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TwinCAT Library for Rotation Stage

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| **Library** |
| Title | RotationStage |
| Version | 1 |
| TwinCAT version | V2.11.0 |
| Name space |  |
| Author | Daniel Sigg |
| Description | This library controls the rotation stage |
| Error Code | None |
| Library Dependencies | None |

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| **User Interface Type**TYPE ET\_EL6742START\_TYPE : ( E\_START\_TYPE\_IDLE E\_START\_TYPE\_ABSOLUTE E\_START\_TYPE\_ENDLESS\_PLUS E\_START\_TYPE\_ENDLESS\_MINUS E\_START\_TYPE\_ENDLESS\_ADDITIVE E\_START\_TYPE\_MODULO\_SHORT E\_START\_TYPE\_MODULO\_SHORT\_EXT E\_START\_TYPE\_MODULO\_PLUS E\_START\_TYPE\_MODULO\_PLUS\_EXT E\_START\_TYPE\_MODULO\_MINUS E\_START\_TYPE\_MODULO\_MINUS\_EXT E\_START\_TYPE\_MODULO\_CURRENT E\_START\_TYPE\_MODULO\_CURRENT\_EXT E\_START\_TYPE\_CALIBRATION\_PLC\_CAM E\_START\_TYPE\_CALIBRATION\_HW\_SYNC E\_START\_TYPE\_CALIBRATION\_MANUAL E\_START\_TYPE\_CALIBRATION\_AUTO E\_START\_TYPE\_CALIBRATION\_CLEAR)END\_TYPE; |
| Type Name | TYPE ET\_EL6742START\_TYPE  |
| Description | Status of rotation position, module, and calibration |
| Definition | ENUM |
| Element | Name: E\_START\_TYPE\_IDLEDescription: No travel command is being executed |
| Element | Name: E\_START\_TYPE\_ABSOLUTEDescription: Absolute target position |
| Element | Name: E\_START\_TYPE\_RELATIVEDescription: Target position relative to the start position |
| Element | Name: E\_START\_TYPE\_ENDLESS\_PLUSDescription: Endless driving in position direction of rotation |
| Element | Name: E\_START\_TYPE\_ENDLESS\_MINUSDescription: Endless driving in minus direction of rotation |
| Element | Name: E\_START\_TYPE\_ENDLESS\_ADDITIVEDescription: New target position relative/additive to the last target position |
| Element | Name: E\_START\_TYPE\_MODULO\_SHORTDescription: Shortest distance to the next modulo position |
| Element | Name: E\_START\_TYPE\_MODULO\_SHORT\_EXTDescription: Shortest distance to the next modulo position w/o modulo window |
| Element | Name: E\_START\_TYPE\_MODULO\_PLUSDescription: Drive in positive direction of rotation to the next modulo position |
| Element | Name: E\_START\_TYPE\_MODULO\_PLUS\_EXTDescription: Drive in position direction of rotation to the next modulo position w/o modulo window |
| Element | Name: E\_START\_TYPE\_MODULO\_MINUSDescription: Drive in negative direction of rotation to the next modulo position |
| Element | Name: E\_START\_TYPE\_MODULO\_MINUS\_EXTDescription: Drive in negative direction of rotation to the next modulo position w/o modulo window |
| Element | Name: E\_START\_TYPE\_MODULO\_CURRENTDescription: Drive in the last implemented direction of ration to the next modulo position |
| Element | Name: E\_START\_TYPE\_MODULO\_CURRENT\_EXTDescription: Drive in the last implemented direction of ration to the next modulo position w/o modulo window |
| Element | Name: E\_START\_TYPE\_CALIBRATION\_PLC\_CAMDescription: Calibration w/ PLC camera |
| Element | Name: E\_START\_TYPE\_CALIBRATION\_HW\_SYNCDescription: Calibration with cam and C-track |
| Element | Name: E\_START\_TYPE\_CALIBRATION\_MANUALDescription: Set calibration manually |
| Element | Name: E\_START\_TYPE\_CALIBRATION\_AUTODescription: Set calibration automatically |
| Element | Name: E\_START\_TYPE\_CALIBRATION\_CLEARDescription: Clear calibration manually |

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| **User Interface Type**TYPE RotationStageInStruct : STRUCT Busy: BOOL; In\_Target: BOOL; Warning: BOOL; Error: BOOL; Calibrated: BOOL; Accelerate: BOOL; Decelerate: BOOL; Act\_Position: DINT; Act\_Velocity: INT; Act\_Drive\_Time: UDINT; Enc\_Latch\_Ext\_Valid: BOOL; Enc\_Set\_Count\_Done: BOOL; Enc\_Count\_Underflow: BOOL; Enc\_Count\_Overflow: BOOL; Enc\_Extrap\_Stall: BOOL; Enc\_InputA\_Status: BOOL; Enc\_InputB\_Status: BOOL; Enc\_Ext\_Latch\_Status: BOOL; Enc\_Sync\_Error: BOOL; Enc\_TxPDO\_Toggle: BOOL; Enc\_Count\_Value: DINT; Enc\_Latch\_Value: DINT; Mtr\_Ready: BOOL; Mtr\_Warning: BOOL; Mtr\_Error: BOOL; Mtr\_Moving\_Pos: BOOL; Mtr\_Moving\_Neg: BOOL; Mtr\_Torque\_Reduced: BOOL; Mtr\_Dig\_Input1: BOOL; Mtr\_Dig\_Input2: BOOL; Mtr\_Sync\_Error: BOOL; Mtr\_TxPDO\_Toggle: BOOL; Interlock: BOOL; END\_STRUCT;END\_TYPE; |
| Type Name | RotationStageInStruct |
| Description | Rotation stage input structure |
| Definition | STRUCT |

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| **User Interface Type**TYPE RotationStageOutStruct : STRUCT Execute: BOOL; Stop: BOOL; Target\_Position: DINT; Velocity: INT; Start\_Type: ET\_EL6742START\_TYPE; Accelerate: UNIT; Decelerate: UNIT; Enc\_Enable\_Latch\_Ext\_Pos: BOOL; Enc\_Set\_Count: BOOL; Enc\_Ext\_Latch\_Ext\_Neg: BOOL; Enc\_Set\_Count\_Value: DINT; Enc\_Latch\_Value: DINT; Mtr\_Enable: BOOL; Mtr\_Reset: BOOL; Mtr\_Torque\_Reduced: BOOL; END\_STRUCT;END\_TYPE; |
| Type Name | RotationStageOutStruct |
| Description | Rotation stage output structure |
| Definition | STRUCT |

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| **User Interface Type**TYPE RotationStageStruct :STRUCT Busy: BOOL; In\_Target: BOOL; Warning: BOOL; Error: BOOL; Calibrated: BOOL; Accelerate: BOOL; Decelerate: BOOL; Act\_Position: DINT; Act\_Velocity: INT; Act\_Drive\_Time: UDINT; Enc\_Latch\_Ext\_Valid: BOOL; Enc\_Set\_Count\_Done: BOOL; Enc\_Count\_Underflow: BOOL; Enc\_Count\_Overflow: BOOL; Enc\_Extrap\_Stall: BOOL; Enc\_InputA\_Status: BOOL; Enc\_InputB\_Status: BOOL; Enc\_Ext\_Latch\_Status: BOOL; Enc\_Sync\_Error: BOOL; Enc\_TxPDO\_Toggle: BOOL; Enc\_Count\_Value: DINT; Enc\_Latch\_Value: DINT; Mtr\_Read\_To\_Enable: BOOL; Mtr\_Ready: BOOL; Mtr\_Warning: BOOL; Mtr\_Error: BOOL; Mtr\_Moving\_Pos: BOOL; Mtr\_Moving\_Neg: BOOL; Mtr\_Torque\_Reduced: BOOL; Mtr\_Dig\_Input1: BOOL; Mtr\_Dig\_Input2: BOOL; Mtr\_Sync\_Error: BOOL; Mtr\_TxPDO\_Toggle: BOOL; Execute: BOOL; Stop: BOOL; Target\_Position: DINT; Velocity: INT; Start\_Type: ET\_EL6742START\_TYPE; Acceleration: UNIT; Deceleration: UNIT; Enc\_Enable\_Latch\_Ext\_Pos: BOOL; Enc\_Set\_Count: BOOL; Enc\_Ext\_Latch\_Ext\_Neg: BOOL; Enc\_Set\_Count\_Value: DINT; Enc\_Latch\_Value: DINT; Mtr\_Enable: BOOL; Mtr\_Reset: BOOL; Target\_Postion\_Deg: REAL; Enc\_Count\_Value\_Deg: REAL; Counts\_Per\_Deg: UDINT; Interlock: BOOL;END\_STRUCT;END\_TYPE; |
| Type Name | RotationStageStruct |
| Description | Structure used in the user interface |
| Definition | STRUCT |
| Tag | Name: BusyType: BOOLDescription: Current active travel |
| Tag | Name: In\_TargetType: BOOLDescription: In target indicator |
| Tag | Name: WarningType: BOOLDescription: Warning indicator |
| Tag | Name: ErrorType: BOOLDescription: Error indicator |
| Tag | Name: CalibratedType: BOOLDescription: Motor is calibrated |
| Tag | Name: AccelerateType: BOOLDescription: Acceleration state |
| Tag | Name: DecelerateType: BOOLDescription: Deceleration stage |
| Tag | Name: Act\_PostionType: DINTDescription: Actual position |
| Tag | Name: Act\_VelocityType: INTDescription: Actual velocity |
| Tag | Name: Act\_Drive\_TimeType: UDINTDescription: Command time information |
| Tag | Name: Enc\_Latch\_Ext\_ValidType: BOOLDescription: Encoder latch |
| Tag | Name: Enc\_Set\_Count\_DoneType: BOOLDescription: Encoder counter |
| Tag | Name: Enc\_Count\_UnderflowType: BOOLDescription: Counter underflow |
| Tag | Name: Enc\_Count\_OverflowType: BOOLDescription: Counter overflow |
| Tag | Name: Enc\_Extrap\_StallType: BOOLDescription: Extrapolated counter |
| Tag | Name: Enc\_InputA\_StatusType: BOOLDescription: Status of encoder A |
| Tag | Name: Enc\_InputB\_StatusType: BOOLDescription: Status of encoder B |
| Tag | Name: Enc\_Ext\_Latch\_StatusType: BOOLDescription: External latch |
| Tag | Name: Enc\_Sync\_ErrorType: BOOLDescription: Sync error |
| Tag | Name: Enc\_TxPDO\_ToggleType: BOOLDescription: TxPDO toggle is toggled by the slave when the data of the associated TxPDO is updated |
| Tag | Name: Enc\_Count\_ValueType: BOOLDescription: Counter value |
| Tag | Name: Enc\_Latch\_ValueType: BOOLDescription: Latch value |

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| Tag | Name: Mtr\_Read\_to\_EnableType: BOOLDescription: Ready to enable |
| Tag | Name: Mtr\_ReadyType: BOOLDescription: Motor ready |
| Tag | Name: Mtr\_WarningType: BOOLDescription: Warning has occurred |
| Tag | Name: Mtr\_ErrorType: BOOLDescription: Error has occurred |
| Tag | Name: Mtr\_Moving\_PosType: BOOLDescription: Positive motion |
| Tag | Name: Mtr\_Moving\_NegType: BOOLDescription: Negative motion |
| Tag | Name: Mtr\_Torque\_ReducedType: BOOLDescription: Reduced torque active |
| Tag | Name: Mtr\_Dig\_Input1Type: BOOLDescription: Digital Input 1 |
| Tag | Name: Mtr\_Dig\_input2Type: BOOLDescription: Digital Input 2 |
| Tag | Name: Mtr\_Sync\_ErrorType: BOOLDescription: Sync error |
| Tag | Name: Mtr\_TxPDO\_ToggleType: BOOLDescription: TxPDO toggle |
| Tag | Name: ExecuteType: BOOLDescription: Execute |
| Tag | Name: StopType: BOOLDescription: Emergency stop |
| Tag | Name: Target\_PositionType: DINTDescription: Target position |
| Tag | Name: VelocityType: INTDescription: Set velocity 0.01% of max |
| Tag | Name: Start\_TypeType: ET\_EL6742START\_TYPEDescription: |
| Tag | Name: AccelerationType: UNITDescription: Acceleration time |
| Tag | Name: DecelerationType: UNITDescription: Deceleration time |
| Tag | Name: Enc\_Enable\_Latch\_Ext\_PosType: BOOLDescription: Latch positive edge |
| Tag | Name: Enc\_Set\_countType: BOOLDescription: Set counter |
| Tag | Name: Enc\_Enable\_Latch\_Ext\_NegType: BOOLDescription: Latch negative edge |
| Tag | Name: Enc\_Set\_Count\_ValueType: DINTDescription: Counter value |
| Tag | Name: Mtr\_EnableType: BOOLDescription: Motor enable |
| Tag | Name: Mtr\_ResetType: BOOLDescription: Reset motor |
| Tag | Name: Mtr\_Reduce\_TorqueType: BOOLDescription: Reduce torque current |
| Tag | Name:Type: BOOLDescription: |
| Tag | Name: Target\_Position\_DegType: REALDescription: Target position in degrees  |
| Tag | Name: Enc\_Count\_Value\_DegType: REALDescription: Counter value in degrees |
| Tag | Name: Counts\_Per\_DegType: UDINTDescription: Encoder counts per degree |
| Tag | Name: InterlockType: BOOLDescription: Interlock readout |

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| **Function Block**TYPE RotationStageFB:VAR\_INPUT RotationStageIn: RotationStageInStruct;END\_VAR;VAR\_OUTPUT RotationStageOut: RotationStageOutStruct;END\_VAR;VAR\_IN\_OUT RotationStage: RotationStageStruct;END\_VAR:END\_TYPE; |
| Type Name | RotationStageFB |
| Description | Function block used to monitor the PSL environment  |
| Definition | Function Block |
| Input Argument | Name: RotationStageInType: RotationStageInStructDescription: Input structure |
| Output Argument | Name: RotationStageOutType: RotationStageOutStructDescription: Output Structure |
| In/out Argument | Name: RotationStageType: RotationStageStructDescription: User interface structure |