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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\_IDLE  Description: No travel command is being executed |
| Element | Name: E\_START\_TYPE\_ABSOLUTE  Description: Absolute target position |
| Element | Name: E\_START\_TYPE\_RELATIVE  Description: Target position relative to the start position |
| Element | Name: E\_START\_TYPE\_ENDLESS\_PLUS  Description: Endless driving in position direction of rotation |
| Element | Name: E\_START\_TYPE\_ENDLESS\_MINUS  Description: Endless driving in minus direction of rotation |
| Element | Name: E\_START\_TYPE\_ENDLESS\_ADDITIVE  Description: New target position relative/additive to the last target position |
| Element | Name: E\_START\_TYPE\_MODULO\_SHORT  Description: Shortest distance to the next modulo position |
| Element | Name: E\_START\_TYPE\_MODULO\_SHORT\_EXT  Description: Shortest distance to the next modulo position w/o modulo window |
| Element | Name: E\_START\_TYPE\_MODULO\_PLUS  Description: Drive in positive direction of rotation to the next modulo position |
| Element | Name: E\_START\_TYPE\_MODULO\_PLUS\_EXT  Description: Drive in position direction of rotation to the next modulo position w/o modulo window |
| Element | Name: E\_START\_TYPE\_MODULO\_MINUS  Description: Drive in negative direction of rotation to the next modulo position |
| Element | Name: E\_START\_TYPE\_MODULO\_MINUS\_EXT  Description: Drive in negative direction of rotation to the next modulo position w/o modulo window |
| Element | Name: E\_START\_TYPE\_MODULO\_CURRENT  Description: Drive in the last implemented direction of ration to the next modulo position |
| Element | Name: E\_START\_TYPE\_MODULO\_CURRENT\_EXT  Description: Drive in the last implemented direction of ration to the next modulo position w/o modulo window |
| Element | Name: E\_START\_TYPE\_CALIBRATION\_PLC\_CAM  Description: Calibration w/ PLC camera |
| Element | Name: E\_START\_TYPE\_CALIBRATION\_HW\_SYNC  Description: Calibration with cam and C-track |
| Element | Name: E\_START\_TYPE\_CALIBRATION\_MANUAL  Description: Set calibration manually |
| Element | Name: E\_START\_TYPE\_CALIBRATION\_AUTO  Description: Set calibration automatically |
| Element | Name: E\_START\_TYPE\_CALIBRATION\_CLEAR  Description: 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: Busy  Type: BOOL  Description: Current active travel |
| Tag | Name: In\_Target  Type: BOOL  Description: In target indicator |
| Tag | Name: Warning  Type: BOOL  Description: Warning indicator |
| Tag | Name: Error  Type: BOOL  Description: Error indicator |
| Tag | Name: Calibrated  Type: BOOL  Description: Motor is calibrated |
| Tag | Name: Accelerate  Type: BOOL  Description: Acceleration state |
| Tag | Name: Decelerate  Type: BOOL  Description: Deceleration stage |
| Tag | Name: Act\_Postion  Type: DINT  Description: Actual position |
| Tag | Name: Act\_Velocity  Type: INT  Description: Actual velocity |
| Tag | Name: Act\_Drive\_Time  Type: UDINT  Description: Command time information |
| Tag | Name: Enc\_Latch\_Ext\_Valid  Type: BOOL  Description: Encoder latch |
| Tag | Name: Enc\_Set\_Count\_Done  Type: BOOL  Description: Encoder counter |
| Tag | Name: Enc\_Count\_Underflow  Type: BOOL  Description: Counter underflow |
| Tag | Name: Enc\_Count\_Overflow  Type: BOOL  Description: Counter overflow |
| Tag | Name: Enc\_Extrap\_Stall  Type: BOOL  Description: Extrapolated counter |
| Tag | Name: Enc\_InputA\_Status  Type: BOOL  Description: Status of encoder A |
| Tag | Name: Enc\_InputB\_Status  Type: BOOL  Description: Status of encoder B |
| Tag | Name: Enc\_Ext\_Latch\_Status  Type: BOOL  Description: External latch |
| Tag | Name: Enc\_Sync\_Error  Type: BOOL  Description: Sync error |
| Tag | Name: Enc\_TxPDO\_Toggle  Type: BOOL  Description: TxPDO toggle is toggled by the slave when the data of the associated TxPDO is updated |
| Tag | Name: Enc\_Count\_Value  Type: BOOL  Description: Counter value |
| Tag | Name: Enc\_Latch\_Value  Type: BOOL  Description: Latch value |

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| Tag | Name: Mtr\_Read\_to\_Enable  Type: BOOL  Description: Ready to enable |
| Tag | Name: Mtr\_Ready  Type: BOOL  Description: Motor ready |
| Tag | Name: Mtr\_Warning  Type: BOOL  Description: Warning has occurred |
| Tag | Name: Mtr\_Error  Type: BOOL  Description: Error has occurred |
| Tag | Name: Mtr\_Moving\_Pos  Type: BOOL  Description: Positive motion |
| Tag | Name: Mtr\_Moving\_Neg  Type: BOOL  Description: Negative motion |
| Tag | Name: Mtr\_Torque\_Reduced  Type: BOOL  Description: Reduced torque active |
| Tag | Name: Mtr\_Dig\_Input1  Type: BOOL  Description: Digital Input 1 |
| Tag | Name: Mtr\_Dig\_input2  Type: BOOL  Description: Digital Input 2 |
| Tag | Name: Mtr\_Sync\_Error  Type: BOOL  Description: Sync error |
| Tag | Name: Mtr\_TxPDO\_Toggle  Type: BOOL  Description: TxPDO toggle |
| Tag | Name: Execute  Type: BOOL  Description: Execute |
| Tag | Name: Stop  Type: BOOL  Description: Emergency stop |
| Tag | Name: Target\_Position  Type: DINT  Description: Target position |
| Tag | Name: Velocity  Type: INT  Description: Set velocity 0.01% of max |
| Tag | Name: Start\_Type  Type: ET\_EL6742START\_TYPE  Description: |
| Tag | Name: Acceleration  Type: UNIT  Description: Acceleration time |
| Tag | Name: Deceleration  Type: UNIT  Description: Deceleration time |
| Tag | Name: Enc\_Enable\_Latch\_Ext\_Pos  Type: BOOL  Description: Latch positive edge |
| Tag | Name: Enc\_Set\_count  Type: BOOL  Description: Set counter |
| Tag | Name: Enc\_Enable\_Latch\_Ext\_Neg  Type: BOOL  Description: Latch negative edge |
| Tag | Name: Enc\_Set\_Count\_Value  Type: DINT  Description: Counter value |
| Tag | Name: Mtr\_Enable  Type: BOOL  Description: Motor enable |
| Tag | Name: Mtr\_Reset  Type: BOOL  Description: Reset motor |
| Tag | Name: Mtr\_Reduce\_Torque  Type: BOOL  Description: Reduce torque current |
| Tag | Name:  Type: BOOL  Description: |
| Tag | Name: Target\_Position\_Deg  Type: REAL  Description: Target position in degrees |
| Tag | Name: Enc\_Count\_Value\_Deg  Type: REAL  Description: Counter value in degrees |
| Tag | Name: Counts\_Per\_Deg  Type: UDINT  Description: Encoder counts per degree |
| Tag | Name: Interlock  Type: BOOL  Description: 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: RotationStageIn  Type: RotationStageInStruct  Description: Input structure |
| Output Argument | Name: RotationStageOut  Type: RotationStageOutStruct  Description: Output Structure |
| In/out Argument | Name: RotationStage  Type: RotationStageStruct  Description: User interface structure |