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.

Pneumatics goes digital: world first Festo Motion Terminal VTEM
Different functions, always the same hardware! Whether for standard directional control valve functions like for example 4/2, 4/3, 3/2 or for presetting the travel time, you can now control functions using apps. For maximum flexibility and standardisation, reduced complexity and installation times, and many other benefits. Find out more:

www.festo.com/motionterminal
Dear reader,

Connections, whether at an interpersonal or a physical or technical level, are hugely important – and not just for companies like Festo. They open up new perspectives and offer countless opportunities for numerous industry sectors. In this issue of trends in automation we focus on the many different forms that connections and networking can take.

Take digitalisation, for example. Without it, we would not be on the road to Industry 4.0. This current megatrend signals a seismic shift in technology, in production and in our working and everyday lives. People and machines will work in close cooperation, as shown by the BionicCobot. Machines and devices will be able to communicate with one another, adjust themselves, repair themselves and request fresh supplies for their production operations.

These new ways of communicating and connecting mean that seemingly infinite amounts of data can be processed and analysed. That is a central feature of this shift. We cannot yet say for sure how far it will take us. Analysts predict that in three years’ time, more than 20 billion devices will be networked. The Festo Motion Terminal, a world first innovation, is already leading the way. Controlled using apps, it is revolutionising pneumatics.

The key to the successful development of the Festo Motion Terminal was the close cooperation between teams from many different disciplines as well as collaboration with customers. This type of industry-oriented, interdisciplinary research with other companies, associations and institutes is set to become increasingly important. It facilitates the development of innovative applications that would simply not be possible without these connections, and benefits many companies and their customers from a wide variety of industry segments.

Intensive exchange has always been a feature of the strong partnerships that Festo has formed with its customers. Not only will this be the case in the future, we also intend to strengthen these connections, whether they are created in the conventional way through direct dialogue, via social media, via e-mail or through the Online Shop.

Stay connected with us! I hope you find this issue an informative read.

Best regards

[Signature]

Dr. Ansgar Kriwet, Member of the Management Board, Sales, Festo AG
In Focus Connections The Atlantic Road in Norway connects numerous small islands in an impressive way (see back cover). The production of the future is providing new ways for people and machines to interact and connect. The success of connected work is evident for example in the collaboration between companies and research institutes.

trends in automation 2.2017

Compass

Inspired by tentacles
OctopusGripper: this latest development from the Festo Bionic Learning Network takes its inspiration from nature and shows us how the grippers of the future might look and function. → 8

Interaction
BionicCobot: the pneumatic light-weight robot offers safe interaction, natural motion sequences and intuitive operation. → 12
**Impulse**

**Ready...set...connect!**
CPX-IoT connects components and modules from the field level, such as the Festo Motion Terminal or handling systems, to the Festo Cloud via their OPC UA interface. → **16**

**Connected research**
In our interview, Prof. Dr. Peter Post from Festo explains why joint research with other companies, research organisations and institutes is important and benefits everyone involved. → **18**

---

**Synergies**

**Carefully packaged**
The freely configurable and flexible Multi-Carrier-System (MCS) synchronises the conveyors for the product and the cardboard box in the servo-controlled horizontal cartoning machine from ECONO-PAK. → **20**

**In good stead**
In the filling and packaging machine from Thimonnier, the valve terminal VTUG with IO-Link controls all pneumatic functions. → **30**

**Precisely dosed**
As the world's first freely scalable sachet machine, the Sigpack VPF from Bosch Packaging uses the new flexibility provided by the digital pneumatics of the Festo Motion Terminal. → **26**
Pulling power

He calls the Port of Hamburg his home. Photographer Jan Sieg finds himself constantly drawn to the water to see the huge container ships as they arrive here from all over the world. He is never short of a subject to photograph, like the CSCL Pacific Ocean shown here. This container ship, which is 367 metres long and sails under the Hong Kong flag, has a deadweight of 184,320 tonnes, making it one of the biggest ships of its kind.

The ship can carry up to 19,100 standard containers. But we shouldn’t forget the real stars of the Elbe – the tugboats. Without them, the big ships wouldn’t get anywhere. They guide the huge container ships and seagoing vessels as they enter and leave the port. These small powerhouses tow, push, tug, steer and brake. With its powerful engines, the “Boxer” achieves a pull and thrust of 70 tonnes.
Inspired by tentacles

Tomorrow’s grippers must be versatile so that they can handle the growing range of products and workpieces. Innovative developments such as the new OctopusGripper effortlessly adapt to different shapes. The bionic tentacle combines the functionalities of multiple grippers in one, thus reducing complexity through flexibility.
Gripping is one of the pivotal functions of automation. Secure picking up, holding and putting down are basic requirements for fast and reliable transport as well as the precise positioning of workpieces. The extensive and varied range of objects to be gripped is now matched by an equally large variety of grippers. Having to change grippers often requires complex replacement and conversion work on a system.

But for the production of the future, more flexible systems are needed with grippers that reduce complexity and autonomously adapt to the product to be manufactured in line with the plug & produce approach. This latest development from the Festo Bionic Learning Network takes its inspiration from nature and shows how the grippers of the future might look and function.

**Grip like an octopus**

The OctopusGripper is a bionic gripper based on and inspired by an octopus tentacle. It consists of a soft, pneumatically actuated silicone structure. When supplied with compressed air, the tentacle bends inwards and wraps around the item to be gripped in a form-fitting manner. Just as with its natural model, the inside of the silicone tentacle has two rows of suction cups. The small suction cups on the end of the gripper work passively and hold the object, while the larger ones are connected to a vacuum line and can be actively controlled during the gripping process.
Simple technical implementation
As soon as the pneumatic tentacle wraps around the object, a vacuum is applied at the suction cups, enabling the gripper to hold the object securely. A chamber runs lengthways along the tentacle and supplies it with compressed air. A textile cover surrounding the air chamber restricts its expansion and protects the silicone against damage.

Getting to grips with different shapes
The combination of secure, form-fitting gripping and adhesion makes the OctopusGripper suitable for a wide variety of objects with different shapes and geometries, with a smooth surface and high sensitivity. But the bionic tentacle can do even more. It also meets the strict requirements of soft robotics and can be used for working in direct contact with people as the other materials used in the structure are elastic. The gripper thus poses no danger in direct contact with people.

For a safe working relationship
To prepare it for use in industry, Festo is testing the OctopusGripper on two pneumatic lightweight robots: the BionicMotionRobot and the BionicCobot. Like the bionic tentacle, these two robots were developed in the Festo Bionic Learning Network. They are designed to be pliable and in terms of their kinematics they can be infinitely stiffened.

They can therefore interact directly with the user. Even in the event of physical contact between people and the machine, the BionicMotionRobot and the BionicCobot are harmless and do not have to be shielded from the user like conventional factory robots.

Digital pneumatics using apps
The varied motion sequences of the two robots, together with the exact dosing of compressed air and vacuum in the OctopusGripper, are made possible by the Festo Motion Terminal. It controls the robot arm as well as the gripper. The software control system of the pneumatic automation platform uses apps to combine the functionalities of over 50 individual components.

Thanks to its digitised pneumatics and its soft structure, the OctopusGripper has major application potential for the collaborative working spaces of the future. By using pneumatic kinematics with vacuum-based holding force, it can already solve a very wide range of industrial gripping tasks.

Further information and animations can be found at www.festo.com/octopusgripper
The motion dynamics of the BionicMotionRobot enable virtually seamless interaction with the OctopusGripper. Its natural model is the elephant’s trunk. And like the elephant’s trunk, the pneumatic lightweight robot is just as sensitive and gentle as it is powerful and dynamic. The 12 degrees of freedom that give the BionicMotionRobot outstanding flexibility are all down to three flexible basic segments, each of which is moved by four pneumatic bellows. Its modular structure enables the robot arm to perform the same fluent, natural movements as its biological model. The predecessor of the artificial elephant’s trunk, the Bionic Handling Assistant, was introduced to the public in 2010 and won the German Future Award.

www.festo.com/bionicmotionrobot

Natural model: grips like the tentacles of an octopus.

Wide range of uses: the flexible gripper on the BionicCobot.
The digitalisation of production is opening up new possibilities in control, sensor and actuator technology. Machines are learning to detect all the different facets and details of their environment, and to become better at recognising people. The traditional distribution of roles in industrial manufacturing is thus rapidly being superseded. Although people and machines are currently still separated from one another by safety guards, in future they will share their working spaces more and more often. To achieve this, robots must ensure that they never put the user at risk. The BionicCobot shows how this

**Interaction**

The requirements for the production of the future are manifold and are changing faster than ever before. This industrial change requires a new way for people and machines to interact. The BionicCobot is the first pneumatic lightweight robot developed by Festo that can work directly and safely with people.
can already be done in automation. Digitised pneumatics makes the BionicCobot extremely pliable, flexible and precise.

**Lending a helping hand**
The bionic robot arm demonstrates how the manual work performed by people and the automated action of the robot merge into one in a collaborative working space. The BionicCobot is based on the human arm not only in terms of its appearance, but also its kinematics – from the shoulder to the upper arm, elbow, ulna and radius down to the wrist and the gripping hand.

Its agonist-antagonist drive concept provides it with highly dynamic movement and adjustable rigidity, just as in the interaction between biceps and triceps in the human upper arm. Like the blood vessels and nerve cords in the human body, the compressed air lines run inside the robot arm where they are well protected and supply the pneumatic semi-rotary vane drives of the seven joints. Thanks to its high degree of built-in flexibility and safety, the BionicCobot offers the user a new way to collaborate. The machine is a partner that shows the human user via an intuitive tablet interface how it can provide support and lend a helping hand with various tasks.

**System shows its sensitive side**
Pneumatics offers a crucial advantage for direct contact between people and machines and gives the systems its inherent flexibility. If an actuator is filled with compressed air, the speed, force and rigidity of the motion generated can be precisely set. In the event of a collision, the system eases off, thus posing no risk to the worker.

While the strengths of pneumatic actuators have always been their ease of operation and their robustness, as well as the low purchase costs and their high power density, in lightweight robots they show their sustainable and flexible side.

**Technical data**
- Degrees of freedom: ... 7
- Net weight: ................. approx. 6 kg
- Payload: ................. approx. 1.5 kg
- Positioning accuracy: ... 1 mm

**Software architecture:**
- User interface: ......................... C# WPF application
- Calculation and path planning: .......... Robot Operating System (ROS)
- Control and regulation: ................. Festo Motion Terminal

2.2017 trends in automation

**Compass 12 – 13**
App controls the pneumatics
The new Festo Motion Terminal also has a part to play in the current BionicCobot. The software control system of the pneumatic automation platform uses apps to combine the functionalities of over 50 individual components. The digitisation of pneumatics is thus opening up completely new areas of application, which until now have been the preserve of electric automation.

The Festo Motion Terminal combines high-precision mechanical components and sensors with complex control and measuring technology within a very small space. With the internal control algorithms of the motion apps and the piezo valves, flow rates and pressures can be precisely dosed, and even varied in several channels at the same time. This enables both powerful and fast, as well as soft and sensitive motion sequences.

People teach technology intuitively
The BionicCobot is operated intuitively via a tablet and graphical user interface. Work steps can be arranged in a timeline in any order by dragging and dropping. The complete motion sequence is depicted virtually and simulated at the same time. The interface between the tablet and the Festo Motion Terminal is the open-source platform Robot Operating System (ROS), which is used to plan the paths of the kinematic system. The ROS interprets the incoming code from the tablet and forwards the resulting axis coordinates to the Motion Terminal. Based on the coordinates received, the Motion Terminal uses its internal algorithms to regulate the pressure in the air chambers and determines the position of the individual axes. The incoming sensor data from the seven joints is channelled into action in real time.

Intuitive operation: the robot arm can easily be taught using the tablet interface.

Conceivable future scenario: the BionicCobot as an assistance system in assembly.

Natural movement creates trust
Along with the tablet interface, the user has a manual control panel on the gripping joint of the BionicCobot. The robot can also communicate with the user via its blue LED light, for instance to indicate a waiting mode or to send warnings.

People teach technology intuitively
The BionicCobot is operated intuitively via a tablet and graphical user interface. Work steps can be arranged in a timeline in any order by dragging and dropping. The complete motion sequence is depicted virtually and simulated at the same time. The interface between the tablet and the Festo Motion Terminal is the open-source platform Robot Operating System (ROS), which is used to plan the paths of the kinematic system. The ROS interprets the incoming code from the tablet and forwards the resulting axis coordinates to the Motion Terminal. Based on the coordinates received, the Motion Terminal uses its internal algorithms to regulate the pressure in the air chambers and determines the position of the individual axes. The incoming sensor data from the seven joints is channelled into action in real time.

Natural movement creates trust
Along with the tablet interface, the user has a manual control panel on the gripping joint of the BionicCobot. The robot can also communicate with the user via its blue LED light, for instance to indicate a waiting mode or to send warnings.
If, despite all this, there is physical contact, the robot arm automatically gives way and poses no danger for the user. The natural movements of the BionicCobot ensure that it can be fully trusted and accepted by people, thus forming the basis for close collaboration.

**Work ergonomically, live better**

In the working and living environment of tomorrow, the BionicCobot will open up new possibilities for relieving people of monotonous or dangerous and unhealthy tasks, improving ergonomics and increasing productivity. The pneumatic lightweight robot can be used to partly automate work steps in production, in manual work and in service or maintenance simply and economically. The specially developed software technology, such as the user interface, can also be transferred to other robot kinematics. The BionicCobot is already literally getting to grips with scenarios that in the not-too-distant future will be part of our everyday lives – in the factory of the future as well as in housing, health and services.

The Festo Bionic Learning Network is continuously working on the development of groundbreaking solutions for a safe and ergonomic working and living environment. The experts report regularly on their latest developments at www.festo.com/bionics.
Four factors are driving Industry 4.0 and the Internet of Things: networking, adaptability, energy efficiency and new business models. The IoT gateway CPX-IoT is the portal to a secure cloud solution. It enables machine and system builders as well as end customers to significantly improve their overall equipment effectiveness through better networking and system adaptability.

Fully networked “things” will simplify business life in the future. Taking centre stage for Festo are products and solutions that are fit for Industry 4.0, such as digitised pneumatics with the Festo Motion Terminal. The main goal is the integration of different functions across system boundaries. To achieve this, a number of requirements must be met, including a common reference architecture in which the Industry 4.0-capable products can collaborate and communicate, as well as gateways and interfaces. These take the information to, for example, the Festo Cloud where it can be evaluated and interpreted.

Digital twin
Festo is using digital twins to embed its products and solutions in the common administration shell of this reference architecture (RAMI). All Festo products, as well as the IoT gateway, are provided with a product label including a data matrix code, known as the Festo product key. This gives access to a wealth of information, and is the entry to the world of Industry 4.0.

Precise data analysis
The IoT gateway is the first solution for IoT-compatible components and dashboards from Festo to come onto the market. CPX-IoT connects components and modules from the field level, such as the Festo Motion Terminal, the energy monitoring module MSE6-E2M or handling systems, to the Festo Cloud via their OPC UA interface. The data can be prepared and monitored using the cloud. Trends can thus be analysed and determined, and early warning systems and automatic notifications can be set up in the event of incidents. Relevant information is communicated in the right format at the right time.

The IoT gateway CPX-IoT enables preconfigured and customisable dashboards in the web browser with diagrams and traffic light indicators for each Festo component. Specific widgets, such as user interface...
components, provide clarity along with diagrams for energy monitoring, preventive maintenance or performance figures for the process and for the overall improvement of equipment effectiveness. The condition monitoring solution improves error diagnostics and analysis, creates transparency about energy consumption, delivers clear information in graph form and makes historical data available.

**IoT systems ready for take-off**

The first product to benefit from the IoT gateway is the compact handling system YXMx. The gateway transmits the collected data to a dashboard. The clear status information in real time facilitates diagnostics and makes accurate preventive maintenance possible. The benefits of the compact handling system are further enhanced by the IoT gateway. This newly launched system solution comprising kinematics with controller, software packages for motion tasks, condition monitoring and now also an app for cloud-based visualisation significantly reduces the time to market for machine and system builders.

Machine builders can easily integrate the ready-to-use system into the application environment of their machines. This saves time spent on engineering as well as programming and commissioning. This solution opens up entirely new potential for savings, and enables machine and system builders to concentrate fully on their core business.

www.festo.com/iot

www.festo.com/yxmx
Interview: research partnerships

Connected research

**Why joint research projects with other companies**, associations, research organisations and institutes is important and benefits all stakeholders. We talk to Prof. Dr. Peter Post, Head of Applied Research at Festo, who was appointed to the German Council of Science and Humanities by the Federal President at the start of 2017.

**You've been a member of the Council of Science and Humanities for almost a year now. Can you give us an insight into the work that you do there?**

**Dr. Peter Post**: In the Scientific Commission, scientists from a wide range of disciplines, including engineering and natural sciences, medicine and social sciences, discuss recommendations drafted by panels of experts. The agreed draft recommendations and any amendments are then discussed at the meeting of the Administration Commission. The Administration Commission consists of Secretaries of State from various Federal Ministries and the Ministers of Science or their representatives from the different states.

When both commissions have a joint meeting, they adopt the recommendations of the council, discuss any other key issues and launch new initiatives. I find this interdisciplinary exchange and the consensus-based decision-making processes very exciting and stimulating.

**What kind of issues are discussed?**

**Post**: We deal with basic questions about the development of science and research in Germany. For example, we might talk about strategies for university teaching or the regional networking of academic and non-academic research and educational institutions as well as application partners. We also draw up recommendations and decision-making guidelines for any major investment required in research infrastructure in the forthcoming parliamentary term.

**You've been with Festo since 1989. What has changed, particularly in industrial research?**

**Post**: A great deal. In the past, we focused primarily on product-related problems, for example within pneumatics or control technology, and then developed solutions based on the available expertise in physics and mathematics. Today, the focus is much more on the application. Research currently being carried out has a much more open approach and an open innovation concept. All stakeholders are involved in the research process, from customers and suppliers to research networks. Everyone therefore gets to see problems from different viewpoints from the very outset. Companies can then create specific solutions for the market.

**Why is it worthwhile for small and medium-sized companies to commit themselves to these networks and research clusters?**

**Post**: Having a strong, trusting relationship with strategic partners is very important for almost every company. Active networking and dialogue with partners enables companies to quickly pick up on new ideas from the global research environment. Applied research makes a significant contribution towards securing the technological future of companies, including Festo. On the one hand, this is about tapping into the opportunities created by using digital technologies in an industrial environment, as discussed in the context of Industry 4.0, and on the other hand, it is about the continuous development of classic basic technologies. Overarching networks...
of companies together with application-oriented research institutes have a lot of leverage here. Joint research means driving the future forward together.

Where is industrial research currently based?

Post: We are all at the junction of scientific, application-oriented solutions developed by technically oriented research institutes and universities. At this crossroads, we pick up on research topics and apply them to the relevant industrial context. But it is also our job as research companies to feedback ideas from these applications to the scientific community through continuous dialogue.

Can you give us an example?

Post: Take collaborative industrial research in fluid engineering, for example. Germany is regarded as a global technology leader in fluid engineering. By working together on future-oriented issues, this research is giving the entire sector a competitive edge. This proven form of pre-competitive collaborative research is just perfect in this context. Small businesses as well as larger industrial partners take part in and commit some of their human resources to research projects. Research projects such as OPAK, the open engineering platform for autonomous mechatronic automation components in a function-oriented architecture, also help to ensure that small and medium-sized companies with fewer resources for research do not miss out on advances in technology thanks to an open, standardised description language.

In which fields should companies be engaged in collaborative research?

Post: Every company involved in collaborative research should first and foremost be looking for research fields that advance them technologically. Whether it’s human-machine cooperation, the digitalisation of automation or the future role of people in automation – all of which are issues that are of particular interest to Festo – these are questions to which each company must find its own answers. In my experience, identifying these fields and embarking on new partnerships gives a company a real boost. Being committed to this is vital, not just technologically, but also to be able to attract highly skilled employees.

An eye to the future. Find out more about networks/partnerships and about the research areas for the production of tomorrow: www.festo.com/research
Carefully packaged

The servo-controlled horizontal cartoner HK-S from ECONO-PAK gently and efficiently places scratch-sensitive tubes of shoe polish into cardboard boxes. The freely configurable and flexible Multi-Carrier-System (MCS) from Festo perfectly synchronises the conveyors for the product and the cardboard box and ensures reliable packaging with a high throughput.
Operators of packaging machines have specific system requirements: they must be robust, reliable and compact, allow a high throughput and be easy to operate. Packaging machine manufacturer ECONO-PAK has developed a machine that offers outstanding precision and functionality. The HK-S is very compact and guarantees a reliable packaging process. It takes the machine just one minute to carefully pack 120 tubes with an extremely scratch-sensitive surface into cardboard boxes. “The Multi-Carrier-System – or MCS for short – from Festo is a key component of the system,” explains Markus Zerbe, Sales Manager at ECONO-PAK.

Pit stop for reloading
In the packaging process, the cartoner and MCS must work together in perfect harmony just like the musicians in an orchestra, as the efficiency of the machine depends on it. At station 1, the feed, a conveyor transports the tubes precisely and in parallel on two lines with a speed of 0.41 metres per second in the direction of the workpiece carriers. During the loading process, the carriers stop so that the transfer can take place without causing any damage. The carriers then accelerate to make up for lost time and synchronise with the speed of the cartoner running in parallel as well as the pusher assembly (0.31 m/s). The tubes are transferred to the cardboard box line via a guide slot and packed in a continuous process. The carriers move along the conveyor completely jerk-free and with minimal vibration.

Synchronisation is crucial
At station 2, the loading area, the product pushers push the tubes through the product cartridges into the cardboard boxes. It is important that the carriers are completely synchronised with the pusher assembly along this section in order to avoid collisions between the tube and the box. As soon as the product pusher exits the product cartridge at the top, the carrier can resume its individual speed.

Station 1: Cycle operation

Buffer

Product transfer

Fresh supplies always at hand: servo-controlled infeed conveyors always transport two tubes parallel to the loading station of the carriers.

Gentle tube feed: to ensure that the tubes are not marked or dented, the carrier does not move during the loading procedure.
Station 2: Continuous operation

Cartoner: the product is packaged in cardboard boxes

“During production peaks additional carriers can be added to the Multi-Carrier-System at any time. That is an important criterion for our customer.”

Markus Zerbe, Head of Sales, ECONO-PAK

Space-saving and efficient: cost-effective return of the carriers using a servo-controlled toothed belt drive.

Synchronous movement increases productivity: the tubes are inserted into the cardboard boxes thanks to the completely synchronous movement of the carrier and the pusher assembly.

Critical passage: the MCS and cartoner are synchronised in this section; insertion in the cardboard box takes place at the rear.
The benefits of the Multi-Carrier-System and its closed recirculating system:

- Highly flexible MCS conveyor with low-cost toothed belt drive return
- With the MCS, cycle operation and continuous motion can be combined on one line
- Maximum dynamic response with outstanding precision thanks to the combination of V-guides for carriers and MCS
- Compact design with freely definable, individual mounting position
- Jerk-free movement of the carrier along the entire conveyor

At the end of the line, the empty carriers are routed back to the starting point vertically, where they can be reloaded.

A multitude of benefits
The vertical return of the carriers saves space and facilitates a slim, compact system design. Furthermore, the carriers return via a servo-controlled toothed belt, which means that the carrier drive is independent of the linear motor technology in this section. This reduces operating costs and makes for easier and more efficient adjustment and control of the system.

“The main advantage of the MCS, however, is that it allows complete synchronisation between the product and the cardboard box and accurately maintains the individual positions,” explains Markus Zerbe. Precisely maintaining the filling position is important for ensuring that the tubes slide gently into the carriers and are not damaged during transfer. “The integrity of the tubes is the biggest priority,” adds Zerbe. This is made possible by the linear motor technology of the MCS. The individual carriers can be accelerated, decelerated and freely positioned independently of one another. The MCS thus combines cycle mode and continuous motion on one line. Another benefit of the MCS for the system operator is its closed recirculating system, which can be quickly adapted to different conditions. For example, additional carriers can be integrated into the system at any time to cope with production peaks. According to Zerbe, a capacity increase to around 200 tubes per minute, for example, is easily achievable.

www.festo.com/mcs

ECONO-PAK GmbH
Im Baumfeld 21–23
55237 Flonheim
Germany
www.econopak.de

Area of business:
Manufacturer and developer of packaging solutions, offering consulting, project planning, design and manufacture, assembly and commissioning, production supervision with training and after-sales service as well as format-specific tool manufacture.
The Multi-Carrier-System makes production processes significantly more flexible. This configurable transport system can be freely integrated into your existing intralogistics and precisely synchronised with the process. It supplements traditional transport solutions exactly where it is needed in the process. Thanks to the modular mechanical system, the Multi-Carrier-System MCS is suitable for a wide range of machine concepts and application requirements. The other conveyors remain unchanged.

The integrated control concept allows jerk-free control of the transport motion, extremely precise motion control functions as well as the coordination of additional machine modules. The high dynamic response minimises inactive times during the process, while seamless format changeovers and shorter retooling times significantly increase productivity. MCS was developed jointly by Festo and Siemens. The powerful Siemens controller integrates all motion control tasks for the entire system.

**Highlights**

- Flexibility: position, speed and acceleration are freely adjustable for each individual carrier
- Dynamic response: up to 4 m/s and 50 m/s²
- Controller: Siemens SIMOTION/SIMATIC for MCS and additional machine modules

**MCS with plastic chain conveyor:** integration into existing intralogistics thanks to seamless connection to current material flow systems, for example in the packaging industry.

**MCS with twin belt conveyor:** integration into existing transfer systems for increased production output, for example for assembly tasks.

**MCS as a closed recirculating system:** increased flexibility thanks to the combination of MCS linear drives and cost-effective, toothed belt carrier return track.

“The Multi-Carrier-System makes production processes more dynamic and flexible than ever before.”

Matthias Bauer, Planning Engineer Business Development, Festo
Quick and precise lane adjustment at the push of a button: this is the job of the new automation platform Festo Motion Terminal VTEM in the flat pouch machine Sigpack VPF from Bosch Packaging.
Packaging machines with digital pneumatics

Precisely dosed

Coffee, sugar, pharmaceuticals – virtually everything is packed in small, low-cost sachets nowadays. The new, flexible flat pouch machine Sigpack VPF from Bosch Packaging Technology ensures correct packaging and a precise mixing ratio. The world’s first freely scalable sachet machine uses the new flexibility provided by the digital pneumatics of the Festo Motion Terminal.

Eating a little something while on the move is quite normal these days. Food producers are tapping into this trend with “food to go” products. They therefore require packaging machines that handle format changeovers flexibly and quickly – and that can precisely dose even quantities of a few grams. The Sigpack VPF (Vertical Platform Flat Pouch) is an example of just such a machine.

With this machine, food producers as well as pharmaceutical manufacturers can easily adapt their production to current market conditions. The machine fills up to 1,800 sachets per minute, offering the best performance per square metre of floor space on the market.

Quick adaptation
Thanks to its modular concept, the flat pouch machine is freely scalable from two up to twelve lanes. The number of lanes depends on the required output and pouch sizes. With the new decentralised dosing system, each lane has its own dosing chamber and a stock of product.

“The separation of the dosing units creates flexibility in a number of areas. Now different products, such as salt and pepper, can be packaged at the same time on one machine,” explains Rolf Steinemann, Product Manager at Bosch Packaging Systems.

Long sealing times at low temperatures guarantee hermetically tight packages, thus ensuring high product quality.

The hygienic and ergonomic design makes the Sigpack VPF easy to access, as well as to oversee and clean. “Short cleaning and changeover times contribute to high overall equipment effectiveness,” says Steinemann. Precise dosing, deep pouch filling and hermetically tight seams reduce product loss and waste. This makes the packaging process more cost-effective for manufacturers. In particular for the pharmaceutical industry, these qualities contribute greatly to patient safety as over- or under-dosing of powdered medication can be avoided.

Precisely dosed every time
The filling mechanism is based on an auger dosing system, which is known for its high degree of accuracy.
“The Festo Motion Terminal combines process advantages with a reduction in the number of valve slices and peripherals.”

Rolf Steinemann, Product Manager Bosch Packaging Systems

Intelligent trend control allows readjustment for more precise dosing. “In the first design for the Sigpack VPF we were planning to use the MPA valve terminal from Festo, which would have allowed us to have product feeding per lane with vacuum and compressed air supply while also having two-chamber separation,” explains Maik Lamprecht, Project Manager for the development of the Sigpack VPF. This would have required additional cleaning components and a proportional valve for each lane.

Formats at the push of a button
“The revolutionary Festo Motion Terminal VTEM made product feeding so much easier,” says Lamprecht, because it allowed every lane to be adjusted individually at the push of a button. “We use three times fewer valve slices and the flat pouch machine has functions that we could have otherwise only achieved with much greater design effort,” adds the Project Manager for the machine.

Greater process reliability
The Sigpack VPF with the Festo Motion Terminal allows pressure and vacuum measurement for process monitoring, leakage monitoring for checking for contamination of the valve as well as individual adjustment of the cleaning and drainage pressure per lane. “The Festo Motion Terminal has given us a significant boost in terms of process reliability,” says Lamprecht. To cover all these functions only one piece of hardware is needed: the Festo Motion Terminal VTEM.
Highly flexible Sigpack VPF: the world's first freely scalable flat pouch machine.

It uses the revolutionary concept of digitised pneumatics in automation technology for the first time. Changes in pneumatic functions and adaptation to new formats are controlled via apps by changing parameters. The integrated intelligent sensors for control, diagnostics and self-learning eliminate the need for additional components, reduce complexity and simplify the ordering process.

The apps of the Festo Motion Terminal can replace up to 50 individual components while machine operators receive status information for individual machines, entire lines or processes in real time. Costly machine downtimes can thus be avoided and machine availability increased.

Reliable product distribution
Thanks to the fast activation of new functions via apps, machine developers only have to create a basic machine type. “We can then quickly and easily select apps and equip machines with different specifications in line with customer requirements,” says Product Manager Rolf Steinemann. In the Sigpack VPF, the “Proportional pressure regulation” app controls the product feeding for the multi-lane dosing process. With changing pouch sizes and powder consistencies, the automation platform ensures reliable product distribution and dependable feed processes.

Individual settings
The additional functions include the adjustable cleaning and ejector pulse. The automation platform monitors the filling process and the valve performance using pressure testing. By monitoring pressure and vacuum, wear and contamination can be detected at an early stage. Leakage control ensures reliable processes with reproducible results. The cleaning and air jet pressure can be set individually for each lane.

“The Festo Motion Terminal makes pneumatics fit for Industry 4.0, as process data from the Festo Motion Terminal can be processed on our own condition monitoring platform,” says Product Manager Rolf Steinemann.

Further information and videos on the Festo Motion Terminal VTEM can be found at www.festo.com/motionterminal

Bosch Packaging Systems AG
Industriestrasse 8
8222 Beringen
Switzerland
www.boschpackaging.com

Area of business: Development and manufacture of packaging and handling systems for the food, pharmaceutical and other industries

The head office of the Food unit with process and packaging technology is also located in Beringen.
System in assembly process:
SF102 filling and sealing system for Doypack® pouches with screw cap.
The French machine builder has already won numerous awards for its commitment to mechatronics and digitalisation and is one of the great hopes for the French government’s Industry 4.0 initiative “Industrie du futur”. Thimonnier’s ability to innovate is in no small part due to the company investing 15% of its revenue in R&D; this helps the global market leader in packaging technology to continuously achieve an average revenue growth of 10% per year.

From stitching to sealing
The company, which is based in the Lyon region, has a long and proud history. The story of the company began when Barthélemy Thimonnier became the world’s first sewing machine manufacturer. In 1830, he developed his patented basic sewing machine model, the Couseuse. In the 1950s, the company was asked by a fashion designer to produce a waterproof raincoat made from PVC.

“My grandfather, Louis Doyen, who was the company’s Managing Director at the time, quickly realised that this could not be done using conventional sewing machines. He added a high-frequency generator to the sewing machines and sealed the PVC film,” explains Sylvie Guinard, the current CEO. Around 10 years later, the sealing of these flexible materials laid the foundation for the Doypack®.

Doyen patented the stand-up pouch in 1963 and the company went on to become a specialist in filling and packaging technology for flexible materials. “Doypack® pouches are the future of packaging. The many benefits of these high-quality stand-up pouches make them extremely popular with manufacturers and consumers,” says Guinard, adding: “The stand-up pouch is an effective marketing tool for brand advertising. It is lightweight and has many great features. For example, it can be resealed, is efficient in terms of logistics, easy to handle and visually appealing.”

Filling and closing
One of the machines from Thimonnier that has been eagerly awaited by the market is the SF102. This filling and sealing machine for Doypack® pouches with screw cap is easy and flexible to operate, easy to clean and access and has a small footprint. It is popular with manufacturers of compotes, baby food, dairy products, fruit juices, soups and sauces as well as liquid detergents and cleaning products, liquid soaps, creams and shampoos, and even engine oil.

After the stand-up pouch has been fed in, a compact cylinder ADNGF from Festo forwards it to the filling station. The correct filling quantity is determined using electromagnetic or mass flow measurement, or a dosing pump depending on the

In good stead
The Doypack® brand has been synonymous with practical stand-up pouches for over 50 years. The patent is held by French company Thimonnier, which is increasingly moving towards mechatronics and ultimately Industry 4.0 for the development of its filling and packaging machines. Pneumatic and electric automation technology from Festo provides a solid foundation for this development.
Quick to install and safe: valve terminal VTUG with IO-Link and MS series compressed air preparation with fine, ultrafine and activated carbon food filters in a control cabinet.

Small but beautiful: the controller CMMO controls the electric cylinder EPCO, connected via IO-Link.

Accurate positioning of the filling unit with the electric cylinder EPCO and its guide unit EAGF.

customer’s requirements. At the next station, the screw caps are screwed onto the stand-up pouches. The Festo swivel module DSM-B transports the filled and sealed pouches to a conveyor.

**IO-Link in action**
All the pneumatic functions of the SF102 are controlled by the valve terminal VTUG. It is compact, has a high flow rate and has IO-Link on board. The uncomplicated wiring of the sensor-actuator combinations with standardised, unscreened cables using IO-Link reduces material costs, simplifies logistics and saves time. This connection technology therefore makes installation much easier.

“With this modern connection technology, Festo is giving our packaging machines a major upgrade that will enable us to move closer towards Industry 4.0,” says Pierre Gualino, Assistant to the Head of Development. For compressed air preparation, the installed MS series service units from Festo are equipped with fine, ultrafine and activated carbon food filters for direct contact with food. The machines from Thimonnier are thus well equipped to guarantee optimum food quality.

**Different pouch sizes**
The THD400 machine is used for larger pouches of up to 5 litres. It fills and seals Doypack® and other pre-formed pouches on the carousel using sealing technology in a four-step process. At the loading station, Festo grippers type HGPL take the pouches from the workpiece carriers and transport them to the opening station where they are opened using compressed air. Filling takes place at the next station.

For accurate positioning of the dosing needles, the EPCO, an electric cylinder from Festo, is used. At the last station,
“State-of-the-art technologies such as IO-Link, which the experts at Festo have made accessible to us, help us to perfect our machines.”

Sylvie Guinard, CEO of Thimonnier

Intelligent sensors and actuators
As an intelligent connection, IO-Link is a perfect match for sensors and actuators for Industry 4.0: complex diagnostics can be transferred rapidly using standardised protocols, and condition monitoring concepts can be implemented. Festo also offers many IO-Link devices, from different sensor series right up to valve terminals, electric drives and stepper motor controllers. “With the support of automation partners like Festo, we can be sure that we are always up to date with the latest developments in mechatronics and Industry 4.0,” says CEO Sylvie Guinard, adding: “Our versatile machines have intuitive human-machine interfaces, consume less energy, require less maintenance and reduce process costs.”

www.festo.com/epco
www.festo.com/io-link

Thimonnier
11 avenue de la Paix
69650 St. Germain au Mont d’Or
France
www.thimonnier.fr

Area of business: Development and manufacture of filling and packaging machines for Doypack® and other plastic pouches
The perfect fit

Italy // The Scm Group is a global business and leading manufacturer of machines and accessories for woodworking and plastics processing. The new machining centres “morbidelli m100” and “morbidelli m200” can be used to process all types of materials, including wood, plastic and various composite materials. The incredible flexibility of these machines makes it possible to address customer-specific requirements in the manufacture of panels, windows, and front and side sections for kitchens and office furniture.

Scm has been able to achieve significant savings in the new generation of machines through working together with Festo, and by using, for example, ready-to-install control cabinets, compact valve terminals VTUG and IO-Link technology. With up to 24 valves on one valve terminal and IO-Link connection technology, Scm was able to reduce both the number of valve terminals and the outlay on cabling. The valve terminals type VTUG control all the pneumatic actuators, such as standards-based round cylinders DSNU, for example. Automation solutions from Festo have contributed to the optimisation of the new machining centres throughout the development process, and have reduced the cost of development and assembly by 20%.
Corporate Responsibility report

Issues such as energy efficiency and resource conservation are becoming increasingly important in production. That is why Festo has adopted a professional approach to sustainability. By adopting a sustainability strategy as well as reporting on sustainability and providing key figures on the environment, energy and the working environment, Festo is adhering to the internationally recognised guidelines of the Global Reporting Initiative (version GRI G4).

www.festo.com/responsibility

Up and away

Czech Republic // In late May and early June of this year, the Festo national company in the Czech Republic treated its customers to an unforgettable experience. In Brno, around 200 km south-east of Prague, and in Hluboká nad Vltavou, 150 km south of Prague, four Festo hot-air balloons took to the skies for one-hour flights over the course of three days. Around 170 customers from 72 companies were given the chance to view their homeland from an entirely different perspective. The view from the ground was just as impressive as that from the air, with the silver balloons attracting a lot of attention – especially the one that was upside down.

Bonjour Paris

France // Paris, the city of revolutions, was exactly the right place to present the revolution in automation, the Festo Motion Terminal, to international trade journalists. More than 80 journalists from 20 countries attended the 16th International Festo Press Conference in July. They were impressed by the simplicity and flexibility of digital pneumatics and were able to experience live how easily customers can use motion apps to implement new functions on the Festo Motion Terminal and thus save the need for up to 50 individual components. A presentation of the BionicCobot, the first pneumatically actuated cooperative robot, offered a clear view of the working environment created by Industry 4.0.

On the 20th floor of the Experience Business Center of SAP France, the journalists were not only able to enjoy a magnificent view of the French capital. They were also afforded a deep insight into the world of Industry 4.0 via the CP Factory from Festo Didactic installed at SAP. This system, which links the shop floor to SAP’s MES software, shows how Festo and SAP are working together to shape this world.
Dubai, United Arab Emirates

The newest member of the international Festo family, Festo Dubai, is one year old. “We see major long-term opportunities in this region, particularly in the process industry,” says Karl Heckl, Sales Management Europe. The first local projects have already been completed, including a pneumatic automation solution in a centralised district cooling plant. 30 shut-off valves, valve terminals and compressed air components ensure reliable operation and low maintenance.

Dubai is home to around 2.9 million people, and is the largest city in the United Arab Emirates.

Dordrecht, the Netherlands

In April of this year, the Da Vinci College acquired the first training system for wind turbine simulations in the Netherlands. Nacelle® was specially developed for the growing wind energy market. Festo Didactic’s reconstruction of a complete wind turbine nacelle has been made for use in an educational environment and measures just 166 x 212 cm. The simulator is an efficient way of training technicians in wind turbine maintenance. The scaled-down wind turbine has all the measuring and control components required for operation. Festo supplies the Nacelle® complete with teaching package and lesson plan for lecturers.

The finishing touch

Czech Republic // A new multi-functional machine from ICE Industrial Services adds the finishing touch to skis produced by ski manufacturer Sporten. Depending on customer requirements, the skis are given tailor-made cut-outs to which skins can be attached to prevent slipping backwards. The machine is also used for gluing and pressing NIS plates under the bindings. With the new machine, up to 80 different types of skis – from professional racing skis to cross-country skis for recreational use – can be processed at a universal workstation. The number of runner profiles can be expanded as required by the application.

One of the biggest challenges in designing the machine was the flexibility of the skis. It is this flexibility that generally makes it much more difficult to develop a system for producing and processing skis. In order to be able to perform the two basic functions of milling and gluing, the skis needed to be securely fixed in place. This was achieved using Festo pneumatic cylinders which press the skis firmly against a pressure plate. This movement is carried out by an electric linear axis type EGC. Once the ski is securely clamped, the cutting tools installed on the EGC axis do their work. The drives are controlled by valve terminals. ICE’s Managing Director Tomáš Vránek is delighted with the technical solution developed by his engineers: “Our development is vastly different to the method previously used by the manufacturer. Our customer is really pleased with it and this success paves the way for further successful cooperation.”

Czech Republic // // www.ice.cz

The multi-functional system from ICE Industrial Services processes up to 80 ski models. Drives type EGC bring the skis into the required position.
Two in one

Japan // The Festo national company in Yokohama had two reasons to celebrate in May of this year: its 40th anniversary and the opening of a new Application Center. The 350 m² space combines a showroom and training facility and allows customer applications to be tested using the latest automation solutions.

Visitors to the new Application Center can gain an insight into the history of Festo as well as future developments such as innovative bionic projects, for example. They can also find out more about software solutions, the world of automation and the Smart Factory. For Country Manager Kenneth Feng, this is an opportunity for Festo to further develop partnerships with customers.

Esslingen, Germany For the third time in a row, Festo has been named Global Preferred Supplier by the Bosch Group for its Standardised Pneumatic Devices material group. Bosch honours its most important suppliers for outstanding performance in the areas of innovation, quality and reliability. The certificate was presented to Dr. Ansgar Kriwet, Member of the Management Board, Sales, during a visit by Purchasing Managers from the Bosch Group.
Off-road or online, Mr. Schäfer?

These two words perfectly describe what drives me – off-road in my spare time and online at work. As Head of Digital Customer Journey I am responsible, together with my teams, for using digitalisation to simplify all customer contact with Festo along the entire value chain. But at the weekend I love to head off the beaten track on my Enduro bike.

Riding on a dirt bike is always something of a journey into the unknown. You never know what kind of surface awaits you around the next bend; it could be sandy, stony or muddy, so you have to be able to adapt your riding style. It requires experience, body control and know-how to anticipate how the bike is going to react in a given situation. If the wheels end up in a rut, you have to accelerate really quickly. Acceleration is a concept that also applies to the Digital Customer Journey. This newly established area combines all the functions that customers encounter when they contact Festo, like a kind of virtual journey. Festo aims to simplify these functions and make them faster for the customer through digitalisation.

If you think how rapidly our professional and personal lives have changed in recent years because of the Internet, you’ll realise that there’s no need to be afraid of venturing into unknown territory. In fact, the projects that we deal with as part of the Digital Customer Journey frequently take us to places where we haven’t been before. These range from completely new online shop solutions to CAD and engineering software as well as product configuration and selection tools.

Our team members also play an important part. Without them, the Digital Customer Journey would be merely an adventure – in the same way that an Enduro tour in unfamiliar territory without proper planning and hard training could be extremely dangerous. But with the specialists in my teams, who are passionate about their work, I can envision a successful digital future for Festo in partnership with our customers. I hope that the next motorcycle trip my friends and I will make to the Spanish countryside early next year, will be equally successful. We are using online tools for off-road trips to make planning our journey faster and easier.
High Speed!

You need maximum dynamic response?
You want a compact design?
We can deliver it in a low-cost, complete solution.

→ WE ARE THE ENGINEERS OF PRODUCTIVITY.

Linear gantry EXCT: very dynamic and compact
The Cartesian high-speed pick and place handling system easily masters fast processes with cycle rates up to 90 picks/min. It's the most dynamic alternative to conventional linear gantries with free movement.
Special connection

In Norway, the combination of unspoiled nature and modern engineering has resulted in a stretch of road just eight kilometres long that is one of the country's most photographed locations. The route slaloms between crags and waves, traversing islands as it makes its way through a spectacular archipelago. This incredible journey takes in a total of eight bridges, including the dramatically curved Storseisund Bridge, which is 260 metres long and 23 metres high.

The Atlantic Road was opened in July 1989. Work on the road started in 1983, and during the construction period the workers had to battle the forces of nature, experiencing a total of twelve hurricanes. But their efforts paid off. Now world-famous, the Atlantic Road was voted Norwegian construction of the century in 2005, was named one of the world's best road trips by the English newspaper “The Guardian” in 2007 and was voted most scenic bike route in Norway in 2010. Its fascinating twists and turns make it a popular choice for photo shoots by car manufacturers.

In Norway, the combination of unspoiled nature and modern engineering has resulted in a stretch of road just eight kilometres long that is one of the country's most photographed locations. The route slaloms between crags and waves, traversing islands as it makes its way through a spectacular archipelago. This incredible journey takes in a total of eight bridges, including the dramatically curved Storseisund Bridge, which is 260 metres long and 23 metres high.

The Atlantic Road was opened in July 1989. Work on the road started in 1983, and during the construction period the workers had to battle the forces of nature, experiencing a total of twelve hurricanes. But their efforts paid off. Now world-famous, the Atlantic Road was voted Norwegian construction of the century in 2005, was named one of the world's best road trips by the English newspaper “The Guardian” in 2007 and was voted most scenic bike route in Norway in 2010. Its fascinating twists and turns make it a popular choice for photo shoots by car manufacturers.