Handling system overview
Multi-axis systems and drives
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Your task defines the solution!

Either you concentrate on your core business and let Festo look after your handling task – with an extensive portfolio of tested and ready-to-install multi-axis systems supported by a highly qualified project engineers and advisors with many years of experience.

Or you can choose the components yourself and use the sophisticated service packages. They provide all the support you need, from application-specific advice, engineering and project planning to startup and extensive after-sales services.

Thanks to excellent system expertise, Festo is able to solve your tasks in handling technology, from pick and place to customised applications. Or you can purchase the appropriate components, whether pneumatic, servopneumatic, electric or a mechatronic mix of components. Everything is fully tested, as a matter of course.

Mechatronic Motion Solutions

Mechatronic Motion Solutions from Festo is a worldwide unique system which comprises components, modules, systems and software. It combines all types of pneumatic, servopneumatic and electro-mechanical automation motion, geared to your task. Irrespective of the control system environment you use, Mechatronic Motion Solutions provides the appropriate interfaces.

Mechatronics
Guarantees mechanical and electrical compatibility at all levels. All pneumatic and electric drives are equipped with suitable interfaces for mechanical, data and energy transmission, thus ensuring that different technologies can be combined in one system. And it enables complex handling and positioning systems to be set up easily and safely.

Motion
Stands for the comprehensive, multi-dimensional portfolio of linear and rotary drives as well as a large variety of mechanical and vacuum grippers. They provide a host of benefits, such as high speed, precision, etc.

Solutions
Represents Festo’s many years of experience in the handling sector across all industries and continents, as well as its expertise in the development of components and sophisticated systems. They range from pre-designed and calculated components to subsystems all the way to complete systems. The logical answer to the demand for pre-installed, customised systems and solutions.

Mechatronic Motion Solutions from Festo is a worldwide unique system which comprises components, modules, systems and software. It combines all types of pneumatic, servopneumatic and electro-mechanical automation motion, geared to your task. Irrespective of the control system environment you use, Mechatronic Motion Solutions provides the appropriate interfaces.
Define the level of cooperation you want: step by step

**Consulting**
Common solution methods lead to better overall solutions. Software tools also provide assistance with design and configuration.

**Quotation**
A prompt, complete and detailed quotation comprising:
- 3D drawing
- Parts lists
- Cycle and travel times
- Performance
- Functional sequence
- Price

**Ordering**
One part number, one order item, one delivery date makes for easy ordering. Includes order tracking.

**Engineering**
We can plan and design your single or multi-axis system in no time at all. Also included are CAD drawings, circuit diagrams, parts lists and detailed system documentation.

**Assembly**
All functions and requested features are fully tested, thus guaranteeing
- Quality
- Perfect fit
- Harmonised interfaces (mechanical and electrical)

**Commissioning**
Festo offers fast and reliable integration and commissioning of complete subsystems – directly in your machine.

**Maintenance**
The production industry is focused on preventing production stoppages. This is another reason why our solutions provide maximum reliability – and reduce your process costs and time to market.

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A detailed description of our services can be found starting on page 54.
Top performer

Generously sized profiles with an optimised cross section afford the drives maximum rigidity and load capacity. Speed, acceleration and torque resistance set a new standard.

Economical

In addition to its technical features, the EGC impresses with its excellent price/performance ratio. And thanks to its high performance, a smaller size can often be used, particularly in the case of spindle axes!

Quicker planning

The integration of the EGC in the Festo multi-axis and modular positioning system offers standardised interfaces for other drives and motor packages. The PositioningDrives software also simplifies the design and ensures it is correctly dimensioned without expensive oversizing.
Compatible motors and controllers:
See Page 46

Compatible motor kits and gear units:
EAMM-A-... motor kit
EMGA-...P-... gear unit

Flexible motor connection on ECG-TB
- Motor can be attached on 4 sides, freely selectable
- Subsequent modifications possible at any time

The benefits to you:
Define a standard attachment variant with one part number and modify to alternative positions as and when needed

Slide variants:

Extended slide
- Longer guide
- For a greater axial torque
- More mounting options

Second slide
- 1 active and 1 passive (freely movable) slide
- Adjustable, extended guide
- For greater axial and lateral torques
- More mounting options

Protected slide
- Scrapers on both sides of the slide
- Removes dirt particles and liquids from the external guide
- For use in aggressive environments

Safety thanks to optional sensing
- Inductive proximity sensor SIES-8M
- Flush mounting of up to 2 sensors in the profile slot – no protruding edges outside of the drive cross section
- Maximum of 4 sensors

Output status display: 2 yellow LEDs for better visibility, regardless of approach direction
- Repetition accuracy ≤ ±0.05 mm (radial)
Toothed belt and spindle axes EGC

Toothed belt and spindle axes
EGC – the new design for
• High speeds and feed forces
• Maximum rigidity
• High loads and torques
• Minimum distance between load and guide centre

Toothed belt axis EGC-TB:
dynamic toothed belt drive with external recirculating ball bearing guide on the slide
The toothed belt axis is designed for high speeds with high loads and long strokes.

• Speeds up to 5 m/s
• Maximum stroke up to 10 m
• Repetition accuracy ±0.1 mm
• Maximum feed force 3000 N
(for additional technical details, see page 25)

Spindle axis EGC-BS: precise spindle drive with ball screw and external recirculating ball bearing guide on the slide
The spindle axis is designed for precision and smooth running with high loads and long strokes.

• Speeds up to 2 m/s
• Maximum stroke up to 5 m
• Repetition accuracy ±0.02 mm
• Maximum feed force 2500 N
(for additional technical details, see page 25)

Guide axis EGC-FA:
Driveless linear guide unit with external recirculating ball bearing guide and freely movable slide.

The guide axis is designed to support forces and torques in multi-axis applications.
• Reduced vibrations with dynamic loads
• Higher torsional resistance

Newly defined rigidity
Load application point near the guide for maximum torques and forces
50% more rigidity than previous solutions!
The newly developed guide system for the EGC axes provides more running smoothness and higher torque resistance. The very rigid axis profile allows longer unsupported strokes without an additional guide axis.

- Thanks to its performance, it is often possible to use a smaller size.
- Can also be used as a mono system with higher loads. The second axis can then be saved.

The toothed belt/spindle axis EGC is a high-performance component for multi-axis applications, thanks to its positive characteristics. Simpler designs enable optimum integration and reduce installation costs.

When combined with handling and assembly systems from Festo, like gripping or turning, the range for new customised design solutions is almost limitless.

In addition:
Nominal stroke = effective stroke
- Smaller and more optimised fitting space
- Excellent price/performance ratio

Individual handling systems with frame
Complete, ready-to-install systems not only consist of gantries with axis mechanics, but are often already mounted on aluminium or steel frames.

Thanks to the considerably enhanced performance of the EGC axes, cross bracing is often not needed for these frames.
- Simpler and lighter construction
- Improved efficiency
Pick and Place

Handling modules are ready-to-install, complete solutions and can be operated with electric or pneumatic drives.

- Comprising a semi-rotary drive with link guide system
- Precision through metallic end positions combined with a sturdy design
- Active waiting position possible
- Freely positionable with the electrical variant
- High repetition accuracy at end positions
- 180° design and 90° pick and place

Range of application:

- Effective load up to 1.6 kg
- For extremely short cycle times (0.6 to 1.2 s)
- For tight installation spaces
- For short stroke ranges

Pick and place systems consist of two yoke drives.

- Possible combinations comprising slides and cantilever axes
- High mechanical rigidity and sturdy design
- Pneumatic and electrical components – freely combinable
- As electrical solution – variable positioning

Range of application:

- Effective load up to 10 kg
- Stroke ranges up to 400 mm
- For applications where the gripper unit needs to be retracted from the area of activity

Example: automotive technology
Module in airbag assembly

Requirements

- Short cycle times
- Precision
- Waiting position

Solution

Handling module HSP-AE with servo drive MTR-DCI and sturdy parallel gripper HGPT-B

Example: sanitary engineering
Valve assembly for flush-mounted systems

Requirements

- Slim design
- Jerk-free movement
- High degree of precision
- Easy to service

Complete solution as pick and place with

- Pneumatic: HMPL/HMPL
- Or electric: EGSA/EGSA with gripping/swivel unit
<table>
<thead>
<tr>
<th>Type</th>
<th>Important characteristics</th>
<th>Construction</th>
<th>Effective load</th>
<th>Max. effective strokes</th>
<th>Components</th>
</tr>
</thead>
</table>
| Link-guided, high-speed pick and place (180°) | • Compact  
• High clock frequencies of up to 100 Hz  
• Intelligent stroke adjustment  
• Waiting position, freely programmable positions (electrical)  
• Easy to commission  
• Easy to install | Completely assembled handling module | Max. 1.6 kg | Z: from 20 ... 70 mm  
Y: from 52 ... 170 mm | Pneumatic: HSP-AP  
electric: HSP-AE (with servo motor MTR-DCI) |
| Link-guided, high-speed pick and place (90°) | • Compact  
• High clock frequencies of up to 100 Hz  
• Intelligent stroke adjustment  
• Waiting position, freely programmable positions (electrical)  
• Easy to commission  
• Easy to install | Completely assembled handling module | Max. 1.6 kg | Max. linear stroke  
90 ... 175 mm  
Working stroke  
9 ... 35 mm | Pneumatic: HSW-AP  
electric: HSW-AE (with servo motor MTR-DCI) |
| 2D Pick and place handling | • Very rigid construction  
• Short cycle times  
• Precise mini slides DGSL  
• High functionality with HMPL  
• Highly dynamic response and precision with long strokes with EGSA and HME | Module unit made up of a slide and/or cantilever axis | Max. 10 kg | Z: up to 400 mm  
Y: up to 400 mm | DGSL  
SLT  
SLTE  
EGSA  
HMP  
HMPL  
HME |
Linear gantries

Movements in 2D: a linear gantry consists of a gantry axis and a yoke drive.
- High mechanical rigidity and sturdy design
- Pneumatic and electrical components – freely combinable
- As electrical solution – variable positioning/any desired intermediate positions

Range of application:
- Ideal for long gantry strokes
- Often used for feeding applications
- Workpiece masses up to 5 kg (effective load up to 10 kg)
- Long gantry strokes up to 3 m and heavy loads up to 10 kg
- High requirements on system resistance to torsion

Example: construction materials industry
Handling, palletising and packing of ceramic tiles

Requirements
- High dynamic response
- Gentle acceleration and braking
- Jerk-free movement
- Good positioning flexibility

Solution
- Linear gantry with toothed belt axes and cantilever axis
- Complete solution, including vacuum gripper
### Important characteristics
- High process reliability thanks to installation integration
- Pneumatic and electric drives (with freely programmable positions)
- Repetition-accurate, centralised direct axis connections
- Mini slide on the Z-axis for maximum precision

### Pneumatic cantilever axis on the Z-axis with high repetition accuracy, high dynamic response and intermediate positions

### Electric cantilever axis on the Z-axis for large strokes, high dynamic response and low moving dead weight

### Components
- Y: DGC/EGC
- Z: DGSL EGSA

### Effective load
- Mono: 0 to 6 kg
- Mono: 0 to 5 kg
- Mono: 0 to 10 kg
- Duo: 0 to 25 kg

### Max. effective strokes
- Y: Up to 5000 mm
- Z: Up to 300 mm
- Y: Up to 5000 mm
- Z: Up to 200 mm
- Y: Up to 5000 mm
- Z: Up to 400 mm
- Y: Up to 5000 mm
- Z: Up to 900 mm

### Type
- Linear gantry as mono or duo axis
- Free movement of the Z-axis in the vertical plane (2D)

### Axis design
- Y: Gantry axes
- Z: Slide
- Cantilever axis
- Y: Gantry axes
- Z: Handling axis
- Cantilever axis

### Effective load
- Mono: 0 to 6 kg
- Mono: 0 to 5 kg
- Mono: 0 to 10 kg
- Duo: 0 to 25 kg

### Max. effective strokes
- Y: Up to 5000 mm
- Z: Up to 300 mm
- Y: Up to 5000 mm
- Z: Up to 200 mm
- Y: Up to 5000 mm
- Z: Up to 400 mm
- Y: Up to 5000 mm
- Z: Up to 900 mm

* With the pneumatic drive DGC, can be used as duo axis

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Higher effective loads of up to 50 kg on request
Cantilever axes

A cantilever system is made up of 2 parallel drives, combined with a pick and place unit.
- High mechanical rigidity and sturdy design
- Pneumatic and electrical components – freely combinable
- As electrical solution – variable positioning/any desired intermediate positions

Range of application:
- Cantilever axes are the best 3-axis solution for movements in 3D or in the available space where three-dimensional gantries are too big or the handling unit needs to be retracted from the area of activity
- Long strokes in horizontal plane of up to 3 m
- Very high requirements on system resistance to torsion

Example: assembly industry
Palletising of hinged housings

Requirements
- High dynamic response
- Good positioning flexibility
- Gentle acceleration and braking

Solution
- Cantilever axes with pneumatic axes DGC and handling modules HMP
- Assembled complete with tubing and electrical connections
<table>
<thead>
<tr>
<th>General</th>
<th>Type</th>
<th>Important characteristics</th>
<th>Axis design</th>
<th>Effective load</th>
<th>Max. effective strokes</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Cantilever axis</td>
<td>• High process reliability</td>
<td>X: Gantry axes Y: Gantry axes or cantilever axes Z: Cantilever axes or slides</td>
<td>0 to 6 kg</td>
<td>X: Up to 3000 mm</td>
<td>Y: Up to 3000 mm</td>
<td>X: DGC/DGPL, DGE/EGC, Y: DGC/DGPL, DGE, EGSA, EGC, HMP/HMPL Z: EGSA, DGSL, SLT/SLTE, HMPL</td>
</tr>
<tr>
<td>• Free movement of Z-axis in the available space (3D)</td>
<td>thanks to installation integration Pneumatic and electric drives Repetition-accurate, centralised direct axis connections</td>
<td></td>
<td>0 to 6 kg</td>
<td>X: Up to 3000 mm</td>
<td>Y: Up to 3000 mm</td>
<td>X: DGC/DGPL, DGE/EGC, Y: DGC/DGPL, DGE, EGSA, EGC, HMP/HMPL Z: EGSA, DGSL, SLT/SLTE, HMPL</td>
</tr>
<tr>
<td>• Size 1.0</td>
<td></td>
<td>X: Gantry axes Y: Gantry axes or cantilever axes Z: Cantilever axes or slides</td>
<td>0 to 2 kg</td>
<td>X: Up to 3000 mm</td>
<td>Y: Up to 200 mm</td>
<td>X: DGC/DGPL, DGE/EGC, Y: HMPL Z: DGSL, HMPL, EGSA</td>
</tr>
<tr>
<td>• Size 2.0</td>
<td>The simplest of designs</td>
<td>X: Gantry axes Y: Gantry axes or cantilever axes Z: Cantilever axes or slides</td>
<td>0 to 4 kg</td>
<td>X: Up to 3000 mm</td>
<td>Y: Up to 400 mm</td>
<td>X: DGC/DGPL, DGE/EGC, Y: HM, DGEA Z: DGSL, HMPL, DGEA, EGSA</td>
</tr>
<tr>
<td>• Size 3.0</td>
<td>by virtue of standard</td>
<td>X: Gantry axes Y: Gantry axes or cantilever axes Z: Cantilever axes or slides</td>
<td>0 to 6 kg</td>
<td>X: Up to 3000 mm</td>
<td>Y: Up to 400 mm</td>
<td>X: DGC/DGPL, DGE/EGC, Y: HM, DGEA, EGSA Z: HM, DGEA, EGSA</td>
</tr>
</tbody>
</table>

**Standard sizes**

- **Standardised cantilever axis in three effective load categories**
  - **Size 1.0**
  - **Size 2.0**
  - **Size 3.0**
Three-dimensional gantries

A three-dimensional gantry consists of horizontal gantry axes and a vertical drive.
- Can be used universally for handling light to heavy workpieces or high effective loads
- Ideal for very long strokes
- High mechanical rigidity and sturdy design
- Pneumatic and electrical components – freely combinable
- As electrical solution – variable positioning/any desired intermediate positions

Range of application:
- For any movement in 3D space
- Very high requirements on precision and/or very heavy workpieces, with long strokes at the same time

Requirements
- Flexible positioning
- High speed and long horizontal strokes
- Fast system availability
- Complete documentation of process values

Solution
Three-dimensional gantry with toothed belt axes DGE from the multi-axis modular system

Planar surface gantry
The planar surface gantry is equivalent to a three-dimensional gantry, but without a Z-axis and allows free movement in the plane.

Example: automotive industry
Load handling in assembly system for solenoids
<table>
<thead>
<tr>
<th>Type</th>
<th>Important characteristics</th>
<th>Axis design</th>
<th>Effective load</th>
<th>Max. effective strokes</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Three-dimensional gantry as mono axis</td>
<td>X: Gantry axes Y: Gantry axes Z: Slides</td>
<td>Mono: 0 to 6 kg</td>
<td>X: Up to 8500 mm Y: Up to 1500 mm Z: Up to 300 mm</td>
<td>X: DGE/EGC Y: DGE/EGC Z: DGPL</td>
</tr>
<tr>
<td></td>
<td>• Free movement of Z-axis in the available space (3D)</td>
<td></td>
<td></td>
<td></td>
<td>Z: DGS</td>
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<tr>
<td></td>
<td>• Compact design</td>
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<td></td>
<td>• High process reliability thanks to installation integration</td>
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<td></td>
<td>• Pneumatic and electric drives</td>
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<tr>
<td></td>
<td>• Repetition-accurate, centralised direct axis connections</td>
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</tr>
<tr>
<td></td>
<td>• Pneumatic and electric drives (with freely programmable positions in X and Y)</td>
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</tr>
<tr>
<td></td>
<td>• Very high dynamic response and precision</td>
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<td></td>
<td>• Three-dimensional gantry as mono or duo axis</td>
<td>X: Gantry axes Y: Gantry axes Z: Slides</td>
<td>Mono: 0 to 5 kg</td>
<td>X: Up to 8500 mm Y: Up to 1500 mm Z: Up to 200 mm</td>
<td>X: DGE/EGC Y: DGE/EGC Z: DGPL</td>
</tr>
<tr>
<td></td>
<td>• Free movement of Z-axis in the available space (3D)</td>
<td></td>
<td></td>
<td></td>
<td>Z: HMP</td>
</tr>
<tr>
<td></td>
<td>• Z-axis with optional intermediate position (can be passed through) and clamping unit</td>
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</tr>
<tr>
<td></td>
<td>• Three-dimensional gantry as mono or duo axis</td>
<td>X: Gantry axes Y: Gantry axes Z: Slides</td>
<td>Mono: 0 to 10 kg*</td>
<td>X: Up to 8500 mm Y: Up to 2000 mm Z: Up to 400 mm</td>
<td>X: DGE/EGC Y: DGE/EGC Z: DGPL</td>
</tr>
<tr>
<td></td>
<td>• Free movement of Z-axis in the available space (3D)</td>
<td></td>
<td></td>
<td></td>
<td>Z: HMP</td>
</tr>
<tr>
<td></td>
<td>• Z-axis with optional intermediate position and clamping unit</td>
<td></td>
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</tbody>
</table>

- System solution for standardised three-dimensional gantries with effective load up to 50 kg on request
- Long strokes in X direction up to 10 m on request

* With the pneumatic drive DGC, can be used as duo axis
Tripod kinematics consisting of electrical gantry axes, designed in the form of a pyramid

- Technical mechatronics solution from the modular system
- Free movements in available space with standard components
- Ideal for 3D high-speed pick and place tasks
- High rigidity and mechanical stability of the overall system
- Small moving masses (no motors or axes are moved): high dynamic response

Special features:

- Essential for dynamic response: axis control using servo motors EMMS-AS and the associated controller CMMP-AS
- Ideal system solution in combination with the effective contour control of the robotic controller CMXR
- Easy programming and commissioning with the FCT software and the handheld terminal CDSA, with plain text language and teach-in function

Advantages:

- Complete system performance from Festo – plug and work – from engineering to commissioning
- High rigidity, minimal vibrations and small moving masses when compared to other solutions (Cartesian axis gantries or robots): large effective loads with high dynamic response
- Maximum acceleration of 100 m/s² and speed of 6 m/s with 1 kg load
- Up to three times quicker than Cartesian systems and with smaller dimensions/smaller space requirement
- Effective loads of up to 5 kg
- Available in 4 standard sizes with a working space of up to 1250 mm in diameter

Range of application:

- For any movements in 3D space
- High-speed handling for pick and place tasks
- Very high requirements on precision and dynamic response

Target applications:

Handling, equipping and palletising of small to medium-sized parts and quite heavy workpieces, e.g. in the following sectors:

- Photovoltaics/solar
- Electronic light assembly/electronics industry
- Food packaging
<table>
<thead>
<tr>
<th>Type</th>
<th>Important characteristics</th>
<th>Axis design</th>
<th>Effective load</th>
<th>Work range</th>
<th>Components</th>
</tr>
</thead>
</table>
| Fast tripod handling unit for repositioning small masses in space (3D) | • Compact design  
• Minimum cycle times with high repetition accuracy  
• Any intermediate positions  
• Long paths in the XY plane  
• Optionally with servo-electric rotary axis  
• Robotics system solution with software and operator unit | • 3-axis pyramid  
• Closed kinematics with high rigidity | 0 to 5 kg |  | DGE/EGC  
Toothed belt axes  
EMMS-AS  
Servo motor  
CMMP-AS  
Motor controller  
CMXR  
Motion controller (robotics) |

Perfect in combination with the Compact Vision System for SBOx-Q:  
• Position and orientation detection  
• Type identification  
• Reliable inspection results including quality test  
• Tracking function in connection with the robotics controller CMXR – Contact our experts!
**Application-specific solutions – Gripper systems**

**Benefits**
- Ready-to-install gripper system, customised to your individual application
- No problems with interface to the handling system
- Easy to install and assemble
- Complete CAD data for fast design

**Scope of services**
Festo plans and designs gripper systems for the front end unit on the basis of your requirements. With an extensive modular system of mechanical grippers and suction grippers, Festo offers the right solution for every application. Individual adaptations according to your specifications, such as ejectors, multiple grippers, gripper fingers and gripper jaws, round off the offer.

**Application examples**
- **Crankshaft handling system**
- **Vacuum gripper system for paper and cardboard boxes**

**Parallel gripper HGPL-40-40**
- With stroke reduction HGPL-HR-40
- With proximity sensor SME-10 in the sensor slot

**Parallel gripper HGPT-63-A-G2**
- With position transmitter SMAT for evaluating the entire gripper stroke

**Gripper jaws**
- With interchangeable plastic inserts
- Category: GBT 3

**Semi-rotary drive**
DRQD-16-90-YSRJ-A-ALFW-E422
Energy throughfeed
- electric
- pneumatic

**Z-axis:**
- Mini slide DGSL-25-80-Y3A
- With integrated clamping unit

**Parallel gripper HGPT-63-A-G2**
- With external sensing using inductive proximity sensor M12

**Gripper jaws**
- With interchangeable plastic inserts
- Category: GBT 3
Application-specific solutions – Individual handling systems

Benefits
- Optimised performance
- Every customised solution is possible
- Short lead times for planning, design and assembly
- Optional: gripper systems

Scope of services
In addition to the flexible standard solutions from the multi-axis modular system, Festo also offers individual handling solutions designed in accordance with your specifications. Adaptations, such as freely definable axis dimensions, facilitate shorter cycle times or integration in machines with a minimal space requirement.

Application examples
Handling and processing of rod material

Two independently positionable X-axes for horizontal transport

Load interface at the front end unit for customer applications

Complete energy chain for X/Y/Z axes

Load interface at the front end unit for customer applications

Complete energy chain for X/Y/Z axes

Load interface at the front end unit for customer applications

Complete energy chain for X/Y/Z axes

Load interface at the front end unit for customer applications

Complete energy chain for X/Y/Z axes

Load interface at the front end unit for customer applications

Complete energy chain for X/Y/Z axes
## Aluminium and steel frames

### Aluminium frames

<table>
<thead>
<tr>
<th>Profile</th>
<th>Effective load*</th>
<th>Standard dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small load 80 x 80 mm</td>
<td>Up to 6 kg</td>
<td><img src="image1" alt="Linear gantry" /> <img src="image2" alt="Three-dimensional gantry" /></td>
</tr>
<tr>
<td>High load 100 x 100 mm</td>
<td>Up to 15 kg</td>
<td><img src="image1" alt="Linear gantry" /> <img src="image2" alt="Three-dimensional gantry" /></td>
</tr>
<tr>
<td></td>
<td>Up to 25 kg</td>
<td><img src="image1" alt="Linear gantry" /> <img src="image2" alt="Three-dimensional gantry" /></td>
</tr>
</tbody>
</table>

**Effective load** = mass at front end of the handling system

### Steel frames

<table>
<thead>
<tr>
<th>Material</th>
<th>Effective load*</th>
<th>Standard dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel structural hollow section to EN 10210 or EN 10219</td>
<td>Up to 15 kg</td>
<td><img src="image1" alt="Linear gantry" /> <img src="image2" alt="Three-dimensional gantry" /></td>
</tr>
<tr>
<td></td>
<td>Up to 25 kg</td>
<td><img src="image1" alt="Linear gantry" /> <img src="image2" alt="Three-dimensional gantry" /></td>
</tr>
<tr>
<td></td>
<td>Up to 50 kg</td>
<td><img src="image1" alt="Linear gantry" /> <img src="image2" alt="Three-dimensional gantry" /></td>
</tr>
</tbody>
</table>

* Effective load = mass at front end of the handling system

= length of the frame
Five steps to a complete system!
How to choose your standardised substructure quickly and easily, suitable for your handling system.

**Step 1:** Handling: Select according to the handling guide, as usual

**Handling plus frame:**

**Step 2:** What kind of system is it?
Linear or three-dimensional gantry

**Step 3:** Which frame size is being used?
BG 3.0, 5.0 or 6.0

**Step 4:** With BG 5.0/6.0, Specify the material of the frame, i.e. steel or aluminium

**Step 5:** Specify the dimensions.
Length, height, width or axis distance

**Design**
All frames are calculated with respect to their rigidity, using finite element software.

This means that only truly essential stiffeners are installed.

The benefit to you: a 100% cost optimisation.

**Special designs**
Our qualified teams are able to create an FEM design within a very short time.

Then a video is created to show the rigidity of the frame.

The benefit to you: 100% design certainty.

**Information**

**Illustration of FEM software**

Deformation due to the acting forces, amplified by a factor of 2000.

Three-dimensional gantry 5 m long, 2.5 m high, 2 m wide

**Individual special solutions!**
If you haven’t yet found the right solution, let us know. We’ll be happy to help.
Electrical gantry axes

Toothed belt and spindle axes

EGC
- Comprehensive series with many variants
- As a single or complete solution in a system
- Integrated in the mechatronic modular system
- Thanks to its high performance (feed force and torques), the EGC can often be used in a smaller size than was previously possible.

Features
- Toothed belt axis and spindle axis
- Optional: protected guide
- Large profile with optimised cross section
- Maximum rigidity and load capacity
- High torque resistance
- Flexible motor attachment for the toothed belt axis, also possible at a later date

Additional details about the EGC can be found starting on page 6.

Electrical axis DGE
- Reliable, comprehensive standard series of electrical gantry axes in several sizes
- Many stroke ranges with several guide types
- High-quality toothed belt drive or precision ball screw spindle

Features
- High speeds
- High repetition accuracy
- Max. stroke 5000 mm
- High torque and force resistance with recirculating ball bearing guide and heavy-duty guide

Electrical toothed belt axis

DGE-ZR-RF
- High-speed variant of the DGE series
- With internal roller bearing guide
- Three sizes

Features
- Very high speed up to 10 m/s
- Minimal noise generation
- Integrated lubrication for service-free running performance of 10,000 km

Electrical axes EGSK/EGSP
- Perfect when precision, repetition accuracy, compactness and rigidity are required
- EGSK: series for standard tasks in the upper segment
- EGSP: greater precision and performance for high-end applications

Features
- Uniform design
- The 100% steel housing also serves as the guide rail
- Constant, smooth running characteristics
- Long service life
- Recirculating ball bearing guide with ball bearing chain for great precision
<table>
<thead>
<tr>
<th><strong>Electrical gantry axes</strong></th>
<th><strong>EGC</strong></th>
<th><strong>DGE</strong></th>
<th><strong>DGE-ZR-RF</strong></th>
<th><strong>EGSK/EGSP</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>50/70/80/120/185</td>
<td>8/12/18/25/40/63</td>
<td>25/40/63</td>
<td>15/20/26/33/46</td>
</tr>
<tr>
<td>Drive</td>
<td>Spindle drive/Toothed belt drive</td>
<td>Spindle drive/Toothed belt drive</td>
<td>Toothed belt drive</td>
<td>Spindle drive</td>
</tr>
<tr>
<td>Guide</td>
<td>Recirculating ball bearing guide</td>
<td>Without guide Recirculating ball bearing guide Heavy-duty guide</td>
<td>Internal roller guide Ball bearing chain</td>
<td>Recirculating ball bearing guide</td>
</tr>
<tr>
<td>Max. stroke [mm]</td>
<td>5,000/8,500 (10,000)</td>
<td>4,500</td>
<td>5,000</td>
<td>800</td>
</tr>
<tr>
<td>Max. speed [m/s]</td>
<td>2/5</td>
<td>1.2/5</td>
<td>10</td>
<td>1.05/2</td>
</tr>
<tr>
<td>Repetition accuracy [mm]</td>
<td>±0.1..0.02</td>
<td>±0.02/0.08/0.1</td>
<td>±0.1</td>
<td>±0.003/0.005/0.01</td>
</tr>
<tr>
<td>Max. force $F_x$ [N]</td>
<td>2,500/3,000</td>
<td>1,600</td>
<td>1,500</td>
<td>320/360</td>
</tr>
<tr>
<td>Max. torque load $M_x$ [Nm]</td>
<td>529</td>
<td>580</td>
<td>65</td>
<td>1,400/1,390</td>
</tr>
<tr>
<td>Max. torque load $M_y$ [Nm]</td>
<td>1,820</td>
<td>1,820</td>
<td>340</td>
<td>547/579</td>
</tr>
<tr>
<td>Max. torque load $M_z$ [Nm]</td>
<td>1,820</td>
<td>1,820</td>
<td>600</td>
<td>547/579</td>
</tr>
<tr>
<td>Options</td>
<td>• Guide axis • Extended slide • Additional slide • Protected design • Central lubrication</td>
<td>• Guide axis • Extended slide • Additional slide • Protected design</td>
<td>• Standard slide • Extended slide • Guide axis</td>
<td>• Standard slide • Short slide • Additional slide • Cover</td>
</tr>
</tbody>
</table>

2009/09 – Subject to change – Handling system overview
Pneumatic gantry axes

### Rodless drive DGC
- Excellent guide qualities
- Maximum characteristic load values and torque resistance
- Minimised installation space
- Proximity sensors built into the profile

### Features
- Optionally with shock absorber and second slide
- Accessible from one side: precision end-position adjustment, sensors, mounting, air connections and pneumatic end-position cushioning

### Rodless drive unit DGP/DGPL
- Dynamic
- Minimal space requirement
- High torque resistance
- Recirculating ball bearing guide: maximum precision and load capacity

### Features
- Space gained through optimised stroke/overall length ratio
- Integratable proximity sensors
- Long service life
- Low leakage
- Easy to install
- Choice of air connections

### Rodless slide SLG
- Flat, quick and precise
- Ideal for dynamic movements in a small space
- Perfect for the precision mechanics and electronics industries

### Features
- Extremely precise, thanks to recirculating ball bearing guide
- Precision adjustment of stroke length possible as required
- Air supply on one or two sides
## Pneumatic gantry axes

<table>
<thead>
<tr>
<th></th>
<th>DGC</th>
<th>DGP/DGPL</th>
<th>SLG</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Size</strong></td>
<td>8/12/18/25/32/40/50/63</td>
<td>18/25/32/40/50/63/80</td>
<td>8/12/18</td>
</tr>
<tr>
<td><strong>Guide</strong></td>
<td>Without guide</td>
<td>Without guide</td>
<td>Recirculating ball bearing guide</td>
</tr>
<tr>
<td></td>
<td>Plain-bearing guide</td>
<td>Plain-bearing guide</td>
<td>Heavy-duty guide</td>
</tr>
<tr>
<td></td>
<td>Recirculating ball bearing guide</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. stroke [mm]</td>
<td>5,000</td>
<td>3,000</td>
<td>900</td>
</tr>
<tr>
<td>Max. speed [m/s]</td>
<td>3</td>
<td>3</td>
<td>1.5</td>
</tr>
<tr>
<td>Max. force F&lt;sub&gt;x&lt;/sub&gt; at 6 bar [N]</td>
<td>1,870</td>
<td>3,016</td>
<td>153</td>
</tr>
<tr>
<td>Max. torque load M&lt;sub&gt;x&lt;/sub&gt; [Nm]</td>
<td>26/96/529/375</td>
<td>32/100/745/375</td>
<td>7</td>
</tr>
<tr>
<td>Max. torque load M&lt;sub&gt;y&lt;/sub&gt; [Nm]</td>
<td>150/450/1,157/560</td>
<td>750/230/1,545/560</td>
<td>23</td>
</tr>
<tr>
<td>Max. torque load M&lt;sub&gt;z&lt;/sub&gt; [Nm]</td>
<td>48/187/1,157/540</td>
<td>140/230/1,545/540</td>
<td>23</td>
</tr>
<tr>
<td>Cushioning (at both ends)</td>
<td>• Flexible, non-adjustable</td>
<td>• Pneumatic, adjustable</td>
<td>• Flexible, non-adjustable</td>
</tr>
<tr>
<td></td>
<td>• Pneumatic, adjustable</td>
<td>• Self-adjusting hydraulic</td>
<td>• Self-adjusting hydraulic</td>
</tr>
<tr>
<td></td>
<td>• Self-adjusting hydraulic</td>
<td>shock absorber</td>
<td>shock absorber</td>
</tr>
<tr>
<td>Options</td>
<td>• Guide axis</td>
<td>• Guide axis</td>
<td>• Intermediate-position module</td>
</tr>
<tr>
<td></td>
<td>• Extended slide</td>
<td>• Extended slide</td>
<td>• Extended slide</td>
</tr>
<tr>
<td></td>
<td>• Additional slide</td>
<td>• Additional slide</td>
<td>• Additional slide</td>
</tr>
<tr>
<td></td>
<td>• Protected design</td>
<td>• Clamping unit</td>
<td>• Clamping unit</td>
</tr>
<tr>
<td></td>
<td>• Central lubrication</td>
<td>• Protected design</td>
<td>• Protected design</td>
</tr>
</tbody>
</table>

2009/09 – Subject to change – Handling system overview
Electrical cantilever axes

Handling axis HME with integrated linear motor
- Complete axis with integrated linear motor, displacement encoder and guide
- Ready-to-install system for greater flexibility, precision and dynamic response

Features
- Maximum freedom of movement since position, acceleration, speed and force can be easily adjusted
- On-site control with the motor controller SFC-LAC (see page 48)

Cantilever axis with spindle EGSA
- Cantilever axis with spindle
- For short strokes, with high dynamic response and precision
- For applications where the axis needs to be retracted from the working space

Features
- High dynamic response for a large effective load
- High repetition accuracy
- Flexible motor mounting – axial or parallel
- Long service life

Cantilever axis DGEA with tooth belt drive
- Dynamic thanks to the reduction of the moving mass
- For long strokes and high loads
- Motor, gear unit and drive head are permanently mounted
- Only the main profile is moved with the load

Features
- Outstanding precision
- Can be accurately positioned
- Protected against contamination thanks to the bearing guide integrated in the profile
- Flat and compact drive head
- Optional: right-angle gear unit

Electrical piston rod cylinder DNCE
- Lead screw for format adjustments
- Ball screw drive for dynamic push and pull applications
- With rod guide unit for cost-optimised cantilever function

Features
- Maintenance-free thanks to lifetime lubrication
- Freely programmable positions
- Stick-slip-free
- Gentle acceleration
- Free programming and parameterisation of speed, travel and acceleration, as well as force control
### Electrical cantilever axes

<table>
<thead>
<tr>
<th></th>
<th>HME</th>
<th>EGSA</th>
<th>DGEA</th>
<th>DNCE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Size</strong></td>
<td>16/25</td>
<td>50/60</td>
<td>18/25/40</td>
<td>32/40/63</td>
</tr>
<tr>
<td><strong>Drive</strong></td>
<td>Linear direct drive</td>
<td>Spindle drive</td>
<td>Toothed belt</td>
<td>Spindle drive (lead screw/ball screw)</td>
</tr>
<tr>
<td><strong>Guide</strong></td>
<td>Recirculating ball bearing guide</td>
<td>Roller bearing guide</td>
<td>Recirculating ball bearing guide</td>
<td>Plain-bearing guide</td>
</tr>
<tr>
<td>Max. stroke (mm)</td>
<td>400</td>
<td>300</td>
<td>1,000</td>
<td>800</td>
</tr>
<tr>
<td>Max. speed (m/s)</td>
<td>3</td>
<td>1.5</td>
<td>3</td>
<td>0.06 ... 1</td>
</tr>
<tr>
<td>Repetition accuracy (mm)</td>
<td>±0.015</td>
<td>±0.01</td>
<td>±0.05</td>
<td>±0.02/0.07</td>
</tr>
<tr>
<td>Max. effective load (horizontal) (kg)</td>
<td>25 (with 100 mm stroke)</td>
<td>10</td>
<td>40</td>
<td>100</td>
</tr>
<tr>
<td>Max. effective load (vertical) (kg)</td>
<td>6</td>
<td>50</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Max. force F&lt;sub&gt;x&lt;/sub&gt; (N)</td>
<td>257 (peak feed force)</td>
<td>240</td>
<td>1,000</td>
<td>2,500</td>
</tr>
<tr>
<td>Max. torque load M&lt;sub&gt;x&lt;/sub&gt; (Nm)</td>
<td>25</td>
<td>133</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Max. torque load M&lt;sub&gt;y&lt;/sub&gt; (Nm)</td>
<td>70</td>
<td>665</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>Max. torque load M&lt;sub&gt;z&lt;/sub&gt; (Nm)</td>
<td>70</td>
<td>460</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td><strong>Options</strong></td>
<td>–</td>
<td>–</td>
<td>Double guide cartridge</td>
<td>External guide</td>
</tr>
</tbody>
</table>

2009/09 – Subject to change – Handling system overview
Pneumatic cantilever axes

Linear module HMP-B
- Hardened steel guide tube
- Preloaded and backlash-free recirculating ball bearing guides
- For handling and assembly systems

Features
- Wear-resistant thanks to the metallic end stop
- Precision adjustment
- Intermediate-position module with swivel levers
- Externally adjustable one-way flow control valves
- Integrated sensor rail

Handling axis HMPL
- Extremely slender and with 2 guide rods
- Suitable as a precise standalone module or can be quickly combined into a pick and place or gantry unit

Features
- Short travel times
- High repetition accuracy
- LEDs for optical display of movements
- Active intermediate positions provide flexibility
- Secure, thanks to optional clamping cartridge
<table>
<thead>
<tr>
<th>Pneumatic cantilever axes</th>
<th>HMP-B</th>
<th>HMPL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>16/20/25/32</td>
<td>12/16/20</td>
</tr>
<tr>
<td>Guide</td>
<td>Recirculating ball bearing guide</td>
<td>Recirculating ball bearing guide</td>
</tr>
<tr>
<td>Max. stroke [mm]</td>
<td>400</td>
<td>200</td>
</tr>
<tr>
<td>Max. speed [m/s]</td>
<td>1.2</td>
<td>1.0</td>
</tr>
<tr>
<td>Repetition accuracy [mm]</td>
<td>±0.01</td>
<td>±0.02</td>
</tr>
<tr>
<td>Max. effective load (horizontal at 6 bar) [kg]</td>
<td>50</td>
<td>10</td>
</tr>
<tr>
<td>Max. effective load (vertical at 6 bar) [kg]</td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>Max. force Fx (at 6 bar) [N]</td>
<td>483</td>
<td>188</td>
</tr>
<tr>
<td>Max. torque load Mx [Nm]</td>
<td>50</td>
<td>4</td>
</tr>
<tr>
<td>Max. torque load My [Nm]</td>
<td>50</td>
<td>5</td>
</tr>
<tr>
<td>Cushioning (at both ends)</td>
<td>• Self-adjusting hydraulic shock absorber</td>
<td>• Self-adjusting hydraulic shock absorber</td>
</tr>
<tr>
<td>Options</td>
<td>• Intermediate-position module • Clamping cartridge • Electric integration rail for sensors</td>
<td>• Intermediate-position module • Clamping cartridge</td>
</tr>
</tbody>
</table>

![Diagram of forces and moments]
Electrical linear motor axes and cylinders

Linear motor with air bearing ELGL-LAS
The electric linear drive ELGL is a handling axis with air bearing and built-in linear motor. The drive elements and the air bearing form a unit.

Wear-resistant
- Thanks to air bearing technology the slide hovers over the axis without touching it.
- The constant air flow out of the air gap prevents particles and dust from penetrating into the axis.
- Magnetic fields are screened to keep metal parts and chips out.

Extremely flexible
- Locking brake built into the linear motor axis, thanks to the magnetic preloaded air cushion bearing
- This enables very exact positioning and excellent linearity
- Minimum stroke <1 mm
- Several slides can move independently of each other on one axis
- Both opposing and synchronous movements are possible
- No friction in guide parts
- Maintenance-free and wear-resistant
- Dust-free thanks to air bearing

<table>
<thead>
<tr>
<th>Size</th>
<th>ELGL-LAS</th>
<th>30</th>
<th>64</th>
<th>120</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slide size [mm]</td>
<td>210 (S)</td>
<td>210 (S)</td>
<td>310 (M)</td>
<td>210 (S)</td>
</tr>
<tr>
<td>Max. stroke (1 slide) [mm]</td>
<td>740</td>
<td>1750</td>
<td>1650</td>
<td>1750</td>
</tr>
<tr>
<td>Max. feed force [N]</td>
<td>44</td>
<td>119</td>
<td>164</td>
<td>240</td>
</tr>
<tr>
<td>Continuous feed force [N]</td>
<td>44</td>
<td>110</td>
<td>160</td>
<td>217</td>
</tr>
<tr>
<td>Repetition accuracy [μm]</td>
<td>±10</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Electrical linear motor cylinder DNCE-LAS

The electric linear motor cylinder is optimised for small loads. All essential components, such as the linear motor, measuring system, guide and reference switch, form a ready-to-use axis.

The DNCE-LAS is designed so that all strong magnetic fields are screened and metal parts or chips are not attracted.

Except for the long side, all mechanical interfaces correspond to the pneumatic cylinder series DNC. Perfect for use with existing accessories.

Can be configured and commissioned using the Festo Configuration Tool (FCT).

Electrical guide axis with linear motor DFME-LAS

The DFME-LAS electric guide axis with linear motor is suitable for maximum positioning precision and excellent dynamic response with small loads.

All required components, such as the linear motor, measuring system, guide and reference switch, form a ready-to-use guide axis. The mechanical interfaces correspond to the pneumatic cylinder DFM. Depending on the design, you can also use accessories from the DFM on the electric cylinder DFME-LAS.

The DFME-LAS is easily configured and commissioned with the Festo Configuration Tool. Simply enter the parameters and positioning records and you’re done!

### Type DNCE-LAS DFME-LAS

<table>
<thead>
<tr>
<th>Type</th>
<th>DNCE-LAS</th>
<th>DFME-LAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>32 40</td>
<td>32 40</td>
</tr>
<tr>
<td>Max. stroke [mm]</td>
<td>100, 200, 320</td>
<td>100, 200, 320, 400</td>
</tr>
<tr>
<td>Max. speed [m/s]</td>
<td>3 3</td>
<td>3 3</td>
</tr>
<tr>
<td>Min. speed [m/s]</td>
<td>0.02 0.02</td>
<td>0.03 0.05</td>
</tr>
<tr>
<td>Max. feed force [N]</td>
<td>141 202</td>
<td>141 202</td>
</tr>
<tr>
<td>Continuous feed force [N]</td>
<td>36 55</td>
<td>36 55</td>
</tr>
<tr>
<td>Repetition accuracy [μm]</td>
<td>±20</td>
<td>±15</td>
</tr>
</tbody>
</table>

Motor controllers SFC-LACI

You can find more information about compatible motor controllers on page 48.
Electrical mini slides

Electromechanical mini slide SLTE
- Precise and rigid guide
- Freely positionable
- Short positioning times
- Through-holes from above and below
- Sensors can be integrated
- Silent lead screw spindle
- Gentle starting and stopping
- Effective loads of up to 4 kg
- Constant travel speeds of 2 ... 200 mm/s
- Available: motors with integrated encoder

The mini slide SLTE and motor controller SFC-DC form a unit.
- Thanks to the protection class IP54, the SFC-DC can be mounted close to the SLTE, either:
  - on central supports
  - with H-rail

- Only one cable required between SLTE and SFC-DC
- Motor controller SFC-DC available with or without control panel
- Easy actuation via:
  - I/O connection
  - fieldbus connection

Parameterisation possible via:
- Control panel:
  - Suitable for simple position sequences
- FCT configuration package (Festo Configuration Tool):
  - Parameterisation using RS 232 interface
  - PC interface in Windows, Festo Configuration Tool

Note:
More details on the motor controller SFC-DC can be found on page 48.

<table>
<thead>
<tr>
<th>Electrical mini slide</th>
<th>SLTE-10</th>
<th>SLTE-16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guide</td>
<td>Roller bearing guide</td>
<td>Roller bearing guide</td>
</tr>
<tr>
<td>Stroke [mm]</td>
<td>50/80</td>
<td>50/80/100/150</td>
</tr>
<tr>
<td>Max. speed [m/s]</td>
<td>0.17</td>
<td>0.21</td>
</tr>
<tr>
<td>Min. speed [m/s]</td>
<td>0.002</td>
<td>0.002</td>
</tr>
<tr>
<td>Repetition accuracy [mm]</td>
<td>±0.1</td>
<td>±0.1</td>
</tr>
<tr>
<td>Max. effective load (horizontal at V_{max}) [kg]</td>
<td>1.5</td>
<td>4</td>
</tr>
<tr>
<td>Max. effective load (vertical at V_{max}) [kg]</td>
<td>0.35</td>
<td>0.7</td>
</tr>
<tr>
<td>Max. torque load M_x [Nm]</td>
<td>4.3</td>
<td>12.6</td>
</tr>
<tr>
<td>Max. torque load M_y [Nm]</td>
<td>4.3</td>
<td>12.6</td>
</tr>
<tr>
<td>Max. torque load M_z [Nm]</td>
<td>1.5</td>
<td>3.5</td>
</tr>
</tbody>
</table>
Pneumatic mini slides

>>> Mini slide DGSL
- Series with ball bearing cage guide for maximum precision and load capacity, in a compact design and with very easy installation
- Designed for high-precision shifting, picking up and inserting – even with high mechanical loads

Features
- Innovative guide unit
- Repetition accuracy of 0.01 mm
- Linearity and parallelism in the 1/100 mm range
- Optional: clamping unit and end-position locking
- 3 adjustable end stop variants
- Integratable proximity sensor

>>> Mini slide SLT
- Double-acting cylinder
- System product for handling and assembly technology
- Easy adjustment of end positions from one side

Features
- Powerful
- Two adjustable end-position cushioning systems:
  - Flexible cushioning components
  - Hydraulic shock absorbers
- Versatile and precise assembly options:
  - Yoke
  - Slide
  - Housing

<table>
<thead>
<tr>
<th>Pneumatic mini slides</th>
<th>DGSL</th>
<th>SLT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>4/6/8/10/12/16/20/25</td>
<td>6/10/16/20/25</td>
</tr>
<tr>
<td>Guide</td>
<td>Ball bearing cage guide</td>
<td>Ball-bearing-guided parallel piston rods</td>
</tr>
<tr>
<td>Max. stroke [mm]</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>Max. speed [m/s]</td>
<td>0.8</td>
<td>0.8</td>
</tr>
<tr>
<td>Repetition accuracy [mm]</td>
<td>±0.01</td>
<td>±0.02</td>
</tr>
<tr>
<td>Max. force Fx [N]</td>
<td>483</td>
<td>590</td>
</tr>
<tr>
<td>Max. torque load Mx [Nm]</td>
<td>130</td>
<td>64</td>
</tr>
<tr>
<td>Max. torque load My [Nm]</td>
<td>80</td>
<td>64</td>
</tr>
<tr>
<td>Max. torque load Mz [Nm]</td>
<td>80</td>
<td>17</td>
</tr>
<tr>
<td>Cushioning (at both ends)</td>
<td>Flexible, non-adjustable</td>
<td>Flexible, non-adjustable</td>
</tr>
<tr>
<td>Options</td>
<td>Clamping cartridge</td>
<td>End-position locking</td>
</tr>
</tbody>
</table>
Electrical rotary drive module ERMB

<table>
<thead>
<tr>
<th>Electrical rotary drive module</th>
<th>ERMB-20</th>
<th>ERMB-25</th>
<th>ERMB-32</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotation angle [°]</td>
<td>Infinite</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positioning times (with servo motor) [s]</td>
<td></td>
<td>&lt;0.3 for 360°</td>
<td></td>
</tr>
<tr>
<td>Repetition accuracy [°]</td>
<td>±0.03 with servo motor EMMS-AS</td>
<td>±0.05 with intelligent servo motor MTR-DCI</td>
<td>±0.08 with stepper motors EMMS-ST</td>
</tr>
<tr>
<td>Max. driving torque [Nm]</td>
<td>0.7</td>
<td>2.2</td>
<td>8.5</td>
</tr>
<tr>
<td>Max. driving torque (depending on speed) [Nm]</td>
<td>3.15</td>
<td>8.8</td>
<td>25.5</td>
</tr>
<tr>
<td>Max. input speed [rpm]</td>
<td>1,350</td>
<td>1,200</td>
<td>900</td>
</tr>
<tr>
<td>Max. output speed [rpm]</td>
<td>300</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>Drive shaft diameter [mm]</td>
<td>6</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>Hollow shaft diameter [mm]</td>
<td>20</td>
<td>24</td>
<td>28</td>
</tr>
<tr>
<td>Service life cycles [million]</td>
<td>15</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Options</td>
<td>Sensing module</td>
<td>Sensing module</td>
<td>Sensing module</td>
</tr>
</tbody>
</table>

Available: harmonised range of motors
- Servo motors
- Stepper motors
- Standardised controller design and software platform simplify commissioning and control.

Position sensing/reference switch
- The sensing module EAPS, available as an accessory, enables impermissible areas to be defined using two inductive sensors and trip cams.
- Sensing on the rotary module is done using inductive sensors type SIEN-M8. An index pin in the retaining ring, which can be adjusted in 90° increments, is queried.
Pneumatic semi-rotary drives

### Swivel module DSM/DSM-B
- Semi-rotary vane drive with shock absorber
- With space-saving sensor technology

#### Features
- Infinite swivel angle adjustment up to max. 270° with positive-locking attachment
- Precision end position via internal hexagon
- All cushioning components with advanced metal sleeve as end stop
- Shock absorber and elastomer buffer

### Twin piston semi-rotary drive DRQD/DRQD-B
- Swivel angle up to 360°
- For handling and assembly tasks, e.g. in the electronics industry or in mechanical engineering

#### Features
- High repetition accuracy even when torque is high
- Compact design
- Position sensing via proximity sensor – end position and mid-position with the same switch type
- Flexible end-position cushioning and precision end-position adjustment

<table>
<thead>
<tr>
<th>Pneumatic semi-rotary drives</th>
<th>DSM/DSM-B</th>
<th>DRQD/DRQD-B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>6/8/10/12/16/25/32/40/63</td>
<td>6/8/12/16/20/25/32/40/50</td>
</tr>
<tr>
<td>Swivel angle</td>
<td>[°]</td>
<td></td>
</tr>
<tr>
<td>permanently set as desired</td>
<td>90/180/240</td>
<td>90/180/360</td>
</tr>
<tr>
<td>max. swivel angle</td>
<td>270 max. (depending on cushioning element)</td>
<td>X angle (max. 360)</td>
</tr>
<tr>
<td>Frequency of oscillation (at 6 bar and max. swivel angle)</td>
<td>[Hz]</td>
<td>3 ... 0.6</td>
</tr>
<tr>
<td>Max. torque (at 6 bar)</td>
<td>[Nm]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.15 ... 40</td>
<td>0.16 ... 50</td>
</tr>
<tr>
<td>Repetition accuracy</td>
<td>[°]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;0.1/1</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Drive shaft</td>
<td>Spigot shaft/flanged shaft</td>
<td>Spigot shaft/flanged shaft</td>
</tr>
<tr>
<td>Cushioning (at both ends)</td>
<td>• Flexible, non-adjustable&lt;br&gt;• Self-adjusting hydraulic shock absorber&lt;br&gt;• Pneumatically adjustable&lt;br&gt;• Self-adjusting hydraulic shock absorber</td>
<td>• Mid-position module&lt;br&gt;• Energy throughfeed, pneumatic and electric</td>
</tr>
<tr>
<td>Options</td>
<td>• With built-in swivel angle measuring system&lt;br&gt;• Freewheel unit</td>
<td></td>
</tr>
</tbody>
</table>
Electrical gripper

Electrical T-slot parallel gripper HGPLE

Features
- Sturdy design: T-slot for very high torque resistance, with high precision
- At least 5 million strokes – guaranteed
- Reduced gripping times thanks to “pre-holding positions”: the gripper fingers stop just in front the workpiece
- Short opening and closing times of 0.6 s, even for the entire stroke
- It is controlled on-site using the reliable motor controller SFC-DC

Note:
More details on the motor controller SFC-DC can be found on page 48.

Electrical gripper

<table>
<thead>
<tr>
<th></th>
<th>HGPLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>25</td>
</tr>
<tr>
<td>Max. total gripping force [N]</td>
<td>600</td>
</tr>
<tr>
<td>Max. total stroke [mm]</td>
<td>80</td>
</tr>
<tr>
<td>Max. speed [mm/s]</td>
<td>65</td>
</tr>
<tr>
<td>Max. acceleration [mm/s²]</td>
<td>500</td>
</tr>
<tr>
<td>Max. permissible force $F_z$ [N]</td>
<td>1500</td>
</tr>
<tr>
<td>Max. permissible torque $M_x$ [Nm]</td>
<td>100</td>
</tr>
<tr>
<td>Max. permissible torque $M_y$ [Nm]</td>
<td>60</td>
</tr>
<tr>
<td>Max. permissible torque $M_z$ [Nm]</td>
<td>70</td>
</tr>
</tbody>
</table>
Servopneumatic gripper

Servopneumatic proportional gripper HGPPI
- For handling tasks which call for adjustable gripping forces
- For dealing flexibly with changing workpiece sizes and shapes

Features
- Free and independent positioning of both gripper fingers
- Force/travel control
- Metering of the gripping force
- Integrated controller

Positioning functionality
- Synchronous, central movement of the gripper fingers
- Gripper detects when the stop is being approached
- Gripper can grip eccentrically and then centre
- The speed, gripping force and gripper finger position can be controlled independently for each gripper jaw as needed.
- Evaluation of the path signal
- Evaluation of the gripping force

<table>
<thead>
<tr>
<th>Electrical gripper</th>
<th>HGPPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>12</td>
</tr>
<tr>
<td>Max. total gripping force [N]</td>
<td>120</td>
</tr>
<tr>
<td>Max. deviation from setpoint gripping force [N]</td>
<td>&lt; 6</td>
</tr>
<tr>
<td>Max. stroke per gripper jaw [mm]</td>
<td>10</td>
</tr>
<tr>
<td>Min. positioning stroke [mm]</td>
<td>0.2</td>
</tr>
<tr>
<td>Min. positioning speed [mm/s]</td>
<td>1</td>
</tr>
<tr>
<td>Typical positioning time [ms]</td>
<td>150 ... 250</td>
</tr>
<tr>
<td>Repetition accuracy [mm]</td>
<td>±0.1</td>
</tr>
<tr>
<td>Operating pressure [bar]</td>
<td>5 ... 6</td>
</tr>
<tr>
<td>Max. permissible force Fz [N]</td>
<td>70</td>
</tr>
<tr>
<td>Max. permissible torque Mx [Nm]</td>
<td>3</td>
</tr>
<tr>
<td>Max. permissible torque My [Nm]</td>
<td>3</td>
</tr>
<tr>
<td>Max. permissible torque Mz [Nm]</td>
<td>3</td>
</tr>
<tr>
<td>Nominal voltage (load and logic) [V DC]</td>
<td>24</td>
</tr>
<tr>
<td>Max. current consumption, load [mA]</td>
<td>70</td>
</tr>
<tr>
<td>Max. current consumption, logic [mA]</td>
<td>200</td>
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<tr>
<td>Fieldbus coupling</td>
<td>Profibus DP</td>
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<tr>
<td>Electrical power supply connection</td>
<td>M12x1, 4-pin</td>
</tr>
<tr>
<td>Electrical fieldbus connection</td>
<td>Sub-D socket, 9-pin</td>
</tr>
</tbody>
</table>
Pneumatic grippers

T-slot gripper HGPT-B
- Parallel gripper
- Synchronous movement of the gripper jaws thanks to force-guided motion sequence of both gripper fingers
- Design with backlash-free, sturdy plain-bearing guide in the T-slot
- Used in heavy mechanical engineering for all gripping tasks
- High-force variant, double the force at half the stroke
- Contamination-resistant, since the sealing air connection protects the gripper against drilling emulsion, dust and dirt, for example, in very rough surroundings

Features
- Piston with oval piston area
- The compression spring provides gripping force backup and ensures that a secure grip is guaranteed in the event of pressure failure. The compression spring additionally supports the gripping force.
- Proximity sensors fit flush with the housing or slot.
- Sensing of up to 4 positions
- Sealing air connection prevents dust from getting into the gripper jaw guide
- Tubeless compressed air supply thanks to optional adapter plate
- Precise gripping thanks to the optional use of centring rings and pins
- High reliability and very long service life with up to 10 million switching cycles.

<table>
<thead>
<tr>
<th>Sizes</th>
<th>16</th>
<th>20</th>
<th>25</th>
<th>35</th>
<th>40</th>
<th>50</th>
<th>63</th>
<th>80</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke per jaw (mm)</td>
<td>3</td>
<td>4</td>
<td>6</td>
<td>8</td>
<td>10</td>
<td>12</td>
<td>16</td>
<td>20</td>
</tr>
<tr>
<td>Total gripping force (N)</td>
<td>85</td>
<td>170</td>
<td>300</td>
<td>550</td>
<td>740</td>
<td>1290</td>
<td>1860</td>
<td>3175</td>
</tr>
<tr>
<td>Force version</td>
<td>Stroke per jaw (mm)</td>
<td>1.5</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Total gripping force (N)</td>
<td>160</td>
<td>375</td>
<td>670</td>
<td>1230</td>
<td>1650</td>
<td>2890</td>
<td>4160</td>
<td>7080</td>
</tr>
<tr>
<td>Standard and force version</td>
<td>Repetition accuracy (mm)</td>
<td>±0.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Torques ( M_x ) (Nm)</td>
<td>9</td>
<td>15</td>
<td>50</td>
<td>80</td>
<td>100</td>
<td>120</td>
<td>160</td>
<td>180</td>
</tr>
<tr>
<td>Torques ( M_y ) (Nm)</td>
<td>12</td>
<td>15</td>
<td>45</td>
<td>60</td>
<td>90</td>
<td>120</td>
<td>180</td>
<td>220</td>
</tr>
<tr>
<td>Torques ( M_z ) (Nm)</td>
<td>6</td>
<td>8</td>
<td>35</td>
<td>50</td>
<td>75</td>
<td>100</td>
<td>140</td>
<td>170</td>
</tr>
<tr>
<td>Sensor slot</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Long-stroke parallel gripper
HGPL
- With T-slot plain-bearing guide for high forces and torques on the gripper jaws
- For general mechanical engineering
- Parallel movements of both fingers during long strokes

Features
- Adjustable opening stroke
- Sensing via proximity sensors
- T-slot guide for absorbing high torques and forces
- Synchronised forced movement of both gripper fingers via an internal pinion drive for reliable, precise centred gripping

Precision parallel grippers
HGPP
- Backlash-free gripper jaw roller bearing
- Perfect gripping and repetition accuracy at the highest permissible torque load
- For precise positioning and mounting

Features
- Synchronised gripper jaw movement
- Maintenance-free operation and long service life – approx. 20 million cycles without relubrication
- For use as a single-acting gripper requiring only one compressed air connection using compression springs
- Gripping force backup open/closed

<table>
<thead>
<tr>
<th>Pneumatic grippers</th>
<th>HGPL</th>
<th>HGPP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>14/25/40</td>
<td>10/12/16/20/25/32</td>
</tr>
<tr>
<td>Max. total gripping force (at 6 bar) [N]</td>
<td>120 ... 1210</td>
<td>80 ... 830</td>
</tr>
<tr>
<td>Max. total stroke [mm]</td>
<td>40 ... 80</td>
<td>4 ... 25</td>
</tr>
<tr>
<td>Repetition accuracy [mm]</td>
<td>&lt;0.03</td>
<td>0.01 ... 0.02</td>
</tr>
<tr>
<td>Max. operating frequency [Hz]</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Opening/closing time (at 6 bar) [ms]</td>
<td>86 ... 438</td>
<td>22 ... 173</td>
</tr>
<tr>
<td>Gripping direction</td>
<td>Internal, external</td>
<td>Internal, external</td>
</tr>
<tr>
<td>Gripping force backup</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Position sensing</td>
<td>With proximity sensor</td>
<td>With proximity sensor</td>
</tr>
<tr>
<td>Max. force Fx [N]</td>
<td>500 ... 2,500</td>
<td>40 ... 720</td>
</tr>
<tr>
<td>Max. torque load Mx [Nm]</td>
<td>35 ... 125</td>
<td>2 ... 50</td>
</tr>
<tr>
<td>Max. torque load My [Nm]</td>
<td>35 ... 80</td>
<td>2 ... 50</td>
</tr>
<tr>
<td>Max. torque load Mz [Nm]</td>
<td>35 ... 100</td>
<td>2 ... 50</td>
</tr>
<tr>
<td>Options</td>
<td>Sensing with Hall sensor</td>
<td></td>
</tr>
</tbody>
</table>
Pneumatic grippers

Radial gripper HGRC and angle gripper HGWC

- Compact and attractively priced, flexible and reliable
- Optimised design
- Die-cast zinc ensures optimal price/performance ratio
- Driven by a sturdy rack and pinion with low-backlash, bearing-supported gripper jaws
- The same constant gripping force is available along the entire movement

Features

- Contactless end-position sensing via reliable SMx-10 sensors
- Integrated throttling ports ensure reduced opening and closing speed
- Long service life thanks to lifetime lubrication
- Workpieces are gripped on the outside as well as the inside.
- Opening/closing times <100 ms
- Sensor slot: for integration of proximity sensors SME-10/SMT-10 without projecting edges

Parallel grippers HGP

- For standard tasks in handling and assembly systems
- Double-acting piston drive (external/internal gripping)

Micro parallel grippers HGPM

- For gripping very small parts or in tight spaces
- Single-acting (spring return)
- Internal or external gripping

<table>
<thead>
<tr>
<th>Pneumatic grippers</th>
<th>HGRC/HGWC</th>
<th>HGP</th>
<th>HGPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size [mm]</td>
<td>12/16/20</td>
<td>6/10/16/20/25/35</td>
<td>8/12</td>
</tr>
<tr>
<td>Max. total gripping torque (6 bar) [Ncm]</td>
<td>13...80</td>
<td>20...750</td>
<td>44...126</td>
</tr>
<tr>
<td>Max. total stroke [mm]</td>
<td>–</td>
<td>4...25</td>
<td>4/6</td>
</tr>
<tr>
<td>Mx. opening angle [°]</td>
<td>30/80/180</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Repetition accuracy [mm]</td>
<td>±0.05</td>
<td>&lt;0.04</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Max. operating frequency [Hz]</td>
<td>4/3/3</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Gripping direction</td>
<td>Internal, external</td>
<td>Internal, external</td>
<td>Internal, external</td>
</tr>
<tr>
<td>Gripping force backup</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Position sensing</td>
<td>With proximity sensor</td>
<td>With proximity sensor</td>
<td>No</td>
</tr>
<tr>
<td>Max. force $F_z$ [N]</td>
<td>40...80</td>
<td>14...380</td>
<td>10/30</td>
</tr>
<tr>
<td>Max. torque load $M_x$ [Nm]</td>
<td>2.5...8</td>
<td>0.1...25</td>
<td>0.15/0.5</td>
</tr>
<tr>
<td>Max. torque load $M_y$ [Nm]</td>
<td>0.6...1.9</td>
<td>0.1...25</td>
<td>0.15/0.5</td>
</tr>
<tr>
<td>Max. torque load $M_z$ [Nm]</td>
<td>2...6.7</td>
<td>0.1...25</td>
<td>0.15/0.5</td>
</tr>
</tbody>
</table>
3-jaw T-slot grippers
HGDT/HGDT-F
- For mechanical and plant engineering
- High-power variant (HGDT-F) with double the force at half the stroke
- Grips reliably with a maximum of 4000 N, even in highly dynamic applications
- Force-guided triple-wedge mechanism for the synchronous movement of all three jaws
- Sturdy T-slot guide for gripper fingers to absorb maximum torques and forces

Features
- Sealing air protects against dust and drilling emulsions in critical environments
- Flexible thanks to sensing of up to 3 positions
- Gripping force backup opening/closing
- Built into the housing: sensing with proximity sensors

Three-point gripper HGD
- Double-acting piston drive
- For standard use on rotationally symmetrical parts
- Variable gripping direction (external/internal gripping)
- High holding forces

Features
- Sensors: adaptable Hall sensors for small standard grippers, and integratable proximity sensors for the medium and large grippers
- Maximum precision

<table>
<thead>
<tr>
<th>Pneumatic grippers</th>
<th>HGDT</th>
<th>HGDT-F</th>
<th>HGD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>25/35/40/50/63</td>
<td>25/35/40/50/63</td>
<td>16/32/50</td>
</tr>
<tr>
<td>Max. total gripping force (at 6 bar) [N]</td>
<td>228 ... 2,172</td>
<td>510 ... 4,000</td>
<td>90 ... 970</td>
</tr>
<tr>
<td>Max. total stroke [mm]</td>
<td>6 ... 20</td>
<td>3 ... 10</td>
<td>5 ... 12</td>
</tr>
<tr>
<td>Repetition accuracy [mm]</td>
<td>±0.03</td>
<td>±0.03</td>
<td>±0.04</td>
</tr>
<tr>
<td>Max. operating frequency [Hz]</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Opening/closing time (at 6 bar) [ms]</td>
<td>25 ... 246</td>
<td>15 ... 130</td>
<td>5 ... 10</td>
</tr>
<tr>
<td>Gripping direction</td>
<td>Internal, external</td>
<td>Internal, external</td>
<td>Internal, external</td>
</tr>
<tr>
<td>Gripping force backup</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Position sensing</td>
<td>With proximity sensor</td>
<td>With proximity sensor</td>
<td>With proximity sensor</td>
</tr>
<tr>
<td>Max. force $F_z$ [N]</td>
<td>350 ... 2500</td>
<td>510 ... 4000</td>
<td>34 ... 173</td>
</tr>
<tr>
<td>Max. torque load $M_x$ [Nm]</td>
<td>7 ... 80</td>
<td>7 ... 80</td>
<td>0.5 ... 4.7</td>
</tr>
<tr>
<td>Max. torque load $M_y$ [Nm]</td>
<td>10 ... 50</td>
<td>10 ... 50</td>
<td>0.8 ... 8.1</td>
</tr>
<tr>
<td>Max. torque load $M_z$ [Nm]</td>
<td>5 ... 60</td>
<td>5 ... 60</td>
<td>0.5 ... 5.3</td>
</tr>
</tbody>
</table>
Vacuum

Vacuum generator OVEM
- Wide range of functions – can be individually chosen, built into one unit
- Three performance classes and integrated air-saving function
- Safety function for de-energised vacuum generation
- Integrated non-return valve for preventing pressure drop
- Built-in solenoid valves for activating the vacuum generator and ejector pulse

Features
- LCD display, numerical and as bar graph, for the constant monitoring of all important values
- Intensity of the ejector pulse can be controlled
- High vacuum: up to 85%
- Protection class IP65
- Integrated filter with inspection window
- Very simple installation via electrical M12 connection and pneumatic plug connector

Vacuum generators VN
- Decentralised vacuum generation for minimum evacuation times
- Three classes of vacuum generators:
  - lightweight and compact
  - standard
  - with vacuum sensor
- With integrated ejector pulse

Features
- Easy to install
- Integrated push-in fittings for easy, pneumatic installation of the ejector
- The vacuum generator can be used directly in the gripping area

Suction grippers ESG
Suitable for almost every workpiece in almost every shape, even for extremely small products with irregular centres of gravity, rough surfaces or awkward shapes.

Features
- Versatile: in the modular ESG system, you can find the right suction gripper for every application
- Resistant to chemicals
- Heat resistant
- Antistatic
- The suction gripper ESG consists of the suction cups ESS and suction cup holder ESH

Suction cup insert OASI
For transporting unstable, fragile and thin workpieces gently and safely

Features
- Suction cup insert made of porous sintered material
### Pressure supply
1. Pressure supply
2. Vacuum port for suction cup
3. Open silencer

### Technical data for suction gripper ESG

<table>
<thead>
<tr>
<th>Material</th>
<th>Nitrile rubber</th>
<th>Nitrile rubber (antistatic)</th>
<th>Polyurethane</th>
<th>Vulkollan®</th>
<th>Silicone</th>
<th>Fluoro elastomer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperatures [°C]</td>
<td>-10 ... +70</td>
<td>-10 ... +70</td>
<td>-20 ... +60</td>
<td>-10 ... +80</td>
<td>-30 ... +180</td>
<td>-10 ... +200</td>
</tr>
<tr>
<td>Typical applications Food</td>
<td>Conventional</td>
<td>Electronic industry</td>
<td>Rough surfaces</td>
<td>Automotive industry</td>
<td>Food industry</td>
<td>Glass industry</td>
</tr>
<tr>
<td>Oily workpieces</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>–</td>
<td>x</td>
</tr>
<tr>
<td>Smooth surfaces</td>
<td>–</td>
<td>–</td>
<td>x</td>
<td>x</td>
<td>–</td>
<td>x</td>
</tr>
<tr>
<td>Rough surfaces</td>
<td>–</td>
<td>–</td>
<td>x</td>
<td>x</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Antistatic</td>
<td>–</td>
<td>x</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Minimal marking</td>
<td>–</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

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Motors and controllers

The controller and motor portfolio from Festo covers a wide range of servo and stepper motor functions and is optimally matched to all electric drives.

Servo motor controller CMMP-AS/CMMS-AS/CMMD-AS and servo motor EMMS-AS

For special requirements: the highly functional controller CMMP-AS. For standard functions: the controller CMMS-AS and the efficient double-controller CMMD-AS.

The CMMP-AS is very well suited for cam disk controllers and highly dynamic movements. The CMMS-AS comes into its own in standard applications and positioning tasks with an I/O connection. The CMMD-AS takes on the task of guiding two servo motors independently of each other. By combining internal modules, such as the fieldbus interface or the intermediate circuit, efficiency is considerably improved.

They all have safe and convenient commissioning, SD card slot, programming and parameterisation via software tools. Integrated safe holding system with restart blocking for safety-related applications.

Servo motors EMMS-AS

One servo motor for three controller types. As a permanently energised, brushless servo motor with eight torque ranges, this motor is designed for dynamic positioning tasks.

Stepper motor controller CMMS-ST and stepper motor EMMS-ST

Stepper motor technology in a genuine plug and work solution package: the single-axis position controller CMMS-ST combined with a stepper motor EMMS-ST, for single and multi-axis handling, with moving loads of up to 20 kg.

In the ServoLite operating mode, the combination of CMMS-ST and EMMS-ST provides you with a closed-loop servo system with maximum operating reliability and fast dynamic response. This sets the stepper motor controller CMMS-ST apart from conventional controllers.

Stepper motors EMMS-ST

The stepper motor combines a long service life and full positioning functionality with an attractive price. It is designed with a high degree of protection and with a plug system suitable for industrial use, optionally with brake and integrated encoder.
Functions of the CMMx-AS
- SD card for parameters and firmware
- Automatic motor brake
- External braking resistor (optional)
- Jerk-free positioning

Functions of the CMMS-ST
- SD card for parameters and firmware
- Automatic motor brake
- External braking resistor (optional)
- Jerk-free positioning

The performance ranges of the motors in conjunction with Festo controllers

Controller comparison table

<table>
<thead>
<tr>
<th>Motor controller for motor type</th>
<th>CMMP-AS Servo motor</th>
<th>CMMS-AS/CMMD-AS Servo motor</th>
<th>CMMS-ST Stepper motor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torque at standstill [Nm]</td>
<td>~25</td>
<td>~4.7</td>
<td>~8.5</td>
</tr>
<tr>
<td>Peak torque [Nm]</td>
<td>~48</td>
<td>~9.2</td>
<td>~8.5</td>
</tr>
<tr>
<td>Speed [rpm]</td>
<td>~10000</td>
<td>~10000</td>
<td>~3000</td>
</tr>
<tr>
<td>Positioning records</td>
<td>255</td>
<td>63</td>
<td>63</td>
</tr>
<tr>
<td>Measuring system</td>
<td>Incremental/absolute</td>
<td>Incremental/absolute</td>
<td>Incremental</td>
</tr>
<tr>
<td>Extended I/O interface</td>
<td>Flexibly configurable</td>
<td>4 working modes</td>
<td>4 working modes</td>
</tr>
<tr>
<td>Notification of remaining distance</td>
<td>Separate for all positions</td>
<td>1 for n</td>
<td>1 for n</td>
</tr>
<tr>
<td>Torque reduction</td>
<td>Separate for all positions</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Record linking</td>
<td>With branching</td>
<td>Linear</td>
<td>Linear</td>
</tr>
<tr>
<td>Safe stop</td>
<td>In accordance with EN 954-1 Cat3</td>
<td>In accordance with EN 954-1 Cat3</td>
<td>–</td>
</tr>
<tr>
<td>Primary voltage</td>
<td>100 ... 230 V AC</td>
<td>100 ... 230 V AC</td>
<td>24 ... 75 V DC</td>
</tr>
<tr>
<td>Motor current</td>
<td>Single-phase: 2.5 and 5 A three-phase: 5 and 10 A</td>
<td>CMMS-AS: 4 A (single-phase) CMMD-AS: 2x 4 A (can be adjusted as desired up to 2 A/6 A)</td>
<td>8 A (peak 12 A)</td>
</tr>
<tr>
<td>Integrated positioning records</td>
<td>256</td>
<td>64</td>
<td>64</td>
</tr>
</tbody>
</table>
Motor controllers

Single-field controllers: SFC-DC, SFC-LAC and SFC-LACI
These single-field controllers offer simple configuration and commissioning using FCT software for parametrisation and commissioning. Just enter the parameters and positioning records, and you’re ready to go.

• Basic parametrisation of mechanics, position controller and the positioning records
• Positioning run and teach mode
• Homing and commissioning
• Diagnostic function
• Thanks to the protection class IP54, the SFC can be mounted close to the drive, either:
  - with central supports
  - with H-rail
• Only one cable needed
• The SFC motor controller is available with or without a control panel
• Activation via I/O or fieldbus

>>> Motor controller SFC-DC
The motor controller SFC-DC together with SLTE or HGPLE form a ready-to-install solution.

Note: More details on the electric gripper HGPLE can be found on page 38.
Note: More details on the electric slide SLTE can be found on page 34.

>>> Position controller SFC-LAC
The position controller SFC-LAC and handling axis HME form a ready-to-install solution.

Note: More details on the handling axis HME can be found on page 28.

>>> Position controller SFC-LACI
The position controller SFC-LACI and the linear motor cylinders DNCE-LAS and DFME-LAS form a ready-to-install solution.

Note: More details on the linear motor cylinders can be found on page 32.
Intelligent servo motor MTR-DCI

This innovative servo motor with its wide torque range is ideally suited for positioning tasks. It combines all necessary components in one: motor, gear unit, motor controller and power electronics.

Its integrated power electronics and controller remove the need for long motor cables, thus improving the electromagnetic compatibility. Additional, integrated monitoring functions ensure optimised reliability and system availability and make troubleshooting easier.

Another convincing feature of the MTR-DCI is the fact that it requires minimal wiring due to the integration of the controller; only one voltage source and only one fieldbus connection or multi-pin plug are required. The entire commissioning process is performed on-site or from a PC using a simple teach-in function, thanks to an optional LC display and clearly structured menus, and is supported by the FCT (Festo Configuration Tool) software.

### Functions
- Compact design with integrated display
- Complete unit with integrated gear unit and position controller
- Smooth profile prevents the ingress of dirt
- Closed-loop operation
- DC motor with planetary gear unit and encoder
- Protection class IP54
- Activation via I/O or fieldbus

### Positioning functionality
- 16 positioning records (including homing)
- Constant acceleration and braking
- Homing mode:
  - left or right up to switching signal
  - left or right up to the mechanical stop (preferable)
- Position control

### Protective functions
- Temperature monitoring
- Current monitoring
- Voltage failure detection
- Following error monitoring
- Software end-position detection

### Electrical data – motor

<table>
<thead>
<tr>
<th>Size</th>
<th>32</th>
<th>42</th>
<th>52</th>
<th>62</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal voltage [V DC]</td>
<td>24 ± 10%</td>
<td></td>
<td></td>
<td>48 ±10%+/5%</td>
</tr>
<tr>
<td>Nominal current (motor) [A]</td>
<td>0.73</td>
<td>2</td>
<td>5</td>
<td>6.19</td>
</tr>
<tr>
<td>Peak current [A]</td>
<td>2.1</td>
<td>3.8</td>
<td>7.7</td>
<td>20</td>
</tr>
</tbody>
</table>

### Mechanical data – motor

<table>
<thead>
<tr>
<th>Size</th>
<th>32</th>
<th>42</th>
<th>52</th>
<th>62</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gear unit ratio</td>
<td>G7</td>
<td>G14</td>
<td>G7</td>
<td>G14</td>
</tr>
<tr>
<td>Gear unit output speed [rpm]</td>
<td>481</td>
<td>237</td>
<td>444</td>
<td>218</td>
</tr>
<tr>
<td>Gear unit output torque [Nm]</td>
<td>0.15</td>
<td>0.29</td>
<td>0.59</td>
<td>1.13</td>
</tr>
<tr>
<td>Radial shaft load [N]</td>
<td>40</td>
<td>70</td>
<td>160</td>
<td>230</td>
</tr>
<tr>
<td>Axial shaft load [N]</td>
<td>10</td>
<td>20</td>
<td>50</td>
<td>80</td>
</tr>
</tbody>
</table>
Multi-axis control systems

Robotic controller CMXR
The robotic controller CMXR is the core of a complete kinematic system solution in the field of handling technology. It combines mechanics, electric drive technology and control technology, thanks to integrated and adapted interfaces. In its function as a control system for the main, manual and secondary axes, the CMXR is compatible with Cartesian and tripod kinematics.

Handheld terminal CDSA for robotic controller CMXR
When adapted to the CMXR robotic control system, the handheld terminal CDSA allows the CMXR to be easily programmed at the highest level.

Modular controller CECX
The modular controller CECX with fieldbus master functionality and electric control options in the upper segment, including simple configuration.

Integrated controller FED-CEC
The integrated controller FED-CEC is a space-saving control concept. The processor module is based on the CoDeSys software platform and can be integrated in the front-end display series 50 to 5000. Display unit and controller are combined in one housing.

- Real 3D functionality for free path control, similar to a robotic functionality
- PLC interface with I/O: for reduced functions
- PLC interface via Proﬁbus: for various functions or external operation
- Modular design for up to 8 extension modules, e.g. inputs and outputs
- Communication interface: CANopen and Ethernet
- With touch screen, emergency stop and conﬁrm buttons
- Simple programming in the Festo Teach Language (FTL), operation and diagnostics, incl. teach-in function. Also available: matching software packages for user-friendly system conﬁguration and programming
- Two product versions
  - Modular master controller with CoDeSys software
  - Motion controller with CoDeSys software and the SoftMotion module
- Module libraries, conﬁguration tools and drivers
- Numerous communication interfaces, such as Proﬁbus, CANopen and Ethernet
- Very simple project planning and programming with CoDeSys and FED Designer (via Ethernet or serial interface)
- Easy control of electric drives and CANopen slave products (integrated CANopen master interface)
- Parameters entered directly into the machine controller
Multi-axis interface CPX-CMXX

Perfect CPX module for uniform parametrisation and electric drive control. Designed for easy commissioning and integration of multi-axis systems into all commonly used control systems.

- Faster cycles, thanks to simply coordinated multi-axis movements
- Designed for quick and easy installation, as well as parametrisation, thanks to the Festo Configuration Tool (FCT)

Integrated controller CPX-CEC-C1 for CPX

- As an intelligent remote I/O terminal in IP65/IP67 directly on the machine, CPX-CEC-C1 reduces installation costs.
- Diagnostics and condition monitoring, thanks to an extensive CoDeSys function library
- Adapted for motion applications with up to 31 electric drives

Interface for electric drives CPX-CM-HPP

The CPX module for the standard control of up to 4 electric Festo drive units via the Festo Handling and Positioning Profile (FHPP) via the fieldbus gateway. Ideally suited for integrating single-axis applications (point-to-point, asynchronous) to fieldbus/Ethernet. It is easy to commission and reduces downtime.

- Highly flexible: compatible with all electric drive units from Festo
- Complete flexibility: Modular I/O system, up to 512 I/Os, CAN master functionality
- On-site remote control: preprocessing on all conventional fieldbus/Ethernet protocols
- With IP65 protection, one-of-a-kind integral automation platform: For standard, proportional and servo pneumatics, sensors and motion control with up to 31 electric drives
- Stand-alone open and closed-loop control: Efficient automation
- The decentralised motion control in the CPX-CMXX relieves the higher-order PLC.
- Connection to additional fieldbuses and networks that are not available in the individual axis controllers, for example:
  - EtherNet/IP
  - Ethernet TCP/IP
  - EasyIP
  - Profinet
  - Interbus
  - CC-Link
- Simplified engineering: shorter commissioning, reduced downtime, standardised control
- Reduced complexity: no programming of the CPX-CM-HPP module required
- Improved diagnostics: based on plain text error messages, reading out the actual position, etc.
- Outstanding efficiency: up to 4 individual axes per module (8 in the system) can be controlled
Compact Vision Systems

Intelligent Compact Vision System SBOC-Q/SBOI-Q

Used for quality assurance, it delivers guaranteed reliable inspection results, including a quality test. The areas of application range from position and orientation detection of parts and type identification to precision axis positioning.

The sensor system for image data acquisition as well as the complete electronic evaluation unit and the interfaces (Ethernet/CAN) for communication with master controllers (PLCs) are already integrated in the system.

- Compact design and low weight
- Easy integration and commissioning via parametrisation
- Teach-in of up to 256 work-pieces

<table>
<thead>
<tr>
<th>Type</th>
<th>SBOC-Q-R1B</th>
<th>SBOC-Q-R1C</th>
<th>SBOI-Q-R1B</th>
<th>SBOI-Q-R1C</th>
<th>SBOC-Q-R2B</th>
<th>SBOC-Q-R2C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensor resolution [pixels]</td>
<td>640 x 480</td>
<td>1280 x 1024</td>
<td>280 x 1024</td>
<td>1280 x 1024</td>
<td>640 x 480</td>
<td>1280 x 1024</td>
</tr>
<tr>
<td>Exposure time [ms]</td>
<td>0.027...1,000</td>
<td>0.008...1,000</td>
<td>0.027...1,000</td>
<td>0.008...1,000</td>
<td>0.027...1,000</td>
<td>0.008...1,000</td>
</tr>
<tr>
<td>Frame rate (full image) [fps]</td>
<td>150</td>
<td>27</td>
<td>150</td>
<td>27</td>
<td>150</td>
<td>27</td>
</tr>
<tr>
<td>Lens mounting</td>
<td>C mount</td>
<td>Integrated lens</td>
<td>C mount</td>
<td>Integrated lens</td>
<td>C mount</td>
<td>Integrated lens</td>
</tr>
<tr>
<td>Sensor type</td>
<td>Monochrome</td>
<td>Colour</td>
<td>Monochrome</td>
<td>Colour</td>
<td>Monochrome</td>
<td>Colour</td>
</tr>
<tr>
<td>Working distance [mm]</td>
<td>Dependent on the lens selected</td>
<td>22...1,000</td>
<td>Dependent on the lens selected</td>
<td>22...1,000</td>
<td>Dependent on the lens selected</td>
<td>22...1,000</td>
</tr>
<tr>
<td>Field of vision [mm]</td>
<td>14 x 10...520 x 390</td>
<td>Dependent on the lens selected</td>
<td>14 x 10...520 x 390</td>
<td>Dependent on the lens selected</td>
<td>14 x 10...520 x 390</td>
<td>Dependent on the lens selected</td>
</tr>
<tr>
<td>Max. no. of test programs</td>
<td>256</td>
<td>256</td>
<td>256</td>
<td>256</td>
<td>256</td>
<td>256</td>
</tr>
<tr>
<td>Sorting function</td>
<td>Up to 16 types per test program</td>
<td>Up to 16 types per test program</td>
<td>Up to 16 types per test program</td>
<td>Up to 16 types per test program</td>
<td>Up to 16 types per test program</td>
<td>Up to 16 types per test program</td>
</tr>
</tbody>
</table>
### Intelligent Compact Vision System SBOC-M/SBOI-M

Innovative and cost-effective alternative to traditional high-speed cameras. Designed for support during diagnostics and commissioning as well as for monitoring fast motion sequences.

- Simple fault localisation thanks to reliable analysis and diagnostics of individual or cyclical high-speed motion sequences
- Integrated electronics for recording and saving motion sequences
- Small dimensions and low weight enable easy integration into an existing system

<table>
<thead>
<tr>
<th>Type</th>
<th>SBOC-M-R1B</th>
<th>SBOI-M-R1B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lens mounting</td>
<td>C mount</td>
<td>Integrated lens</td>
</tr>
<tr>
<td>Working distance [mm]</td>
<td>Dependent on the lens selected</td>
<td>22 ... 1,000</td>
</tr>
<tr>
<td>Field of vision [mm]</td>
<td>Dependent on the lens selected</td>
<td>Ca. 14x10 ... approx. 520x390</td>
</tr>
<tr>
<td>Sensor resolution [pixels]</td>
<td>640x480</td>
<td></td>
</tr>
<tr>
<td>Frame rate/full image [fps]</td>
<td>185</td>
<td></td>
</tr>
<tr>
<td>Exposure time [ms]</td>
<td>0.04 ... 1,000</td>
<td></td>
</tr>
<tr>
<td>Protection class</td>
<td>IP65/67</td>
<td></td>
</tr>
<tr>
<td>Bus connection</td>
<td>Ethernet 100 Mbit/s; M12</td>
<td></td>
</tr>
<tr>
<td>Temperature range [°C]</td>
<td>-10 ... +50</td>
<td></td>
</tr>
<tr>
<td>Dimensions (W x H x L) [mm]</td>
<td>45 x 45 x 136.7 (incl. lens shield tube)</td>
<td>45 x 45 x 83.7</td>
</tr>
</tbody>
</table>
Software tools – faster project planning and design, commissioning and operation

More intelligent automation
Festo consistently relies on frequent analysis and identification of potential.

This has resulted in combining the new FHPP software platform combined with the tried and tested FCT Festo configuration tool. It ensures uniform operation and ideal interface management of all motor controllers, from the fieldbus to the drive system.

Available to you:
Software tools for downloading from the Internet at: www.festo.com

FCT software – Festo
Configuration Tool for commissioning
• All system drives can be managed and archived in a common project
• Project and data management for all supported device types
• Simple to use thanks to graphically supported parameter entry
• Universal mode of operation for all drives
• Work offline at your desk or online at the machine

FHPP – Festo Handling and Positioning Profile
Festo has developed an optimised data profile, the “Festo Handling and Positioning Profile (FHPP)”, specifically tailored to handling and positioning applications. The FHPP data profile enables Festo motor controllers to be controlled, with fieldbus interface, via standardised control and status bytes.
Designing with PositioningDrives

The PositioningDrives software tool prevents design errors and improves energy efficiency by helping you to choose the right components. Designing drive mechanics, gear units and motors separately increases safety factors, resulting in overdimensioned electric drive units and wasted primary energy.

Toothed belt drives, spindle drives or direct drives, servo motors, stepper motors or DC motors, ball bearing guides or plain-bearing guides – the plethora of different options to choose from presents the user with a major challenge: calculating the correct drive.

Once a few application details have been entered, the PositioningDrives software calculates the ideal combination from the extensive, harmonised range of electric linear axes, motors, gear units, controllers and software. By specifying various project parameters, the tool also calculates the characteristic load values for the selected drive quickly and reliably.

This is also suitable for third-party motors, once the technical parameters have been entered.

Typical program interfaces

Application parameters, such as mounting position, mass, stroke and precision need to be entered. You also have the option of specifying the required process time and preselecting the drive technology.

Select the desired solution package

For easy selection, these are sorted by motor and axis technology, component utilisation, cycle time or price.

Detailed results

The program also provides detailed results such as motor characteristic curve, dynamic characteristic values, system data, product data and parts list. These results are saved as a file and can be used for ordering and machine documentation.
The first step to a CAD model for your application.

Send us your requirements and within 1-2 days you will receive the following:

- Standard designs from the mechatronic multi-axis modular system
- Simple modifications, e.g. adjustment of the strokes
- 3D models as STEP, IGES, SAT or Parasolid file
- 2D drawings as DWG, DXF or PDF file

Examples of CAD models from the standard multi-axis modular system

- Linear gantry with cantilever axis (Z)
- Heavy-duty linear gantry with toothed-belt axis (Y) and spindle axis (Z)
- Three-dimensional gantry with toothed belt axis (XY) and spindle axis (Z)
All-inclusive advantages – ready-to-install solutions

Build it yourself, or have it built – it’s up to you. But complete systems can save you as much as 50%.

With ready-to-install handling systems you almost completely avoid laborious development and construction and complex working processes. Tell us what your requirements are and we will design, order, commission, test and deliver. We can also assemble your system and put it into operation, on request.

You concentrate on your core tasks. We take care of the rest. That not only saves time and money, but brings maximum reliability with regard to function and optimal settings.

We offer you the following:
- Engineering
- Documentation
- Assembly
- Testing and test runs
- Commissioning
- Servicing during the operating phase

Individually or completely – your decision

**Engineering**
Qualified engineers support you right from the outset.

- Technical advice
- Expert knowledge based on the latest technological standards
- Managing all engineering tasks
- Designs from the mechatronic multi-axis modular system
- Always suitable: frames made of aluminium or steel structural hollow sections
- Customised solutions for handling systems and frames
- Expertise in vacuum systems and gripper fingers

**Documentation**
Documentation for your handling system.

- Detailed documentation on your handling system, in the required language
- Construction drawing as instructions for assembly, including parts list
- Circuit diagrams in EPLAN or Promis
- Easy to reproduce with the documentation on CD or on paper
Commissioning service for axis systems

Getting there quicker
Smooth interaction of the axis system with the overall system is decisive for maximum system productivity. The selection and assembly of an axis system is one thing – fast and reliable commissioning of an axis system is another. What at first only appears to be a small step can, in reality, repeatedly prove to be a real marathon. In order for everything to run as it should, we recommend the Festo commissioning service for axis systems.

Services at a glance
• For reliable operation: checking of wiring, connections, travel paths and energy chains
• For optimum paths: axis configuration and parametrisation
• For maximum performance: optimisation of the control parameters and homing
• For tested safety: actuation of the axes in test mode
• For safeguarded knowledge: data backups and documentation
• For reliable operation: briefing machine operators, e.g. on error diagnostics and troubleshooting or on changing the position values

Fast
Time-saving commissioning for maximised efficiency is a matter of course for our experts and completion of your system on schedule is guaranteed.

Reliable
Our experts know exactly what they have to watch out for when commissioning, thus ensuring that your axis system operates reliably at all times.

Optimally adapted
Maximum axis system performance, e.g. with regard to cycle time, thanks to optimum configuration, parametrisation as well as homing.

We will support you during commissioning, regardless of the number of axes.
The production industry is focused on efficiency and 100% system availability. This means ensuring maximum reliability is a must. And that’s what our services are designed to do. They are available in 176 countries around the world and can be completely integrated in your total productive maintenance (TPM) concept.

- **Technical hotline**
  Guaranteed availability via telephone or e-mail.

- **Spare parts service**
  Accessible at any time online: comprehensive spare parts lists with all consumable and wearing parts.

- **Repair service**
  We will repair complex components and sub-assemblies. If needed, we can also carry out express repairs.

- **24-hour emergency service**
  No waiting times for registered customers: you will receive urgently required parts within a few hours by express courier (this does not apply to order-specific parts).

- **After-sales service on-site**
  Professional inspection, maintenance, repairs and commissioning, directly on your system.

- **Modular service contracts**
  Ideal support for preventive maintenance, but also in an emergency.

### Other services for efficient system operation

**Festo Energy Saving Services**

help system operators determine their savings potentials with regard to compressed air and help them utilise this to the full. The result: up to 60% energy and cost savings with increased productivity.

**Condition Monitoring Service**

Monitor critical processes continually and avoid expensive, unplanned machine downtimes. Festo specialists will develop and design a condition monitoring solution especially for your system and help you to implement it.

**Would you like to learn more about our services? Ask our specialists!**