

Dagens webinar

# Motion Control

## Teknologiobjekter og applikationseksempler



SIEMENS



# Dagens værter



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# Agenda

**What is a Technology Object (TO)**

**Different Technology Object types**

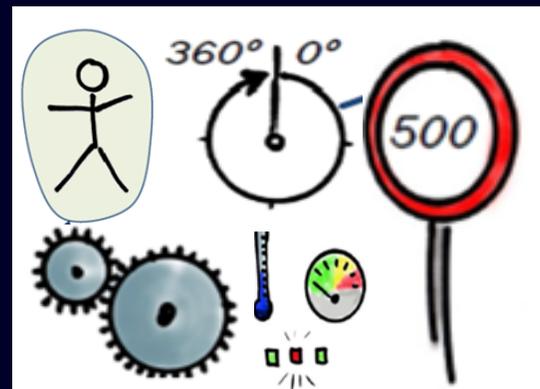
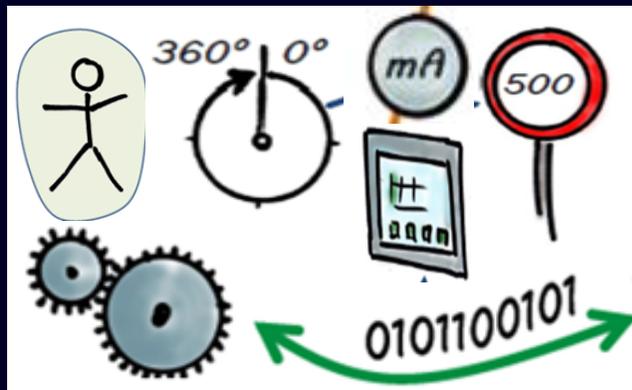
**Technology Object in TIA Portal**

**Application examples**

# Why Technology Objects ?

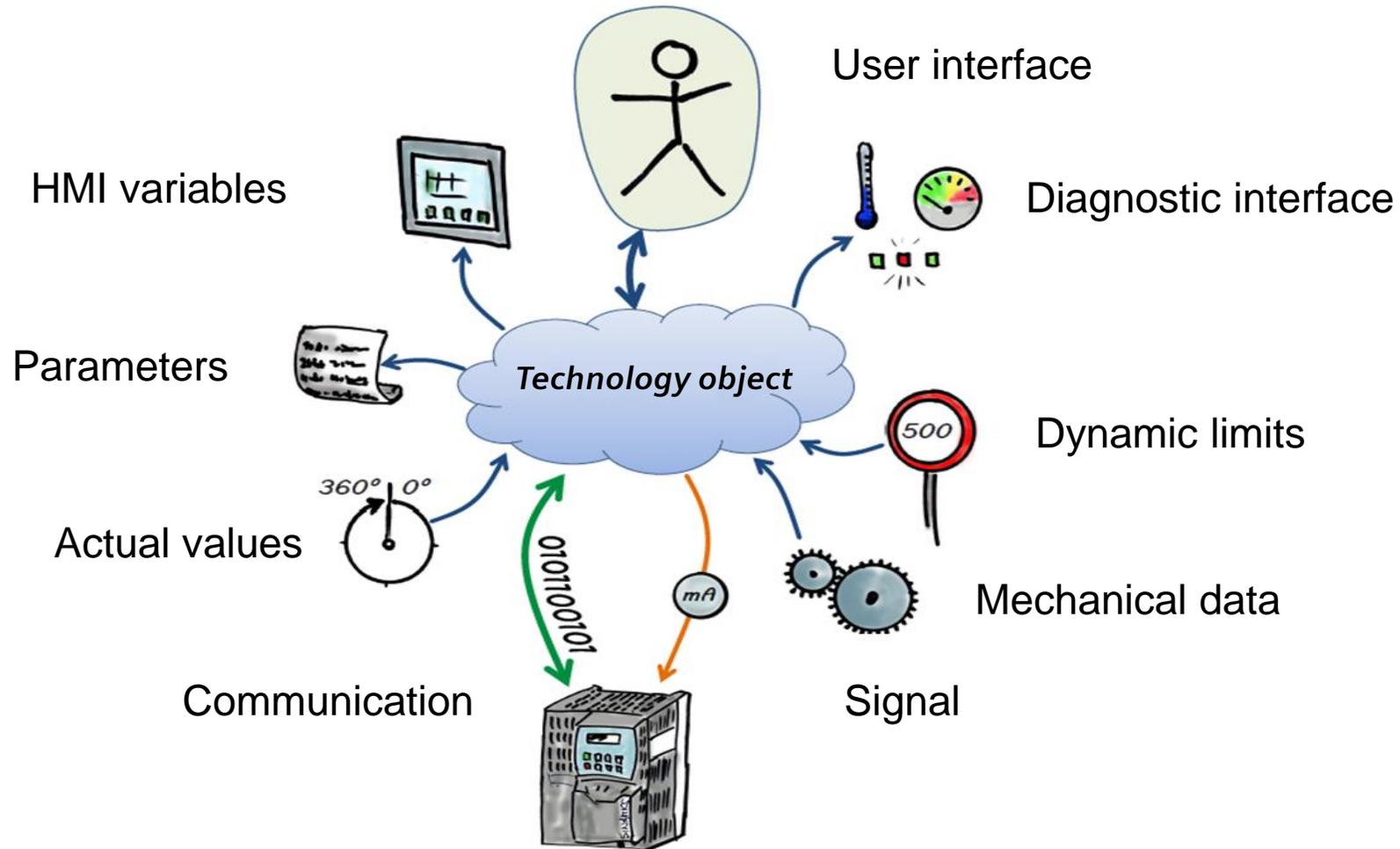
- **Increasing complexity**
- **Short time to market**
- **Standardization**
- **Complete system integration**
- **Co-working, support and maintenance**

# Classic Motion Control task



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# SIMATIC S7-1500- Technology Objects



# Technology Objects - Configuration

The screenshot displays the SIMATIC Manager interface for configuring a technology object. The left pane shows the project tree with the following structure:

- TechObject02
  - Devices & networks
    - PLC\_1 [CPU 1510SP-1 PN]
      - Technology objects
        - PositioningAxis\_1 [DB1]

The right pane shows the configuration for **PositioningAxis\_1** under the **Basic parameters** tab. The configuration includes:

- Name:** PositioningAxis\_1
- Hardware interface:** Drive, Encoder, Data exchange with the drive, Data exchange with encoder, Leading value settings.
- Extended parameters:** Mechanics, Dynamic default values, Emergency stop.
- Limits:** Position limits, Dynamic limits, Torque limits, Fixed stop detection.
- Homing:** Active homing, Passive homing.
- Position monitoring:** Position monitoring, Following error, Standstill signal.
- Control loop:** Control loop.

The **Axis type** section shows the **Linear** radio button selected, with a 3D model of a linear axis below it.

The **Units of measure** section includes the following settings:

- Use position values with higher resolution
- Unit of measure for position: mm
- Unit of measure for velocity: mm/s
- Unit of measure for torque: Nm
- Unit of measure for force: N

The **Modulo** section includes the following settings:

- Enable modulo
- Modulo start value: 0.0 mm
- Modulo length: 1000.0 mm

The Siemens logo is visible in the bottom right corner.

# Technology Objects - Configuration

The screenshot displays the Siemens SIMATIC Manager configuration environment for a technology object. The interface is divided into three main sections:

- Project tree (Left):** Shows the project hierarchy: TechObject02 > PLC\_1 [CPU 1510SP-1 PN] > Technology objects > PositioningAxis\_1 [DB1]. The 'Configuration' sub-object is selected.
- Parameter List (Middle):** Lists various configuration parameters for the 'Hardware interface' and 'Extended parameters' categories. Each parameter has a status indicator (green or blue checkmark).
- Hardware Interface (Right):** Contains two diagrams illustrating the physical connections:
  - Hardware interface diagram:** Shows a PLC connected to a Drive. The Drive is connected to an Encoder, which is in turn connected to a Motor. Data exchange is shown between the PLC and Drive, and Encoder data is shown between the Drive and Encoder.
  - Encoder diagram:** Shows a similar setup but with a focus on the Encoder and Motor connection.

Below the diagrams, there are configuration options:

- Drive type: PROFIdrive
- Data connection: Drive
- Drive: Drive unit\_1.Drive\_control\_SIE...

Buttons for 'Device configuration' and 'Drive configuration' are also visible.

# Technology Objects - Configuration

The screenshot displays the Siemens SIMATIC Manager interface for configuring a technology object. The project tree on the left shows the hierarchy: TechObject02 > PLC\_1 [CPU 1510SP-1 PN] > Technology objects > PositioningAxis\_1 [DB1]. The central configuration pane is titled 'Mechanics' and contains the following sections:

- Basic parameters**
- Hardware interface**
- Encoder**
- Data exchange with the drive**
- Data exchange with encoder**
- Leading value settings**
- Extended parameters**
- Mechanics** (highlighted)
- Dynamic default values**
- Emergency stop**
- Limits**
- Homing**
- Position monitoring**
- Control loop**

The 3D model shows a motor with a blue 'JUL' label connected to a lead screw mechanism. The configuration parameters are as follows:

- Encoder**
  - Encoder mounting type: On motor shaft
  - Invert encoder direction
- Drive mechanism**
  - Invert rotation direction of drive
- Load gear**
  - Number of motor revolutions: 1
  - Number of load revolutions: 1
- Position parameters**
  - Leadscrew pitch: 10.0 mm/rot

# Technology Objects - Configuration

Project tree: TechObject02 > PLC\_1 [CPU 1510SP-1 PN] > Technology objects > PositioningAxis\_1 [DB1]

Navigation pane: Basic parameters, Hardware interface, Encoder, Data exchange with the drive, Data exchange with encoder, Leading value settings, Extended parameters, Mechanics, **Dynamic default values**, Emergency stop, Limits, Position limits, Dynamic limits, Torque limits, Fixed stop detection, Homing, Active homing, Passive homing, Position monitoring, Position monitoring, Following error, Standstill signal, Control loop

Dynamic default values

The default values take effect if values < 0 are used for the parameters "Velocity", "Acceleration", "Deceleration" or "Jerk" at the motion control instructions.

Velocity: 100.0 mm/s

Acceleration: 2000.0 mm/s<sup>2</sup>

Deceleration: 2000.0 mm/s<sup>2</sup>

Ramp-up time: 0.05 s

Ramp-down time: 0.05 s

Smoothing time (t<sub>j</sub>): 0.05 s

Jerk: 40000.0 mm/s<sup>3</sup>

The specified ramp-up time and ramp-down time apply without jerk limit. The ramp-up time and the ramp-down time are increased by the smoothing time when jerk limit is activated (jerk > "0").

# Technology Objects - Configuration

The screenshot displays the configuration interface for a PositioningAxis\_1 [DB1] object in a Siemens SIMATIC Manager project. The project tree on the left shows the hierarchy: TechObject02 > PLC\_1 [CPU 1510SP-1 PN] > Technology objects > PositioningAxis\_1 [DB1]. The central pane shows the 'Limits' configuration section expanded, with sub-sections for Position limits, Dynamic limits, Torque limits, Fixed stop detection, Homing, Position monitoring, Following error, Standstill signal, and Control loop. The main configuration area on the right is divided into two sections:

- Hardware and software limit switches:** This section includes checkboxes for 'Enable HW limit switches' and 'Enable SW limit switches'. It features input fields for 'Input negative HW limit switch' and 'Input positive HW limit switch', both set to '<Select tag>'. Below these are dropdown menus for 'Level selection negative HW limit switch' and 'Level selection positive HW limit switch', both set to 'High level'. A diagram shows a horizontal axis with a red dot on the left and a blue dot on the right, representing the hardware limit switches. Below this are input fields for 'Position of negative SW limit switch' (set to  $-1.0e+12$  mm) and 'Position of positive SW limit switch' (set to  $1.0e+12$  mm).
- Dynamic limits:** This section includes a text description: 'A change in the velocity limit affects acceleration and deceleration; the ramp-up time and ramp-down time stays the same.' Below this is a graph titled 'Velocity' showing a trapezoidal velocity profile. The 'Maximum velocity' is set to  $500.0$  mm/s.

# Technology Objects - Configuration

Project tree: TechObject02 > PLC\_1 [CPU 1510SP-1 PN] > Technology objects > PositioningAxis\_1 [DB1]

Navigation pane: Homing > Active homing

Select the homing mode:

- Use zero mark via PROFIdrive telegram
- Use reference cam and zero mark via PROFIdrive telegram
- Use homing mark via digital input

Digital input homing markcam: <Select tag>

Level selection: High level

Enable direction reversal at HW limit switch

Homing direction:

- Positive
- Negative

Approach velocity: 100.0 mm/s

Homing velocity: 25.0 mm/s

Velocity vs. Position graph showing homing direction.

# Technology Objects - Commissioning

The screenshot displays the SIMATIC Manager interface for commissioning a technology object. The left pane shows the project tree with the following structure:

- TechObject02
  - Devices & networks
    - PLC\_1 [CPU 1510SP-1 PN]
      - Technology objects
        - PositioningAxis\_1 [DB1]

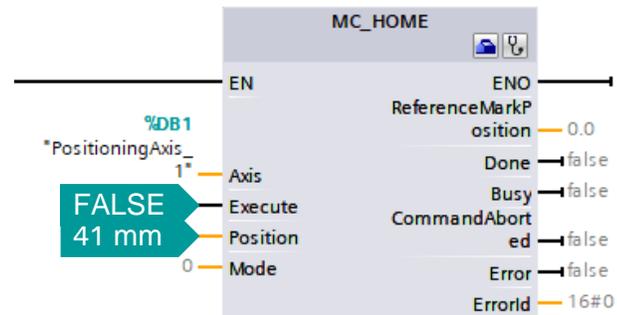
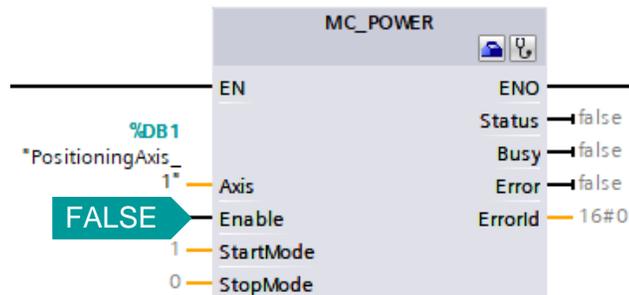
The main window shows the 'Axis control panel' for 'PositioningAxis\_1 [DB1]' in 'Tuning' mode. The interface includes the following sections:

- Master control:** Activate, Deactivate, Enable, Disable buttons.
- Axis:** Enable, Disable buttons.
- Operating mode:** Positioning absolute (dropdown menu).
- Control:** Position: 1000.0 mm, Velocity: 250.0 mm/s, Acceleration: 1000.0 mm/s<sup>2</sup>, Deceleration: 1000.0 mm/s<sup>2</sup>, Jerk: 200000.0 mm/s<sup>3</sup>. Includes Start and Stop buttons.
- Axis status:** Drive ready (checked), Error (unchecked), Enabled (checked), Homed (unchecked). Includes a 'More' link and an 'Active errors' field with a 'Confirm' button.
- Current values:** Position: 297.543 mm, Velocity: 0.0 mm/s.
- Alarm display:** Alarm display button.



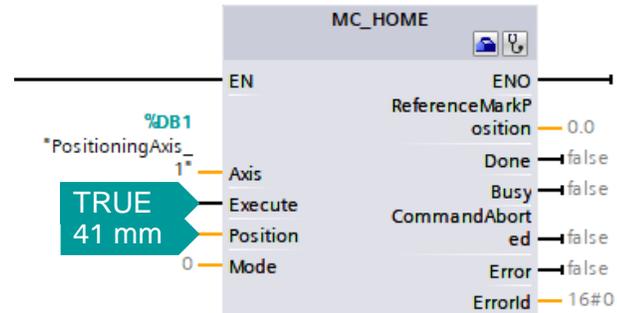
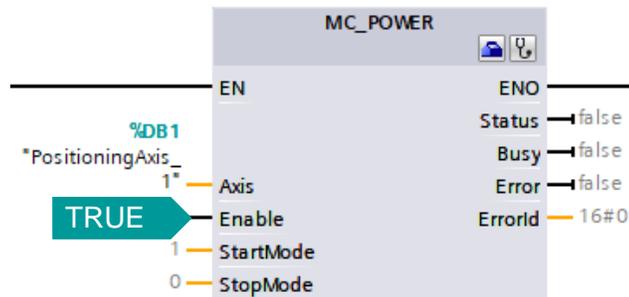
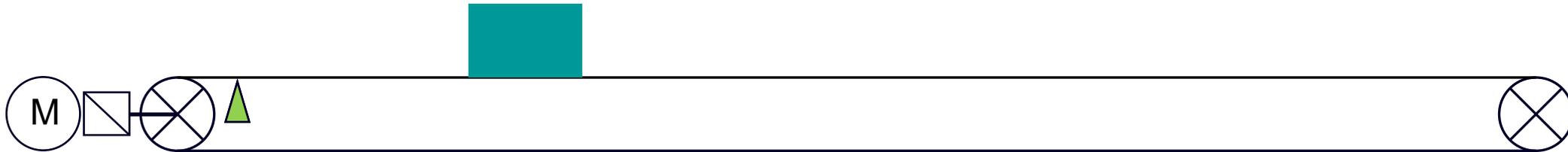
# TO Positioning + MC Home

● Home position unknown



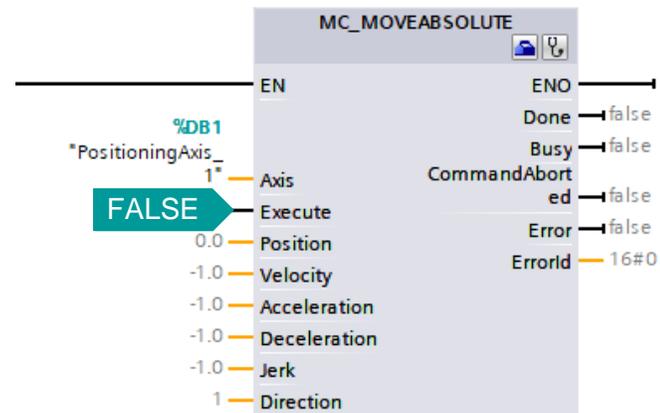
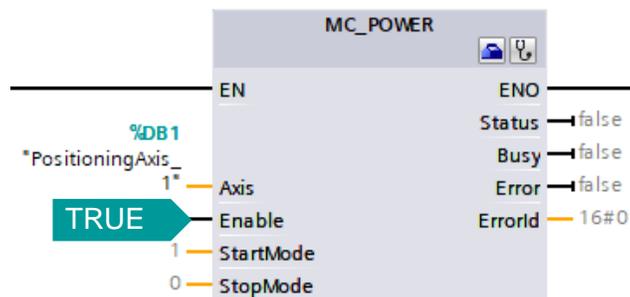
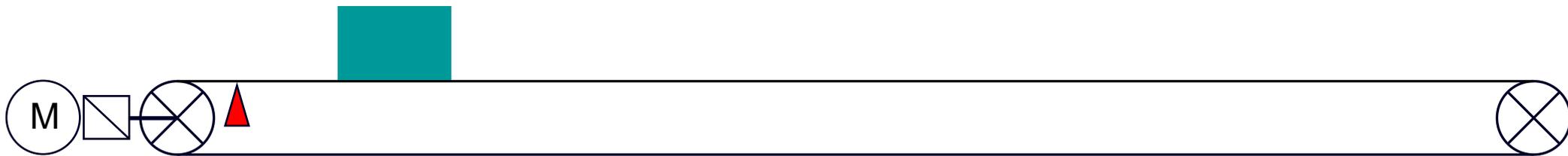
# TO Positioning + MC Home

● Home position known



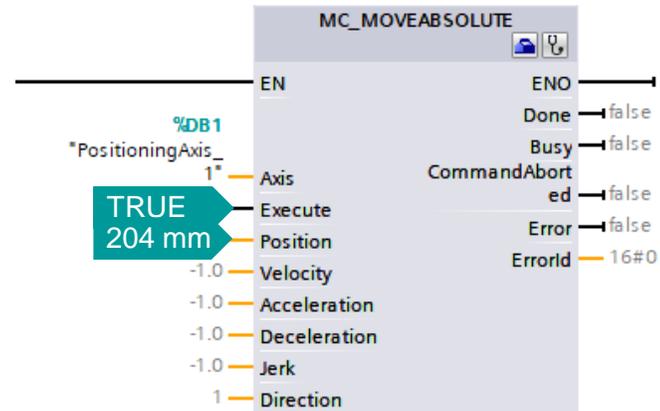
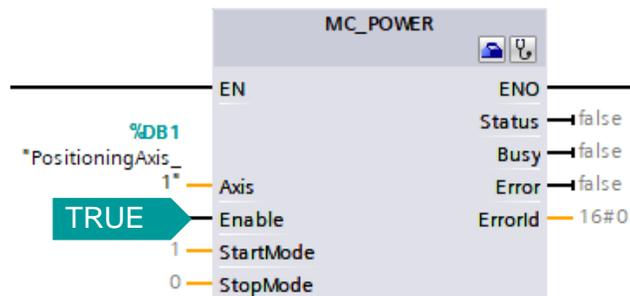
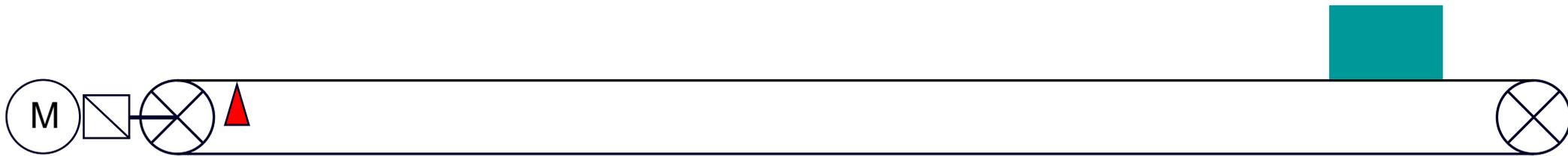
# TO Positioning + MC Move Absolute

● Home position known



# TO Positioning + MC Move Absolute

● Home position known



# SIMATIC S7-1500- Technology Object types

## Synchronized axis

### Positioning axis

### Speed-controlled axis

#### Moving with speed control

User program

- Velocity setpoint

TO generates the acceleration and braking ramps

The drive controls the speed  
→ Position encoder is not required

#### Positioning

User program

- Position setpoint
- Homing
- Superimposed motion

TO generates the acceleration and braking ramps

TO controls the position

The drive controls the speed  
→ Position encoder is required

#### Gearing and camming

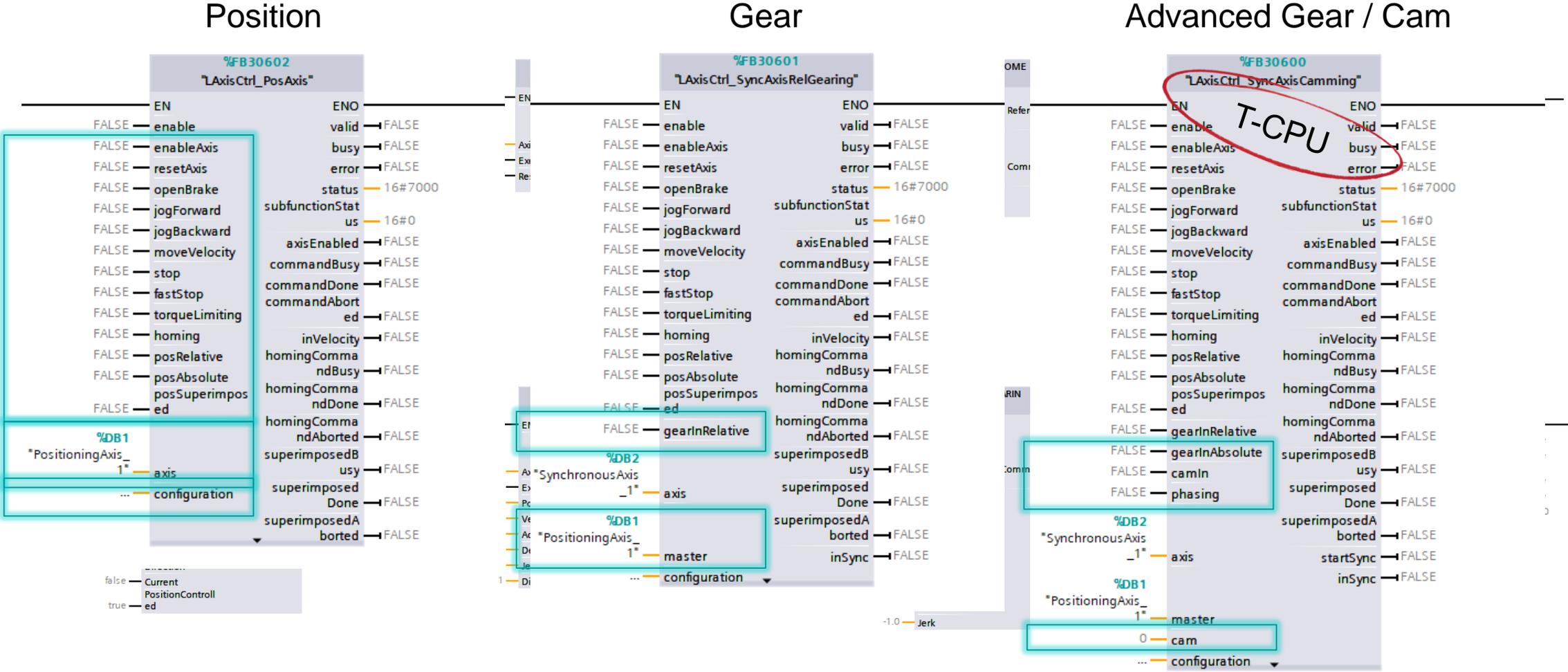
User program

- Synchronization
  - Leading value
  - Gear ratio
  - Cam

TO calculates and controls the position for the synchronized axis depending on a leading value

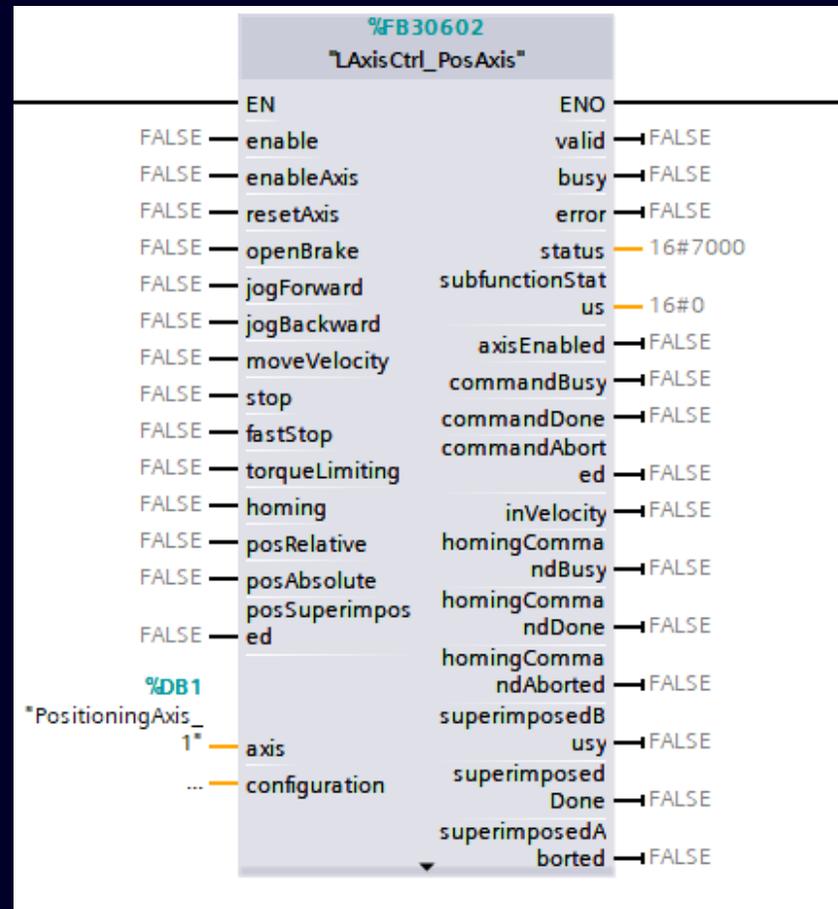
The drive controls the speed  
→ Position encoder is required

# PLC open with LAxisCtrl



# Transforming "The best code in the world" to Standardized and reusable code

1010011001  
 10011 32788 001  
 65536  
 1001101  
 346/543 001 01110  
 FF0F 16384  
 65536 F0FF  
 0010101 1  
 01110101



# LAxisCtrl...

- **Performing an angular synchronizem at the right position...**
- **Without using a T-CPU but handled by a 1510 CPU**
- **Function testing by using Trace**
- **Additional features of the Trace functionality**

# SIOS: Motion Control overview and links

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Intranet | Register | Log in

Industry Online Support  
Product Support

Industry Online Support International | Language | Contact | Help | Support Request | Site Explorer | Search in Online Support

Home | Product Support

Entry ID: 109751049, Entry date: 12/18/2019

★★★★★ (17)  
> Rate

## SIMATIC Technology - Motion Control: Overview and Important Links

This topic page gives you an overview of the essential documents, entries and links on the topic of Motion Control. The topic Motion Control contains every control task to the operation of drives and capturing position values with the help of position sensors.

The tasks treated here reaches from steering for individual axes up to the method of several coordinate axes.

The motion instructions are based on the international PLCopen standard, thereby providing users a flexible means of programming their motion application without special knowledge. Applications can be programmed in all standard programming languages of IEC 61131.

Motion Control | > Signalprocessing/output | > PID Control

Product Support | Services | Forum | mySupport

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### mySupport Cockpit

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### Product information

- Presales info
- Catalog and ordering system online
- Technical info
- Support
- Service offer
- Training
- Contact & partners

### Topic pages for this entry

- > TIA Portal - An Overview of the Most Important Documents and Links - Motion

Link for:

- Manuals
- FAQ
- Application examples
- Firmware

[SIOS: 109751049](#)

# Applications examples in SIOS

The screenshot shows the Siemens Industry Online Support (SIOS) website interface. At the top, there is a navigation bar with the Siemens logo, 'Industry Online Support Product Support', and links for 'Internet', 'Register', and 'Log in'. Below this is a secondary navigation bar with 'Industry Online Support Denmark', 'Contact', 'Help', 'Support Request', 'Site Explorer', and a search bar labeled 'Search in Online Support'. The main content area is titled 'Filter criteria for entries' and includes radio buttons for 'All Products' and 'My Products', a 'Product tree' dropdown, and a search input field containing 'motioncontrol\_apc\_applications'. A dropdown menu for 'Entry type' is open, showing 'Application example (286)' and 'Example type' with 'All' selected. Below the filters, there is a list of 286 entries. The first entry is 'Application example SIMATIC - Failsafe library LDrvSafe to control the Safety Integrated functions of the SINAMICS drive family', dated 12/17/2020, with ID 109485794 and 5 stars. The second entry is 'Application example SINAMICS S/G/V: Simple acyclic Funktionen Blocks for Controlling a SINAMICS in TIA Portal', dated 11/12/2020, with ID 109760317 and 4 stars. The third entry is 'Application example SIMATIC Winder and Tension Control', dated 03/15/2021, with ID 58585043 and 5 stars. The fourth entry is 'Application example SIMATIC S7-1500 / S7-1500T: Standard application axis control', dated 05/20/2020, with ID 109749348 and 5 stars. On the right side of the page, there is a 'mySupport Cockpit' section with links for 'Favorites', 'My requests', 'CAX downloads', and 'My Products / Clipboard'. Below that is a 'Product information' section with links for 'Presales info', 'Catalog and ordering system online', 'Technical info', 'Support', 'Service offer', 'Training', and 'Contact & partners'.

## SIOS – Product Support – Application example

Keyword:  
motioncontrol\_apc\_applications

# Kontakt



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