Motion control

There are two main options for motion control in machines or systems. If the mechanical processing of workpieces is the primary objective and if the workpiece geometries have been designed with CAD systems, the machines are mostly based on CNC controllers. The use of programmable logic controllers (PLC), however, is common in all other processing machines.

With PC Worx, Phoenix Contact enables motion functions (without CNC functions) to be optimally and completely integrated into precisely this PLC world.

For this purpose, Phoenix Contact provides motion control function blocks in accordance with the motor functions as defined in IEC 61131-3 in the high-end S-MAX 400 CE PN MC controller. Thanks to the function blocks, axes can be controlled and synchronized from PC Worx with extremely high dynamics and precision. The library for dynamic and high precision one-axis or multi-axis motions requires electrical servo drives to be networked with Sercos.

The motion control solutions thus reliably fulfill requirements such as fast point-to-point positioning, pick&place functions, electronic cam discs or gears.

Distributed drives

Various distributed drives such as motor starters and frequency inverters with IP54 and IP67 degrees of protection in sheet-steel and high-grade steel are available for conveying technology.

Phoenix Contact provides variants with INTERBUS, INTERBUS-LWL and PROFIBUS for establishing connections to various controllers.

Numerous motor starters that are directly integrated into the system can be used for direct implementation with the Inline I/O system.
**Motion control function blocks**

All motion functions are available as function blocks in all IEC 61131 programming languages. Corresponding variables are used to access the axes.

The scope of functions comprises:

- MC_MoveAbsolute
- MC_MoveRelative
- MC_MoveAdditive
- MC_MoveSuperimposed
- MC_MoveVelocity
- MC_Home
- MC_Stop
- MC_Power
- MC_ReadStatus
- MC_ReadAxisError
- MC_Reset
- MC_ReadParameter
- MC_ReadBoolParameter
- MC_WriteParameter
- MC_WriteBoolParameter
- MC_ReadActualPosition
- MC_ReadActualVelocity
- MC_SetPosition
- MC_SetOverride
- MC_PositionProfile
- MC_VelocityProfile
- MC_AccelerationProfile
- MC_CamTableSelect
- MC_CamIn
- MC_CamOut
- MC_GearIn
- MC_GearOut
- MC_Phasing
- MC_GearInPos

The function blocks available for the motion functions comply with the descriptions in the PLCopen specifications "Function Blocks for Motion Control 1 and 2".

Here, all function blocks are implemented with the maximum described scope of functions for maximum functionality. All motion data is processed as 64-bit floating points, in order to guarantee maximum possible accuracy even in fast applications.

The Motion Control function blocks provide the basic functions required within an application in a uniform and standardized manner.

**Optimum drive solution**

The servo drives are interconnected via the open and high-performance Sercos fieldbus system. This means that devices from various manufacturers can be used without having to make complex adaptations to the relevant programs.

An optimum automation solution is thus available in combination with the INTERBUS system for networking sensors and actuators, and PROFINET for establishing connections to higher-level systems.
All parameters of the motion functions are processed in the runtime system of the controller. They are thus activated when the relevant function block is called up; a transfer of the corresponding parameters to the appropriate axis is omitted. Therefore, several motion functions with different parameters can be executed by the connected drives in a very short period, and all functions are available for every connected drive at all times.

Motions within a cam disc function, for example, are also coupled within the controller. As a result, axes can be flexibly assigned to the respective motions at all times.

Therefore, all drive and motion data can be accessed using the function blocks within a control program. This solution also enables the use of machine-oriented data.

**SERCOS**

The drives are connected with the SERCOS drive bus, with which a data transmission rate of 16 MBaud or a cycle time of 1 ms is possible.

**Applications**

**Handling**
In automated handling systems, the point-to-point motions must attain higher and higher speeds when transporting products, in order to meet the increasing time requirements of the users. Here, the positioning functions enable easy integration.

**Packing**
Motion control systems with many axes and various performance classes are used in packaging machines. Motion Control function blocks support coordinated and synchronized movements in the master-slave principle with the virtual master axis.

**Mounting**
The PC-WORX controller with integrated Motion Control gives a new dimension to assembly machines.

The motions of the assembly machines are becoming increasingly complex, in order to guarantee high-quality assemblies.
### One-channel reversing starter
- Type: IBS IP 400 ME-ELR R-3A DI4
- Order No.: 2732884
- Description: With 4 digital inputs and 2 digital outputs, IP54 degree of protection
- Page: 426

### Two-channel direct starter
- Type: IBS IP 400 ME-MLR 2-8A
- Order No.: 2884295
- Description: With 4 digital inputs, IP54 degree of protection
- Page: 426

### Variable frequency drive
- Type: IBS IP 400 ME-VFD 1-3A DI4
- Order No.: 2836939
- Description: With 4 digital inputs, IP54 degree of protection
- Page: 427

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### In a sheet-steel housing (copper connection)

![Image 1](image1.png)

![Image 2](image2.png)

![Image 3](image3.png)

---

### In sheet-steel housing (FO connection)

![Image 1](image1.png)

![Image 2](image2.png)

![Image 3](image3.png)

---

### In high-grade steel housing (copper connection)

![Image 1](image1.png)

![Image 2](image2.png)

![Image 3](image3.png)

---

### In sheet-steel housing (copper connection)

![Image 1](image1.png)

![Image 2](image2.png)

![Image 3](image3.png)
Motion control

**Type**

**Order No.**

**Description**

S-MAX 400 CE PN MC

2700609

High-End PLC with motion control function, PC-based with full Ethernet and IT connectivity

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**Inline Modular power-level terminals and accessories**

<table>
<thead>
<tr>
<th>Type</th>
<th>Order No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IB IL 400 MLR 1-8A</td>
<td>2727365</td>
<td>Electromechanical direct starter, up to 3.7 KW / 400 V AC</td>
</tr>
<tr>
<td>IB IL 400 ELR 1-3A</td>
<td>2727332</td>
<td>Electronic direct starter, up to 1.5 KW / 400 V AC</td>
</tr>
<tr>
<td>IB IL 400 ELR R-3A</td>
<td>2727378</td>
<td>Electronic reversing load starter, up to 1.5 KW / 400 V AC</td>
</tr>
<tr>
<td>IB IL DC AR 44/10A</td>
<td>2819206</td>
<td>Servo amplifier for DC motors with brushgears</td>
</tr>
<tr>
<td>IB IL EC AR 48/10A-PAC</td>
<td>2819587</td>
<td>Servo amplifier for EC-motors without brushgears</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Type</th>
<th>Order No.</th>
<th>Description</th>
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<tbody>
<tr>
<td>IBS HVO</td>
<td>2836052</td>
<td>Manual on-site operator panel</td>
</tr>
<tr>
<td>IB IL 400 BR</td>
<td>2727394</td>
<td>Brake modules</td>
</tr>
<tr>
<td>IB IL 400 CN-PWR-IN</td>
<td>2836078</td>
<td>Power connector</td>
</tr>
<tr>
<td>IB IL 400 CN-BRG</td>
<td>2836081</td>
<td>Power bridge</td>
</tr>
<tr>
<td>GMVSTBW 2,5 HV/4-ST7,62 NZIL</td>
<td>1893957</td>
<td>Motor circuit connector</td>
</tr>
</tbody>
</table>

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---

**Lower housing parts and accessories**

<table>
<thead>
<tr>
<th>Type</th>
<th>Order No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBS IP 400 MBH</td>
<td>2732671</td>
<td>Lower sheet-steel part, IP54 degree of protection</td>
</tr>
<tr>
<td>IBS IP 400 MBH/MS</td>
<td>2734825</td>
<td>Lower sheet-steel part, IP54 degree of protection, with switch-disconnector, fuse holder and power distribution</td>
</tr>
<tr>
<td>IBS IP 400 FO-MBH</td>
<td>2734281</td>
<td>Lower sheet-steel part, IP54 degree of protection, FO guide plate, jumpers for 24 V (U2 and U3)</td>
</tr>
<tr>
<td>IBS IP 400 FO-MBH/MS</td>
<td>2734281</td>
<td>Lower sheet-steel part, IP54 degree of protection, switch-disconnector, fuse holder, FO guide plate, power distribution and jumpers for 24 V (U2 and U3)</td>
</tr>
</tbody>
</table>

Page 427 427 429 429

<table>
<thead>
<tr>
<th>Type</th>
<th>Order No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBS IP 400 MBH-F</td>
<td>2732686</td>
<td>High-grade steel lower part, IP67 degree of protection</td>
</tr>
<tr>
<td>IBS IP 400 MBH/MS-F</td>
<td>2734831</td>
<td>High-grade steel lower part, IP65 degree of protection, with switch-disconnector, fuse holder and power distribution</td>
</tr>
<tr>
<td>MBH/INST</td>
<td>2734947</td>
<td>Lower housing part for DIN rail mounting, IP54 degree of protection</td>
</tr>
<tr>
<td>MBH/FUSE</td>
<td>2734264</td>
<td>Lower housing part with fuse holders, IP54 degree of protection</td>
</tr>
</tbody>
</table>

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PHOENIX CONTACT

Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370

Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com
The high-end PLC SMAX 400 CE PN MC provides an integrated motion control function and full Ethernet- and IT- connectivity, whereby the PLC periphery is coupled via INTERBUS or PROFINET and the distributed axes via Sercos II. The SMAX 400 CE PN MC is thus a high-performance motion control device for up to 20 axes in combination with a powerful controller (PLC) based on PC WorX.

Just like all other Phoenix Contact controllers: in addition to the usual control and motion tasks, the SMAX 400 CE PN MC also carries out all communication tasks for which Ethernet has become established today in industrial applications. An integrated web server makes it possible to store machine-specific pages in the controller for remote machine control, and an FTP server allows data exchange. Open TCP/IP or UDP/IP blocks further round off the Ethernet- and IT-compatibility.

It does not matter whether the controller has to send e-mails, wants to get a new application program from a central server, has to log data in real-time or has to read and write databases without stress. All these functions can be implemented quickly and easily.

Unlike its sister model, the SMAX, with an "MC" added to its name, offers the motion control functions as per the PLCopen standard part 1, version 1.1 and part 2, version 1.0 (FB MC.LIB). This so called motion core runs on the SMAX with a high level of time synchronism with the SERCOS II cycle.

Internally, the motion core provides a setpoint generator function for position setpoints that are transported to the drives in real-time through Sercos. All Sercos drives have a position controller so that the lower-level drives can process the position setpoints.

The advantage for fast machines

In order to combine the advantages of electronic motion control with easy programming and start-up of machines, these two features have been integrated into a common platform. In other words, the motion function has been integrated directly into the process-managing controller in SMAX 400 CE PN MC. The controller thus has significant saving potential. Phoenix Contact has therefore combined all the required PLC and motion functions in the SMAX 400 CE PN MC on the basis of the PLCopen description such that they are available in the PC Worx engineering software in the IEC 61131-3 languages.

Due to its high performance, the SMAX 400 CE PN MC can process comprehensive motion control and automation tasks quickly and reliably. The flexibility of the servo technology is thus combined with the easy and economical programming in the classic PLC languages. The integration of motion calculation into the process-managing controller is also advantageous because different motion functions can be carried out with individual values without any delay.
The SMAX 400 CE PN MC is a high-end controller with full Ethernet and IT compatibility and also has an integrated motion control functionality. Like all other Phoenix Contact controllers, this device is also programmed using the PC Worx software and thus conforms to the IEC 61131 standard. INTERBUS master, PROFINET and an optional Modbus/TCP have been integrated in order to bring medium and large numbers of I/Os into the PLC controller as well.

The motion control functionality in the SMAX 400 CE PN MC is provided by additional IEC 61131 function blocks that have been certified according to PLCopen Function Blocks for Motion Control Part 1 + 2.

The motion functions can thus be simply added to the PLC program, increasing the clarity of the overall machine programming. The drives for motion control are networked via SERCOS II. Since SERCOS and the motion control evaluation work parallel, this enables very short cycles. The motion control cycle time depends on the number of axes connected and starts at 500 µs. Depending on the system configuration, this can be set between 0.5 and 16 ms. Here, the SERCOS cycle acts as the system clock for the motion control core as well as for all drives and is always precisely maintained.

<table>
<thead>
<tr>
<th>Description</th>
<th>Type</th>
<th>Order No.</th>
<th>Pcs. / Pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-end PLC - Motion Control functionality</td>
<td>S-MAX 400 CE PN MC</td>
<td>2700609</td>
<td>1</td>
</tr>
</tbody>
</table>

Technical data

**Controller data**

- Fieldbus master
- Power supply for module electronics
- Supply voltage
- Range of supply voltages
- Max. current consumption

**Network**

- 1xEthernet (10/100/1000 MBIT), RJ45
- 2xEthernet (10/100 Mbit)

**Fieldbus master**

- INTERBUS master

**Supply voltage**

- 24 V DC ± 10%

**Range of supply voltages**

- 21.6 V DC ... 26.4 V DC (including ripple)

**Max. current consumption**

- 2 A

**Basic functionality**

- PLC with integrated Motion Control function
- Drives
- Motion control

**Motion control**

- Max. number of axes: 20
- Axis types: Corresponding SERCOS specification for drives
- Axis functions: Standard functions as per PLCopen section 1 and 2:
  - start/stop/reset/homing, speed presetting, point-to-point positioning with various speed profiles, higher-level movements, synchronized movement, (virtual) electronic shaft, electronic gear.

**Cycle time**

- > 500 µs (adjustable)
- Min. 1 ms (Up to five axes)
- Min. 2 ms (Up to ten axes)
- Min. 4 ms (Up to 20 axes)

**Direct inputs/outputs**

<table>
<thead>
<tr>
<th>Description</th>
<th>Type</th>
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<tbody>
<tr>
<td>Number of inputs</td>
<td>12</td>
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<tr>
<td>Number of outputs</td>
<td>4</td>
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</table>

**General data**

<table>
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<tr>
<th>Description</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
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<tr>
<td>Height</td>
<td>240 mm</td>
</tr>
<tr>
<td>Depth</td>
<td>174 mm</td>
</tr>
<tr>
<td>Ambient temperature (operation)</td>
<td>0°C ... 55°C</td>
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<tr>
<td>Permissible humidity (operation)</td>
<td>10% ... 85% (non-condensing)</td>
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<tr>
<td>Vibration (operation)</td>
<td>DIN EN 60068-2-6</td>
</tr>
<tr>
<td>Shock</td>
<td>DIN EN 60068-2-29</td>
</tr>
</tbody>
</table>
INTERBUS motor starters and variable frequency drives in sheet-steel housing (IP54)

The motor starters and variable frequency drives in a sheet-steel housing with IP54 degree of protection can be used directly on machines and plants in conveyor systems.

Since they are available in different versions, INTERBUS motor starters cover many important applications.

The 1 and 2-channel motor starters allow direct drives to be controlled. There is a reversing load version for applications involving different drive directions.

A variable frequency drive offers suitable control for applications that require different speeds and starting times.

Additional features include:
- Simple assembly
- Pluggable connection system
- Exchangeable module electronics
- Power networking 400 V AC/ 20 A
- Power networking with an extended lower part and 10 mm² conductor
- Extended lower part with integrated maintenance switch
- Comprehensive status and diagnostics display on the module
- Startup without bus possible with manual operating function
- Four initiator inputs for sensor connections
- Two digital outputs for actuator connections
- Sheet-steel housing suitable for plant engineering
- Nominal output power of 1.5 kW (ELR, VFD) / 3.7 kW (MLR)
- Slot-in Pg screw connections for use with preassembled cable sets

Description

**Electronic motor starter**, electronics module without lower part of the housing
- 1-channel reversing starter, 1.5 kW
- 2-channel direct starter, 1.5 kW

**Electromechanical motor starter**, electronics module without lower part of the housing
- 2-channel direct starter, 3.7 kW

**Variable frequency drive**, electronics module without lower part of the housing
- 1-channel, 1.5 kW

**Lower part of the housing**, sheet-steel
- Standard version
- With an integrated maintenance switch

**Connector set for sheet steel versions**, consisting of:
- connectors, Pg cable gland inputs, shield brackets and filler plugs

**Hand-held operator panel**, for motor starters and variable frequency drives

**Fuses**
- ME-ELR (Midget/ 10.3 x 38)
- ME-VFD (Midget/ 10.3 x 38)
- ME-MLR (Midget/ 10.3 x 38)

Technical data

**Interface**
- Name: INTERBUS remote bus
- Type of connection: MINI COMBICON
- Power supply for module electronics: 24 V DC (U_{IN})
- Supply voltage: 20 V DC ... 30 V DC (including ripple)
- Range of supply voltages: U_{IN} = U_{IN} minus 2 V DC
- Power supply for sensors: 50 mA
- Minimum voltage: Against inductive reverse voltages, polarity reversal and short circuits

**Digital inputs**
- Number of inputs: 4
- Type of connection: M12 connector
- Connection method: 3, 4-wire

**Digital outputs**
- Type of connection: M12 connectors, (A-coded)
- Connection method: 2-wire
- Output current: Max. 500 mA (per channel)

**Thermistor input**
- Type of connection: POWER-COMBICON terminal strips X10
- Connection method: 2-wire

**Motor starter, output**
- Type of connection: POWER-COMBICON
- Operating voltage: 360 V AC ... 440 V AC (line voltage 50/60 Hz)
- Nominal current range: 0.2 A ... 3.6 A
- Frequency range: 50 Hz ... 60 Hz (mains frequency)
- Nominal motor power: 1.5 kW (2-pos. at U_{max} = 400 V AC)
- Motor monitoring: Based on class 10 A of IEC 60947-4: 1990
- Parameterization range: 0.2 A ... 3.6 A
- Tripping class: Polarized solid-state contact

**Motor starter, brake**
- Type of contact: With POWER-COMBICON terminal strip of the motor connection (X10)
- Connection method: Based on class 10 A of IEC 60947-4: 1990
- Continuous load current: Max. 0.3 A
- General data
- Weight: 3 kg
- Degree of protection: IP54 in acc. with IEC 60529/1989

The motor starters and variable frequency drives in a sheet-steel housing with IP54 degree of protection can be used directly on machines and plants in conveyor systems.

Since they are available in different versions, INTERBUS motor starters cover many important applications.

The 1 and 2-channel motor starters allow direct drives to be controlled. There is a reversing load version for applications involving different drive directions.

A variable frequency drive offers suitable control for applications that require different speeds and starting times.

Additional features include:
- Simple assembly
- Pluggable connection system
- Exchangeable module electronics
- Power networking 400 V AC/ 20 A
- Power networking with an extended lower part and 10 mm² conductor
- Extended lower part with integrated maintenance switch
- Comprehensive status and diagnostics display on the module
- Startup without bus possible with manual operating function
- Four initiator inputs for sensor connections
- Two digital outputs for actuator connections
- Sheet-steel housing suitable for plant engineering
- Nominal output power of 1.5 kW (ELR, VFD) / 3.7 kW (MLR)
- Slot-in Pg screw connections for use with preassembled cable sets
<table>
<thead>
<tr>
<th>Type</th>
<th>Order No.</th>
<th>Pcs. / Pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBS IP 400 ME-VFD 1-3A DI4</td>
<td>2836939</td>
<td>1</td>
</tr>
<tr>
<td>IBS IP 400 MBH</td>
<td>2732871</td>
<td>1</td>
</tr>
<tr>
<td>IBS IP 400 MBH/MS</td>
<td>2734125</td>
<td>1</td>
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<tr>
<td>IBS VFD PLSET 1-3A</td>
<td>2836942</td>
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<tr>
<td>IBS HVO/M12</td>
<td>2837006</td>
<td>1</td>
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<tr>
<td>IBS IP 400 MBH/MS</td>
<td>2734125</td>
<td>1</td>
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<tr>
<td>IBS FUSE 10X38/16AGR</td>
<td>2734073</td>
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<td>IBS FUSE 10X38/10AGL</td>
<td>2704090</td>
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<tr>
<td>IBS FUSE 10X38/16AGL</td>
<td>2734316</td>
<td>10</td>
</tr>
</tbody>
</table>

**IBS IP 400 ME-VFD 1-3A DI4**
Variable frequency drive with four digital inputs, sheet-steel housing, IP54 degree of protection

**IBS IP 400 MBH**
Sheet-steel lower part, IP54 degree of protection

**IBS IP 400 MBH/MS**
Sheet-steel lower part, IP54 degree of protection, with switch-disconnector, fuse holder and power distribution

**INTERBUS remote bus**
- MINI COMBICON

**MINI COMBICON**
- 24 V DC (U_min)
- 20 V DC ... 30 V DC (including ripple)
- U_min = U_min minus 2 V DC
- 50 mA
- Against inductive reverse voltages, polarity reversal and short circuits

**POWER-COMBICON terminal strips X10**
- 2-wire

**POWER-COMBICON**
- 340 V AC ... 550 V AC (line voltage 50/60 Hz)
- Max. 4 A
- 2 Hz ... 100 Hz
- 1.5 kW (AT U_main = 400 V AC)

**Solid-state contact**
With POWER-COMBICON terminal strip of the motor connection
- (X10)
- Max. 0.5 A
- 6.1 kg

**IBS in acc. with IEC 60529:1989**
-
INTERBUS motor starters and variable frequency drives in sheet-steel housing (IP54) with fiber optic connection

Motor starters and variable frequency drives with fiber optic connectors are suitable for use in environments with high levels of electromagnetic interference. When this transmission method is used, the device is completely insensitive to electromagnetic interference. In addition, complete electrical isolation ensures that there are no more problems relating to potential.

Two-channel motor starters and one-channel reversing motor starters are available for different applications. Variable frequency drives make it possible to implement freely definable speed and acceleration times.

Additional features include:
- Simple assembly
- Pluggable connection system
- Fiber optic connection via F-SMA connectors
- Two digital outputs for actuator connections
- Exchangeable module electronics
- Power networking 400 V AC / 20 A
- Power networking with an extended lower part and 10 mm² conductor
- Extended lower part with integrated maintenance switch
- Comprehensive status and diagnostics display on the module
- Startup without bus possible with manual operating function
- Four initiator inputs for sensor connections
- Sheet-steel housing suitable for plant engineering
- Nominal output capacity 1.5 kW
- Slot-in Pg screw connections for use with preassembled cable sets

## Description

**Electronic motor starter**, electronics module without lower part of the housing

- 1-channel reversing starter, 1.5 kW
- 2-channel direct starter, 1.5 kW

**Variable frequency drive**, electronics module without lower part of the housing

- 1-channel, 1.5 kW

**Lower part of the housing**, sheet-steel

- Standard version
- With an integrated maintenance switch

**Connector set for sheet steel version**, consisting of:

- Connectors, PG cable gland inputs and filler plugs, FSMA connectors

**Hand-held operator panel**, for motor starters and variable frequency drives

**Fuses**

- ME-ELR (Midget/ 10.3 x 38)
- ME-VFD (Midget/ 10.3 x 38)

## Technical data

**Interface**

<table>
<thead>
<tr>
<th>Name</th>
<th>Order No.</th>
<th>Pcs. / Pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTERBUS remote bus (FO)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F-SMA connector</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Power supply for module electronics**

- 24 V DC (U_{IN})
- 20 V DC ... 30 V DC (including ripple)

**Power supply for sensors**

- U_{IN} = U_{I1} minus 2 V DC
- 50 mA

- Against inductive reverse voltages, polarity reversal and short circuits

**Digital inputs**

- Number of inputs: 4
- Type of connection: M12 connectors, (A-coded)
- Connection method: 3, 4-wire

**Digital outputs**

- Type of connection: M12 connectors, (A-coded)
- Connection method: 2-wire
- Output current: Max. 500 mA (per channel)

**Thermistor input**

- Number of inputs: 1
- Type of connection: POWER-COMBICON terminal strip X10
- Connection method: 2-wire

**Motor starter, output**

- Type of connection: POWER-COMBICON
- Operating voltage: 300 V AC ... 440 V AC (line voltage 50/60 Hz)
- Nominal current range: 0.2 A ... 3.6 A
- Frequency range: 50 Hz ... 60 Hz (mains frequency)
- Nominal motor power: 1.5 kW (2-pos. at U_{IN} = 400 V AC)

**Motor monitoring**

- Parameterization range: 0.2 A ... 3.6 A
- Tripping class: Based on class 10 A of IEC 60947-4: 1990

**Motor starter, brake**

- Type of contact: Polarized solid-state contact
- Connection method: With POWER-COMBICON terminal strip of the motor connection (X10)
- Max. 0.3 A

**General data**

- Weight: 3 kg
- Degree of protection: IP54 in acc. with IEC 60529:1989

---

**Hand-held operator panel**, for motor starters and variable frequency drives

**Fuses**

- ME-ELR (Midget/ 10.3 x 38)
- ME-VFD (Midget/ 10.3 x 38)
**Distributed drives**

---

**IBS IP 400 ME-VFD 3A FO**
Variable frequency drive with four digital inputs and two digital outputs, sheet-steel housing, IP54 degree of protection, fiber optics connection

---

**IBS IP 400 FO-MBH**
Sheet-steel lower part, IP54 degree of protection, Fiber optics guide plate, jumpering for 24 V (U_{US1} and U_{US2})

---

**IBS IP 400 FO-MBH/MS**
Sheet-steel lower part, IP54 degree of protection, Switch-disconnector, fuse holder, fiber optics guide plate, power distribution and jumpering for 24 V (U_{US1} and U_{US2})

---

<table>
<thead>
<tr>
<th>Type</th>
<th>Order No.</th>
<th>Pcs. / Pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBS IP 400 ME-VFD 3A FO</td>
<td>2734523</td>
<td>1</td>
</tr>
<tr>
<td>IBS IP 400 FO-MBH</td>
<td>2734345</td>
<td>1</td>
</tr>
<tr>
<td>IBS IP 400 FO-MBH/MS</td>
<td>2734581</td>
<td>1</td>
</tr>
<tr>
<td>IBS FO VFD PLSST</td>
<td>2734659</td>
<td>1</td>
</tr>
<tr>
<td>IBS HVO/M12</td>
<td>2837006</td>
<td>1</td>
</tr>
</tbody>
</table>

---

**IBS FUSE 10X38/16AGR**
Max. 10 A

**IBS FUSE 10X38/10AGL**
Max. 10 A

---

**INTERBUS remote bus (FO)**
- F-SMA connector
- 24 V DC (U_{US1})
- 20 V DC ... 30 V DC (including ripple)
- U_{US1} = U_{US2} minus 2 V DC
- Against inductive reverse voltages, polarity reversal and short circuits

- 4 M12 connectors, (A-coded)
- 3, 4-wire
- M12 connectors, (A-coded)
- 2-wire
- Max. 500 mA (per channel)
- 2 POWER-COMBICON terminal strips X10
- 2-wire
- POWER-COMBICON
  - 360 V AC ... 550 V AC (line voltage 50/60 Hz)
  - Max. 4 A
  - 2 Hz ... 100 Hz
  - Max. 4 A

- Solid-state contact
- With POWER-COMBICON terminal strip of the motor connection (X10)
  - Max. 0.5 A

- 6.1 kg
- IP54 in acc. with IEC 60529:1989

---

Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370
Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com
Inhalt 9 kaliert 

Breite s 

IBS IP 400 ME-MLR ... DI4F 

Electromechanical motor starter with four digital inputs and two digital outputs, high-grade steel housing, IP65/67 degree of protection

<table>
<thead>
<tr>
<th>Description</th>
<th>Type</th>
<th>Order No.</th>
<th>Pcs. / Pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electromechanical motor starter, electronics module without lower part of the housing</td>
<td>IBS IP 400 ME-MLR R-8A DI4F</td>
<td>2732949</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>IBS IP 400 ME-MLR 2-8A DI4F</td>
<td>2732965</td>
<td>1</td>
</tr>
<tr>
<td>Variable frequency drive, electronics module without lower part of the housing</td>
<td>IBS IP 400 MBH -F</td>
<td>2732868</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>IBS IP 400 MBH/MS-F</td>
<td>2734031</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>IBS MLR PLSET 2-8A-F</td>
<td>2836557</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>IBS HVO</td>
<td>2836052</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>IBS PG SET</td>
<td>2836599</td>
<td>1</td>
</tr>
</tbody>
</table>

Technical data

<table>
<thead>
<tr>
<th>Interface</th>
<th>Name</th>
<th>Type of connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTERBUS remote bus</td>
<td>MINI COMBICON</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Power supply for module electronics</th>
<th>Supply voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>24 V DC (U_{I2} / U_{I3})</td>
</tr>
<tr>
<td></td>
<td>20 V DC ... 30 V DC (including ripple)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Power supply for sensors</th>
<th>Minimum voltage</th>
<th>Nominal current per sensor</th>
<th>Name of protection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>50 mA</td>
<td>Against inductive reverse voltages, polarity reversal and short circuits</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Digital inputs</th>
<th>Number of inputs</th>
<th>Type of connection</th>
<th>Connection method</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4</td>
<td>MINI COMBICON</td>
<td>3, 4-wire</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Digital inputs</th>
<th>Type of connection</th>
<th>Connection method</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MINI COMBICON</td>
<td>2-wire</td>
</tr>
<tr>
<td></td>
<td>Max. 500 mA (per channel)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Digital inputs</th>
<th>Type of connection</th>
<th>Connection method</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>POWER-COMBICON</td>
<td>2-wire</td>
</tr>
<tr>
<td></td>
<td>terminal strips X10</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Digital inputs</th>
<th>Operating voltage</th>
<th>Nominal current range</th>
<th>Frequency range</th>
<th>Nominal motor power</th>
<th>Motor monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>360 V AC ... 440 V AC (line voltage 50/60 Hz)</td>
<td>0.2 A ... 8 A</td>
<td>50 Hz ... 60 Hz (mains frequency)</td>
<td>3.7 kW (2-pos. at U_{max} = 400 V AC)</td>
<td>0.2 A ... 8 A</td>
</tr>
<tr>
<td></td>
<td>Based on class 10 A of IEC 60947-4: 1990</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Motor starter, brake</th>
<th>Type of contact</th>
<th>Connection method</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mechanical relay contact</td>
<td></td>
</tr>
<tr>
<td></td>
<td>With POWER-COMBICON terminal strip of the motor connection (X10)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Motor starter, brake</th>
<th>Continuous load current</th>
<th>General data</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Max. 1 A</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Motor starter, brake</th>
<th>Weight</th>
<th>Degree of protection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3.3 kg</td>
<td>IP67 in acc. with IEC 60529</td>
</tr>
</tbody>
</table>

Drives

Distributed drives

INTERBUS motor starters and variable frequency drives in stainless steel housing (IP65/67)

The motor starters and variable frequency drives in a stainless-steel housing with IP65/67 degree of protection were developed for use directly on machines and plants in the beverage and foods industry. The IP65/67 family of devices is available in different versions and performance levels for a wide variety of applications.

The two-channel motor starters allow direct drives to be controlled. There is a reversing load version for applications involving different drive directions. A variable frequency drive offers suitable control for applications that require different speeds and starting times.

Additional features include:

– Simple assembly
– Pluggable connection system
– Exchangeable module electronics
– Power networking 400 V AC/ 20 A
– Power networking with an extended lower part and 10 mm² conductor
– Extended lower part with integrated maintenance switch
– Comprehensive status and diagnostics display on the module
– Startup without bus possible with manual operating function
– Initiator inputs for sensor connections
– Nominal output power of 1.5 kW (VFD) / 3.7 kW (MLR)
### Drives
### Distributed drives

#### IBS IP 400 ME-VFD 1-3A DI4F
Variable frequency drive with four digital inputs, high-grade steel housing, IP65/67 degree of protection

<table>
<thead>
<tr>
<th>Type</th>
<th>Order No.</th>
<th>Pcs. / Pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBS IP 400 ME-VFD 1-3A DI4F</td>
<td>2836955</td>
<td>1</td>
</tr>
</tbody>
</table>

#### IBS IP 400 MBH -F
High-grade steel lower part, IP67 degree of protection

<table>
<thead>
<tr>
<th>Type</th>
<th>Order No.</th>
<th>Pcs. / Pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBS IP 400 MBH -F</td>
<td>2732868</td>
<td>1</td>
</tr>
<tr>
<td>IBS IP 400 MBH/MS-F</td>
<td>2734031</td>
<td>1</td>
</tr>
</tbody>
</table>

#### IBS IP 400 MBH/MS-F
High-grade steel lower part, IP65 degree of protection, with switch-disconnector, fuse holder and power distribution

<table>
<thead>
<tr>
<th>Type</th>
<th>Order No.</th>
<th>Pcs. / Pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBS IP 400 MBH/MS-F</td>
<td>2734031</td>
<td>1</td>
</tr>
</tbody>
</table>

---

**INTERBUS remote bus**

**MINI COMBICON**

24 V DC (U_{dc})

20 V DC ... 30 V DC (including ripple)

U_{dc} = U_{dc} minus 2 V DC

50 mA

Against inductive reverse voltages, polarity reversal and short circuits

**4**

**MINI COMBICON**

3, 4-wire

**POWER-COMBICON**

**terminal strips X10**

2-wire

**POW**

**ER-COM**

340 V AC ... 550 V AC (line voltage 50/60 Hz)

Max. 4 A

2 Hz ... 100 Hz

1.5 kW (AT U_{max} = 400 V AC)

Max. 4 A

Solid-state contact

With POWER-COMBICON terminal strip of the motor connection (X10)

Max. 0.5 A

5.1 kg

IP67 in acc. with IEC 60529
PROFIBUS motor starters and variable frequency drives in sheet-steel housing (IP54)

Distributed installation of the PROFIBUS motor control switches close to the motors seamlessly integrates the numerous drives in a plant into a universal system using a combined data and power bus.

In this way, the sensors and actuators distributed throughout the machinery and plants can be directly connected to PROFIBUS without the need for many intermediate stations or additional cabling.

PROFIBUS motor control switches in sheet-steel housings with IP54 degree of protection are available in different versions.

The two-channel motor control switch allows direct drives to be controlled. There is a reversing load motor control switch for applications involving different drive directions. If different speeds, startup and braking times are required, a variable frequency drive provides the required control.

Additional features include:
- Simple assembly
- Pluggable connection system
- Exchangeable module electronics
- Power networking 400/500 V AC / 20 A
- Expanded lower part with integrated maintenance switch and fuse holder for 10 mm² cable
- Comprehensive status and diagnostics display on the module
- Startup without bus possible with manual operating function
- Four digital inputs for sensor connections
- Two digital outputs for actuator connections
- Sheet-steel housing suitable for plant engineering
- Nominal output capacity 1.5 kW
- Slot-in Pg screw connections for use with preassembled cable sets

Device master data files

The latest versions of the device master data files needed for startup can be found on the Internet at www.phoenixcontact.net/download in the download section.

PB IP 400 ME-ELR ...-3A
Electronic motor starter with four digital inputs and two digital outputs, sheet-steel housing, IP54 degree of protection

<table>
<thead>
<tr>
<th>Description</th>
<th>Type</th>
<th>Order No.</th>
<th>Pcs. / Pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronic motor starter, electronics module without lower part of the housing</td>
<td>PB IP 400 ME-ELR R-3A</td>
<td>2734840</td>
<td>1</td>
</tr>
<tr>
<td>Variable frequency drive, electronics module without lower part of the housing</td>
<td>PB IP 400 ME-ELR 2-3A</td>
<td>2734772</td>
<td>1</td>
</tr>
<tr>
<td>Lower part of the housing, sheet-steel</td>
<td>IBS IP 400 MBH</td>
<td>2732871</td>
<td>1</td>
</tr>
<tr>
<td>Sheet-steel housing, IP54 degree of protection</td>
<td>IBS IP 400 MBH/MS</td>
<td>2734125</td>
<td>1</td>
</tr>
<tr>
<td>Fieldbus connector, female, straight, 5-pos., M12, shielded, B-coded, for incoming PROFIBUS</td>
<td>IBS ELR PLSET 2-3A</td>
<td>2836816</td>
<td>1</td>
</tr>
<tr>
<td>Hand-held operator panel, for motor starters and variable frequency drives</td>
<td>IBS HVO/M12</td>
<td>2837006</td>
<td>1</td>
</tr>
<tr>
<td>Termination resistor, M12</td>
<td>SACC-M12FSB-5CON-PG9 SH AU</td>
<td>1507777</td>
<td>1</td>
</tr>
<tr>
<td>Fuses ME-ELR (Midget/10.3 x 38)</td>
<td>SACC-M12MSB-5CON-PG9 SH AU</td>
<td>1507764</td>
<td>1</td>
</tr>
<tr>
<td>Fuses ME-VFD (Midget/10.3 x 38)</td>
<td>SAC-P-M12MS PB TR</td>
<td>1507803</td>
<td>5</td>
</tr>
</tbody>
</table>

Technical data

Interface
- Type of connection
- Power supply for module electronics
- Supply voltage
- Range of supply voltages
- Power supply for sensors
- Minimum voltage
- Nominal current per sensor
- Name of protection
- Digital inputs
- Number of inputs
- Connection method
- Typical input current per channel
- Type of connection
- Motor starter, output
- Type of connection
- Operating voltage
- Nominal current range
- Frequency range
- Motor monitoring
- Parameterization range
- Tripping class
- Motor starter, brake
- Type of connection
- Connection method
- Continuous load current

PROFIBUS interface
- M12 connectors, B-coded
- 24 V DC (U\text{IN})
- 20 V DC ... 30 V DC (including ripple)
- U\text{IN} = U\text{IN} \text{min} \text{DC}
- 50 mA
- Against inductive reverse voltages, polarity reversal and short circuits
- 4
- 3, 4-wire
- Approx. 5 mA (for U\text{IN} = 24 V)
- M12 connectors, (A-coded)
- 2-wire
- U\text{IN} \text{min} \text{DC}
- 2-wire
- POWER-COMBICON terminal strips X10
- POWER-COMBICON
- 360 V AC ... 440 V AC (line voltage 50/60 Hz)
- 0.2 A ... 3.6 A
- 50 Hz ... 60 Hz (mains frequency)
- 0.2 A ... 3.6 A
- Based on class 10 A of IEC 60947-4: 1990
- 0.3 A

PB IP 400 ME-ELR ...-3A
Electronic motor starter with four digital inputs and two digital outputs, sheet-steel housing, IP54 degree of protection
### Drives

**Distributed drives**

**PB IP 400 ME-VFD-3A**
Variable frequency drive with four digital inputs and two digital outputs, sheet-steel housing, IP54 degree of protection, fiber optics connection

<table>
<thead>
<tr>
<th>Type</th>
<th>Order No.</th>
<th>Pcs. / Pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PB IP 400 ME-VFD-3A</td>
<td>2734785</td>
<td>1</td>
</tr>
<tr>
<td>IBS IP 400 MBH</td>
<td>2732871</td>
<td>1</td>
</tr>
<tr>
<td>IBS IP 400 MBH/MS</td>
<td>2734125</td>
<td>1</td>
</tr>
<tr>
<td>IBS VFD PLSET 1-3A</td>
<td>2836942</td>
<td>1</td>
</tr>
<tr>
<td>SACC-M12FSB-5CON-PG9 SH AU</td>
<td>1507777</td>
<td>1</td>
</tr>
<tr>
<td>SACC-M12FMB-5CON-PG9 SH AU</td>
<td>1507764</td>
<td>1</td>
</tr>
<tr>
<td>SAC-5P-M12MS PB TR</td>
<td>1507803</td>
<td>5</td>
</tr>
</tbody>
</table>

**IBS IP 400 MBH**
Sheet-steel lower part, IP54 degree of protection

**IBS IP 400 MBH/MS**
Sheet-steel lower part, IP54 degree of protection, with switch-disconnector, fuse holder and power distribution

<table>
<thead>
<tr>
<th>Type</th>
<th>Order No.</th>
<th>Pcs. / Pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBS IP 400 MBH/MS</td>
<td>2734125</td>
<td>1</td>
</tr>
<tr>
<td>IBS FUSE 10X38/16AGR</td>
<td>2734073</td>
<td>10</td>
</tr>
<tr>
<td>IBS FUSE 10X38/10AGL</td>
<td>2704090</td>
<td>10</td>
</tr>
</tbody>
</table>

**PROFIBUS interface**
- M12 connectors, B-coded
- 24 V DC (U_{24})
- 20 V DC ... 30 V DC (including ripple)

**24 V DC (U_{24})**
- U_{24} = U_{2} minus 2 V DC
- 50 mA
- Against inductive reverse voltages, polarity reversal and short circuits

**3, 4-wire**
- Approx. 5 mA (for U_{24} = 24 V)
- M12 connectors, (A-coded)
- 2-wire
- U_{24} minus 2 V
- POWER-COMBICON terminal strips X10
- 2-wire
- POWER-COMBICON
- 340 V AC ... 550 V AC (line voltage 50/60 Hz)
- Max. 4 A
- 2 Hz ... 100 Hz
- Max. 4 A
- Solid-state contact
- With POWER-COMBICON terminal strip of the motor connection (X10)
- Max. 0.5 A