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

Example: automotive industry
Load handling in assembly system for solenoids

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.

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
<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>• Three-dimensional gantry as mono axis • Free movement of Z-axis in the available space (3D)</td>
<td>• Compact design • High process reliability thanks to installation integration • Pneumatic and electric drives • Repetition-accurate, centralised direct axis connections • Pneumatic and electric drives (with freely programmable positions in X and Y) • Very high dynamic response and precision</td>
<td>X: Gantry axes Y: Gantry axes Z: Slides Cantilever axis</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: DGSL EGSA</td>
</tr>
<tr>
<td>• See above</td>
<td>• See above, points 1–5</td>
<td>X: Gantry axes Y: Gantry axes Z: Cantilever axis</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 DGC/DGPL Z: DGSL</td>
</tr>
<tr>
<td>• See above</td>
<td>• See above, points 1–5</td>
<td>X: Gantry axes Y: Gantry axes Z: Cantilever axis</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 DGC/DGPL Z: HMP</td>
</tr>
<tr>
<td>• Three-dimensional gantry as mono or duo axis • Free movement of Z-axis in the available space (3D)</td>
<td>• See above, points 1–5 • Z-axis alternative guides and drive concepts (motors)</td>
<td>X: Gantry axes Y: Gantry axes Z: Cantilever axis</td>
<td>Mono: 0 to 15 kg Duo: 0 to 25 kg</td>
<td>X: Up to 8500 mm Y: Up to 2000 mm Z: Up to 900 mm</td>
<td>X: DGE/EGC Y: DGE/EGC DGC/DGPL Z: DGEA</td>
</tr>
</tbody>
</table>

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

• 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
# Standard 3D gantry RP 1

Effective load up to 1 kg

## Technical data

<table>
<thead>
<tr>
<th>Stroke/mm</th>
<th>Intermed. position</th>
<th>Repetition accuracy/mm</th>
</tr>
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<tbody>
<tr>
<td><strong>Z-axis</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP EGSA-50</td>
<td>0 ... 100</td>
<td>Any</td>
</tr>
<tr>
<td>ES EGSL-35</td>
<td>0 ... 50</td>
<td>Any</td>
</tr>
<tr>
<td>P DGSL-10</td>
<td>0 ... 200</td>
<td>Any</td>
</tr>
<tr>
<td>P DFM-12</td>
<td>0 ... 200</td>
<td>Any</td>
</tr>
<tr>
<td><strong>Y-axis</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ZR 1 x EGC-70-TB-KF</td>
<td>0 ... 1000</td>
<td>Any</td>
</tr>
<tr>
<td>SP 1 x EGC-70-BS-KF</td>
<td>0 ... 1000</td>
<td>Any</td>
</tr>
<tr>
<td>P DGC-18-KF</td>
<td>0 ... 1000</td>
<td>1*</td>
</tr>
<tr>
<td>PS DGCI-18-KF</td>
<td>0 ... 1000</td>
<td>2/any**</td>
</tr>
<tr>
<td><strong>X-axis</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ZR EGC-80-TB-KF</td>
<td>0 ... 8500</td>
<td>Any</td>
</tr>
</tbody>
</table>

* More than 1 on request
** 2 with SPC11/CMPX, any with SPC200/CMAX
*** With cushioning P1/Y3
**** With shock absorber YSR/YSRW
Grey shading: drive components in the illustration
EGC-HD: available end of 2011
Reference for cycle times

Z-axis

Y-axis

X-axis

Note

An operating pressure of 6 bar is assumed for all the pneumatic drives shown here.
## Overview of Festo control products

<table>
<thead>
<tr>
<th>FED-CEC</th>
<th>CPX terminal</th>
</tr>
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<tbody>
<tr>
<td>Integrated controller FED-CEC</td>
<td>CoDeSys controller CPX-CEC-C1</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Single axis (point-to-point asynchronous)</th>
<th>C1: single axis</th>
<th>C1: single axis</th>
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<tbody>
<tr>
<td></td>
<td>M1: interpolation</td>
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</table>

### Maximum number of possible axes
- **Recommended:** 8 axes
- **Note:** one axis is treated as a CANopen node.
- **128 nodes are possible (as defined by CANopen specifications).**

### Motion
- Point-to-point asynchronous
- Every axis moves with its own pre-defined parameter
- The axes do not reach their end positions at the same time and the path is not defined
- 2.5D interpolation
- PLC Open

### Special features
- Integrated controller in a display screen
- Function integration on the CPX valve platform
- CNC editor
- DXF import
- Cam disk editor

### Application examples
- Handling systems
- Pick & place, palletising
- Path control, bonding, cutting, handling, flying saw, cam disk

### Programming environment
- CoDeSys
- CoDeSys
- CoDeSys + Softmotion
### Modular control

<table>
<thead>
<tr>
<th>Modular controller CECX-C1</th>
<th>Motion controller CECX-M1</th>
<th>CMXR-C1 (Basic)</th>
<th>CMXR-C2 (Advanced)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Single axis</strong>&lt;br&gt;(point-to-point asynchronous)</td>
<td><strong>Interpolation</strong>&lt;br&gt;(2.5D)</td>
<td><strong>Robotics</strong>&lt;br&gt;(3D)</td>
<td><strong>Robotics</strong>&lt;br&gt;(3D)</td>
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Recommended: 8 axes
Note: one axis is treated as a CANopen node.
128 nodes are possible (as defined by CANopen specifications).

Max. 6 interpolated axes, of which max. 3 basic axes and 1 orientation axis and max. 3 dependent auxiliary axes that are interpolated together with the kinematics system.

Additional single axes (not interpolated together with others) can be controlled via the integrated CoDeSys PLC. Recommended: 16 axes.

3D contour interpolation with an orientation axis for kinematics systems with up to 4 degrees of freedom.
E.g. 3D gantry with an axis of rotation on the front end.

- **2.5D interpolation**
- **PLC Open**
- **Economical design and configuration with the Festo Configuration Tool (FCT)**
- **Simple programming of motions with Festo Teach Language (FTL), no specialist expertise required**
- **Optional teach pendant with 2-channel permission button**
- **Reduced speed in manual override mode**
- **Automatic repositioning when continuing interrupted motions**
- **Simple teaching of positions**
- **Definition of tools, allowing easy use of multiple grippers**
- **Real orientation axes on the front end**
- **Integrated kinematics models e.g. for Cartesian systems, tripod, H- and T-gantries**

- **Powerful PLC**
- **Encoder interface**
- **Interrupt function**
- **Fast clock pulse inputs**
- **ProfiBus master**
- **Two Canbus masters**
- **RS 232/ RS 485-A/422-A**

- **CNC editor**
- **DXF import**
- **Cam disk editor**

- **Handling systems**
- **Pick & place, palletising**

Path control, bonding, cutting, handling, flying saw, cam disk

Handling, palletising, bonding, metered dispensing, painting, cutting

Tracking applications such as processing of moving parts on a conveyor or belt or synchronised kinematics movement with up to 6D

- **FTL + CoDeSys**