

# Motion App

Motion Runtime Environment for ctrlX CORE  
Version 3.6.0

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DC-AE/PAD-SYS (MiSc)/(PiaSt)

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# 1 About this documentation

## Editions of this documentation

Edition	Release date	Note
01	2024-08	Motion App Version 3.2.0
02	2024-12	Motion App Version 3.4.0
03	2024-12	Motion App Version 3.4.0 Changes in the chapter <a href="#">↔ Chapter 5.3 Notes on use and known restrictions on page 19</a>
04	2025-01	Motion App Version 3.4.1
05	2025-03	Motion App Version 3.6.0

## Additional information

- See [↔ Motion App, Application Manual](#)

# 2 Important information

## 2.1 Product information

For the latest information on our products, go to [↔ https://www.boschrexroth.com](https://www.boschrexroth.com).

For current security advisories, please refer to [↔ https://psirt.bosch.com/security-advisories/](https://psirt.bosch.com/security-advisories/)

# 3 Version 3.6.0

## 3.1 New functions

### 3.1.1 Feature 141562: Axis mode torque control

#### Description

This command switches the operation mode in the drive to "Torque/force control with velocity limitation" and commands the axis to the set torque with the specified parameters. The PLCopen function block MC\_TorqueControl enables simple control of this functionality.

### 3.1.2 Feature 520713: Interface for teaching kinematic positions

#### Description

This function allows you to conveniently create and edit robot positions in the PCS (product coordinate system) and ACS (axis coordinate system).

The point tables generated in this way are saved in the Data Layer and can be used for applications from the PLC or other scripting languages.

### 3.1.3 Feature 722321: Simplified command option for commanding with "PolyTrans"

#### Description

The new "PathSmooth" command option combines the "PolyTrans", "KinContour" and "ContMotion" command options. The option can be called with the parameters of the other command options and distributes them to the subordinate options. If the "PathSmooth" command option is switched off, it also switches off all subordinate command options.

### 3.1.4 Feature 743604: Enabling the master and slave axis offset at the switchover position of the flex profile

#### Description

For a synchronous switchover between two flex profiles at a specified switchover position, the flex profile internal offsets `angleAdjust` (master axis offset after flex profile gearbox) and `slaveAdjust` (slave axis offset after profile calculation) are provided during commanding. While the "masterOffset" and "slaveOffset" offsets are already calculated when the command is enabled, "angleAdjust" and "slaveAdjust" only take effect at the switchover position. This functionality is relevant for the "LockOn/LockOff PLC module, for example.

### 3.1.5 Feature 809077: Belt-synchronous kinematic operations

#### Description

The function enables belt-synchronous pick-and-place applications. Here, a kinematic system synchronizes with a linear belt, moves synchronously with it and synchronizes again. Alternate synchronization between two belts is also supported.

### 3.1.6 Feature 821837: Fast writing of a flex profile from the PLC

#### Description

This function allows a flex profile to be written and validated from a synchronous PLC Motion task. Write access is therefore deterministic. The written profile can be enabled immediately.

### 3.1.7 Feature 858295: Violated protection zone or workspace in the Data Layer

#### Description

If a violation was detected during the last check of a protection zone or work area (if the "kinSafeArea" or "kinSafeAreaInExecution" command option is active), this protection zone or work area can be read out in the Data Layer.

Data Layer address:

"motion/kin/[name]/state/functions/safe-areas/last-violated-safe-area" Node type: Character string; read-only

Note:

If a violation of the inclusive workspaces has been detected (if the kinematics is outside all inclusive workspaces), the first monitored inclusive workspace is always displayed in the Data Layer node.

### 3.1.8 Feature 886959: Substitute function for actual position of axes and axis transformation in a kinematic system

#### Description

If the configuration of the kinematic axes is unique (each axis is assigned to exactly one index of exactly one kinematic), the actual position of the axis is mirrored in the actual position of the kinematic, even if the axis has not yet been assigned to the kinematics. This means that the kinematics returns the current actual position of the axes even if the axes are not yet grouped.

If either exactly one basic transformation or one basic transformation and one orientation transformation are configured in a kinematic, their parameters are all configured correctly, all required licenses are installed and all required axes have a replacement function, the replacement function for the axis transforma-

tions becomes active. This means that the axis transformation can be calculated even if it has not been enabled via the command option - it is always active.

The Data Layer nodes can be used to query whether the functions are active. If the configuration settings are ambiguous, these nodes also provide information on where ambiguities exist. This information is determined when switching from SETUP to OPERATION. However, an HMI can also determine this information in the SETUP state by calling the appropriate VALIDATION methods in the Data Layer. Both replacement functions can also be disabled using Data Layer nodes.

Relevant Data Layer nodes

- motion/kin/[name]/state/capabilities/kin-axis-cfg-unambiguous
- motion/kin/[name]/state/capabilities/joint-trafo-cfg-unambiguous
- motion/kin/[name]/cfg/validation/kin-axes-cfg-unambiguous
- motion/kin/[name]/cfg/validation/kin-joint-trafo-unambiguous
- motion/kin/[name]/cfg/coord-systems/settings/use-kin-axes-fallback
- motion/kin/[name]/cfg/coord-systems/settings/use-axis-trafo-fallback

### 3.1.9 Feature 893384: Display of the CamIn status in the PLC

#### Description

Both the ML\_CamIn function block and the AxisInterface now display the activation of a cam plate.

### 3.1.10 Feature 903143: Kinematics for three-axis flex stamper

#### Description

Axis transformation for a parallelogram with three rotary axes (Rot1, Rot2, Rot3). Rot1 and Rot2 are located at the base of the robot. The basic coordinate system is located at the position of the Rot1 axis. The third axis, Rot3, is located on the penultimate link and is used to adjust the alignment of the flange in the robot plane.

### 3.1.11 Feature 912557: Kinematics for two-axis delta slides

#### Description

Axis transformation for delta robots with two linear axes Lin1 and Lin2, which are located on the same guide rail that runs along the X-axis. Links that are attached to the linear axes have the same length and connect at one point. At the connection point, some robots can have an additional link with an individual length.

### 3.1.12 Feature 923629: Generic interface for reading/writing drive parameters

#### Description

The drive parameters that can be transferred cyclically can be read and written via these bundle interfaces. The function supports a maximum of 6 parameters for the input and 6 parameters for the output. The parameters should be configured in I/O Engineering and in the axis profile and are called up cyclically.

### 3.1.13 Feature 924677: PLC function block for teach points

#### Description

The MB\_PCSTeachIn PLC function block provides a convenient way of configuring the teach points of a kinematic system in PCS (product coordinate system).

- 3.1.14 Feature 929654: Real-time access to the raw values of the actual position of an encoder axis**
- Description**
- This function enables access to the raw values of the actual position of an encoder/drive axis in real time and their acquisition with a touch probe. This is required for the implementation of a "flying saw" to compensate for material slip.
- 3.1.15 Feature 931608: Introducing new axis licenses**
- Description**
- Building on the license for 10 axes, new axis licenses for 20 and 40 axes have been added. An additional license can completely remove the limit on the number of axes. This increases the axis limit to currently 125 axes. The number of axes refers to the sum of the real and virtual axes. Older axis licenses can still be used. However, they cannot be combined with the new licenses.
- 3.2 Bugfixes and modifications**
- 3.2.1 Bug 954066: Interpolation error**
- Description**
- If the coarse interpolation results in many zones of the same constant velocity with different acceleration dynamics, an error occurs in the interpolation logic during maximum deceleration.
- 3.2.2 Bug 958183: Probe parameters "deadtime" and "expectWindow" cannot be changed during operation**
- Description**
- Probe parameters "deadtime" and "expectWindow" could not be changed in the Data Layer when the probe was active.
- 3.2.3 Bug 969982: String input of the ML\_BrowseDataProvider function is too short**
- Description**
- The regex input of the ML\_BrowseDataProvider function was limited to 50 characters. This input can be used to pre-filter the data registered with the data provider. For detailed pre-filtering, the string length has to be at least as long as the URI of the registered data.
- Bug fixing**
- The string length of the regex input of the ML\_BrowseDataProvider function has been extended to 250 characters.
- 3.2.4 Bug 971665: System crash at a filter cut-off frequency of 250 Hz**
- Description**
- The system crashed if the filter cut-off frequency of the encoder axis is set to 250 Hz or higher.

**Bug fixing**

The start process is aborted and the message "Filter initialization failed" is displayed if the cut-off frequency of the encoder axis is higher than 250 Hz.

### 3.2.5 Bug 976932: Adaptation of Motion SDK examples to changed interface

**Description**

The Celix interface of the Motion app, which is used in the Motion SDK, has changed. The SDK examples have been adapted accordingly - they now use the new Celix Helper class. Please adjust your code accordingly.

Please also note that apps created with the Motion SDK require the runtime license "ctrlX OS License - Motion SDK Standard (add-on)" (SWL-XC\*-RUN-MOT\*SDK\*\*\*\*\*-NNNN R911427354) if they are to be executed on a real control (no license is required if they are used on a virtual control).

**Bug fixing**

In motion\_component celix::start():

```
// register the bundle itself on the ctrlX MOTION
    motion::core::ComponentVersionAdd compData;
    compData.m_compName = "MotionAddCmdExample";
    compData.m_appName = "app.filter";
    compData.m_versionMajor = 0;
    compData.m_versionMinor = 0;
    compData.m_versionPatch = 1;
    compData.m_versionBuild = 123;
    compData.m_versionString = "MotionAddCmdExample-0.0.1-
develop.123";
    compData.m_branch = "develop";
    compData.m_gitCommit = "";
    if (!createCelixHelper(m_motionExtIf, compData,
m_celixHelper))
    {
        std::cout << "Can't register bundle in motion.core!" <<
std::endl;
        return;
    }
    m_motionExample->start(m_motionCmdIf, m_motionSysIf,
    m_motionDataIf, m_motionSdkIf, m_dataLayerFactory,
    m_flatbufferJson, m_celixHelper->getSdkInterface(),
    m_dataLayerFactory, m_flatbufferJson, m_bundleIf);
```

In motion\_component celix::stop():

```
m_celixHelper.reset(); // unregister bundle from ctrlX MOTION
```

### 3.2.6 Bug 978255: "Reset AppData" does not reset the system configuration of ctrlX MOTION

**Description**

If the "Reset AppData" function was used to reset the configuration, this did not happen completely immediately.

### 3.2.7 Bug 983519: build\_snap\_arm64 script error

**Description**

Executing the script "build\_snap\_arm64.sh" resulted in an error as the arm64-toolchain file was not found.

### 3.2.8 Bug 990875: ImcCtrl.Admin.RetriggerOpMode runs with error

#### Description

In the PLC program, only the MB\_ImcInterface function block is executed with RetriggerOPMode = TRUE, ImcCtrl.Admin.RetriggerOpMode := TRUE; MB\_ImcInterface();

```
ImcCtrl.Admin.RetriggerOpMode := TRUE;
```

```
MB_ImcInterface();
```

the MB\_ImcInterface returned the error code 16#090F2001, 16#0C570100.

#### Bug fixing

Calling the MB\_ImcInterface with enabled RetriggerOPMode, ImcStatus is triggered between "Configuration" and "Execution".

### 3.2.9 Bug 993419: Axis interface does not detect external power shut-down

#### Description

If the axis status OpModeAct is not ModeAB and ModeExternalFB, switch off the current supply in the Motion app (external power cut-off), subsequently the axis interface OpModeActBits does not switch to ModeExternalFB.

#### Bug fixing

If the axis status OpModeAct is not ModeAB and ModeExternalFB, switch off the current supply in the Motion App, subsequently, both OpModeActBits and OpModeAct could switch to ModeExternalFB.

### 3.2.10 Bug 994587: Device status does not work if axes are defined under Glob\_Var

#### Description

If the user defined the axis as TE\_AXIS\_IDX\_CONFIG\_MODE.GLOB\_VAR in the library parameters and these parameters differed from the Motion runtime configuration, all nodes under the device status of this axis did not work.

#### Bug fixing

If the user defines the axis in the library parameters as TE\_AXIS\_IDX\_CONFIG\_MODE.GLOB\_VAR and these parameters deviates from the Motion runtime configuration, the node displays the correct value for the configured axis in the Motion interface under Device status of this axis.

### 3.2.11 Bug 995788: Interpolation error

#### Description

If the coarse interpolation resulted in many zones of the same constant velocity with different acceleration dynamics, an error occurred in the interpolation logic during maximum deceleration.

#### Bug fixing

The mechanism for maximum deceleration has been stabilized.

### 3.2.12 Bug 1001772: TE\_AxisInterfaceMainProg returns the error code 80010001/00000000 in the configuration status

#### Description

If the axis was created for the first time, the Motion runtime status was in configuration and you started a PLC project with the Motion interface template, TE\_AxisInterfaceMainProg returned the error code 80010001/00000000 by default.

#### Bug fixing

The Motion/real-time nodes are not read in the configuration status. When starting a PLC project with a Motion interface template in Motion configuration status, no error is reported, regardless of whether the axis has been created or not.

### 3.2.13 Bug 1001793: Incompatible change for MB\_WriteFlexProfile & MB\_ReadFlexProfile

#### Description

1.  MB\_WriteFlexProfileType02 is added for fast writing of flex profiles from the PLC to the Data Layer based on the Motion function axsFlexProfile-Config. However, the inputs of MB\_WriteFlexProfile/Type02 are different. This is impractical for the user.
2.  Currently, the event number cannot be greater than the segment number. Therefore, users cannot make any further changes to ProfileEvent. This use is incorrect.

#### Bug fixing

1.  In order to standardize the input/output of the "Write FlexProfile" function, some incompatible changes have been implemented for MB\_WriteFlexProfile and MB\_ReadFlexProfile:
  - Replace the structure MB\_ProfileSegment with ML\_iAxsFlexProfileSegment in MB\_WriteFlexProfile
  - Replace the structure MB\_ProfileEvent with ML\_iAxsFlexProfileEvent in MB\_WriteFlexProfile
2.  Optimizing the logic of the event number and its value, which can be greater than the segment number.

### 3.2.14 Bug 1007552: G-Code Node-RED UI: Kinematics cannot be enabled due to an invalid script language type

#### Description

PLC programs in the template project try to create a script instance with "Python" by default, resulting in the error "081F0000, 0C270005"

#### Bug fixing

The PLC interface in the template is extended by the "Language" input and the default value is "gcode".

## 4 Version 3.4.1

### 4.1 Resolved defects and modifications

#### 4.1.1 Bug 958183: The probe parameters "deadtime" and "expectWindow" cannot be changed in active status

##### Description

The probe parameters "deadtime" and "expectWindow" could not be changed via the Data Layer and the PLC if the probe was disabled.

#### 4.1.2 Bug 963636: System exception when an encoder axis is created

##### Description

If an encoder axis was configured, a system exception occurred after a few seconds. This also applied if a project with an encoder axis was loaded.

#### 4.1.3 Bug 965823: System crash at a filter cut-off frequency of 250 Hz

##### Description

The system crashed if the filter cut-off frequency of the encoder axis was set to 250 Hz or higher.

##### Bugfix

The boot process is interrupted and the trace message "Filter initialization failed" is displayed if the filter cut-off frequency of the encoder axis is higher than 250 Hz.

### 4.2 Notes on use and known restrictions

#### 4.2.1 Bug 950703: Silent running in case of unbuffered PosAbs/PosRel/PosAdd

##### Description

If an unbuffered PosAbs/PosRel/PosAdd is commanded and the new command interrupts another (slow) movement, the new movement to the target point is sporadically executed at low speed.

#### 4.2.2 Bug 963636: System exception when an encoder axis is created

##### Description

If an encoder axis is configured or a project with an encoder axis is loaded, a system exception occurs after a few seconds.

## 5 Version 3.4.0

### 5.1 New functions

#### 5.1.1 Feature 146942: Function blocks MB\_FlexLockPrepareType01 and MB\_FlexLockType01 are integrated into CXA\_MotionPrinting

##### Description

The new PLC library CXA\_MotionPrinting contains the function blocks MB\_FlexLockPrepareType01 and MB\_FlexLockType01.

- MB\_FlexLockPrepareType01:

The function block generates four flex profiles (ProfileDwell, ProfileStart, ProfileRun, ProfileStop).

- MB\_FlexLockType01:  
The function block selects and activates the corresponding profiles (Run, Stop, LockOn or LockOff) depending on the "LockOn" input for the LockOn/ LockOff functionality.

### **5.1.2 Feature 314588: Dynamic check of the workspace during command processing**

#### **Description**

This command option enables the permanent monitoring of a protection or work area during command processing for all motion commands until it is explicitly disabled. Several protection and work areas can be enabled with several command calls.

### **5.1.3 Feature 427999: Supporting the "Open-Loop" drive mode**

#### **Description**

For simple automation tasks, such as conveyor belts, drives without position feedback can be used in open-loop mode.

The ctrlX Motion supports these drives in SoE and CoE axis profiles.

### **5.1.4 Feature 454162: Switching the axis mode during the motion**

#### **Description**

Up to this version, the operation mode of an axis (e.g. PosAbs, MoveVel, GearIn, ...) could only be changed at standstill. This extension allows switching during the move.

This function has been optimized for ctrlX DRIVE and IndraDrive. Other drives may require an adjustment of the extrapolation time.

### **5.1.5 Feature 605759: SDK Base - MExA helper for SafeZone monitoring**

#### **Description**

The SafeZone monitoring aid enables the implementation of a command option that monitors safe zones (or work areas). These safe zones can be defined and customized by the SDK user. It is implemented as a command option where the user has to create the geometry data to define the SafeZone. If the SafeZone is violated, an error diagnostics is also created. A simple example to demonstrate the use of the SDK with SafeZone monitoring is supplied with the SDK.

### **5.1.6 Feature 748190: UI: Improving the assignment of cyclic parameters in the axis profile**

#### **Description**

The configuration dialogs for parameters to be transferred cyclically between the drive and control have been revised. Operation has been simplified and frequently required work steps have been integrated into the process.

### **5.1.7 Feature 814161: Jogging in the tool coordinate system**

#### **Description**

This function enables a jog motion in the tool coordinate system (TCS). The motion takes place along the tool orientation. This facilitates to predict the robot's motion.

One use case is teaching a position in a motion sequence.

### 5.1.8 Feature 817278: Creating and commanding of TeachPoints

#### Description

TeachPoints can be created and managed in the Data Layer. With the new KinMoveToPointLinCmd and KinMoveToPointDirectCmd commands, they can also be easily used in move commands.

### 5.1.9 Feature 852168: Extending the data connection for the PLC

#### Description

The PLC interface to the flex profile has been expanded to include read functions for the access phase and effective master axis velocity process steps. This information can now be read cyclically by the PLC.

### 5.1.10 Feature 857545: SDK Base - MExA helper for multi-axis filters

#### Description

The MExA multi-axis filter is provided as part of the SDK-Base (Software Development Kit). It allows SDK users to implement their own user-defined filters and apply them to the axes of the kinematics. The filter function works according to the interpolation and transformation of the kinematics. Interpolated axis positions can be used as inputs for the filter, e.g. to calculate a forward torque that has to be transmitted to the drives using the cyclic telegram. A simple example to demonstrate the use of the SDK with the multi-axis filter is provided with the SDK.

## 5.2 Resolved defects and modifications

### 5.2.1 Bug 880640: CXA\_MotionInterface – Configuration of more than 22 axes can cause memory errors or system crashes

#### Description

If more than 22 axes are configured, the array limits of the CXA\_MotionInterface can be exceeded subsequently causing memory errors or system crashes.

#### Bugfix

The array size is adjusted based on the number of axes so that the array limits cannot be exceeded.

### 5.2.2 Bug 885765: CXA\_MotionInterface – The PlcOpenState value differs from the respective value in the Data Layer

#### Description

The value of the variable `arAxisStatus_gb[].Data.DeviceStatus.PlcOpenState` in the MotionInterface differs from the Data Layer node value: `motion/realtime/cyclicStatusData/data/X/PlcOpenState`

#### Bugfix

The variable `arAxisStatus_gb[].Data.DeviceStatus.PlcOpenState` always maps the corresponding value in the Data Layer.

### 5.2.3 Bug 889633: CamIn: Could not write the last active point-table

#### Description

If a point-table is used in a CamIn command and the CamIn command is stopped or another command is commanded, then it isn't possible to write to this point-table, although it isn't used by the CamIn command anymore.

#### Bugfix

A point-table can be written, if it isn't used by a CamIn command.

### 5.2.4 Bug 890737: CamIn command blocked after abort of wait for switching position

#### Description

If a CamIn command is commanded with "switchProfileOnPos" and is aborted before the switching position is reached, no other CamIn command can be executed.

#### Bugfix

After aborting a CamIn command with "switchProfileOnPos", another CamIn command can be executed.

### 5.2.5 Bug 898015: CXA\_MotionInterface – Faulty Admin\_OpModeAck signal when commanding "ModePosAbs"

#### Description

If the value `arAxisCtr_gb[].Admin_OpMode` is commanded with "ModePosAbs" and the axis is not moved (e.g. distance to target position is 0) or the motion is completed, the status signal `arAxis_Status_gb[].Admin_OpModeAck` displays the value "ModeStop". Status only during the motion: "ModePosAbs"

#### Bugfix

When the "ModePosAbs" command is enabled via `arAxisCtr_gb[].Admin_OpMode`, the status signal `arAxis_Status_gb[].Admin_OpModeAck` also displays the value "ModePosAbs" until a different value is transferred.

### 5.2.6 Bug 899487: Conversion error in velocity unit (degrees/s)

#### Description

A conversion error occurred when degrees/s was selected for a rotary axis on the control.

#### Bugfix

The velocity scaling for degrees/s matching parameter S-0-0044 bit 5 was implemented.

### 5.2.7 Bug 900079: G-Code: Error when two kinematics are running in parallel

#### Description

There are two kinematics working with G-code in parallel.

- Kinematics\_1 runs with a simple G-code script and calls a subroutine in endless while loop
- Kinematics\_2 runs with a short script full with X/Y/Z address words

As long as kinematics\_2 is not in BUSY state, kinematics\_1 works well for a pretty long time.

After kinematics\_2 starts running G-code , Kinematics\_1 will run into error state.

#### Bugfix

The problem was fixed in the Motion app.

### 5.2.8 Bug 901114: Incorrect processing sequence of command preparation for insert commands

#### Description

If a insert command is created e.g. using PolyTrans the processing sequence of the command preparation could be incorrect. This can result in an unfavorable speed profile or a calculation error.

#### Bugfix

Troubleshooting in the internal preparation sequence.

### 5.2.9 Bug 910502: Error cannot be deleted following an AxsStopCmd

#### Description

If another command (except AxsStopCmd with changed dynamics) was sent during the braking ramp of an AxsStopCmd, an error occurred in the Axs-StopCmd (as described in the application manual). However, this error could not be deleted.

### 5.2.10 Bug 914368: Changes to "EventConditionControl" in FlexProfile/CamIn

#### Description

1. The "EventConditionControl" element should not be deleted in the "CamIn" operating mode.
2. The "EventConditionControl" element should be checked cyclically in "FlexProfile" mode.

#### Bugfix

1. The "EventConditionControl" element is not deleted by the "CamIn".
2. "EventConditionControl" is checked cyclically.

### 5.2.11 Bug 919090: Interpolation error

#### Description

When interrupting and continuing with the kinematics commands KinInterrupt and KinContinue, a movement with an extremely low constant velocity has occurred due to an error in the interpolator.

#### Bugfix

The interpolation error has been fixed so that the best possible movement profile with maximum dynamics can be found and interpolated instead of an emergency solution.

### 5.2.12 Bug 925154: System error in motion system while special single axis commands are running

#### Description

If a single axis is commanded with a movement command (e.g. PosAbs) and the previous movement was almost, but not yet completely finished, and the new movement takes place with jerk limit values and includes a reversal of direction, a "system error in the movement system" can occur.

### 5.2.13 Bug 927828: GearInPos on a encoder axis could lead to a wrong modulo calculation

#### Description

If a GearInPos with a relative synchronization mechanism is commanded, both axes are configured translatory modulo and the master axis is an encoder axis, it could happen, that the modulo calculation is done wrong.

#### Bugfix

The modulo calculation is done correct for the described scenario.

### 5.2.14 Bug 928301: Blending in singularity handling leads to the "position gap"

#### Description

If the blending command option is active and a singularity handling occurs with a ctrlX MOTION movement command, this can lead to a 'position gap' error. This leads to an error reaction and thus the movement is aborted.

#### Bugfix

Blending is now suppressed for commands automatically inserted by the ctrlX MOTION for singularity handling. Blending is not used to round off before and after this inserted command.

### 5.2.15 Bug 930411: Change the error code of CXA\_ModbusTCP from 0A0F1850/0C230006 to 0A0F0119/0C230006

#### Description

The error does 0A0F1850/0C230006 not match any of the listed error codes for the IL\_ModbusTCPWriteMultipleRegisters function block.

#### Bugfix

The error code in CXA\_ModbusTCP has been changed from 0A0F1850/0C230006 to 0A0F0119/0C230006. This error is the standard exception response type code in the Modbus TCP protocol, its means is "master is too busy to answer".

### 5.2.16 Bug 937963: Licence check reports error during start-up

#### Description

The licence check reports an error (detail code 0x560212 "An installed licence requires a different licence as a basis. Because the base licence is not installed, the installed licence cannot be used."), although the reported licence is neither installed nor used.

- 5.2.17 Bug 944905: Probe ENCODER\_1 and ACT\_POS are not equal in acceptable range**
- Description**  
Probe ENCODER\_1 and ACT\_POS are not equal in acceptable range.
- 5.2.18 Bug 944906: The control-based dead time compensation of the touch probe is not working properly**
- Description**  
The time compensation is calculated correctly, the compensation is applied twice.
- Bugfix**  
The calculation of the compensation was corrected.
- 5.2.19 Bug 952786: Probe: The offset is not set correctly**
- Description**  
The probe could not adapt to the offset changes of the EtherCAT.
- Bugfix**  
The control-based probe has automatic time compensation.  
The compensation considers the DC standard time, the send offset and the sync0 offset of the fieldbus.
- 5.2.20 Bug 956615: Kinematics movement - error in job preparation**
- Description**  
Internal IVAJ preparation error. Handling of negative speeds during forward calculation.
- 5.3 Notes on use and known restrictions**
- 5.3.1 Bug 950703: Silent running in case of unbuffered PosAbs/PosRel/PosAdd**
- Description**  
If an unbuffered PosAbs/PosRel/PosAdd is commanded and the new command interrupts another (slow) movement, the new movement to the target point is sporadically executed at low speed.
- 5.3.2 Bug 963636: System exception when an encoder axis is created**
- Description**  
If an encoder axis is configured or a project with an encoder axis is loaded, a system exception occurs after a few seconds.

## 6 Version 3.2.0

### 6.1 New functions

#### 6.1.1 Feature 321386: Programmable limit switch (PLS) function

##### Description

Programmable cams (MB\_DigitalCamSwitch) have been added to the CXA\_PLCOpen library. This function block can switch discrete outputs on or off based on the position of a master axis (linear and rotating). This function block can be used with/without a high-speed IO.

#### 6.1.2 Feature 605751: SDK Base - MExA joint transformation

##### Description

The MExA joint transformation is part of the SDK basis. It enables the user to convert a position from the MCS (machine coordinate system) to the position values of the ACS (axis coordinate system). The user can implement a user-defined conversion between these coordinate systems. An example provided as part of the SDK Base shows how a user can implement their conversion.

#### 6.1.3 Feature 630333: Expression in high-level language programmed in NC block

##### Description

An expression in high-level language can be programmed with an NC block, whereby the parts of the expression are enclosed in square brackets ("[" and "]"). This allows a parameterizable value to be assigned to the NC functions and parameters of NC functions.

```
N10 YPos = DL.plc.app.Application.sym.PLC_PRG.TargetPos
N20 G1 Y[YPos]
N30 XPOS = 10
N40 X[XPOS*2 + 30]
```

#### 6.1.4 Feature 662682: Access to a FlexProfile configuration via the PLC function blocks MB\_ReadFlexProfile and MB\_WriteFlexProfile

##### Description

The function blocks MB\_ReadFlexProfile and MB\_WriteFlexProfile have been added to the PLC library CXA\_PLCOpen. By using these function blocks, the user can read or modify the FlexProfile configuration in the PLC application. Reading and writing of the parameter is asynchronous.

#### 6.1.5 Feature 681541: 2D orientation interpolation

##### Description

When working with 2D orientation transformations, the shortest path between two orientations can be achieved by rotating the Z-axis of the tool by a vector that is perpendicular to both the start position and the target position.

If this interpolation is performed with SLERP on quaternions, this may not be the case for many situations. The implementation was therefore adjusted to achieve the expected behavior.

### 6.1.6 Feature 688793: Drive-based touch probe for CoE standard

#### Description

The drive-based probe supports CoE drive with standard signals defined in CIA402: positive/negative edge and positive/negative edge counter.

### 6.1.7 Feature 689040: Encoder position via ctrlX Drive

#### Description

Encoder axes are used to detect an additional encoder that is connected to the ctrlX drive axis and provides position information within the system. An encoder axis serves as a master axis for synchronized motions, but cannot be controlled directly. Regardless of whether an encoder axis is designated as a virtual or real axis, its position data originates from the connected encoder profile.

The encoder profile serves as the axis profile type interfaces as well as the structure are identical for real and virtual axes. The encoder axis supplies the current position and speed data in the unit configured by the customer.

### 6.1.8 Feature 758164: Detecting the input angle of a cam

#### Description

The control-based probe is extended to measure the entry angle of an active FlexProfile or CamIn command.

### 6.1.9 Feature 773302: Changes to the velocity limit value of dynamic synchronization

#### Description

The behaviour of the dynamic synchronization velocity limit for synchronized motion has been changed. In particular, the restriction that negative velocity = - positive velocity has been removed. This facilitates to configure different values for positive and negative velocities. The positive velocity represents the upper velocity limit that the slave can reach during dynamic synchronization, while the negative velocity limit represents the lower velocity limit that the slave can reach additively during dynamic synchronization. Setting suitable velocity limits can therefore also be used to avoid directional changes during synchronization.

### 6.1.10 Feature 776964: Sequence control with IF/While/For/GoTo statement

#### Description

The high-level language syntax of the sequential control was extended in the G-Code interpreter.

Available statement:

- IF <expression> THEN block {ELSE block} ENDIF
- WHILE <expression> DO block ENDWHILE
- FOR <CountingVar>=<InitialValue> [STEP <Step Width>] TO <EndValue> block ENDFOR
- GOTO Label

In the current version, the block can use the GOTO command to jump to a specific label in the current program, but not to a line number.

### 6.1.11 Feature 853800: Check function whether the Motion kernel is still processing commands

#### Description

A new function "isObjectIdle" has been implemented, which can be used to determine whether an axis or kinematics is currently still processing commands or not. This function is available in the Motion Celix interface, in the PLC, in the Data Layer and in the Python script.

## 6.2 Resolved defects and modifications

### 6.2.1 Bug 818296: Probe command can only be created in STANDSTILL state

#### Description

The probe command could only be created when the axis was in state STANDSTILL. The command was not accepted in the application.

### 6.2.2 Bug 864784: Renaming the function from G152 to G154

#### Description

The function G152 was renamed to G154 in GCO-V-0206. In GCO-V0302, function G154 is used to select the PCS table.

### 6.2.3 Bug 868445: Encoder axis: Configuration for gearbox input revolutions and gearbox output revolutions is interpreted the wrong way round

#### Description

When using the "Encoder Axis" drive type, the configuration for gearbox input revolutions and gearbox output revolutions was interpreted the wrong way round.

#### Bugfix

Please note that the correction of the incorrect value calculation is a necessary incompatible change.

### 6.2.4 Bug 869271: Value NAN for the Y-coordinate if moveDirectAbs was commanded for a delta XZ transformation

#### Description

The Y-coordinate is no longer used for a delta XZ transformation and is set to NAN.

### 6.2.5 Bug 870259: Axis/kinematics with invalid name can be created via a C++ interface

#### Description

It was possible to create an axis or kinematics with an invalid name via the C++ interface.

Permitted names:

- Max. 16 characters
- Starts with characters
- May contain characters + number + underscore

Please note that the number of permitted characters may be lower if you use UTF8 special characters (e.g. Chinese).

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