LinMot®

EtherCAT®

MC-Link with EtherCAT Interface 4.2

User Manual

This document applies to the following controllers:
B8050-ML-EC

Document version 4.2 / Whp, Mrz 2011

Table of Content

1 System overview

The LinMot Ethernet/IP servo controllers have the following functionalities:

Device Property	Value / Remark
Minimal Ethernet/IP cycle time	2 ms
DHCP -Support	Supported
EDS Support	Not yet supported from AB
IEEE1588 (CIP-Synch)	For 3rd parties not supported from AB
DLR Support (Device Level Ring Protocol)	No

Ethernet/IP is a real time Ethernet protocol based on the standard Ethernet protocols TCP/IP and UDP/IP.

For further information on Ethernet/IP please visit: http://www.odva.org

1.1 References

All User Manuals are distributed with the LinMot-Talk configuration software the newest version could be downloaded from the LinMot homepage in the download section.

Ref	Title	Source
1	User Manual Motion Control SW	www.linmot.com
2	LinMot Servo Controller Configuration over Fieldbus Interfaces SG4	www.linmot.com
3	Usermanual_MC_Link_with_Ethernet_IP_SG5.pdf	www.linmot.com

2 Connecting to the EtherCAT Network

2.1 Pin Assignment of the Connectors X17-X18

The Ethernet/IP connector is a standard RJ45 female connector with a pin assignment as defined by EIA/TIA T568B:

X17 – X18	RealTime Ethernet Connector		
	**Pin**	**Wire color code**	**Assignment 100BASE-TX**
	1	WHT/ORG	Rx+
	2	ORG	Rx-
	3	WHT/GRN	Tx+
	4	BLU	-
	5	WHT/BLU	-
	6	GRN	Tx-
	7	WHT/BRN	-
	8	BRN	-
	case	-	-
RJ-45	Use standard patch cables (twisted pair, S/UTP, AWG26) for wiring. This type of cable is usually referred to as a “Cat5e-Cable”.		

X17 is the EtherCAT input and X18 the EtherCAT Output Connector.

3 Setup in the PLC

In the following the steps the integration of a LinMot EtherCAT servo controller in the PLC is described. In the example a Beckhoff master PLC is used.

3.1 Copy Device Description File

The LinMot servo controller is described with *.xml device description file distributed with the LinMot-Talk software.

Copy this file to PLC so it can access it.

Example Source path of EtherCAT Device description file:

C:\Programme\LinMot\LinMot-Talk 4 Build 20100707\Firmware\Interfaces\EtherCAT_ML\XML\LinMot_BM8050_EC_V2s1.xml

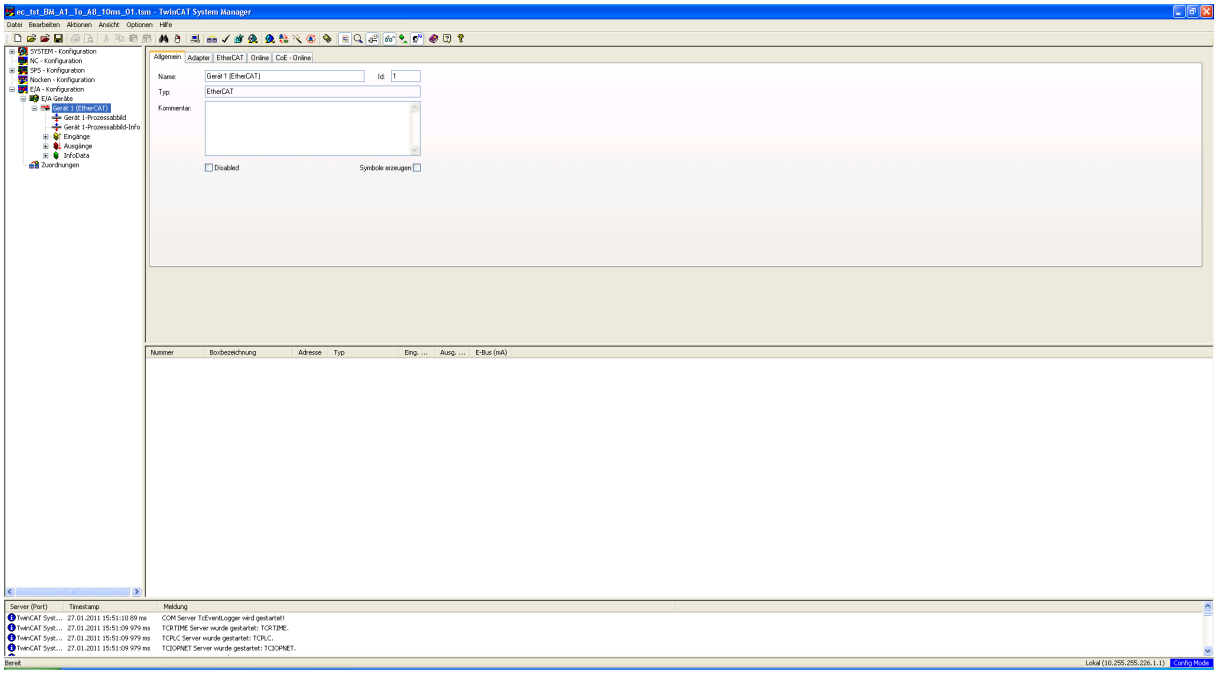
Example Destination path of EtherCAT Device description file:

C:\TwinCAT\Io\EtherCAT\LinMot_BM8050_EC_V2s1.xml

If this is done the PLC should recognize all LinMot Servo controller on the EtherCAT fieldbus automatically.

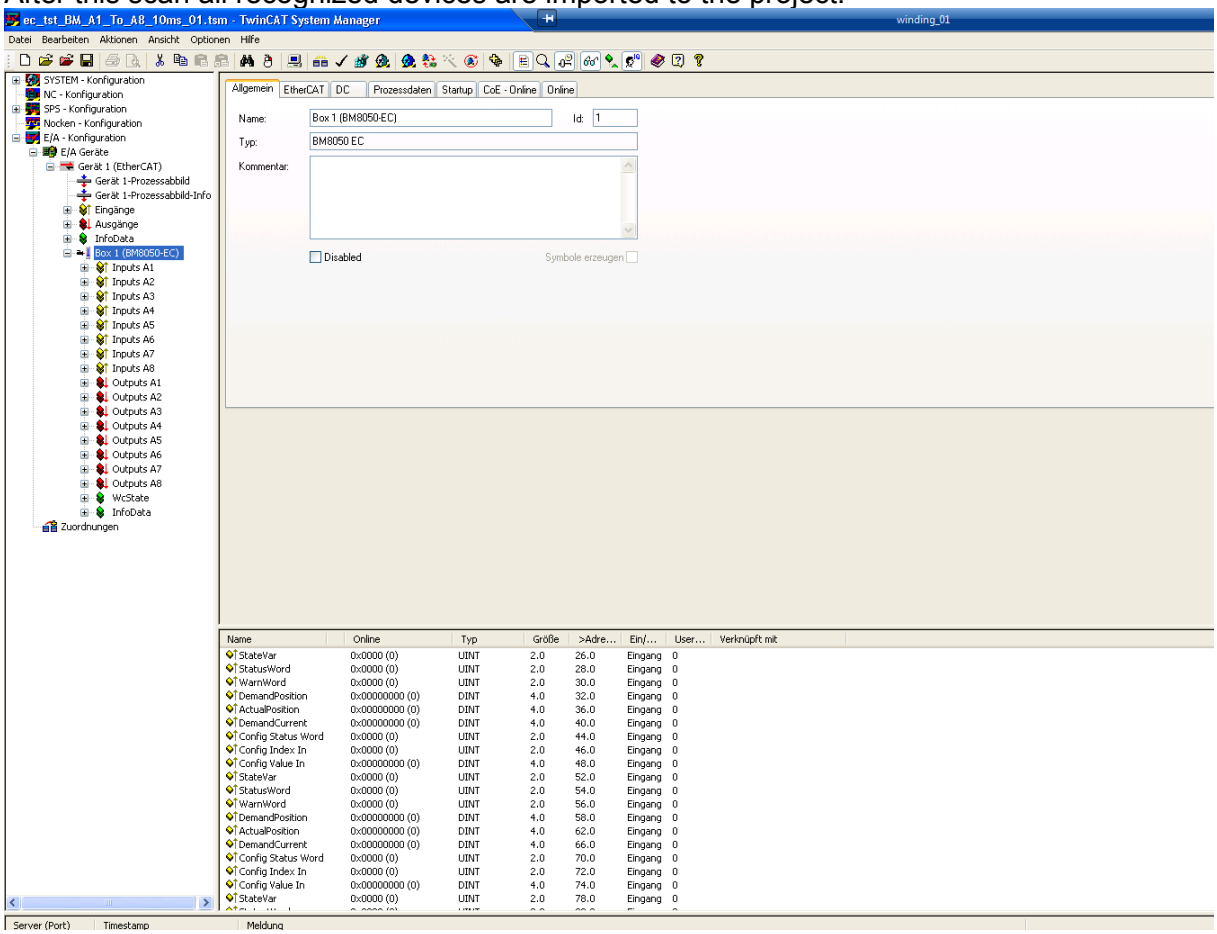
3.2 Scan the EtherCAT slave devices

Connect the EtherCAT LinMot BusModule to the EtherCAT-Master and power on the Signal Supply. Then Scan for the connected devices in the System manager:



Scan for EtherCAT slave devices

After this scan all recognized devices are imported to the project:



In this example the scan found a BM8050-EC bus module and is imported to the project. The Busmodule has IO data for 8 Axis configured by default. If less than 8 Axis are needed some axis could be deleted (see chapter 5).

4 EtherCAT Parameters

4.1 Parameters

The Ethernet/IP interface has an additional parameter tree branch (Parameters → Ethernet/IP Intf), which can be configured with the distributed LinMot-Talk software.
With these parameters, the Ethernet/IP communication parameters can be configured.
The LinMot-Talk software can be downloaded from http://www.linmot.com under the section download, software & manuals.

EtherCAT Dis-/Enable
With the Dis-/Enable parameter the LinMot Bus Module can be run without the Ethernet EtherCAT Interface going online. So in a first step the system can be configured and run without any bus connection.

EtherCAT\ Dis-/Enable	
Disable	Bus Module runs without EtherCAT.
Enable	Bus Module runs with EtherCAT connection.

IMPORTANT: If the ETHERCAT Interface is disabled, the integrated ETHERCAT-ASIC rests in reset state! No messages will be sent to other devices connected to the ETHERCAT-Network via the BM8050-EC Bus Module.

5 Realtime IO Data Mapping

For each axis a container of data is exchanged which allows to control the axis and even to configure it over the exchanged real time data.

5.1 IO Data Mapping of each Axis

With this real time IO configuration, an additional configuration module is mapped into the IO data communication. The functionality of this module is same for the different fieldbus interfaces. For this reason, the functionality is described in documentation [2] “Controller Configuration over Fieldbus”.

5.1.1 Output Data Mapping of one axis

In this real time IO Mapping the 16 bit control word the 16 bit motion command header and motion command parameters are exchanged. The size of this mapping is 32 bytes or **16 words** for each configured axis.

Output Data Mapping of one Axis		
Byte Offset	***Description***	***Size / Type***
00h	MC SW_ControlWord	Uint16 / Bit coded
02h	MC SW_MotionCommandHeader	Uint16 / 12Bit Command 4Bit count nibble
04h	MC SW_MotionCommandPar Bytes 00..03	Uint32 / Command specific
08h	MC SW_MotionCommandPar Bytes 04..07	Uint32 / Command specific
0Ch	MC SW_MotionCommandPar Bytes 08..11	Uint32 / Command specific
10h	MC SW_MotionCommandPar Bytes 12..15	Uint32 / Command specific
14h	MC SW_MotionCommandPar Bytes 16..19	Uint32 / Command specific
18h	Cfg Module Control Word	Uint16
1Ah	Cfg Module Index/..	Uint16
1Ch	Cfg Module Value/..	Uint32/Sint32

5.1.2 Input Data Mapping of one axis

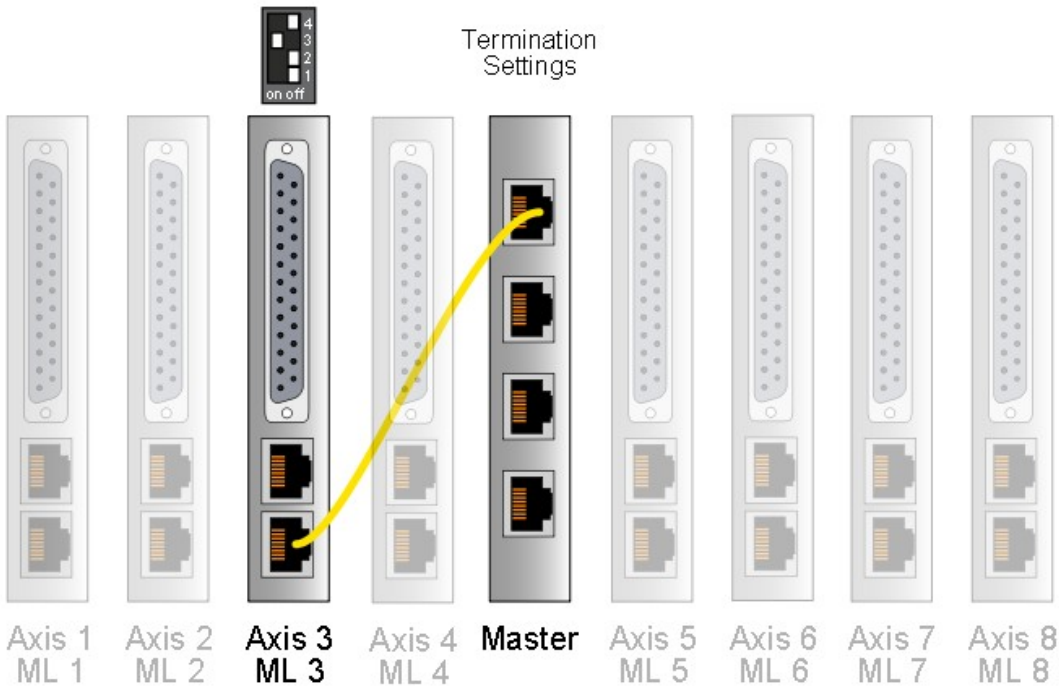
In this real time IO mapping the StateVar for the main state machine and several other helpful data are exchanged. The size of this mapping is 26 bytes or **13 words** for each configured axis.

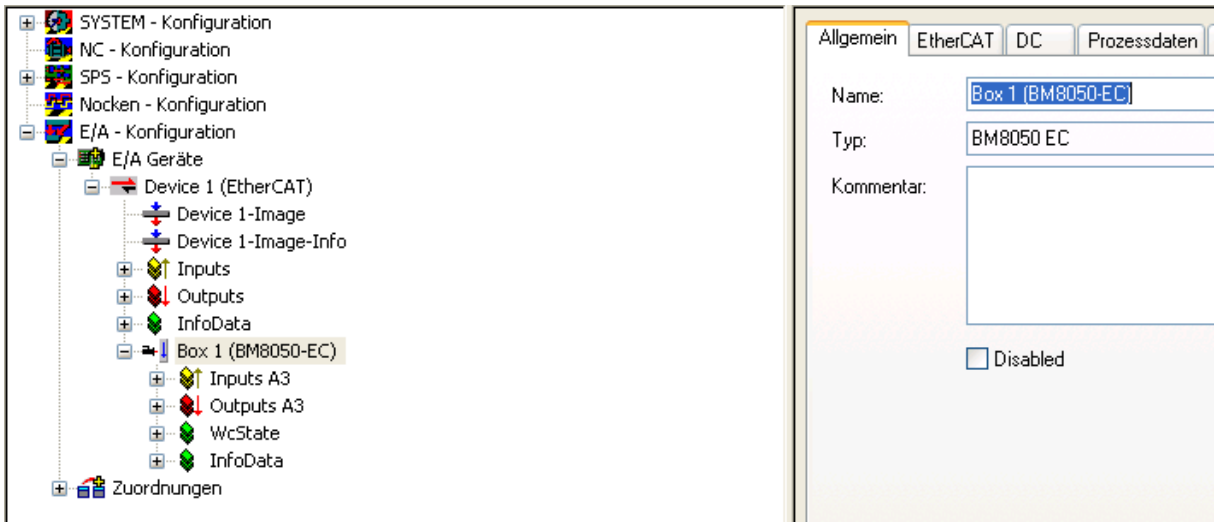
Input Data Mapping of one Axis		
Byte Offset	***Description***	***Size / Type***
00h	MC SW StateVar	Uint16 / coded state depending
02h	MC SW StatusWord	Uint16 / Bit coded
04h	MC SW WarnWord	Uint16 / Bit coded
06h	MC SW DemandPosition	Int32 / Position [100nm]
0Ah	MC SW ActualPosition	Int32 / Position [100nm]
0Eh	MC SW DemandCurrent	Int32 / Current [1mA]
12h	Cfg Module Status Word	Uint16
14h	Cfg Module Index/..	Uint16
16h	Cfg Module Value/..	Uint32/Sint32

The use of the Control word and Motion Command interface is described in [1]. The real time configuration module is described in [2].

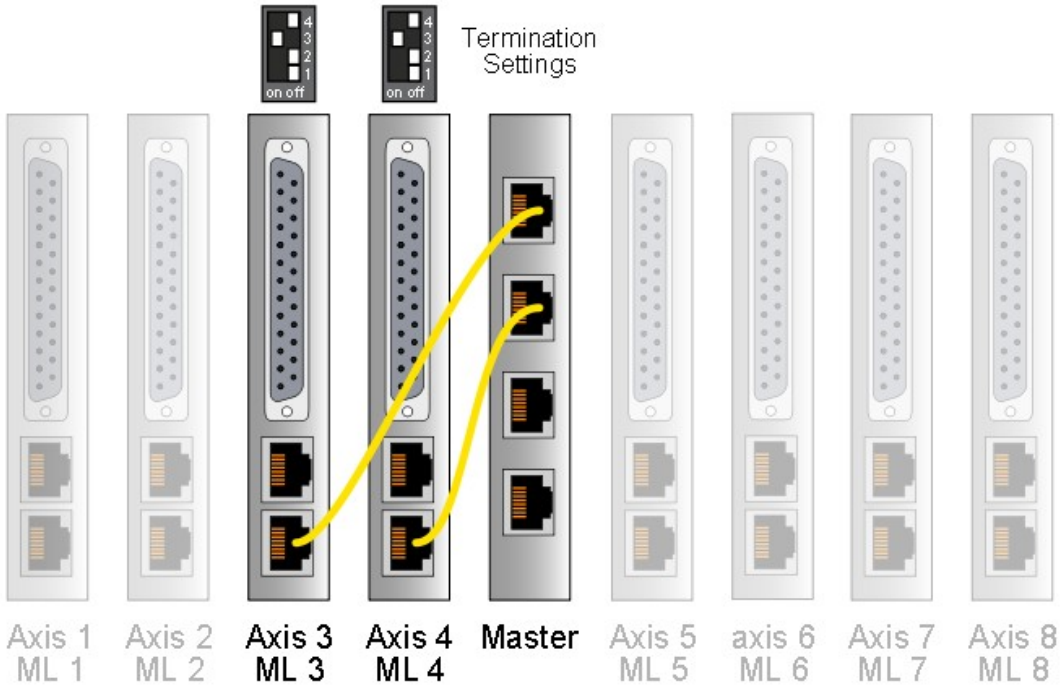
5.2 PLC Setup with different numbers of Axis

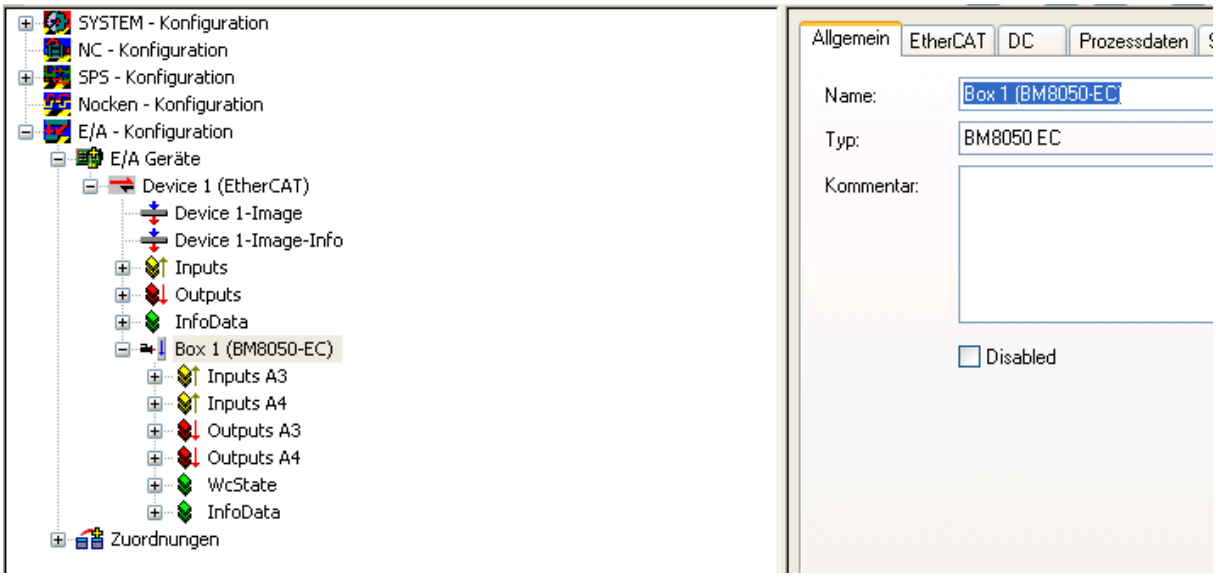
5.2.1 PLC Setup with 1 Axis



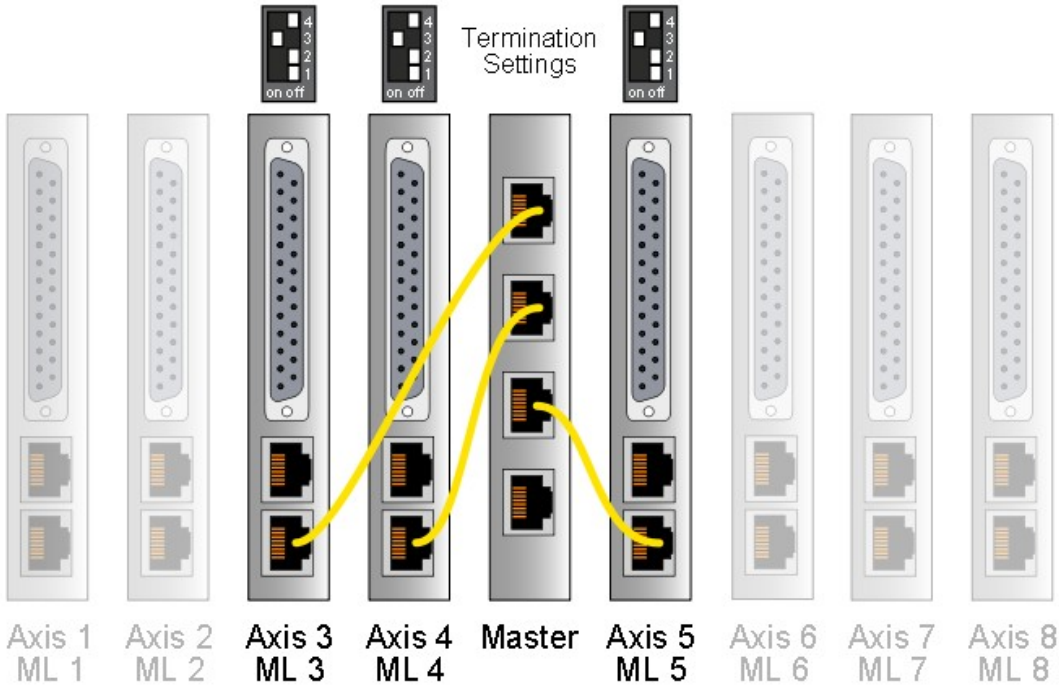


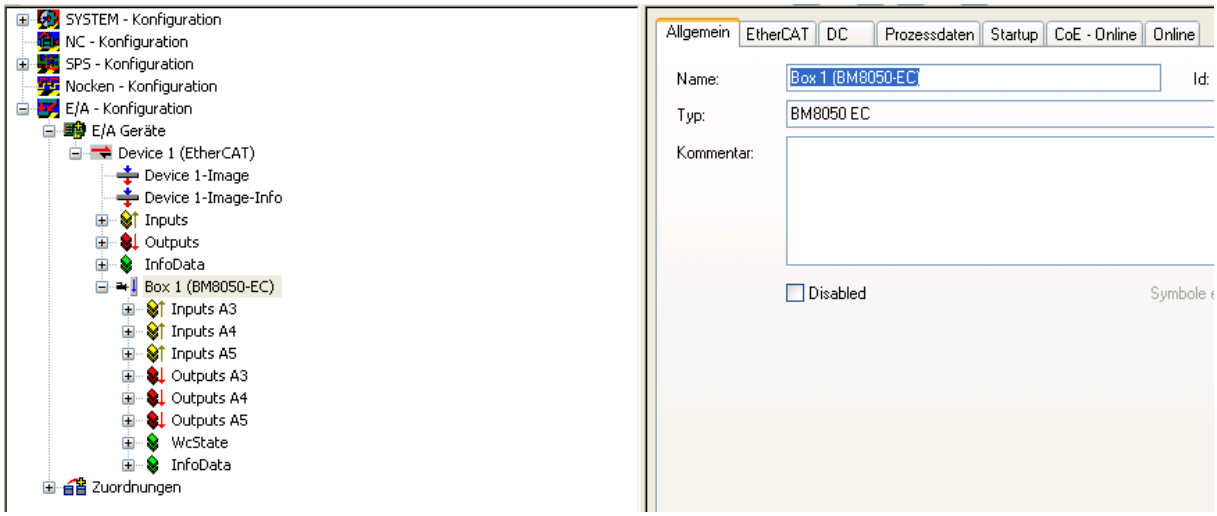
5.2.2 PLC Setup with 2 Axis



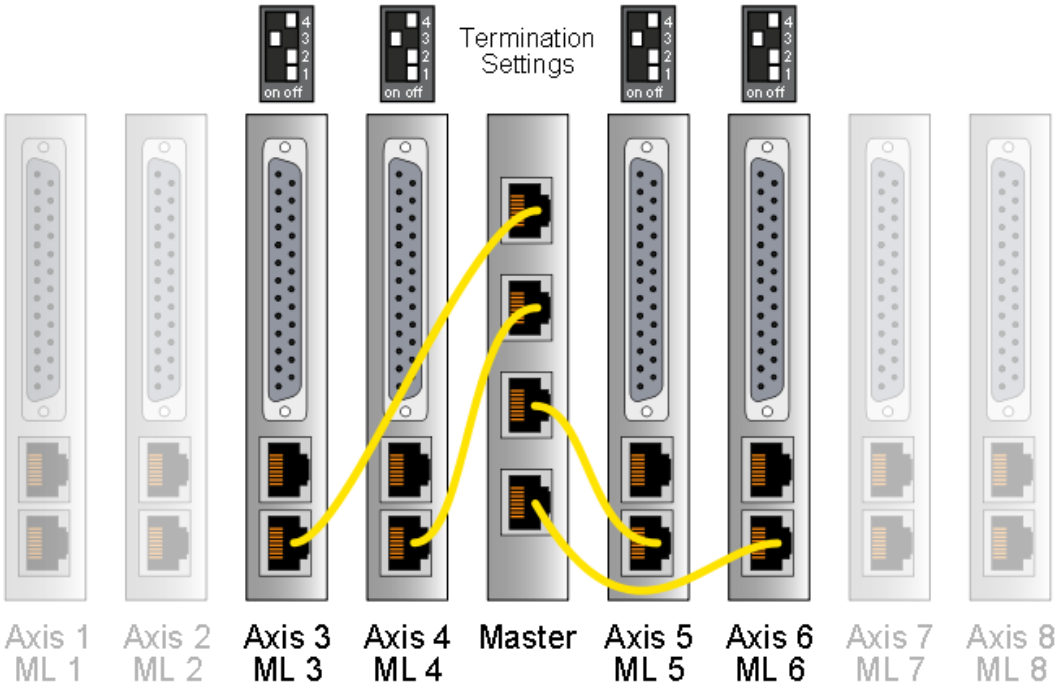


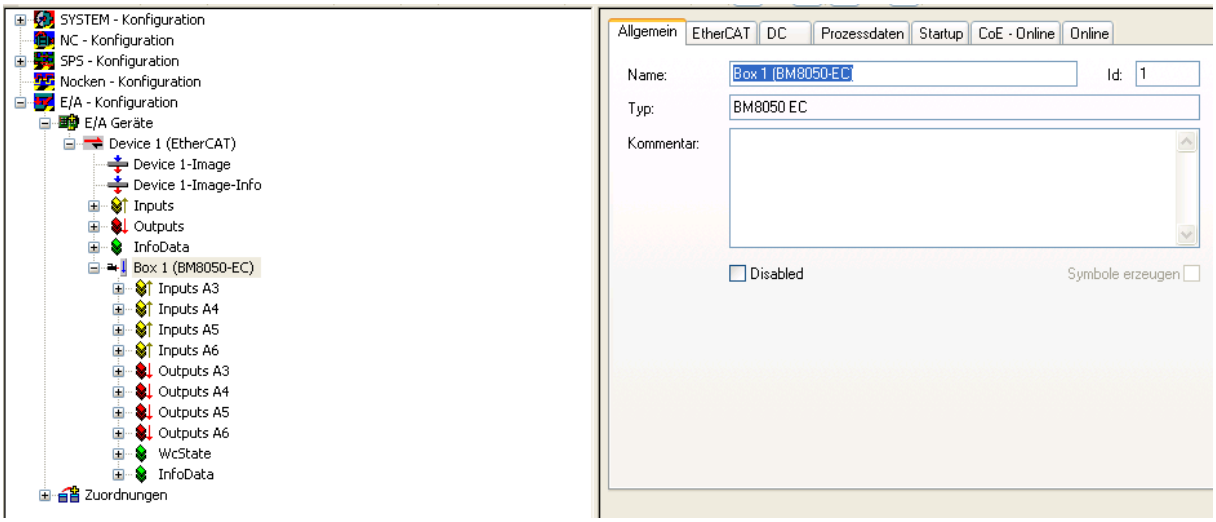
5.2.3 PLC Setup with 3 Axis



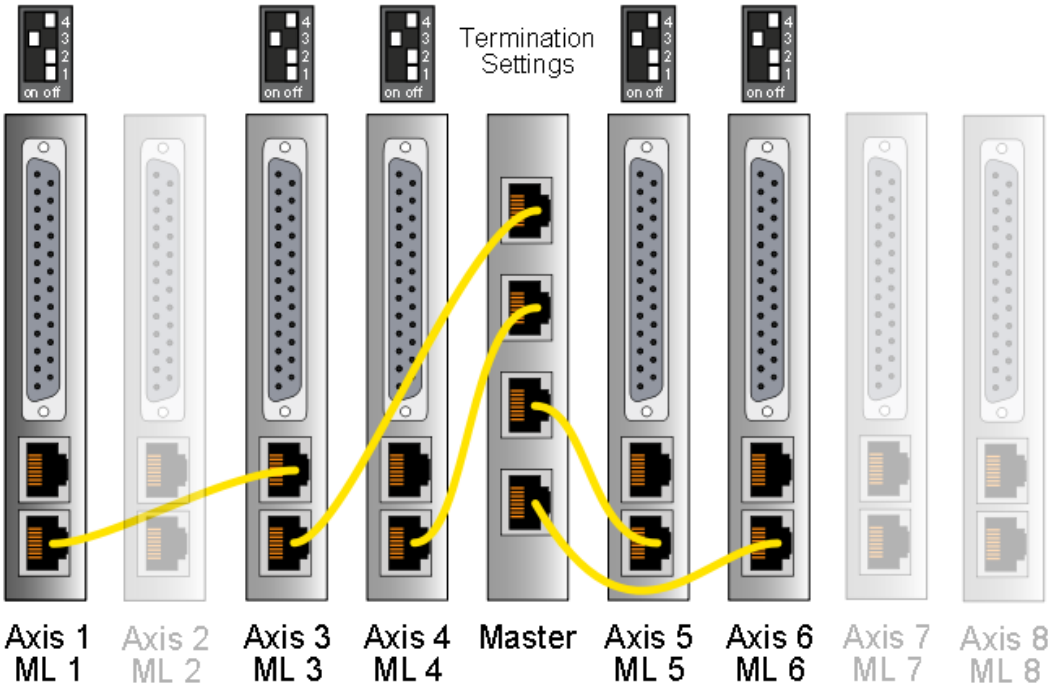


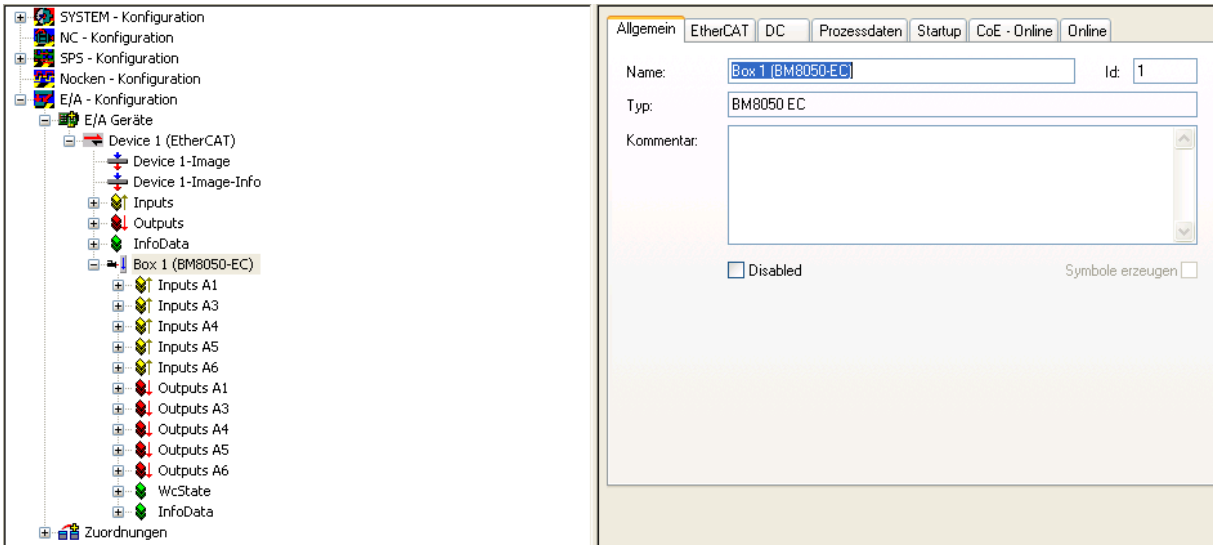
5.2.4 PLC Setup with 4 Axis



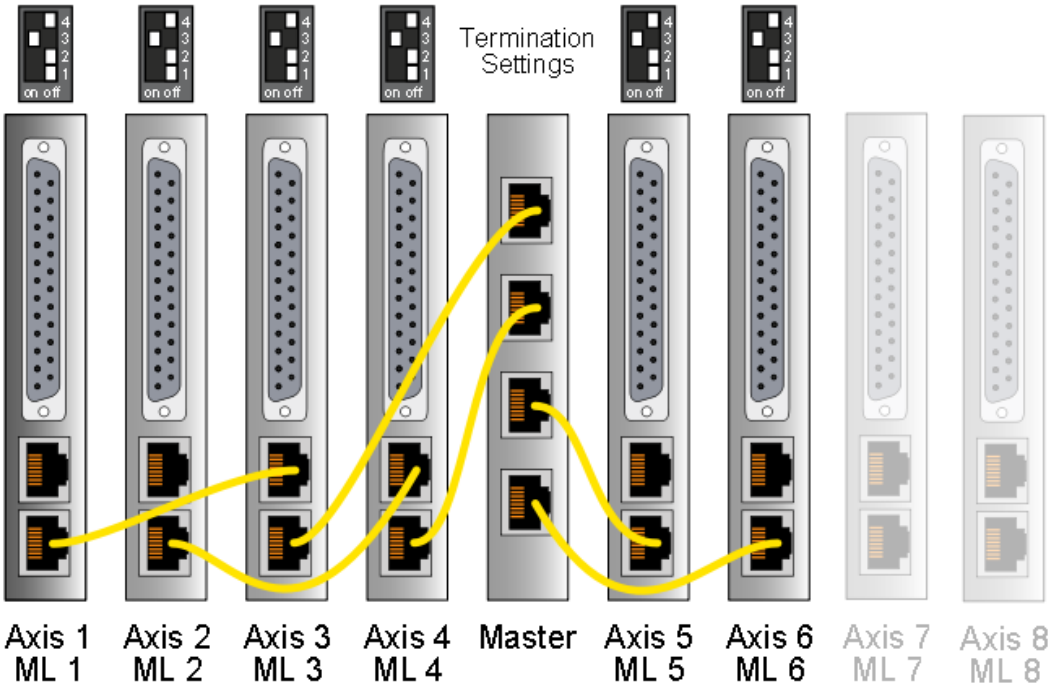


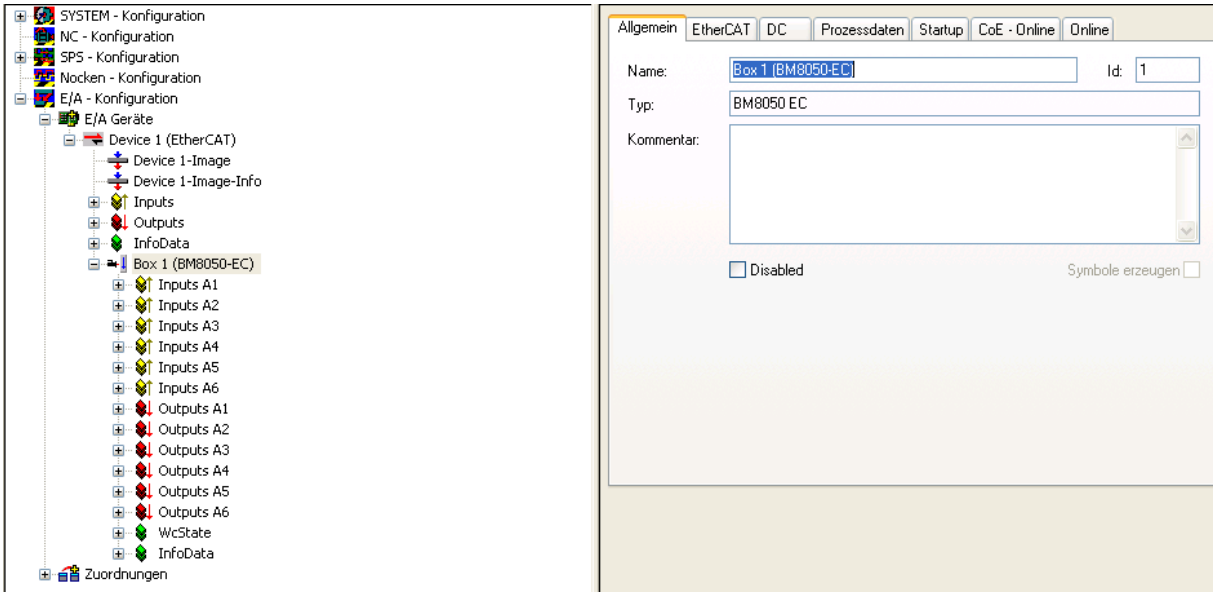
5.2.5 PLC Setup with 5 Axis



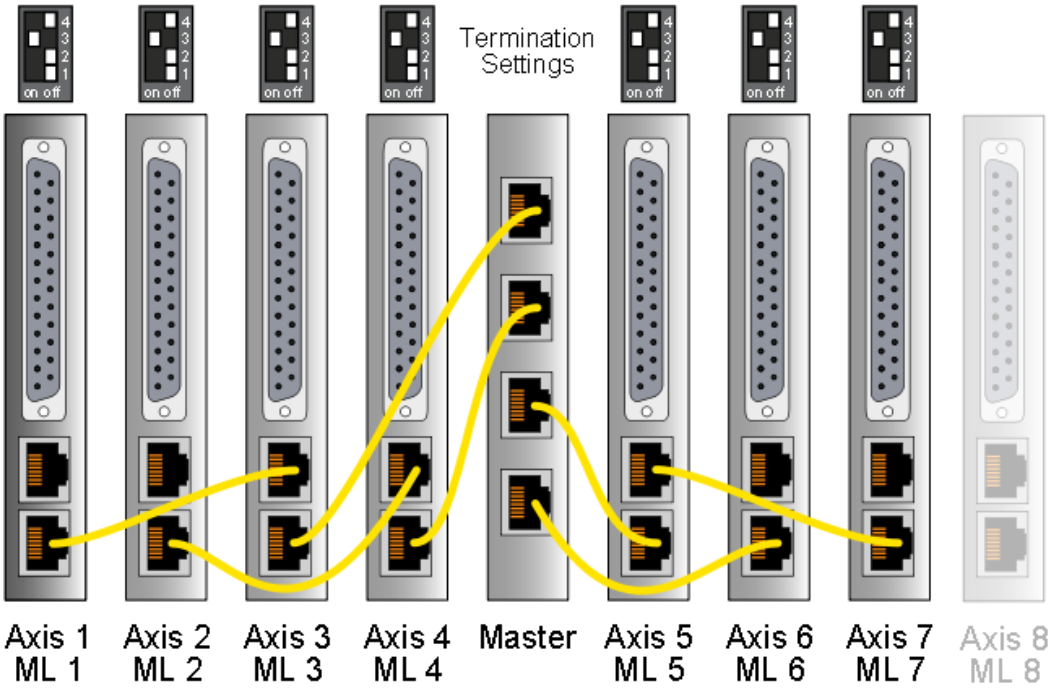


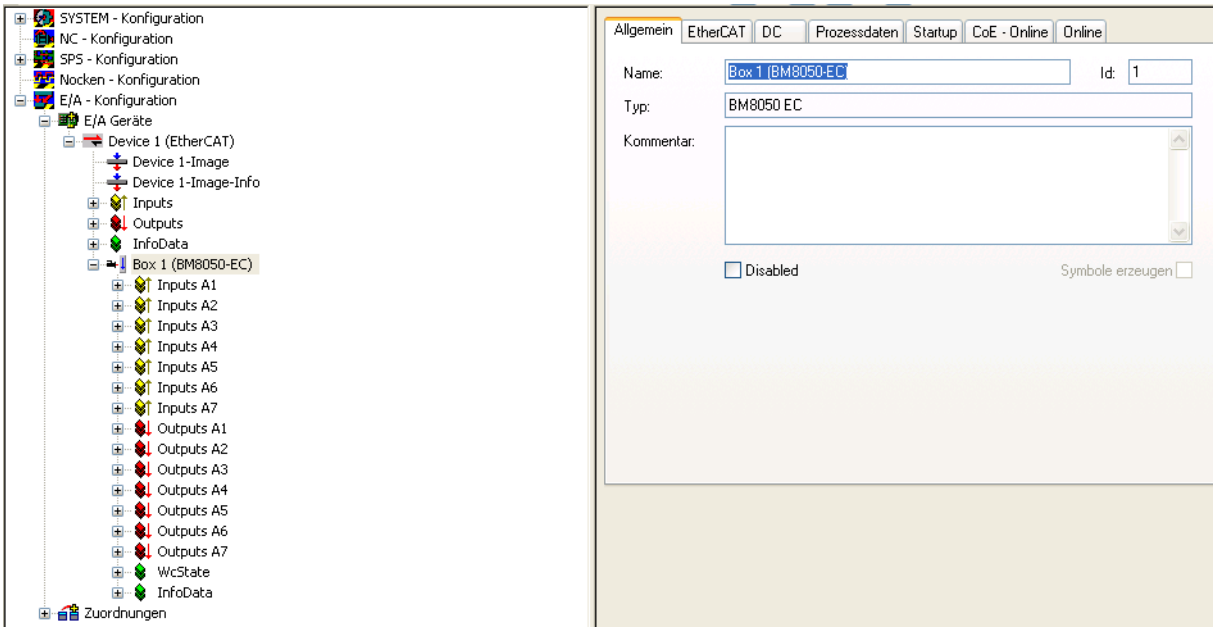
5.2.6 PLC Setup with 6 Axis



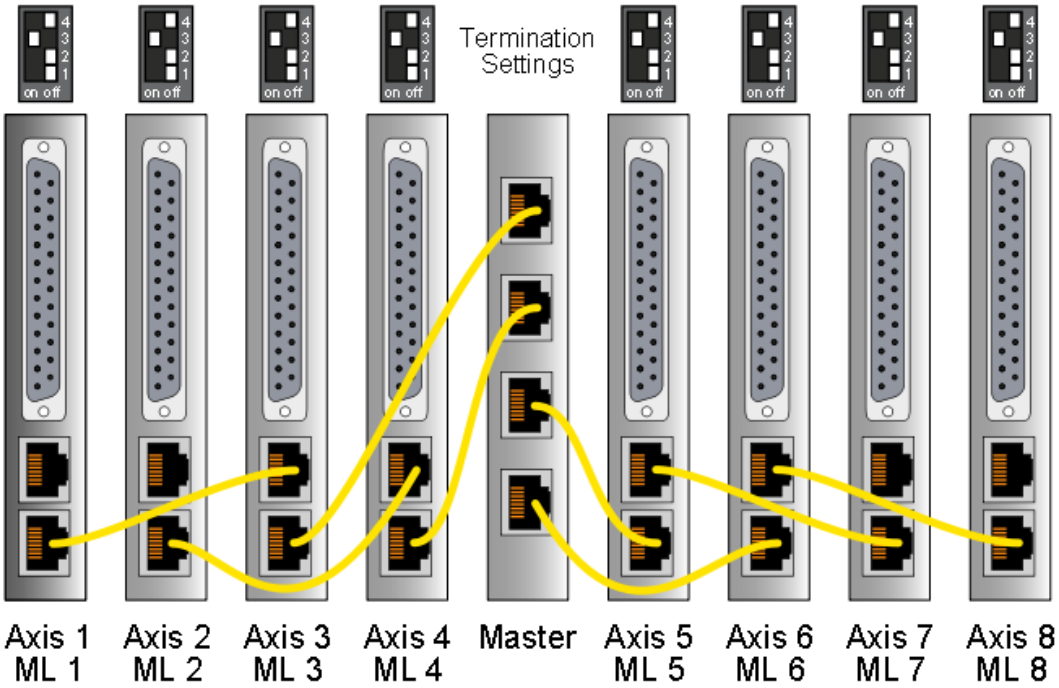


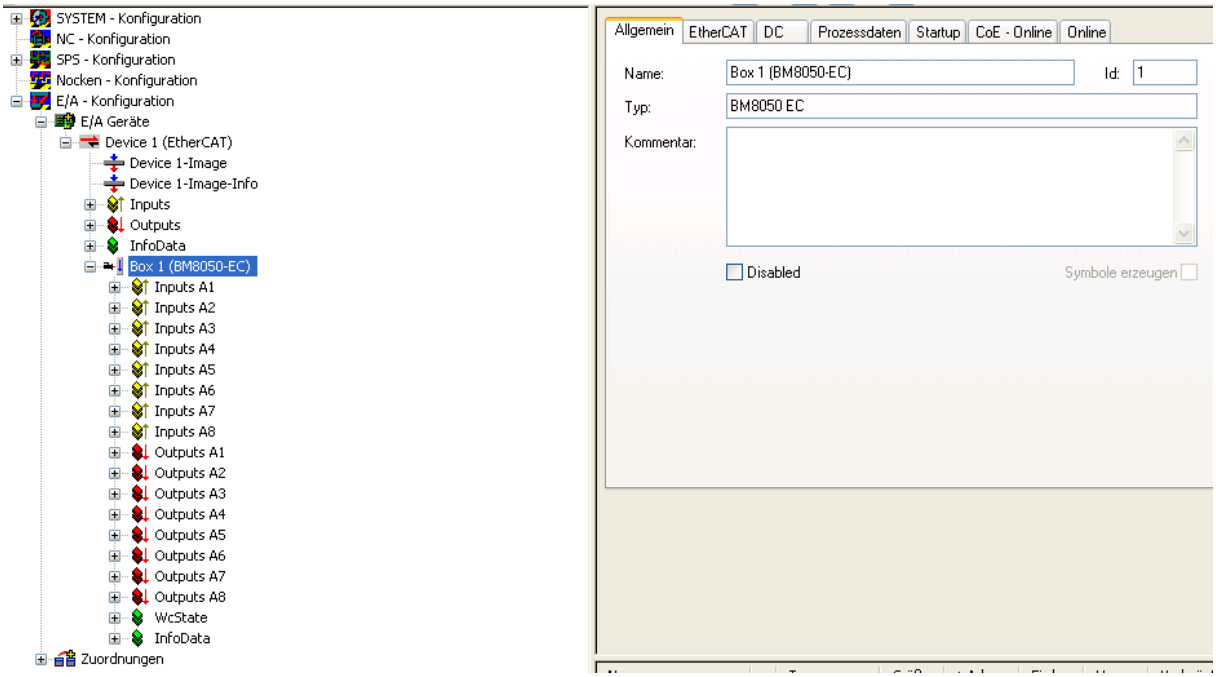
5.2.7 PLC Setup with 7 Axis





5.2.8 PLC Setup with 8 Axis





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