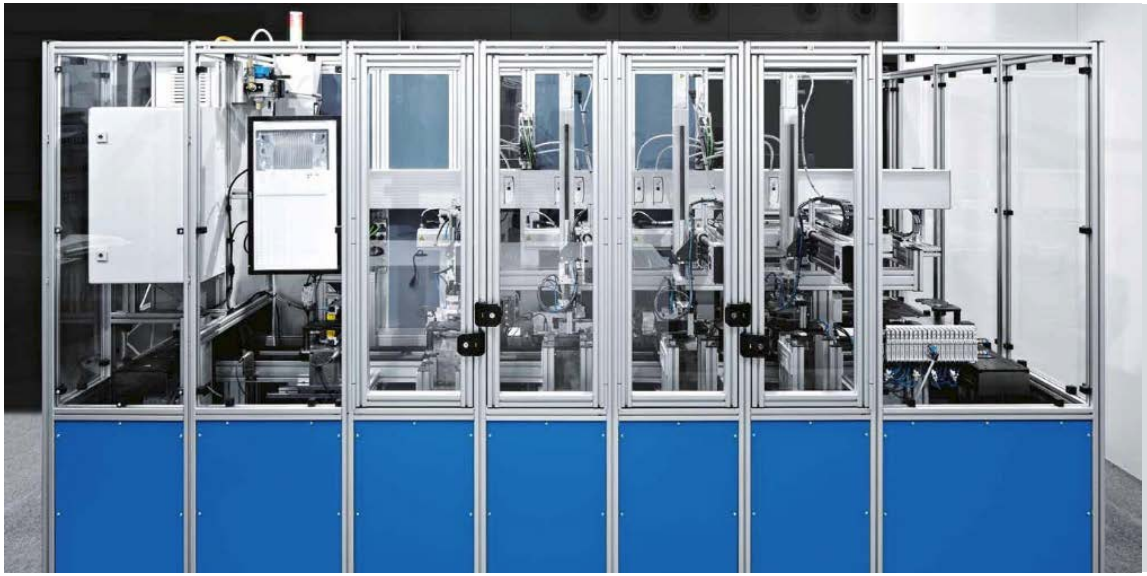
Quality inspection of bipolar plates for fuel cells



Highlights

- Vibration and damage-free movement of bipolar plates with electric cylinder EPCO
- Contactless repositioning of bipolar plates from a conveyor to the workpiece carrier using Bernoulli grippers
- Short cycle times of roughly four seconds
- Reduced workload for commissioning after product changeovers with extremely simple teaching of the EPCO electric cylinders
- IO-Link interface

Customer

P+K Maschinen- und Anlagenbau GmbH (Germany)
Design, development and production of mechanical and electrical systems, special purpose machinery, manufacturing equipment, fixture construction, assembly systems, testing stations and leak testers

Project

Vibration-free transport and gentle handling of sensitive workpieces in a test system for bipolar plates for use in fuel cells

Requirements

- Gentle handling (transport, lifting, positioning) of sensitive workpieces in the test cell
- Continuous test operation with short cycle times
- Avoidance of vibrations
- Rapid and simple commissioning and integration in an existing control concept

Solution

Linear gantry solution for gently lowering of workpieces:

- Electric cylinder EPCO with tried and tested end position cushioning, ball screw and non-rotating piston rod with plain bearing guide
- y-movement via cost-optimised toothed belt axis ELGR
- The electric axes are driven and controlled via stepper motors EMMS-ST and controller CMMO-ST

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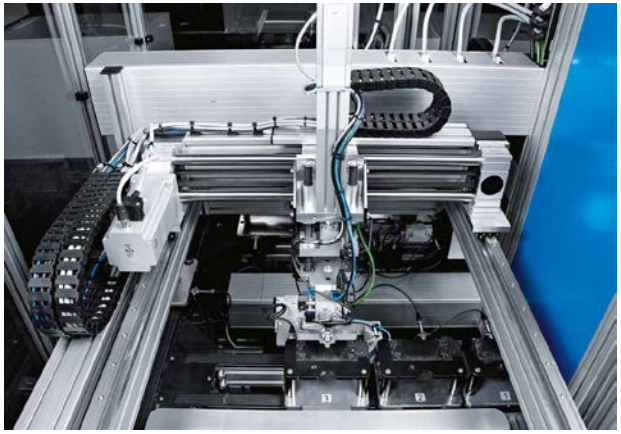
Gentle, vibration-free handling

Storing bipolar plates: the stepper motors of electric cylinder EPCO and toothed belt axis ELGR in the handling system are actuated by servo controller CMMO-ST.



The plates are turned 90 or 180 degrees by a pneumatic semi-rotary drive DRRD mounted on the Z-axis within the three-dimensional gantry in station 1.

A valve terminal VTUG controls all the pneumatic actuators of the system, connected to the master controller via IO-Link.

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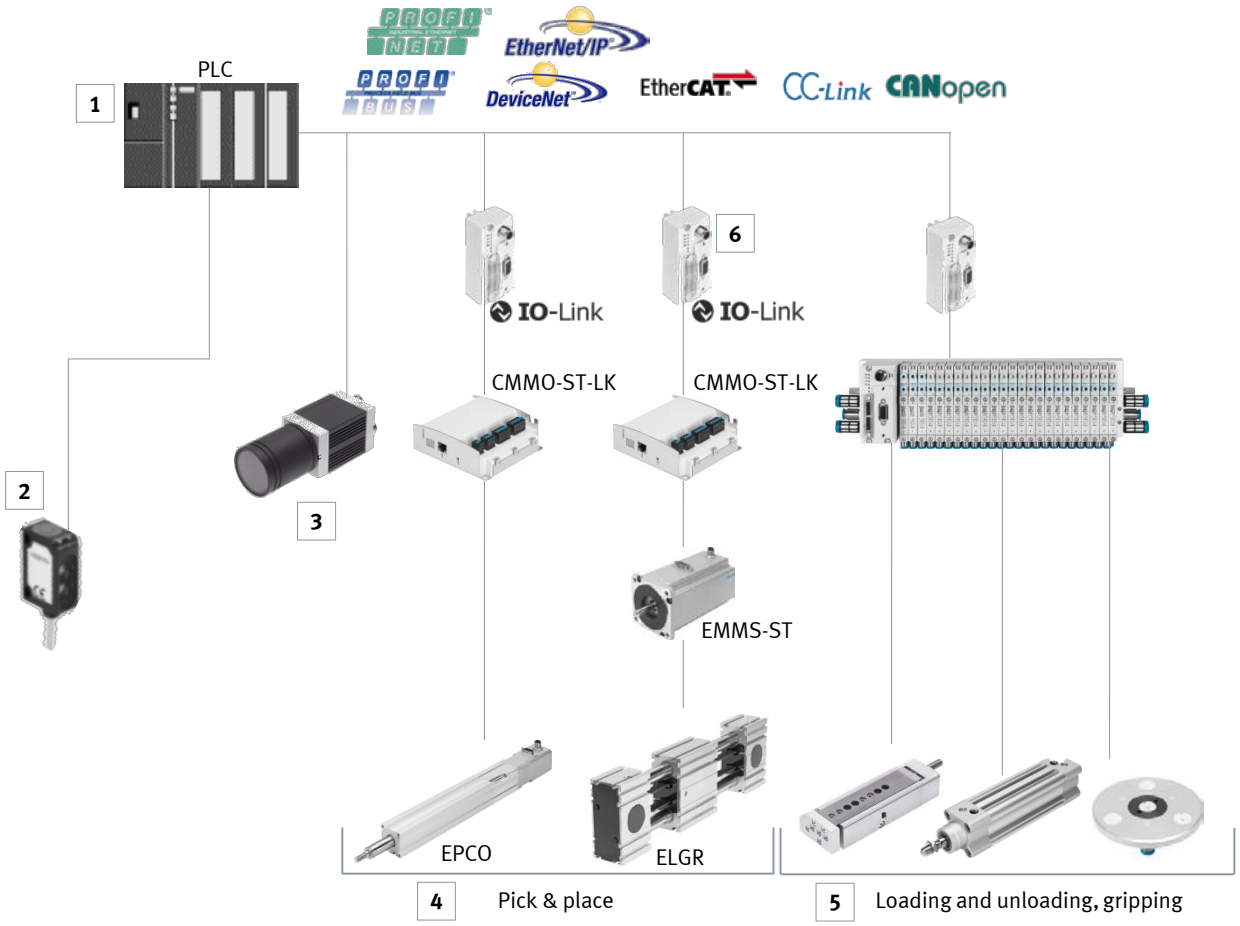
Automation concept



1 Human-machine interface
Motion control (third party PLC)

2 Sensors

3 Vision systems

4 Pick & place
Electrical

5 Loading and unloading, pneumatic gripping

6 Data exchange with CMMO-ST
via CTEU BUS:
16 byte I/O for PROFINET
16 byte I/O for Ethernet/IP
16 byte I/O for EtherCAT
16 byte I/O for CC-LINK®
16 byte I/O for PROFIBUS
8 byte I/O for CANopen
8 byte I/O for DeviceNet

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Components in detail

Electric cylinder EPCO incl. stepper motors EMMS-ST

- Size: 16, 25, 40
- Stroke length: 50 ... 400 mm
- Max. feed force: 650 N
- Max. speed: 500 mm/s

- Clean Look ensures that it is easy to clean
- Long service life of 10,000 km running performance
- Low-cost with optimised performance
- Quick commissioning via web server/browser concept

Toothed belt axis ELGR

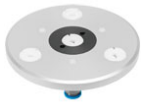
- Size: 35, 45, 55
- Stroke lengths 50 ... 1500 mm
- Forces 50 ... 350 N
- Recirculating ball bearing guide or plain-bearing guide

- Long service life of 5,000 km
- Payloads up to 6.5 kg
- Cost-optimised rod guide
- Ready-to-install unit
- Heavy-duty plain bearings for use in harsh operating conditions

Controller CMMO-ST

- Voltage: 24 V DC
- Nominal current: 5 A
- Micro step: 12,800 steps/revolution

- Closed-loop servo controller for stepper motors
- Closed-loop servo system
  - Maximum operational reliability
  - Use of the maximum motor characteristic curve
- Supports safety function STO
- Easy actuation via:
  - I/O interface
  - IO-Link or I-Port
  - Modbus TCP
- Parameterisation possible via:
  - FCT (Festo Configuration Tool)
  - Ethernet interface with integrated web server



Bernoulli grippers OGGB

- Suction cup size: 60, 100, 140 mm
- Connection: G1/8
- Holding force: 10 N
- Supply pressure: 0.1 ... 6 bar
- Ambient temperature: 0 ... +60°C
- Volume: 65 dBA
- Air consumption: 110 l/min (at 1 bar)

- The ideal solution for minimal contact gripping, and for gripping pliable, porous and brittle workpieces
- The workpiece floats on an air cushion and only comes into contact with the gripper at the few stops