Studica

Exploring Automation & Control Systems with FISCHERTECHNIK

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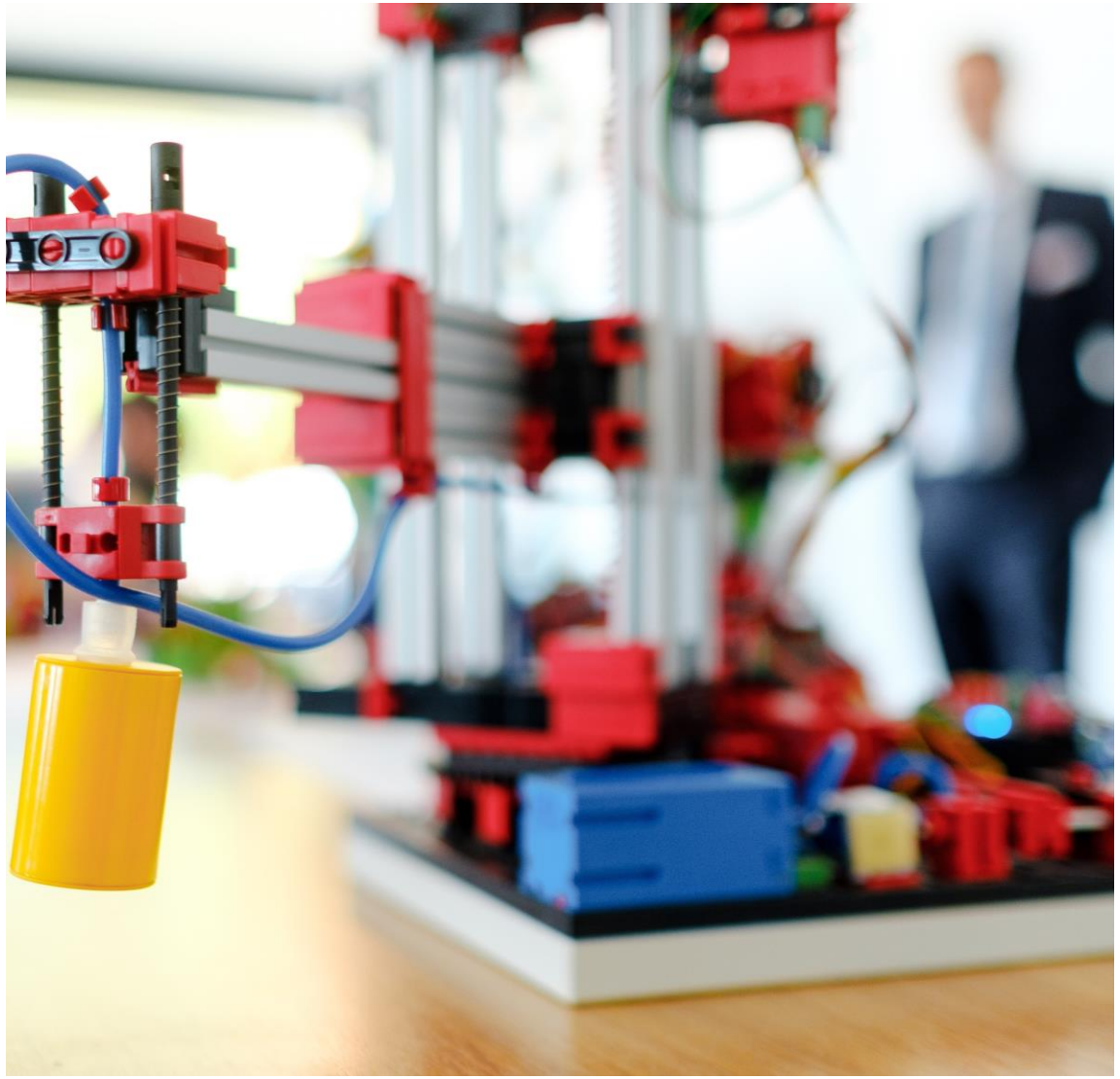
Spring 2021

Fischertechnik Industrial Simulation Models

- High School CTE Training
- College & University Lab Use
- Incumbent Worker Training
- Workforce Development
- Trade Show Demonstrations
- Software Development
- Exploring and understanding IoT
- …and more.



The Skills Gap

STEM Skills Gap

STEM is an acronym -- Science, Technology, Engineering, and Mathematics

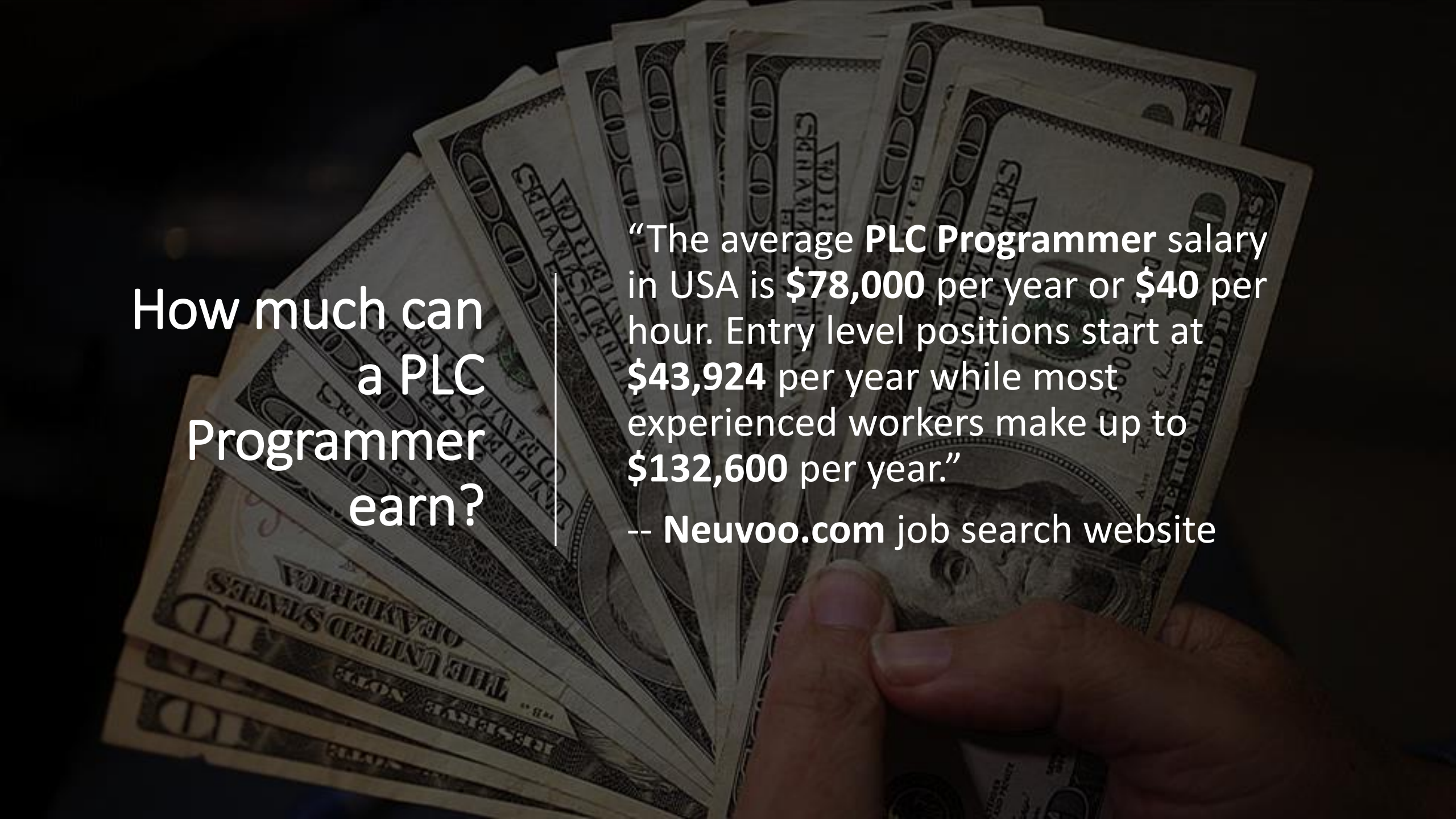
Probably the most discussed topic in education over past decade

Manufacturing: Then & Now

Manufacturing: Then & Now

PLC – Programmable Logic Controller

- PLC is a specialized computer used to control automated processes in modern manufacturing.
- As our dependence on automated control systems grows, so does the need for skilled programmers.



How much can a PLC Programmer earn?

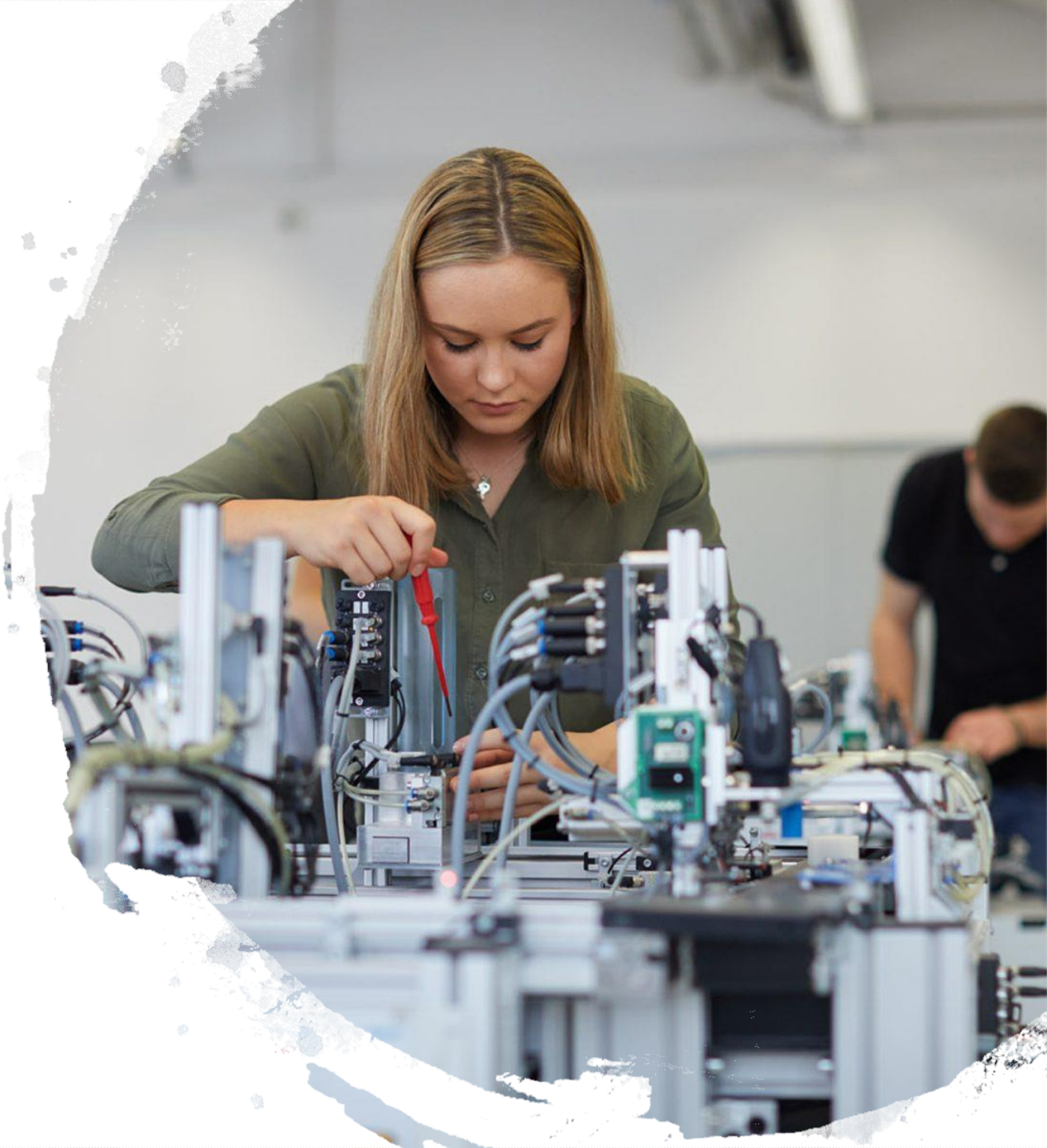
"The average **PLC Programmer** salary in USA is **$78,000** per year or **$40** per hour. Entry level positions start at **$43,924** per year while most experienced workers make up to **$132,600** per year."

-- **Neuvoo.com** job search website

How Long Does It Take To Learn?

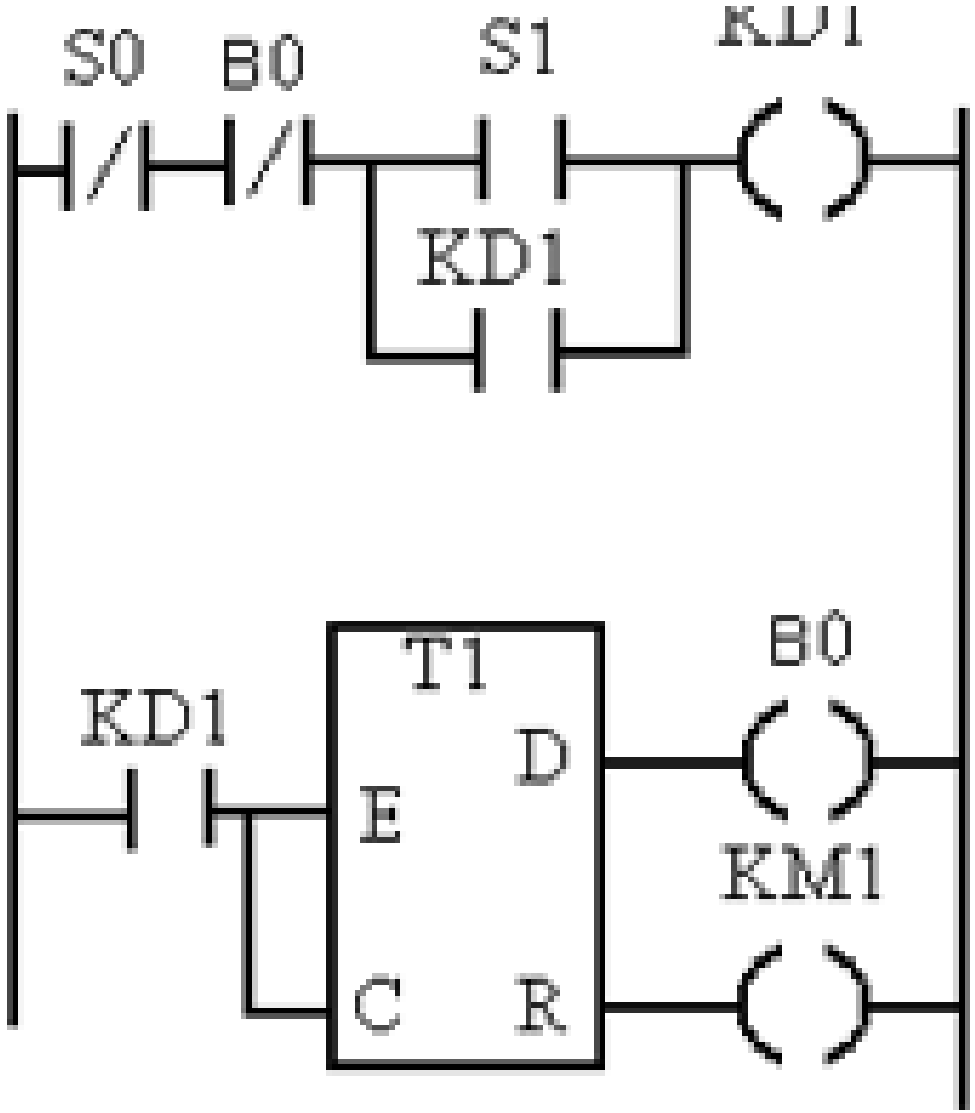
- Depending on background, ***very*** basic PLC skills could be learned in as little as 30 to 40 hours.

- To be truly proficient, more extensive training is required.



Popular PLC Programming Languages:

- Ladder Diagram **(LD)**
- Sequential Function Charts **(SFC)**
- Function Block Diagram **(FBD)**
- Structured Text **(ST)**
- Instruction List **(IL)**



PLC Training Options:

- College and University Programs
- High School CTE (Career and Technical Education) Programs
- Adult Continuing Ed Programs
- Vocational Training
- Technical Training and Trade Schools
- Employer sponsored Incumbent Worker Training Programs

The Dilemma for Educators:

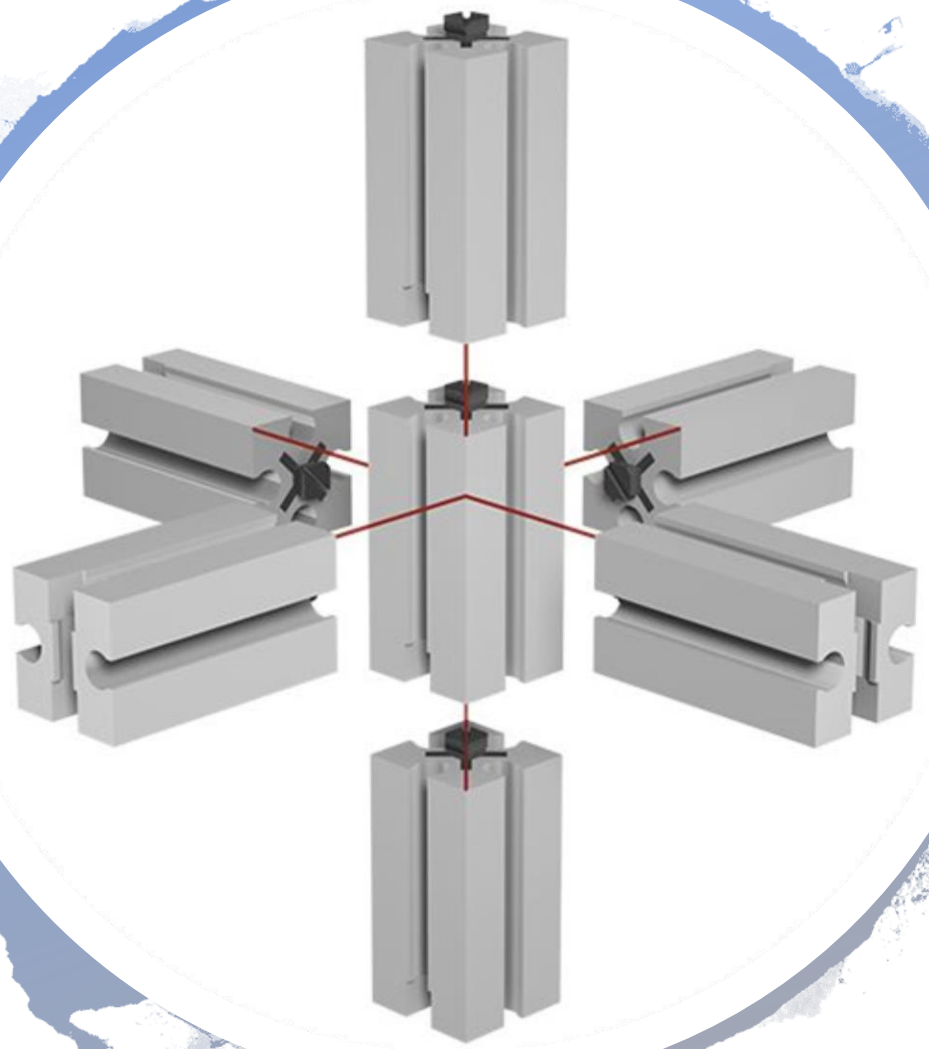
- How to make it relevant
- How to make it engaging
- How to make it realistic and “hands-on”

Other Areas of Need

- Product and software development
- Logistics and production planning
- Automation and digitization
- Trade show demonstrations
- IoT (Internet of Things) and Cloud Based Control

The fischertechnik Solution:

- A compact, engaging, and hands-on method for teaching and demonstrating high-end automated systems.
- Pre-assembled, table top models.
- Replicate in appearance and function automated systems found in commercial manufacturing.
- Highly affordable, cost-effective!



What is **fischertechnik**?

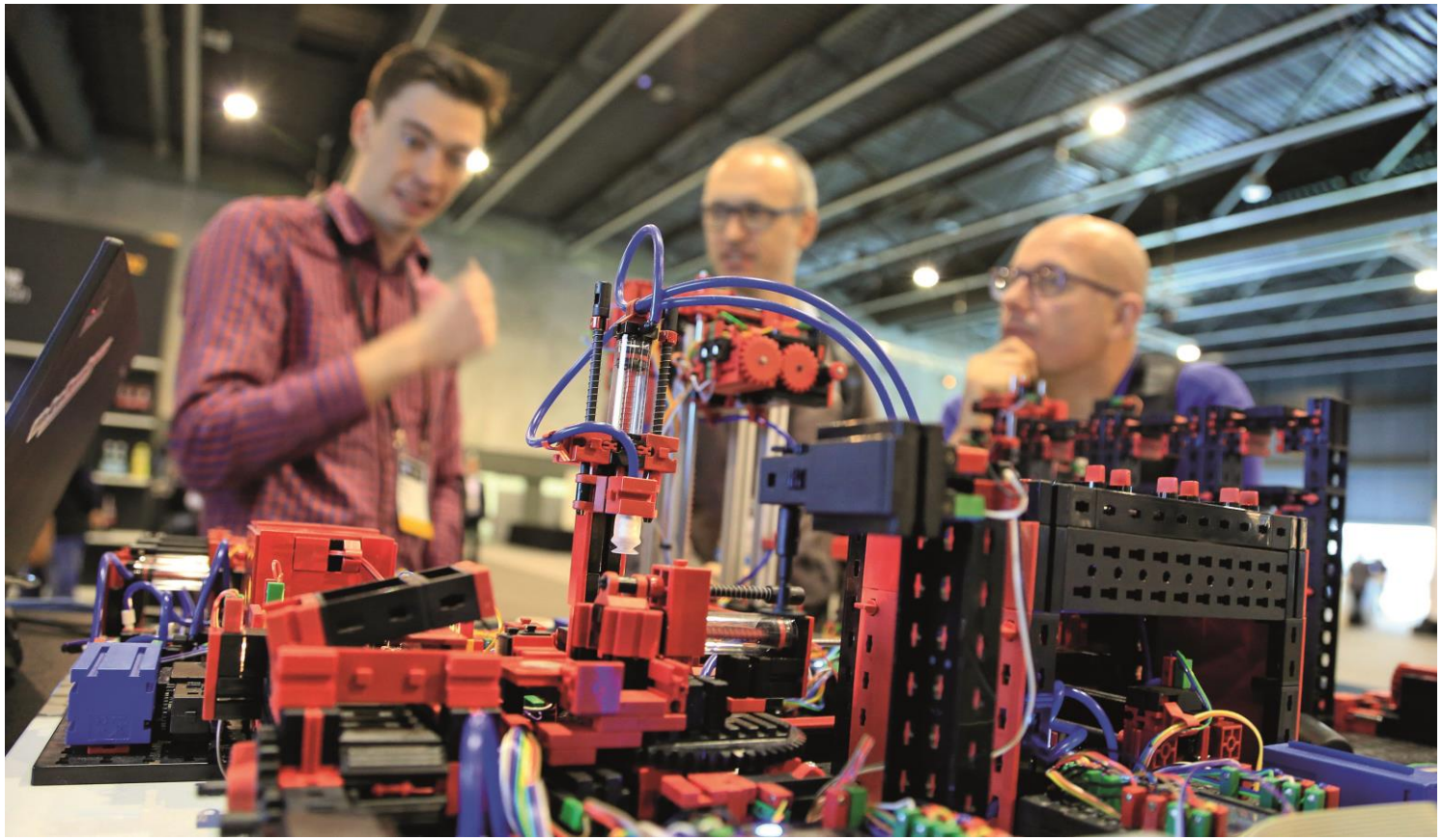
- **fischertechnik** is the brand name for a technology-focused building system.
- Used in education for over 50 years.
- System is unique in that the core building component allows attachment from all six sides.
- Address very specific design needs.

Artur Fischer, German Inventor

- Created fischertechnik in 1964.
- More patents than Edison (1100 total).
- Synchronized flash photography (1949).
- Expanding nylon wall plug (1958).
- Founder of fischer Group

fischertechnik and Education

- Technology focused building sets.
- STEM topics: mechanics, pneumatics, renewable energy, robotics, etc.
- Standards-focused, curriculum based classroom programs.
- Project-based learning.

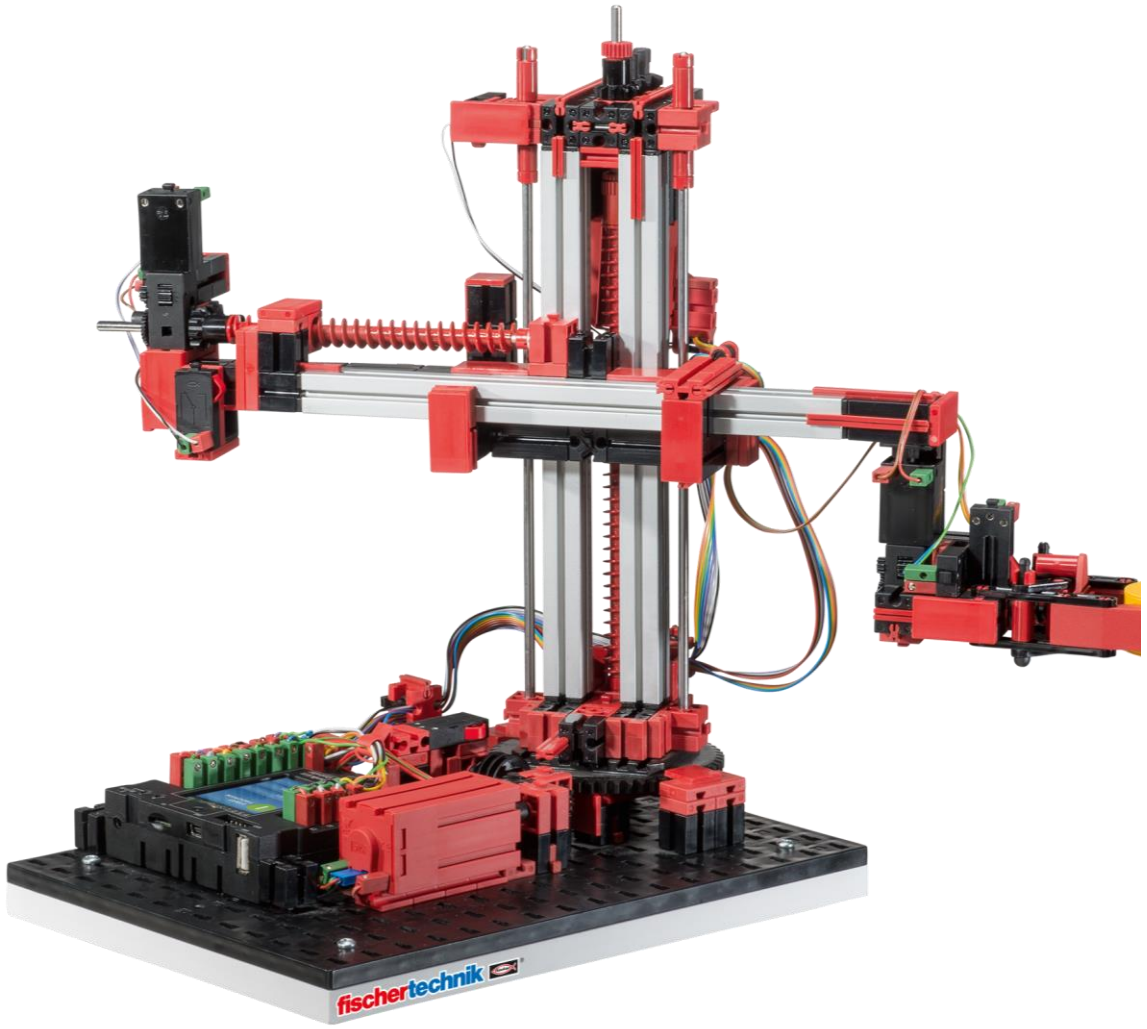


fischertechnik Simulation Solutions

- Pre-assembled.
- Small scale, table top sized models.
- Realistically replicate—in appearance and in function—automated and robotic machines and systems.

fischertechnik Simulation Solutions

- Conveyor belts
- Punching machines
- Three axis pick-and-place robotic arms
- Color sorting lines
- High-bay warehouse storage systems
- Complete material cycles



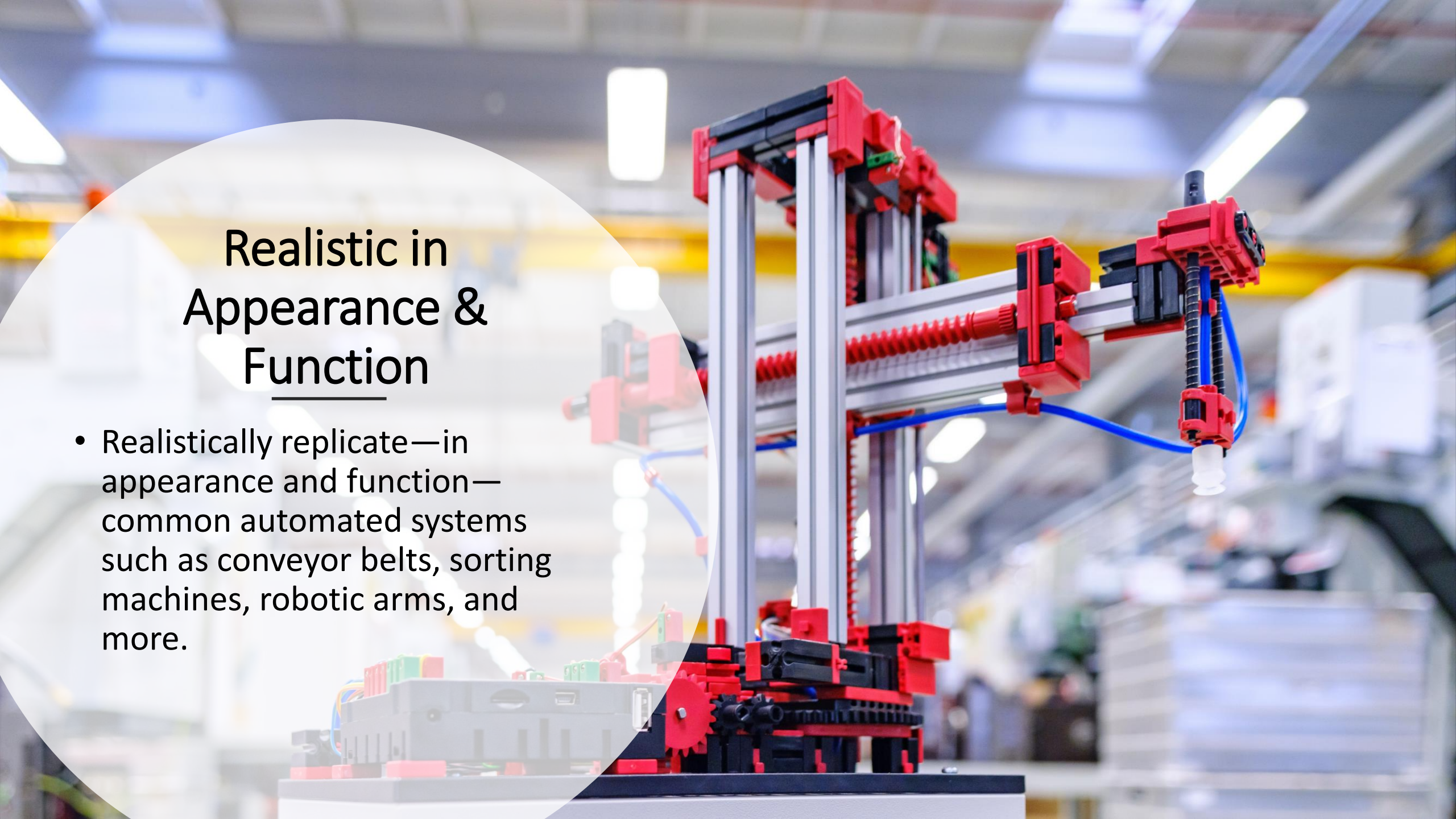
Hands-On Tools for Education

- Engaging, hands-on tools for teaching, exploring, and understanding various aspects of automation and programming.

Advantages of fischertechnik Simulation Models

Realistic in Appearance & Function

- Realistically replicate—in appearance and function—common automated systems such as conveyor belts, sorting machines, robotic arms, and more.



Compact, Table -Top Size Models

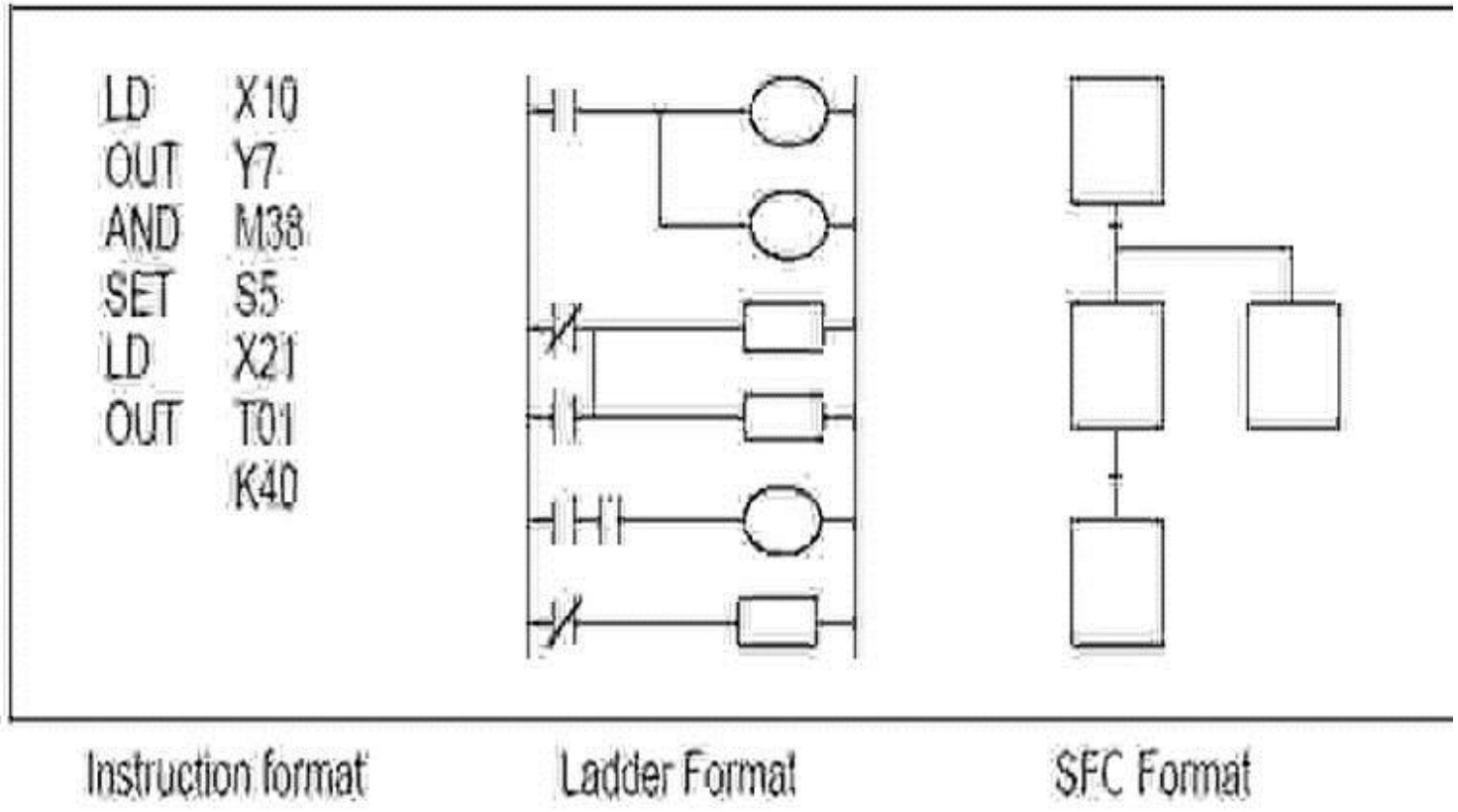
- Classroom
- Office
- Trade Show

High Quality, German Engineered Products

Assembled by hand.

Standard 24V versions for use with PLC

- Allen-Bradley
- Siemens
- Honeywell
- Mitsubishi
- GE
- and others.



PLC Programing Languages

- Ladder Diagram **(LD)**
- Sequential Function Charts **(SFC)**
- Function Block Diagram **(FBD)**
- Structured Text **(ST)**
- Instruction List **(IL)**

Select 9V versions also available

- Ideal for classroom and non-industrial use.
- ROBO Pro graphic software.
- fischertechnik ROBOTICS TXT Controllers.

Ideal for IoT Applications

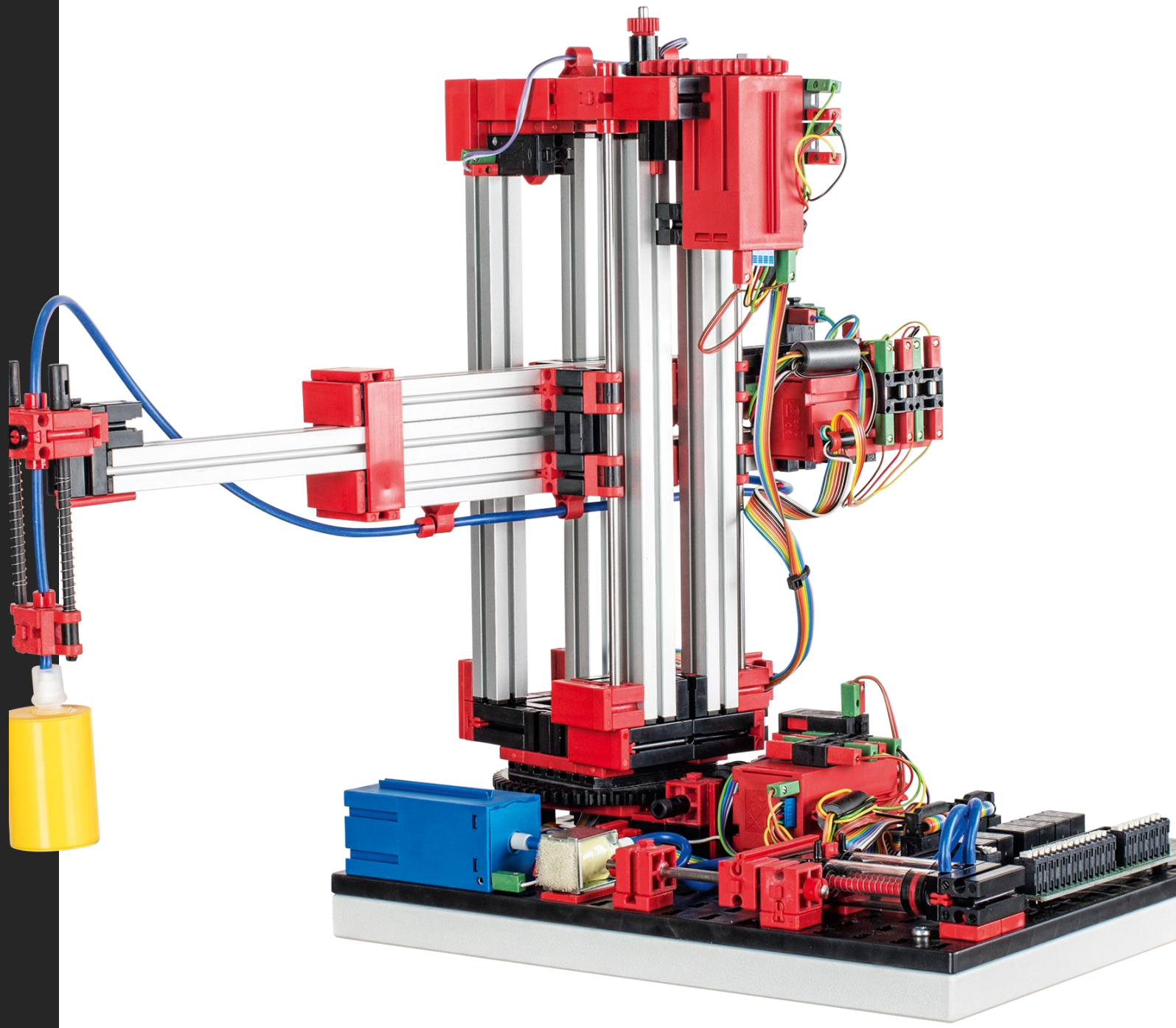
- “Internet of Things”
- Cloud-based control and monitoring of automated processes and systems.

Highly Affordable and Cost-Effective

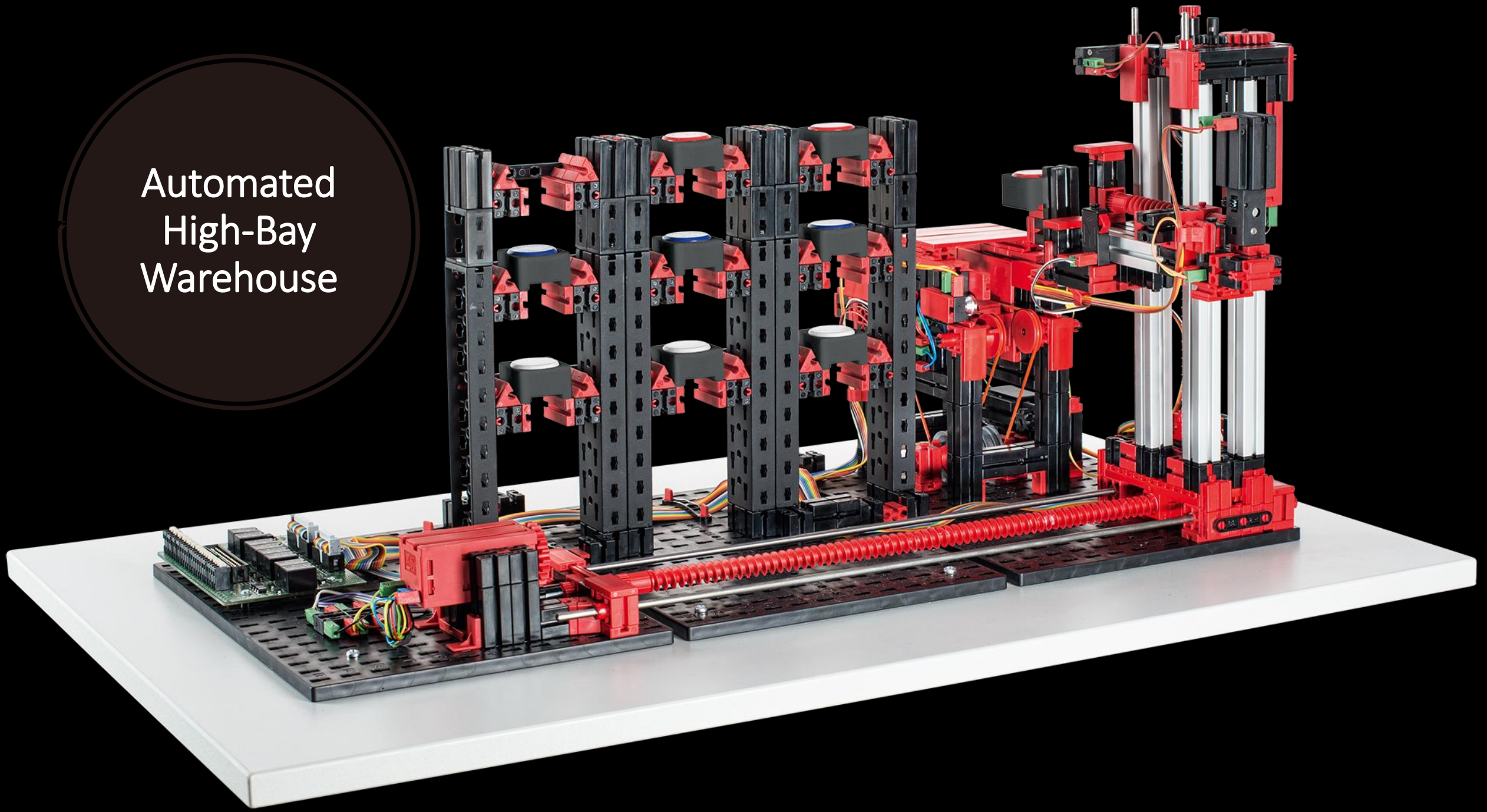
- While competing hardware based simulation solutions can easily start at $20,000 to $30,000…or much more, fischertechnik solutions are available for only a fraction of that price!

Let’s get started with our overview…

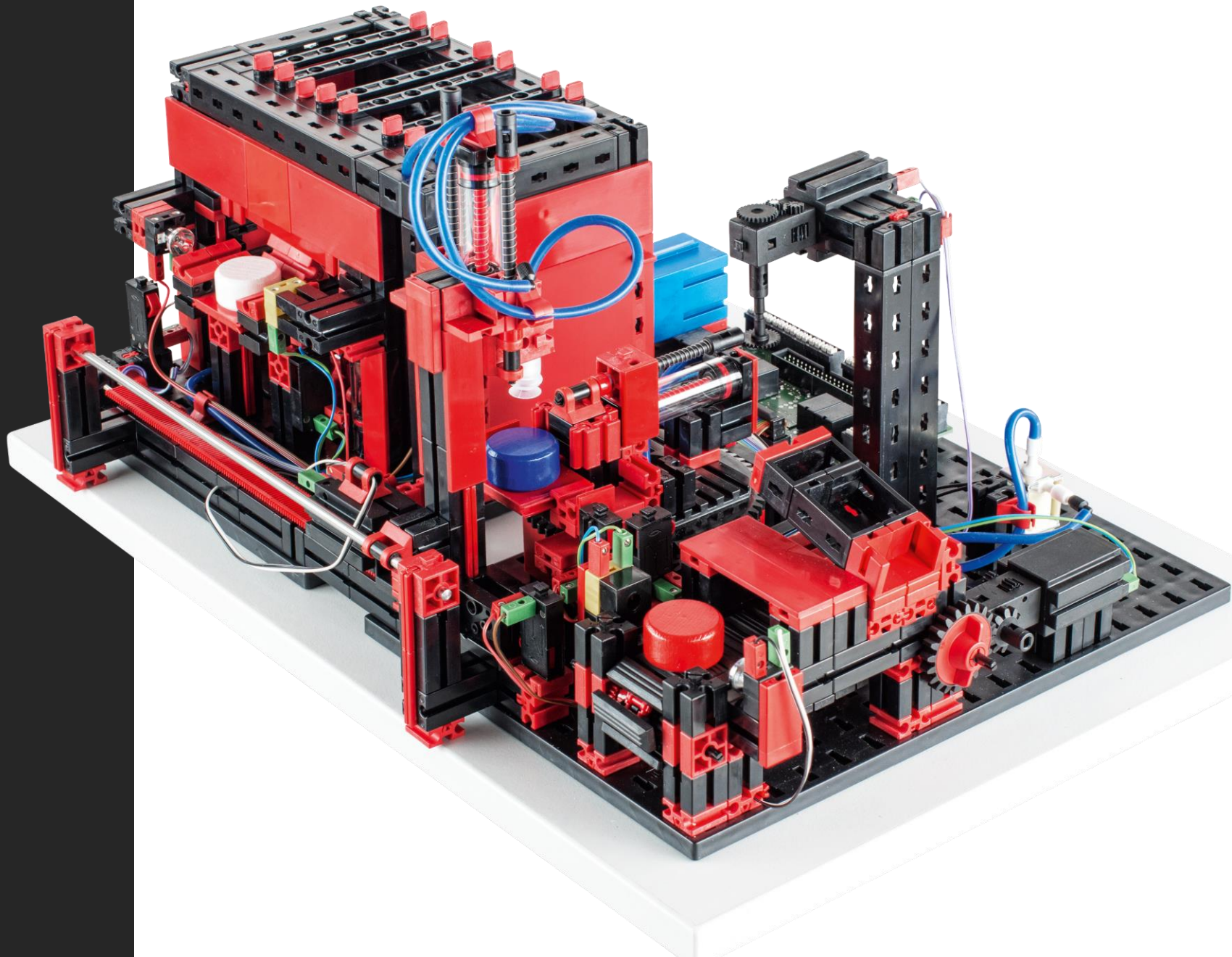
Vacuum Gripper Robot



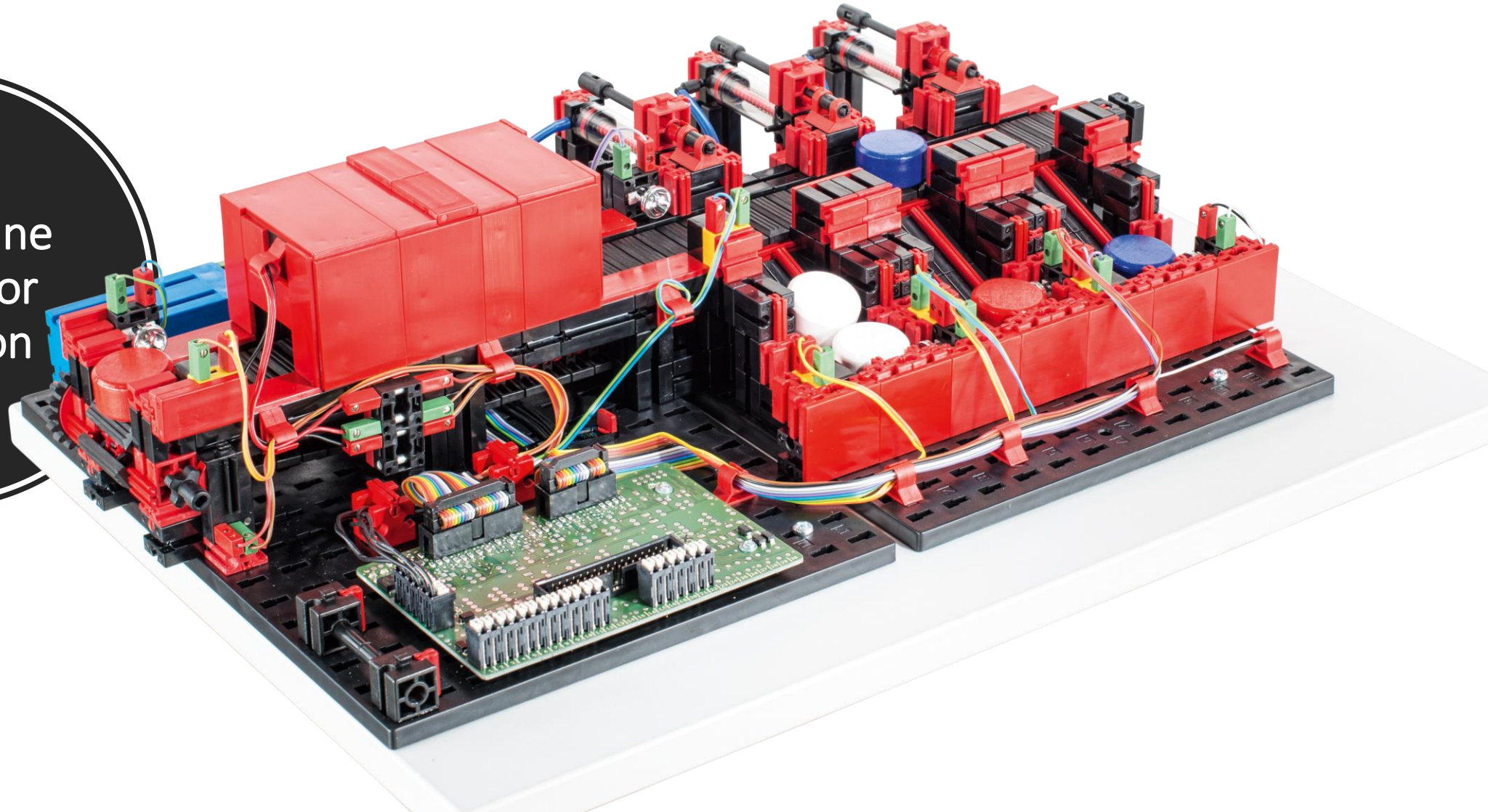
Automated High-Bay Warehouse



Multi-Processing Station with Oven



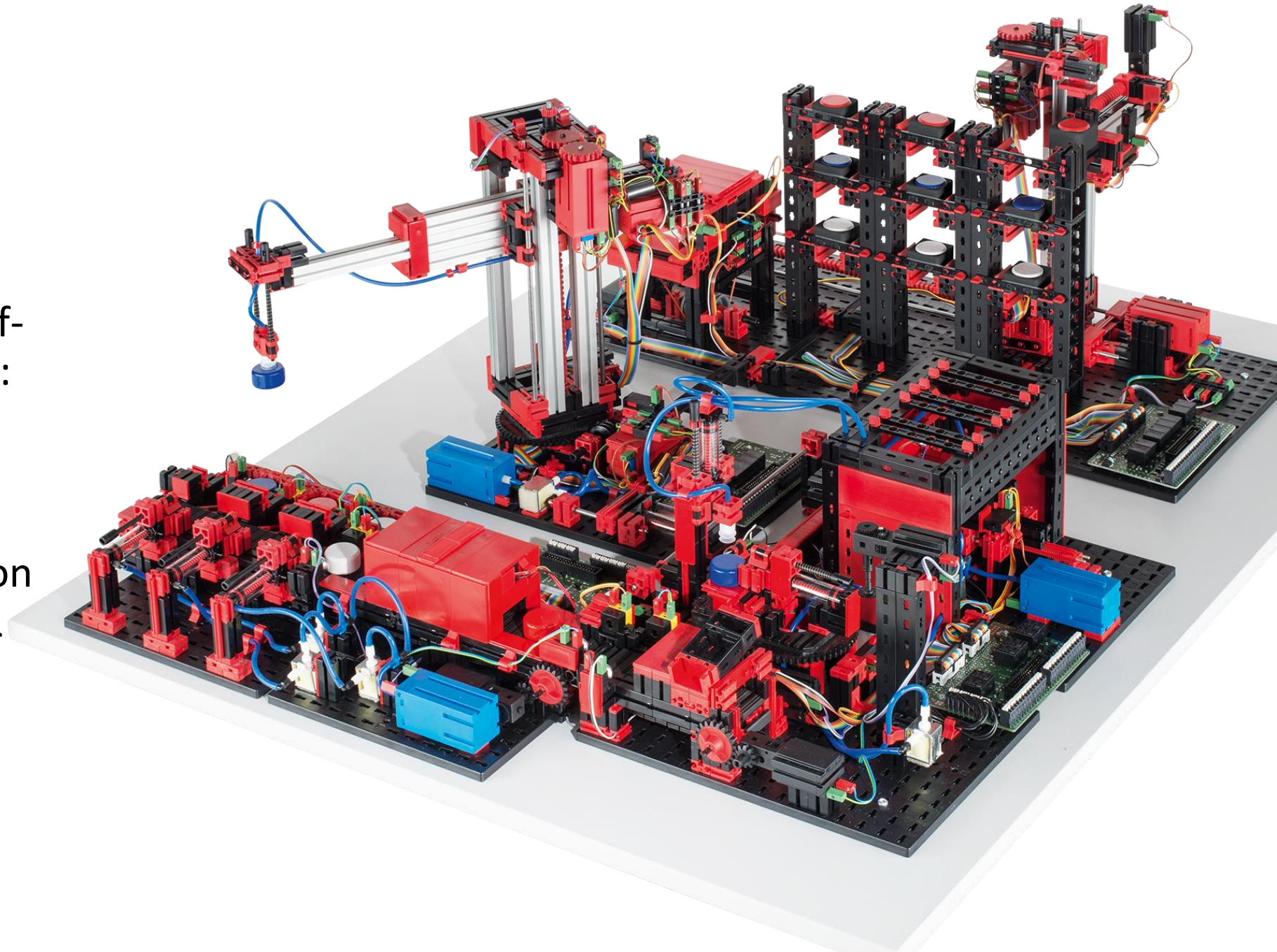
Sorting Line with Color Detection



Factory Simulation

Combines the following four models into one self-contained material cycle:

- Vacuum Gripper
- High-Bay Warehouse
- Multi-Processing Station
- Sorting Line with Color Detection

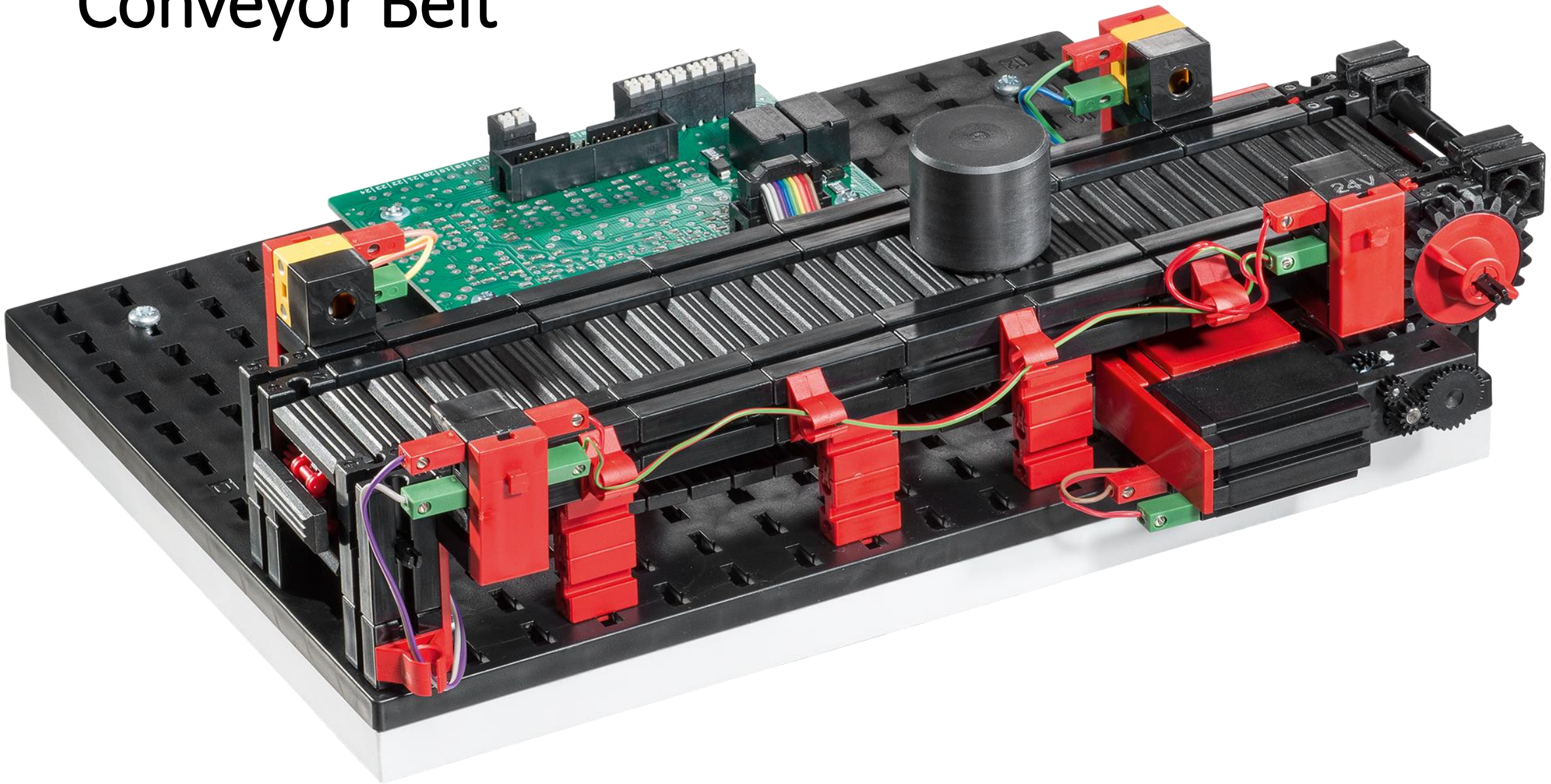


Travel & Storage Case

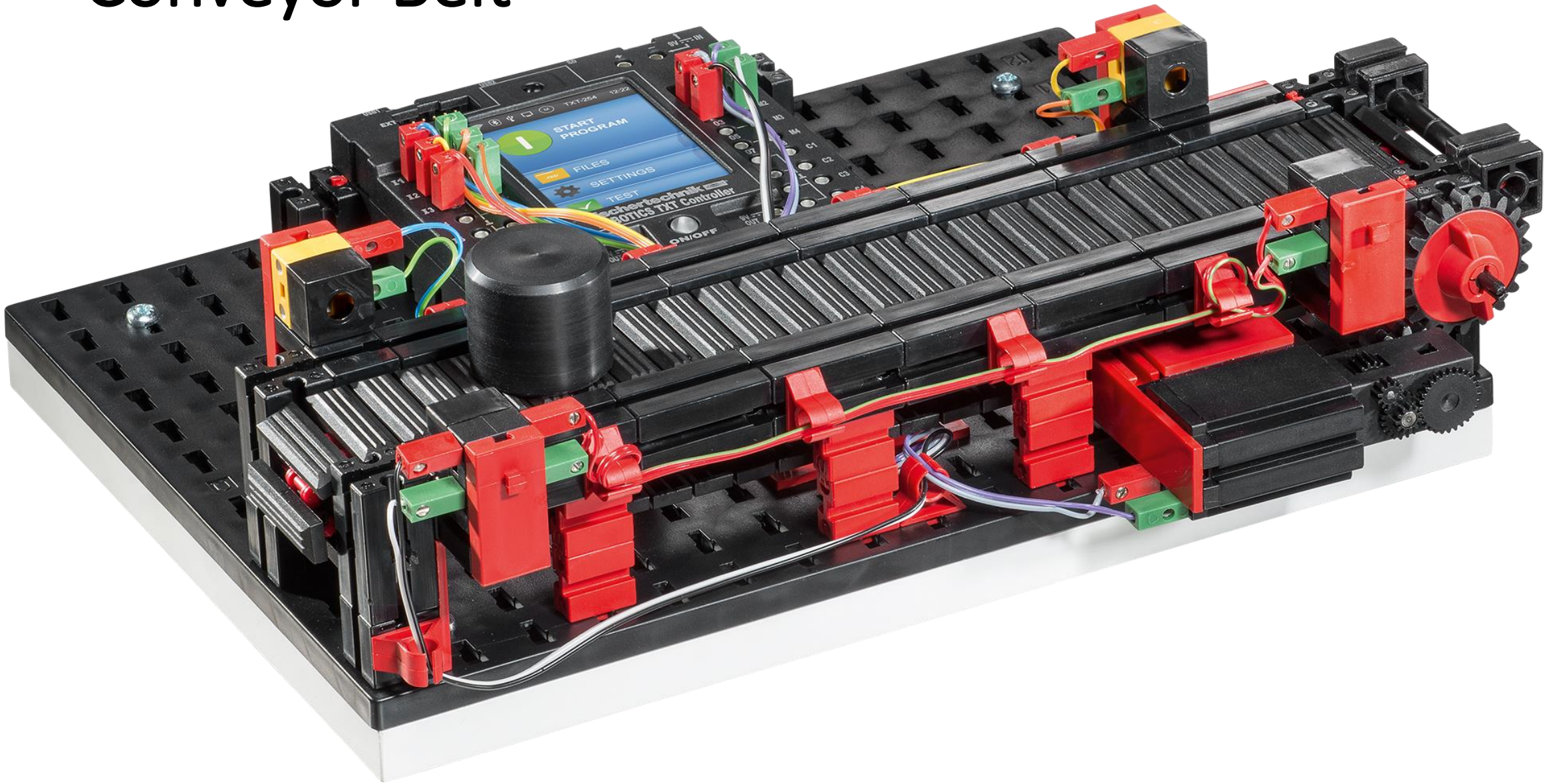
- Designed for storing either the **24V** or **9V Factory Simulation** models.

- Also designed for storing the **Training Factory Industry 4.0** models we will examine later in this presentation.

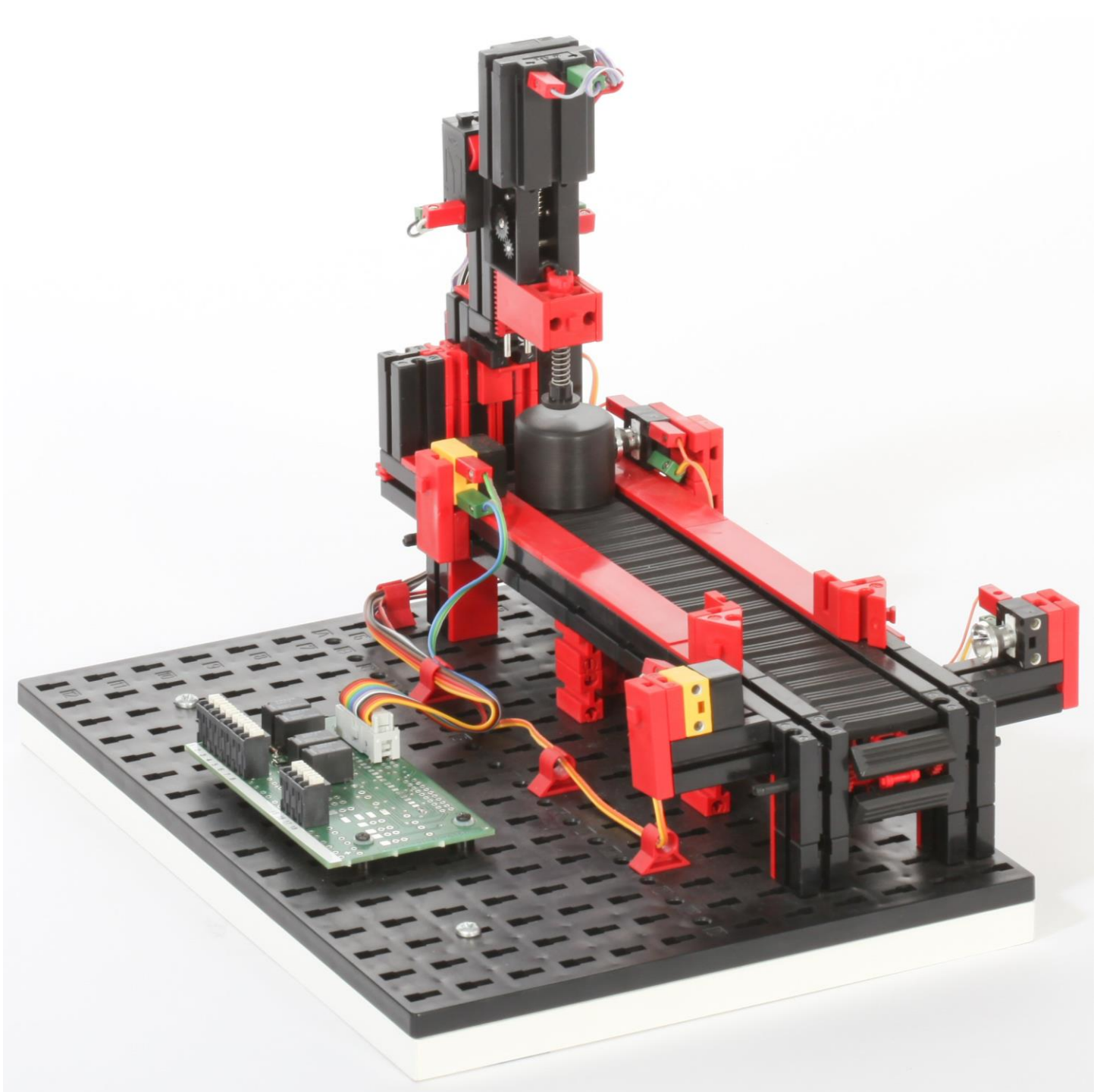
Conveyor Belt



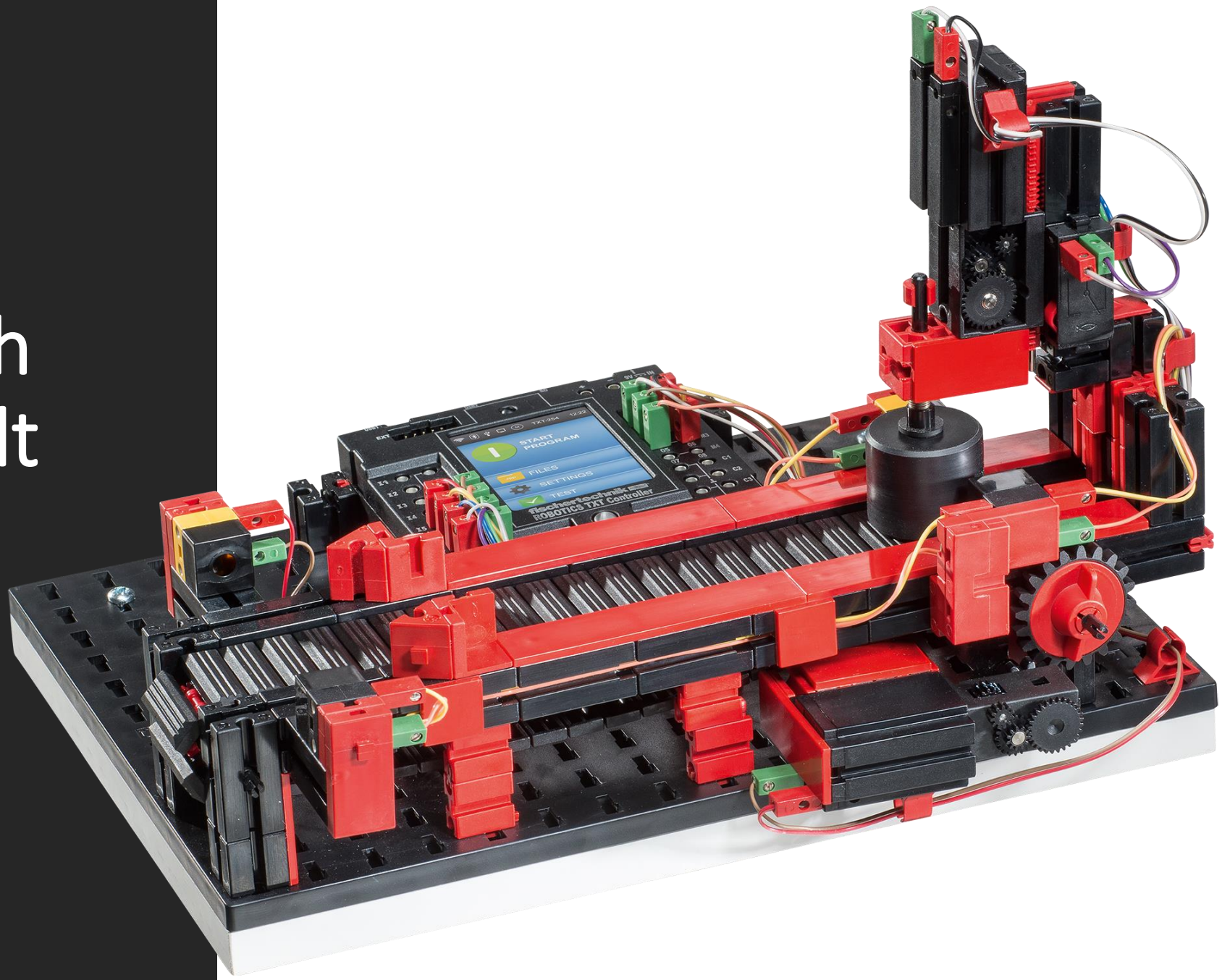
Conveyor Belt

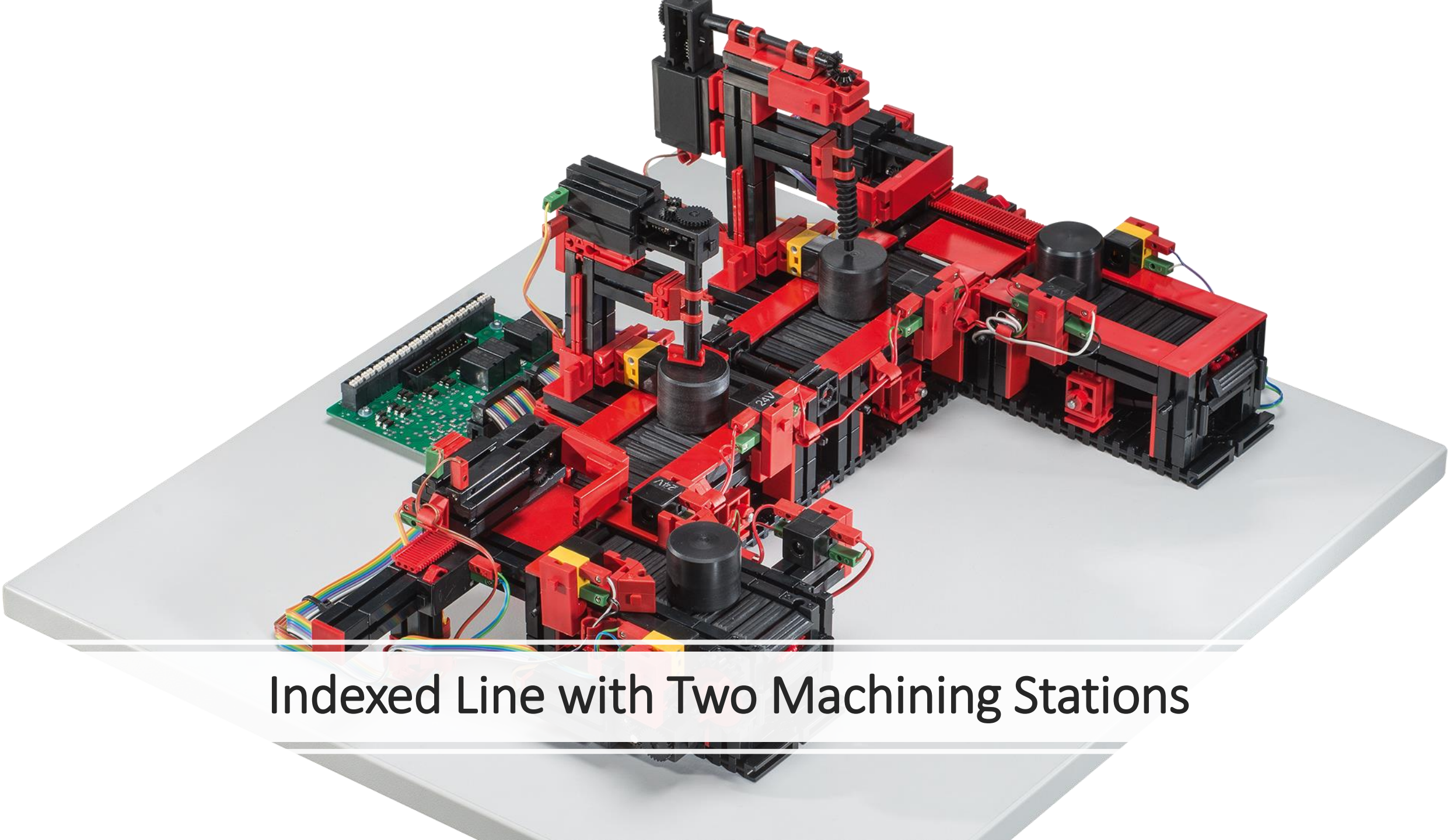


Punching Machine with Conveyor Belt

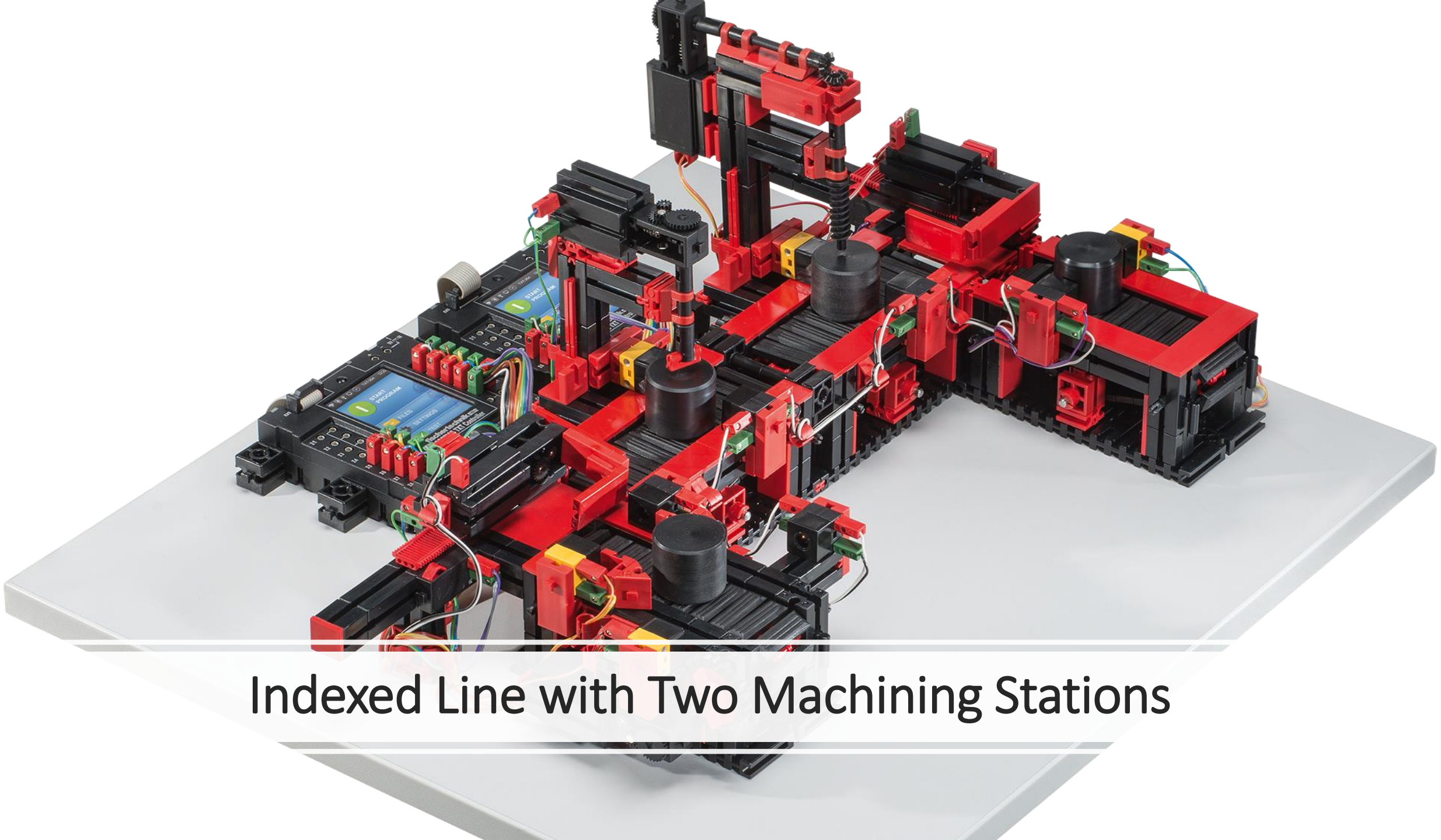


Punching Machine with Conveyor Belt



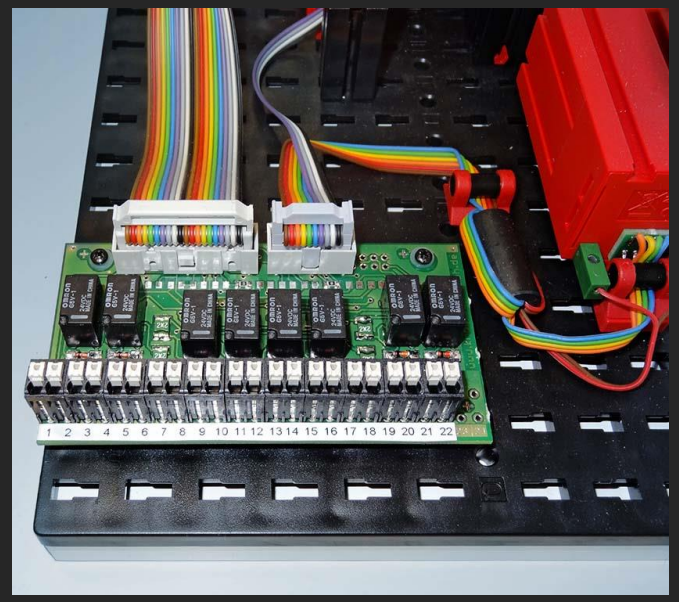


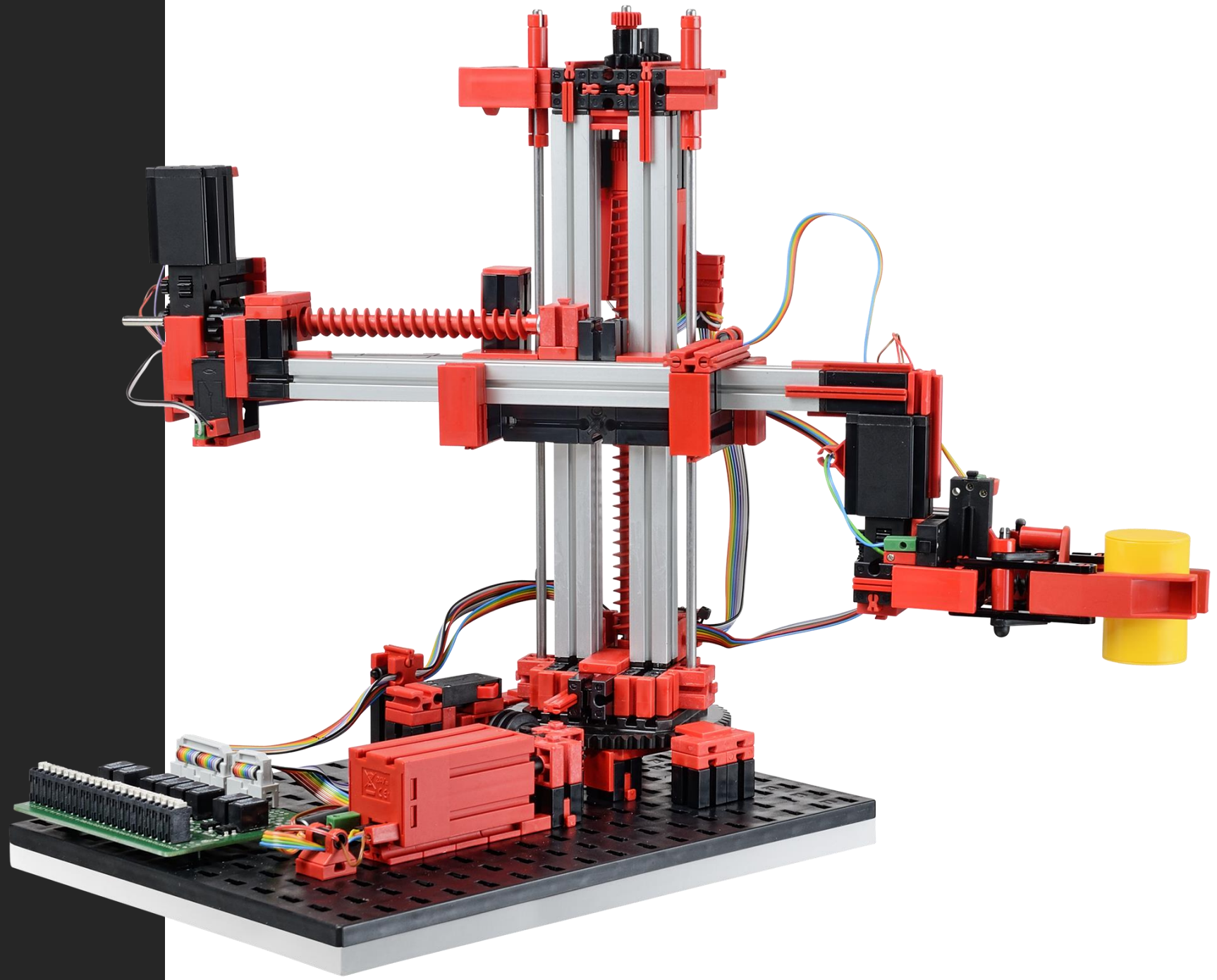
Indexed Line with Two Machining Stations



Indexed Line with Two Machining Stations

3-D Robot (Three Axis)



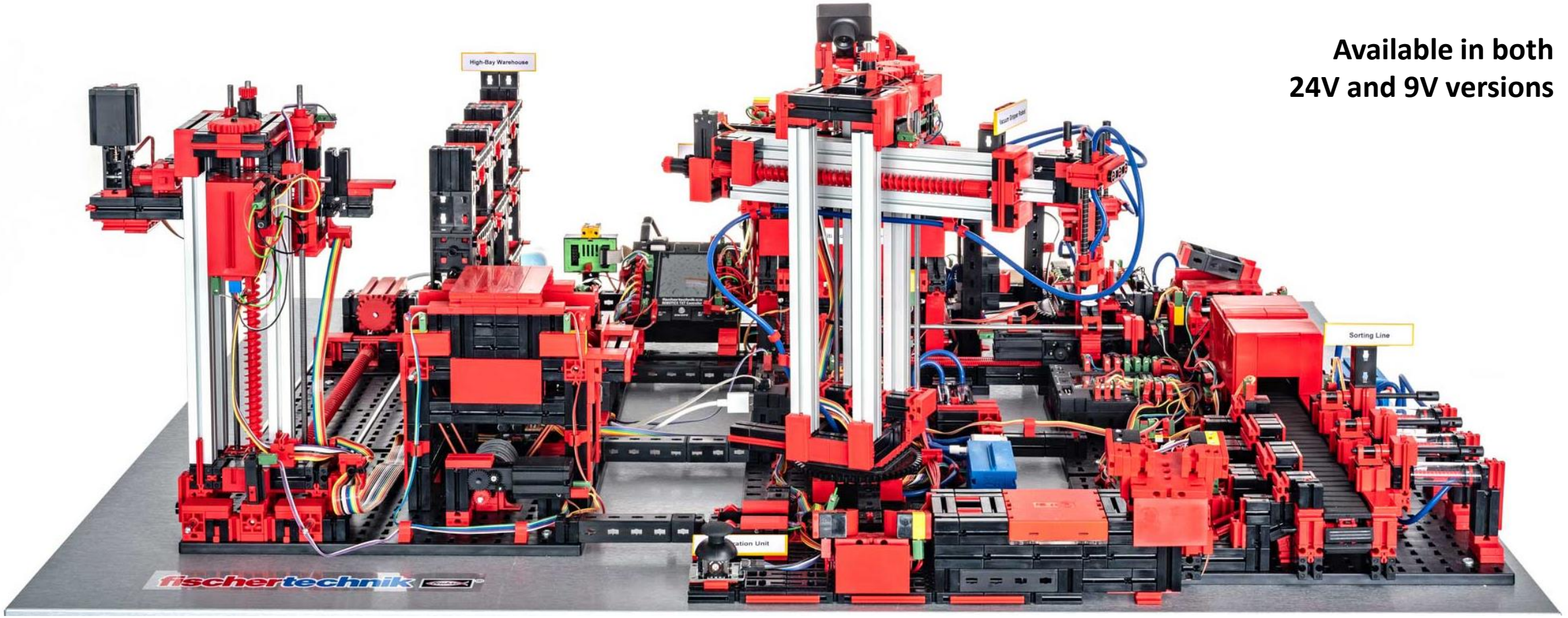


3-D Robot (Three Axis)

The Main Industrial Simulation Line

- All models available in 24V versions for use with industry standard PLCs and programming.

- Select models are also available in 9V versions—pre-programmed with ROBOTIC TXT Controllers-- for classroom and non-industry users.



Available in both
24V and 9V versions

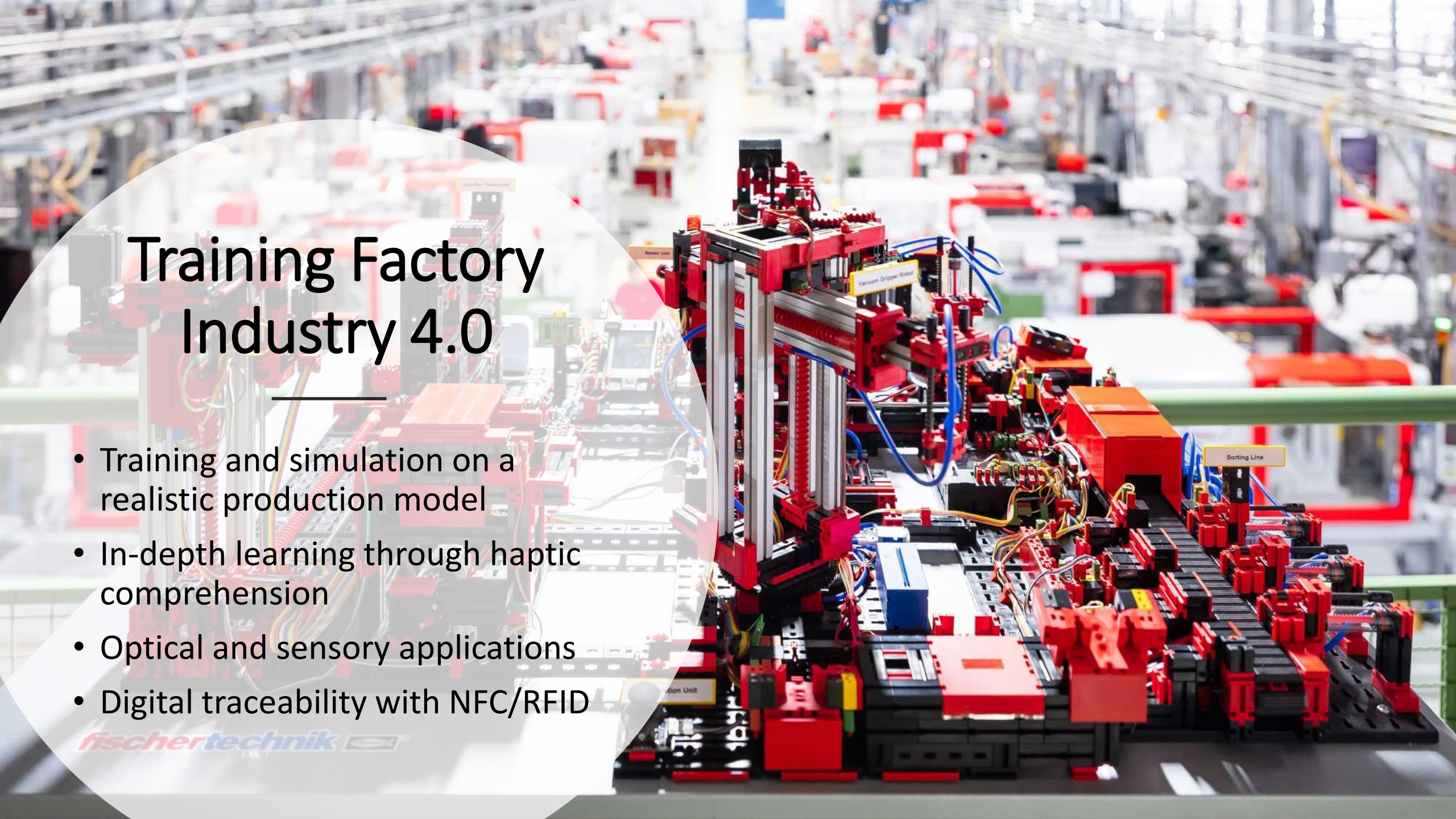
Training Factory Industry 4.0

Designed for exploring, teaching and understanding digitization, networking, and IoT.

Vacuum Gripper Robot
Sorting Line
Delivery and Pickup Station

Training Factory Industry 4.0

- Training and simulation on a realistic production model
- In-depth learning through haptic comprehension
- Optical and sensory applications
- Digital traceability with NFC/RFID



Training Factory Industry 4.0

- Customised production in lot size 1
- Integrated cloud connection, control via smart devices
- Using and operating dashboards
- Web-based remote maintenance

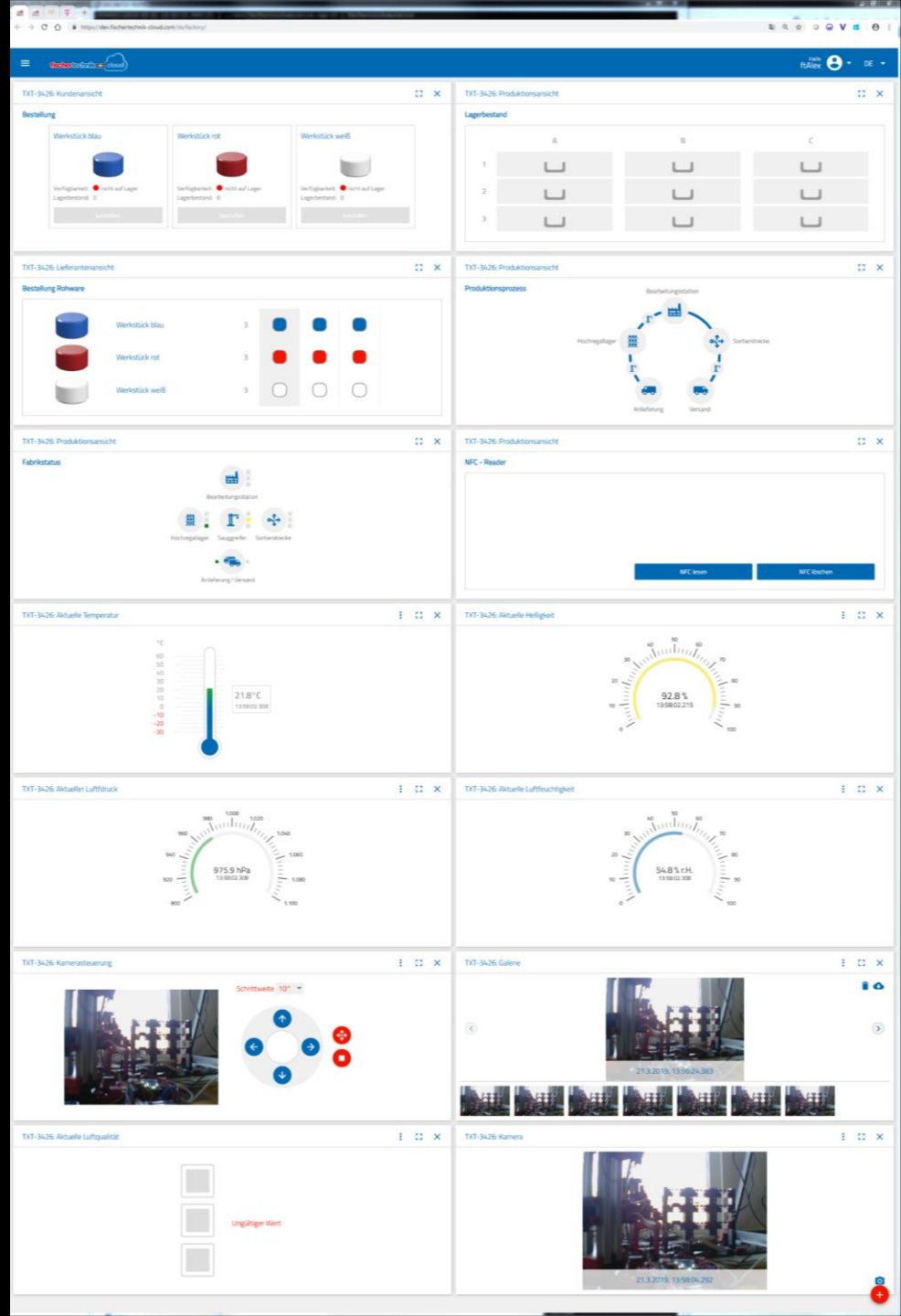
Training Factory Industry 4.0

- Linking of production and materials planning data
- Connection of upstream and downstream logistics processes

Training Factory Industry 4.0

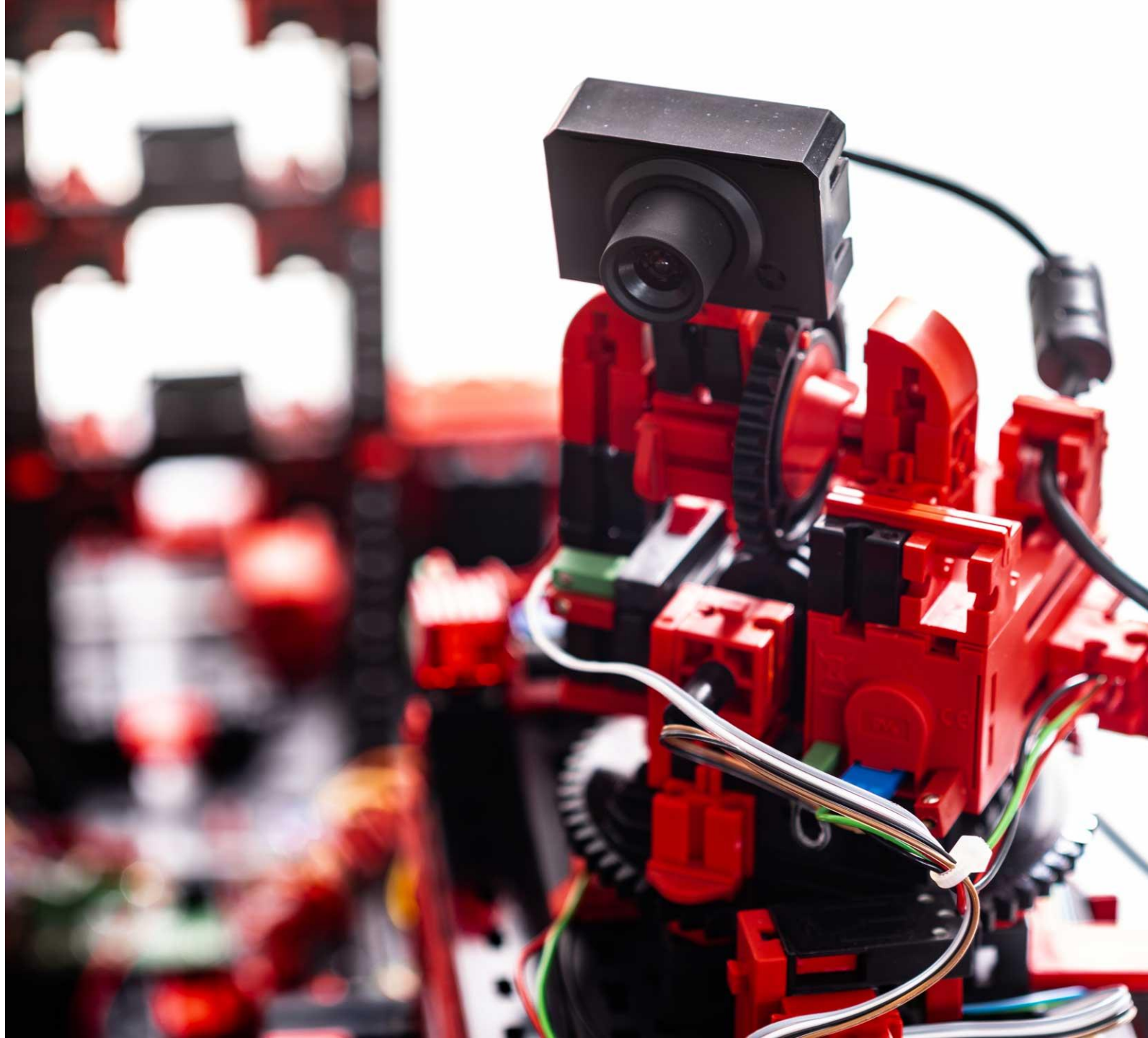
- **Cloud-Based Dashboard**—for remote control and monitoring of model.

- Offers three different views - **Customer View**, **Supplier View**, and **Production View**.



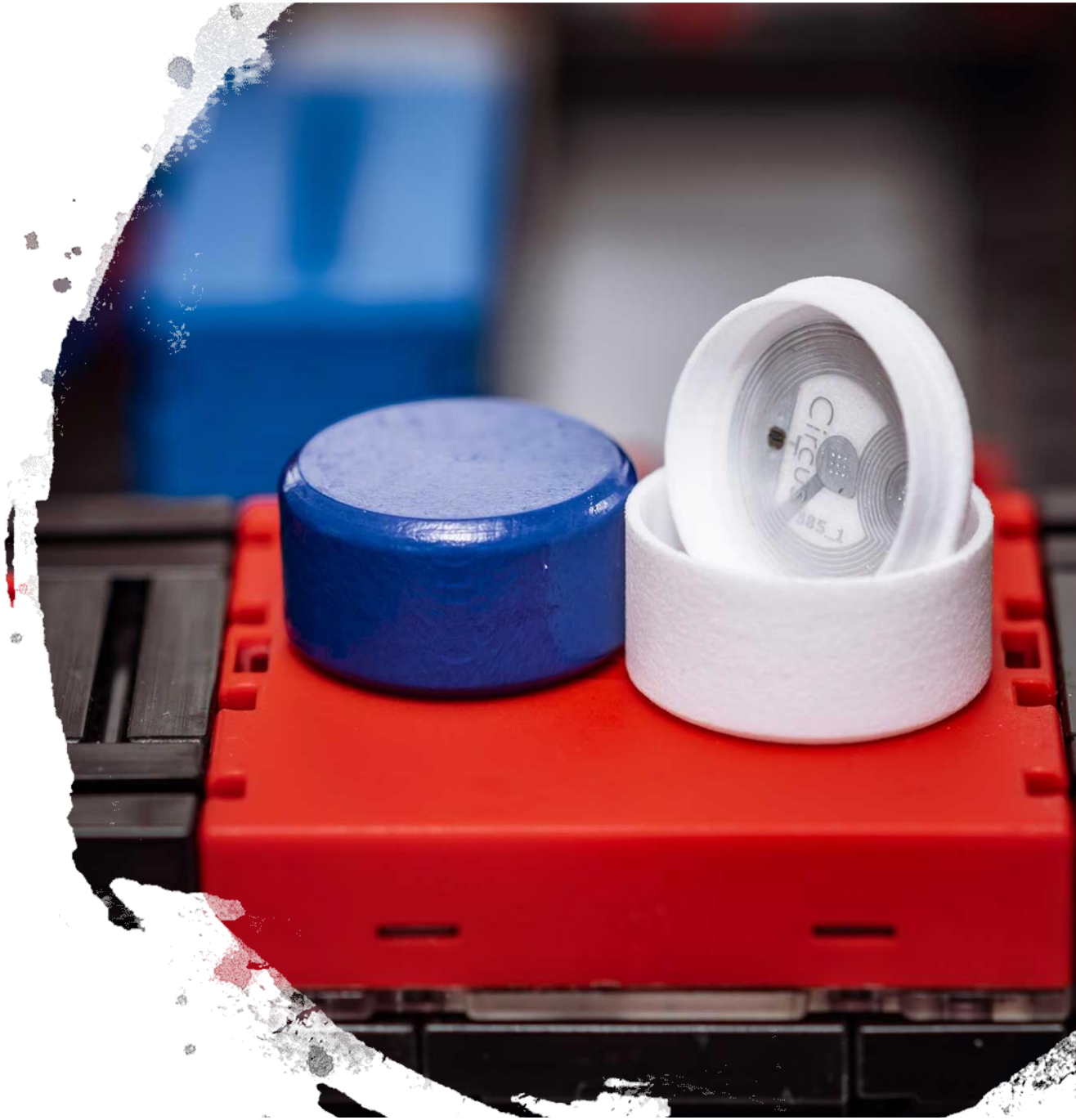
Training Factory Industry 4.0

- **Camera**—for remotely viewing all processes on the dashboard.

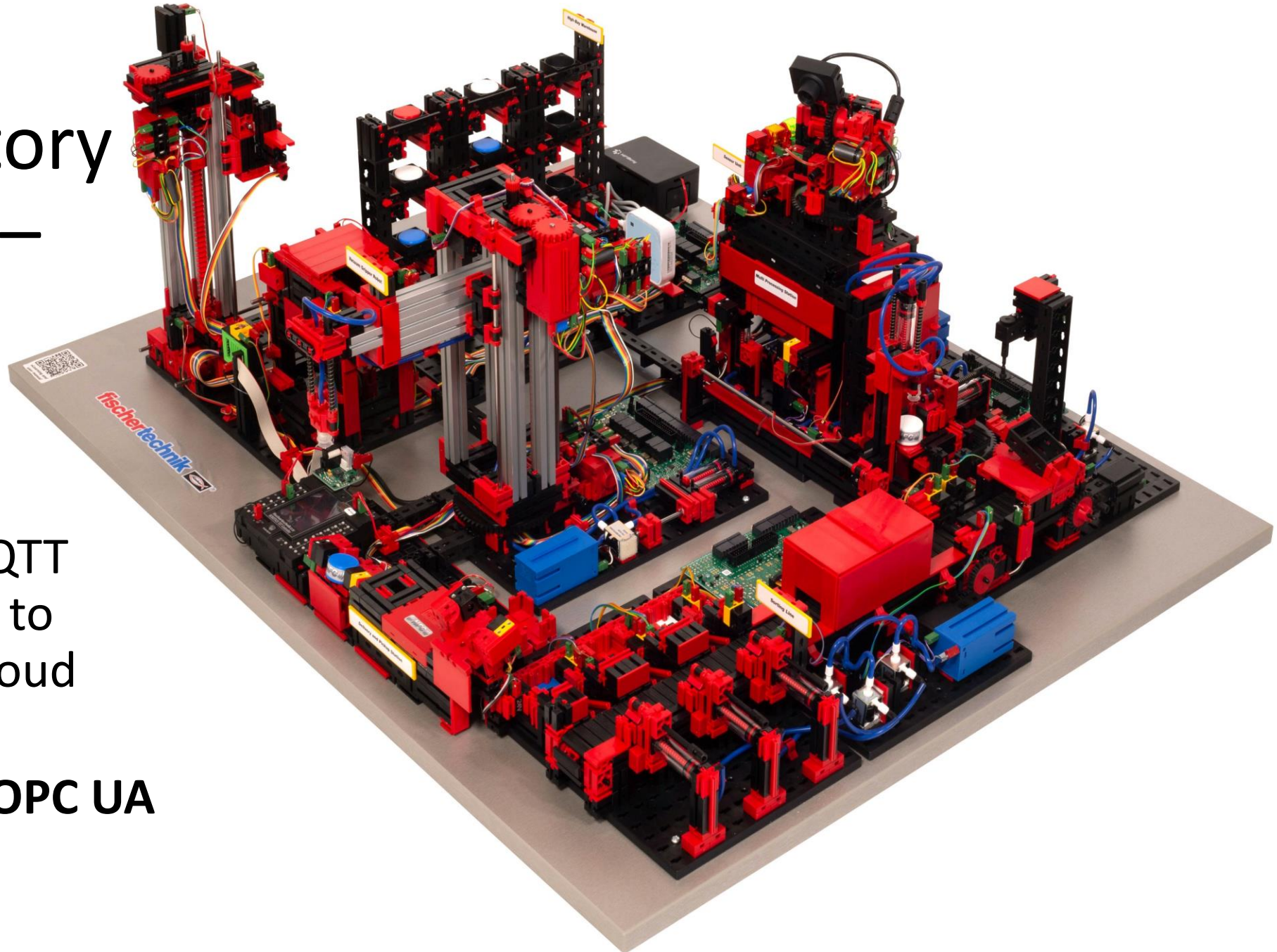


Training Factory Industry 4.0

- **NFC Chips** in each workpiece
- **NFC Reader**
- **MQTT—**Message Queuing Telemetry Transport



Training Factory Industry 4.0 – 24V version

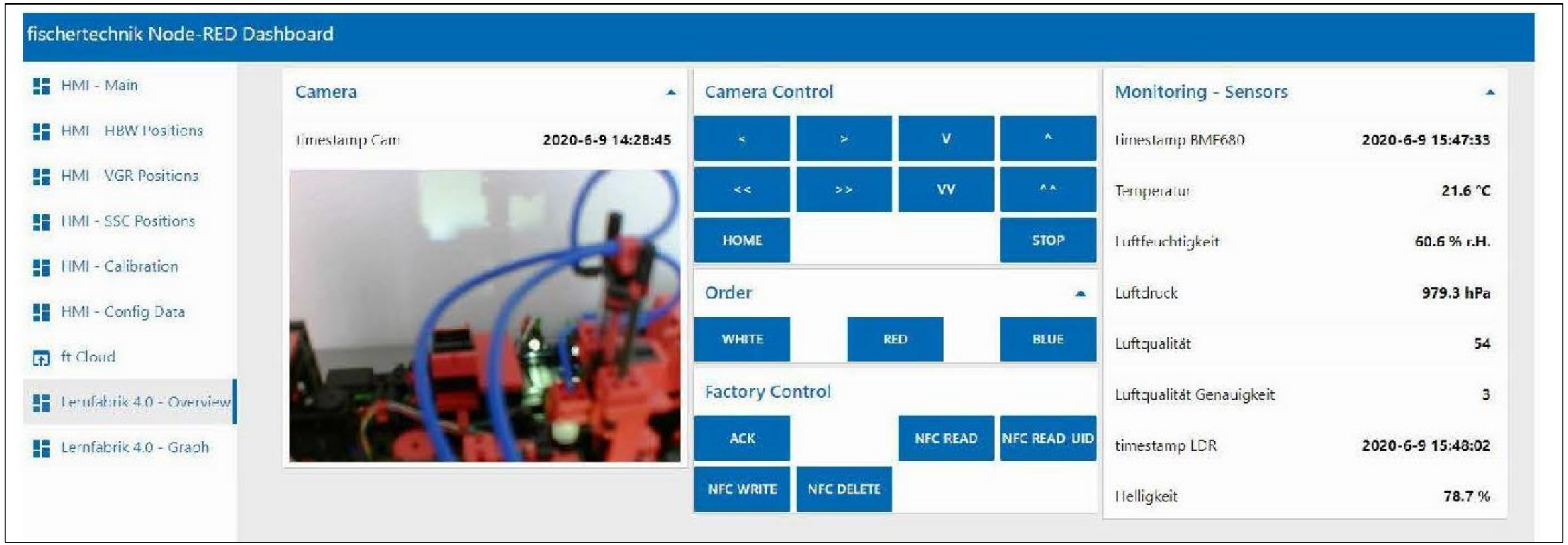


- **Robotics TXT Controller** as MQTT broker/interface to fischertechnik cloud

- IoT gateway via **OPC UA**

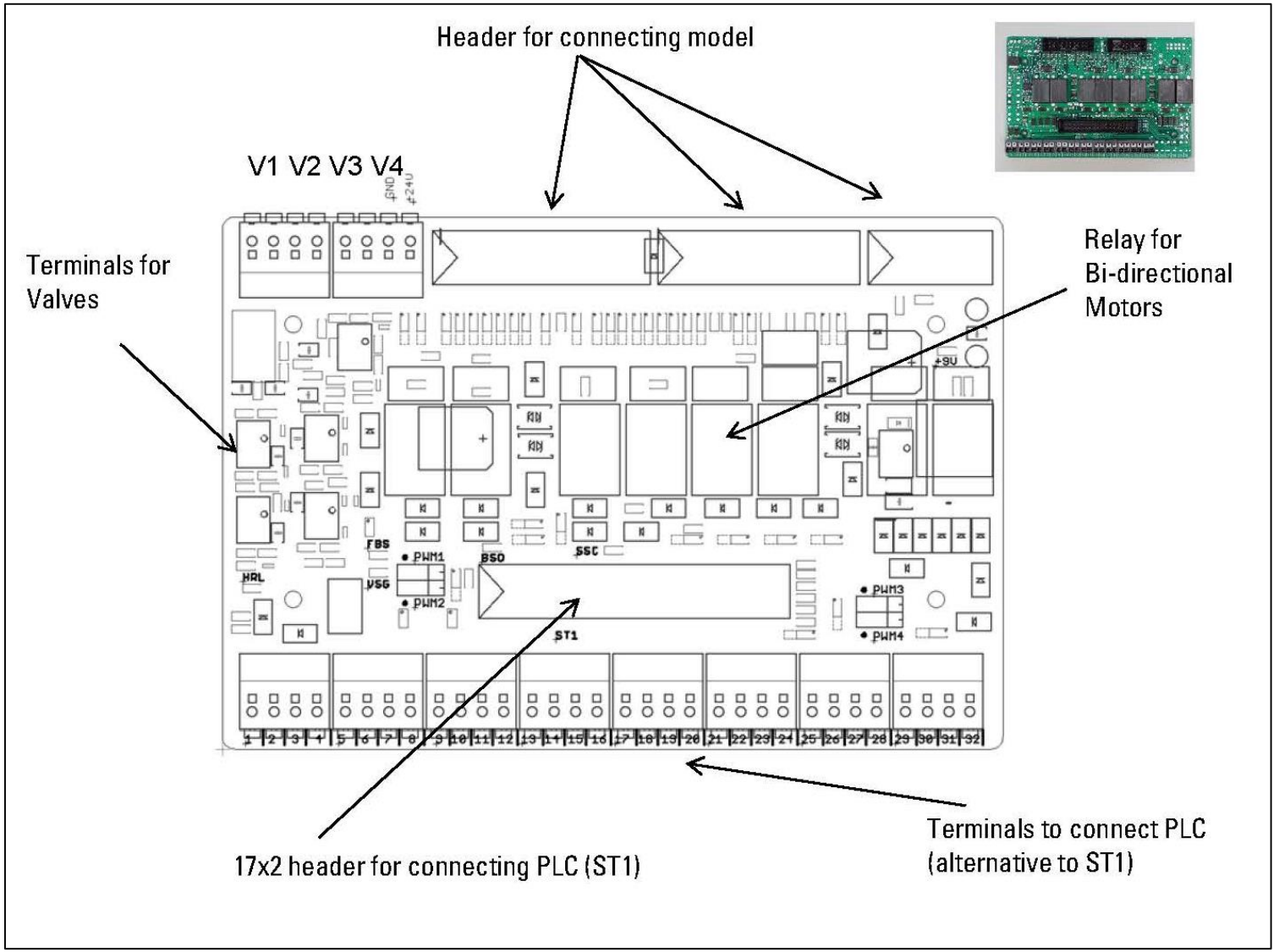
Additional Dashboard Option

- IoT Gateway using **Raspberry Pi**
- Display data and calibrate stations in a **Node-RED** dashboard.



New 24V Adapter Board

- Control speed of encoder motors via **PWM** (Pulse Width Modulation)
- Push/Pull output stages for phototransistors and buttons

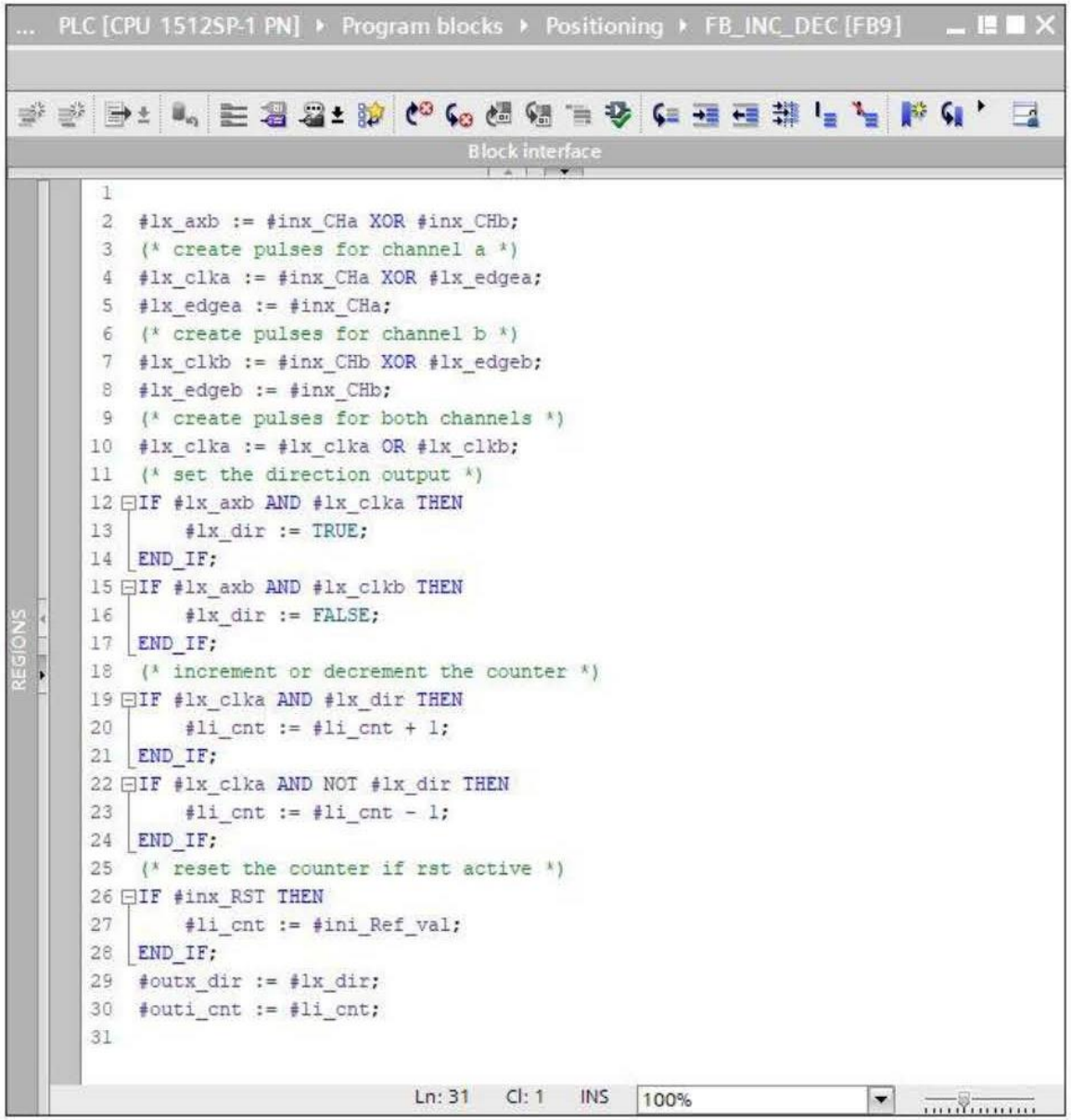


Incudes Sample Program

- **Structured Text (ST)** program, for use with **Siemens S7-1500** PLC

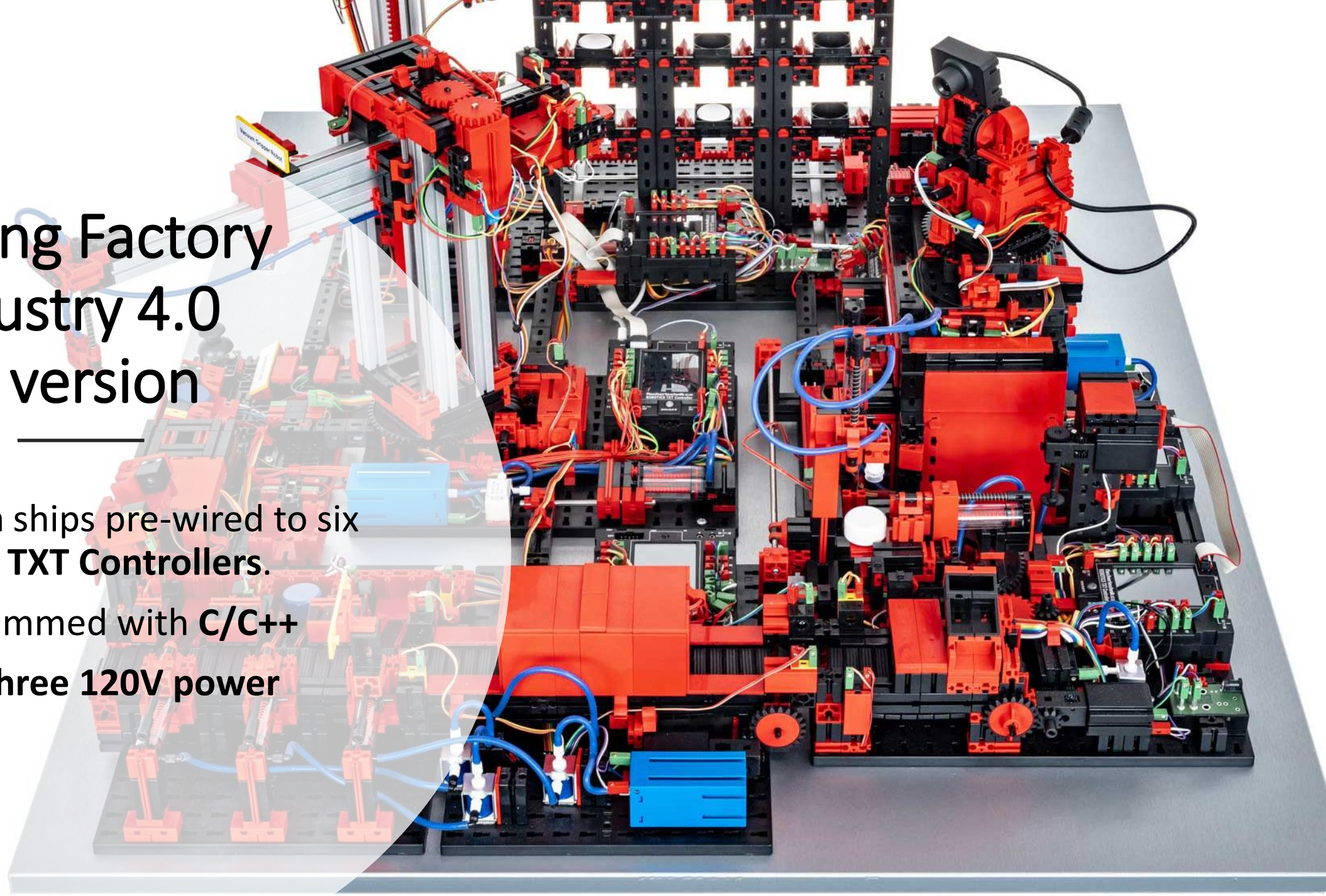
- Easily modified for other PLC makes and models

- Program and source codes available for download from **Github**

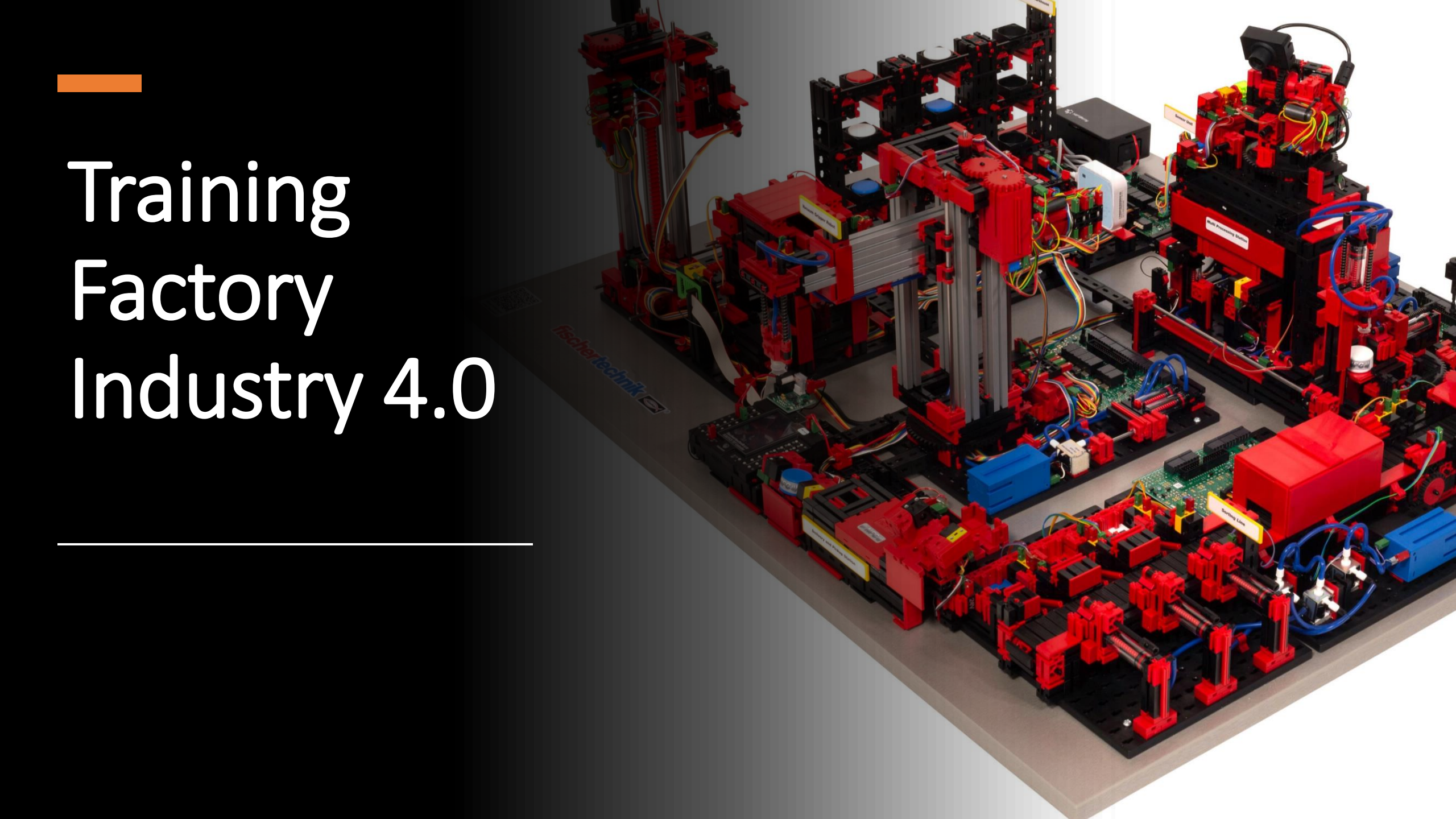


Training Factory Industry 4.0 9V version

- **9V version** ships pre-wired to six **ROBOTICS TXT Controllers**.
- Pre-Programmed with **C/C++**
- Requires **three 120V power adaptors**.

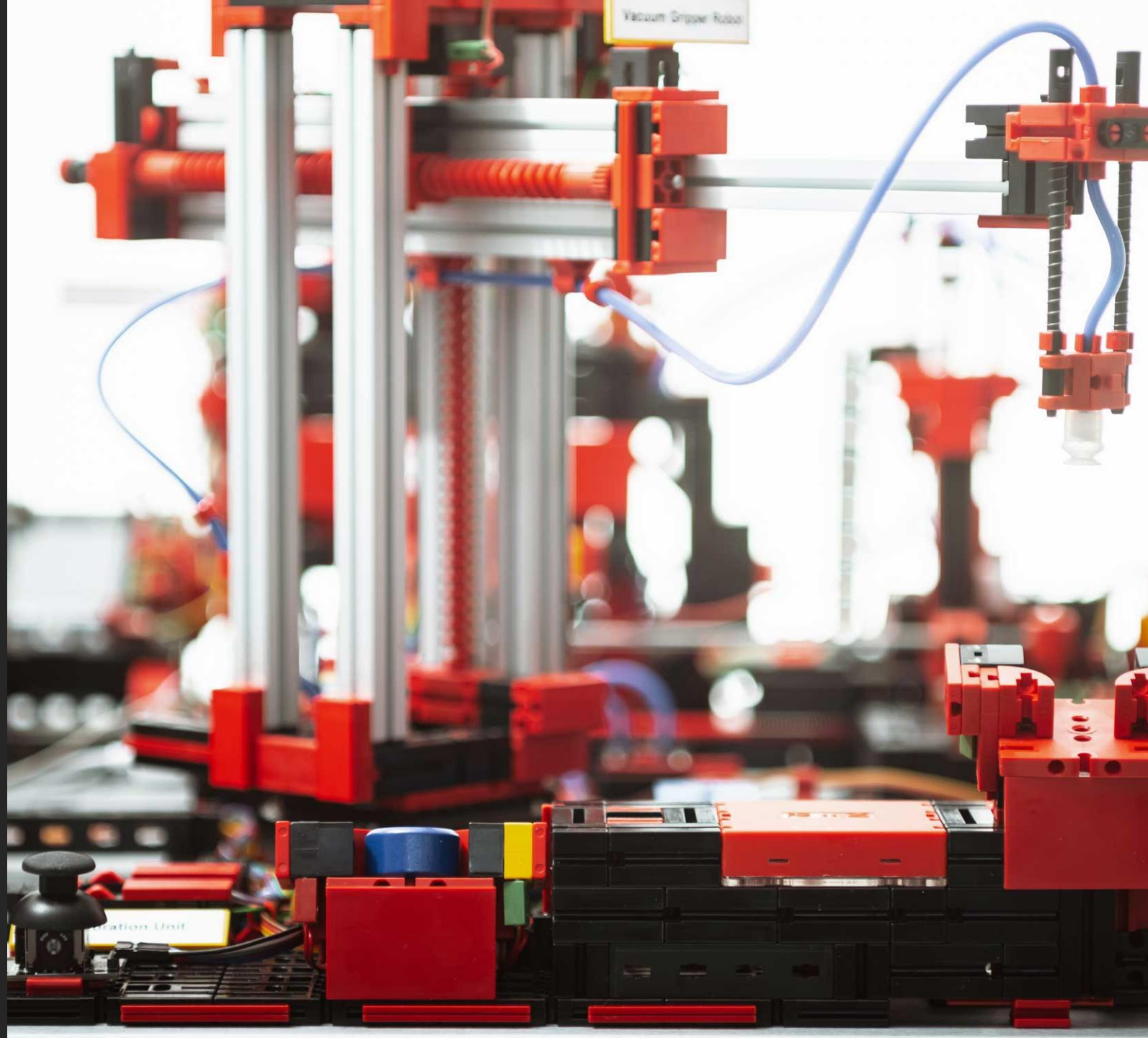


Training Factory Industry 4.0



So…how much do they cost?

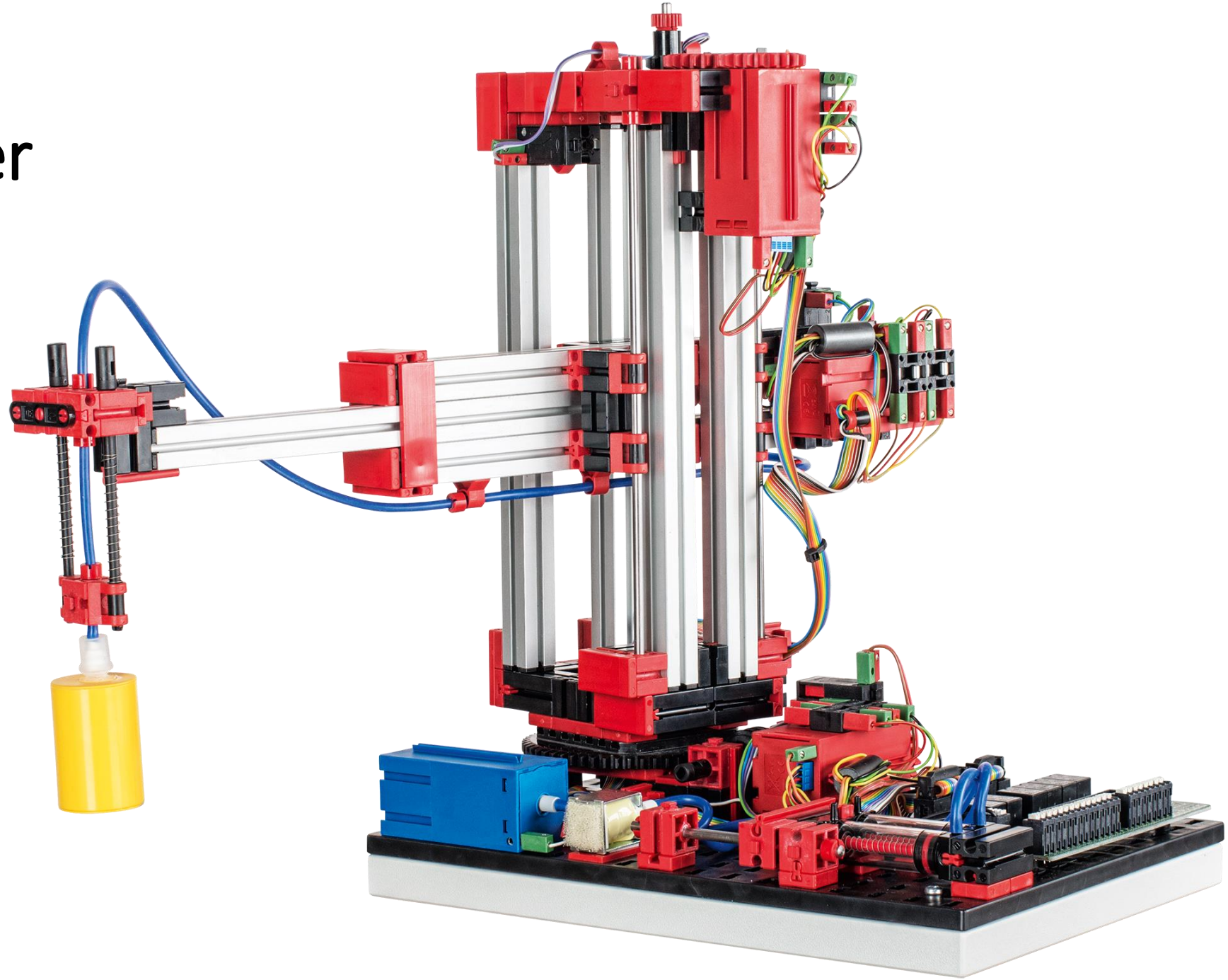
Let’s review with pricing…



Vacuum Gripper Robot

- 24V version - #536630
  $974.00 each

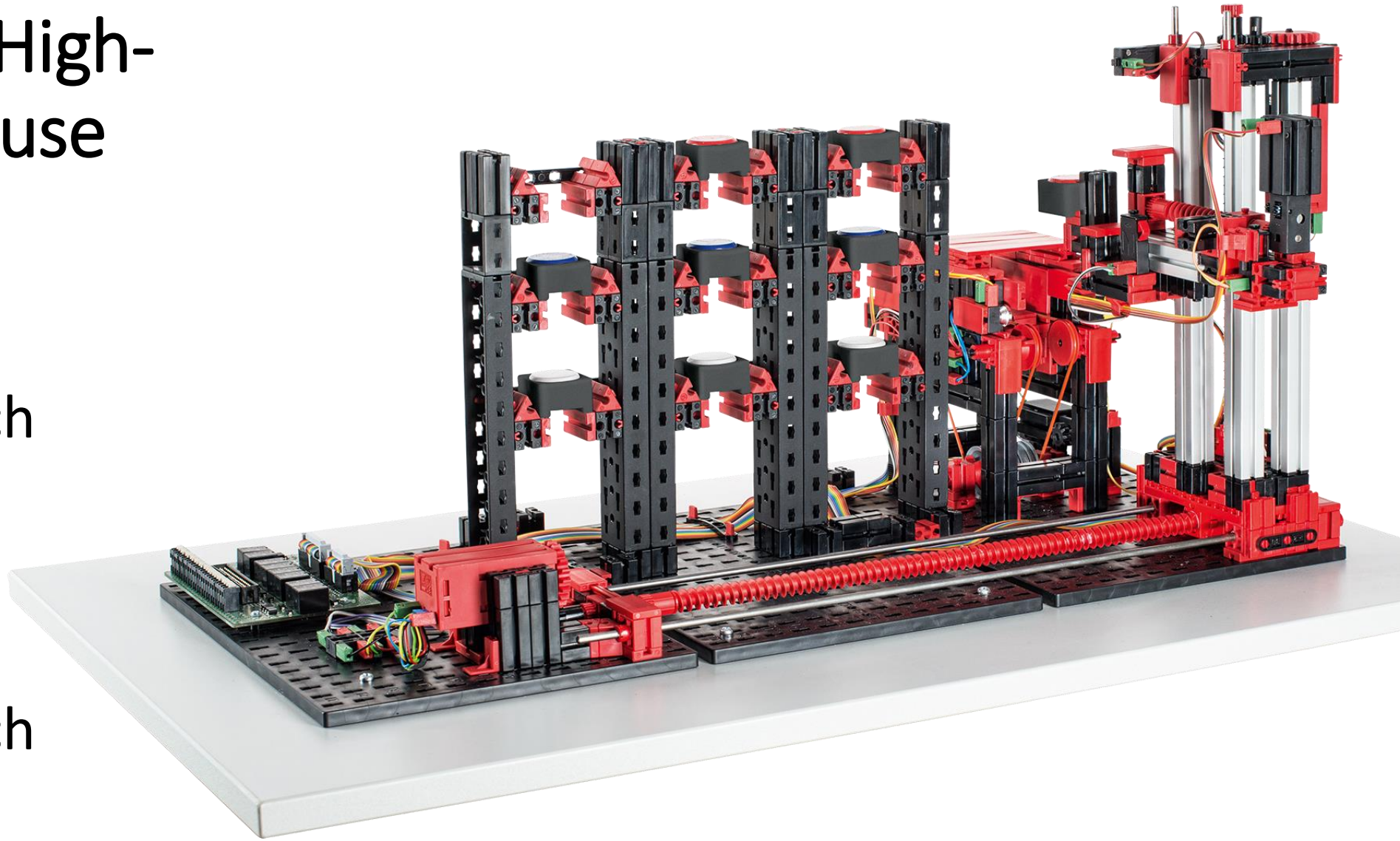
- 9V version - #536625
  $1199.00 each



Automated High-Bay Warehouse

- 24V version - #536631
  $1099.00 each

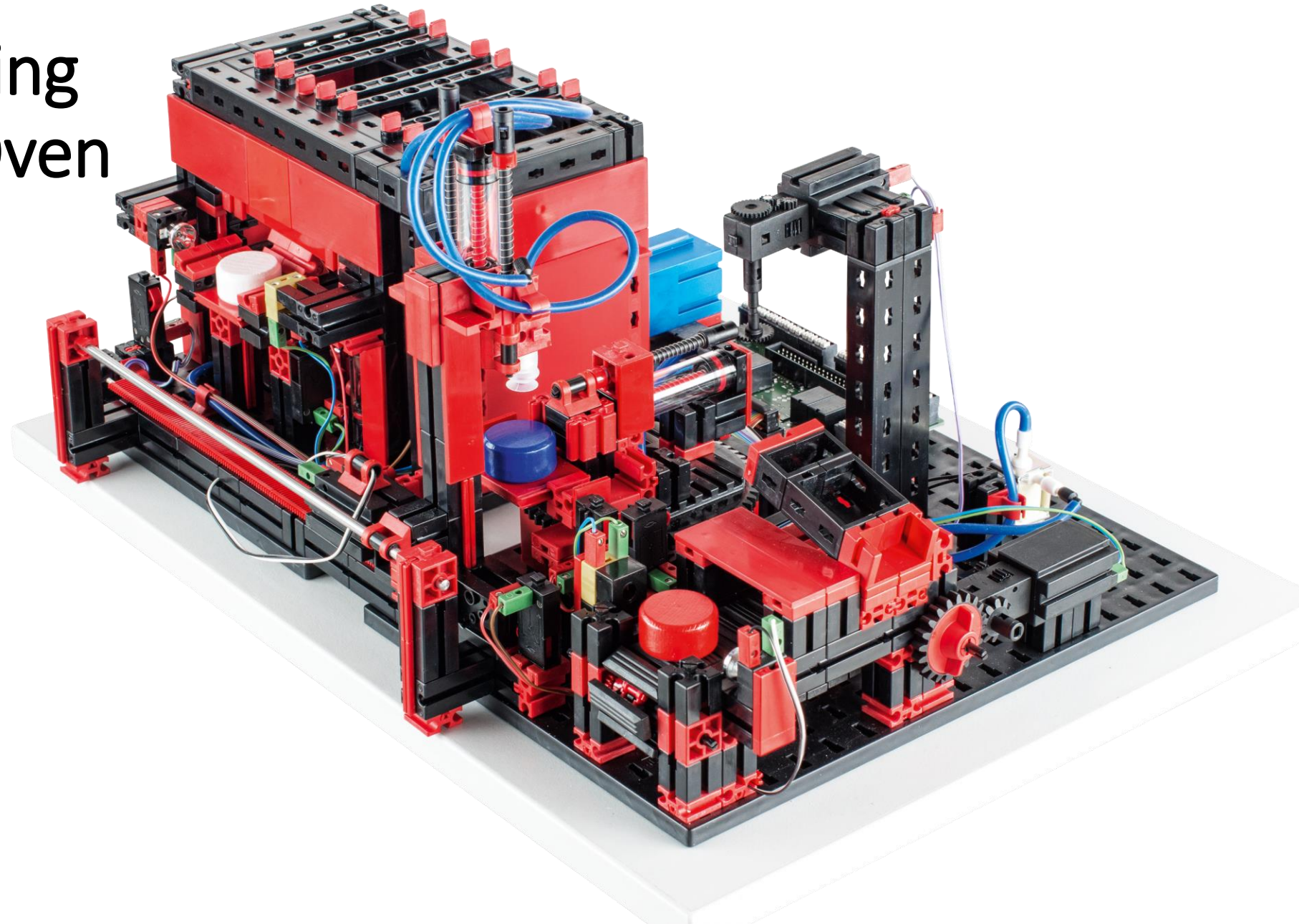
- 9V version - #536626
  $1319.00 each



Multi-Processing Station with Oven

- 24V version - #536632
  $999.00 each

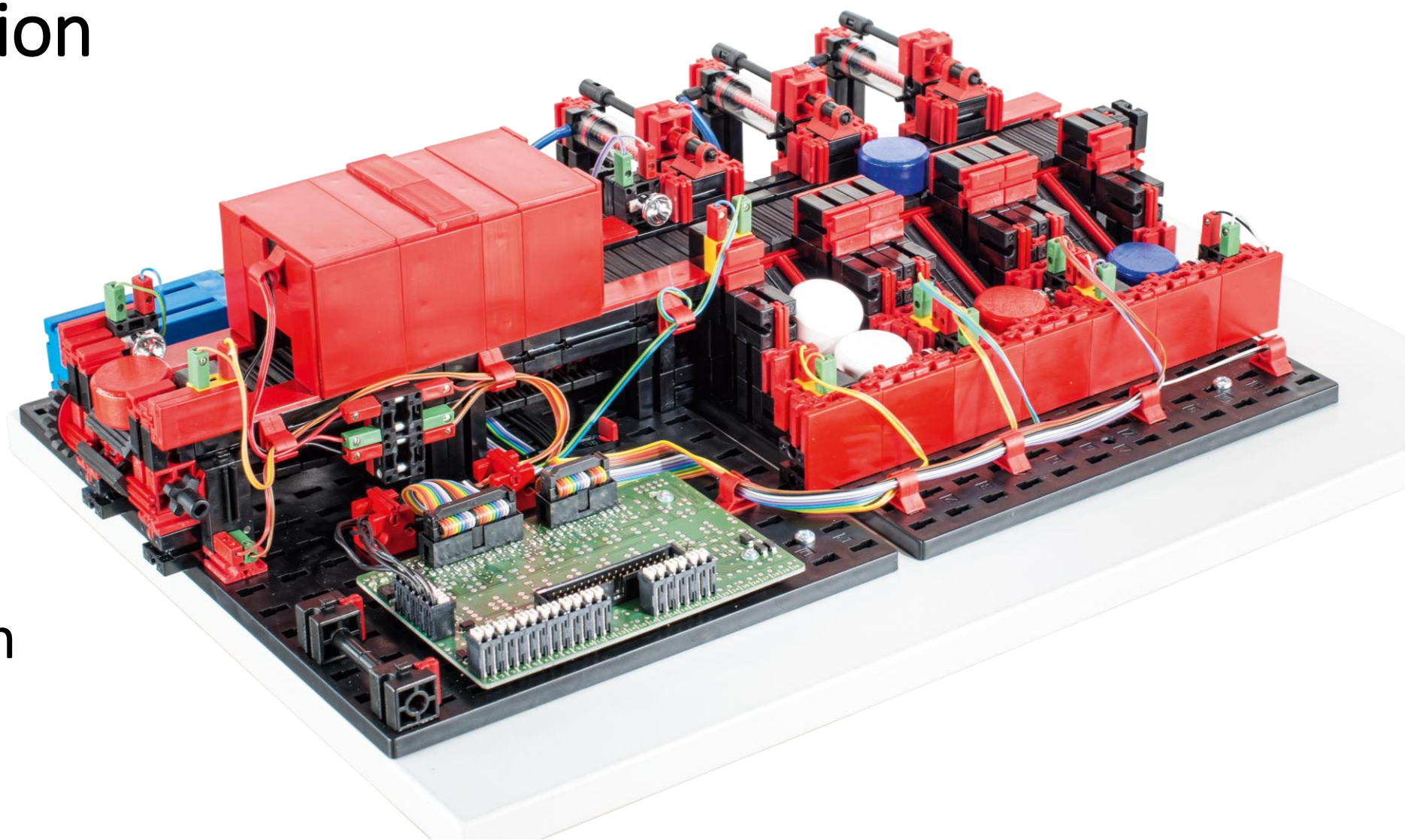
- 9V version - #536627
  $1479.00 each



Sorting Line with Color Detection

- 24V version - #536633
  $836.00 each

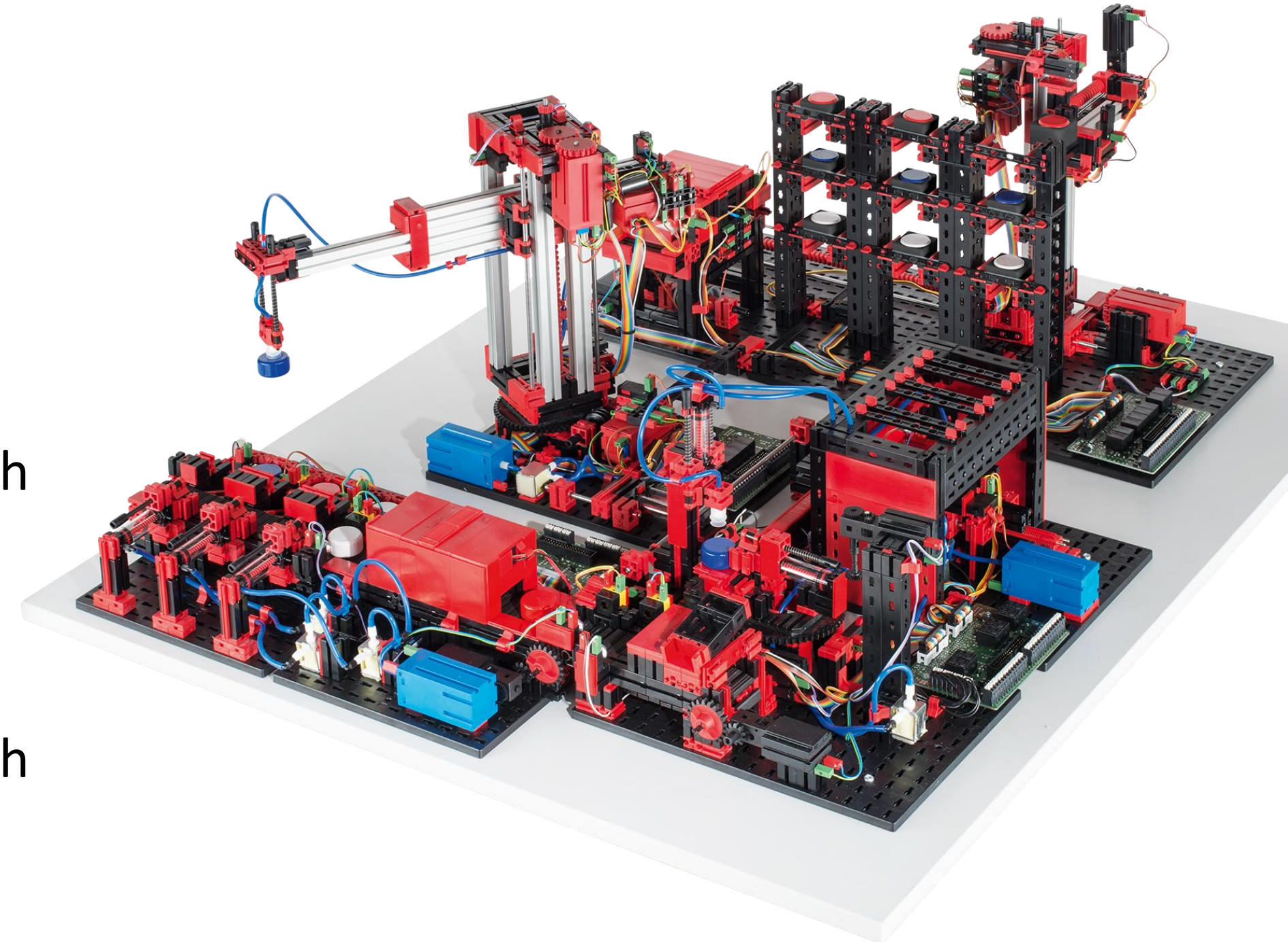
- 9V version - #536628
  $1129.00 each



Factory Simulation

- 24V version - #536634 **$4029.00** each

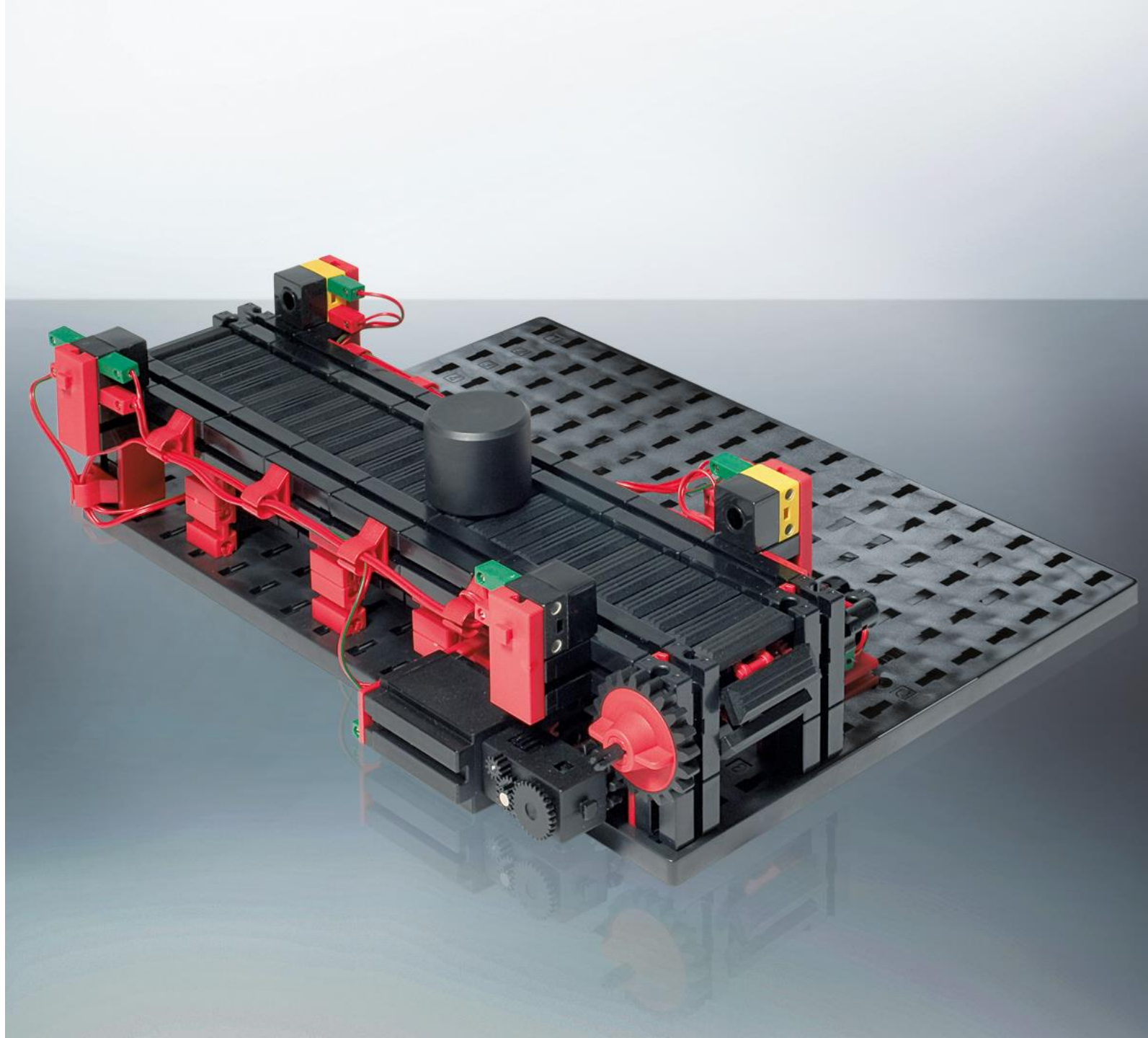
- 9V version - #536625 **$5239.00** each



Conveyor Belt

- 24V version - #50464
  $226.00 each

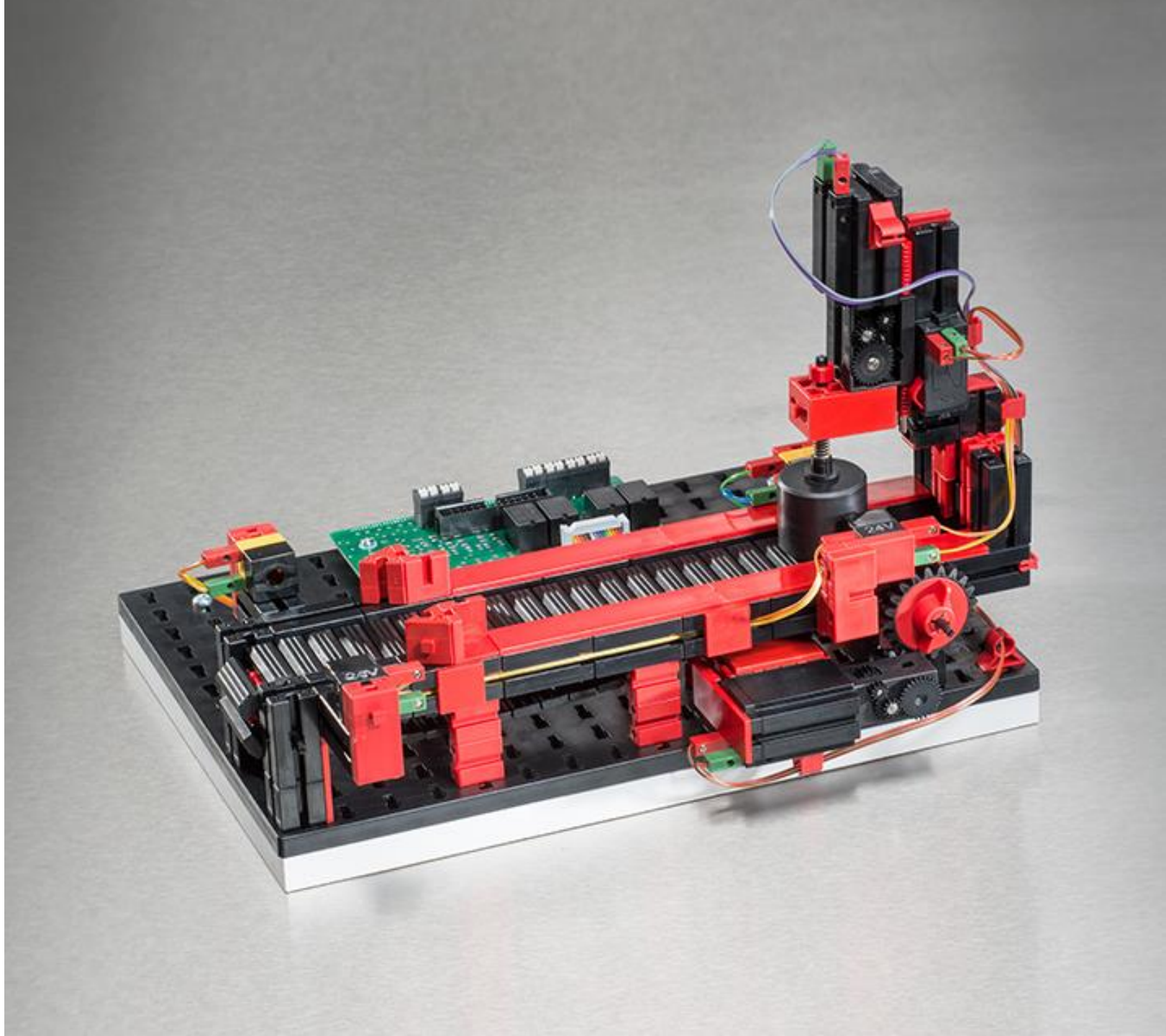
- 9V version - #50463
  $519.00 each



Punching Machine with Conveyor Belt

- 24V version - #96785
  $299.00 each

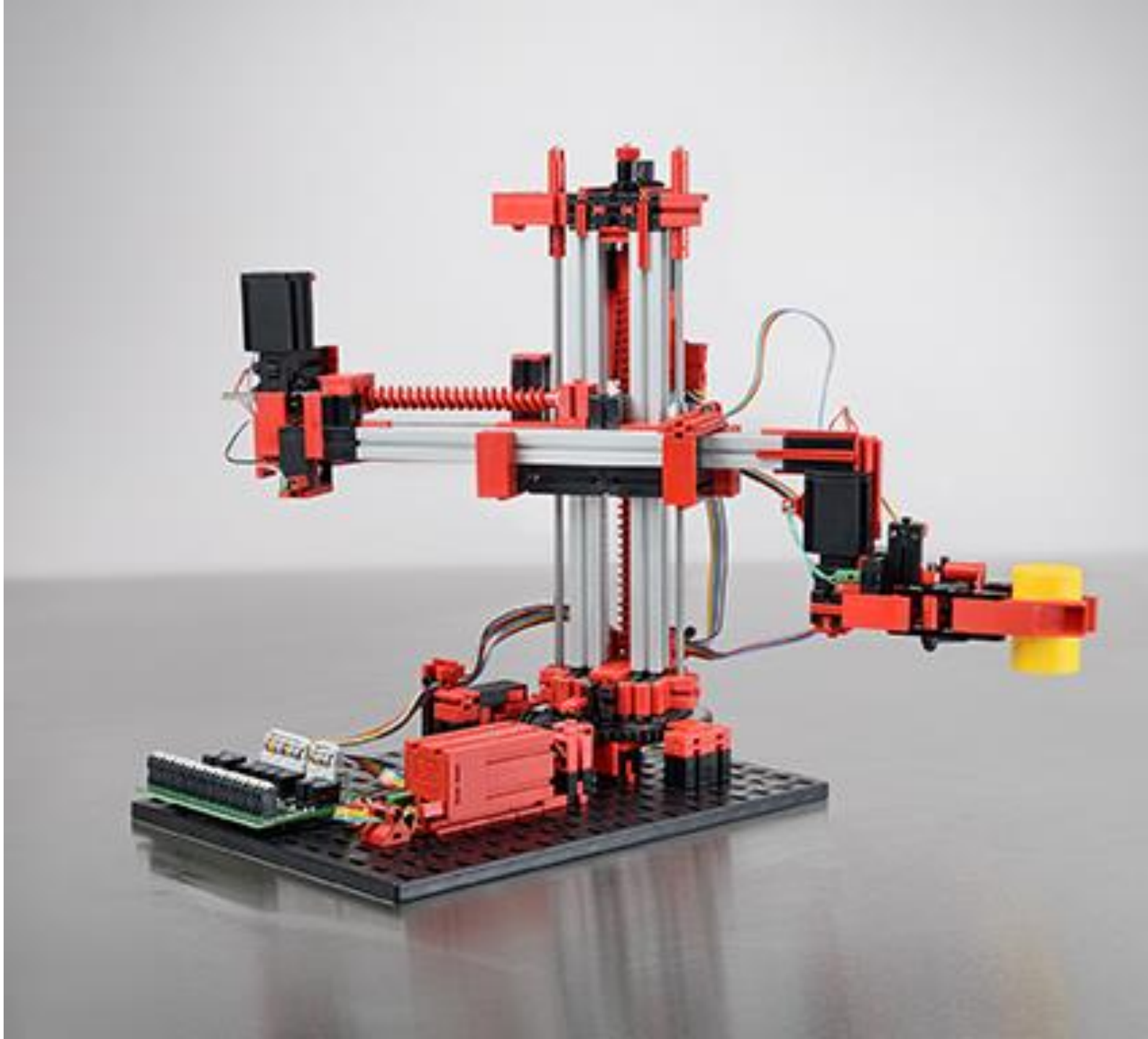
- 9V version - #51663
  $599.00 each



3-D Robot

- 24V version - #511938
  $865.00 each

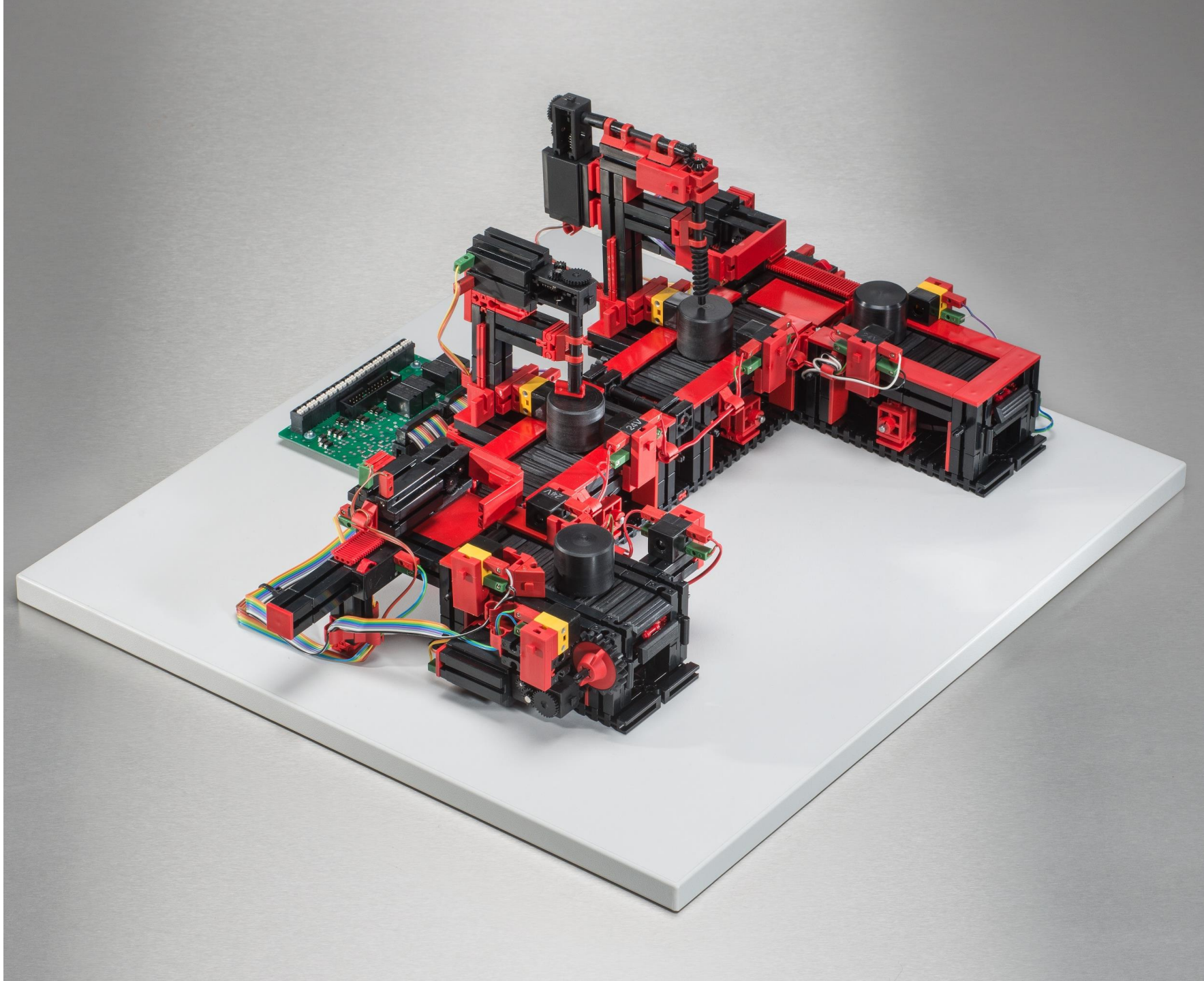
- 9V version - #511937
  $1169.00 each



Indexed Line with Two Machining Stations

- 24V version - #96790
  $869.00 each

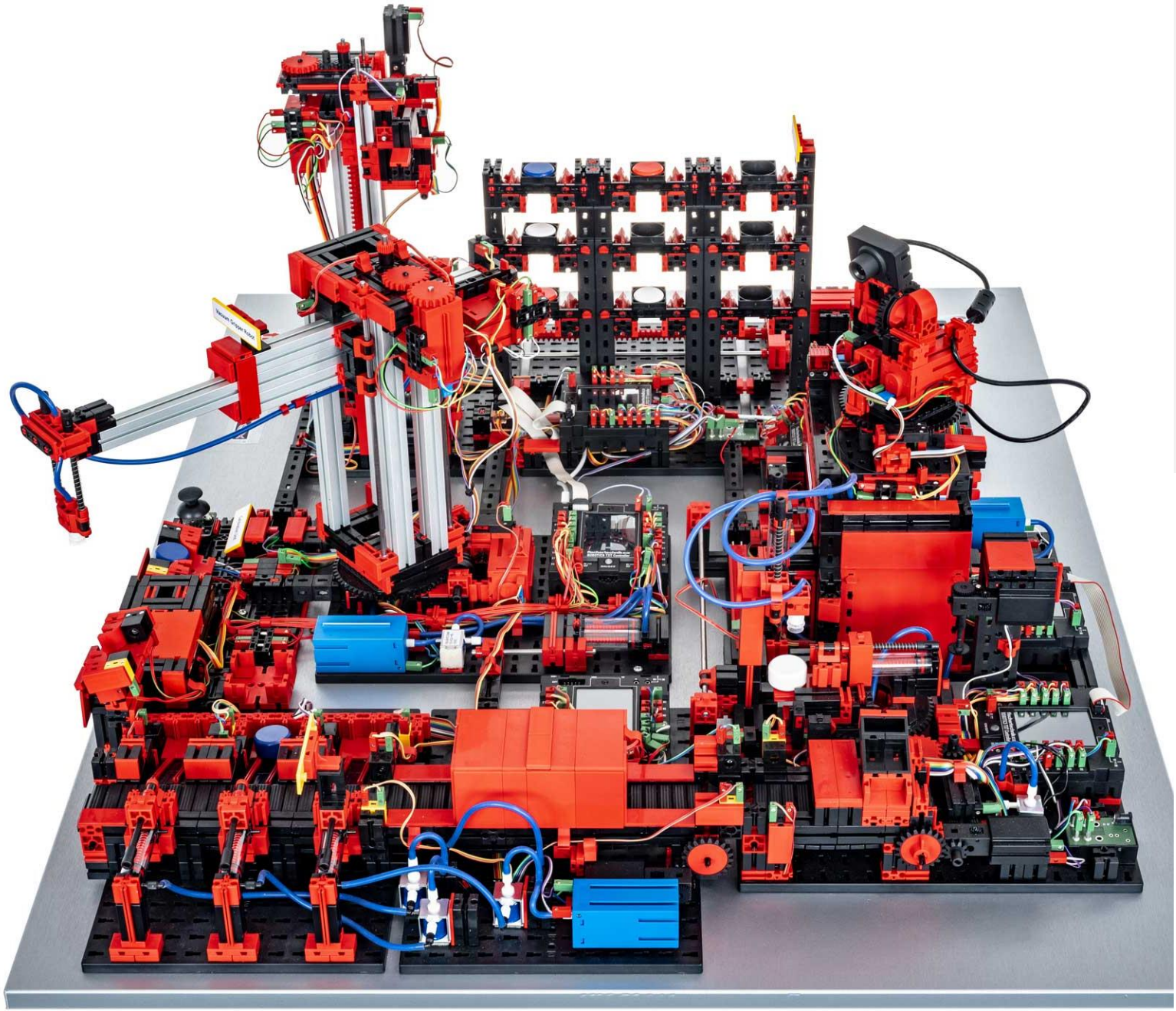
- 9V version - #51664
  $1399.00 each



Training Factory Industry 4.0

- 24V version – #554868 **$7896.00** each

- 9V version - #551584 **$7560.00** each



Other Items:

- **120V Power Adaptors** (for 9V models) - **$12.99** each

- **Travel and Storage Case** – for all **Factory Simulation** and **Training Factory Industry 4.0** models-- #551587 - **$1000.00 each**

Please use the ZOOM Chat Window or Question Window

Taking the Next Step:

- Request a **full-color brochure** and **current pricing**.
- Ask **questions** directly.
- Request a **quote**.
- Speak with your **dedicated educational representative**.
- And more!
- **Studica US (888) 561-7521**
- **Info@Studica.com**
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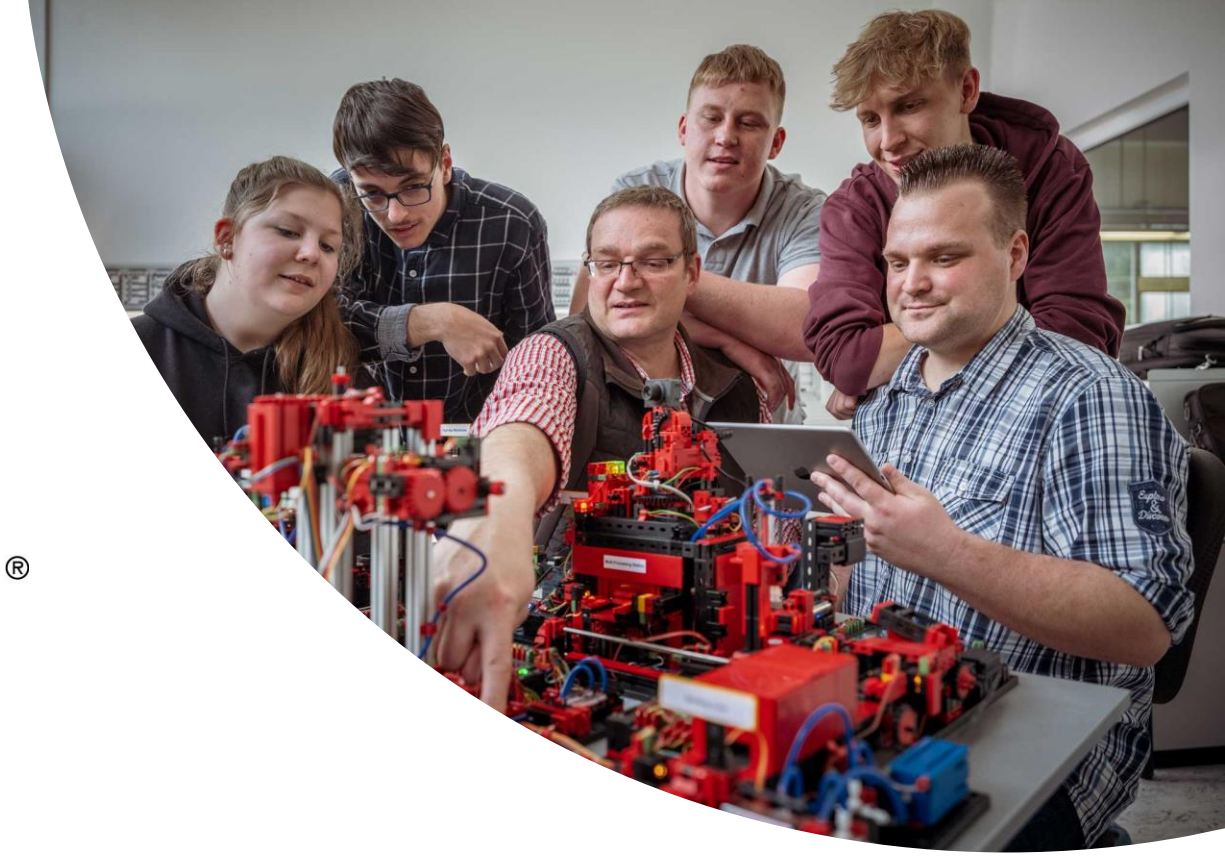

Thank you for attending today's presentation!