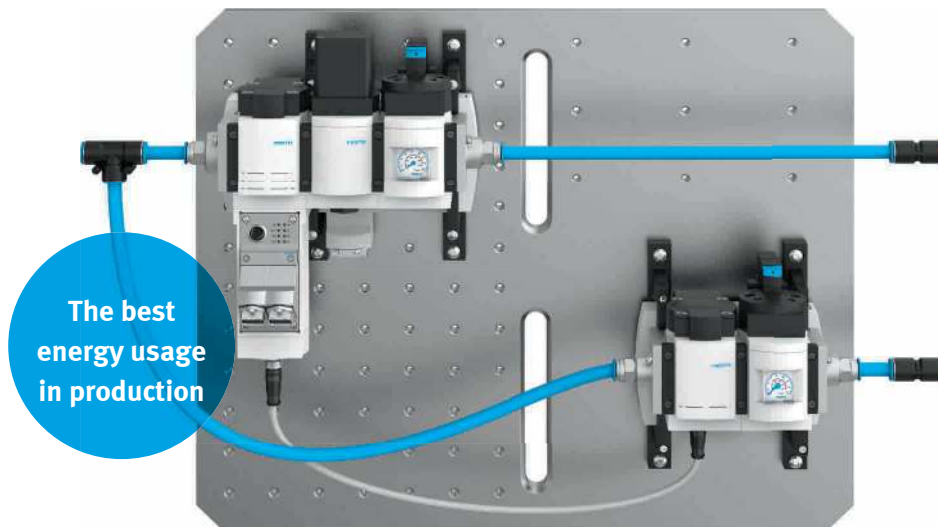


Energy efficiency modules MSE6

FESTO



Reduce your CO₂ emissions!

Highlights

- A unique solution, the first of its kind on the market
- Monitoring the compressed air consumption and supply
- Automatic detection of leakages
- No negative impact on plant and system availability
- Can be expanded in the CPX system
- Quick return on investment

Where previously condition monitoring and control in compressed air systems was limited to gathering and analysing measurement data, consumption can now be automatically reduced by actively intervening in the supply. Thanks to patented technology from Festo, you can save up to 3.2 t of CO₂, and hundreds of euros in operating costs per year.

Intelligent use of energy

The energy efficiency module MSE6-C2M combines pressure regulator, on/off valve, sensors and fieldbus communication in one unit. It monitors the compressed air consumption, shuts off the compressed air after production has stopped for a certain amount of time, and prevents the system pressure from falling below a specific stand-by pressure level.

Ready for Industry 4.0

With the modules -C2M and -E2M from the MSE6 series condition monitoring takes place via fieldbuses or PROFINET and measured values such as pressure and flow rate are provided via the PLC or the cloud. The additional module MSE6-D2M is an efficient extension of the -C2M via a second supply string.

Greater process reliability

All modules of the MSE6 series are connected to the machine control system, and detect and report leakages that occur after the system has been shut off.

Thinking ahead about compressed air supply

New standards for clean production

The topics of resource conservation and energy efficiency, galvanised by the Paris Climate Protection Agreement on CO₂ reduction, are also playing an increasingly important role in industrial automation. Leading companies have already defined clear CO₂ targets for their products. Implementing these requires machines that achieve significant energy savings compared to previous models. That is precisely why Festo offers the MSE6 series, a solution that is unique on the market.

Energy efficiency modules MSE6 at a glance



MSE6-C2M



MSE6-D2M

Whether with existing or new systems, there are implementation options in almost every application

Energy efficiency modules MSE6 can be installed in existing or new systems, wherever the supply of compressed air is to be monitored and controlled.

Detecting stand-by states, automatic shut-off or stand-by pressure control

After entering machine-specific parameters, the modules recognise when a system is operating or idling. By shutting off the compressed air supply, air cannot be consumed unnecessarily and will not continue to be supplied to any leaks in the machine. Instead, the MSE6-C2M can maintain the output pressure at a previously defined stand-by pressure so that system availability is not impaired.

Leakage measurement

After shutting off the compressed air supply, the system can be checked for pressure leaks. The user therefore first needs to determine if the rate of pressure drops are too high or untypical. By reporting such pressure drops to the PLC, the energy efficiency modules trigger a warning, such as “Possible leakage in the machine. Check required”. This information can then be used by maintenance staff to plan and carry out a service.

Condition monitoring

Energy efficiency modules MSE6 can be fully integrated into the machine control system via fieldbus nodes in order to cyclically exchange important energy consumption and availability data for the system. This data can be transferred from the MSE6-E2M to the cloud via the Festo IoT gateway CPX-IOT, and thus recorded and analysed as long-term measured values.



MSE6-E2M

Plenty of savings potential

Return on investment after only 1 to 1½ years*

Let's assume that a machine is operational on 250 days per year based on two shifts and has a compressed air consumption of 2,000 l/min at 6 bar and a leakage rate of 10%. If the compressed air is not shut off during the 4,000 hours of non-production time, 48,000 Nm³ is simply lost. This would be an

expensive luxury that would cost you €912 and 3.2 t of CO₂ emissions. On the other hand, by simply reducing the pressure from 6 bar to 2.5 bar, you can save as much as €640 and 2.2 t in CO₂ emissions. And since the energy efficiency modules incorporate additional functions such as those of the classic pressure regulator MS6-LR, on/off valve MS6-EE, pressure

sensors SPAU and flow rate sensors SFAM, the amortisation period is further reduced. Especially if you consider the costs of a cyclical manual leakage detection. The bottom line is that a more conscious use of compressed air pays for itself in less than 1 to 1½ years.

* Please note: the following sample calculations are based on realistic assumptions and conditions. The values for your systems may differ and therefore the validity of this information cannot be guaranteed.

Possible savings with the module MSE6-C2M

Example 1:

- Costs for compressed air: €0.019/Nm³
- Consumption of the machine: 2,000 l/min
- Production/day: 16 h
- Production/year: 250 d
- Leakage rate: 10%
- Working pressure: 6 bar
- Stand-by pressure: 2.5 bar

Production time/non-production time

Total production time/year: 365 d · 24 h = 8,760 h
 Production time according to example 1:
 250 d · 16 h = 4,000 h → 240,000 min
 Non-production time according to example 1:
 365 d · 24 h – (250 · 16 h) = 4,760 h* → 4,000 h → 240,000 min

Leakage

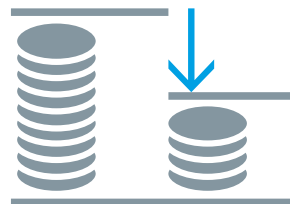
10% at 2,000 l/min** = 2,000 l/min → f_i = 0.2 Nm³/min

Leakage during non-production time (at 6 bar)

0.2 Nm³/min · 240,000 min = 48,000 Nm³

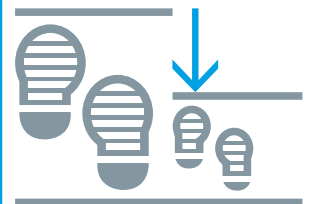
Savings during non-production time

when reducing the pressure from 6 bar to 2.5 bar
 48,000 Nm³ · 0.7 · 0.019 ct/Nm³ = €639



Costs are reduced

Cost savings at 4,000 h/a by switching to stand-by pressure
 ~€639 per year



CO₂ footprint is reduced

CO₂ savings:
 ~2.24 t per year***

By switching to stand-by pressure, the MSE6-C2M can reduce leakage losses by 60–75% during non-production time!**

* Assumption: 760 h repair/maintenance

** Depending on the type of leakage:
 based on a purely statistical worst-case scenario (hole in the tubing) = 70%

*** 1 kWh of electricity produces 0.5 kg CO₂.

These figures apply to Germany and may vary in other countries.
 Source for 2015 figures: German Federal Environment Agency
 (<https://www.umweltbundesamt.de/themen/klima-energie/energieversorgung/strom-waermeversorgung-in-zahlen#Strommix>)

Possible savings with the modules MSE6-E2M and MSE6-D2M

Example 2:

- Costs for compressed air: €0.019/Nm³
- Consumption of the machine: 2,000 l/min
- Production/day: 16 h
- Production/year: 250 d
- Leakage rate: 10%
- Working pressure: 6 bar

Production time/non-production time

Total production time/year: 365 d · 24 h = 8,760 h

Production time according to example 2:

250 d · 16 h = 4,000 h → 240,000 min

Non-production time according to example 2:

365 d · 24 h – (250 · 16 h) = 4,760 h* → 4,000 h → 240,000 min

Leakage

10% at 2,000 l/min** = 2,000 l/min → $f_i = 0.2 \text{ Nm}^3/\text{min}$

Leakage during non-production time (at 6 bar)

$0.2 \text{ Nm}^3/\text{min} \cdot 240,000 \text{ min} = 48,000 \text{ Nm}^3$

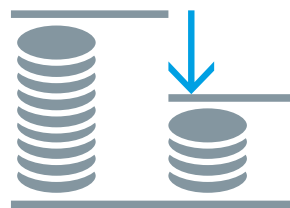
Savings during non-production time

$48,000 \text{ Nm}^3 \cdot 0.019 \text{ ct}/\text{Nm}^3 = €912$

Savings during non-production time

when switching off the pressure

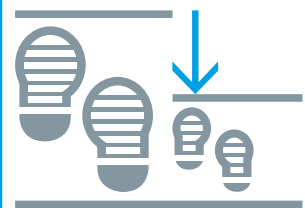
$48,000 \text{ Nm}^3 \cdot 0.019 \text{ ct}/\text{Nm}^3 = €912$



Costs are reduced

Cost savings at 4,000 h/a by switching off:

~€912 per year



CO₂ footprint is reduced

CO₂ savings:

~3.2 t per year***

By having the MSE6-E2M or MSE6-D2M switch off the system during non-production time, costs can be reduced by €912 per year.

* Assumption: 760 h repair/maintenance

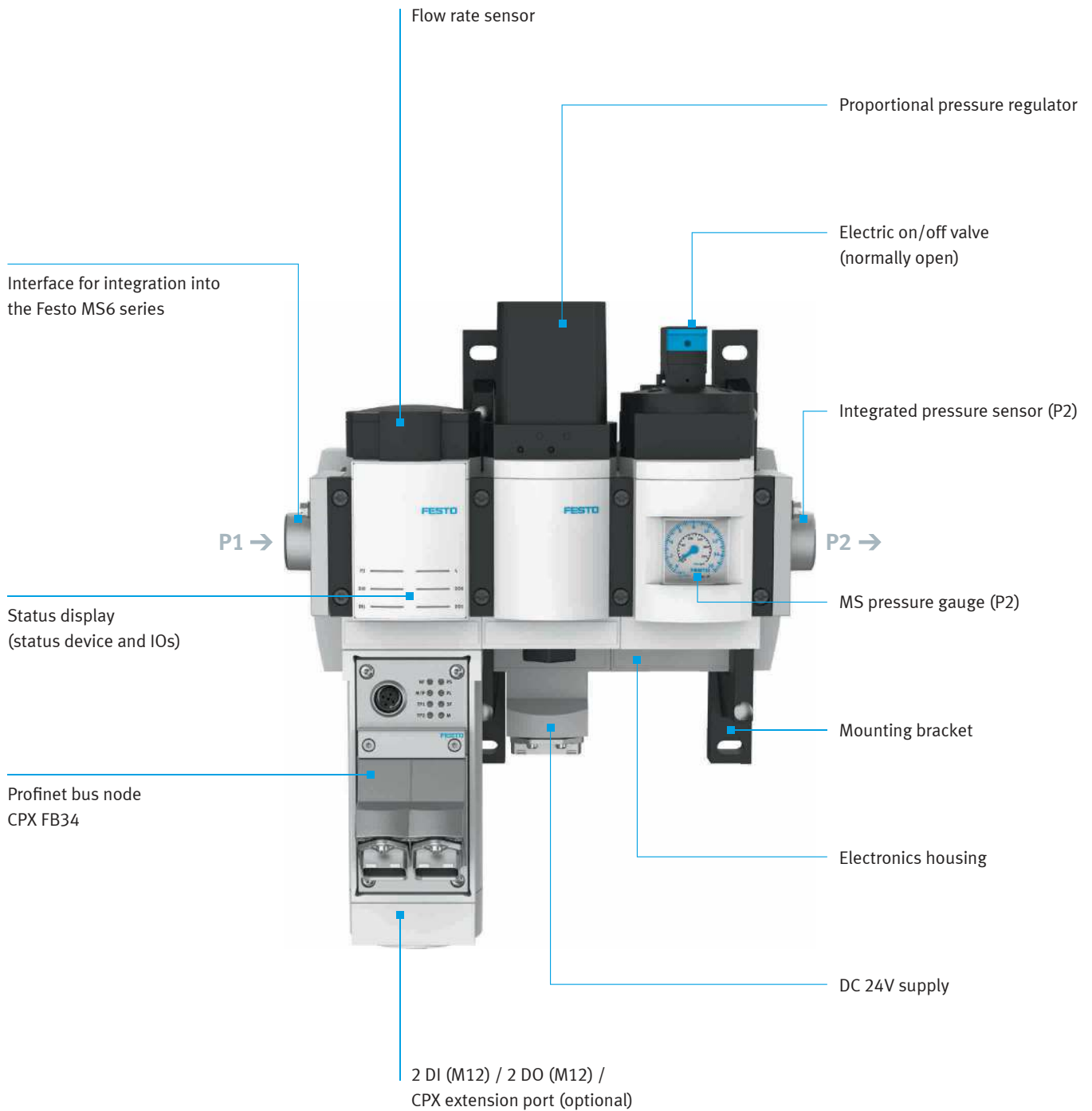
** Depending on the type of leakage

*** 1 kWh of electricity produces 0.5 kg CO₂.

These figures apply to Germany and may vary in other countries.
Source for 2015 figures: German Federal Environment Agency
(<https://www.umweltbundesamt.de/themen/klima-energie/energieversorgung/strom-waermeversorgung-in-zahlen#Strommix>)

Energy efficiency module MSE6-C2M

Reducing the pressure in stand-by mode



Control functions

- Adjustable regulated output pressure
- Automatic pressure reduction without exhausting the system during downtimes
- Detecting leaks by evaluating the pressure drop in stand-by mode
- Adjustable pressure increase (soft-start)
- Digital inputs and outputs

Process monitoring

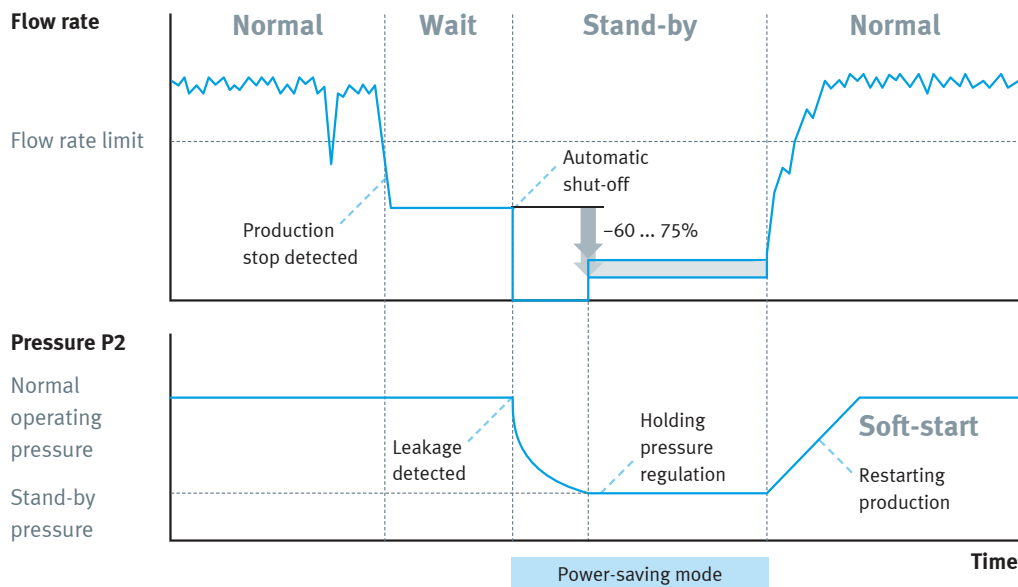
- Flow rate
- Air consumption
- Output pressure
- Change in pressure

Modularity

- Can be combined in the MS modular system
- Compatible with CPX (system bus extension)



Operation in automatic mode



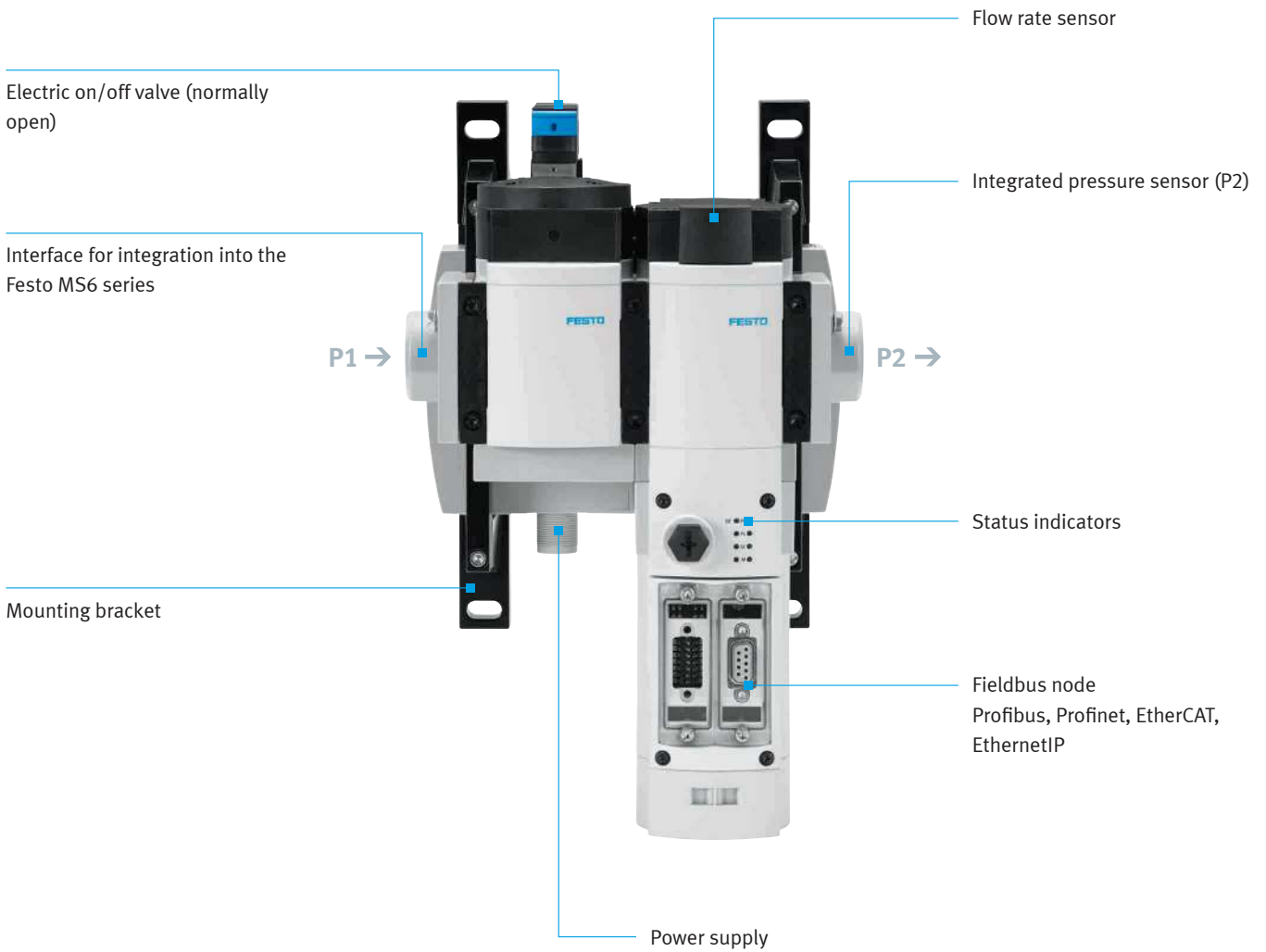
Benefits

- Optimised consumption through adjustable, regulated output pressure
- Avoiding or reducing compressed air consumption during system downtime
- Leakage detection
- Gathering and preparing pneumatic measured variables for process monitoring
- Connecting external components via electrical inputs and outputs
- Fieldbus networking

Example of regulating the holding pressure from 6 bar to 2.5 bar, depending on the type of leakage: based on a purely statistical worst-case scenario (hole in tubing) = 60%

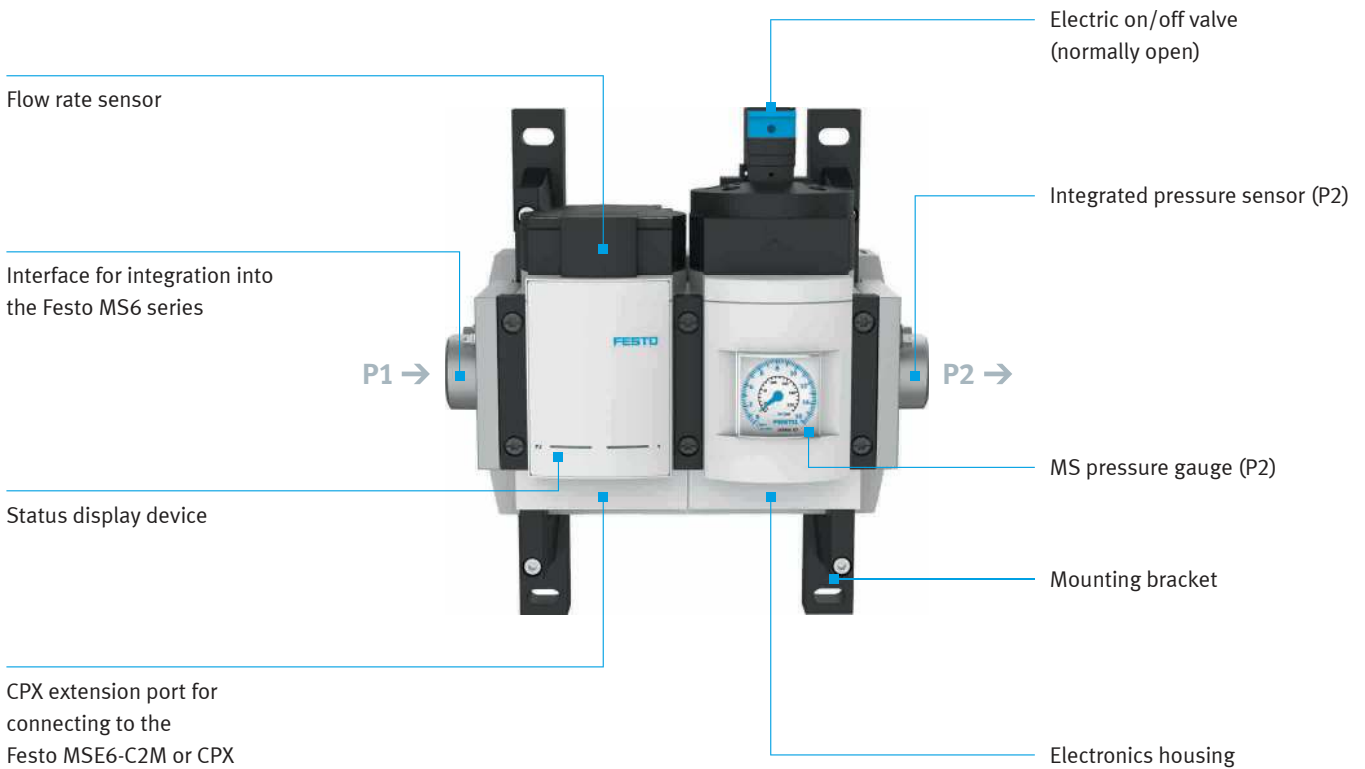
Energy efficiency module MSE6-E2M

Stand-alone solution for shutting off the compressed air

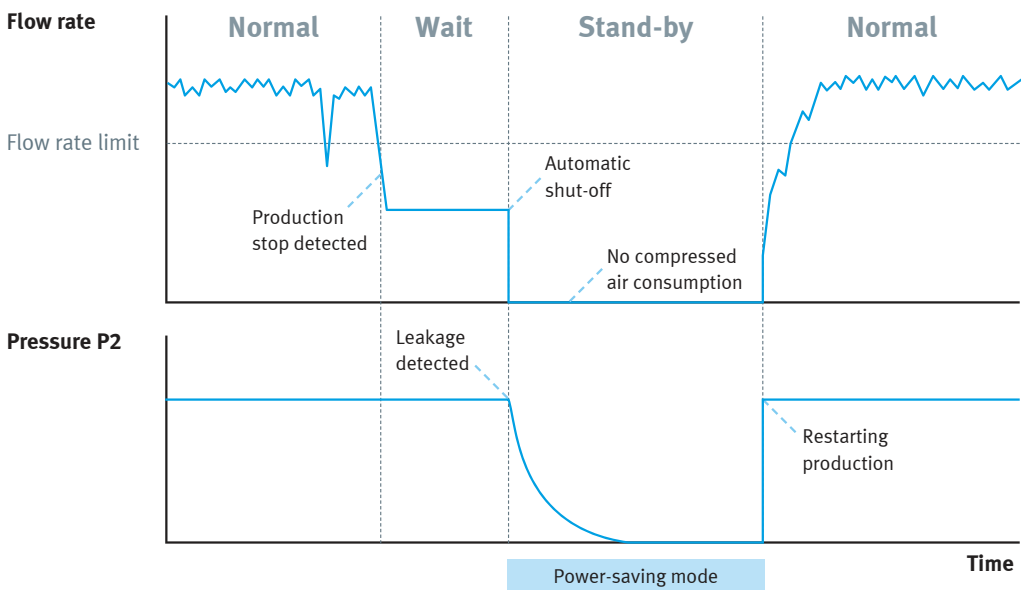


Energy efficiency module MSE6-D2M

Extended solution for shutting off the compressed air



Operation in automatic mode



Benefits

- Avoiding compressed air consumption during system downtime
- Leakage detection
- Gathering and preparing pneumatic measured variables for process monitoring
- Connecting external components via electrical inputs and outputs
- Fieldbus networking

Shaping the future with a leading technological edge

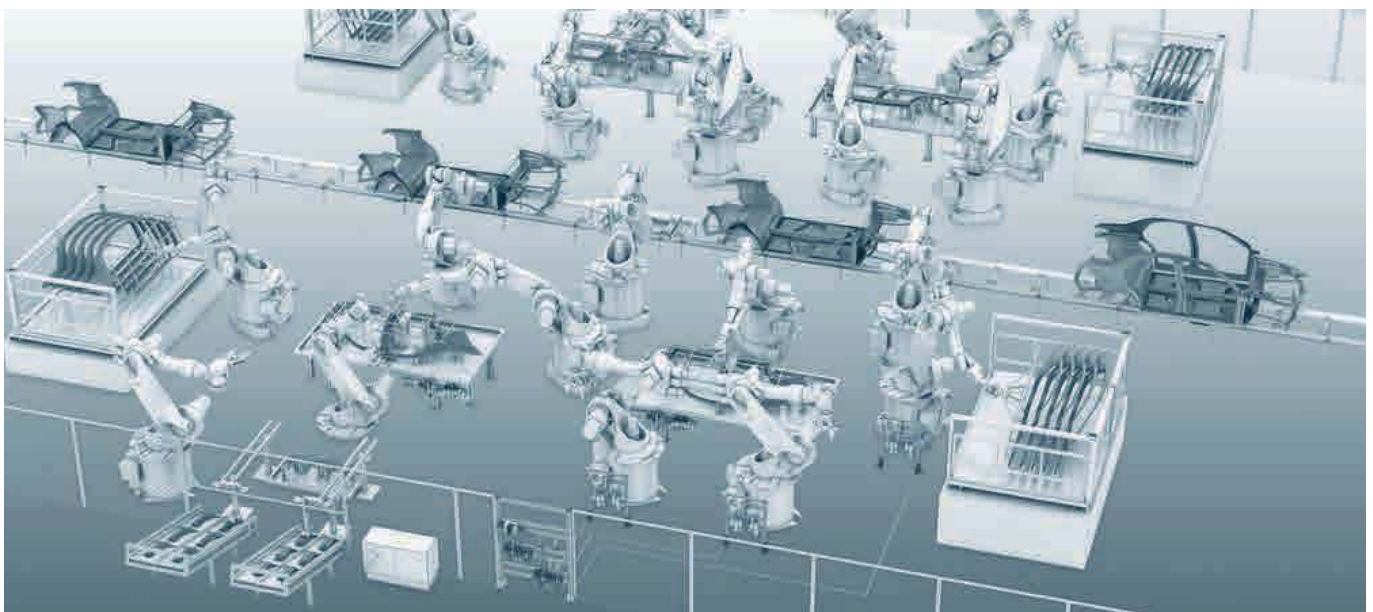
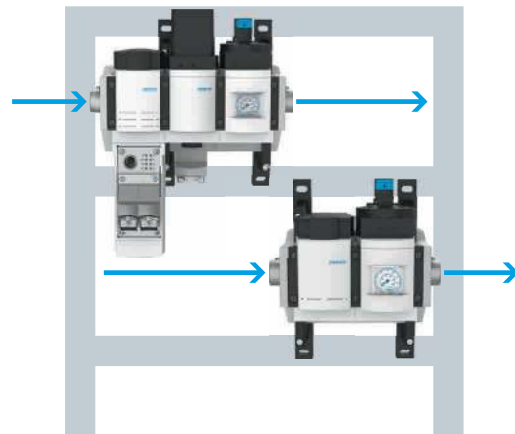
How to distinguish yourself as a “green company”

The energy efficiency modules MSE6 are particularly interesting for applications in the automotive industry, in machine tools, in food and packaging systems, in general machine building and in process technology. But they can also contribute to energy optimisation in virtually every industry that has a high degree of automation, whether it is integrated in or separate from an existing service air preparation unit.

MSE6-C2M/D2M in the car body shop in the automotive industry

Perfect for supplying compressed air to cells

- Pressure control via fieldbus
- Continuous pressure and flow measurement
- Automatic holding pressure reduction during non-production times prevents pneumatic clamps from dropping
- Automatic leakage detection
- Connecting additional devices (IOs) to the hall or robot installation plate
- Data provider for condition monitoring and process data acquisition system

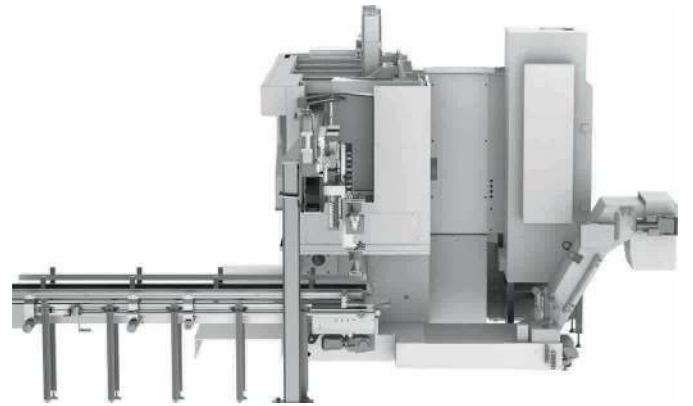
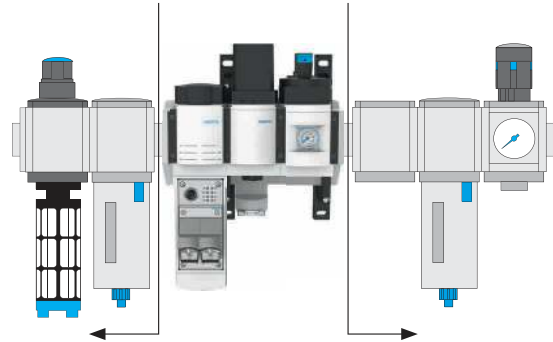


MSE6-C2M in machine tools

Perfect for supplying compressed air to machine tools

- Pressure control via fieldbus
- Continuous pressure and flow measurement
- Automatic reduction of the stand-by pressure during non-production times
- Guaranteed supply of sealing air during stand-by

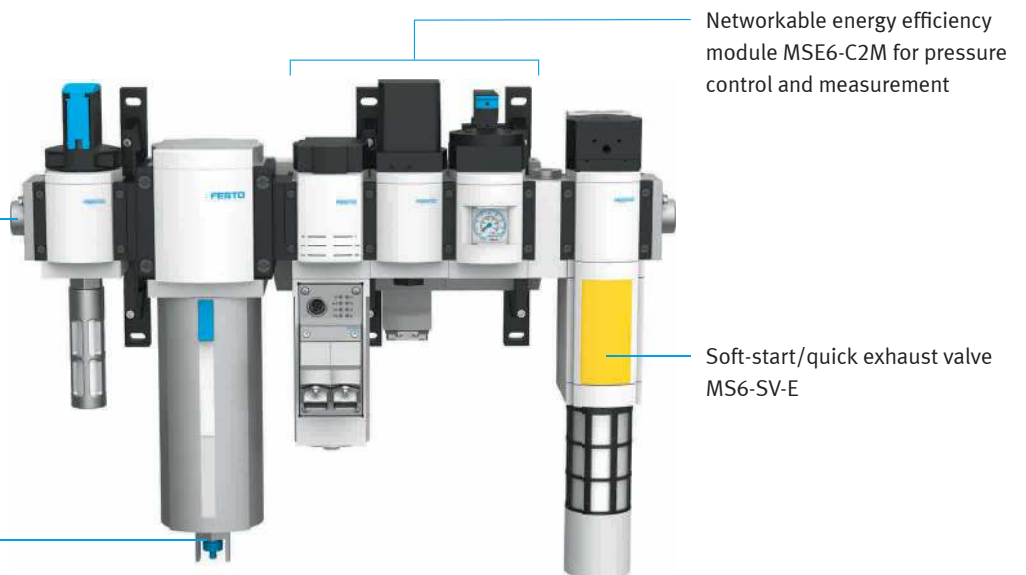
- Automatic leakage detection
- Mounting additional devices (IOs) on the installation plate reduces the number of fieldbus nodes
- Data provider for condition monitoring and process data acquisition system as well as apps and services



MSE6 in an air preparation environment

Lock-out/tag-out: lockable manual on/off valve MS6-EM1 with exhaust function

Low pressure drop for maximum energy efficiency: high-flow MS9-LF filter in size 9



Clever combination for comprehensive concepts

The right product at the right time

Virtually all large companies across all industry sectors are setting themselves ambitious energy efficiency targets. This is precisely where the Festo MSE6 series is the perfect solution, as it demonstrates how products that are available immediately can create significant added value in digitalisation and energy efficiency. Being able to expand the MSE6-C2M-...-M-...with an MSE6-D2M or a CPX IO terminal saves you fieldbus nodes. This enables you to control sub-functions such as mounting plates for system power supply with only one fieldbus connection. The network topology of your system remains lean and clear.

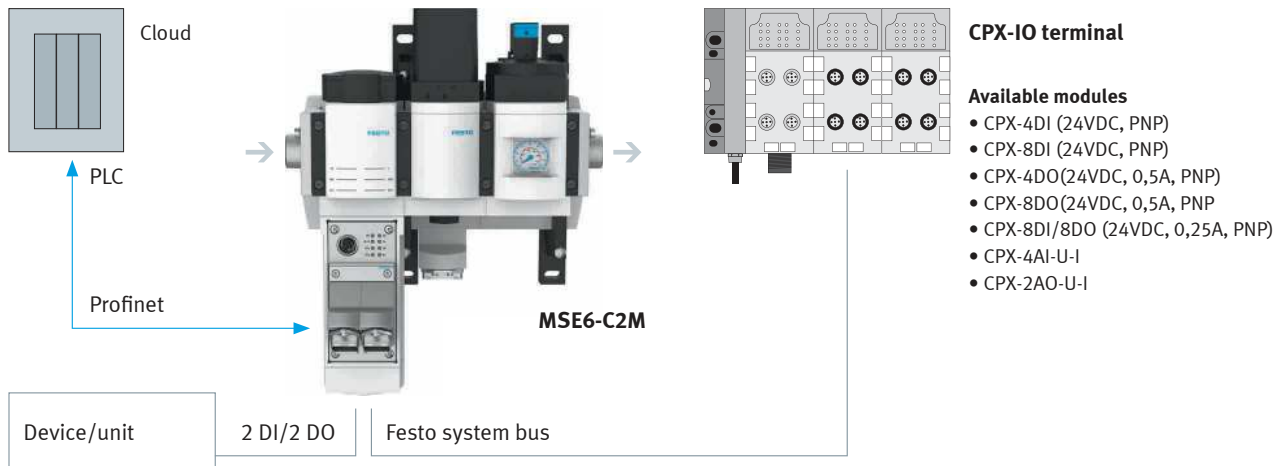
Application 1: combination of MSE6-C2M and MSE6-D2M



Benefits

- Energy efficiency function for two separate compressed air networks
- Leakage detection
- Only one fieldbus connection required
- Direct integration of 2DI/2DO, e.g. for controlling external valves and sensor technology
- Process monitoring
- Integrated pressure and flow measurement
- Fieldbus controlled pressure regulation with automatic stand-by pressure reduction via MSE6-C2M

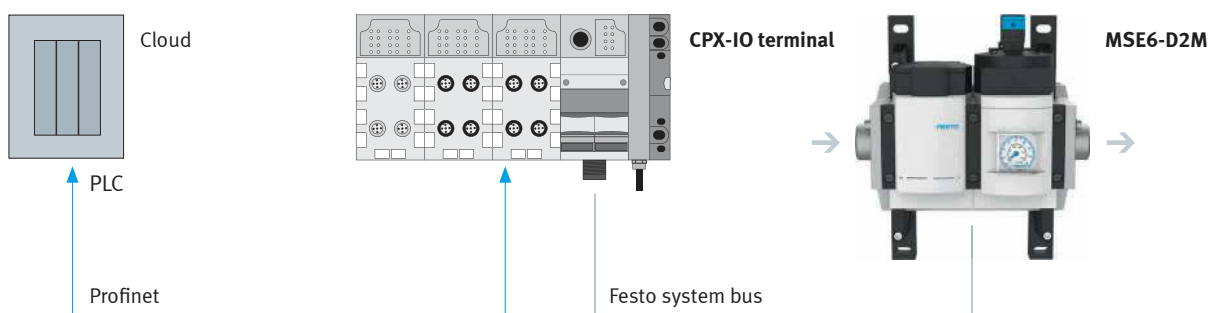
Application 2: combining MSE6-C2M with CPX terminal



Benefits

- Energy efficiency function with pressure regulation
- Leakage detection
- Only one fieldbus connection required
- Direct integration of 2DI/2DO, e.g. for controlling the valves and the sensor technology
- Additional DI/DO/AI/AO can be integrated on a CPX IO terminal (max. 3 modules – please observe the system limits of the CPX)
- Process monitoring with leakage detection
- Integrated pressure and flow measurement
- Fieldbus-controlled pressure regulation with automatic stand-by pressure reduction

Application 3: combining CPX terminal with connected MSE6-D2M on a mounting plate



Benefits

- Energy efficiency function
- Connection to CPX terminal with CPX extension (please observe the system limits of the CPX)
- Process monitoring with leakage detection
- Integrated pressure and flow measurement
- Automatic detection of the end of production and subsequent shut-off of the compressed air supply
- Cost-efficient solution with only one fieldbus node

Easy and consistent implementation of digitalisation with the MSE6

What's the compressed air consumption and the system status? Completely transparent!

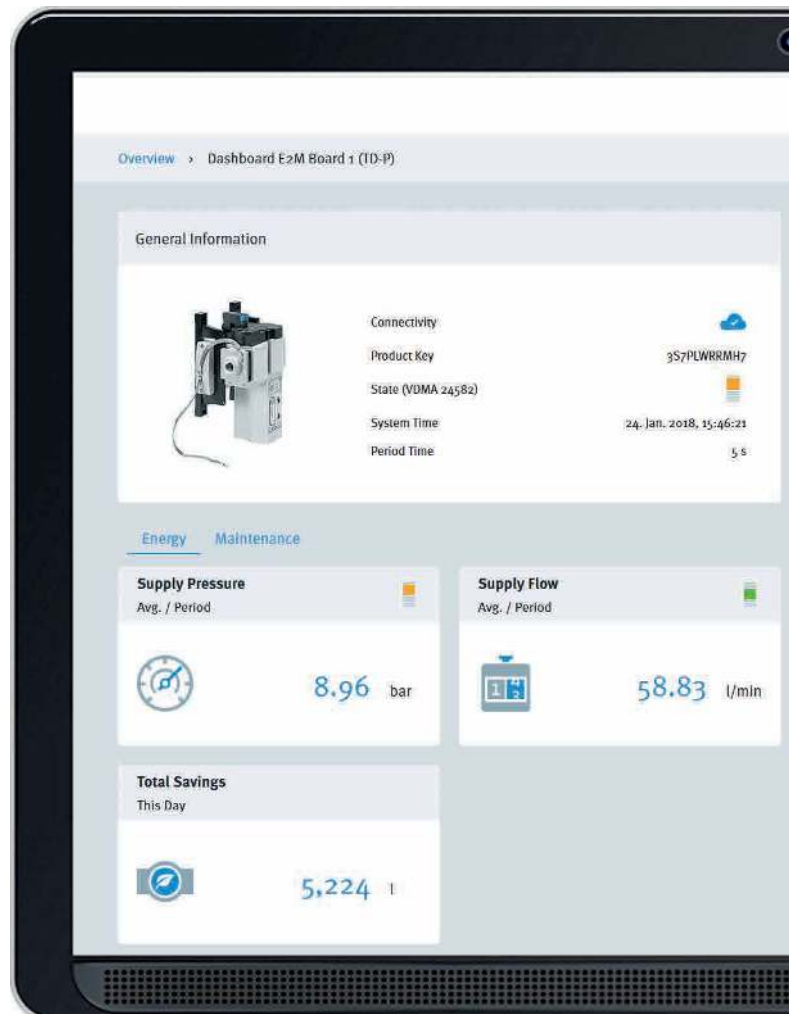
Thanks to cloud-based analysis with the Festo energy efficiency module MSE6-E2M and the Festo Dashboard you can now find out exactly how your system is doing.

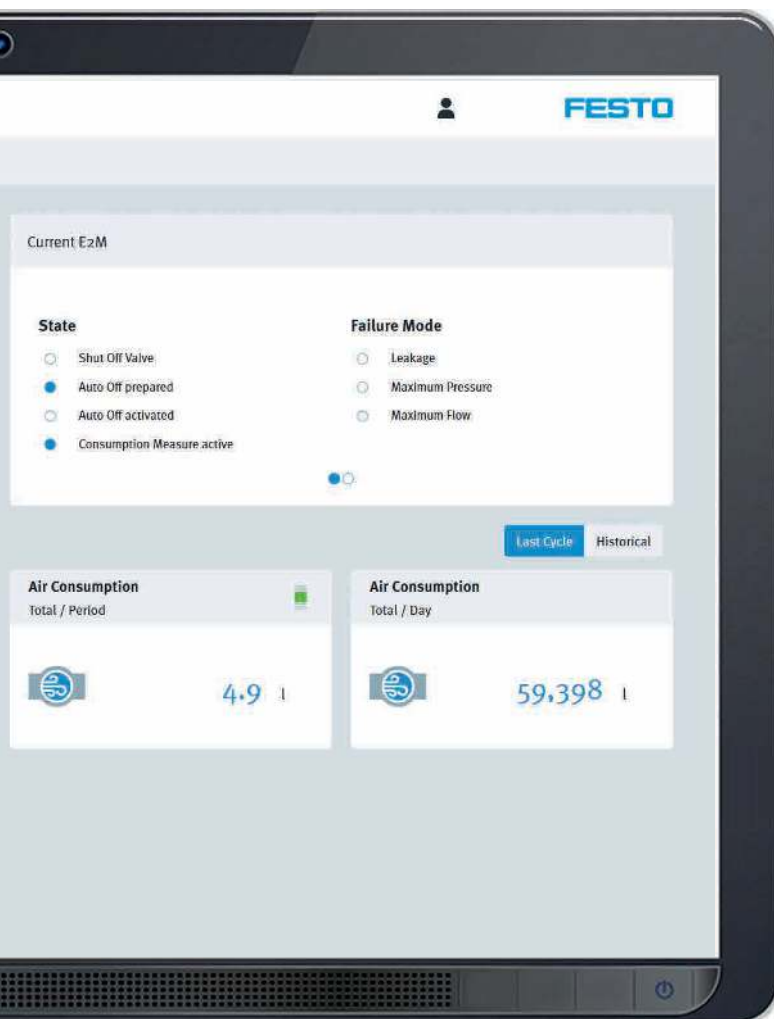
Innovative cloud solution

Modern web-based data analysis ensures greater transparency and improves the availability of the pneumatics in your system. You will immediately notice the energy and CO₂ savings that are achieved when using the Festo energy efficiency module. Not only does this save you money, but it can also help your company to answer any questions about certification, e.g. by providing information on the CO₂ footprint of the products, sustainability and so on.

Predictive maintenance

The new analysis options support the early detection of changes in the system. As a result, service can be scheduled to take place outside of production hours. This reduces unplanned downtime and unproductive time as well as cuts costs.





Total values over defined periods

Flow rate sensor

Festo Dashboards

Festo's cloud solution supports you as a customer over the entire life cycle of your system – and increases your productivity, e.g. through more efficient engineering and various value-added services. The first step is to access the condition monitoring dashboard for your Festo devices.

Flexible widgets for a wide range of evaluations

You can analyse limit values for any periods within a given year. The energy savings that have been automatically made during idle times are clear to see.

IoT gateway CPX-IOT hardware for unlimited communication

The industrial Internet of Things gateway in the CPX module format collects information about Festo devices and their statuses via Ethernet using a standardised communication protocol. It then sends this information to the cloud via the second Ethernet port. State-of-the-art IT security mechanisms keep the data completely secure.

- New cloud technology with web interface without the need for additional software
- Cloud-based database for fast and efficient analysis of long-term measured values

Energy efficiency modules MSE6

Everything that distinguishes a classic win-win situation

Everyone benefits from intelligent solutions that make processes even more efficient thanks to a competitive advantage. A welcome effect is that anyone who drives automation with Festo is also at the forefront of environmental awareness. See for yourself!

Advantages for OEMs in machine building

- + You have the opportunity to sell energy efficiency packages
- + You can offer after-sales services in case of leakage
- + You will distinguish yourself as a leader in innovation

Benefits for corporate end users

- + You lower your manufacturing costs by reducing your compressed air consumption
- + You considerably reduce your CO₂ footprint
- + You will distinguish yourself as a “green company”

Overview: MSE6-C2M/-D2M/-E2M technical data

		MSE6-C2M-...	MSE6-C2M-...-M-...	MSE6-D2M	MSE6-E2M
Measurement data acquisition	Flow measurement	•			
	Pressure measurement p2	•			
Measurement data calculation (derived measurement data)	Consumption measurement	•			
	Change in pressure	•			
Pressure regulation and control functions	<ul style="list-style-type: none"> • Shut-off function: automatic shut-off in the event of a permanent flow rate shortfall (energy efficiency function) • User-controlled pressurisation/exhausting 	•			
	<ul style="list-style-type: none"> • Pressure regulation minus holding pressure • Working pressure control 	•		—	
Connections	Electrical inputs	2x DI (24V)		—	
	Electrical outputs	1x DO (24V 0.5A) 1x DO (24V 0.5A) (together max. 1A)		—	
	CPX extension	—	•	•	—
	24V supply	• (Push-pull AIDA)		—	• (M18)
Display	LEDs (status indication)	•			(•)
	Pressure gauge p2	•			—
Fieldbus connection	Profibus / Profinet / EtherCAT / Ethernet IP	— / Profinet / — / —			• / • / • / •
Characteristic values – pneumatics	Operating pressure P1	5.0 ... 11.0 bar		3.5 ... 13.0 bar	4.0 ... 10.0 bar
	Output pressure P2	2.5 ... 10.0 bar		3.5 ... 13.0 bar	4.0 ... 10.0 bar
	Standard nominal flow rate (qnN)	5,000 L/min		4,500 L/min	4,500 L/min