

*phy***MOTION™**

## **Analogue I/O Module**

### **AIOM01 / AIM01 and AOM01**

#### **Firmware Version:**

<b>V1.0.01 (Loader)</b>
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<b>V1.0.0 (System)</b>
------------------------

#### **Hardware Version:**

<b>AIOM01 V1.0 (F)</b>
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<b>AIM01 V1.0 (F)</b>
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<b>AOM01 V1.0 (F)</b>
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**TRANSLATION OF THE ORIGINAL GERMAN MANUAL**

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Intention of the manual:

In this manual you will find descriptions and specifications of the *phyMOTION*<sup>TM</sup> module:  
Analogue Input- and Output module AIOM01 / AIM01 / AOM01

Digital Input and Output Module DIOM01/DIOM0a.

This manual is a supplementary volume to the operating instructions  
*phyMOTION*<sup>TM</sup> *Modular Multi-axis Controller for Stepper Motors*

In the manual *phyMOTION*<sup>TM</sup> *Modular Multi-axis Controller for Stepper Motors*  
(<http://www.phytron.de/phyMOTION>) are the descriptions of the features and specifications  
for the *phyMOTION*<sup>TM</sup> stepper motor controller.

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.

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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.eu/>) in your local agencies

# 1 Legal Instructions

**i** 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:

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

## 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*<sup>TM</sup> 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 Module Overview AIOM01 / AIM01 / AOM01

AIOM stands for „Analogue Input Output Module“ and is used in the modular stepper motor controller *phyMOTION*<sup>™</sup>. The analogue IO module is controlled by the main controller module (MCM) and depending on the equipment version, it contains 4 of both analogue, electrically isolated **inputs and outputs (AIOM01)**; only **4 analogue inputs (AIM01)**; or only **4 analogue outputs (AOM01)**.

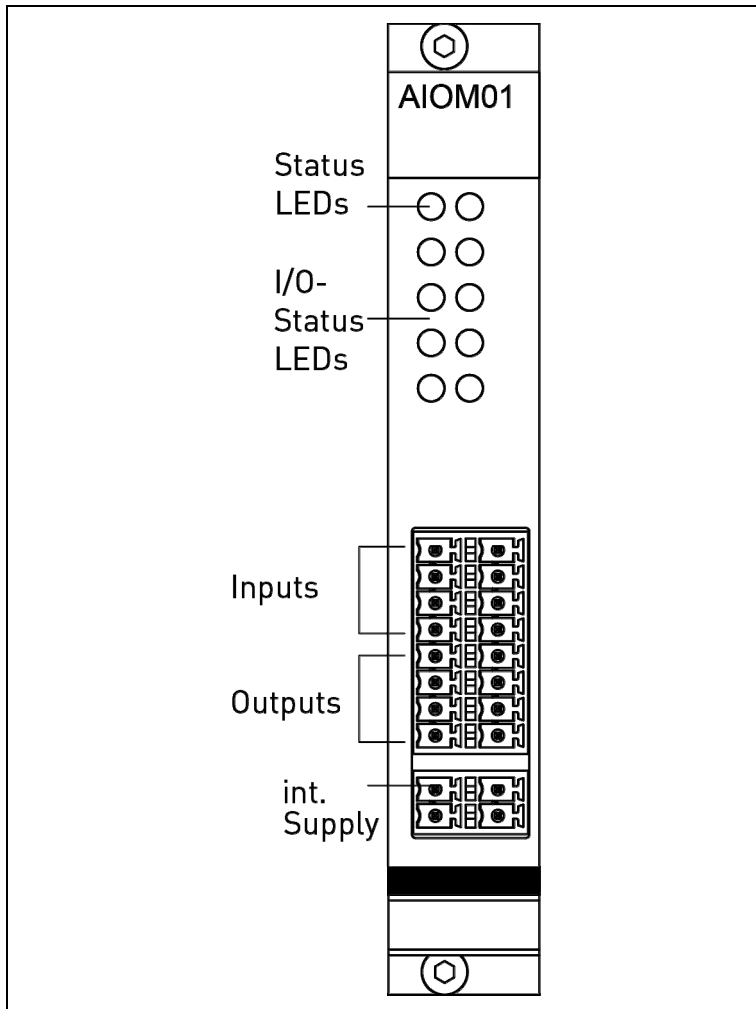


Fig.1 AIOM01 front view

**The inputs or outputs are defined as follows:**

- 4 analogue inputs:  $\pm 10$  V bipolar, 0...10 V, 0...20 mA  
 resolution: 14 bit  
 sampling: 416 Hz  
 electrically isolated
- 4 analogue outputs:  $\pm 10$  V bipolar, 0...10 V, 0...20 mA  
 resolution: 16 bit  
 short circuit proof (voltage output), max. output current 16 mA  
 thermal overload protection  
 electrically isolated

## 4 Technical Data

### 4.1 Declaration of Conformity



### 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
EXAM01.1	Indexer Interface Module
I1AM01.1	1-Axis Stepper Motor Drive
I1AM02.1	Indexer and Carrier Module for APS Power Stage
I1AM0a.1	1-Axis Stepper Motor Drive (customer-specific version)
I4XM01.1	4 Axes HighEnd Indexer
INAM01.1	Carrier Module for APS Power Stage
MCM01.1	Main Controller Module
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 1402xxxxx

**Applied harmonized standards**

- EN 61000-6-1: 2007-01 Electromagnetic Compatibility (EMC) - Immunity for residential, commercial and light-industrial environmental

AP QS-0672-4  
CE 7034 Rev. 2

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Postbank München - Kto. 0286001800 - BLZ 70010080



- 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 device is built in a suitable casing e.g. phyMOTION-6SL-MR-s.

Gröbenzell, 2014-02-27



Johannes Schmid  
Technical Director

### 4.2 Mechanical Data

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<b>Dimensions</b>	100 x 100 mm (without front panel)
<b>Weight</b>	66 g / 87 g (without / with front panel)
<b>Mounting</b>	Plug-in module into the modular stepper motor controller <i>phyMOTION</i> <sup>TM</sup>
<b>Mounting position</b>	Vertical

### 4.3 Features

Performance Characteristics	
<b>Superior controller</b>	Modular controller <i>phyMOTION</i> <sup>TM</sup>
<b>Supply voltage</b>	24 V <sub>DC</sub> internal via central supply point at thePOWM01 or POWM02 module
<b>Current consumption maximum</b>	75 mA at 5 V <sub>DC</sub> internal 5 mA at 24 V <sub>DC</sub>
<b>Cable length – analogue inputs / outputs</b>	30 m; if longer (100 m max.) use shielded cable and connect shield close to the controller.
<b>Status LEDs</b>	see chap. 6.1

<b>Interfaces</b>	
<b>4 analogue outputs</b>	O1 to O4 output level: $\pm 10$ V bipolar, 0...10 V, 0...20 mA (tolerance 0.5 %: $\pm 0.05$ V, $\pm 0.1$ mA) max. output current: 16 mA (in the voltage mode) resolution: 16 Bit short circuit proof thermal overload protection max. switching frequency: 1 kHz
<b>4 analogue inputs</b>	I1 to I4 input level: $\pm 10$ V bipolar, 0...10 V, 0...20 mA (tolerance 0.5 %: $\pm 0.05$ V, $\pm 0.1$ mA) resolution: 14 Bit sampling: 416 Hz electrically isolation
<b>I/O supply</b>	$\pm 15$ V, +5 V
<b>Communication via backplane bus</b>	Proprietary phytron bus
<b>Communication and Programming</b>	
<b>Programming</b>	Via phytron's programming environment <i>phyLOGIC</i> <sup>TM</sup> ToolBox
<b>Communication</b>	Master-slave communication. The AIOM01, AIM01 or AOM01 is slave and communicates with the MCM01 main controller module.

## 5 Installation

### 5.1 Mechanical Installation of the AIOM01 module

Phytron always delivers the *phyMOTION*<sup>™</sup> 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<sup>™</sup> Modular Multi-axis Controller for Stepper Motors”*

In case you receive an individually packed AIOM01 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<sup>™</sup> 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.

Identify the correct slot position for your AIOM01 module referring to your order and documentation – the AIOM01 needs a POWM01 power supply module and the MCM main controller module.

Before integrating or switching modules always make sure that the *phyMOTION*<sup>™</sup> is shut down and the power supplies are 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*<sup>TM</sup> 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 sandwich module carefully into the guide rail until the rear contacts the housing frame of the *phyMOTION*<sup>TM</sup>.

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

Connector	Number of pins	Connector on the module (Phoenix)	Mating connector (Phoenix)	Mating connector ID number
I/Os	2x8	MCDN1,5/8-G1-3,5P26	FMC1,5/8-ST-3,5	10005881
Power supply	2x2	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 Pin Assignment

In the following the pin assignment:

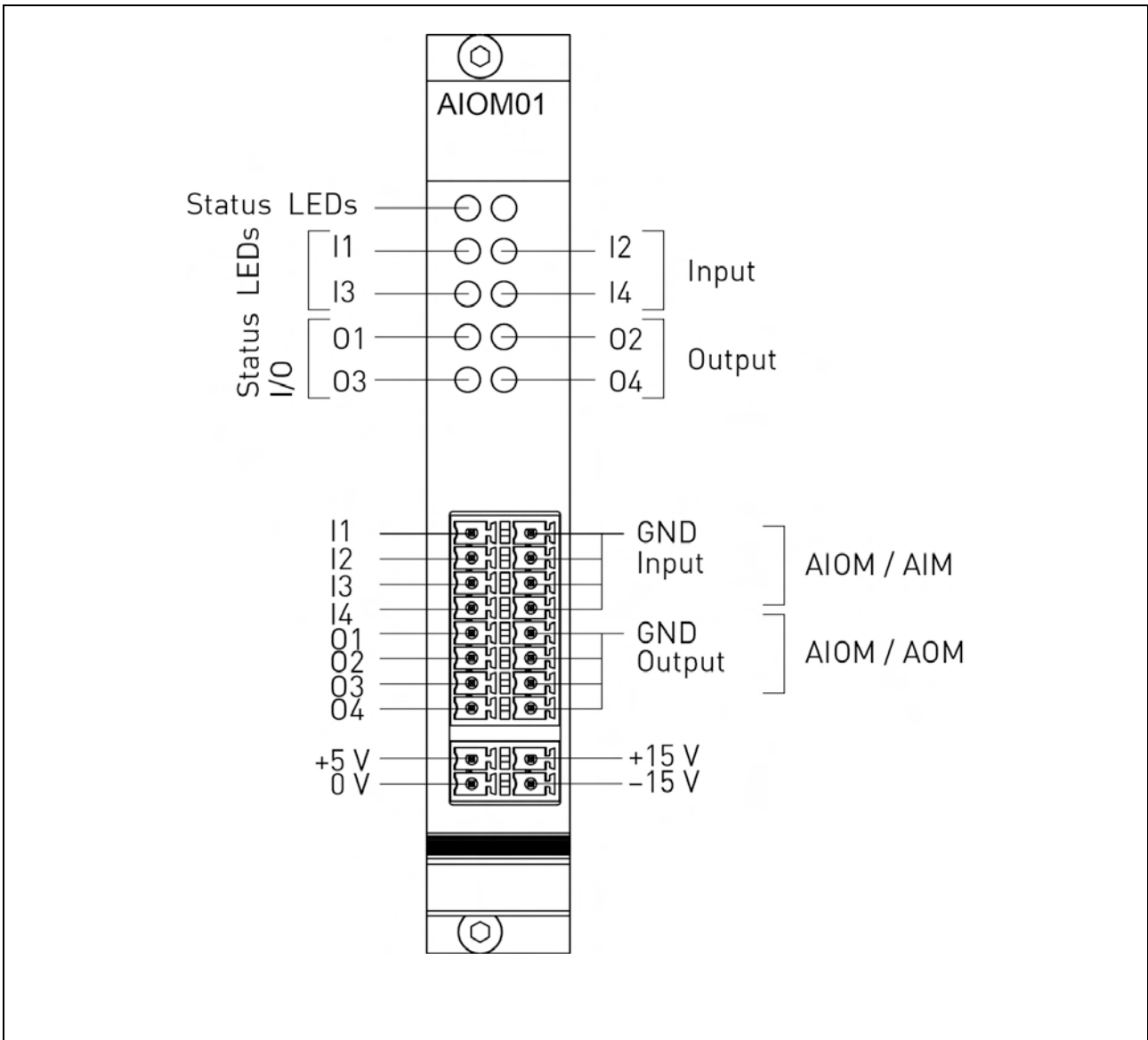


Fig.2 Pin assignment

Use the specified mating connectors for wiring.



### 5.2.3 Input Wiring (AIOM / AIM)

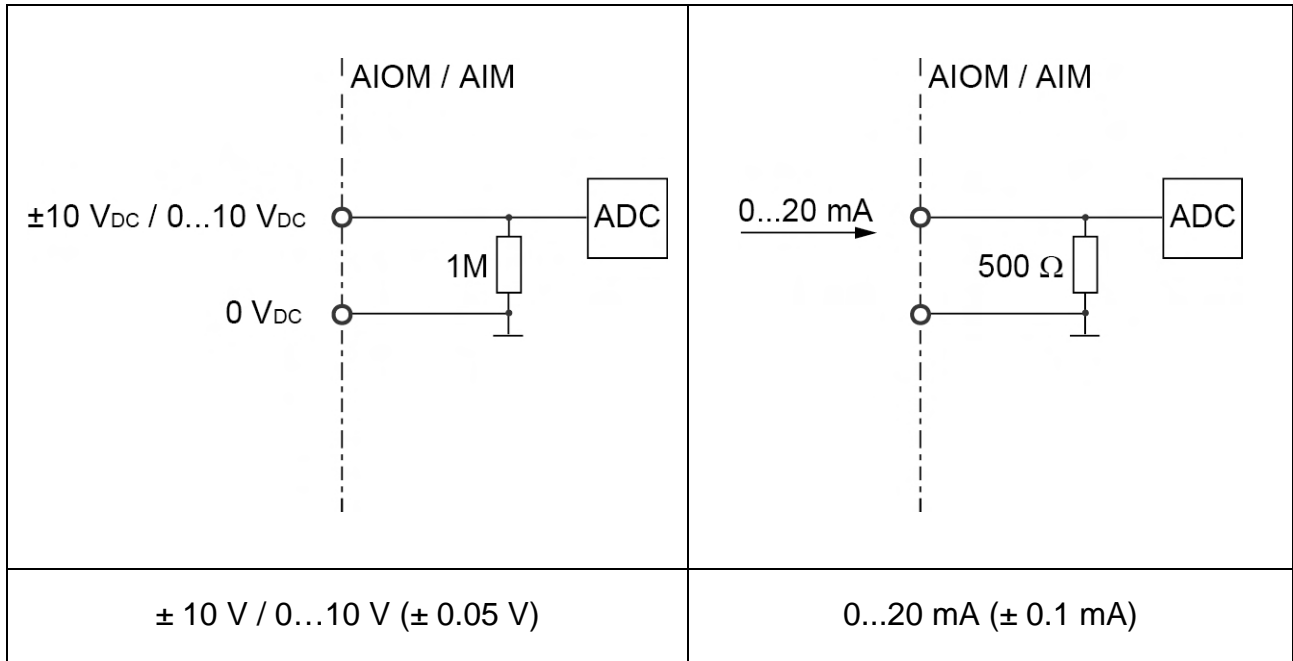


Fig.3 Input wiring

### 5.2.4 Output Wiring (AIOM / AOM)

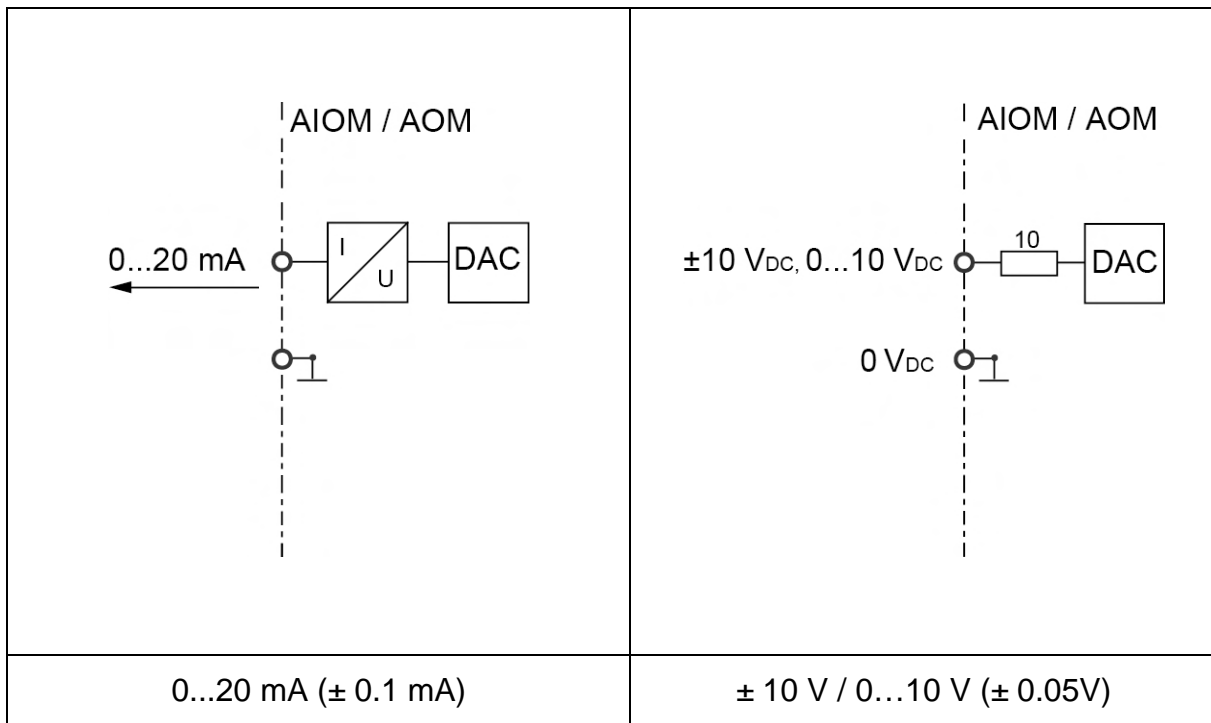


Fig.4 Output wiring



### **CAUTION – Possible damage!**

*Damage of the module by wrong connection.*

- Do not exchange the 8 pin limit switch connector with the 8 pin connector for the encoder evaluation.

## 6 Commissioning

Please read the manual for basic commissioning information of the AIOM01 module:



### Further manual

*Detailed information on this subject is in a supporting manual:*

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

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



### Further manual

*Detailed information on this subject is in a supporting manual:*

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

For programming the sequential program please read:



### Further manual

*Detailed information on this subject is in a supporting manual:*

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



### CAUTION – Possible damage!

*Some modules are set to a default value on delivery. So e.g., the motor current must be set to the corresponding value (see the motor data from the motor manufacturer). Connected components like motors can be damaged by incorrectly set values.*

- Please check if the parameters are correct before starting.

## 6.1 Diagnostics by the LEDs

The LEDs indicate the status of the AIOM module by colour and blinking:

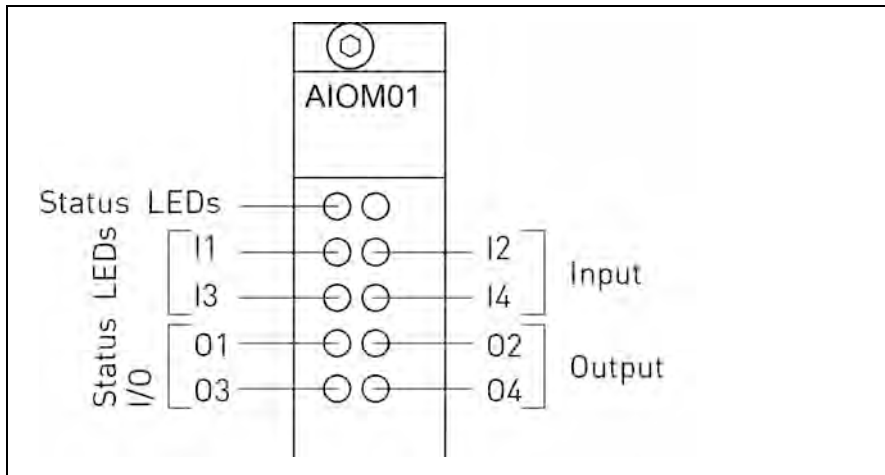


Fig.5 Status LEDs

	Status LEDs		Status LEDs I/O
	Top left	Top right	
<b>off</b>	No power supply available		I/Os not active
<b>green</b>	Isolated supply: OK	OK	output O1 to O4 lights up when 25 % of the output value are reached.
<b>red</b>	–	Slowly blinking ( $\approx 2$ Hz): module is not addressed Fast blinking ( $\approx 5$ Hz): error	input I1 to I4 lights up when 25 % of the input value are reached.

## 6.2 Parameterising the Module

The following parameterising is necessary for the AIOM01 module:

<b>Inputs</b>	Current or voltage input
	Unipolar 0..10 V Bipolar $\pm 10$ V
<b>Outputs</b>	Voltage output
	Unipolar 0...10 V Bipolar $\pm 10$ V
	Current output: unipolar

Information about AD converter you'll find in the following manual:



### Further manual

*Detailed information on this subject is in a supporting manual:*

*“**phyLOGIC**<sup>TM</sup> Command Reference for the **phyMOTION**<sup>TM</sup> Controller”*

### 7 Service

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First try to identify the technical problem. Feel free to ask our support team for help we are pleased to assist you.

#### Removal of a module:

- Switch off the *phyMOTION*<sup>TM</sup>'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. Do not slide the blade between the front panels at any time. When refitted 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*<sup>TM</sup> after removing a module, the gap has to be covered 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

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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

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The *phyMOTION*<sup>™</sup> 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, unauthorised modifications, incorrect handling or wiring.

### 8.3 Registered Trademarks

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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 of rights of third parties. Some product names used herein are for instance.

- *phyMOTION*<sup>™</sup> is a trademark of the Phytron GmbH.
- *phyLOGIC*<sup>™</sup> is a trademark of the 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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