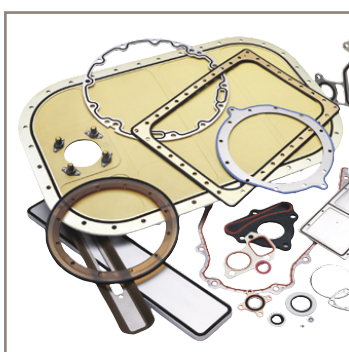
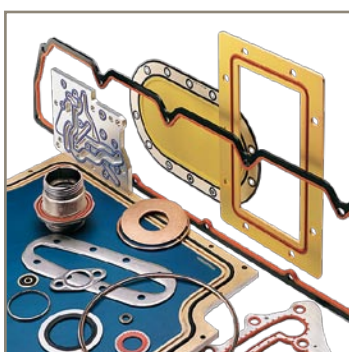
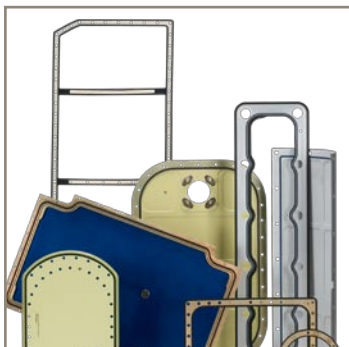




Composite sealing plates

Carrier plates with elastomer sealing element

aerospace
climate control
electromechanical
filtration
fluid & gas handling
hydraulics
pneumatics
process control
sealing & shielding

Sealing plates

First choice for flange sealing applications

Parker sealing plates perform two major functions. Firstly, they are used for external sealing as well as for separating various media (oils, coolants, fuels and gases) from each other in technical components – for example in automotive, mechanical and equipment engineering. Secondly, they enable forces to be transmitted between flanges.

Thanks to their versatility, these composite parts can be used to achieve optimum product solutions in a wide range of applications: for example, in control housings or transmissions and pumps. This makes sealing plates the first choice for all flange sealing applications.

What are sealing plates?

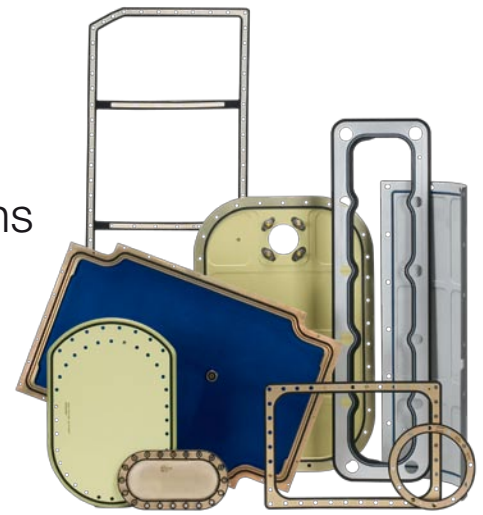
Sealing plates are composite parts and come in various versions. They consist of a carrier element with a vulcanised elastomer profile and are particularly suited for use as quasi-static sealing elements in flange areas.

The type of sealing plate to be used depends on the particular requirements profile. Rubber-coated sheet metal, for example, is suitable for sealing gases, while a rubber lip vulcanised to the metal edge is designed to seal hydraulic oils.

What are the advantages of sealing plates?

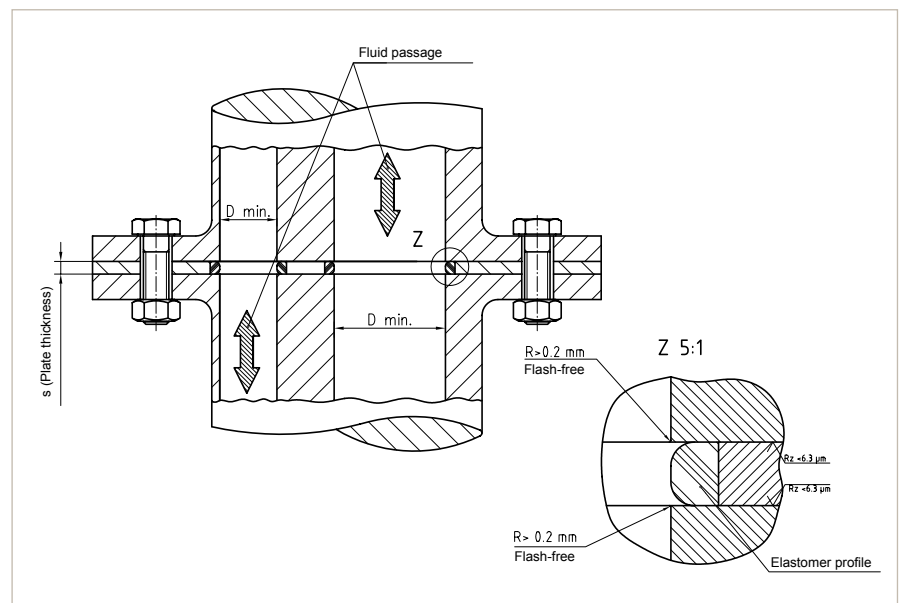
Sealing plates offer a number of convincing advantages:

- After installation, the sealing lip is protected from external influences and from internal, mechanical overloading.
- No seal groove is required in the flanges.
- Multi-window seals reduce the number of components and thus potential sources of defects.
- Automatic installation of sealing plates reduces assembly times.
- Since the sealing plate is visible from the outside the installation of the seal can be visually checked.



How do sealing plates work?

First, using the screw forces of the flange, the vulcanised elastomer profiles of the sealing plate are compressed. Once the compression limit has been reached, a force-closed flange connection via the seal carrier has been created. The elastomer profile backs away from the pressure load to the side and, due to the resulting restoring forces of the elastomer, provides sealing on a sealing line.



General installation instructions for sealing plates

Where are sealing plates used?

The use of sealing plates and fastener seals is becoming increasingly important in various applications and markets such as automotive engineering, air conditioning technology, general industrials, and in the field of EOG. Sealing plates are used exclusively as static flange seals. They are easy to fit and can be customised to suit special requirements.

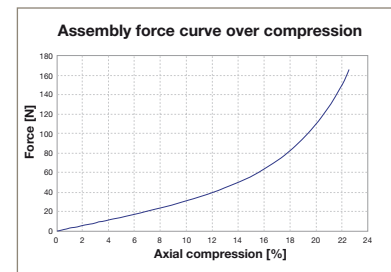
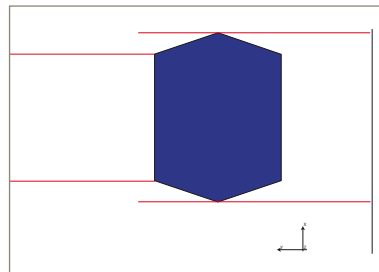
The simplest versions are fastener seals used as sealing elements at the screw head. The

elastomer seal offers advantages in terms of the sealing function and can replace metal seals such as copper rings. Furthermore, customer-specific sealing plates can be used in applications involving a wide range of media, if necessary. For such applications, various elastomers ensuring the respective chemical compatibility can be fitted on separate pressure passages. In addition, composite sealing plates exhibit their assembly benefits whenever individual small or unstable sealing

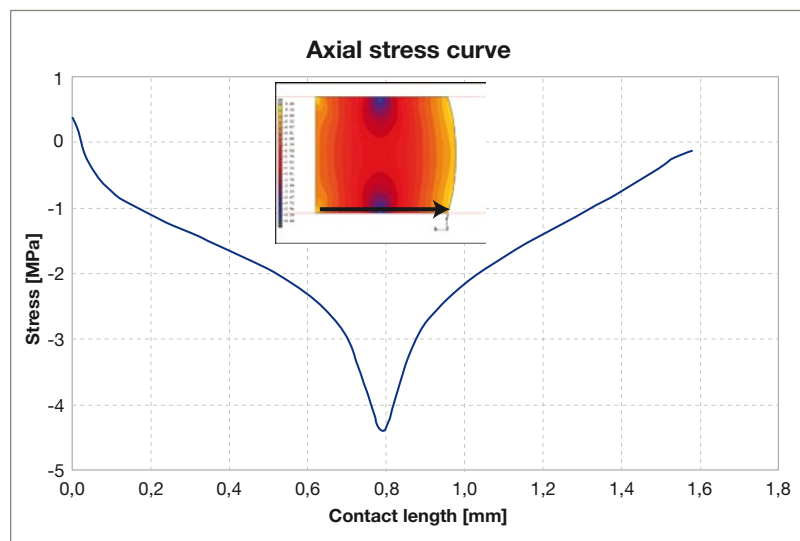
elements (e.g. O-rings or moulded seals) can be installed only with great difficulty or not at all. Due to the metallic frame the sealing element can be fitted, for example, by robots or automatic assembly systems to inaccessible locations.

Finite Elements Analysis

Before making the first samples we subject new sealing plate concepts to an extensive Finite Elements Analysis (FEA). During this analysis the required compression forces, deformations or material stress in the elastomer profile and the carrier element are evaluated.

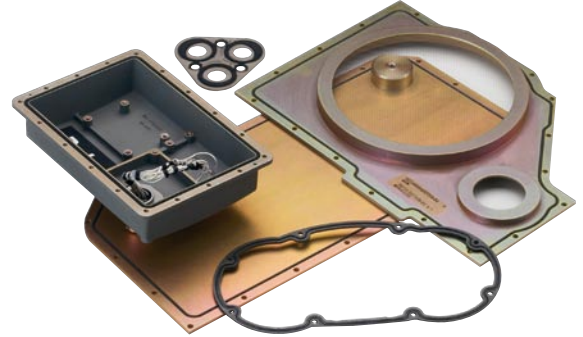


The following figures show a sealing plate with an elastomer profile vulcanised to the carrier edge. In the assembled state stress occurs in the elastomer profile which is visualised across the width of the sealing lip using FEA. This allows conclusions to be drawn regarding the sealing effect and loads acting on the material.



Carrier elements

Materials and selection aids



Aluminium

(EN AW-5754, AlMg3)

Compared with other AlMg alloys, this aluminium alloy exhibits high levels of strength and higher wear-hardening. Its high tenacity as well as good seawater and weather resistance make it the material of choice for automotive body and trim parts as well as in apparatus, die and boat construction.

Constructional steel

(DIN EN 10130 DC01 or DC04)

Both types of steel exhibit low tensile strength. They are corrosive and easy to weld. The cold-rolled flat stock lends itself well to forming and deep-drawing and can subsequently be provided with metallic coatings. Typical fields of application are mechanical and automotive engineering.

Spring steel strip

(EN10132-4 C67S+LC or C60S+LC)

These steel strips are used for mechanical engineering applications. With a carbon content of

more than 0.5 %, they have high tensile strength and good tenacity combined with high surface hardness. They are typically used in gears, crank- and camshafts.

Stainless steels (DIN EN 10088-2 X5CrNi18-10 or X6Cr17)

These high-grade steels are easy to cold-form and weld and difficult to cut or machine. Both steels are used in apparatus construction and vehicle engineering as well as in the foodstuffs and chemical industries.

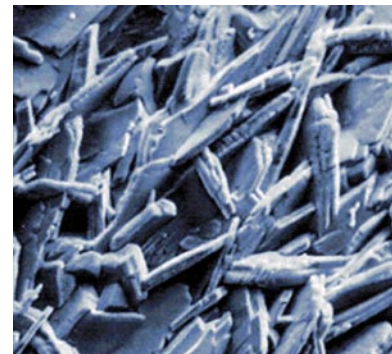
Filled plastics

In addition to low weight, filled plastics offer high levels of tensile strength and modulus of elasticity. To minimise material shrinkage and achieve good dimensional stability at high temperatures, the following recommended base materials are typically filled with glass or carbon fibres:

- PA66
- PPS
- PAI
- PEEK

Pre-treatment: carrier material surfaces

Blank metal surfaces must be protected from corrosion and prepared for the rubber connection. Typically, the metal surface is corrosively closed by a passivation and prepared for the subsequent connection of the elastomer sealing lips by means of a special phosphate coating.



Phosphate-coated steel surface

Carrier material selection aid

	Carrier materials				
	Aluminium	Constructional steel	Spring steel strip	High-grade/stainless steel	Filled plastics
Weather resistance	O	-	-	+	+
Workability (forming)	+	+	O	O	-
Strength	O	O	+	+	-
Corrosion resistance	O	-	-	+	+
Low dead weight	+	O	-	-	+

Elastomers

Materials and selection aids

NBR

This material exhibits good resistance to petrol, mineral oils and greases and possesses high abrasion resistance. NBR can be used up to a maximum temperature of 100 °C.

EPDM

Vulcanised EPDMs offer good heat and ageing resistance combined with good cold-temperature performance. At service temperatures of up to 130 °C these vulcanised materials are typically used in automotive applications (water pumps).

HNBR

If the application requires high resistance to weather, ozone, oils and greases as well as good wear resistance, HNBR is the material of choice. At temperatures of up to 150 °C this material is preferably used in fluid power and engine applications.

FKM

The characteristic properties of this special rubber are outstanding temperature and chemical resistance. This material can be used up to 200 °C and is suitable

for engine, machine and equipment engineering applications.

ACM

The outstanding properties of this group of vulcanised materials are high resistance to ozone and oxygen as well as good swelling resistance in mineral oils. Thanks to their temperature resistance of up to 160 °C ACM materials are frequently used in engine and mechanical engineering applications (oil pans and chain cases).

Elastomer selection aid

	Elastomers (seal profiles)				
	EPDM	ACM	HNBR	FKM	NBR
Fuels	-	O	+	+	+
Oils	-	+	+	+	+
Water (100 °C)	+	-	+	O	-
Gas permeability (- high / + low)	O	+	O	+	+
Brake fluid (glykol-based)	+	-	-	O	-
Wear resistance	O	-	+	-	+
Temperature range for permanent use (°C)	-30 / +130	-20 / +150	-30 / +150	-20 / +200	-30 / +100

Relative costs of various material combinations

	NBR	EPDM	ACM	HNBR	FKM
Special metal alloys	3	3	3	4	7
Post-processed plastics	3	3	3	4	7
High-grade/stainless steel	2	2	2	3	6
Steel with surface coating	1	1	1	2	5
Injection-moulded plastics	1	1	1	2	5
Aluminium	1	1	1	2	5

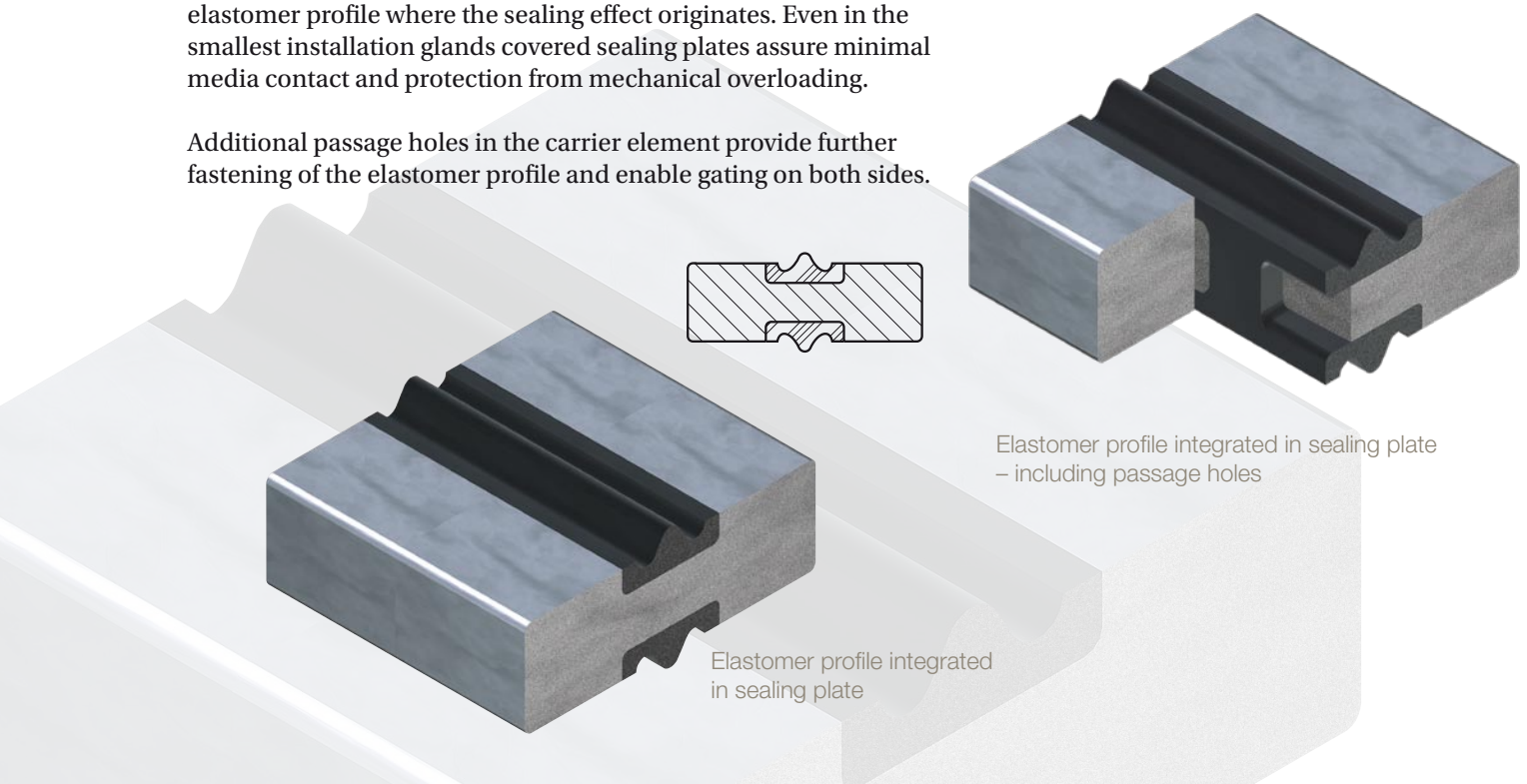
Sealing plate types and requirements

For different requirements – regarding the particular installation space and environment – we offer suitable types of sealing plates.

Sealing plates with Elastomer profile integrated in sealing plate

Particularly for long-term installations it makes sense to protect the elastomer profile where the sealing effect originates. Even in the smallest installation glands covered sealing plates assure minimal media contact and protection from mechanical overloading.

Additional passage holes in the carrier element provide further fastening of the elastomer profile and enable gating on both sides.

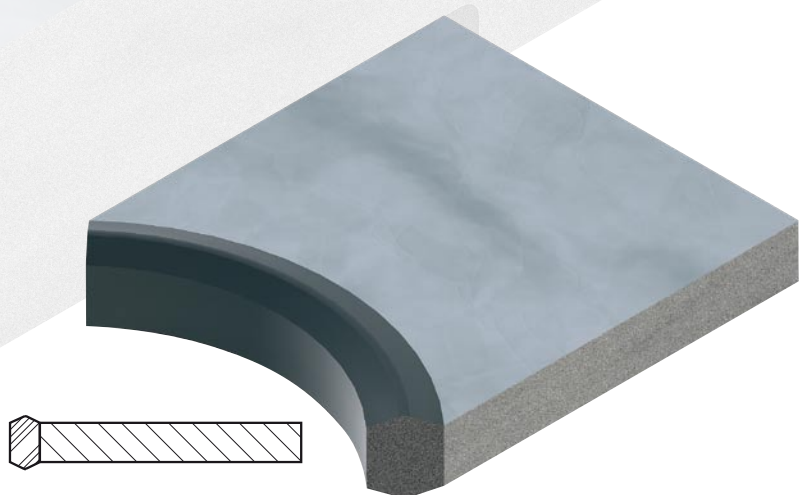


Elastomer profile integrated in sealing plate – including passage holes

Elastomer profile integrated in sealing plate

Sealing plates with elastomer profiles vulcanised to the carrier element edge

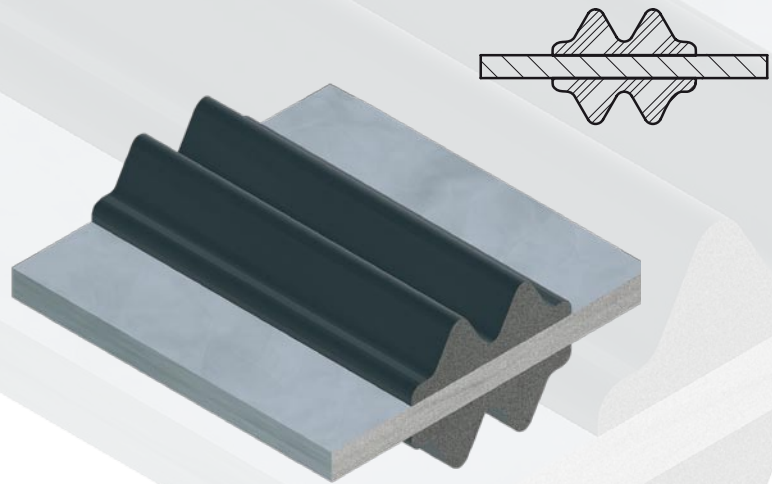
The typical sealing plate for fluid applications has an elastomer profile vulcanised to the edge of the carrier element. Appropriate dimensioning assures that the face side of the elastomer profile is flush with the fluid channel. Consequently, the elastomer profile in its small installation gland can only be attacked and damaged from the media side.



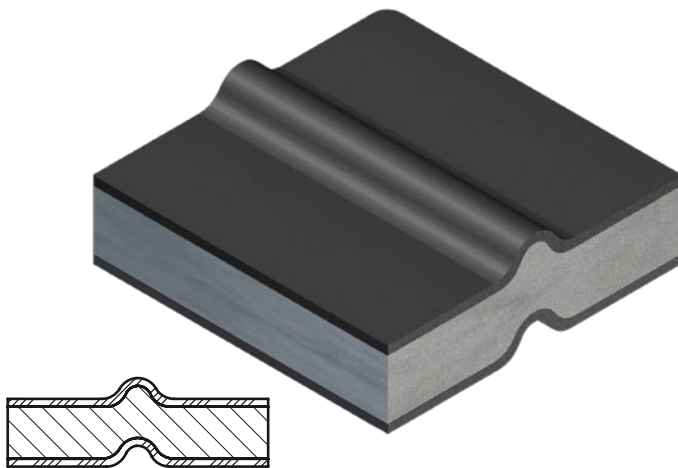
Sealing plate with elastomer profile vulcanised to the carrier element edge

Sealing plates with elastomer profile vulcanised on the carrier element

Installation conditions may require freely accessible vulcanisation of the elastomer profile to the carrier element. The compression of the elastomer profile must be limited by the design. Otherwise, the frictional connection is routed via the elastomer profile. In addition, this version exposes the elastomer profile to mechanical loads such as shearing or media and weather attacks.



Elastomer profile vulcanised on the carrier element



Coated carrier element

Coated carrier elements

Especially for sealing of CO₂ and coolants coated carrier elements are used. The previously coated sheet metal with an elastomer coating thickness of 0.1 to 0.2 mm receives its final shape by forming processes (bending, die-cutting, cutting, drawing). Beading supports the elastomer coating via the spring effect of the steel.

Flange and sealing area requirements

Requirements	Dimension	Max.	Min.
Required area compression of the seal	N/mm ²	5,0	1,0
Gaps between screws	mm	100,0	50,0
Evenness	mm	0,1	0,2
Roughness R _z	µmm	6,3	2,5
Thickness of the carrier element	mm	4,0	0,8
Required compression of the sealing lip	%	30,0	15,0



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