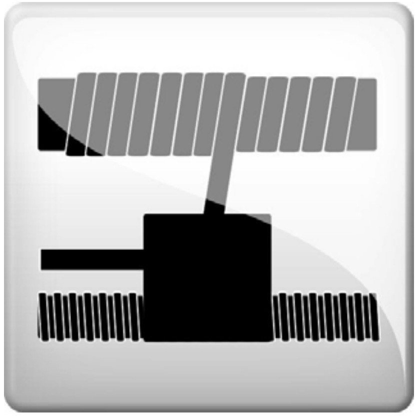
FAST Application Software

Technology module



Traverser

Reference Manual EN

13531750

Lenze

Contents

1 About this documentation

This documentation ...

- contains detailed information on the functionalities of the "Traverser" technology module;
- is part of the "Controller-based Automation" manual collection. It consists of the following sets of documentation:

Documentation type	Subject
Product catalogue	Controller-based Automation (system overview, sample topologies) Lenze Controller (product information, technical data)
System manuals	Visualisation (system overview/sample topologies)
Communication manuals **Online helps**	Bus systems • Controller-based Automation EtherCAT® • Controller-based Automation CANopen® • Controller-based Automation PROFIBUS® • Controller-based Automation PROFINET®
Reference manuals **Online helps**	Lenze Controllers: • Controller 3200 C • Controller c300 • Controller p300 • Controller p500
Software manuals **Online helps**	Lenze Engineering Tools: • »PLC Designer« (programming) • »Engineer« (parameter setting, configuration, diagnostics) • »VisiWinNET® Smart« (visualisation) • »Backup & Restore« (data backup, recovery, update)

More technical documentation for Lenze components

Further information on Lenze products which can be used in conjunction with Controller-based Automation can be found in the following sets of documentation:

Planning / configuration / technical data	
☐	**Product catalogues** • Controller-based Automation • Controllers • Inverter Drives/Servo Drives
Mounting and wiring	
🕮	**Mounting instructions** • Controllers • Communication cards (MC-xxx) • I/O system 1000 (EPM-Sxxx) • Inverter Drives/Servo Drives • Communication modules
☐	**Hardware manuals** • Inverter Drives/Servo Drives
Parameter setting / configuration / commissioning	
☐	**Online help/reference manuals** • Controllers • Inverter Drives/Servo Drives • I/O system 1000 (EPM-Sxxx)
☐	**Online help/communication manuals** • Bus systems • Communication modules
Sample applications and templates	
☐	**Online help / software and reference manuals** • i700 application sample • Application Samples 8400/9400 • FAST Application Template Lenze/PackML • FAST technology modules

Symbols:

🕮 Printed documentation
☐ PDF file / online help in the Lenze engineering tool

Tip!

Current documentation and software updates with regard to Lenze products can be found in the download area at:

www.lenze.com

Target group

This documentation is intended for all persons who plan, program and commission a Lenze automation system on the basis of the Lenze FAST Application Software.

1.1 Document history

Version			Description
1.0	05/2017	TD17	First edition

1.2 Conventions used

This documentation uses the following conventions to distinguish between different types of information:

Type of information	Highlighting	Examples/notes
Spelling of numbers		
Decimal separator	Point	The decimal point is always used. For example: 1234.56
Text		
Program name	» «	»PLC Designer« ...
Variable names	*italics*	By setting *bEnable* to TRUE...
Function blocks	**bold**	The **L_MC1P_AxisBasicControl** function block ...
Function libraries		The **L_TT1P_TechnologyModules** function library ...

Source code	Font
	`"Courier new"`
		`...`
		`dwNumerator := 1;`
		`dwDenominator := 1;`
		`...`

Icons		
Page reference	(📖 6)	Reference to further information: Page number in PDF file.

Variable names

The conventions used by Lenze for the variable names of Lenze system blocks, function blocks, and functions are based on the "Hungarian Notation". This notation makes it possible to identify the most important properties (e.g. the data type) of the corresponding variable by means of its name, e.g. xAxisEnabled.

1.3 Definition of the notes used

The following signal words and symbols are used in this documentation to indicate dangers and important information:

Safety instructions

Layout of the safety instructions:

> ### Pictograph and signal word!
> (characterise the type and severity of danger)
>
> **Note**
>
> (describes the danger and gives information about how to prevent dangerous situations)

Pictograph	Signal word	Meaning
	Danger!	**Danger of personal injury through dangerous electrical voltage** Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken.
	Danger!	**Danger of personal injury through a general source of danger** Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken.
	Stop!	**Danger of property damage** Reference to a possible danger that may result in property damage if the corresponding measures are not taken.

Application notes

Pictograph	Signal word	Meaning
	Note!	Important note to ensure trouble-free operation
	Tip!	Useful tip for easy handling
		Reference to another document

2 Safety instructions

Please observe the safety instructions in this documentation when you want to commission an automation system or a plant with a Lenze Controller.

The device documentation contains safety instructions which must be observed!

Read the documentation supplied with the components of the automation system carefully before you start commissioning the Controller and the connected devices.

Danger!

High electrical voltage

Injury to persons caused by dangerous electrical voltage

Possible consequences

Death or severe injuries

Protective measures

Switch off the voltage supply before working on the components of the automation system.

After switching off the voltage supply, do not touch live device parts and power terminals immediately because capacitors may be charged.

Observe the corresponding information plates on the device.

Danger!

Injury to persons

Risk of injury is caused by ...

- unpredictable motor movements (e.g. unintended direction of rotation, too high velocities or jerky movement);
- impermissible operating states during the parameterisation while there is an active online connection to the device.

Possible consequences

Death or severe injuries

Protective measures

- If required, provide systems with installed inverters with additional monitoring and protective devices according to the safety regulations valid in each case (e.g. law on technical equipment, regulations for the prevention of accidents).
- During commissioning, maintain an adequate safety distance to the motor or the machine parts driven by the motor.

STOP

Stop!

Damage or destruction of machine parts

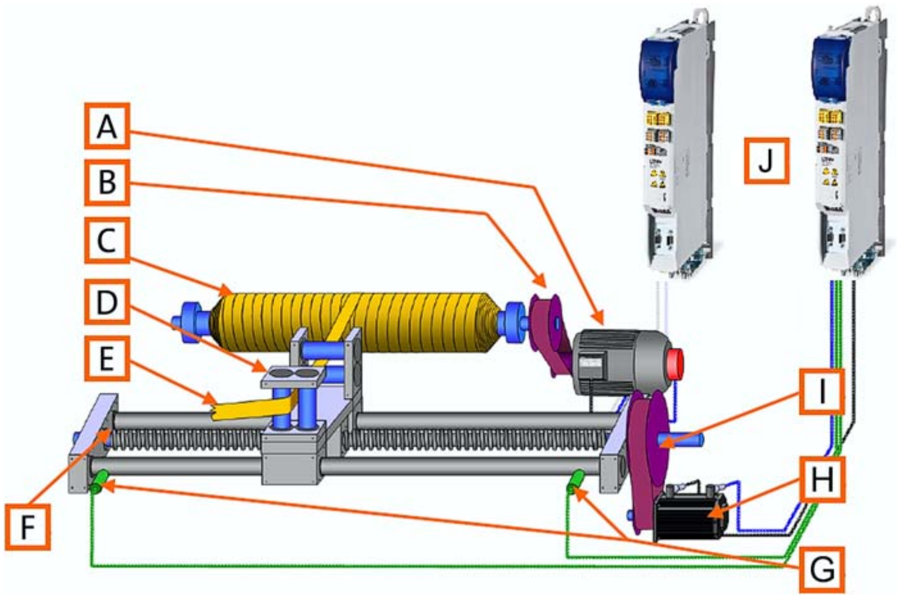
Damage or destruction of machine parts can be caused by ...

- Short circuit or static discharges (ESD);
- unpredictable motor movements (e.g. unintended direction of rotation, too high velocities or jerky movement);
- impermissible operating states during the parameterisation while there is an active online connection to the device.

Protective measures

- Always switch off the voltage supply before working on the components of the automation system.
- Do not touch electronic components and contacts unless ESD measures were taken beforehand.
- If required, provide systems with installed inverters with additional monitoring and protective devices according to the safety regulations valid in each case (e.g. law on technical equipment, regulations for the prevention of accidents).

3 "Traverser" functional description

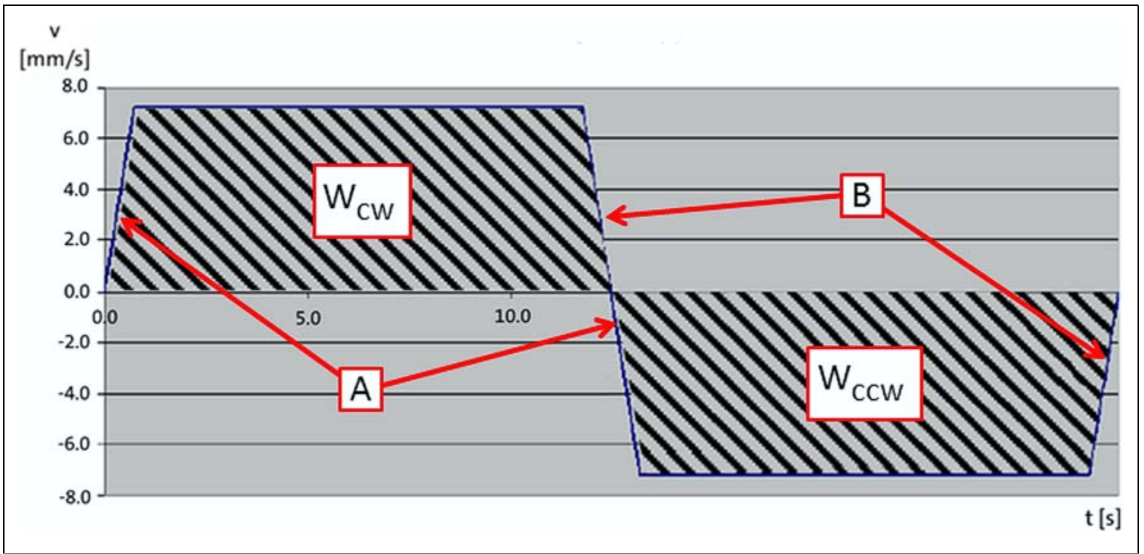


A	Motor winder
B	Gearbox winder
C	Coil (bobbin)
D	Material guiding
E	Material web (e.g. paper, foil, cable)
F	Spindle feed constant
G	Limit switch
H	(Servo) motor traversing drive
I	Gearbox traversing drive
J	Servo-Inverter i700

[3-1] Typical mechanics of the technology module

In production machines with continuous material webs such as paper, foil, wire, cables etc., the material is often wound at the end. If the material width is smaller than the coil width, the winding process additionally requires a controlled distribution of the material over the entire reel width. For this purpose, the material is guided via a traversing drive along the coil in oscillating movements and thus the material is evenly wrapped around the reel. The traversing drive moves by a traversing step per winder revolution.

Basic parameters of the standard traversing



A	Acceleration ramp
B	Deceleration ramp
W_{cw}	Winding of the first layer (forward movement)
W_{ccw}	Winding of the second layer (backward movement)

[3-2] Example: Travel profile of the traversing drive for winding the first two layers

In the example [3-2], the following parameters are defined for the traversing drive:

Parameters	Value
Coil speed (n_{Coil})	60.0 rpm
Material width ($\Delta s_{Material}$)	15.0 mm
Lower winding limit position (S_{Lo})	0.0 mm
Upper winding limit position (S_{Hi})	100.0 mm
Traversing step (S_{Step})	7.2166 mm/rev
Acceleration angle ($\varphi_{acc, basic}$)	260.0 °
Deceleration angle ($\varphi_{dec, basic}$)	260.0 °

3.1 Overview of the functions

In addition to the basic functions for operating the **L_MC1P_AxisBasicControl** function block, the **Stop function** and the **Holding function**, the technology module offers the following functionalities:

Functionality	Versions	
	Base	State
Detection of the winding movement (🕮 34)	●	●
Manual jog (jogging) (🕮 34)	●	●
Homing (🕮 35)	●	●
Stop (🕮 35)	●	●
Margin stop (🕮 36)	●	●
Trimming during the traversing process (🕮 37)	●	●
Traversing step change during operation (traversing step override) (🕮 38)		●
Traversing step increase in the marginal areas (overspeed) (🕮 40)		●
Traversing onto conical coils (🕮 41)		●
Radius correction of the coil (🕮 42)		●
Reverse offset (edge offset) (🕮 44)		●
Material guiding line (🕮 46)		●

»PLC Designer« Online help

Here you will find detailed information on the **L_MC1P_AxisBasicControl** function block, the **stop function** and the **holding function**.

3.2 Important notes on how to operate the technology module

Controlled start of the axes

Motion commands that are set in the inhibited axis state (*xAxisEnabled* = FALSE) after enable (*xRegulatorOn* = TRUE) must be activated again by a FALSE↗TRUE edge.

In this way it is prevented that the drive starts in an uncontrolled manner after controller enable.

Example Manual jog (jogging) (📖 34)**:**

1. In the inhibited axis state (*xAxisEnabled* = FALSE), *xJogPos* is set to TRUE.
   - *xRegulatorOn* = FALSE (axis is inhibited.)
     ==> "READY" state (*xAxisEnabled* = FALSE)
   - *xJogPos* = TRUE (manual jog is to be executed.)
2. Enable axis.
   - *xRegulatorOn* = TRUE
     ==> "READY" state (*xAxisEnabled* = TRUE)
3. Execute manual jog.
   - *xJogPos* = FALSE↗TRUE
     ==> "JOGPOS" state

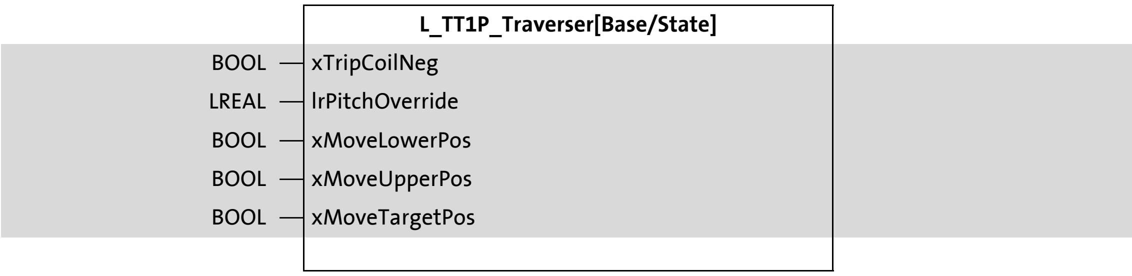
3.3 Function block L_TT1P_Traverser[Base/State]

The figure shows the relation of the inputs and outputs to the "Base" and "State" versions.

The additional inputs and outputs of the "State" version are shaded.

L_TT1P_Traverser[Base/State]

Type	Input	Output	Type
Base			
BOOL	xEnableInternalControl	xInternalControlActive	BOOL
BOOL	xEnable	eTMState	L_TT1P_States
scCtrl_ABC	scCtrlABC	scStatusABC	scStatus_ABC
BOOL	xResetError	xError	BOOL
BOOL	xRegulatorOn	xWarning	BOOL
BOOL	xStop	eErrorID	L_IE1P_Error
BOOL	xHalt	scErrorInfo	L_TT1P_scErrorInfo
L_TT1P_scPar_Traverser[Base/State]	scPar	xAxisEnabled	BOOL
AXIS_REF	MasterAxis	scSignalFlow	L_TT1P_scSF_Traverser[Base/State]
AXIS_REF	SlaveAxis	xDone	BOOL
L_TT1P_scPersistentVarsTraverser[Base/State]	scPersistentVars	xBusy	BOOL
L_TT1P_scAP_Traverser[Base/State]	scAccessPoints	xIsHomed	BOOL
BOOL	xJogPos	xHwLimitSwitchPos	BOOL
BOOL	xJogNeg	xHwLimitSwitchNeg	BOOL
BOOL	xHomeExecute	xSwLimitEnabled	BOOL
BOOL	xHomeAbsSwitch	xSwLimitSwitchActive	BOOL
BOOL	xEnableHWLimit	xTraversingActive	BOOL
BOOL	xHWLimitPos	lrActVel	LREAL
BOOL	xHWLimitNeg	lrActPos	LREAL
BOOL	xTraversingCtrl	lrActFollowingError	LREAL
BOOL	xTrimPos		
BOOL	xTrimNeg		
BOOL	xLoadLayerCounter		
DINT	diSetLayerCounter		
BOOL	xReversingSwitchUpper		
BOOL	xReversingSwitchLower		
BOOL	xSetLowerPos		
LREAL	lrLowerPos		
BOOL	xSetUpperPos		
LREAL	lrUpperPos		
BOOL	xExecuteReversing		
BOOL	xReversingInstant		
State			
LREAL	lrSetDiam		
BOOL	xLoadCoilData		
BOOL	xTripCoilPos		



L_TT1P_Traverser[Base/State]
BOOL xTripCoilNeg
LREAL lrPitchOverride
BOOL xMoveLowerPos
BOOL xMoveUpperPos
BOOL xMoveTargetPos

3.3.1 Inputs and outputs

Designator / Data type	Description	Available in version: Base	State
MasterAxis AXIS_REF	Axis reference of the winder drive The parameters lrSetPosition and lrCycleLength of the winder are read out of this axis reference.	●	●
SlaveAxis AXIS_REF	Axis reference of the traversing drive	●	●
scPersistentVars L_TT1P_scPersistentVarsTraverser[Base/State]	In this data structure, the technology module saves information with mains failure protection. This is, for instance, how the reverse positions and layer counters remain known in case of a renewed mains power-up.	●	●

3.3.2 Inputs

Designator / Data type	Description		Available in version: Base	State
xEnableInternalControl BOOL	TRUE	In the visualisation, the internal control of the axis can be selected via the "Internal Control" axis.	●	●
xEnable BOOL	Execution of the function block		●	●
	TRUE	The function block is executed.		
	FALSE	The function block is not executed.		
scCtrlABC scCtrl_ABC	Input structure for the **L_MC1P_AxisBasicControl** function block • scCtrlABC can be used in "Ready" state. • If there is a request, the state changes to "Service". • The state change from "Service" back to "Ready" takes place if there are no more requests.		●	●
xResetError BOOL	TRUE	Reset axis error or software error. In the State version, the first touch probe mark subsequently has to be saved again with the teaching function.	●	●
xRegulatorOn BOOL	TRUE	Activate controller enable of the axis (via the **MC_Power** function block).	●	●
xStop BOOL	TRUE	Cancel the active movement and brake the axis to a standstill with the deceleration defined via the lrStopDec parameter. • The state changes to "Stop". • The technology module remains in the "Stop" state as long as xStop is set to TRUE (or xHalt = TRUE).	●	●
xHalt BOOL	TRUE	Cancel the active movement and brake the axis to a standstill with the deceleration defined via the lrHaltDec parameter. • The state changes to "Stop". • The technology module remains in the "Stop" state as long as xStop is set to TRUE (or xHalt = TRUE).	●	●
scPar L_TT1P_scPar_Traverser[Base/State]	The parameter structure contains the parameters of the technology module. The data type depends on the version used (Base/State).		●	●

Designator / Data type	Description		Available in version: Base	State
scAccessPoints L_TT1P_scAP_Traverser[Base/State]	Structure of the access points The data type depends on the version used (Base/State).		●	●
xJogPos BOOL	TRUE	Traverse axis in positive direction (manual jog). If xJogNeg is also TRUE, the traversing direction selected first remains set.	●	●
xJogNeg BOOL	TRUE	Traverse axis in negative direction (manual jog). If xJogPos is also TRUE, the traversing direction selected first remains set.	●	●
xHomeExecute BOOL	The input is edge-controlled and evaluates the rising edge.		●	●
	FALSE↗TRUE	Start homing. The function is aborted via the xStop input.		
xHomeAbsSwitch BOOL	TRUE	Connection for reference switch: For homing modes with a reference switch, connect this input to the digital signal which maps the state of the reference switch.	●	●
xEnableHWLimit BOOL	TRUE	The evaluation of the travel range limit switch (hardware limit switch) is activated.	●	●
xHWLimitPos BOOL	Positive hardware limit switch Connect this input to the corresponding digital input that is connected to the limit switch.		●	●
	TRUE	The positive hardware limit switch has been reached or approached. • The xHwLimitSwitchPos output is also set to TRUE. • The axis is brought to a standstill with the deceleration in the alrStopDec parameter. • The state changes to "ERROR" with the error message ’20500’ (HWLimitPos).		
xHWLimitNeg BOOL	Negative hardware limit switch Connect this input to the corresponding digital input that is connected to the limit switch.		●	●
	TRUE	The negative hardware limit switch has been reached or approached. • The xHwLimitSwitchNeg output is also set to TRUE. • The axis is brought to a standstill with the deceleration in the alrStopDec parameter. • The state changes to "ERROR" with the error message ’20501’ (HWLimitNeg).		
xTraversingCtrl BOOL	The input is edge-controlled and evaluates the rising edge.		●	●
	FALSE↗TRUE	The traversing operation is started until this input is reset to FALSE again. When the traversing operation is active, it is changed to the "TRAVERSING" state (raw value ’190’).		
xTrimPos BOOL	TRUE	Trim velocity in positive direction. If xTrimNeg is also TRUE, the traversing direction selected first remains set.	●	●
xTrimNeg BOOL	TRUE	Trim velocity in negative direction. If xTrimPos is also TRUE, the traversing direction selected first remains set.	●	●
xLoadLayerCounter BOOL	TRUE	Acceptance of the value at the diSetLayerCounter input as current value of the layer counter.	●	●

Designator Data type	Description		Available in version: Base	Available in version: State
diSetLayerCounter DINT	Starting value for the layer counter Acceptance of the value when xLoadLayerCounter = TRUE • Unit: Numerical value • Initial value: 0		●	●
xReversingSwitchUpper BOOL	Upper reverse limit switch The input is edge-controlled and evaluates the rising edge.		●	●
	FALSE↗TRUE	Start of the inversion of the direction in the "traversing between limit switches" operating mode (see eMode parameter).		
xReversingSwitchLower BOOL	Lower reverse limit switch The input is edge-controlled and evaluates the rising edge.		●	●
	FALSE↗TRUE	Start of the inversion of the direction in the "traversing between limit switches" operating mode (see parameter eMode).		
xSetLowerPos BOOL	TRUE	Acceptance of the lrLowerPos value as current lower reverse position.	●	●
lrLowerPos LREAL	Default value for the lower reverse position • Unit: units • Initial value: 0		●	●
xSetUpperPos BOOL	TRUE	Acceptance of the lrUpperPos value as current upper reverse position.	●	●
lrUpperPos LREAL	Default value for the upper reverse position • Unit: units • Initial value: 0		●	●
xExecuteReversing BOOL	The input is edge-controlled and evaluates the rising edge.		●	●
	FALSE↗TRUE	An inversion of the direction of the traversing drive is immediately started considering the ramps.		
xReversingInstant BOOL	The input is edge-controlled and evaluates the rising edge.		●	●
	FALSE↗TRUE	An inversion of the direction of the traversing drive is started <u>without</u> ramps.		
lrSetDiam LREAL	Selecting the current diameter of the coil (for instance coming from a winder technology module). **Note:** In the "CoilData" operating mode (see eMode parameter), this value is sometimes directly included in the calculation of the reverse positions. Only clear, and if required, latched signals may be created. This also applies to the use of the radius correction in the "position" operating mode". • Unit: units • Initial value: 0			●
xLoadCoilData BOOL	TRUE	The coil geometry (scCoilData parameter) is read in again. Available trimming values or touch probe corrections are discarded. The currently used coil geometry is saved in the persistent variables with mains failure protection (data structure scPersitentVars).		●

Designator Data type	Description		Available in version: Base	Available in version: State
xTipCoilPos BOOL	TRUE	Inching in positive direction Selection of the target variable via selection parameters: • xSelMinDiam • xSelMaxDiam • xSelLowerPosMinDiam • xSelLowerPosMaxDiam • xSelUpperPosMinDiam • xSelUpperPosMaxDiam L_TT1P_scPar_Traverser[Base/State] (22)		●
xTipCoilNeg BOOL	TRUE	Inching in negative direction Selection of the target variable via selection parameters: • xSelMinDiam • xSelMaxDiam • xSelLowerPosMinDiam • xSelLowerPosMaxDiam • xSelUpperPosMinDiam • xSelUpperPosMaxDiam L_TT1P_scPar_Traverser[Base/State] (22)		●
lrPitchOverride LREAL	Traversing step override • Initial value: 1.0 (100 %) • Range: 0.01 to 1.99 (internal limitation)			●
xMoveLowerPos BOOL	TRUE	Start of a positioning to the current lower reverse position. Only possible in the "Ready" state!		●
xMoveUpperPos BOOL	TRUE	Start of a positioning to the current upper reverse position. Only possible in the "Ready" state!		●
xMoveTargetPos BOOL	TRUE	Start of a positioning to a target position (lrTargetPos parameter). Only possible in the "Ready" state!		●

3.3.3 Outputs

Designator / Data type	Description		Available in version: Base	Available in version: State
xInternalControlActive BOOL	TRUE	The internal control of the axis is activated via the visualisation. (xEnableInternalControl input = TRUE)	●	●
eTMState L_TT1P_States	Current state of the technology module ▸ State machine (📖 29)		●	●
scStatusABC scStatus_ABC	Structure of the status data of the **L_MC1P_AxisBasicControl** function block		●	●
xError BOOL	TRUE	There is an error in the technology module.	●	●
xWarning BOOL	TRUE	There is a warning in the technology module.	●	●
eErrorID L_IE1P_Error	ID of the error or warning message if xError = TRUE or xWarning = TRUE. **"FAST technology modules" reference manual:** Here you can find information on error or warning messages.		●	●
scErrorInfo L_TT1P_scErrorInfo	Error information structure for a more detailed analysis of the error cause		●	●
xAxisEnabled BOOL	TRUE	The axis is enabled.	●	●
scSignalFlow L_TT1P_scSF_Traverser[Base/State]	Structure of the signal flow The data type depends on the version used (Base/State). Signal flow diagram (📖 30)		●	●
xDone BOOL	TRUE	The request/action has been completed successfully.	●	●
xBusy BOOL	TRUE	The request/action is currently being executed.	●	●
xIsHomed BOOL	TRUE	The axis has been referenced (reference known).	●	●
xHwLimitSwitchPos BOOL	TRUE	The positive hardware limit switch has been reached or approached. • The xHwLimitPos input has to be connected to the digital input that is connected to the limit switch. • The xHWLimitPos input is also set to TRUE. • The drive is brought to a standstill with the deceleration set in the lrStopDec parameter. • The state changes to "ERROR" with the error message '20500' (HWLimitPos).	●	●
xHwLimitSwitchNeg BOOL	TRUE	The negative hardware limit switch has been reached or approached. • The xHwLimitNeg input has to be connected to the digital input that is connected to the limit switch. • The xHWLimitNeg input is also set to TRUE. • The drive is brought to a standstill with the deceleration set in the lrStopDec parameter. • The state changes to "ERROR" with the error message '20500' (HWLimitNeg).	●	●
xSwLimitEnabled BOOL	TRUE	Activate the monitoring of the software limit positions.	●	●

Designator / Data type	Description		Available in version: Base	State
xSwLimitSwitchActive BOOL	TRUE	A software limit position has been reached or exceeded. • The drive is brought to a standstill with the deceleration set in the lrStopDec parameter. • The state changes to "ERROR" with error message '20306' (SWLimitPos) or '20307' (SWLimitNeg).	●	●
xTraversingActive BOOL	TRUE	Traversing operation is active.	●	●
lrActVel LREAL	Current velocity • Unit: units/s		●	●
lrActPos LREAL	Current position • Unit: units		●	●
lrActFollowingError LREAL	Current following error • Unit: units/s^2		●	●

3.3.4 Persistent variables

L_TT1P_scPersistentVarsTraverser[Base/State]

In this data structure, the technology module saves information with mains failure protection. This is how the following information remains known in case of a renewed mains power-up.

Designator / Data type	Description	Available in version: Base	State
diLayerCounter DINT	Layer counter • Initial value: 0	●	●
lrModLowerPos LREAL	Current lower reversal point • Unit: units • Initial value: 0.0	●	●
lrModUpperPos LREAL	Current upper reversal point • Unit: units • Initial value: 100.0	●	●
scCoilData L_TT1L_scCoilData	Data of the coil geometry (📖 28)		●

3.3.5 Parameters

Note!

A change of the traversing profile-describing parameters may take 20 PLC cycles until the changes become visible in the traversing profile.

The background is that the integrated profile generator does not directly use the traversing profile-describing parameters but intermediate variables. This minimises the number of calculations during runtime. The technology module distributes the conversion of the parameters into intermediate variables over several PLC cycles to reduce the jitter of the task runtime.

L_TT1P_scPar_Traverser[Base/State]

The **L_TT1P_scPar_Traverser[Base/State]** structure contains the parameters of the technology module.

Designator Data type	Description	Available in version	
		Base	State
lrStopDec LREAL	Deceleration for the stop function and when hardware/software limit switches and the following error monitoring function are triggered • Unit: units/s^2 • Initial value: 10000	●	●
lrStopJerk LREAL	Jerk for the stop function and for the triggering of the hardware limit switches, software limit positions, and the following error monitoring function • Unit: units/s^3 • Initial value: 100000	●	●
lrHaltDec LREAL	Deceleration for the holding function Specification of the maximum speed variation which is to be used for deceleration to standstill. • Unit: units/s^2 • Initial value: 3600 • Only positive values are permissible.	●	●
lrJerk LREAL	Jerk for compensating an offset value, trimming, clutch, or holding function • Unit: units/s^3 • Initial value: 100000	●	●
lrJogJerk LREAL	Jerk for manual jog • Unit: units/s^3 • Initial value: 10000	●	●
lrJogVel LREAL	Maximum speed to be used for manual jog. • Unit: units/s • Initial value: 10	●	●
lrJogAcc LREAL	Acceleration for manual jog Specification of the maximum speed variation which is to be used for acceleration. • Unit: units/s^2 • Initial value: 100	●	●
lrJogDec LREAL	Deceleration for manual jog Specification of the maximum speed variation which is to be used for deceleration to standstill. • Unit: units/s^2 • Initial value: 100	●	●

Designator Data type	Description		Available in version: Base	Available in version: State
lrHomePosition LREAL	Home position for a reference run (homing) • Unit: units • Initial value: 0		●	●
xUseHomeExtParameter BOOL	Selection of the homing parameters to be used • Initial value: FALSE		●	●
	FALSE	The homing parameters defined in the axis data are used.		
	TRUE	The **scHomeExtParameter** homing parameters from the application are used.		
scHomeExtParameter L_MC1P_HomeParameter	Homing parameters from the application • Only relevant if xUseHomeExtParameter = TRUE.		●	●
scHomeExtTP MC_TRIGGER_REF	Transfer of an external touch probe event • Only relevant for "external encoder" touch probe configuration. • For describing the MC_TRIGGER_REF structure, see the **MC_TouchProbe** function block.		●	●
xInvertMasterDir BOOL	Convert master direction of rotation.		●	●
	FALSE	The traversing drive moves forward if the winder rotates in positive direction.		
	TRUE	The traversing drive moves backward if the winder rotates in negative direction.		
eMasterValueSource MC_SOURCE	Selection of the source for the master position: • mcActualValue: The actual value of the master drive is used (initial value). • mcSetValue: The setpoint of the master drive is used.		●	●
eMode L_TT1P_TaverserMode	Operating mode of the traversing drive		●	●
	0	Position (initial value): • The upper and lower reverse positions are defined as position values. • The drive must be referenced so that his operating mode can be used.		
	1	Switches: Traversing operation between two limit switches • When a travel range limit switch has been reached (input xReversingSwitchLofwer/ xReversingSwitchUpper =TRUE), the reverse procedure starts with a delay, margin stop etc. • The limit switches must be installed/wired correctly!		
	2	CoilData: • The upper and lower reverse position are dynamically calculated via the reel diameter and the coil geometry (scCoilData parameter).		
eStartDir L_TT1P_TraverserStartDir	Starting direction of the traversing drive if eStartMode = StartCurrentPos		●	●
	-1	Negative direction: The drive starts in driving direction towards the lower reverse position.		
	0	Direction active last (initial value): The drive starts in the direction it travelled last. This serves to make a restart easily.		
	1	Positive direction: The drive starts in driving direction towards the upper reverse position.		
lrSetJerk LREAL	Jerk for positioning (has no effect in the traversing drive) • Unit: units/s^3 • Initial value: 10000		●	●

Designator Data type	Description	Available in version	
		Base	State
lrSetVel LREAL	Maximum velocity for positioning (has no effect in the traversing drive) • Unit: units/s • Initial value: 100	●	●
lrSetAcc LREAL	Acceleration for positioning (has no effect in the traversing drive) Specification of the maximum speed variation which is to be used for acceleration. • Unit: units/s^2 • Initial value: 100	●	●
lrSetDec LREAL	Deceleration for positioning (has no effect in the traversing drive) Specification of the maximum speed variation which is to be used for deceleration to standstill. • Unit: units/s^2 • Initial value: 100	●	●
lrTraversingPitch LREAL	Traversing step (feed of the traversing drive per winder revolution) • Unit: units • Initial value: 5	●	●
lrSyncInAngle LREAL	Ramp angle in winder units The ramp angles refer to the traversing step (lrSetPitch). Irrespective of the master/winder scaling, the feed constant is read out and considered. 360° is always one winding revolution, irrespective of the currently set winder scaling. • Unit: Degree • Initial value: 90	●	●
lrSyncOutAngle LREAL	Ramp angle in winder units The ramp angles refer to the traversing step (lrSetPitch). Irrespective of the master/winder scaling, the feed constant is read out and considered. 360° is always one winding revolution, irrespective of the currently set winder scaling. • Unit: Degree • Initial value: 90	●	●
lrEndStopAngleLower LREAL	Selection of the margin stop angle at the lower end of the reel. • Unit: Degree • Initial value: 270	●	●
lrEndStopAngleUpper LREAL	Selection of the margin stop angle at the upper end of the reel. • Unit: Degree • Initial value: 270	●	●
lrTrimVel LREAL	Trimming speed used for superimposing the traverser velocity. • Unit: units/s • Initial value: 0	●	●

Designator / Data type	Description		Available in version: Base	Available in version: State
eStartMode L_TT1P_TraverserStartMode	Starting performance of the traversing drive			●
	0	StartCurrentPos: The traversing drive starts at the current position as long as this is within the traversing range (Persistent variables lrModLowerPos and lrModUpperPos). If the position is outside the traversing range, first it is positioned to the nearest traversing range limit. Only then the traversing operation is started.		
	1	StartLowerPos: First, it is positioned to the lower traversing range limit (lrModLowerPos). Only then the traversing operation is started.		
	2	StartUpperPos: First, it is positioned to the upper traversing range limit (lrModUpperPos). Only then the traversing operation is started.		
	3	StartVirtualPos: First, it is positioned to the virtual traversing position (MP18_lrVirtualPos). Only then the traversing operation is started.		
xStartInstant BOOL	Starting performance with/without ramp			●
	FALSE	Start with ramp (initial value)		
	TRUE	Start without ramp (ramp only via master ramp)		
scCoilData L_TT1L_scCoilData	Data of the coil geometry (📖 28)			●
lrCoilOffsetLower LREAL	Offset to the current reverse position at the lower coil end • Unit: units • Initial value: 0.0			●
lrCoilOffsetUpper LREAL	Offset to the current reverse position at the upper coil end • Unit: units • Initial value: 0.0			●
eAlignMode L_TT1P_TraverserAlignMode	Alignment of the material guiding Is only effective if eMode = 2: CoilData.			●
	-1	AlignLower: Left-justified material guiding (initial value)		
	0	AlignCenter: Centred material guiding		
	1	AlignUpper: Right-justified material guiding		
lrMaterialWidth LREAL	Material width Is only effective if eMode = 2: CoilData. Influences the reverse positions. • Unit: units • Initial value: 0.0			●
eDiamMode L_TT1P_TraverserDiamMode	Source for the reel diameter • Initial value: 0 (DiamInput)			●
	0	DiamInput: The value at the lrSetDiam input is used as current reel diameter.		
	1	DiamCalc: The reel diameter is calculated via layer number and material thickness (lrMaterialThickness parameter).		
lrMaterialThickness LREAL	Material thickness (for diameter calculation) • Unit: units • Initial value: 0.0			●

Designator Data type	Description	Available in version	
		Base	State
lrTipCoilStepDist LREAL	Value by which the coil geometry changes by one inching process (see inputs xTipCoilPos/xTipCoilNeg). • Unit: Units • Initial value: 1.0		●
eProfileType L_TT1P_ProfileType	Profile type of the profile generator • Initial value: 0 (4th degree polynomial) 0 – poly_4th_order (4th order polynomial) 1 – poly_2nd_order (2nd order polynomial)		●
eOverrideMode L_TT1P_OverrideMode	Override mode • Initial value: 0 (OverrideConstant) 0 – OverrideAccDec Override influences acceleration and deceleration. 1 – OverrideConstant Override does <u>not</u> influence acceleration and deceleration.		●
lrOverspeedStartLower LREAL	Traversing step increase in the marginal area at the beginning of a layer at the lower end of the reel • Unit: % (1.00 = 100 %: No increase) • Initial value: 1.25 (25 % increase)		●
lrOverspeedStartUpper LREAL	Traversing step increase in the marginal area at the beginning of a layer at the upper end of the reel • Unit: % (1.00 = 100 %: No increase) • Initial value: 1.25 (25 % increase)		●
lrOverspeedEndLower LREAL	Traversing step increase in the marginal area at the end of a layer at the lower end of the reel • Unit: % (1.00 = 100 %: No increase) • Initial value: 1.25 (25 % increase)		●
lrOverspeedEndUpper LREAL	Traversing step increase in the marginal area at the end of a layer at the upper end of the reel • Unit: % (1.00 = 100 %: No increase) • Initial value: 1.25 (25 % increase)		●
lrOverspeedAngleStartLower LREAL	Reel angle for traversing step increase at the beginning of a layer at the lower end of the reel. • Unit: Degree • Initial value: 90		●
lrOverspeedAngleStartUpper LREAL	Reel angle for traversing step increase at the beginning of a layer at the upper end of the reel. • Unit: Degree • Initial value: 90		●
lrOverspeedAngleEndLower LREAL	Reel angle for traversing step increase at the end of a layer at the lower end of the reel. • Unit: Degree • Initial value: 0		●
lrOverspeedAngleEndUpper LREAL	Reel angle for traversing step increase at the end of a layer at the upper end of the reel. • Unit: Degree • Initial value: 0		●

Designator / **Data type**	**Description**		**Available in version: Base**	**Available in version: State**
eAngularShiftMode L_TT1P_AngularShiftMode	Reverse offset A change of this setting only gets effective at the end of the next layer. The setting has no effect on the current layer. • Initial value: 0 (no correction)			●
	0	Disabled: No correction		
	1	PitchIncreaseOnly: The traversing step is only increased to reach the reverse position.		
	2	PitchDecreaseOnly: The traversing step is only decreased to reach the reverse position.		
	3	PitchShortest: The traversing step is increased or decreased depending on what requires less correction.		
lrAngularShiftLower LREAL	Margin shift angle for the reverse shift function at the lower end of the reel • Unit: Degree • Initial value: 0			●
lrAngularShiftUpper LREAL	Margin shift angle for the reverse shift function at the upper end of the reel • Unit: Degree • Initial value: 0			●
lrAngularShiftLimit LREAL	Limit value for the reverse shift function with regard to the set traversing step • Unit: 1 (factor: 1.1 means traversing step change by 10 %) • Initial value: 1.1 • Lower limit: 1.0 (no traversing step change) • Upper limit: 10.0 (max. traversing step change by factor 10)			●
xSelMinDiam BOOL	Selection parameters for inputs xTipCoilPos and xTipCoilNeg: • Initial value: FALSE			●
	TRUE	Minimum diameter for inching		
xSelMaxDiam BOOL	Selection parameters for inputs xTipCoilPos and xTipCoilNeg: • Initial value: FALSE			●
	TRUE	Maximum diameter for inching		
xSelLowerPosMinDiam BOOL	Selection parameters for inputs xTipCoilPos and xTipCoilNeg: • Initial value: FALSE			●
	TRUE	Lower reversal point at minimum diameter for inching		
xSelLowerPosMaxDiam BOOL	Selection parameters for inputs xTipCoilPos and xTipCoilNeg: • Initial value: FALSE			●
	TRUE	Lower reversal point at maximum diameter for inching		
xSelUpperPosMinDiam BOOL	Selection parameters for inputs xTipCoilPos and xTipCoilNeg: • Initial value: FALSE			●
	TRUE	Upper reversal point at minimum diameter for inching		
xSelUpperPosMaxDiam BOOL	Selection parameters for inputs xTipCoilPos and xTipCoilNeg: • Initial value: FALSE			●
	TRUE	Upper reversal point at maximum diameter for inching		
lrTargetPos LREAL	Target position for positioning The target position is approached when xMoveTargetPos = TRUE. • Unit: units • Initial value: 200.0			●

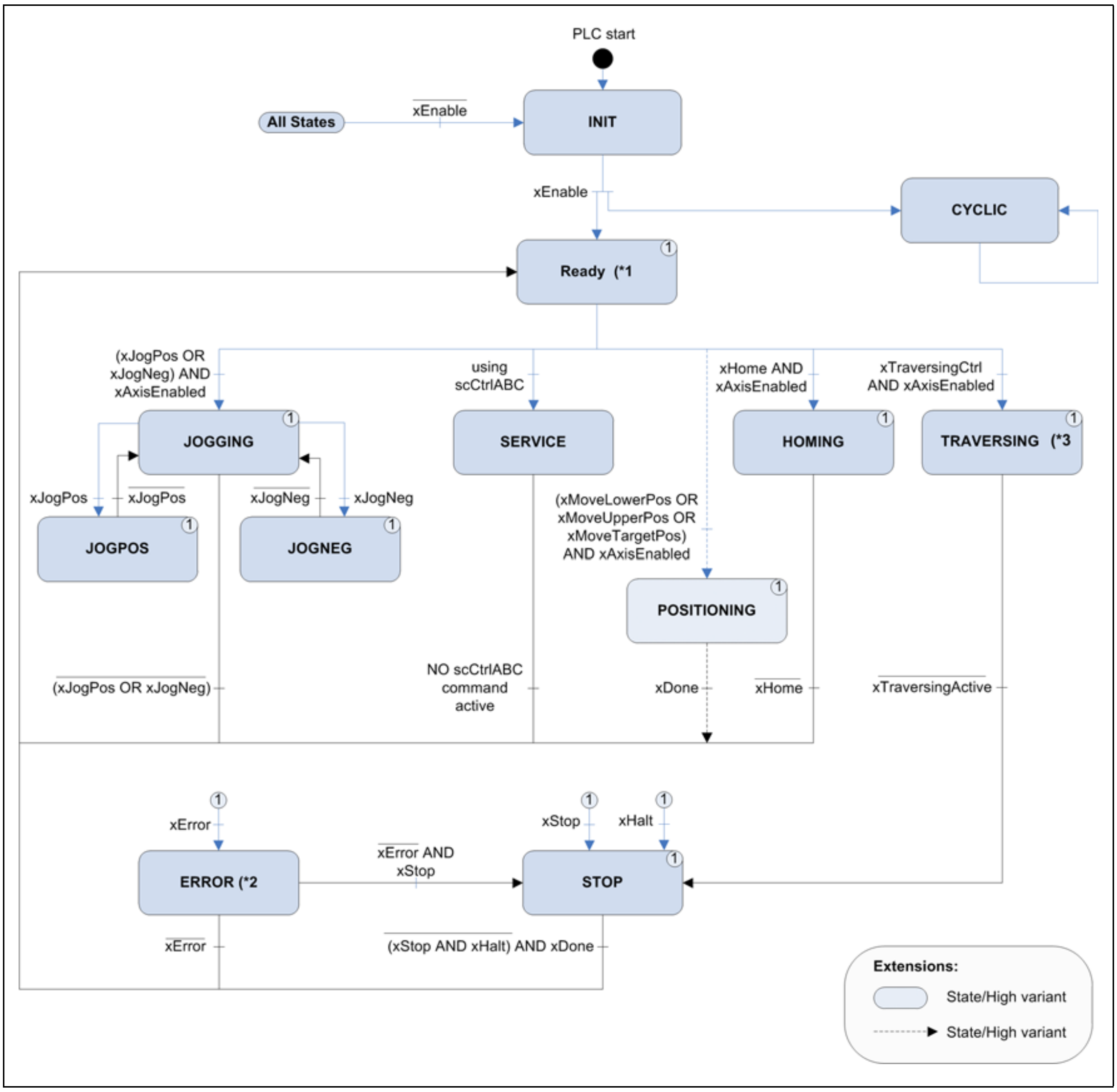
<table>
<tr><th rowspan="2">Designator
Data type</th><th rowspan="2" colspan="2">Description</th><th colspan="2">Available in version</th></tr>
<tr><th>Base</th><th>State</th></tr>
<tr><td rowspan="3">eCornerCorrMode
L_TT1P_TraverserCornerCorrMode</td><td colspan="2">Correction of the reverse position in the coil corners
• Initial value: Disabled</td><td rowspan="3"></td><td rowspan="3">●</td></tr>
<tr><td>0</td><td>Disabled:
No correction</td></tr>
<tr><td>1</td><td>Radius:
"Radius" correction mode active.</td></tr>
<tr><td>lrCornerCorrRefDiam
LREAL</td><td colspan="2">Reference diameter
• Unit: units
• Initial value: 0.0</td><td></td><td>●</td></tr>
<tr><td>lrCornerCorrLowerRadius
LREAL</td><td colspan="2">Radius for the lower coil end
• Unit: units
• Initial value: 0.0</td><td></td><td>●</td></tr>
<tr><td>lrCornerCorrUpperRadius
LREAL</td><td colspan="2">Radius for the upper coil end
• Unit: units
• Initial value: 0.0</td><td></td><td>●</td></tr>
</table>

3.3.6 Data of the coil geometry

L_TT1L_scCoilData

Designator / Data type	Description	Available in version: Base	Available in version: State
lrMinDiam LREAL	Minimum coil diameter • Unit: units • Initial value: 100.0		●
lrMaxDiam LREAL	Maximum coil diameter • Unit: units • Initial value: 500.0		●
lrLowerPosMinDiam LREAL	Lower reversal point at minimum coil diameter • Unit: units • Initial value: 100.0		●
lrLowerPosMaxDiam LREAL	Lower reversal point at at maximum coil diameter • Unit: units • Initial value: 100.0		●
lrUpperPosMinDiam LREAL	Upper reversal point at minimum coil diameter • Unit: units • Initial value: 600.0		●
lrUpperPosMaxDiam LREAL	Upper reversal point at maximum coil diameter • Unit: units • Initial value: 600.0		●

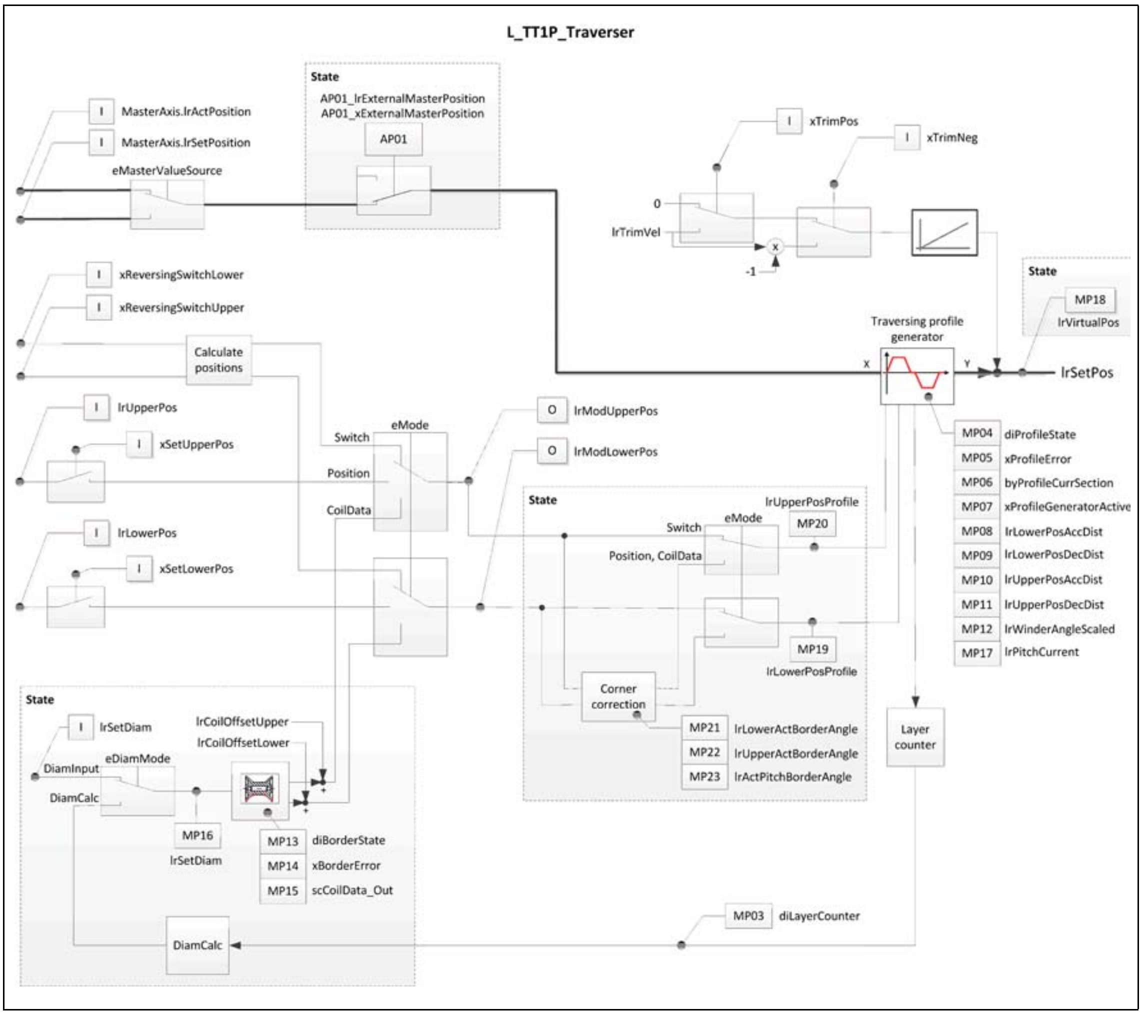
3.4 State machine



[3-3] State machine of the technology module

(*1 In the "Ready" state, xRegulatorOn has to be set to TRUE.
(*2 In the "ERROR" state, xResetError has to be set to TRUE in order to acknowledge and reset the errors.
(*3 In L_TT1P_States, the "TRAVERSING" state is assigned to the value ’190’.

3.5 Signal flow diagram



[3-4] Signal flow diagram

The illustration [3.5] shows the main signal flow of the implemented functions.

The signal flow of the additional functions such as "manual jog" is not displayed here.

3.5.1 Structure of the signal flow

L_TT1P_scSF_Traverser[Base/State]

The contents of the **L_TT1P_scSF_Traverser[Base/State]** structure are read-only and offer a practical diagnostics option within the signal flow (Signal flow diagram (📖 30)).

<table>
<tr><th rowspan="2">Designator
Data type</th><th rowspan="2" colspan="2">Description</th><th colspan="2">Available in version</th></tr>
<tr><th>Base</th><th>State</th></tr>
<tr><td>MP01_lrTurnPositionLowerOut
LREAL</td><td colspan="2">Setpoint of the reverse position at the lower reel end
This value is always updated when the traverser restarts from the lower limit position.</td><td>●</td><td>●</td></tr>
<tr><td>MP02_lrTurnPositionUpperOut
LREAL</td><td colspan="2">Setpoint of the reverse position at the upper reel end
This value is always updated when the traverser restarts from the upper limit position.</td><td>●</td><td>●</td></tr>
<tr><td>MP03_diLayerCounter
DINT</td><td colspan="2">Layer counter</td><td>●</td><td>●</td></tr>
<tr><td>MP04_diProfileState
DINT</td><td colspan="2">Status bit field of the internal function block SupportMotionProfile
Contains profile error messages that are already displayed in the eErrorID output.
In case of eErrorID "17150", these bits are useful for the analysis:
• Bit 16: Negative path constant travel towards upper limit position
• Bit 17: Negative path constant travel towards lower limit position</td><td>●</td><td>●</td></tr>
<tr><td>MP05_xProfileError
BOOL</td><td colspan="2">Sum error bit of the internal function block SupportMotionProfile</td><td>●</td><td>●</td></tr>
<tr><td rowspan="17">MP06_byProfileCurrSection
BYTE</td><td colspan="2">Active curve section (0 ... 15) of the traversing profile</td><td rowspan="17">●</td><td rowspan="17">●</td></tr>
<tr><td>0</td><td>Accelerating from the lower limit position to overspeed</td></tr>
<tr><td>1</td><td>Constant travel - overspeed</td></tr>
<tr><td>2</td><td>Decelerating to traversing step</td></tr>
<tr><td>3</td><td>Constant travel with traversing step towards upper limit position</td></tr>
<tr><td>4</td><td>Acceleration to overspeed at the upper layer end</td></tr>
<tr><td>5</td><td>Constant travel with overspeed</td></tr>
<tr><td>6</td><td>Deceleration to standstill</td></tr>
<tr><td>7</td><td>Margin stop at the upper limit position</td></tr>
<tr><td>8</td><td>Accelerating from the upper limit position to overspeed</td></tr>
<tr><td>9</td><td>Constant travel - overspeed</td></tr>
<tr><td>10</td><td>Decelerating to traversing step</td></tr>
<tr><td>11</td><td>Constant travel with traversing step towards lower limit position</td></tr>
<tr><td>12</td><td>Acceleration to overspeed at the lower layer end</td></tr>
<tr><td>13</td><td>Constant travel with overspeed</td></tr>
<tr><td>14</td><td>Deceleration to standstill</td></tr>
<tr><td>15</td><td>Margin stop at the lower limit position</td></tr>
<tr><td>MP07_xProfileGeneratorActive
BOOL</td><td>TRUE</td><td>The profile generator is active.
Movements of the winder are monitored and the traverser setpoint position is calculated even if the traverser does not travel itself.</td><td>●</td><td>●</td></tr>
<tr><td>MP08_lrLowerPosAccDist
LREAL</td><td colspan="2">Distance covered by the traverser during acceleration.
Helpful for controlling the profile data.</td><td>●</td><td>●</td></tr>
</table>

Designator Data type	Description	Available in version Base	State
MP09_lrLowerPosDecDist LREAL	Distance covered by the traverser during deceleration. Helpful for controlling the profile data.	●	●
MP10_lrUpperPosAccDist LREAL	Distance covered by the traverser during acceleration. Helpful for controlling the profile data.	●	●
MP11_lrUpperPosDecDist LREAL	Distance covered by the traverser during deceleration. Helpful for controlling the profile data.	●	●
MP12_lrWinderAngleScaled LREAL	Winder angle currently used for profile calculation, scaled to modulo 360°.	●	●
MP13_diBorderState DINT	Status bit field of the internal function block **SupportBorderPos**		●
	Bit 13: lrSetDiam < lrMinDiam (warning)		
	Bit 14: lrSetDiam > lrMaxDiam (warning)		
	Bit 15: Sum error		
	Bit 16: lrCurrentLowerPos > lrCurrentUpperPos (error)		
	Bit 17: lrLowerPosMinDiam > lrUpperPosMinDiam (error)		
	Bit 18: lrLowerPosMaxDiam > lrUpperPosMaxDiam (error)		
	Bit 19: lrMinDiam < 1 (error)		
MP14_xBorderError BOOL	Sum error bit of the internal function block **SupportBorderPos**		●
MP15_scCoilData_Out L_TT1L_scCoilData	Coil geometry (trimmed, touch probe changed) ▸ Data of the coil geometry (📖 28)		●
MP16_lrSetDiam LREAL	Current reel diameter for calculating the reversal points due to the coil geometry		●
MP17_lrPitchCurrent LREAL	Currently effective traversing step Combination of the values of lrTraversingPitch parameter and lrPitchOverride input		●
MP18_lrVirtualPos LREAL	If the traverser is operated in eMode = "Position" or eMode = "CoilData", the profile generator continues to run after the traversing step operation has been completed (xTraversingCtrl = FALSE). Only the axis is stopped. MP18_lrVirtualPos shows this "virtual traverser position" (where the traverser would stand if it was not switched off)		●
MP19_lrLowerPosProfile LREAL	This value is defined for the profile generator as setpoint for the lower reverse position. Usually, this value corresponds to the persistent lrModLowerPos variable. When the radius correction is activated, the influence on the variable can be seen here.		●
MP20_lrUpperPosProfile LREAL	This value is defined for the profile generator as setpoint for the upper reverse position. Usually, this value corresponds to the persistent lrModUpperPos variable. When the radius correction is activated, the influence on the variable can be seen here.		●
MP21_lrLowerActBorder Angle LREAL	Angle of the master drive at the last impact on the lower reversal point.		●
MP22_lrUpperActBorder Angle LREAL	Angle of the master drive at the last impact on the upper reversal point.		●
MP23_lrActPitchBorder Angle LREAL	Projected traversing step including the influence of the margin shift angle control (lrTraversingPitch * lrPitchOverride + influence of margin shift angle)		●

3.5.2 Structure of the access points

L_TT1P_scAP_Traverser[Base/State]

The access points (AP) can be used to influence signals. In the initial state, the access points do not have any effect.

Each access point acts as an alternative branch and is activated via an OR operation or a switch.

Designator **Data type**	**Description**	**Available in version**	
		Base	**State**
AP01_xExternalMaster Position BOOL	Enable of the AP01_lrExternalMasterPosition access point • Initial value: FALSE TRUE: The master position is not read out of the master axis structure but defined directly. **Caution:** Change-over if made directly (hard)! A wrong use may cause abrupt movements of the traversing drive!	●	●
AP01_lrExternalMaster Position LREAL	External setting of the master position As Modulo value of the mater, fixed 360.0° are assumed for one reel revolution. • Unit: Degree • Range: 0.0 ... 360.0	●	●
AP02_xSyncInAngleLower BOOL	Enable of the AP02_lrSyncInAngleLower access point TRUE: The access point overwrites the values at the access point in the signal flow.	●	●
AP02_lrSyncInAngleLower LREAL	The lrSyncInAngle parameter (ramp angle) is used at the lower and upper reversal point. AP02_lrSyncInAngleLower serves to provide an alternative ramp angle for the <u>lower</u> reversal point.	●	●
AP03_xSyncInAngleUpper BOOL	Enable of the AP03_lrSyncInAngleUpper access point TRUE: The access point overwrites the values at the access point in the signal flow.	●	●
AP03_lrSyncInAngleUpper LREAL	The lrSyncInAngle parameter (ramp angle) is used at the lower and upper reversal point. AP03_lrSyncInAngleUpper serves to provide an alternative ramp angle for the <u>upper</u> reversal point.	●	●
AP04_xSyncOutAngleLower BOOL	Enable of the AP04_lrSyncOutAngleLower access point TRUE: The access point overwrites the values at the access point in the signal flow.	●	●
AP04_lrSyncOutAngleLower LREAL	The lrSyncOutAngle parameter (ramp angle) is used at the lower and upper reversal point. AP04_lrSyncOutAngleLower serves to provide an alternative ramp angle for the <u>lower</u> reversal point.	●	●
AP05_xSyncOutAngleUpper BOOL	Enable of the AP05_lrSyncOutAngleUpper access point TRUE: The access point overwrites the values at the access point in the signal flow.	●	●
AP05_lrSyncOutAngleUpper LREAL	The lrSyncOutAngle parameter (ramp angle) is used at the lower and upper reversal point. AP05_lrSyncOutAngleUpper serves to provide an alternative ramp angle for the <u>upper</u> reversal point.	●	●

3.6 Detection of the winding movement

The winding movement is directly obtained from the winding drive (AXIS_REF *MasterAxis*).

▶ Inputs and outputs (📖 16)

The use of a "winder" technology module is recommended for the rewinder, but it is not mandatory.

If no soft-motion axis exists for the rewinder, a virtual axis can be connected instead. The reel position must be specified via an access point (L_TT1P_scAP_Traverser[Base/State] (📖 33)).

3.7 Manual jog (jogging)

Precondition

- The technology module is in the "Ready" state.
- The slave axis is enabled (*xRegulatorOn* = TRUE).

Execution

For manual jog of the axis, the manual jog speed *lrJogVel* is used.

If the *xJogPos* input is TRUE, the axis is traversed in positive direction and if the *xJogNeg* input is TRUE, the axis is traversed in negative direction. The axis is executed for as long as the input remains set to TRUE.

The current travel command cannot be replaced by another jog command. Only if both inputs have been reset, the State machine (📖 29) changes to the "Ready" state again.

Parameters to be set

The parameters for the manual jog are located in the L_TT1P_scPar_Traverser[Base/State] (📖 22) parameter structure.

```
lrJogVel : LREAL := 10;       // Velocity [units/s]
lrJogAcc : LREAL := 100;      // Acceleration [units/s^2]
lrJogDec : LREAL := 100;      // Deceleration [units/s^2]
lrJogJerk : LREAL := 100000; // Jerk [units/s^3]
```

The parameter values can be changed during operation. They are accepted when the *xJogPos* or *xJogNeg* input is set to TRUE again.

3.8 Homing

Precondition

- The technology module is in the "Ready" state.
- The slave axis is enabled (*xRegulatorOn* = TRUE).

Execution

Homing is started with a rising edge (FALSE↗TRUE) at the *xHomeExecute* input. The axis will be traversing until the home position is reached. After successful homing, the State machine (📖 29) changes back again to the "Ready" state.

The homing process is not interrupted if the *xHomeExecute* input is set to FALSE too early. The function is aborted via the *xStop* input.

Parameters to be set

The parameters for homing are located in the L_TT1P_scPar_Traverser[Base/State] (📖 22) parameter structure.

```
xUseHomeExtParameter : BOOL := FALSE;
lrHomePosition : LREAL := 0.0;
scHomeExtParameter : L_MC1P_HomeParameter;
scHomeExtTP : MC_TRIGGER_REF;
```

3.9 Stop

Execution

The *xStop* = TRUE input serves to lead the axis to standstill via a defined stop ramp. The *lrStopJerk* parameter is considered as jerk.

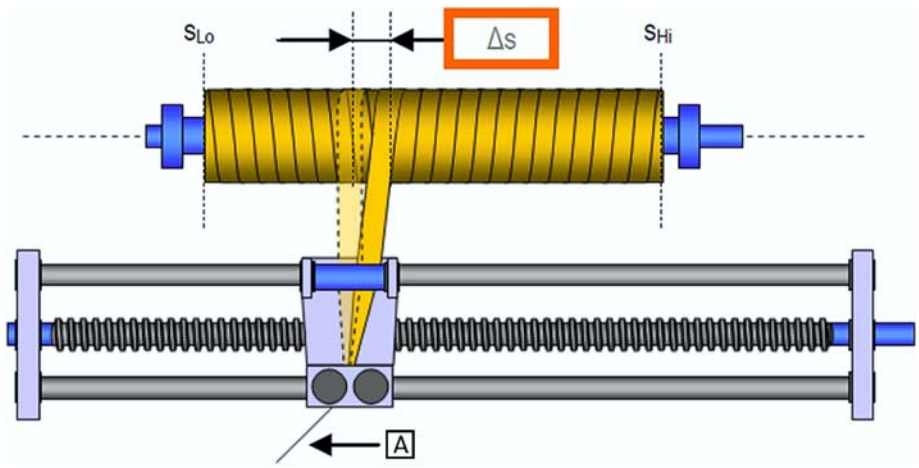
Parameters to be set

The parameters for stop are located in the L_TT1P_scPar_Traverser[Base/State] (📖 22) parameter structure.

```
lrStopDec : LREAL := 10000;
lrStopJerk : LREAL := 100000;
```

3.10 Margin stop

In practice, the impact point of the material on the reel is not identical to the position of the traversing drive. Depending on the distance between the traversing axis and the winding axis, an offset arises (Δs):



Δs	Offset
S_{Lo}	Lower reel limit position
S_{Hi}	Upper reel limit position
A	Direction of movement of the material guiding

[3-5] Offset (Δs) between traversing drive and impact point of the material on the reel

In case of an immediate reversing of the traversing axis in the winding limit positions (reversal points S_{Lo}, S_{Hi}), the offset (Δs) between traverser position and impact point of the material on the reel would prevent the margin positions of the reel to be wound.

This can be remedied by the margin stop function which lets the traversing drive pause in the winding limit positions (inputs *lrLowerPos* and *lrUpperPos*) for a certain angle of rotation of the reel. During the pause time, the web is pulled stronger into the winding limit positions by the rotating reel. The margin stop angle can be set for the lower and upper winding limit position each.

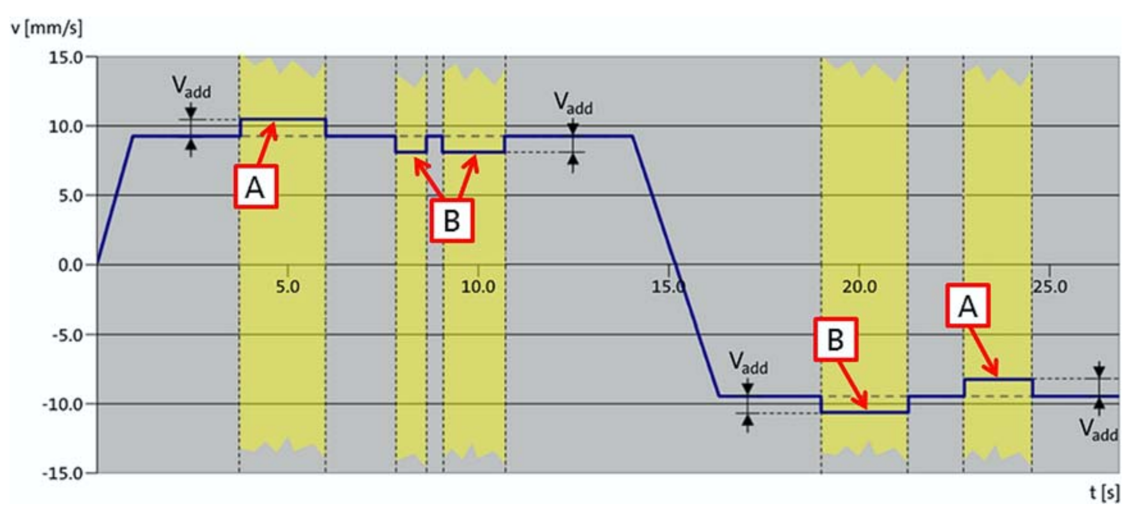
Parameters to be set

The parameters for the margin stop angle are located in the L_TT1P_scPar_Traverser[Base/State] (📖 22) parameter structure.

```
lrEndStopAngleLower : LREAL := 270;
lrEndStopAngleUpper : LREAL := 270;
```

3.11 Trimming during the traversing process

Especially in case of narrow winding material (e.g. thin wire) it may happen during the running process that the traversing pattern must be corrected manually in order to avoid the creation of peaks and valleys. Moreover, by setting the inputs *xTrimPos* = TRUE or *xTrimNeg* = TRUE, the actual movement of the traversing drive can be superimposed positively or negatively with a trimming speed (parameter *lrTrimVel*). If both inputs (*xTrimPos* and *xTrimNeg*) are set to TRUE, the travel direction selected first is maintained.



V_{add}	Superimposed trimming speed [units/s]
A	Inching command in positive direction (xTrimPos = TRUE)
B	Inching command in negative direction (xTrimNeg = TRUE)

[3-6] Impact of the superimposed trimming function on the resulting setpoint

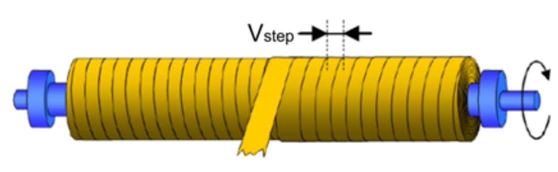
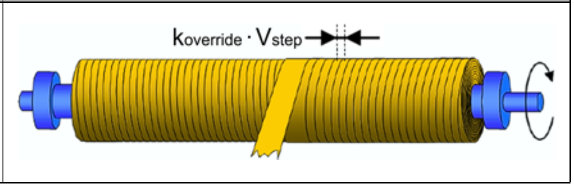
Parameters to be set

The parameter for the superimposed trimming speed is located in the L_TT1P_scPar_Traverser[Base/State] (22) parameter structure.

```
lrTrimVel : LREAL := 0;
```

3.12 Traversing step change during operation (traversing step override)

The override function for the traversing step permits a change of the traversing step (*lrPitchOverride* input) during traversing operation. For the traversing step. the override causes a proportional impact on the traversing velocity.

Input *lrPitchOverride* = 1 (100 %)	Input *lrPitchOverride* < 1
	

Depending on the selected override mode (*eOverrideMode* parameter), the traversing step override is included in the acceleration/deceleration ramp.

- "OverrideAccDec" override mode (📖 38)
- "OverrideConstant" override mode (📖 39)

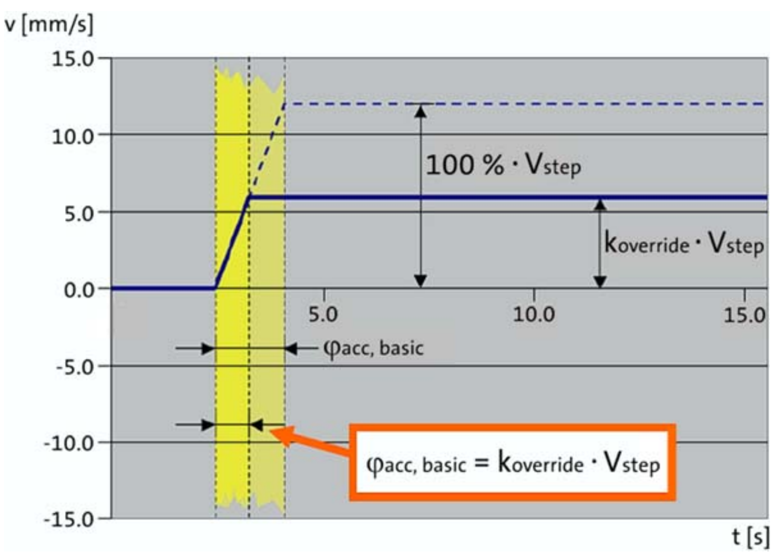
Parameters to be set

The parameter for selecting the override mode is located in the L_TT1P_scPar_Traverser[Base/State] (📖 22) parameter structure.

```
eOverrideMode : L_TT1P_OverrideMode := 0;  // OverrideAccDec
eOverrideMode : L_TT1P_OverrideMode := 1;  // OverrideConstant
```

3.12.1 "OverrideAccDec" override mode

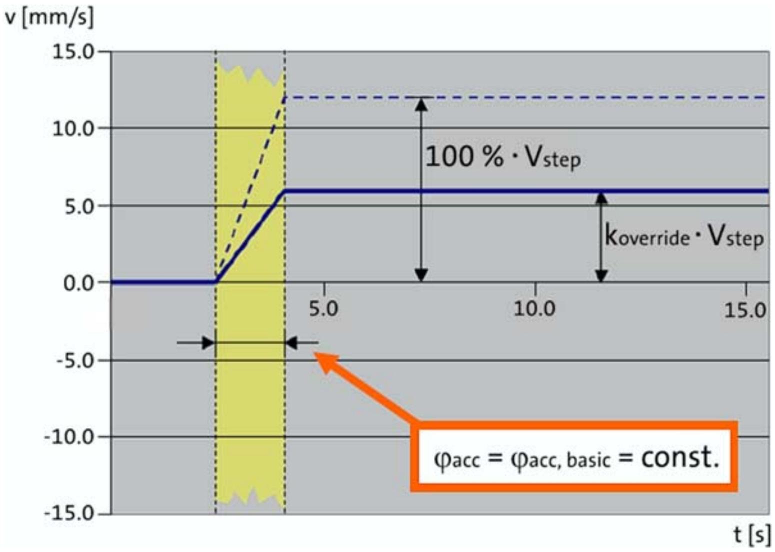
Just like the traversing step, the acceleration/deceleration angle has an impact on the traversing step override.



[3-7] "OverrideAccDec" override mode

3.12.2 "OverrideConstant" override mode

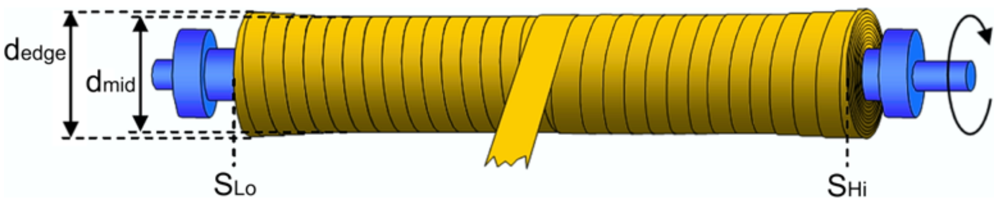
The acceleration/deceleration angle remains constant irrespective of the traversing step override.



[3-8] "OverrideConstant" override mode

3.13 Traversing step increase in the marginal areas (overspeed)

And even winding of the coil can theoretically only be achieved if the impact point of the material continuously moves along the coil axis in an oscillating manner. Speed ramps and stop phases in the edge areas usually cause the traversing drive to stay a bit longer in the edge areas as in the central area of the coil. Thus, the material piles up at the edge areas ($d_{edge} > d_{mid}$).



d_{edge}	Reel diameter at the edge areas of the coil
d_{mid}	Reel diameter in the central area of the coil
S_{Lo}	Lower reel limit position
S_{Hi}	Upper reel limit position

[3-9] Material accumulation in the edge areas

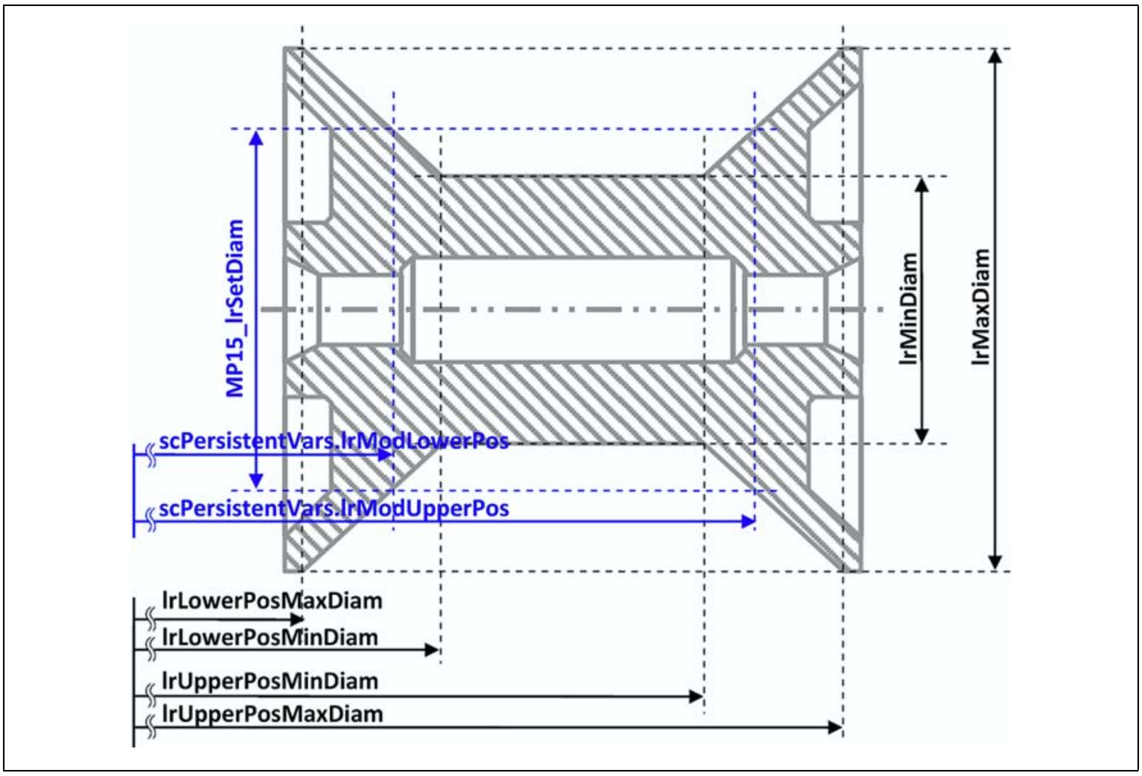
The effect can be avoided by compensating the dwell time of the traversing drive at the edge areas (Margin stop (📖 36)) by increasing the traversing step directly after the reversing process.

Parameters to be set

The parameters for the traversing step increase are located in the L_TT1P_scPar_Traverser[Base/State] (📖 22) parameter structure.

```
lrOverspeedStartLower : LREAL := 1.25;     // 1.00 = 100 % (no raising)
lrOverspeedStartUpper : LREAL := 1.25;     // 1.00 = 100 % (no raising)
lrOverspeedEndLower : LREAL := 1.25;       // 1.00 = 100 % (no raising)
lrOverspeedEndUpper : LREAL := 1.25;       // 1.00 = 100 % (no raising)
lrOverspeedAngleStartLower : LREAL := 90;
lrOverspeedAngleStartUpper : LREAL := 90;
lrOverspeedAngleEndLower : LREAL := 0;
lrOverspeedAngleEndUpper : LREAL := 0;
```

3.14 Traversing onto conical coils



[3-10] Conical coils

In many cases, the material to be wound is traversed onto coils that have a conical cross-section. This cross-section type causes diameter-dependent reverse positions.

A similar effect takes place when a material with a critical cross-section is traversed (e.g. yarn or narrow and smooth plastic foil). In the edge areas, constant reverse positions frequently cause the material to "fall out" of the single layers. In order to make the reel structure more stable, winding with reduced traversing widths towards wider diameters (trapezoidal cross-section) has proven successful. Here, the layer width is reduced with an increasing diameter.

Parameters to be set

The parameters for conical coils are located in the parameter structures ...

- L_TT1P_scPersistentVarsTraverser[Base/State] (📖 21):

```
lrModLowerPos : LREAL := 0;    // [units]
lrModUpperPos : LREAL := 100;  // [units]
```

- L_TT1L_scCoilData (📖 28):

```
lrMinDiam : LREAL := 100;          // [units]
lrMaxDiam : LREAL := 500;          // [units]
lrLowerPosMinDiam : LREAL := 100;  // [units]
lrLowerPosMaxDiam : LREAL := 100;  // [units]
lrUpperPosMinDiam : LREAL := 600;  // [units]
lrUpperPosMaxDiam : LREAL := 600;  // [units]
```

3.15 Radius correction of the coil

Some coils have a radius at the transition from the bottom to the side panel. For this purpose, the State version provides for the option of activating a radius correction with the parameter *eCornerCorrMode* = 1 in the traversing modes "Position" and "CoilData" (*eMode* parameter).

▶ Radius correction in the "Position" traversing mode (📖 42)

▶ Radius correction in the "CoilData" traversing mode (📖 43)

The radius correction can be monitored via the signal flow points *MP19_lrLowerPosProfile* and *MP20_lrUpperPosProfile*.

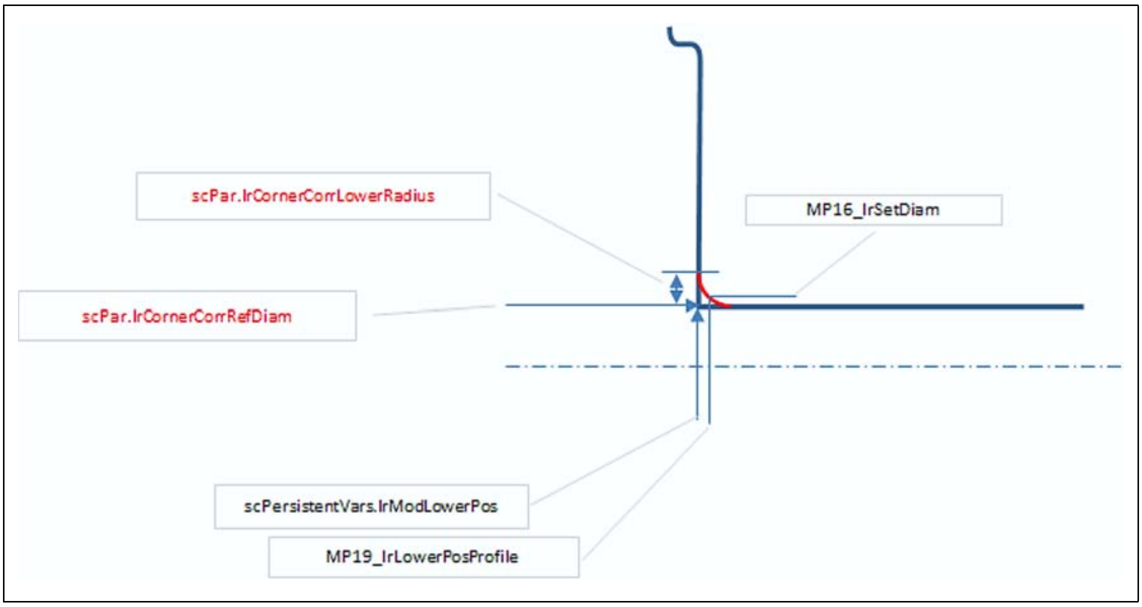
▶ Signal flow diagram (📖 30)

Parameters to be set

The parameters for the radius correction are located in the L_TT1P_scPar_Traverser[Base/State] (📖 22) parameter structure.

```
eMode : L_TT1P_TaverserMode := 0;  // Position
eMode : L_TT1P_TaverserMode := 2;  // CoilData
eCornerCorrMode : L_TT1P_TraverserCornerCorrMode := 1;
lrCornerCorrRefDiam : LREAL := 0.0;
lrCornerCorrLowerRadius : LREAL := 0.0;
lrCornerCorrUpperRadius : LREAL := 0.0;
```

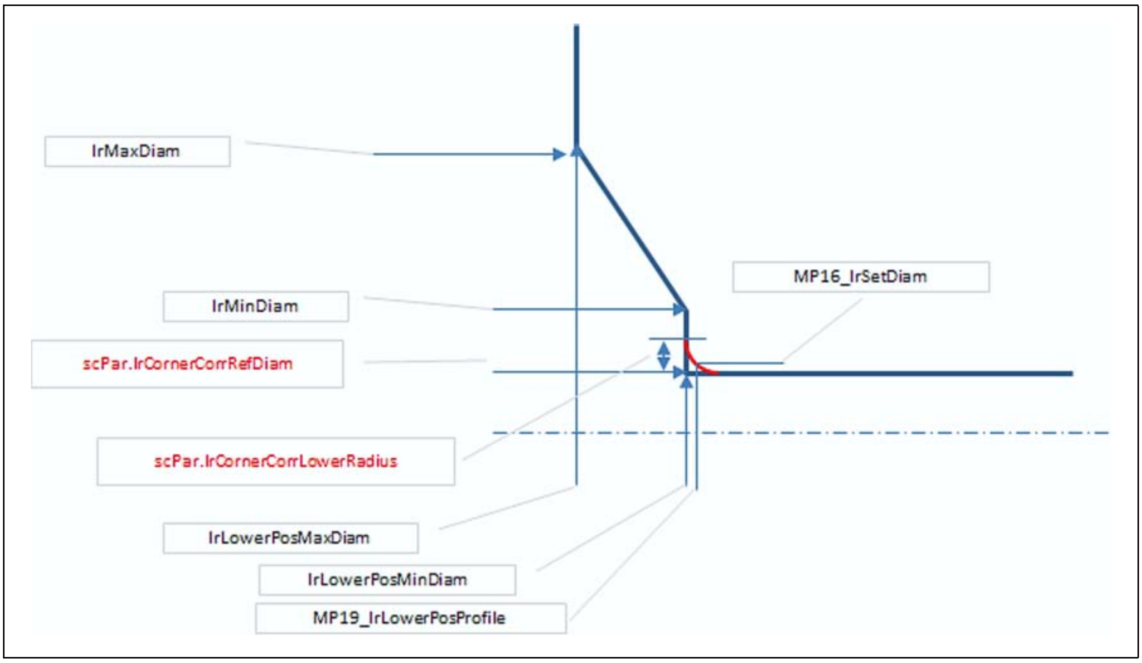
3.15.1 Radius correction in the "Position" traversing mode



[3-11] Radius correction in the "Position" traversing mode

If the radius correction is activated with the parameter *eCornerCorrMode* = 1, the technology module automatically considers the resulting correction for the reverse position *lrCornerCorrLowerRadius* or lrCornerCorrUpperRadius depending on the current diameter (*lrSetDiam*) and the reference diameter (*lrCornerCorrRefDiam*.

3.15.2 Radius correction in the "CoilData" traversing mode



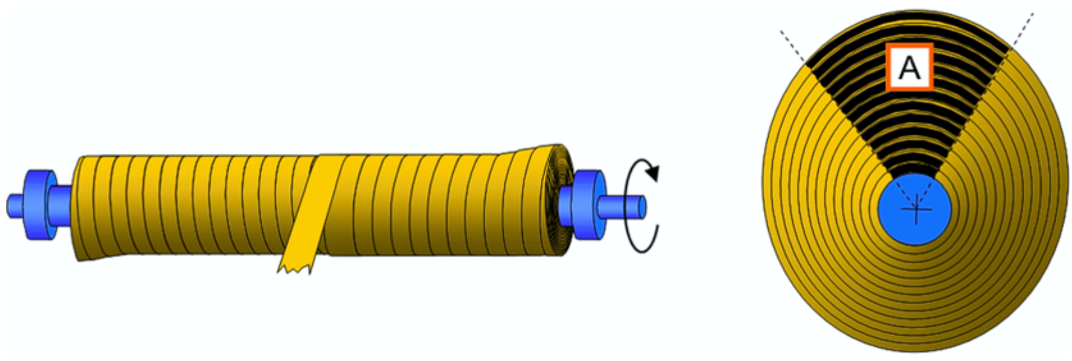
[3-12] Radius correction in the "CoilData" traversing mode

If the radius correction is activated with the parameter *eCornerCorrMode* = 1, the technology module automatically considers the resulting correction for the reverse position *lrCornerCorrLowerRadius* or lrCornerCorrUpperRadius depending on the current diameter (*lrSetDiam*) and the reference diameter (*lrCornerCorrRefDiam*.

In this case, the current diameter and the reference diameter may also be below the minimum coil diameter (*lrMinDiam*).

3.16 Reverse offset (edge offset)

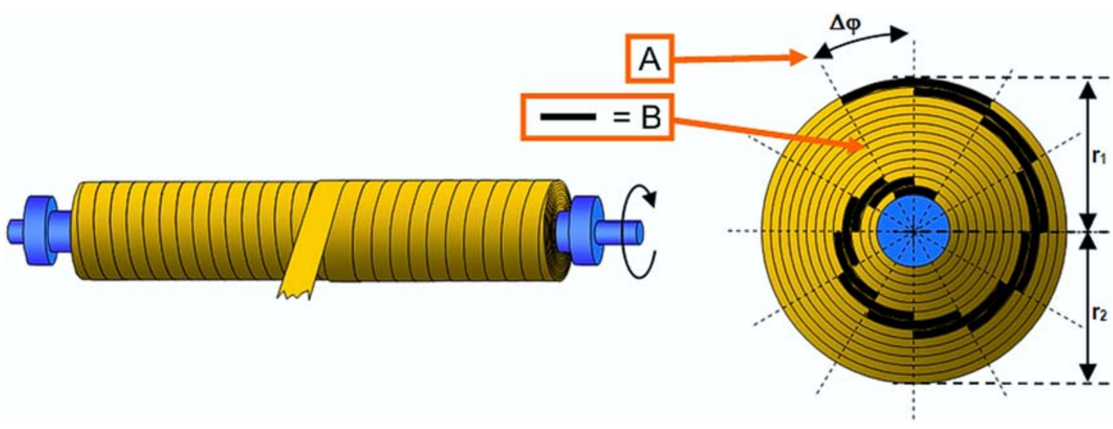
In case of unfavourable traversing parameters it may be that the reversal points (margin stop areas) at the winding limit positions are always at the same positions with regard to the circumferential angle of the reel. This may lead to bulges of the reel at the edge areas of the coil and to an asymmetrical reel cross-section ($r_1 > r_2$, fig. [3-13]).



A	Reversal points (edge stop areas) at the winding limit positions

[3-13] Uneven winding at the edge areas

An even distribution of the reversal points (margin stop areas) with a defined angular offset can prevent this effect. In this case, the reversal point in a certain position with reference to the reversal point in the previous position is offset by a certain angle. Thus, an accumulation of the margin stops at a certain angle value of the coil does not occur in the first place ($r_1 = r_2$, fig. [3-14]).



A	Defined reverse offset angle $\Delta\varphi$
B	Reversal points (edge stop areas) at the winding limit positions

[3-14] Even winding at the edge areas

The *eAngularShiftMode* parameter serves to activate this control. The impact on the traversing step is determined here as well (only increase, only decrease, or optimal).

The angular offset is defined for the lower limit position (*lrAngularShiftLower* parameter) and for the upper limit position (*lrAngularShiftUpper* parameter).

The edge offset is realised by a slight internal adjustment of the traversing step. Precisely, by a "virtual" acceleration or deceleration of the master velocity.

The *lrAngularShiftLimit* parameter serves to limit the maximum impact of the change:

- *lrAngularShiftLimit* = 1.0: No change of the traversing step
- *lrAngularShiftLimit* = 1.1: Increase of the traversing step by 10 % (e.g. from 5.0 to 5.5)
- *lrAngularShiftLimit* = 2.0: Duplication of the traversing step (e.g. from 5.0 to 10.0).

This also applies for decreasing the traversing step:

- *lrAngularShiftLimit* = 1.1: Decrease of the traversing step by 10 % (e.g. from 5.0 to 4.5)
- *lrAngularShiftLimit* = 2.0: Halving the traversing step (e.g. from 5.0 to 2.5).

An active limitation is displayed by setting the output *xWarning* = TRUE and the error code '17152' (TraversingAngularShiftLimitReached) in the *eErrorID*output.

Parameters to be set

The parameters for the reverse offset (edge offset) are located in the L_TT1P_scPar_Traverser[Base/State] (📖 22) parameter structure.

```
eAngularShiftMode : L_TT1P_AngularShiftMode := 0;  // disabled
lrAngularShiftLower : L_TT1P_TaverserMode := 0;
lrAngularShiftUpper : L_TT1P_TraverserCornerCorrMode := 0;
lrAngularShiftLimit : LREAL := 1.1;
```

3.17 Material guiding line

Available for the State version in the "CoilData" operating mode (parameter *eMode* = 2).

The material guiding line determines the reference of the traverser towards the coil edges and is used for winding wide materials.

The *eAlignMode* parameter serves to select these modes:

- *eAlignMode* = -1 (AlignLower): Material feeding is left-justified (initial value)
- *eAlignMode* = 0 (AlignCenter): Material feeding is centred
- *eAlignMode* = 1 (AlignUpper): Material feeding is right-justified

In addition, the material width must be defined with the *lrMaterialWidth* parameter.

Example

If the "AlignLower" mode is defined with *eAlignMode* = -1 and *lrMaterialWidth* = 10.0 [units], the real travel range is from the current lower reverse position (*lrLowerPos* input) to the upper reverse position (*lrUpperPos* input) -10.0 units.

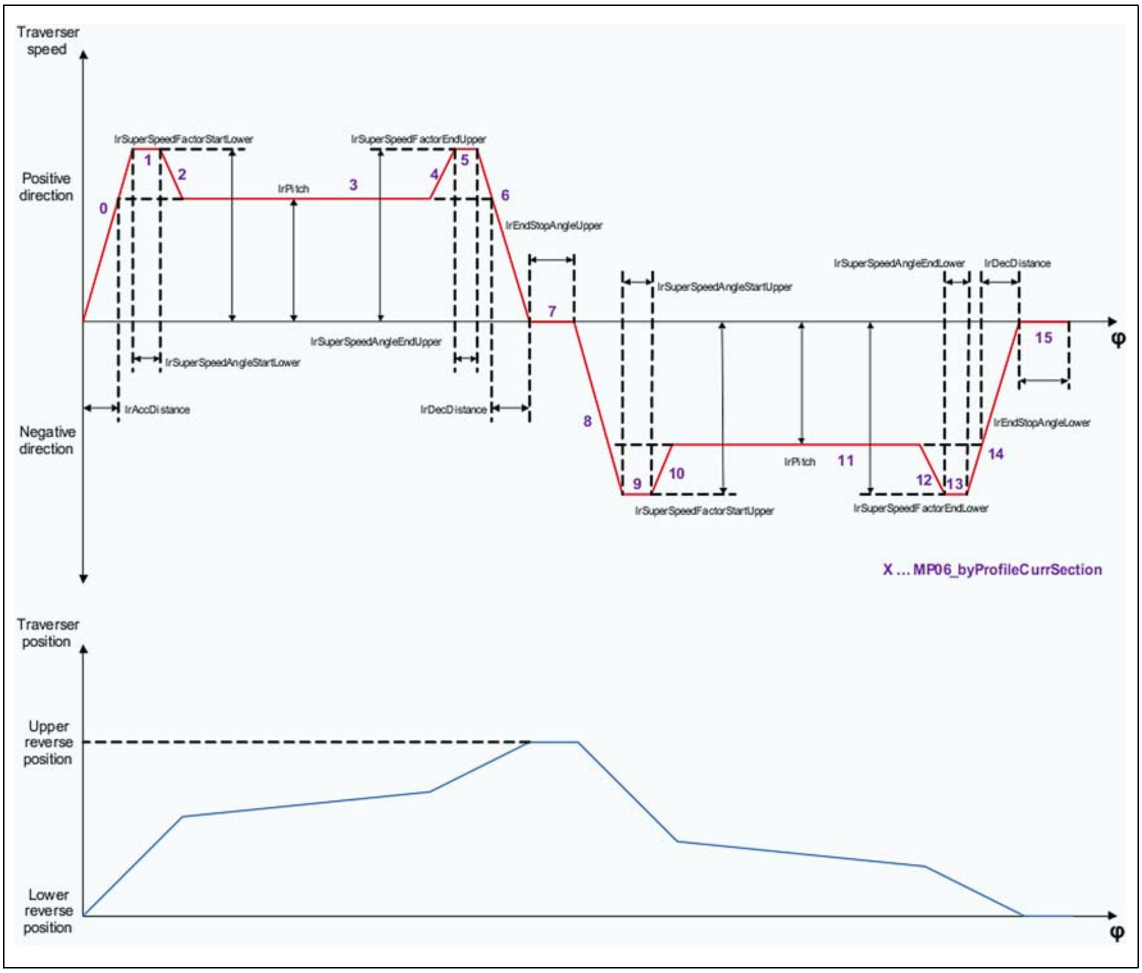
The positions *lrLowerPos* and *lrUpperPos* are the reverse positions calculated from the Data of the coil geometry (📖 28) (parameter structure *scCoilData*) and the current diameter.

Parameters to be set

The parameters for the reverse offset (edge offset) are located in the L_TT1P_scPar_Traverser[Base/State] (📖 22) parameter structure.

```
eMode : L_TT1P_TaverserMode := 2;               // CoilData
eAlignMode : L_TT1P_TraverserAlignMode := -1;  // AlignLower
lrMaterialWidth : LREAL := 0.0;
```

3.18 Traversing profile (example)



[3-15] Traversing profile (example)

3.19 CPU utilisation (example Controller 3231 C)

The following table shows the CPU utilisation in microseconds using the example of the 3231 C controller (ATOM™ processor, 1.6 GHz).

Interconnection of the technology module	CPU utilisation	
	Average	Maximum peak

xEnable := TRUE;
xRegulatorOn := TRUE;
xExecuteReversing := TRUE;
	60 µs	90 µs

Index

A

C

D

E

F

G

H

I

L

M

N

O

P

R

S

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Vielen Dank für Ihre Unterstützung.

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