

A large, curved tunnel under construction. The tunnel walls are made of concrete segments with visible rebar. A worker in a blue uniform is walking away from the camera in the distance. The lighting is bright, highlighting the texture of the concrete and the structural elements.

SEAL ABLE

pioneers in profiles

SEALABLE TUNNEL GASKET SOLUTIONS

Innovative and experienced



SEALABLE
pioneers in profiles

The SEALABLE segment gaskets comply according to the main worldwide guidelines.

SEGMENT GASKETS INNOVATIVE AND EXPERIENCED TUNNELLING SOLUTIONS FROM SEALABLE

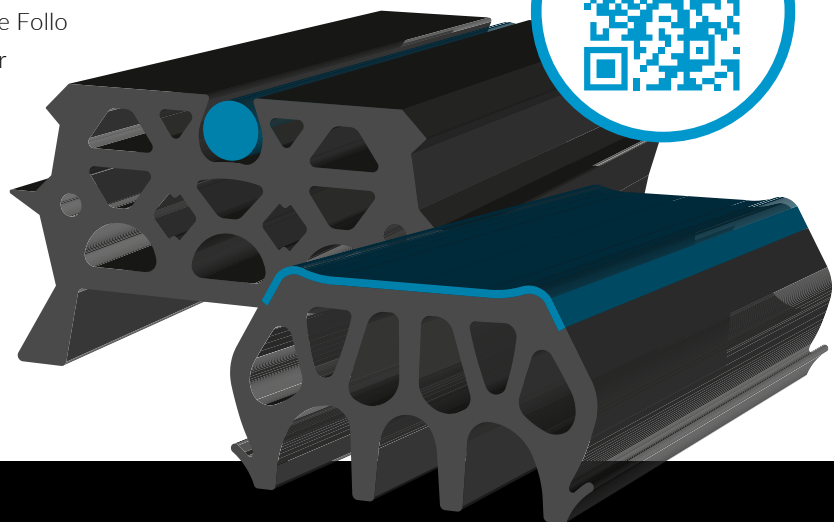
With increasing urbanisation, underground infrastructures are becoming increasingly important. Tunnel constructions are needed in many areas: whether for metro lines, rail and road traffic, supply and disposal lines or flood tunnels for flood protection. Durability, safety and reliability are our focus, while requirements are becoming increasingly complex.

High pressure, seismic activities and geological features (gases, oil, etc.) require the precise and project-specific selection of tunnel segment gaskets and combinations. We offer high material quality, which is decisive for the durability of such structures. Our products are based on customer and market requirements, place high demands on innovation and frequently lead to patents.

SEALABLE segment gaskets first started in 1969 with the New Elbe Tunnel in Hamburg (Germany) sealed the Follo Line Tunnel in Oslo (Norway) and are now used for the Grand Paris Express projects in France. They are available in more than 50 different cross-sections to cover the entire range of today's various kinds of projects. Metro tunnels, River crossing tunnels, Road and Railway tunnels, Cable tunnels, Waste water and Water supply tunnels all around the world can be found on a long list of more than 790 successful reference projects.

In addition to the standard program shown, SEALABLE can offer various tailor-made solutions. During many years of deep involvement in the largest, deepest and riskiest tunnel projects, SEALABLE has setup international standards for profiles, testing methods and quality control systems, all of which are established in many projects with our international partners.

Our expertise in tunnel gaskets and the demand for innovative solutions often come into play when the competition throws in the towel. After all, we rely on confidence in our work to provide you with security when projects and challenges seem too complex.



WE ARE INNOVATION.

We work with you to develop ideas and take them through to product maturity.



WE ARE EXPERTS.

You benefit from grown resources, structures and know-how in terms of a trusting customer relationship.



WE ARE REGIONAL-GLOBAL.

Regional roots combined with a worldwide network of long-term partners offer you reliable service.

ANCHORED

With more than 10 years of experience, SEALABLE developed and introduced first gaskets that are directly anchored in the concrete segment, offering a variety of remarkable advantages:

- Leaner process during the gasket installation
- Cost saving at segment production
- Better adhesion of gasket to segment groove
- Higher tightness performance through maximized water resisting gasket surface into the ring system
- Environmentally friendly

GLUED

Glued gaskets are the traditional kind of installation of the SEALABLE gasket and adhesive system.

- Longest experience with this type of gaskets since 1969
- Application is possible at the precast plant or at the tunnelling site before installation of the segments
- Easy to check
- Easy to repair in case of damage

MIXED EVOLUTIVES

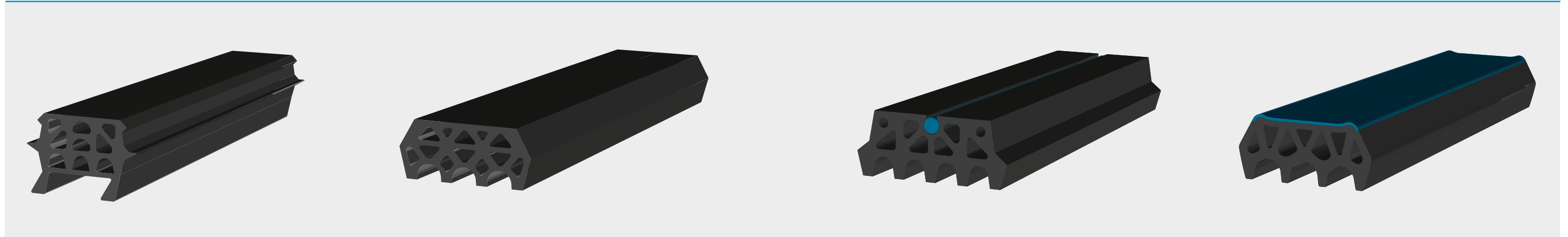
The Composite Seal combines two different sealing technologies - a compression seal and a hydroswelling round cord.




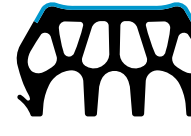
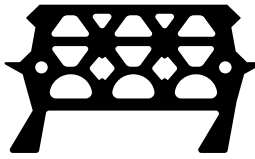



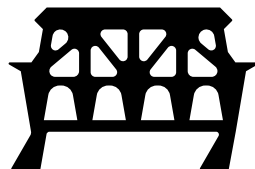
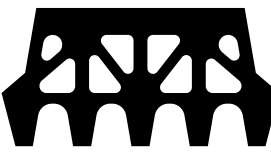
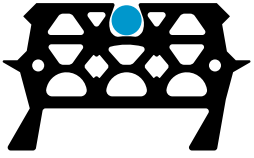
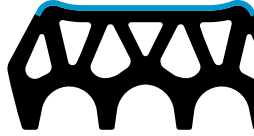
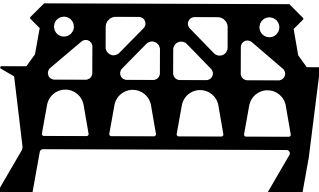

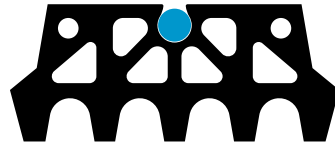
- Additional sealing capacity due to high performance hydrophilic round cord
- Self-healing effect in case of leakages due to improper ring build
- Insertion of the hydroswelling cord right at the shaft before the segment goes into the tunnel

COEX

Coex gaskets are provided with a thin colored hydrophilic layer at the contact surface.

- Expands when in contact with water
- Swelling process starts after a few hours of contact with water
- Even after years embedded in dry environment the swelling reacts in the same way



<p>M38933 Doha 26 x 10 mm</p> 	<p>M38596 Portland 26 x 10 mm</p> 	<p>M38912 Lai Chi Kok 26 x 10 mm</p> 	<p>M74008 Bangalore 26 x 10 mm</p> 
<p>M38936 Rennes 33 x 10 mm</p> 	<p>M38903 Mexico 33 x 10 mm</p> 	<p>M38916 Hong Kong 33 x 10 mm</p> 	<p>M74002 Singapore 33 x 8 mm</p> 
<p>M80103 West Gate 36 x 12,5 mm</p> 	<p>M38587 Groene Hart 36 x 12,5 mm</p> 	<p>M38923 CVV 33 x 10 mm</p> 	<p>M74029 Jurong Island 36 x 11 mm</p> 
<p>M38928 Oslo 44 x 12 mm</p> 	<p>M38573 Weser 44 x 12 mm</p> 	<p>M38925 Alaskan Way 44 x 12 mm</p> 	



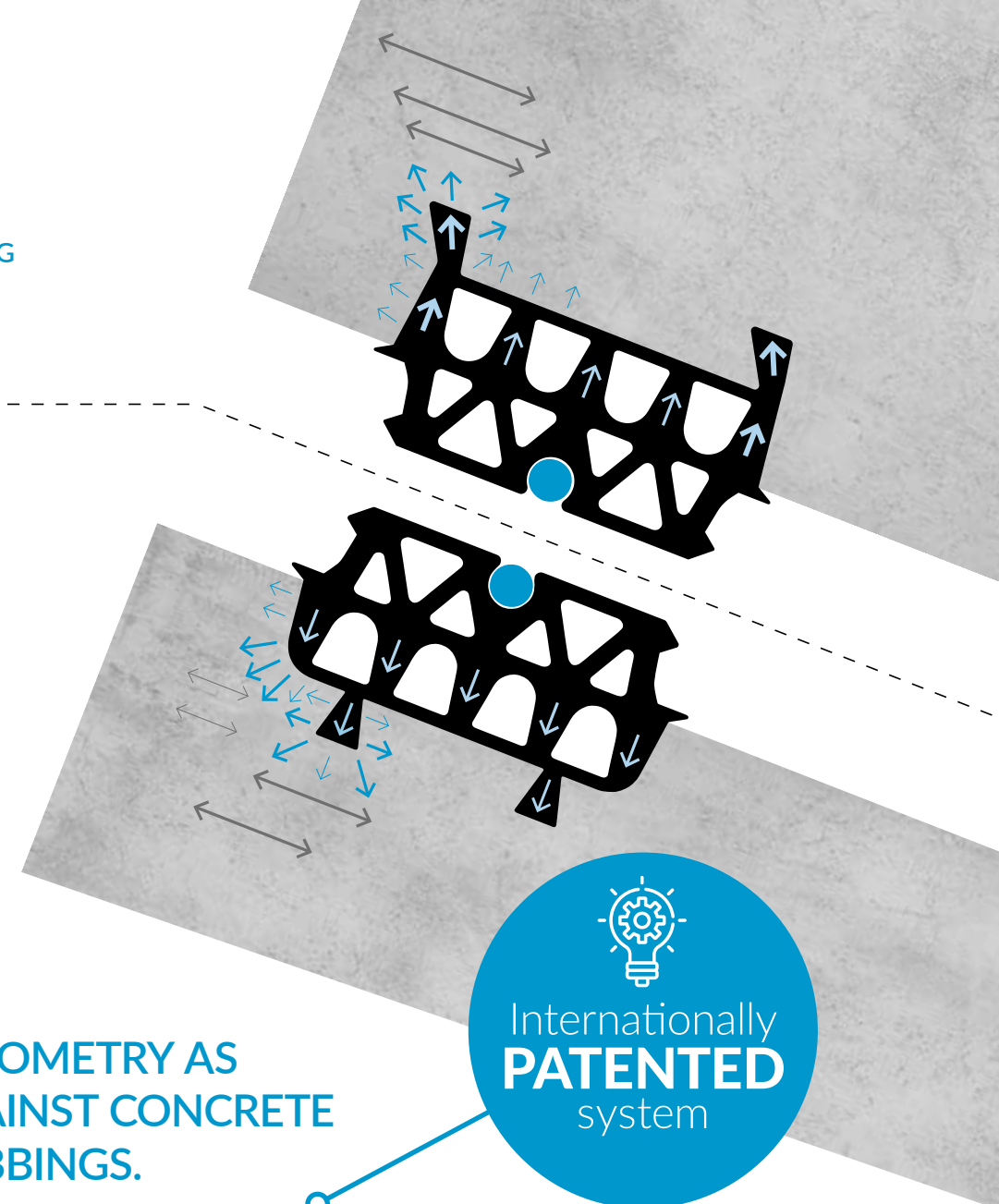
CONVENTIONAL ANCHORING

PROFILE WITH STRAIGHT FLANKS AND CONVENTIONAL POSITIONED ANCHORING FEETS

NEW SEALABLE PATENT

PROFILE WITH ROUNDED FLANKS AND THE ANCHORING FEETS DISPLACED TO THE PROFILE AXIS

- ↔ Tensile stress in concrete
- ← Compressive stress in the profile
- ← Compressive stress in concrete



NEW GROOVE GEOMETRY AS PREVENTION AGAINST CONCRETE SPALLING ON TUBBINGS.

It is generally known that the design of segments tends to become thinner and thinner due to cost, handling and environmental aspects. Consequently, the contact area between segment ring to segment ring is also decreasing. This in turn means that the space available for the gasket is also becoming smaller. The gasket is pushed further and further to the outside edge of the segments. If sufficient concrete cover is not possible with the gasket very close to the edge, spalling of the concrete can occur during gasket compression, prompting water to find its way below the gasket and ultimately causing leakage. Being proactive and respond appropriately to these requirements, SEALABLE is making an innovative and valuable contribution with our new patent.

WHAT IS NEW ABOUT OUR PATENTED PROFILE?

Since spalling occurs largely as an extension of the anchoring foot position, it was important to shift this force and redirect it further from the outer edge into the concrete via the inwardly placed feet away from the edge of the gasket.

In order to achieve an even better distribution, we redesigned the gasket shape as well on the flank. It is no longer straight, no longer angular, but: rounded!

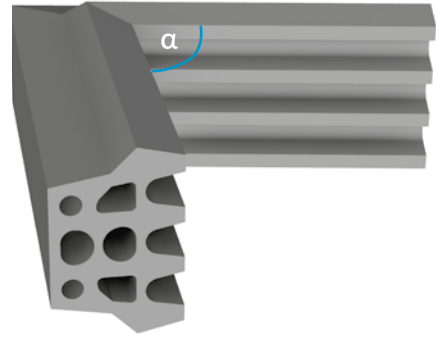
The tensile and compressive stresses in the concrete are shifted inwards, through the combination of embedded anchoring feet and rounded flanks, away from the outer edge of the segment. This solution offers the advantage that the gasket can be replaced more easily if damaged. On the one hand, the cutting process is simplified for smaller groove bases by simultaneously removing the anchoring feet, and on the other hand, possible breakouts in the concrete that occasionally occur during replacement can be covered completely and offer no direct lateral attack for leakage under the gasket.

The patent is applied to anchored profiles with a groove base width of ≥ 33 mm. The first reference project is the Swinemünde Road Tunnel, where the M80382 profile (44 mm groove width) is used.

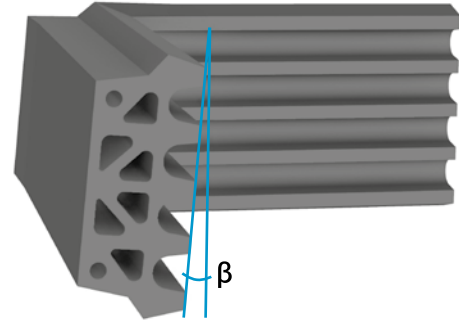
PERFORMANCE CORNER

In order to seal properly tunnels, it is necessary to generate the right balance between force and performance and build a performance corner

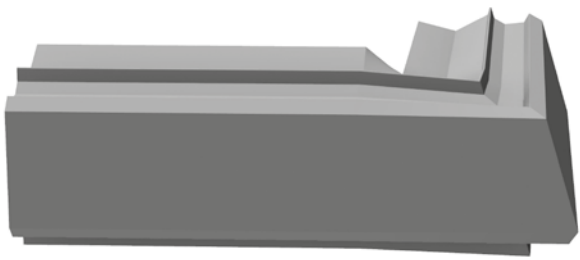
1 | Glued-on gasket corner with adjusted opening angle α



2 | Glued-on gasket corner with twisting angle β



3 | Anchored gasket with project based twisted angle corner β



4 | Combisegments® gasket corner (System HKFT) with adapted opening angle α and twisting angle β



ADHESIVE G 3000 PLUS

This product has been developed to fulfill the high demands when mounting elastomer seals to concrete segments. The glue offers both economical use and safety. In cooperation with the manufacturer „WIWA“, adjusted spraying equipment is available for even more economical use of our G 3000 Plus. We also have available a Sealing paste FP 75 in case of repairs.



SPECIAL PROFILES

Starting seals are used to seal the gap between the excavation line and TBM. They mounted on a special support frame and SEALABLE provides starting seals and filler profiles.

STARTING SEAL M

- easy and quick to install with standard fixing rail element

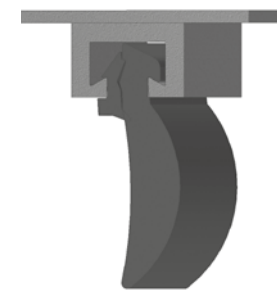
STARTING SEAL L

- suitable for small to middle size TBM offering high performances

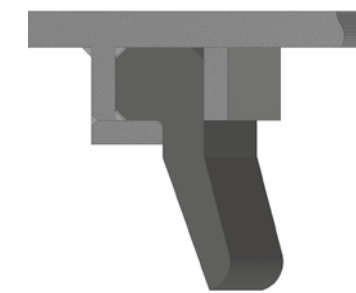
STARTING SEAL XL

- designed for large TBM and maximum performances for high ground water pressure

M72038



M35721



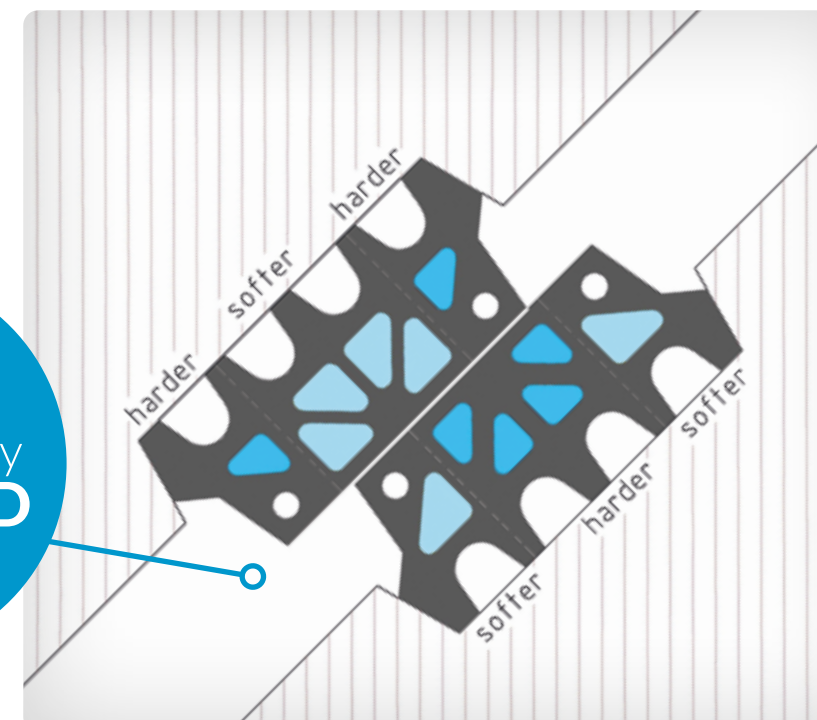
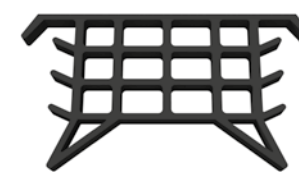
M35697



DRAINAGE PROFILE

- Leaking joints can limit service and threaten safety
- Profiles guide water in joints in a controlled way
- Preventing unwanted and damaging ingress of water

M90099



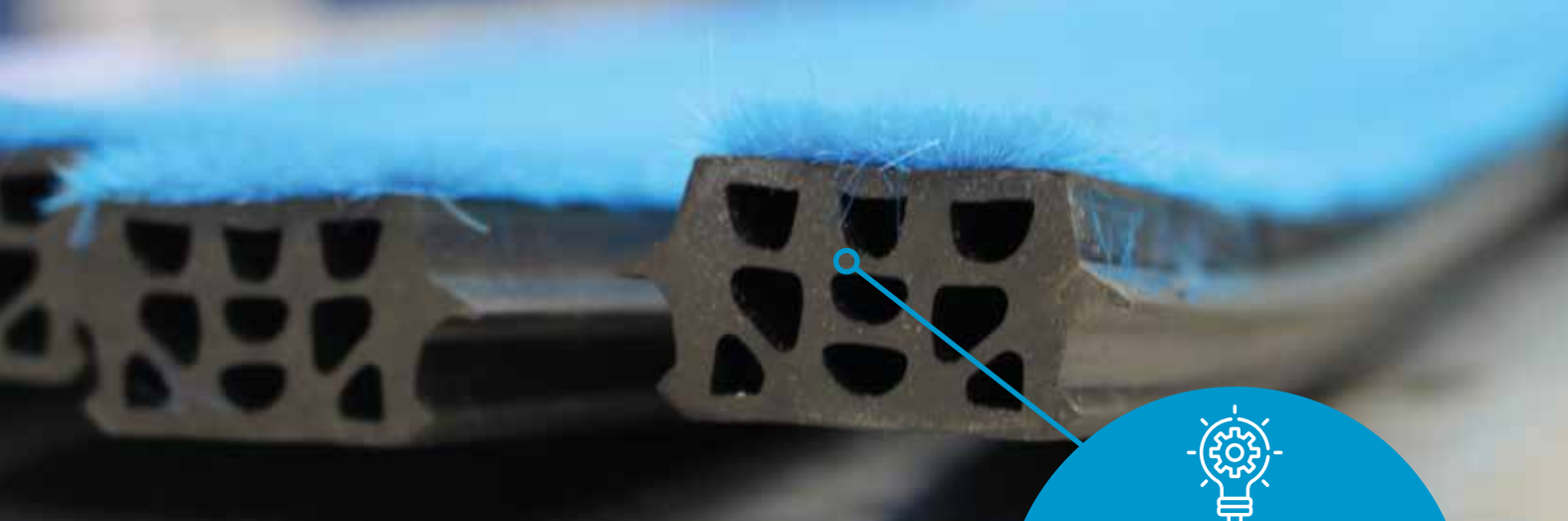
BALANCE SYSTEM

Due to the tolerances that appear when erecting the tunnel ring, offsets between single segments can occur. As a result, varyingly strong restoring forces and hence poorer water-tightness performance, come about.

Bossler Tunnel in Germany as part of the project „Albaufstieg“ was the first project our Balance principle had been applied.

YOUR BENEFIT

- The restoring forces are kept nearly constant despite varying offset conditions
- Constant tightness performance for a defined offset range



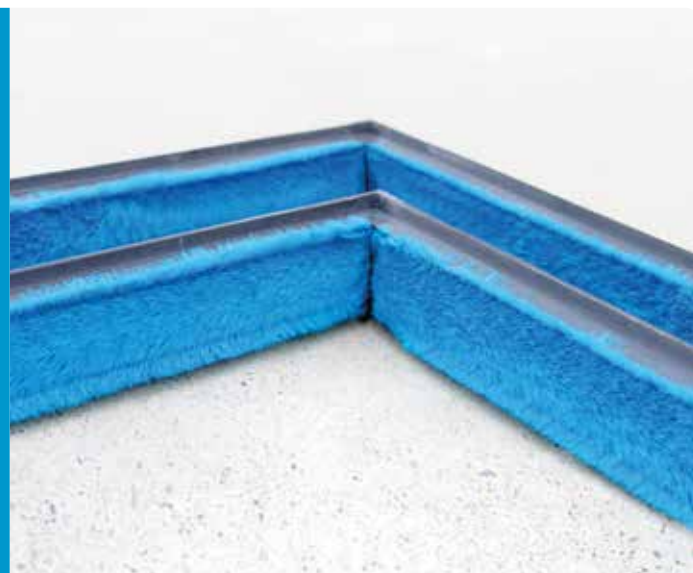
FIBER ANCHORED

As a leader of innovations, SEALABLE has enhanced glued and „feet“-anchored gaskets. Following the request of our customers, we are now able to provide anchoring the full gasket bottom with thousands of fibers, in contrast to the previous method of linear anchoring with feet made of rubber. The new fiber-anchored gaskets enable a free positioning of the gasket in the concrete segment.

The new **INNOVATION** in gasket solutions: fiber anchored gaskets

YOUR BENEFIT

- Safe and easy installation
- Enhanced packaging in cardboard boxes
- Improved spalling behavior
- Improved gasket-concrete connection due to a completely anchored surface
- Easy to repair
- Lean process at segment production due to inline gasket installation
- Elimination of adhesive and the entire gluing procedure



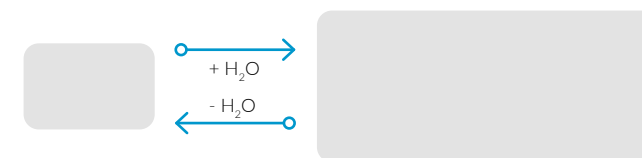
APPLICATION



BLACKSWELL + QUICKSWELL

Quickswell is based on a mix of rubber compound (EPDM/NR/NBR) mixed with special hydrophilic material providing hydrophilic properties. This process depends on the temperature, as well as, on the quality or composition of the water. The created expansion pressure ensures a reliable water sealing performance. For the first time, it is possible to combine the excellent properties of EPDM polymers with swelling material.

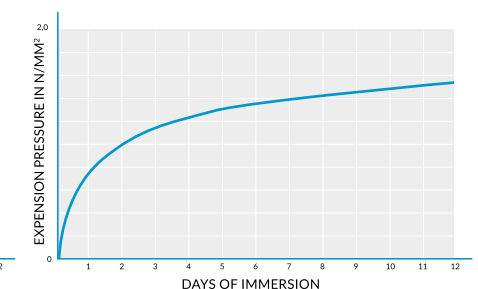
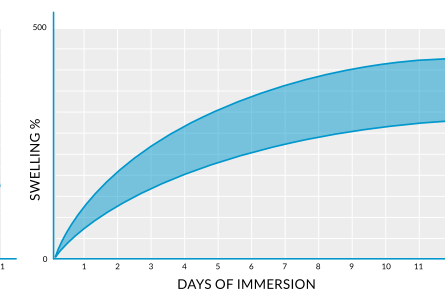
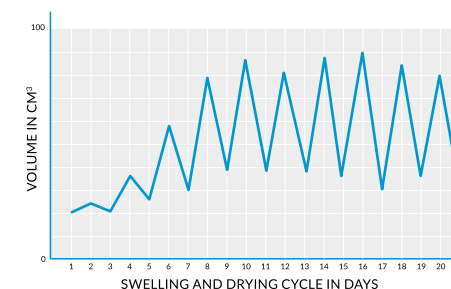
BlackSwell is available in various shapes, e.g. as molded parts or extrusion profiles depending on the application.



YOUR BENEFIT

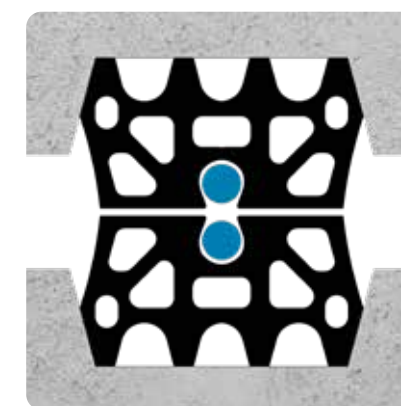
- Reliable and reversible swelling performance
- Rubber mix compound with hydrophilic nano particles
- Excellent chemical and ozon resistance
- High resistance against permanent deformation
- High water impermeability

MATERIAL CHARACTERISTICS

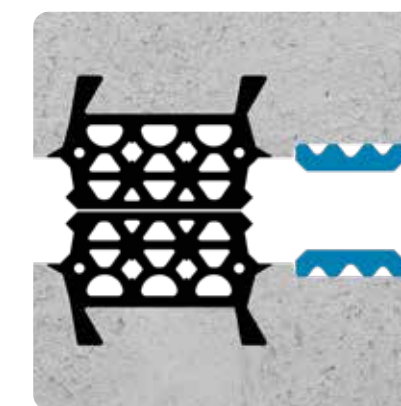


VARIANTS

1 | a hydroswellung round cord as composite tunnel gasket (available in different diameters)

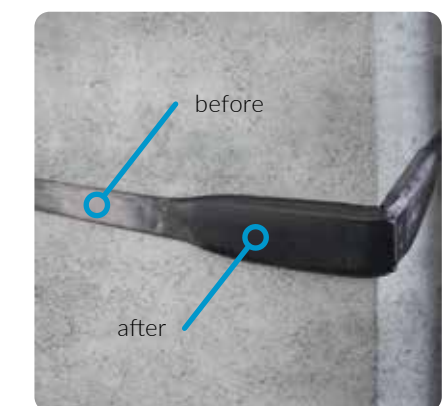


2 | a profile as separate seal next to the tunnel gasket (available in different forms and sizes)



APPLICATION

BlackSwell before and after swelling with moulded corner





APPLICATION AND TEST METHODS

It has always been part of our philosophy to assist our customers with maximum support while using our products.

- Our staff takes care of handling instructions on site
- Own testing laboratory for water tightness Performance testing in steel and concrete
- Project-related tests prepared in accordance with project specific requirements

LOAD-GAP PERFORMANCE

The load-displacement behaviour of the gasket profile is particularly significant for the assembly of the segments, because the profiles are intentionally compressed to the minimum groove bottom distance. With the determined deflection force the dowels or connecting bolts can be dimensioned for their pull-out forces.

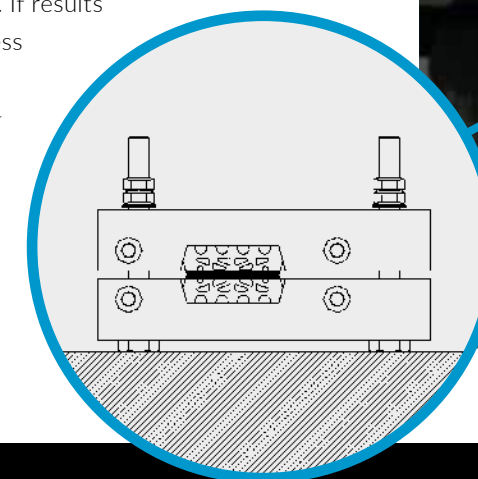
Two sections of gasket profile, each with a length of 200 mm (tolerance $-1.0/+0.0$ mm), are used to determine the maximum deflection force. The test shall be performed at room temperature of 20 ± 5 °C, with a rate of 50 mm/min. The deflection is measured at the machine (measurement at the traverse) and not at the profile.

Forms of steel, aluminium or concrete with a length of 200 mm must be used. The ends must be closed. The geometry of the groove in the testing form must correspond to the groove in the segment; in particular, this applies to the designed groove depth.

WATER TIGHTNESS TEST

To determine the water tightness, gasket frames must be used with lengths suitable for the testing forms. The sections of profile between the frame corners and the flat picture frame corners should each be at least 100 mm long. The test shall be performed under laboratory conditions at a room temperature of 20 ± 5 °C at least twice with different gasket frames. In case the test results deviate strongly, a third test may be performed to confirm the test results. Adequately stiff testing forms of steel, aluminium must be used.

The geometry of the groove in the testing forms must correspond to the groove in the segment in the corner area and to the length of the section of profile. The geometry of the groove outside the profile section (flat picture frame corner) must not affect the water tightness in the tested profile section. If results from previous water tightness tests are available with the same groove bottom distance as the gasket frames to be tested, but in which the groove depth was smaller, then these results can also be used for a larger groove depth

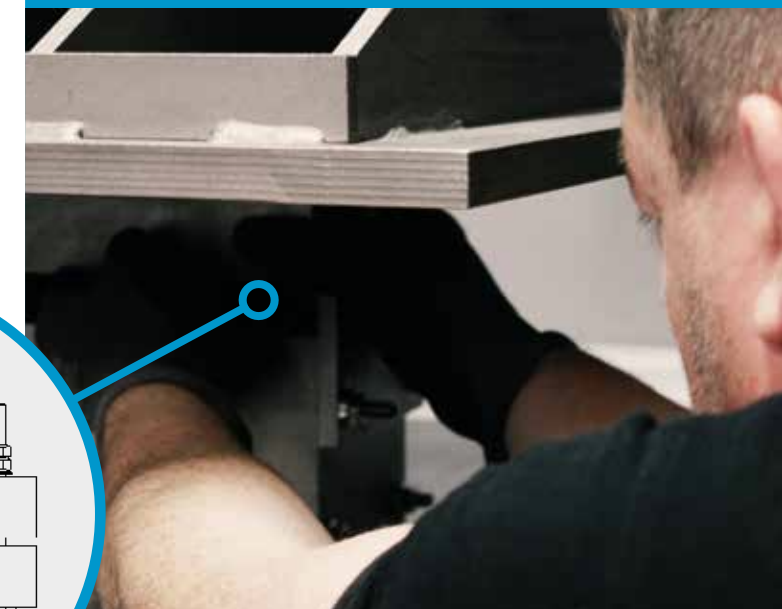


on the safe side. New, unused gasket frames must be used for each test. Depending on the type of joint and the test samples, the following special features must be considered.

The tests are performed on testing forms that model a T-joint. The test-layout consists of two angled elements and a cover, into which the test frames are fitted (not glued-in). Thus, 4 actual gasket corners are tested. The 12 flat picture frame corners, which do not exist in the segmental lining, are not part of the test area. To set up the offset situation for T-joint testing, one of the two lower elements must be placed with the same offset to the other lower element as to the cover.

LONG TERM RELAXATION

Investigation of the stress relaxation behaviour shows how over time the stress in the sealing system reduces in the long term for a constant groove bottom distance. The loss of stress is relatively high at the beginning and slows down considerably over time. Similar to the stress, also the water tightness of the sealing system is reduced. To accelerate the relaxation, the gasket profile is thermally conditioned between the individual measurements of a test. This allows extrapolation of the results to the behaviour after for example 120 years. The basis for the extrapolation is the equation according to Williams-Landel-Ferry.





More than fifty years of market experience provide the foundation for our range of high quality sealing solutions to meet every challenge in your project.

WE HAVE ALWAYS BEEN EXPERTS IN THE FIELD OF PROFILES & SEALING.

It all began more than 200 years ago with the production of fire hoses. As our product range has diversified, our expertise in elastomer profiles and skill in processing various types of rubber has grown over the last 50 years.

Through various stages of development and ownership arrangements, starting with PHOENIX AG, ContiTech AG, then PHOENIX Dichtungstechnik GmbH and finally DÄTWYLER Sealing Technologies Deutschland GmbH, our organisation has grown into an international company.

In 2018, we received the Thuringian Innovation Award in the "Tradition & Future" category for our "bicycle-safe track"; we also hold 43 patents. Following the management buy-out in May 2020, SEALABLE Solutions GmbH now operates as a Thuringian company with a global network.

Our approach is based not only on worldwide sales, but also on placing particular emphasis on reliable, close contact with our customers and partners. As a result, our partnerships are sustainable and often involve an entire product lifecycle.

MORE THAN 790 PROJECTS WORLDWIDE



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CERTIFICATIONS AND ASSOCIATIONS



Member of German Tunnelling Association in Cologne



Member of French Tunnelling and Underground Space Association



792
PROJECTS



261
CLIENTS



33
PATENTS



34%
RESEARCH PART

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