

*phy***MOTION**TM

CPU and Bus Module

MCM02.1 / MCM03.1

Firmware Version from:

V1.0.3 (Loader)

V1.0.07 (System)

V2.5.0 (*phy*LOGIC System)

TRANSLATION OF THE GERMAN ORIGINAL MANUAL

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In this manual you will find the descriptions of the features and specifications of the **phyMOTION™** module: CPU and Bus Module MCM02 and MCM03

(<http://www.phytron.de/phyMOTION>).

This manual is supplementary to the “**phyMOTION™** *Modular Multi-axis Controller for Stepper Motors*” manual.

Every possible care has been taken to ensure the accuracy of this technical manual. All information contained in this manual is correct to the best of our knowledge and belief but cannot be guaranteed. Furthermore we reserve the right to make improvements and enhancements to the manual and / or the devices described herein without prior notification.

We appreciate suggestions and criticisms for further improvement.

Email address: doku@phytron.de

Questions about the use of the product described in the manual that you cannot find answered here, please contact your representative of Phytron (<http://www.phytron.de/>) in your local agencies.

1 Legal Information



This manual:

Read this manual very carefully before mounting, installing and operating the device and if necessary further manuals related to this product.

- Please pay special attention to instructions that are marked as follows:

Key of hazard warnings

	DANGER – Serious injury!	<i>Indicates a high risk of serious injury or death!</i>
	DANGER – Serious injury from electric shock!	<i>Indicates a high risk of serious injury or death from electric shock!</i>
	WARNING – Serious injury possible!	<i>Indicates a possible risk of serious injury or death!</i>
	WARNING – Serious injury from electric shock!	<i>Indicates a possible risk of serious injury or death from electric shock!</i>
	CAUTION – Possible injury!	<i>Indicates a possible risk of personal injury.</i>
	CAUTION – Possible damage!	<i>Indicates a possible risk of damage to equipment.</i>
	CAUTION – Possible damage due to ESD!	<i>Refers to a possible risk of equipment damage from electrostatic discharge.</i>
	”Any heading“	<i>Refers to an important paragraph in the manual.</i>

Observe the following safety instructions!

Qualified personnel



WARNING – Serious injury possible!

Serious personal injury or serious damage to the machine and drives could be caused by insufficiently trained personnel!

Without proper training and qualifications damage to devices and injury might result!

- Design, installation and operation of systems may only be performed by qualified and trained personnel.
- These persons should be able to recognize and handle risks emerging from electrical, mechanical or electronic system parts.
- The qualified personnel must know the content of this manual and be able to understand all documents belonging to the product. Safety instructions are to be provided.
- The trained personnel must know all valid standards, regulations and rules for the prevention of accidents, which are necessary for working with the product.

Safety Instructions



Further Manual

This manual is in addition to the following main manual:

“phyMOTION™ Modular Multi-axis Controller for Stepper Motors”

- First, read the main manual and then continue with this manual.



Intended use:

The phyMOTION™ is designed for operating in a drive system.

- An installation is allowed only if the requirements of the EC Machinery and EMC Directives are conformed with.



Part of a machine:

This product is used as a part of a complete system, therefore risk evaluations concerning the specific application must be made before using the product.

- Safety measures have to be taken according to the results and be verified.
- Personnel safety must be ensured by the concept of this overall system (e.g. machine concept).



WARNING – Serious injury from electric shock!

If the phyMOTION™ is not operated with SELV/PELV voltages, the risk of dangerous voltages may be on the device. Touching these components carrying high voltages can cause serious injury or death from electric shock:

- Always observe the safety concept SELV / PELV to ensure safe isolation and separation of low voltage supplies from the mains.



WARNING – Serious injury from electric shock!

During electrical installation cables, connectors, etc. can be live.

- Before starting wiring, make sure that none of the power supplies are connected to the primary side of the mains supply. Isolate the power supplies from the mains or remove the appropriate fuses.
- All modules must be inserted and screwed into the phyMOTION™ housing before powering up. If necessary, unoccupied module slots must be covered with the supplied blank front plates. Never operate the equipment when open.
- Do not plug or unplug the modules while powered.
- Do not plug or unplug the connectors while powered.
- If the equipment was energised, wait 3 minutes after power off to allow the capacitors to discharge and ensure that there are no residual charges on cables, connectors and boards.

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3 MCM02 / MCM03 Module Overview

MCM02 stands for "Main Controller Module." This module is the intelligent head unit of *phyMOTION™* and thus part of each device. The module carries the main CPU and an optional selectable host interface.

It provides the external supply voltages for the power stages (24 V_{DC} to 70 V_{DC}), as well as the supply for I/Os and limit switches (24 V_{DC} isolated). The operating voltage of the single modules must be considered.

From the supply voltage for the power stages (24 V_{DC} to 70 V_{DC}) the internal logic voltage of 5 V is generated.

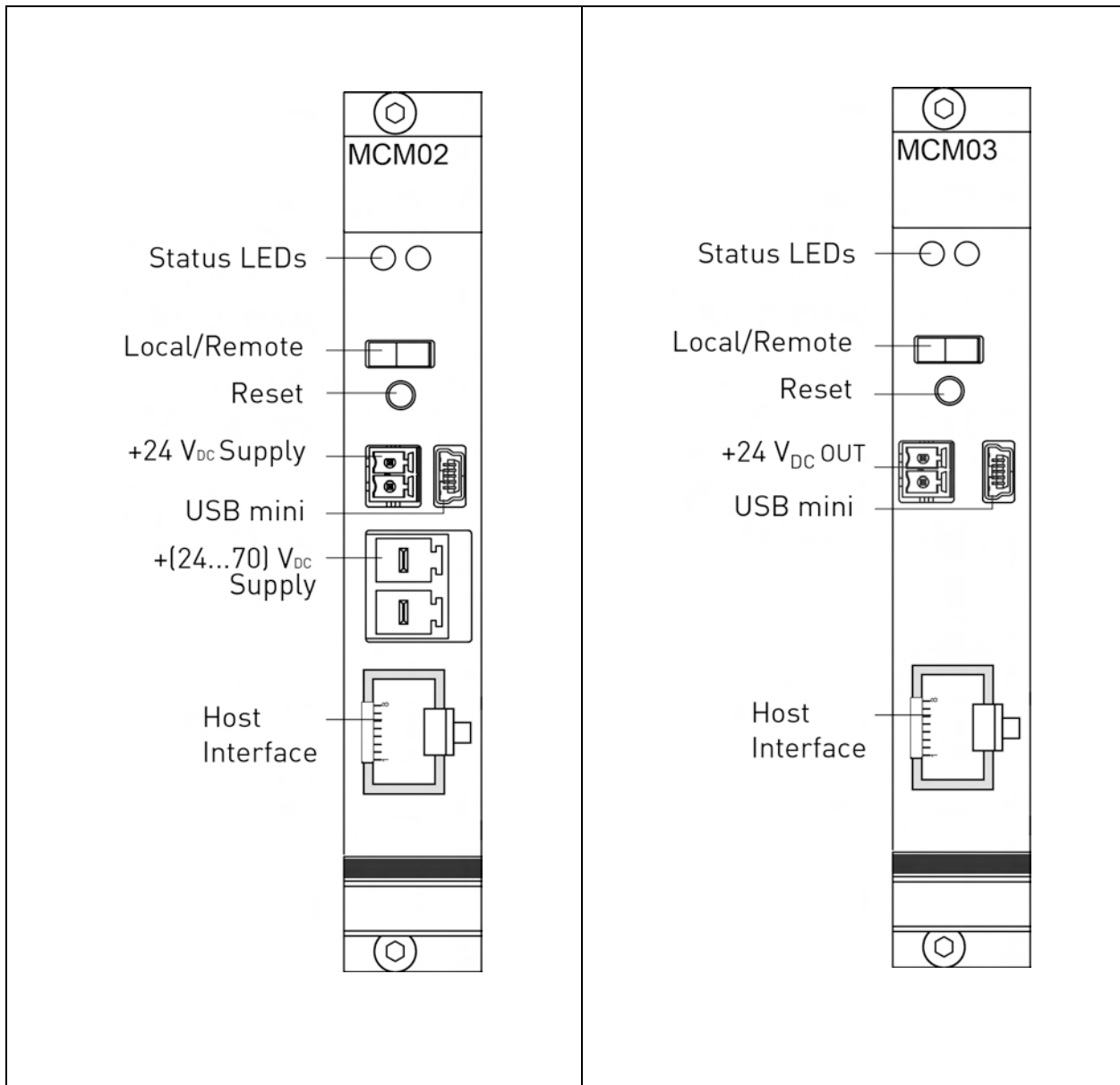


Fig. 1: MCM02 and MCM03 front view e.g. with Ethernet

Intelligent CPU:

- Controls and administers up to 64 modules (in the current housing concept limited to 21 modules per device)
- Program and register memory up to 4 MB
- Internal memory expandable with future memory modules
- Script program administration
- Firmware administration
- Elegant programming with *phyLOGIC*™

Power Supply:

EXT MCM02:

- 24 to 70 V_{DC} supply voltage (for motors and generates internally the logic voltages) – 20 A max.
- Electrically isolated 24 V_{DC} for inputs/outputs, limit and reference switches

The external supply must be designed for the required current (e.g. by the SPH 240-2410-24 power supply unit).

INT MCM03:

- No external supply (internal supply)
- 24 V_{DC} output voltage:
The total current at + 24V_{DC} for all inputs / outputs, as well as limit and reference switches, encoders and sensors incl. the 24 V_{DC} tap of MCM03 and/ MCM04 modules must not exceed the value of 5 A per total *phyMOTION*™.

Operating switches

- Remote/Local switch
- Reset button

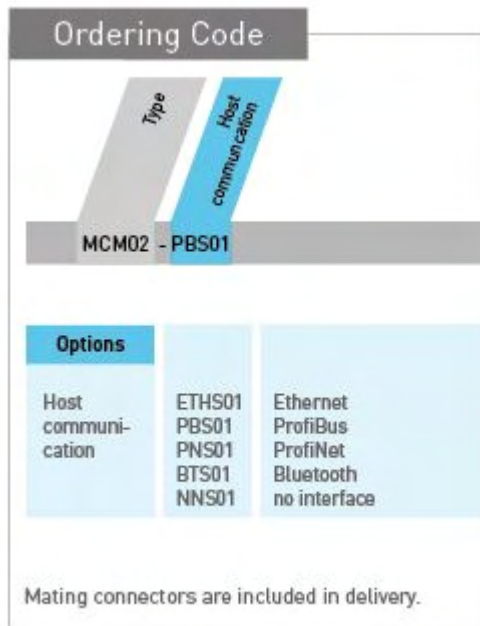
USB interface (mini USB connector)

Selectable communication interface:

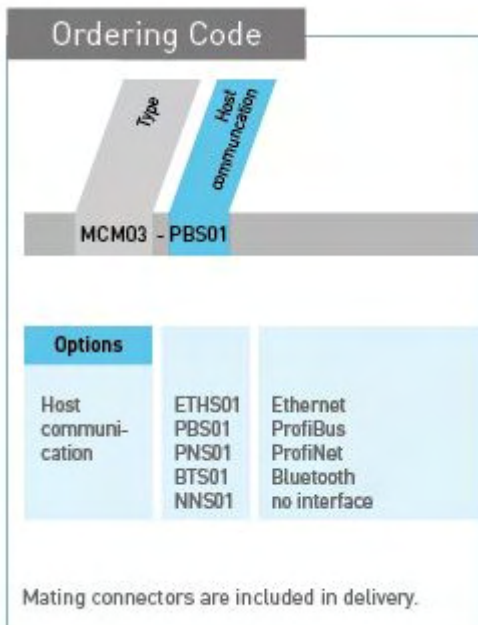
- Ethernet
- ProfiBus
- ProfiNet
- Bluetooth

Ordering code of the main controller module (MCM):

Ordering code (example): **MCM02-PBS01**



Ordering code (example): **MCM03-PBS01**



4 Technical Data

4.1 Declaration of Incorporation: Modules gen. and ext. Supply **EXT**



Declaration of Conformity according to EC directive 2004/108/EC (EMC-Directive)

Name and address of the manufacturer:

Phytron GmbH,
Industriestr. 12
82194 Gröbenzell

We declare that the following product is in conformity with the EC Directives 2004/108/EC relating to EMC.

Product denomination

Part-Name	Description
AIM01.1	Analog Input-Module
AIOM01.1	Analog I/O Module
AOM01.1	Analog Output-Module
APS01.1	High-End Stepper Motor Power Stage
CANS01.1	CAN Communication Sub Module
DIOM01.1	Digital I/O Module
DIOM0a.1	Digital I/O Module (customer-specific version)
ECAS01.1	SSI/ Quadratic Encoder Sensing Sub Module
ECES01.1	EnDat Encoder Sensing Sub Module
ECMS01.1	Resolver Evaluation Submodule
EXAM01.1	Indexer Interface Module
I1AM01.1	1-Axis Stepper Motor Drive
I1AM0a.1	1-Axis Stepper Motor Drive (customer-specific version)
I1AM0b.1	Indexer & Power Stage Carrier (cust)
I4XM01.1	4 Axes HighEnd Indexer
INAM01.1	Carrier Module for APS Power Stage
MCM01.1	Main Controller Module
MCM02.1	Main Controller & ext. Power Input
PBS01.1	Profibus Communication Sub Module
PNS01.1	ProfiNet Communication Sub Module
POWM01.1	Main Power Input Module
POWM02.1	Intermediate Power Input Module
RSS01.1	RS485/RS232 Communication Sub Module

From serial number 1506xxxxx

AP QS-0672-6
CE 7034 Rev.3

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Oberbank München - Kto. 1041021021 - BLZ 70120700
Volksbank Fürstenfeldbruck - Kto. 712531 - BLZ 70163370
Postbank München - Kto. 0286001800 - BLZ 70010080

Applied harmonized standards

- EN 61000-6-1: 2007-01 Electromagnetic Compatibility (EMC) - Immunity for residential, commercial and light-industrial environmental
- EN 61000-6-2: 2005-08 Electromagnetic compatibility (EMC) - Immunity for industrial environments
- EN 61000-6-3: 2007-01 Electromagnetic compatibility (EMC) - Emission standard for residential, commercial and light-industrial environments
- EN 61000-6-4: 2007-01 Electromagnetic compatibility (EMC) - Emission standard for industrial environments

Comment:

This declaration of conformity is valid only if the product is built in a suitable casing e.g. phyMOTION-6SL-MR-s.

Gröbenzell, 2015-06-25

Birgit Hartmann
Managing Director

4.2 Declaration of Incorporation: Modules with internal Supply **INT**



Declaration of Conformity according to EC directive 2004/108/EC (EMC-Directive) and EC directive 2006/95/EC (electrical equipment)

Name and address of the manufacturer:

Phytron GmbH,
Industriestr. 12
82194 Gröbenzell

We declare that the following product is in conformity with the EC Directives 2004/108/EC relating to EMC.

Product denomination

Part-Name	Description
NETM01.1	Power Supply Input 230V
POWM03.1	Main Power Input; int. Supply
POWM04.1	Secondary Power Input; int. Supply
MCM03.1	Main Controller & internal Supply
PEM01.1	Protective Earth Module
INAM02.1	High Performance Power Stage Carrier
MSXS01.1	Power Stage; 15A

From serial number 1506xxxxx

Applied harmonized standards

- EN 60664-1: 2008-01 Insulation coordination for equipment within low-voltage systems Part 1: Principles, requirements and tests
- EN 61000-6-1: 2007-01 Electromagnetic Compatibility (EMC) - Immunity for residential, commercial and light-industrial environmental
- EN 61000-6-2: 2005-08 Electromagnetic compatibility (EMC) - Immunity for industrial environments
- EN 61000-6-3: 2007-01 Electromagnetic compatibility (EMC) - Emission standard for residential, commercial and light-industrial environments
- EN 61000-6-4: 2007-01 Electromagnetic compatibility (EMC) - Emission standard for industrial environments

Comment:

This declaration of conformity is valid only if the product is built in a suitable casing e.g. phyMOTION-6SL-MR-s.

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CE 7049 Rev.1

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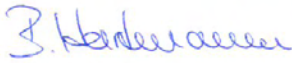
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phytron

Extreme. Precision. Positioning.

Gröbenzell, 2015-06-25



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4.3 Mechanical Data

Dimensions	100 x 100 mm (without front panel)
Weight	MCM02: 79 g without and 95 g with front panel MCM03: 74 g without and 90 g with front panel
Mounting	Plug-in module into the modular stepper motor controller <i>phy</i> MOTION TM
Mounting position	Vertical

4.4 Features

Features	
Power supply	<p>24...70 V_{DC} / max. 20 A (motor voltage U_B)</p> <p>+24 V_{DC} (±20 %) electrically isolated / max. 5 A (I/O supply)</p> <p>5 V_{DC} (powered internally by 24...70 V).</p> <p>MCM02 EXT</p> <p>24...70 V_{DC} / max. 20 A (motor voltage U_B)</p> <p>+24 V_{DC} (±20 %) electrically isolated / max. 5 A (I/O supply)</p> <p>5 V_{DC} (powered internally by 24...70 V)</p> <p>MCM03 INT</p> <p>Supply in the <i>phyMOTION</i>TM device</p> <p>+24 V_{DC} (±20 %) electrically isolated / max. 5 A (I/O supply)</p> <p>The total current at +24V_{DC} for all inputs / outputs, as well as limit and reference switches, encoders and sensors incl. the 24 V_{DC} tap of MCM03 and POWM04 modules must not exceed the value of 5 A per total <i>phyMOTION</i>TM.</p>
Potential separation	between 24...70 V _{DC} and 24 V _{DC} I/O
Current capacity	max. 20 A / U _B , max. 5 A / +24 V _{DC}
Current consumption (max.)	180 mA (logic voltage)
Power loss	1400 mW at U _B = 70 V
Over voltage protection	Transil diodes
Short circuit protection	Logic voltage (5 V): chip fuse 1 AT U _B : 2 x 10 A
Diagnostic	2 status LEDs on the front panel for diagnostic
Operating modes of the controller	<ul style="list-style-type: none"> • Remote • Local: Stand-alone device with sequence program
Refresh rate	2 ms

Interfaces	
24-70 V_{DC} Motor power supply (MCM02 EXT)	24 V _{DC} to 70 V _{DC} input range for the supply of the power stages and for generating the internal logic supply.
24 V_{DC} I/O power supply (MCM02 EXT)	Separate 24 V _{DC} for the supply of I/Os (e.g. digital inputs/outputs of the DIOM01), limit and reference switches (e.g. on the I1AM01, INAM01 and EXAM01).
24 V_{DC} Output voltage (MCM03 INT)	24 V _{DC} for connection of i.e. sensors The total current at + 24V _{DC} for all inputs / outputs, as well as limit and reference switches, encoders and sensors incl. the 24 V _{DC} tap of MCM03 and POWM04 modules must not exceed the value of 5 A per total <i>phyMOTION</i> TM .
USB	USB mini (female) for PC connection
Communication via backplane bus	Proprietary phytron bus
Bus connection host	Selectable host interface: Ethernet, ProfiBus, ProfiNet, Bluetooth

Communication and programming	
Programming	via phytron's programming environment <i>phyLOGIC</i> TM Toolbox
Communication	Master slave communication with all modules and interfaces of the <i>phyMOTION</i> TM .
Memory	Up to 4 MB
HMI	Internal interface for an integrated touch panel (TPM01) Bluetooth interface (BTS01 module) for operating an Android-based Tablet

4.5 Functional Description

System control

The MCM02 controls the complete program sequence and coordinates all the modules (master-slave communication, interrupt enabled), HMI and interfaces.

Power supply:

EXT MCM02:

- 24 to 70 V_{DC} supply voltage (for motors and generates internally the logic voltages) – max. 20 A
- Optional electrically isolated 24 V_{DC} for inputs/outputs, limit and reference switches

INT MCM03:

- 24V_{DC} output voltage
The total current at + 24V_{DC} for all inputs / outputs, as well as limit and reference switches, encoders and sensors incl. the 24 V_{DC} tap of MCM03 and POWM04 modules must not exceed the value of 5 A per total *phyMOTION*TM.

Communication module

The MCM02 can be expanded with a communication module containing either an Ethernet, ProfiNet, ProfiBus or USB interface (with electrically isolation).

Operation

- **Remote/Local** for switching the mode from **Remote** (controller receives the commands via HOST interface) to **Local** (the controller is running in pure stand-alone mode with a sequential program).
- **Reset button** for the resetting of the controller

5 Installation

5.1 Mechanical Installation of the MCM Modules

Phytron always delivers the **phyMOTION™** completely assembled in order to make sure you can start with the installation and the wiring right away.



Further manual

Detailed information on this subject is in a supporting manual:

*“**phyMOTION™** Modular Multi-axis Controller for Stepper Motors”*

You'll get the MCM only as a single module card, if you sent it to us for reasons of maintenance or repair.

In case you receive an individually packed MCM as an expansion module or after repair or service unpack the module in ESD protected area only.



CAUTION – Possible damage by ESD!

*The modules of the **phyMOTION™** consist of sensitive electronic components that can be destroyed by electrostatic discharge voltages.*

- Always store and transport single modules in ESD protective packaging.
- Always handle the components in compliance with the ESD protection measures.
- No liability is accepted for any consequences resulting from improper handling or non-ESD-friendly packaging.

The MCM module is inserted always at the first position in the rack.

Before integrating or switching modules always make sure that the **phyMOTION™** is shut down and the power supply is disconnected.



WARNING – Serious injury from electric shock!

During electrical installation cables, connectors, etc. can be live.

- Before starting wiring, make sure that none of the power supplies are connected to the primary side of the mains supply. Isolate the power supplies from the mains or remove the appropriate fuses.
- All modules must be inserted and screwed into the **phyMOTION™** housing before powering up. If necessary, unoccupied module slots must be covered with the supplied blank front plates. Never operate the equipment when open.
- Do not plug or unplug the modules while powered.
- Do not plug or unplug the connectors while powered.
- If the equipment was energised, wait 3 minutes after power off to allow the capacitors to discharge and ensure that there are no residual charges on cables, connectors and boards.

Make sure not to leave free slots in between modules so the module addressing sequence can work correctly.

Push the module carefully into the guide rail until the rear contacts the housing's frame of the **phyMOTION™**.

In the last few millimetres the module's plug has to match with the backplane's socket. You should be able to push in the module with light pressure. In case you experience problems move the module's front plate slightly to the left and to the right while pushing in the module, so that the plug's pins can slide into the backplane's socket.

As soon as the module's front plate contacts the housing's frame the module is integrated properly and can be fixed with two electro-conductive bolts.

Now you can start with the electrical installation.

5.2 Electrical Installation

Ensure sufficient bending radius of the cables during installation. Do not lay the cables in tension or bend them.

We recommend labelling the mating connectors to prevent interchanging the connectors.

If all the connections are made, the last step is to plug in the power supply to the mains.

5.2.1 Connectors - Overview

Modul type	Connector	Number of pins	Connector on the module (Phoenix)	Mating connector (Phoenix)	Mating connector ID number
MCM02	+(24...70) V Supply	1x2	PC4/2-G-7,62	PC4/22-ST-7,62	10014443
	+24 V Supply	1x2	MCDN1,5/2-G1-3,5P26	FMC1,5/2-ST-3,5	10007077
MCM03	+24 V Supply	1x2	MCDN1,5/2-G1-3,5P26	FMC1,5/2-ST-3,5	10007077

The mating connector is included in delivery of the module and is usually plugged into the module at the factory.

5.2.2 Connection Plan for ProfiBus

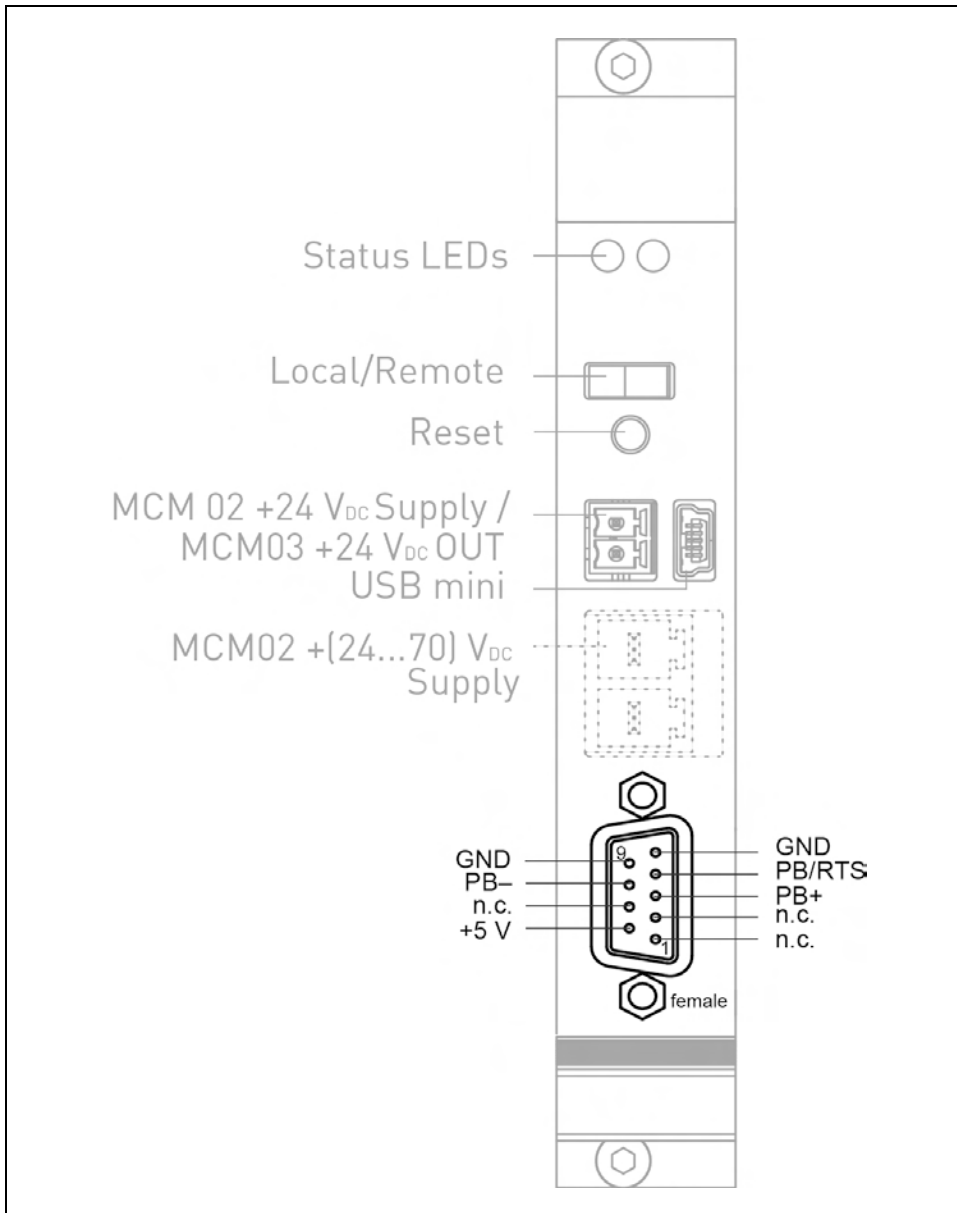


Fig. 2: Pin assignment ProfiBus (female)

For ProfiBus communication use a commercially available 9-pin D-SUB connector.

5.2.3 Connection Plan for ProfiNet/Ethernet

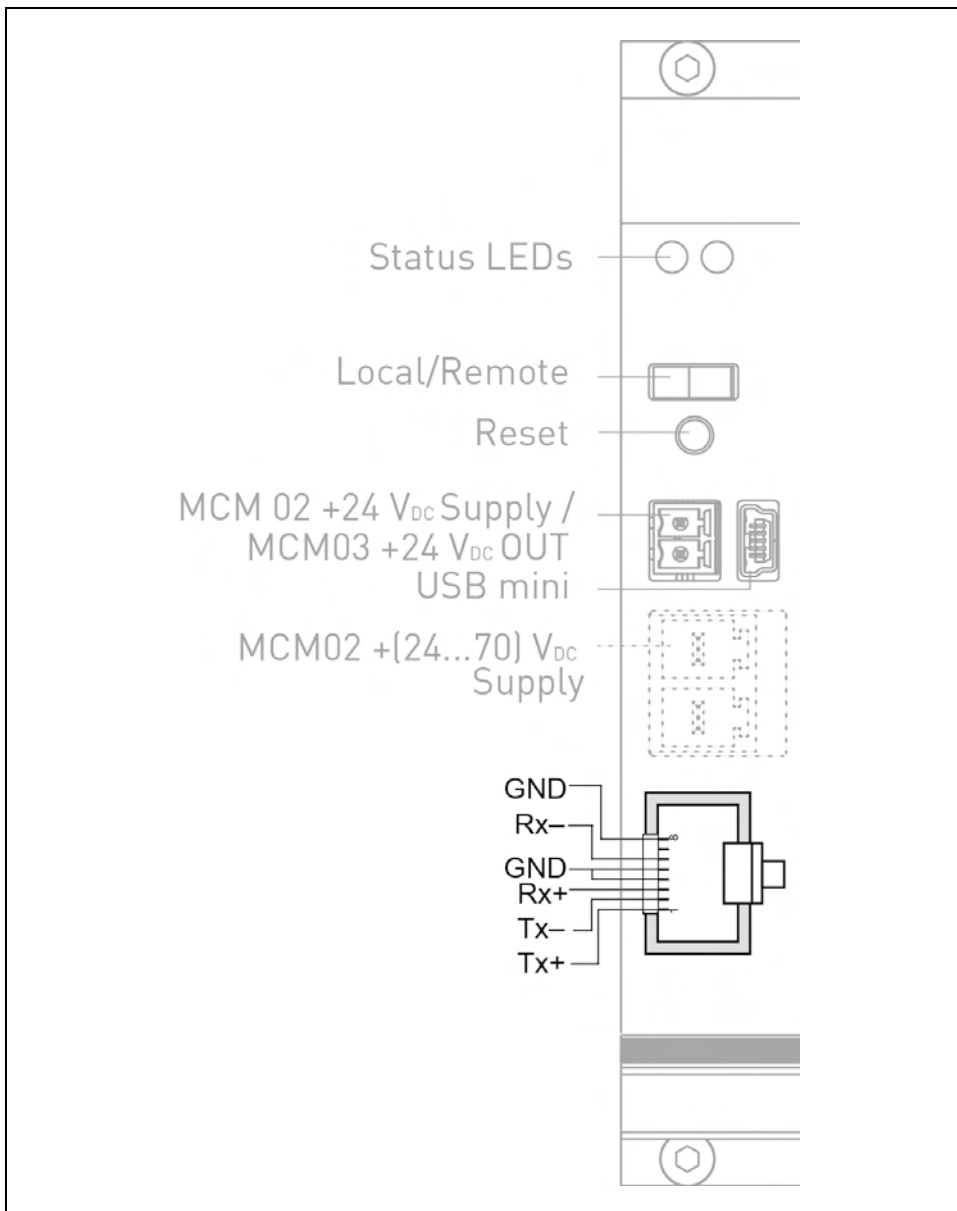


Fig. 3: Pin assignment Ethernet/ProfiNet

ProfiNet and Ethernet hosts are connected with commercially available cable with RJ 45 connectors.

5.2.4 Connection Plan for USB Interface

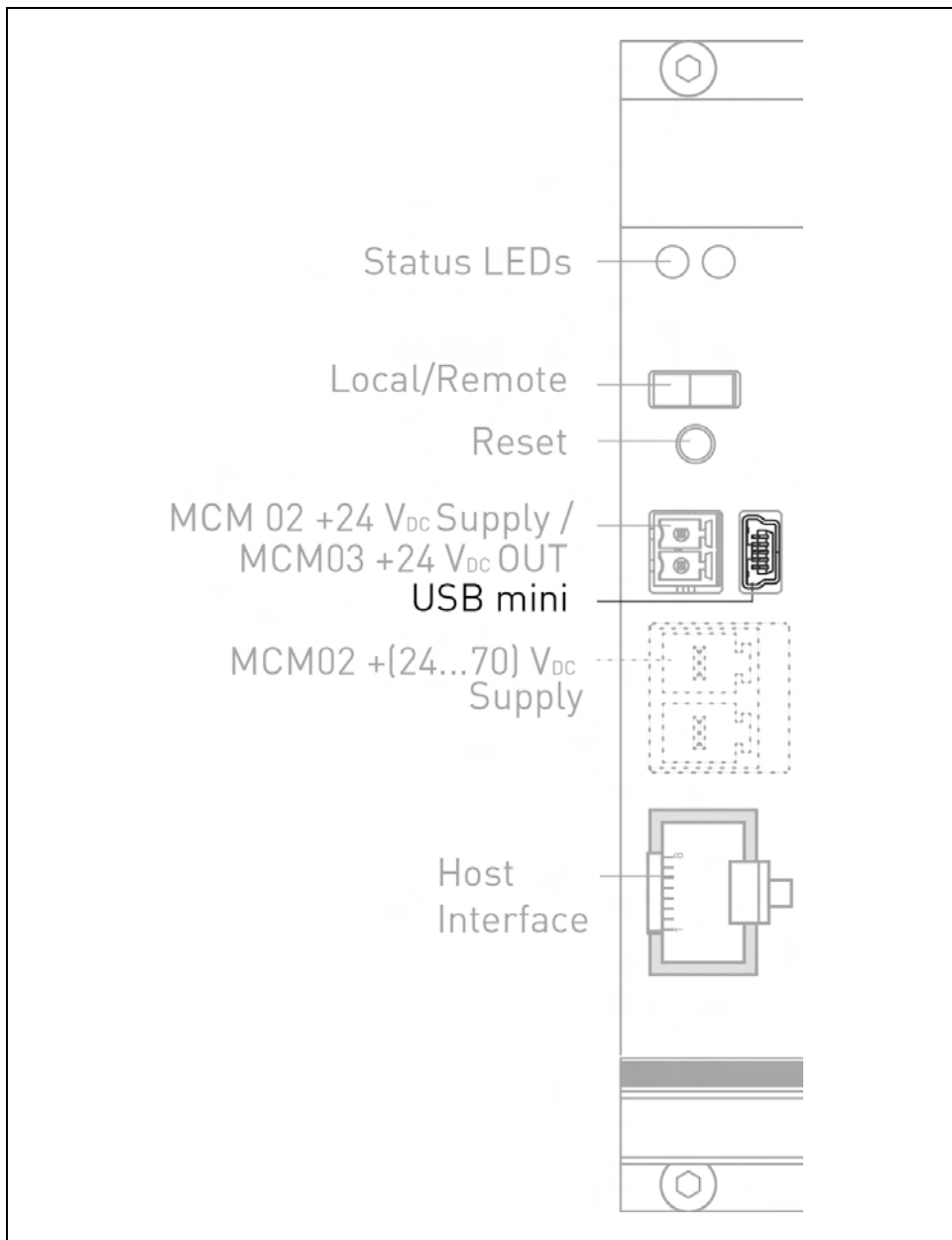


Fig. 4: Pin assignment USB

USB host is connected with commercially available cable with USB B-A connectors.

6 Commissioning

Please read the manual for basic commissioning information of the MCM02 module:



Further manual

Detailed information on this subject is in a supporting manual:

“**phyMOTION**TM Modular Multi-axis Controller for Stepper Motors”

The programming environment **phyLOGIC**TM ToolBox is explained in the following manual:



Further manual

Detailed information on this subject is in a supporting manual:

“**phyLOGIC**TM ToolBox – Communication Software for the
phyMOTIONTM Stepper Motor Controller”

For programming the sequential program please read:



Further manual

Detailed information on this subject is in a supporting manual:

“**phyLOGIC**TM Command Reference for the **phyMOTION**TM Controller”

6.1 REMOTE/LOCAL-Switch R/L

The mode can be selected with the REMOTE/LOCAL switch:

REMOTE:



The controller is connected via an interface with the PC. In this mode user-created programs can be transferred to the controller and back. It is possible to test individual commands in the REMOTE mode or to drive the motor for test purposes via **phyLOGIC**TM ToolBox.

LOCAL:



Switching to LOCAL starts the stored program automatically. The program must be in the start up tab.

- a) The program is executed without connecting to a computer.
- b) Program execution with connection to an external computer: During the program sequence you can access it on the external computer to exchange current data.

6.2 Reset button

The reset button on the Remote/Local switch is recess mounted in order to prevent unintentional activation. The Reset resets any error messages.

6.3 Diagnostics by the LEDs

The LEDs indicate the status and error of the MCM02 module by colours and blinking:

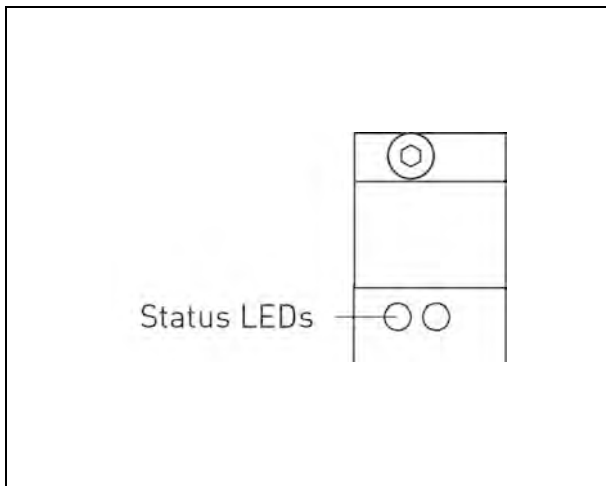


Fig. 5: Status-LEDs

LEDs	left	right
off	–	No program active
green	System o.k., ready	Program active
red	Administration necessary	Program failure
orange	Booting (addressing is running...)	–

7 Service

In case of a service contract, please proceed as follows:

First try to identify the technical problem and document the fault. Feel free to ask our support team for help. We are pleased to assist you: tel. 0049-8142-503252 (local rate).

Removal of a module:

- Switch off the *phyMOTION*TM's supply voltage
- Disconnect the supply voltage
- Cut the red seal tape and the black label tape carefully on the left and right edge of the module/front panel which you want to remove. Don't slide the blade between the front panels by no means. When backfitting by our service the red seal tape is renewed.
- Loosen the screw on top and the screw on the bottom of the module's front plate
- Pull the card carefully by the handle.
- If you want to use the *phyMOTION*TM after removing a module, the gap has to be sealed with a blanking plate before power supply is reconnected and switched on.
- To send a module to phytron use ESD packaging only.

8 Warranty, Disclaimer and Registered Trademarks

8.1 Disclaimer

Phytron GmbH has verified the contents of the manual to match with the hardware and software. However, errors and omissions are exempt and Phytron GmbH assumes no responsibility for complete compliance. The information contained in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

8.2 Warranty

The *phyMOTION*[™] modules are subject to **legal warranty**. Phytron will repair or exchange devices which show a failure due to defects in material or caused by the production process. This warranty does not include damage caused by the customer, for example, not intended use, unauthorized modifications, incorrect handling or wiring.

8.3 Registered Trademarks

In this manual several trademarks are used which are no longer explicitly marked as trademarks within the text. The lack of these signs may not be used to draw the conclusion that these products are free from third parties' rights. For example, some product names used herein are:

- *phyMOTION*[™] is a trademark of Phytron GmbH.
- *phyLOGIC*[™] is a trademark of Phytron GmbH.
- Microsoft is a registered trade mark and WINDOWS[®] is a trade mark of the Microsoft Corporation in the USA and other countries.

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