

# SEALS FOR TUNNEL CONSTRUCTION

Sealing Profiles for Modern Tunnelling Methods

NO MATTER WHAT  
**THE FUTURE** HOLDS





## DATWYLER TUNNEL SEALS

Sealing Profiles for Modern Tunnelling Methods

The Datwyler Group is a focused industrial supplier with leading position in global and regional market segments. With its technological leadership and customised solutions, the Group delivers added value to customers in the markets served. Datwyler concentrates on markets that offer opportunities to create more value and sustain profitable growth. The Technical Components Division is one of Europe's foremost high-service distributors of electronic, automation and ICT components and accessories. The Sealing Solution Division is a leading supplier of customised sealing solutions to global market segments, such as the automotive, health care, civil engineering and consumer goods industries etc. With a total of more than 50 operating companies, sales in over 100 countries and some 6,500 employees, the Datwyler Group generates annual revenue of some CHF 1,300 million. The Group has been listed on the SIX Swiss Exchange since 1986 (security number 3048677).

## MILESTONES OF DATWYLER IN TUNNELLING

- |             |   |
|-------------|---|
| <b>1969</b> | Datwyler developed, manufactured and supplied sealing gaskets made of „combe-shaped“ compression profiles for the first time at Elbe Tunnel in Hamburg.   |
| <b>1974</b> | Datwyler has developed and supplied compression sealing gaskets made of a „hollow-chamber-profile“ for a sewer project in Hamburg for the first time.   |
| <b>1984</b> | For a sewer project in Sheffield (England), Datwyler developed the famous 33 mm „Don Valley“ profile shape and established a classical gasket groove and profile geometry design.   |
| <b>1989</b> | Datwyler signed a supply contract for segment sealing gaskets for the Channel Tunnel between France and Great Britain. The contract value was up to now the largest contract for sealing gaskets ever been signed in the history of tunnelling construction.  |
| <b>1996</b> | Datwyler developed the new generation of double-row sealing profiles that could offer a better sealing performance at larger ring building tolerances.  |
| <b>1997</b> | Datwyler got involved in developing and supplying a highly sophisticated double sealing gasket system for the 4 <sup>th</sup> Tube of Elbe Tunnel in Hamburg. At that time the project with a diameter of 14.2 meters using the largest TBM ever built.   |
| <b>2000</b> | Datwyler reached a number of more than 100 international patent application with more than 50 international patents being in force.   |
| <b>2003</b> | Datwyler successfully supplied sealing gaskets for the challenging Arrowhead Feeder Tunnel Project in the St. Bernadino Mountains near Los Angeles. To date the waterproofing requirements with a working pressure of maximum 27 bar and a test pressure of 42 bar have been the highest ever been tested for a completed shield-driven tunnel project. |
| <b>2012</b> | Datwyler purchased the Divison PDT Profiles. With this aquisition, Datwyler combined the forces and know-how of the two leading manufactures of elastomer tunnel seals of that time, merging together and continuing their activities at the former PHOENIX plant in Waltershausen, Germany.  |
| <b>2014</b> | Datwyler reached a number of more than 600 successfully completed reference projects.   |







## ELASTOMER SEALS FOR TUNNEL CONSTRUCTION

For decades Datwyler has been delivering a broad range of sealing profiles for various tunnel building techniques.

Datwyler engineers have developed reliable sealing systems for the various applications such as segment for tunnel boring machines (TBM) and shield driven tunnel, various types of jacking pipe and for tunnel refurbishment. The latest development is a seal that is anchored into the concrete during the tunnel segment production process. This system will make segment production and gasket installation easier and faster without the added cost of the adhesive.

## REFERENCES

Seals by Datwyler are in successful service in over 600 tunnels on five continents. Our rubber seals keep tunnels watertight, thus contributing significantly to uninterrupted operation, protection of electromechanical equipment and of course long service life of the tunnel.



**Road**



**Rail**



**Metro**



**Cable/Service**



**Water/Sewer**

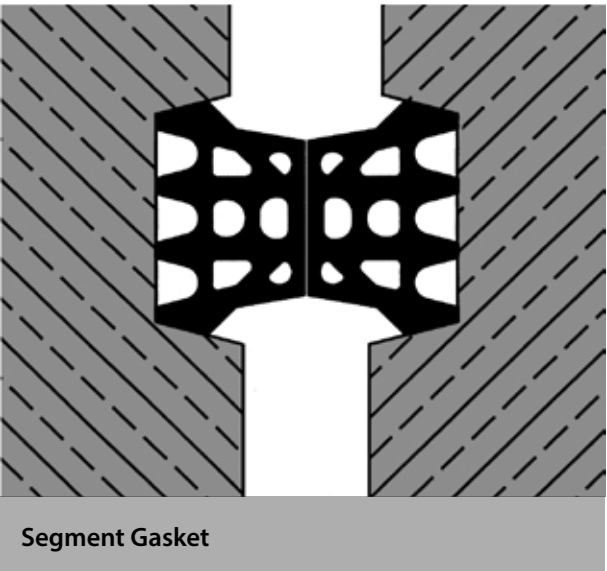




# SEGMENT GASKETS

Datwyler segment gaskets were first used in 1969 on the New Elbe Tunnel in Hamburg and are now 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 600 successful reference projects. In addition to the standard program shown here Datwyler can offer various tailormade solutions.

During many years of deep involvement and close cooperation with the largest construction companies Datwyler has set-up an international standard for product testing at their German plant, inclusive of regular internal quality control audits, all of which are accepted by many international partners and consultants.



## DATWYLER SEGMENT GASKETS COMPLY WITH STUVA TESTING GUIDELINES



## Standard geometries - „glued-on“

M 385 96  
Portland



Groove: 26 x 10 mm

M 389 03  
Mexico



Groove: 33 x 10 mm

M 385 87A  
Groene Hart



Groove: 36 x 12,5 mm

M 385 73  
Wesertunnel



Groove: 44 x 12 mm

## Standard geometries - „anchored“

M 385 66  
Lee Tunnel



Groove: 26 x 10 mm

M 389 36  
Metro Rennes



Groove: 33 x 10 mm

M 801 03  
Groene Hart anchored



Groove: 36 x 12,5 mm

M 389 28  
Oslo



Groove: 44 x 12 mm

As a forward-looking technology Datwyler gaskets that are directly anchored in the concrete segment offer a variety of remarkable advantages:

- Shortened process in the segment factory due to time savings for correction of imperfections and cleaning of the groove area
- Saving costs for adhesive and adhesive application equipment as well as time for mounting the gaskets
- Remarkable higher adhesion between gasket and concrete (no detachment while installing the keystone)
- Higher tightness because of maximizing the distance for the water between gasket and concrete

## Standard geometries - „composite“

M 389 12  
Lai Chi Kok



Groove: 26 x 10 mm

M 389 16  
MTR C 823A



Groove: 33 x 10 mm

M 389 23  
CVV



Groove: 33 x 10 mm

M 389 25  
Alaskan Way



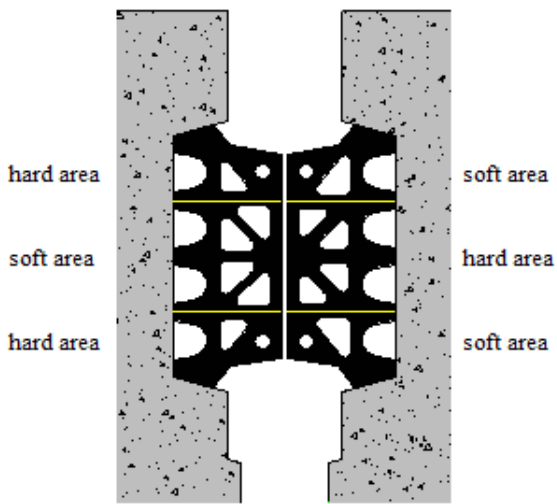
Groove: 44 x 12 mm

The Composite Seal combines two different sealing technologies - a compression seal and a hydro-swelling strip, which provides a self-healing effect in case of leakage caused by improper ring build.



Innovations - DatBalance System

Caused by tolerances in the erecting of the tunnel-tube there are offsets between the single segments. As a result of this there are varying strong restoring forces and hence poorer water-tightness performances. With our DatBalance principle the restoring forces are kept near-constant despite varying offset conditions. Thus we obtain a constant tightness performance for a defined offset-range. Bossler Tunnel in Germany was the first project where we applied our DatBalance principle.

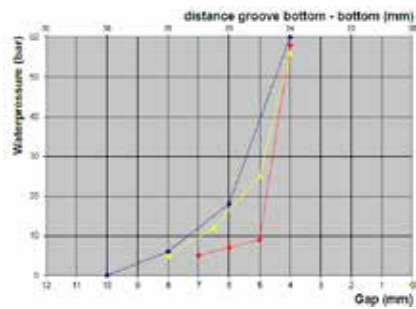


INTERNATIONALLY PATENTED SYSTEM

Performance

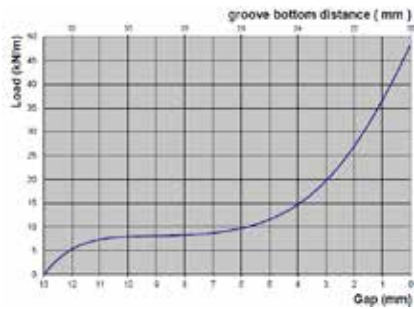
Diagrams of each profile are available on request.

Watertightness Diagram



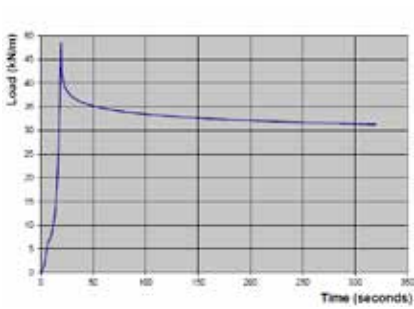
Tightness of seal in relation to various offsets and gaps at joint

Load Deflection Diagram



Strength of seal in relation to various offsets and gaps at joint

Short Term Relaxation

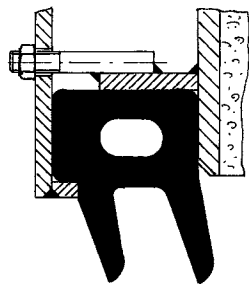
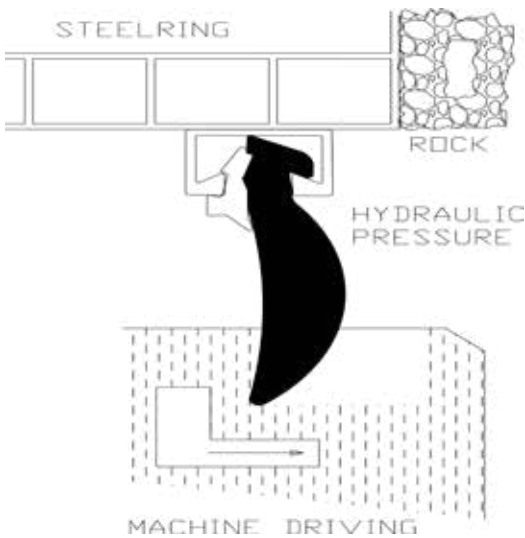


Loss of residual stress of seal after segment installation

SPECIAL PROFILES

Starting Seals

Starting seals are used to seal the gap between the excavation line and TBM (tunnel boring machine). Starting seals are mounted on a special support frame. For greater watertightness, several starting seals can be installed in series. Datwyler provides starting seals and filler profiles for various pressure ranges.

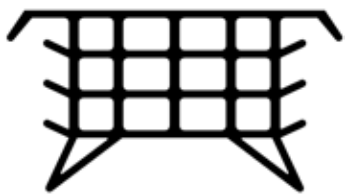
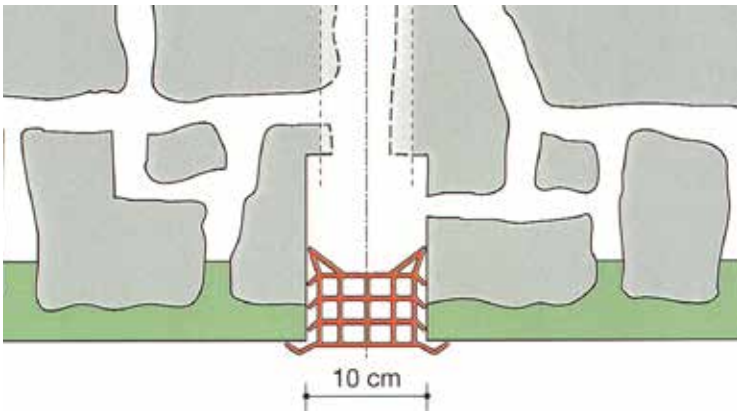


DATWYLER STARTING SEALS FOR A SAFE ENTRY OF THE TBM



Seals for Tunnel Refurbishment

Leaking joints can limit service and threaten safety. Robust and durable Datwyler profiles are ideal for sealing the joints. The profiles deflect water in joints in a controlled way, thereby preventing unwanted and damaging ingress of water.



M 900 99



M 720 23



M 720 01

DATHESIVE G 3000 PLUS (TOLUOL FREE)

This product of Datwyler 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.

PACKAGING AT DATWYLER:

- Clear
- Environment friendly
- Safe

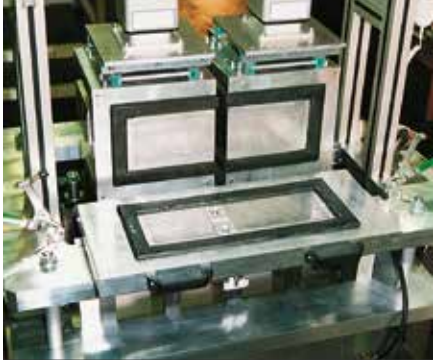


APPLICATION, TEST METHODS AND MOUNTING TECHNOLOGY AT DATWYLER

It has always been part of our philosophy to assist our customers with maximum support while using our products. Therefore, our staff takes care of handling instructions on site at the beginning as well as to the completion of a project. Datwyler has his own testing laboratory for water tightness performance testing. Project-related tests can be conducted in accordance with project specific requirements and following the recommendations provided by acknowledged organizations such as STUVA, BTS and AFTES.



Efficient and successful on-site training everywhere in the world



Test rig for water tightness test



Handling and application instructions by technician



Datwyler has several sales and representative offices in most parts of the world. Don't hesitate to contact our headquarters and they will guide you to your nearest Datwyler representative.

