using a light scanner.

Table 3-10

<b>FoilFeedCompanion axis controlled with LFFS_FoilFeedGear block (optional)</b>	
Task:	The second foil feed axis is operated in 1:1 gearing synchronous operation (with opposite turning direction) to the first (main) foil feed axis
Technology:	Synchronous axis
Axis type:	Real axis, Linear
Leading axis:	FoilFeed
Coupling:	Gearing (-1 / 1) Note: the block parameters <i>parameters.syncOperation.gearRatioNumerator</i> and <i>gearRatioDenominator</i> of the LFFS_FoilFeedGear block are set to -1 and 1 for this use case

Table 3-11

<b>CrossSealerJaws axis controlled with LAxisCtrl_PosAxis block</b>	
Task:	Perform sealing cycle every machine cycle (close, seal, open) <ul style="list-style-type: none"> <li>• <i>posAbsolute</i> functionality of LAxisCtrl_PosAxis block is to be used</li> <li>• LFFS_VFFSMachineMasterPos outputs <i>crossSealerCloseExecute</i>, <i>crossSealerClosePosition</i> and <i>crossSealerCloseDynamics</i> define the parameters for the absolute positioning command for cross sealer closing</li> <li>• LFFS_VFFSMachineMasterPos outputs <i>crossSealerOpenExecute</i>, <i>crossSealerOpenPosition</i> and <i>crossSealerOpenDynamics</i> define the parameters for the absolute positioning command for cross sealer opening</li> </ul>
Technology:	Positioning axis
Axis type:	Real axis, Linear (Rotary in case of slider-crank)
Modulo length:	Without modulo function

Table 3-12

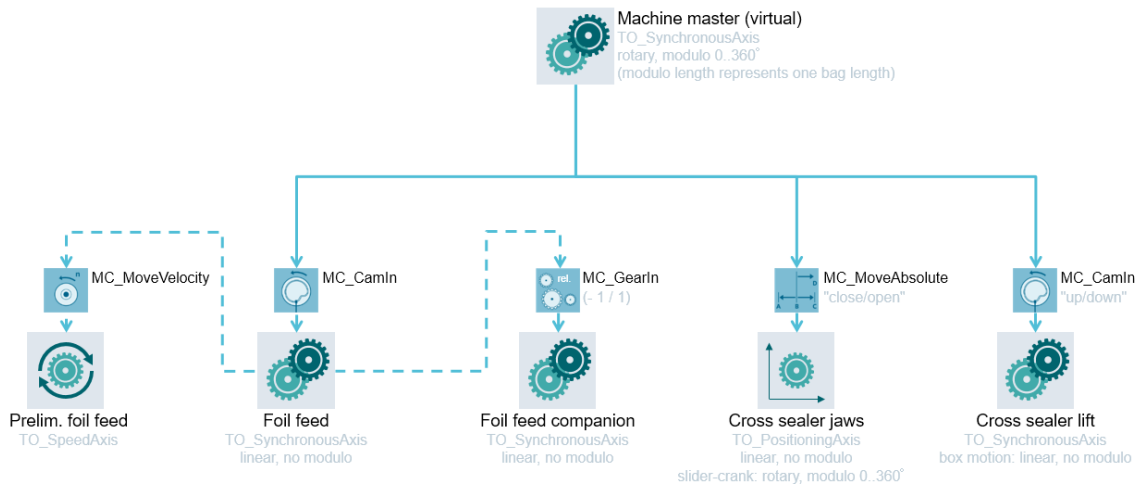
<b>CrossSealerLift axis controlled with LFFS_BoxMotCrossSealerCam block</b>	
Task:	<u>Continuous mode:</u> Traversing (up/down) of the cross sealer unit  <u>Intermittent mode:</u> Inactive (not needed, because foil is at a standstill while sealing is done)
Technology:	Synchronous axis
Axis type:	Real axis, Linear
Modulo length:	Without modulo function
Leading axis:	MachineMaster
Coupling:	Camming

**NOTE**

Temperature control is not part of the LFFS application. Standard system functionality is to be used (PID control).  
  
 Nevertheless, note that PID\_Compact is sufficient in most cases (instead of PID\_Temp, which supports cascade, heating and cooling, ...). PID\_Compact needs less memory and less CPU processing time.

Overview of the technology objects / axes / synchronous operations

Figure 3-4



## 4 Appendix

### 4.1 Service and support

#### Industry Online Support

Do you have any questions or need assistance?

Siemens Industry Online Support offers round the clock access to our entire service and support know-how and portfolio.

The Industry Online Support is the central address for information about our products, solutions and services.

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We support you with our globally available training courses for industry with practical experience, innovative learning methods and a concept that's tailored to the customer's specific needs.

For more information on our offered trainings and courses, as well as their locations and dates, refer to our web page:

[www.siemens.com/sitrain](https://www.siemens.com/sitrain)

#### Service offer

Our range of services includes the following:

- Plant data services
- Spare parts services
- Repair services
- On-site and maintenance services
- Retrofitting and modernization services
- Service programs and contracts

You can find detailed information on our range of services in the service catalog web page:

[support.industry.siemens.com/cs/sc](https://support.industry.siemens.com/cs/sc)

#### Industry Online Support app

You will receive optimum support wherever you are with the "Siemens Industry Online Support" app. The app is available for Apple iOS, Android and Windows Phone:

[support.industry.siemens.com/cs/ww/en/sc/2067](https://support.industry.siemens.com/cs/ww/en/sc/2067)

## 4.2 Application support

Siemens AG  
 Digital Industries  
 Factory Automation  
 Production Machines  
 DI FA PMA APC  
 Fraunauracher Str. 80  
 91056 Erlangen, Germany  
 mailto: [tech.team.motioncontrol@siemens.com](mailto:tech.team.motioncontrol@siemens.com)

## 4.3 Links and literature

Table 4-1

No.	Topic
\1\	Siemens Industry Online Support <a href="https://support.industry.siemens.com">https://support.industry.siemens.com</a>
\2\	Link to this entry page of this application example <a href="https://support.industry.siemens.com/cs/ww/en/view/109770904">https://support.industry.siemens.com/cs/ww/en/view/109770904</a>
\3\	LCalcMC library - Calculation of motion profile details <a href="https://support.industry.siemens.com/cs/ww/en/view/109475569">https://support.industry.siemens.com/cs/ww/en/view/109475569</a>
\4\	LCamHdl library - Creation of cam disks at runtime <a href="https://support.industry.siemens.com/cs/ww/en/view/105644659">https://support.industry.siemens.com/cs/ww/en/view/105644659</a>
\5\	LAxisCtrl library - Standard application axis control <a href="https://support.industry.siemens.com/cs/ww/en/view/109749348">https://support.industry.siemens.com/cs/ww/en/view/109749348</a>
\6\	LPrintMark library - Print Mark Acquisition with TO Measuring Input <a href="https://support.industry.siemens.com/cs/ww/en/view/109475573">https://support.industry.siemens.com/cs/ww/en/view/109475573</a>
\7\	Packaging Toolbox <a href="https://support.industry.siemens.com/cs/ww/en/view/109770338">https://support.industry.siemens.com/cs/ww/en/view/109770338</a>

## 4.4 Change documentation

Table 4-2

Version	Date	Modifications
V1.0	07/2021	First version