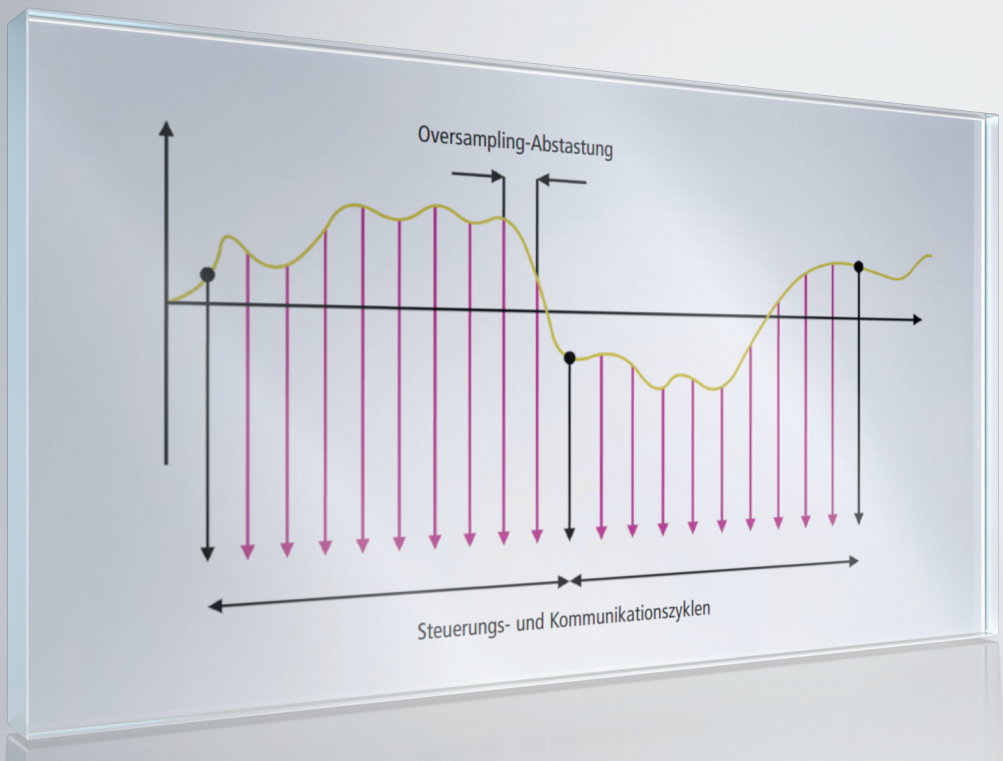
BECKHOFF New Automation Technology

Information Oversampling | EN

AX8000

Multi axis servo system



6/2/2021 | Version 1.1

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The contents of this documentation apply to the AX8000 multi-axis servo system. The chapters contain information on the use of the oversampling function and how to parameterize it via CoE objects.

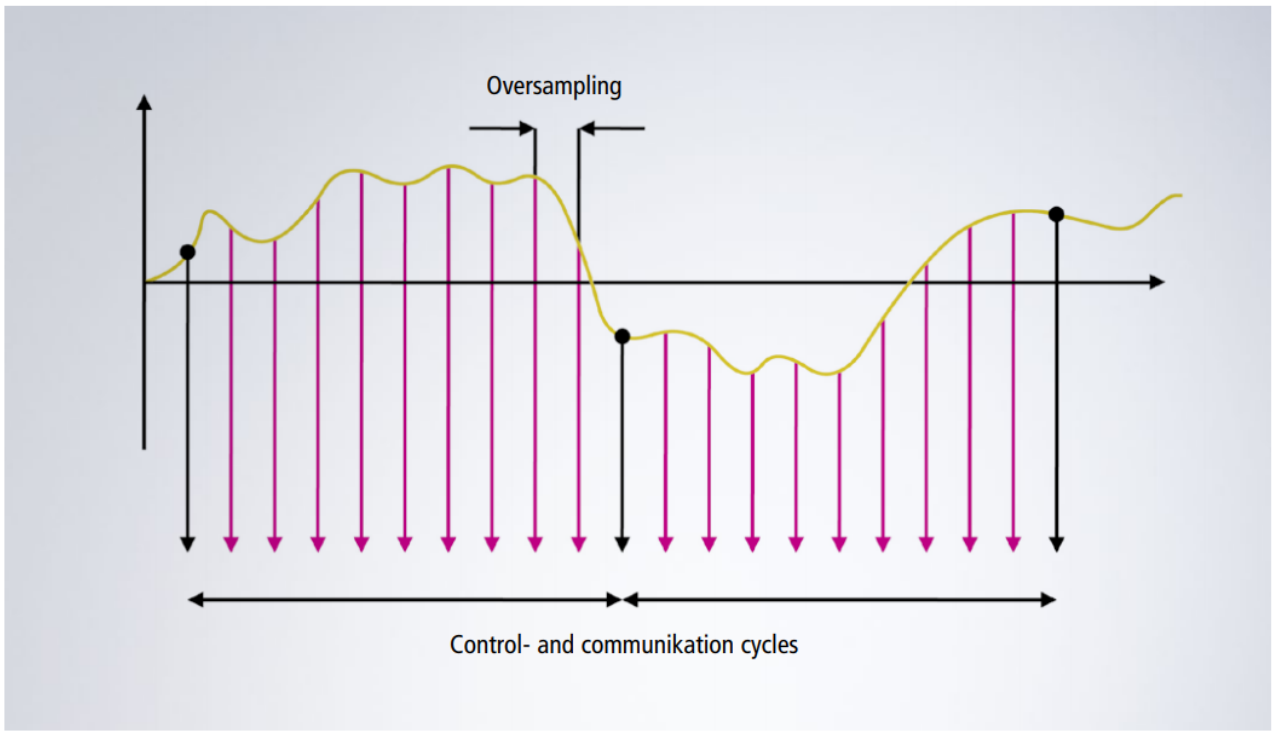
Function

Process data are usually transferred exactly once per communication cycle. Conversely, the temporal resolution of a process data directly depends on the communication cycle time. Higher temporal resolution is only possible through a reduction in cycle time - with associated practical limits.

Oversampling enables the multiple sampling of a process data within a communication cycle and the subsequent (inputs) or previous (outputs) transfer of all data in an array. The oversampling factor describes the number of samples within a communication cycle and is therefore a multiple of one.

Triggering of the sampling within the I/O components is controlled by the local clock (or the global system time), which enables associated temporal relationships between distributed signals across the whole network.

System prerequisites for the function
You have the possibility to use the oversampling on axis modules from the AX8xxx series from the firmware version v1.03. The function can be used on the device and on the channel.



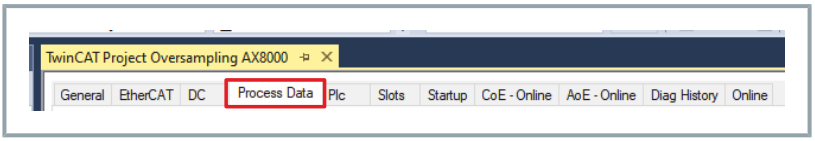
Configuration

You have the possibility to configure the content of a PDO variables multiple times in order to use the oversampling.

A general explanation of PDOs and the Process Data tab can be found here.

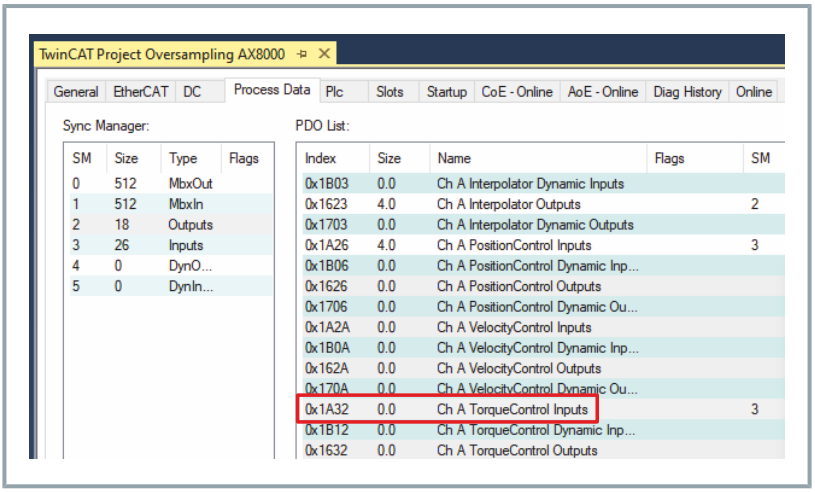
Proceed as follows to use the oversampling:

► Select the desired axis module in the I/O tree



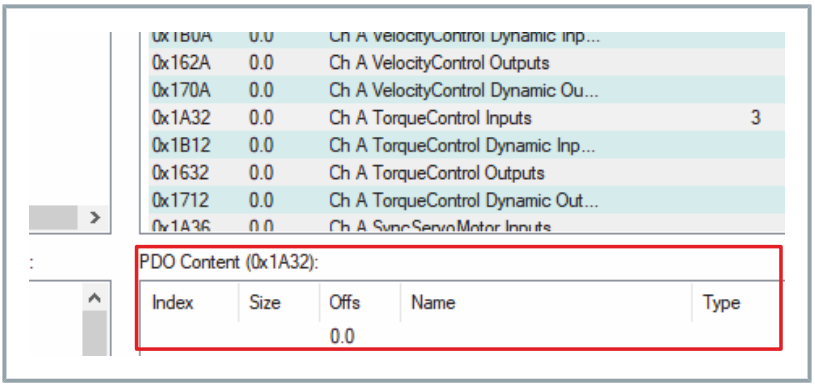
► Left-click "Process Data"

The dialog box "Process Data" opens



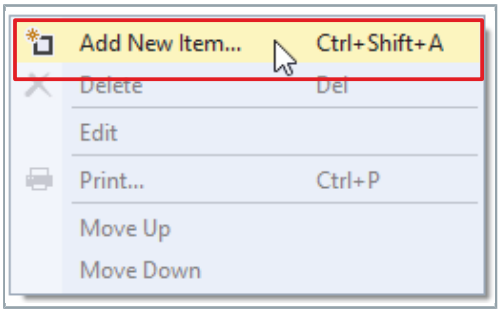
► Select "0x1A32 ChA Torque Control Inputs"

The currently configured PDOs can be found in the dialog box "PDO Content" below the "PDO List". These are part of the previously selected PDO.



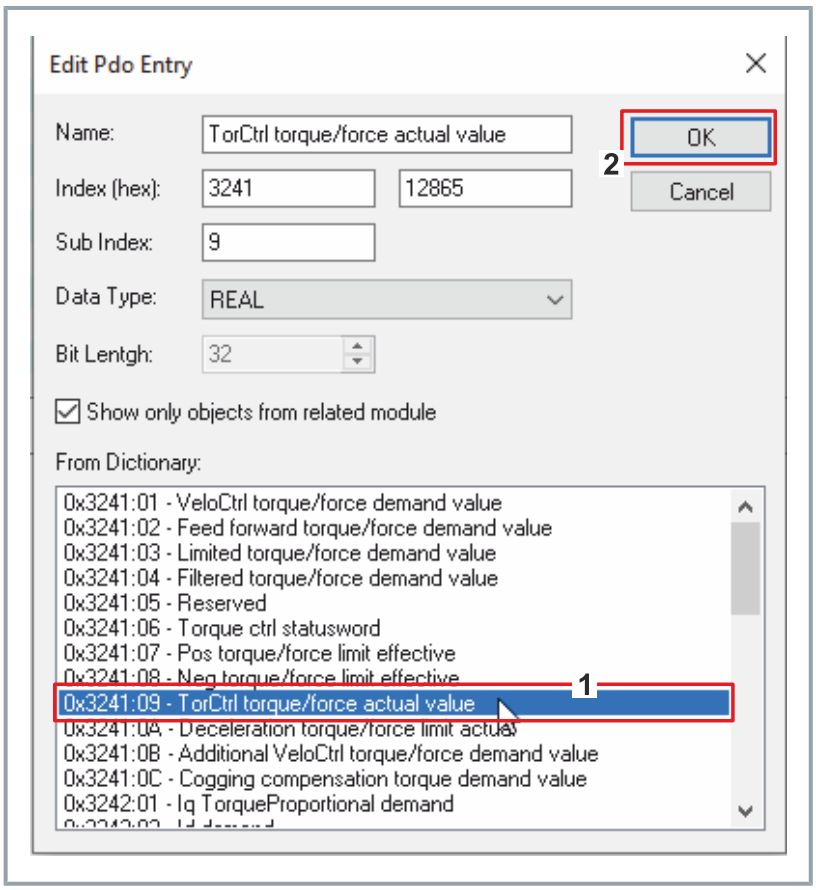
► Right-click "PDO Content"

A new dialog box opens.



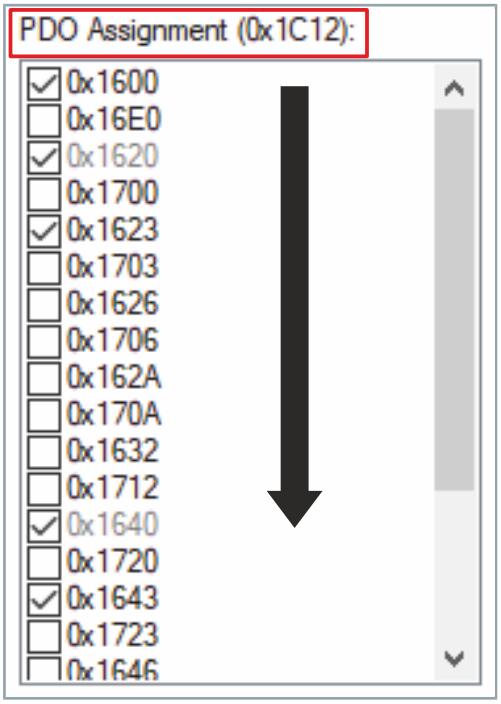
► Left-click "Add New Item"

A new dialog box "Edit PDO Entry" opens



► Select "0x3241:09 TorCtrl Torque/Force actual value" [1]

► Confirm with "OK" [2]



► In the "PDO Assignment", check whether the checkbox for the PDO "0x1A32" is active

If the checkbox is not active, the PDOs in the process image are not ready:

► activate the TwinCAT configuration in order to accept changes

Repeat the above actions in order to add further PDOs to the process image. The oversampling is now active for all PDOs that exist multiple times in the process image.

If you list a variable twice in order to use oversampling than these variables need to be configured directly one after another. It´s not allowed to have another variable in between. Same applies when doing oversampling with a higher oversampling factor.

Oversampling factor

Oversampling enables the multiple sampling of a process data within a communication cycle. The oversampling factor describes the number of samples within a communication cycle and is therefore a multiple of one.

The AX8000 has an internal cycle time of 62.5 µs. A process data can´t be updated faster than that.

Maximum oversampling

The highest oversampling factor results from:

- Cycle time of the AX8000
- Cycle time of the task to be synchronized; e.g. the NC task SAF

Calculation
max_over_factor = cycle time of sync task / cycle time AX8000
= cycle time of sync task / 62.5 µs

Possible values of the oversampling factor

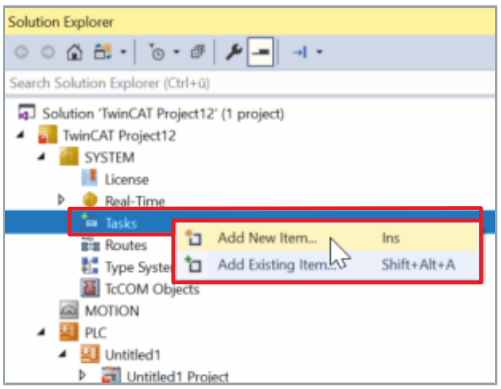
If the oversampling is to be implemented with less than the maximum oversampling factor, the number of samples cannot be selected arbitrarily. Otherwise, the values would not match the timing of the controller cycle time.

Calculation
possible_over_factor = max_over_factor / 2^n

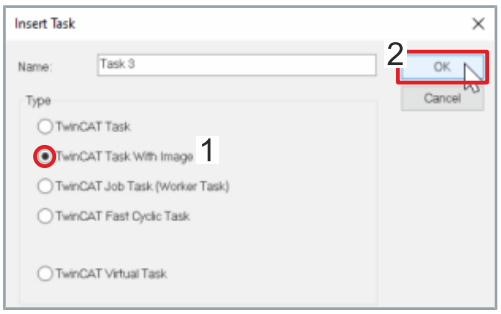
Note that the oversampling function does not work if a PDO is only transferred once per cycle. Select an appropriate value for "n".

Integration

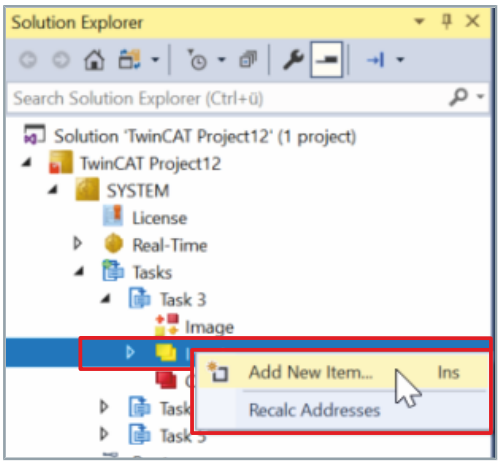
The values transferred by oversampling can be used in the higher-level controller or generated there. An array can be used to group several process data together for this.



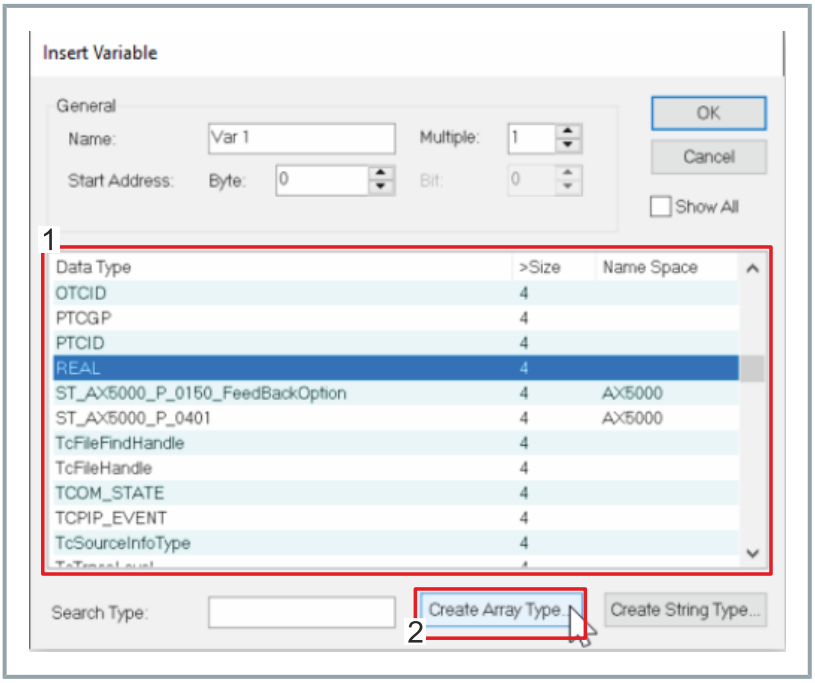
► Right-click "Task"
► Left-click "Add New Item"



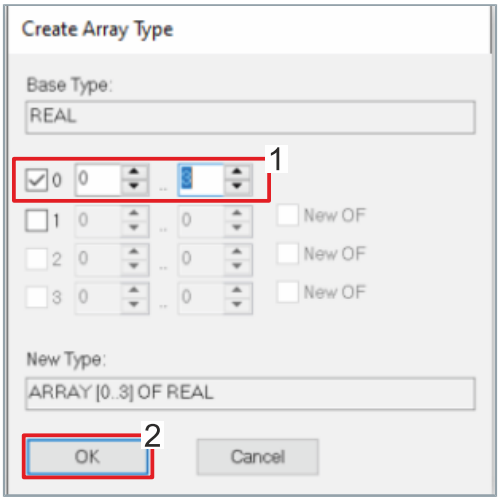
► Select "Task with image" [1], give it a name and confirm with "OK" [2]



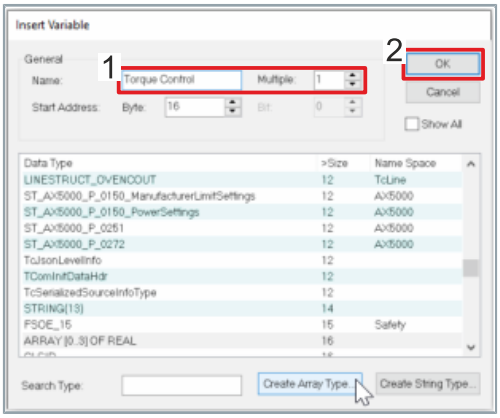
► Right-click "Input"
► Left-click "Add New Item"



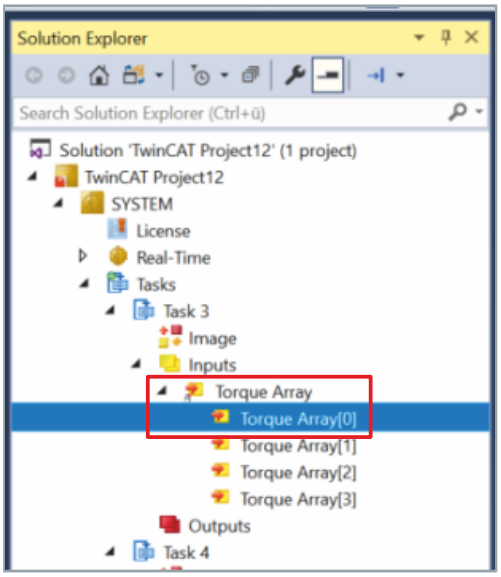
► Select a variable type from the list and click "Create Array Type"



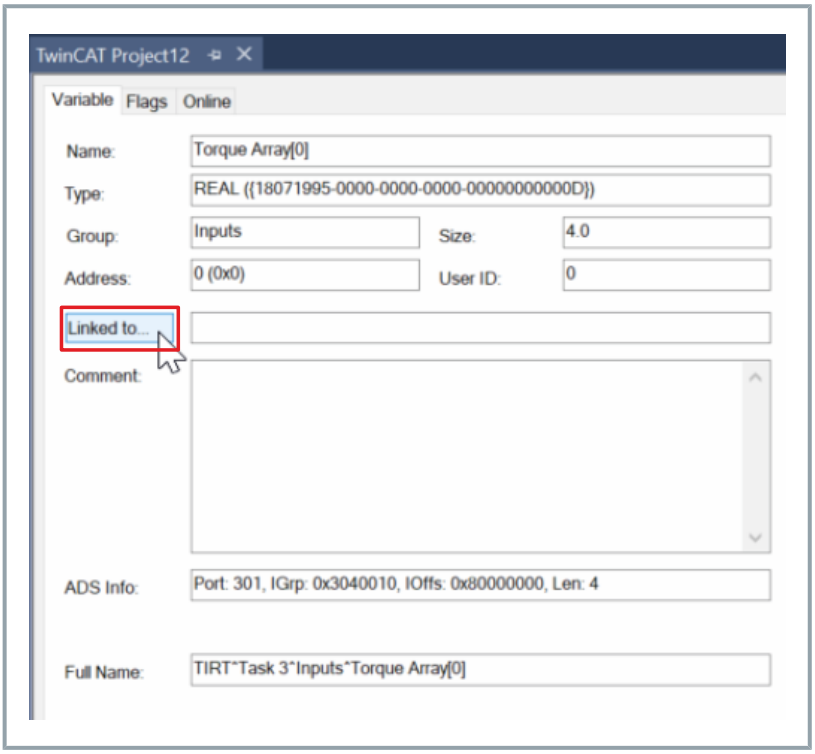
► Define "Array" size [1] and confirm with "OK" [2]



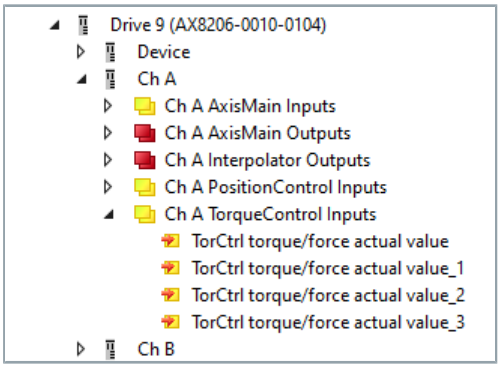
► Select the created "Array Type" and issue a name [1]
► Confirm with "OK" [2]



► In the Solution Explorer, left-click "Array" element



► Left-click "Linked to"



► Select "Sample" and confirm with "OK"

Repeat this step for all "Array" elements.

You can now use the "Array" in a "Scope", for example.

More Information:
www.beckhoff.com/ax8000

Beckhoff Automation GmbH & Co. KG
Hülshorstweg 20
33415 Verl
Germany
Phone: +49 5246 9630
info@beckhoff.com
www.beckhoff.com