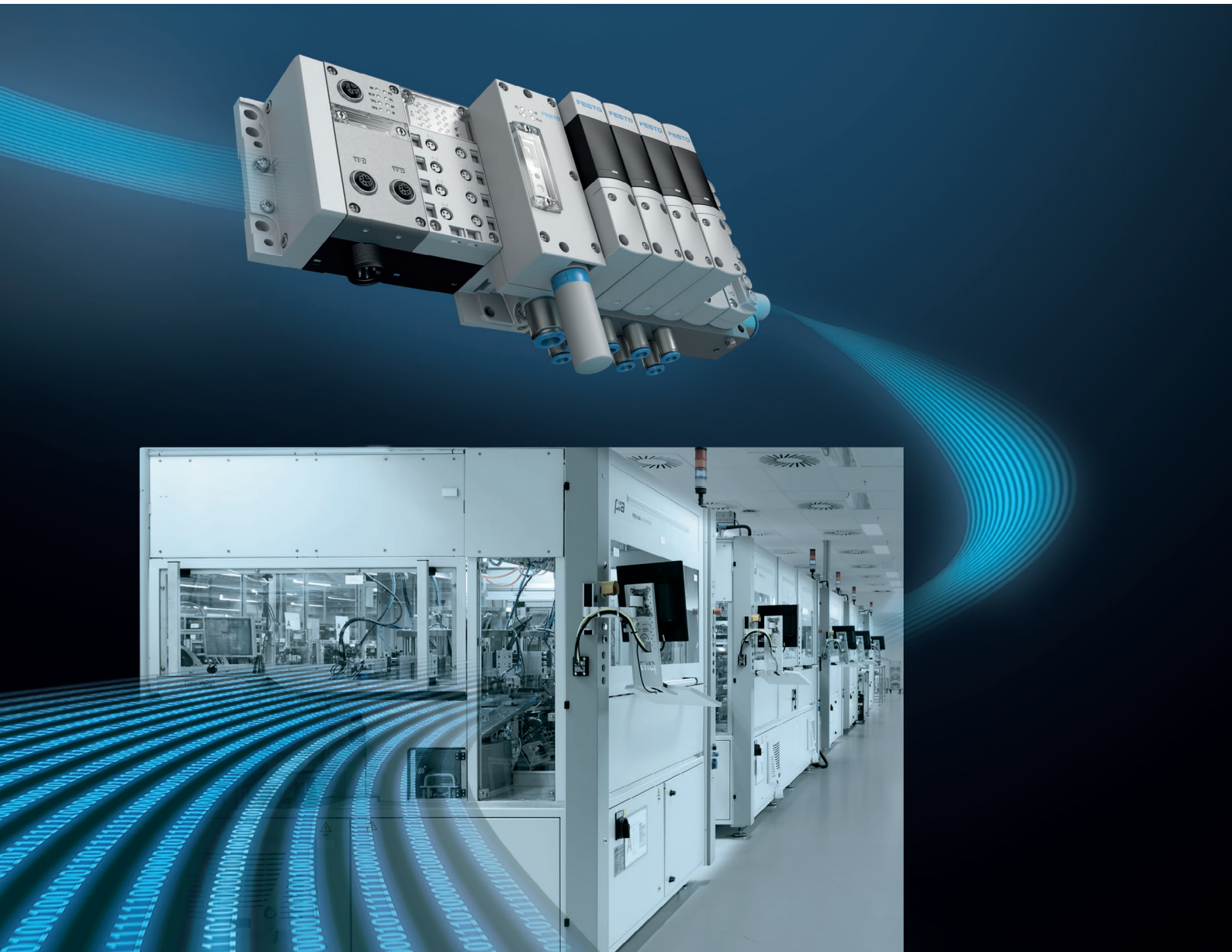


Move ahead digitally!
With the Festo Motion Terminal.

FESTO



Digitised pneumatics: This revolutionary innovation is leading to a new age for your production. For the first time, Motion Apps control one piezo valve for almost all pneumatic tasks. This means less hardware but more functions. Highly flexible yet standardised and offering complete reliability and energy efficiency, digitised pneumatics reduces complexity and time to market for you.

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.**



More productive and efficient all round – with digitised pneumatics

How can you increase productivity in your production, be highly flexible and reduce energy costs at the same time? With digitised pneumatics. It intelligently combines mechanics, electronics and software for maximum adaptability, flexibility and overall equipment effectiveness (OEE).

The Festo Motion Terminal, for example, offers maximum flexibility combined with a high level of standardisation. For the first time, the functions of a valve can be changed by software without the need to change the hardware, with the spectrum ranging from simple directional control valve functions to complex motion tasks. Digitising the parameter sets gives the mechanical systems an extremely high level of repetition accuracy and makes them tamper-proof.

The integrated sensors provide process transparency and options for self-optimisation or self-adaptation to external influences. Diagnostic functions for condition monitoring and traceability as well as reduced energy consumption can also be implemented more easily.

Gain along the entire value chain

From faster planning and design to simpler procurement and logistics as well as easier commissioning and parameterisation, the Motion Terminal generally pays for itself quickly. More productive operation and the ability to quickly and easily convert or modernise your system will also speed up the return on investment.

Turning theory into practice: suggestions for the future of your automation

On pages 6-23 you will find real-life applications that can make your company much more productive, and at the same time more energy efficient. They are examples of the variety of freely combinable motions that are possible with the Motion Terminal, including for retrofitting your system. Get ready to be inspired!

Festo Motion Terminal VTEM

The Festo Motion Terminal really comes into its own in pneumatic regulation of motion, pressure and flow rate. The pneumatics controlled via apps, the valve structure with many more degrees of actuation freedom and the integrated data acquisition and data processing make pneumatics fit for the future, especially for Industry 4.0. The benefits of this digitalisation are found in all stages of the value chain, and for OEMs as well as for end users.

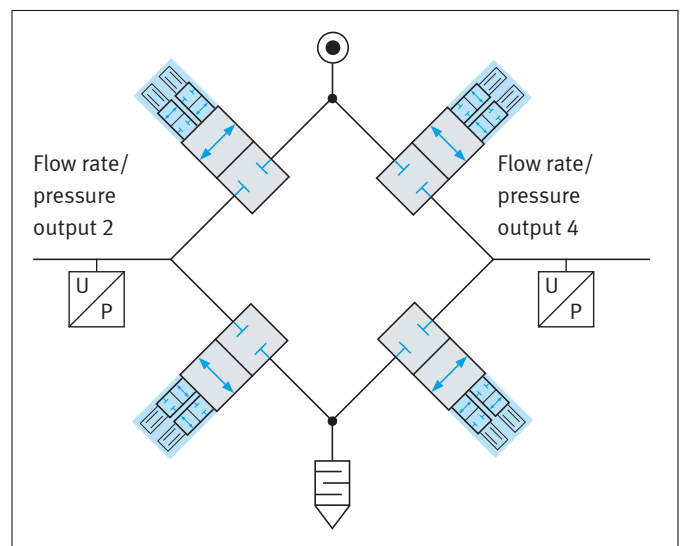
A fundamental characteristic of the Motion Terminal is the interaction of a number of technical innovations. Without the unique bridge technology and pilot control with piezo valves, the Motion Apps could not even begin to ensure their functionality. It is only by combining

the two technologies that the virtually limitless flexibility of digitised pneumatics can be exploited – with just one piece of hardware instead of many components.

The benefits of piezo valves

- Continuous, extremely precise proportional regulation
- High energy efficiency thanks to incredibly low power consumption
- Extremely long service life with more than 300 million switching cycles
- Worldwide unique compact design

Bridge circuit in the valve



Benefits along the entire value chain

Engineering

- Reduced complexity, faster project engineering, faster time to market
- One piece of hardware + the necessary apps
- No need for shock absorbers, flow control valves, and often even external sensors
- Smaller installation space
- Subsequent changes possible extremely quickly

Procurement

- Minimised ordering, logistics and warehousing
- Lower costs for data management and maintenance
- Reduced product costs

Motion Apps

The apps are the key to almost limitless function integration with the Motion Terminal VTEM. The following apps are available:

- Directional control valve functions
- Proportional directional control valve
- Soft Stop
- Proportional pressure regulation
- Model-based proportional pressure regulation
- ECO drive
- Selectable pressure level
- Leakage diagnostics
- Supply and exhaust air flow control
- Presetting of travel time
- Positioning
- Flow control

For more detailed information:

→ www.festo.com/motionapps



App World

Whether you want to download apps for the Motion Terminal or are looking for firmware or additional software, you will find what you need in the App World

→ www.festo.com/appworld



Commissioning

- Less assembly and wiring effort and thus more reliable installation
- No time-consuming, manual adjustment processes
- No complicated synchronising of flow control valves, etc.
- Fast parameter changes for very short setup times
- Easy duplication of presets on a number of systems

Operation

- Best overall equipment effectiveness (OEE) thanks to less downtime
- Consistent quality through high reproducibility/ repetition accuracy
- Tamper-proof as values via PLC
- Active adjustment in case of differing values
- Condition monitoring for a large number of parameters
- Built-in traceability
- Retrofitting is straightforward
- Optional leakage detection
- VTEM supports higher-level AI analysis processes

Make your pick & place system very flexible!

With the Motion Terminal VTEM you can realise all the functions in your pick & place application in just one system. There is no longer a need for components like shock absorbers, flow control valves, etc. Since Motion Apps now take over many tasks and replace complicated mechanical structures, the design process is much easier. The process data can be read out at any time so you can respond quickly to deviations and thus ensure consistent quality.

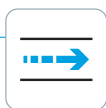
The app “Positioning” gives you great flexibility when positioning workpieces of different sizes such as tubs. You can optimise the end-to-end motions for every possible workpiece size, for example by precisely defining the variables such as the motion speed and impact energy in the end position.

By using the app “Proportional pressure regulation” safe transport with vacuum is ensured. You simply adjust the vacuum level to the weight to be moved. This also increases the energy efficiency of your application. Changeover times or manual format changes are a thing of the past as you simply switch over to the parameters you need. The virtually vibration-free travel into the end position with the app “Soft Stop” minimises wear – and shortens the cycle times.

1

Positioning

- Highly flexible thanks to variable positions: one pick & place system for multiple container sizes



2

Proportional pressure regulation

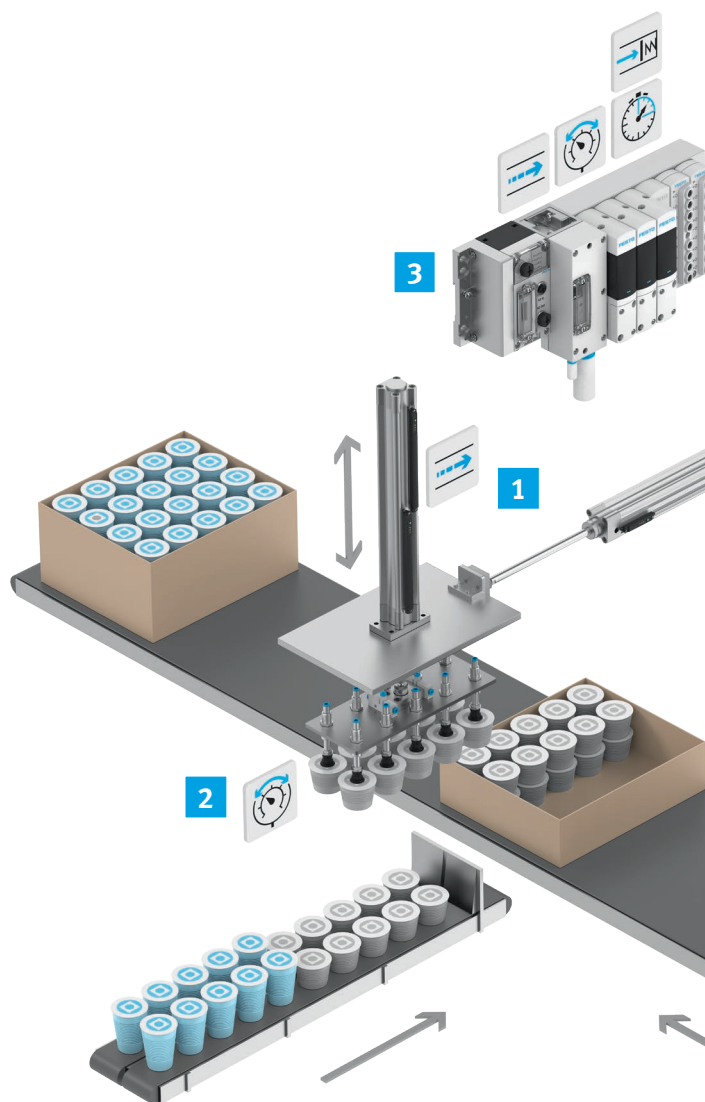
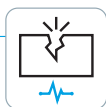
- Regulated vacuum for different forces, depending on weight
- Reliable detection of vacuum build-up
- Controlled ejector pulse
- Energy-optimised



3

Leakage diagnostics

- Predictive maintenance
- Save energy and costs



+ Highly flexible

+ Greatly reduced changeover times

+ Shorter cycle times

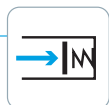
4



Presetting of travel time

- Different travel times for different products
- Automatic correction of deviations due to wear

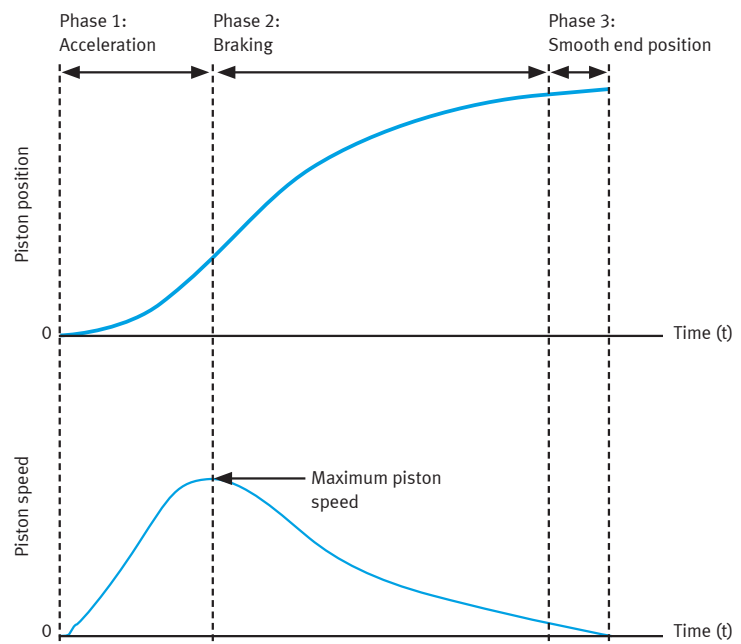
5



Soft Stop

- No shock absorbers
- Virtually vibration-free and thus less wear
- Shorter cycle times
- Process-reliable

Optimised motion sequence based on modelled calculations:



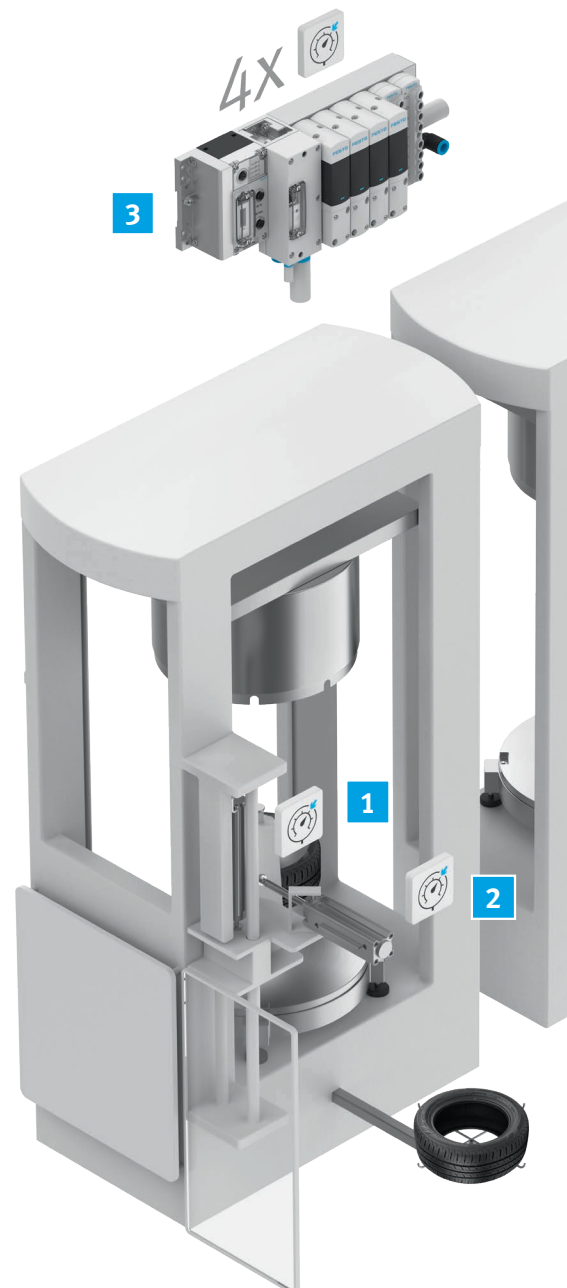
Make swivelling smooth and vibration-free!

The Motion Terminal lets you load workpieces, for example into presses, more smoothly, quickly and efficiently. The virtually vibration-free motion significantly shortens cycle times and at the same time extends the system's lifetime. Pressure during the empty return travel is low to optimise energy.

In this application, two feeding units synchronously carry out lifting and swivelling motions. The app "Selectable pressure level" regulates the pressure and flow rate to ensure both horizontal and vertical motion sequences are smooth. Both can be adjusted as required. For workpieces of different sizes and weights, you can create presets and simply retrieve them at the push of a button or in the PLC program, thus minimising your setup times.

The lower vibration in the end position greatly reduces the cycle times during lifting without the need for additional shock absorbers. During horizontal motion, the force curve is non-linear. With the VTEM, the necessary parameters are extremely easy to adjust as appropriate to

the position. This is done using a ramp function and trigger signals, for example. This also enables you to combine two benefits during swivelling: short cycle times and low kinetic energy when retracting into the end position.



1

Selectable pressure level (vertical)

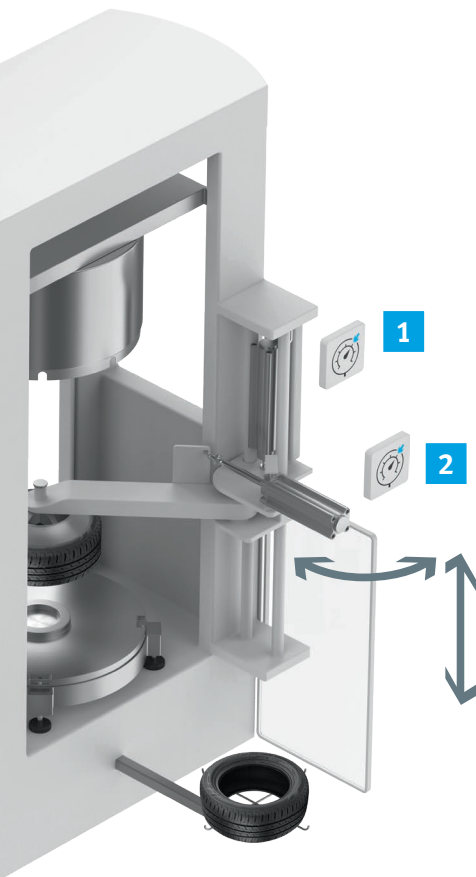
- Optimised, needs-based adjustment of the pressure during the lifting motion
- Downward motion with reduced energy



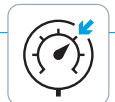
+ **Fast and smooth**

+ **Vibration-free**

+ **Energy-efficient**

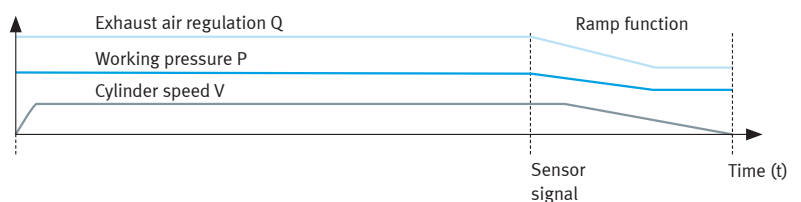


2



Selectable pressure level (horizontal)

- Position-dependent adjustment of speed and force, e.g. through ramp function for:
 - Fast swivelling
 - Vibration-free movement into the end position



3



Leakage diagnostics

- Predictive maintenance
- Save energy and costs

Make machining processes faster and more reliable !

In this application the Motion Terminal lets you achieve several objectives at the same time: from custom gripping of the workpieces and accelerated opening and closing of the safety doors to contact monitoring for optimum machining of the workpieces.

Tailored gripping force regulation with the app “Selectable pressure level” means you can always grip different workpieces with the right force. The force is reduced when opening the gripper fingers to further improve energy efficiency.

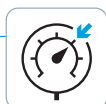
Faster travel times when opening and closing the safety doors are ensured by the app “Soft Stop”. There is no need for shock absorbers for vibration-free travel into the end position. This means you can use maximum speed. Further benefits include less wear and automatic detection of safety door faults. With the app “Positioning” you can move the doors to intermediate positions, if required.

The workpiece must be in the correct position to ensure it will be perfectly machined. Before it is held in place, the app “Proportional pressure regulation” checks the position by measuring an air gap. The app then switches to sealing air to avoid contamination of the workpiece during machining. You only need one valve to control both contact checks in this application.

1

Selectable pressure level

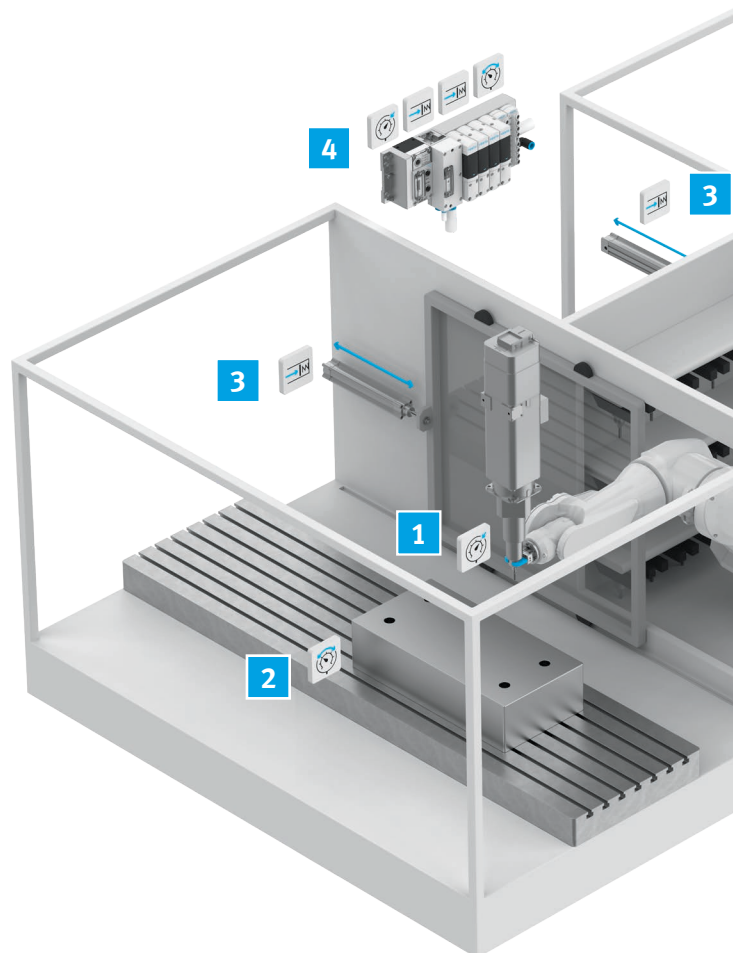
- Custom control of the gripping force
- Energy-efficient: grip with high force, open with lower force

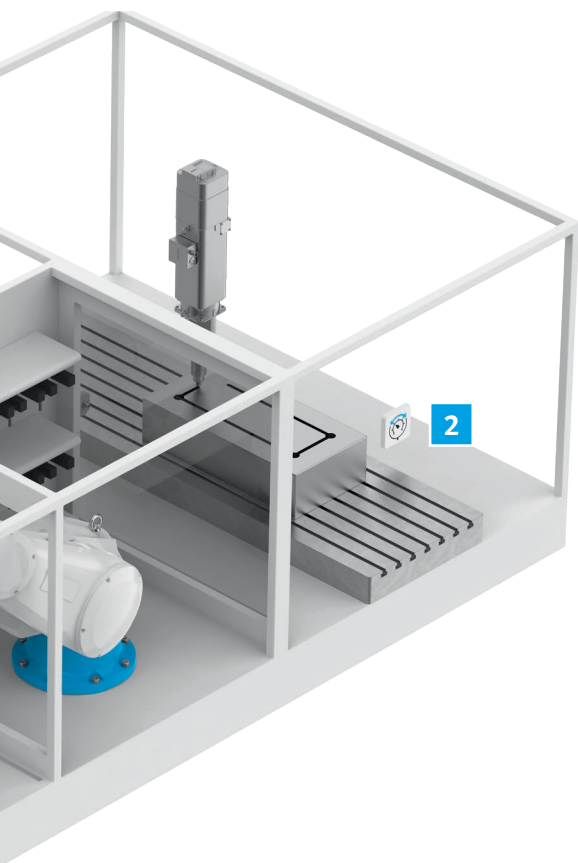


2

Proportional pressure regulation

- Contact check for higher process reliability and quality
- Measure air gap in the 0.01 mm range using back pressure
- Sealing air: blow out machining residues



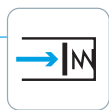


+ Custom gripping

+ Faster travel times

+ Reliable machining

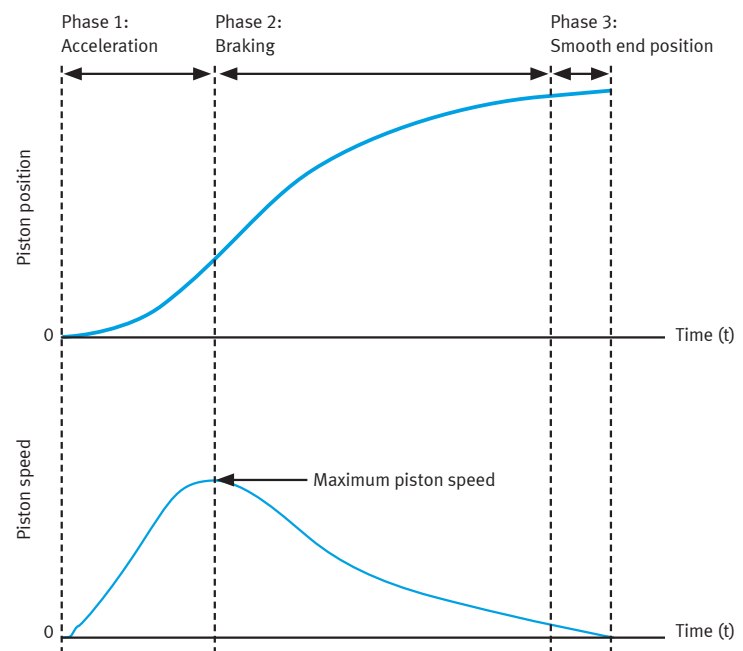
3



Soft Stop

- Shorter cycle times
- Virtually vibration-free and thus less wear
- Automatic detection of safety door faults
- Process-reliable
- No shock absorbers

Optimised motion sequence based on modelled calculations:



4



Leakage diagnostics

- Predictive maintenance
- Save energy and costs

Control several flow rates with one piece of hardware!

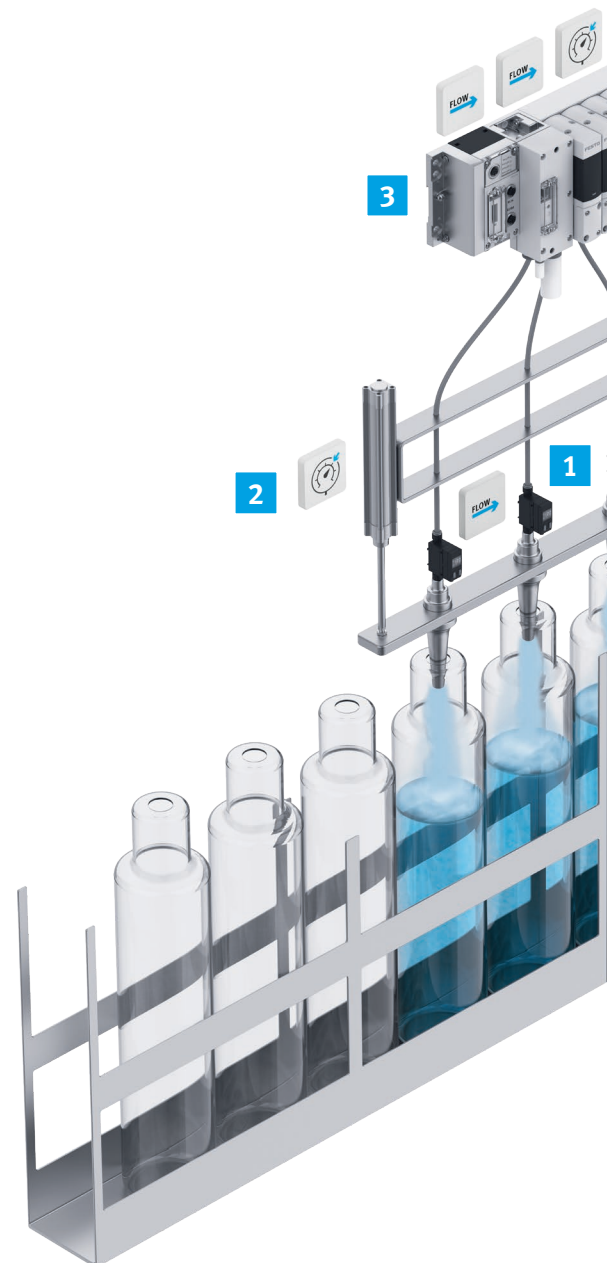
The app “Flow control” makes filling containers such as bottles with nitrogen or other gases more economical. The flow for up to 8 channels is controlled simultaneously. Thanks to precise dosing, you also save a significant amount of nitrogen. Digitised nitrogen control is tamper-proof, flexible and, thanks to the app “Selectable pressure level”, even shortens cycle times.

Nowadays containers for products are often rinsed and filled using gases. The VTEM can be used with various gases.

The flow in litres per minute is controlled using the app “Flow control”, which enables more efficient dosing of the gas. The more precisely the filling quantity is defined, the more accurate the filling will be since the percentage deviation from the target quantity can be optimally detected. The fill levels are monitored by external sensors.

When you want to measure the flow rate with even greater accuracy, you can use an additional external sensor. The measurement data is evaluated directly in the Motion App.

The app “Selectable pressure level” moves the filling nozzles to the bottles quickly and accurately, and the flexible parameterisation shortens the cycle times. After filling, the filling nozzles are retracted with reduced pressure to save energy.



1

Flow control

- Flow control in l/min with and without external sensors
- Precise filling saves nitrogen and thus costs
- Control of various gases

FLOW →

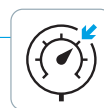


+ Multi-channel control

+ Saves nitrogen

+ Shorter cycle times

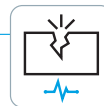
2



Selectable pressure level

- Shorter cycle times through flexible parameterisation
- Fast approach to the working area
- Energy-saving motion through reduced pressure

3



Leakage diagnostics

- Predictive maintenance
- Save energy and costs

Make highly complex processes simple!

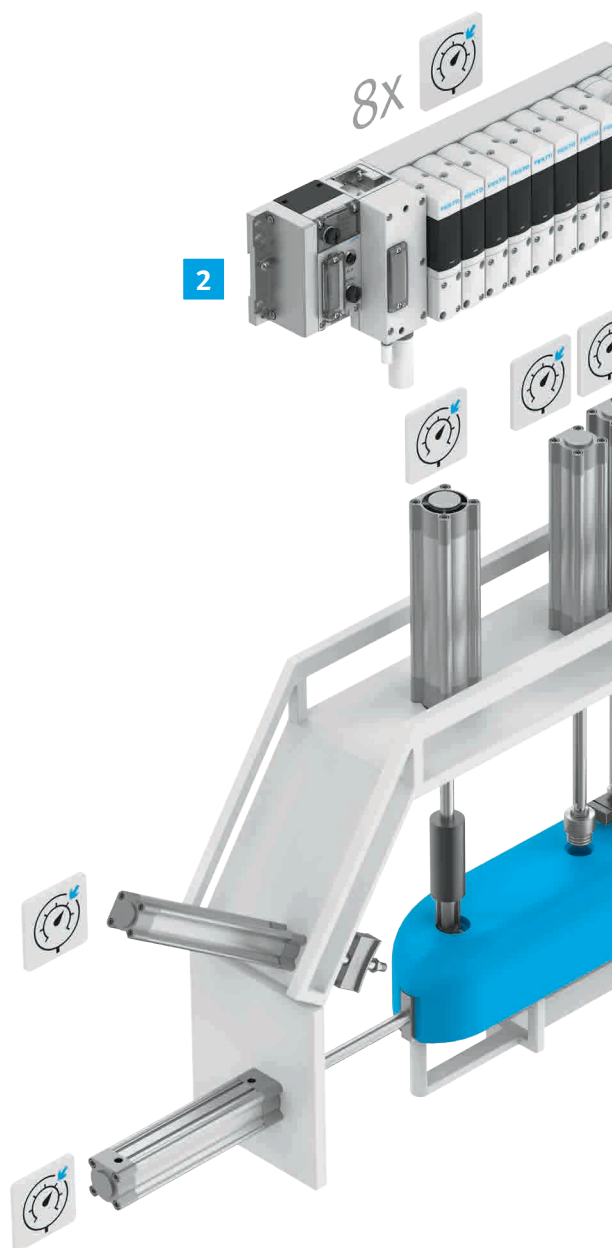
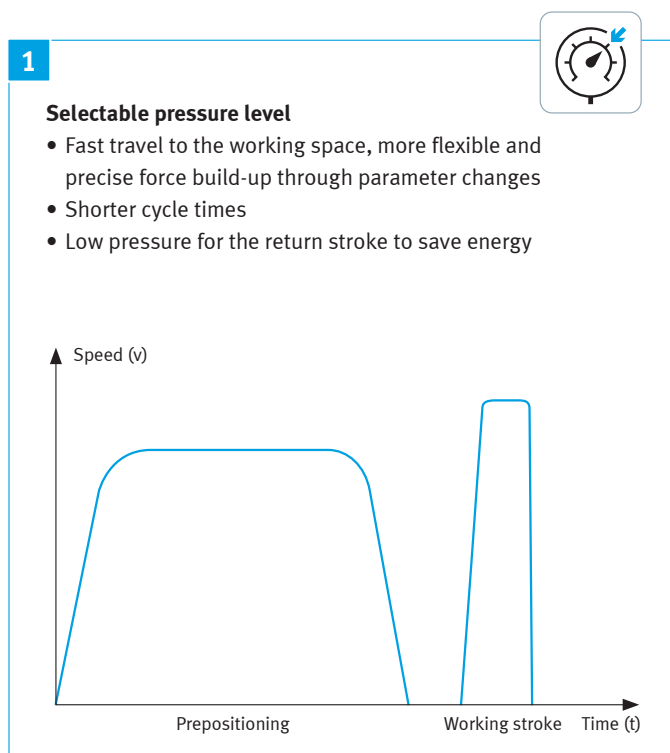
The Motion App “Selectable pressure level” lets you control up to 8 double-acting cylinders that perform different tasks for machining a plastic tank in parallel. The digitised pressure control is customised for each cylinder and always ensures the right working pressure without the need for external sensors. You can thus achieve optimum process reliability and save compressed air in many areas.

The cylinders hold the workpiece in place, insert seals, punch holes or place stickers. Digital flow control specification allow the travel speed of each drive to be controlled individually and dependent on the position. After fast travel to the pre-position, there is a programmed waiting time so that the short working strokes run simultaneously or sequentially.

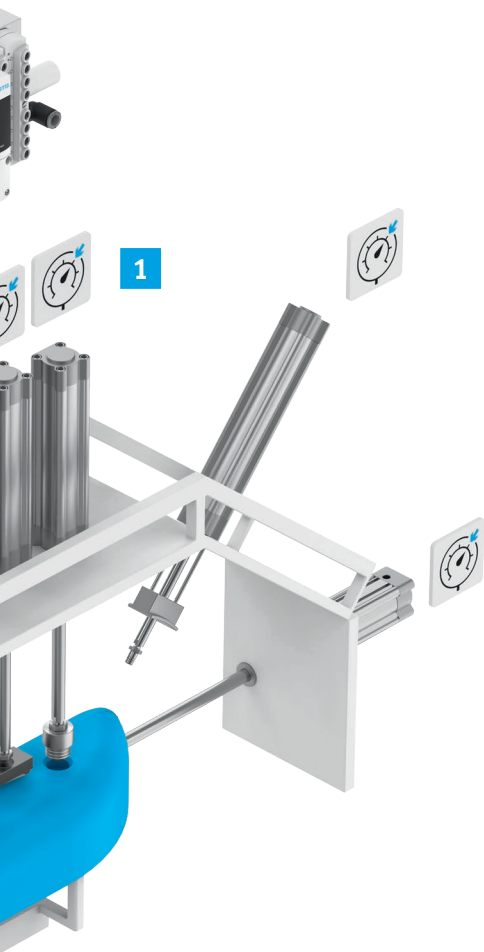
The fast return travel with reduced pressure ensures energy-saving motions and shortened cycle times. There is no need for mechanical shock absorbers. You no longer need to bother with complex adjustment, synchronisation and re-adjustment.

Program once, then just duplicate

This saves you a huge amount of time during commissioning since you only need to define pneumatic parameters once. You can then copy these values for the other systems. You can create presets for different tasks on the same system and retrieve them individually, thus minimising your setup times.



- + **Reliable**
- + **Shorter cycle times**
- + **Easy to duplicate**



2

Leakage diagnostics

- Predictive maintenance
- Save energy and costs



Press in flexible materials quickly and reliably!

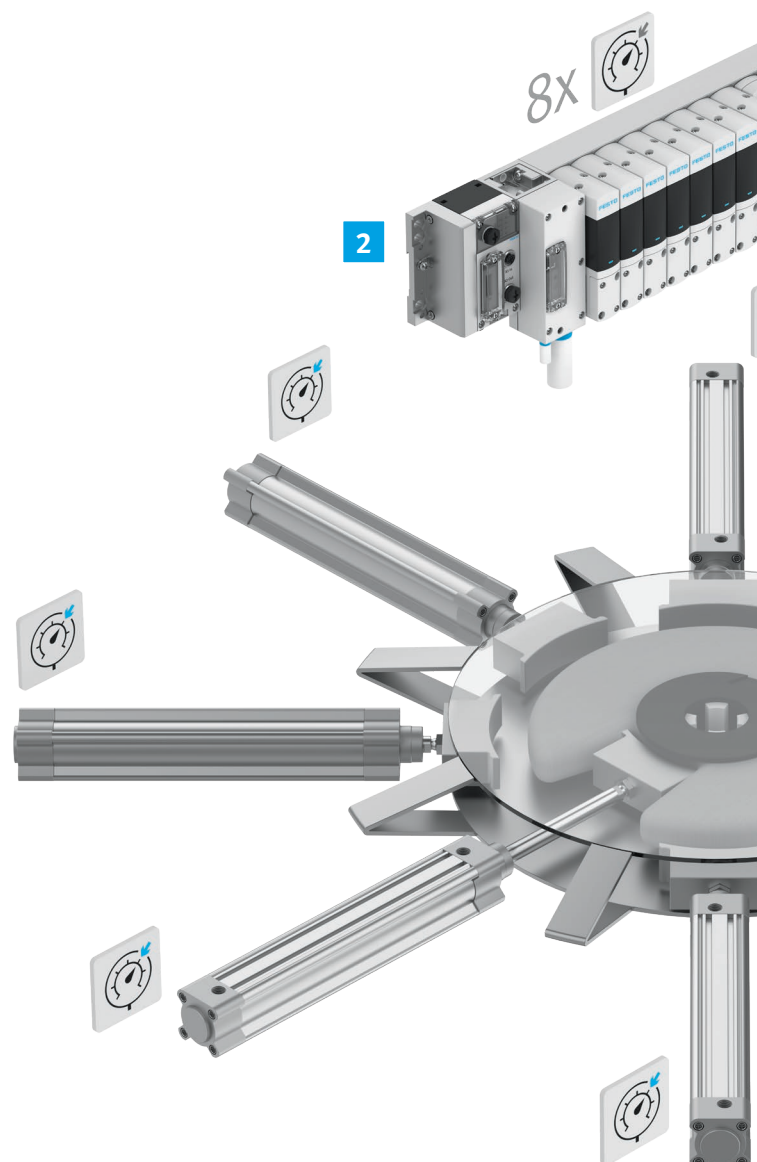
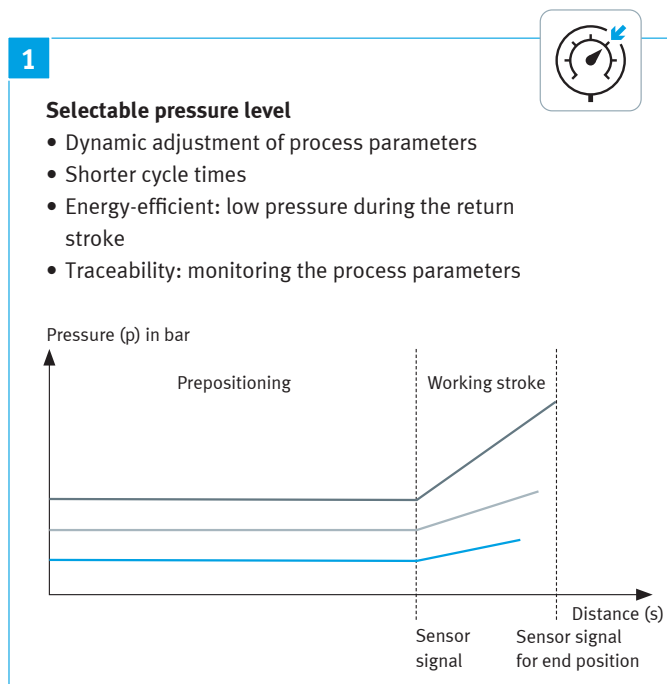
Dynamic pressure adjustment via the app “Selectable pressure level” gives you the highest possible process quality when pressing in flexible materials, for example airbags in cartridges. The design process is much more straightforward than conventional pneumatics, and the parameter sets can be conveniently duplicated.

To prevent damage to the materials when they are being pressed in, the process is dynamic: at the beginning, the loose material is pushed together by the cylinder in a specific sequence with low pressure and speed. The more the material is compressed, the more force is required.

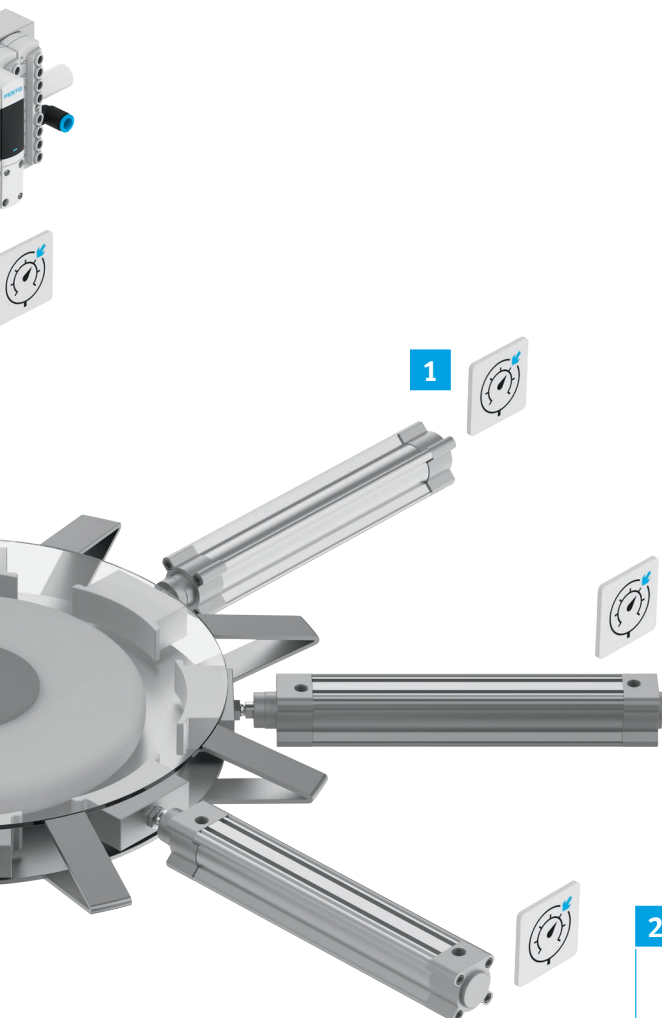
The app “Selectable pressure level” controls the pressure and the function of the flow control valves. It increases the pressure during each cycle and reduces the speed until the material is fully pressed in. The next process step does not start until the programmed

parameters match the measured data; otherwise an error message is generated. Presets enable you to flexibly adjust all process parameters to all product variables.

The cycle times are reduced by optimally coordinating the cylinder motions. By digitally monitoring all key process parameters, convenient traceability is now possible for the first time.



- + **Reliable**
- + **Dynamic pressure adjustment**
- + **Built-in traceability**



2

Leakage diagnostics

- Predictive maintenance
- Save energy and costs



Make flexible gripping even easier!

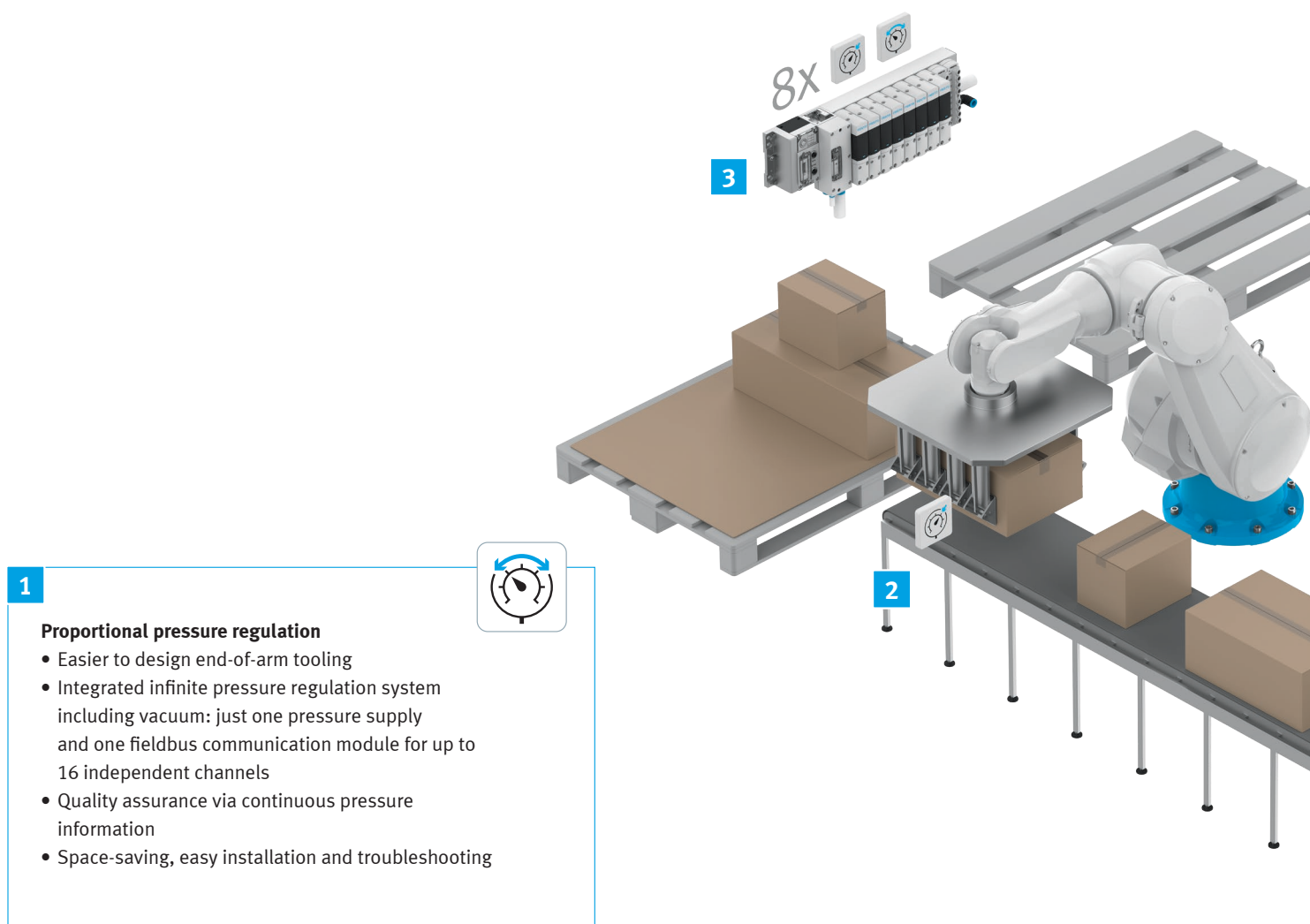
Robots can perform a wide range of tasks by simply changing the end-of-arm tooling (EOAT), which is equipped with various components. The Motion Terminal makes it easier for you to use this flexibility during operation: no matter how many EOATs are used on a robot, the Motion Terminal controls them all centrally. Design and commissioning become easier at the same time.

One Motion Terminal replaces a large number of valve terminals on the end-of-arm tooling, since it can model the necessary valve functions of the EOAT. Thanks to the Motion Apps, the VTEM integrates all these functions in one piece of hardware, for example gripper or vacuum activation.

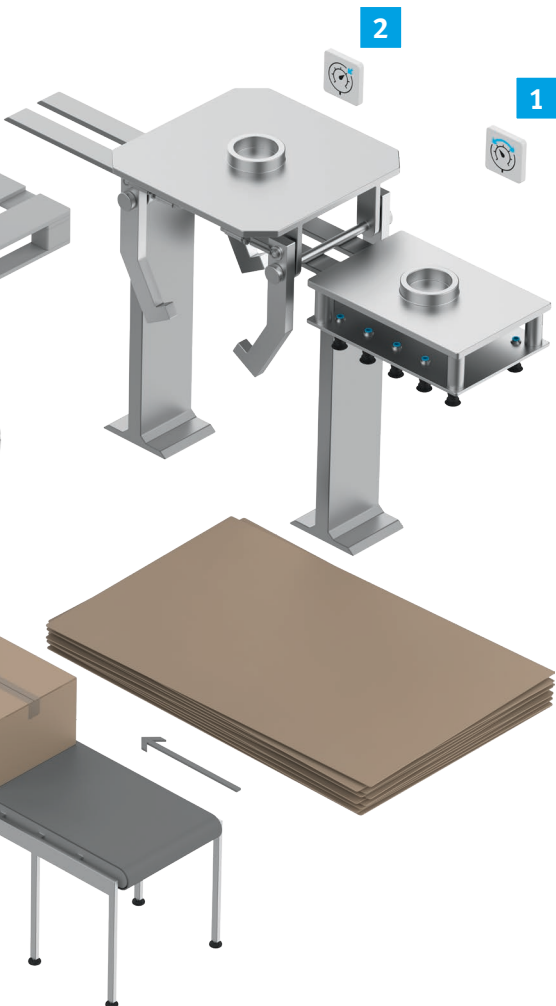
With the app “Selectable pressure level” you not only regulate the force, but also the number of gripper fingers required. This enables you to adapt the gripping process perfectly to the size and weight of the different objects, such as boxes and pallets as in this case. The force is reduced when opening the gripper fingers to further improve energy efficiency.

A vacuum solution with the app “Proportional pressure regulation” ensures the protective box is safely transported onto the pallet. You simply adjust the required vacuum level to the weight to be moved.

You can define the process sequences in presets so they can be reproduced. And by digitally monitoring the process parameters you have the opportunity to conveniently trace the process for the first time.



- + Simply flexible
- + Custom gripping
- + End-of-arm tooling made easier



2

Selectable pressure level

- Easier to design end-of-arm tooling
- Custom control of the gripping force
- Energy-efficient: grip with high force, open with lower force



3

Leakage diagnostics

- Predictive maintenance
- Save energy and costs



Ensure the web tension is always correct!

The intelligent, digitised control of the dancer roller ensures a constant web tension at all times, whether for textiles, plastic film or paper. The app “Proportional pressure regulation” immediately compensates tension fluctuations in the belt. The real-time system monitoring – including via remote diagnostics – significantly increases your process reliability.

The force and thus the belt tension can be individually and dynamically adjusted during each process stage by flexibly regulating and controlling the pressure in a pneumatic cylinder. With the Motion Terminal you can regulate the pressures in two working channels independently per valve slice, which means that two valve slices are all that is needed to control all four cylinders.

The tension can also be controlled using conventional pneumatics. However, the setup is much more complex since you need more components such as additional sensors, cables, communication technology, pressure supply, etc. The Motion Terminal does this with one piece of hardware via the Motion Apps.

Another benefit for you is the digital information about the pressure status that you can use for real-time diagnostics. Changes in the pressure are immediately visible. You can also read out this data via remote diagnostics and respond quickly should the situation demand it.



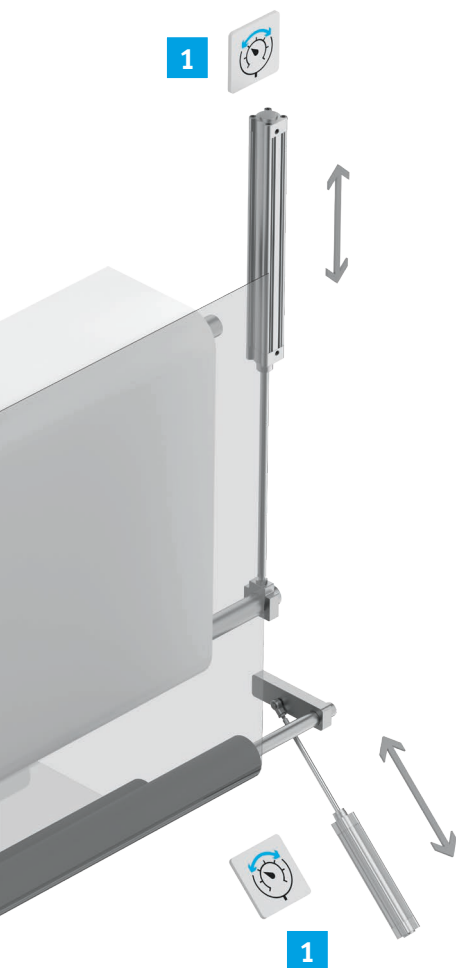
1

Proportional pressure regulation

- Quality assurance via continuous pressure information
- Integrated pressure regulation system: just one pressure supply and one fieldbus communication module for individually regulating four channels
- Space-saving, easy installation and troubleshooting



- + **Dynamic parameter adjustment**
- + **Real-time monitoring**
- + **Maximum process reliability**



2

Leakage diagnostics

- Predictive maintenance
- Save energy and costs

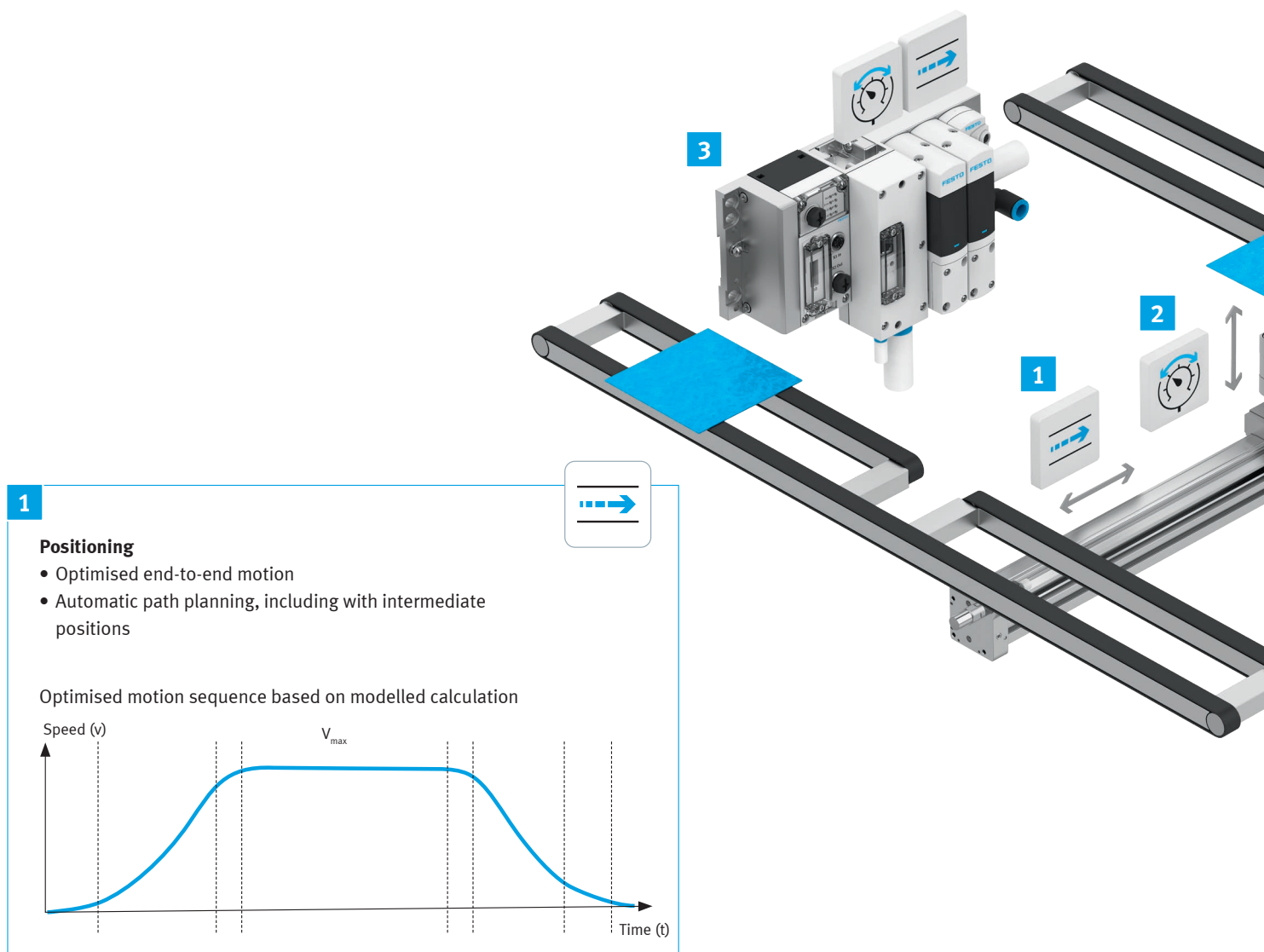


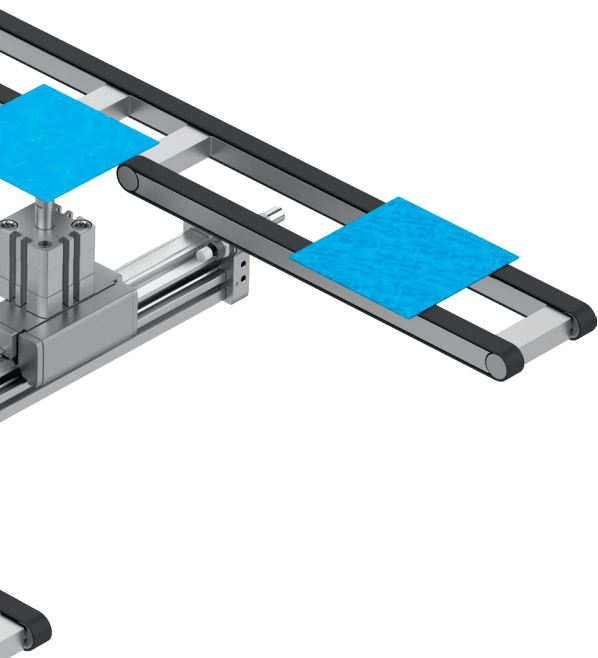
Handle delicate components safely, gently and quickly!

By combining the Motion Apps “Positioning” and “Proportional pressure regulation” you can resolve the contradiction between speed and safe transport. You can see how this works when handling extremely delicate wafers. The two apps are synchronised so they each play to their strengths at precisely the right points in the process.

The Motion App “Positioning” moves the X-axis quickly and with minimal vibration from belt to belt using full stroke measurement. If necessary you can also define intermediate positions. The travel profile in this application is configured using limit values for the parameters speed, acceleration and jerk so that the app accelerates up to maximum speed and then decelerates in order to reach the end position smoothly.

You can control the valve’s two working ducts independently of each other with the Motion App “Proportional pressure regulation”. The first working duct moves the single-acting cylinder of the Z-axis using pressure regulation, while the second one grips the wafer using precisely metered vacuum control and gently sets it down. For safe transport, the vacuum is increased from the initial value of -0.2 bar to -0.7 bar and then lowered to -0.2 bar again during the braking phase.





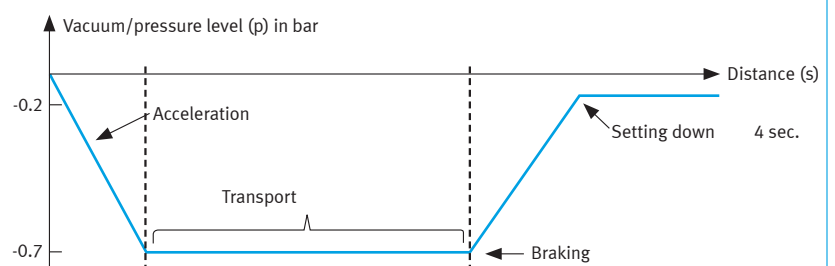
- + Fast and gentle**
- + Optimised motion**
- + Safe transport**

2



Proportional pressure regulation

- Regulated vacuum with different forces
- Controlled ejector pulse



3



Leakage diagnostics

- Predictive maintenance
- Save energy and costs



Productivity

Maximum productivity is a question of ambition

Do you share this attitude? We will be glad to help you achieve this goal – through our four outstanding qualities:

• Security • Efficiency • Simplicity • Competency

We are the engineers of productivity.

Discover new dimensions for your company:

→ www.festo.com/whyfesto