

10.00 Industry 4.0 implementation and qualification at Festo

- Target definition
- Flexible Automation
- Some examples of Festo Production Plant
- Technology behind Industry 4.0
- Qualification for Industry 4.0

The Spirit of Industrie 4.0

flexible

cooperative

autonomous

communicating

self organizing

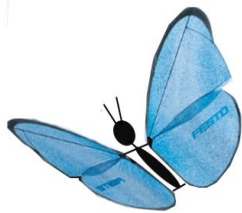
intuitive

efficient

mobile

light

easy to use



The Goal of Industrie 4.0

- for Festo internally (e.g.)

to increase the productivity of the plants

to increase Energy Efficiency

to master the complexity of variants

to improve Diagnostics and Maintenance Process

- for Festo Customers (e.g.)

to increase engineering productivity

to offer highly functional products / systems

to offer energy efficient products / systems

to offer additional services



The Festo Group

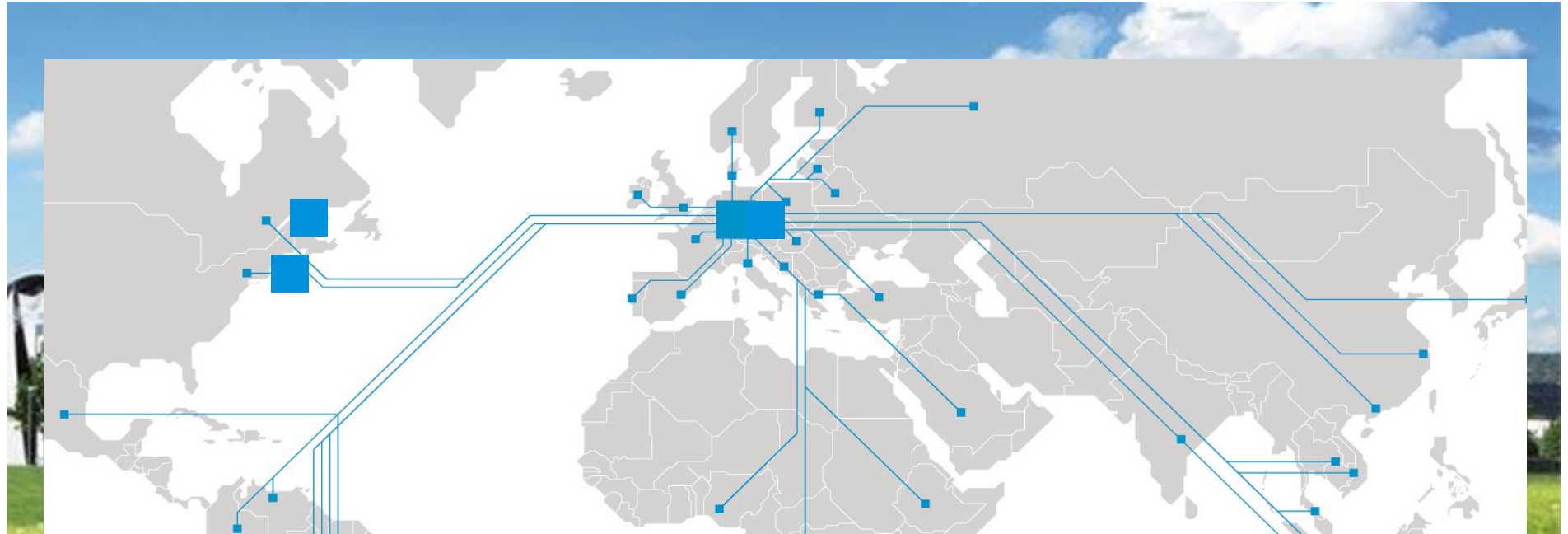


Turnover: 2.45 billion / 18.000 employees worldwide / 60 subsidiaries active in 176 countries for 300.000 clients

Innovative and self-learning: 3,000 patents, more the 100 innovations/year Education investments: 1,5% of sales



Festo Didactic



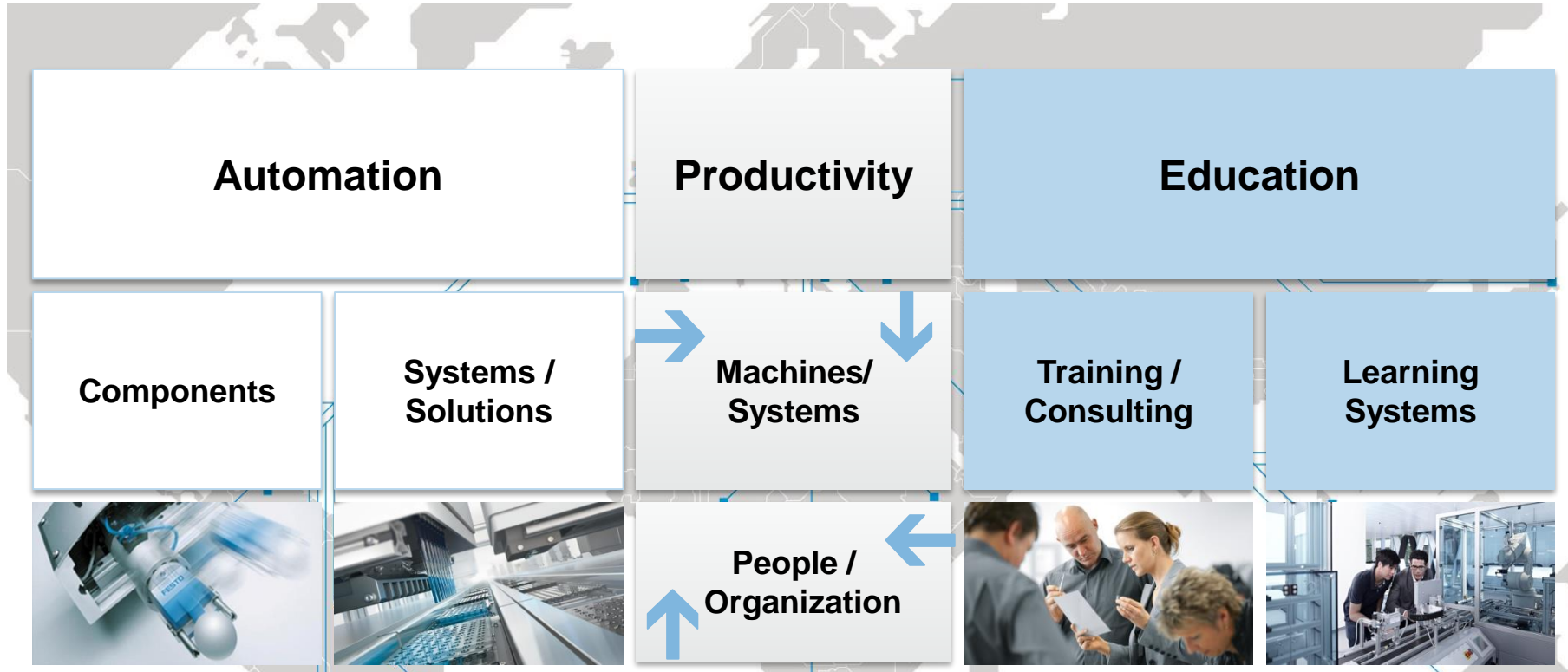
Core locations in Germany, Canada and USA

60 Festo locations / over 900 employees worldwide

active in 176 countries for 300.000 clients



The holistic approach of Festo



Increasing the productivity of over 300.000 clients worldwide.

Flexible Automation

"In order to secure the existence and ensure competitiveness of companies, it is absolutely necessary that production planners and those responsible for factory organisation learn how they can compensate for market turbulences without interfering with running production", says Prof. Engelbert Westkämper, Director of the IFF at the University of Stuttgart and of the Fraunhofer Institute for Production Technology and Automation (IPA – In-

Reference IFF

<http://www.lernfabrik-aie.de/aktuelles/>



Universität
Stuttgart **iff**

Institut für Industrielle
Fertigung und Fabrikbetrieb

...

Wandlungsfähigkeit muss zum Bestandteil der betrieblichen Kulturen und Standards werden.

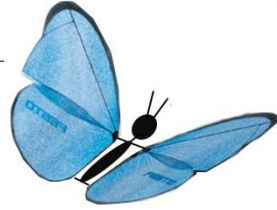
...

In technischer Hinsicht kommt der flexiblen und konfigurationsfähigen Automatisierung eine zentrale Rolle zu.

...

aus: Forschung stärken, Produktion sichern
Autor: Prof.Dr.-Ing. Prof.e.h.Dr.-Ing.e.h.Dr.h.c.mult.Engelbert Westkämper

Flexible Automation



What is Flexible Automation?

Flexible Automation is the ability for a robot or system to be quickly and easily re-tasked to change product design for both low and high mix manufacturing. When properly utilized, a Flexible Automation cell can evolve with your process and demand, reduce and fix production costs, improve quality, and eliminate

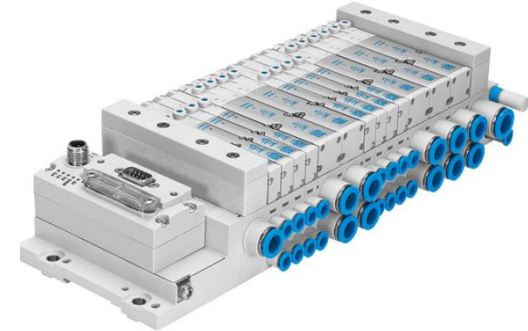


Flexible Automation

Example:
Tesla Production



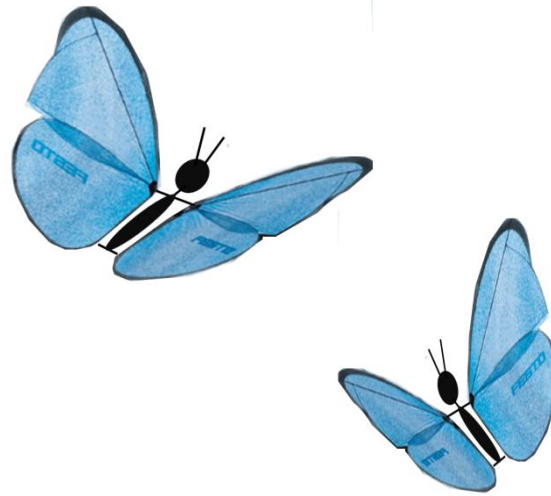
Flexible Automation



no panacea for flexible automation

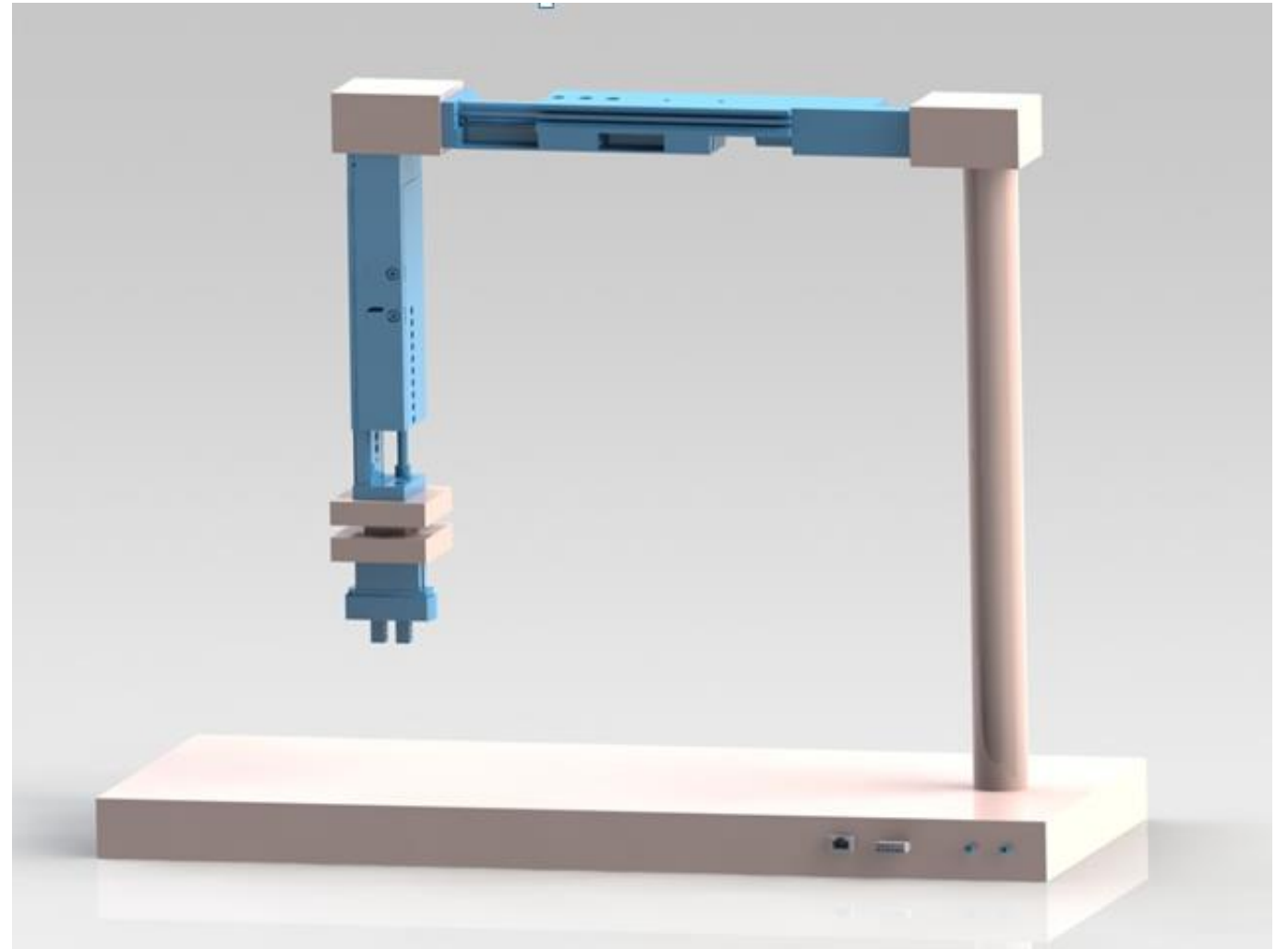
Flexible Automation

- simple bricks
- many bricks
- clear grid
- well defined interfaces
- intuitive handling



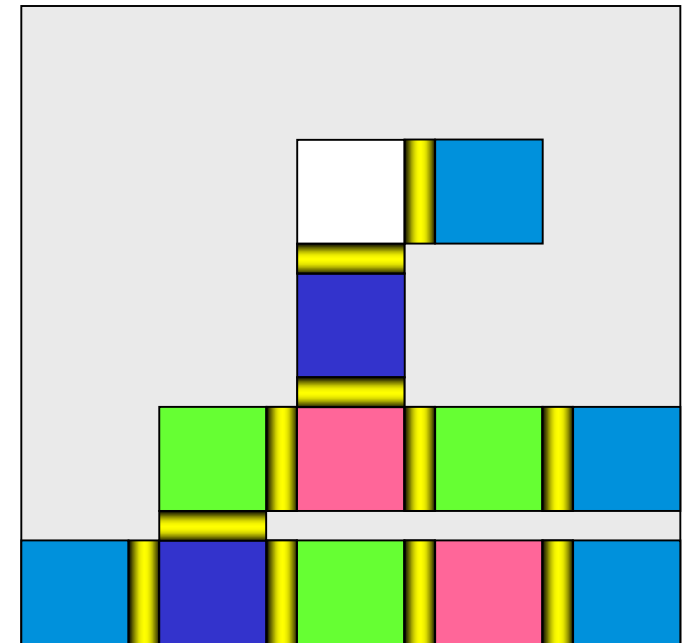
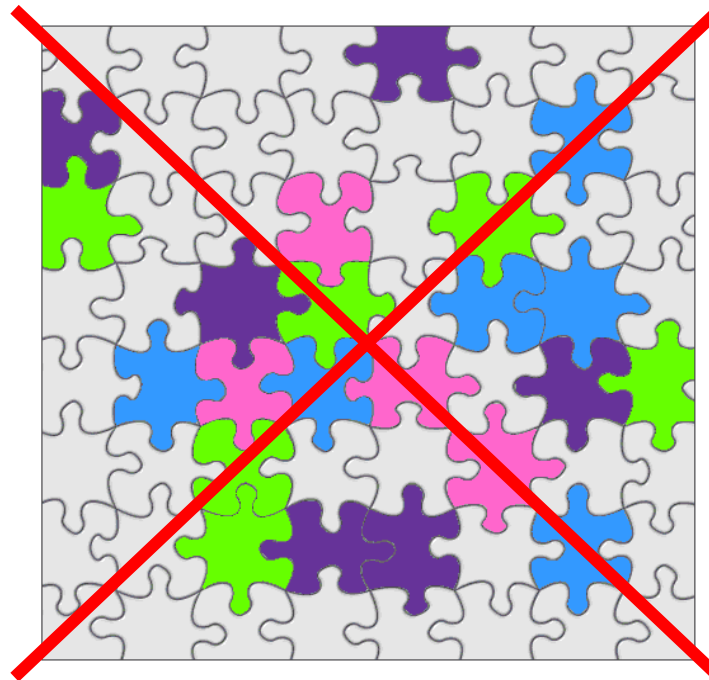
Flexible Automation

- simple bricks
- many bricks
- clear grid
- well defined interfaces
- intuitive handling



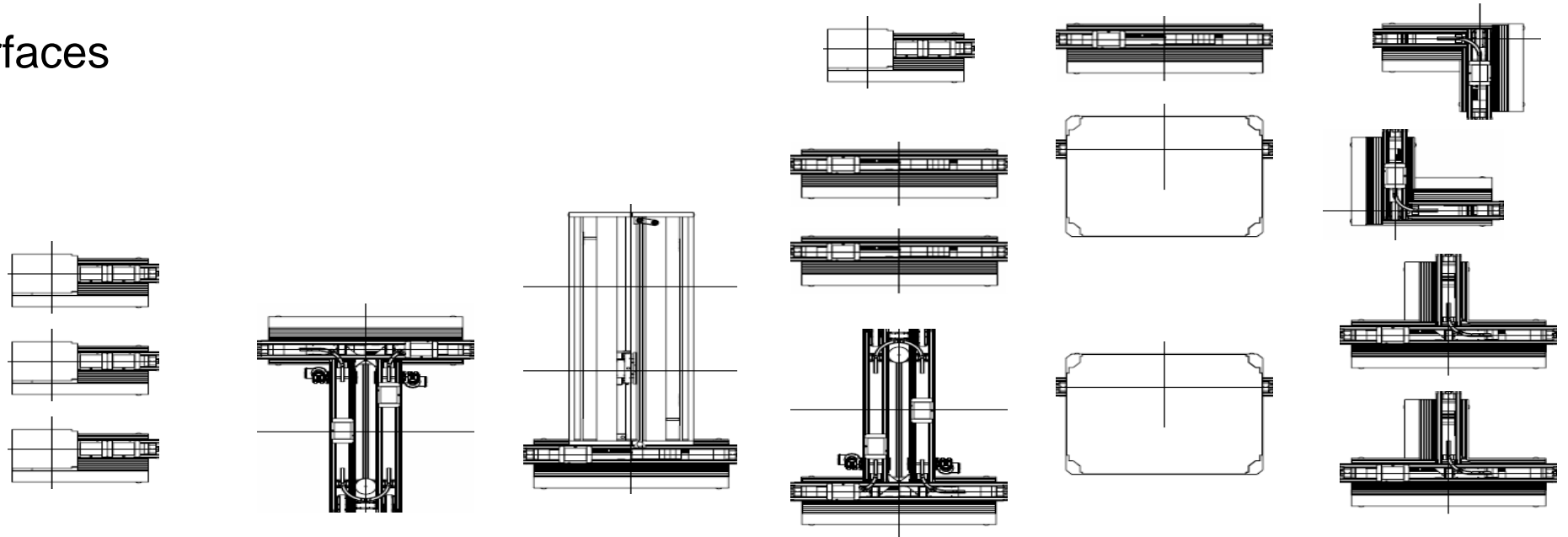
Flexible Automation

- simple bricks
- many bricks
- clear grid
- well defined interfaces
- intuitive handling

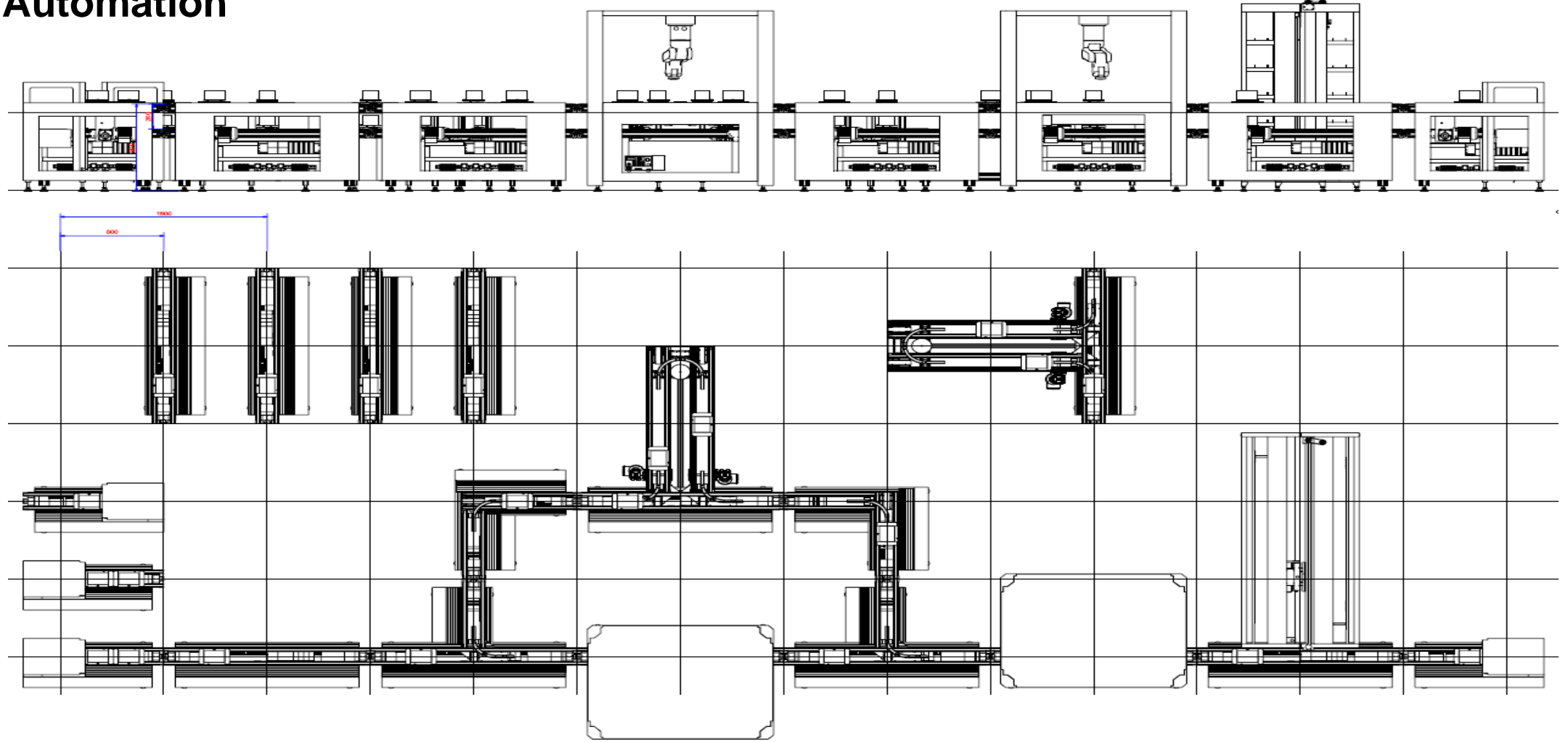


Flexible Automation

- simple bricks
- many bricks
- clear grid
- well defined interfaces
- intuitive handling

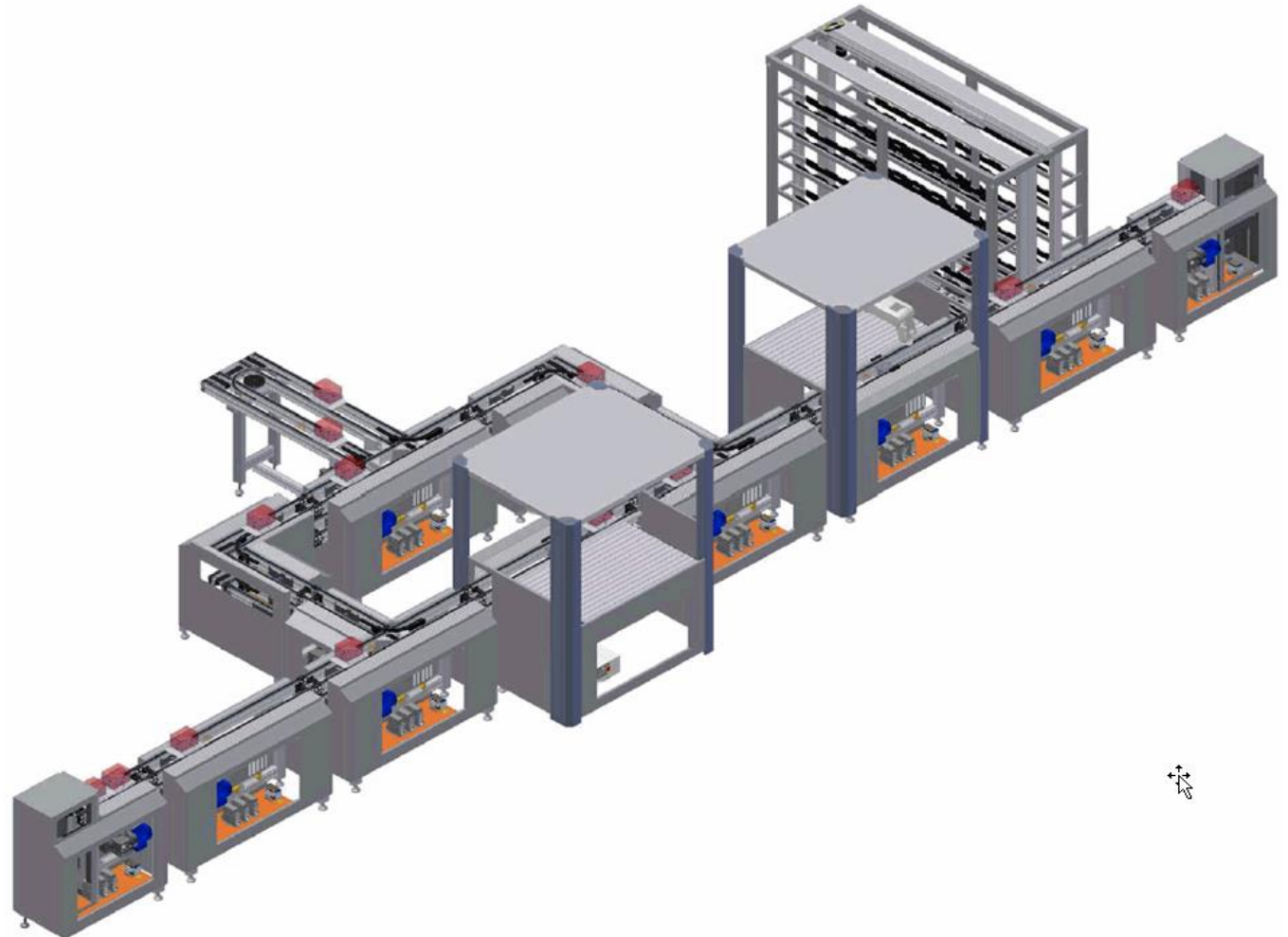


Flexible Automation

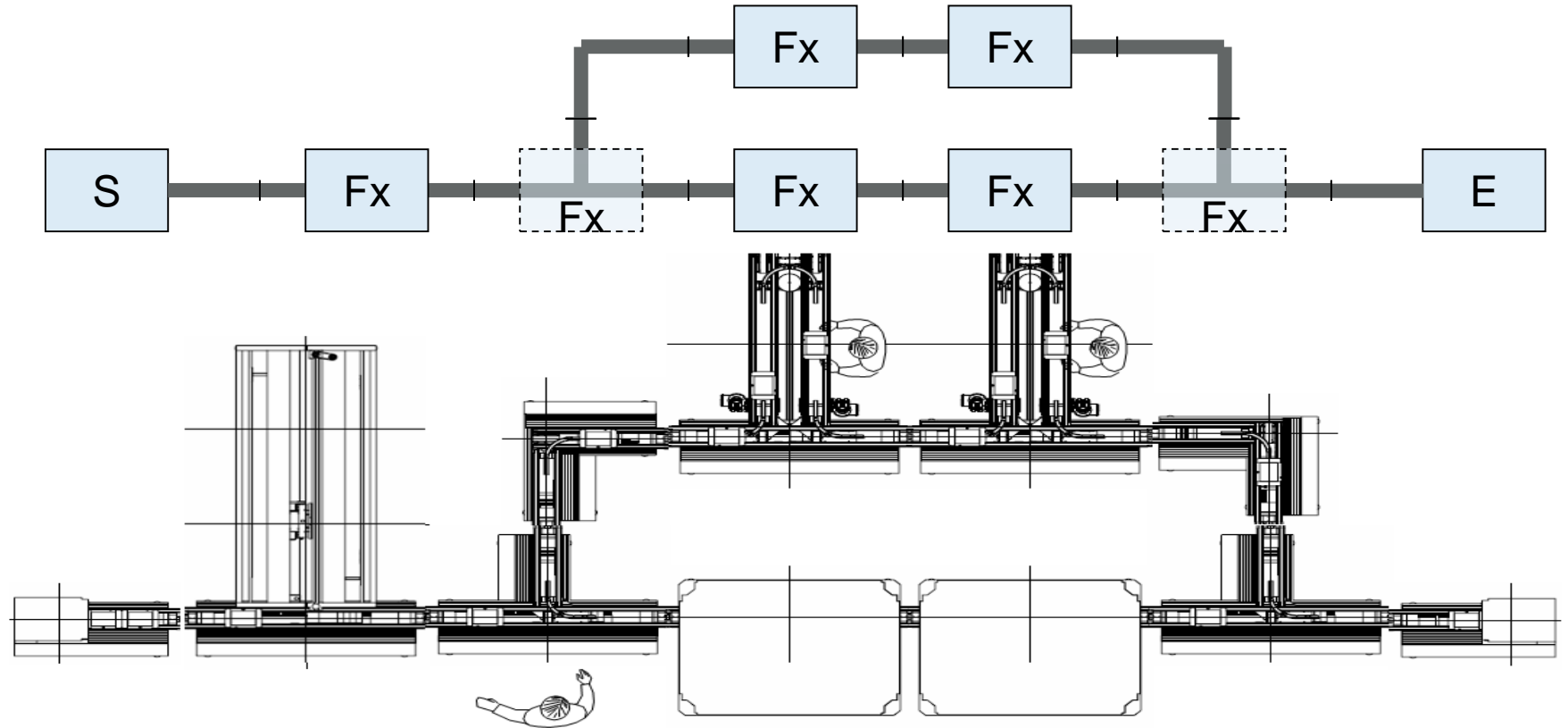


Flexible Automation

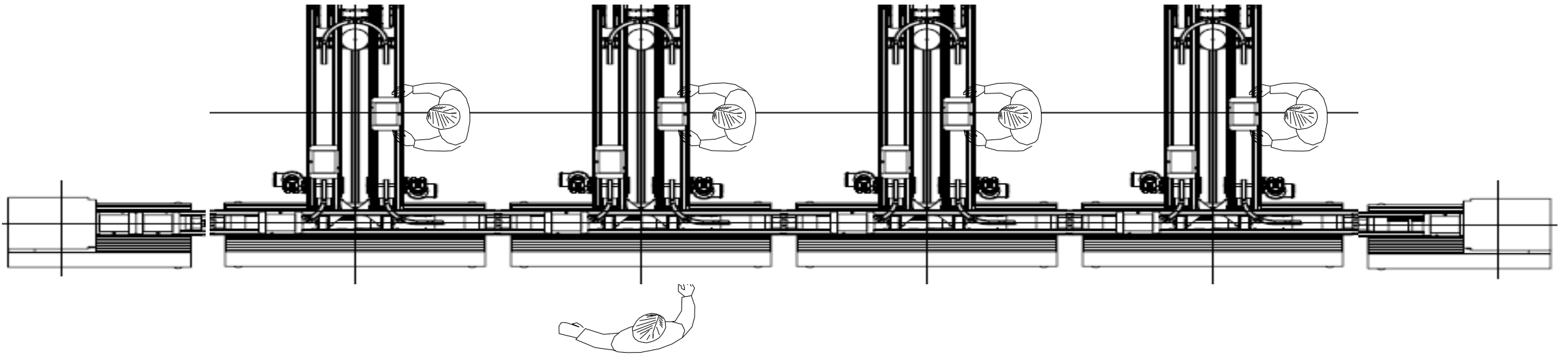
- simple bricks
- many bricks
- clear grid
- well defined interfaces
- intuitive handling



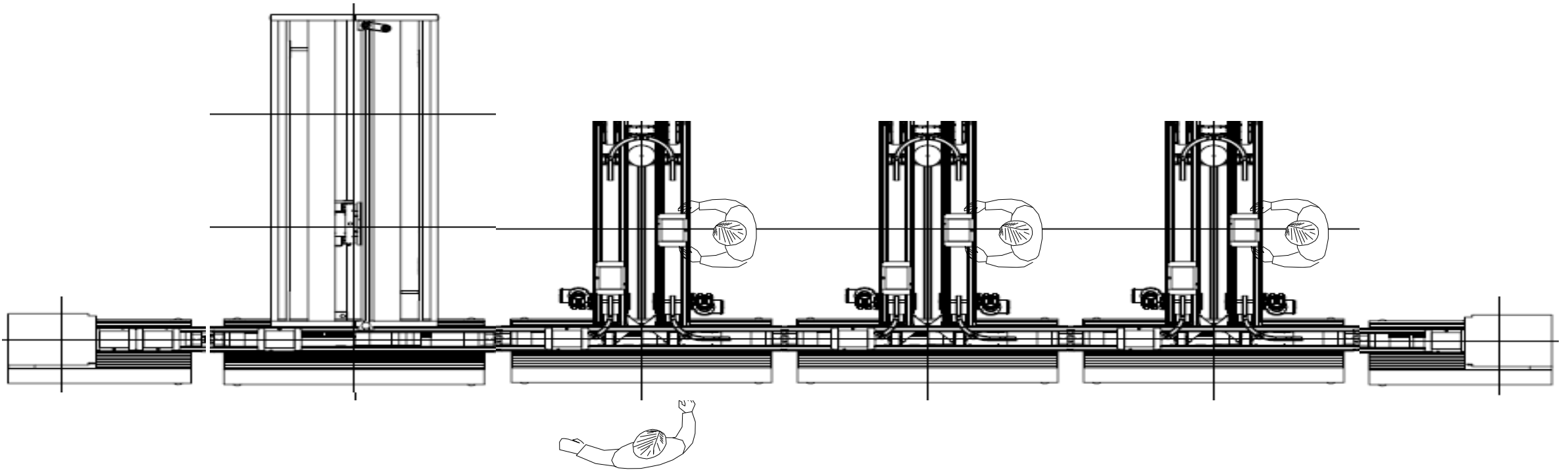
Flexible Automation



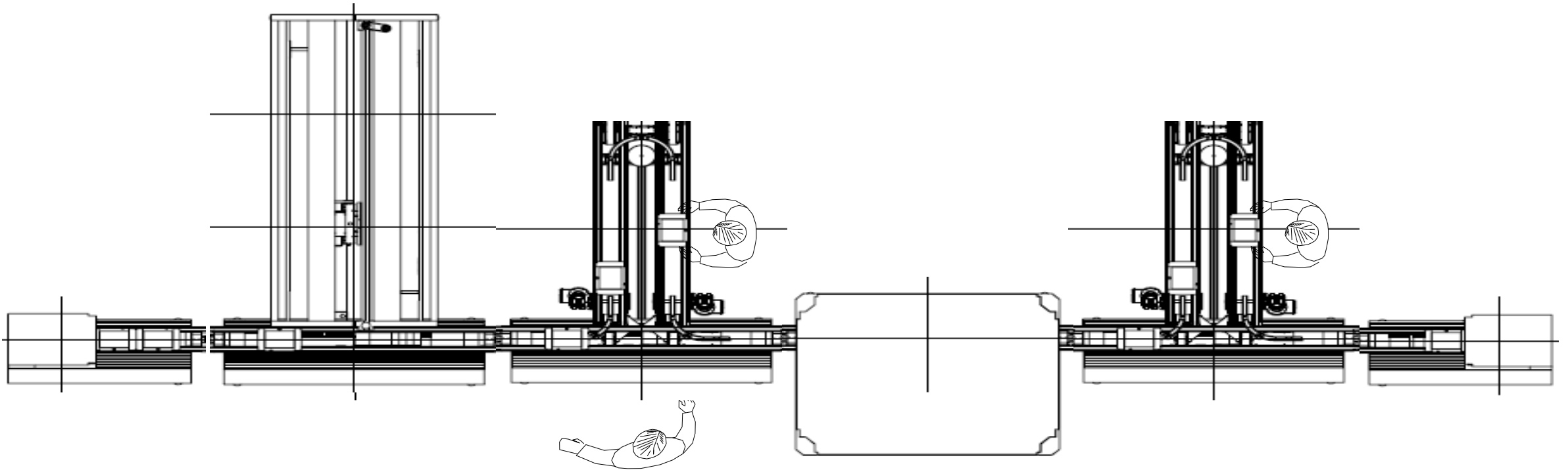
Flexible Automation



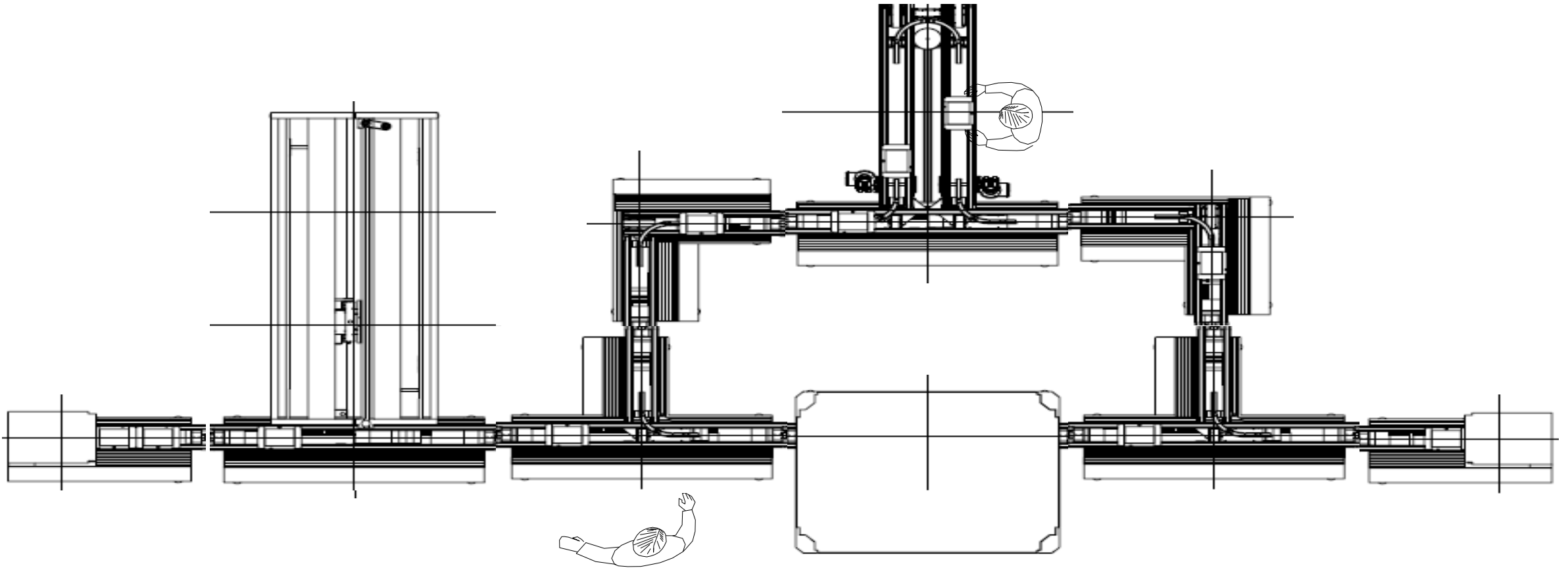
Flexible Automation



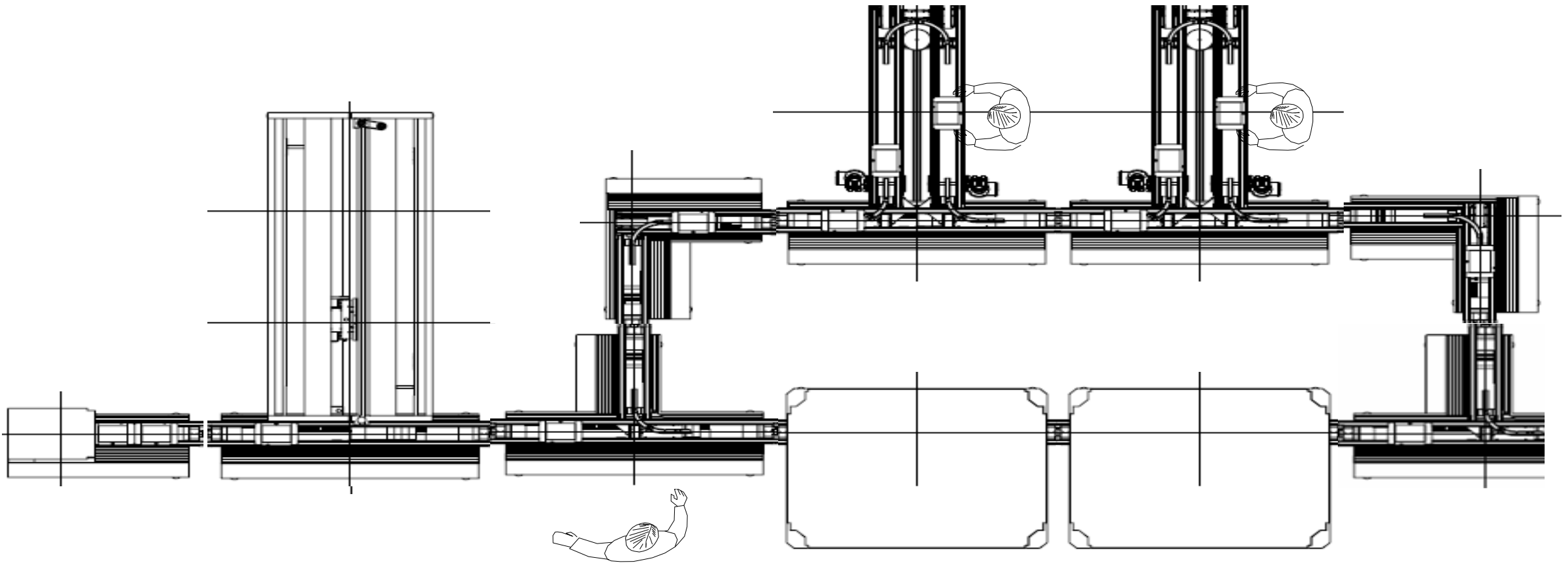
Flexible Automation



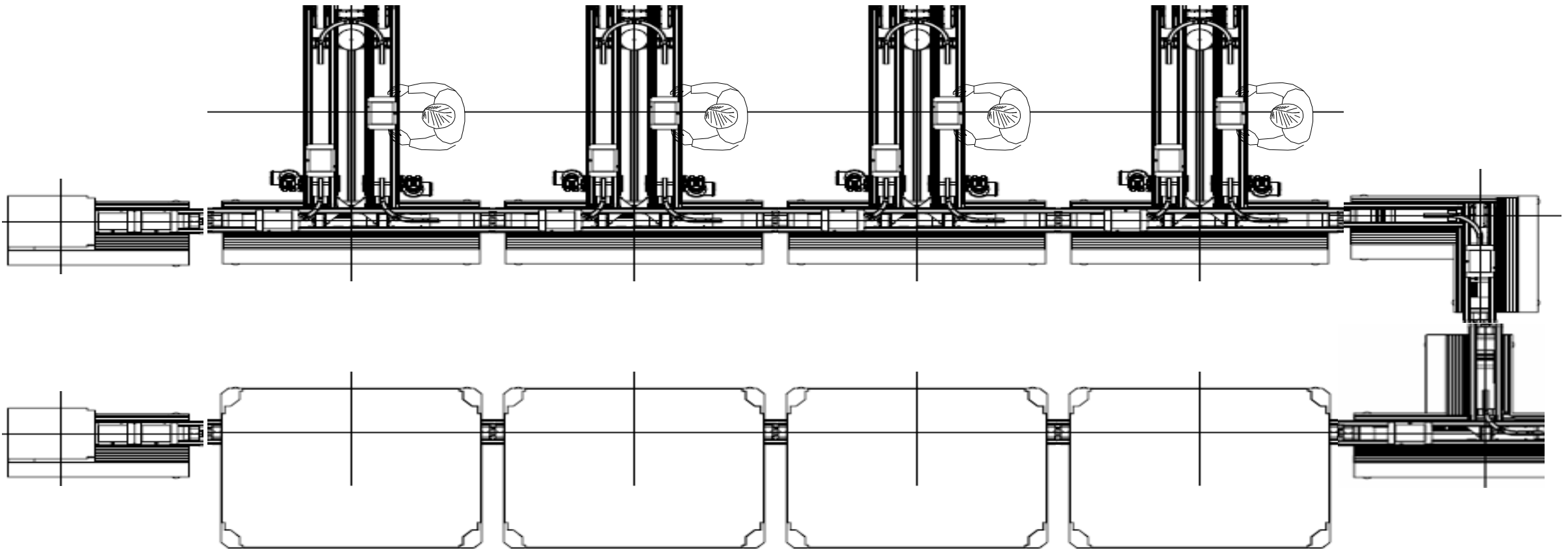
Flexible Automation



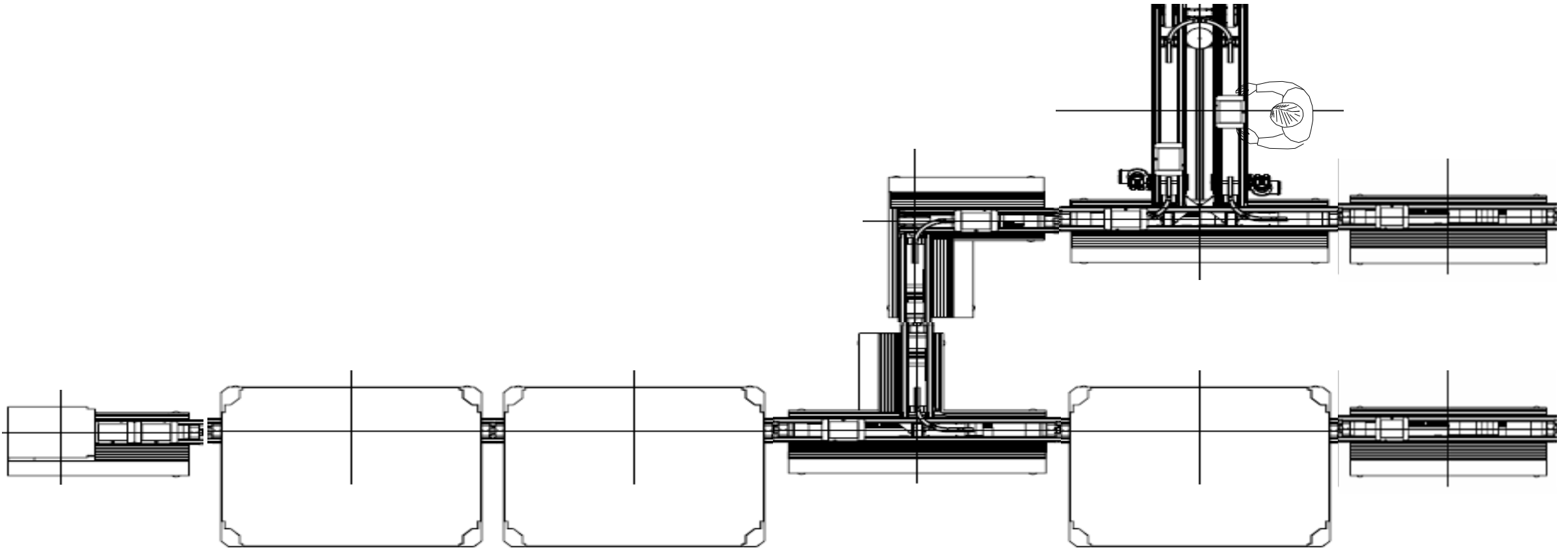
Flexible Automation



Flexible Automation



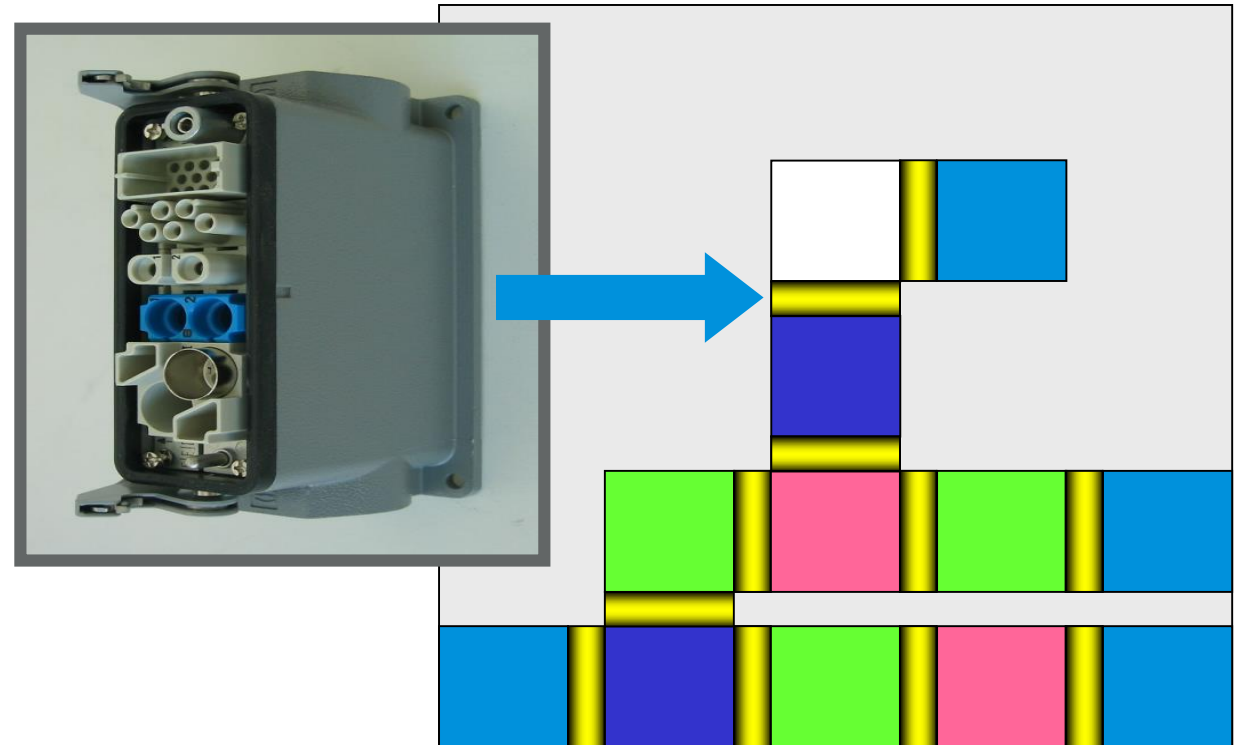
Flexible Automation



Flexible Automation

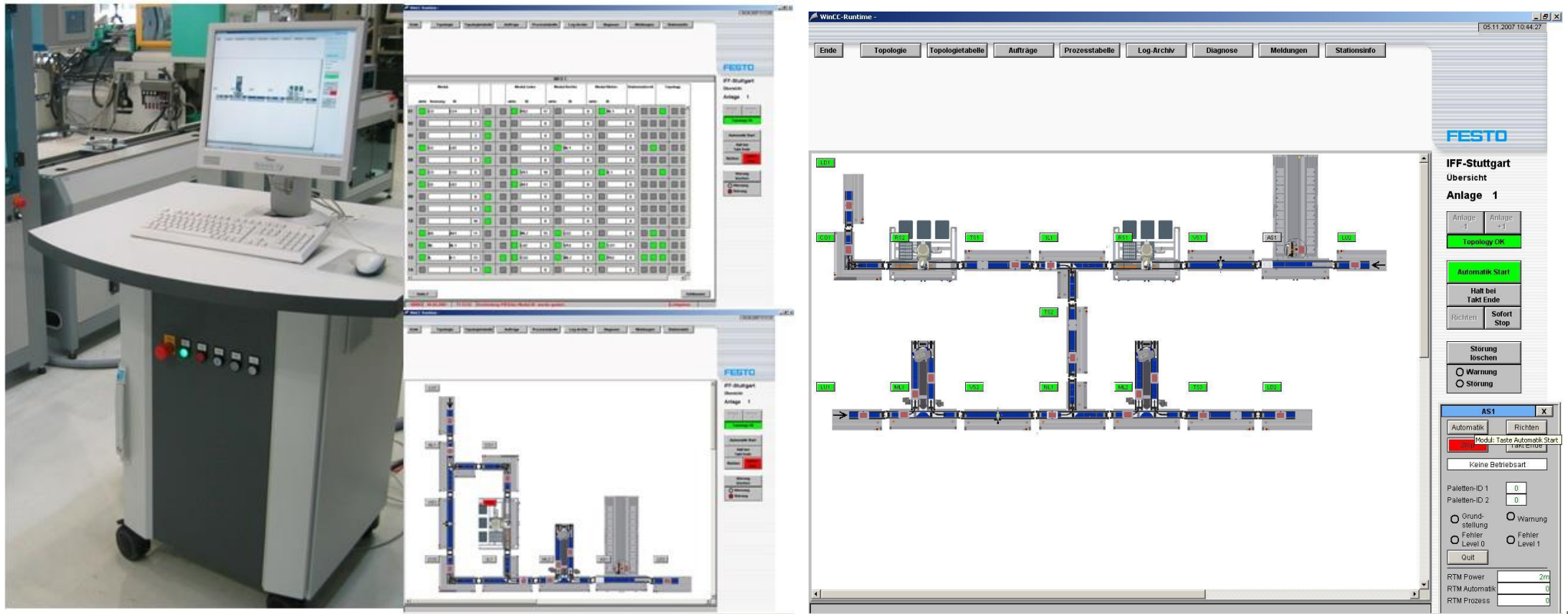
System Plug*

- Power 400 V
- Pressed Air
- Ethernet
- Safety
- Potential



* Bei hohem Energieverbrauch lokale Einspeisung

Flexible Automation



Flexible Automation



Flexible Automation



Flexible Automation

Example:
Research Project OPAK

Projektdaten

- Projektlaufzeit 3 Jahre
- Auftraggeber BMWi
- Projektträger DLR
- Budget knapp 5 Mio. €
- Projektstart 01.10.2013



Gefördert durch:



aufgrund eines Beschlusses
des Deutschen Bundestages

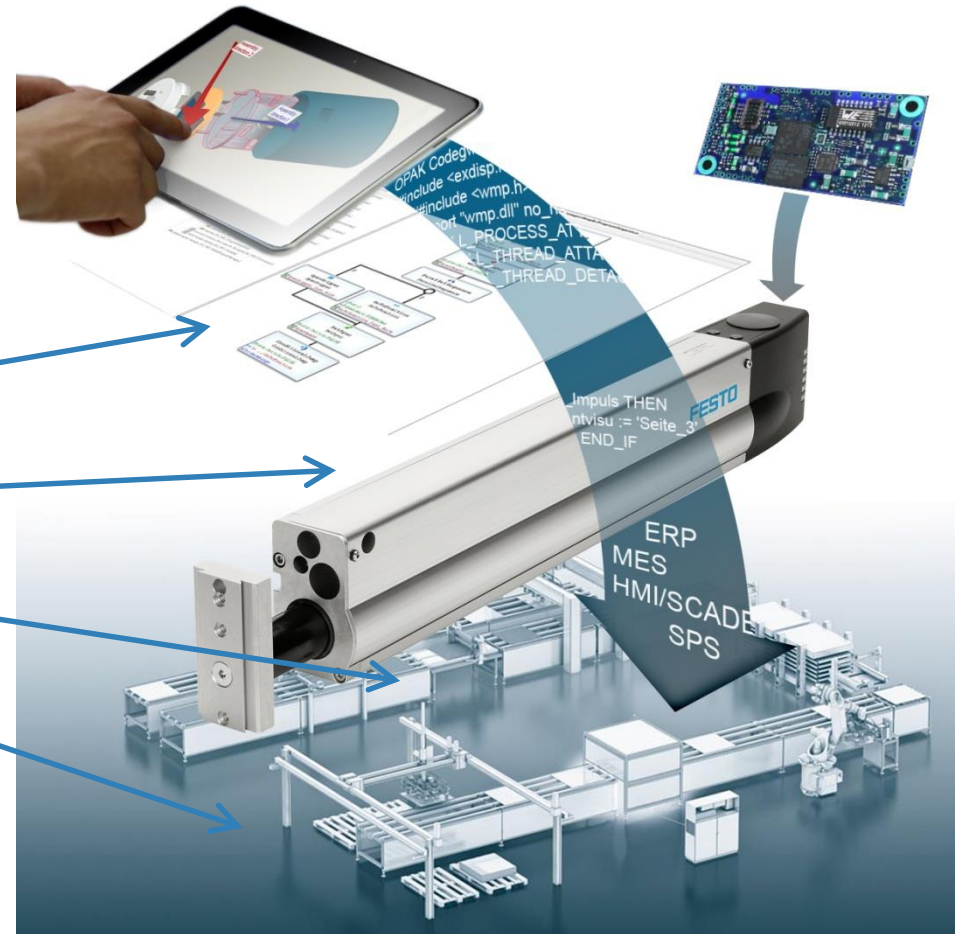


Flexible Automation

Example:
Research Project OPAK



- Interaction
- Engineering
- Components
- Code Generation
- Systems



Flexible Automation

Example:

Research Project OPAK



Expectations:

Lower
Cost



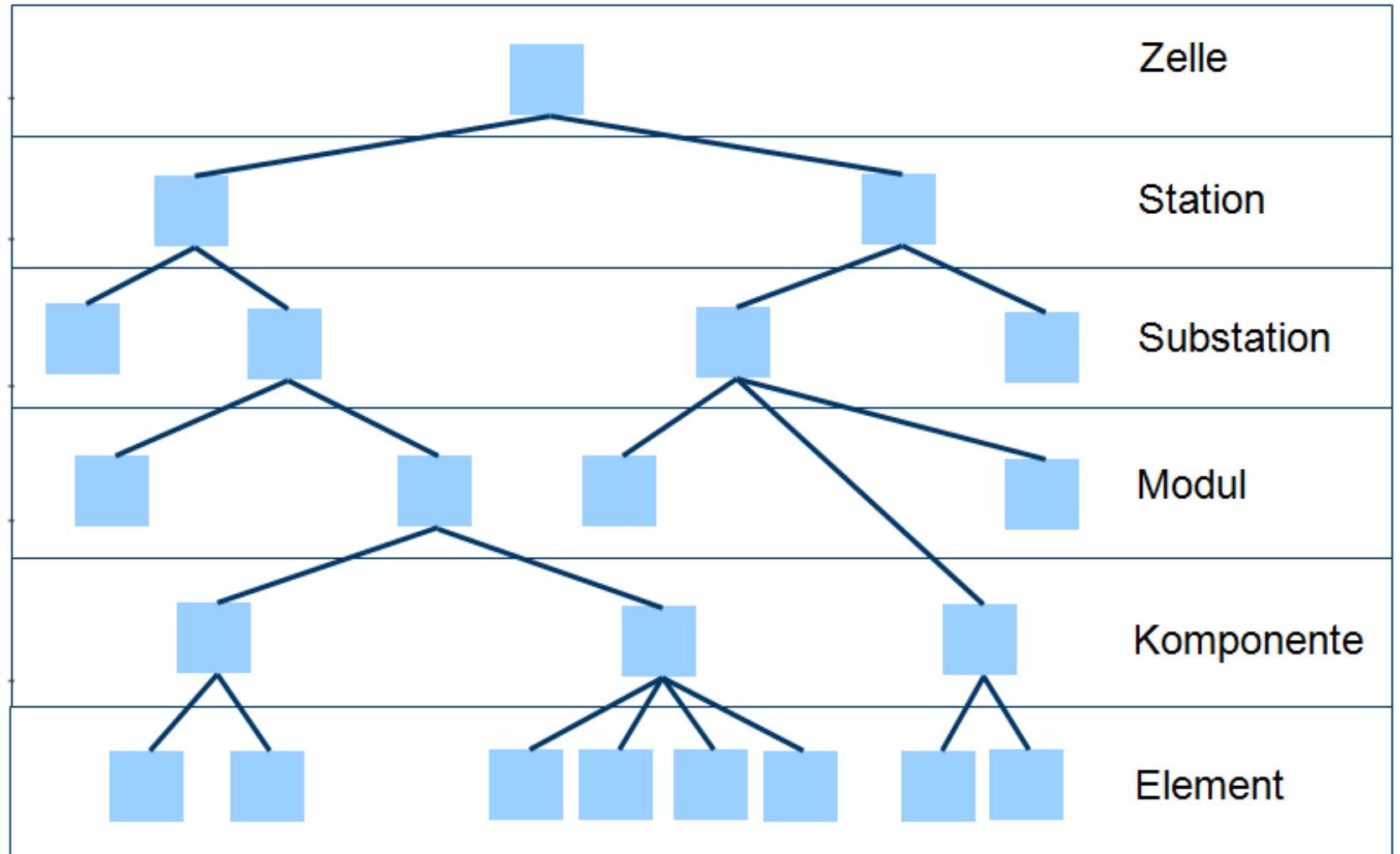
Reduction of
Engineering



Higher
Quality

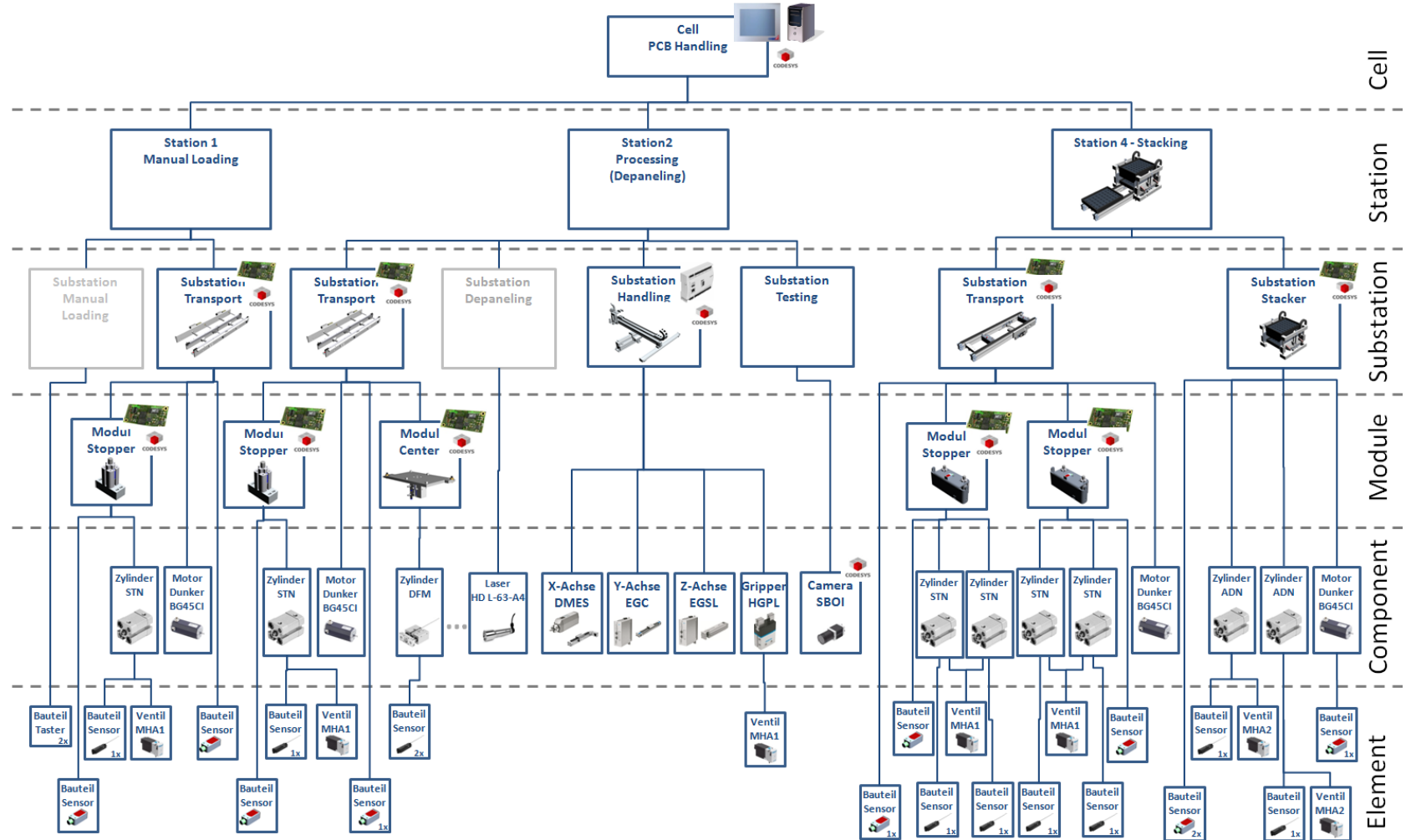
Flexible Automation

Example:
Research Project OPAK



Flexible Automation

Example:
Research Project OPAK



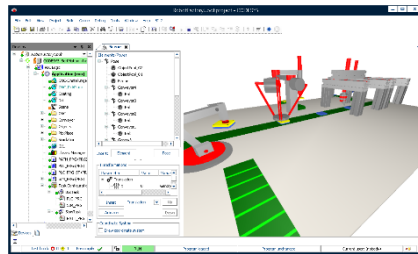
Flexible Automation

Example:
Research Project OPAK

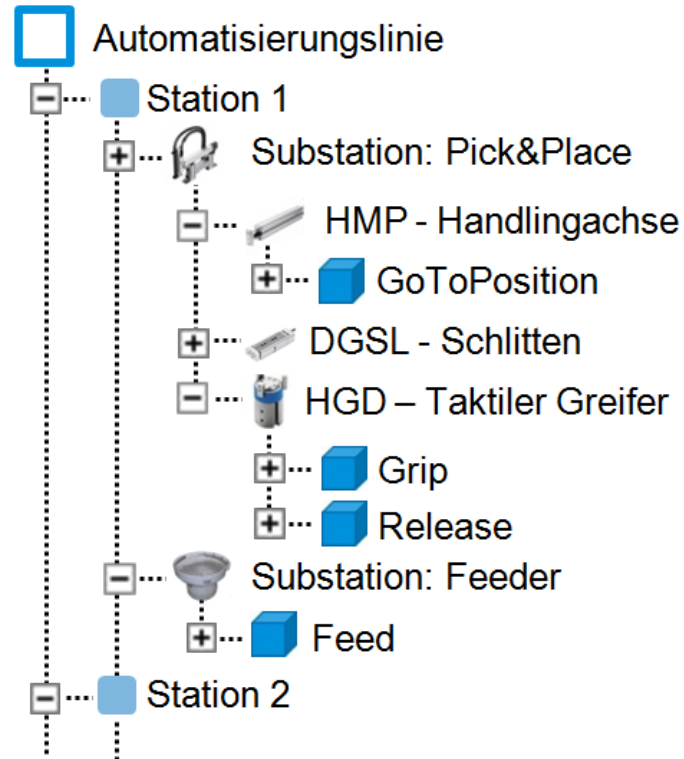
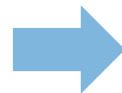


Flexible Automation

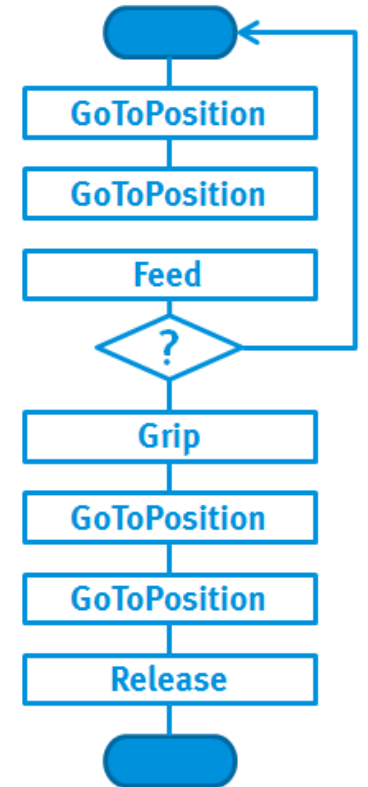
Example:
Research Project OPAK



3D Engineering



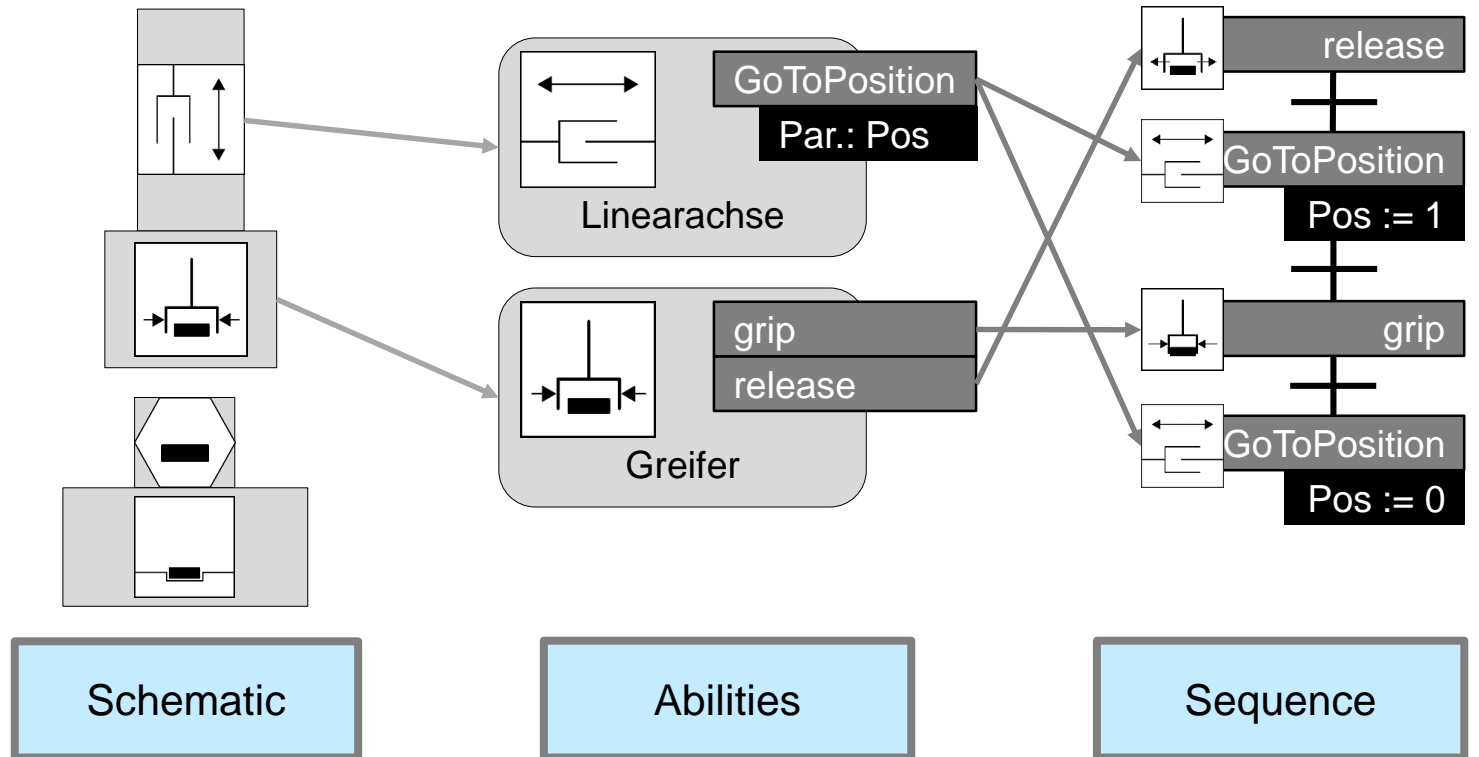
Automation Architecture

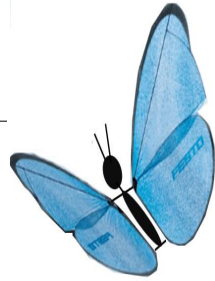


PLC Code /
Sequence

Flexible Automation

Example:
Research Project
OPAK





Flexible Automation

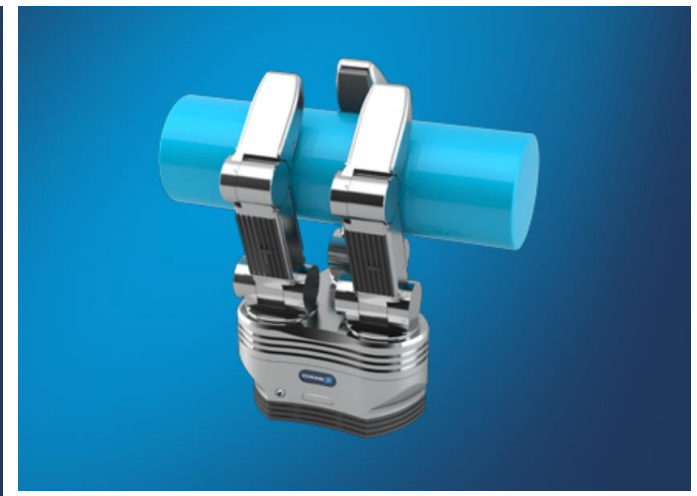
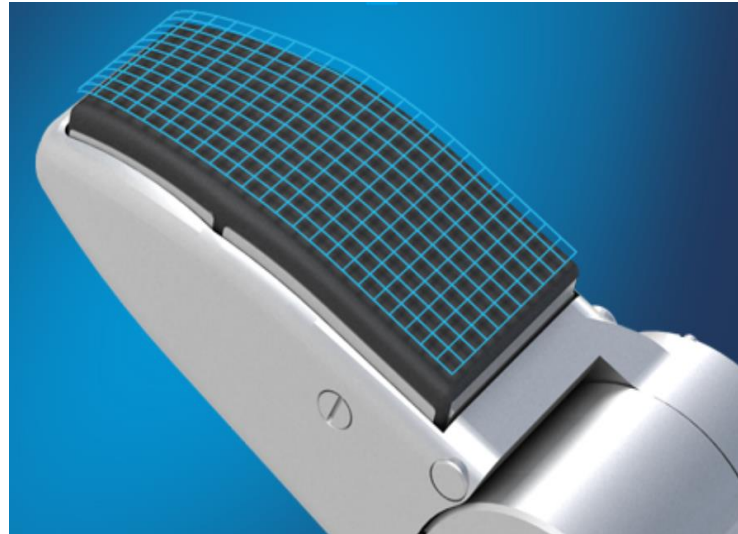
Example:
Research Project
OPAK



Flexible Automation

Grippers

Enabler for Flexibility



Flexible Automation

Grippers

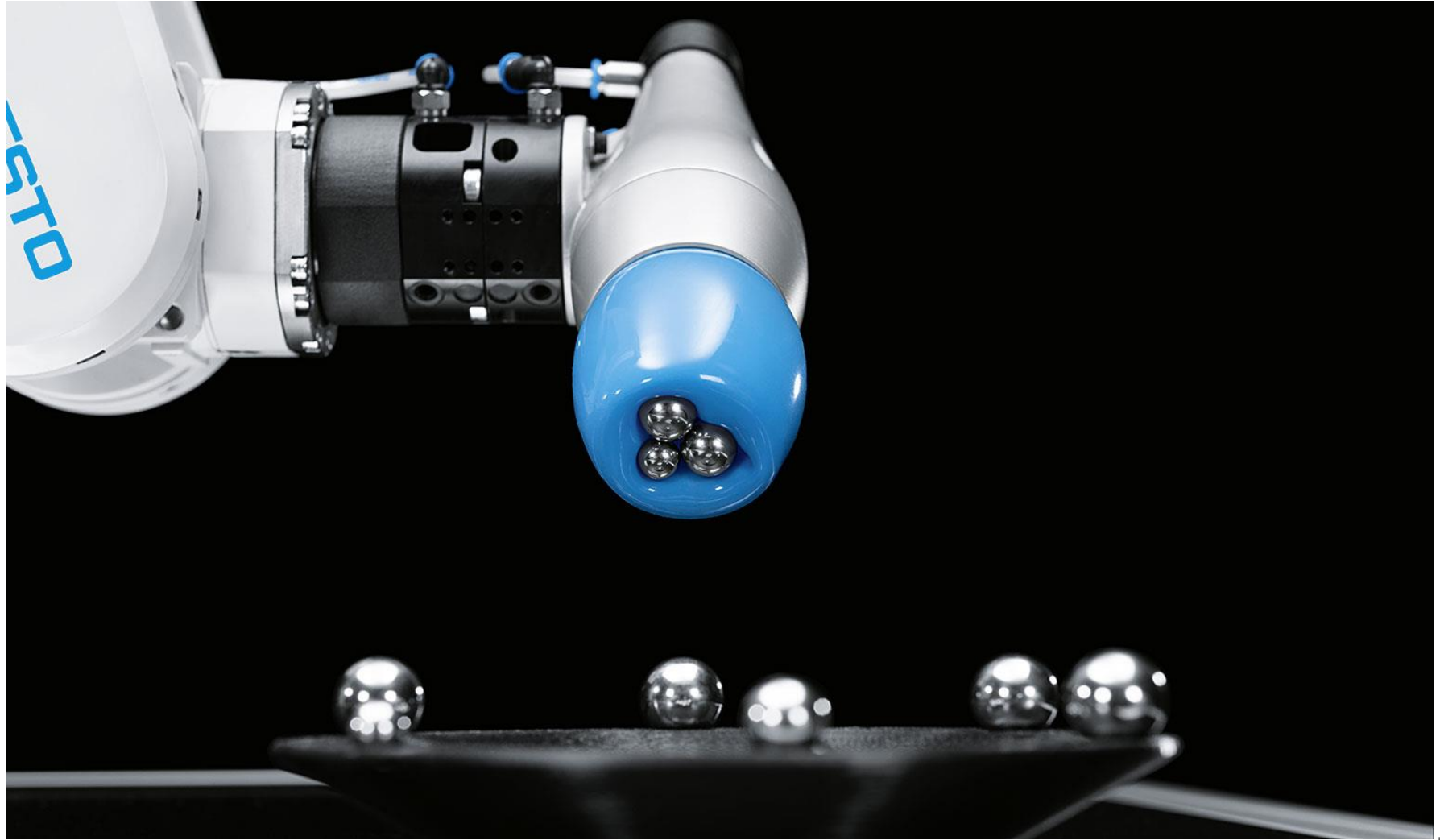
Enabler for Flexibility



Flexible Automation

Grippers

Enabler for Flexibility



Some examples of Festo Plant

Some examples of Festo Plant

Valve Production Optimized Production Layout

Zahlen, Daten, Fakten

4 Ebenen

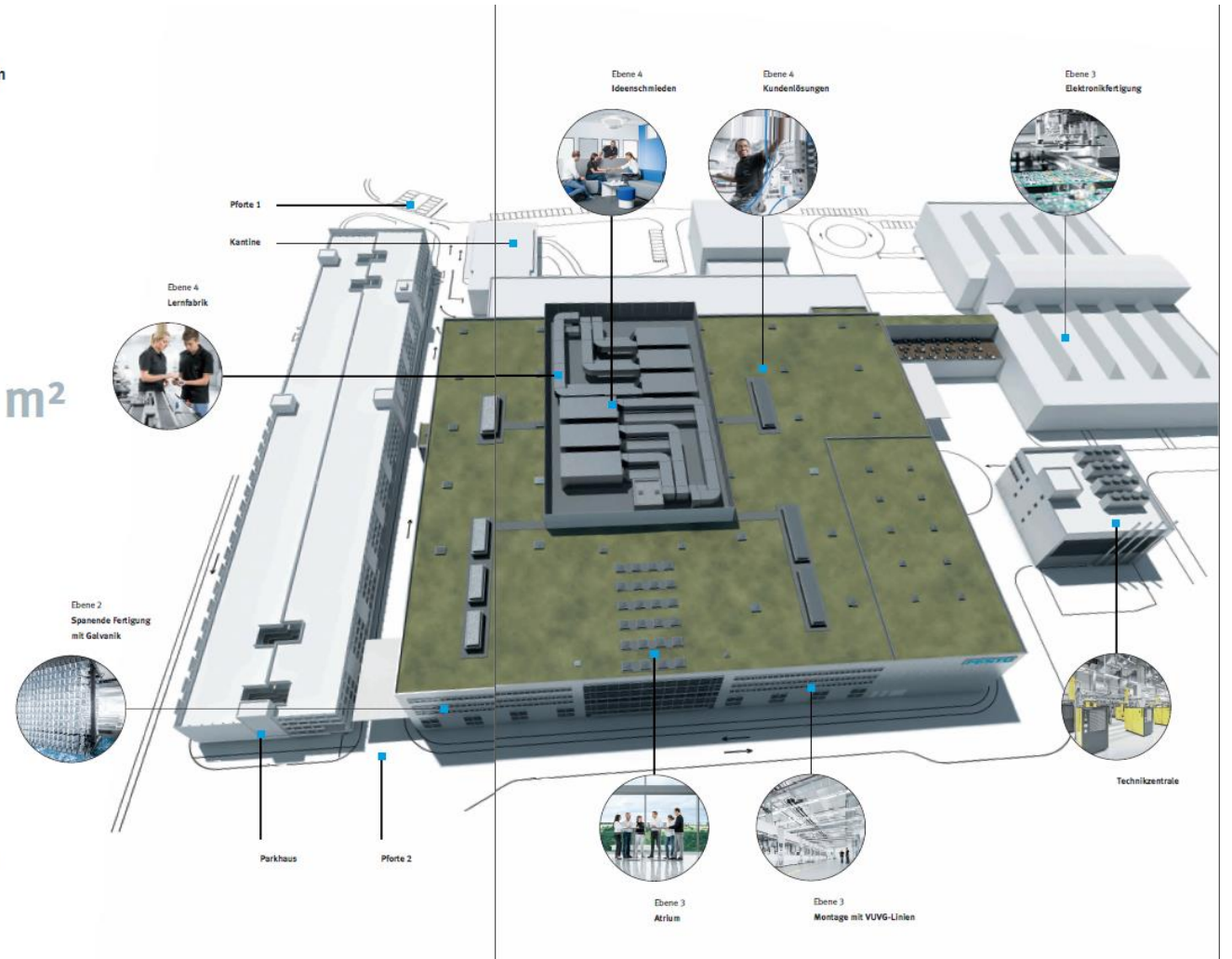
66.000 m²
Nutzfläche

22 m
Gebäudehöhe

1.200
Mitarbeiter

20%
Strom aus
Eigenerzeugung

220 m²
große Lernfabrik



Some examples of Festo Plant

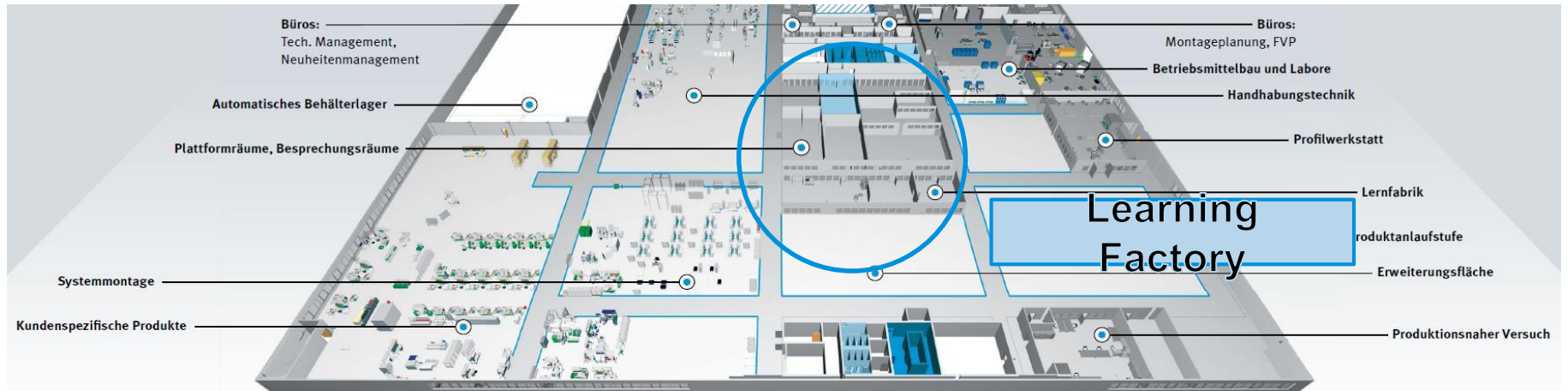
Details of the Building

- 9.000 Lamps
- 125 km Kabel und Druckluftleitungen
- 70 km Datenleitungen und 6,5 km Glasfaserkabel
- 28 km Rohre für Heizung und Kühlung
- 1.000.000 m³/h Frischluft 2,5 x ausgetauscht pro Stunde
- 40.000 m² Produktionsfläche
- 22.000 m² Logistik
 - 80.000 Stellplätze Kleinteile (12 Gassen)
 - 3.000 Stellplätze Paletten
 - 1500 – 2000 Einlagerungen täglich
- 1.200 Mitarbeiter (3 Schichten) + ca. 500 IT und weitere Bereiche



Some examples of Festo Plant

Layout: Learning Factory



Some examples of Festo Plant

Layout:
Optimized Logistics Flow



Some examples of Festo Plant

Flexible Assembly Lines

More than 1 Million Valves /a
Few Seconds Cycle Time
Integrated Test
Highly flexible / many variants



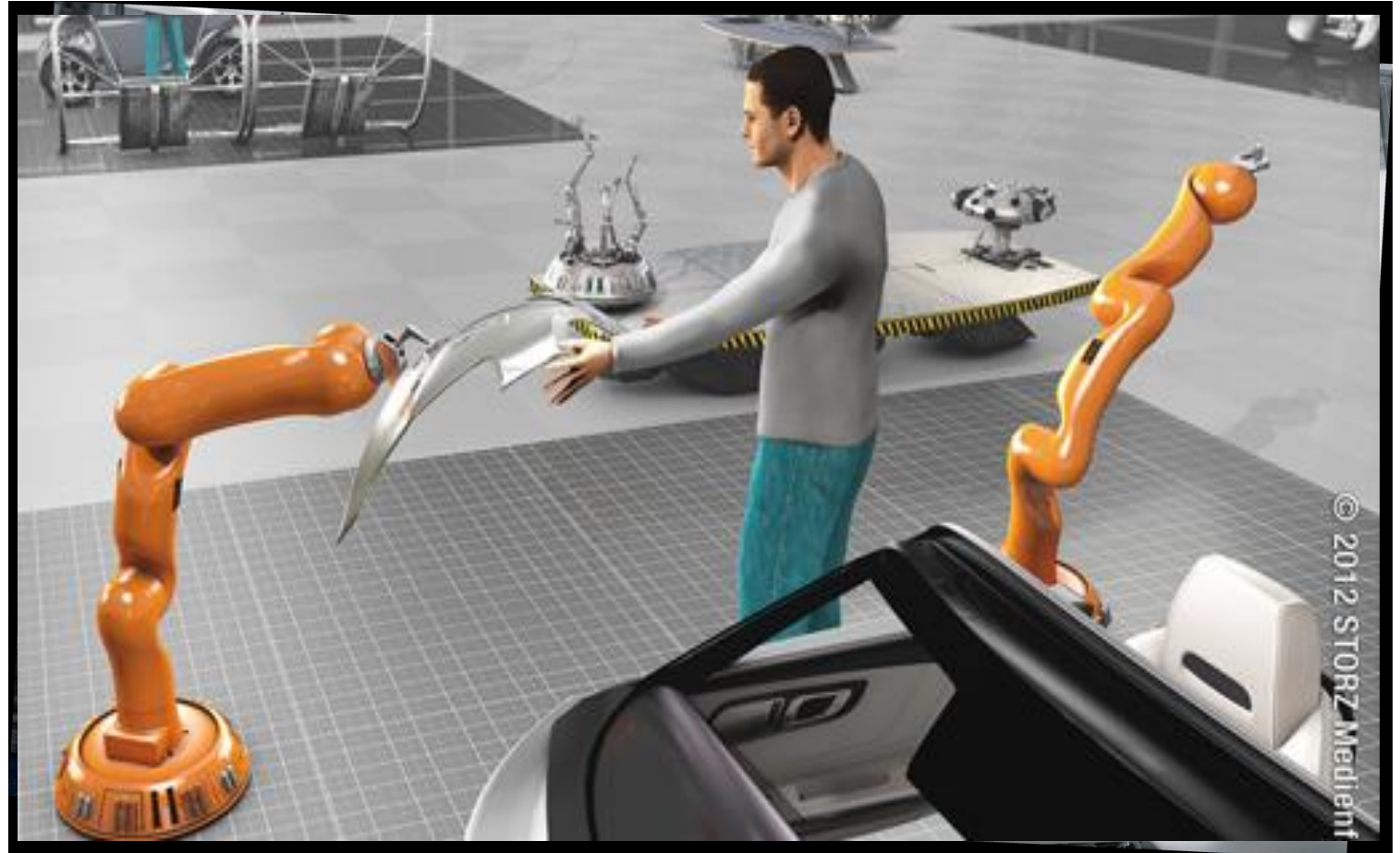
Some examples of Festo Plant

Cooperative Robotics

No fence,
a lot of positive effects....

e.g.

- Savings for integration
- Multiuse



Some examples of Festo Plant

Energy Efficiency



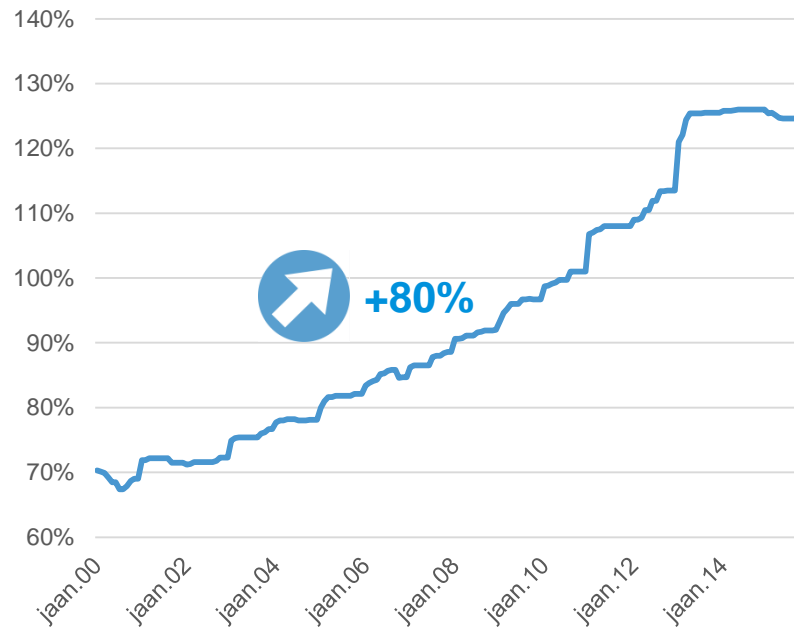
Some examples of Festo Plant

Energy Efficiency

Energy Management

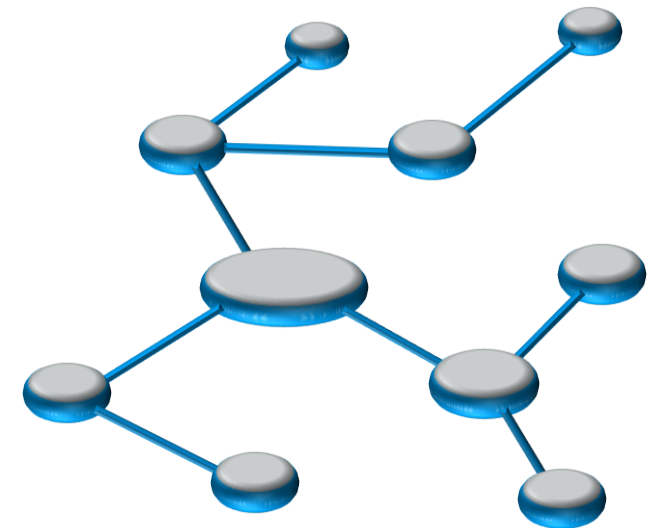
Increased Importance of Energy Efficient Production

New Possibilities for Energy Management utilizing Communication



Strompreise bei gewerblicher Nutzung, bezogen auf 2010

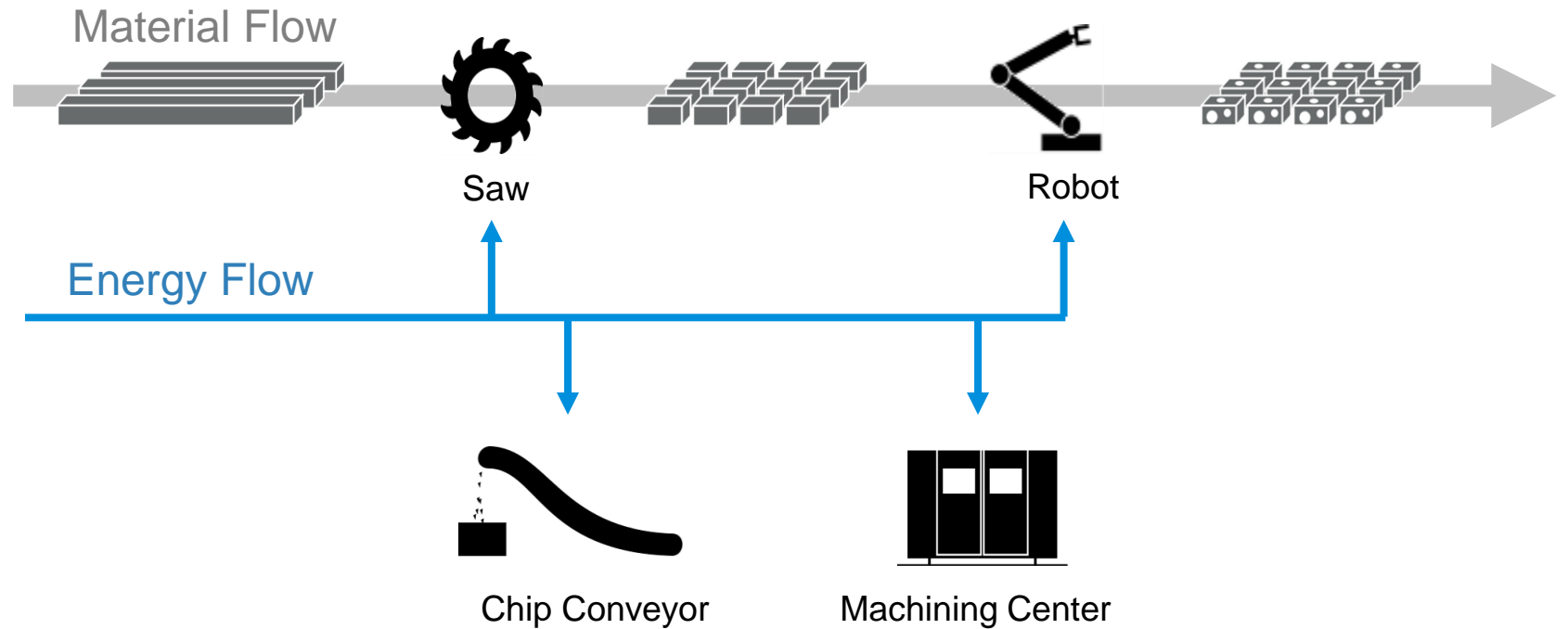
Quelle: Statistisches Bundesamt



Some examples of Festo Plant

Energy Efficiency

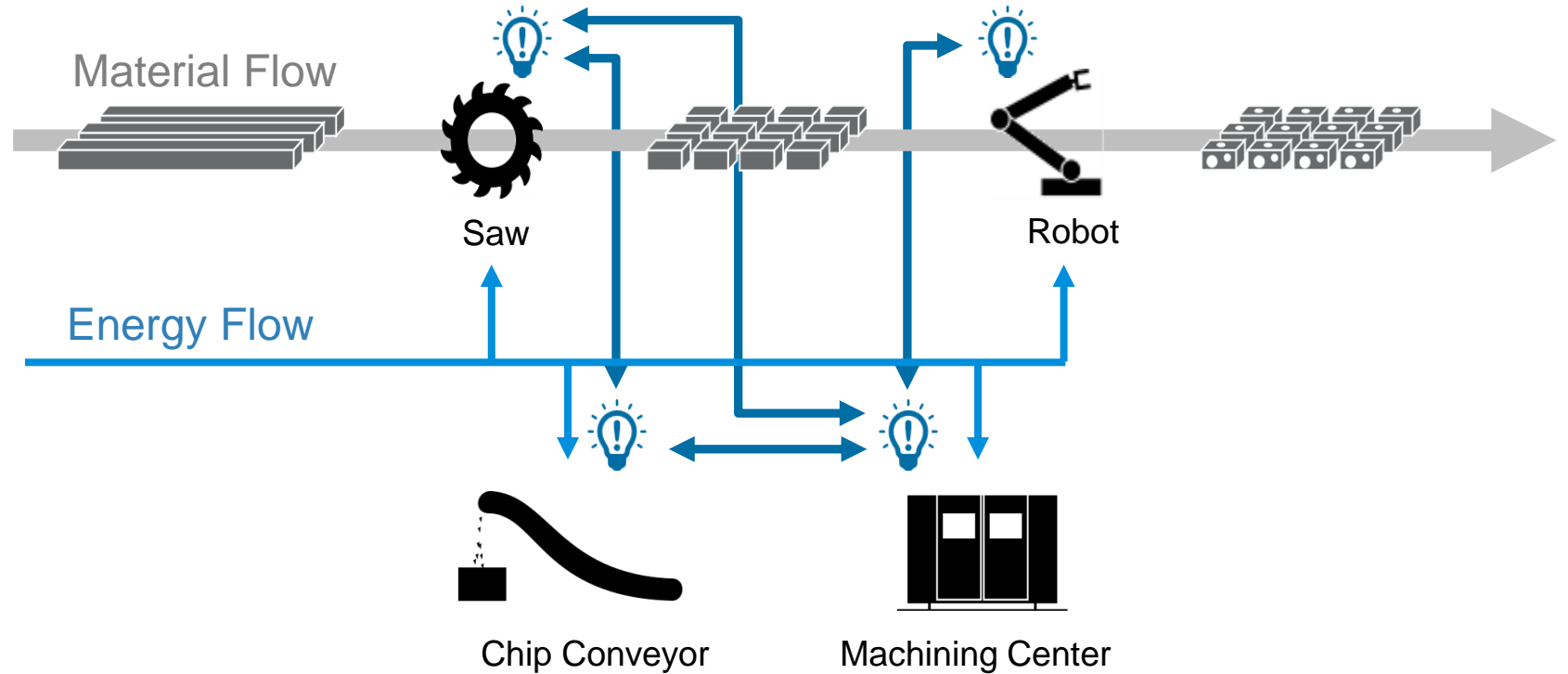
Energy Management



Some examples of Festo Plant

Energy Efficiency

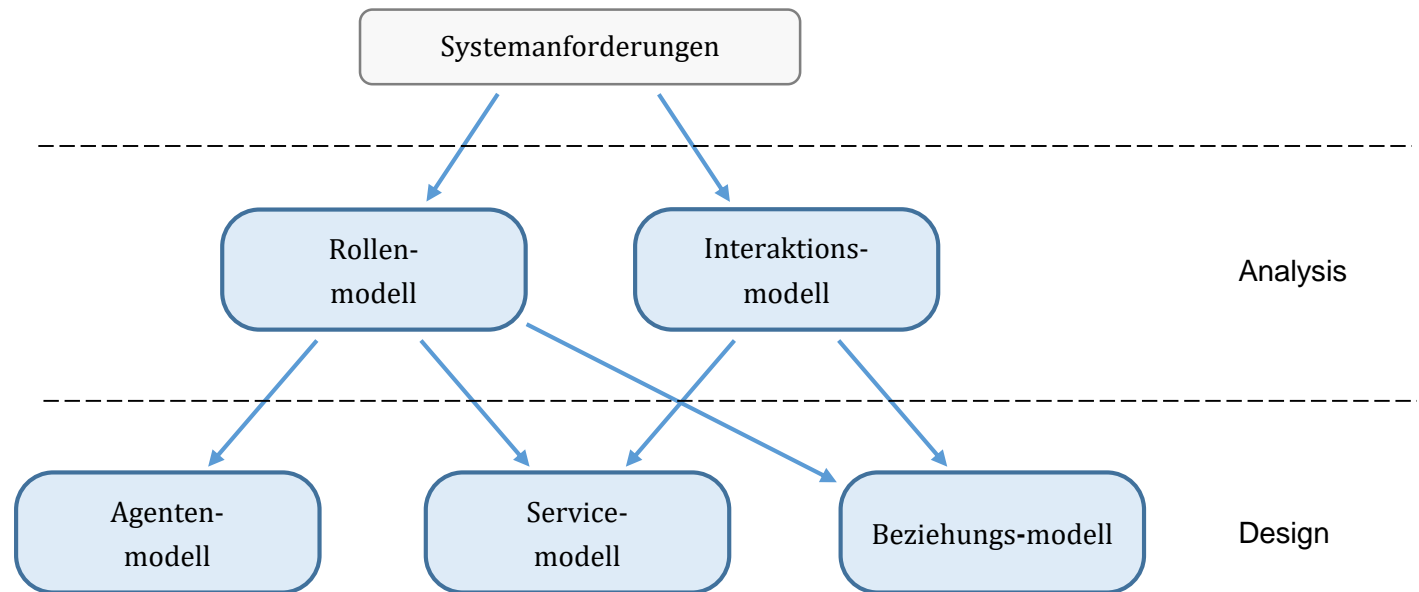
Distributed Energy Management System



Some examples of Festo Plant

Energy Efficiency

Energy Management utilizing GAJA Methods for Design of Agent-Systems



[Wooldridge, Jennings, Kinny 2000]

Some examples of Festo Plant

Energy Efficiency

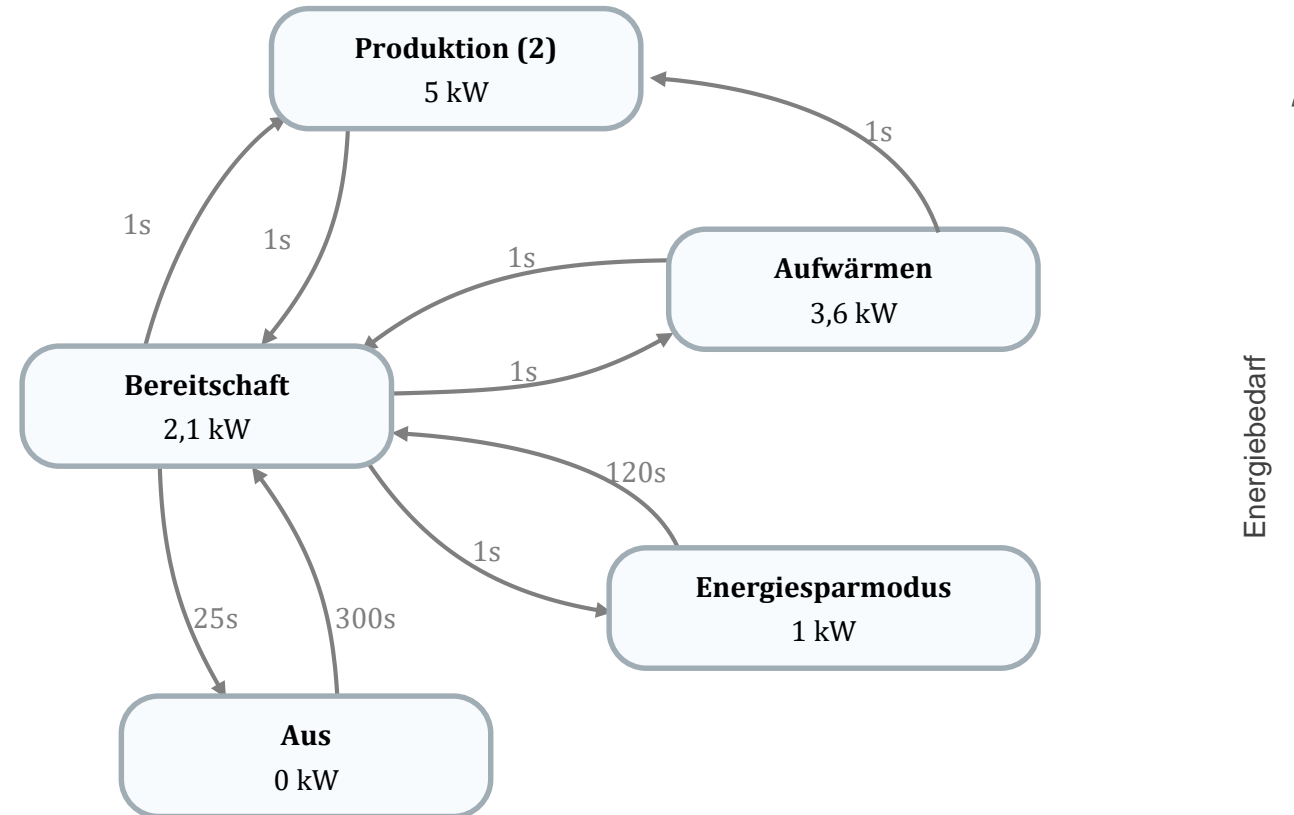
Interaction Model



Some examples of Festo Plant

Energy Efficiency

Energy Management on the Base of a State Model of the Machining Center



Some examples of Festo Plant

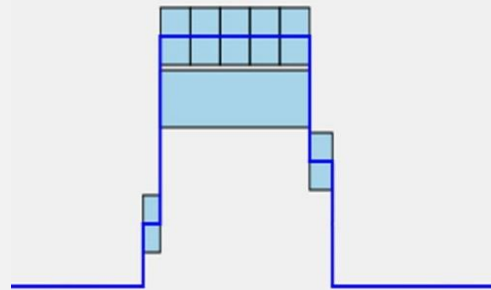
Energy Efficiency

optimized utilization of Auxiliaries by **Logon / Logoff**

Machining Center

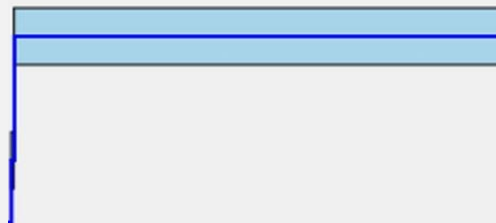
without Logon and Logoff

Production
Stand By
Shut Down
Start Up
OFF



Chip Conveyor

Conveying
Shut Down
Start Up
OFF



Some examples of Festo Plant

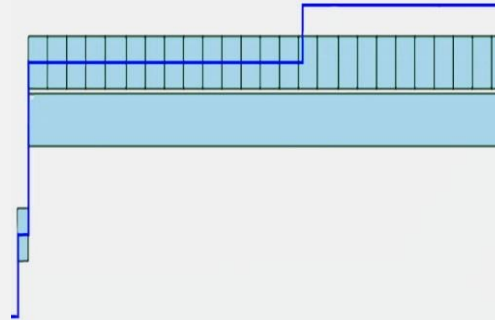
Energy Efficiency

optimized utilization of Auxiliaries By **Error-Handling**

without error-handling

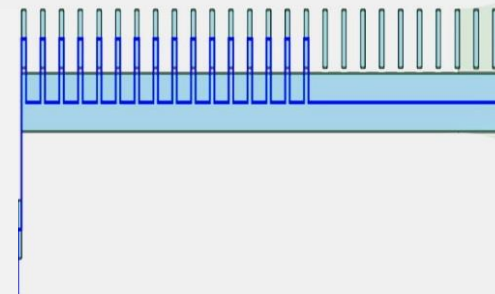
Machining Center

Error Production
Stand By
Shut Down
Start Up
OFF



Chip Conveyor

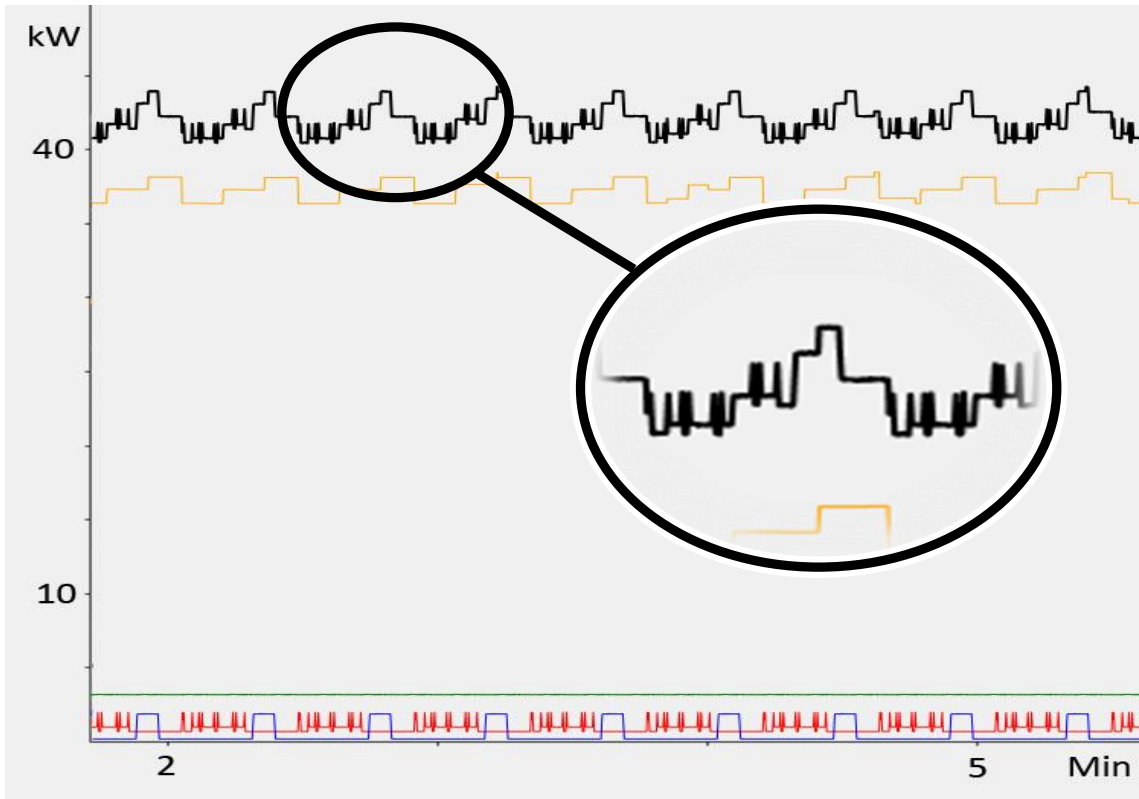
Conveying
Stand By
Shut Down
Start Up
OFF



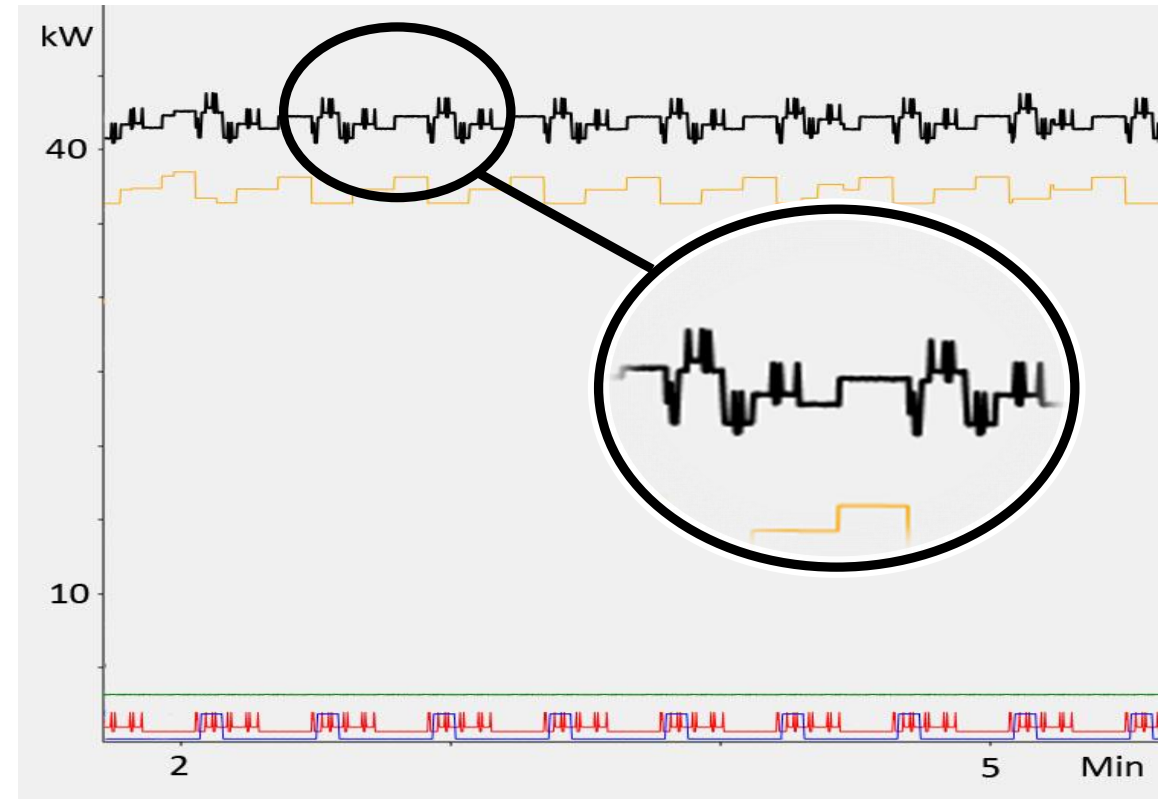
Some examples of Festo Plant

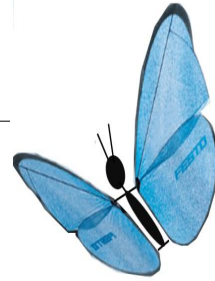
Leveling

without leveling



with leveling





Some examples of Festo Plant

Innovation

Innovation needs **Creativity!**

Rooms which offer creative atmosphere and tools to be creative.



Technology behind I 4.0

Technology behind I 4.0

Architecture

Transformation

Technology behind I 4.0

Software

Cloud Technologies

Security Technologies

Big Data and Analytics

Wireless Technologies

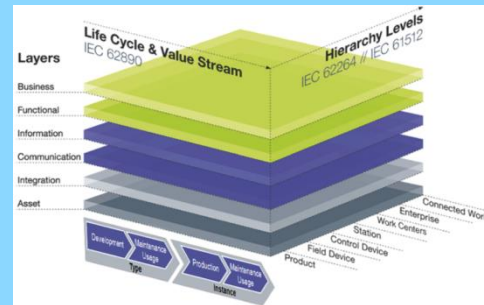
Semantic Technologies

Virtual Reality

Communication

Internet / Industrial Internet

STANDARDS



Seamless Engineering

Factory

Control / Embedded

RFID / NFC

Mobile Devices / APPs

Functional Integration

OPC-UA

Augmented Reality

Technology behind I 4.0

IoT
Semantics

talk to the devices



Technology behind I 4.0

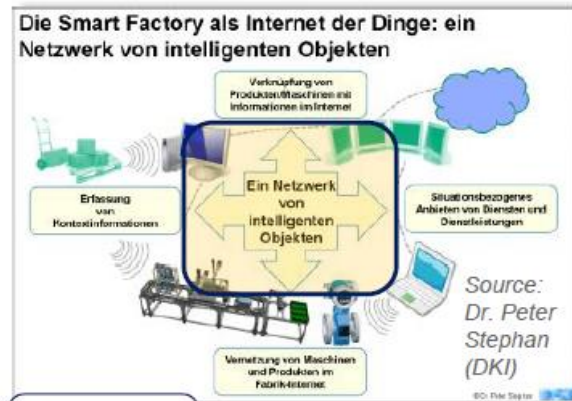
IoT
Semantics

and listen to them



Technology behind I 4.0

IoT Networks


























The Network and Computing is the Foundation
IoE = Industrie 4.0

Cisco Calls It The Internet of Everything (IoE)



Technology behind I 4.0

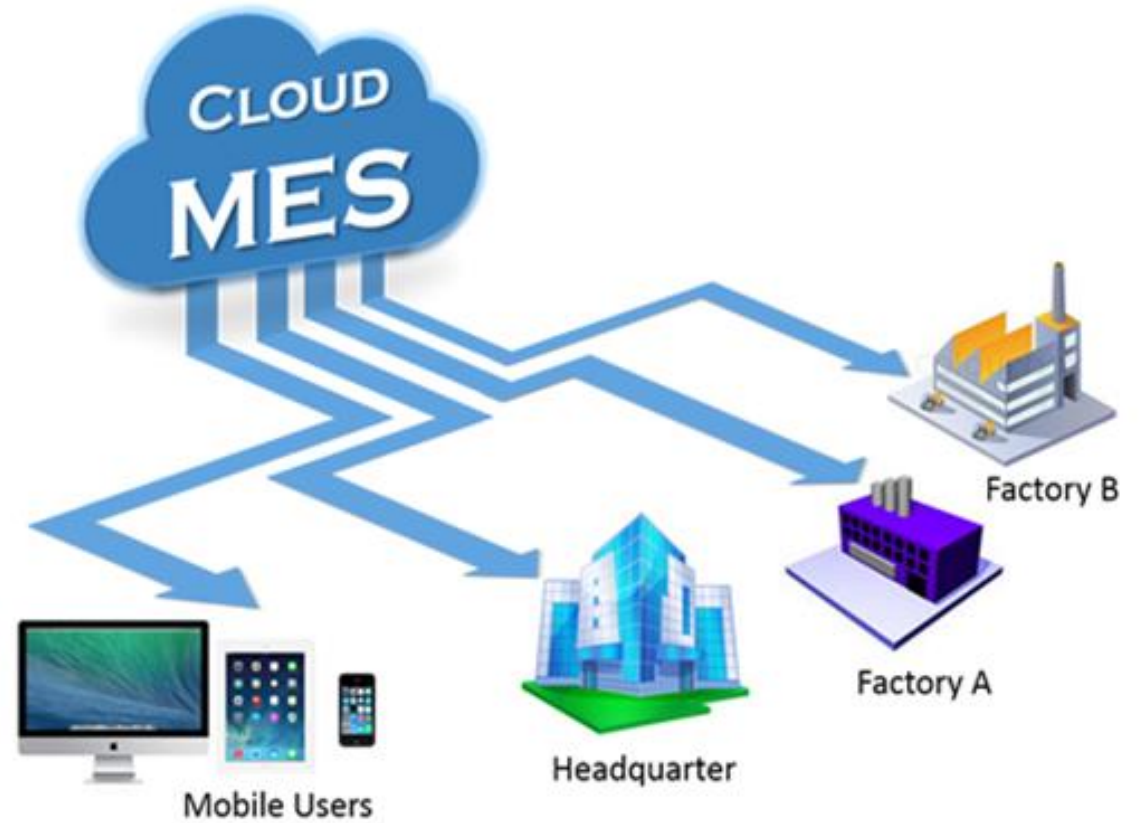
Big Data Analytics

Assets & Mfg.	Moving Assets & Enhanced Prediction		Business Networks	
SAP Connected Logistics 	SAP Connected Logistics FP1 	SAP Connected Logistics FP2 	SAP Connected Logistics FP3 	SAP Connected Logistics FP4 
SAP Predictive Maintenance & Service 	SAP Predictive Maintenance & Service FP1 	SAP Predictive Maintenance & Service FP2 	SAP Predictive Maintenance & Service FP3 	SAP Predictive Maintenance & Service FP4 
SAP AR Service Technician 	SAP AR Service Technician FP1 	SAP Vibration Analysis for Pred. Maint. & Service 	SAP Vibration Analysis for Pred. Maint. & Serv. FP1 	
SAP AR Warehouse Picker 	SAP AR Warehouse Picker FP1 	IoT Application Serv. FP2 	IoT Application Serv. FP3 	IoT Application Serv. FP4 
SAP Manufacturing Execution Suite (ME/MII) 15.0 	SAP Manufacturing Execution (ME/MII) 15.0 FP 1 	Car Telematics (Early Adop.) 		SAP Manufacturing Execution (ME/MII) 15.1 
Planned for Q4/2014	Planned innovations		Future direction	



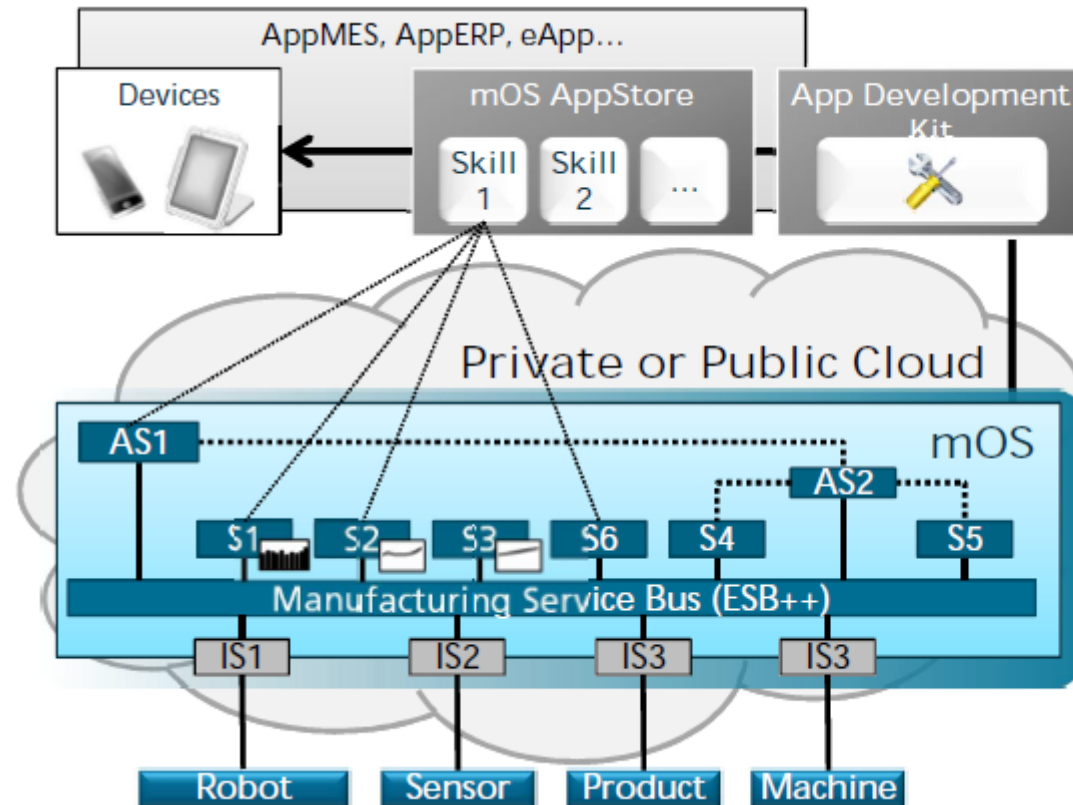
Technology behind I 4.0

Cloud
PaaS
SaaS



Technology behind I 4.0

Cloud
PaaS
SaaS

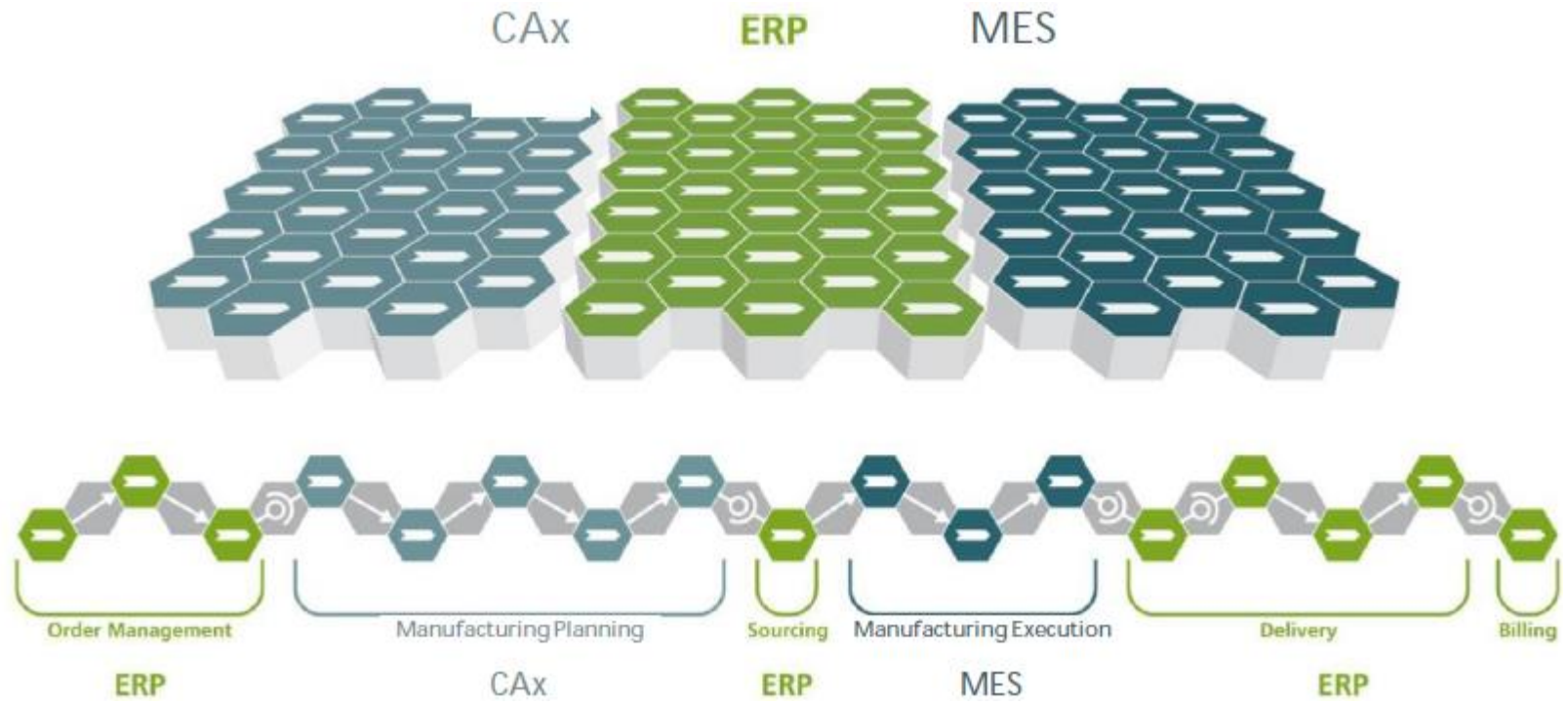


SOA, WS

- Legend:
- S Service
 - AS Aggregated Service
 - IS Integration Service
 - CS Cloud Service
 - CPS Cyber-Physical-System
 - mOS Manufacturing Operating System

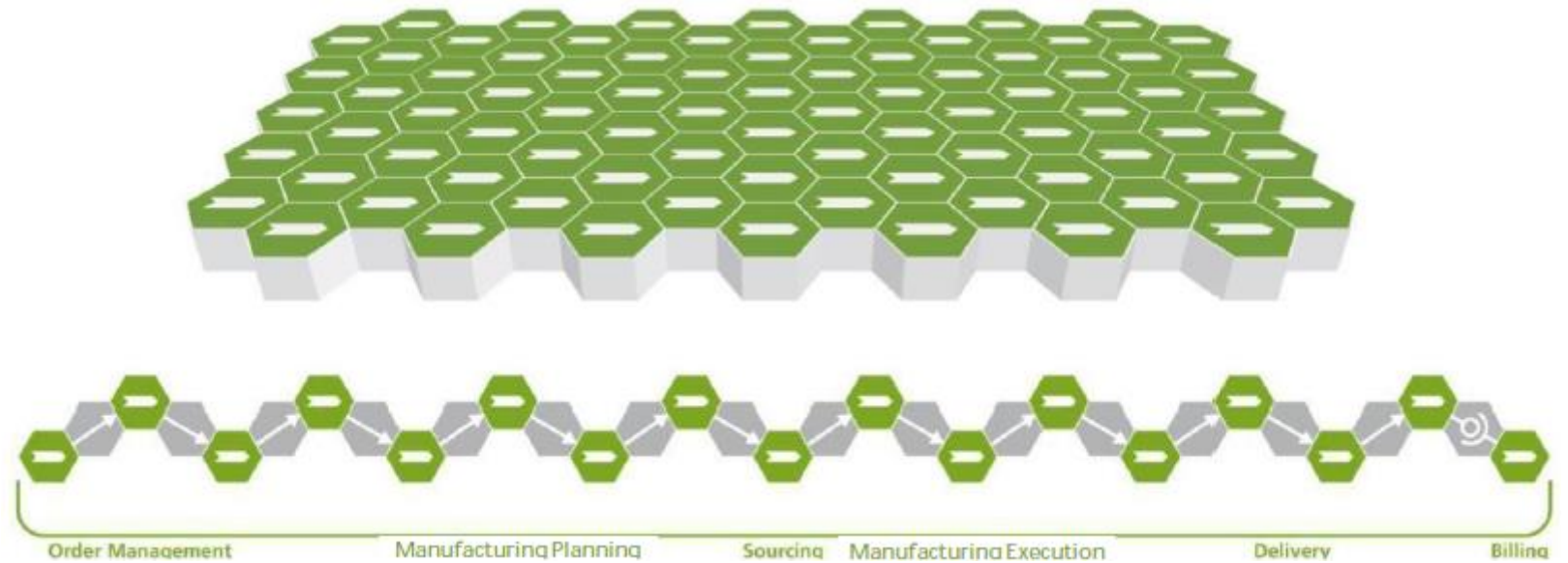
Technology behind I 4.0

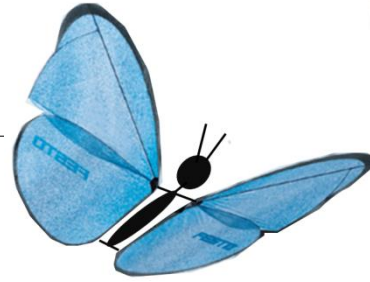
Cloud
PaaS
SaaS



Technology behind I 4.0

Cloud
PaaS
SaaS





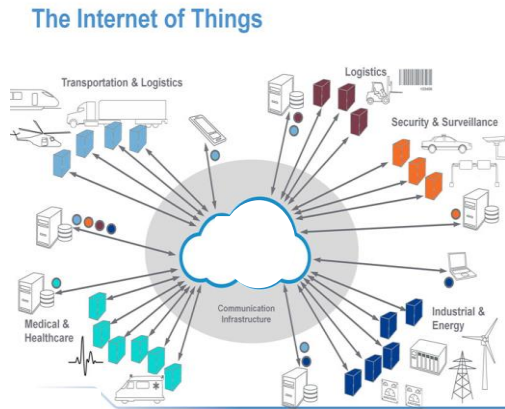
Technology behind I 4.0

- Mobile
- Service
- Diagnostics
- HMI
- Logistics



Technology behind I 4.0

Functional Integration
 Plug&Produce
 IoT



Internet of Things

↑ + IP - capabilities

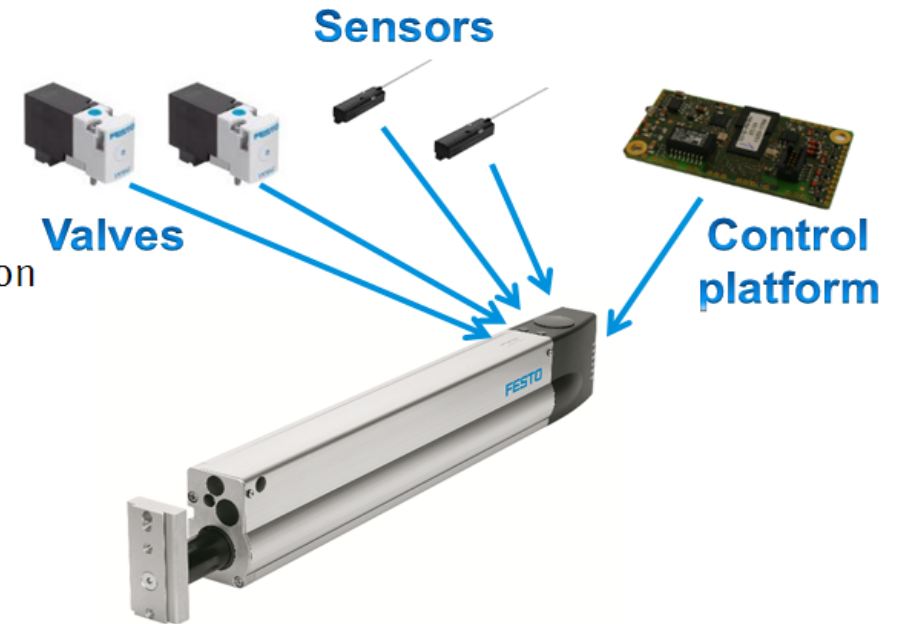
Cyber Physical Systems

↑ + internet communication
 + machine to machine Communication
 • wireless communication
 • semantic description

Embedded Systems

↑ + sensors, actuators
 + integrated intelligence

Physical Objects, Devices



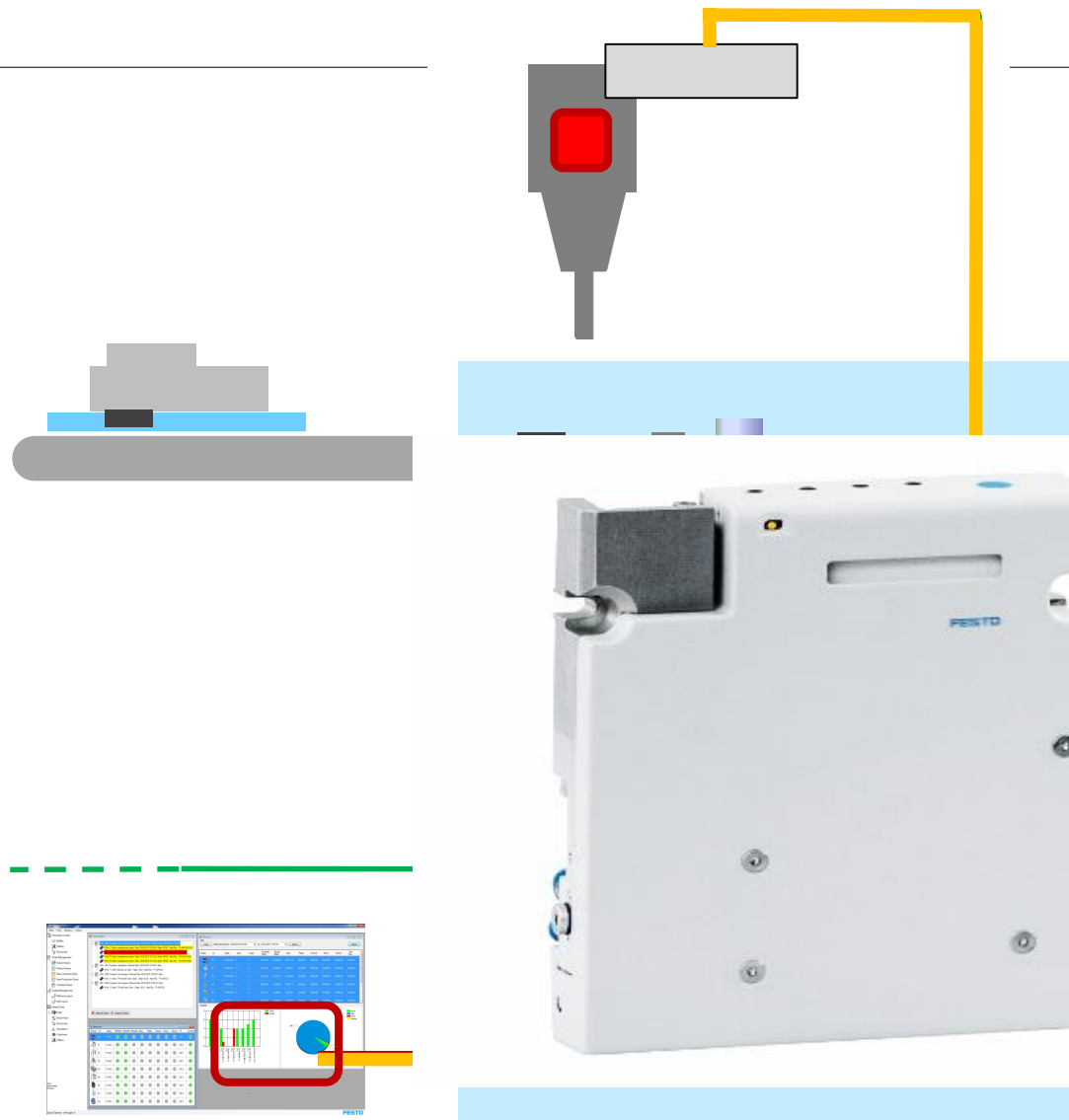
Technology behind I 4.0

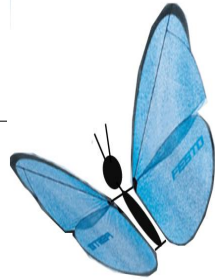
Functional Integration

Plug&Produce

IoT

- Pallet Conveyor
- Stopper
- Valves , Sensors
- Identification (RFID, QR, ..)
- Fieldbus Nodes
- PLC
- Process Module
- Production Data (MES, ...)





Technology behind I 4.0

Functional Integration

Plug&Produce
IoT

> Highly Integrated CPS Stop Gate

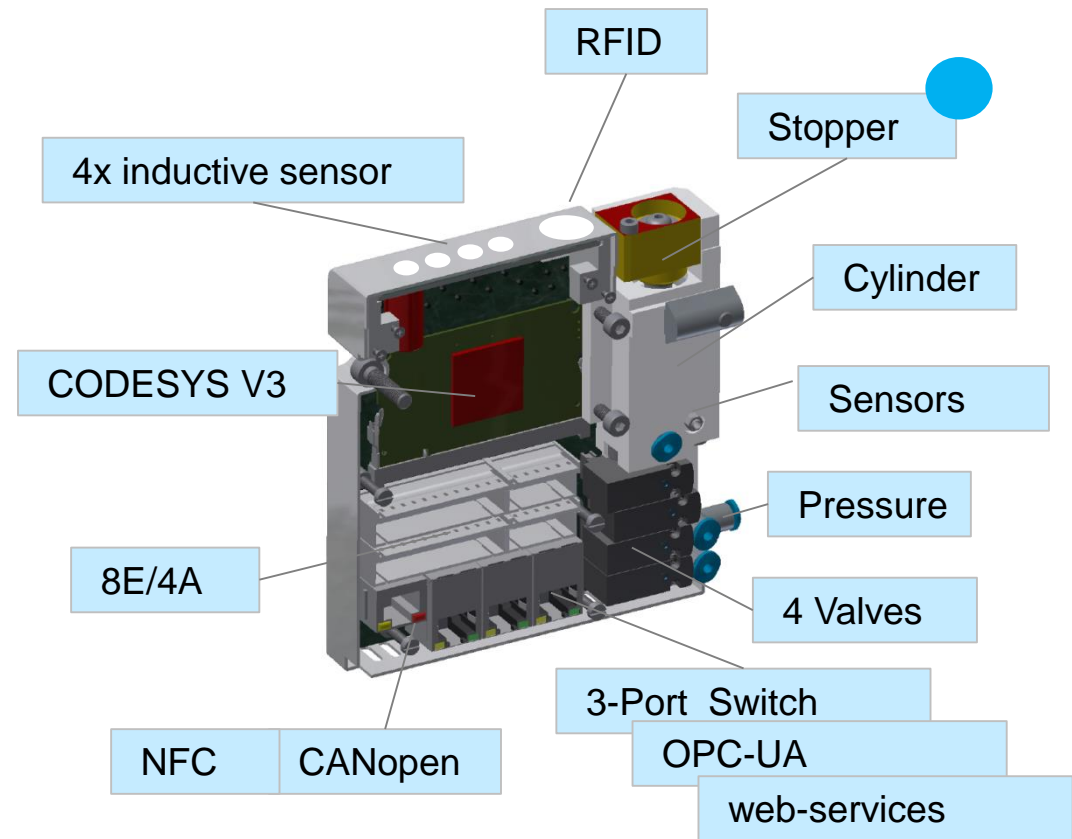
- Conveyor
- CPS-Stop Gate
- **Mech. Stopper**
- **Valves / Sensors**
- **Shunt Control**
- **Identification RFID**
- **Parametrizing NFC**
- **IEC 61131 Controller**
- Line Controller
- Data Server (MES, ...)



Technology behind I 4.0

Functional Integration

Plug&Produce
IoT

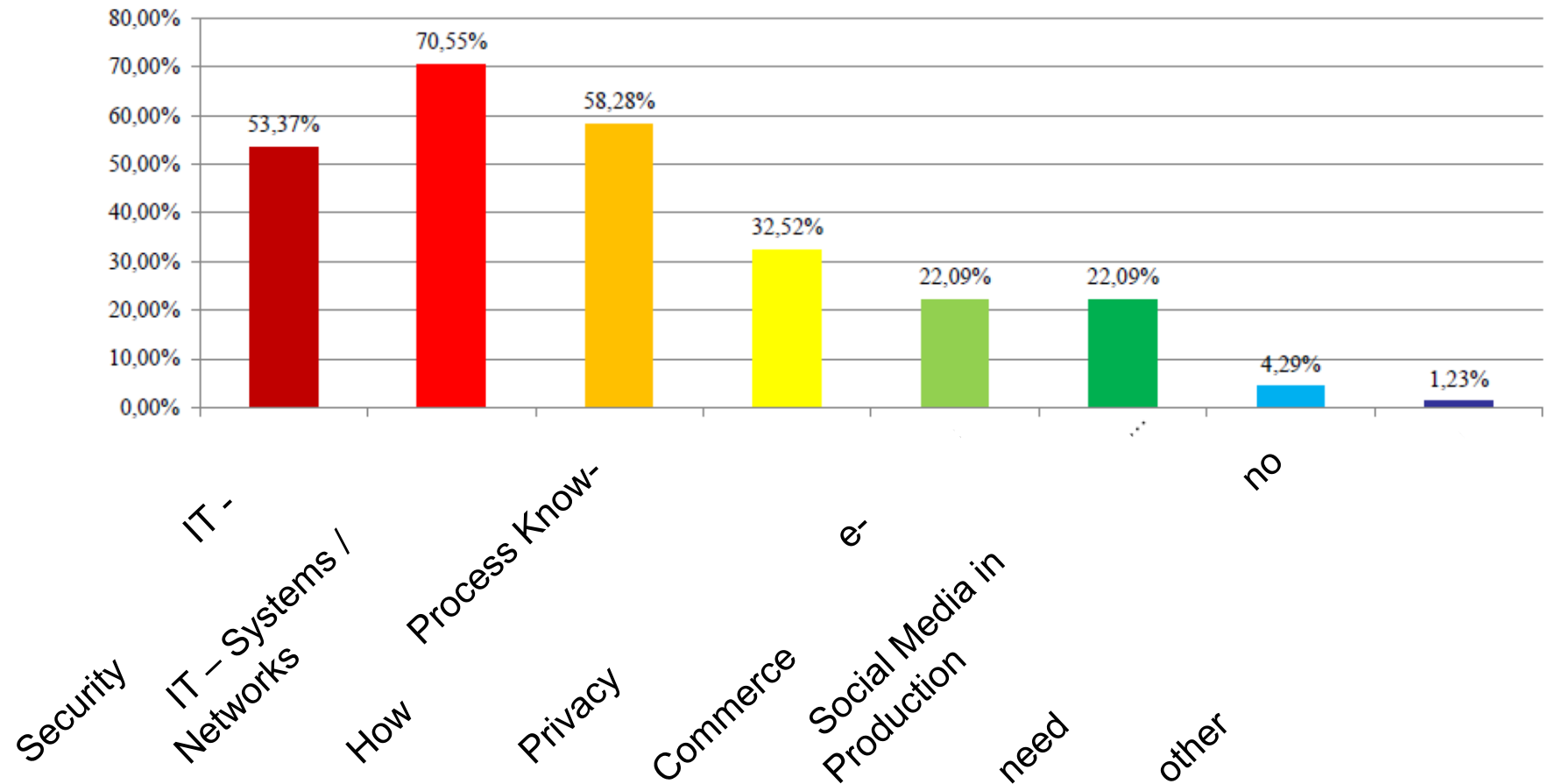


Qualification for I4.0

Qualification for I4.0

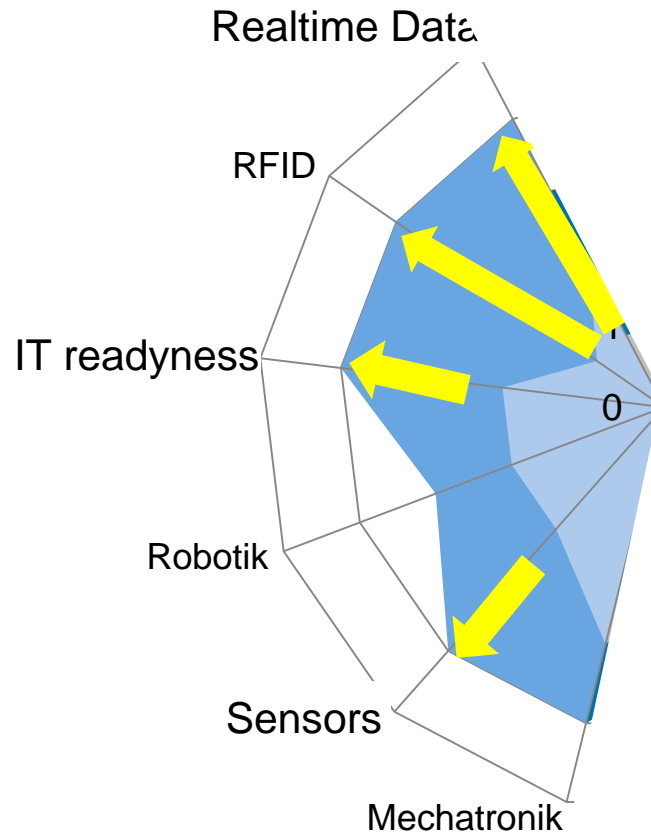
Qualification Demand for I4.0

In which areas do you see need for qualification for your employees ?



Qualification for I4.0

Qualification Profile
Maintenance Staff
FESTO





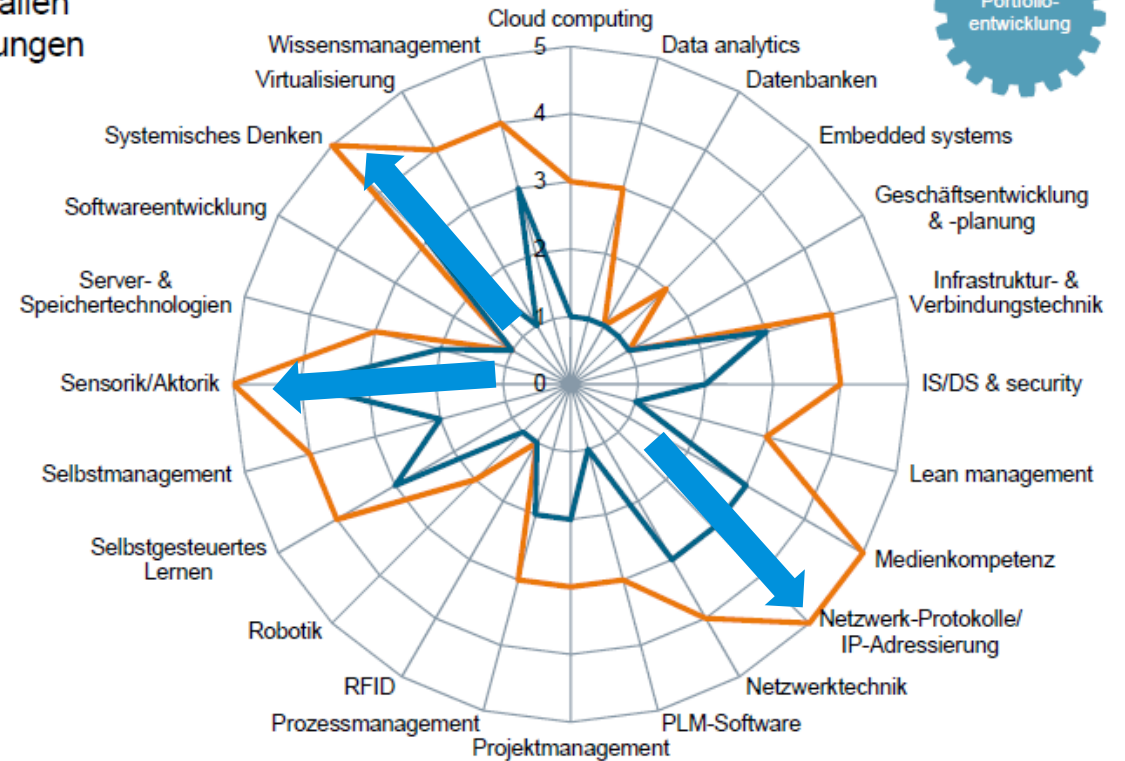
Qualification for I4.0

Qualification Profile
 Maintenance Staff
 SIEMENS

Basierend auf 25 Anwendungsfällen können sich je Rolle Verschiebungen von Industrie 4.0 relevanten Kompetenzfeldern ergeben

Diese Vorgehensweise stellt folgendes sicher:

- ✓ Keine Annahmen
- ✓ Hoher Realitätsbezug
- ✓ Hoher Praxisbezug
- ✓ Repräsentative Erhebung



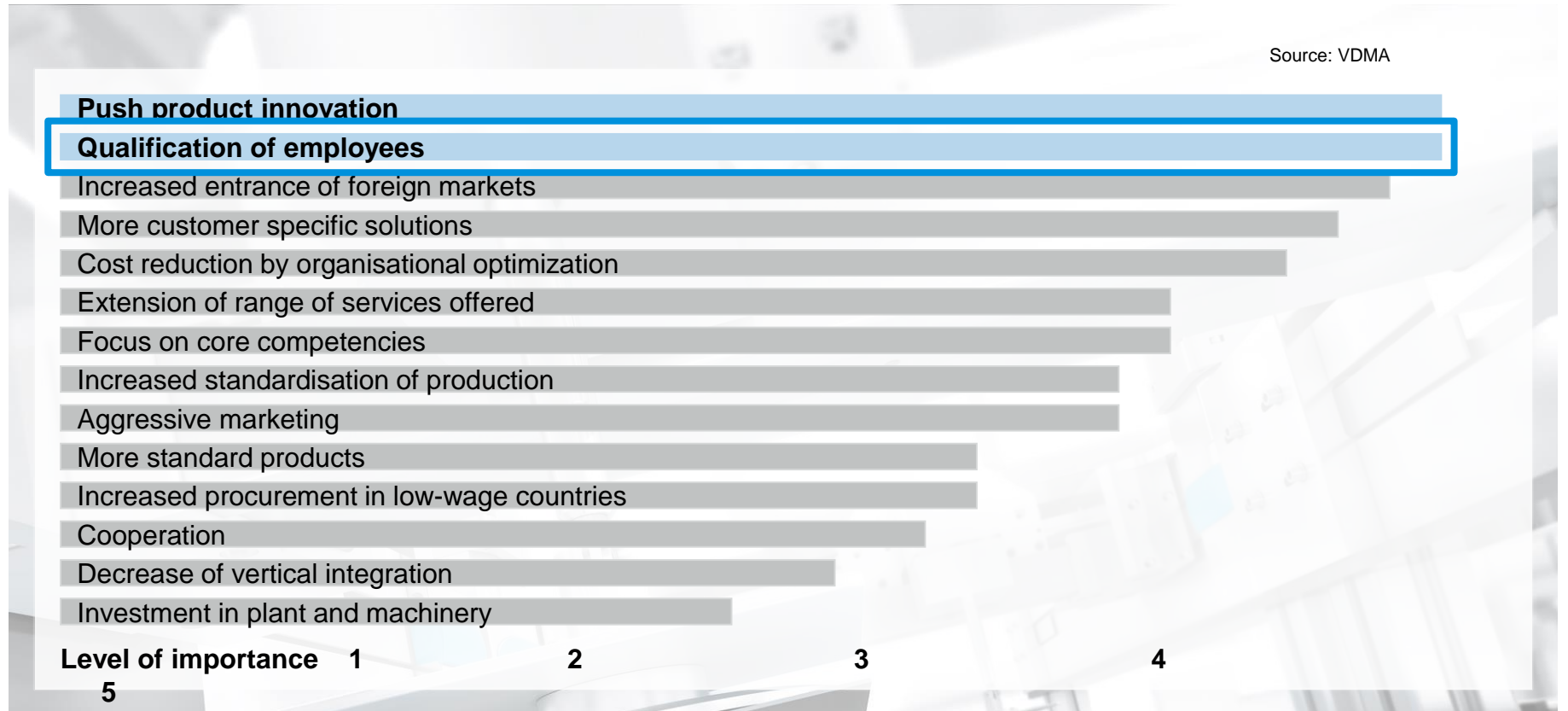
Beispiel: **Service-Techniker**

— Heute/IST — Morgen/SOLL

Qualification for I4.0

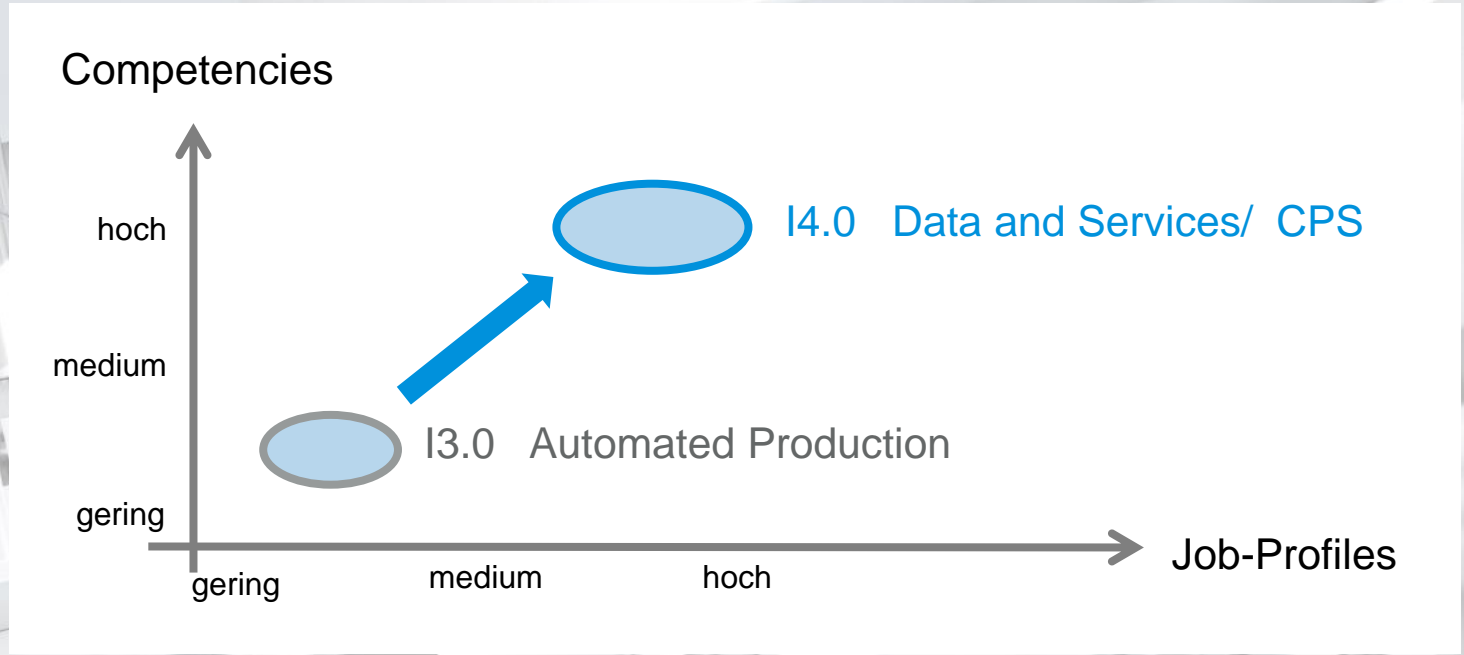
German manufacturers invest in the “Circle of Innovation and Qualification”

Source: VDMA



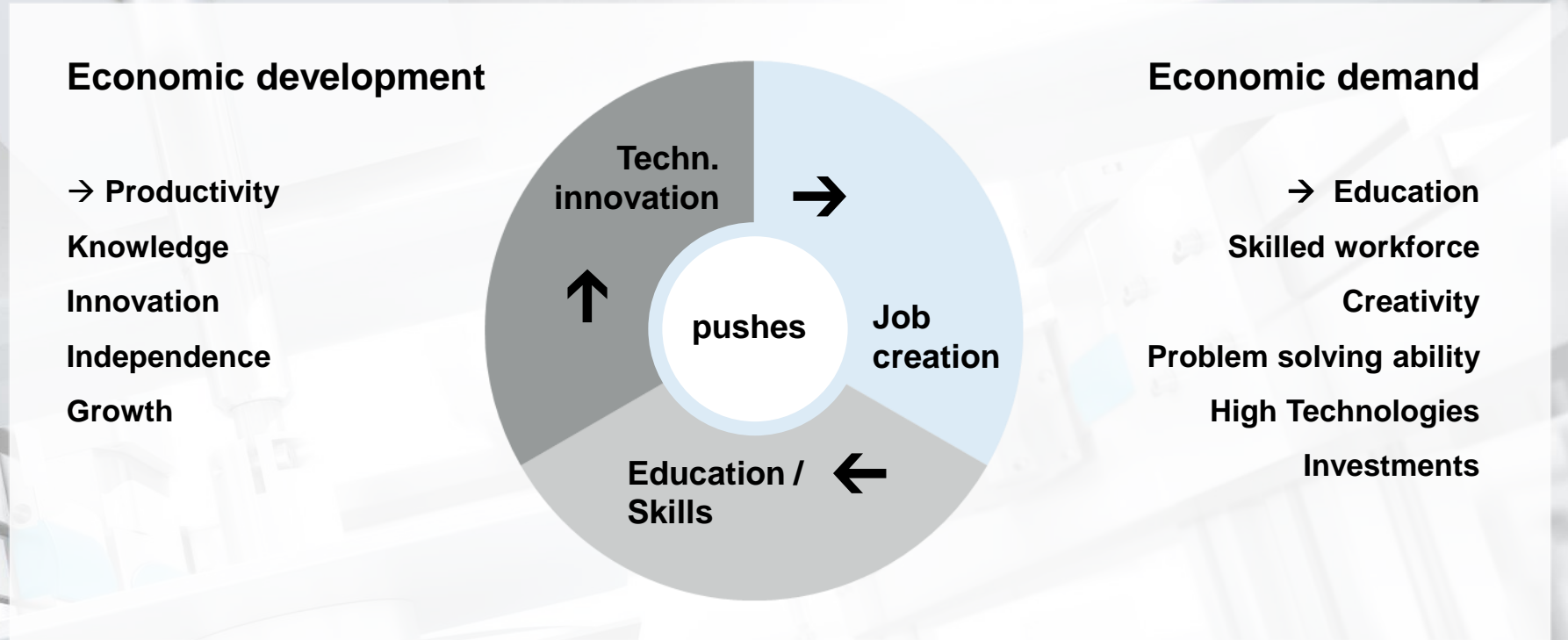
Qualification for I4.0

Changed Job Profiles for Employes in I4.0 Environment



Qualification for I4.0

Productivity and qualification



Qualification for I4.0

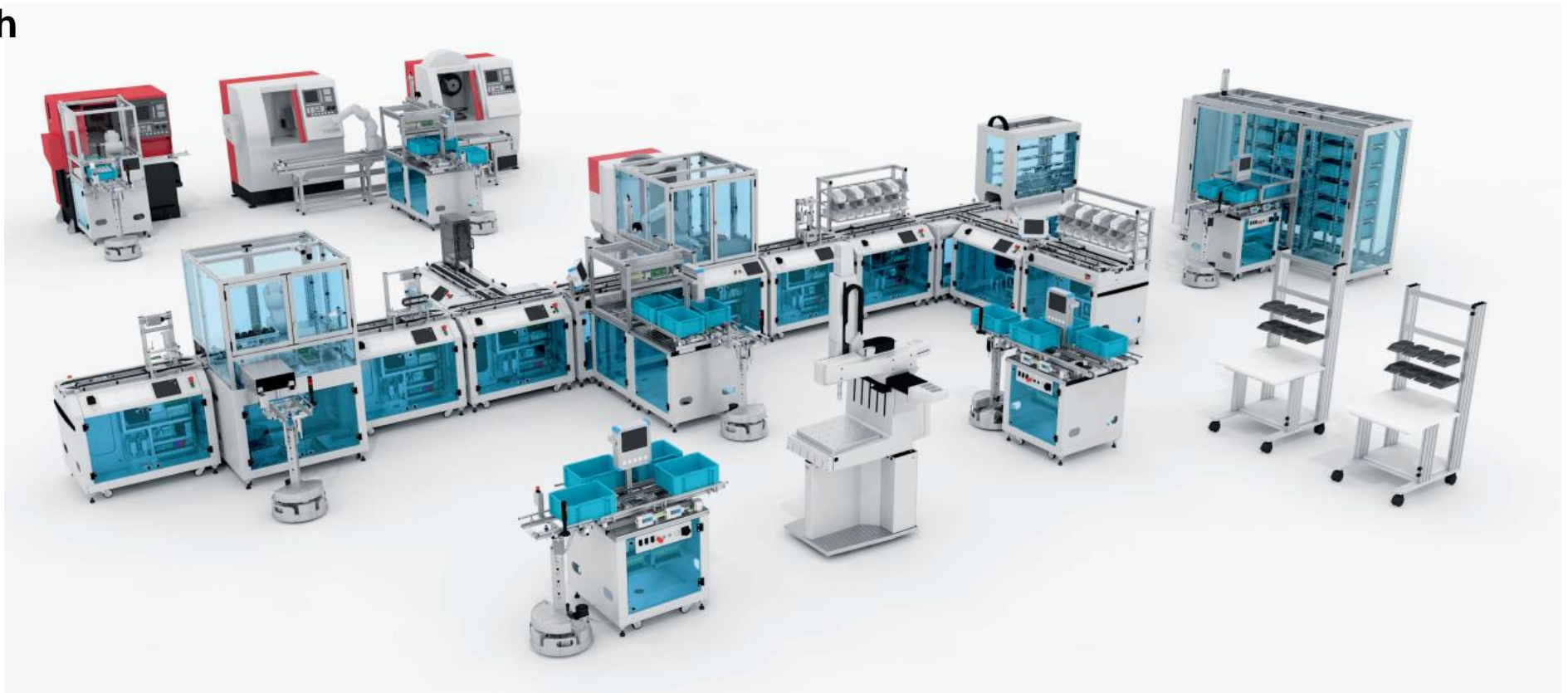
3 Pillars



Qualification for I4.0

Training and Research Platform

CP Factory



Qualification for I4.0

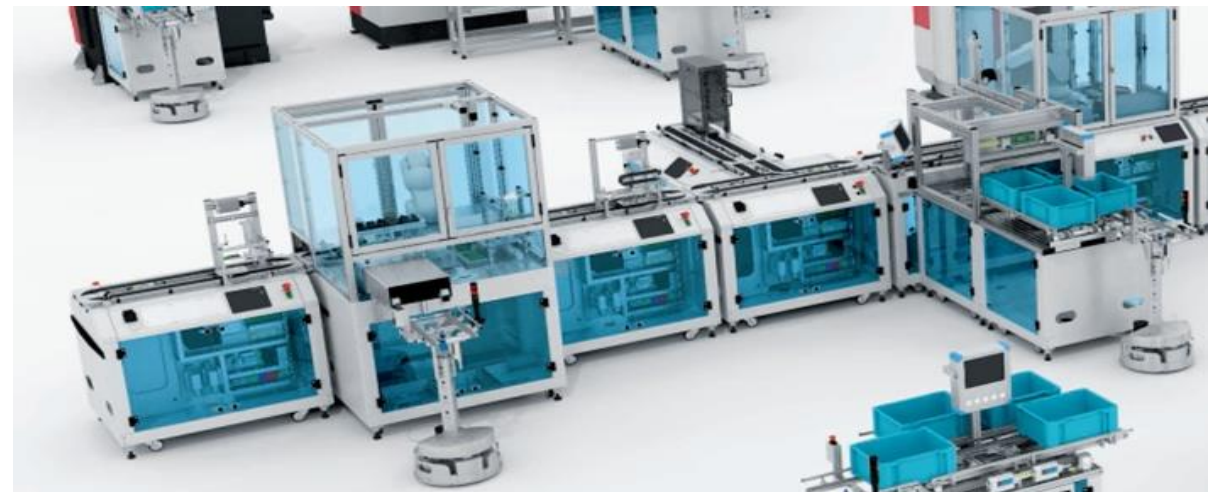
Training and Research
Platform

CP Factory

Real plant



Training Factory



Qualification for I4.0

Training and Research Platform

CP Factory

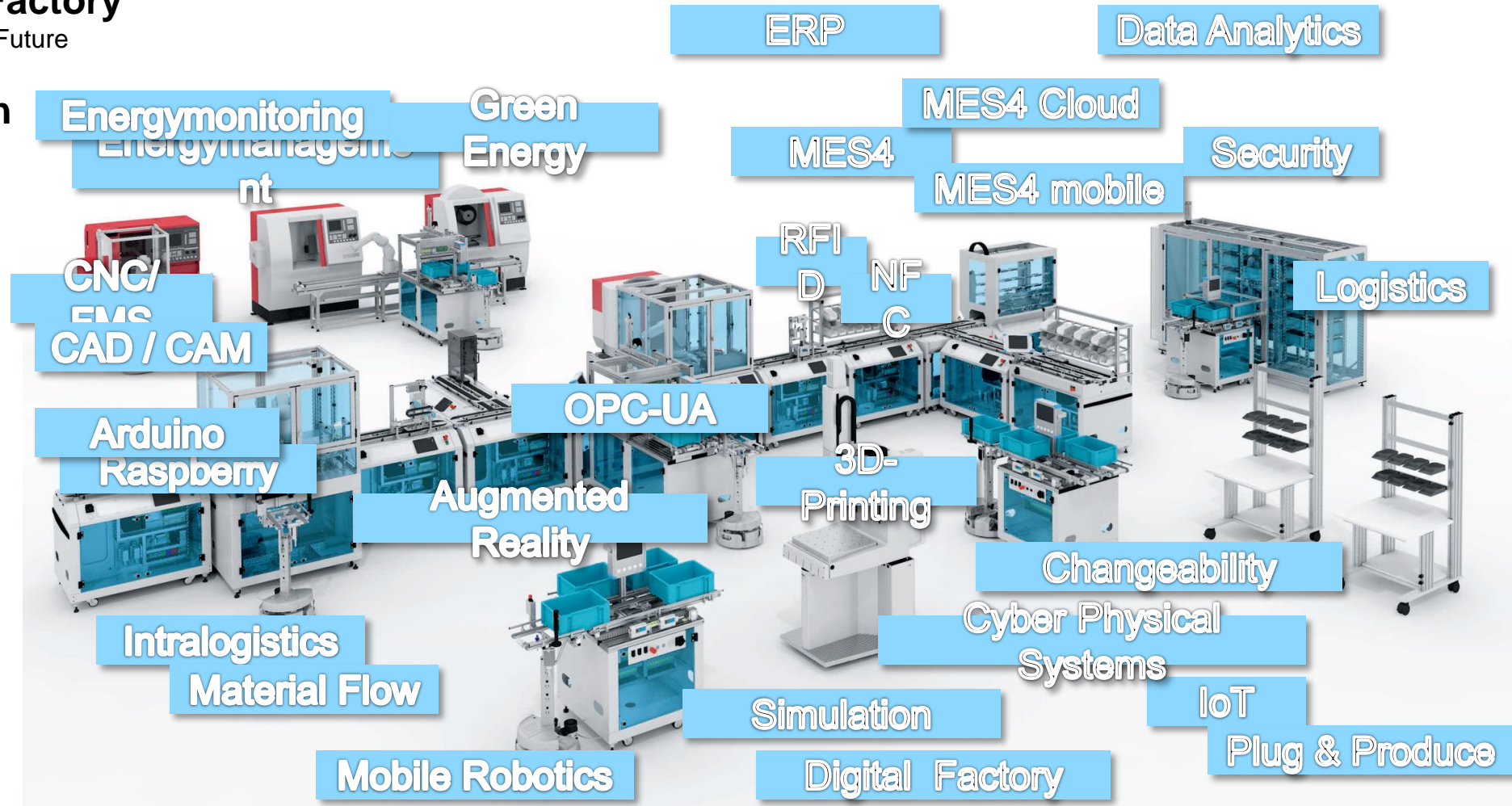
- Modularity
- Flexibility
- Changeability
- Plug & Produce



Industrie 4.0 @ CP Factory

Qualification for the Factory of the Future

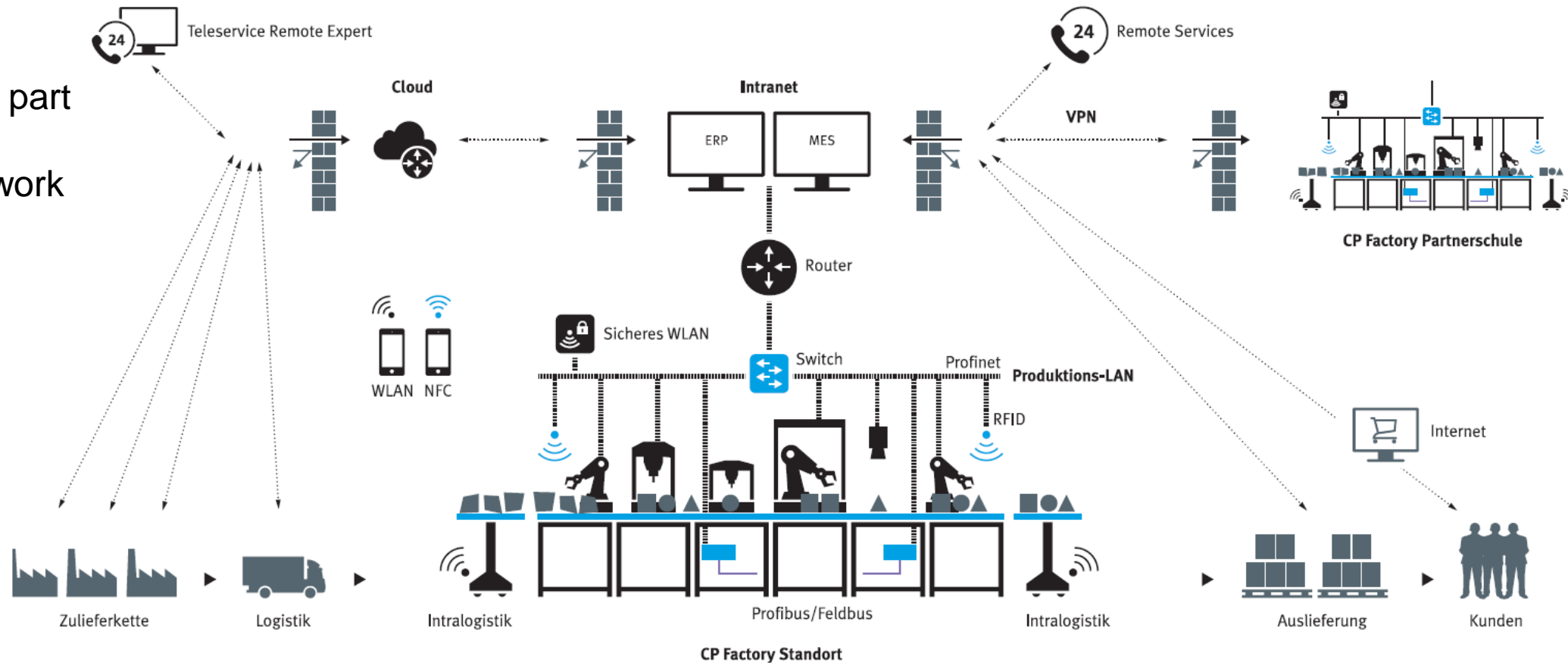
Training and Research Platform

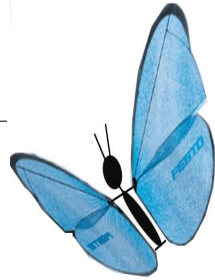


Qualification for I4.0

CP Factory

The factory as a part of a worldwide Production Network

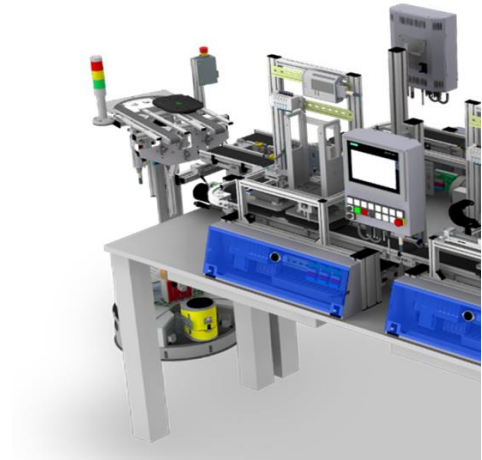




Qualification for I4.0

Changeability

Mobile robotics as an enabler for Changeability and Flexibility.



Qualification for I4.0

Production Data

MES as a Data Server for Production Data

The screenshot displays the MES 4 software interface, which is divided into several functional areas:

- Left Navigation Panel:** Contains various management tools such as Production Control, Buffers, Utilities, Resources, Order Management, and Quality Management.
- Actual Orders Panel:** Shows a list of production orders with details like customer, planned start, and state. Some orders are highlighted in yellow and red.
- Resources Panel:** A grid showing the status of various resources (e.g., TF-AS, TF-AM) with columns for MES, Autom, Manual, Buy, Reset, Error, and IP.
- Efficiency Panel:** Features a table of production data and two charts: a bar chart for Quantity and a pie chart for Duration.

Efficiency Table Data:

Picture	ID	Name	yield	scrap	Automatic Mode	Manual Mode	Buy	Reset	ErrorL0	ErrorL1	ErrorL2	Total Time
	50	TF-ASRS32	6	0	00:35:23	00:00:00	00:01:39	00:00:35	00:00:00	00:00:00	00:00:00	01:00:00
	51	TF-AM-ORI	5	0	00:47:32	00:00:27	00:00:45	00:00:00	00:00:06	00:00:00	00:00:00	01:00:00
	52	TF-AM-PRE	4	0	00:47:50	00:01:52	00:00:28	00:00:00	00:00:00	00:00:00	00:00:00	01:00:00
	53	TF-AM-MA	4	0	00:22:07	00:00:00	00:00:12	00:00:00	00:00:00	00:00:00	00:00:00	01:00:00
	54	TF-AM-HEA	0	4	00:21:31	00:00:00	00:00:20	00:00:00	00:00:00	00:00:00	00:00:00	01:00:00
	55	TF-AM-TU	0	0	00:47:52	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	01:00:00

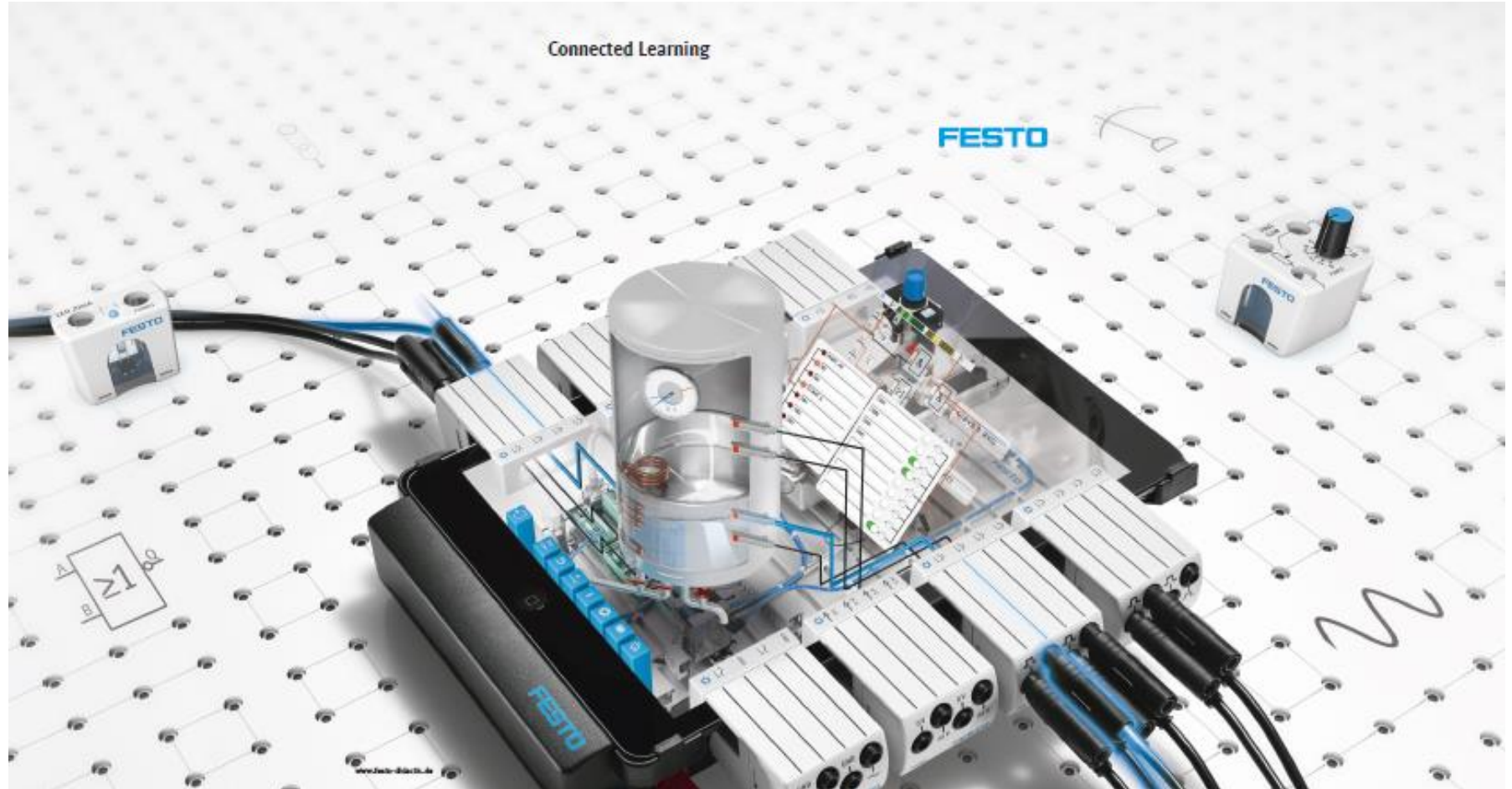
Quantity Chart: A bar chart showing yield and scrap for various resources. Yield is represented by green bars and scrap by red bars.

Duration Pie Chart: A pie chart showing the distribution of time spent on different activities: work (green), idle (blue), error (red), and startup (yellow).

Qualification for I4.0

QI4.0

New Training Methods



The Spirit of Industrie 4.0



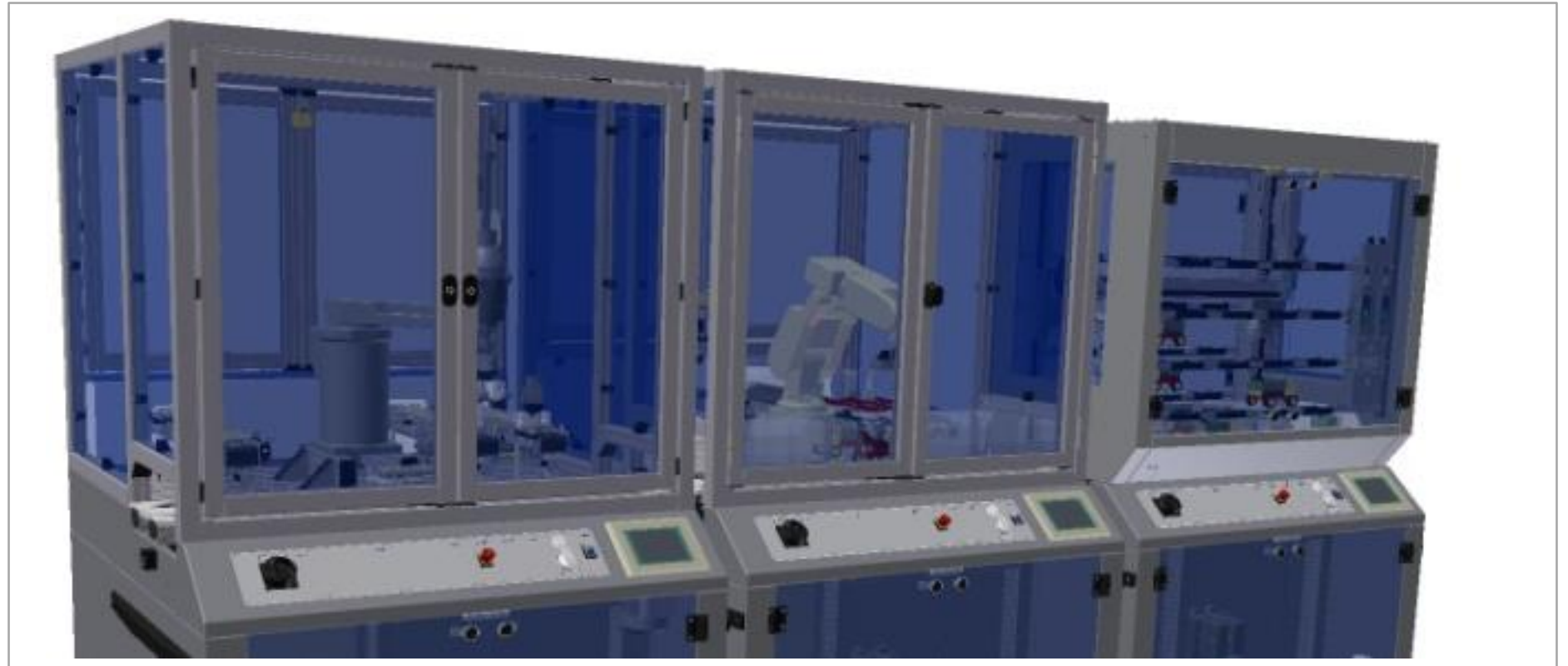
Thank You



Festo Didactic - Research Platform for flexible Robot Assembly Systems

Reference DHBW Mannheim

- MPS
TransferFactory
Robotic Lab
- Including Robot
assembly cell with
RV-3SDB robot,
SCARA robot cell,
Cartesian robot
AS/RS
- Training topics:
Lean management
and lean produc-
tion, value stream
analysis, TPM, ...



Festo Didactic - Research Platform for flexible Robot Assembly Systems

Reference DHBW Mannheim

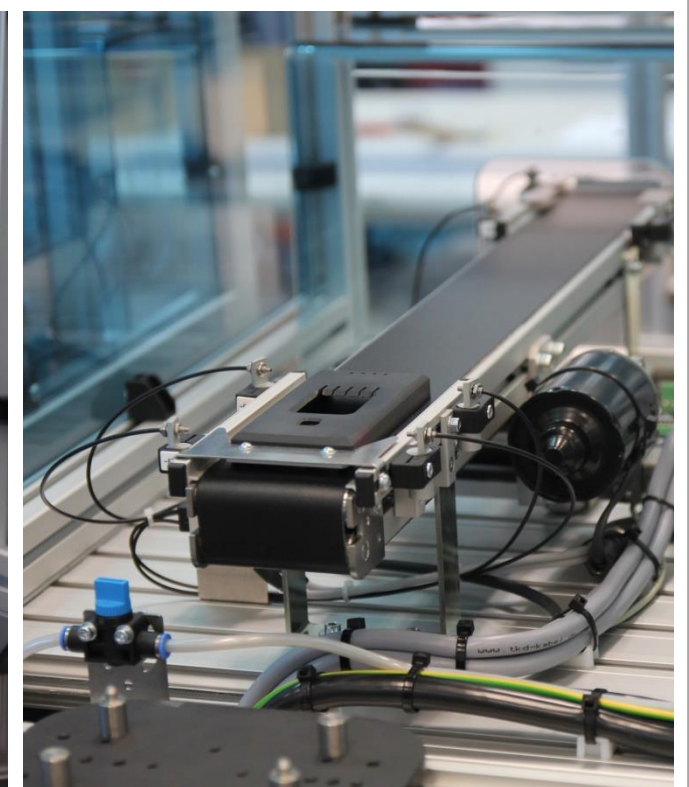
- MPS
TransferFactory
Robotic Lab
- Including Robot
assembly cell with
RV-3SDB robot,
SCARA robot cell,
Cartesian robot
AS/RS
- Training topics:
Lean management
and lean produc-
tion, value stream
analysis, TPM, ...



Festo Didactic - Research Platform for flexible Robot Assembly Systems

Reference DHBW Mannheim

- MPS
TransferFactory
Robotic Lab
- Including:
1x Robot assembly
cell with RV-3SDB
robot,
1x SCARA robot
cell,
1x AS/RS
(Cartesian robot)
- Training topics:
Robotics,
workpiece tracking
Handling



Festo Didactic - Training and Research Platform for Hybrid Automation

Reference Guilford Technical Community College USA, AFB Factory

→ Hybrid training
factory AFB

→ including:
Process automation
and factory
automation
Handling technology,
Robotics,
RFID technology,
camera inspection
and Datamatrix
coding



Festo Didactic - Training and Research Platform for Hybrid Automation

Reference Guilford Technical Community College USA, AFB Factory

- Hybrid training factory AFB
- including:
Process automation and factory automation
Handling technology, Robotics,
RFID technology, camera inspection and Datamatrix coding



Festo Didactic - Training and Research Platform for Hybrid Automation

Reference Guilford Technical Community College USA, AFB Factory

- Hybrid training factory AFB
- including:
 Process automation and factory automation
 Handling technology, Robotics,
 RFID technology, camera inspection and Datamatrix coding



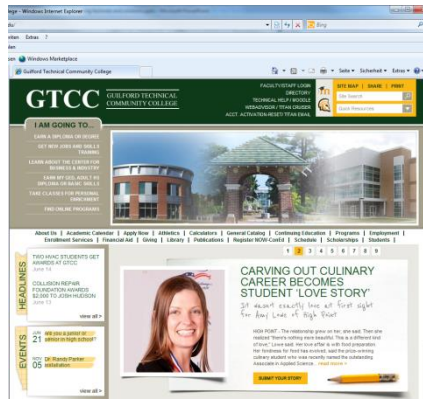
Festo Didactic - Training and Research Platform for Hybrid Automation

Reference Guilford Technical Community College USA, AFB Factory

→ Hybrid training factory AFB

→ including:
 Process automation and factory automation
 Handling technology, Robotics,
 RFID technology, camera inspection and Datamatrix coding

More infos:



<http://www.gtcc.edu/>



Festo Didactic - Training and Research Platform for Flexible Manufacturing

Reference Anhui University of Science and Technology, China

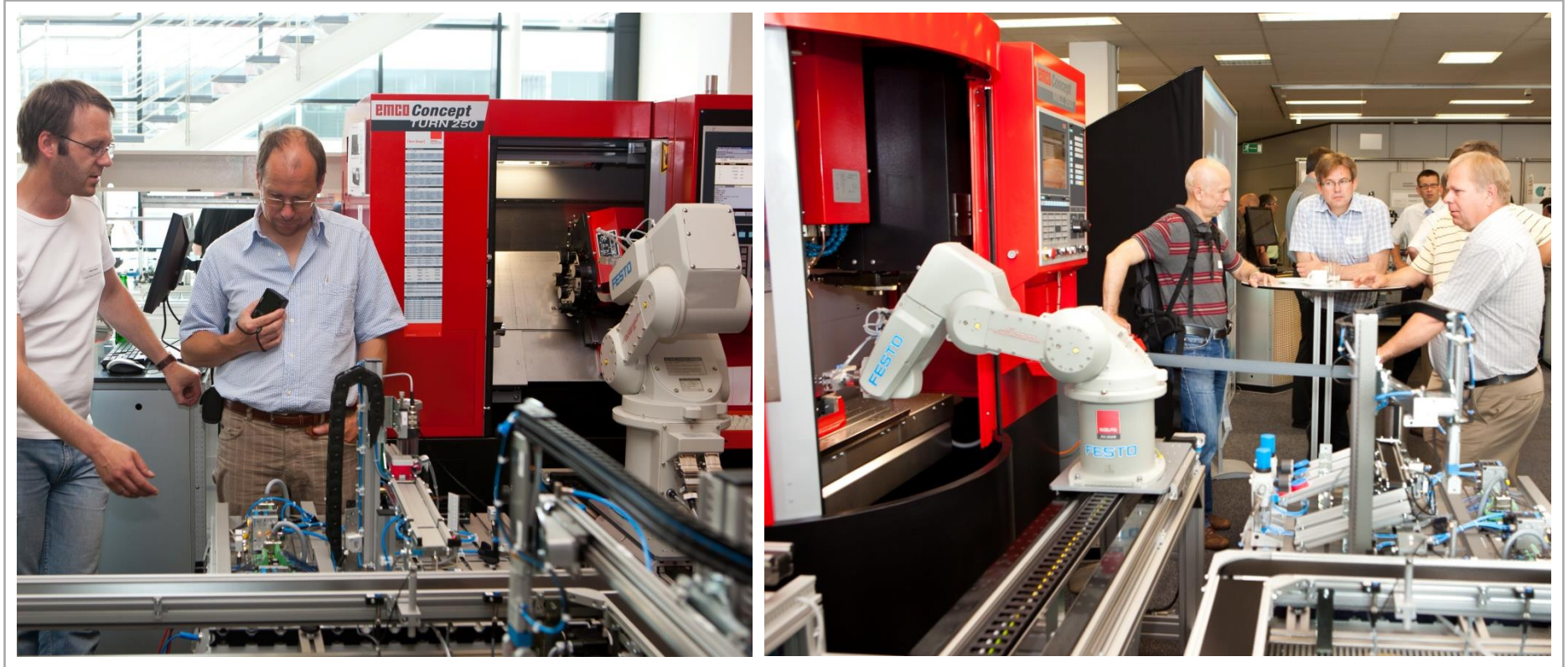
- MultiFMS
- including:
EMCO Mill250,
EMCO Turn 250
Complete MPS500
system
- Training content:
CNC Technology,
Robotics,
Mechatronics,
PLC Technology



Festo Didactic - Training and Research Platform for Flexible Manufacturing

Reference Anhui University of Science and Technology, China

- MultiFMS
- including:
EMCO Mill250,
EMCO Turn 250
Complete MPS500
system
- Training content:
CNC Technology,
Robotics,
Mechatronics,
PLC Technology



Festo Didactic - Training and Research Platform for Mobile Robotics and Logistics

Reference Universidad Autonoma de Campeche, Mexico

→ Prolog Factory

→ including:
 Production line
 MPS
 Picking station with
 robot RV-2SDB
 Logistic field with

→ Training content:
 Logistics,
 Robotics,
 Mobile robotics,
 Mechatronics,
 RFID technology,
 Communication



ProLog factory



More information

→ Video ProLog factory



- Kanban
- Just in sequence
- Order scheduling ...

The exciting new training platform for logistics, communication technology, mechatronics and industrial engineering.

<http://www.festo-didactic.com/de-de/service/videos/7354.htm?fbid=ZGUuZGUuNTQ0LjEzLjMyLjg5Ny43MzU0>

Festo Didactic - Training and Research Platform for Mobile Robotics and Logistics

Reference Universidad Autonoma de Campeche, Mexico

→ Prolog Factory

→ including:
Production line
MPS
Picking station with
robot RV-2SDB
Logistic field with

→ Training content:
Logistics,
Robotics,
Mobile robotics,
Mechatronics,
RFID technology,
Communication



Festo Didactic - Training and Research Platform for Mobile Robotics and Logistics

Reference Universidad Autonoma de Campeche, Mexico

→ Prolog Factory

→ including:
 Production line
 MPS
 Picking station with
 robot RV-2SDB
 Logistic field with

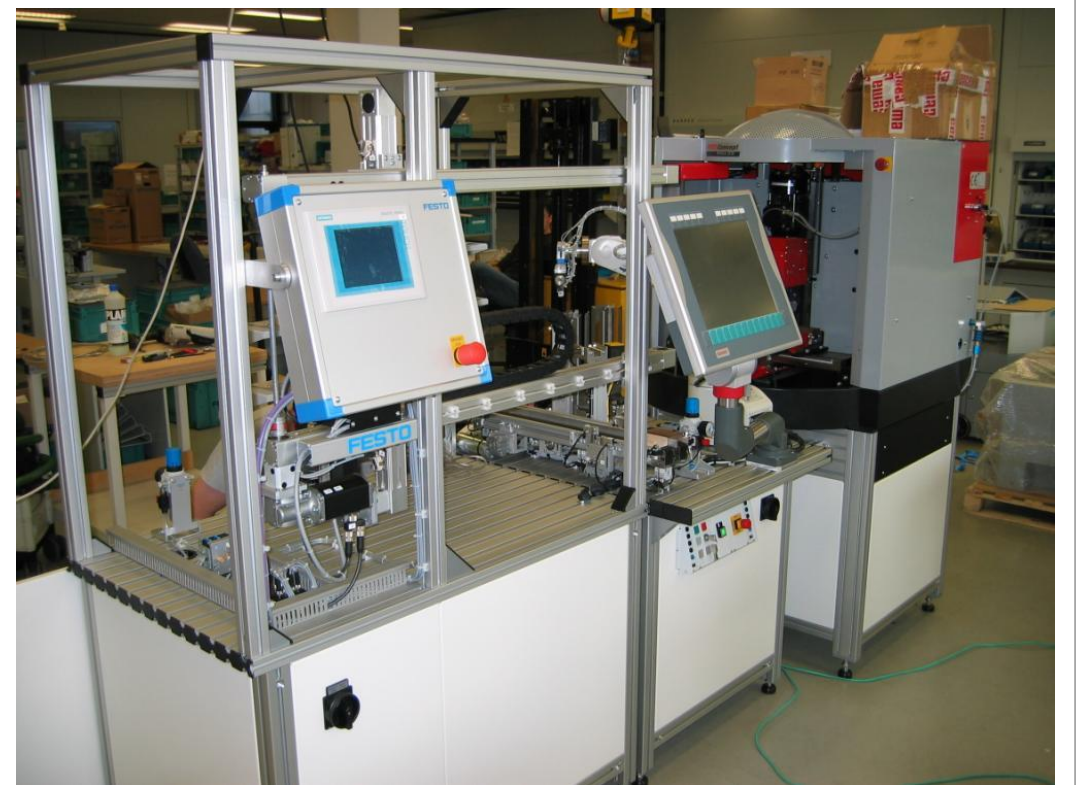
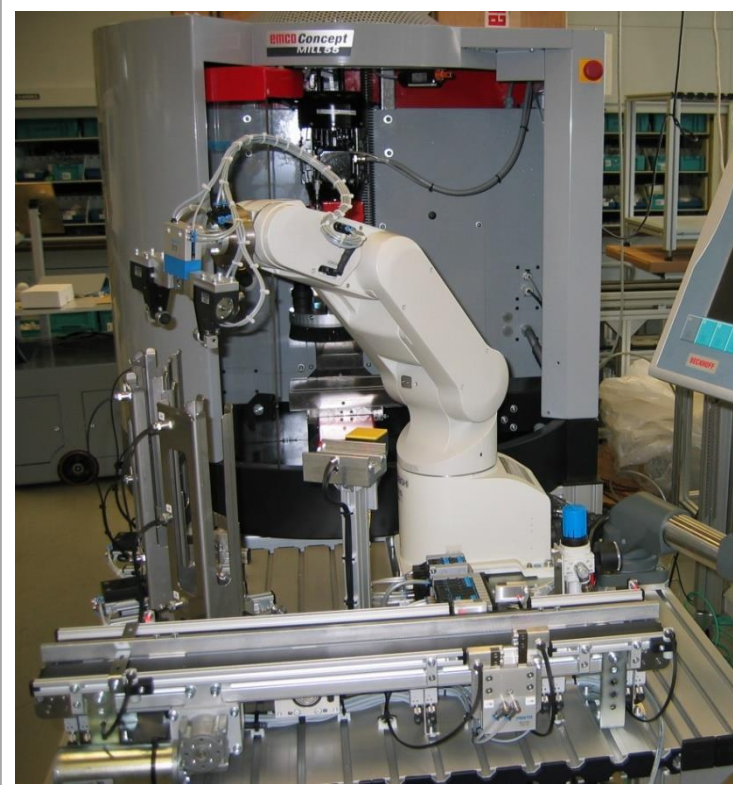
→ Training content:
 Logistics,
 Robotics,
 Mobile robotics,
 Mechatronics,
 RFID technology,
 Communication



Festo Didactic - Research Platform for Industrie 4.0

Reference Future Factory SAP Research Dresden, MicroFMS

- Gaining full transparency and insight into all manufacturing processes
- SAP addresses the challenges around data acquisition, system integration, and visualization
- Supporting sustain-able energy efficient production is focus of current research and development



Festo Didactic - Research Platform for Industrie 4.0

Reference Future Factory SAP Research Dresden, MicroFMS

- Gaining full transparency and insight into all manufacturing processes
- SAP addresses the challenges around data acquisition, system integration, and visualization
- Supporting sustain-able energy efficient production is focus of current research and development

SAP RESEARCH LIVING LABS

FUTURE FACTORY INITIATIVE

Managed by [SAP Research in Dresden](#), the Future Factory Initiative is a joint effort between SAP Research and industrial partners to foster co-innovation, research, and development for the manufacturing industry.



Using a real-world setting, the Future Factory Initiative presents leading edge software and the latest hardware with different scenarios, SAP products, and prototypes in a typical discrete manufacturing environment. With more than 20 partners, including large, midsize, and small companies, the Future Factory Initiative constitutes a heterogeneous and strong ecosystem of market and technology leaders.

Following the SAP corporate strategy to develop the world's best business applications for on-premise, on-demand, on-device, and orchestration, the Future Factory Initiative is active in three areas:

<http://www.sap.com/corporate-en/our-company/innovation/research/livinglabs/futurefactory/index.epx>

Future Factory

Overview
Virtual Tour
SAP Solutions
FFI Partners
Research

Welcome to the Virtual Future Factory!

The Virtual Future Factory allows you to explore SAP's current manufacturing solutions and gives a preview of potential future solutions. It is a virtual representation of the real Future Factory located at SAP Research in Dresden.

The Future Factory facilitates research, development, and co-innovation in a Living Lab environment, providing an infrastructure for test, validation, and demonstration. Using a real-world setup it shows leading edge software and the latest hardware with different scenarios, SAP products, and prototypes in a typical discrete manufacturing environment. With more than 20 partners including large, medium, and small companies, the Future Factory Initiative (FFI) constitutes a strong and heterogeneous ecosystem of market and technology leaders.

The business processes at the Future Factory are closely following the Supply-Chain Operations Reference-model (SCOR). SCOR enables users to address, improve, and communicate supply chain management practices within and between all interested parties in the Extended Enterprise. The SCOR model is based on five distinct management processes: Plan, Source, Make, Deliver, and Return (Service).

www.sap.com/futurefactory

Festo Didactic - Research Platform for Industrie 4.0

Reference iFF Stuttgart transformable production, iFactory

→ At the learning factory for Advanced Industrial Engineering, principles of the transformable assembly and production facilities that are fundamentally important in terms of planning, physical and control technology aspects are being implemented.



Festo Didactic - Research Platform for Industrie 4.0

Reference iFF Stuttgart transformable production, iFactory

→ At the learning factory for Advanced Industrial Engineering, principles of the transformable assembly and production facilities that are fundamentally important in terms of planning, physical and control technology aspects are being implemented.



Festo Didactic - Research Platform for Industrie 4.0

Reference iFF Stuttgart transformable production, iFactory



The connection between the cells is done via one standardized connector, including:

- power supply 400V
- air-supply
- Ethernet
- Grounding
- 24V Emergency Stop

This allows a fast and save connection of the different cells of the iFactory.

Intelligent network:



Festo Didactic - Research Platform for Industrie 4.0

Reference IFF Stuttgart transformable production, iFactory



"In order to secure the existence and ensure competitiveness of companies, it is absolutely necessary that production planners and those responsible for factory organisation learn how they can compensate for market turbulences without interfering with running production", says Prof. Engelbert Westkämper, Director of the IFF at the University of Stuttgart and of the Fraunhofer Institute for Production Technology

and Automation (IPA – In-

Reference IFF Stuttgart:

<http://www.lernfabrik-aie.de/aktuelles/>



Universität
Stuttgart **if**

Institut für Industrielle
Fertigung und Fabrikbetrieb



Festo Didactic - Research Platform for Industrie 4.0

Reference Cognitive Factory iwb TU Munich, iCIM

- **Research area**
Cognitive factories
Computer
Integrated Manu-
facturing (CIM)
Green machining

- **Excellence**
University TU
Munich, Germany



Festo Didactic - Research Platform for Industrie 4.0

Reference Cognitive Factory iwb TU Munich, iCIM

→ **Research area**
 Cognitive factories
 Computer
 Integrated Manufacturing (CIM)
 Green machining

→ **Excellence**
 University TU
 Munich, Germany



Festo Didactic - Research Platform for Industrie 4.0

Reference Cognitive Factory iwb TU Munich, iCIM

→ **Research area**
 Cognitive factories
 Computer
 Integrated Manu-
 facturing (CIM)
 Green machining

→ **Excellence**
 University TU
 Munich, Germany



Festo Didactic - Research Platform for Industrie 4.0

Reference Cognitive Factory iwb TU Munich, iCIM

➔ **Research area**
 Cognitive factories
 Computer
 Integrated Manu-
 facturing (CIM)
 Green machining

➔ **Excellence**
 University TU
 Munich, Germany



The screenshot shows the website for the Institute of Production (iwb) at TU Munich. It features a navigation menu on the left with categories like 'Aktuelles', 'Institut', 'Studium', 'Forschung', 'Industrie', 'Karriere', 'Veranstaltungen', and 'Kontakt'. The main content area is titled 'Ausstattung im Bereich der Automation und der Robotik' and lists several pieces of equipment, including a Festo FMS-System iCIM (Flexible Manufacturing System), an Emco Dreh- und Fräsmaschine, a Palettentransportsystem, and a Be-Einfräse-roboter. An 'Ansprechpartner' (contact person) is also listed as Florian Geiger.

<http://www.youtube.com/watch?v=eYCKhpdQHMM>

The screenshot shows a YouTube video player for the video 'The Cognitive Factory - TU München'. The video is from the channel 'TUMuenchen1' and has 14 videos and 1,308 views. The video content shows a modern industrial factory floor with robotic arms and machinery. The video player interface includes standard YouTube controls like play, volume, and full screen, along with a list of suggested videos on the right side.