

# trends in automation

The Festo customer magazine **Issue 35**

**FESTO**



In focus

## Paths

Of groundbreaking technologies and processes in an era of change

Impulse

### On course

Digitalisation: new direction in system and machine building

Compass

### Flight acrobat

BionicFlyingFox: ultra-light-weight with modern kinematics

Synergies

### Streamlined

Valve terminal technology in woodworking

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**Eliza Rawlings**, General Manager, Festo GB

**Dear reader,**

Industrial automation is heading full speed towards digitalisation. As a leader in innovation, Festo is also actively leading the way on this exciting journey, and we want you – our customers and partners – to join us. Many of the articles in this issue of our customer magazine therefore focus on the transformation taking place in the world of automation.

The systems of the future will be modular, flexible, networked and efficient. Digital app-controlled pneumatic components such as the Festo Motion Terminal VTEM are perfect examples. Along with increased flexibility and productivity, the Festo Motion Terminal offers greater process reliability. Apps such as the digital maintenance manager Smartenance are also shaping the future of automation. Networking and sensor technology support in-depth and reliable analysis of recorded data using the cloud and dashboards as output devices. The opportunities that this creates range from optimised processes through engineering and predictive maintenance to new business models (page 18).

The effects of this transformation are being felt far beyond the product world. Our working world is also undergoing radical change. One example is the BionicWorkplace, where people and machines work and learn together (page 8). Algorithms process data generated by systems, thus making the tasks carried out during work better every time. The end result of this is better cooperation between people and machines. Festo Didactic has also set itself the challenge of developing skills in the digital age (page 26).

Festo GB celebrated our 50<sup>th</sup> Anniversary in 2018 and during our celebrations we reflected on the many changes in the world of automation so far and our plans for the future. We look forward to the exiting challenges ahead working together with our customers on their digitalisation journeys.

I hope you find this issue an inspirational read.

A stylized, handwritten signature in black ink, likely belonging to Eliza Rawlings.



**In focus Paths** For thousands of years, caravans have crossed the world's deserts and travelled along ancient trade routes. In the age of digitalisation, machine and system builders are striking out in a new direction. In this issue, you can find out exactly what Festo has been doing in the area of digitalisation. You can also discover how automation solutions from Festo are setting new standards in many sectors.

# trends in automation Issue 35

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**BionicWorkplace:** autonomously learning workstation for human-machine collaboration.

## Compass

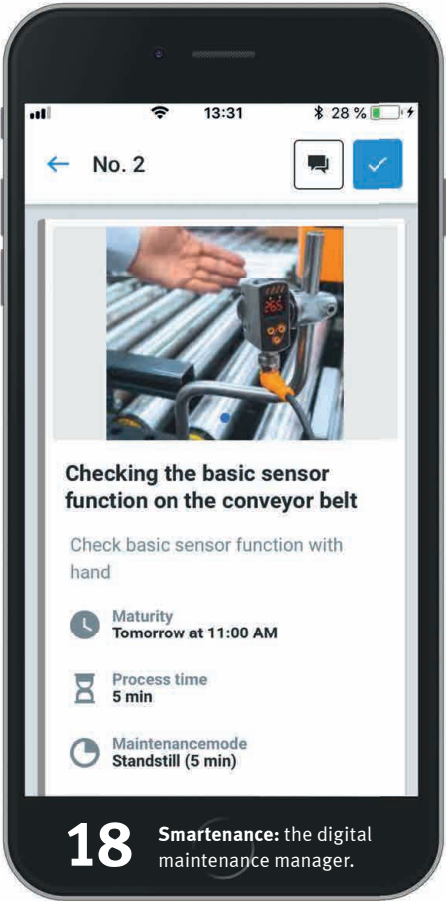
### Intelligent interaction

Forward-looking technology: in the BionicWorkplace, a person works with a robot arm as well as numerous other assistance systems that are networked with each other. → 8

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**Smartenance:** the digital maintenance manager.

## Impulse

### Paths to a new world

In the age of digitalisation, the automation landscape is changing. Industry 4.0 relies on fully networked, adaptive production through intelligent products. What route will machine and system builders take in order to make the most of digitalisation? → 18

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The digital future is also transforming professional skills development. Klaus Zimmermann, Head of Training & Consulting at Festo Didactic, explains how. → 26



**Everything in view:** the world's fastest band saw line.

## Synergies

### Tradition and innovation

The south of the Korean peninsula is well positioned for further growth. Yet Korean culture is still steeped in traditions. → 28

### High-tech wood cutting

In Sweden, function terminals CPX/VTSA are enhancing the world's fastest band saw line. The valve terminal technology shortens installation and commissioning times. → 34

### Optimised consumption

In its mixing chamber for automotive coatings, the IVECO plant in Madrid is achieving successful results with an energy efficiency solution from Festo. → 40

### Pneumatic fitness

Pneumatic advantage: pre-assemblies from Festo allow gentle movements of training equipment for senior citizens and rehabilitation patients. → 44







## Leading the way

The best way to explore Barcelona is on foot. Fascinating discoveries await visitors around every corner. When you view Spain's second-largest city from the sky, your eye is automatically drawn to one particular area of the city: the Eixample. Its grid pattern remains a clear symbol of the city's transition into the modern age. Planned and built in the mid-19th century by urban planner Ildefonso Cerdà, the aim of the 'expansion', as it is translated, was to provide an open and sunny living environment for the city's growing population.

The distinctive blocks are not just popular residential areas; they are also perfect examples of modernism and of the Spanish Art Nouveau style. Their chamfered corners are visionary in every sense of the word. They open up the view of the adjacent streets, improve road safety and provide ample room for cafés. At the heart of the Eixample sits the famous Sagrada Família. The church designed by Antonio Gaudí attracts visitors from all over the world. Construction began back in 1883 and has not yet been completed.



BionicWorkplace: autonomously learning workstation for human-machine collaboration

# Intelligent interaction

**Face to face, hand in hand.** The BionicWorkplace shows the extent to which human-machine collaboration is already possible with artificial intelligence. The modular workstation registers the person's movements, accepts voice commands and learns for the future from every single action.

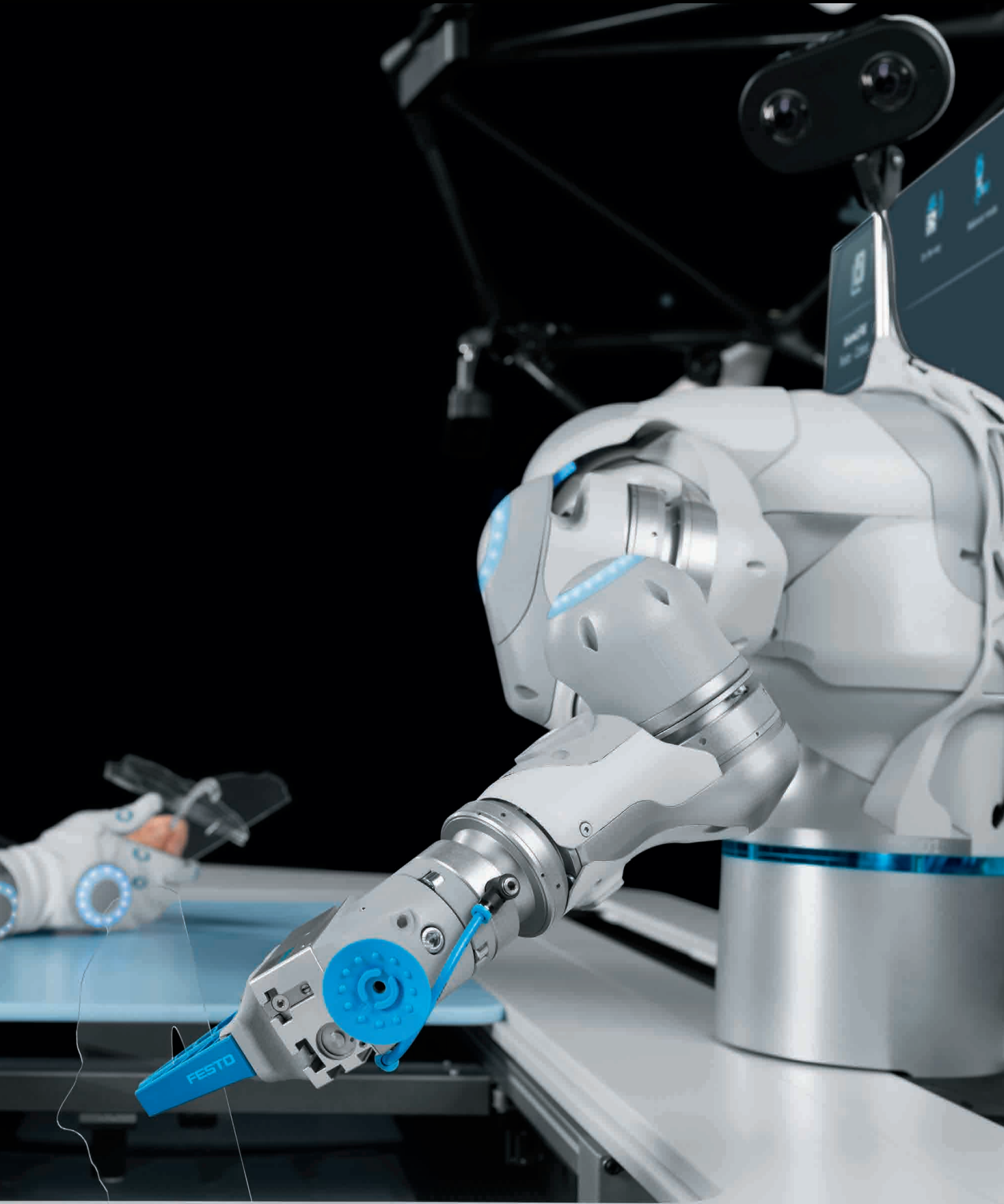
**O**n a worktable with a glossy white surface sits a multi-axis robot arm – the BionicCobot. Rising above it is a black tubular frame with an interactive screen at its centre. Positioned around this are 3D and infrared cameras as well as automatic lighting. The worktable itself is equipped with a planar surface gantry EXCM, the pneumatic linear axis DGCI as well as a projector and the Festo Motion Terminal VTEM. Next to the futuristic workstation is a modular control cabinet for the electronics, computer and compressed air reservoirs. The autonomous transport robot Robotino is responsible for feeding and removing material.

## Informative eye contact

The main person working at the BionicWorkplace is the production employee. For precise interaction with the bionic workstation, he wears a special long-sleeved shirt and glove with inertia sensors for measuring inclination and acceleration as well as infrared markers for precise position sensing. All his movements are recorded and analysed by cameras. Even his eye movements. This means that when his eye focuses on specific information on the screen, this information can be enlarged. →







Also in the camera's field of vision are tools and materials on the work surface. They are handled by the sensitive robot arm BionicCobot. It assists the worker by feeding materials to a laser cutter inside the worktable and then removing them once they have been processed. People and machines work together closely, safely and flexibly. Thanks to this cooperation between people and artificial intelligence, both learn for the future, from one moment and project to the next.

#### **Intelligent head model**

With its modular design, the BionicWorkplace can be adapted for a wide range of applications. The current set-up is used to manufacture acrylic glass sections for an individual model of a head. In this application, the facial features of a person are scanned using a smartphone with a depth-sensing camera and then converted into a CAD model. According to the

three-dimensional template, the laser cutter mounted on the planar surface gantry cuts the elements out of acrylic glass. The BionicCobot takes the slices from the cutting area and hands them to the worker, who then puts them together to make an individual model.

#### **Self-optimising system**

The BionicWorkplace is one of the latest in a series of developments from the Bionic Learning Network. This is one possible set-up for a human-machine workplace and shows how interaction might look in the future. The collaborative abilities of the BionicCobot, supported by networked assistance systems and peripheral devices plus artificial intelligence, turn the BionicWorkplace into a learning system that optimises itself with every step. The worker directly interacts with the bionic robot arm and controls it using movement, touch and speech.



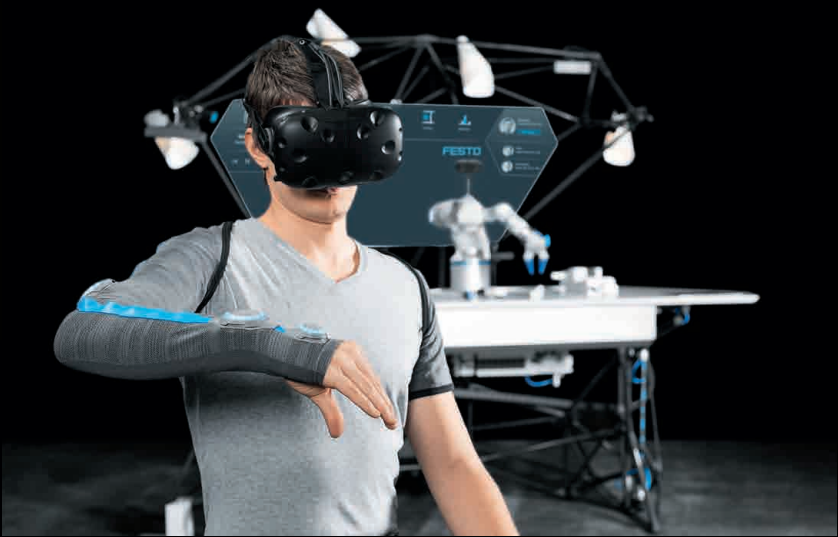
**Collaborative working environment:** the BionicWorkplace interacting with the BionicMotionRobot as a pick-and-place unit and a Robotino®.

### Controlled by voice command

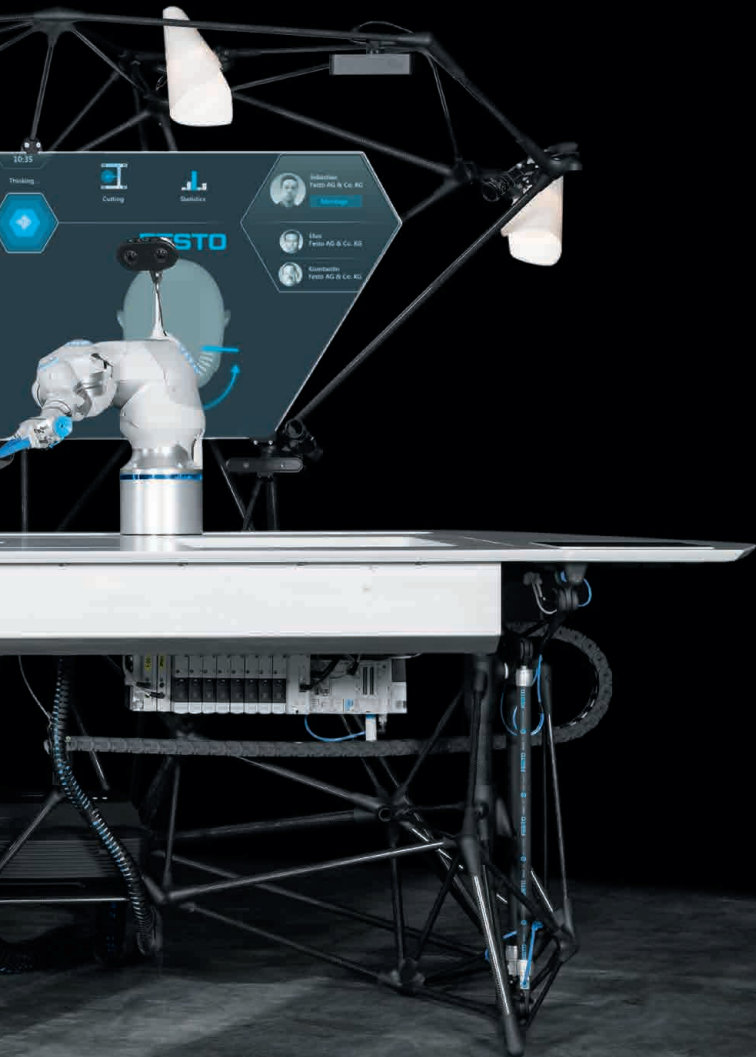
As the machine's counterpart to the human brain, the intelligent software accepts voice commands, converts them into context objects and simultaneously processes all data and inputs recorded using sensors from the various peripheral devices. It uses all the information to create an overall picture and to establish the optimal program sequence. It then sends this to the projection screen so it can be visualised for the employee, and as an information package to the BionicCobot. The BionicCobot thus knows how and where it is supposed to move. With every action that is solved, the system learns something new.

### Handling at a distance

In addition to working on site, remote manipulation is possible using virtual-reality goggles and a sensor glove. For a physically separated control system, the



**Controlled remote manipulation:** risk-free working with the help of textile wearables and virtual-reality goggles from a safe distance.



BionicWorkplace uses a 180-degree 3D stereo camera attached to the BionicCobot that monitors the entire working space. The worker can use virtual-reality goggles to access and follow the images from the camera in real time. The robot can thus be controlled from a distance, which is beneficial, for example when handling hazardous substances or carrying out processes that are harmful to health. A worker could also possibly control several systems at once, even if these are spread out over factory facilities across the world.

### Worldwide application of knowledge

An intelligent workplace capable of learning not only demonstrates how collaboration between people and machines will be even more intuitive, simple and efficient in future, but it also represents global networking in line with Industry 4.0. Once learned, building blocks of knowledge and new skills can be endlessly shared and accessed globally. It will therefore one day be possible to set up workplaces in a worldwide network, adapt them on site and adjust them to individual tasks. ■



# At a glance

## BionicWorkplace

Autonomously learning workstation for human-robot collaboration

### Interview



**Dr. Elias Knubben,**  
Head of Corporate Research and Innovation, Festo

**trends in automation:** What safety issues do the new working spaces such as the BionicWorkplace represent?

**Dr. Elias Knubben:** The workplace is currently a future concept that is neither intended for series production nor certified for use. However, it is essentially designed to make human-robot cooperation as intuitive and as simple as possible. We see great potential in the pneumatic robot solution, particularly because of its inherent adaptability – it responds safely and flexibly in the event of a collision. Sensors and camera systems offer additional safety for the worker and allow precise tracking of his movements.

⊕ **Personalised end product:** individual items, like the 3D head models produced as an example, are becoming an integral part of the factory of tomorrow.

#### 4 x infrared cameras

Recording the worker's position using the infrared markers on their work clothing (wearable)

#### 3D camera

Object detection and determination of the ideal gripping points on an object

#### BionicCobot

Collaborative assembly to take the strain off the worker

#### Robotino®

Autonomous transport of material between the BionicMotionRobot and the BionicWorkplace

#### Planar surface gantry EXCM with laser cutter

Production of individual workpieces according to the template of a CAD model

#### Pneumatic linear axis DGCI

Extra degree of freedom for the BionicCobot

#### Projector

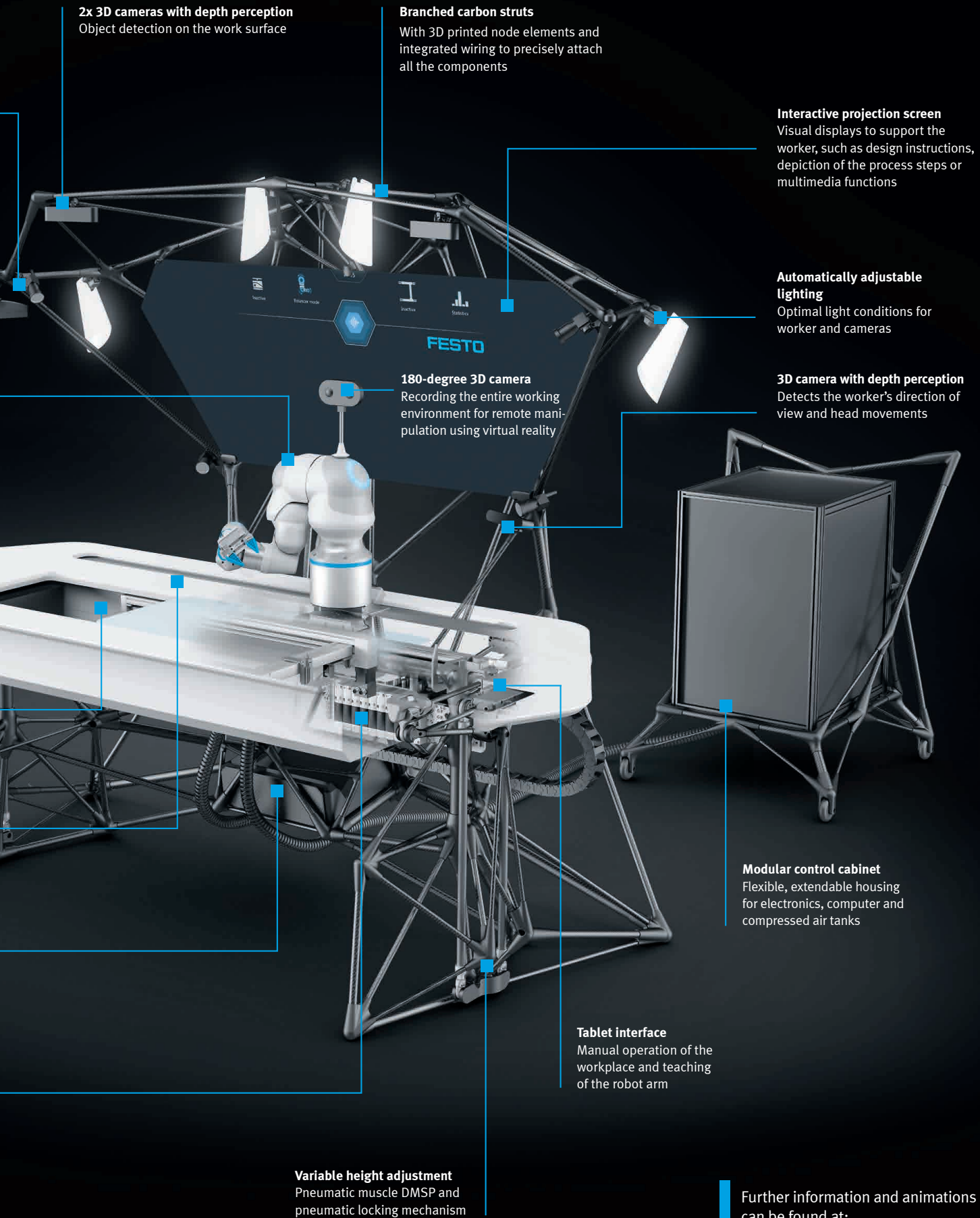
Display on the projection screen

#### Festo Motion Terminal VTEM

Precise control of the BionicCobot







BionicFlyingFox: flying object with intelligent kinematics

# Agile fly- ing

**It doesn't need to learn how to fly,** only how to reach its destination by perfectly adjusting the beat of its wings. The BionicFlyingFox is good at learning. It automatically optimises its skills by interacting with a master computer. It follows elegant flight paths thanks to its modern kinematics.





**Flight acrobat:** the BionicFlyingFox can manage a tight flight radius despite its large wingspan.



**W**hen they are not flying, flying foxes live in a world where everything is upside down. Sleeping, eating, mating – the largest members of the bat family prefer to do everything head down. But when they take to the skies, they are one of the most impressive fliers in the animal kingdom, with a wingspan of up to 170 cm. Their bionic counterpart, the BionicFlyingFox, is equally impressive, boasting a wingspan of 228 cm.

### **Skilled flying manoeuvres**

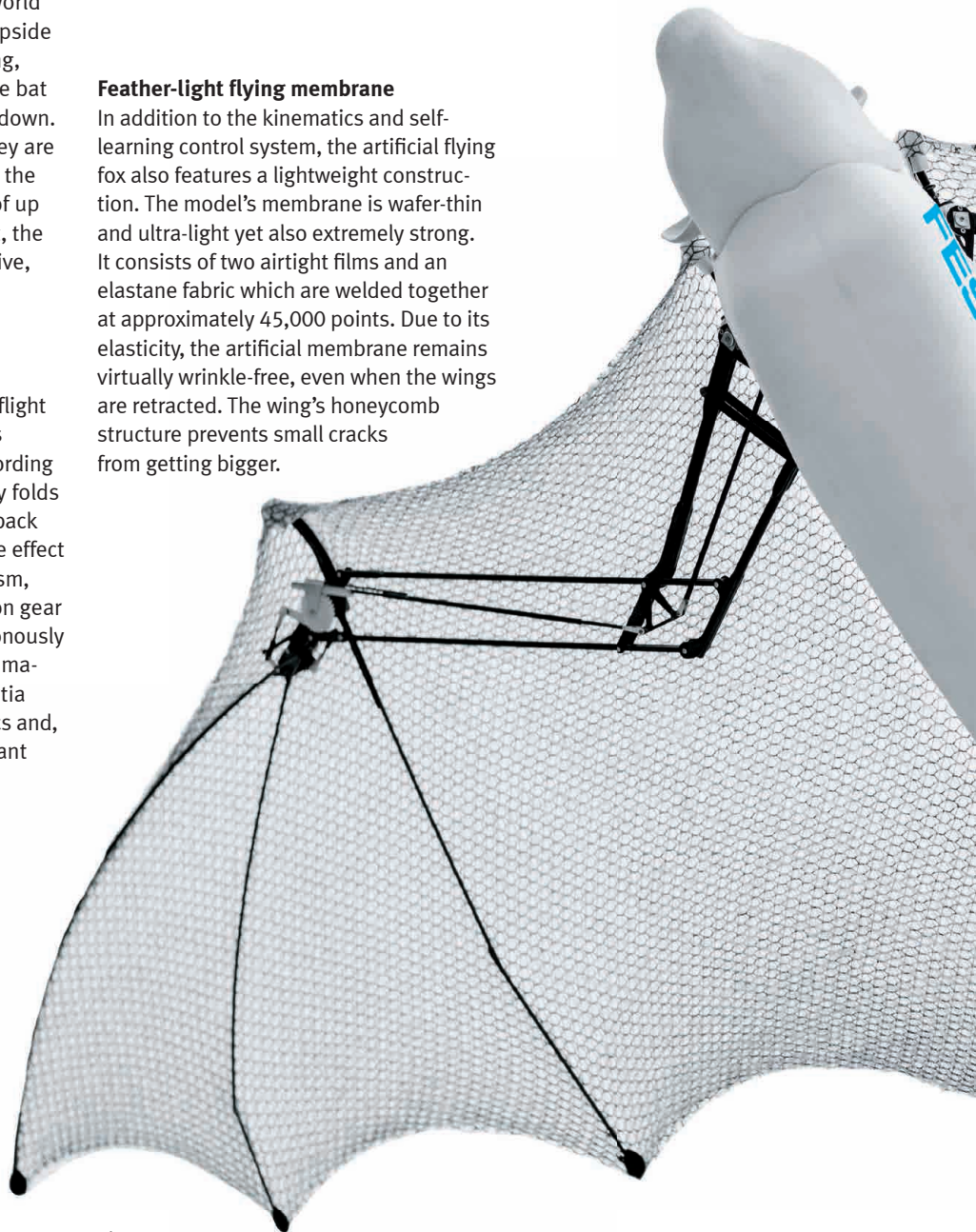
Despite its large wingspan, the BionicFlyingFox can manage a tight flight radius. This is made possible by its kinematic system, which works according to the scissor principle. The primary folds in during the upswing and spreads back out for the powerful downswing. The effect is achieved using a clever mechanism, consisting of 90° and rack-and-pinion gear units which move the wings synchronously using forced kinematics. The flying manoeuvres can be monitored by inertia sensors and the on-board electronics and, if need be, corrected with the relevant control signals.

### **On-board intelligence**

The BionicFlyingFox communicates with a motion tracking system so that it can move within a defined airspace. This detects its position, plans flight paths and sends the control commands. The human pilot takes care of the take-off and landing. The camera images of the motion tracking system are transmitted to a central master computer that evaluates the data and coordinates the flight like an air traffic controller. The artificial flying fox calculates the wing and leg movements required for its flight paths itself using the on-board electronics. It gets the algorithms it needs from the master computer, which constantly improve them. The BionicFlyingFox is thus able to optimise its behaviour during flight and can follow the specified routes more precisely with each circuit flown. Therefore only some knowledge needs to be programmed into the control electronics at the start.

### **Feather-light flying membrane**

In addition to the kinematics and self-learning control system, the artificial flying fox also features a lightweight construction. The model's membrane is wafer-thin and ultra-light yet also extremely strong. It consists of two airtight films and an elastane fabric which are welded together at approximately 45,000 points. Due to its elasticity, the artificial membrane remains virtually wrinkle-free, even when the wings are retracted. The wing's honeycomb structure prevents small cracks from getting bigger.



The BionicFlyingFox provides important findings for industrial automation. It demonstrates how, in the production of the future, the intelligence from a central control system will be increasingly distributed to subsystems and components. ■

Further information and impressive animations of the flight acrobat can be found here: [www.festo.com/bionicflyingfox](http://www.festo.com/bionicflyingfox)





### Technical data

- Wingspan:.....228 cm
- Body length:.....87 cm
- Weight:.....580 g
- Wing structure:.....carbon fibre
- Wing surface:.....knitted elastane fabric with spot-welded PE film, approximately 45,000 spot welds
- Body casing: .....foam, shaped
- Motor: .....brushless motor, 40 W
- Active markers: ....4 infrared LEDs



**State-of-the-art motion tracking system:** the cameras are quick to commission and can follow the flying object dynamically.



Digitalisation

# Paths to a new world

**HoloLens, mobile phones, 3D printing or smart glasses** – the gadgets that captured the public imagination in the blockbuster movie “Back to the Future” over 30 years ago have now become a reality. All thanks to digitalisation. Industry 4.0 is automating the modern working world and helping machine and system builders reach new heights. What route will the sector take in order to make the most of digitalisation?

Photo: © Deutscher Zukunftspreis/  
Ansgar Pudenz



“By consistently merging the digital and real worlds, it will be possible to manage the increasingly dynamic nature and complexity of factories.”

Prof. Dr. Dr. h.c. mult. Wolfgang Wahlster,  
CEO of the German Research Center for Artificial Intelligence (DFKI)

**T**he international drivers of Industry 4.0 work in close collaboration. The Industry 4.0 platform, through which 300 participants from 150 organisations promote digitalisation in Germany, the “Alliance Industrie du Futur” in France, “Piano Impresa 4.0” in Italy, the Industrial Internet Consortium in the USA, IMSA, the equivalent of the German Reference Architecture Model Industrie 4.0 (RAMI 4.0) in China, and the Robot Revolution Initiative in Japan – all share the common goal of establishing networks and internationally recognised standards on the road towards the production of the future.

#### The importance of data security

Data is the oil of the 21st century, and storing and processing it creates added value. Well-known Internet giants make a living from the data of their users by using their information to develop business models. A machine with security measures isn't any faster or more efficient than an unprotected machine. This is why the issue of IT security has often taken a back seat. However, data scandals have highlighted the critical importance of confidentiality and data security. In the machine building sector, data security is a major

contributor to business success and future revenues therefore depend on it. In the age of Industry 4.0 and digitalisation, a company that cannot verifiably demonstrate its security credentials will have difficulty obtaining orders, credit and insurance. The German network platform Industry 4.0, together with its international partner networks, is therefore working on this area too.

#### Who owns machine data?

Thanks to big data analytics, data produced using and by machines can be systematically evaluated on a large scale. Smart analysis leads to greater efficiency, a competitive edge and new business models. But can the “analogue” world keep pace with the fast-moving developments in a digitised industry?

The possibilities of smart data often only become apparent when combined company-wide. Competitors can become partners and partners can become competitors. Questions about data sovereignty as well as the scope and the permissibility of partnerships – in other words, questions about market power and competition law – must be reviewed and possibly regulated differently in the age of Industry 4.0.

#### Digital images

The administration shell is the interface between the physical object (asset) and Industry 4.0 communication. Every relevant asset has its own administration shell, essentially its own digital image, so that it can be integrated into networked Industry 4.0 production. For example, the administration shell of a drilling machine gives the real asset a unique ID. This virtual identity thus represents the asset as a separate Internet presence.

This virtual ID acts as a standardised communication interface in the network and allows access to all information about the object as well as execution of the command “Drill a hole with a diameter of 3.5 mm and a depth of 4 mm at position 4,” for example. The real object, such as a drilling machine, a component or a product together with its administration shell form the Industry 4.0 component. The virtual IT world and the real world of production are therefore increasingly converging.

#### Fully networked and adaptive

In the age of digitalisation, the automation landscape of the classic pyramid is changing. This change is being accompanied by new products, cloud services →



“As an innovator and trendsetter, Festo is making a major contribution to Industry 4.0. The aim is to support customers and partners and take them into the digitalised age as part of this transformation process.”

Dr. Ansgar Kriwet, Member of the Management Board Sales, Festo AG

## Goals of future production

Production systems will become digitally networked throughout. This will be achieved when intelligent, self-regulating and self-controlling plug-and-produce components make their own way through a production process. Virtual images of machines and systems will make virtual commissioning and reconfiguration easier. Highly flexible production plants make manufacturing batch sizes of 1 more economical. Speedily balanced workloads in a production network improve delivery performance. Prompt adjustment to the orders in hand ensures the efficient use of resources. Comprehensive condition monitoring helps to avoid downtime and optimises maintenance procedures as well as mobile maintenance.

and apps as well as new online shops with comprehensive, integrated engineering concepts. This will ensure that, in the medium term, data will be available seamlessly and globally on all user devices.

Industry 4.0 relies on fully networked, adaptive production through intelligent products with so-called embedded functions – the cyber-physical systems. Many Festo components already meet the hardware and software requirements. These products can be integrated into IoT or cloud environments such as Siemens MindSphere, Rockwell Factory Talk or the Festo Cloud. With the IoT gateway CPX-IoT, the data can be visualised and utilised on the user interface of Festo MyDashboards.

### Integration in MindSphere and Factory Talk

MindSphere is a cloud-based, open IoT operating system from Siemens with which machines and physical infrastructure can be connected to the digital world. This enables huge data volumes from countless smart devices to be used. Festo was the first partner in the MindSphere initiative to integrate a smart field device, the energy efficiency module MSE6-E2M, into the MindSphere via the IoT gateway CPX-IOT in the factory environment.

This integration opened up key aspects such as encrypted connection to the cloud for easy commissioning, MindSphere via MindConnect LIB, and field level via OPC UA. Such Industry 4.0 scenarios provide an opportunity to analyse and above all combine various data in MindSphere. Examples include basic data and insights such as real air consumption and pressure indication in real time, pattern recognition for consumption profiles, leakage and selectable tolerance windows for error messages.

### Smart factory

Festo's newest production plants, such as the Scharnhausen Technology Plant, both produce and use these products, thus paving the way for Industry 4.0. The Scharnhausen Technology Plant is Festo's main factory for the production of valves, valve terminals and electronics. It was designed from the outset as a future-proof, adaptable factory for harnessing and implementing ideas from the digital environment. The knowledge gained from Festo research into Industry 4.0 is also incorporated into its further development. Not only is it a smart factory, it will also in future be a fully networked factory. It should be possible to produce millions of units every year, but in flexible batch sizes from 10 to 10,000.





**Adaptable:** the systems in the Festo Scharnhausen Technology Plant are designed for a wide range of component variants with different batch sizes.

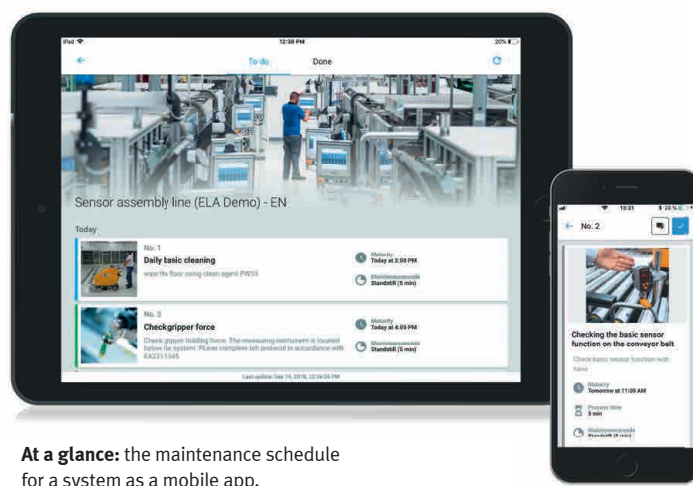


**Already a reality:** cooperating robot at the Festo Scharnhausen Technology Plant.

### Mobile maintenance

An example of the digitalisation approach at the Scharnhausen Technology Plant is the porting of all the data for a machine, such as plans, bills of materials, spare parts and repair instructions, to mobile devices and linking them up to a central computer. This allows on-site maintenance technicians to view, analyse and prioritise all the alarms, and to work their way efficiently from one machine to the next. They can also consult experts online, exchange photos, view stocks of spare parts, and directly pick or order stock – all paperlessly.

Error messages are entered directly in a digital log. “This log is like the machine’s medical record,” explains Jacob Decker, innovation management expert in the Plant Engineering department of the Festo Scharnhausen Technology Plant. The roll-out of the project to all other Festo plants is currently underway. The return on investment takes less than six months – a perfect example of how quickly digitalisation pays. ■



**At a glance:** the maintenance schedule for a system as a mobile app.

**Get digital. Now!**



On the way to the production of the future – further information can be found at:  
**[www.festo.com/industry-4-0](http://www.festo.com/industry-4-0)**

**Get digital. Now!** This is the slogan with which Festo is inviting its customers to explore new paths, paths towards digitalisation. You can find out exactly what Festo has been doing in this area on the following pages.

## Pneumatics goes digital

**The Festo Motion Terminal VTEM is the first pneumatic automation platform to be controlled by Motion Apps.** Pneumatic functions are simply added using an app. This makes it possible to replace up to 50 individual components of a pneumatic control loop without having to change the hardware. This synergy between mechanical and electronic components and software is reliable and tamper-proof, as it cannot be adjusted mechanically. Software developers are constantly working on new motion apps for mapping other pneumatic functions. The latest app available to download from the Festo App World features the Soft Stop function. It reduces cycle times by up to 70% as Soft Stop allows dynamic yet gentle positioning motion without needing wear-prone shock absorbers. Further Motion Apps are in development.

[www.festo.com/vtem](http://www.festo.com/vtem)  
[www.festo.com/appworld](http://www.festo.com/appworld)

## Smartenance – the maintenance app

**Preventive plant maintenance** is a time-consuming process which, astonishingly, is for the most part still documented using pen and paper. **Smartenance**, the digital maintenance manager for production supervisors and machine operators, is the first exclusively digital product from Festo. It is available to download as a mobile app for smartphones and tablets in the Apple and Google app stores. The dashboard can simply be opened in a web browser. Smartenance enables end customers to plan, monitor and evaluate system maintenance. A digital maintenance schedule makes maintenance easier, quicker and more reliable. Reciprocal checking by system operators and production managers provides greater reliability. It eliminates many processes and the need for coordination.

[www.festo.com/smartenance](http://www.festo.com/smartenance)



## Increased productivity with cloud services



### Benefits of digitalisation

If the power of digital transformation is harnessed correctly, there are many advantages for everyone:

- Greater productivity in design and production
- Optimised and accelerated processes
- Improvements in overall equipment effectiveness (OEE), primarily through preventive and predictive maintenance concepts
- Traceability of production
- Energy monitoring

**Further processing and long-term analysis of data** takes place in the **cloud**. Dashboards visualise the information obtained. Festo supports machine builders and end users with visualising and processing data. The result is increased productivity through better utilisation (OEE), lower costs through greater energy efficiency and fewer downtimes thanks to comprehensive diagnostics, condition monitoring and improved maintenance. This is done through the IoT gateway CPX-IoT, the first turnkey solution for IoT-enabled components and dashboards. It connects components and modules from the field level, such as the valve terminal CPX/MPA, the energy monitoring module MSE6-E2M or handling systems, to the Festo Cloud via their OPC UA interface.

[www.festo.com/iot](http://www.festo.com/iot)

[www.festo.com/e2m](http://www.festo.com/e2m)



## Training 4.0



**The path to the digital future** is a journey into an uncertain future for many workers, engineers, IT specialists and managers. Many workers fear losing their jobs as a result of digitalisation and artificial intelligence. There is a noticeable blurring of the lines between IT, electrical engineering and mechanical engineering. **Festo Didactic** therefore offers skills development programmes with turnkey training factories, laboratory facilities, innovative training systems, e-learning and training programmes to make people fit for the fourth industrial revolution

[www.festo.com/didactic](http://www.festo.com/didactic)

## World of work 4.0



**The workplace of the future** could be the **BionicWorkplace** from Festo. In this concept study for the “World of Work” 4.0, people work together with a bionic robot arm as well as numerous assistance systems and peripheral devices that are networked and communicate with each other. The technology supports the workers and makes their jobs easier when carrying out strenuous or hazardous activities.

[www.festo.com/bionicworkplace](http://www.festo.com/bionicworkplace)



## What is your role at Festo on the road towards digitalisation?



**Thomas Heubach,**  
Head of Digital Business Projects

"In my department we are looking at the future of digitalisation. Our aim is to identify trends and developments in the online world and implement them through the Festo Cloud, the CPX-IoT gateway, the dashboards, and so on. We are considering the entire chain from measured value to added value for the customer."



**Jost Litzen,**  
Digital Strategy and Business Model

"My job is to develop and implement ideas for new apps. The Smartenance app is the first app that our customers are now using."



**Dominik Heigemeir,**  
Head of Market Communication,  
Festo Sales Germany

"Digitalisation has arrived in industry! My job is to provide our customers with detailed information about digitalisation and present the solutions that make it possible. How digitalisation is handled will determine whether providers and users are among the winners or losers."



**Martin Maichl,**  
Digital Pneumatics

"With the Festo Motion Terminal, Festo launched the world's first pneumatic module with pneumatic functions that are assigned using software apps. Our department is developing new digital functions for it."



**Christian Kubis,**  
Head of Plant Engineering

"My task at the Festo Scharnhausen Technology Plant is to test and evaluate the Industry 4.0 ideas that will make our plant more productive."



**Tilman Schäfer,**  
Head of Digital Customer Journey

"The employees in my area develop solutions for making the customer's journey along all contact points with Festo as simple and efficient as possible and to map this journey digitally – from customer service through product selection and ordering to issues such as maintenance and service."



**Simon Colas,**  
Head of Didactic at Festo France

"The CP Factory from Festo Didactic enables people to acquire skills for 'Industrie du Futur' or Industry 4.0 in the areas of modern industrial control systems, communication, processing and protecting data, the concepts of modern production processes as well as the optimised use of production data."

The future of vocational learning

# Interview

**Improved media literacy, increased IT readiness and willingness to learn, working together in interdisciplinary teams** – the digital future is transforming professional skills development. Festo Didactic is supporting its customers on this journey and preparing its employees for the smooth transition to Industry 4.0. Klaus Zimmermann, Head of Training & Consulting at Festo Didactic, explains how.

► **trends in automation:** Mr. Zimmermann, learning and learning methods are set to change significantly in many areas in the future. Can you give us a concrete example of this?

**Klaus Zimmermann:** Maintenance is a good example. Because we will have more machine intelligence in the future, employees will have a lot more information available to them to help them get machines up and running again. The traditional time-consuming process of fault finding is becoming less common. In the future, systems will offer suggestions for the source of the fault as well as appropriate solutions.

Being able to work with digital devices such as tablets is therefore important. In addition, maintenance technicians must be able to understand and analyse the algorithms provided by the system. They must be comfortable with the digital logic. We call this media literacy or IT readiness. However, this does not mean that maintenance technicians will have to become IT specialists. The basic qualification will remain the same. It will still be necessary to manually maintain systems and replace components in the future. It will not be enough to be able to use digital operator units; basic specialist knowledge will also be required. Cyber-physical systems, for example, require both IT knowledge and mechatronics skills. The ability to grasp and permanently solve new, previously unknown problems in interdisciplinary teams is also important.

► How will this cooperation take shape and how will it differ from the traditional specialist approach that is still the norm today?

**Zimmermann:** To develop skills for working in interdisciplinary teams, we employ methods such as Design Thinking. In a problem situation, a team of IT specialists, maintenance technicians and employees from production and equipment manufacturing develops a new solution for which there was no previous model. This can be done by examining causes and solutions from different perspectives. Together they develop a prototype that describes the approach to be taken in the future when a specific error occurs. The prototype can take different forms and be created as a graphic or a physical three-dimensional model, for example.

We set up our training factory so that we could start teaching this in practice. We actively apply the Design Thinking method and develop interdisciplinary solutions, including for securing newly acquired knowledge. This is an ongoing process which will continue well into the future. Our training factory is a learning hotspot that opens up new possibilities for employee development.

► How does Festo Didactic apply knowledge from its own company to its basic and further training programme? What hardware and software tools are available for companies?

**Zimmermann:** We are using the Festo cyber-physical training factory in our Scharnhausen Technology Plant to work out how to introduce employees to Industry 4.0 in a concrete and practical way. The cyber-physical training factory, from the project workstation I4.0 and the CP Lab to the comprehensive CP Factory, is a seamless learning system



“The learning concepts from Festo Didactic are so flexible that we can immediately integrate any development step that is needed for the digital transformation.”

Klaus Zimmermann, Head of Training & Consulting, Festo Didactic

which allows employees to learn how to deal with digitalisation in the workplace. We also offer numerous training and learning concepts, such as our digital training manager. This is a combination of classic and web-based training. For apprentices there is the eCademy Starter, which provides step-by-step preparation for our professional courses for industrial/technical and commercial professions.

Then there is our newly developed training concept on the topic of controllers with programmable connections or our renowned simulation program FluidSIM. This circuit diagram, design and simulation program for pneumatics, hydraulics and electrical engineering supports the design of control systems. It promotes solution-focused working and at the same time encourages creativity. With FluidSIM, trainers also have a wide range of texts, photos and films at their disposal for multimedia teaching.

► Is Tec2Screen going in a similar direction?

**Zimmermann:** Yes, it is. With our mobile, multimedia and interactive learning tool Tec2Screen, learning units can be adapted to the specific learning process. Courses and simulations deliver valuable training content regardless of the amount of space and time available. Then of course there is our simulation software CIROS. Our Cyber-Physical Lab (CP Lab) can be controlled with the virtual learning environment for PLC programming. This also includes simulations of faults and malfunctions, just like on a real system.

► Talking about CP Lab – with modular production systems, Festo Didactic offers its customers an extensive range of practical basic and further training opportunities.

**Zimmermann:** Yes, the Cyber-Physical Lab combines practical experience with the transfer of knowledge through doing, direct application and a hands-on experience. All manner of suitable scenarios can be created for a wide range of teaching approaches. They range from individual components and multiple modules to the stations of an entire system.

The functionality of modular production systems extends from various drive technologies and the efficient flow of materials and information to modern and flexible control concepts. People who participate in this type of training get to experience first-hand how digitalisation and Industry 4.0 are making their mark on the world of automation. The learning concepts from Festo Didactic are so flexible that we can immediately integrate any development step that is needed for the digital transformation. ■

[www.festo-tac.com](http://www.festo-tac.com)





# TRADITION &

The southern half of the Korean peninsula has experienced very rapid growth in the past fifty years. This small country with big ambitions is today best known for electronics products. A look beyond that shows a nation with a long history, a diverse nature and a multifaceted culture.





# INNOVATION





# CAPITAL 서울



37° 33' 59.526" N 126° 58' 40.689" E



99.720 km<sup>2</sup>  
LAND AREA



51.7 million   
POPULATION 

**T**he Korean national flag unites the symbols of an ancient culture. The white background represents purity and peace. The red and blue eum and yang symbol, the Korean equivalent of yin and yang, represents the universe and its contrasts such as fire and water, day and night, masculine and feminine. Arranged around it in groups are the trigrams from the old I Ching text, representing the universal elements of heaven, earth, water and fire. Alongside all the modernity that the country has to thank for its enormous economic growth, Korean culture today is still steeped in traditions. For example, values such as respect for age and social standing play a major role in private and professional life.

#### Innovation is tradition

The national flag gives a clear sense of the complexity of the Korean peninsula. Traditional Korean house building, garden design, dance and music are closely linked to the forces of nature. Confucian and Buddhist customs have shaped the country for many hundreds of years, and created a culture that can look back on more than 5,000 years of history. In the recent past, Christianity has also played an important role. When it comes to crafts, such as the production of silk, ceramics and goldsmithing, Korean masters reached a high level of craftsmanship early on. Evidence of printing with metal letters dates from as early as the fourteenth century. At the end of the sixteenth century, the so-called turtle ships – large, armoured warships – bore witness to the shipbuilding skills of the Koreans. Korea experienced one of its biggest

geographical expansions and a cultural high point in the ninth century of the Western era. At that time, the country stretched all the way to Manchuria. This was followed by changing kingdoms and massive changes during Japanese colonial rule. Korea did not gain its independence until 1945. Nowadays, 15 August is celebrated as the National Liberation Day. The joy was short lived, however, because just three years later, in 1948, the country was split into North and South Korea by the Allies and the then Soviet Union. The Korean War from 1950 to 1953 deepened the split. It is only in recent times that relations between the two countries have been more conciliatory.

#### Island nation and mega city

In contrast to its economically weaker counterpart to the north, South Korea is considered one of the so-called tiger countries. This is the name given not only to South Korea, but also to the three other countries that are experiencing rapid economic growth, i.e. the Republic of China and Taiwan, Singapore and Hong Kong. The land of the economic miracle, known worldwide for its electronics products and being one of the leading shipbuilding nations, is also a true natural wonder. More than 4,400 small and big islands nestle against the over 2,400 kilometres of coastline, particularly to the south and west. Only



around 500 are populated. Korea has a total population of 51.7 million. The Korean mainland and the islands all have a rich and diverse vegetation. Around 70% of the country is covered by mountains. Its highest mountain, the volcano Hallasan, rises to 1,950 metres above sea level. Although the climate is generally moderate, Koreans have to adapt to some extremely cold and dry winds from Siberia in winter. From January onwards there is often a special, recurring climate phenomenon: three very cold days are followed by four milder ones, and so on. It is not just the rural population that has to adapt to this weather event; the more than ten million inhabitants of the mega city of Seoul also to cope with it too.

Best known for the 1988 Summer Olympics, the city is the heart of the surrounding metropolitan region, which, with around 25 million inhabitants, is considered to be the second largest metropolitan area in the world after Tokyo. The 1988 Summer Olympics were followed thirty years later by the Winter Olympics in the Pyeongchang region. Despite its rapid economic development, numerous temples, pagodas, historical and holy sites, especially in rural regions, continue to link the country's past with the modern era. An era which is characterised by high tech as well as the famous kimchi. This national dish made of fermented vegetables and specially prepared beans is now also considered to be a miracle cure for a variety of cultural ailments by the Western culinary and healthcare world. ➔







### Rapidly growing economy

Today, South Korea is the country with the world's fastest Internet – something that is no coincidence. Thanks to a wide-ranging package of economic measures the country transformed itself from what was still an agricultural nation in the 1960s into one of the leading high-tech countries of the 21st century. Although this did not go entirely smoothly during the Asian crisis at the end of the 1990s, South Korea's strong economic performance meant it was able to fully repay its debts to the International Monetary Fund (IMF) in 2001.

As a small country with a great appetite for work, it is the eleventh biggest national economy in the world today. Gross domestic product per capita is already equivalent to that of the EU average. A look at GDP also illustrates the magnitude of Korea's leap in growth: in 1960 the gross income was USD 100, in 2016 it was USD 27,539. The largest contributor to this is industry, with a wide selection of products and services ranging from consumer electronics to telecommunications products such as smartphones and tablets to the semiconductor industry. Vehicles, ships, chemical and steel products and textiles also account for the country's economic success. The largest proportion of the wealth is contributed by the service sector, with around 62% of gross domestic product. The most important providers are industry, retail, transport and tourism. Among the country's best known companies are Samsung, Hyundai, KIA Motors and LG.

GDP 2017: **USD 1.538 trillion**

GDP 2018: **USD 1.829 trillion**



ECONOMIC GROWTH 2018:

**3,0%\***

\* Source: GTAI 2018 - Forecast estimate



INTERNET SPEED:

**#1** WORLD-WIDE

**Automation on the upswing**

South Korea occupies a strong position in the fields of robotics and automation; this is reflected by the robust growth in factory automation. The total turnover for the industry is expected to grow from 4.98 billion in 2015 to 8.12 billion in 2021, an increase of more than 10% per annum. This growth will primarily be attributed to developments in sensor technology. The trend is also bolstered by substantial investment in research and development as well as state support for innovative technologies. Another reason for the positive growth is the country's good education system. Attractive target markets for companies in the factory automation sector include the automotive and telecommunications industries. The automotive industry alone recently set an all-time record with a total of 3.171 million exported units worth USD 71.8 billion.

**Festo in Korea**

Festo recognised Korea's potential early on. Festo Korea was founded on 22 May 1980, almost four decades ago now. Pioneering pneumatic technology solutions for ever increasing automation contributed to the success story of the Korean economy. On top of this came solutions for electronic automation as well as factory and process automation. Today, in addition to its headquarters in Seoul, Festo has seven sales and service offices in Suwon, Cheonan, Gwangju, Daejeon, Ulsan, Daegu and Young-nam. There are also more than 50 Festo sales partners nationwide. The North Asia Application Center in Seoul has been a hub for Festo in Korea since March 2013. It supplies customers with state-of-the-art handling systems such as tripods, linear gantries and planar surface gantries. Here, automation solutions can be realistically simulated before they are implemented, ensuring their optimal operation.

The company is thus well positioned for further growth in the country. A country whose people know where they come from and where they want to go. It is at the forefront of international wealth – with virtues like wisdom, decency and justice – and of course with one other, very important virtue: ambition. ■



“Our success is based on our willingness to accept the challenges presented by the market and overcome them for the benefit of our customers.”

Simon Park, General Manager Festo Korea



Festo Korea has its headquarters in the huge metropolis of Seoul.





CPX/VTSA function terminals at the fastest sawmill in the world

# High-tech wood cutting

**“With our new automated saw, we achieve a speed of 150 metres per minute.** This makes it the fastest band saw line in the world”, explains Johan Fredriksson from Swedish timber supplier Norra Timber. The modular line was supplied by the Swedish subsidiary of the American system builder USNR. It includes the flexible function terminals CPX/VTSA in key places for actuating the pneumatic and hydraulic systems.







**From the timber harvest to facade cladding:**  
(as shown on the left in the picture of the art museum in Umeå, Sweden): after the powerful harvesters have done their job, the logs are taken to the Sävar Såg sawmill owned by Swedish timber supplier Norra Timber. Before the sawing process, state-of-the-art computer tomography is used to check the logs for foreign matter that could damage the machines.



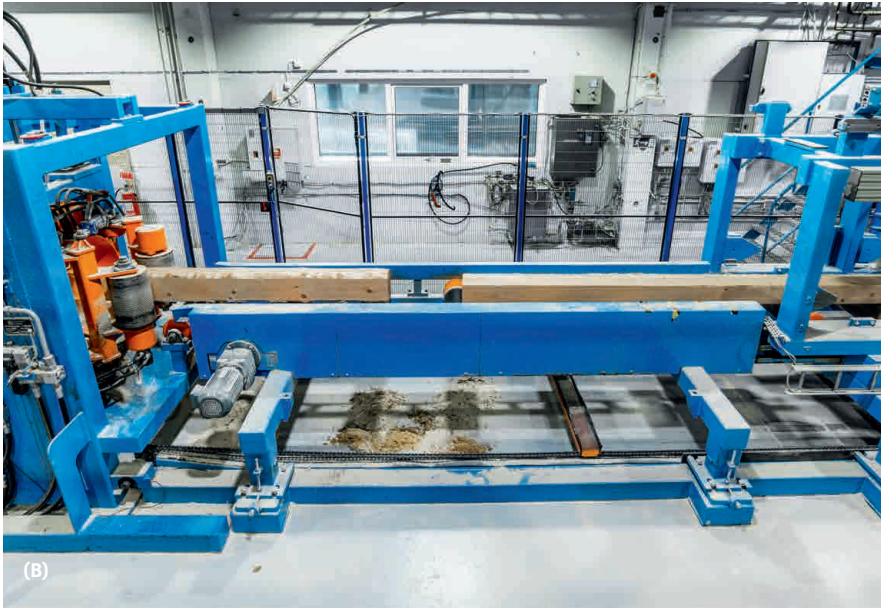


“The function-integrated valve terminals CPX/VTSA play a major role in our modular design.”

Jonas Ljung, Design Manager at USNR





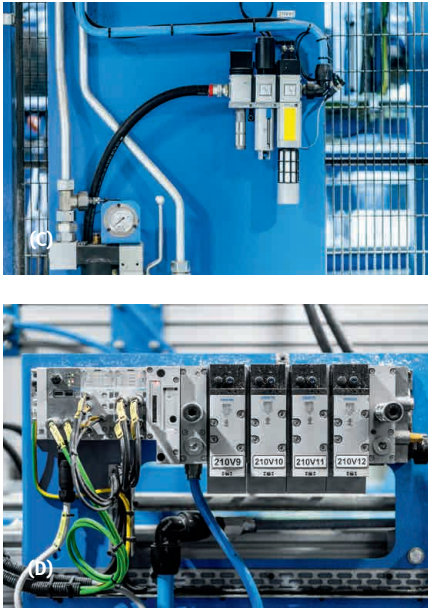


**(A) One by one:** as the logs pass through each station of the modular system, the distance between them becomes shorter.

**(B) In good shape:** the log's cross section is now rectangular. The high belt speed is possible thanks to precise cutting and the shorter distances between the logs

**(C) Safety valve MS6-SV:** ensures that safety-critical system components are exhausted and de-energised as quickly as possible in the event of an emergency.

**(D+E) Extremely robust in the dust of the sawmill:** the flexible function terminal CPX/VTSA with different fieldbus modules from PROFINET to EtherNet/IP and from Modbus® to DeviceNet®.



Johan Fredriksson is a production developer in the Sävär Såg sawmill of the Swedish timber supplier Norra Timber, located in the middle of never-ending pine and spruce forests in the north of the country. This means that there is an abundance of wood. “However, given the tough competition in the timber industry, it is crucial to invest in advanced technology in order to increase productivity and therefore yields,” emphasises Fredriksson. A further highlight of the sawmill is a computer tomograph upstream of the band saw line. This assesses the quality of the logs, and enables an optimal cutting pattern. It also protects the system by detecting foreign matter such as rocks that could damage the saw blades.

In the sawing process itself, automation technology from Festo supports the modular design. Thanks to the flexible function terminals CPX/VTSA, the flexible fieldbus modules and the large number of standards-based cylinders DNC, the plant modules worldwide can be adapted to individual customer requirements. In addition, the reduced wiring for the valve terminal technology shortens the time needed for installation and commissioning.

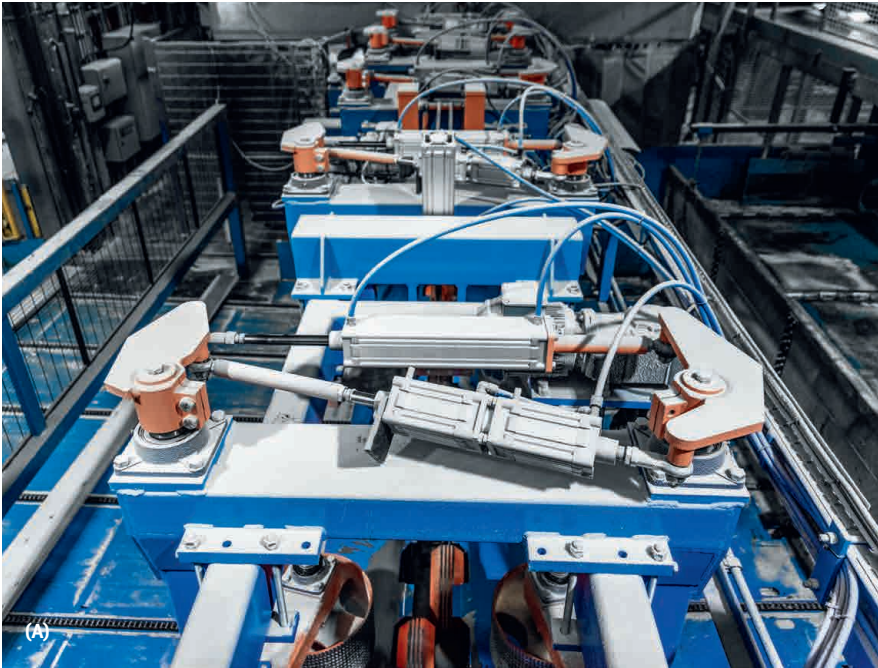
#### Higher timber yields

An understandably proud Fredriksson reports higher yields: “Up to now, we could only use 50% of a log for sawn boards. With the new band saw line, we have increased the timber yield per log by 6%.” With this, Norra Timber wants to increase

its annual output to 270,000 m³ sawn boards by 2020. The rest of the log is turned into wood shavings used by the pulp and paper industry as well as sawdust and bark for the sawmill’s own combined heat and power station to generate the heat for the kilns.

“The new band saw line from USNR is superior to other sawing technologies because it generates relatively little sawdust and wood shavings thanks to its fine and precise cuts,” says sawmill expert Fredriksson. A further benefit to boost productivity is the reduced distances between the logs along the conveyor section, thanks to the band saw line’s individual modules, allowing the high band speed to be used to the full. ➔





**(A+C) Transporting, clamping, centring:** standards-based cylinders DNC and ADN can handle dust and wood shavings.

**(B) Advising on future plans** to make the band saw line even more productive: Johan Fredriksson, Project Manager for the band saw line at Norra Timber (right), Jonas Ljung, Design Manager at USNR (centre) and Kristian Lütz, Industrial Sector Manager at Festo.



### Faster commissioning

“The automation platform CPX and the function-integrated valve terminals CPX/VTSA that actuate all drives – no matter whether pneumatic, servo-pneumatic or hydraulic – also play a major role in our modular design,” remarks Jonas Ljung, design manager at USNR. The robust valve terminals with protection to IP65 can handle dust, sawdust and wood shavings and are operated with different pressure zones. They actuate the many pneumatic cylinders of the type DNC and ADN that carry out positioning, clamping, centring and transport functions.

Hydraulic drives get their electrical pulses via the automation platform CPX. If greater flexibility is required because of the different dimensions of the logs, making the clamping and centring positions different, the pneumatic cylinders are actuated using

the servo-pneumatic module CMAX via the CPX/VTSA. The pneumatic cylinders DNC used for this are additionally equipped with a displacement encoder to ensure precise positioning.

### International fieldbus modules

The connection to the process control level is maintained by the CPX fieldbus module. “Here in Sweden we mostly use the PROFIBUS module, or Modbus® from Schneider Electric for other customers in Europe. In the USA and Canada, however, the band saw line can be supplied with the EtherNet/IP module or the DeviceNet® module on the CPX,” says Ljung when describing the high flexibility of the function-integrated valve terminals from Festo.

Control cabinet assembly is not necessary with the CPX/VTSA because of the high protection to IP65. Thanks to this and the

fieldbus technology, the time for installation and commissioning is reduced by 65%. There is less need for wiring, since there are also 80% fewer connection points. “As well as these hard facts, what’s also important for us is that Festo has been our partner in automation technology for more than 10 years and their automation experts are always on hand with service and advice – worldwide,” says Ljung. ■

[www.festo.com/cpx](http://www.festo.com/cpx)

You can find the **video** and more information on the wood processing industry at [www.festo.com/wood](http://www.festo.com/wood)





“With the new band saw line, we have increased the timber yield per log by 6%.”

Johan Fredriksson, Production Developer at Norra Timber



## Successful cooperation

USNR – known in Sweden until recently by the brand name Söderhamn Eriksson – is a long-standing partner of Norra Timber. USNR is a world-leading American corporate group in woodworking machines. With the integration of Söderhamn Eriksson, the Americans have gained a strong foothold in northern Europe and at the same time landed a technology leader in timber processing, since the Swedes have long had a name worldwide in the industry for speed, productivity and flexible automation.

“We were very happy that USNR installed the new line in two weeks, as it meant that we were able to get back to working at full speed after four weeks. We had planned more than six weeks of downtime,” reports Project Manager Fredriksson from Norra Timber. The shorter commissioning time was made possible by the modular design of the band saw line. Reducers, log turners, conveyor lines and band saw units are independent units that are put together in the assembly halls of the Swedish subsidiary of USNR in Söderhamn with all of their automation technology before being installed as complete modules on the factory floor of Norra Timber.

## Norra Timber

Skeppargatan 1  
Box 4076  
904 03 Umeå  
Sweden

Area of business:  
Sawing and marketing timber boards for the construction industry for facade cladding or for floors

[www.norratimber.com](http://www.norratimber.com)


## USNR

Box 113  
826 23 Söderhamn  
Sweden

Area of business:  
Manufacturer of band saw lines and further woodworking machines for sawmills

[www.usnr.com](http://www.usnr.com)



A black and white photograph of a worker in a spray booth. The worker is wearing a dark jacket and gloves, holding a spray gun that is emitting a fine mist of paint. They are painting a large, light-colored car part, possibly a door or fender, which is suspended in the air. The spray booth has a metal frame and a perforated floor. In the background, there are various industrial components and a sign that says "SALIDA".

Energy efficiency in commercial vehicle production

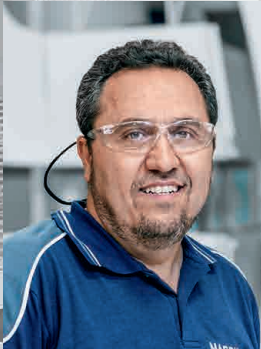
# Optimised consumption

**Energy efficiency doesn't just begin on the road.** It starts with vehicle production where intelligent automation solutions help to save energy and reduce costs. The IVECO plant in Madrid relies on an energy efficiency solution from Festo to achieve just this.





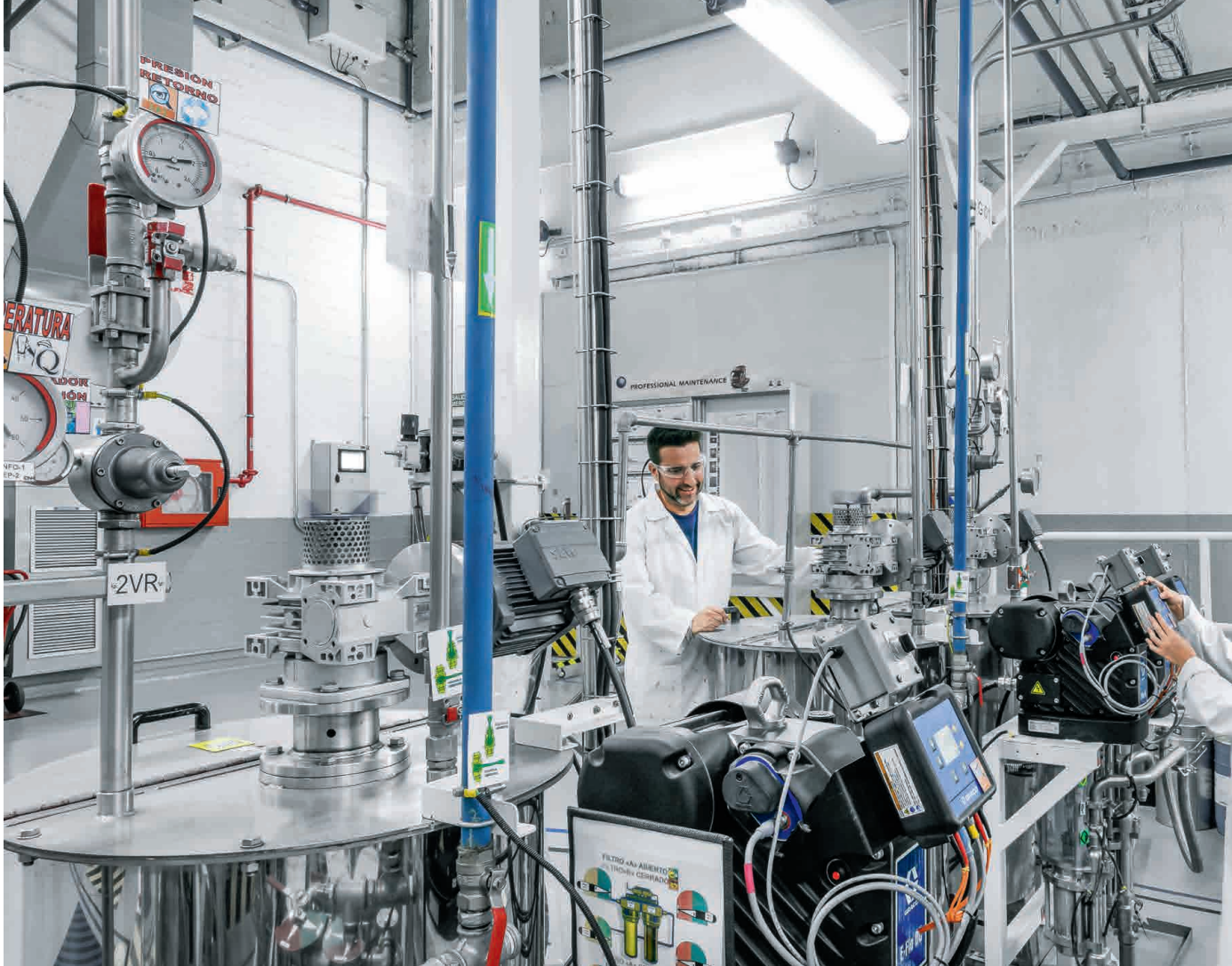
**Energy efficiency in action:** manually spraying plastic car body parts at the IVECO plant in Madrid.



“The energy efficiency module gives us the advantage of being able to continuously monitor the relevant process data – this is condition monitoring with a view to Industry 4.0.”

Miguel Ángel Daganzo, Maintenance Manager at IVECO Madrid





**In the mixing chamber for automotive coatings**, the energy efficiency module reduces compressed air consumption.

**A**t the Spanish production facility for heavy commercial vehicles – which is also home to IVECO’s research and development centre – a series of improvements in environmental protection have been introduced in recent years. As a result, CO2 emissions per vehicle produced have fallen by 53 per cent. Up to 99 per cent of waste materials are recycled. As the first IVECO plant of CNH Industrial N.V., which specialises in capital goods such as commercial vehicles, the Madrid site achieved World Class Manufacturing Gold Level in 2017 for the integrated management of production systems and processes. In its quest to reduce its carbon footprint, the plant has now taken the next step and introduced an energy efficiency solution based on MS9 series service units from Festo. The customised solution basically functions in the same way as the energy efficiency module MSE6-E2M, but has higher flow rates.

#### **Automatic monitoring**

The energy efficiency module is used in the mixing chamber for automotive coatings, where it achieves sustainable energy savings. The mixing chamber at IVECO Madrid serves as an internal

supply centre for both manual paint booths and paint booths equipped with robots. Maintenance Manager Miguel Ángel Daganzo describes the benefits of the pneumatic mixing process: “The module automatically controls and regulates the compressed air supply. We save energy because the intelligent device permanently monitors the amount of air consumed and automatically shuts off the air supply when the system is in stand-by mode.”

#### **Less maintenance work**

With its intelligent pneumatics, the energy efficiency module from Festo is making an impact in the paint booths. The benefits include an end to the constant pressure build-up as well as the detection and reporting of costly leakages. “As soon as the system detects a drop in pressure, it sends a notification,” says Miguel Ángel Daganzo. “This means that it is no longer necessary to have an entire team of employees permanently dedicated to maintenance work.”

#### **Transparent processes**

The energy efficiency module also monitors the relevant process data. Miguel Ángel Daganzo: “Monitoring critical process data gives us a major advantage in



**The compact design** of the energy efficiency module means that it fits in the ATEX safety cabinet. It is operated using a touch screen, smartphone or tablet.

the context of Industry 4.0. The energy efficiency of the pneumatic components in our production systems is increasing because we now have access to process data that was not previously available to us.” The information collected by the module can simply be received and read using a smartphone or tablet. Faults can be detected quickly and easily. Response times are getting shorter.

**Safe operation**

The energy efficiency module was installed together with a CPX terminal with touch screen for controlling the system directly in the plant. For safety reasons, both the module and the CPX terminal are protected by two ATEX cabinets. The automation solution thus complies with the ATEX directive of the European Union for potentially explosive areas. This is where

IVECO Madrid benefits from the compact design of the module. As the benchmark for energy efficiency, IVECO is considering introducing the energy efficiency module in other plants. ■

- 🌐 [www.festo.com/efficiency](http://www.festo.com/efficiency)
- 🌐 [www.festo.com/e2m](http://www.festo.com/e2m)

**IVECO España S.L.**

Avenida de Aragón 401  
28022 Madrid  
Spain  
[www.iveco.com/spain](http://www.iveco.com/spain)

Area of business:  
Development and production of  
commercial vehicles and passenger  
transport vehicles





# Pneumatic fitness

**The fitness market is booming.** Training centres are springing up like mushrooms. There are lots of fitness equipment manufacturers, but only a few who produce pneumatically assisted equipment that is gentle on joints and muscles. Finnish company HUR is one of the pioneers of this technology and uses cylinders and pre-assemblies from Festo.

**T**raining equipment that can adapt to muscle power, such as leg presses, shoulder presses or multi gyms that enable gentle and smooth movement and resistance, is the fitness equipment of choice, particularly for rehabilitation after accidents and operations or for older people. It is easy to adjust and simulates the natural movement of the muscle when working against a resistance. The use of Festo pneumatic products in the training devices from HUR permits these gentle movements – without any inertia effect. Compressed air means that the resistance in the equipment can always be perfectly adapted to the power output of the muscles, regardless of the speed of the movement. HUR offers its customers tailored equipment solutions and concepts, whether for use in physiotherapy, rehabilitation clinics, retirement homes, fitness studios, hotels or in-company gyms.

The name HUR stands for Helsinki University Research – and the development of the training equipment by the company founders is indeed based on scientific findings. They named their system Natural Transmission™. It is the result of scientifically based product development involving biomechanics experts from numerous universities the world over.

## Avoiding the inertia effect

With effective equipment-based training, the power output changes – in line with the natural human movement. Conventional training equipment with weight plates tries to achieve this through the use of eccentric cams. Additional power has to be applied to accelerate or decelerate

the weight at the beginning and end of a movement. The faster the weights are moving, the more pronounced this effect is. The power output at weight training equipment therefore changes as a function of the performance level during the exercise. The result is a less than optimum training effect, particularly during fast movements when the inertia distorts the load on the muscles. This has a negative effect on the joints.

## Weight plates replaced by pneumatics

However, fast movements and short response times are very important in sport and in daily life. The company therefore uses pneumatics instead of weight plates. The result: no inertia. This offers decisive advantages, especially for rehabilitation patients and senior citizens. Starting the resistance close to 0 and increasing it in increments of 100 g or 1 kg helps this group of people to achieve visible successes quickly, and motivates them to permanently integrate training in their everyday life.

## Benefits of pre-assembly module and standards-based cylinder

Depending on the piece of equipment, up to six standards-based cylinders DSBC from Festo with low friction and therefore low noise generation are used. “We achieved this using a special bearing cap,” explains Markus Högnäs, Plant Manager at HUR in Kokkola. The cylinders are activated using valves VUVG. Festo supplies these to the fitness equipment manufacturer together with pressure sensors and pressure regulators as pre-assembly modules. The resistance of the cylinders has low friction to ensure precise and prolonged training.

The cylinders were tested over 10 million cycles without any noticeable signs of wear. All the pneumatic components comply with the ISO and VDMA standard.

“Using standards-based industrial parts may be more expensive, but it guarantees that you can get spare parts at a fair price anywhere in the world within a reasonable time,” says Markus Högnäs. This is especially important for HUR, since it exports 90% of its annual production of 2,500 pieces of training equipment. ■

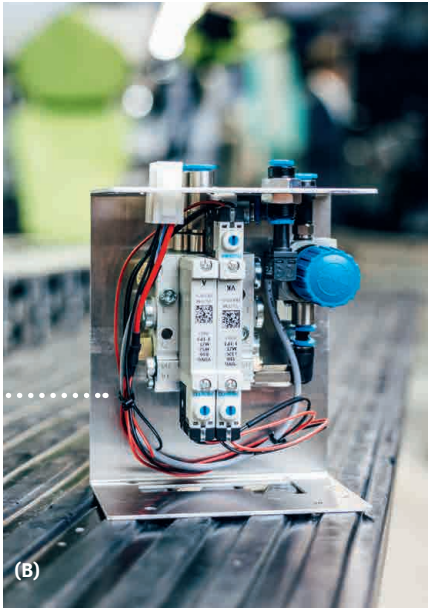
[www.festo.com/dsbc](http://www.festo.com/dsbc)

[www.festo.com/vuvg](http://www.festo.com/vuvg)

## HUR Oy

Patamäentie 4  
67100 Kokkola  
Finland  
[www.hur.fi](http://www.hur.fi)

Area of business:  
Manufacture of pneumatically assisted fitness equipment and development of integrated fitness concepts for fitness and rehabilitation centres



(A) **Pneumatic fitness:** no inertia effect in training equipment with the standards-based cylinder DSBC and the pre-assembly for controlling the actuators. (pictured: Markus Högnäs, Plant Manager at HUR).

(B) **Customised pre-assemblies:** supplied as a complete module, they reliably control the pneumatic drives.

“The resistance in the training equipment always adapts perfectly to the power output of the muscles thanks to compressed air.”

Markus Högnäs, Plant Manager at HUR



# [ Compact ]

From around the world



**Suncun, China** “We are well on schedule,” says Gerald Müller, Project Manager for One Location Suncun, describing the status of the building work for the new production plant. A lot has happened since the foundation stone was laid almost exactly a year ago. The first of a total of four construction phases is scheduled for completion in the spring of 2019. Part of the current Global Production Center located 15 km away in Jinan will then be moved here. The new logistics centre will open its doors in 2020. It will ensure that Festo can supply the Chinese market quickly and directly, thus strengthening the global production network.



**As far as the eye can see:** the first construction phase in July of this year...



...and this is the same site in October.



## Pneumatics at the Arctic Circle

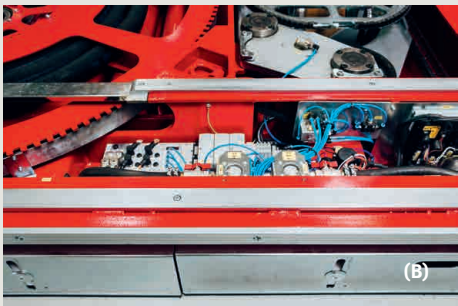
**Russia** // Drilling for gas in the polar regions is a challenge. It's not unusual for temperatures to drop as low as  $-60^{\circ}\text{C}$ . Not to mention the fact that the gas fields here are located a good three kilometres below the surface. The pressure in the deposits is high, as is the temperature of the gas. Under these conditions, hydrate can form. Ice crystals can block the pipelines and, in the worst case, can cause them to burst. Getting hold of spare parts can take weeks because there is no infrastructure in the Arctic.

While searching for a reliable, individually configurable solution and for gas valves that could withstand the harshest of conditions, the Russian company Gazprom, the world's largest gas supplier, approached Festo. The main demands of the system were that it must be robust both on the outside and on the inside, it must be completely temperature-resistant, and it must be durable, efficient and resource-saving. In an emergency it should be possible to operate by hand. Each valve should only operate with as much pressure as the application actually requires. And finally, Gazprom wanted to carry out tests on the actuator unit under realistic conditions.

The result was a complete valve-actuator solution that was designed for controlling hazardous media in pipelines and operation at extreme temperatures. The explosion-proof pneumatic actuator and control system GBVA for ball valves has been deployed along the Russian natural gas pipelines since 2014. GBVA/DAPS ensures the reliable automated and manual control of process valves. The control principle is based on quarter turn actuators DAPS. VSNZ control valves make it possible to safely switch to the valve actuator in the local control mode. All the components are explosion protected (ATEX classification II 2 GD EEx d IIC T5). At the same time, the solution is easy to install, set up, control, maintain and to operate.



**Cool customer:** a long service life and very low maintenance and service requirements are what sets the GBVA/DAPS system apart.



# Making light work of heavy loads

**Finland** // From aircraft fuselages to locomotives and oversized paper rolls, Solving can literally “solve” all problems when it comes to handling heavy, bulky loads. Air cushions controlled by the valve terminal CPX/MPA from Festo provide the technological basis for the solutions developed by the Finnish company.

The air cushion transport systems from Solving transport heavy loads of up to a thousand tonnes or more. The load is either placed directly on the transporter or first placed on a loading platform, which is positioned above the air cushion transporter, to lift the load. The air cushion virtually eliminates friction. In most cases, the transport vehicle is controlled remotely, which means that only a single operator is required to control and monitor the transport of heavy loads.

To control the air bearings, which were developed in-house, Solving uses valve terminals CPX/MPA, some with a very large flow rate and proportional valves. “These give us the degrees of freedom required to adapt the systems to our customers’ individual requirements,” explains Torbjörn Södergård, Senior Technical Advisor at Solving. “The fact that the CPX/MPA combines the complete pneumatic and electrical control system in a single component is extremely practical from a design perspective,” he adds.

[www.solving.com](http://www.solving.com)

**(A) Moving a plane fuselage:** an easy task for the transport systems from Solving.

**(B) Controls air bearings** for heavy loads: valve terminal CPX/MPA with safety functions.

**(C) Torbjörn Södergård**, Senior Technical Advisor at Solving, shows how easy the transport system is to operate.

**Silverstone, England** Festo Great Britain had a very special reason to celebrate this year. At the venue where Formula 1 cars normally do their laps around the circuit, this time it was a golden birthday that was the centre of attention. Managers and staff of Festo GB gathered at Silverstone, the home of British Motor Racing, to look back at the last fifty years together with members of the Festo founding family Stoll, all Corporate Board members and many European General Managers. Eliza Rawlings, General Manager of F-GB (see photo): “This milestone anniversary event was a celebration of the great progress the company has made and we look forward to many more years working together with our customers in the future.”



**50** years  
Festo  
Great Britain  
1968 – 2018



**Berlin, Germany** Together with Festo and 17 other companies, Siemens AG founded the global user organisation MindSphere World for the open, cloud-based MindSphere IoT operating system. The association intends to expand the ecosystem surrounding MindSphere around the world and to assist members with, amongst other things, developing and optimising IoT solutions on MindSphere. Andreas Oroszi, Senior Vice President Digital Business at Festo, was elected as a member of the Management Board of MindSphere World at the founding event on 24 January 2018.



**Andreas Oroszi**, Senior Vice President Digital Business at Festo (bottom row, second from right), and the founding members of MindSphere World

Since its foundation, the number of member companies has risen to over 30, and is still growing. A new MindSphere World association was founded in Italy in August 2018. Together with Mindsphere World in Germany, which also acts as the umbrella organisation, the Italian association covers the southern European countries. There are also plans to found new associations in Asia in 2018 and in North and South America in 2019. By participating in the Technology, Business Processes and Marketing committees, member companies have the opportunity to use the MindSphere IoT platform and play a key role in the expansion and further development of this ecosystem.

[www.mindsphereworld.com](http://www.mindsphereworld.com)



# Vitamin DHAS

**Spain //** Spanish firm Giró is responsible for inventing the net bags used all over the world for the packaging of fruit. Known for its innovative automation solutions for packaging, the company's latest development is the Exact 100 dynamic weigher. It offers up to 100 weighs per minute and is accurate to 10 g. One of the highlights of the system are the adaptive gripper fingers DHAS from Festo. These ensure that the fruit is weighed quickly and precisely before being packaged. The bionic gripper fingers were attached to the ends of eight V-shaped vibrating channels in a static feed system. They ensure that the correct number of fruits drop into the weighing pan.

Thanks to the innovative automation solution, the system can perform 100 weighing processes per minute. The gripper fingers adapt gently and flexibly to different shapes thanks to the Fin Ray Effect® inspired by a fish's fin. Two flexible bands, which meet at the top like a triangle, form the basis of the Fin Ray Structure®. The bands are connected by regularly spaced ribs, using flex hinges. This flexible but sturdy connection of the joints allows the gripper fingers to adapt to the contours of a workpiece. As a result, the oranges – as seen here in the system developed by Spanish fruit and vegetable packaging specialist Giró – remain undamaged even at high process speeds..



**Gentle transport:** the patented system from Giró with flexible gripper fingers DHAS from Festo.

[www.giro.es](http://www.giro.es)

# The bionic classroom



**Germany //** A fish's fin, a chameleon gripper, an elephant's trunk and much more – the interactive Bionics4Education training concept brings the diversity of bionics into the classroom. Consisting of a practical training kit and digital learning environment, it teaches pupils between the ages of 14 and 18 how to build their own bionic animal robot. The bionics kit contains all the components required to develop fascinating bionic motion models.

It includes servo motors, electronics components and polymer components such as the three-dimensional Fin Ray structures. These components can be combined with everyday materials that you would find in a school to create completely individual models. Students can access free online support at [www.bionics4education.com](http://www.bionics4education.com). Along with helpful tips for practical implementation in class and at home, there are training videos, software codes and CAD data for printing out components on a 3D printer. The interdisciplinary learning content is especially suitable for integration in the subjects of biology, physics, technology and IT and can be used during project days.

[www.festo.com/bionics4education](http://www.festo.com/bionics4education)



With Bionics4Education the variety of topics in bionics can now be experienced in the classroom.



## About this magazine

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### Please note

All terms such as customer, user, specialist or sales engineer refer to both men and women.

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# Is precision important to you, Ms. Hägele?

”

Yes, you could definitely say that. Precision matters a great deal to me, both in my work as a cyberneticist and in my hobby as a dressage rider. Both require attention to detail and perseverance, taking small steps to achieve your goal. There are two things that I always need to keep in mind. Firstly, I need to concentrate on the path immediately in front of me, in other words what I want and need to do next; secondly, I also need to focus on the path further ahead, the path that will lead me to my future goal.

I've always been fascinated by dressage. You need a passion for precision and a great deal of patience for tweaking things until they work perfectly. I train regularly with my mare Deltona – literally working step by step to become better. When I was studying engineering cybernetics, I learned how you can control something in order to make it move in a particular way at a specific time. This is exactly what I do in my work on adjusting the valve stroke for the development of the Festo Motion Terminal. When I create a model, it should behave in exactly the same way and have the intended effect in the real system. But this isn't always the case. Reality can only be predicted to a certain extent.

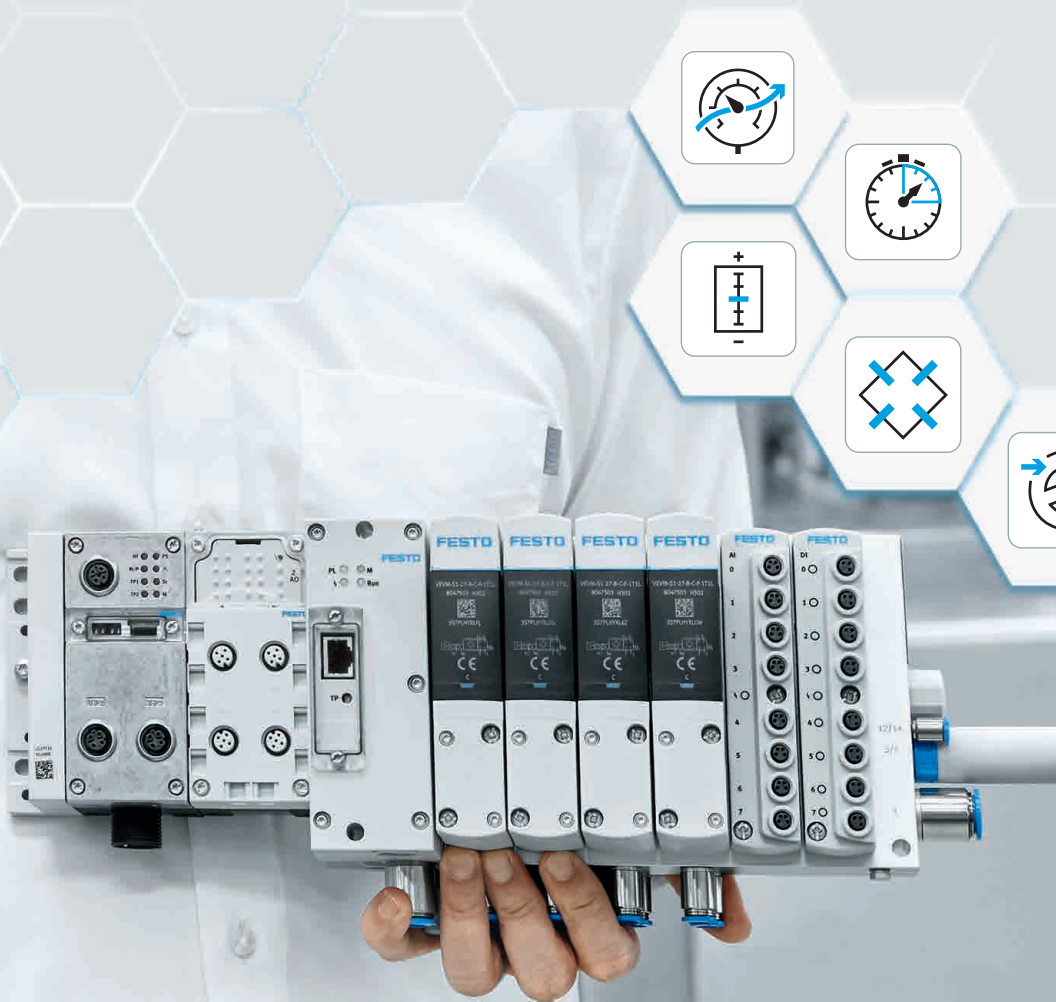
The Festo Motion Terminal was uncharted territory for us in the Digital Pneumatics department. We had no idea beforehand what to expect. As the first standardised platform to be controlled using apps, this was a major step towards Industry 4.0. Everyone on the team was focused on the common goal and believed that we could achieve it. We are continuing to work on the further development of the Festo Motion Terminal. We are adding more functions in the form of new apps, for example. We also work very closely with our customers. Just like in dressage, we are making improvements as part of a long-term, open process. I always think of the wise words of my trainer: "You have to strive for the impossible in order to achieve the possible."



# Get digital. Now!

With the Festo Motion Terminal VTEM

**FESTO**



You rely on maximum flexibility.  
You are looking for intelligent and intuitive solutions.  
We are making pneumatics go digital.

**→ WE ARE THE ENGINEERS  
OF PRODUCTIVITY.**

The first valve to be controlled using apps – with the functionality of over 50 individual components in a single piece of hardware. It thus combines the advantages of electric and pneumatic technologies.

→ [www.festo.com/motionterminal](http://www.festo.com/motionterminal)





### Invisible paths

Sahara, Gobi, Taklamakan – for thousands of years, caravans have crossed the world's deserts as they travel along now-famous paths such as the Silk Road and the Incense Route. They face the searing sun and desert winds, with oases and watering holes providing the only relief. These perilous journeys, often taking several weeks, were extremely important in the pre-industrial age. Trade and cultural goods, including precious gold, silk, myrrh, incense and exotic spices made their way along seemingly invisible paths from their place of origin all the way to Europe. The transport of valuable goods led to the establishment of communication networks from one world to another, bringing knowledge and values from Africa and the Orient to the West. The salt caravans of the Tuareg (pictured above) can still be seen making their way through the Ténéré region of the southern Sahara in northern Niger today.

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