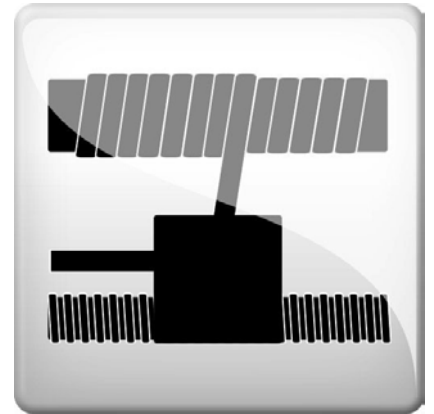


Technology module



Traverser_____

Reference Manual

EN



Contents

1	About this documentation	3
1.1	Document history	5
1.2	Conventions used	6
1.3	Definition of the notes used	7
2	Safety instructions	8
3	"Traverser" functional description	10
3.1	Overview of the functions	12
3.2	Important notes on how to operate the technology module	13
3.3	Function block L_TT1P_Traverser[Base/State]	14
3.3.1	Inputs and outputs	15
3.3.2	Inputs	15
3.3.3	Outputs	19
3.3.4	Persistent variables	20
3.3.5	Parameters	21
3.3.6	Data of the coil geometry	27
3.4	State machine	28
3.5	Signal flow diagram	30
3.5.1	Structure of the signal flow	31
3.5.2	Structure of the access points	33
3.6	Detection of the winding movement	34
3.7	Manual jog (jogging)	34
3.8	Homing	35
3.9	Stop	35
3.10	Margin stop	36
3.11	Trimming during the traversing process	37
3.12	Traversing step change during operation (traversing step override)	38
3.12.1	"OverrideAccDec" override mode	38
3.12.2	"OverrideConstant" override mode	39
3.13	Traversing step increase in the marginal areas (overspeed)	40
3.14	Traversing onto conical coils	41
3.15	Radius correction of the coil	42
3.15.1	Radius correction in the "Position" traversing mode	42
3.15.2	Radius correction in the "CoilData" traversing mode	43
3.16	Reverse offset (edge offset)	44
3.17	Material guiding line	46
3.18	Traversing profile (example)	47
3.19	CPU utilisation (example Controller 3231 C)	48
	Index	49
	Your opinion is important to us	51

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 About this documentation

1.1 Document history

1.1 Document history

Version			Description
1.2	06/2019	TD29	Error corrected
1.1	08/2018	TD29	L_TT1P_States added
1.0	05/2017	TD17	First edition

1 About this documentation

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	<i>italics</i>	By setting <i>bEnable</i> 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!

Damage or destruction of machine parts

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

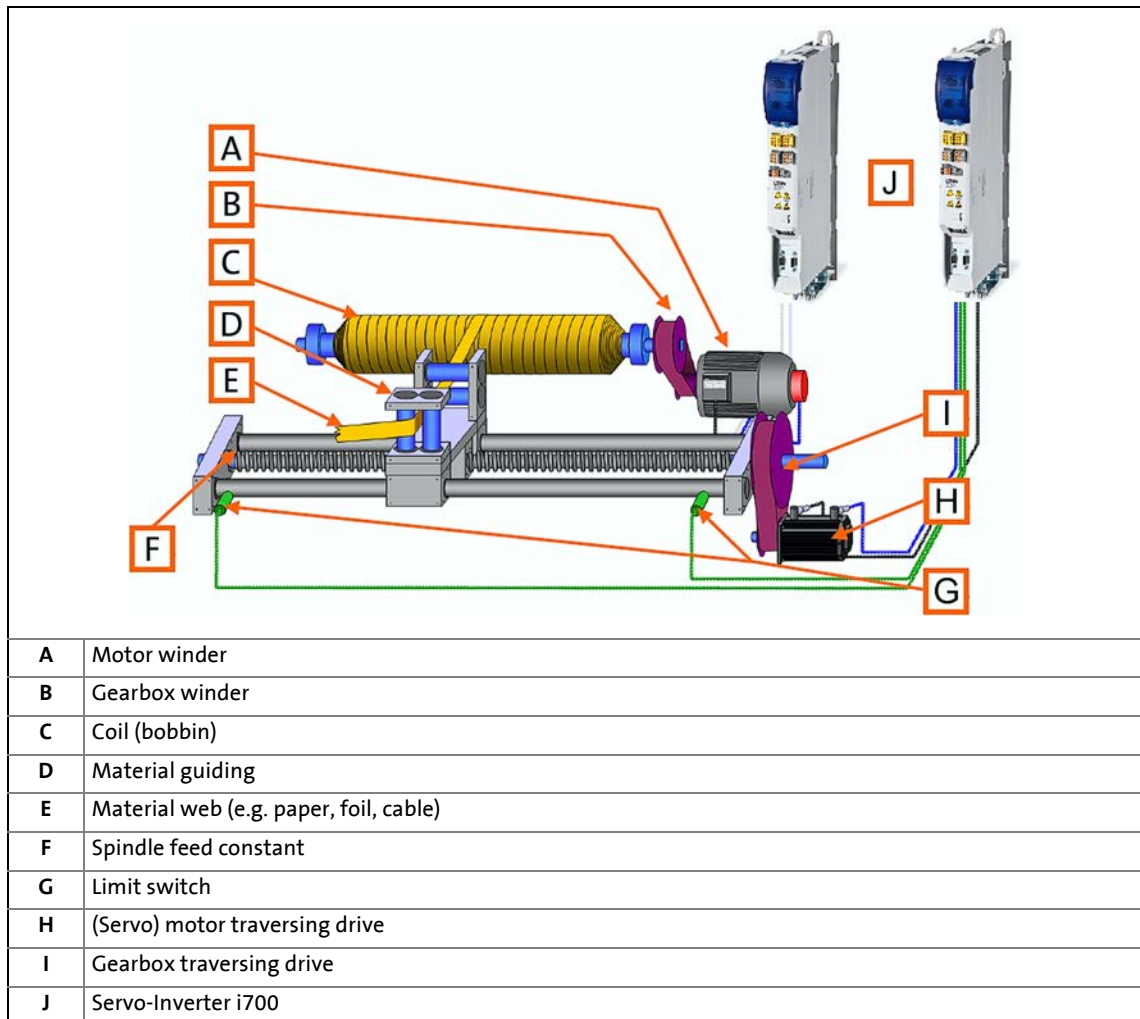
- Short circuit or static discharges (ESD);
- unpredictable motor movements (e.g. unintended direction of rotation, too high velocities or jerky movement);
- impermissible operating states during the parameterisation while there is an active online connection to the device.

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

3 "Traverser" functional description

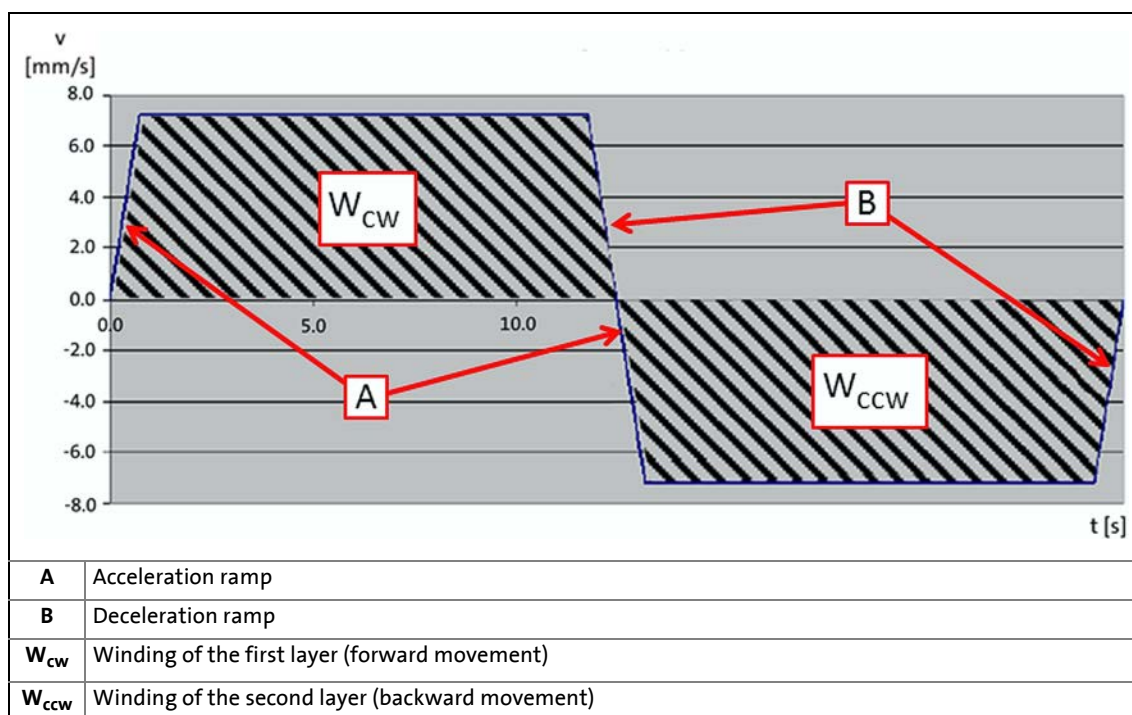


[3-1] Typical mechanics of the technology module

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.

3 "Traverser" functional description

Basic parameters of the standard traversing



[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 "Traverser" functional description

3.1 Overview of the functions

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 $FALSE \rightarrow TRUE$ edge.

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



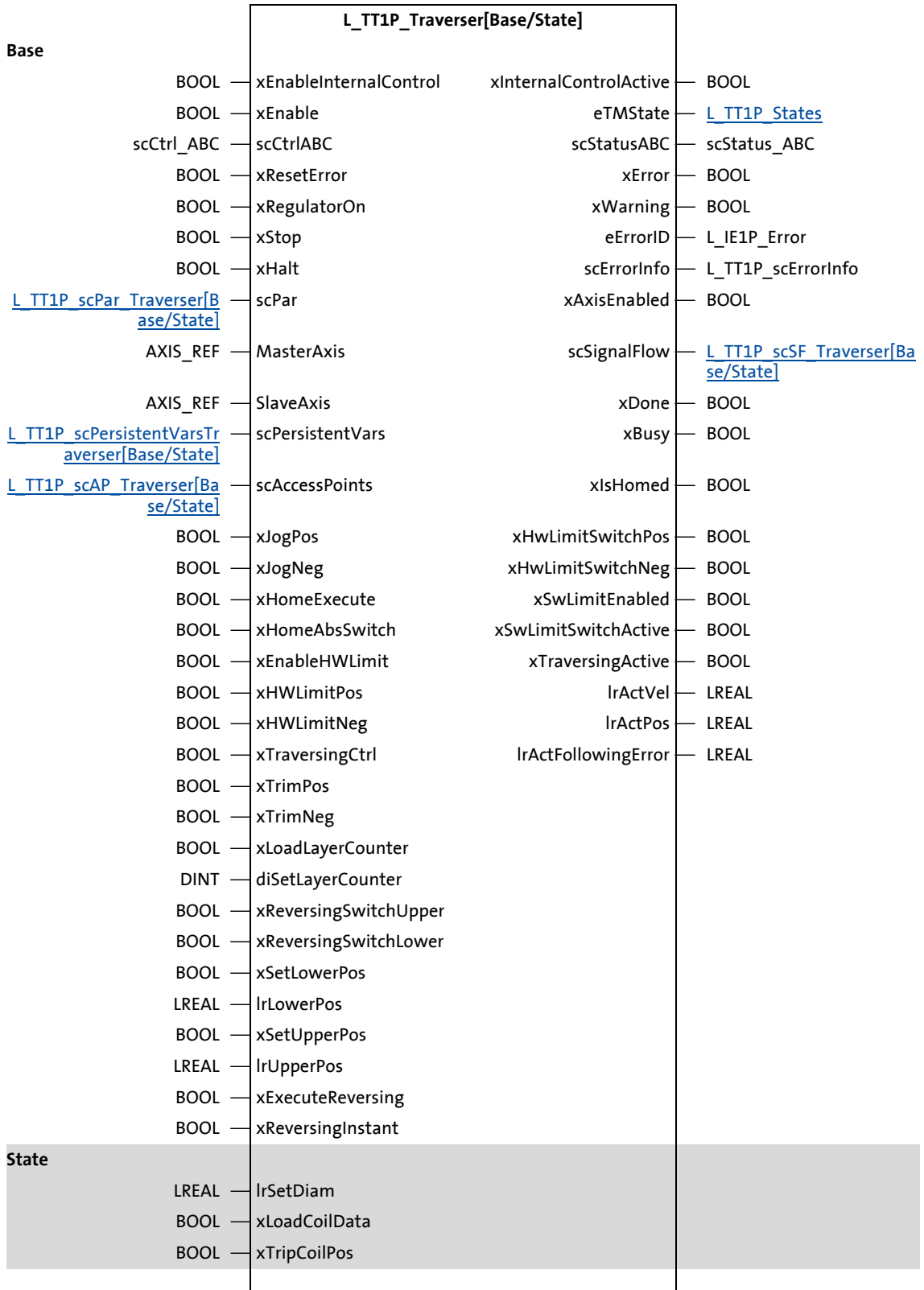
Example [Manual jog \(jogging\)](#) (34):

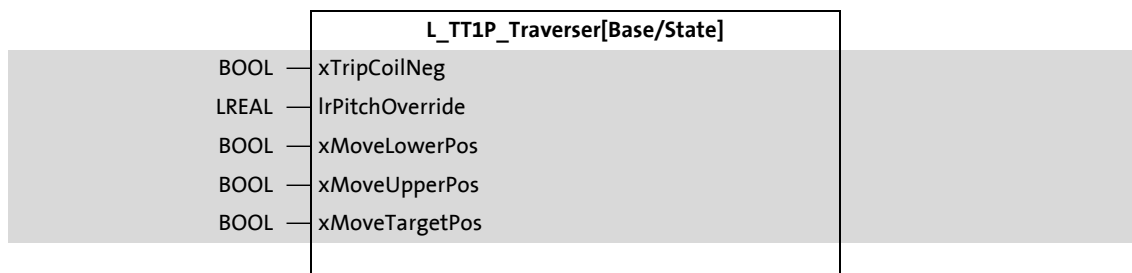
1. In the inhibited axis state ($xAxisEnabled = FALSE$), $xJogPos$ is set to TRUE.
 - $xRegulatorOn = FALSE$ (axis is inhibited.)
==> "READY" state ($xAxisEnabled = FALSE$)
 - $xJogPos = TRUE$ (manual jog is to be executed.)
2. Enable axis.
 - $xRegulatorOn = TRUE$
==> "READY" state ($xAxisEnabled =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

3 "Traverser" functional description

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.





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).	●	●

Designator	Data type	Description		Available in version	
				Base	State
xHalt	BOOL	TRUE	Cancel the active movement and brake the axis to a standstill with the deceleration defined via the lHaltDec 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).		●	●
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	Start homing.		
		TRUE	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	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').		
		TRUE			
xTrimPos	BOOL	TRUE	Trim velocity in positive direction. If xTrimNeg is also TRUE, the traversing direction selected first remains set.	●	●

Designator	Data type	Description		Available in version	
				Base	State
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.	●	●
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 lLowerPos value as current lower reverse position.	●	●
lLowerPos	LREAL	Default value for the lower reverse position • Unit: units • Initial value: 0		●	●
xSetUpperPos	BOOL	TRUE	Acceptance of the lUpperPos value as current upper reverse position.	●	●
lUpperPos	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.		
lSetDiam	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 scPersistentVars).		●

Designator	Data type	Description		Available in version	
				Base	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] (21)		●
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] (21)		●
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	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 (□ 28)		●	●
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 IrStopDec 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 IrStopDec 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 IrStopDec parameter. • The state changes to "ERROR" with error message '20306' (SWLimitPos) or '20307' (SWLimitNeg).	●	●
xTraversingActive	BOOL	TRUE	Traversing operation is active.	●	●
IrActVel	LREAL	Current velocity • Unit: units/s		●	●
IrActPos	LREAL	Current position • Unit: units		●	●
IrActFollowingError	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	●	●
IrModLowerPos	LREAL	Current lower reversal point • Unit: units • Initial value: 0.0	●	●
IrModUpperPos	LREAL	Current upper reversal point • Unit: units • Initial value: 100.0	●	●
scCoilData L_TT1L_scCoilData		Data of the coil geometry (□ 27)		●

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
IrStopDec	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	●	●
IrStopJerk	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	●	●
IrHaltDec	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.	●	●
IrJerk	LREAL	Jerk for compensating an offset value, trimming, clutch, or holding function • Unit: units/s ³ • Initial value: 100000	●	●
IrJogJerk	LREAL	Jerk for manual jog • Unit: units/s ³ • Initial value: 10000	●	●
IrJogVel	LREAL	Maximum speed to be used for manual jog. • Unit: units/s • Initial value: 10	●	●
IrJogAcc	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	●	●
IrJogDec	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	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_TraverserMode		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 xReversingSwitchLower/ 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
IrSetVel	LREAL	Maximum velocity for positioning (has no effect in the traversing drive) • Unit: units/s • Initial value: 100	●	●
IrSetAcc	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	●	●
IrSetDec	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	●	●
IrTraversingPitch	LREAL	Traversing step (feed of the traversing drive per winder revolution) • Unit: units • Initial value: 5	●	●
IrSyncInAngle	LREAL	Ramp angle in winder units The ramp angles refer to the traversing step (IrSetPitch). 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	●	●
IrSyncOutAngle	LREAL	Ramp angle in winder units The ramp angles refer to the traversing step (IrSetPitch). 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	●	●
IrEndStopAngleLower	LREAL	Selection of the margin stop angle at the lower end of the reel. • Unit: Degree • Initial value: 270	●	●
IrEndStopAngleUpper	LREAL	Selection of the margin stop angle at the upper end of the reel. • Unit: Degree • Initial value: 270	●	●
IrTrimVel	LREAL	Trimming speed used for superimposing the traverser velocity. • Unit: units/s • Initial value: 0	●	●

Designator	Data type	Description		Available in version	
				Base	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 IrModLowerPos and IrModUpperPos). 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 (IrModLowerPos). Only then the traversing operation is started.		
		2	StartUpperPos: First, it is positioned to the upper traversing range limit (IrModUpperPos). Only then the traversing operation is started.		
		3	StartVirtualPos: First, it is positioned to the virtual traversing position (MP18_IrVirtualPos). 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 (27)			●
IrCoilOffsetLower	LREAL	Offset to the current reverse position at the lower coil end • Unit: units • Initial value: 0.0			●
IrCoilOffsetUpper	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		
IrMaterialWidth	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 IrSetDiam input is used as current reel diameter.		
		1	DiamCalc: The reel diameter is calculated via layer number and material thickness (IrMaterialThickness parameter).		
IrMaterialThickness	LREAL	Material thickness (for diameter calculation) • Unit: units • Initial value: 0.0			●

Designator	Data type	Description	Available in version	
			Base	State
IrTipCoilStepDist	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.		
IrOverspeedStartLower	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)		●
IrOverspeedStartUpper	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)		●
IrOverspeedEndLower	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)		●
IrOverspeedEndUpper	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)		●
IrOverspeedAngleStartLower	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		●
IrOverspeedAngleStartUpper	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		●
IrOverspeedAngleEndLower	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		●
IrOverspeedAngleEndUpper	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	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			●

Designator	Data type	Description	Available in version	
			Base	State
eCornerCorrMode	L_TT1P_TraverserCornerCorr Mode	Correction of the reverse position in the coil corners • Initial value: Disabled		●
0		Disabled: No correction		
1		Radius: "Radius" correction mode active.		
IrCornerCorrRefDiam	LREAL	Reference diameter • Unit: units • Initial value: 0.0		●
IrCornerCorrLowerRadius	LREAL	Radius for the lower coil end • Unit: units • Initial value: 0.0		●
IrCornerCorrUpperRadius	LREAL	Radius for the upper coil end • Unit: units • Initial value: 0.0		●

3.3.6 Data of the coil geometry

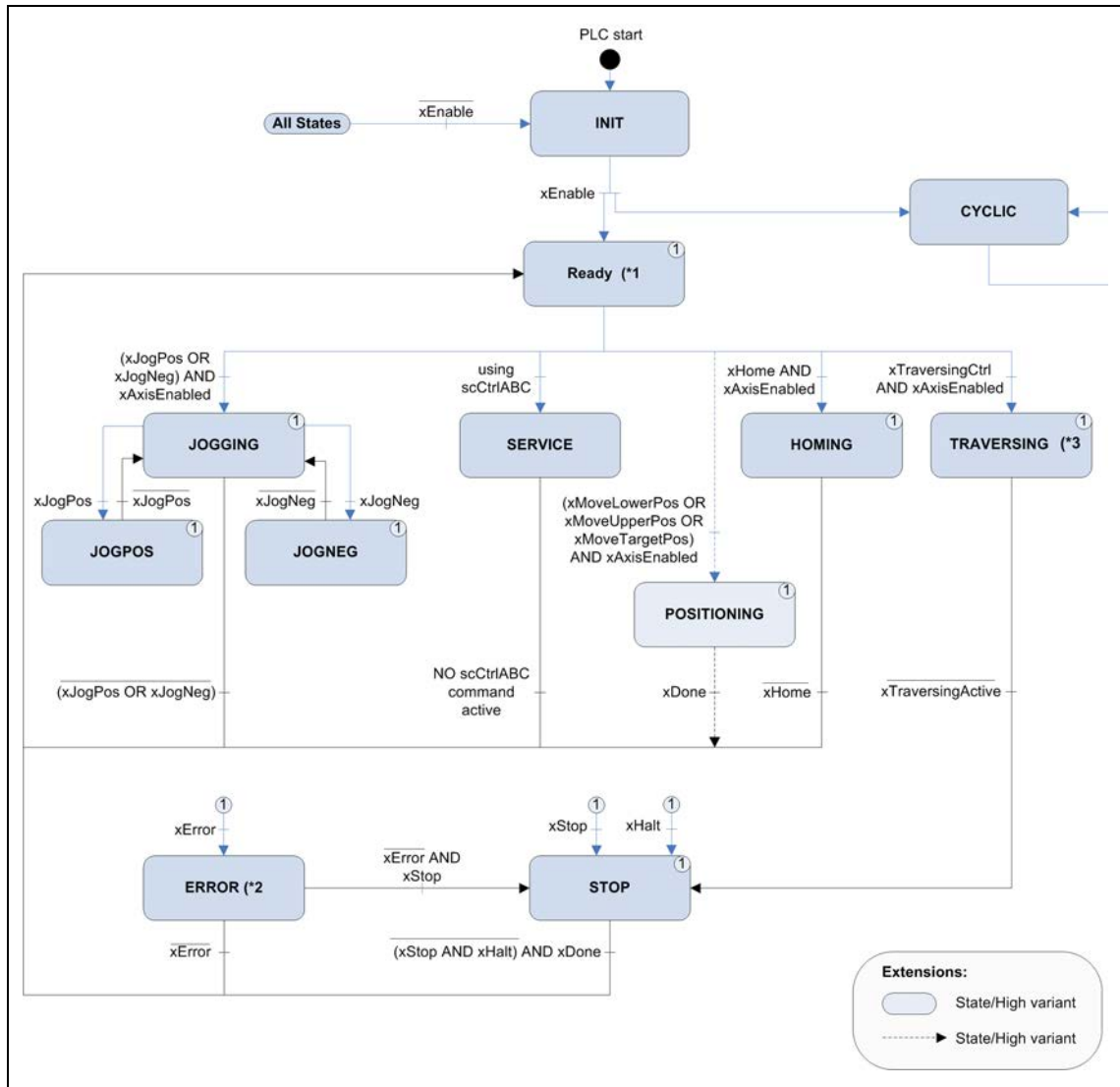
L_TT1L_scCoilData

Designator	Data type	Description	Available in version	
			Base	State
IrMinDiam	LREAL	Minimum coil diameter • Unit: units • Initial value: 100.0		●
IrMaxDiam	LREAL	Maximum coil diameter • Unit: units • Initial value: 500.0		●
IrLowerPosMinDiam	LREAL	Lower reversal point at minimum coil diameter • Unit: units • Initial value: 100.0		●
IrLowerPosMaxDiam	LREAL	Lower reversal point at at maximum coil diameter • Unit: units • Initial value: 100.0		●
IrUpperPosMinDiam	LREAL	Upper reversal point at minimum coil diameter • Unit: units • Initial value: 600.0		●
IrUpperPosMaxDiam	LREAL	Upper reversal point at maximum coil diameter • Unit: units • Initial value: 600.0		●

3 "Traverser" functional description

3.4 State machine

3.4 State machine



[3-3] State machine of the technology module

① A transition to the ERROR or STOP state is possible.

(*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'.

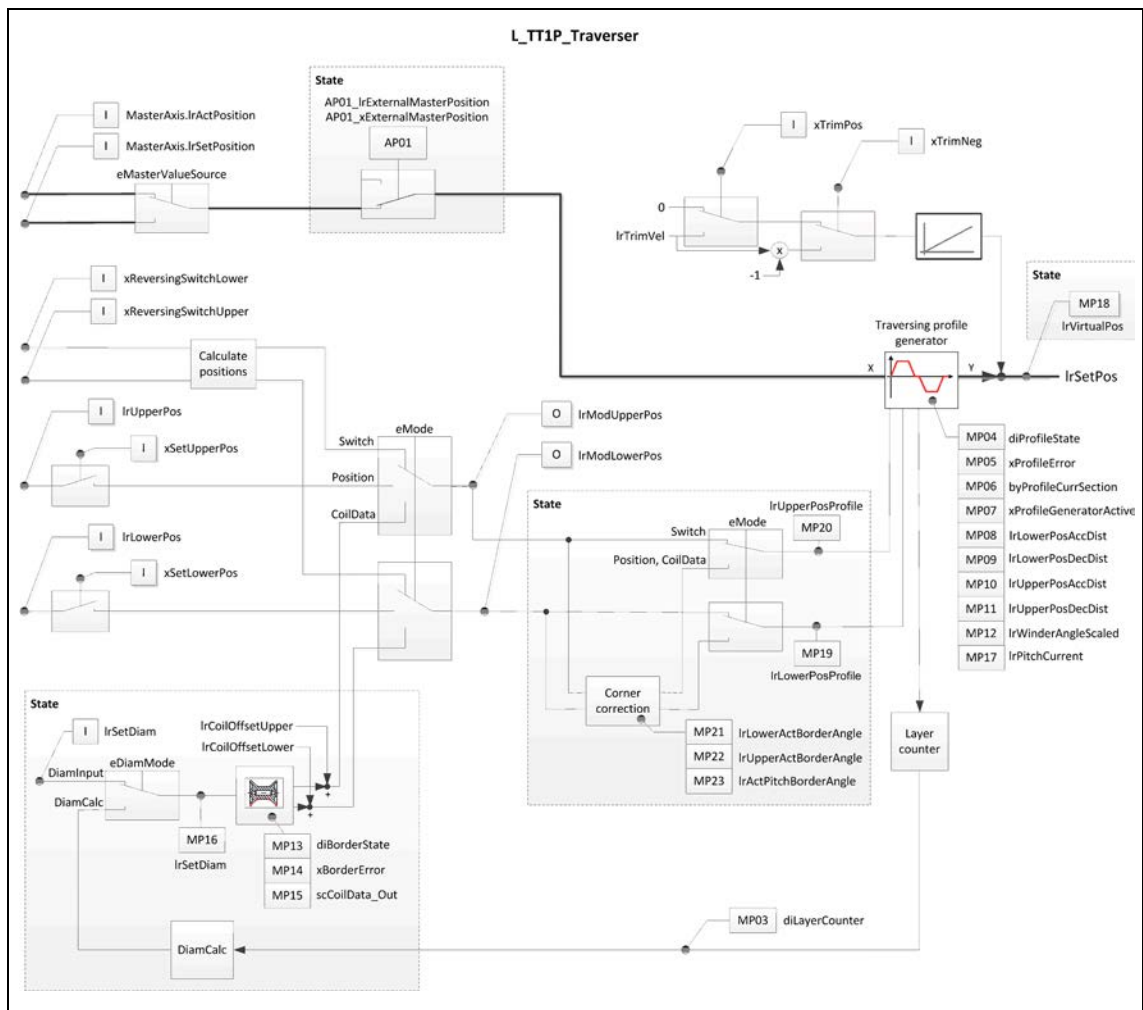
States of the eTMState output (L_TT1P_States)

No.	L_TT1P_States	Description
1	INIT	Initialisation of the technology module active.
2	READY	Technology module ready for operation.
3	HOMING	Referencing active.
10	JOGGING	Manual jog active.
11	JOGPOS	Manual jog in positive direction active.
12	JOGNEG	Manual jog in negative direction active.
190	TRAVERSING	Traversing active
996	STOP	Stop/Halt active.
998	SERVICE	The technology module is in service mode. The internal L_MC1P_AxisBasicControl function block is controlled via the <i>scCtrlABC</i> input structure. The status of the function block can be viewed via the <i>scStatusABC</i> output structure.
999	ERROR	Error state
1000	SYSTEMFAULT	System fault

3 "Traverser" functional description

3.5 Signal flow diagram

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)).

Designator	Data type	Description	Available in version	
			Base	State
MP01_lTurnPositionLower Out	LREAL	Setpoint of the reverse position at the lower reel end This value is always updated when the traverser restarts from the lower limit position.	●	●
MP02_lTurnPositionUpper Out	LREAL	Setpoint of the reverse position at the upper reel end This value is always updated when the traverser restarts from the upper limit position.	●	●
MP03_diLayerCounter	DINT	Layer counter	●	●
MP04_diProfileState	DINT	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	●	●
MP05_xProfileError	BOOL	Sum error bit of the internal function block SupportMotionProfile	●	●
MP06_byProfileCurrSection	BYTE	Active curve section (0 ... 15) of the traversing profile	●	●
		0 Accelerating from the lower limit position to overspeed		
		1 Constant travel - overspeed		
		2 Decelerating to traversing step		
		3 Constant travel with traversing step towards upper limit position		
		4 Acceleration to overspeed at the upper layer end		
		5 Constant travel with overspeed		
		6 Deceleration to standstill		
		7 Margin stop at the upper limit position		
		8 Accelerating from the upper limit position to overspeed		
		9 Constant travel - overspeed		
		10 Decelerating to traversing step		
		11 Constant travel with traversing step towards lower limit position		
		12 Acceleration to overspeed at the lower layer end		
		13 Constant travel with overspeed		
		14 Deceleration to standstill		
		15 Margin stop at the lower limit position		
MP07_xProfileGenerator Active	BOOL	TRUE 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.	●	●
MP08_lLowerPosAccDist	LREAL	Distance covered by the traverser during acceleration. Helpful for controlling the profile data.	●	●

Designator	Data type	Description	Available in version	
			Base	State
MP09_IrLowerPosDecDist	LREAL	Distance covered by the traverser during deceleration. Helpful for controlling the profile data.	●	●
MP10_IrUpperPosAccDist	LREAL	Distance covered by the traverser during acceleration. Helpful for controlling the profile data.	●	●
MP11_IrUpperPosDecDist	LREAL	Distance covered by the traverser during deceleration. Helpful for controlling the profile data.	●	●
MP12_IrWinderAngleScaled	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 IrSetDiam < IrMinDiam (warning)		
		Bit 14 IrSetDiam > IrMaxDiam (warning)		
		Bit 15 Sum error		
		Bit 16 IrCurrentLowerPos > IrCurrentUpperPos (error)		
		Bit 17 IrLowerPosMinDiam > IrUpperPosMinDiam (error)		
		Bit 18 IrLowerPosMaxDiam > IrUpperPosMaxDiam (error)		
		Bit 19 IrMinDiam < 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 (□ 27)		●
MP16_IrSetDiam	LREAL	Current reel diameter for calculating the reversal points due to the coil geometry		●
MP17_IrPitchCurrent	LREAL	Currently effective traversing step Combination of the values of IrTraversingPitch parameter and IrPitchOverride input		●
MP18_IrVirtualPos	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_IrVirtualPos shows this "virtual traverser position" (where the traverser would stand if it was not switched off)		●
MP19_IrLowerPosProfile	LREAL	This value is defined for the profile generator as setpoint for the lower reverse position. Usually, this value corresponds to the persistent IrModLowerPos variable. When the radius correction is activated, the influence on the variable can be seen here.		●
MP20_IrUpperPosProfile	LREAL	This value is defined for the profile generator as setpoint for the upper reverse position. Usually, this value corresponds to the persistent IrModUpperPos variable. When the radius correction is activated, the influence on the variable can be seen here.		●
MP21_IrLowerActBorder Angle	LREAL	Angle of the master drive at the last impact on the lower reversal point.		●
MP22_IrUpperActBorder Angle	LREAL	Angle of the master drive at the last impact on the upper reversal point.		●
MP23_IrActPitchBorder Angle	LREAL	Projected traversing step including the influence of the margin shift angle control (IrTraversingPitch * IrPitchOverride + 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_xExternalMasterPosition 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_lrExternalMasterPosition 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 "Traverser" functional description

3.6 Detection of the winding movement

3.6 Detection of the winding movement

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

► [Inputs and outputs](#) (□ 15)

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](#) (□ 28) changes to the "Ready" state again.

Parameters to be set

The parameters for the manual jog are located in the [L TT1P_scPar_Traverser\[Base/State\]](#) (□ 21) 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 "Traverser" functional description

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](#) (28) 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\[Base/State\]](#) (21) 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\[Base/State\]](#) (21) parameter structure.

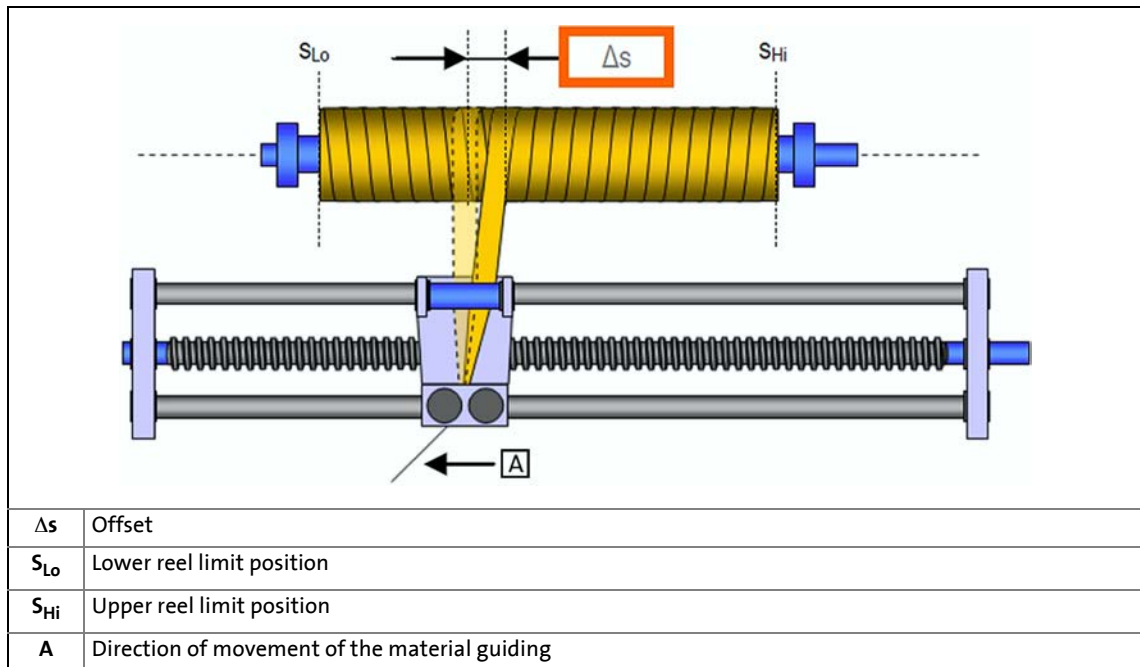
```
lrStopDec : LREAL := 10000;  
lrStopJerk : LREAL := 100000;
```

3 "Traverser" functional description

3.10 Margin stop

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):



[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\[Base/State\]](#) ([21](#)) parameter structure.

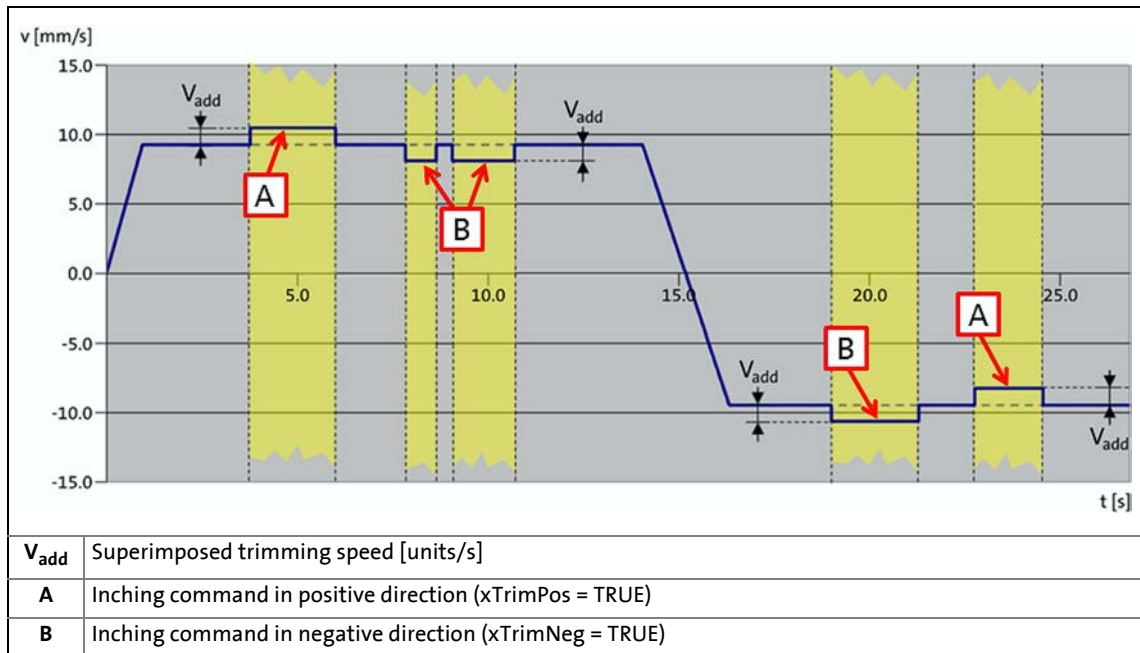
```
lrEndStopAngleLower : LREAL := 270;  
lrEndStopAngleUpper : LREAL := 270;
```

3 "Traverser" functional description

3.11 Trimming during the traversing process

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.



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

Parameters to be set

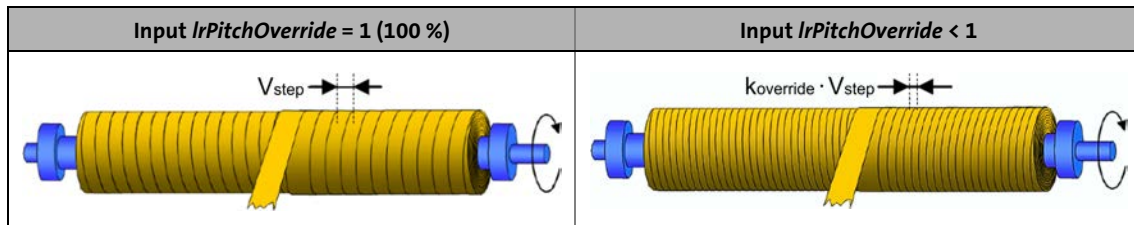
The parameter for the superimposed trimming speed is located in the [L TT1P_scPar Traverser\[Base/State\]](#) (21) parameter structure.

```
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.



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

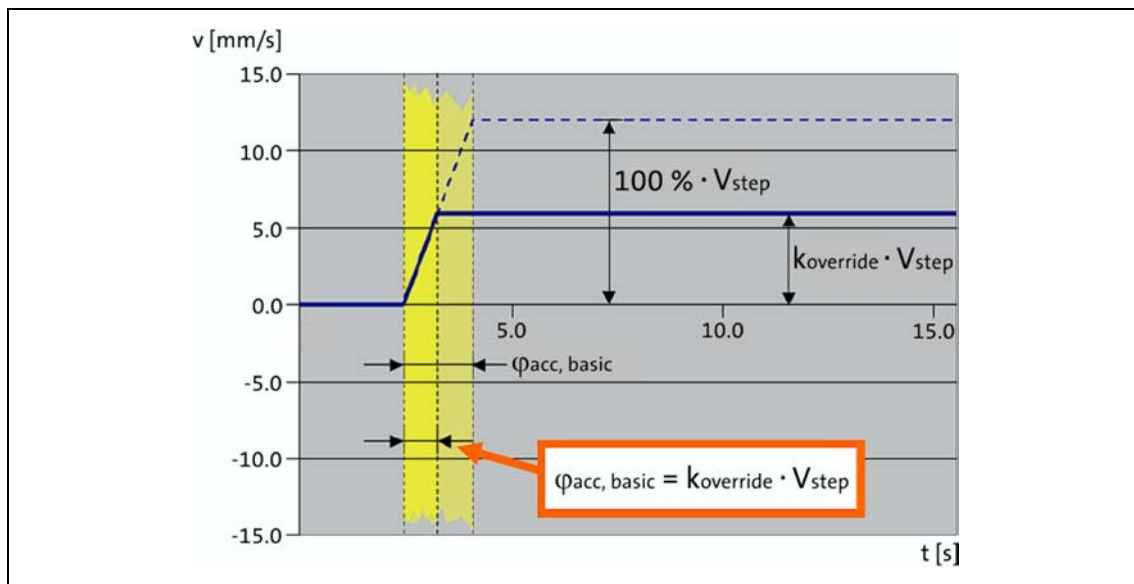
The parameter for selecting the override mode is located in the [L_TT1P_scPar_Traverser\[Base/State\]](#) (21) parameter structure.

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

3.12.1

"OverrideAccDec" override mode

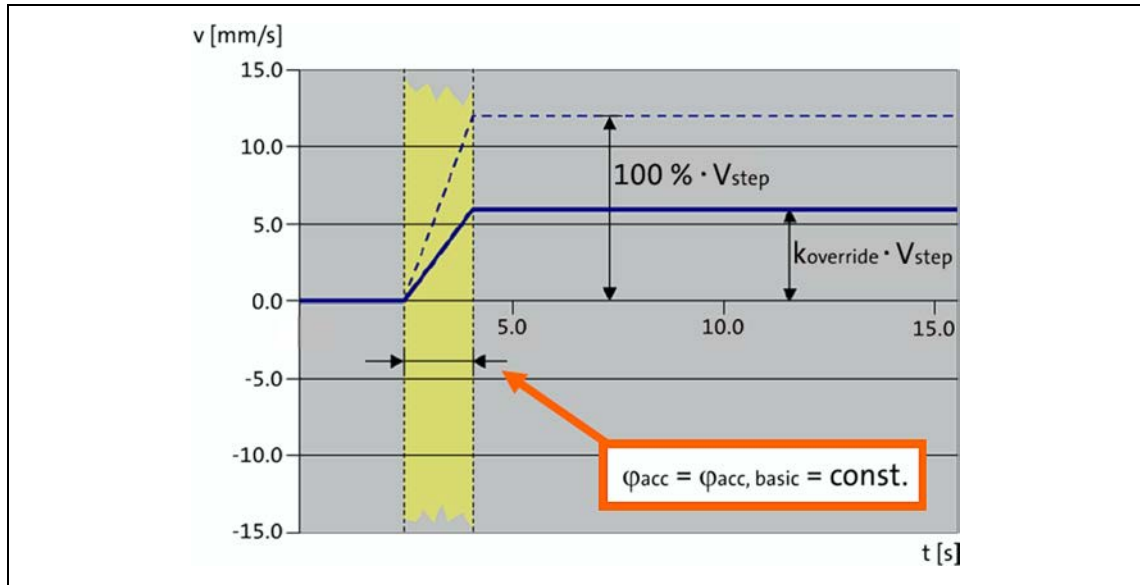
Just like the traversing step, the acceleration/deceleration angle has an impact on the traversing step override.



[3-7] "OverrideAccDec" override mode

3.12.2 "OverrideConstant" override mode

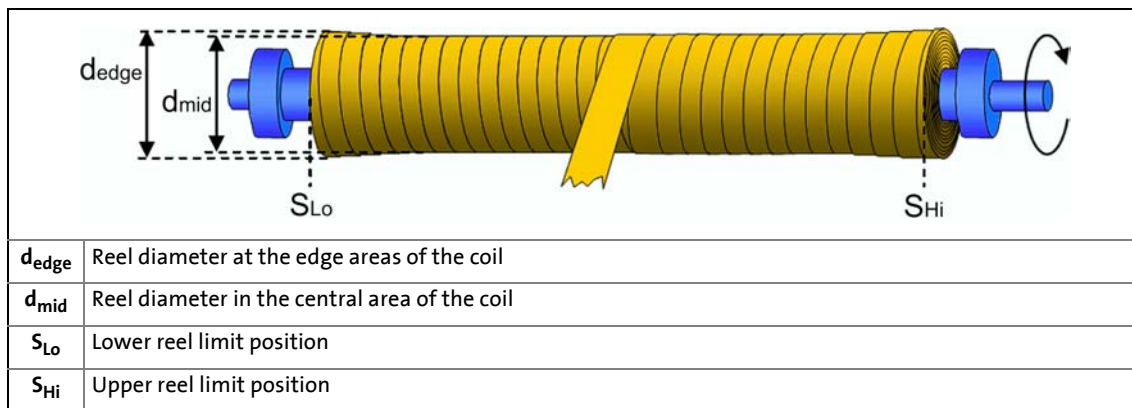
The acceleration/deceleration angle remains constant irrespective of the traversing step override.



[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 ($d_{\text{edge}} > d_{\text{mid}}$).



[3-9] Material accumulation in the edge areas

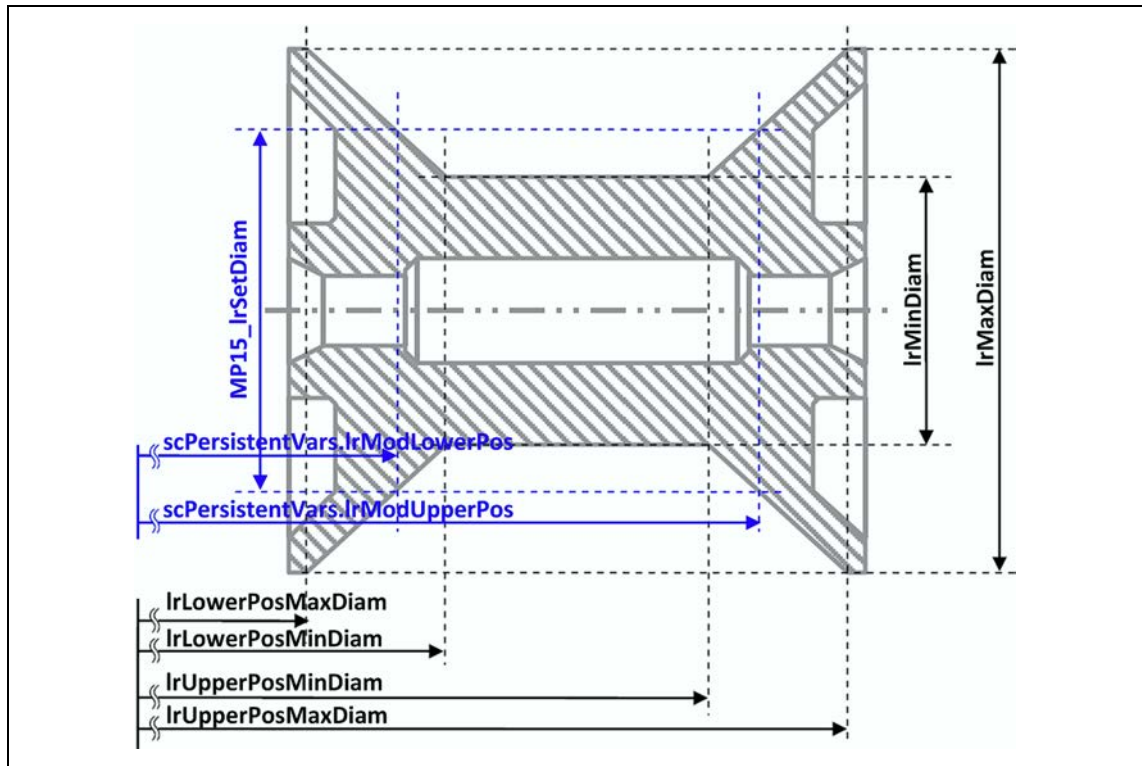
The effect can be avoided by compensating the dwell time of the traversing drive at the edge areas ([Margin stop](#) (□ 36)) by increasing the traversing step directly after the reversing process.

Parameters to be set

The parameters for the traversing step increase are located in the [L TT1P_scPar_Traverser\[Base/State\]](#) (□ 21) 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\[Base/State\]](#) (20):

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

► [L TT1L_scCoilData](#) (27):

```
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_IrLowerPosProfile* and *MP20_IrUpperPosProfile*.

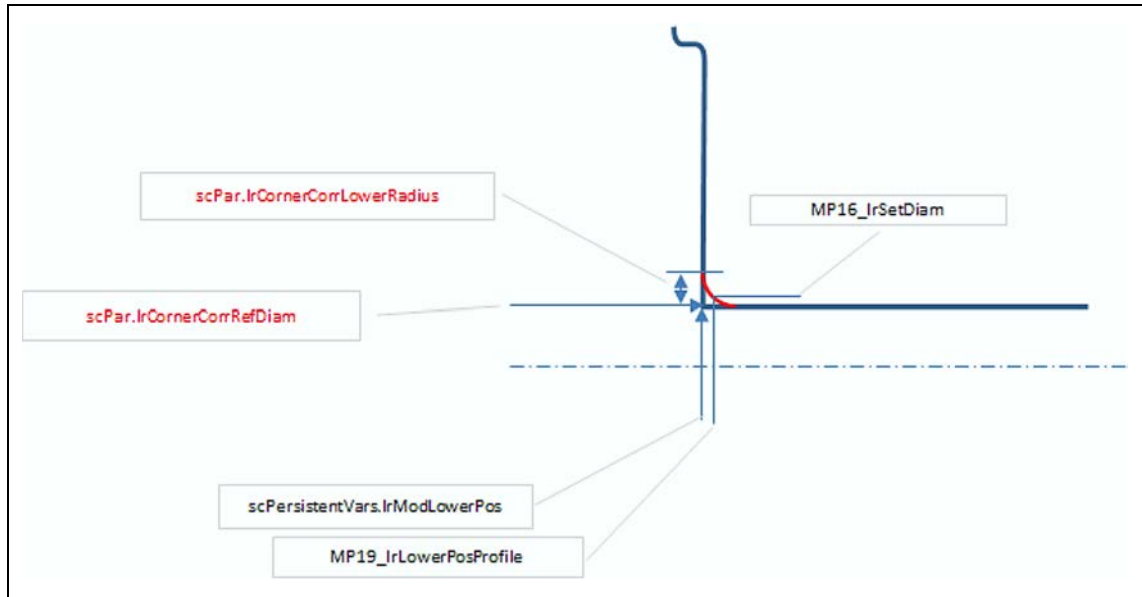
▶ [Signal flow diagram](#) (30)

Parameters to be set

The parameters for the radius correction are located in the [L_TT1P_scPar_Traverser\[Base/State\]](#) (21) 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



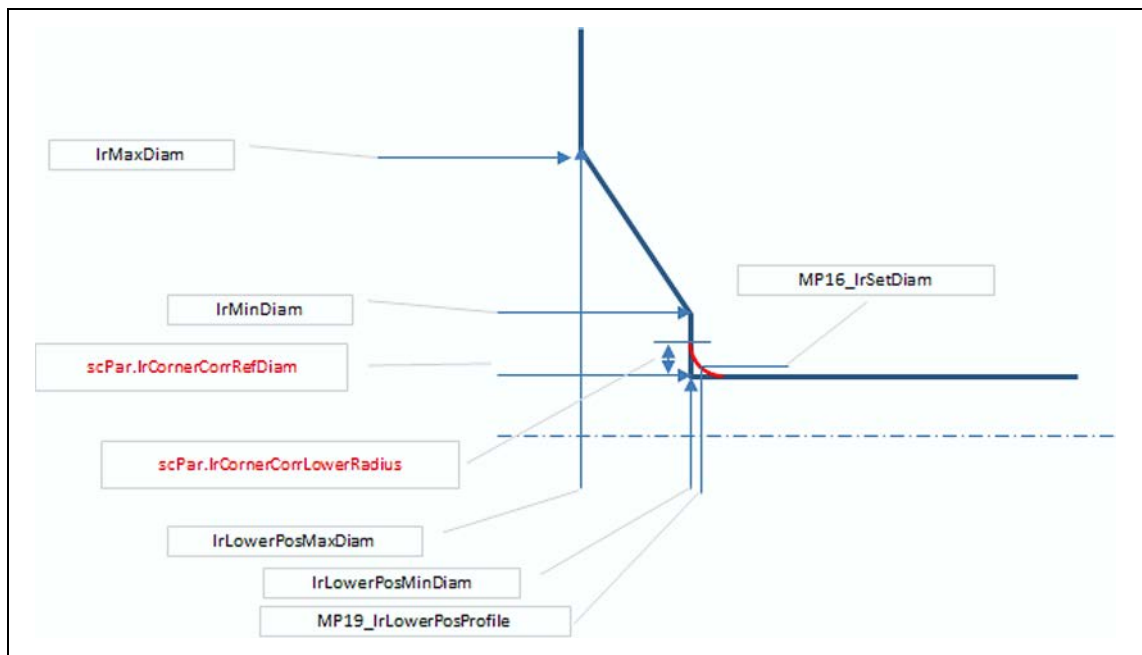
[3-11] Radius correction in the "Position" traversing mode

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 "Traverser" functional description

3.15 Radius correction of the coil

3.15.2 Radius correction in the "CoilData" traversing mode



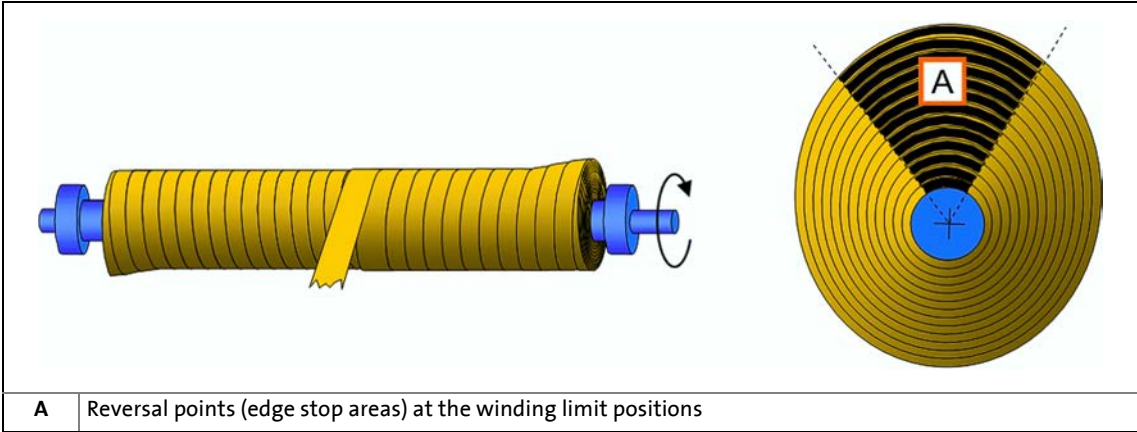
[3-12] Radius correction in the "CoilData" traversing mode

If the radius correction is activated with the parameter *eCornerCorrMode* = 1, the technology module automatically considers the resulting correction for the reverse position *IrCornerCorrLowerRadius* or *IrCornerCorrUpperRadius* depending on the current diameter (*IrSetDiam*) and the reference diameter (*IrCornerCorrRefDiam*).

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

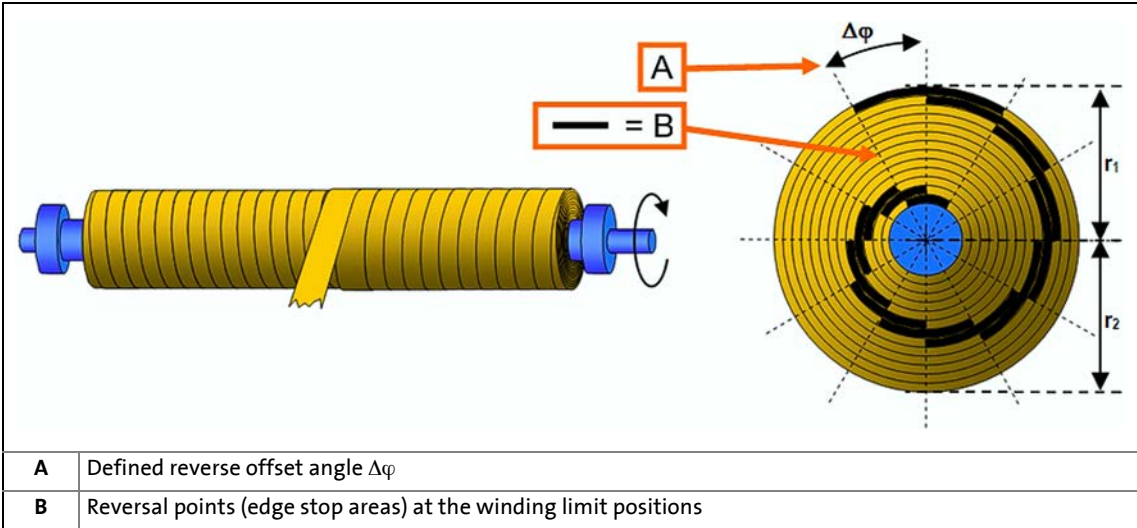
3.16 Reverse offset (edge offset)

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]).



[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]).



[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\[Base/State\]](#) (21) parameter structure.

```
eAngularShiftMode : L_TT1P_AngularShiftMode := 0; // disabled
lrAngularShiftLower : L_TT1P_TraverserMode := 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](#) (27) (parameter structure *scCoilData*) and the current diameter.

Parameters to be set

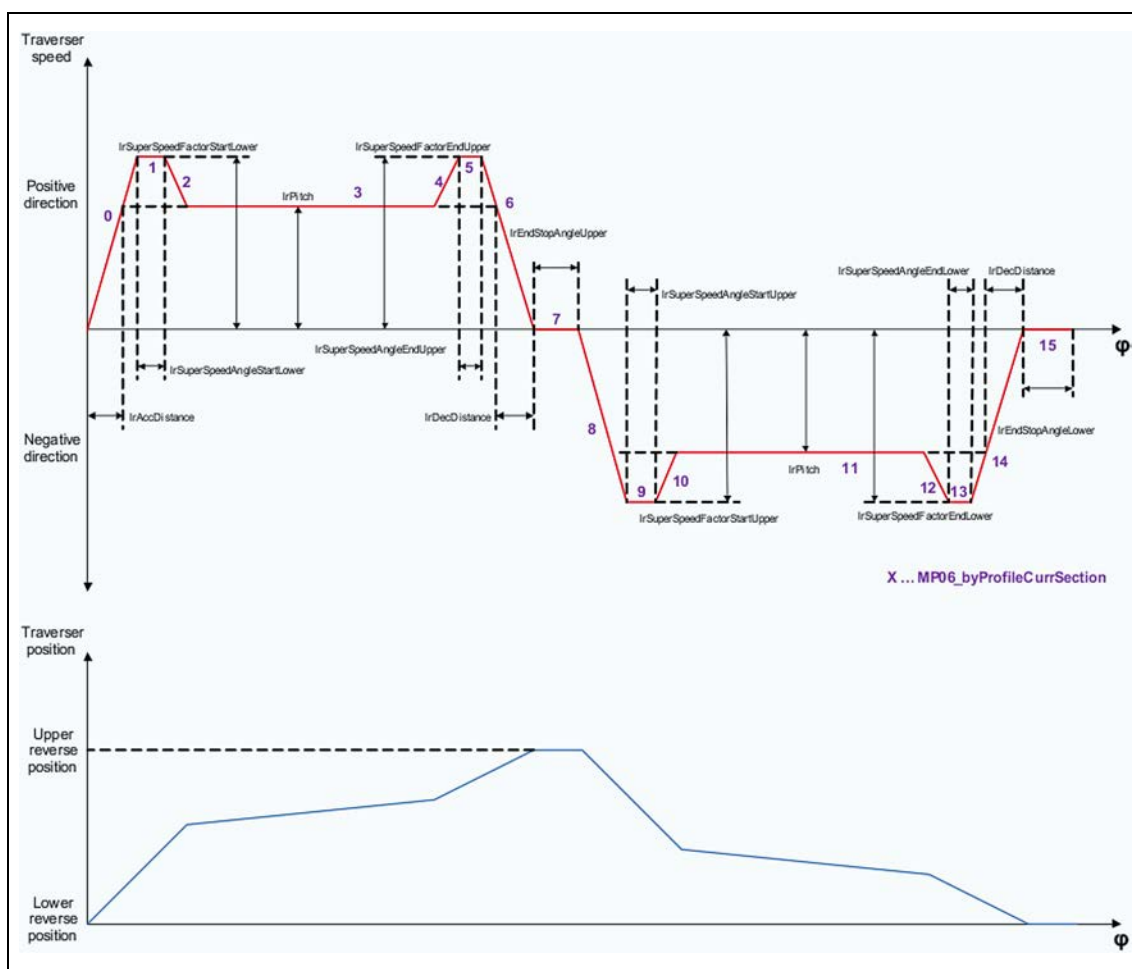
The parameters for the reverse offset (edge offset) are located in the [L TT1P_scPar_Traverser\[Base/State\]](#) (21) parameter structure.

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

3 "Traverser" functional description

3.18 Traversing profile (example)

3.18 Traversing profile (example)



[3-15] Traversing profile (example)

3 "Traverser" functional description

3.19 CPU utilisation (example Controller 3231 C)

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

Symbole

"CoilData" mode (radius correction) [43](#)
"OverrideAccDec" mode [38](#)
"OverrideConstant" mode [39](#)
"Position" mode (radius correction) [42](#)
"Traverser" functional description [10](#)

A

Access points [33](#)
Application notes [7](#)

C

Coil geometry (data) [27](#)
Conical coils [41](#)
Controlled start of the axes [13](#)
Conventions used [6](#)
CPU utilisation (example Controller 3231 C) [48](#)

D

Data of the coil geometry [27](#)
Detection of the winding movement [34](#)
Document history [5](#)

E

Edge offset [44](#)
E-mail to Lenze [51](#)
eTMState [29](#)
Even winding at the edge areas [44](#)

F

Feedback to Lenze [51](#)
Function block TraverserBase/State [14](#)

G

Guiding line [46](#)

H

Homing [35](#)

I

Inputs [15](#)
Inputs and outputs [15](#)

L

L_TT1L_scCoilData [27](#)
L_TT1P_scAP_TraverserBase [33](#)
L_TT1P_scAP_TraverserState [33](#)
L_TT1P_scPar_TraverserBase [21](#)
L_TT1P_scPar_TraverserState [21](#)
L_TT1P_scPersistentVarsTraverserBase [20](#)
L_TT1P_scPersistentVarsTraverserState [20](#)
L_TT1P_scSF_TraverserBase [31](#)
L_TT1P_scSF_TraverserState [31](#)
L_TT1P_States [29](#)

L_TT1P_TraverserBase [14](#)
L_TT1P_TraverserState [14](#)
Layout of the safety instructions [7](#)

M

Manual jog (jogging) [34](#)
Margin stop [36](#)
Material guiding line [46](#)

N

Notes on how to operate the technology module [13](#)

O

Outputs [19](#)
Override (traversing step) [38](#)
OverrideAccDec (mode) [38](#)
OverrideConstant (mode) [39](#)
Overspeed [40](#)

P

Parameter structure L_TT1P_scPar_TraverserBase/State [21](#)
Parameters of the standard traversing [11](#)
Persistent variables [20](#)

R

Radius correction in the "CoilData" traversing mode [43](#)
Radius correction in the "Position" traversing mode [42](#)
Radius correction of the coil [42](#)
Reverse shift [44](#)

S

Safety instructions [7](#), [8](#)
Signal flow diagram [30](#)
Standard traversing (basic parameter) [11](#)
Start of the axes [13](#)
State machine [28](#)
States [28](#)
Step change during operation [38](#)
Step increase in the marginal areas [40](#)
Stop [35](#)
Structure of the access points L_TT1P_scAP_TraverserBase/State [33](#)
Structure of the signal flow L_TT1P_scSF_TraverserBase/State [31](#)

T

Target group [4](#)
Technology module functions (overview) [12](#)
Traverser (functional description) [10](#)
Traversing (basic parameters) [11](#)
Traversing on conical coils [41](#)
Traversing profile (example) [47](#)
Traversing step change during operation [38](#)
Traversing step increase in the marginal areas [40](#)

Index

Traversing step override [38](#)

Trimming during the traversing process [37](#)

V

Variable names [6](#)

W

Winding movement (detection) [34](#)



Your opinion is important to us

These instructions were created to the best of our knowledge and belief to give you the best possible support for handling our product.

Perhaps we have not succeeded in achieving this objective in every respect. If you have suggestions for improvement, please e-mail us to:

feedback-docu@lenze.com

Thank you very much for your support.

Your Lenze documentation team

Lenze Automation GmbH
Postfach 10 13 52, 31763 Hameln
Hans-Lenze-Straße 1, 31855 Aerzen
Germany
HR Hannover B 205381
 +49 5154 82-0
 +49 5154 82-2800
 sales.de@lenze.com
 www.lenze.com

Service

Lenze Service GmbH
Breslauer Straße 3, 32699 Extertal
Germany
 008000 24 46877 (24 h helpline)
 +49 5154 82-1112
 service.de@lenze.com