



***LinMot***<sup>®</sup>



**EtherCAT**<sup>®</sup> 



**MC-Link with  
EtherCAT Interface**  
User Manual



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

© 2018 NTI AG

This work is protected by copyright.

Under the copyright laws, this publication may not be reproduced or transmitted in any form, electronic or mechanical, including photocopying,

recording, microfilm, storing in an information retrieval system, not even for didactical use, or translating, in whole or in part, without the prior written consent of NTI AG.

LinMot® is a registered trademark of NTI AG.

Note:

The information in this documentation reflects the stage of development at the time of press and is therefore without obligation. NTI AG reserves itself the right to make changes at any time and without notice to reflect further technical advance or product improvement.

Document version 6.4 / Whp, August 2018

## Table of Content

<b>1 SYSTEM OVERVIEW.....</b>	<b>4</b>
1.1 REFERENCES.....	4
<b>2 CONNECTING TO THE ETHERCAT NETWORK.....</b>	<b>5</b>
2.1 PIN ASSIGNMENT OF THE CONNECTORS X17-X18.....	5
<b>3 SETUP IN THE PLC.....</b>	<b>6</b>
3.1 COPY DEVICE DESCRIPTION FILE.....	6
3.2 SCAN THE ETHERCAT SLAVE DEVICES.....	6
<b>4 ETHERCAT PARAMETERS.....</b>	<b>8</b>
4.1 PARAMETERS.....	8
<b>5 REALTIME IO DATA MAPPING.....</b>	<b>9</b>
5.1 IO DATA MAPPING OF EACH AXIS.....	9
5.1.1 Output Data Mapping of one axis.....	9
5.1.2 Input Data Mapping of one axis.....	9
5.2 PLC SETUP WITH DIFFERENT NUMBERS OF AXIS.....	10
5.2.1 PLC Setup with 1 Axis.....	10
5.2.2 PLC Setup with 2 Axis.....	11
5.2.3 PLC Setup with 3 Axis.....	12
5.2.4 PLC Setup with 4 Axis.....	13
5.2.5 PLC Setup with 5 Axis.....	14
5.2.6 PLC Setup with 6 Axis.....	15
5.2.7 PLC Setup with 7 Axis.....	16
5.2.8 PLC Setup with 8 Axis.....	17
<b>6 CONTACT ADDRESSES.....</b>	<b>18</b>

## 1 System overview

The LinMot EtherCAT-ML controllers have the following functionalities:

Device Property	Value / Remark
Minimal EtherCATcycle time	2 ms

EtherCAT is the open real-time Ethernet network originally developed by Beckhoff. The LinMot act as Slave in this network and is implemented with the standard ASIC ET1100 from Beckhoff.

For further information on the EtherCAT fieldbus please visit:

<http://www.ethercat.org/>

### 1.1 References


All user manuals are distributed with the LinMot-Talk configuration software the newest version can be downloaded from the LinMot homepage under the download section.

Ref	Title	Source
1	User Manual Motion Control SW	<a href="http://www.linmot.com">www.linmot.com</a>
2	LinMot Drive Configuration over Fieldbus Interfaces SG4	<a href="http://www.linmot.com">www.linmot.com</a>
3	Usermanual_MC_Link_with_EtherCAT_SG5.pdf	<a href="http://www.linmot.com">www.linmot.com</a>

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

#### 3.1 Copy Device Description File

The LinMot 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_MLXML\LinMot_BM8050_EC_V2s1.xml
```

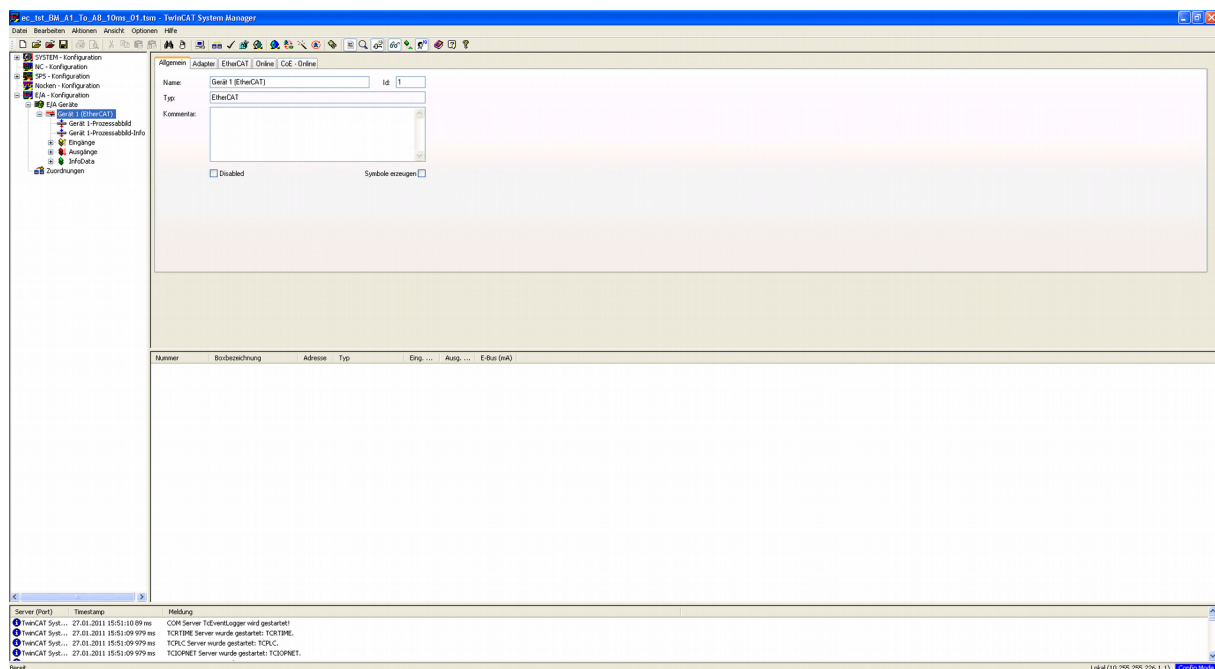
Example Destination path of EtherCAT Device description file:

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

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

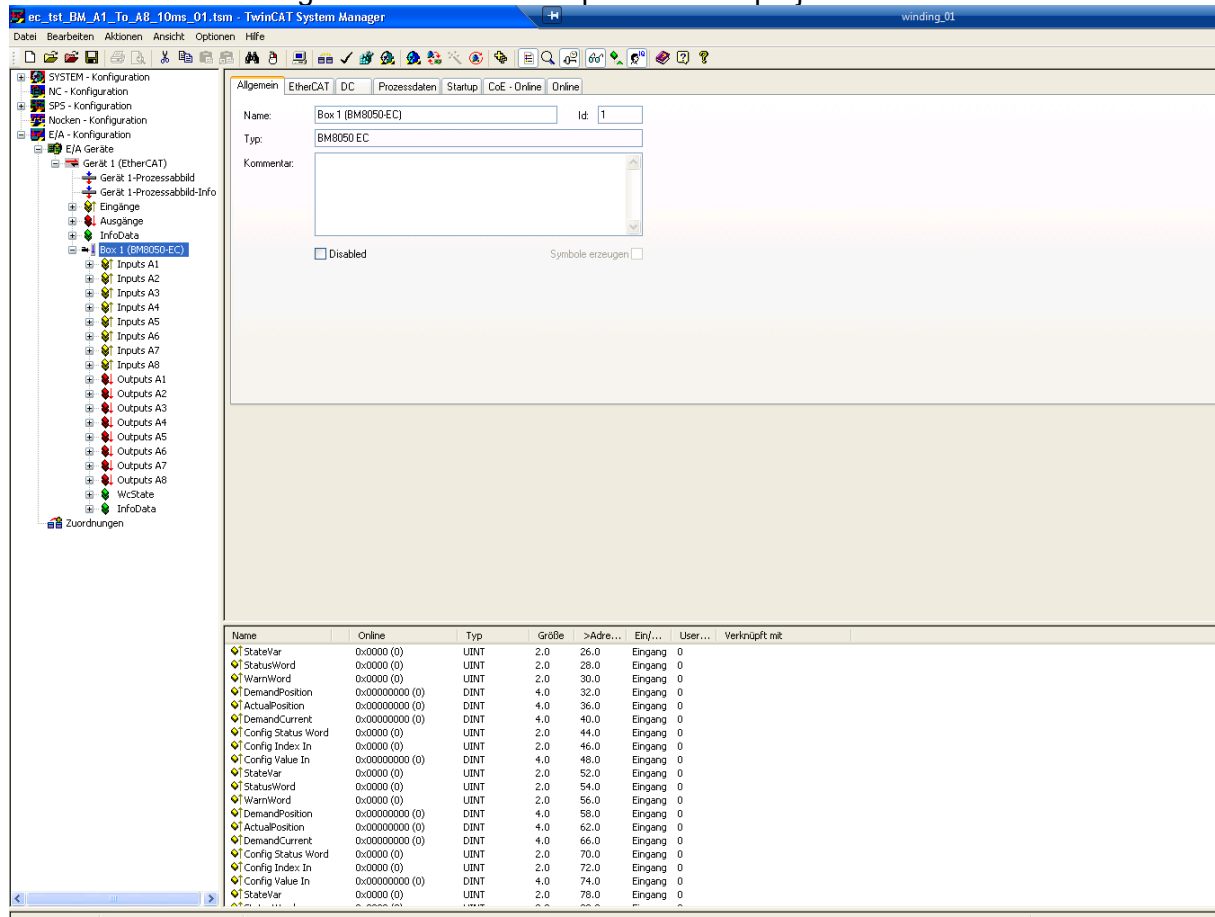
#### 3.2 Scan the EtherCAT slave devices

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, which is imported to the project. The bus module has IO data for 8 Axis configured by default. If less than 8 Axis are needed some axis can be deleted (see chapter 5).

## 4 EtherCAT Parameters

### 4.1 Parameters

The EtherCAT Interface has an additional parameter tree branch (Parameters → EtherCAT), which can be configured with the distributed LinMot-Talk software.

With these parameters, the EtherCAT interface can be enabled or disabled.

The LinMot-Talk software can be downloaded from <http://www.linmot.com> under the section download\software and manuals\Servo Controller\.

#### ***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 the same for all 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 the 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

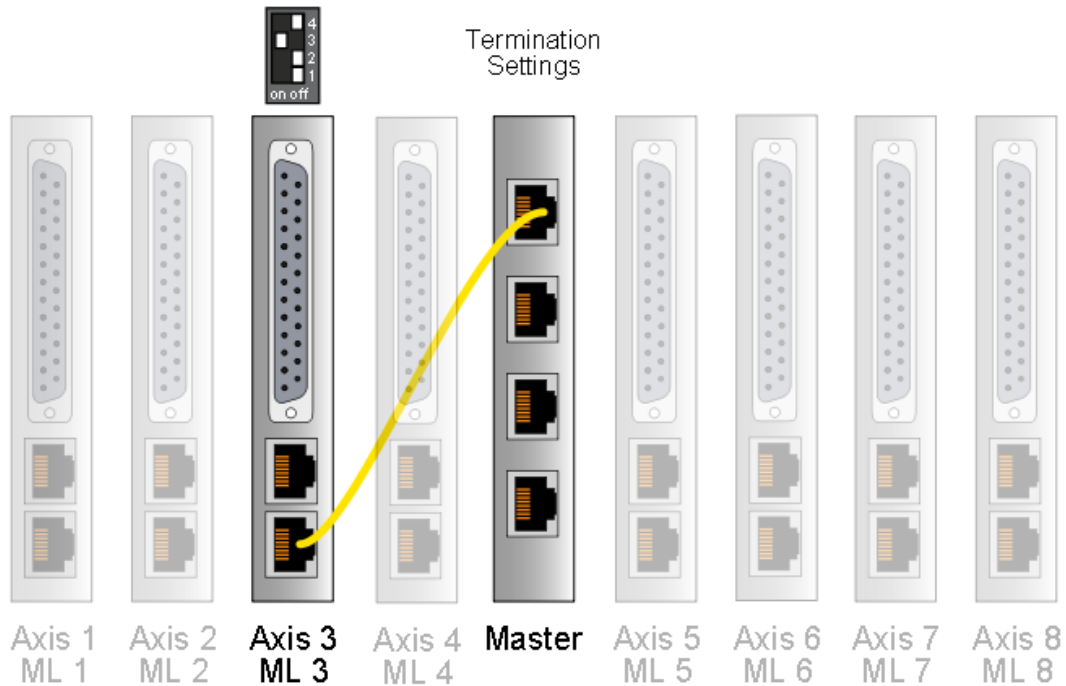
In this real time IO mapping the StateVar for the main state machine and several other helpful data are exchanged. The size of this mapping is 26 bytes or **13 words** for each configured axis.

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



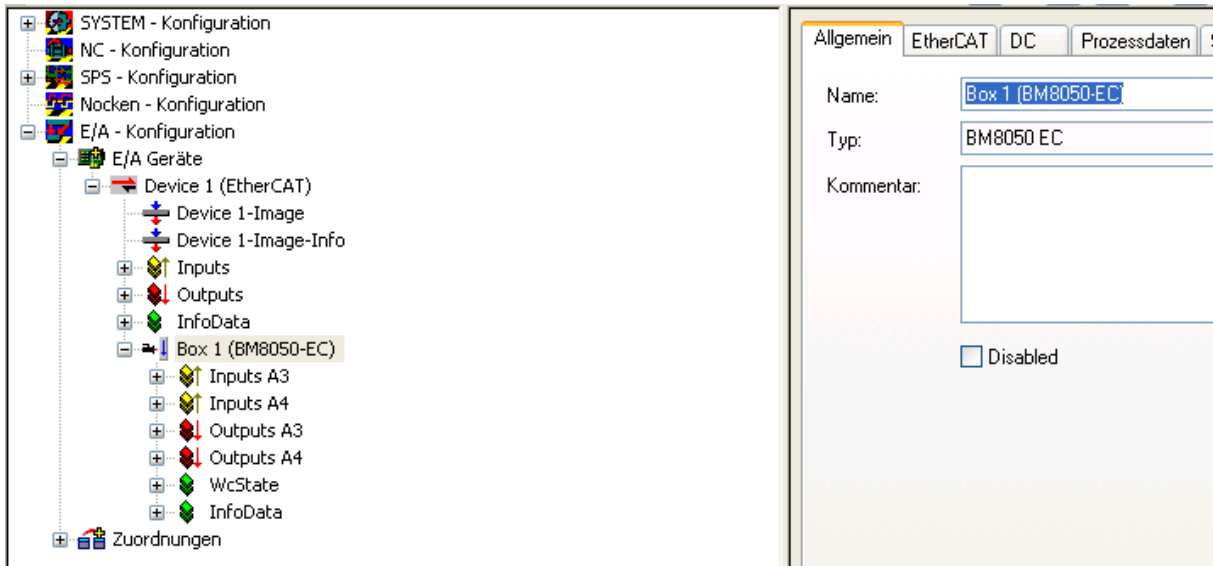
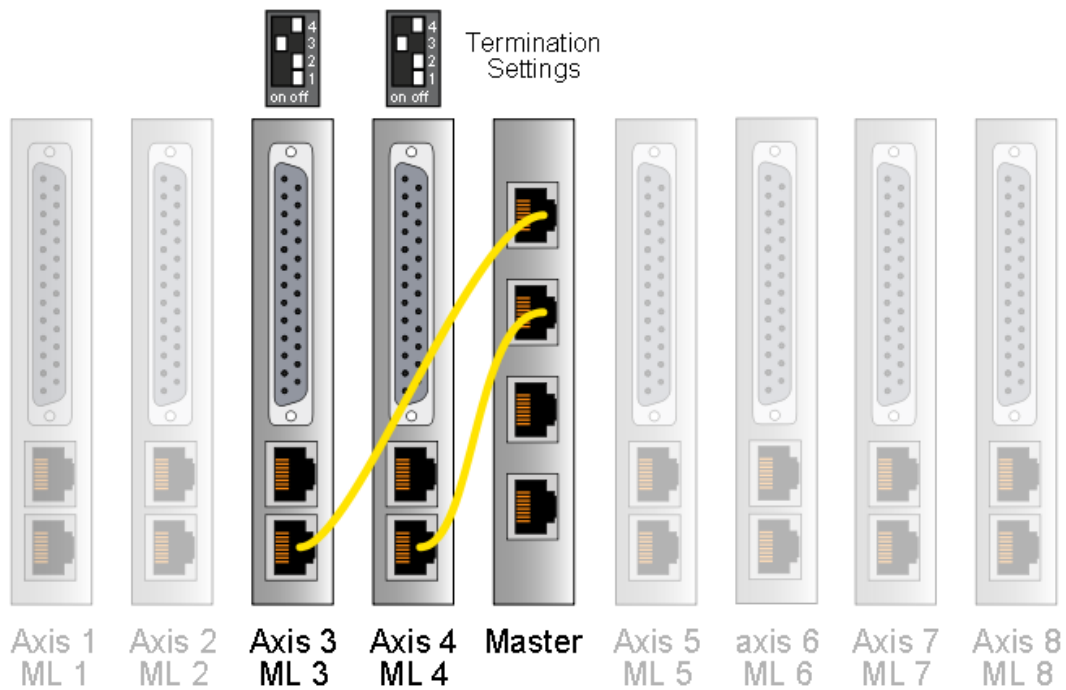
The screenshot shows the SIMATIC Manager configuration interface. On the left is a project tree with the following structure:

- SYSTEM - Konfiguration
- NC - Konfiguration
- SPS - Konfiguration
- Nocken - Konfiguration
- E/A - Konfiguration
  - E/A Geräte
    - Device 1 (EtherCAT)
      - Device 1-Image
      - Device 1-Image-Info
      - Inputs
      - Outputs
      - InfoData
      - Box 1 (BM8050-EC)
        - Inputs A3
        - Outputs A3
        - WcState
        - InfoData
- Zuordnungen

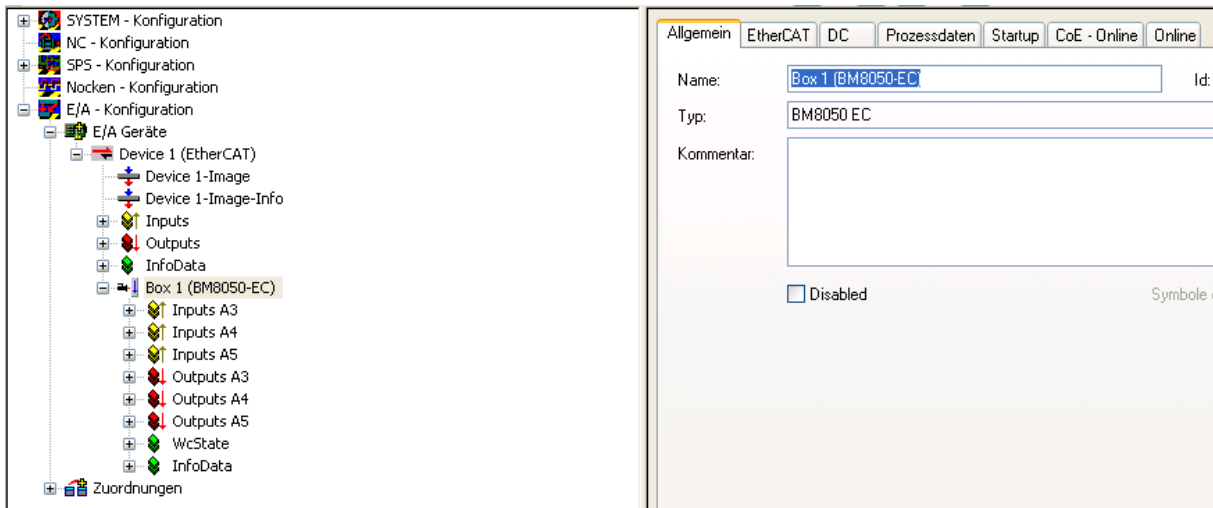
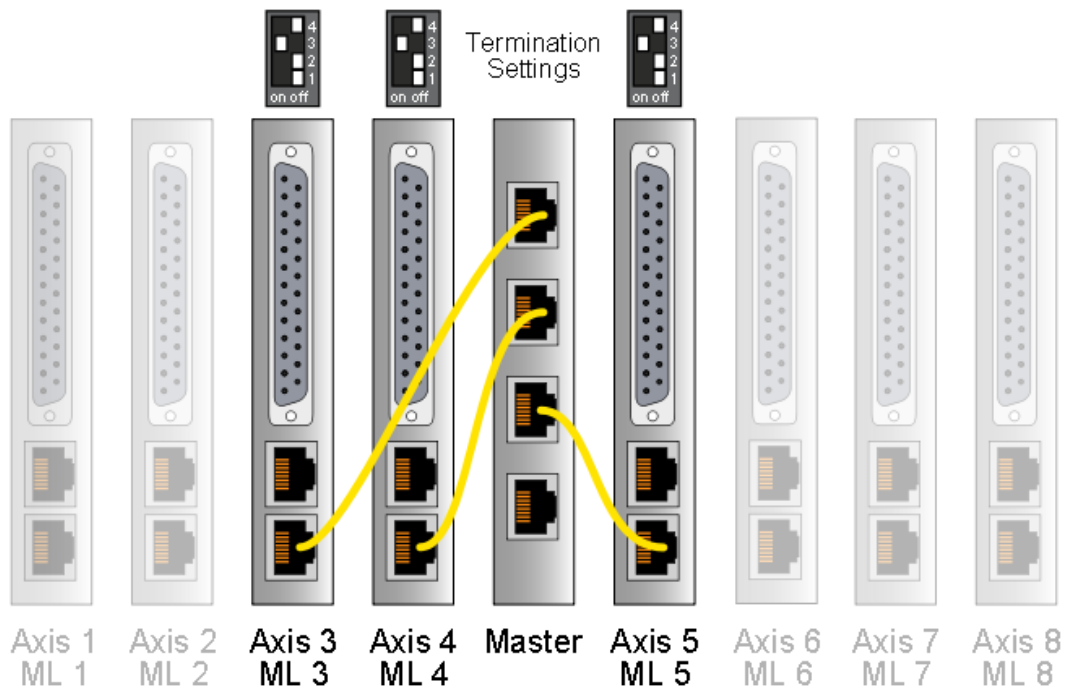
On the right is the 'Properties' dialog for 'Box 1 (BM8050-EC)'. The 'Allgemein' tab is active, showing:

- Name:
- Typ:
- Kommentar:
- Disabled

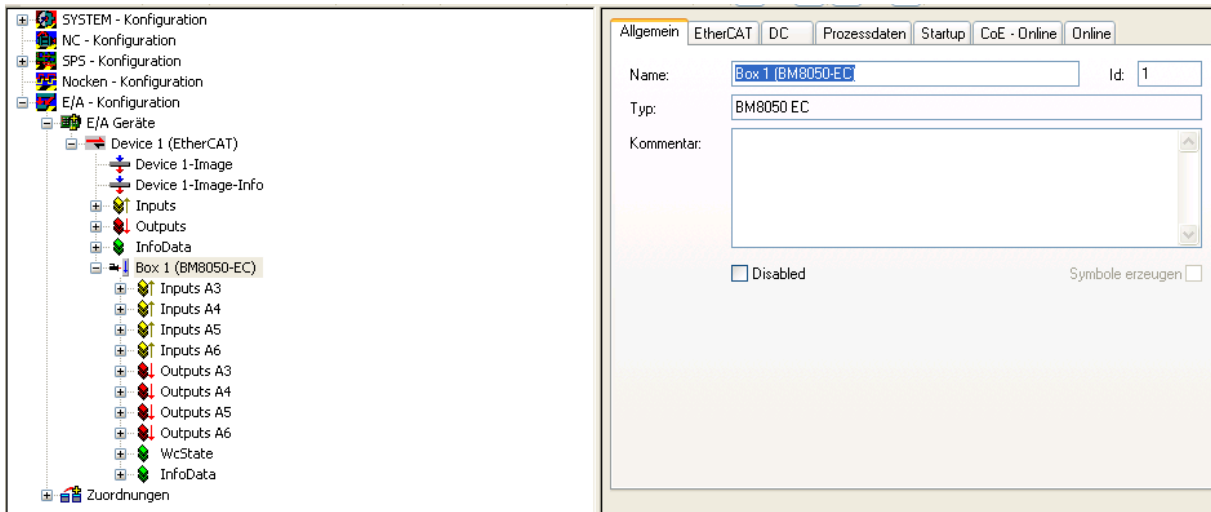
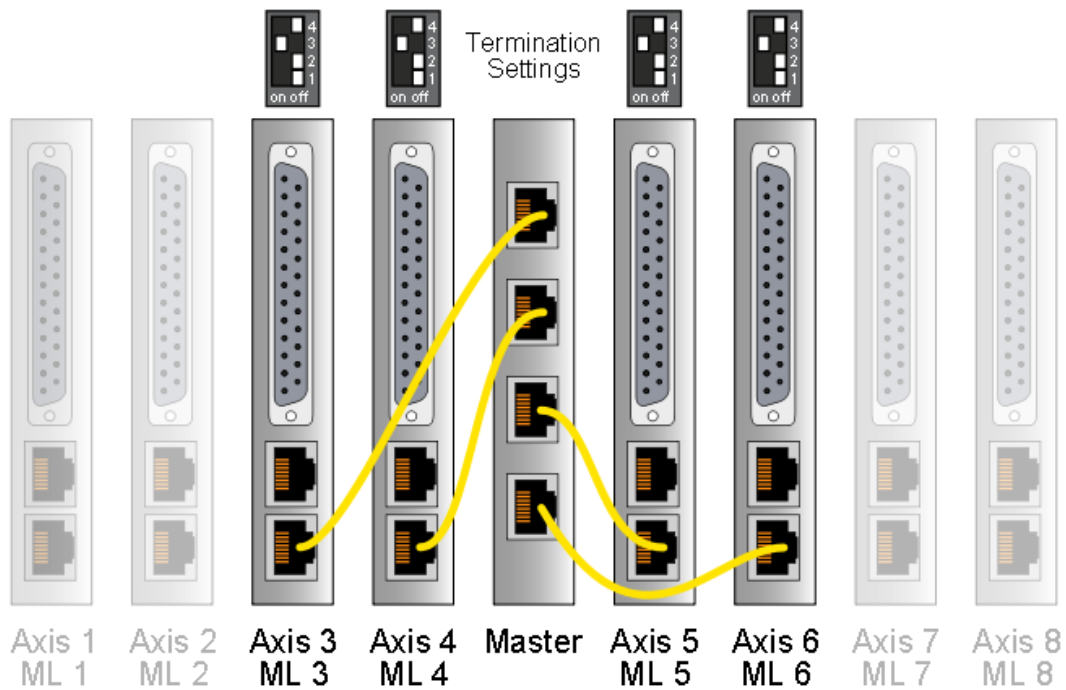
5.2.2 PLC Setup with 2 Axis



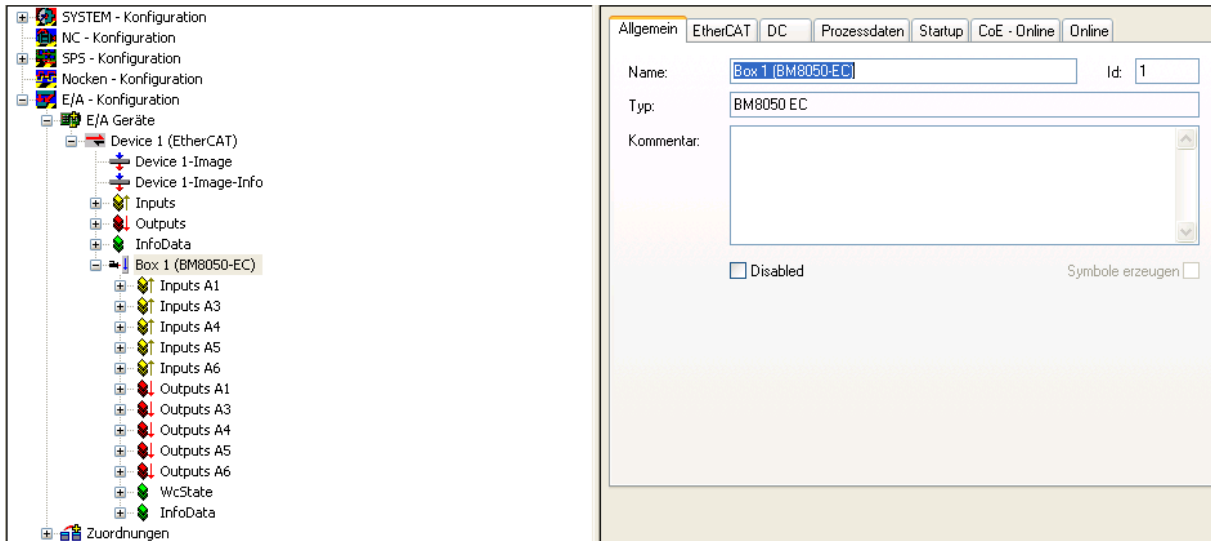
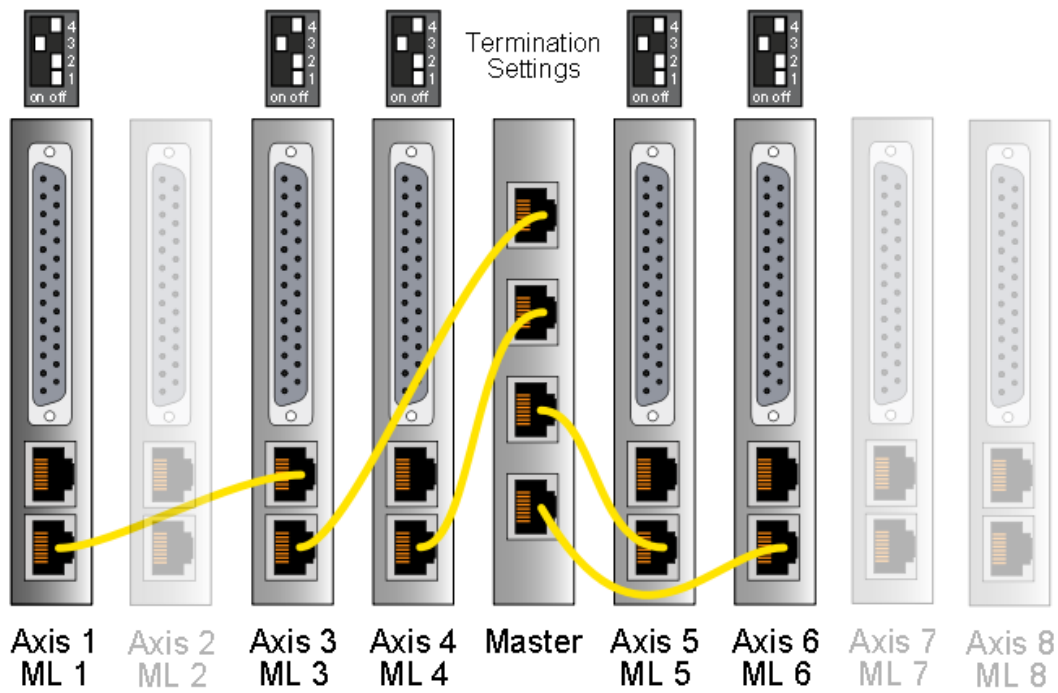
5.2.3 PLC Setup with 3 Axis



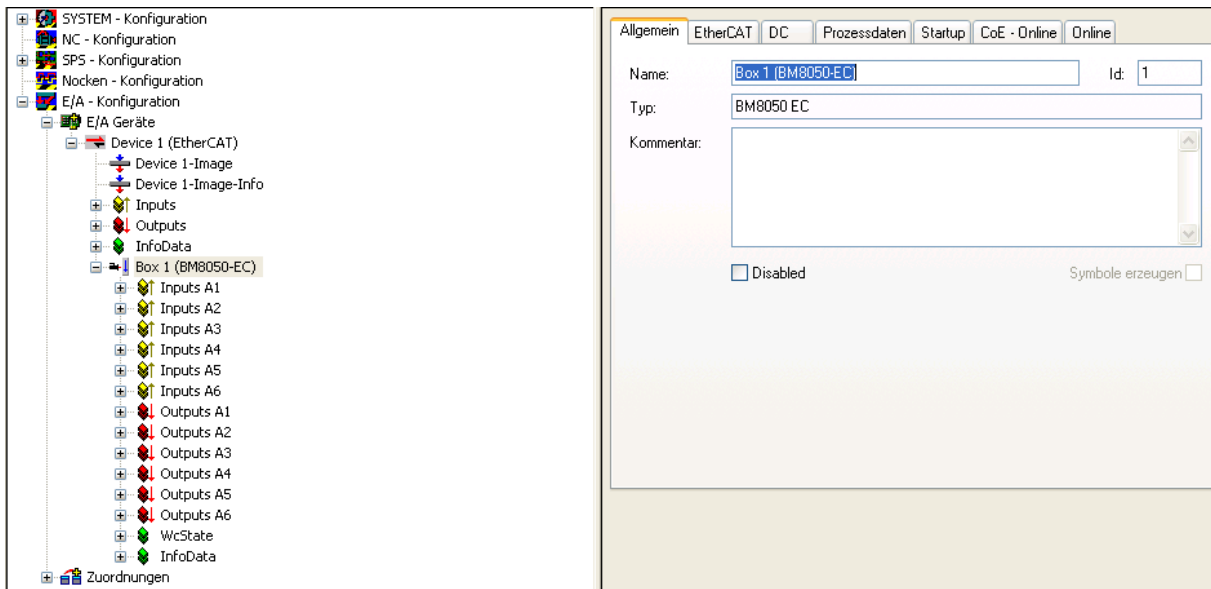
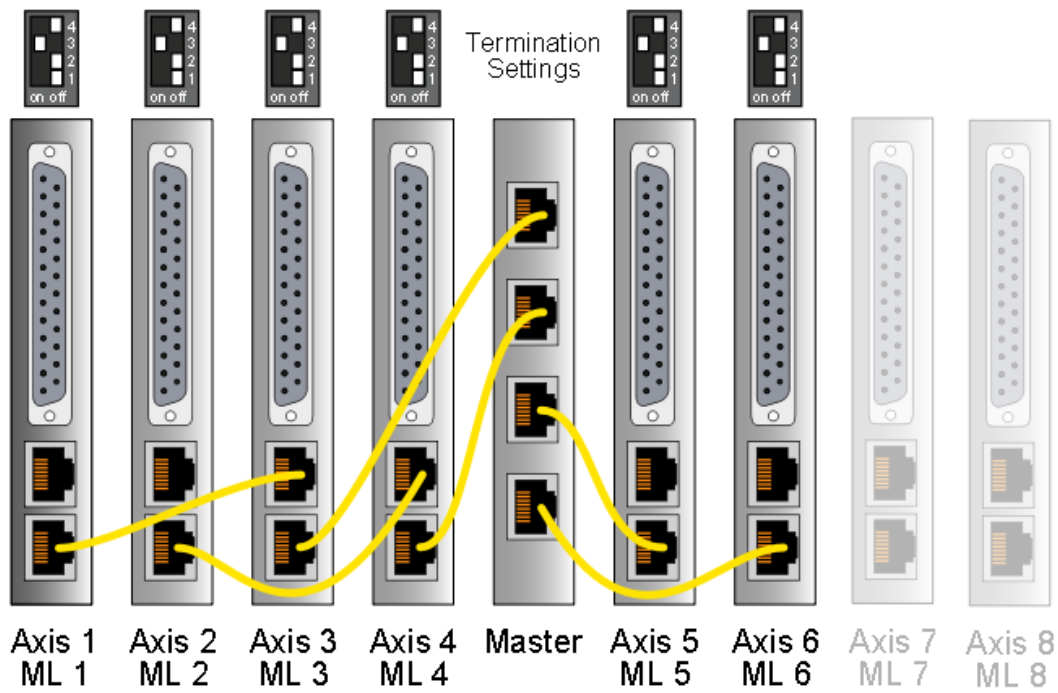
5.2.4 PLC Setup with 4 Axis



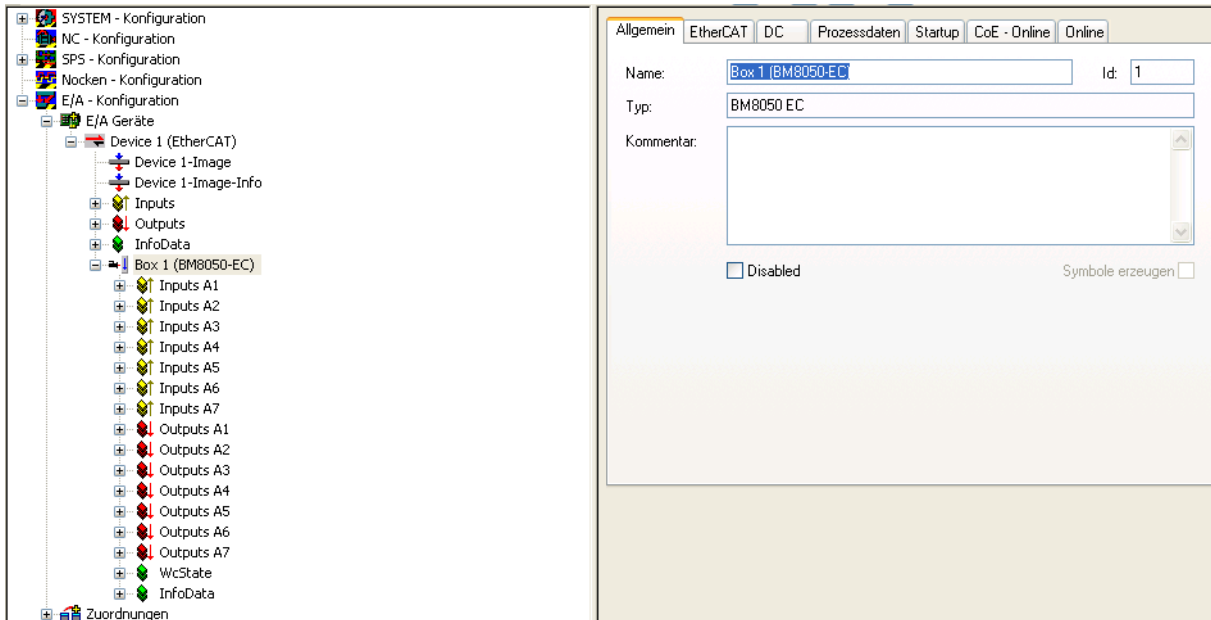
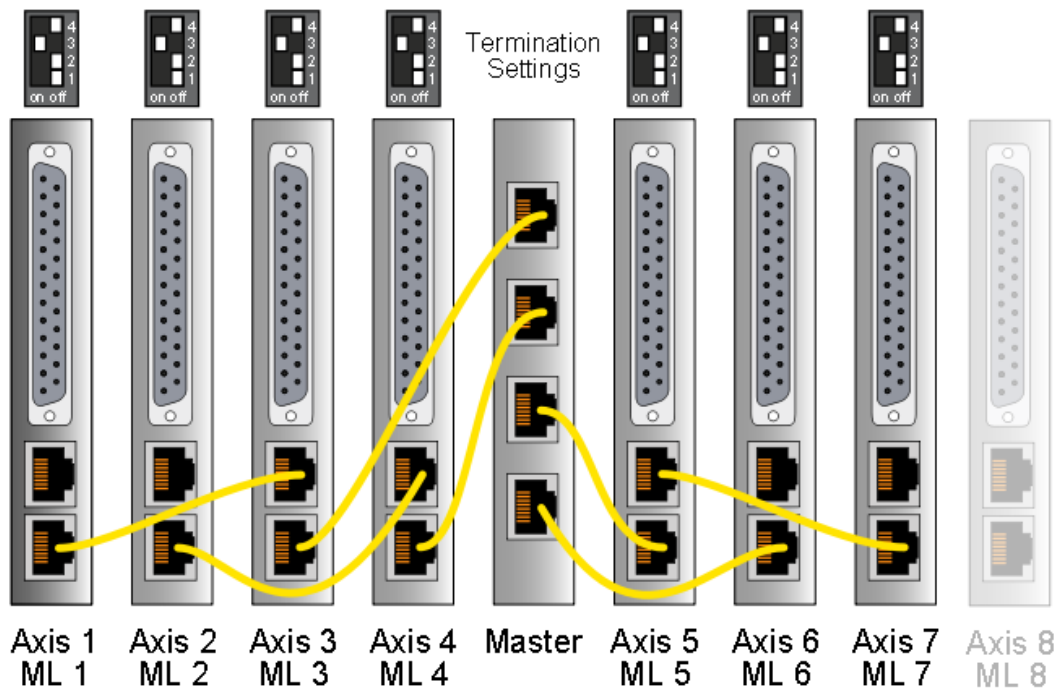
5.2.5 PLC Setup with 5 Axis



5.2.6 PLC Setup with 6 Axis

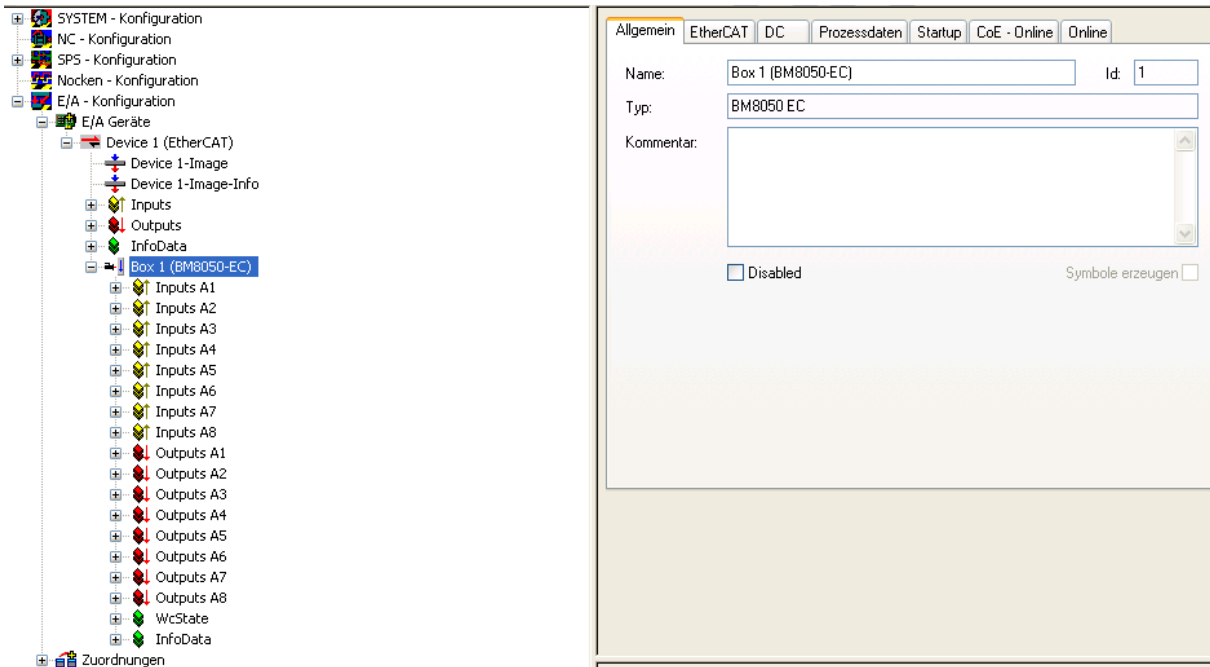
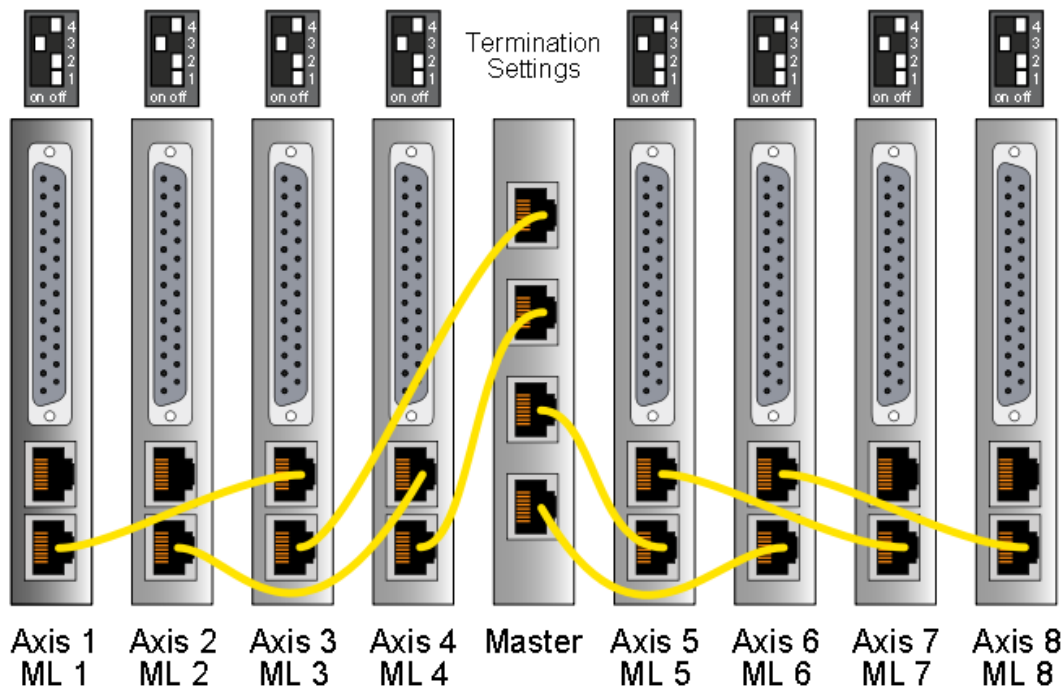


5.2.7 PLC Setup with 7 Axis





5.2.8 PLC Setup with 8 Axis



## 6 Contact Addresses

---

### SWITZERLAND

**NTI AG / LinMot**  
Bodenaeckerstrasse 2  
CH-8957 Spreitenbach

**Sales and Administration:** +41-(0)56-419 91 91  
[office@linmot.com](mailto:office@linmot.com)

**Tech. Support:** +41-(0)56-544 71 00  
[support@linmot.com](mailto:support@linmot.com)

**Tech. Support (Skype) :** <skype:support.linmot>

**Fax:** +41-(0)56-419 91 92  
**Web:** <http://www.linmot.com>

---

### USA

**LinMot USA Inc.**  
N1922 State Road 120, Unit 1  
Lake Geneva, WI 53147

**Phone:** 262-743-2555

**E-Mail:** [usasales@linmot.com](mailto:usasales@linmot.com)  
**Web:** <http://www.linmotusa.com/>

---

Please visit <http://www.linmot.com> to find the distributor closest to you.

Smart solutions are...

