



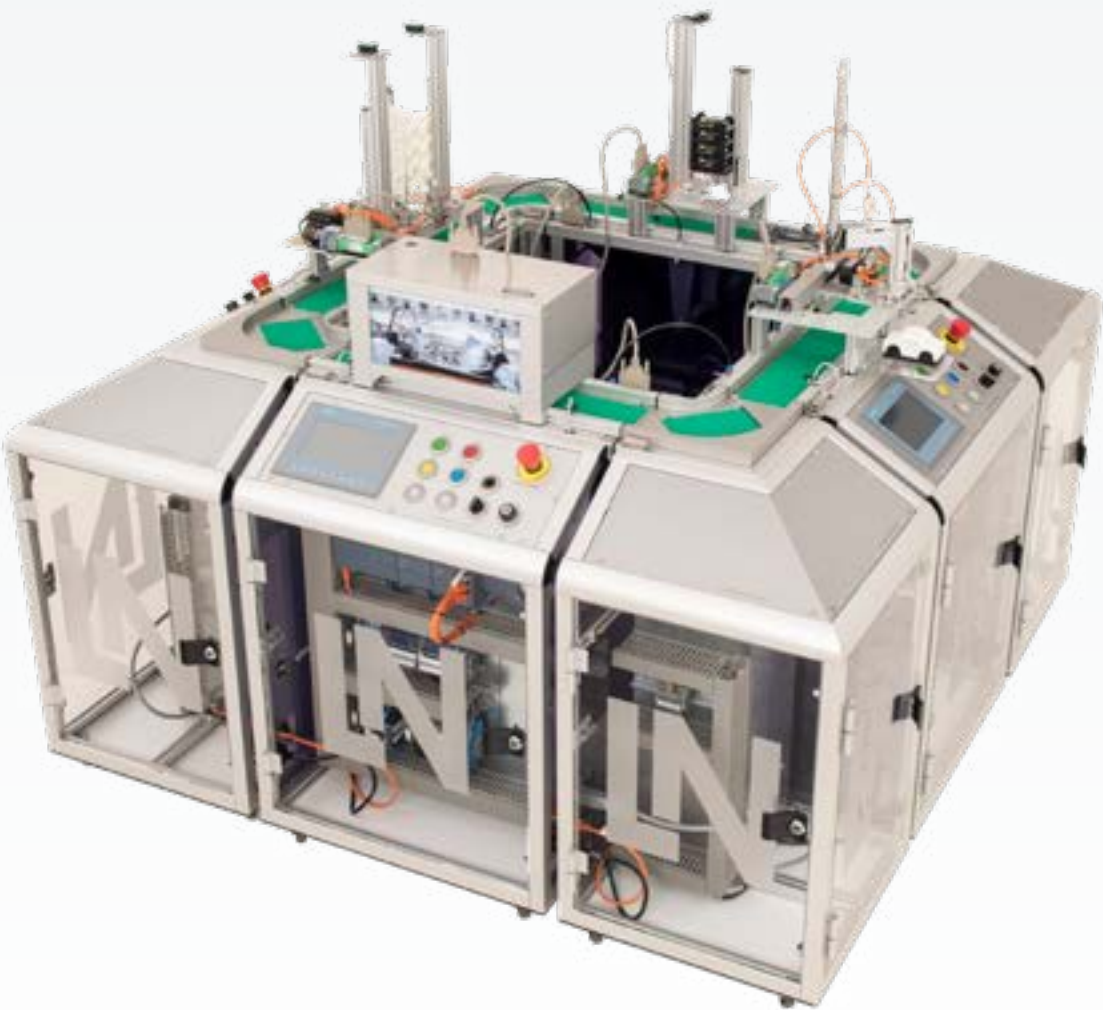
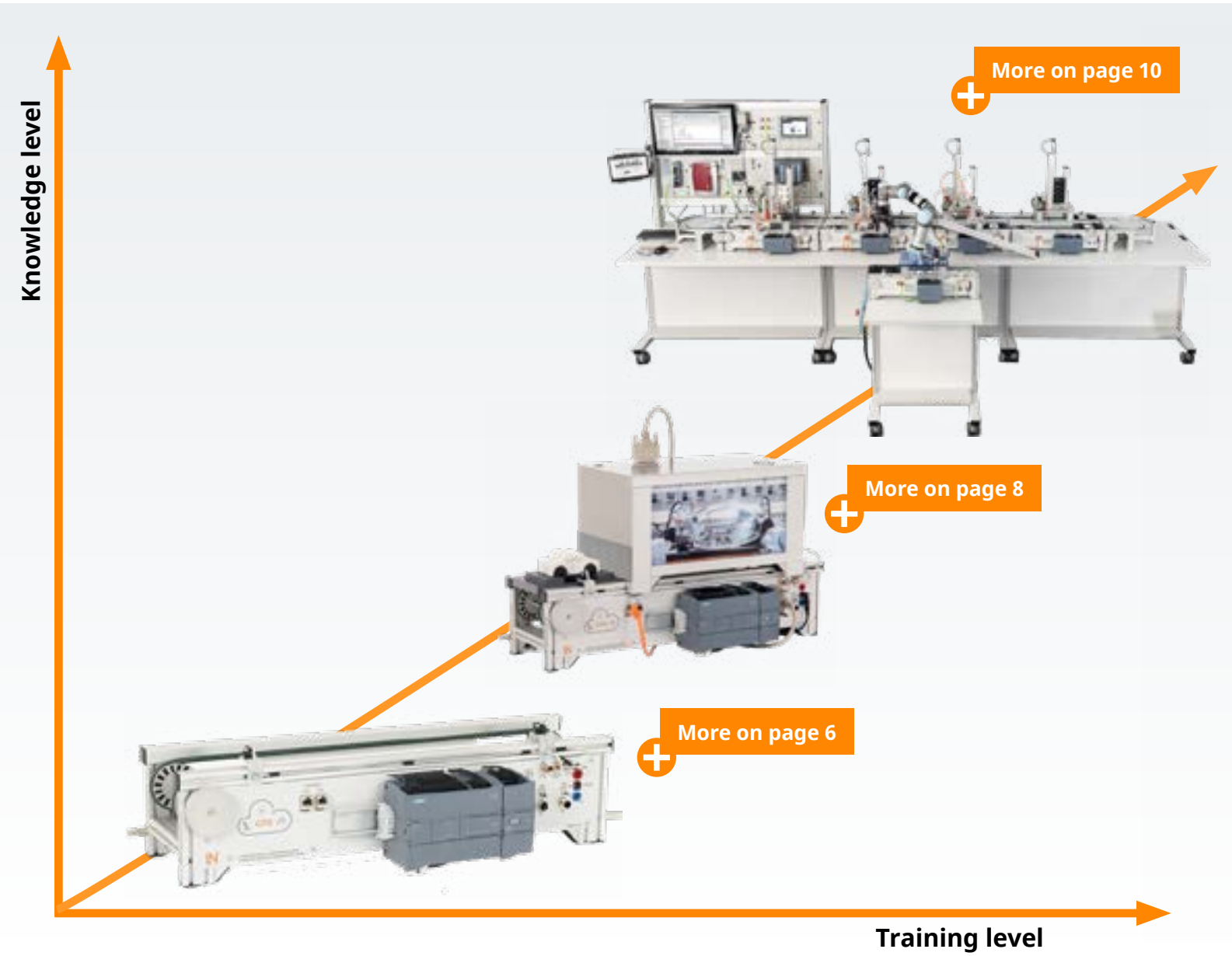
LN

INDUSTRY 4.0 TRAINING SYSTEMS

1st Edition

TRAINING CONCEPT

INDUSTRY 4.0



Lucas-Nülle Training Concept

- Working on the same training system from start to finish
- Increasing degree of difficulty as training progresses
- Individualised equipment configuration to fit your lessons
- The appropriate LabSoft course in digital form for each equipment configuration

LabSoft

- One software for the administration of all your courses
- Courses with graphic presentations and practical exercises covering every topic
- Learning level monitoring and statistics
- Create your own courses or use and edit courses that we provide
- Create and administer your own questions, measurement tasks, tables and diagrams

Modern factories have many defining features in terms of both the hardware and the software they use. For example, many highly automated manufacturing facilities have industrial robots and more and more frequently also **collaborative robots**, or so-called "cobots." Technicians service the machines using **Augmented Reality**. Sensors communicate with controllers using ever more intelligent protocols such as **IO-Link**. Even the products produced contain more and more information, which is stored on **RFID tags** and/or shared directly with the **ERP** via WiFi. That information and much more is analysed and used in powerful software systems: the ERP systems. This makes it possible to automate the manufacturing of individualised products according to customer wishes right down to **batch sizes of one**.

The **Industry 4.0** plants from Lucas-Nülle use these technologies. Prepare your students for what awaits them in the industrial world, Industry 4.0.

ERP LAB



+ The webshop is part of the ERP system. The programs, databases and interfaces used are open source and freely configurable.

+ Receive information about orders, finished products and the status of the plant.

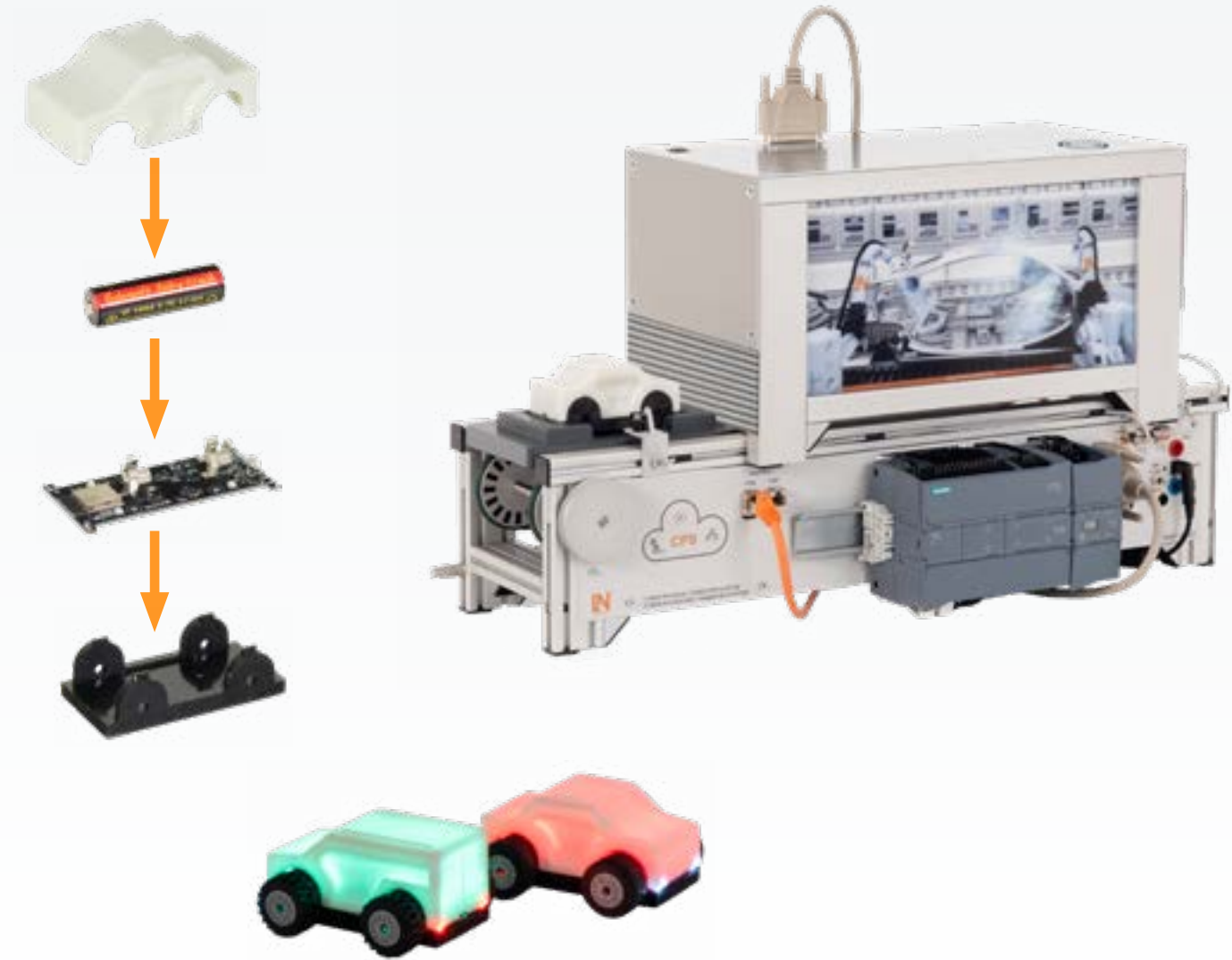


Whether 3D printing, production or intelligent manual workstation: the centrepiece is the ERP Lab. The ERP Lab networks all the modules of your laboratory together. Through the use of OPC-UA, additional devices such as sensors and robots can be integrated and addressed.

The didactic structure, the **open source** programs used, and the course software supplied with the system provide for a solid understanding of the topic and enable you to configure and expand your plants according to **your own needs**.

- Benefits**
- **ERP:** Set up new products, collect and monitor your plant's data
 - **MES:** Configure your plant or expand it with your own devices
 - **SCADA:** Monitor the condition of individual components in real time
 - **Webshop:** Use the OpenCart webshop to order your configured products
 - **Analyser:** Graphic overview of accrued sensor data
 - **AR:** See machine conditions and product information in Augmented Reality

CAR PRODUCTION



Manufacture individual and versatile products on your production line. Each car is made of a chassis, a PCB, a battery and a body. The PCB contains multiple LEDs, which make it possible to individually colour the body after passing through the painting station. To save energy, an integrated sensor is used to activate the PCB at the start of production. A charging station with practical USB-C connection is provided for recharging the batteries.

Networking with the ERP

The PCB links via WiFi to the ERP system of your production plant. You specify the body colour and model via the webshop. After production, use the ERP Lab to test the lights and the horn.

IMS CONVEYOR BELT SYSTEM



Conveyor Belt System

On the front of the system, there is a freely programmable **Siemens PLC**, which takes charge of controlling the module. Along with various digital sensors and the motor that drives the belt, the belt has an **IO-Link** master module used to connect an **RFID** read/write device. Additional intelligent sensors can be connected. Via the 25-pin D-sub connector, the PLC can control the different workstations (see pp 8 and 9). Two Ethernet ports are available to serve as a communication interface.

Industrial Mechatronics Unit

The Industrial Mechatronics Unit expands the functions of the conveyor belt system with the addition of a large control panel. The electrical cabinet provides room for various other hardware. The system was developed to make it even easier and faster to set up and reconfigure the plants. Compressed air supply, communication and power supply are even easier to install, for example.

INDUSTRIAL MECHATRONICS UNIT IMU



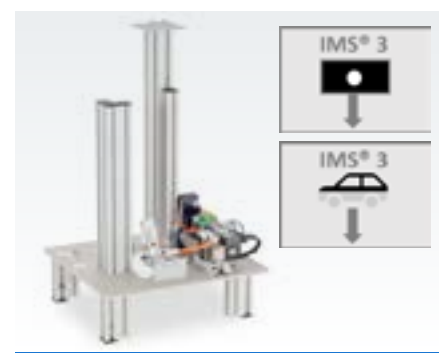
Benefits of the IMU

- Control panel with HMI
- Programmable emergency stop
- System can be locked with a key
- Status display via LED strips
- Flexible hardware configuration
- Locking door
- Air pressure connection and air flow in frame profile
- Connection of multiple systems via quick release couplings

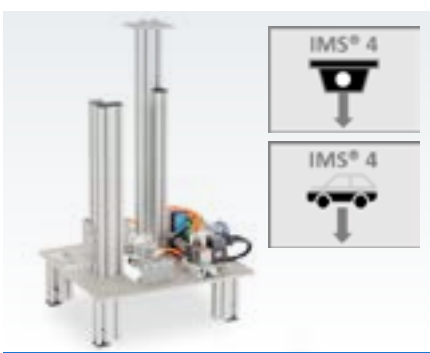
Learning content of both devices

- PLC programming with TIA Portal
- Read-out of digital sensors
- DC motor control via PWM signals
- Working with intelligent sensors via IO-Link
- Profinet

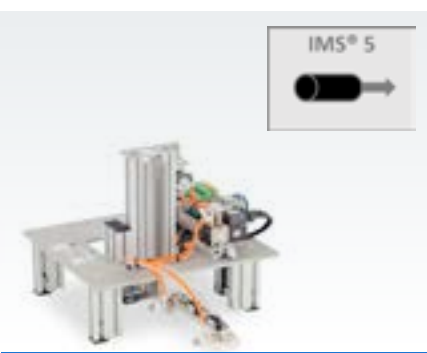
SUBSYSTEMS AT A GLANCE



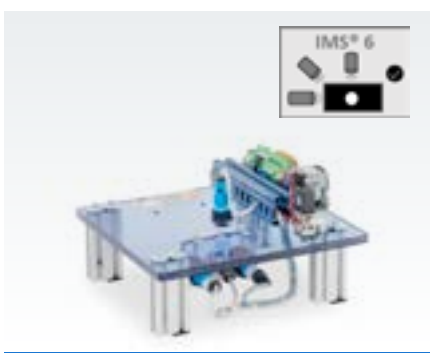
IMS® 3 Station Sorting



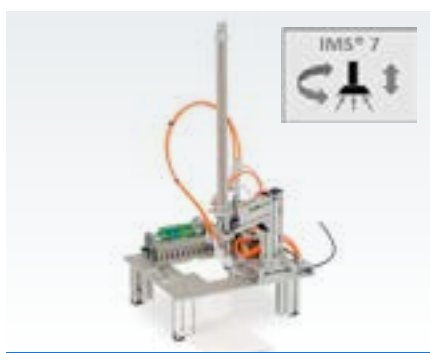
IMS® 4 Station Assembling



IMS® 5 Station Processing



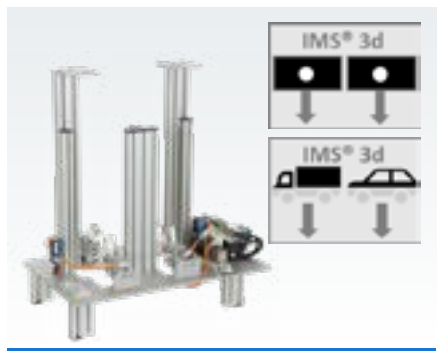
IMS® 6 Station Testing



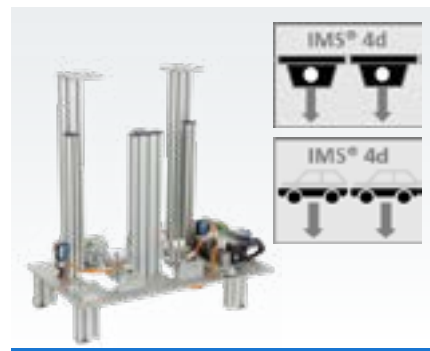
IMS® 7 Station Handling



IMS® 8 Station High Bay Warehouse



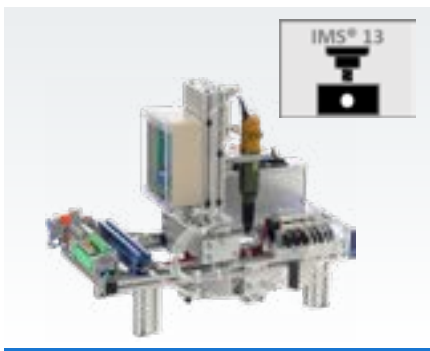
IMS® 3d Double Station Sorting



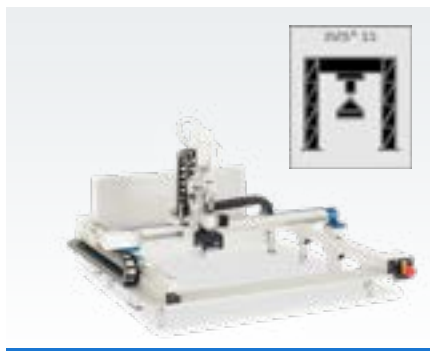
IMS® 4d Double Station Assembling



IMS® 5d Double Station Processing



IMS® 13 Station Drilling and Milling



IMS® 15 Station Portal Robot



IMS® 16 Station Painting

Modularity
The modularity of the system enables many combinations and project variants. Adapt the arrangement and the complexity to your needs and to the conditions of the specific lesson. The robust construction of the stations ensures trouble-free set-up and disassembly of a plant. The conveyor belt including power supply are connected via a SUB-D connectors.

Compatibility
The stations are compatible with both the IMS conveyor belts and the IMU units and can be used for both car production and block production.

Industrial and practical
Nearly all components are industrial components. As a result, trainees will soon feel right at home in professional life.



IMS® 17 Station Labelling

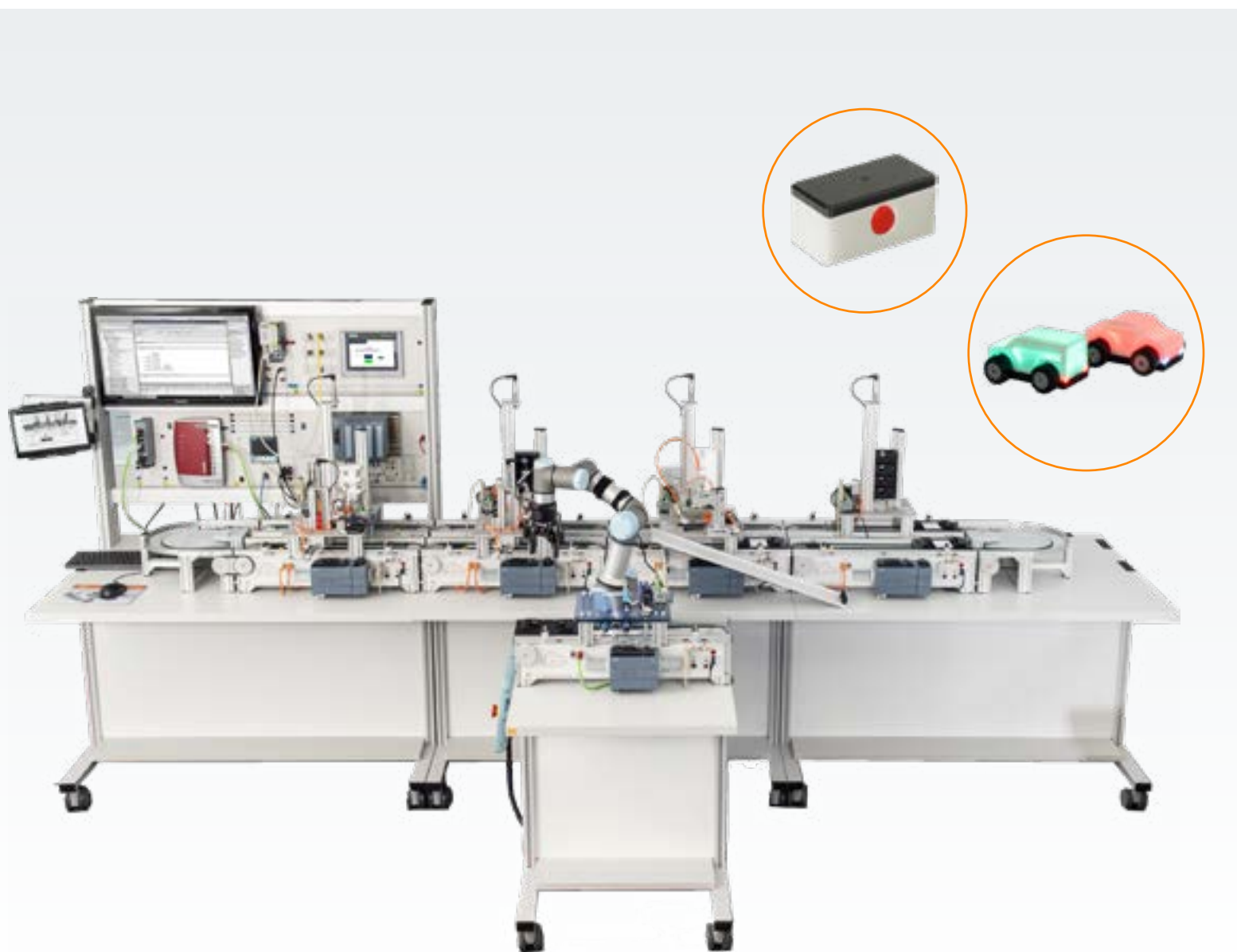


IMS® 18 Station Camera Inspection



IMS® 19 Station Camera Inspection with AI System

CBP AND CCP PRODUCTION LINES



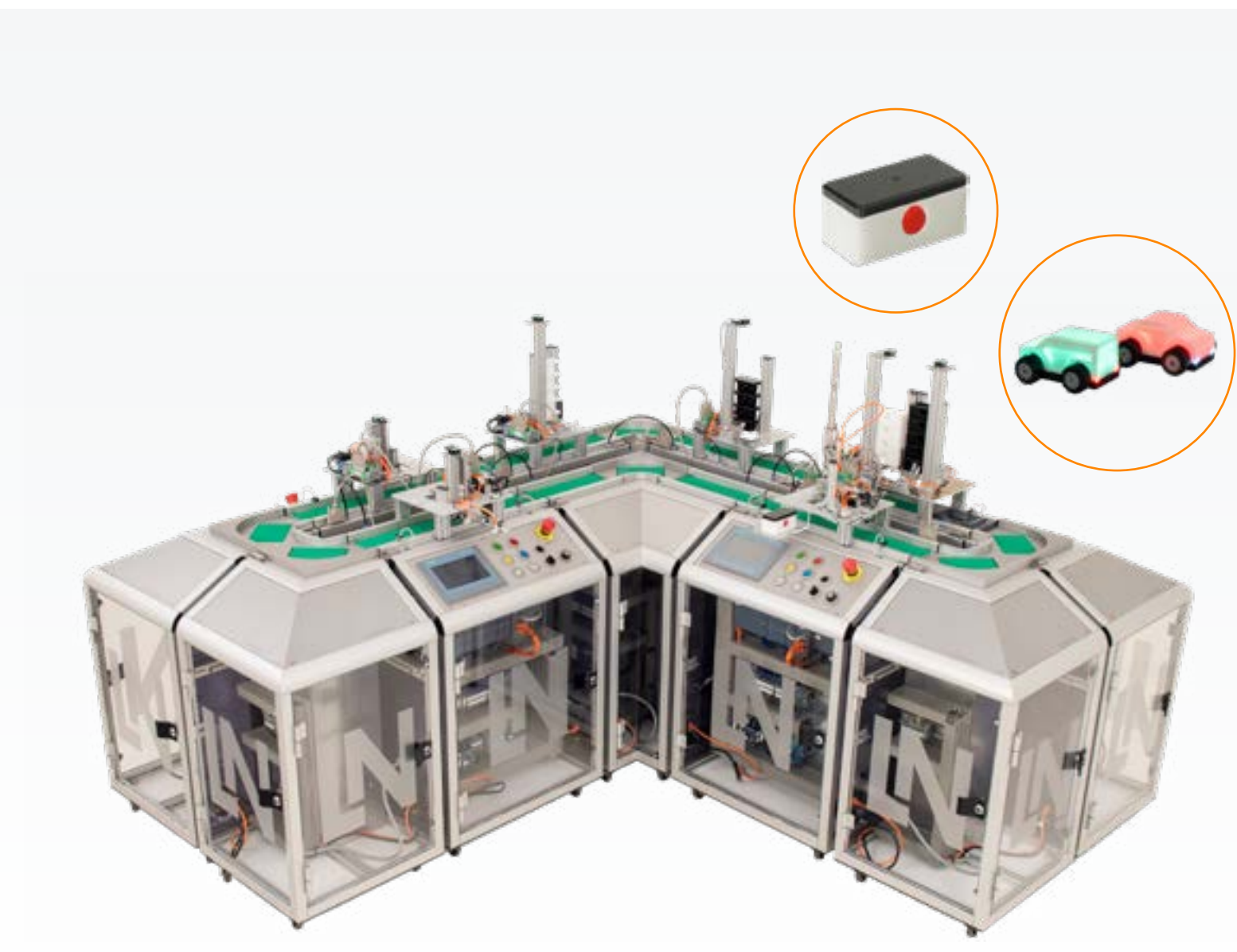
Manufacturing plant

The production lines are created by connecting individual modules together. Use the handy conveyor belt system (IMS) or the unit in the industrial design (IMU) here as the basis for your plant and produce a wide range of variants of the individual car and block products.

From subsystem to industrial plant

Getting started on vocational and advanced training with a complex production line can be a long and tiresome process. **Modularise** the system into separate workstations to teach the fundamentals. Network the conveyors via Profinet to operate as a complete plant. Operate the plant in conventional Industry 3.0 production mode. Add the ERP Lab to create an Industry 4.0 level network.

UBP AND UCP PRODUCTION LINES



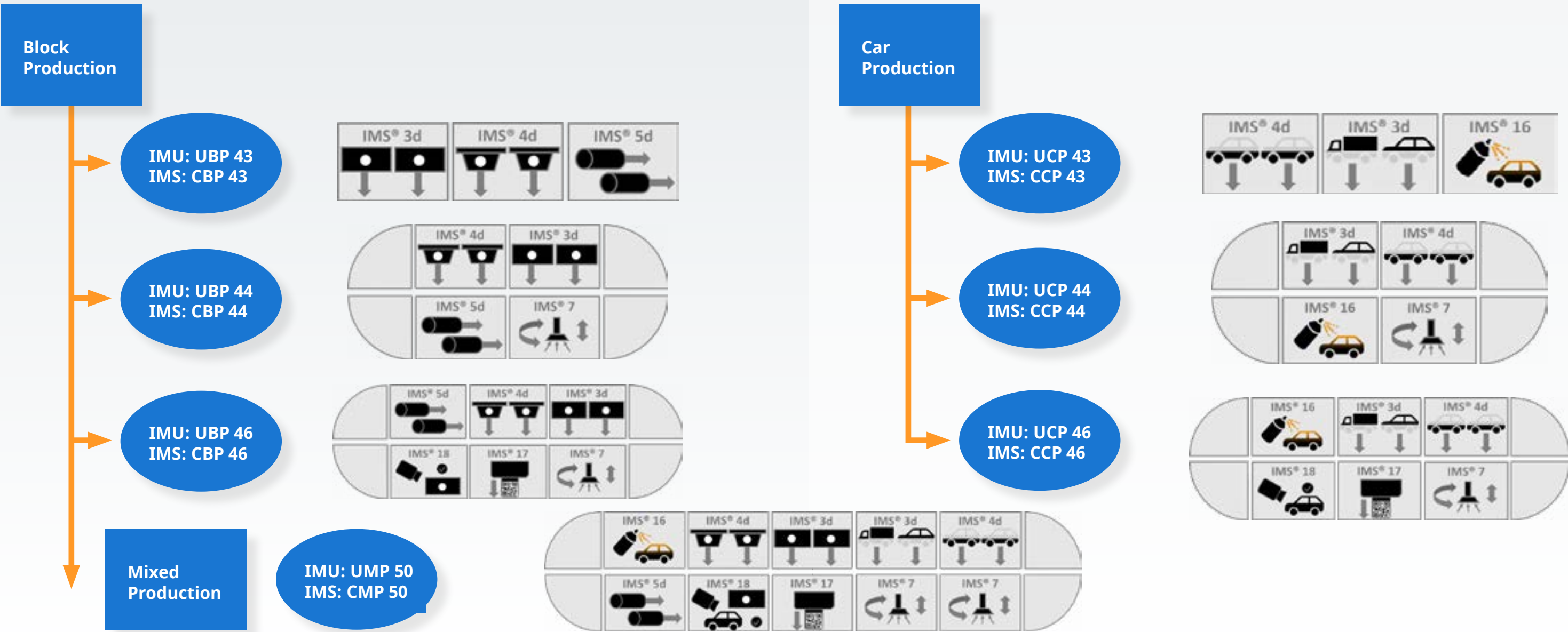
Expansion options

The modularity of the system makes it very flexibly expandable and able to meet your every need. Whether connecting an **automated guided vehicle (AGV)**, integrating **Augmented Reality (AR)** or using an **intelligent manual workstation** to increase the number of variants, there is no limit to the potential level of complexity.

Benefits

- Equipment variants for every budget
- Provide instruction using systems with industrial components and standards
- High degree of modularity
- Rapid set-up and disassembly
- ERP, OPC-UA, Profinet, PLC
- Accompanying course software for each sub-topic

INDUSTRY 4.0 EQUIPMENT CONFIGURATIONS



Starting out small

There are Lucas-Nülle production plants in sizes and configurations for every need and every budget. With just 3 conveyors, you can already start out with a full-fledged production line for blocks or cars with a wide range of variants. Operate your plant conventionally via PLC using Profinet or as a network with ERP Lab. Add small lines step by step with additional stations for ejection, labelling or quality control.

Blocks or cars? Both!

If you already have a block production line, then with just one additional station (Painting) you can convert to car production or set up a new manufacturing operation to produce both blocks and cars.

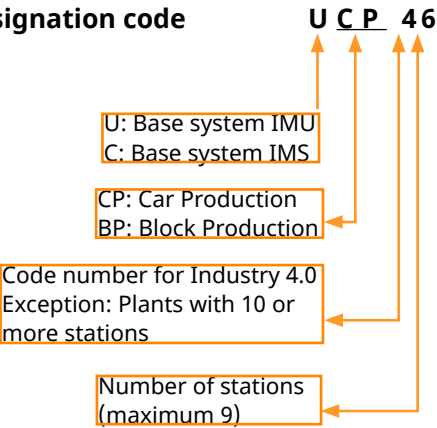
One ERP system for all configurations

Configure all of the equipment variants shown here and other configurations in the same ERP system. Your existing plant can be expanded or converted in just a few steps. None of your data or orders are lost.

Benefits

- Configurations matched to budget, space and content
- Flexibly expandable or modifiable
- Control via PLC (I3.0) or ERP Lab (I4.0)
- One ERP Lab for everything (No additional software costs for expansion)

Designation code



ADDITIONAL EQUIPMENT | AUGMENTED REALITY CFA 1 EQUIPMENT



Factory app
 In this era of Industry 4.0 and ever advancing technological development, there is a vital need to modernise maintenance operations. New technologies must make it possible not only to monitor manufacturing operations, but also to intervene and control a process manually. The LN Factory app enables the user to display live values of sensors and control actuators via a direct connection to the PLC.

- Training content**
- Introduction to Augmented Reality
 - Communication between PLC and AR app
 - Display of signal states in real time
 - Control of hardware via app
 - Signals can be freely positioned in the AR environment
 - Configuration of error messages
 - Free use of PLC signals also for other applications

ADDITIONAL EQUIPMENT CONFIGURATION | CAMERA INSPECTION WITH ARTIFICIAL INTELLIGENCE



Quality control with AI
 Quality control is of crucial importance in the manufacturing of products and components. More and more industries are turning to automated quality control with artificial intelligence to ensure high utilisation, efficiency and accuracy at low cost. LN's Camera Inspection with AI system includes the station with an industrial camera as well as an AI controller with NVIDIA processor for training on the models.

- Training content**
- Application and optimisation of self-learning algorithms
 - Generation of datasets
 - Training the model
 - Optical quality inspection
 - Use throughout the Industry 4.0 plant



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