

magazine

INTERNATIONAL ENGINEERING SOLUTIONS

INTO SPACE WITH CUTTING-EDGE TECHNOLOGY

O-rings from Angst+Pfister play a key role in the «Delft Aerospace Rocket Engineering» project.

COFFEE MACHINES FOR SATISFIED CUSTOMERS

For Carimali high-quality seals are the more economical solution in the long run.

H-MOUNTS FOR EVERY APPLICATION

Manitou relies on standard products from Angst+Pfister – available in unique variations.



Editorial



Dear Reader,

Do your markets demand high-quality optimisations, adaptation in line with regulatory requirements or innovations? Angst+Pfister supplies around 25,000 customers worldwide competing in extremely challenging markets. Anyone who regularly reads our customer magazine will be aware that most of them are committed to innovation. These 25,000 customers operate in multiple industries across numerous countries. As a systems supplier, we provide high-tech solutions in sealing, antivibration, fluid, drive and plastics technology. The heterogeneity of our customers and our extensive know-how provide ongoing inspiration for innovation, and a virtually inexhaustible source for knowledge transfer - both internally and externally.

When you buy from us, not “only” do you get high-quality components developed at the leading edge of research, but also the expertise in how to optimise their performance – either from our technical support team or, as happens more and more frequently, also from seminars. We are in a position to understand the complexity of your work and the wide-ranging requirements of your markets. With our support, you can assume a leading role. Angst+Pfister has improved

its technical and chemical competencies further and increased investment to sustain this in the future, too. We want you to fast track to market success - with innovative strength and the right high-quality components.

Our high-performance components are designed and manufactured in-house and while becoming more and more specialised, also combine all the properties demanded by your markets. Many of our products have set benchmark industry standards. A couple of examples: Our elastomer seals for the food and drinking water industry combine maximum purity and custom-tailored properties with the approvals required by all the major international markets. Similarly, our elastomers in antivibration technology achieve top ratings in fire safety with excellent mechanical parameters. The potential in the development of new elastomers is virtually limitless.

Even in the era of globalisation and digitalisation, a strong personal relationship with you is an important factor in continually developing new products. That’s why we have local offices, understand your culture and speak your language. People who understand and trust each other are in a position to join innovative forces in developing high-performance components for the markets of tomorrow.

In the following pages, you can read how we do that together with our customers. I wish you an insightful and interesting read.

Erich Schmid
Chief Technology Officer

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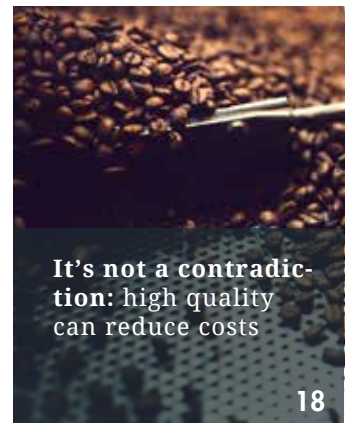
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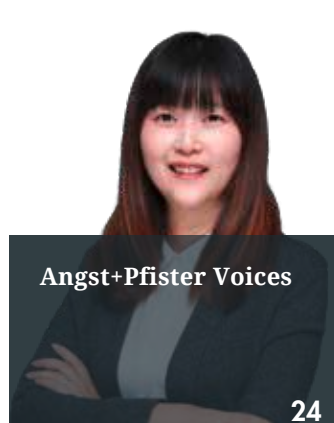
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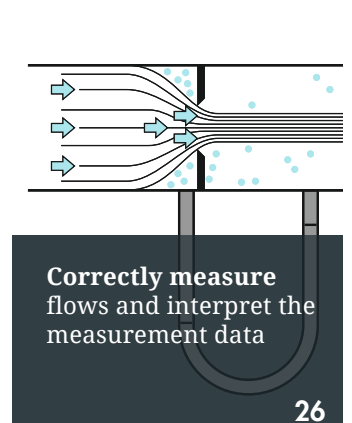
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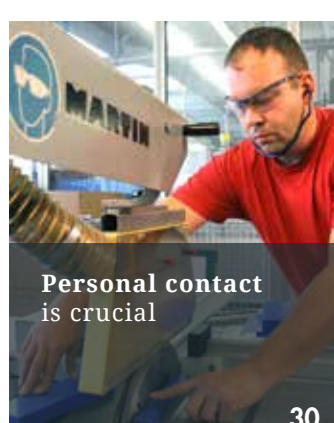
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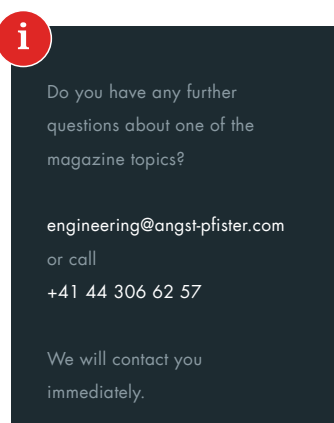
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Do you have any further
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Angst + Pfister Magazine Nr. 16

PERTEC® UP FKM – when purity is priority

The PERTEC® product range is Angst+Pfister's response to the strict industry regulations across the various international markets applying to numerous products – whenever high performance and high quality are demanded. PERTEC® UP FKM is the latest coup for the Angst+Pfister company – an unbeaten leader in purity with exceptional mechanical capabilities.

“More and more markets are calling for more stringent regulation with ever more complex requirements,” acknowledges Enrico Donati, product manager in sealing technology at Angst+Pfister's head office in Zurich. And the trend is set to continue.

Keeping an eye on the international markets

Angst+Pfister closely monitors certification developments in its customers' markets. “Some are mandatory, others are on the way to being mandatory, and ever more companies are committing to one hundred percent clean components in their products,” says Enrico Donati. As a result, the performance demanded for advanced materials is also growing. It is not unusual for Angst+Pfister to know in advance of the customer which requirements a component will have to fulfil – both now and in the future. Angst+Pfister is meeting this situation with the latest technology so that its customers can succeed in their markets – and their own customers' confidence can continue to grow.

In-house expertise and production

The many certifications of PERTEC® products have positioned Angst+Pfister as a leading supplier of high quality compounds. “We produce all our PERTEC® products in-house. We know exactly what is in them – so quality inconsistencies are excluded,” explains Enrico Donati. “We have the materials expertise necessary to design these special elastomer compounds.” In this way Angst+Pfister is also able to supply customers with any sort of shape in whatever quantity they require.

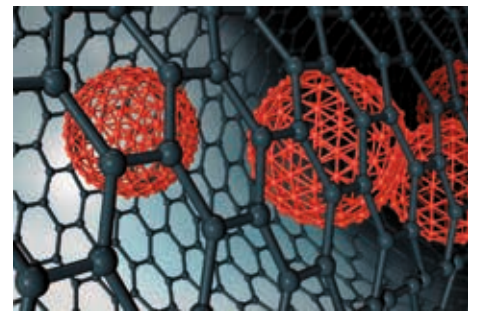
“We can make virtually anything the customer wants from these special compounds.”

New: PERTEC® UP FKM

There is a new, high performance product in the PERTEC® family: PERTEC® UP FKM is the “big brother” of the previously developed PERTEC® UP VMQ silicone elastomer. It has even better mechanical capabilities – in a temperature range of -20 to +200 degrees Celsius. In addition, PERTEC® UP FKM is extremely resistant to aggressive chemicals. “Fluoroelastomer rubber products, that is our FKM products, can therefore be used in applications where silicone would have reached its limit,” explains Enrico Donati. With these two products, Angst+Pfister has passed the migration tests for the food industry in China – and that again makes them leading elastomer compounds.



“Coffee machines are a typical application for our PERTEC® products,” says Enrico Donati giving just one example. When impairment of taste and impurities are a significant issue then PERTEC® is your first choice. The PERTEC® range offers solutions determined by the application area. “Our CIP FKM products are parti-



cularly suitable for dynamic applications. For example, when steam ejection is part of the system, the ST FKM products are unbeatable. For applications in contact with food there are the UP VMQ or UP FKM products,” recommends Enrico Donati.

Purer than all the others

The newly developed compound formula for PERTEC® UP FKM complies with nearly all the drinking water and food requirements of the determinative international regulations. All the substances that they contain are listed in addition in the food regulations of the EU and USA. “UP” stands for a promise: ultra pure. The polymer was designed specifically for the pharmaceutical, food and medical industries on the basis of the need to protect human health. As such, there can be no substance migration or contamination of the environment by the materials utilised. PERTEC® UP FKM complies with the PAHs Category 1 requirements – aimed at potentially carcinogenic polycyclic aromatic hydrocarbons. “That's quite something for FKM compounds,” says Enrico Donati. There are products with a similar performance, but not with the same level of purity.



A perfect O-ring for perfect coffee

The customers of Angst+Pfister are superbly equipped for the international market with PERTEC® UP VMQ – the compound unites outstanding product performance with all the major approval requirements for the drinking water and food sector on all continents. For Digmesa, manufacturer of precision flow sensors, use of micro-talced PERTEC® O-rings along with custom packing has resulted in significantly lower rejection rates during production.

May I take your order? A coffee, espresso, ristretto, an Americano or perhaps the latte after all? Taste may vary from person to person – but quantity is never a matter for discussion! The precision flow sensors made by the Swiss company Digmesa control the right quantity in the coffee machines of the top coffee outlets. They channel an exact amount of liquid into your favourite caffeine drink. And Angst+Pfister supplies the perfect O-ring to keep the flow sensors tightly sealed. Ten million components annually – this is the figure covering a range of sectors and customers – demonstrate on a daily basis that the innovative, high performance elastomer compounds made by Angst+Pfister handle extremes and keep on going and going and going...

A unification of numerous properties

Angst+Pfister developed the PERTEC® product portfolio specifically for such applications: O-rings, mould parts, membranes, currently available in 5 different high performance elastomer compounds for a range of industries and applications. The PERTEC® UP VMQ O-rings for Digmesa not only provide a tight seal for longer, they also uniquely combine the properties of durability and maximum purity, for applications in the food and drink sector, with production and mechanical improvements: “Circularity and evenness are critical for these rings,” explains Reto Müller, sealing technology product leader at Angst+Pfister. In other words, the products have to be perfectly round and lie absolutely flat on a surface. “That’s a real

challenge for O-rings with a small cross section diameter and relatively large internal diameter.”

To the customer on air cushions

The rings are built into the flow sensors at Digmesa (see illustration). During the automated assembly process, they must not fall into the multi-part housing – which is why absolute circularity is required along with prevention of distortion. And when the housing is being connected, the rings have not to stick, even under the minimal force applied – hence the importance of the friction value of the seal. Packed and stacked in boxes in their thousands – the weight of the rings alone make maintaining circularity, smoothness and the surface characteristics

difficult after delivery to the customer. “We consequently designed a special bag with air cushions for transportation,” remarks Yves Riedo, sealing technology senior engineer at Angst+Pfister. In this way deformations are avoided, the rings stay round and their surface is kept smooth.

One by one

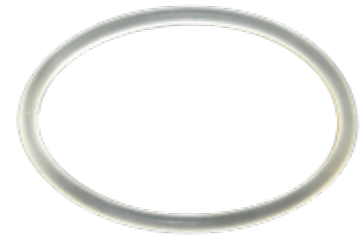
Once at Digmesa, the O-rings are taken from their bag and enter the fully automated assembly via a chute. “The chute gives the rings a thorough shake to move them on,” says Yves Riedo. But this carries the risk of the rings sticking to one another rather than advancing to their intended destination in the flow sensors. “We solved this problem with a special surface treatment,” relates the product manager Enrico Donati. The micro-talcing treatment functions like baby powder and keeps the PERTEC® O-rings separated by reducing the adhesion typical for silicones. “As a result, Angst+Pfister has significantly reduced our rejection rate,” Michael Perret, production leader at Digmesa, is pleased to report. “We used to treat the surfaces ourselves, now we can rely on the competence of Angst+Pfister.” When the rings are not perfectly circular and smooth, or they clump together during assembly, then the machines stop – and have to be restarted manually. That costs time and money.

Many markets – one product

Angst+Pfister’s PERTEC® O-rings have one more advantage: They comply with all the industry-specific approval requirements of the major markets, whether it is approval for the European, Chinese, South American or US markets. “This is an emerging trend,” Reto Müller acknowledges. In the past compliance with the requirements of the US markets was generally sufficient for the international companies. Nowadays, more businesses than ever before are attempting to comply with the specific health requirements of all the markets. Angst+Pfister’s PERTEC® products meet those requirements. So now, how about a perfect cappuccino?



Flow meter with PERTEC® O-ring



The PERTEC® Angst+Pfister O-rings meet all industry-specific approvals for the major markets.



«We consequently designed a special bag with air cushions for transportation.»

Yves Riedo, Senior Engineer Sealing Technology, Angst+Pfister Group

Certificates

PERTEC® UP VMQ complies with almost all food contact, pharma and medical regulations worldwide.

3-A Sanitary Standard Number 18-03 Class I

ADI free

BfR XV (Silicone)

D.M. 21/03/1973

DPR 777/82

DVGW EN 549 D2/H3

DVGW W 270

EC 1935/2004 article 3

FDA - CFR 21 - 177.2600 food a) - f)

French Arrete 17.12.92 No. 293 (migration test)

GB 4806.1-2016

GB 9685-2016

GB 4806.11-2016

GMC/RES. N° 28/99

KIWA NSF/ANSI 51 formulation

KTW Guideline cold water (23 °C) and hot water (85 °C)

LFGB § 30/31

PAH Category 1 (AfPS GS 2014:01)

PAHs requirements according Regulation (EU) No 1272/2013

Phthalate free

SR 817.023.21

USP Class VI Chapter 87 and Chapter 88, 121°C



Moreover due to the high purity of the material also many other regulations can be fulfilled like for example NSF 61 for drinking water or WRAS (BS 6920).

Setting the trend through specialisation in compounding

One year ago, the new compounding facility of Angst+Pfister partner TSF Performance Compounds Kaucuk AS started operations in Bursa next door to the Angst+Pfister production facility.

This new company was founded by TSF S.p.A. Italy who have already been operating compound production sites in Italy for more than 35 years (as TSF SpA and Ligom Srl). Products include silicones (VMQ), fluorosilicones (FVMQ), fluoroelastomers (FKM), perfluoroelastomers (FFKM), EPDM, HNBR, and NBR, among others. The TSF group (TSF SpA and Ligom Srl) offers a total capacity of more than 18 000 tons of compounds per year.

The alliance was formed to secure and expand the compounding capabilities of the Angst+Pfister Group and to enable access to the expertise and support of a group of companies which are considered world leaders in this area.

Angst+Pfister Advanced Technical Solutions now receives all of its rubber compound volume from the new production site. With a size of 8'000 sqm it offers 5'000 tons of capacity from two highly efficient production lines. The TSF Performance Compounds Kaucuk site uses two compounding lines with one tangential and one intermeshing banbury with mixing mills and batch-off lines complemented by an automatic micro dosage system and feeder systems. A third line is planned for 2020. The site also contains a fully equipped state-of-the-art laboratory with a 2.8l laboratory banbury mixer and mixing mill to develop new compounds.

A compounding competence hub is emerging and serving not just Angst+Pfister, but

also other producers of sealing products and anti-vibration parts across Turkey. This is contributing to network effects and helps Angst+Pfister and the local rubber parts manufacturing industry to all benefit from innovations in material development and compounding.

This and the close collaboration of our engineering and compounding production enables Angst+Pfister to not only offer high tech performance compounds developed to satisfy the most stringent and up-to-date specifications, but to also match any specific transforming needs of the customer to the best equilibrium and optimization between quality, moldability and performance of the finished part. With specifically customized advice on vulcanisation and mould flow.

The highest goal is to offer our customers innovative high tech solutions by continuously developing and improving the expertise for all application areas, like for example the customer-specific design of compounds for seals and their mechanical and dynamic properties.

And strategic foresight is proving successful. Angst+Pfister has been a partner and regular supplier not only to the major players in the railway and automotive industries for years, but also to an increasing number of other industries like marine, agriculture, construction and white goods sectors. With increasing expertise, the portfolio is constantly being expanded into new areas.

Due to the current market requirements, especially from the railway industry, there is a strong focus on the development of fire safety compounds. This being one of the

most significant special fields Angst+Pfister already offers a wide range of products that are compliant with EN45545, see page 12/13.

Angst+Pfister has through our network developed a new range of high-performance materials under the PERTEC® brand that includes new compounds for the process industry and with specific purities:

- PERTEC® UP FKM
- PERTEC® UP VMQ
- PERTEC® CIP FKM
- PERTEC® ST FKM
- PERTEC® NP FKM
- EPDM
- HNBR
- VMQ
- NBR



Resource pooling aimed at the customer

“Laspar Angst+Pfister” is now “Angst+Pfister Advanced Technical Solutions”: Another step has been taken towards integrating the research and development centre in Turkey. The state-of-the-art facility in Bursa has become a vital cog for Angst+Pfister with expertise in high-end rubber metal components and a location conveniently close for the automotive and rail industries. It stands out from the crowd due to its unparalleled value for money, fast-paced development projects and innovative environment – as demonstrated by the success story with automotive supplier SEG Automotive.



Angst+Pfister Advanced Technical Solutions A.S. in Bursa, Turkey was established under the name Laspar in 1982. The facility came into the ownership of the Angst+Pfister Group in 2013 and since 2016 has operated the group's global research and development centre. Angst+Pfister Advanced Technical Solutions additionally is an important hub for the whole company for rubber-metal components, and for the automotive industry, which has a strong presence in Turkey. Angst+Pfister Advanced Technical Solutions also serves many customers in the rail business. The focus is on high-end products in sealing and antivibration technology.

Custom rubber-metal components

Closeness to the automotive industry in Bursa, excellent production conditions and the highly-specialised, application-focussed research and development engineering team make Turkey an ideal location. As already mentioned, the employees are highly-skilled in the design, development and manufacture of customised, high-performance elastomer parts with rubber and metal components. This includes

- in-house development of application-related and application-oriented compounds (also with fire protection)
- FEM simulation of rubber-metal components, design optimization and new developments,

- design, manufacture and simulation of tools and moulds
- surface treatments as corrosion protection
- vulcanization process and corresponding application of adhesion promoter
- refinement and finishing (surface treatment, calibration, deburring and final inspection)
- as well as assembly and logistics.

Throughout, Angst+Pfister Advanced Technical Solutions never loses sight of customer requirements in cost, quality and scheduling.

SEG relies on Angst+Pfister

The seals project for the automotive supplier SEG Automotive was a typical project in which Angst+Pfister Advanced Technical Solutions could highlight its expertise. The company is at the forefront of shaping technological advances in efficient and durable starter motors and generators. Its focus is on innovation, development capabilities and meeting the highest of quality requirements. Angst+Pfister was commissioned to reduce the noise level of a generator by means of new seals. Further requirements were to guarantee a long service life and ensure performance at high temperatures. “To do this we introduced alternative rubber compounds; we proposed several different designs and performed finite element analyses – everything was very customer specific,” says Selçuk Hocoğlu, Vice General Manager / Sales & Marketing at Angst+Pfister Advanced Technical Solutions. Within no time at all

prototypes had been produced and tested. Ultimately the product delivered was the optimum product. Since then Angst+Pfister has been the go-to partner for seal solutions.

Experience, expertise, infrastructure and alliances

There are currently 300 employees in Bursa working on a site totalling 15,000 square metres for customers such as SEG Automotive. They produce annually around twenty million antivibration components and ninety million sealing components. This highly competent, passionate and youthful team has been operating under Angst+Pfister brand name since November 2017 – a name that stands for almost one hundred years of experience in international markets. “That allows us to cooperate with world-renowned businesses,” remarks Selçuk Hocaoğlu. The



teams in Turkey not only have a vast amount of knowledge, they are also masters of the equipment required to resolve technical problems or handle ambitious co-designs. Angst+Pfister also forged a strategic alliance in 2017 with TSF of Italy, a global market leader in the compounding sector: To do this, the entire production of rubber compounds was consolidated in Bursa. “This enabled us to modernise our production lines, add to our formulae and once again gain in know-how – including future market expectations.»

Innovative research environment

All engineering and production facilities are under the same roof. Customers profit from exceptionally efficient processes, swift decision-making channels and the interaction of the technical teams. The employees in Bursa are well aware of what really matters to the companies in the automotive and railway industry. Moreover Angst+Pfister Advanced Technical Solutions is an accredited research and development centre in Turkey dedicated to innovative projects recognised by the government – and is frequently partnered by leading businesses in the automotive industry. Consequently, Angst+Pfister Advanced Technical Solutions has been able to invest in additional personnel and technical infrastructure. The engineers are working non-stop on development projects and constantly acquiring new knowledge from which all customers benefit. “These are key factors that



allow us to get things right the first time,” acknowledges Selçuk Hocaoğlu. That saves a lot of time - for Angst+Pfister and the customer: In-house prototyping allows a delivery time of five to six weeks – following the technical specifications of the customer.

The major advantage of the products of Angst+Pfister Advanced Technical Solutions is the value for money in engineering and production. This is supported by flexibility, passion, speed and a proactive approach to all phases of a project. For example, Angst+Pfister Advanced Technical Solutions could be called

to work on a product design that reduces weight while maintaining mechanical properties and finely-tuned parameters. In other words: Customer specifications are met – with cost and weight reductions – without altering the product geometry.

Success through customer focus

The engineers at the headquarters in Zurich or other regional subsidiaries who work on site at customer premises provide the interface. “Intensive collaboration in the development phase is an absolute necessity to design a successful product,

» says Selçuk Hocaoğlu.



«To do this we introduced alternative rubber compounds; we proposed several different designs and performed finite element analyses – everything was very customer specific.»

Selçuk Hocaoğlu, Vice General Manager / Sales & Marketing, Angst+Pfister Advanced Technical Solutions A.S.

Angst+Pfister – high performance elastomer compounds – the multi-taskers

«When it comes to the fire prevention properties of elastomer compounds, we are at the cutting edge,» says Michael Forrer. Angst+Pfister's engineers have developed two new components for Bombardier: A vertical buffer and a layer spring – to raise the comfort level for passengers on a new tram, while ensuring maximum safety.



«Creating a good balance between fire protection and mechanical properties is an art in itself.»

Michael Forrer, Senior Engineer Antivibration Technology, Angst+Pfister Group



If, in the not too distant future, you travel by tram across the city of Vienna, your relaxed journey will, in part, be due to components made by Angst+Pfister. The components were created as a joint development project with the manufacturer Bombardier for «Flexity Vienna». «Bombardier gave us rigorous specifications for the design of the components. However, they were open to proposals for improvements,» recounts Michael Forrer. For the senior engineer for Antivibration Technology at Angst+Pfister's headquarters in Zurich, this was sufficient motivation to go that proverbial extra mile: «We have a high level of expertise for developments like this. So we leapt at the chance and contributed a few suggestions.» Consequently, the new components are the result of a co-design with the customer. «Our input enabled Bombardier to perform new finite element analysis on each of the components – until the product satisfied the very stringent requirements,» adds Michael Forrer. The specific objectives were a layer spring and a vertical buffer.

For a pleasant journey

Bombardier attaches the vertical buffers to the bogie frame with two bolts – with each bogie requiring two vertical buffers. The bogie acts as an interface between the vehicle body and the track, and is responsible both for a comfortable journey and for protection from the risk of derailment. When a tram travels along a bend, the vehicle body tilts against the vertical buffer. «First off, it is an end stop for extreme loading conditions or tight curves and not primarily designed to resist vibration,» explains Michael Forrer. Not only will the buffers be stressed at the sides, but the sliding plate at the top made from high-performance plastic will also be subjected to horizontal movements. «There must not be any stick-slip,» says Michael Forrer. «Otherwise, bumps to the vehicle body would be transferred – and easily heard inside.» Angst+Pfister's layer springs are used to reduce the vibration caused by uneven tracks or rolling noise. There are two layer springs positioned both left and right of the vertical buffers, mounted between the two bogie axles to absorb vibration. Without them the vibration would also be transferred to the passenger areas.

Performance improvement

«The vertical buffers in particular were a particularly challenging design project.» The engineers of Angst+Pfister suggested a few changes regarding the contours of the elastomer, its properties and the overall choice of material. In addition to the elastomer in the middle, the buffers have a plastic skid plate at the top and a metal component at the base (see picture). «For example, we changed the material for the skid plate from its original polyamide to polyethylene. Polyethylene has lower sliding friction coefficients.» The result was a gliding capacity three times greater. «The more pressure the component is subjected to, the better it glides,» says Michael Forrer. «Both parts had to pass a multitude of tests.» For example, the vertical buffers were compressed about 800,000 times during the endurance tests. The component performance values at the end of a test may not differ more than 25% from the start values. After all, the buffers are going to be in service a full nine years.

One fire protection standard, one elastomer

«Angst+Pfister, is one of the only producers able to offer a homogenous rubber component guaranteed to meet the fire protection regulations for components with up to two kilogrammes of pure elastomer mass to the market. The fire protection standard at stake is EN45545. The products that Angst+Pfister now supplies to Bombardier easily fall into the R24 product requirement classification – and that is unparalleled. «Other providers coat the bearing elastomer with a material that complies with the fire protection standard. This also conceals any imperfections in the rubber – such as cracks.» That is why clients clearly prefer a homogenous compound. In addition, suppliers who have insufficient knowledge to produce a fire protective homogenous compound have to carry out complex market analysis: According to EN45545 (section 4.7), they have to prove that the component cannot be made using a homogenous compound. «This is a loophole in the fire protection regulations. Thanks to Angst+Pfister's homogenous compounds, there is no need to go to the extra expense of conducting market research,» says Michael Forrer proudly. For elastomers: The more

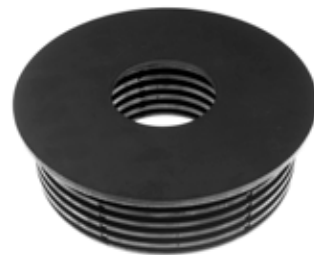
flame retardant additives are added to a compound, the worse it performs in the mechanical tests. «Creating a good balance between fire protection and mechanical properties is an art in itself,» explains Michael Forrer. Moreover, the rubber has to withstand a variety of environmental factors. «Ozone, cold, heat, pollutants, aggressive cleaning solutions and so on.» Angst+Pfister also provides the customers with maintenance guidelines so that the components only have to be replaced as infrequently as possible.

Leading the way in fire protection

The team at Bombardier is very happy with the cooperation with Angst+Pfister. The solution-orientated, proactive approach to engineering is excellent. «Regarding the development of fire retardant rubber components, Angst+Pfister is on the right track and in a very good position. Their engineers have vast expertise. It means that we don't need to make any concessions when it comes to quality,» confirms Andreas Wolf, lead suspension engineer at Bombardier.



Vertical buffers serve as end stops for heavy load or in tight curves.



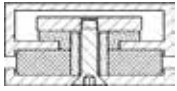



Layer springs absorb the vibrations that would otherwise pass into the passenger compartments.


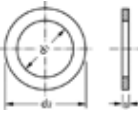

EN45545 Fire Protection Certificates on Angst + Pfister products



APSOvib® Antivibration Technology

Part type		Material	Hardness ShA +/-5	DIN EN 45545
Antivibration elements for bogies (layer springs, primary buffers, round and stop buffers)		NR	50 ShA	R24: HL2
		NR(BR)	70 ShA	R24: HL3
Floor supports		CR	45 ShA	R10: HL2
		CR	49 ShA	R9: HL3, R10: HL3
		CR	70 ShA	R9: HL3, R10: HL3
		EPDM	46 ShA	R10: HL3
Floor supports – Metal Cushion		Metal Cushion		> HL3
Floor supports – PUR metal		APSOPUR® L55 (12.5 mm)		R10: HL3

APSOseal® Sealing Technology

Part type		Production technology	Material	Type	Hardness ShA +/-5 (Density g/cm ³)	DIN EN 45 545
Molded parts, molded flat gaskets, o-rings		Compression	EPDM	Compact	60 ShA	R1: HLR2
			EPDM	Compact	65 ShA	R22: HL2, R23: HL2
			EPDM	Compact	70 ShA	R22: HL3, R23: HL3
			VMQ	Compact	40 ShA	R22: HL3, R23: HL3
			VMQ	Compact	70 ShA	R22: HL2, R23: HL3
Flat gaskets		Punching	EPDM	Compact	70 ShA	R22: HL3, R23: HL3
			VMQ	Foam	(0,16 g/cm ³)	R22: HL3, R23: HL3
			VMQ	Foam	(0,208 g/cm ³)	R22: HL2, R23: HL2
			VMQ	Foam	(0,35 g/cm ³)	R22: HL3, R23: HL3
			VMQ	Foam	(0,43 g/cm ³)	R22: HL3, R23: HL3
			CR	Foam – closed cells	(0,195 g/cm ³)	R24: HL3
Elastomeric profiles		Extrusion	EPDM	Compact	50 ShA	R22: HL2, R23: HL2, R24: HL2
			EPDM	Compact	60 ShA	R22: HL3, R23: HL3, R24: HL3
			EPDM	Compact	65 ShA	R22: HL3, R23: HL3
			EPDM	Compact	70 ShA	R22: HL3, R23: HL3
			EPDM	Compact	75 ShA	R22: HL3, R23: HL3
			EPDM	Compact	77 ShA	R22: HL3, R23: HL3
			EPDM	Foam	(0,8 g/cm ³)	R22: HL2, R23: HL2
			EPDM	Foam – mixed closed and open cells	(0,8 g/cm ³)	R22: HL2, R23: HL2
			VMQ	Compact	40 ShA	R22: HL3, R23: HL3
			VMQ	Compact	50 ShA	R22: HL3, R23: HL3
			VMQ	Compact	60 ShA	R22: HL3, R23: HL3
			VMQ	Compact	70 ShA	R22: HL3, R23: HL3
			VMQ	Foam – closed cells	(0,35 g/cm ³)	R22: HL3, R23: HL3
			VMQ	Foam – closed cells	(0,55 g/cm ³)	R22: HL3, R23: HL3

APSOfluid® Fluid Handling Technology

Part type	Product	Material	DIN EN 45 545
Industrial hoses	Conveyance hose for water	EPDM	R22: HL3 R23: HL3
	Cable protection hose	EPDM and NBR	R22: HL3 R23: HL3
	Cable protection hose	Silicon	R22: HL3 R23: HL3
	Air brake hose	CR	R22: HL3 R23: HL3
Hydraulic hoses	Hydraulic hose Type 2TE	NBR/EPDM	R22: HL3 R23: HL3
	Hydraulic hose Type 1SC	NBR/EPDM	R22: HL3 R23: HL3
	Hydraulic hose Type 2SC	NBR/EPDM	R22: HL3 R23: HL3
	Hydraulic hose Type 1SN	NBR/EPDM	R22: HL3 R23: HL3
	Hydraulic hose Type 2SN	NBR/EPDM	R22: HL3 R23: HL3
Shrink hoses	Shrink hose flame-retardant	Polyolefin	R22: HL3 R23: HL3
Metal hoses	ASSIWELL® metal hoses	Stainless Steel	> HL3

APSOplast® Engineering Plastics Technology

Material	Type	DIN EN 45 545
UP-HLM FR	Hand layup GRP Laminate	R1, R2, R3: HL2
UP-GRP	Pultrusion profile	R1, R2, R3: HL3 R22, R23, R24: HL3
UP-GM 203	Red/white	R1, R2, R3: HL2 R22, R23, R24: HL3
EP-GC 202	Natural, (Yellow/brown)	R7, R17: HL2 R1, R2, R3, R11, R12, R22, R23, R24: HL3
PE-UHMW FR	Black	R7: HL2 R10, R24, R26: HL3
PE-UHMW FR ECBlack		R8, R17: HL1, R2: HL2, R3, R4, R10, R25, R26: HL3
PA 66 FR	Black	R17, R23: HL1 R24, R26: HL3
PA 6 FR	White/black	R22, R23, R24, R26: HL3
PA 6 FR	Extrusion profile, coloured	R22, R23, R24, R26: HL3
PC FR transp	Transparent, flame-retardant	R1: HL1, R3: HL2 R4, R22, R23, R24: HL3



In addition to this range of products, we can supply you with special and/or customized products up on request at any time: consult us!



The dream of space

Angst+Pfister is sharing its passion for advanced technology and engineering with the ambitious university students running the “Delft Aerospace Rocket Engineering” rocket project. The stars of Angst+Pfister’s sponsoring commitment are the O-rings able to perform in extreme cold environments, while remaining pressure resistant. They will be in use above and beyond the stratosphere – at this altitude “only” for the time being.

Everyone holds their breath: “Five, four, three, two, one – lift off!” There’s not much that beats a rocket launch countdown for excitement, is there? A boys’ and girls’ dream of today? That dream is being lived by the university students of the “Delft Aerospace Rocket Engineering” – acronym DARE – in the Netherlands. Based at the Delft University of Technology, this is one of the most advanced amateur rocket clubs in the world. In July 2018, the students of the club launched the rocket “Stratos III”. The goal was to break the European altitude record of 33 kilometres. Unfortunately, the rocket disintegrated over the sea 20 seconds after launch at an altitude of 10 kilometres - and speed of 3500 kilometres per hour. After improving this design, the aim is to make their Stratos IV rocket the first student-built rocket in space. However,

the current propulsion system is not powerful enough to reach even higher altitudes. A cryogenic liquid propulsion system is now in development for exactly this purpose, that is, flying the DARE rocket higher than ever. This propulsion system uses sealing technology made by Angst+Pfister.

For a new generation of engineers

More than a hundred students with an infectious zeal for space, rockets and the accompanying science are working on this project. “We agreed to help the minute we got the request,” says Jan Boomsma, product application engineer at Angst+Pfister in the Netherlands. After all, this is about promoting the profession for a new generation of engineers. Angst+Pfister is not alone: The list of partners





Significant amounts of frost showing on the top of the liquid oxygen tank. These are the conditions the O-ring has to cope with.

and sponsors the enthusiastic students have convinced to contribute to their project reads like a “who’s who” of international advanced technology.

Knowledge sharing

“It is not simply about firing a rocket into the sky,” declares Jan Boomsma. As well as facilitating scientific publications, the project in this highly innovative environment also stimulates knowledge transfer with the Delft University of Technology. Many of the students who had previously taken part in the project have gone on to a career with one of the project partners after graduation. The ambitious student team is always looking to go one step further. “It’s our dream to get to space as the first amateur rocketry team in the world,” says the student Krijn de Kievit.

Operation under extreme conditions

Future Stratos missions will very likely be powered by liquid oxygen and bioethanol. The students have chosen this propellant combination because it is much more efficient than the fuels currently used. The problem is oxygen can only be liquid at cryogenic temperatures, that is, extremely low temperatures. Angst+Pfister’s O-rings seal the oxygen tank – under no circumstances can the liquid escape from the tank. “If a leak led to it coming into contact with the bioethanol, there would be a very high chance of the rocket exploding,” explains Jan Boomsma. In other words, everything is at stake. The O-rings supplied by Angst+Pfister have to provide a perfect seal at minus 183 degrees Celsius – and a pressure of 40 bar. “Under such extreme conditions, conventional materials such as polytetrafluoroethylene (PTFE) cannot be used,” adds Jan Boomsma. Pure metal rings in the sizes required would have been excessively expensive and virtually impossible to install in this design of tank. Angst+Pfister decided to go for

a FEP-O-Seal type O-ring, whereby a Cryolox stainless steel core is encapsulated with FEP. “We would be happy to provide the students with other products such as our hoses – and technology expertise.”

Successful tests

The first three tests of the rocket system and the sealing rings in the spring of 2018 went well, however, in these tests we used liquid nitrogen and water as substitutes, because these liquids are not explosive. “We first wanted to test the complete operation of the system and our procedures in a much safer, but still thermally-equivalent environment to the one present during an actual launch. Moreover, we wanted to validate our design calculations with these tests,” explains Krijn de Kievit. Nonetheless, this was the first time the system had been subjected to a temperature of almost minus 200 degrees Celsius. “Our O-rings gave a tight seal,” comments a happy Jan Boomsma. Now, the first test involving fire is due – expectations are running high. If this test is successful, a big milestone will have been achieved in the quest to build a rocket that reaches an altitude higher than ever before.

The skilled engineers of Angst+Pfister have long been fascinated by the idea that the world record will be broken and that their solutions and the company logo may one day be transported into space...

For more information see:
www.dare.tudelft.nl



Overview of the test setup.



High-pressure expulsion of liquid nitrogen and water.



Ice on the main line to the machine.



«If a leak led to it coming into contact with the bioethanol, there would be a very high chance of the rocket exploding.»

Jan Boomsma, Product Application Engineer, Angst+Pfister Netherlands

Welcome to our new members of the Angst+Pfister family

At the beginning of 2019, Angst+Pfister welcomes MCM and OL Seals as new members to the family. In addition mcm-oL seals N.V. based in Belgium will also become a part of the Group, serving its region with sealing solutions and technical components for local and global customers. They have been in the Angst+Pfister partner network for many years.



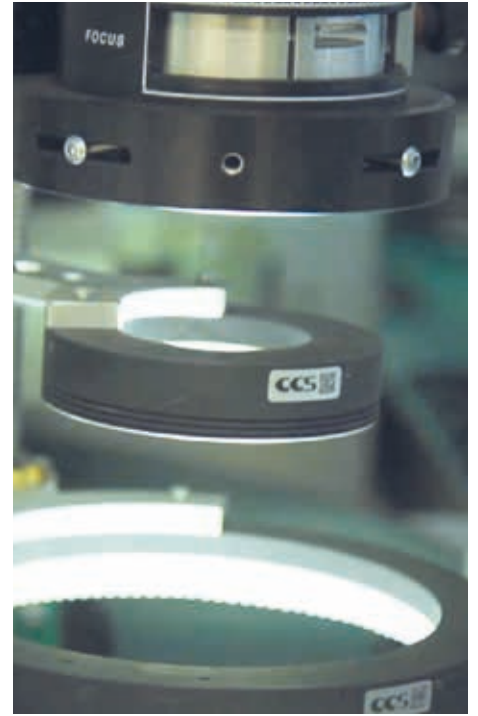
By bringing these partners closer into the fold, Angst+Pfister is broadening its customer base, its sealing portfolio and strengthening its engineering and production competence for high performance sealing solutions by adding access to the immense know-how of both companies. They bring a great deal of experience in terms of outstanding design competence, high-tech tools and state-of-the-art material expertise. As a result, our customers will benefit from even more customized services in all disciplines.

MCM S.p.A. specializes in the manufacturing of high technological sealing solutions, espe-

cially O-rings and molded parts made of high-performance compounds (FKM, HNBR, VMQ, FVMQ, ACM, Aflas). MCM produces customized rubber gaskets for v-petrochemical. They produce both compression and injection molded parts from small series to mass production. The company has a wide array of own compounds with certifications from FDA and USP through automotive standards (e.g. MAN and VW) to NORSOK and NACE, and is also able to provide PTFE coating in-house.

O.L. Seals A/S is an internationally well-established supplier for high-performance standard and tailor-made sealing solutions

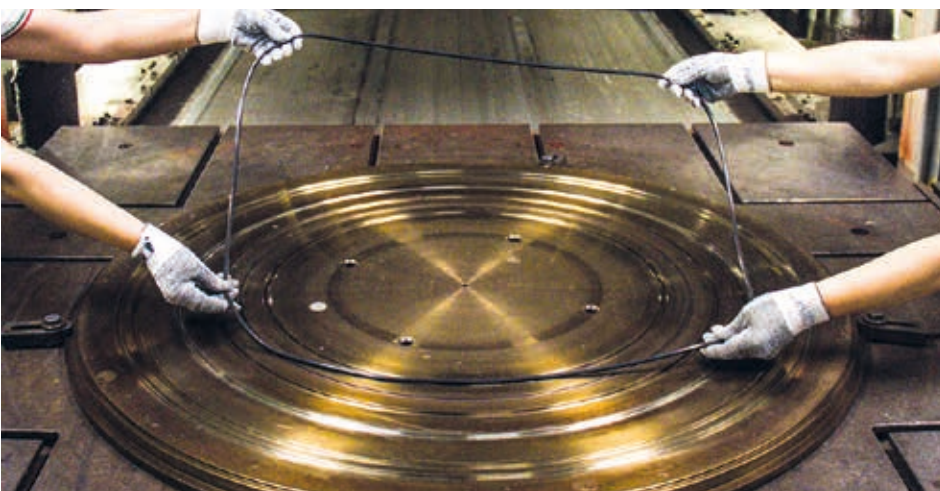
providing customer solutions directly and through selected distributors worldwide. The product range includes spring energized seals, rod and piston seals, scrapers, back-up rings, and flange seals. They offer a wide range of compounds like PTFE (in-house compounding, also "Non free flow"), UHMW-PE, PUR, PEEK and many other Kefloy® compounds, a full-scale production including post launch support. Production is both isostatic and compression molded for diameters from small precision parts up to as wide as 2 metres. With remarkable lead times – in 4 weeks from design proposal through prototype to production parts and documentation. In



In addition, O.L. Seals A/S has an own in-house spring manufacturing to produce spring energized seals material like Stainless steel, Hastelloy® and Elgiloy® in different designs. All products are quality certified according to ISO 9001 and since 2014 also for food deliveries.

The many years of successful cooperation between Angst+Pfister and MCM and OL Seals are reflected not least in a whole series of successful joint projects. For example, customer-specific sealing solutions in the form of FKM O-rings developed for a well-known brand of precision watches, HNBR sealing solutions for flow meters for a market leader in process automation and one of the most influential automotive suppliers, various solutions for large international companies in the process industry and many more.

The Angst+Pfister family is happy and proud to have these strong new members on board. They further increase the added value for the benefit of all customers and are part of our network strategy of ensuring a combination of network partners and in-house capabilities from material development all the way to the finished parts are combined in order to provide our customers with the most appropriate high quality application solution.





It's not a contradiction: high quality can reduce costs

A high-end seal for a high-end coffee machine – the sealing specialists at Angst+Pfister in Italy convinced Carimali, a company with tradition, to use a very high quality lip seal in their brewing units. Even though the new seals come at a price, now that less servicing is required the overall running cost of a professional fully automatic coffee machine has gone down.

Cristiano Pinca knows what he is talking about: “False economies can be expensive.” If you consider the overall running cost of a professional coffee machine – including repairs and maintenance – then at the end of the day apparently cheaper solutions for the internal workings result in unnecessary costs. Some time ago, Cristiano Pinca, Product Application Engineer for sealing technology at Angst+Pfister Italy, tried to persuade Carimali, manufacturer of coffee machines, of the benefits of various sealing solutions for the steel brewing unit of its machines. The seal in the automatic coffee machines moves up and down and because of this it has to be able to endure a lot of wear.

A special lip seal ensures there is a scraping effect to keep the area free of coffee remains. “That provides a first class coffee experience,” explains Cristiano Pinca. In addition, the sealing has to comply with a range of hygiene standards.

Tenacity does it

“We were totally convinced that we could help Carimali with our solutions and in 2012 began to make a few recommendations – first the standard fluorocarbon O-rings that had to have a low unit price,” says Cristiano Pinca. “In the following years, we tried out a lot of new seals and then approached

Carimali with them.” The company was impressed with the purity of the material and its exceptional health compatibility. “This is important, because the legislation includes stiff penalties for non-compliance,” warns Cristiano Pinca. Initially, Carimali insisted on staying with the old components and suppliers due to the sales targets which focussed mainly on cost. The team around Cristiano Pinca showed persistence. The two Product Application Engineers Walter De Vecchi and Carlo Lorenzi as well as Sales Application Engineer Alessio Bertini at Angst+Pfister Italy did not lose heart and looked for other ways of enhancing the quality of the Carimali coffee machines –

without losing sight of the cost issue. Six years after the first O-rings the day finally arrived: Angst+Pfister triumphed, winning over Carimali with a special product of exceptional quality and durability. “Angst+Pfister won our trust with a special product of exceptional quality and durability”, tells Adamo Ballo, R&D Manager at Carimali.

Lower overall running costs

The new technical director of Carimali recognised, in renewed tests, the benefits of the silicone-filled lip seals with the scraping-effect (mentioned above) that the engineers of Angst+Pfister had specially designed: The seal contains an internal spring to maintain elasticity for as long as possible. Carimali realised that all in all, in effect here was a more economical solution than the previous one. It fulfils the requirements for seal resistance particularly well and Carimali can now expect fewer repairs, fewer complaints and higher customer satisfaction. At the same time, the seal complies, of course, with the strict European Union purity requirements for components that come into contact with foodstuffs.

“The point is that although the new seal is more expensive per unit than the previous seal – when you look at the overall running costs, the price is more than justified,” says Cristiano Pinca pleased. In the long run, the new high quality seals are the cheaper ones. The seal will now be used in the sort of high end coffee machines for which the customers have equivalently high expectations. “We are convinced that this will give them even more quality and indulgence”, says Adamo Ballo of Carimali. Angst+Pfister will also be supplying O-rings for a second coffee machine model with a plastic brewing unit from the product group PERTEC® – with the highest degree of purity with regard to the EU regulations.

More information on PERTEC® products is available on page 4 of this magazine.

Carimali – coffee as you love it

The traditional company Carimali has a great deal of technical experience: It was founded in 1919, produces coffee machines for

commercial use and sells them the world over. Its headquarters are located near Bergamo in Italy. This is also the site of its most important production facility. A second plant with a logistics centre is situated in Suzhou, China. The product range includes semi-automatic and fully automatic coffee machines, coffee grinders and accessories.



Carimali manufactures coffee machines for commercial use.



«We continually endeavour to be not just a supplier for our customers – but a real partner, too.»

Cristiano Pinca, Product Application Engineer, Angst+Pfister Italy

Combined heat and power units – energy for the future with Angst+Pfister’s expertise

The Bayern BHKW name has stood for top quality since 1921. This long-established company aims to gain a competitive advantage with its combined heat and power units. Angst+Pfister is doing its bit by providing cleverly designed and welded ASSIWELL® fluid handling technology.



Combined heat and power plants require a complex system of hoses and pipes.

“We never promise what we can’t deliver,” says Manfred Artinger. The Profit Centre Leader for Fluid Handling Technology at Angst+Pfister in Germany knew more or less immediately after meeting Bayern BHKW how he could support the company. The required expertise is not a matter of chance: Angst+Pfister Germany supplies many of the sector leaders in combined heat and power units. Ever increasing energy prices and the political environment mean commerce and industry are increasingly putting their faith in new solutions such as this one. “Competition is hard, our family business is now in its fourth generation and intends staying ahead when it comes to quality,” says Maximilian Niedermeier, CEO of Bayern BHKW. This is a typical scenario for Angst+Pfister solutions.

Flexible hose and pipe system

The engine cooling systems of a combined heat and power (CHP) unit calls for a complex system of hoses and pipes. What’s more, some of the gas pipes come with special industrial approvals. The system has to be flexible enough to absorb engine oscillation. The engine

is mounted on floating bearings - that is - six engine bearings made by Angst+Pfister, the “marine engine mounts type 3”. “In order for the system to absorb the oscillation optimally, the hose sections have to be as short as possible, but also as long as necessary,” explains Manfred Artinger.

There’s welding and then there is welding

“It was clear to me that the quality of the welding would have to be the very best throughout the entire system,” remembers Manfred Artinger from his first consultative meeting with Bayern BHKW. Due to the steadily increasing production volume, the customer had already made a few attempts to outsource the welding work – but was concerned to maintain the established high quality. “The pipelines have to be very carefully adjusted to the machines. In the past, several of the suppliers failed to meet our high expectations,” relates the production leader Alexander Frank. Every single angle has to be exactly right so that the pipe system is not subjected to stresses. Angst+Pfister has the necessary welding skills, several



«It was clear to me that the quality of the welding would have to be the very best throughout the entire system.»

Manfred Artinger, Profit Centre Leader Fluid Handling Technology, Angst+Pfister Germany



welders and CL1 level certification – the highest level of quality, when a supervisory engineer is in attendance.

First understand, then supply

“We want to be the most reliable company, not the cheapest,” says Manfred Artinger. Bayern BHKW provided Angst+Pfister with system drawings. “From then on communication is important, we have to understand everything in detail and at the start, we exchanged numerous CAD models.” For instance – where does each connector belong? The welders need to know exactly how to go about the work – detailed on very professional drawings. Only then does Angst+Pfister make suggestions – suggestions that are as economical as possible. The Angst+Pfister team began to optimise the entire construction. The number of welds could be reduced – that increases the quality of the system.

Close customer support

Manfred Artinger was on site for the first fitting of the ASSIWELL® hose and pipe system. In addition to consultation, intensive support is part of Angst+Pfister’s service for projects like this – as is professional project coordination. And so no one was in the least bit surprised when the new system fitted perfectly. “We couldn’t quite believe that Angst+Pfister would get it right the first time,” says Alexander Frank, head of production for Bayern BHKW, looking back. “But we were very happy to be disabused of that notion.” The high competency of Angst+Pfister is reflected in its quality products and quality of project development.

A perfect handover

Angst+Pfister meanwhile supplies the fluid handling technology for all five models of Bayern BHKW’s combined heat and power units. “That speaks volumes for the excellent collaboration,” says a contented Alexander Frank. Another aspect is looking after the details such as packing and transport of the systems. “The individual sets are packed carefully and systematically,” explains Alexander Frank. They must be protected against friction to ensure that they arrive at the customer’s site in perfect condition – this is another issue that unfortunately is often underestimated.



Welding
competence:
Every angle
must be exactly
right.

“We pay a visit, we ask questions, we take measurements and we make sense of the problem.” – Custom solutions for Manitou Italy using standard APSOvib® mounts

A solution can be produced in next to no time for many of the challenges facing Angst+Pfister’s engineers. The technical support team and the ready-availability of highly-specialised standard products make it a fast and uncomplicated process to find the right antivibration component for customers like Manitou: For its MLA-T 533-145 V+ (Castelfranco) telehandler, Manitou has selected APSOvib® H-Mounts.

Manitou designs, manufactures, and distributes rough-terrain handling material for agriculture, construction and industries. They are used the world over – for example, in cereal production, livestock farming, construction or quarries, forestry and airports. Time and time again you hear: “In these situations there is absolutely no margin for error,” says Christian De Marco. He is an engineer working for Manitou in Italy.

Knowledge rather than components

The components Manitou’s suppliers provide have to be of such a quality that they pass the tests the first time round. Manitou relies heavily on the technical support of its suppliers. Manitou in Italy has worked closely with Angst+Pfister for many years. Many of its machines are fitted with engine bearings

and cabin suspension made by Angst+Pfister. “You can always optimise. We were looking for a new antivibration solution for the steering pump on one of our telehandlers,” recounts Christian De Marco. It was creating significant oscillations inside the telehandler reducing its service life and making it uncomfortable for the driver. The engineers at Angst+Pfister soon realised that the stiffness of the current antivibration components had not been sufficiently customised for use.

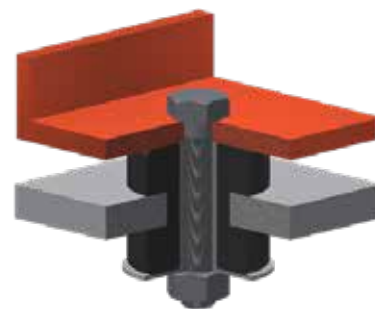
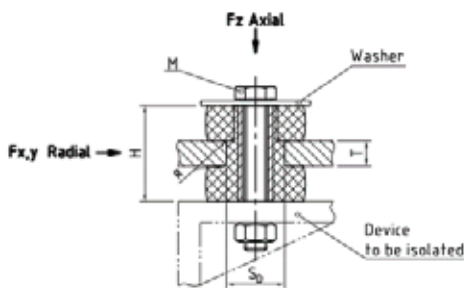
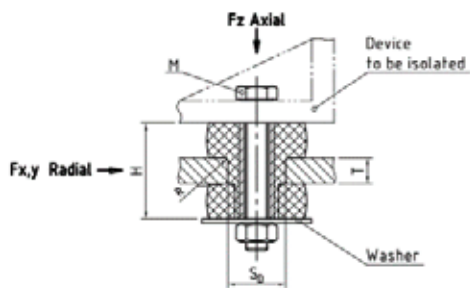
On-site problem solving

“There were two areas where we clearly stood apart from our competitors in this project,” says Philippe Kirsch of Angst+Pfister, looking back. He is the Business Development Director in the agriculture and construction machines sector. In the first place there is the

technical support that Christian De Marco spoke about: “When he rings us, we don’t simply refer him to a page in our catalogue,” says Philippe Kirsch. “We pay a visit, we ask questions, we take measurements and we make sense of the problem.” In cases like this, after one or two tests there has to be a good solution ready on the table – swiftly and easily. For that to be possible, Angst+Pfister has a portfolio of standard products that in its breadth and depth is second to none.

On site, the two engineers Filippo Galli and Riccardo Cristina focussed on insulating the vibrations in the telehandler. “We count on the technical experience of these two,” says Christian De Marco of Manitou. “That’s why I called them.” Based on the existing housing and the anticipated work





load, the Angst+Pfister guys suggested a product from the standard catalogue: A short time later, Manitou took delivery of the APSOvib® H-Mounts in two different rubber compounds for testing. Due to its chemical properties, chloroprene rubber – better known as neoprene – is suitable for contact with oils, fats, UV radiation or ozone and good for use in agricultural and construction machines.

Custom solutions straight from the warehouse

This was how the engineers of Angst+Pfister were able to reduce the unwanted oscillations – without the cost of time-consuming tool development, etc. “Our customers benefit from the highly-specialised products that we keep in stock – no matter whether we are talking about two items for prototypes

or a last-minute request for x-thousand for a production series,” says Philippe Kirsch. Angst+Pfister’s APSOvib® H-Mounts are already absorbing vibrations in numerous suspension units, engines and gearboxes, cabins, cooling systems, compressors, pumps, exhausts and generators – for many customers. The potential for application is huge – and the price very competitive.

H-Mounts are available in a range of sizes – and in three different shapes for different stresses: with and without pre-stressing or with metal inserts to reduce wear. Each size and each shape is available “off the peg” in four rigidities. “Further customisation on request is not a problem,” mention Filippo Galli and Riccardo Cristina.

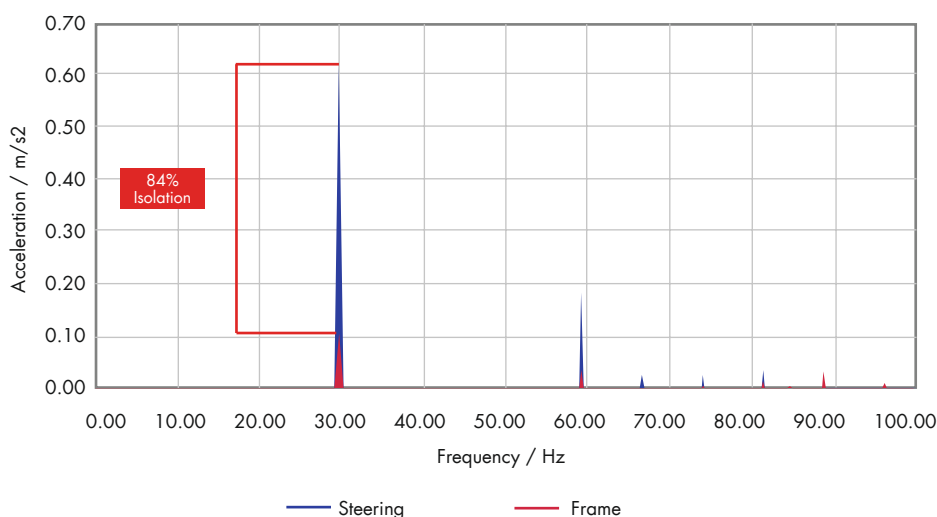





«Further customisation on request is not a problem.»

Filippo Galli, Sales Application Engineer, Angst+Pfister Italy
 Riccardo Cristina, Product Application Engineer, Angst+Pfister Italy

Engine RMP = 850 min⁻¹



To define a suitable mounting setup for the steering pump, Angst+Pfister did measurements with APSOvib® H-Mounts in different stiffnesses. The aim is to find the best possible solution with the highest isolation efficiency.

The measurements show the occurring acceleration amplitudes at the correlating frequency.

In this case there is a clear excitation at 30 Hz visible on the steering pump. The APSOvib® H-Mount helps to reduce the transmitted vibrations by 84%.

Angst+Pfister Voices



Göksel Onver

Project Manager, Angst+Pfister
Advanced Technical Solutions Turkey

«Angst+Pfister inspires us, promotes our personnel competence and increases success through the exchange of knowledge among the companies of the Group»

Having gained extensive experience over many years in design, project management, R&D and project supervision in the automotive industry, Göksel joined Angst+Pfister in 2014 as a senior project engineer for the divisions of Rubber Metal Antivibration and Sealing Parts. Only a year later he became project executive and since 2018 has been project manager.

“My team and I feel a great deal of motivation getting involved in new and challenging projects, being part of a successful team and seeing a prospering company with fully satisfied customers. It is great that we get encouraged to try new things and be innovative. What could be better than having a very tight deadline with just one try to get it right and the result being better than we could ever have imagined. Since 2014 more than 200 antivibration and sealing projects were completed successfully for various customers from the railway and automotive industries as well as producers of industrial equipment while simultaneously tackling many restrictions, balancing delivery time, quality and cost.”



Amy Huang

Internal Sales Leader, Angst+Pfister China

«Angst+Pfister is like a big multicultural family»

Amy joined Angst+Pfister China as a sales agent in Shanghai in 2013. Her performance is consistently good, she is ambitious with great commitment and last, but not least, her extraordinary team spirit has made her the internal sales leader that she is today. Handling customer orders and offers, while acting as a gatekeeper for processes, she heads the internal sales team in their work to support other departments and provide excellent customer service resulting in outstanding customer satisfaction.

“Angst+Pfister is like a big family with a very international, multicultural background, which makes employees feel respected and well looked after. The company offers continuous training, which gives us the opportunity to develop ourselves and others continuously. I really enjoy being part of it.”



Simon Lewandowski

Product Application Engineer,
Angst+Pfister Germany



Alessandra De Bernardi

E-Marketing Manager, Group Marketing

«You can never sleep in digital marketing»

Alessandra joined Angst+Pfister in 2014 as Group e-marketing manager and is responsible for the main digital communication channels including the Angst+Pfister and AP-SOparts websites, email marketing communication, search engine marketing activities and social media channels. Her main objective is to devise strategies to drive online traffic to the company websites and generate conversions for the online shop by making improvements to the existing channels and by creating new ones through different digital marketing campaigns.

“I particularly enjoy working in the digital space, as it is an ever-changing environment where fast-paced innovation invites you to learn something new every day. Also, I love the diversity of my job, which encompasses all areas of digital marketing whose potential today is endless. You can never sleep in digital marketing, and definitely you never get bored! Another special aspect of Angst+Pfister for me is being part of an international team with many different nationalities and cultural backgrounds: on an average day at the office, I get to talk in four different languages.”



Philippe Kirsch

International Business Development Director for agricultural and construction machines, Angst+Pfister Group

«Do what no other competitor does!»

Philippe joined Angst+Pfister in 1985 as a product application engineer for Sealing Technology in Geneva, which put him in charge of introducing high-performance elastomer gaskets for critical applications in a range of industries. As he gravitated towards management and business development, he took the lead as profit center leader and then became sales office leader for French-speaking Switzerland. In 2007, he began managing Antivibration Technology for the Angst+Pfister Group as international profit center leader, taking on additional responsibilities in 2016 as the international new business development director for the agriculture and construction machinery as well as special vehicles market segments.

“Throughout my various positions, I particularly appreciated participating in the international business development with a large range of technical products of high added value. And above all, direct contact with key customers: understanding customer needs and providing specific solutions that fully meet expectations.”

«With a great team of experienced, driven and ambitious people to full customer satisfaction»

With comprehensive experience in engineering and sales of Fluid Handling products Simon joined Angst+Pfister in 2018. In his position as Product Application Engineer his main tasks are the representation of Angst+Pfister's product range of fluid technology products, managing the whole customer journey from engineering solutions to after-sales and overall customer service.

“What I particularly like about my job is to work with a great team of experienced, driven and ambitious people to provide our clients with individual and customized solutions for their day-to-day business to their fullest satisfaction. This also includes the implementation of smooth and running supply chains by reverting back to Angst+Pfister's excellent product portfolio and its vast sto-

rage resources. Also I really appreciate Angst+Pfister providing a safe, structured and creative work environment which allows the employees to develop.”

Correctly measure flows and interpret the measurement data

With the Pewatron business unit, the Angst+Pfister Group is able to offer a wide product range in the fields of sensors and power. For example, they create customer-specific sensor solutions in the realm of flow measurement for virtually all measuring tasks (gas, liquid) with various technologies (thermal, pressure, ultrasound, direct).

A common measurement task in medical or industrial sectors is measuring volume or mass flow. These tasks vary according to the application and how the measurement data is interpreted.

As is often the case in technology and even daily life, tasks can be performed in various different ways. The example of flow measurement shows how important it is to choose the right approach from the beginning. We offer the two most widespread processes for flow measurement: measuring via differential pressure and flow measurement according to the thermal principle. Other valid processes exist but are more niche. This article primarily focuses on gaseous media. Many aspects of this also apply to liquids, while others must be considered separately.

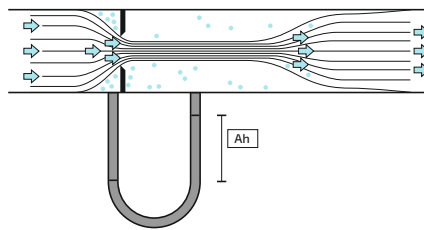
The first consideration is the difference between volume flow and mass flow. For the mass flow, the number of molecules is measured – whereas the space taken up by the molecules is measured for volume flow. Gases can be compressed, so a volume flow can change in the event of temperature or pressure changes. The thermal state equation of ideal gases ($pV = nRT$) describes this relationship. It can be well illustrated through an example with two flasks.

Why mass flow is the most precise

In order to make a statement about a mass flow, the direct measurement of the mass flow is generally the most precise option. In other processes, the flow is derived by means of differential pressure, volume flow

or flow velocity. These methods, however, depend on pressure and temperature, and must be corrected accordingly. If the mass flow is the variable to be measured, an immediate measurement is usually more accurate. This direct measurement is performed by means of the thermal principle. What exactly is the thermal principle? In simple terms, the energy transport is measured. This refers to energy generated through the heater and discharged through the flow. In this case, it is plain that it's not volume but the number of molecules that is crucial for energy transport.

The differential pressure measurement via measuring orifice.

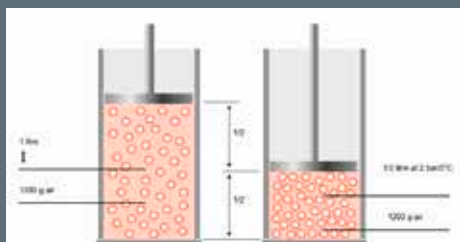


These relationships make it clear that a mass flow should actually be expressed in units of weight such as mg/s or g/h. In practice, however, volume units are often used. This is not wrong as long as the pressure and temperature are specified. There are two prepared conditions for this. A pressure of 1013 mbar and a temperature of 0°C was defined as a normal condition. This volume unit is indicated by the subscript letter n: l_n/min. A second common definition for mass to volume conversion is the standard condition. This is based on 20°C instead of 0°C and is accordingly marked with an s instead of the

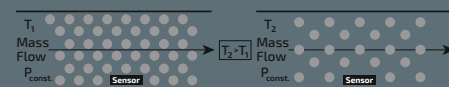
n: l_n/min. These indications of temperature and pressure are absolutely mandatory. If the difference between l_n/min and l_s/min is disregarded, the result is an error of about 7%. If the pressure conditions also deviate from the 1013 mbar, the measured value can deviate even more from the true figure. Volumetric measuring equipment such as impeller counters, rotameters or turbine flow meters do not detect temperature and pressure changes. For a mass flow measurement, additional sensors for the variables as well as an arithmetic unit would be needed, which calculates the true mass flow from all the raw measurement data. However, this is avoided and the measurement principles are usually used when an approximate measured value (not high accuracy) is required or when the volume flow is the quantity desired. Whether a volume flow or a mass flow should be measured is defined by the application itself. This is often historically limited or dependent on the industries. If purchases or sales are made by volume, volumetric measurements should be made. If, as in the case of petrol, the price factor is weight, then the mass flow should be measured.

Application-specific environmental conditions

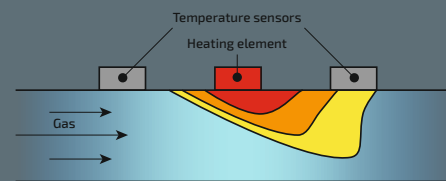
In addition to the measured variable, which also depends on the application, the ambient conditions contribute to which sensor or which measuring principle is used. A good example is a volumetric flow controller for HVAC ventilation. There are two main factors to consider: pollution and long-term offset drift. Dust naturally accumulates in the



The thermal state equation of ideal gases illustrated in the example using two flasks. A container with a volume of one litre and a movable, weightless plunger contains 1293 g air, the ambient pressure is one bar. If the plunger moves down, the volume reduces to $\frac{1}{2}$ litre. The pressure increases to two bar. The mass remains constant at 1293 g.



Mass vs volume flow and temperature behaviour.



The principle of the thermal measurement principle.

ventilation units within homes and commercial buildings over time. When comparing a MEMS differential pressure sensor with a thermal flow sensor, it can be seen that dust has a completely different effect on the two measurement principles. Typically, a measuring orifice produces a differential pressure that varies with the flow. The pressure difference is measured with a MEMS low pressure sensor. These are usually a few mbar. Dust is not a major problem here. There is no connection between the two measuring points due to the membrane.

There is no flow through the sensor, i.e. the sensor cannot become clogged by dust. Thermal flow sensors work differently. These can be configured as differential pressure sensors and used in the same setup. However, they have the disadvantage that there must always be a small flow through the sensor. If the sensor is clogged by dust or dirt, the flow is interrupted and the sensor becomes defective. Despite the specified disadvantages, thermal flow sensors also offer a number of benefits. Due to the principle, the offset hardly drifts over the years. As a result, no offset adjustment is necessary in the application. Due to their physical construction, pressure sensors have an offset drift – especially low-pressure sensors, some of which are even dependent on the position. In a design with a pressure sensor, it is always advisable to adjust the offset during production or commissioning and, if possible, during the entire service life. If there is a known, defined state during operation, it should be used to correct the offset via software. If that is possible in an application, the pressure sen-

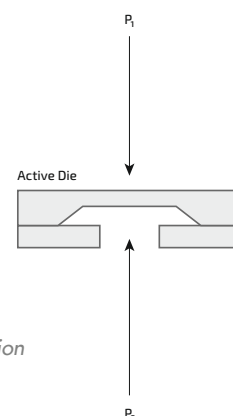
sor is usually the best solution as it is more accurate and cost effective. If an adjustment is not possible, the offset drift must be taken into account in the accuracy calculations.

Comparing different measurement principles

As with any measurement task, the various measurement principles that come into question should be compared and the advantages and disadvantages considered. Depending on the application, very different concepts can be used. The price is often a deciding factor, whereby the most commercially promising solution is chosen instead of the best technical solution. It is important to consider these aspects and boundary conditions as early as possible during development and during the design-in phase.

We also offer similar approaches and solutions in the field of fluid flow measurements. Our ultrasound technology is often used for this purpose, and we would like to personally introduce you to it.

Contact:
Pewatron AG
sales@pewatron.com
www.pewatron.com



A principle illustration of MEMS pressure sensors.

100,000 Times Exactly the Right Product

It doesn't always have to be a specification. For developers and especially for buyers, it's worth taking a look at the extensive range of Angst+Pfister on www.angst-pfister.com - or a visit to the online shop www.apsoparts.com.

Whether it is an O-ring or hose, a cone bearing for vibration isolation, visually recognisable plastics or a toothed belt: The Angst+Pfister range includes more than 100,000 standard products.

They can be ordered online and are available immediately for the most part. Standard products and individual advice are not mutually exclusive.

The international engineering team, which designs sophisticated solutions for its customers, provides support as needed. On the one hand,

a large number of the standard products have emerged directly from successfully tested engineering solutions from Angst+Pfister, so that today the customer pays well for the product, but not for its design. And on the other hand, the experts from Angst+Pfister also use standard products for their customised designs, which they specify further. The straightforward order process is complemented by lean logistics. It is able to fully integrate into the customer's supply chain, and it can thereby further reduce costs.

APSOseal® HITEC® O-ring



The Angst+Pfister HITEC® O-ring range includes O-rings with approvals for drinking water, food, pharmaceutical and medical technology in the materials NBR, EPDM, VMQ and FKM. The material EPDM 70.10-02 is particularly worthy of note, since this material, in addition to outstanding mechanical properties such as low compression set also has all the approvals in the aforementioned industries - and for a single material too.



APSOseal® FEP-O-SEAL® O-ring



The FEP-O-SEAL® O-ring is the optimal combination of two materials: The core of elastic silicone or FKM ensures the restoring force and the FEP sleeve guarantees the chemical resistance. FEP-O-SEAL® O-rings are ideal for use in the food, pharmaceutical and medical industries: They can be deployed in a variety of applications at temperatures ranging from -60 °C to +200 °C. In addition, they are pressure-resistant and guarantee low compression set coupled with much lower tendency towards cold flow compared to PTFE. They also have FDA and EG1935/2004 compliance, as well as 3A Sanitary Standard and USP Class VI.



APSOseal® Kalrez® perfluoroelastomers (FFKM) O-ring



Kalrez® O-rings possess unique operational properties that are unmatched by any other elastomer material. Kalrez® synthetic rubber in its various compounds combines the elasticity and sealing power of a genuine elastomer with the chemical resistance of PTFE. Kalrez® O-rings are resistant against practically all chemicals and can be deployed in continuous operation at temperatures up to +327 °C or for brief periods at temperatures up to +350 °C. Kalrez® O-rings compliant with FDA or USP VI requirements are also available. Angst + Pfister stocks a huge assortment of Kalrez® O-rings and has direct access to special-sized Kalrez® O-rings. Where conventional materials fail, Kalrez® perfluoroelastomers (FFKM) provide the least expensive and most reliable long-term solution from a total cost standpoint.

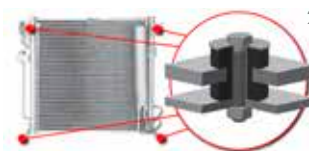


APSOvib® H-Mounts



APSOvib® H-Mounts are specially designed for the secure attachment of devices to mobile applications, can be used on agricultural and construction machinery, trucks and trailers, special vehicles and for all industrial applications:

- Typical applications include the isolation of motors, gearboxes and differential cases, cabin vehicles, auxiliary equipment such as radiators, radiators, compressors, pumps and generators, attachment of exhaust ducts and exhaust pipes in the industry.
- 3 different versions cover a load capacity F_z from 405 to 16'000 N.
- Each item is available from stock in soft, medium soft, medium hard and hard.



APSOvib® conical bearings

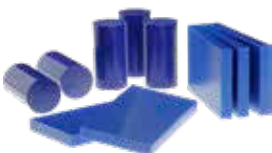


APSOvib® conical bearings are designed for use in agricultural and construction machinery to absorb impact and isolate engine vibration in cabs.

- Typical applications include the isolation of motors, gearboxes, differential cases, cabins, and others.
- Conical bearings can be used for loads from 2'600 N to 30'000 N.
- They are available from stock in six different sizes, each in different rigidities and breakaway-proof by the use of stop discs.
- The directional stiffness allows a good vibration isolation in the vehicle transverse direction and sufficient rigidity in the direction of travel for the suspension of shock and braking forces.



APSOplast® Visually recognisable plastics according to FDA and EC 1935/2004



These visually recognisable blue plastics stand out clearly from the colour of processed foods and help with the visual inspection of food. Any fragments of a plastic component can be recognised quickly. The optical recognition is economical and has proven to be successful in a variety of applications in the food industry. Our customers have successfully used blue plastics not only in food processing machines but also in pharmaceutical and medical devices.

These plastics are suitable for direct and indirect food contact according to FDA and EC 1935/2004. They are available as POM-C and PE-UHMW in plates and rods.



APSOdrive® BRECOFLEXmove®



The BRECOFLEXmove® is a timing belt specifically designed for high performance drives and traction drives with a particularly high stiffness requirement. A newly developed Steel cord tension member increases belt stiffness and tear-resistance, making transmission of stronger forces possible. The tooth flank geometry has been optimised through the Finite Element Method (FEM). This leads to an optimisation of the contact pressure distribution and reduces the work of friction between the timing belts and tooth washer, thus minimising wear. In addition, a friction optimised laminate coating is applied to the tooth side.



APSOfluid® TETRAFLEX® S PTFE hose lines



PTFE (also known as Teflon™) is one of the most versatile plastics on the market: It has almost universal chemical resistance and withstands temperatures from -60°C to +260°C. Our TETRAFLEX® S PTFE hose assemblies have an inner tube made of this unique material and are therefore suited to a wide variety of applications. Due to the external braiding made of stainless steel, the pipes also withstand high pressure and have good kink resistance. The pipe connections can be individually adapted to the customer's wishes: Normal closing, custom-made, stainless steel or galvanized steel. The selection of TETRAFLEX® S PTFE pipes is also varied: they are available in diameters DN 5 - DN 25, in antistatic versions or with multi-layer braiding for particularly high pressure resistance.



Logistics, quality assurance and customer focus worldwide

Our state-of-the-art logistics centre is the linchpin of Angst+Pfister's logistical services. At the roughly 23,000-square-metre logistics centre, 140,000 different stock-keeping units are warehoused and more than 1,500 separate items are reliably processed and shipped daily. Excellent C-parts management coupled with a world-wide procurement network guarantees high product availability – even for custom items – with fast delivery times. With just-in-time, Kanban, supply management and other logistics concepts, Angst+Pfister enables customers to synchronise their incoming parts shipments to precisely match their production rhythm and to thus minimise inventory carrying costs. Our ISO 9001:2014, ISO 14001:2004 and ISO/TS 16949:2009-certified complete quality assurance system additionally enables customers to greatly simplify their incoming goods inspection procedures.

Personal contact is crucial

Looking back to the beginnings of APSOparts, one of the first web shops – what the Angst+Pfister family have to say.



Ralf Werder, CEO APSOparts AG, www.apsoparts.com

How was the organisation grown and positioned within the AP Group?

At that time we were a small unit that had just learned to operate in the B2B e-commerce environment. In addition we had begun to sell Europe-wide.

What were your priorities over the last 5 years?

For me, the first priority was always to stay close to the customers. Not just on the phone or through emails, but face-to-face. Over the past few years we have built up a strong sales team that is regularly on-site with the customers. At the end of the day, the B2B e-commerce customer wants to have a face of the company. They want to have a contact person. In addition, we have put a lot of effort into the data quality. This is a never ending task. But the main focus of our work has been on delivery precision. Where today large B2C web shops operate with a “delivery in 18-24 days” system, we work to a precise day for

delivery. Reliability is an important factor in the industrial environment.

To what extent has online business changed in the environment of APSOparts?

Market data shows that the B2B e-commerce environment is growing strongly. The industrial customers have recognised the value of the way a web shop allows fast access to information, and they make use it. We launched APSOparts 10 years ago. The apprentices and students of those days are now between 25 and 35 and often are in management positions or are important influencers. For these people, web shops are a normality and they use them. The affinity to B2B e-commerce has increased markedly in these ten years.

Where is APSOparts heading?

What are the plans for the future?

In the future, closeness to our customers is going to continue to be very important in B2B

e-commerce. On the one hand we will be on-site at the customer's and on the other hand, able to provide consultation via a live online chat. The chat service will be manned by experienced employees and provide support for our customers in all queries. In the near future, we will update the web shop and integrate customers' feedback and wishes.

What is your personal wish for the future of APSOparts?

To continue to have great, motivated team colleagues and, of course, satisfied customers who click the purchase button very often.





Interview with Andreas Hampel, CEO of ATEC Armaturenbau und -Technik GmbH, Klein-Winternheim, Germany

ATEC Armaturenbau und -Technik GmbH has constructed and manufactured special ball valves for the chemical, food, pharmacy and cosmetics industries since 1989. Its specialist areas are dead-space-free ball valves in soft and metallic sealed designs and specialist ball valve constructions for extreme conditions in special materials such as titanium and Hastelloy®.



Since when have you ordered online from APSOparts?

Since 2015.

Have the ordering processes become any easier for you since digitalisation and introduction of the new system?

Yes, they are much faster and more transparent. There is no need to make an initial enquiry, it's possible to place a direct order.

Are there other benefits for your day-to-day work?

It's easy to calculate a price, which makes ordering much simpler as the prices can be seen directly.

Do you find you are ordering more online than by the classic telephone/email methods?

No, we still order about 80% using the traditional enquiry, offer and order method. That's mainly because most providers do not have an online shop.

What is important for you when selecting an online partner in the supply chain system?

A fast website and a fast ordering process as well as transparency and the availability of personal contact.

What do you like about APSOparts?

We like the very good service based on personal

contact. That makes APSOparts something special.

How do you see future of digitalisation?

Key aspects are definitely fast processing, price transparency, low prices due to strong competition. However, this will increase the pressure to deliver faster. Fewer qualified employees will be needed. Jobs will be lost due to automatization. This will save costs and will make Germany, as a place of business, a more interesting prospect. Many companies will move their business base back to Germany.



Interview with Bruno Brändli, workshop manager of Greuter AG, Hochfelden, Switzerland

Greuter AG provides wide-ranging specialist civil engineering services and end-to-end solutions, all under one roof. Innovative solutions and a modern machinery/equipment pool provide an excellent basis for flexible implementation of simple to complex projects in specialist civil engineering, tunnel renovation and crash barriers.



Since when have you ordered online from APSOparts?

I have been ordering from APSOparts for 8 years now.

Have the ordering processes become any easier for you since digitalisation and introduction of the new system?

Yes, you are less dependent on the ordering times, that is, you can order outside of office hours. That has given us significantly more flexibility.

Are there other benefits for your day-to-day work?

When you place an order online, you have immediate access to the latest prices and availability, which makes planning and calculation much easier.

Do you find you are ordering more online than by the classic telephone/email methods?

I order about 80% online, that is, the standard products and about 20% by telephone/email, that is, the customer-specific products.

What is important for you when selecting an online partner in the supply chain system?

It is important to me that an online partner has quick delivery times and high stock availability as we generally need the products to repair and maintain our machinery pool.

What do you like about APSOparts?

APSOparts offers all the benefits of online ordering and in addition personal consultation. In addition, you are always sent information about the order by email and always receive an order confirmation email.

How do you see future of digitalisation?

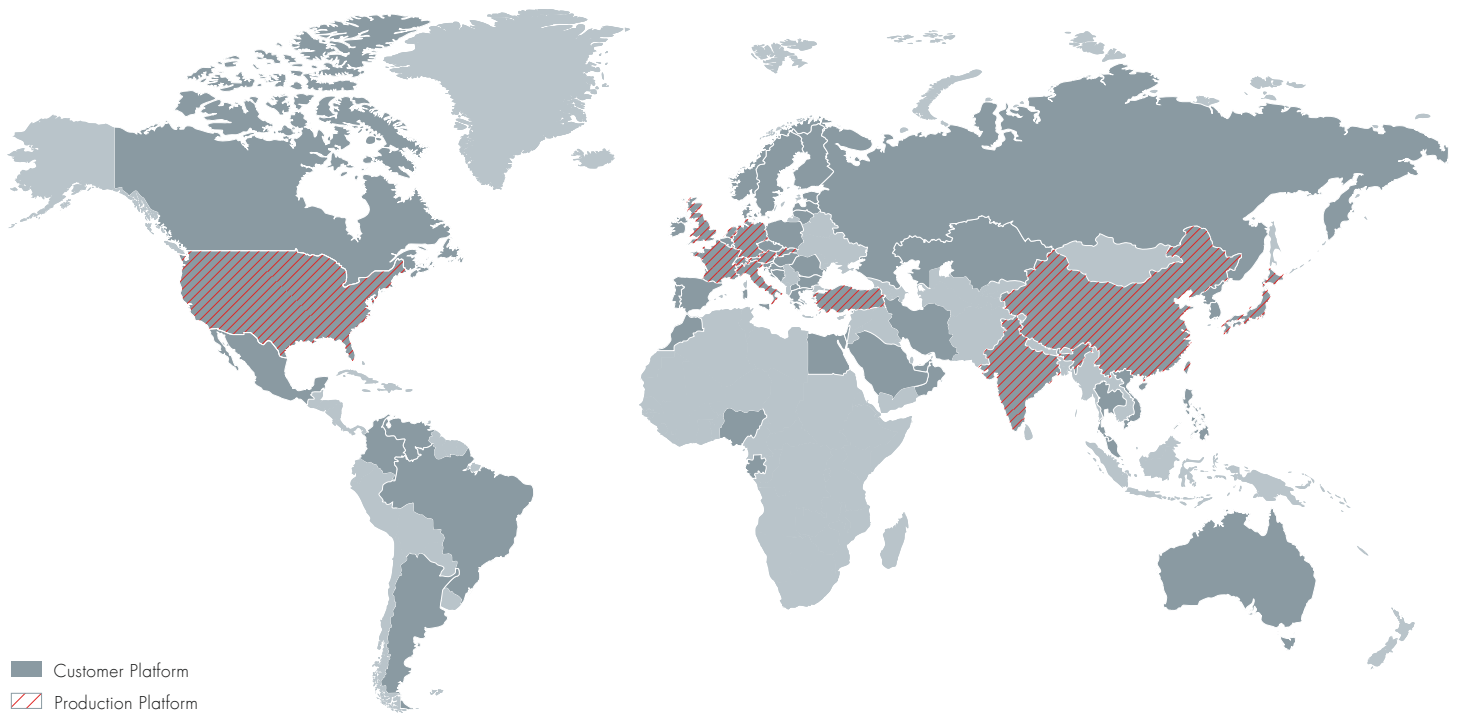
In the future, we will not be able to function without the digitalised processes. Unfortunately, we will, of course, lose a bit of the personal contact.

Services

The Angst+Pfister Group supplies its services to every corner of the globe. We are offering solutions tailored to the customer's specific needs with our local application specialists. We are providing engineering-lead solutions to thousands of original equipment manufacturers in over 50 countries.

Production Platform

Our global production platform spans across 15 countries. In addition to our own state-of-the-art manufacturing, we have reserved capacity with internationally renowned production partners. This allows us to always select the best production location based on our customers' quality, quantity and delivery requirements.



No matter where you are – your gateway
to the products and services of Angst+Pfister:
www.angst-pfister.com

Your benefits at apsoparts.com

- Standard range of over 100,000 items
- Real-time availability display
- Online cut-to-size configurators
- Upload your own ERP order

APSOparts® serves more than 15,000 satisfied customers.



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