**phyMOTION™**

Modular multi-axes controller for stepper motors

The phyMOTION™ combines PLC and motion control functions into a flexible and convenient framework for multi-axis stepper motor applications. The free software phyLOGIC™ Toolbox, the LabVIEW interface, the Android-based touch interface (internal/external) and the open protocol for controller drive and parameterising create additional scope for development. The integrated, high resolution power stages up to 15 A_{peak} at 120 V_{DC} simplify the wiring significantly.

**Designed for Industry 4.0**

The phyMOTION™ can be operated below existing PLC systems as a slave system, as distributed intelligence or as a stand-alone motion control solution. Online parameterising and diagnostics are also standard feature as limit switch/reference switch inputs per axis. Each axis can be expanded with encoder (Endat, SSI-Quadrature) and temperature evaluation. Besides standard PLC functions such as analogue and digital I/Os, a variety of interfaces (Ethernet, Profinbus, Profinet, RS232/485, USB) the phyMOTION™ also provides linear and circular interpolation.

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### In 4 steps to your stepper motor controller

1. **Choose the phyMOTION™ type**

<table>
<thead>
<tr>
<th>External</th>
<th>Integrated</th>
</tr>
</thead>
<tbody>
<tr>
<td>4SL-s, 8SL-s, 10SL-s or 21SL-s</td>
<td>Rack, wall, rail mounting or bench</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Supply / Mains connection</th>
<th>Housing width</th>
<th>Touch Panel</th>
<th>Type of mounting</th>
<th>Supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal 115 V_{AC} to 230 V_{AC}</td>
<td>215L-p</td>
<td>Integrated</td>
<td>Bench, rack or rack-inverse</td>
<td>POWM03+MCM03 or MCM03</td>
</tr>
</tbody>
</table>

*) 3 supply modules 500 W each can be combined, also with different motor voltages (48 V, 70 V, 120 V).

2. **Define host interface:** Ethernet, Profinbus/Profinet, RS 485, RS 232, RS 422

3. **Select the modules**

4. **Order and receive the fully assembled phyMOTION™**

Any questions? Please call us! Together we will find your desired configuration: 0049-8142-503250
Module selection for your phyMOTION™

To make the module selection as comfortable as possible, we coded the modules by main and auxiliary functions.

**CPU**

This main function is included in the respective module.

**CPU**

The main function is not available in the respective module.

**I/O D**

Auxiliary functions are shown only if the module supports them.

* means the main or auxiliary function is selectable as option.

<table>
<thead>
<tr>
<th>Main functions</th>
<th>CPU</th>
<th>INDEX</th>
<th>POWER STAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>The CPU contains intelligent processors and can execute the total sequential programs and enable phyMOTION™ to drive in stand-alone mode.</td>
<td></td>
<td>The INDEXER represents the functionality to generate signals from commands of a programming language, which the power stage can amplify. Normally, the signal is control pulses/direction or SIN/COS.</td>
<td><strong>POWER STAGE</strong> represents a stepper motor amplifier. Incoming control pulses/direction or SIN/COS signals are amplified and output to the motor.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Auxiliary functions</th>
<th>ENC</th>
<th>TEMP</th>
<th>I/O D</th>
<th>I/O A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Encoder evaluation</td>
<td>Power distribution</td>
<td>Motor temperature evaluation</td>
<td>Digital inputs and/or outputs</td>
<td>Analogue inputs and/or outputs</td>
</tr>
<tr>
<td>POW IN</td>
<td>COM</td>
<td>SAFETY</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Options for your phyMOTION™

Options are available for the main or auxiliary functions. The following overview will make the option selection as easy as possible:

**POWER STAGE**

• APS power stage [APS01]:
  - step frequency up to 500,000 steps/sec.
  - up to 5 $A_{PEAK}$ at 24 to 70 VDC (Derating dep.on application)
  - precision up to 1/512 step resolution
  - Sinusoidal current curve
  - Overdrive function (a motor independent compensation of the phase current decrease in the upper speed range)

• LPS power stage [LPS01]:
  - step frequency up to 250,000 steps/sec.
  - up to 9 $A_{PEAK}$ at 24 to 70 VDC (Derating dep.on application)
  - precision up to 1/256 step resolution
  - Sinusoidal-like current curve

**ENC**

• Option selectable encoder evaluation

<table>
<thead>
<tr>
<th>Encoder type</th>
<th>supply</th>
<th>resolution</th>
<th>supported types</th>
<th>option (submodule)</th>
</tr>
</thead>
<tbody>
<tr>
<td>differential</td>
<td>5 V / 5.5 V, 500 mA</td>
<td>21³</td>
<td>Quadrature with zero track</td>
<td><strong>ECAS01</strong></td>
</tr>
<tr>
<td>SSI</td>
<td>5 V / 5.5 V, 500 mA</td>
<td>21¹</td>
<td><strong>SSI</strong></td>
<td>✓</td>
</tr>
<tr>
<td>BiSS</td>
<td>5 V / 5.5 V, 500 mA</td>
<td>21¹</td>
<td>BiSS-C BiSS-B</td>
<td>✓</td>
</tr>
<tr>
<td>EndDat</td>
<td>5 V / 5.5 V, 500 mA</td>
<td>21¹</td>
<td>Endat 01 02 21 22 T</td>
<td>✓</td>
</tr>
<tr>
<td>Resolver</td>
<td>5 to 10 Vrms, 1 to 10 kHz</td>
<td>2³</td>
<td>Resolver 6-wire LVDT / RKVT 6-/5-/6-wire</td>
<td>✓</td>
</tr>
</tbody>
</table>

**TEMP**

• Option selectable motor temperature evaluation

  • with KTS01 submodule: the stepper motor temperature is evaluated with the metall thermocouple type K by comparison measurement
  • with PTS01 submodule: the stepper motor temperature measurement with the Pt resistor sensors
Housing and Supply

Housing types of the phyMOTION™:

- Rack mounting (connection side is the front)
- Wall mounting or rack-inverse (like rack mounting, but connection side is back)
- Bench or rail mounting

### Housing depth / current supply

<table>
<thead>
<tr>
<th>Type</th>
<th>Slots</th>
<th>U</th>
<th>Width</th>
<th>Height</th>
<th>Depth</th>
<th>Mounting</th>
</tr>
</thead>
<tbody>
<tr>
<td>s / external or s / internal</td>
<td>6</td>
<td>24</td>
<td>137</td>
<td></td>
<td></td>
<td>R/W/MR/D</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>32</td>
<td>177.6</td>
<td></td>
<td>121</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>40</td>
<td>218.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>21</td>
<td>84</td>
<td>442.4</td>
<td>132.5</td>
<td>360</td>
<td>R/R/D</td>
</tr>
</tbody>
</table>

### Options

- number of slots: 6SL, 8SL, 10SL, 21SL
- mounting: W, MR, R, D
- housing depth: s, small, p / power, p / internal, X / customer demand

Dimensions in mm
Mounting bracket for rack, rack-inverse or wall mounting: +40.6 mm

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**Main Supply (POWM01)**

The beginning of each phyMOTION™:

- **Main supply:**
  - 24 to 70 VDC supply voltage (for motors and generates internally the logic voltages) – max. 20 A
  - Electrically isolated 24 VDC for inputs/outputs, limit and reference switches
- **Configuration**
  - USB interface for programming and diagnostics
  - Device address switch
  - Reset key
  - Connection of an external Phytron touch panel
- **The external supply must be designed for the required current (e.g. by the PS5-48 power supply unit).**

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**Ordering Code**

- **POWM01**
- Mating connectors are included in delivery.
Intermediate Supply (POWM02)

- Maximum 20 A per supply
- 24 to 70 VDC supply voltage (for motors and generates internally the logic voltages) – max. 20 A
- Electrically isolated 24 VDC for inputs and outputs, limit and reference switches
- The external supply must be designed for the required current (e.g. by the PSS-48 power supply unit).

Main Supply (POWM03)

- Configuration
  - USB interface for programming and diagnostics
  - Device address switch
  - Reset key
  - Connection of the external Phytron touch terminal (TPE)
  - 24 VDC output (for e.g. sensors)

Intermediate Supply (POWM04)

- Maximum 20 A for subsequent power stages (except MSX)
  - 48 to 70 VDC Power supply (for motors and generates internally the logic voltages) – max. 20 A
  - 24 VDC output (for e.g. sensors)
115 to 230 V Power Supply (NETM02)

External mains voltage (115 V to 230 V)
- Mains switch
- 115 V to 230 V mains voltage
- Internal supply of the phyMOTION™ with motor and logic voltage
- Per 500 W defined motor voltage (max. 3)

Supply of the Intermediate Circuit Voltage (SUPM)

Power supply for intermediate circuit voltage (24, 48, 70 and 120 V DC)
- Generates the internal supply of the phyMOTION™ with motor and logic voltage from the mains voltage
- Options depend on housing depth:
  - SUPM02, 04 and 07 (with front panel) with housing depth s
  - SUPM08 and 12 (without front panel) with housing depth p

External Power Supply Unit (SPH)

Compatible Power Supply Unit (5 to 20 A)
- Mains supply voltage 115 / 230 V AC
- Internally fused mains input
- Output voltage:
  - 24 V DC (10 A / 20 A), 48 V DC (5 A / 10 A / 20 A), 72 V DC (6.7 A / 13.5 A)
- Permanently short circuit-proof output
- Overvoltage protection primary and secondary side
- Overtemperature protection
- Integrated fan
- Dimensions (WxHxD): SPH240: 45 x 125 x 121, SPH500: 82 x 125 x 121, SPH1013: 66 x 230 x 183
- DIN rail or wall

Mating connectors are included in delivery.
Main Controller (MCM01)

CPU with host interface:
- Main CPU:
  - Controls and administers up to 64 modules
  - Program and register memory up to 4 MB
  - Internal memory expandable with future memory modules
  - Script program administration
  - Firmware administration
  - Elegant programming with phyLOGIC™ and G-Code

- Selectable communication interface:
  - Ethernet
  - ProfiBus/ProfiNet
  - RS 485, RS 232, RS 422

Ordering Code

Options
- Ethernet
- ProfiBus
- ProfiNet
- RS 232 or RS 485/422

Mating connectors are included in delivery.

Main Controller and Supply (MCM02)

CPU with host interface and supply:
- Main CPU:
  - Controls and administers up to 64 modules
  - 24 to 70 VDC supply voltage
  - Mini USB interface
  - Program and register memory up to 4 MB
  - Internal memory expandable with future memory modules
  - Script program administration
  - Firmware administration
  - Elegant programming with phyLOGIC™

- Selectable communication interface:
  - Ethernet
  - ProfiBus/ProfiNet

Ordering Code

Options
- Ethernet
- ProfiBus
- ProfiNet
- RS 232 or RS 485/422

Mating connectors are included in delivery.

Main Controller and Supply (MCM03)

CPU with host interface for internal supply:
- Main CPU:
  - Controls and administers up to 64 modules
  - Program and register memory up to 4 MB
  - Internal memory expandable with future memory modules
  - Script program administration
  - Firmware administration
  - Elegant programming with phyLOGIC™

- Selectable communication interface:
  - Ethernet, ProfiBus

- 24 VDC output (for e.g. sensors)

Ordering Code

Options
- Ethernet
- ProfiBus
- ProfiNet

Mating connectors are included in delivery.
Power Stages and Indexer

1 Axis Stepper Motor Drive I1AM01 or I1AM02

Indexer with integrated 3.5 A power stage (I1AM01) or selectable power stage (I1AM02)

- Integrated indexer for standard functions:
  - Relative and absolute positioning
  - Reference movements/speed mode
  - Selectable step frequency up to 40,000 steps/second
- I1AM01: Integrated 3.5 A power stage
  - 3.5 APEAK at 24 to 48 VDC (derating dep. on application)
  - Selectable step resolution up to 1/256 step
  - Online power stage parameterisation and diagnostics
- I1AM02: with selectable power stage
  - 3 limit/reference switches
  - Optional encoder evaluation
  - SSI, differential, BiSS or Endat; Resolver
  - Optional motor temperature evaluation
  - for Pt100 sensors (PTS01) or K types (KTS01)

1 Axis Stepper Motor Drive I1EM02

Indexer for external power stage

- Integrated indexer for standard functions:
  - Relative and absolute positioning
  - Reference movements/speed mode
  - Online power stage parameterisation and diagnostics
- Outputs Control pulses/Direction/Boost and Enable to an external power stage
- 3 limit/reference switches
- Optional encoder evaluation
- SSI, differential, BiSS or Endat; Resolver

4 Axes High End Indexer I4XM01

Indexer module

- 1, 2, 3 and 4 axes stepper motor indexer
- Circular interpolation for 2 any axes
- Linear interpolation for 4 axes (also for reduction gears axes)
- Additional Control Pulses/Direction input and output for “electronic wave”
- Expanded indexer functions:
  - Velocity/end position during the movement changeable
  - Variable, short ramps; high velocities
  - Interpolation also for gear axes
  - High speed: up to 500,000 steps/second
  - ...

Ordering Code

I1AM02 - APS01 - ECAS01 - PTS01

Options

1 Axis drive type
- I1AM01
- I1AM02
Power stage
- APS01
- LP501
- with power stage 5 A / 70 V
- with power stage 9 A / 70 V
- with power stage 3.5 A / 48 V (I1AM01)
Encoder evaluation
- ECES01
- ECAS01
- ECBS01
- ECMS01
- ENDAT encoder
- SSI/QUADR. encoder
- BiSS
- Resolver
- no encoder module
Temperature evaluation
- PTS01
- KT501
- Pt sensor
- K type
- no temperature module

Mating connectors are included in delivery.

Ordering Code

I1EM02 - ECAS01

Options

Encoder evaluation
- ECES01
- ECAS01
- ECBS01
- ECMS01
- ENDAT encoder
- SSI/QUADR. encoder
- BiSS
- Resolver
- no encoder module

Mating connectors are included in delivery.

Ordering Code

I4XM01

Mating connectors are included in delivery.
1 Axis Carrier Module for APS-/LPS Power Stage (INAM01)

**APS/LPS, encoder and temperature**
- Requires an upstream installed indexer for interpolation (i.e. I4XM01)
- Selectable high end power stage
deg) 3 limit/reference switches
- Optional encoder evaluation*)
  - SSI, differential, BiSS or Endat; Resolver
- Optional motor temperature evaluation
  - For Pt100 sensors (PTS01)
  - K types (KTS01)

<table>
<thead>
<tr>
<th>Option</th>
<th>INAM01</th>
<th>APS01</th>
<th>ECAS01</th>
<th>PTS01</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power stage</td>
<td></td>
<td>APS01</td>
<td>LPS01</td>
<td></td>
</tr>
<tr>
<td>Encoder eval.</td>
<td>ECES01</td>
<td>ECAS01</td>
<td>ECT501</td>
<td></td>
</tr>
<tr>
<td>Temp. eval.</td>
<td>PTS01</td>
<td>KTS01</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Mating connectors are included in delivery.

Power Stage Module with Safe Torque Off (INSM01)

**APS, STO and Encoder**
- with Safe Torque Off function SIL3/Ple
- Currently the high end power stage APS01 can be selected
  - Up to 5 \( A_{\text{max}} \) for 24 to 70 VDC (derating dep. on application)
  - Precision up to 1/512 step resolution
  - Online parameterisation and diagnostics
- 3 limit/reference switches
- Optional encoder evaluation*)
  - SSI, differential, BiSS or Endat; Resolver (refer to page 2)

<table>
<thead>
<tr>
<th>Option</th>
<th>INSM01</th>
<th>APS01</th>
<th>ECAS01</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power stage</td>
<td></td>
<td>APS01</td>
<td></td>
</tr>
<tr>
<td>Encoder eval.</td>
<td>ECES01</td>
<td>ECAS01</td>
<td>ECT501</td>
</tr>
<tr>
<td>Temp. eval.</td>
<td>PTS01</td>
<td>KTS01</td>
<td></td>
</tr>
</tbody>
</table>

*Mating connectors are included in delivery.

1 Axis Module for integrated MSX° Power Stage (INAM03)

**MSX° Power stage, encoder and temperature**
- Requires an upstream installed indexer for interpolation (i.e. I4XM01)
- Currently the high end power stage MSX° can be selected
  - Up to 15 \( A_{\text{max}} \) for up to 120 VDC
  - Precision up to 1/20 step resolution
  - (5+1) pin motor connector with PE
- 3 limit/reference switches
- Optional encoder evaluation*)
  - SSI, differential, BiSS or Endat; Resolver
- Optional motor temperature evaluation
  - For Pt100 sensors (PTS01)
  - K-types (KTS01)

*Mating connectors are included in delivery.

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* on request: 5-pin Phoenix connector for the motor connection

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* refer to page 2

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**Indexer Interface (EXAM01) for External Power Stage**

Interface between indexer and external power stages

- Requires an upstream installed indexer (i.e. I4XM01)
- Outputs Control pulses/Direction/Boost and Enable to an external power stage
- External power stages with ServiceBus can be parameterised online by the interface on the indexer module (i.e. I4XM01) and be diagnosed.
- 3 limit/reference switches
- Optional encoder evaluation (SSI, differential, BiSS or Endat; Resolver)
- Optional motor temperature evaluation for Pt100 sensors (PTS01) or K types (KTS01)

**I/Os (analogue/digital)**

**PID Regulation Module (PIDM01)**

Proportional, Integral, Derivative Regulation Module

- 4 analogue measuring inputs i.e. for Pt100 sensors and K types
- 4 digital inputs 24 V
- 4 digital outputs 24 V, max. 1 A
- 24 V supply of the I/O is centrally delivered either by the power modules or directly at the PIDM01
- 4 independent PID controllers with PWM output

**Digital I/Os (DIOM01)**

Digital I/O module

- 8 digital inputs 24 Vdc
- 8 digital outputs 24 Vdc, max. 1 A
- 24 V supply of the inputs and outputs is centrally delivered either by the power modules or directly at the DIOM01.
- DIOM01 can also be used as a single channel counter module.
On demand Customised modules can be realised on demand.

Analogue Inputs and Outputs (AIOM01)

4 analogue inputs and outputs included
Inputs: ±10 V bipolar, 0...10 V, 0...20 mA
Resolution: 14 Bit

Outputs: Max. output current: 16 mA
Resolution: 16 Bit
Short-circuit proof
Thermal overload protection
Electrically isolated

Analogue input and output module

Ordering Code

Mating connectors are included in delivery.
HMI-Interfaces

Android-based integrated Touch Panel (TPM01)

Integrated human-machine interface

- 800 x 480 px – TFT display
- Integrated in the phyMOTION™ housing
- Touch functionality
- As user interface i.e. for parameter selection
- For support, parameterisation and diagnostics

Control via Android-based Tablets (from version V 4.0)

External human-machine interface

- from 480 x 800 px (recommended: 7”-display) – TFT display
- For connection to the POWM01 main power module (Ethernet or WLAN)
- Touch functionality
- As user interface i.e. for parameter selection
- For support, parameterisation and diagnostics

Control with Operator Touch Panel (TPE01)

External human-machine interface

- For connection to the POWM01 main power module (terminal interface)
- 800 x 480 px – TFT display
- Touch functionality
- For configuration, service and diagnostics
- Housing:
  - Rear cover: galvanised steel BTK
  - Housing frame: PC UL 94 V0 BTA
  - Front frame: aluminium anodised
  - up to IP 65/DIN EN 60529
Control with Operator Panel BT5 AM

External human-machine interface

- For connection to the POWM01 main power module (terminal interface)
- For support, parameterisation and diagnostics
- Status display, operating mode
- Parameter reading
- Function keys
- Remote or Local mode
Software

phyLOGIC™ ToolBox

Free of charge development environment
- Operating software and development environment for the phyMOTION™ Phytron controller
- Easy to program: Drawing and converting of 2D contours in phyLOGIC™ commands (Motion Creator)
- Parameterising, programming, editing, debugging
- Support in the commissioning phase i.e. by test functions
- Display of status and graphical presentation of a current XY position
- Archiving of parameter sets and programs

phyLOGIC™ Control

Free of charge App for tablets and mobile phones
- Operating software for tablets connected to the phyMOTION™ Phytron controller
- Direct mode, operating mode, I/O monitor, configuration of the controller
- Status display and parameter reading

LabVIEW®-VI

VIs for phyMOTION™
- Simulation software with a graphical style
- Use the VIs (Virtual Instruments) generated by Phytron and integrate them in your LabVIEW® project. So you can easily control the Phytron controller phyMOTION™ from your usual programming environment.
Industrial

EPICS Motor Module

Software environment for large-scale experiments

- Software environment to develop and realise distributed control systems for large-scale experiments such as telescopes and accelerators. EPICS provides the SCADA support.
- Also in multi-axis operation: positioning, limit switches, encoder evaluation
Equipment

Motor Shield Clamp

- Easy to go
- Plug-in connection for motor shielding of the following modules of the Phytron controller phyMOTION™: INAM-, EXAM-, I1AM01- or I1AM02-module
- On delivery: shielded clamp with cableties and screws
- The motor connectors are included in the package of your phyMOTION™ controller.

Strain Relief for Motor cable

Mountable rail for strain relief of the motor cables

- Dimension: (482.6 x 44.5 x 8) mm
- Material: Aluminium
- 21 cable clamps
- Mountable at the 19"-switching cabinet with two M3 screws

Carrying and Assembly Handle

For 19"-Housing

- Shapely and universal
- Grip adjustment by pushbutton by 30°
- Material: handle profile: extruded aluminium, handle bar, housing adapter: zinc die cast
- Surface: handle bar: RAL 9011 graphite black, pushbutton, screw lens: black plastic
- Carrying capacity: 50 kg
## phyMOTION™ with internal supply and housing depth p

**Ordering code example:**

<table>
<thead>
<tr>
<th>Housing</th>
<th>Ordering code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>phyMOTION-21SL-R-p</td>
<td>19” subrack housing, housing depth 360 mm</td>
</tr>
</tbody>
</table>

### Modules

<table>
<thead>
<tr>
<th>Slot</th>
<th>Ordering code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slot 1</td>
<td>MCM03-ETHS01</td>
<td>Main controller with Ethernet interface, internal supply</td>
</tr>
<tr>
<td>Slot 2</td>
<td>DIOM01</td>
<td>Digital I/O module</td>
</tr>
<tr>
<td>Slot 3</td>
<td>DIOM01</td>
<td>Digital I/O module</td>
</tr>
<tr>
<td>Slot 4</td>
<td>DIOM01</td>
<td>Digital I/O module</td>
</tr>
<tr>
<td>Slot 5</td>
<td>I4XM01</td>
<td>4 axes indexer module</td>
</tr>
<tr>
<td>Slot 6</td>
<td>INAM02-MSX-ECAS01</td>
<td>MSX power stage with Quadratic encoder evaluation</td>
</tr>
<tr>
<td>Slot 7</td>
<td>INAM02-MSX-ECE501</td>
<td>MSX power stage with Endat encoder evaluation</td>
</tr>
<tr>
<td>Slot 8</td>
<td>INAM02-MSX-ECAS01</td>
<td>MSX power stage with Quadratic encoder evaluation</td>
</tr>
<tr>
<td>Slot 9</td>
<td>INAM01-APS01-ECES01-KTS</td>
<td>Internal 5 A power stage with Endat-Enc./Motor temp. evaluation</td>
</tr>
<tr>
<td>Slot 10</td>
<td>-19</td>
<td>blank front panels</td>
</tr>
<tr>
<td>Slot 20</td>
<td>NETM01-230V-120V-120V-120V</td>
<td>Ext. mains voltage 230 V, 3 x 500 W for 120 V</td>
</tr>
</tbody>
</table>

## phyMOTION™ with SLS

**Ordering Code Example:**

<table>
<thead>
<tr>
<th>Housing</th>
<th>Ordering code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>phyMOTION-21SL-R-p</td>
<td>19” subrack housing, housing depth 360 mm</td>
</tr>
</tbody>
</table>

### Modules

<table>
<thead>
<tr>
<th>Slot</th>
<th>Ordering code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slot 1</td>
<td>POWM01</td>
<td>Main supply module</td>
</tr>
<tr>
<td>Slot 2</td>
<td>MCM01-RSS485</td>
<td>Main controller with RS 485 interface</td>
</tr>
<tr>
<td>Slot 3</td>
<td>I4XM01</td>
<td>4 axes indexer module</td>
</tr>
<tr>
<td>Slot 4</td>
<td>EXAM01-ECAS01</td>
<td>Indexer interface for MSX power stage with Quadr. encoder eval.</td>
</tr>
<tr>
<td>Slot 5</td>
<td>EXAM01-ECAS01</td>
<td>Indexer interface for MSX power stage with Quadr. encoder eval.</td>
</tr>
<tr>
<td>Slot 6</td>
<td>EXAM01-ECAS01</td>
<td>Indexer interface for MSX power stage with Quadr. encoder eval.</td>
</tr>
<tr>
<td>Slot 7</td>
<td>EXAM01-ECE501-KTS</td>
<td>Indexer interface for MSX power stage with Endat-encoder/-Motor temp. evaluation</td>
</tr>
<tr>
<td>Slot 8</td>
<td>DIOM01</td>
<td>Digital I/O module</td>
</tr>
<tr>
<td>Slot 9</td>
<td>DIOM01</td>
<td>Digital I/O module</td>
</tr>
</tbody>
</table>
APPLICATION in SCIENCE

Use for Vacuum Chambers

Vacuum chambers are the core of many modern research and production plants. The phyMOTION™ offers additional functions for the control of also complex machines from outside the vacuum chamber such as temperature monitoring, encoder and resolver evaluation as well as linear and circular interpolation for high-precision positioning. The heating of the motors is minimised in the application by the high-quality power stage design.

The phyMOTION™ with integrated power stages close to the vacuum chamber allows a low-noise monitoring of the temperature sensors and a direct motor cable connection.

For large systems make sure that the automation for the vacuum actuators can be seamlessly integrated into the existing PLC world despite the special requirements.

The integrated power stages can be optionally provided with temperature monitoring and encoder evaluation.

The integrated field bus interface allows both the control out of a PLC system SPS-System and the operation via supplied software, LabView interface or touch panel.

The phyMOTION™ is also successfully used in the research plant Max Planck Institute for Extraterrestrial Physics, Neuried for aligning optical systems in a vacuum.

The controller is controlled via Ethernet and LabView.

Configuration:

phyMOTION™ with external supply:
MCM01, POWM01, POWM02, 2 x I4XM01, 6 x I1AM01, 2 x DIQM01
XY Alignment for Cutting Baked Wafer Blanks

The phyMOTION™ is part of the circular cutting machine for wafers. Here, the baking wafers are cut with a rotating circular blade out of the baked blanks.

The radius-dependent, area optimisation XY positioning of the semi-finished goods under the punching knife is controlled by the phyMOTION™.

The external touch panel allows a comfortable operation.

Configuration:

phyMOTION™ in combination with a plug-in power stage unit SLS with internal power supply: MCM02 with ETHS01, I4XM01, 2x INAM02, 1x DIOM01, 2x MSX152 power stages, external touch operator panel.
### Configuration Example

**19” rack housing with internal supply and integrated touch panel: 4 axes with indexer and I/Os**

<table>
<thead>
<tr>
<th>Ordering Code Example:</th>
<th>Housing</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>phyMOTION-21SL-p</td>
<td>19” rack mounting housing with 10 slots, integrated touch panel and depth 360 mm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Module</th>
<th>Ordering Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TPM01</td>
<td>TPM01</td>
<td>Android-based integrated touch panel</td>
</tr>
<tr>
<td>Slot 1</td>
<td>POWM03</td>
<td>Main power supply</td>
</tr>
<tr>
<td>Slot 2</td>
<td>MCM03-PBS01</td>
<td>Main controller with ProfiBus interface</td>
</tr>
<tr>
<td>Slot 3</td>
<td>DIOM01</td>
<td>Digital I/O module</td>
</tr>
<tr>
<td>Slot 4</td>
<td>DIOM01</td>
<td>Digital I/O module</td>
</tr>
<tr>
<td>Slot 5</td>
<td>I4XM01</td>
<td>4 axes indexer module</td>
</tr>
<tr>
<td>Slot 6</td>
<td>INAM01-APS01-ECAS01</td>
<td>Internal 5 A power stage with Quadratic encoder evaluation</td>
</tr>
<tr>
<td>Slot 7</td>
<td>INAM02-MSX+-ECMS01</td>
<td>1 axis module for integrated MSX+ power stage with resolver</td>
</tr>
<tr>
<td>Slot 8</td>
<td>INAM02-MSX+-ECMS01</td>
<td>1 axis module for integrated MSX+ power stage with resolver</td>
</tr>
<tr>
<td>Slot 9</td>
<td>INAM02-MSX+-ECMS01</td>
<td>1 axis module for integrated MSX+ power stage with resolver</td>
</tr>
<tr>
<td>Slot 10</td>
<td>NETM01</td>
<td>230 V (115 V) supply with grounding connection if motor voltage &gt; 70 V</td>
</tr>
</tbody>
</table>
### 10-Slot housing for rack mounting: 4 axes with indexer and I/Os

<table>
<thead>
<tr>
<th>Ordering Code Example:</th>
<th>Housing phyMOTION-10SL-R-s</th>
<th>Rack mounting housing with 10 slots and depth 120 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module</td>
<td>Ordering Code</td>
<td>Description</td>
</tr>
<tr>
<td>Slot 1</td>
<td>POWM01</td>
<td>Main power supply</td>
</tr>
<tr>
<td>Slot 2</td>
<td>MCM01-RSS01</td>
<td>Main controller with RS 485 interface</td>
</tr>
<tr>
<td>Slot 3</td>
<td>DIOM01</td>
<td>Digital I/O module</td>
</tr>
<tr>
<td>Slot 4</td>
<td>DIOM01</td>
<td>Digital I/O module</td>
</tr>
<tr>
<td>Slot 5</td>
<td>DIOM01</td>
<td>Digital I/O module</td>
</tr>
<tr>
<td>Slot 6</td>
<td>I4XM01</td>
<td>4 axes indexer module</td>
</tr>
<tr>
<td>Slot 7</td>
<td>INAM01-APS01-ECAS01</td>
<td>Internal 5 A power stage with Quadratic encoder evaluation</td>
</tr>
<tr>
<td>Slot 8</td>
<td>INAM01-APS01-ECES01</td>
<td>Internal 5 A power stage with ENDAT encoder evaluation</td>
</tr>
<tr>
<td>Slot 9</td>
<td>INAM01-APS01-ECAS01-PTS</td>
<td>Internal 5 A power stage with Quadratic encoder- and motor temperature evaluation with PT sensor</td>
</tr>
<tr>
<td>Slot 10</td>
<td>INAM01-APS01-ECES01-KTS</td>
<td>Internal 5 A power stage with ENDAT encoder- and motor temperature evaluation with K types</td>
</tr>
<tr>
<td>Power supply</td>
<td>SPH240-2410-W</td>
<td>External power supply unit with 240 W, 24 VDC output voltage and 10 A for rear wall</td>
</tr>
<tr>
<td>Power supply</td>
<td>SPH240-4805-W</td>
<td>External power supply unit with 240 W, 48 VDC output voltage and 5 A for rear wall</td>
</tr>
<tr>
<td>TPE</td>
<td>TPE</td>
<td>External Operator Touch Panel</td>
</tr>
</tbody>
</table>

All illustrations, descriptions and technical specifications are subject to modifications, no responsibility is accepted for the accuracy of this information.