



# TwinCAT Tria-Link library upgrade 3.9.0

## Software Change Notification

Preliminary Release

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## 1 Summary

With the TwinCAT Tria-Link library 390, we introduce four major changes, which are described in this document.

The new library now supports the new PCIe adapter TL/Rev1 with a DMA function.

Improvements were made to the path interpolator of the TL\_Trialink2 interface and the interface TL\_Trialink is now considered legacy.

Triamec Motion AG drives provide an error register, which communicates any pending errors to the parent system and finally to the customer interface. The current concept only allows a limited number of errors and only partly allows warnings. Therefore, errors cannot be displayed with satisfying precision to the customer interface.

Triamec Motion AG introduces a new message concept that allows a more precise description of the reason of an error and will include warnings in the future. This document describes the new concept and changes to the TwinCAT interface. Two legacy modes allow to fall back to the old error IDs to support legacy implementations on customer sites.

The old TwinCAT library threw TwinCAT events in case of library or drive errors. With the new library, this code is moved to the sample code to improve customer flexibility.

## 2 PCIe DMA

The new PCIe board TL/Rev1 now supports Direct Memory Access (DMA). This improves the throughput of the board, especially for traffic from the Tria-Link towards the PC. Make sure, the following requirements are fulfilled, otherwise, the drive will run in none-DMA mode:

- TL-Board firmware 1.10.55 or newer.
- Windows Driver 1.1.20.0 or newer .
- TwinCAT library 3.9.0 or newer with interface TL\_TRIALINK2
- DMA not disabled Trialink.Config.DmaDisable is FALSE
- Drive firmware 4.12 or newer.

With the new mode, the following changes are active

### **TL\_Axis2::act\_pos**

The actual position is updated with MAIN\_FAST instead of MAIN\_SLOW

### **TL\_Axis2::act\_err**

The position error is updated with MAIN\_FAST instead of MAIN\_SLOW

### **TL\_Axis2::DigitalInputBits**

This output now supplies the same digitalInputs as the corresponding drive register. In the past, only the bits that correspond to the mask 0x033f were supplied.

### **TL\_publishMasterToSlave**

This interface allows to publish drive data cyclically to the master. This is now more efficient and should not consume much CPU load anymore.

### 3 Position Trajectory Interpolator

Target positions are supplied with MAIN\_FAST and must be interpolated to the drive frequency of 100kHz. This release implements improvements of the position path interpolator. These improvements are important if the target position is subject to large changes of the jerk from cycle to cycle.

## 4 The new message concept

### 4.1 Drive and Explorer Side

The new message concept is available for firmware 4.13 or newer.

The axis interface (Axes[]).Signals.General) now contains the following status signals

- AxisError The legacy error enumeration
- MessageId The new identification value for errors and warnings
- Message A string representation of the message

The new MessageId is organized as follows

- 6144-8191 Errors (for example "position error limit")
- 4096-6143 Warnings (for example "STO open")
- 2048-4095 Notice messages (for example when a reference move is ongoing)

The message contains a human readable string of the error along with extended information for further clarification.

The TAM System Explorer supports the new error concept since release 7.17.1.

The explorer now checks for any change of the MessageId and then reads the string message from the drive. This error is then displayed in the axis monitor area at the lower left corner. See Figure 1. Furthermore, the strings are appended to the log view for future reference.

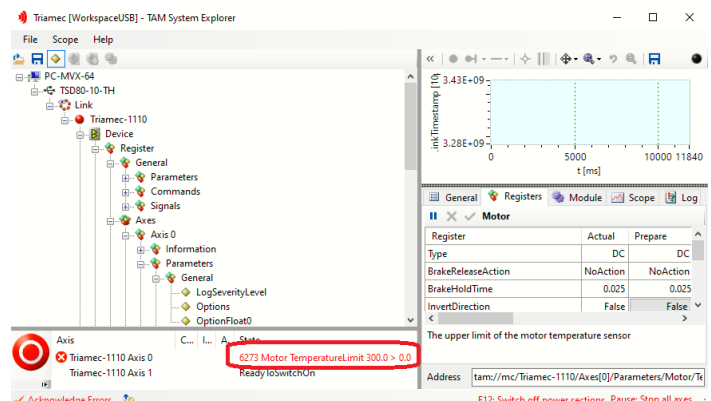


Figure 1: New message string for the new TAM System Explorer

### 4.2 Documentation

The application note AN103 [1] shows new and old errors, for document revisions 11 or higher. The message IDs are grouped depending on the severity and the source of a message:

- | id        | source | description  |
|-----------|--------|--|
| 6144-8191 | 3702   | Drive Errors   |
| 4096-6143 | 3702   | Drive Warnings (Future extension)                                      |
| 2048-4095 | 3702   | Drive Notice messages (Future extension)                               |
| 128-600   | 3701   | TwinCAT Tria-Link Axis library errors and legacy axis errors (261-316) |
| 65-78     | 3700   | TwinCAT Tria-Link PCI adapter errors                                   |

### 4.3 TwinCAT Tria-Link

The TwinCAT interface supports the new error concept for Tria-Link devices with release 390.0 or higher.

The axis object TL\_Axis2 now contains the following state outputs for error feedback, updated with TASK\_SLOW. The bold output is new:

- errorId            The library error number
- **messageId**       The drive error number
- sState            The library error as a string
- error             The library shows an error errorId

With the previous implementation, the errorId showed two sorts of errors: library errors such as a communication problems and drive errors such as a PositionErrorLimit. With the new concept, errorId shows library errors and messageId shows drive errors or warnings.

Special care is taken to support existing applications. Two legacy modes are available: The mode "**MessageForcedLegacy**" is activated by setting

- TL\_Axis2::Config.MessageForcedLegacy := TRUE;

In this case the errorId and sState strings behave as before.

The second mode "**Automatic fallback**" is active if the above switch is not set and one of the following conditions is met:

- DMA mode is off on this drive, see chapter 2.
- A drive with firmware older than 4.15 is used.

The following table describes the outputs depending on the legacy mode:

	New mode	Automatic fallback	MessageForcedLegacy
errorId error	Show library errors but not drive errors.	Show library and legacy drive error codes	
sState	Library error strings	Library and legacy drive error strings	
messageId	New drive message codes	0	

## 5 TwinCAT Events

In the past, the library threw TwinCAT events in case of an error to be displayed on the customer HMI and used sourceids starting at 700. In the meantime, Beckhoff started to use sourceids starting at 700 for TwinCAT events, which caused a conflict to the Triamec library. With the new library release, we move the code from the library into the sample codes for flexible adaptation into customer code and flexible use of the sourceid. Therefore, the following parameters are now FALSE by default and considered legacy code:

- TL\_Trialink2::Config.TcEventEnable
- TL\_Trialink2::Config.TcEventShowReferenceInfos
- TL\_Trialink2::Config.TcEventShowWarnings

Two documents are supplied by Triamec, which can be used for the TwinCAT event system to propagate error and warning events to the customer interface:

- triamecEventsTrialinkLib3.9.0.ecpx                      Events from the library      (release 3.9.0 and higher)
- triamecEventsDrive4.15.ecpx                              Events from the drive      (firmware 4.15 or higher)

Please note that events from drives older than 4.15 use the library file (automatic fallback).

## 6 References

- [1] "Triamec Errors and other Messages", AN103\_TwinCAT-ErrorMessages\_EP011.pdf, Triamec Motion AG, 2022.