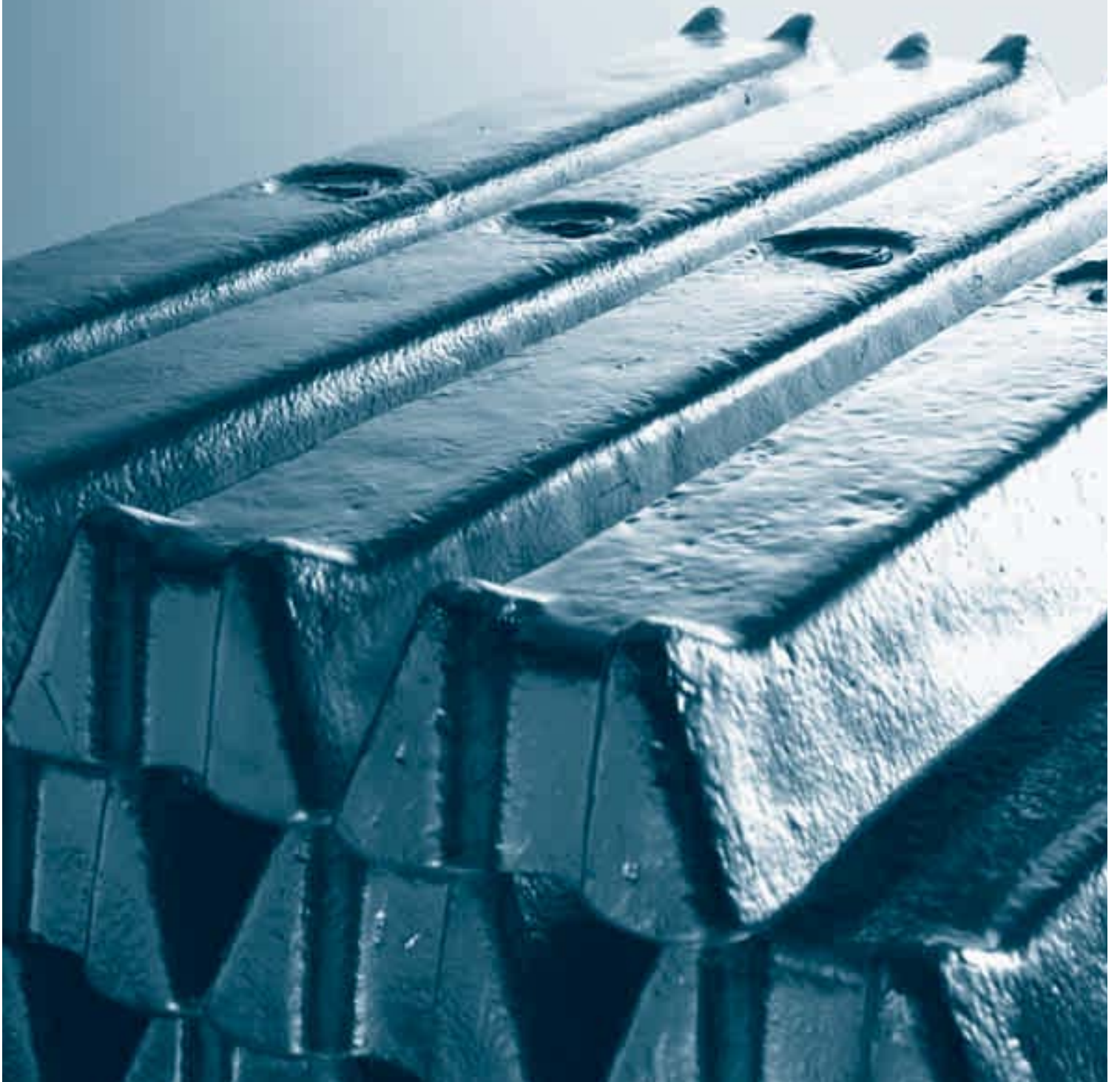


**Partners to the aluminium industry**

**FESTO**





## Festo: the company

**New product concepts evolve from the synergy between efficiency and a passion for technology. Customised service evolves when the customer is the main focus of attention.**

### **How can we further improve your performance?**

That is the question 12,800 Festo employees ask themselves every day. As partner to its customers, Festo wants to ensure that you can make the most of your factory and process automation by means of cost-efficient automation solutions along the entire control chain.

In addition, Festo Didactic offers qualification through ongoing vocational and further training courses in automation in order to achieve maximum productivity through tailor-made value creation. More than 200 industry sectors benefit from products and services by Festo, including the aluminium sector, as can be seen on the following pages.



<b>Inhalt</b>	<b>Seite</b>
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Air-saving function	8
Valves for high temperatures	11
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## Complete: our product portfolio for the aluminium industry

The Festo product range for the aluminium industry has been specially optimised for tough environmental conditions. In combination with a choice of over 23,000 standard products, it represents the ideal solution for requirements in modern aluminium smelters.

### Drives



Crust breakers,  
feeder cylinders

### Valves



ISO-valves for  
wide temperature  
ranges

### Air Preparation



Filters, regulators

### Systems



Customised  
control cabinets

### Accessories



Tubings, fittings,  
silencer



Courtesy of Fives Solios

### **Greatest features: extremely sturdy and durable**

The automation components in aluminium smelters are incessantly subjected to extreme heat and ultra-fine dust from aluminium oxide.

Crust breakers from Festo have been successfully used for more than 30 years. With good reason: the crust breaker, which sets standards in its

field, was designed by highly experienced engineers. Their knowledge enabled them to make use of high-quality materials for every part, from the cylinder to the seal. These factors combined make Festo's crust breaker "best in class", performing its duties reliably for many years.





## The crust breaker: sturdy and economical

Extremely sturdy and reliable: these are not the only impressive features of Festo's crust breaker. It also boasts air consumption reduced by more than 50% and lower operating costs, improvements achieved through the use of four patented innovations for energy-efficient deployment of the crust breaker.

All in all, the durability and energy efficiency of the crust breaker make an important contribution towards a faster return on investment.

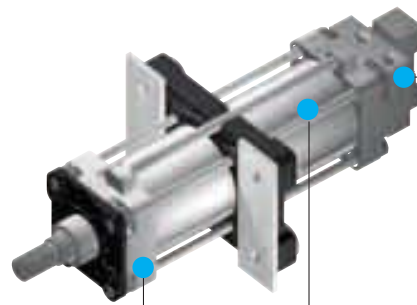
### Technical features

- Diameters of 100, 125, 160, 200 and 250 mm
- Adjustable end position cushioning with special seals in both end positions
- Screw-on cover for easy replacement of wiper seal and piston rod seal
- Special hard wiper seal made from PTFE for peak temperatures of up to 200 °C
- Piston seal made from fluoro rubber
- Piston rod seal for continuous temperatures of up to 150 °C
- Extra-long piston rod guide and wide piston ensure a long service life
- Cylinder lubricated with high-temperature grease
- Piston rod chromed or made entirely from stainless steel on request

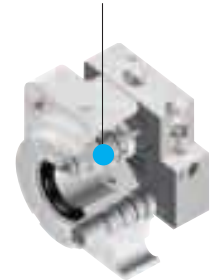


**Only from Festo: systematically reduced air consumption**

**Patent 1**  
 Electronic air-saving circuit: the movement of the crust breaker is continuously monitored; countermeasures can be immediately implemented in the event of deviations from the normal travel profile

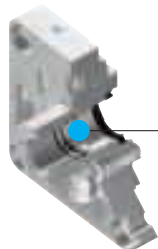


**Patent 2**  
 Air-saving circuit integrated in the cover plate



**Patent 3**  
 Integrated displacement encoder: for precise measurement of the level of the molten cryolite

**Patent 4**  
 Electrical contact sensing of the melt via the piston rod for generating the signal "no crust present" or "cryolite touched"



## Compressed air consumption reduced by over 50%

Highly experienced engineering: Festo offers an air-saving circuit, a patent with a very fast return on investment for users.

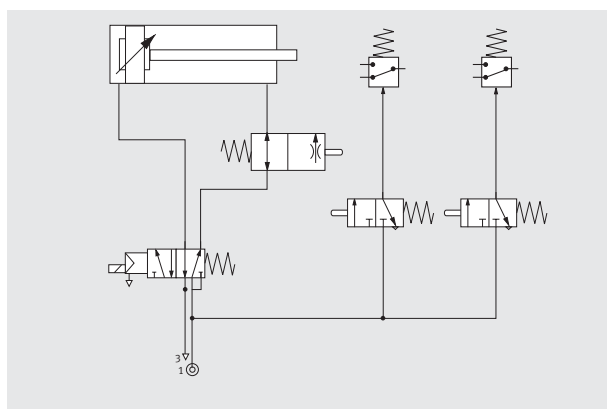
The principle is as follows: the crust breaker from Festo detects whether there is a crust. Only then does it proceed with “full force”. It also detects whether the chisel comes into contact with the molten cryolite. In this case, the crust

breaker does not need to travel to the end position and the chisel can immediately return to its initial position.

### Greater benefits thanks to the air-saving circuit

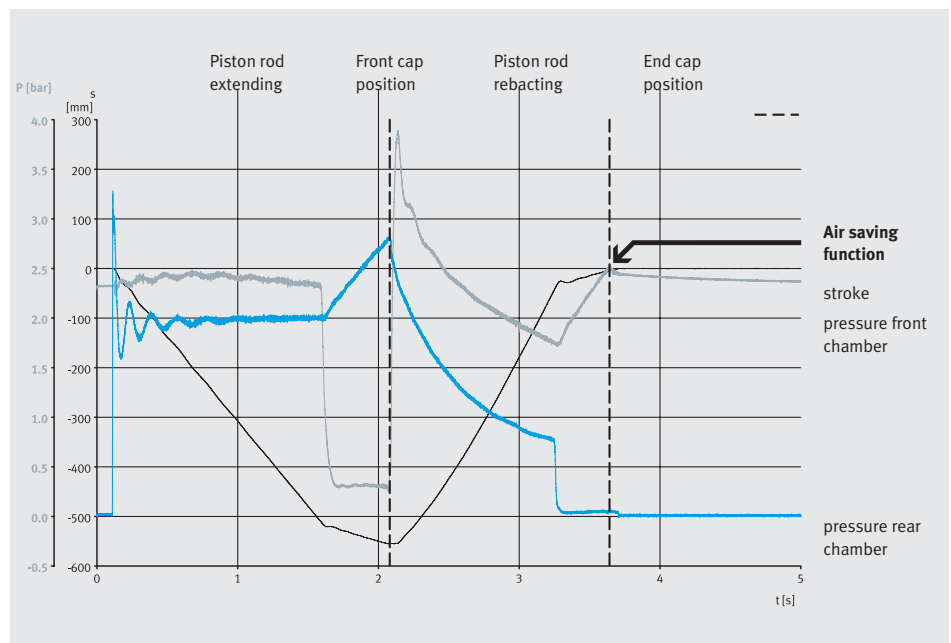
This has its benefits, especially for systems comprising a few hundred crust breakers:

- Significantly reduced compressed air consumption
- Noticeable saving in operating costs, and last but not least
- Extended service life of the cylinders, since the crust breaker does not always have to travel with full force to the end positions



Principle of the air-saving circuit





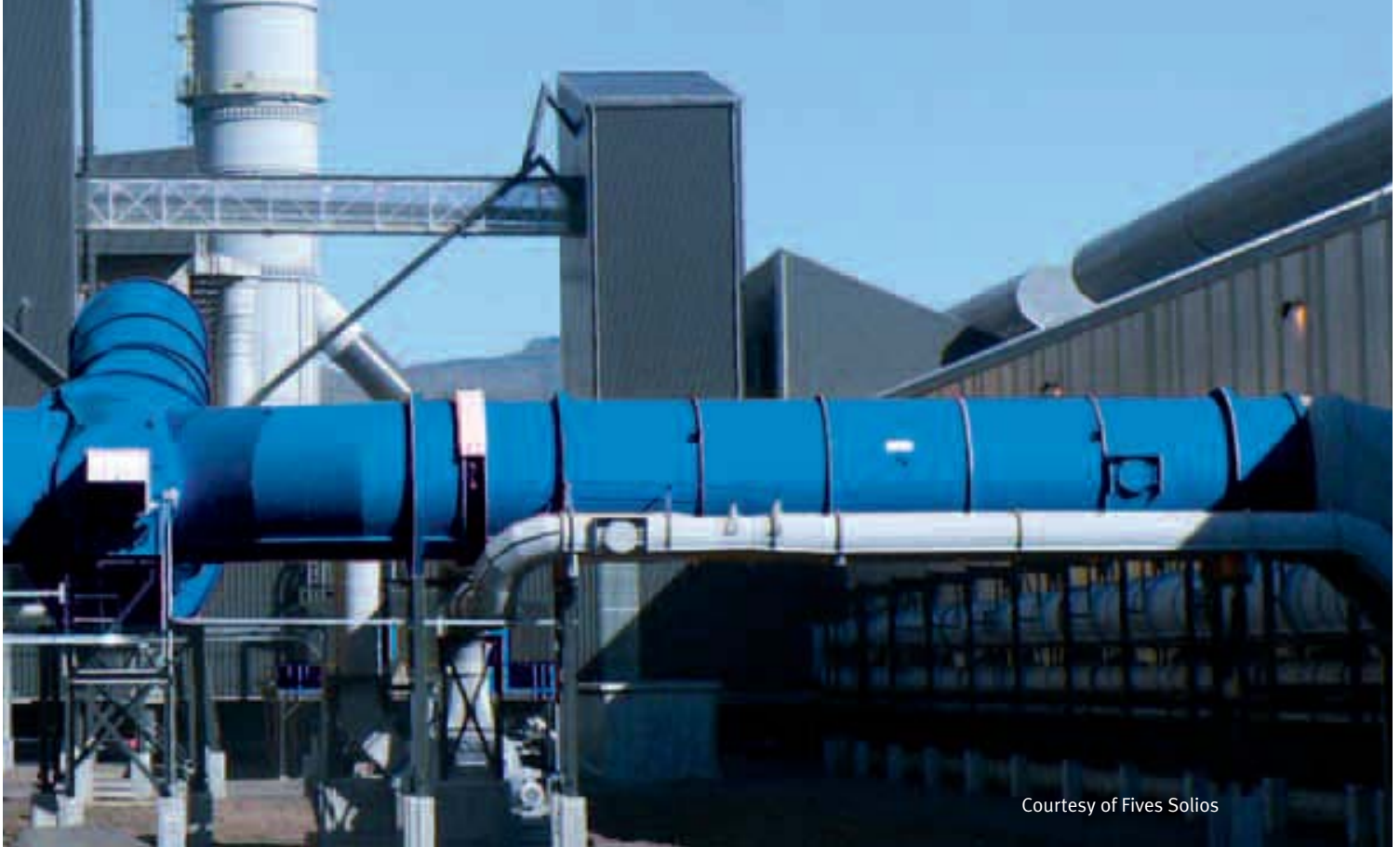
Pressure curve with air-saving circuit  
 Sample calculation for a crust breaker with diameter of 200 mm.



### Energy saving using the example of a crust breaker with a piston diameter of 200 mm

Technical Data	Parameter	Comments
Cylinder diameter $\varnothing$ [mm]	200	
Stroke [mm]	570	
Piston rod $\varnothing$ [mm]	50	
Volume rear chamber [l]	17,91	
Volume front chamber [l]	16,79	
System pressure [bar]	6	
$p \times$ total volume [l.bar] (p = absolute pressure)	242,86	100% consumption at 6 bar
Final pressure in rear chamber [bar]	2	piston retracts immediately
$p$ rear $\times$ volume rear [l.bar] (p = absolute pressure)	53,72	
Final pressure in front chamber [bar]	2,2	air saving function
$p$ front $\times$ volume front [l.bar] (p = absolute pressure)	53,72	
Increase of pressure in front chamber [bar/min]	0,1	(leakage compensation function)
Total air consumption [l.bar]	107,64	
Air saved	56%	

Note: The achieved pressures ranges are generally dependent on the cylinder speed (cycle time) and the required time until the pressure in the cylinder chamber reaches the system pressure by touching the crust. These parameters can be preset individually.



Courtesy of Fives Solios

## Heat resistant: valves for high temperatures

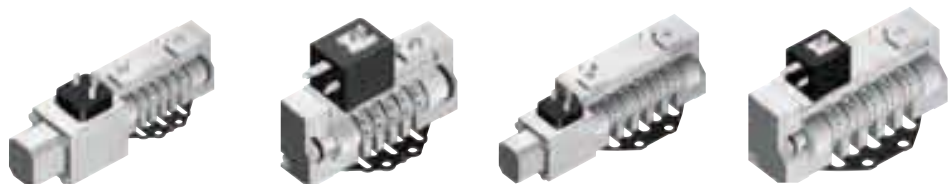
The valves for the crust breakers are not just subjected to high temperatures; they also have to be able to cope with often greatly fluctuating air quality in the harsh environment of smelting furnaces.

Festo offers valves with a soft seal for applications involving continuous temperatures of up to 100 °C. Valves with a hard spool seal principle are suitable for continuous temperatures of up to 150 °C.

### Modular structure: the valve functions

- 5/2-way pneumatic valve, single pilot with mechanical or pneumatic spring
- 5/2-way solenoid valve, single solenoid with mechanical or pneumatic spring
- 5/2-way bistable valves, bistable and bistable with dominant signal, pneumatic or with solenoid
- 5/3-way solenoid valves, normally closed, exhausting or pressurising

The port pattern is in principle designed to ISO 5599-1.





## Business excellence through quality<sup>5</sup>

Let's take a look behind the scenes at Festo. A short virtual tour through

- Research and Development,
- Production,
- the Customer Service Centre will explain more than a thousand words ever could. Experience (Quality)<sup>5</sup> live!

### Innovation quality

Let's look at some of the figures:

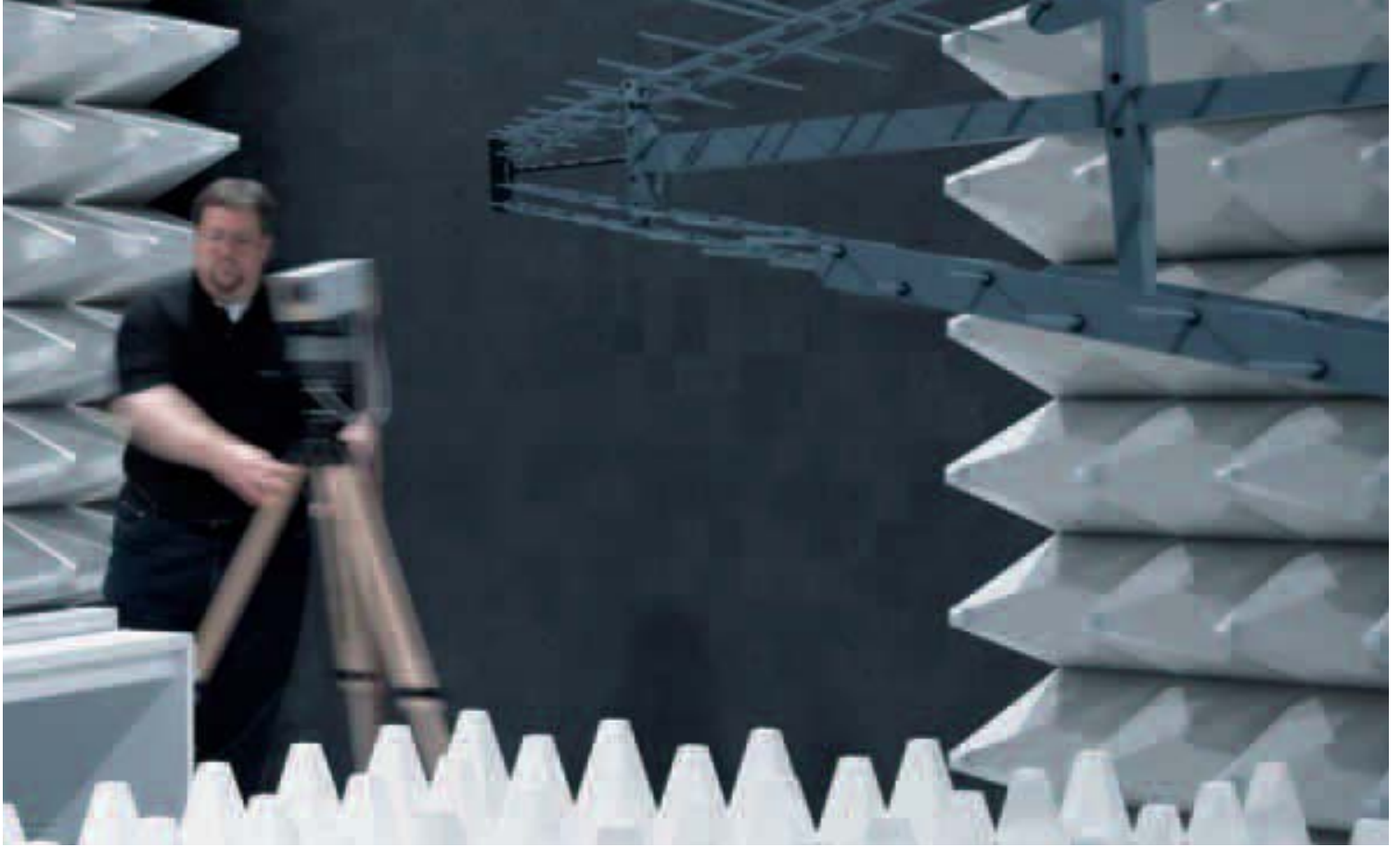
- 7.5 % of turnover
- 2,800 patents with 100 new applications every year
- 3D engineering and simulation
- Around 12,800 employees worldwide – all of them potential lateral thinkers

### Production quality

You are interested in quality and economy; we therefore place considerable value on:

- Minimum production tolerances
- Ultra-modern, proprietary production methods
- Core competencies in production
- Defined quality standards along the entire production chain
- Strict quality assurance systems: on which you can depend





#### **Price quality**

Festo trend: more performance for less money.

Many of the new and further developments in the Festo product range have one aspect in common: they are technically superior and more attractively priced than their predecessors. Examples are to be found in all product segments: among the drives, valves, valve terminals; among the service units, and among the range of accessories.

#### **Range quality**

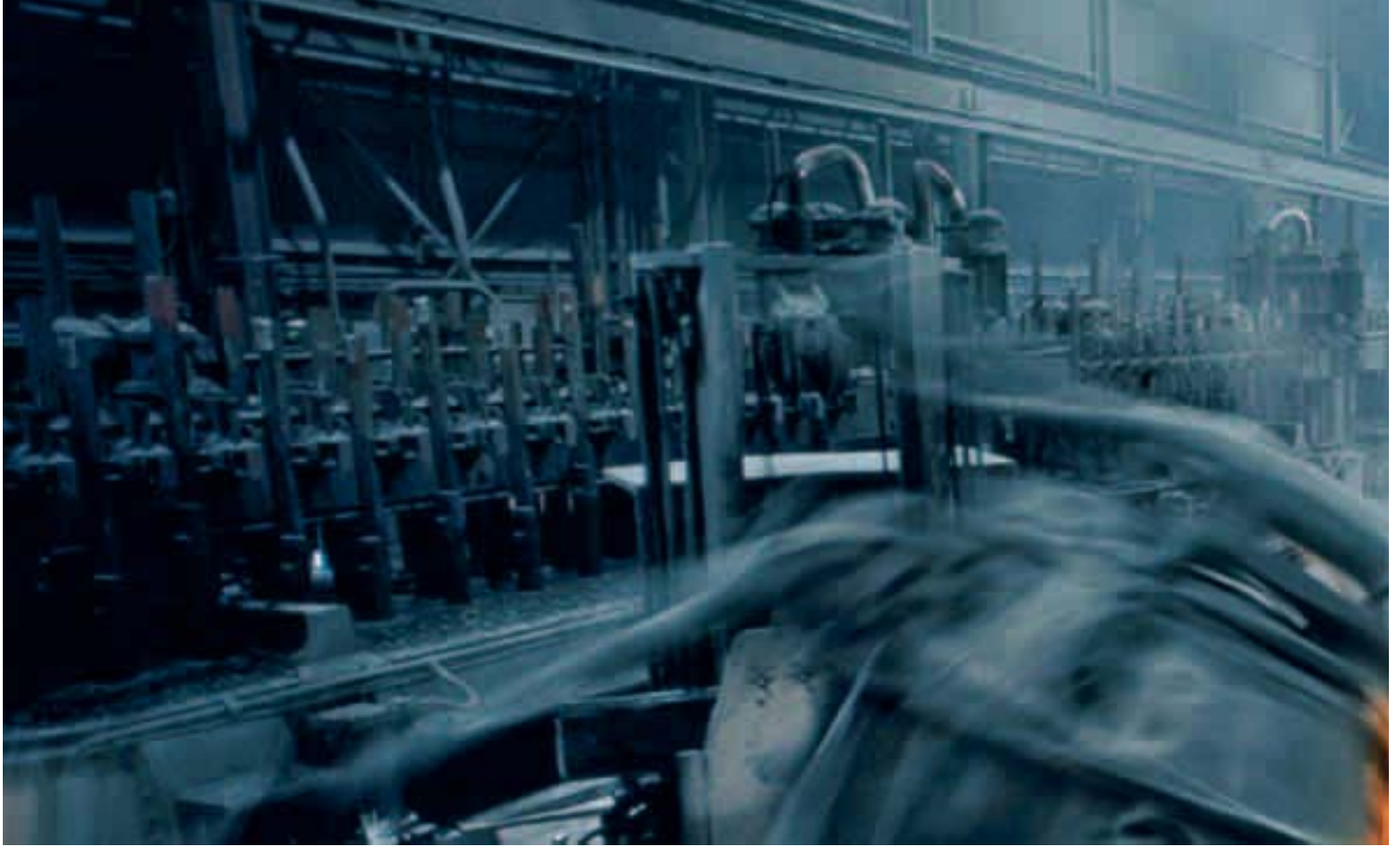
For individual solutions. Festo offers components in standard design, industry-specific designs as well as standards-based and highly individual special designs.

Ready-to-install combinations of these components are an integral part of the Festo product portfolio as modules or systems. Incidentally, an increasing number of components can be individually configured as modular products.

#### **Didactic quality**

To complement the products and services for automation, Festo Didactic offers exceptionally efficient training hardware, learning software and seminars of the highest quality. Optimally tailored to your value creation chain. In short, training in practical applications for practical application.





## References

### Excerpt of references

- Albras; Brasil
- Alcasa; Venezuela
- Alcor; Italy
- Aldel; Netherlands
- Almahdi; Iran
- ALRO; Romania
- Aluminio; Spain
- Aluminium de Greece; Greece
- Balco; India
- Bogoslovsky; Russia
- Bratsk; Russia
- ECL; France
- Fives Solios; France
- Goldendale; USA
- HuBei Dan Jiang Aluminium Ltd; China
- Huta; Poland
- Hakarsky; Russia
- Irkutsk; Russia
- Kamensk Uralsky; Russia
- Kandalakscha; Russia
- Krasnojarsk; Russia
- Nadvoitsy; Russia
- Norsk Hydro; Norway
- Novokusnetsk; Russia
- Sayanogorsk; Russia
- Slovalko; Slovakia
- Sohar; Oman
- Szabarasze; Ukraine
- Tayshet; Russia
- Vanalum; Venezuela
- VAW; Neuss, Germany
- Volgograd; Russia





## Business excellence – today and tomorrow

There is no doubt that the technical properties of our crust breaker solutions for the aluminium industry are outstanding. This does not mean, however that Festo is content to rest on its laurels; on the contrary. The only way to set trends and demonstrate excellence in business is by continuously reflecting the requirements of customers and working on new and even better solutions.

To enable us to keep shaping these trends in the future and use them to maximise the benefits for our customers, we are working on the following additional properties and features of our crust breaker:

- high resistance against high magnetic fields
- plug and work system
- information about position and speed of the piston
- information about pressure in the chambers
- air consumption diagnostics.

Expect further exciting news about our crust breaker solutions over the coming months and years.



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