Firmware TSD-4.30.0

Summary: Support Trajectory Streaming Dynamic Axis Coupling

4.30.0: CpuFirmware: 2.26.5 Date: 2026-10-29 11.34:54 +0100 SVN: Revision: 58122
FpgaFirmware: 3.8.8
- NEW: implemented dynamic axis coupling for the TrajectoryStreaming feature (DACT)
- CHG: Use stream.start to start Streaming by TAMA instead of *MoveStreamCoupled*
- CHG: EtherCAT increase MAX_PD_CYCLE_TIME from 3ms to 50ms

Option	Modules	
TOE1	**EN**	3.6.2
TOE2	**EH**	3.6.2
TOE4	**EN/EH**	3.9.0
- unchanged		
TOF1	**FF**	1.30.0
- unchanged		
TOF2	**PT**	1.8.4
- unchanged		
TOA3	**AO**	2.2.3
- unchanged		
TOA4	**AN**	2.2.3
- unchanged		
TOU1	**UN**	284
- unchanged		

Firmware TSD-4.29.7

Summary: Support TSR700 and EtherCAT ModeOfOperation TRAST

4.29.0: CpuFirmware: 2.24.9 Date: 2026-05-11 17.10:432 +0100 SVN: Revision: 55211
Remarks: Use TAM Software >= 7.29.1 to support NTC motor temperature sensor selection
FpgaFirmware: 3.8.8
- NEW: Show more information for serial encoder error 6830
- NEW: Support TSR700
- NEW: Support EtherCAT ModeOfOperation TRAST=255
- FIX: Gantry invalidate homing on axis1 encoder error #1747
- FIX: StartRotatingVectorConstantCurrent should not reset the actual vector angle
- FIX: TSD80/Revision 6a showed wrong dcBusCurrents if not in STO mode
- CHG: The i2t-model starts at 0.5f to prepared for the UL-standard

4.29.1: CpuFirmware: 2.24.12 Date: 2026-06-09 11:42:36 +0200 SVN: Revision: 55586
- CHG: Increase DcBusCurrent limit for TSP700 products
- FIX: prevent overflow of tableHead in streaming mode
- FIX: Backlash causes NaN in the Encoder-Position (#1784)

4.29.2: CpuFirmware: 2.25.3 Date: 2026-07-03 13:31:37 +0200 SVN: Revision: 55978
- CHG: improve throughput for Trajectory streaming
- CHG: improve EtherCAT with Trajectory streaming: Edge triggered Halt
- CHG: EtherCAT: Support controllers which do not support a correct timebase
- NEW: Support PulseTrain for TSD80/Rev6

4.29.3-beta: CpuFirmware: 2.25.5 Date: 2026-07-17 10:10:44 +0200 SVN: Revision: 56101
- CHG: solved EtherCAT locking problems (>5kHz feed)

4.29.3: CpuFirmware: 2.25.6 Date: 2026-09-30 08:51:50 +0200 SVN: Revision: 57590
- FIX: TSP700 internal Voltage Error at startup (#1863)
- FIX: Trajectory streaming: Modulo behavior (#1873)

4.29.4: CpuFirmware: 2.25.9 Date: 2026-10-13 08:07:38 +0200 SVN: Revision: 57767
- FIX: Biss-Encoder FrameDelay/Idle margin 1.1us (#1887), Length of dataFormat
- FIX: Ethernet: Robust input buffer (#1831, partA)
- FIX: Trajectory streaming: Out-of-data error 6421 (#1868)

4.29.6: CpuFirmware: 2.25.12 Date: 2026-10-16 13:45:59 +0200 SVN: Revision: 57837
- FIX: Trajectory streaming occationally failed to start (#1868)
- FIX: ETH Trialink connection was not closed (type 2)

4.29.7: CpuFirmware: 2.25.13 Date: 2026-10-21 13:39:33 +0200 SVN: Revision: 57927
- NEW: Trajectory streaming end detection
- FIX: if the axis was disabled during phasing, the phasing state stalled at "Hold"
- CHG: Improve handling of error 6336

OptionModules

TOE1	**EN**	3.6.2
TOE2	**EH**	3.6.2
TOE4	**EN/EH**	3.9.0

- unchanged

TOF1	**FF**	1.30.0

- unchanged

TOF2	**PT**	1.8.4

- unchanged

TOA3	**AO**	2.2.3

- unchanged

TOA4	**AN**	2.2.3

- unchanged

TOU1	**UN**	284

- unchanged

Firmware TSD-4.28.5

Summary: Support 8kHz and 4kHz EtherCAT

4.28.2: CpuFirmware: 2.23.4 Date: 2026-02-06 10:50:07 +0100 SVN: Revision: 53451
Remarks: Use TAM Software >= 7.29.1 to support NTC motor temperature sensor selection
FpgaFirmware: 3.7.7
- CHG: implemented support for EtherCAT(8kHz and 4kHz)
- FIX: improved extrapolation for EtherCAT (Polynom5A_Smooth)
- CHG: Cogging compensation is now only active when AxisState >= Standstill.
- CHG: TSP700-40 increase delta current between boards from 6A to 10A
- CHG: Support TOA4 and TOE4 revision 0a minimum FW 4.28.0

4.28.3: CpuFirmware: 2.23.4 Date: 2026-02-19 09:46:26 +0100 SVN: Revision: 53595
- NEW: FPGA 3.8.6 to support TSD80/Revision6

4.28.4: CpuFirmware: 2.23.6 Date: 2026-03-05 17:31:54 +0100 SVN: Revision: 53843
- FIX: PositionOutput mode must ignore invertDirection. Use PU_Output ..inverted to invert direction
- CHG: new Safety FW777: avoid error message STO-SafeMode-PulseTestFailure 7014 on TSR and TSD80 HW

4.28.5: CpuFirmware: 2.23.7 Date: 2026-03-06 14:38:06 +0100 SVN: Revision: 53869
- CHG: new Safety FW778: avoid error message STO-SafeMode-PulseTestFailure 7014 on TSR and TSD80 HW

OptionModules

TOE1	**EN**	3.6.2
TOE2	**EH**	3.6.2
TOE4	**EN/EH**	3.6.2

- unchanged

TOF1	**FF**	1.30.0

- unchanged

TOF2	**PT**	1.8.4

- unchanged

TOA3	**AO**	2.2.3

- unchanged

TOA4	**AN**	2.2.3

- unchanged

TOU1	**UN**	284

- unchanged

Firmware TSD-4.27.1

Summary: Bugfixes for TCP and TrajectoryStreaming. Change Encoder Overrange behaviour

4.27.0: CpuFirmware: 2.22.4 Date: 2025-11-20 16:42:28 +0100 SVN: Revision: 52490
Remarks: Use TAM Software >= 7.29.1 to support NTC motor temperature sensor selection
FpgaFirmware: 3.5.4
- FIX: TCP frame drops on heavy traffic
- FIX: TraSt-Mode Continuous during timestamp wrap (int overflow)
- FIX: FPGA TSD350/Rev2: Overcurrent caused PWM Shut down on both axes instead of one (FPGA 3.5.4)
- CHG: (breaking, TraSt)Rename tStreamErrorReaction to tErrorReaction
- CHG: (breaking, TraSt)Move Axis[].Commands.PathPlanner.Stream.Error to General.Emergency:
  SafePosition → SafePosition, Reaction/FeedTimeout → TrajectoryStreamError.Reaction/ FeedTimeout
- NEW: Add Watchdog functionality and registers and ErrAxWatchdogTimeout
- CHG: Disable ADC-DcBusOverCurrent (FPGA 3.5.4)
- CHG: FPGA Encoder 1.2V Range Warning, update TOE4 (FPGA 3.5.1)
- NEW: Support TSD350 Rev3 with new safety firmware (FW775) and FPGA

4.27.1 CpuFirmware: 2.22.6 Date: 2025-12-18 11:53:54 +0100 SVN: Revision: 52842
FpgaFirmware: 3.6.2
- FIX: Trajectory streaming table wrap shortly before new feed polynomial causes an illegal situation (#1711)
- FIX: Release FPGA 3.6.2 LatchingUnit for digital encoders
- CHG: (breaking)Axis[].Commands.General.Emergency.SafePosition now of datatype double instead of float

OptionModules

TOE1 **EN** 3.4.4 → 3.5.1
TOE2 **EH** 3.4.4 → 3.5.1
TOE4 **EN/EH** 3.4.4 → 3.5.1
- Encoder Overrange threshold is right under the clipping value.

TOF1 **FF** 1.30.0
- unchanged

TOF2 **PT** 1.8.4
- unchanged

TOA3 **AO** 1.13.9 → 2.2.3
- Improve update robustness after next update (>4.27.1)

TOA4 **AN** 1.5.11 → 2.2.3
- Improve update robustness after next update (>4.27.1)

TOU1 **UN** 284
- unchanged

Firmware TSD-4.26.3

Summary: Bugfixes and support for newest functional safety drives. ! Important fix for EtherCAT

4.26.0: CpuFirmware: 2.21.1 Date: 2025-09-01 11:26:30 +0200 SVN: Revision: 51466
Remarks: Use TAM Software >= 7.29.1 to support NTC motor temperature sensor selection
FpgaFirmware: 3.4.0
- FIX: Homing with eventInput==Current und DualLoop #1668
- FIX: Minor follow-up of #1659
- CHG: Functional Safety release 774 and Safety Release 519
- NEW: FPGA 3.4.0 for TSD80 Revision 6 the SPI to the Option-Flash was moved

4.26.1 CpuFirmware: 2.21.3 Date: 2025-09-08 15:40:40 +0200 SVN: Revision: 51579
- FIX: StreamFrequency was not updated during EtherCAT CSP mode and caused vel=acc=FFCurrent=0
- FIX: EtherCAT modulo was not handled correctly since 4.24 (Trast) if "position change since last csp" >Modulo/2
- FIX: Consider excentricity during move to homingPosition

4.26.2 CpuFirmware: 2.21.5 Date: 2025-09-15 07:47:09 +0200 SVN: Revision: 51653
- FIX: EtherCAT modulo and FeedForward **was not handled correctly since 4.24** (Trast)
- FIX: Minimum firmware for TSP700 revision 3 is 4.26.2

4.26.3 CpuFirmware: 2.21.6 Date: 2025-10-23 11:05:14 +0200 SVN: Revision: 52110
FpgaFirmware: 3.4.4
- FIX: Use TCP for event messages, #1538
- FIX: Ecat transition from CSV to CSP was not supported until now.
- FIX: CST was not functional since the implementation of Trast, #1686
- FIX: Modulo problems when entering CSP-mode (#1684)
- CHG: Relax flash wear protection to 64MB+1File
- NEW: implemented NTC motor temperature sensor support in drive types

OptionModules

TOE1 EN 3.3.5→3.4.4
- FIX: PositionLatch must only detect the first edge
- FIX: Support EncoderIndex for type IncrementalTLL

TOE2 EH 3.3.5→3.4.4
- FIX: Sometimes after power-up, the phaseA/B was stuck constant at -1
- FIX: PositionLatch must only detect the first edge
- FIX: Support EncoderIndex for type IncrementalRS422 and IncrementalTLL

TOE4 EN/EH 3.3.6 →3.4.4
- NEW: For TSD80 Revision 6 the SPI to the Option-Flash was moved
- FIX: Support EncoderIndex for type IncrementalTLL

TOF1 FF 1.30.0
- unchanged

TOF2 PT 1.8.4
- unchanged

TOA3 AO 1.13.9
- unchanged

TOA4 AN 1.5.11
- unchanged

TOU1 UN 284
- unchanged

Firmware TSD-4.25.2

Summary: Support functional safety devices, trajectory streaming and the pulsing unit mode “TTL4”. New MotorTemperature type “NTC” for TSD80 drives.

4.25.0: CpuRelease 2.20.10 Date: 2025-07-14 10:14:40 +0200 SVN: Revision: 50931
Remarks: Use TAM Software >= 7.29.0 to support the TTL4 mode of the PU and FunctionalSafety
FpgaFirmware: 3.3.5
- FIX: Ecat Legacy interfaces must not touch externalInput
- FIX: EoT (#1644)
- FIX: TSP700-40 / Rev 3 wrong DcBusCurrent scale
- FIX: AngleSearch2 did not yet handle modulo
- FIX: Pulsing unit: Support Encodertype “None”. Commit when active caused hidden turning off.
- CHG: DigitalBiss now adjusts the frame delay to 500 ns
- NEW: Pulsing unit TTL4 output mode
- NEW: Support TrajectoryStreaming
- NEW: Support TSD80/130-10 TSD80-06 TSD80-15 revision 6 with FunctionalSafety
- NEW: Default EncoderFlags QuadrantError and EncoderRange for analog encoders

4.25.1: CpuRelease 2.20.11 Date: 2025-07-23 16:00:12 +0200 SVN: Revision: 51083
- FIX: FW-update causes timeout with drives that have two option modules: (#1659)
- FIX: Polarity of A and B signals in TOE4 option modules

4.25.2: CpuRelease 2.20.12 Date: 2025-10-15 09:01:06 +0200 SVN: Revision: 51997
- FIX: EtherCAT CSP mode caused vel=acc=FFCurrent=0 since 4.24 (Trast)
- FIX: EtherCAT modulo was not handled correctly since 4.24 (Trast)
- FIX: Homing with eventInput==Current und DualLoop #1668
- FIX: Consider excentricity during move to homingPosition #1666
- FIX: FW-update causes timeout with drives that have two option modules
- NEW: Ecat transition from CSV to CSP was not supported until now (untested feature)
- NEW: implemented NTC motor temperature sensor support in TSD80/130 drives

OptionModules
TOE1 EN 1.18.45 → 3.3.5
TOE2 EH 1.28.45 → 3.3.5
- FIX: Various smaller bugfixes for the pulsing unit
- FIX: Faulty position sub-resolution increments resolved for incremental & serial encoders
- CHG: Input phase overrange detection activated
- NEW: Support gray-coder for SSI-Encoders (serial encoder)
- NEW: Pulsing unit has new pulsing-mode (PositionOutput) and linked with that a new output-mode: TTL4

TOE4 First release 3.3.5 →3.3.6
- FIX: Polarity of A and B signal fixed in bugfix 1

TOF1 FF 1.30.0
- unchanged

TOF2 PT 1.8.4
- unchanged

TOA3 AO 1.13.9
- unchanged

TOA4 AN 1.5.11
- unchanged

TOU1 UN 284
- unchanged

Firmware TSD-4.24.0

Summary: Support gantry with digital encoders and new commutation mode AngleSearch2. Improved Smooth PositionController Commit

4.24.0: CpuRelease 2.19.19, Date: 2025-03-26 09:30:03 +0200 SVN: Revision: 49797
FpgaFirmware: 3.2.54
Remarks: Use TAM Software >= 7.28.2 to support AngleSearch2
- FIX: Firmware update of legacy EtherCAT drives ends up with a Tria-Link product (#1597)
- FIX: The "ChangeUnit" command did not update all the affected axis parameters to the new unit.
- FIX: Ethernet stack thread safety
- FIX: Encoder initial commit could cause Position == 0.0 because of missing data memory barrier (#1615)
- CHG: PathInterpolator.Acceleration and Jerk are updated at 10kHz now
- CHG: (Breaking) Consider integral component in the smooth commit case (#1045)
- CHG: (Breaking) EtherCAT: New enable control is now active by default:
  Enable with control 0xb, status 0x123 for switchedOn. Use option 0xdf for old behavior.
- CHG: Ecat remove obsolete waiting for streamFilter settling
- CHG: Hide unused general.signals.digitalInputBits
- CHG: Phasing gain updated at 100kHz (previously only 10kHz)
- NEW: Support highSpeed DcBusVoltage ADC for TSP700-10 revision 3 and TSD350-10 TSD350-15 revision 2b-d
- NEW: File states Ready, Empty and Corrupt (#1576)
- NEW: MIMO gantry aligns Axis1 after enabling if AlignAfterHoming is activated (#1575)
- NEW: Added file state information to dir.html and dir.json
- NEW: DumpFiles event numbers now increment on device level: Show always same event number as Snapfiles
- NEW: Gantry now allows digital encoders, but both axis must have the same type for encoder[0]
- NEW: Phasing method *AngleSearch2* allows motion during phasing. Set VelocityFilterT1 of masterEncoder.

OptionModules
TOE1 EN 1.18.45
- unchanged
TOE2 EH 1.28.45
- unchanged
TOF1 FF 1.30.0
- unchanged
TOF2 PT 1.8.4
- unchanged
TOA3 AO 1.13.9
- unchanged
TOA4 AN 1.5.11
- unchanged
TOU1 UN 284
- unchanged

Firmware TSD-4.23.6

Summary: Support Tria-Link Master-Mode, Enhanced EtherCAT locking, SSI-Encoder, Archive for persistent logs, extended Auto-IP, Fix for FW-Update with Legacy EtherCAT drives

4.23.0-beta: CpuRelease 2.17.10, Date: 2024-09-24 15:32:29 +0200 SVN: Revision: 47640
FpgaFirmware: 2.0.5
Remarks: Use TAM Software >= 7.26.0 to support the warning parameters
- NEW: Support the Trialink-Master-Mode (FPGA=2.0.5, #1530)
- NEW: Ecat Support EK1100 with bus-shift and SpeedCounterDiff=0x932
- NEW: Ecat implement error for not supported touch probe modes
- NEW: Ecat Encoder position out of integer-range check in csp-mode
- NEW: Support basic SSI interface (FPGA 2.0.3, #1517)
- NEW: Archive with loading of the last seven dump- and snap-files from archive during boot
- NEW: Extended AutoIP feature
- NEW: Pathplanner Halt, also in homing and Ecat (#1379)
- FIX: Enable must be possible in Standstill and an event must be sent #1544
- CHG: Immediately change the IP-address after changing the IP Settings
- CHG: An encoderError/Warning is only shown once then wait for resetError, #1552
- CHG: Error 6392 is now a warning 4519
- CHG: Clear the ModeOfOperation statemachine, if the link or DC is lost

4.23.1-beta CpuRelease: 2.18.2 Date: 2024-09-27 14:31:26 +0200 SVN: Revision: 47708
- CHG: Improved EtherCAT locking behaviour for bus-shift mode

4.23.2 CpuRelease: 2.18.5 Date: 2024-10-24 16:22:17 SVN: Revision: 47984
- CHG: FPGA 2.0.6: Improved clockShift controller and Tria-Link master locking
- FIX: AxisCompensation Dim2-Fit used size of Dim2 for the next fit index instead of Dim1
- FIX: Device name length fixes

4.23.3 CpuRelease: 2.18.9 Date: 2024-11-05 17:15:09 SVN: Revision: 48125
- FIX: Encoder errors were counted even if not masked. This caused first time ignore of an error in some cases
- FIX: 6378 error when booting from a persistent option encoder, #1571
- FIX: AxisCompensation fix from 4.23.2 contained another bug
- NEW: Register durationAsyMax collects the maximum duration of an asy cycle since resetDiagnostics

4.23.4 CpuRelease: 2.18.10 Date: 2025-01-16 12:23:31 SVN: Revision: 48850
- FIX: The "ChangeUnit" command did not update all the affected axis parameters to the new unit
- FIX: #1597 firmware update of legacy EtherCAT drives ends up with a Tria-Link product and throws BootError 8963. Solution: Update to newest FW with Legacy Firmware Update enabled in TAM System Explorer

4.23.5 CpuRelease: 2.18.11 Date: 2025-02-06 10:47:47 SVN: Revision: 49069
- NEW: EtherCAT: Option 0x40000 enables with command 0xb
- FIX: #1603 Homing with encoder1=Sensor must ignore encoder1 because this is not a standard dual-Loop setting
- FIX: Gantry homing did not set axis1 homingDone, which prevents using some cogging functions and software limits on axis1

4.23.6 CpuRelease: 2.18.12 Date: 2025-02-20 13:26:50 SVN: Revision: 49234
- FIX: #1610 TSD80-15 Rev 5 (not 5a etc): Error 6990 and FW update problems

OptionModules
TOE1 EN 1.18.45
- unchanged

TOE2 EH 1.28.45
- unchanged

TOF1 FF 1.30.0
- unchanged

TOF2 PT 1.8.4
- unchanged

TOA3 AO 1.13.9
- unchanged

TOA4 AN 1.5.11
- unchanged

TOU1 UN 284
- unchanged

Firmware TSD-4.22.5

Summary: Support flexible EtherCAT cyclic data, Warning-Levels

4.22.1: CpuRelease 2.15.3 2024-06-07 15:53:33 +0200 SVN: Revision: 46886
FpgaFirmware: 1.24.21 for EtherCAT device and 1.24.0 for Tria-Link devices
Remarks: Use TAM Software >= 7.26.0 to support the warning parameters
- FIX: For proper encoder inversion mask timing, the warning/error mask must be set after waiting for dataValidTime
- FIX: EncoderTopology OptionD used the wrong trigger axis for homing.
- FIX: Option module FF new firmware 1.30.0 (scaling bug caused a hardware test failure)
- FIX: #1479 the rejected error was not resetable in coupled state
- CHG: Large Tables are now 8M instead of 2M
- CHG: ETH discovery now starts after DHCP
- CHG: Ecat sync0-PLL time changed from -30us to -10us
- CHG: Ecat sync0 to output telegram time changed from 60us to 40us
- NEW: (Breaking HC) Flexible PdoAssignments and CST, new HC 3->4
- NEW: Support: positionErrorWarning, peakCurrentWarning and nominalCurrentWarning
- NEW: Pathplanner-Parameter jerkEmergency
- NEW: Ecat unwrap function for the distributed clock PLL.

4.22.3: CpuRelease 2.15.6 Date: 2024-06-12 09:11:48 +0200 SVN: Revision: 46913
- FIX: EmergencyDeceleration wrong if value smaller than velocityMaximum
- CHG: Ecat unit is only checked during ring boot to avoid annoying error during drive boot
- CHG: remove QuadrantError from default encoder mask

4.22.4: CpuRelease 2.16.3 Date: 2024-08-09 11:47:54 +0200 SVN: Revision: 47210
- FIX: Touchprobe cyclic data always used axis 1 data
- FIX: USB sent 512 Bytes in the wrap situation even if no packets follow -> event missing
- CHG: Ecat Replace 0x60fd with 0x2098 to avoid mapping 6xxx in the CNC (CNC compatibility)
- NEW: Support DataFormat "NN-0-..." for Endat encoders to set numberOfBits to NN. Adjust pitch by 2^-NN
- CHG: TSD80 thermal pad problem: Use I2t instead of thermal sensor on TSD80/5a-e

4.22.5 CpuRelease 2.16.4 Date: 2024-09-03 16:27:01 +0200 SVN: Revision: 47406
- FIX: Gantry homing showed wrong homing error in mode alignAfterHoming/TamaHoming

OptionModules
TOE1 EN 1.18.45
- unchanged

TOE2 EH 1.28.45
- unchanged

TOF1 FF 1.22.12 → 1.30.0
- FIX: scaling bug caused a hardware test failure (since 4.19.1, SVN44628)

TOF2 PT 1.8.4
- unchanged

TOA3 AO 1.13.9
- unchanged

TOA4 AN 1.5.11
- unchanged

TOU1 UN 284
- unchanged

Firmware TSD-4.21.3

Summary: Support the Pulsing unit and fast counting on the EH-module. Firmware update bugfixes.

4.21.1: CpuRelease 2.13.28 Date: 2024-02-28 09:20:18 +0100 SVN: Revision: 46207
FpgaFirmware: 1.24.21 for EtherCAT device and 1.24.0 for Tria-Link devices
- FIX: Option module EN 1.18.45, see below
- FIX: Option module EH 1.28.45, see below

4.21.2: CpuRelease 2.14.0 Date: 2024-04-23 12:06:04 +0100 SVN: Revision: 46579
- FIX: FW-Update TSD350/0: Sometimes the Bridge-Monitor threw an error (MPS-Dependency)
- FIX: Option module FW-legacy-update FW was installed but showed a misleading error
- FIX: Gantry Stop caused an endless Stop entry in axis1
- FIX: Cogging source motorTurn
- FIX: Homing SetPosition for dualLoop
- FIX: #1496 Spontaneous 6990 Monitor not running on drive that has no TCU monitor
- CHG: Gantry: Do not limit positionController output by drivePeak. Limit at the currentController input instead
- CHG: Rename *.TAMuri files to *.TAMsnap
- CHG: If ETH receives DHCP while AutoIP is active, it should switch to Ready
- NEW: Reject SetPosition in states > Standstill (#1479)
- NEW: Timeout: If more than 20 web-connections were opened, very old connections are closed now

4.21.3: CpuRelease 2.14.1 Date: 2024-05-02 10:35:33 +0200 SVN: Revision: 46681
- FIX: Cogging motorTurn wrong commit sequence for reload.
- NEW: Cogging allow velocityThreshold=0 with velocity dependence
- FIX: Normally FW update is not allowed in TSD80/STO situations. Allow this, safetyMonitor is in the base image
- FIX: OnePositionTwoMotors: Second axis did not disable if STO was thrown in enable state

OptionModules

TOE1 EN 1.18.6 → 1.18.45
- FIX: Pulsing unit: Support static output changes

TOE2 EH 1.11.6 → 1.28.45
- NEW: Digital count up to 10 MHz with revision >= 5B
- FIX: Support Pulsing unit
  last versions (4.19.11-4.19.12 and 4.20.3-4.20.5) did not support the pulsing unit and were restricted to 2.5MHz
  Intermediate versions (4.19.0-4.19.10 and 4.20.0-4.20.2) contained a bug, which might cause counting errors

TOF1 FF 1.22.12
- unchanged

TOF2 PT 1.8.4
- unchanged

TOA3 AO 1.13.9
- unchanged

TOA4 AN 1.5.11
- unchanged

TOU1 UN 284
- unchanged

Firmware TSD-4.20.5

Summary: Compensation and Cogging tables refactured. Hysterese for Coulomb-Feedforward. Limit switch generates an EmergencyStop. EtherCAT minor interface changes. Bugfixes for Gantry and EtherCAT !

4.20.0: CpuRelease Date: 2023-12-13 09:56:13 +0100 SVN: Revision: 45907
FpgaFirmware: 1.22.16
- CHG: (Breaking) Remove table selectors for cogging and axisCompensation and use 4 dedicated tables
- CHG: (Breaking) Only one table read function for all tables
- CHG: (Breaking) #1378: The coulomb feedForward does not change anymore if the absolute velocity decreases
- CHG: Make sure, parameters.homing.secondSearchMove.eventInput is not Skip
- CHG: After bridgeMon or MotTempMon communication error, rewrite all localbus registers of the monitor
- CHG: Ecat Homing remove cmd 0x10 must interrupt homing, sync ModeOfOperationDisplay with Status 0x400
- CHG: Ecat Reset must be edge triggered
- CHG: Ecat PP-Mode must not always write xnew, vnew
- CHG: Ecat Warn bit for axis warnings
- FIX: No state Disabling for immediate disable events such as FaultDisable and no brakes)
- FIX: compensation function commit must wait for its table finished loading
- FIX: Avoid endless ResetFault in monitor-SM
- FIX: The motor damping mode during Phasing-StartTime must continue position-tracking
- FIX: EtherCAT boot should not try to answer an enabling request until the drive is ready
- NEW: Enforce checksum validation after persistent table load
- NEW: Warning on unknown uri if persistent data contains enabled obsolete table selectors
- NEW: Limit Switch generates an EmergencyStop
- NEW: An emergency stop always generates an error
- NEW: Warnings for LimitSwitches and SoftwareLimit reached in Standstill
- NEW: Homing-Command SetHomingDone must be possible from idle state too (not only in Tama mode)
- NEW: Commit for CoggingCompensation and axisCompensation
- NEW: File-based Firmware update (faster)
- NEW: Ecat external bit set if overwriteControlSystem

4.20.1: CpuFirmware: 2.13.18 Date: 2023-12-20 16:40:21 +0100 SVN: Revision: 45935
- FIX: Gantry ErrorStopDisable runs into a timeout 6284 during the emergencyStop ramp
- FIX: Gantry emergencyStop now waits for both axes stopped before disabling
- FIX: Gantry phasing timing issue caused a wrong commutation angle of axis1

4.20.2: CpuFirmware: 2.13.21 Date: 2024-01-10 16:20:09 +0100 SVN: Revision: 45993
- FIX: After SoftReset, a TSD350/0 or TSD80/4 sometimes showed a 6997 0xd 1 error
- FIX: Allow Emergency events of Axis1 in Gantry mode in disabled state
- FIX: Gantry balance bug

4.20.3
- FIX: Revert to EH 1.11.6

4.20.4: CpuRelease 2.13.22 Date: 2024-01-19 10:28:18 +0100 SVN: Revision: 46062
- FIX: FW-Update of monitors: 6236-31: Early-Answer-problem and allow update of a broken bridge monitor

4.20.5: CpuRelease 2.13.28 Date: 2024-02-21 16:14:50 +0100 SVN: Revision: 46149
FpgaFirmware: 1.22.21 for EtherCAT only
- FIX: Legacy FW download of option modules (There was an error, but the firmware was installed anyways)
- FIX: FPGA 1.24.21 to support the Ecat DC-Slave PLL (EtherCAT build only, Trialink still uses 1.24.0)

OptionModules
TOE1 EN 1.18.6
- unchanged

TOE2 EH 1.11.6 → 1.26.6 → 1.11.6
- FIX: Reliable support > 2.5 MHz for revision >= 5B, reverted to 1.11.6 in bugfix 3

TOF1 FF 1.22.12
- unchanged

TOF2 PT 1.8.4
- unchanged

TOA3 AO 1.13.9
- unchanged

TOA4 AN 1.5.11
- unchanged

TOU1 UN 284
- unchanged

Firmware TSD-4.19.12

Summary: CurrentControllerFilter. BissC extensions. Support TSD350/2. Analog outputs for UN. External input for homing. Support SingleTurnEndat. Revert Option Module EH Firmware to 4.16.10 because of known analog encoder issue on the EH-Module. Bugfixes for EtherCAT !

4.19.0: CpuRelease: 2.12.11 Date: 2023-07-11 16:27:17 +0200 SVN Revision: 44453
FpgaFirmware: 1.22.16
Remarks: Use TAM SDK >= 7.24.0 to support the new puls train interface
- CHG: The positionErrorAnalysis features turn off done after commit if method==Disabled
  StandardDeviation must not wait for trigger and should set done to true after first time success
- FIX: Some digital encoder error messages showed up on the wrong axis
- FIX: During TCP connection timeout check, TCP and UDP send was frozen
- FIX: Re-enabling must not cause a currentD peak
- CHG: New safety messages are now always active
- NEW: Phasing-error message: 3/SineFrequency<RampRiseTime+RampConstTime*0.8
- FIX: Wrong behaviour when the Ethernet physical returned a disconnect and new register countUnplugProblems
- FIX: TestSigGen reprogram caused wrong amplitude or neg out: Fix and allow reprogramming during the ramp
- FIX: With large brake times, EtherCAT tried to couple during Disabling
- CHG: (Breaking)Pulsing unit fifo mode
- NEW: HomingMode ExternalInput for homing, LimitSwitches and PositionLatch
- NEW: CurrentControllerFilter
- NEW: Report Uri-State-Files
- NEW: Warning mask "W" followed by hex value for Biss, Endat, Nikon, Tamagawa
- NEW: Inversion mask "I" followed by hex value for Biss, Endat, Nikon, Tamagawa
- NEW: Downsampling "DS10"=10kHz for Biss (Default 20kHz for DigitalBiss and 100kHz for AnalogBiss)
- NEW: Clock setting "-F4MHz" or "-F5MHz" for Biss (Default is 2MHz)
- FIX: Biss: if SingleTurn>18, the encoder nameplate contained a wrong scale
- FIX: TSP700-40: Sign of second current measurement
- NEW: Drives with two SafetyMonitors now support functional safety
- NEW: Support for TSD350 Rev. 2
- NEW: Introduced signal multiplexing for safety and TSP700 monitoring
- CHG: Allow 5% higher value for maxLineVoltage on TSP700

4.19.1: CpuRelease: 2.12.12 Date: 2023-07-25 12:55:12 +0200 SVN Revision: 44628
- FIX: EtherCAT: Ommit controlWord.1 (bugfix 1)
- CHG: Enlarge the encoder DataFormat string from 4*4 to 6*4 bytes (bugfix 1)
- FIX: EtherCAT disable warnings with clearError: (bugfix 1)
- FIX: All PathPlanner errors now set AxisCommandError (bugfix 1)
- NEW: Support TOA3 AO Revision 1a (bugfix 1)

4.19.2: CpuFirmware: 2.12.14 Date: 2023-08-08 10:08:53 +0200 SVN Revision: 44746
- FIX: Bridge Mode not functional since 4.18 (bugfix 2)
- FIX: Encoder DataFormat Warning and Inversion mask for Endat and Analog (bugfix 2)

4.19.3: CpuFirmware: 2.12.15 Date: 2023-08-11 09:12:05 +0200 SVN Revision: 44765
- FIX: Trialink suddenly receives the last 111 packets again, causing bad path data (bugfix 3)

4.19.4: CpuFirmware: 2.12.17 Date: 2023-08-16 15:58:13 +0200 SVN Revision: 44800
FpgaFirmware: 1.24.0
- FIX: Wrong 100kHz version of masterPosition. (bugfix 4)
- FIX: FPGA receive FIFO (bugfix 4)

4.19.5: CpuFirmware: 2.12.21 Date: 2023-08-30 14:08:53 +0200 SVN Revision: 44916
- FIX: Sticky windowComparator fault and application.variables.booleans[0] (bugfix 5)
- CHG: SafetyMonitor 515, remove WindowComparator test (bugfix 5)

4.19.6: CpuFirmware: 2.12.22 Date: 2023-09-01 14:51:11 +0200 SVN Revision: 44943
- CHG: Increase DcBusMax to 780V and V-Cap to 421V (bugfix 6)

4.19.7: CpuFirmware: 2.12.22 Date: 2023-09-06 11:13:18 +0200 SVN Revision: 44975
- FIX: BridgeMonitor 312 increase adiabatic energy limits of the brake model (bugfix 7)

4.19.8: CpuFirmware: 2.12.23 Date: 2023-09-12 10:21:57 +0200 SVN Revision: 45067
- FIX: Some situations caused an endless log in TSP700 (bugfix 8)

4.19.9: CpuFirmware: 2.12.24 Date: 2023-09-13 13:57:08 +0200 SVN Revision: 45087
- FIX: Motor damping mode during Phasing-StartTime with position-tracking (bugfix 9)
- FIX: TSP700 BridgeMonitor error 7001 on spindles (Release 313) (bugfix 9)

4.19.10: CpuFirmware: 2.12.27 Date: 2023-11-03 16:16:50 +0100 SVN Revision: 45632
- NEW: Support wrap of singleTurn absoluteEncoders (bugfix 10)

4.19.11: SVN Revision: 45662
- FIX: Revert EH-Modul to 1.11.6 (bugfix 11)

4.19.12: CpuRelease 2.12.27 Date: 2024-02-22 09:50:31 +0100 SVN: Revision: 46150
FpgaFirmware: 1.22.21 for EtherCAT only
- FIX: FPGA 1.24.21 to support the Ecat DC-Slave PLL (EtherCAT build only, Trialink still uses 1.24.0)

OptionModules

TOE1 EN 1.18.6
- unchanged

TOE2 EH from 1.11.21 to 1.22.7, then 1.22.12, then 1.11.6
- CHG: Update Pulsing-Unit
- NEW: Analog encoder uses incremental signals for high frequencies for HW>=5b
- adjusted timing in asymetric 40MHz clock (1.22.12) (bugfix 1)
- Revert to 1.11.21 (4.18 version) (bugfix 10)
- Revert to 1.11.6 (4.16 version) (bugfix 11)

TOF1 FF 1.18.17
- First release: unchanged
- Decimation capability (1.22.12) (bugfix 1)

TOF2 PT 1.8.4
- unchanged

TOA3 AO 1.13.9
- unchanged

TOA4 AN 1.5.11
- unchanged

TOU1 UN from 280 to 283
- NEW: Support for two analog outputs Axes[i].Commands.OptionModule.AnalogOut[0] / AnalogOut[1]

Firmware TSD-4.18.10

Summary: New cogging compensation, axisCompensation, 100kHz LowPass, AnalogInput to controller and AnalogOutput from controller. FastRS422 encoder. OnePositionTwoMotors mode. Support for the pulsing unit. New EncoderTopology OptionD. Show both axes on TSP700 devices. Fix Tria-Link synchronization issue introduced in 4.18.3. Fix Trialink Bridge-Mode. Fix PU-Module

CpuFirmware: Build 2.11.10 (4.18.10)
Release Date: 2023-04-24 10:06:59 +0200 (Mo, 24 Apr 2023)
SVN Revision: Revision: 43720
Remarks: Use TAM SDK >= 7.19.0 to support the minimum firmware downgrade check
- FIX: #1296 In AnalogOutput-Mode and an AC motor was enabled then disabled and then switched to DC-motor
- NEW: Pulsing unit updates some 100kHz signals, new interface
- CHG: No Kd-Limit
- FIX: PositionError settling analysis and changes (bugfix 0+2+3)
- CHG: The invert bit for the PU unit is now 0x04 not 0x20 (bugfix 0)
- FIX: Unreliable Monitor firmware download (bugfix 2)
- NEW: Mininum FW release for TSP700-20/2 and TSP700-40/2 is 4.18.6-proto (bugfix 2+6)
- FIX: Wrong DcBusCurrent gain for TSP700/2 products (bugfix 2)
- FIX: Signal processor bug introduced in 4.17 (bugfix 2)
- FIX: Position Latch for Option modules (since 4.17) (bugfix 3) (#1317)
- FIX: 100kHz controller analog inputs not according to AN149 (bugfix 3)
- NEW: EncoderTopology OptionD (bugfix 4)
- NEW: Add a 25ms delay after setPosition before homingDone (bugfix 4)
- NEW: AxisOption 0x390 sets PositionError = DesiredPos - (Enc0+Enc1) (bugfix 4)
- CHG: TSP700 now shows both axes to allow option module B access (bugfix 4)
- FIX: torqueActualInc 0x6077 showed wrong value for negative torques (bugfix 4)
- CHG: Remove obsolete general options 0x85/0x86/0x99 (bugfix 4)
- CHG: Computing time optimizations for the Tama virtual machine (bugfix 4)
- NEW: TOE2 option modules publish there temperature to the bridge monitor (bugfix 5)
- FIX: Trialink bridge mode not functional since localbus rework (bugfix 6)
- FIX: OnePositionTwoMotors currentLimit0/1 visibility (bugfix 6)
- FIX: Improvements on Ethernet connection problems (bugfix 8)
- CHG: OptionModule temperature relaxed by 10°C (bugfix 8, 10)
- FIX: The pathplanner injected triplet was added the wrong way (bugfix 9)
- FIX: Ignore the option temperature, if an option module is unknown (bugfix 9)
- FIX: OptionEncoderAdc Test for reduced safety only for optionRevision 4 and newer (10)

FpgaFirmware: Build 1.12.9 / 1.16.0 (bugfix 4)
- FIX: Tria-Link synchronization issue introduced in 4.17/4.18.3 (bugfix 4)
- FIX: TOEN pulsing unit 1.18.6 (bugfix 7)

MonitorFirmware:
- No change

Firmware TSD-4.17.2-beta

Summary: New cogging compensation, axisCompensation, 100kHz LowPass, AnalogInput to controller and AnalogOutput from controller. FastRS422 encoder. OnePositionTwoMotors mode. Caution!: Firmware Downgrade must be done by TAM SDK 7.19.0 or newer.

CpuFirmware: Build 2.8.0 FPGA 1.12.9 (4.17.2-beta)
Release Date: 2022-12-29 15:08:50 +0100 (Do., 29 Dez 2022)
SVN Revision: Revision: 42681
Remarks: Use TAM SDK >= 7.19.0 to support the minimum firmware downgrade check
- NEW: AnalogOutput from 100kHz Controller AN149
- NEW: AnalogInput into 100kHz controller AN149
- NEW: PositionError analysis feature
- NEW: OnePositionTwoMotors with Phasing offset (SVN42021)
- NEW: AxisCompensation
- NEW: CoggingCompensation
- NEW: Support encoder IncrementalRS422Fast
- NEW: Support Signalprocessor setting Lowpass
- NEW: Pathplanner moveDuration
- CHG: (!) Rename TSP700-15 to TSP700-20 and TSP700-30 to TSP700-40
- CHG: (!) Breaking: Exchanged the parameters for the first order LeadLag-Filter
- CHG: Some gantry parameters are now always visible
- CHG: Replace misleading error on MotorType=None: 6277 by 6285
- FIX: Gantry homing did not support TamaHoming
- FIX: recovery from 7114
- FIX: After a homingError followed by a reset, a Gantry axis was disabled plus a MasterAxisTimeout
- CHG: (!) Current-Shunt 7mOhm for TSP700-30/2 and TSP700-15/2

FpgaFirmware: Build 1.11.6 1.12.9
- Remove subresolution from digital Position in Analog_Encoder_Counter
- Remove Status _Control

MonitorFirmware:
- No change

Firmware TSD-4.16.10

Summary: Maintain BrakeTiming after DcBusVoltage error, FieldWeakening, LimitSwitch during homing, StoppingMode for Airbearings during Phasing. EtherCAT: Optimized PDO-Interrupt and Cyclic telegram content specified using Triamec parameters. Caution!: Firmware Downgrade must be done by TAM SDK 7.19.0 or newer.

CpuFirmware: Build 2.6.7
Release Date: 2022-11-03 10:25:14 +0100 (Do., 03 Nov 2022)
SVN Revision: Revision: 42234
Remarks: Use TAM SDK >= 7.19.0 to support minimum firmware downgrade check

- NEW: Ecat: Optimized IRQ-PDO-Interrupts
- NEW: #1181: serviceCmd now returns a feedback
- NEW: axis statemachine device errors wait for the brake now
- NEW: Pathplanner and statemachine Errors and Warnings
- FIX: Gantry: Pathplanner reset after commutation command in PC after phasing did not work
- FIX: Ecat tryToStop function with MoveVelocity does never end: Make velocity dependent instead
- NEW: Read Endat Errors and Warnings during startup
- NEW: **FieldWeakening** function implemented #1035
- NEW: Minimum FW release 4.4.12, 4.12.1 (TSD350-15), 4.13.1 (TSD80-6 TSP700-10/1+2 TSP700-30), 4.13.8 (TSD80/5 TSD80-6), 4.14.0 (TSD350/1 TSP700-15), Options: 4.12.6 (AN), 4.13.1 (AO), 4.13.8 (PT), 4.13.8 (EN, EH)
- FIX: Encoder RS422: Avoid race condition for fastEncoder resolution and correct masking
- FIX: ignore **LimitSwitch** during **homing** if identical until past MoveToHome state
- FIX: TSP700 showed overcurrent in STO situation
- FIX: Reboot of option modules
- FIX: Gantry: Do not propagate switchOff to the other axis
- CHG: Increase startup time of All encoders to 880ms because of Endat specification (during boot only)
- FIX: Missing positionUnit check error for EtherCAT
- CHG: Update Encoder errors 6790-6801 and TSP700 messages and add waiting time to 6242
- NEW: PWM **stopping mode** during **phasing StartTime**
- NEW: **Ecat Interface** distinguish between TSD (dual axis) and TSP (Single axis) types: TS*_minFW4.16.xml
- CHG: Table and Dump files are now all uncached (bugfix 3)
- NEW: Support ISSI-Flash and **option revision 5** (EN, EH, PT, FF, AH)
- NEW: Check if Bit TBS is programmed on ISSI flashes: ErrSpi 13 (bugfix 1)
- NEW: Prevent option module firmware erase if option module not known (bugfix 1)
- FIX: Logic if optionmodule does not exist "NO" (bugfix 2)
- FIX: Ethercat scan devices, including single axis devices (bugfix 3)
- FIX: Option module erase timeout for 64k set to 3.5s instead of 1.5s (bugfix 4)
- NEW: Ecat PP-Mode with velocity and acceleration limits, (bugfix 5)
- CHG: Ecat cyclic extension commit (bugfix 5)
- FIX: Axis0/Encoder warning/error inconsistencies after ClearDeviceFault (bugfix 5)
- FIX: Ethercat cyclic data set by Triamec parameters (bugfix 5)
- FIX: TSP700-10 Rev 2: DcBus overcurrent was not active on board A (bugfix 7)
- FIX: OptionModule FF should also support digital inputs (bugfix 7)
- FIX: Occational OptionModule "8965 BootError opt module missing" (bugfix 7)
- FIX: Biss encoders stay in the encoderBusy state after commit (bugfix 10)

FpgaFirmware: Build 1.11.6
- No change

MonitorFirmware:
- No change

Firmware TSD-4.15.5

Summary: Endat Encoder activate CRC and ERR1 errors by default. Optimized I2t when changing the PWM frequency. New functions for Homing. Fix encoder amplitude limits and TSP700 external brake model

CpuFirmware: Build 2.4.24
Release Date: 2022-05-17 16:54:33 +0200 (Di., 17 Mai 2022) $
SVN Revision: Revision: 40819
Remarks: Use TAM SDK >= 7.18.0 to support continuousCurrentDiagnostic registers
- CHG: Default errorMask for endat encoders is now 0x35 (AnalogEndat) and 0x34 (DigitalEndat)
- CHG: (breaking) I2t diagnostics uses new registers ContinuousCurrentDiagnostics is now scaled to 1.0
- FIX: EtherCAT Extended IO: Skipped extensions must increase the bit size anyways
- FIX: A homing error could only be reset by restarting a new homing or Invalidating the homing. Support ResetError
- NEW: Support TSP700/2
- NEW: Tama: Support structs with non-default constructors. Fixes #1172.
- FIX: MotorTemperatureLimit behavior
- NEW: homingSearch eventAxis input
- FIX: SetPosition did not run from homingDone state
- NEW: Support homing TamaProgram (Fix 2) and SetAbsoluteOffset0/1
- FIX: EtherCAT revision was updated too early, yielding always zero
- FIX: Prevent resetting an active encoder error
- NEW: Endat Encoder::DataFormat M2 turns off the timing check, M3 simulates a timing check error
- NEW: Endat R50 forces a conservative 50kHz mode (Fix 2)
- FIX: #1204 Endat missing during boot then Reset caused bad commutation factor (Fix 2)
- NEW: Read Endat Errors and Warnings during startup (Fix 2)
- FIX: Ax0Anc0=None caused failure of homing: masterPositionSource sets ref for SetPosRelative, Track (Fix 3)
- FIX: Missing event-clear in MasterAxis Timeout (Fix 3)
- FIX: TSP700/0 after STO (Fix 3)
- FIX: SoftwareLimit check in coupled motion must not consider acc (Fix 3)
- FIX: homing checks (Fix 3)
- FIX: wrong errorMask for Analog and RS422 encoders (Fix 4)
- FIX: TSP700 ExternalBrakeResistor parameter (Fix 5)

FpgaFirmware: Build 1.11.6
- FIX: EncoderAmplitudes including encoder option modules) (Fix 5)

MonitorFirmware:
- FIX: TSP700 external brake resistor model for TR 1kW (Fix 5)

Firmware TSD-4.14.5

Summary: NEW: Persistent cyclic data, Smooth Commit of the Position Controller, KNOWN BUG: The global position latch inputs EncIn2 and EncIn3 are currently not functional

CpuFirmware: Build 2.3.14 (4.14.5)
Release Date: 2022-01-20 09:36:37 +0100 (Do., 20 Jan 2022)
SVN Revision: Revision: 39839 $
Remarks: Use TAM SDK >= 7.17.1 to support persistent cyclic data and smooth commit
- NEW: Support TSD350/1 and TSP700-15 Revision 0 and 1=reducedSafety
- NEW: Activate the new axis state Disabling, deactivate using general option 0x9b
- NEW: Allow a shortcut to directly Enable an axis from Tama without SwitchOn the device
- FIX: An encoder error could be cleared even if the error was still active.
- CHG: Ecat error after Override==1 only, see FirmwareFeature-Meeting 18.11.2021
- FIX: ExcentricityFeature showed wrong master position (Merge from 4.12.18, SVN39279)
- NEW: EncoderTopologyStandard Homing of dual loop axes
- NEW: Persistent cyclic data: TriaLink Channel function and EtherCAT definitions
- NEW: Smooth commit of the position controller
- NEW: EncoderBusy forces the axis to the startup-state
- FIX: Gantry: Wrong logic for event forward to axis1 (error 26)
- FIX: Homing did not support direction change for covered EncoderInX inputs (Fix4)
- FIX: Gantry Disable must consider Disabling state (Fix4)
- FIX: TOF2 option module, Error 60 when commiting Disabled mode (Fix4)
- FIX: SmoothCommit (Fix5)

FpgaFirmware: Build 1.8.7
- No changes

MonitorFirmware:
Release Date: 2021-12-16
- NEW: activated the option encoder supply and ADC voltage limits
- CHG: no longer set other limits for PlowPos0&1 for TSD80-15 HW-Type
- CHG: implemented Tri-state HW-Pin detection
- CHG: delay initial measurements

Release Date: 2022-01-21
- CHG: Support PCT Motor temperature sensors

Firmware TSD-4.13.14

Summary: New software position limits, Stator decoupling mode, Encoder Diagnostics, Support TSP700-30.

CpuFirmware: Build 2.2.27 (4.13.14)
Release Date: 2021-11-25 09:30:42 +0100 (Do., 25 Nov 2021)
SVN Revision: Revision: 39346
Remarks: Use TAM SDK >= 7.16.0 to support Tables and Option modules AN and AO
- NEW: Allow using EncoderType==Sensor for positionControl: Branch0=PhaseA and Branch1=AN[0]
- NEW: Support AO, PT, TSD80-06, TSP700-30, TSD80 Rev 5
- FIX: EncoderTopology OptionB with only one option module caused an error 6803
- CHG (Breaking): Different messageIds for Std and Opt encoders
- FIX: ERR 6802 plus EncoderDataBusError caused event flooding and is now replaced and solved by 6378
- CHG: Remove most old monitor interfaces
- NEW: Improve Ethernet behavior: DHCP to AUTO-IP transition after 2s, DNS name, DHCP inform for static IP
- FIX: Absolute Encoders: Saveing the commutation is directed to the same encoder as used for commutation
- FIX: An absolute encoder without homing config did not set Enc0=Enc1
- FIX: Update EN/EH option module to 1.8.7
- NEW: Software Limits
- NEW: Extend CommutationSource for stator decoupling
- NEW: Axis Command TriggerDump
- NEW: Counters AmplitudeWarning DigitalFlag1/2, DigitalCrc DigitalCommunication OverrangePhaseA/B
- NEW: (Temporary) Add 2x2x2 encoder phase signals to 100kHz dump
- FIX: DcBusVoltage checks: Highest prio for hardwareLimit and allow recovery of warnings if Upper=Lower=0.0f
- NEW: Leaving OverrideControlSystem with Ecat-Enable throws error 6287
- FIX: TSP700 errors not suppressed in TSD80 (fix 10)
- FIX: When a scope was interrupted by USB disconnect, any further connect failed scoping (#1136) (fix 10)
- NEW: Leaving OverrideControlSystem with Ecat-Enable throws error 6287 (fix 10)
- CHG: Biss: Extend the singleturn and multiturn precision settings to 50, total packet length is 64bit (fix 10)
- NEW: Allow to choose errorMask for analog encoders using a hex mask dataFormat="E0C1" (fix 10)
- CHG: Change current limits for TSD350-15 (fix 10)
- FIX: Wrong amplitude warnings with DigitalEndat (fix 11)
- FIX: Mask power supply errors in STO situations (fix 11)
- NEW: Monitor images (fix 10+chg12)
- FIX: STO error after reboot (fix 13)
- CHG: TSP700-30 Currents 60A (fix 13)
- FIX: 100kHz Interpolation wrong behavior if 10kHz forces a position step (0x320 for old behavior) (fix 14)
- FIX: Legacy product naming for 0x168 and 0x169 and 0x16A (fix 14)

FpgaFirmware: Build 1.8.7
- FIX: Option AH ENCODER : Encoder inputs EncIn were not high impedance

MonitorFirmware:
Release Date: 2021-10-22
Bridge:
- NEW: Coding of SiC drivers for high current version TSD80-15 and TSD350-15 implemented
- NEW: TSD80/130: added HW-ID and HW-Type Pin support, Adapt PlowPos0 levels
- CHG: lowered PBM_PLOW_POS lower error limit to -15% for the SiC cases
- CHG: Changed logic of Diag Bit brakeEnergyValid to brakeEnergyNotValid (used by TSP700 only)
- CHG: Use filtered measurements for PBS_PlowPosX voltages.

Safety:
- NEW: encoder power supply on/off,
- NEW: first firmware version for TSD80/TSD130 Rev5
- FIX: int temp measurement problem on TSD80/130 Rev5

Firmware TSD-4.12.16

Summary: We strongly propose to use this release because of faster reaction to OverCurrent events! New Tama functions use large persistent tables based on filesystem. New dump files for error diagnostics.
Bugfix 16 fixes a boot problem on EtherCAT drives and an internal voltage OutOfRange problem and the FastEncoder-DigInputs

CpuFirmware: Build 2.1.18 (4.12.15) (branch 4.12)
Release Date: Date: 2021-09-16 10:44:03 +0200 (Do., 16 Sep 2021)
SVN Revision: Revision: 38860
Remarks: Use TAM SDK >= 7.16.0 to support Tables and Option modules AN and AO
- FIX: The PulseTrain option must support negative cyclic data
- CHG: The Tama timeout detection was far too slow.
- FIX: Priority of STO warnings against DcBus warnings for the TSD350
- FIX: MotorTemperature fixes for the TS350
- FIX: Redmine #1067 USB-Jitter problems and other fixes
- NEW: masterError is now a 100kHz register
- CHG: EtherCAT: Default sConfiguredModuleIdentList is now two axes
- CHG: EtherCAT: Default resolution is now 1e6 instead of 10000
- CHG: EtherCAT: Some register write messages are now only shown with severity flags 0x04000000
- FIX: Not absolute encoders must setPosition(0)
- NEW: TOA4 parameters and fixed several TOA4 problems
- NEW: Individual dumpFile per axis, including EtherCAT signals
- CHG: Default velocityFilterT1=10ms
- CHG: Common Mode Current compensation is made after writing the Signals ActualCurrent.U,V,W
- FIX: Immediate Disable of PWM
- NEW: Phasing integrator limit error
- NEW: A commutationSource register allows specifying the encoder used for the commutation source
- FIX: Not-serial encoder commit not always successful
- FIX: The encoder velocity filter class used tau/2pi instead of tau.
- FIX: Publishing CPU-Temperature to the bridge monitor was accidently removed in SVN33608 (4.9.1)
- NEW: Log file is now a cicular file log.txt instead of log0.txt and log1.txt
- NEW: Timeout for homing setPosition in cases, where an external command overrides standstill
- NEW: persistent file system 10 tables
- CHG: (Breaking) No USB massstorage, obsolete because of EoT
- NEW: move to home position for absolute encoders, if already homingDone
- NEW: Directory format is now html instead of plain text and add a directory link to index.html
- FIX: Encoder conflict error: Wrong logic on encoderTopology change
- NEW: Homing must show errors in the explorer, prevent overwrite of axis error in case of errors that cause disable
- FIX: Gantry homing with ax1.secondSearch==Skip showed a parameterError (4.10.7, 36940)
- CHG: Excentricity option now also sets the excentricity register and saves it with the persistency
- FIX: EncoderTopology OptionB threw an error, if the 2nd option module was not an encoder mod. (4.12.10, 38126)
- FIX: EtherCAT Boot problems (4.12.15)

FpgaFirmware: Build 1.4.9/1.6.9
- FIX: Improve reaction time to DcBusOverCurrent events
- FIX: Update Encoder option modules (Build 1.6.9, 4.12.12) (TOE2, Build 1.6.13, 4.12.16)

MonitorFirmware:
Release Date: 2021-09-20
- FIX: BM, use filtered measurements for PBS_PlowPosX voltages.
- NEW: SDMA/B, encoder power supply on/off, first firmware version for TSD80 light
- NEW: BM, added HW-ID and HW-Type Pin support for TSD80/130, Adapt PlowPos0 levels

Firmware TSD-4.10.x

Summary: New gantry features, fixes and improvements

CpuFirmware: Build 1.10.18 (4.10.7)
Release Date: $Date: 2021-02-24 09:35:38 +0100 (Mi., 24 Feb 2021) $
SVN Revision: $Revision: 36960 $
Remarks: Use TAM SDK >= 7.14.0 to support "Ethernet over Tria-Link"
- CHG: (BREAKING) remove obsolete axes[0].parameters.currentController.currentErrorLimit register
- NEW: Activate motor simulation (option 0x9A) and angleSearch directly writes the phasing angle now
- FIX: Allow homing with limit switches
- NEW: Use Axes[].Parameters.PositionController.ExcentricityCompensation (optional)
- NEW: Use Axes[].Parameters.CurrentController.FeedForwardLimit
- NEW: Support Gantry parallel angleSearch phasing and Gantry.Parameters.AlignAfterHoming (optional)
- FIX: bug from 35096 restart phasing must be possible for all encs
- FIX: Finish Phasing and reset pathplanner after phasing for standard enabling sequence, not only encoder-save
- CHG: Start phasing ramp at 20mA instead of 100mA
- FIX: Homing Invalidate did not reset the command
- CHG: (Breaking) New naming convention
- FIX: SaveParametersPermanently
- NEW: PositionLatch and homing feature positionErrorThreshold
- FIX: USB BooleanGaps issue introduced with Vitis migration
- NEW: Homing cmd SetPosition
- FIX: Relocate move of a modulo axis must not use continuous motion
- TEMP: Temporary release for 50mOhm shunt test (36232, 1.10.11 4.10.3-alpha)
- FIX: No abos for TOU1 and TOA1 since 34399/34430
- FIX: USB ASY bug due to BSP interrupts in XusbPsu_EpBufferRecv
- FIX: Sensorless bandpass filter should be zero for electrical velocities smaller than 1Hz
- FIX: Encoder conflict error: Wrong logic on encoderTopology change (from 36627)
- FIX: Too short filename in fw upload validation (4.10.7, from 36717)
- FIX: Modulo DirectCoupled (#1003) (4.10.7, 36959)
- FIX: BrakeTime (4.10.7, 36940)

FpgaFirmware: Build 1.4.5
- No changes

MonitorFirmware:
Release Date: 2020-10-12
- CHG: lowered motor temperature lower limits to -10°C/-5°C

Firmware TSD-4.9.x

Summary:
This firmware update is recommended for all TSD drive types and solves an occational SafeTorqueOffStartup error caused by an unwanted watchdog reset of the safety monitor during STO pulse tests

CpuFirmware: Build 1.9.47 (4.9.7)
Release Date: Date: 2020-10-15 09:06:34 +0200 (Do., 15 Okt 2020)
SVN Revision: Revision: 35096
Remarks: Use TAM SDK >= 7.14.0 to support "Ethernet over Tria-Link"
- NEW: RestoreFactory function
- NEW: device commands for persistency save (blocks 180ms), disable and (re)load (blocks 80ms)
- FIX: TCP_MSS 1440
- NEW: desiredCurrentQ/D for the current controller
- NEW: Position controller active command
- NEW: Encoder Injected position, with linear interpolation
- NEW: Support Files system over USB and Tria-Link
- CHG: (Breaking) move masterPosition from command to signal, MasterPosition source must not be "Ignore"
- CHG: (Breaking) StartCurrentSineStaticVector and StartRotatingVectorConstantCurrent
  now generate a D-current, not a Q-current
- NEW: Support Nikon 8MHz ("16-24-F8MHz", downsampling 2)
- CHG (!) Gantry2 rotative coordinate is now pos0-pos1 instead of (pos0-pos1)/2 (34335, 4.9.0-alpha)
- NEW: Support Gantry3 (34335, 4.9.0-alpha)
- FIX: Pathplanner endposition not precise redmine #913 / #915 (34430, 4.9.0-alpha)
- FIX: Support TOA4 modules (34430, 4.9.0-alpha)
- FIX: Redmine #916 (34430, 4.9.0-alpha)
- NEW: Support product TSP710 (34430, 4.9.0-alpha)
- CHG: (Breaking)Remove parameter modulationMethod (34430, 4.9.0-alpha)
- FIX: Ethernet connection loss during FW update: #919 LWIP (34570, 4.9.1-alpha)
- FIX: Persistence of DigitalEncoders (34794, 4.9.2)
- NEW: Improvements of the Sensorless mode: Notch (34822, 4.9.3-alpha)
- FIX: FPGA-OpenTrialink behavior (34857, 4.9.3-beta)
- FIX: USB issues (34895, 4.9.3)
- NEW: Register currentController.sensorlessBandpassDamping (34910, 4.9.5-beta)
- CHG: Extend amplitudes of 3-phase and 2-phase motors (34910, 4.9.5-beta)
- FIX: BridgeMode no abo/events for slaves (34967, 4.9.6-beta)
- FIX: SetPositionRelative after homing with Xnew at -1.0000000002 (4.9.7)

FpgaFirmware: Build 1.4.5
- add Trialink watchdog timer
- double size trialink fifo
- add lsb timestamp to extio:
- Support TSP710
- Current U,V,W with 18 bit resolution
- Serial Encoder (except Endat) with comunication error and valid flag(OPT MODULES)
- Add Boot_Control and A7_Health_Monitor to slave_top.vhd
- add a pulldown resistor to the encoder ext_io
- saturation for enc_int.x and enc_int.y

MonitorFirmware:
Release Date: 2020-09-14

No changes since last Release

Firmware TSD-4.8.x

CpuFirmware: Build 1.9.8 (4.8.6+7)
Release Date: $Date: 2020-04-14 11:42:04 +0100 $
SVN Revision: $Revision: 33538 $
Remarks: Use TAM SDK >= 7.10.1 to support Biss-C

Changes since last Build:
- NEW: Nikon Encoder. Implement a string -F2.5MHz and -F4MHz to specify the frequency
- FIX: AnalogEndat and Tamagawa Zero function
- FIX: Backlash filter was limited to 20ms: Now sampled at 10 kHz, max 0.2s
- CHG: Ecat: Wait for booting finished at ISO and ASY
- FIX: TOE1 pulldown of EncIn and reboot
- NEW: Support axes[].commands.general.event = ChangeUnits
- CHG: Prio STO > LinkNotReady
- NEW: errorNumber registers supported and General.Signals.DigitalInputBits and internals.linkAddress
- FIX: if position is close to modulo, coupling can throw a false alarm 26.05
- FIX: MotorTempMon VoltageOutOfRange bug
- CHG: Correct limits for currentController.desiredVoltageD
- FIX: USB ISO might be collected with delay by a slow PC hardware
- FIX: BridgeOverCurrent was delayed unnessessarily
- FIX: FeedForward coulomb friction was not correctly merged from 4.4 branch in SVN30354

CpuFirmware: Build 1.8.0 (4.8.2)
Release Date: $Date: 2019-12-17 10:11:31 +0100 (Di., 17 Dez 2019) $
SVN Revision: $Revision: 32561 $
Remarks: Use TAM SDK >= 7.10.1 to support Biss-C

Changes since last Build:
- FIX: Not absolute encoders during init: Do not set offset=0 but position=0
- FIX: USB abo gaps introduced in 4.8.0
- CHG: Ecat Touchprobe: use option positions for touchProbe1 if source & 0x1000 (use 0x100E for Fast Axis0DigIn1)

CpuFirmware: Build 1.7.13 (4.8.0)
Release Date: Date: 2019-12-09 16:23:33 +0100 (Mo., 09 Dez 2019)
SVN Revision: Revision: 32478
Remarks: Use TAM SDK >= 7.10.1 to support Biss-C

Changes since last Build:
- NEW: Product TSD81
- NEW: SafetyFOutputs
- NEW: Commutation Angle Parameter
- NEW: Log-File with LogSeverity switches
- FIX: Error recovery of Position controller caused frozen "Enabling" until disable
- FIX: Ecat LinkNotReady did not show up after first boot.
- FIX: TOE1: Build 1.3.6: IncrementalEncoderSaturation
- FIX: Setting Encodertype to Analog for a TOA1 device caused a not recoverable situation
- FIX: Encoderzero for AnalogBiss, PositionLatch of AnalogBiss and AnalogEndat did not consider analogOffset.
- CHG: Use option 0x800 to replace the Ecat state *27 normally used in standstill and coupled mode
  by 0x23 and show 0x27 only when coupled. Do not use with CNC-ISG (Post-Homing-Problem).
- CHG: Ecat: Option 0xe7 for legacy enable with Command bit 3.
- CHG: Faster Commit

FpgaFirmware: Build 1.3.5
Release Date: 2019-09-20
- no changes since 4.7.5

MonitorFirmware:
Release Date: 2020-09-14

Changes since last Release:
- FIX: Occational SafeTorqueOff error (4.8.7), see dedicated Monitor releaseNotes for details

Firmware TSD-4.7.x

CpuFirmware: **Build 1.6.17 (4.7.5)**
Release Date: **Date: 2019-10-23 16:17:36 +0200 (Mi., 23 Okt 2019)**
SVN Revision: **Revision: 32053**
Remarks: **Use TAM SDK >= 7.10.1 to support Biss-C**

- FIX: Absolute Encoders: Set persistence of hom and comm only on saving
- FIX: Absolute Encoders: Biss-B stored the wrong commutation offset
- FIX: STO inconsistent required two clearFaults instead of one
- FIX: Delay BridgeVoltageOutOfRange after bridgeMonitor ready to allow ADC settling
- FIX: Ecat register read/write Triamec-URIs was accidently removed in 4.7.0
- BREAKING: Ecat state *27 instead of *23 in not coupled operation
  (CNC-Homing-Problem), use opion 0x2000 for legacy behavior

CpuFirmware **Build 1.6.12 (4.7.3)**
Release Date **Date: 2019-09-17 14:09:07 +0200 (Di., 17 Sep 2019)**
SVN Revision **Revision: 31847**

- NEW: Support revision4 FPGA option modules with Monitor activation, FIX TOU1 issue
- CHG: If domainName parameter is empty, choose "TSD-NNN" with NNN=serialNumber
- CHG: EtherCAT Upgrade SSC11 from V5.11 to V5.12 (Tool 1.4.2)
- FIX: "ERR63.71 HttpGet FileNotFound" caused TCP errors
- FIX: Sensorless pathplanner tracking and phasing bug
- NEW: Position unit "turns"
- NEW: Reboot function
- NEW: Leave Operational notEnabled with (STO, linkNotReady and BridgeVoltageOutOfRange).
- FIX: Motor temperature settings after STO, and persistency bug with STO
- CHG: SignalProcessor is turned off if mode is turned off even without setting start
- NEW: Encoder short errors

Absolute Encoders
- NEW: Commutation Commands (see AN108)
  StartPhasingAndSaveEncoder and enabling method AbsoluteEncoderOffsetEncoder
  StartPhasingAndZeroEncoder
  InvalidateEncoder requires disabled axis, changed enum from 6 to 10
- NEW: Support Biss-C and fix Biss-B nameplate read and analog bug
- CHG: AnalogEndat and AnalogBiss SubresolutionCheck enabled using dataFormat "M1"
- CHG: Digital encoder without nameplate should not init to zero, but to real absolute position
- FIX: AnalogEndat Legacy commutation Nameplate not handled and analogCount bug
- NEW: Nikon: Status info at Diagnostics.state 0x0F00000, read only during encoder start
- BREAKING: use 16 bit Nikon nameplate
- NEW: AbsoluteEncoder commutation based on mode zero

FpgaFirmware: Build 1.3.5 (4.7.5)
Release Date: 2019-09-20
- FIX: endat position with sign extension

FpgaFirmware: Build 1.3.4 (4.7.3)
Release Date: 2019-08-28
- FIX: software controlled switch on of the TAD SPI DRIVERS (Option modules).
- FIX: Global latch digital input inverted

MonitorFirmware:
Release Date: 2019-09-04

Changes since last Release:
- see dedicated Monitor releaseNotes for details

Firmware TSD-4.6.x

CpuFirmware: Build 1.5.9 (4.6.6)
Release Date: $Date: 2019-09-04 10:22:58 +0200 (Mi., 04 Sep 2019) $
SVN Revision: $Revision: 31717 $
Remarks: Use TAM SDK >= 7.10.0 to support TOF1, bridge mode and static IP registers

Changes since last Build:
TSD 4.6.3:
- NEW: CSV-Mode based on integrated B-spline, PV-Mode and CSP with velocity based modulo estimation
  use 0x1604/0x1a04 or 0x1600/0x1a00 for cyclic telegrams with velocity
  0x6502 contains info of CSV and PV modes
- FIX: Triamec.xml: TwinCAT cannot handle type double in startup list (0x23EE=ReferencePosition)
- NEW: restart AnalogEndat after encoderError
- NEW: Ecat: Register for axes[0].parameters.pathPlanner.streamInterpolatorMode
- NEW: New nameplate for DigitalEndat
- FIX: StreamReceiver: Support stop from coupled
- NEW: AxisCommandError "Pathplanner couple" if streamX is not within positionErrorLimit
- FIX: fixed Bug#689 'wrong acceleration when modulo-limit is set during move'
- CHG: improved calculation of deceleration move ratios
- FIX: Option encoders did not show amplitude errors (bug introduced in 4.4)
- NEW: homing persistent offset used on encoder finish, use legacy if OptionEncoderDrivePersistency.
- NEW: errorMessage strings
- NEW: general.signals.etherCAT.cyclic.pdo1c12 and pdo1c13
- NEW: (Re-)StartPhasing tested from Disabled/Operational
- CHG: In the standalone case, EtherCAT must not disable axes
- FIX: Tamagawa and Nikon require a wakeup time of 10ms. 5ms -> 50ms
- FIX: init of tama VMs (1.4.8)

TSD 4.6.4
- BREAKING: Ecat product revision is now 2 for Revision4 drives (1 for revision3 drives)
  Use Triamec1.6.xml or option 0x100 to force old behavior
- NEW: File upload /put.html and directory /dir
- NEW: Axes[].Parameters.PathPlanner.InterpolatorDelay delays interpolator signals in microseconds. Use -24.0 for legacy behavior.
- NEW: Bridge Mode Ethernet to TriaLink
- NEW: Ethernet parameters for static IP
- NEW: Support new option modules TOA2, TOF1 (FFT)
- FIX: Persistent boot: MotorTemperatureSensor parameters must be copied on success only
- FIX: 1.5.6 Sensorless damping worked only, if a standard encoder was used before (4.6.2-beta, 31292)
- FIX: 1.5.7: Sensorless must disable pathplanner tracking (normally done in disabled) (4.6.3-beta, 31306)
- FIX: 1.5.8 There was a peak of desiredCurrentQ at the beginning of the phasing ramp (4.6.4)
- FIX: 1.5.8 TOF1-Modul interface (merge with 1.5.8, 4.6.4, SVN31361)

TSD 4.6.6 (4.9.2019)
- FIX: 1.5.9 Large encoderCountsperMotorRevolution caused bad commutation wrapping

FpgaFirmware: Build 1.3.2
Release Date: 2019-07-01

Changes since last Release:
NEW: Node addresses can be changed by local bus
NEW: Dedicated node addresses for bridge mode by USB or Ethernet over a drive.
NEW: drive can overtake the trialink master role (rings without trialink controller card)

MonitorFirmware:
Release Date: 2019-05-17

Changes since last Release:
- see dedicated Monitor releaseNotes for details

Firmware TSD-4.4.12 (19.3.2019)

If option modules are present, TSD-4.2.0 must have been installed before this!

CpuFirmware: Build 1.2.12 (4.4.12)
Release Date: Date: 2019-03-13 14:11:04 +0100 (Mi, 13 Mrz 2019)
SVN Revision: Revision: 30312
Remarks: Use TAM SDK >= 7.9.0 to support coulomb friction registers and stream filter

Changes since last Build:
- NEW: Ecat Stream Mode turned on with option 0x200000
- NEW: FeedForward coulomb friction
- NEW: Position Stream Filter
- FIX: TSD80: motorTemperature Configuration lost during STO
- NEW: Prototype of logfile http://triamec-NNN/1:/log.txt (option = 0x1000)
- CHG: Min EtherCAT cycle time is now 100us instead of 200us
- FIX: Clearing a hidden STO safe fault was blocked in some cases
- NEW: Encoder: Tamagawa, Analog-Biss-B and Biss-B error reaction
  no absoluteCommutation so far
- FIX: DigitalEndat: modulo wrap
- !BREAKING! DigitalEndat: new scale (1.0 per turn)(ROT) or (1.0 per count)(LIN)
- NEW: EtherCAT: Support Explicit Device Id with Trialink1.4.xml
  add error UnspecifiedPositionUnit on booting with unspecified scaling factor

FpgaFirmware: Build 1.2.11
Release Date: 2019-02-06

Changes since last Release:
FIX: option modules transmit data with a downsampling of 79
due to a bug inside the new Zynq SERDES calibration unit.
NEW: first TSP710 support with 2-Level Pwm
NEW: Nikon encoder support
NEW: Tamagawa encoder support
NEW: Extended encoder error messages (not yet completed)
CHG: Serial encoder rework
NEW: Serial encoder without bit filter
FIX: Pll error counters was not clearable

MonitorFirmware:
Release Date: 2019-02-19

Changes since last Release:
- see dedicated Monitor releaseNotes for details

Firmware TSD-4.3.4 (18.1.2019)

If option modules are present, TSD-4.2.0 must have been installed before this!

CpuFirmware: Build 1.0.8
Release Date: $Date: 2019-01-18 13:54:17 +0100 (Fr, 18 Jan 2019) $
SVN Revision: $Revision: 29556 $
Remarks: Use TAM SDK >= 7.8.0 to support new product naming and new homing method

Changes since last Build:
- !BREAKING! SerialEncoder Persistency (Position-Offset) requires
  parameters.homing.method = AbsoluteEncoderN!
- CHG: Products: Changed strings, support orthogonal scheme and remove obsolete products (SCN 006)
- FIX: USB: Delayed BIOS boot of attached PCs, Support USB3 plugs (Windows USB Stack 3)
- CHG: Adjust continuous current i2t time from 2s to 20s and temperature limits
- CHG: Encoder: change analogEndat mode readposition mode for endat 2.2 encs
- NEW: Ethernet: AUTO-IP hard-coded to 0x169.254.222.222 (AN123)
- FIX: Ethernet: improve plug disconnect behavior during publish
- NEW: resetDiagnosticCounters
- NEW: DigitalBissB encoder
- NEW: Latching of (slow) digital inputs with 100us resolution
- NEW: Support analog sensor input of encoder
- NEW: Axes[]/Signals/PathPlanner/StreamGapCount counts missing stream pakets
  use TwinCAT CAxis2::simulateStreamError to force a missing paket
- FIX: TSD350: wrong units of Axis[1] motorTemperature
- FIX: Option module axis1 wrong amplitudeState

FpgaFirmware: Build 1.1.11
Release Date: 2019-1-18

Changes since last Release:
- **FIX:** option modules unintended downsampling of 79 due to a bug
- CHG: encoder amplitude error and warning passed through a bit filter
- NEW: encoder error handling
- NEW: biss b, biss c and ssi encoder
- CHG: endat local bus rework
- NEW: encoder error signals on cyclic interface
- CHG: pll not locked behaviour (debouncing of the errors)
- see dedicated FPGA releaseNotes for details

MonitorFirmware:
Release Date: 2019-01-11

Changes since last Release:
- see dedicated Monitor releaseNotes for details

Firmware TSD-4.2.0 (14.11.2018)

CpuFirmware: Build 2329 (TSD-4.2.0-proto)
Release Date: $Date: 2018-11-13 10:53:30 +0100 (Di, 13 Nov 2018) $
SVN Revision: $Revision: 28759 $
Remarks: Use TAM SDK >= 7.6.0 to support Ethernet connections

Changes since last Build:
- **MANDATORY FIX**: MotorPeakCurrent > DrivePeakCurrent can cause hardware damage
- FIX: FW update of an Option module in backup-mode
- CHG: etherCAT object 0x6092 (feed) is not writable in OP, recalculate on unit change
- NEW: units mm and degree
- NEW: add objects 0x1623 and 0x1a23
- NEW: digital endat: Set position zero if no persistency data
- CHG: Ecat Homing does not stop anymore if cmd 0x10 disappears, use Option 0x200 for legacy behavior

FpgaFirmware: Build 1.1.4
Release Date: 2018-11-12

Changes since last Release:
- **MANDATORY FIX**: TriaLink PLL-not-locked issues
- see dedicated FPGA releaseNotes for details

MonitorFirmware:
Release Date: 2018-11-08

Changes since last Release:
- see dedicated Monitor releaseNotes for details

THIS RELEASE DOES NOT CONTAIN FPGA OPTION MODULE FIRMWARE
USE NEXT RELEASE FOR OPTION MODULE UPDATE

Firmware TSD-4.1.2 (08.11.2018)

CpuFirmware: Build 2327
Release Date: Date: 2018-11-06 08:05:47 +0100 (Di., 06 Nov 2018)
SVN Revision: Revision: 28696
Remarks: Use TAM SDK >= 7.6.0 to support Ethernet connections

Changes since last Release:
- FIX: Ethernet Ungraceful Disconnection handled
- FIX: Ethercat eeprom station alias not persistent
- FIX: Option Module FW download solve retries
- NEW: Show Factory FW Release number and TSD130 string

KNOWN ISSUE: FW Download of an Option Module that is running in backup-mode

- see dedicated FPGA releaseNotes for details

FpgaFirmware: Build 2211
Release Date: 2017-12-18

Changes since last Release:
- see dedicated FPGA releaseNotes for details

MonitorFirmware:
Release Date: 2018-11-08

Changes since last Release:
- see dedicated Monitor releaseNotes for details