magazine for innovative gasket technologies and applications – by revoseal

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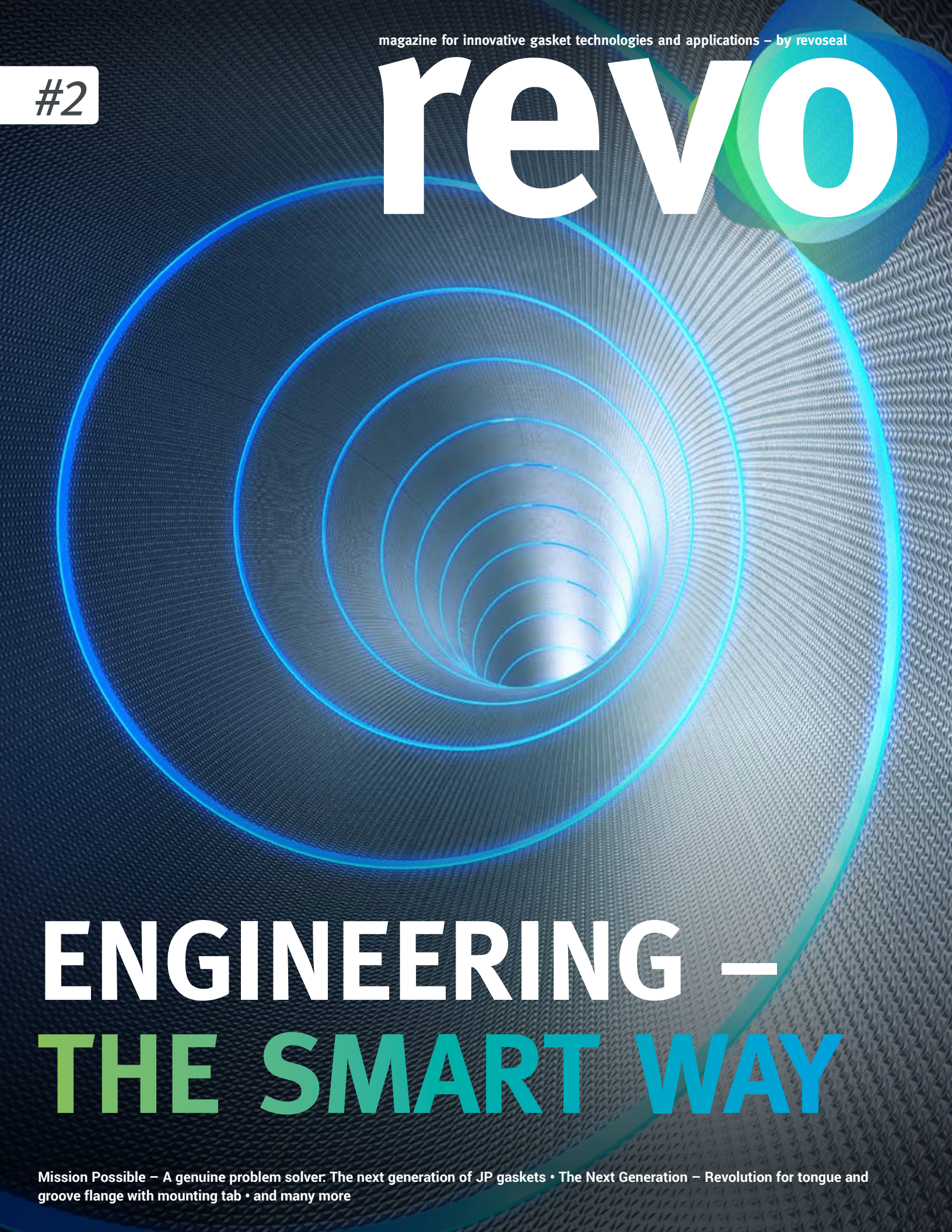


ENGINEERING – THE SMART WAY

Mission Possible – A genuine problem solver: The next generation of JP gaskets • The Next Generation – Revolution for tongue and groove flange with mounting tab • and many more

Dr. Ulrich Horsmann,
CEO Xeless Group

Dear Readers,

As a world forum and international leading show for the process industry, ACHEMA in Frankfurt, Germany, offers the ideal platform for the publication of the second edition of Revo News.

As usual, we provide some topics of general interest in connection with a number of new and refined technological developments. The latter are a result of the close cooperation with our customers pursuing the common goal to eliminate current and recursive problems in the production system of a company.

Product standardization and prevention of contamination are two industry requirements that led to the development of Revolution / PTFE, a solution that conforms to FDA regulations for pharma and food applications. This development of capability made it possible to permanently replace a variety of different seals and to avoid installation errors, while dually reducing the PTFE volume to a minimal level, so that subsequent disposal costs of a seal could be drastically reduced.

An innovative solution can become an industry standard if it can address difficult flange connections. Such a precedent has been set by installing dual sealing cross sections JP-NG to replace multi-piece sealing components. This method facilitates installation, eliminates errors, reduces the assembly costs, and averts complex cleaning of the flanges. In an interview, the operations manager of an industrial plan reported about his interesting experiences with this solution.

In a further article, we provide a forum for GAIST GmbH to present their services. GAIST offers comprehensive solutions for sealing technology based on many years of experience in the scientific environments. Their capabilities grew out of the research fields located at the Fachhochschule Münster (Münster University of Applied Sciences) and their research projects are still the main focus. However, at the same time a wide range of services was created.

An insight on how to determine gasket characteristic values according to the EN13555 standard is given by specialist Michael Reppien (GAIST GmbH). Important gasket data as leakage, mechanical load and creep / relaxation are considered in this article. Due to this development, both computer and system operators are now able to perform calculations and strength tests at temperatures of 600 °C and higher.

Another result of our credo, "listen to your customer," is the development of Revolution NF, a product for tongue and groove flanges with the additional featured "mounting flap." The idea sounds simple, but in practice appears brilliant. The flap facilitates the positioning during assembly, enables the disassembly with minimal efforts and in one piece, and avoids complex cleaning of the groove.

"Make your life easier and still better" is supposed to be a motto in your professional everyday life. Revoseal Vario can help you to achieve your business goals. The patented metallic seal connected with a worldwide unique centering system reduces the variety of pressure-dependent seal types to one independent system, prevents incorrect installation, simplifies storage, reduces costs, and increase the tightness and safety level.

We will be pleased to present to you these topics and many more at ACHEMA trade fair. As a heads up, our booth is C57 in hall 9.0.

Content

-93%

is the reduction of the PTFE volume in a revoseal Revolution PTFE gasket compared to a regular PTFE gasket – thus reducing the disposal costs proportionally.

Revolution PTFE

The formula for success in pharmaceutical and food industries

Due to the existing risk for contamination, it is necessary to utilize a variety of different static sealing systems in the pharmaceutical and food industries to guarantee the purity of the final product. The various production steps ranging from raw material processing to energy production and completion of the purified product create a high chance for contamination and leave little scope for further standardization in the future.

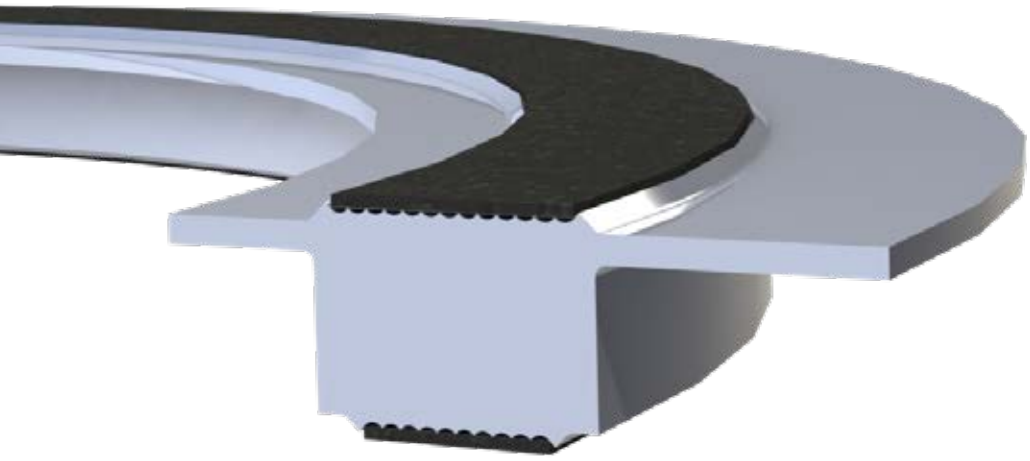
Undoubtedly, it would mean for a significant improvement if one could use a single sealing concept, whether it be process steam production or the technique of using sterile steam, processed water, ultrapure water and WFI (Water for Injection). Revoseal successfully implemented such a project using its patented "Revolution" spring-tooth-system with a globally operating pharmaceutical company.

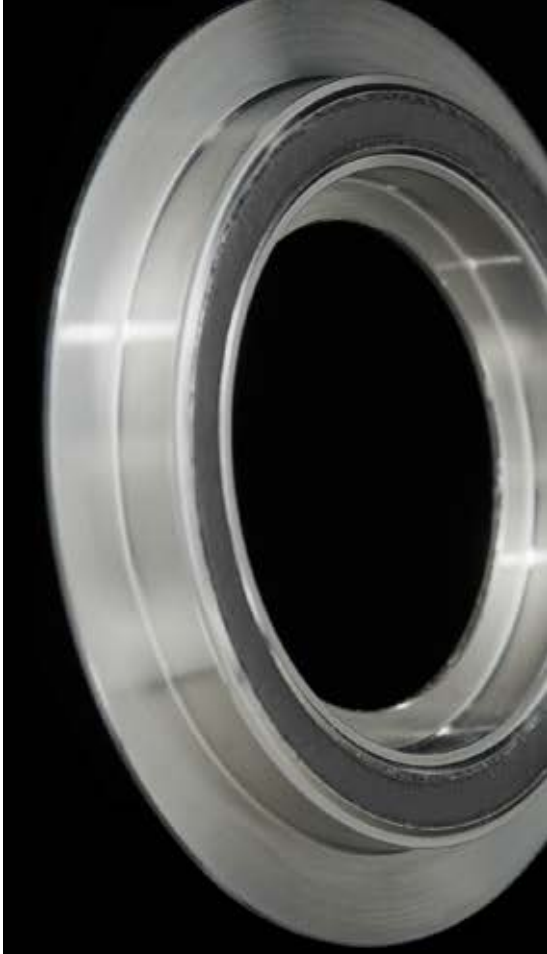
Professionally installed, Revoseal used a metallic sealing that meets the high purity criteria of a pharmaceutical company. This solution consisted of a tooth-like embossed stainless steel material and a 100% pure PTFE layer without fillers. The seal design and the used materials met FDA standards, which were provided as a written confirmation, and then verified and confirmed by the pharmaceutical company. The specific values determined by GAIST confirmed the seal designs analytical strength verification, further proving the high quality and long-term sealability.

Another substantial advantage is the drastic reduction of the PTFE ratio. PTFE is known to be a material of virtually unlimited chemical resistance with minimal creep tendency and has numerous applications. However, the biggest disadvantage is caused by the high disposal costs that are further increasing as a result of new environmental regulations. Consequently, every plant operator should strive to reduce the volumes of PTFE to very low levels.

Compared to conventional seals, Revoseal's "Revolution" gasket makes it possible to reduce the PTFE volume **from 100 % to less than 7 %** thus reducing the disposal costs proportionally.

By using the “Revolution FDA” gasket, you will be in a position to not only reduce the seal variety and avoid improper installation, but also reduce the costs for storage and disposal while protecting the environment at the same time.





Mission Possible

A genuine problem solver: The next generation of JP gaskets

The phrase "Listen to your customer," is one of the most important principles that suppliers, account managers and product developers always keep in mind. Take a look at the following example and you will understand why this guiding principle has topmost priority.

Revoseal's new development in sealing solutions is namely a result of intensive dialogue between Revoseal and a major producer in the chemical industry that relies on high quality sealings.

Our customers initial concern had to do with an extremely unfavorable connection between two components which require a static sealing. The first component being the flange side of the pipe, which was designed with a raised face sealing area (flange form B), and the second being a valve of different design based on a groove geometry (flange form C).

The plant operator had already tested various sealing solutions with little success, leading to issues such as leakage or short lifetime. A last-ditch effort using a non-practical solution to the problem was to combine a tanged graphite gasket in the groove, a stainless-steel bushing and a corrugated graphite ring. Unfortunately, as all engineers know, an optimally working production plant needs as little interfaces/sealing points as possible, and thus it was a failure. The best solution was and remains as reducing the number of sealing components to a minimum of one. This ambitious target was successfully achieved by usage of the "Revoseal JP-NG."

Why is the "Revoseal JP-NG" gasket the best choice in this case? A dual sealing concept bridges the connection between a raised face flange and a grooved flange. In addition, this process leaves the exceptional sealing properties of the JP technology unchanged. There are no restrictions relating to temperature, pressure and tightness.

The benefits are obvious:

- "One piece design"
- Quick and easy assembly as well as disassembly
- Adaptable for many related connections
- Incorrect assemblies are impossible
- No residues of graphite
- No complex cleaning
- Reduced stock

The Next Generation

Revolution for tongue and groove flange with mounting flap

Sometimes the supposedly minor developments have a significant impact on the existing practices. Besides reducing costs, they simplify assembly and disassembly, and facilitate a quick and clean project.

As a function-optimized gasket for all flanges according to DIN EN 1092-1 Form C (up to DN400), Revolution tongue and groove is a prime example of a solution combining all of these advantages in one piece.

Each maintenance staff is aware of the difficult disassembly of a graphite gasket: First it must be installed with high stress leading to intensive sticking when it should be removed after life time. Furthermore, it is necessary to clean the groove in a complex way to guarantee a correct positioning and a proper function of the new gasket. This is a very time and cost intensive procedure.

The good news: this method is now a matter of the past! The Revolution NF – also based on the well-known spring-tooth seal technology – opens up completely new possibilities. How does the new technology work? Correctly installed, it results in a metallic primary seal. The graphite coating will be pressed carefully, whereby the applied surface pressure will be limited. In this fashion, the graphite will be blow-out safe contained and the erosion of graphite can be minimized in case of disassembly of the gasket. Thanks to this solutions, a complex cleaning of the groove is not necessary.

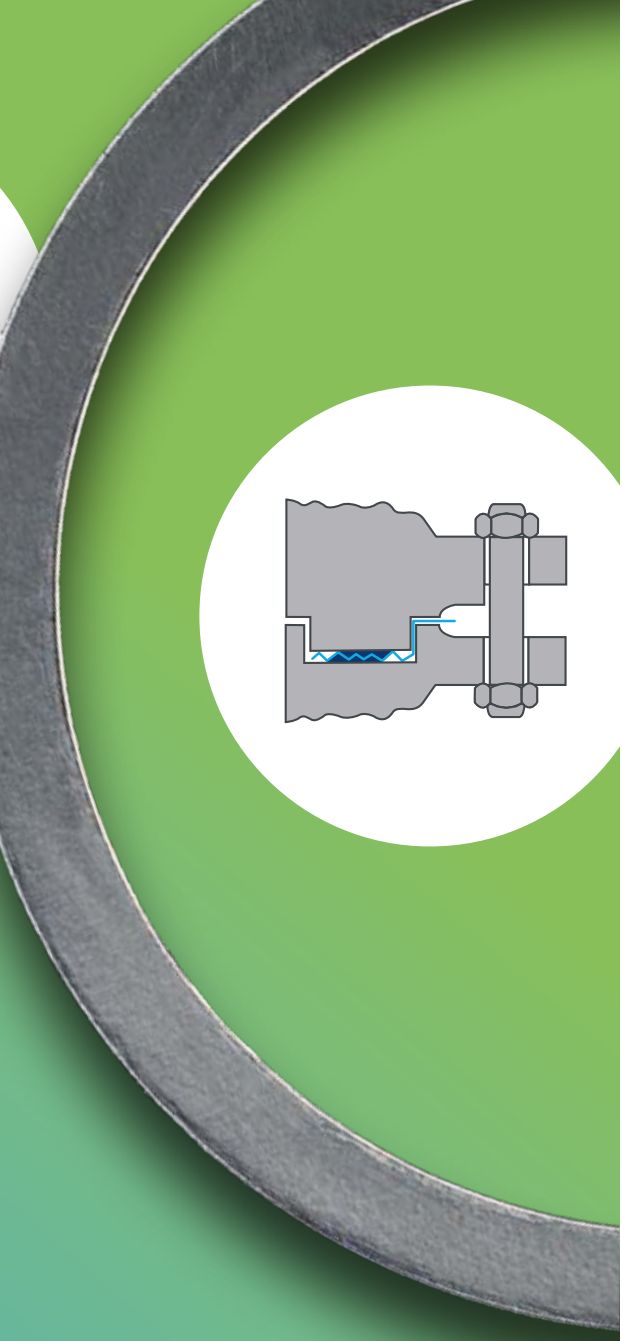
The mounting flap facilitates the positioning of the gasket even if the flanges are difficult to access. The only 0,1 mm thick flap bends upwards during installation and eases identification when installed. When opening the flange, the gasket can be easily removed using the flap and pulling it without any great effort. A new gasket can be installed without complex cleaning of the groove.

About Revolution

The revolution gasket is an embossed, flat profile gasket consisting of a flexible stainless steel carrier and encapsulated graphite or PTFE on both sides. By the revolutionary construction and flexibility of the embossed cog height double metallic sealant, an encapsulation of the graphite or PTFE is guaranteed. Thanks to its wide application range, Revolution is the alternative to all conventional flat gasket types.

Highlights

- Temperature: from -200°C up to + 500°C
- Pressure range: from vacuum to 64 bar (400 lbs)
- Over-achieves TA-Luft and VDI 2290 in connection with a leakage check according to EN 1591-1 (also at using screw of minor quality)
- Standard material 1.4571
- Available for DIN and ANSI – flanges to DN 400 / 16”
- Available with graphite or PTFE coating
- Total thickness 1.6 mm (+/- 0.1 mm)
- Fire Safe Certificate according to API 607 (also for PTFE) and blow-out resistance according to VDI 2200



The inserted mounting flap facilitates the positioning of the gasket even if the flanges are difficult to access.

An interview with Hans-Georg Döring

Hans-Georg Döring has 40 years of professional experience in chemical industry. 1979 he completed an apprenticeship as a craftsman with Bayer AG. Subsequently he attended an evening technical school and became a specialist engineer. From 1988 to 1995 he was Plant Engineer in ABS Plants at Lanxess AG. In the following years he was responsible for the development of technical plants and projects > 60 millions in Spain, USA and Germany for Bayer Technology Services. Afterwards the 54 years old specialist was responsible for three subdivisions in company Bayer CropScience AG as plant engineer. Since 2017 he has worked as Senior Project Manager at Covestro AG. In this company he is responsible for site engineering projects in North-Rhine Westphalia.

How did the collaboration with Revoseal take place?

Döring: Revoseal, providing the appropriate solutions, was already previously our partner for a different operational unit. In the course of this continuous and intensive dialogue at the company's location also the problem of the flushing process with tongue-/groove smooth joining was subject of discussion.

What exactly does this mean?

Döring: About 80 % of the old plants in this special manufacturing area were equipped with tongue-/groove joining flanges. The inline hoses that are used at the flushing and emptying procedure all are equipped with raised face flanges and PTFE Inliner. And the hose connections are not feasible with groove. The hoses with inlays are only equipped with raised face flanges so they cannot be connected with tongue-/groove pipelines. As the most secure solution we have used so far graphite layers with corrugated ring. In order to improve this system Revoseal intensively looked for a manageable and practicable solution.

What is the result?

Döring: The new connection between raised face flanges and tongue-/groove flanges with only one gasket is the result. A dual use gasket that is reusable and that is charcterized by a flat sealing on the right side and a tongue sealing on the left side – all in one component! Apart from fulfilling the applicable standards and requirements the most important benefit of this project was the acceptance of the new solution by the employees that are really happy with it and the accompanying work simplification.

What are further concrete advantages?

Döring: An evaluable and secure sealing system, easy handling from tongue and groove connections, the reuse of the sealing after finishing and saving costs. And especially any leakage at groove / raised or flat face connections is definitely eliminated. Furthermore, this sealing meets the standards according to the new draft design of TA Luft.

How do you judge the cooperation with Revoseal?

Döring: The complete process of cooperation was very constructive and practice-oriented in close collaboration with the employees involved. Even the timeframe for the development of the solution was very tight. The technical aspects were handled very well and also the practicable implementation. The complete staff was introduced with the new flange connection during all shifts – even during the night shifts. Additionally, Revoseal gave a comprehensive introduction to all employees how to apply the solution correctly. This was an excellent service!

A real all-rounder: System Vario

Form closure and variable installation set new standards

Operators of large industrial and process plants are often faced with several issues regarding C-parts and the associated C-parts management. For example, consider static seals. One might think that such problems should no longer arise thanks to improvements in work standards and definition of several tube categories, but this first impression is misleading. Even in these cases there is potential for improvements.

One such area of improvement is in the installation of the seal. Often during installation, the centering rings of metallic seals are installed solely using identical nominal diameters with disregard to the various pressure levels of the seals which are distinguished by the outside diameter. When not using corresponding dimensions and pressure classes, faults and failures of the sealings are expected. However, the Vario Centering System prevents one from improperly installing the seal while at the same time reducing the number of seal types to be stored and increasing system availability.

This solution is possible thanks to the shape of the centering segments that the Vario Centering System provides ensuring the balance between different outside diameters. During installation the seal will be turned radially against the screws. In this manner the sealing can be positioned absolutely centric. Afterwards all screws can be tightened with the required tightening torque, thus guaranteeing there is no risk of confusion and a proper centric installation. Furthermore, time-consuming positioning of segments by means of anti-fatigue bolts is no longer necessary and can be avoided altogether.

The Vario System replaces cam profile gaskets, spiral wound gaskets and serrated gaskets in all current pressure levels by using one single geometry. This solution is accomplished by using the primary metallic sealing of the JP sealing system whereby the graphite only acts as a secondary sealing element.

This example shows that a Vario gasket can replace up to eight dimensions of a cam profile gasket with identical nominal diameter but various pressure classes.

All benefits at a glance:

- Significant reduction of different variants
- Precise centering of the sealing
- Significant cost savings in procurement and storage
- No risk of confusion
- Easier assembly when using anti-fatigue bolts

How does the Vario-system work?

If a customer has only DIN-flanges up to PN 160, he can replace four gaskets by one gasket with the Vario-centering system. If a customer has only ANSI-flanges up to 600 lbs, he can also replace four gaskets with the Vario-centering system. The customer using DIN as well as ANSI flanges in a.m. pressure ratings can replace eight dimensions of two different standards!

ANSI-flanges

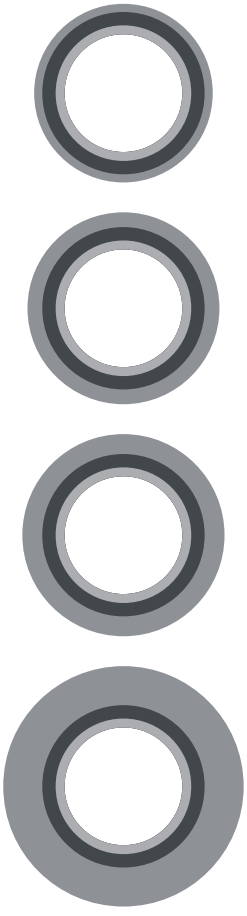
6“,
600 lbs

6“,
400 lbs

6“,
300 lbs

6“,
150 lbs

DIN-flanges

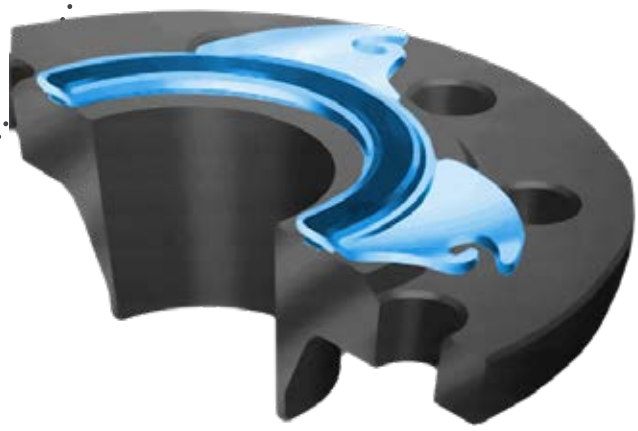


DN 150,
PN 10/16

DN 150,
PN 25/40

DN 150,
PN 64

DN 150,
PN 100/160



Michael Reppien
GAIST GmbH

EN13555 testing standard and the „gasketdata.org“ - datasheet

The testing standard EN13555 which was amended in 2014 is the basis for the calculation of gasket characteristic values that are indispensable for the flange calculation to EN1591-1. Calculations with this standard are required for many media-carrying plants as proof of strength and tightness of a flange connection. Therefore, they are often the prerequisite of relevant operating licenses.

All gaskets being part of the series of standards according to EN1514 and EN12560 can be characterized and evaluated with regard to performance and tightness due to the test methods that are listed in EN13555. For that reason the semi-automated testing machine is equipped with raised face testing platens of the dimension DN40/PN40 according to EN1092-1 or NPS4 Class 300 according to EN1759-1 respectively. Testing platens are exchangeable and shows sealing surfaces that are similar to flange surfaces with their surface roughness Ra in the range of 3.2 µm < Ra < 6.3 µm. Thus meeting the specifications according to the flange standards EN1092-1 and EN1759-1. In order to withstand the loading which is exerted on the sealing the testing platens feature the necessary form stability. The load changes that are simulated in the testing system are carried out with 0.5 MPa/s (0.1 MPa/s to PTFE-based gaskets) and temperature changes with 2 K/min.

For easier removal and reduction of the cleaning requirements and consequently for the protection of the surfaces the standard permits the use of stainless steel foils with a thickness of 50 µm for tempered me-chanical tests. Experiences up to now have revealed that test results are influenced conservatively by using stainless steel foils. That means that the results slightly deteriorate in general. The exact impact of stainless steel foils on the achieved results requires further exami-nation.

The characteristic values need to be determined by examination of two trials being in full compliance with the standard. Furthermore, all test items have to be conditioned in advance. That means that they are stored for at least 48h in a climatic chamber at 23±5°C and 50 ±5% rH. Testing platens have to show a temperature of 23±2°C at the beginning of each test.

In principle it is possible to divide the testing standard in two sections. On the one hand the leakage behavior of gaskets is determined, on the other hand the mechanical strength and the setting behavior are tested.

The determination of the leakage behaviour follows a prescribed sequence comprising different loading surface pressure and unloading surface pressure that are intended to simulate the assembly process of a gasket with the inevitable surface pressure drop as a result of setting and ageing processes. Next the leakage is determined by measuring the helium permeation according to the different surface pressure settings. The subsequent presentation of the determined leakage values in a logarithmically scaled curve diagram allows the easy reading of the values Qmin(L) and Qsmin(L) by interpolation between the individual measurement values. Qmin(L) corresponds to the respective intersection with the tightness class L during loading, Qsmin(L) describes the intersections according to L during the respective conducted unloadings. The plastic deformation of the sealing material that raises during the loading results usually from lower and often flatter unloading curves depending on the type of sealing and design as well as the previous applied loading surface pressure (see chart 1).

Each gasket will lose its thickness in the course of their life cycle, type-depending already the largest amount during the installation. As mentioned above this permanent deformation results in a reduced leakage: The gasket material creeps in the roughness depth of the test platens where it compresses. Less cavity leads to reduced surface leakage, a lower gasket thickness leads to a lower permeation surface in the case of the same raw material. This in turn leads to lower diffusion. However, decreasing gasket thickness leads in normal operation also to surface pressure loss due to the construction of a flange connection. Consequently, the determination of the creep relaxation in a simulated deployment model limited in time is indispensable for the flange calculation. For the simulation of a creep-relaxation the gasket is loaded with a usual flange pressure so that after a short dwell time due to the adjusted simulation of stiffness a creep-relaxation can take part at room temperature as well as at increased temperature. Creeping corresponds to the reduction of the gasket thickness at constant load, relaxing is the surface pressure loss with unchanged gasket thickness. The composed process is simulated and recorded by the testing machine (see chart 2).

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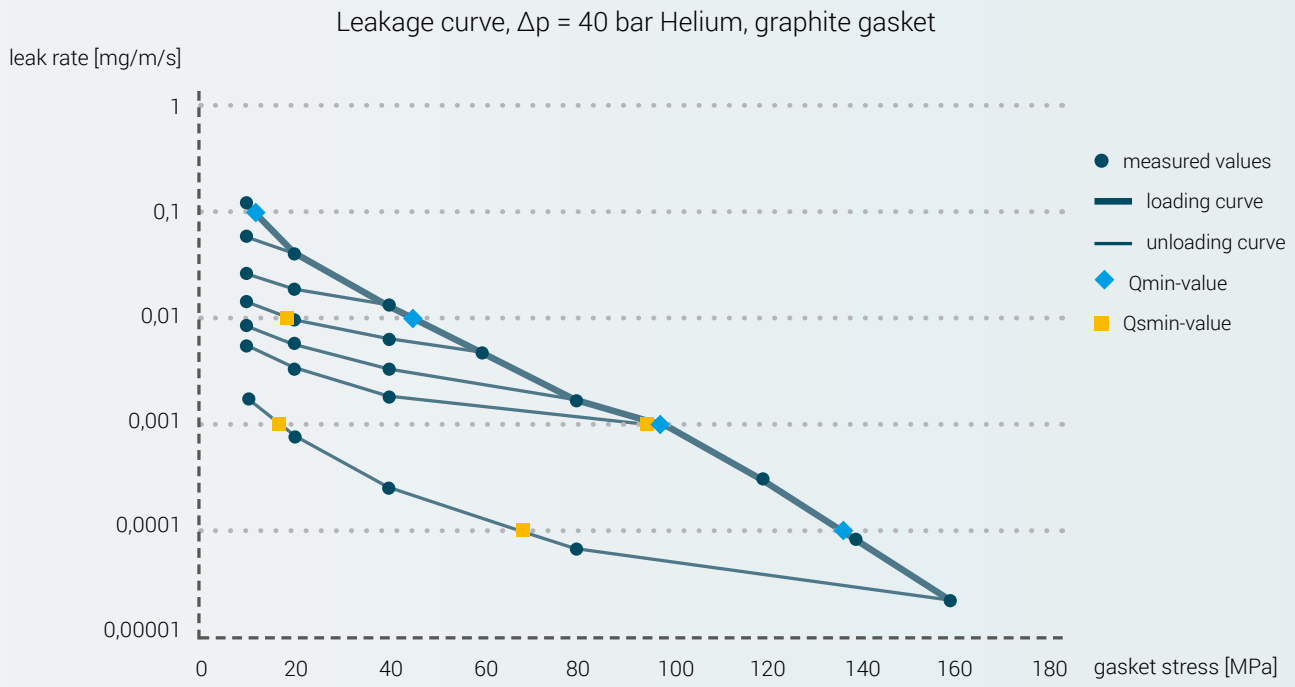

Chart 1: Leakage diagram of a graphite gasket

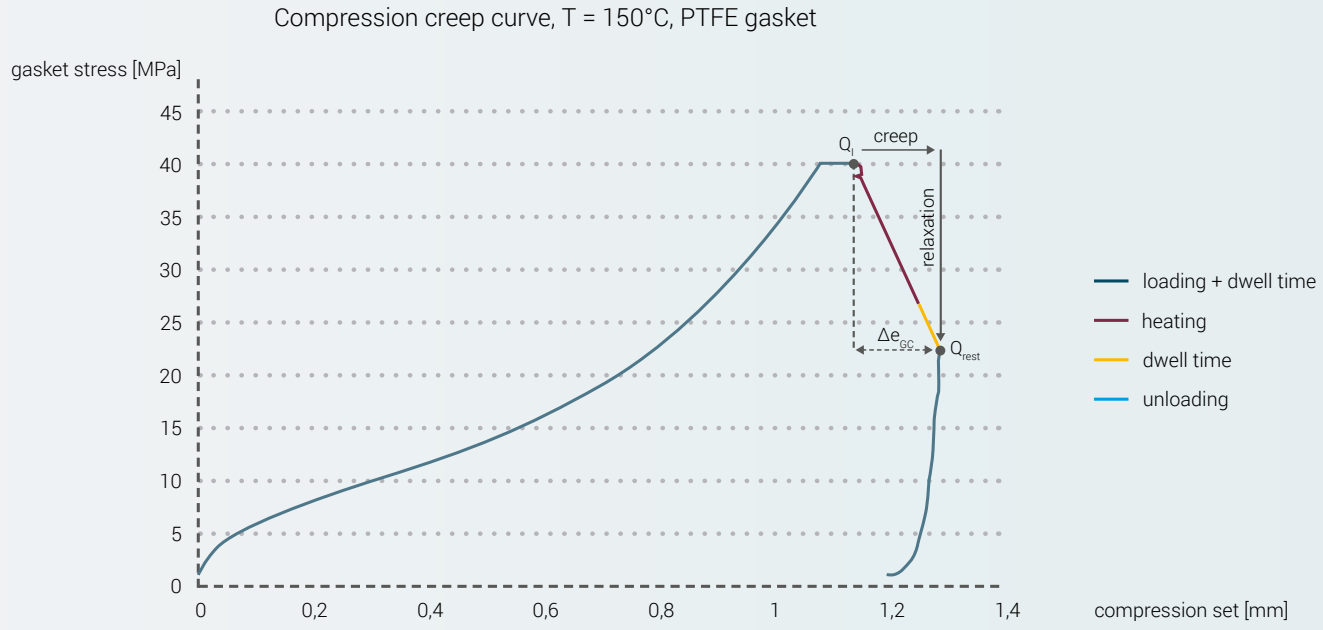

Chart 2: Creep relaxation test with a PTFE flat gasket

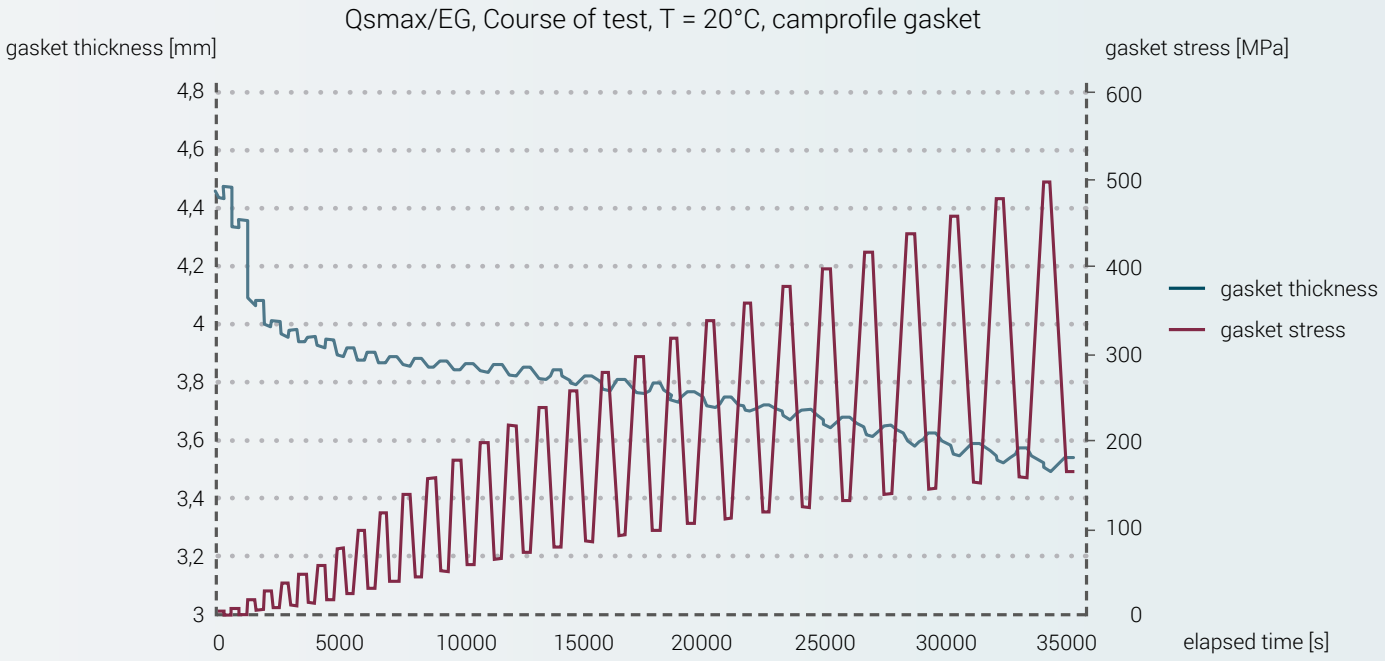

Chart 3: Test sequence of a cyclical Qsmax compression test

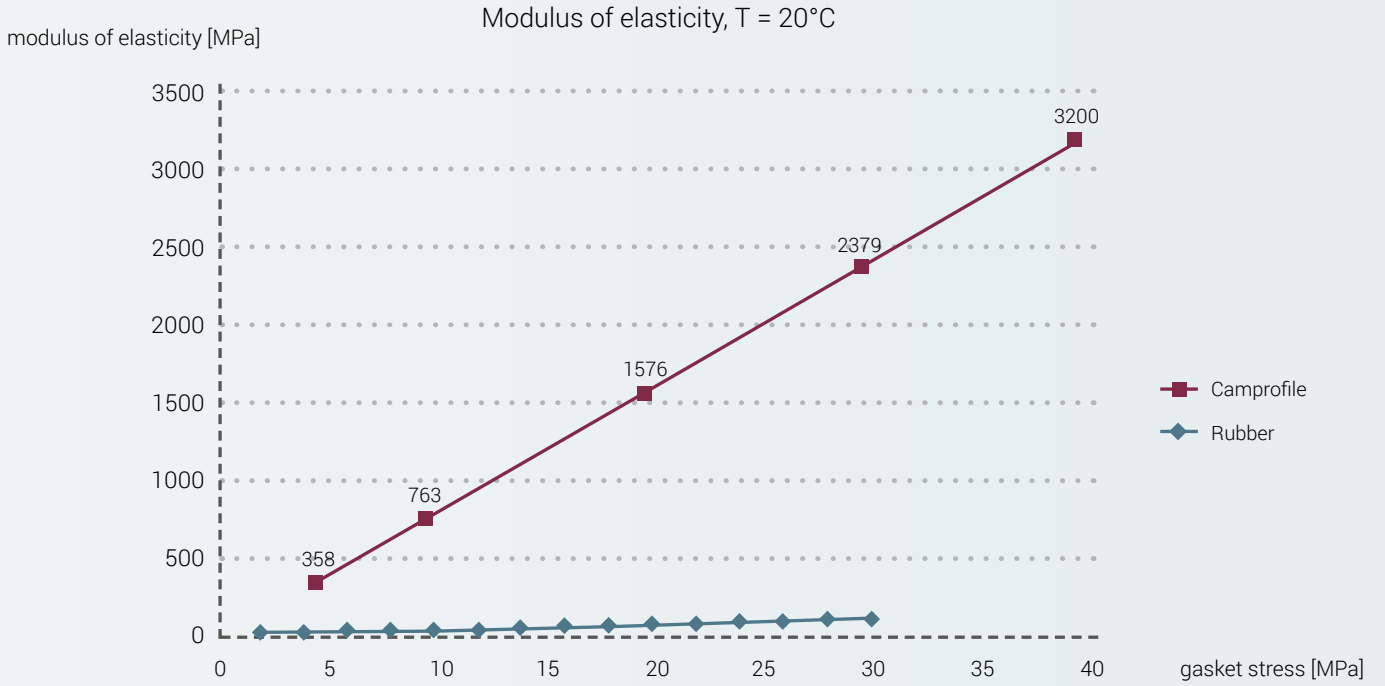

Chart 4: E-modulus of a rubber gasket and a camprofile gasket in comparison

Emerging from the surface pressure loss there finally can be calculated the value PQR(QI/T) which defines the ratio between residual surface pressure Qres and the initial surface pressure QI while T corresponds to the test temperature. The gasket thickness difference being caused by the creeping is displayed as value ΔeGc. Knowing well that reality cannot be depicted during the heating process and a four-hour dwell time the results nevertheless suffice for the flange calculation and enable an interpretation even for significant longer periods as well.

In order to cover different operation scenarios it is common practice to simulate three surface pressures at room temperature

and two further ones at increased temperature. The highest temperature should correspond to the maximal design temperature of the gasket while the average temperature – as its name implies – is defined in a range between room and maximum temperature. Two of the defined surface pressures should be located in the common range of use. The third and highest should correspond to the temperature-dependent maximal tolerable surface pressure of the gasket.

For determining the maximal tolerable surface pressure Qsmax of a gasket a cyclical compression test is required as each loading follows an unloading to one third of the loading surface pressure. Each surface pressure level is holded a total of five minutes. In this period of time the gasket can creep. Essential for the generated results are the gasket thicknesses after creeping, that means at the end of every dwell time. The increase of the surface pressure between the several levels takes at first 10 MPa, after arriving at a loading with 60 MPa the growth will be doubled on 20 Mpa (see chart 3).

In general the testing machines permit a maximal surface pressure at 230 MPa concerning to flat gaskets, dimension 92 x 49 mm. Smaller gasket surfaces can also show significantly higher values, for example 1000 MPa. Any compression test should be performed at the same temperatures as applied at creep relaxation tests, that means room temperature and at least two increased temperatures.

In a first step, the compression test defines the maximal tolerable surface pressure (at a defined temperature) as the surface pressure the exceeding of which provokes abrupt collapse of the gasket or other signs of an overload. This surface pressure is indicated by Qsmax/T whereby T will be replaced by the information about the test temperature. Each value Qsmax/T needs to be confirmed by appropriated creep relaxation tests.

In a second step the loadings and unloadings allow the information about the spring back ΔeG concerning each loading surface pressure QA. The product from the surface pressure difference ($^2/_3$·QA) and the quotient from the gasket thickness for the start of the unloading and the spring back (eQA/ΔeG) provides the module EG(QA/T), whereby QA is to be replaced by the information about the loading surface pressure and T by the testing temperature. In summary, smaller EG modules indicate a high recovery, higher EG modules a smaller recovery, as shown exemplary by comparison of E modules of a hardly recovering camprofile gasket and a strongly recovering rubber gasket (see chart 4).

Finally, after having submitted a complete data set to the gasketdata database www.gasketdata.org provided by Münster University of Applied Sciences (FH Münster) the values can be published clearly arranged with a two- or three-page fact sheet. All previously published fact sheets were ascertained by independent test institutes or, in case of proprietary tests, verified by an independent crosscheck.

Author: Michael Reppien, Managing Director of GAIST GmbH, May 2018

GAIST
Measurement- and Sealingtechnology

GAIST GmbH is a research and development service provider, manufacturer of testing equipment and training provider in the field of sealing systems for manufacturers and users. Since its founding in 2011, GAIST GmbH (Gesellschaft for applied engineering Steinfurt) developed to a leading test laboratory in the field of testing services for sealing elements and components of the industry. The investigation of sealing materials and systems according to common national and international standards (eg TA Luft, EN13555, ASTM F36) is also as included in the portfolio as the development and implementation of customized testing tasks.

In-house engineering, own electrical engineering and software development for operation and automisation put GAIST in the position to offer high quality testing equipment. Solutions for testing requirements in production, laboratory and development are also custom-made by GAIST and implemented in short time.

For the international clients in Chemical, Pharmaceutical, Automotive, Research, Aerospace Aerospace GAIST also offers training courses for engineers, technicians and assembly personnel (e.g. according to EN1591-4), which are conducted in the training center of GAIST but can also be done in-house.

As an active member of the DIN Standards Committee and member in other independent working groups, in which the topics environmental protection, plant availability and quality assurance are in focus, we prove our expertise.

The proximity to the FH Münster, one of the most research-intensive universities of Germany, enables GAIST to offer its customers a unique bandwidth of research methods as single source provider. Interdisciplinary cooperation of different entities allow the observation of a complex problem from many different viewing angles, e.g. in the determination of causes for damages. GAIST cooperates with the different facilities in electrical engineering, mechanical engineering, chemistry, plastics technology, always efficient and with the focus on goal oriented solutions for the customers.

Kontakt

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Complex, risky or dangerous?

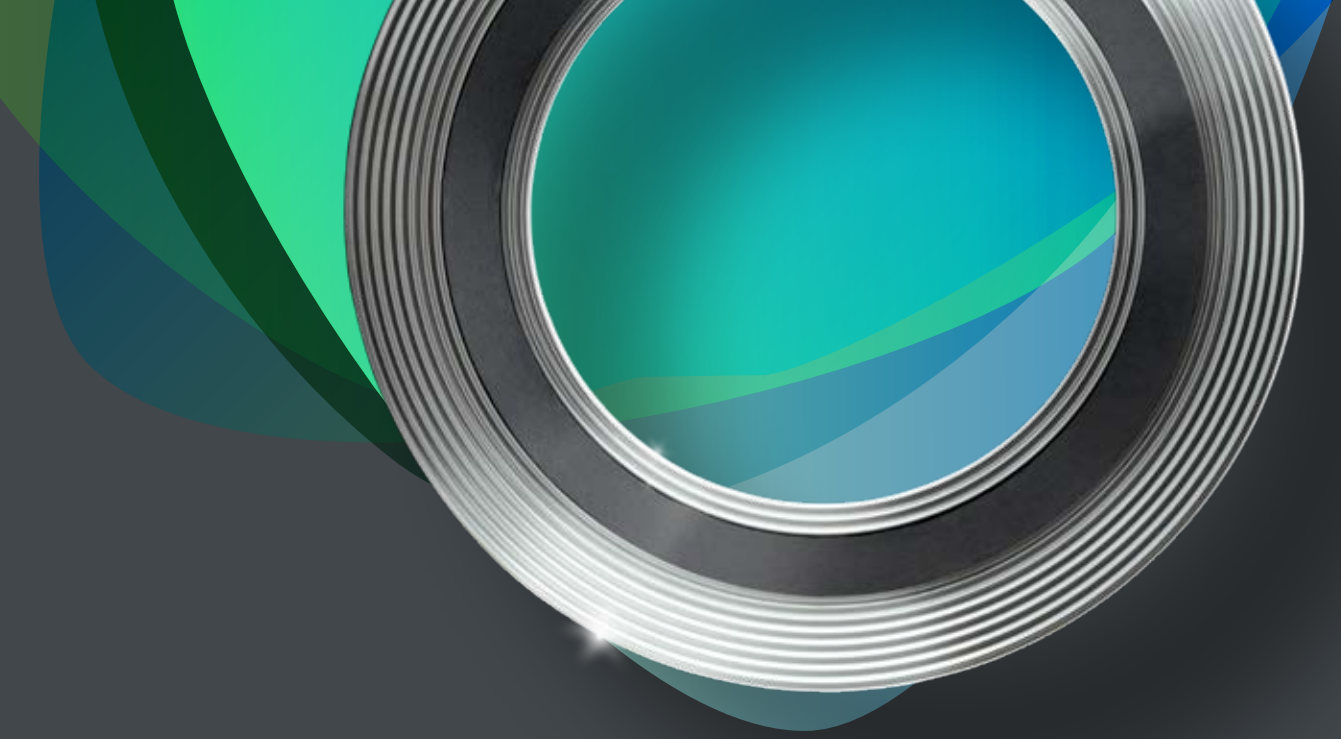
TEC-LOG: Experienced specialist for technical and logistic services

TEC-LOG GmbH was established in 2006 and is now a subsidiary of the Xeless Group as a systems supplier for technical and logistic services. Since its foundation, TEC-LOG has systematically perfected its services based on more than 20 years of practical experience. TEC-LOG GmbH is based in Parsberg, Germany and focuses on service lifecycle management of various production facilities. As a customer service provider independent of manufacturers, TEC-LOG GmbH prides itself as an innovative partner when it comes to the assembly of new machines/ plants, servicing, industrial cleaning, machine and plant relocation as well as transportation and logistics.

Today, TEC-LOG is active throughout the entire world providing the proper balance of state-of-the-art assembly equipment and experienced specialists to relieve customers from the strenuous and tedious work associated with relocating plants and machinery, assembling new equipment and undertaking repair work on sometimes highly complex production plants. By using the right technology at the right time together with intelligent solutions, TEC-LOG specialists master every challenge and meet all requirements with regard to cleaning machines, plants and production halls at a consistent high standard of service.

All of TEC-LOG's areas of work are staffed by its own expert specialists from the fields of mechanical and plant engineering or electrical engineering. At the same time TEC-LOG offers reliable planning security by guaranteeing fixed deadlines and fixed costs. This allows us to consistently meet our customers' high-quality expectations in every area of work. TEC-LOG has documented this performance since 2008 with the ISO certifications for quality management pursuant to DIN EN ISO 9001:2008, for their environmental management system pursuant to DIN EN ISO 14001:2009 and for their health system pursuant to DIN OHSAS 18001:2007.

“ We want to convince our customers anew every day by presenting ourselves on the buyer’s market as a trustworthy and reliable partner having the capability to inspire and fascinate our customers.”



This is not a gasket. This is

risk management

revoseal

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