EagleBurgmann
Rely on excellence

Mechanical seal technology and selection

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Seal selection by media

Content and other brochures

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Mechanical seal selection by media

Additional information

EagleBurgmann – Your System Supplier

Separately available brochures offer information about additional product lines as well as notes on the technology and selection of mechanical seals.

All products can be retrieved interactively from eagleburgmann.com. Among others, you will find current data sheets in PDF format available for download here.

Mechanical seals, Magnetic couplings

Catalog 150 pages (Code: DMS_MSE)

The complete range of seals from EagleBurgmann:

Pump seals, agitator seals, compressor seals, and magnetic couplings.

Important note

All the technical specifications are based on extensive tests and our many years of experience. However, the diversity of possible applications means that they can serve as guide values only.

It should be noted that the extremal values of each operating parameter cannot be applied at the same time because of their interaction. Furthermore, the operating range of each specific product depends on the respective shaft diameter, materials used, mode of operation and on the medium to be sealed.

A guarantee can only be given in the individual case if the exact conditions of application are known and these are confirmed in a special agreement. When critical conditions of operation are involved, we recommend consulting with our specialist engineers.

Subject to change.

Seal supply systems

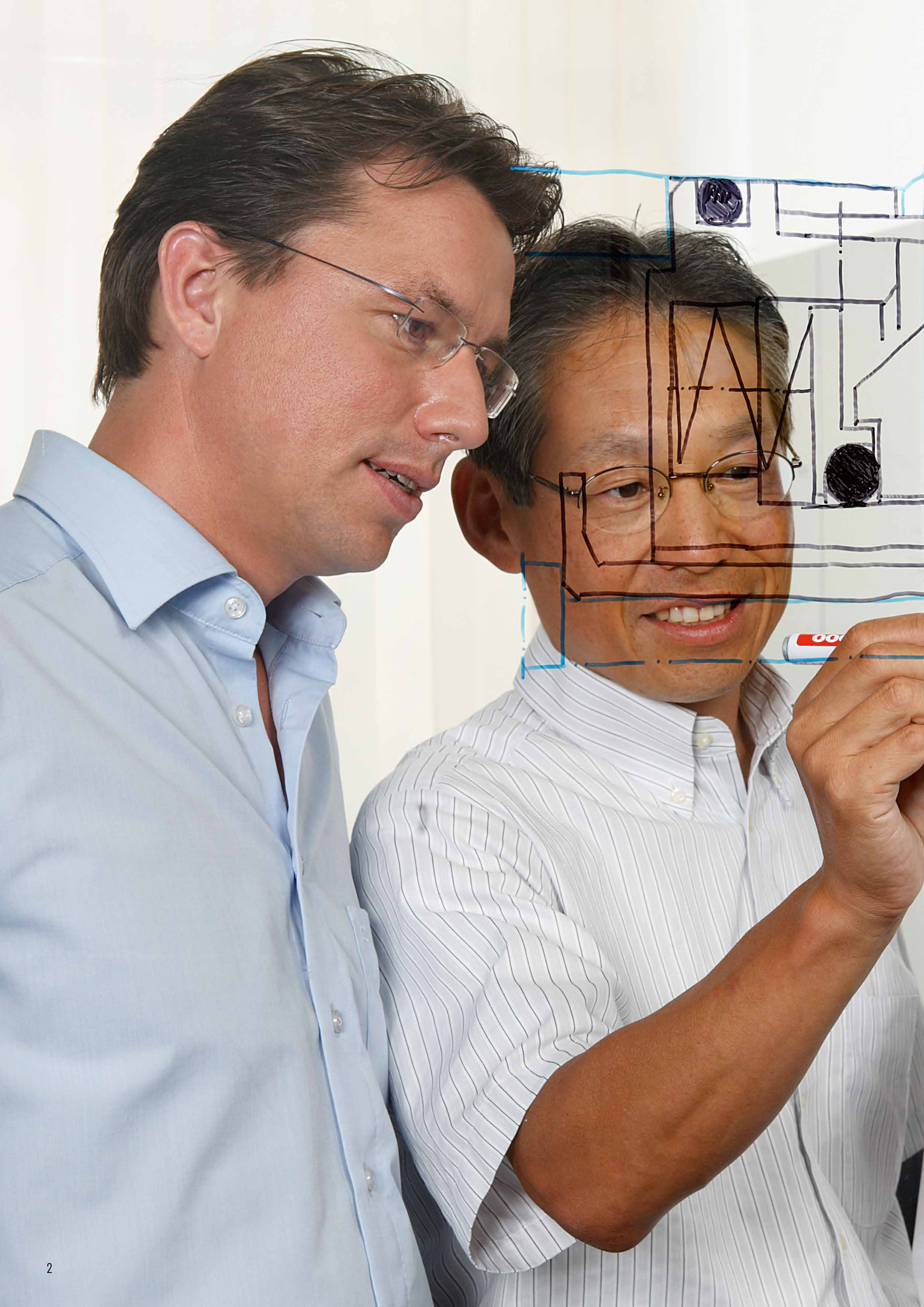
Brochure 84 Pages (Code: DMS_SSE)

The entire product portfolio of systems and components for the cooling, flushing, pressurization and supplying of liquid and gas-lubricated mechanical seals, e.g. quench and Thermosiphon systems, heat exchangers, buffer pressure systems, leakage monitoring and API682-compliant supply systems.

Carbon floating ring seals

Brochure 32 Pages (Code: EBES)

Maintenance-free, compact cartridge labyrinth seals with long service life and best performance from EagleBurgmann-Espey. For the sealing of gases, dust and vapors in turbines, fans, compressors, centrifuges and mills.



Our products – as varied as our customers

EagleBurgmann products deliver safe, reliable sealing performance in any application including oil pumping and cracking, gas compression, process gas containment, phase separation or synthesis of chemical substances, pipeline sealing, dairy product filling or compensation of temperature expansion in flue gas systems.

Our challenge is to design seals that are able to withstand a wide range of media, different aggregate states and varying pressure and temperature and to provide special solutions for small installation up to seal contact areas of several meters. Every application has its own special requirements profile, and our job is to provide the best sealing solution.

The EagleBurgmann portfolio:
A product range with an unlimited horizon.
EagleBurgmann is one of the world's leading manufacturer of industrial sealing solutions. Our extensive portfolio includes everything from standard seals to one-off application-specific designs:

- Mechanical seals
- Magnetic couplings
- Seal supply systems
- Carbon floating ring seals
- Compression packings
- Gaskets
- Expansion joints
- Special products
- TotalSealCare Services

Total commitment to quality excellence.
Outstanding quality is the top priority at EagleBurgmann. Our products are designed for user-friendly installation, optimal functionality and long service life. Our R&D activities, advanced quality management system, in-house test facilities and in-depth engineering expertise ensure that our seals meet the most demanding customer expectations. Starting right back in the development phase, our employees continually verify the quality of our products, and we carry out systematic inspection and testing to guarantee that customers are getting top quality.

Proud of the trust which our customers place in us.
EagleBurgmann is a dependable, competent partner. Our customers are always in total control of the media in their pumps, agitators, compressors, blowers, turbines, valves and pipeline systems even when operating conditions are extremely harsh. There is good reason why customers in the oil & gas, refinery, chemical, energy, food processing, paper, water, marine, aerospace, mining and other industries choose EagleBurgmann as their sealing solutions supplier.

Technical information

In this brochure we collected some important and interesting technical information about the mechanical seals section. You can find – besides technical basic information – notes on design, installation and operation and also useful theoretical articles. In case of any queries, please do not hesitate to contact us.

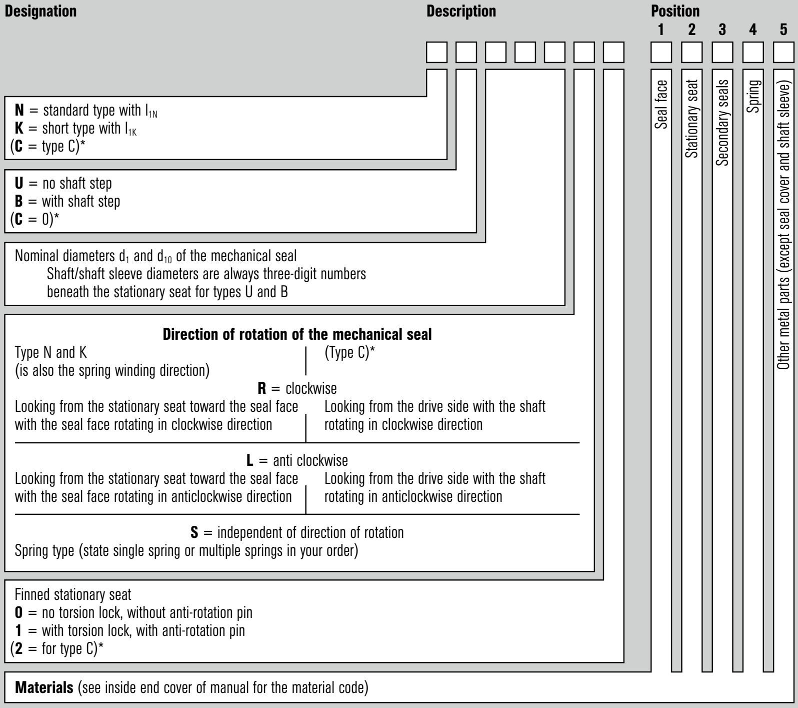
Symbols

A	Area of sliding face
A_H	Area hydraulically loaded by medium pressure
b	Width of sliding face
c	Specific heat capacity
D	Outer diameter of sliding face
d	Inner diameter of sliding face
D_a	Outer diameter of bellows
d_H	Hydraulic diameter
D_i	Inner diameter of bellows
d_m	Mean diameter of sliding face
D_w	Diameter of shaft
f	Coefficient of friction
F_f	Spring force
h	Gap width
H	Delivery head of pumping screw
k	Balance ration
k_1	Pressure gradient factor
n	Speed
p_1	Medium pressure
p_2	Atmosphere pressure
p_3	Buffer fluid pressure
Δp	$p_1 - p_2$; $p_3 - p_1$; $p_3 - p_2$
p_f	Spring pressure
p_G	Sliding pressure
p_r	Calculated load for the frictional force of the secondary seal
P_R	Power consumption of sliding faces
P_V	Turbulence loss through rotating parts
$\dot{V}$	Delivery rate
Q	Mechanical seal leakage rate
R_a	Mean roughness index (calculated)
t,T	Temperature of the medium to be sealed
ΔT	Rise in temperature of the medium to be sealed
t_3	Temperature of the buffer medium
v_g	Sliding velocity
η	Dynamic viscosity
κ	Load factor
ρ	Density
ν	Kinematic viscosity

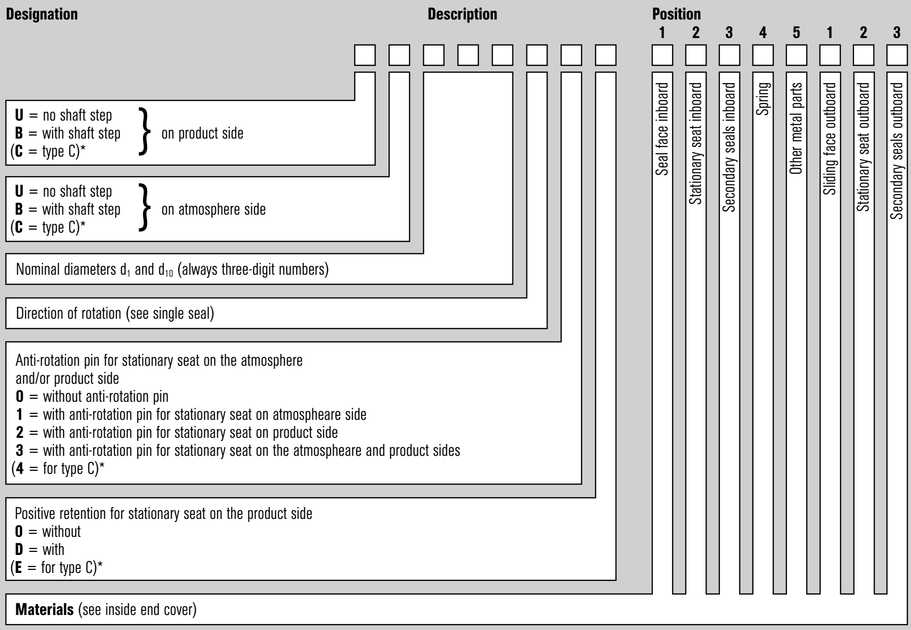
Mechanical seals according to EN 12756 (code system)

For single mechanical seals there is a distinction drawn between standard (N) and short (K) types. For double mechanical seals (back-to-back) EN specifies the short type only.

Single seal



Double seal



* DIN 24960

Code system for agitator seals to DIN

. . . . . – . . . / d_w – . .

Type
M
Seccomix
AGSZ

Range
(M45 ... 56)

Features[1)]
K = internally balanced (pressure from the inside)
L = with bearing
F = pumping screw
U = for bottom entry

Type
D = double seal

[1)] If more than one feature apply, the code letters are listed one after the other.

N.B.: The code system published in DIN 28138 Part 3 can also be used to describe and order DIN agitator seals.

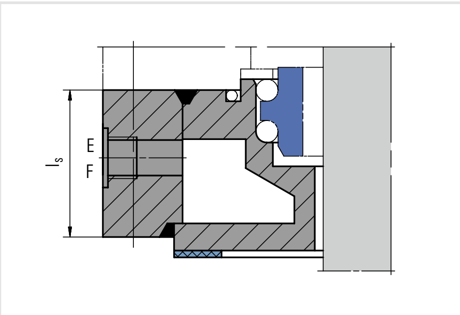
Customer specification

Shaft diameter

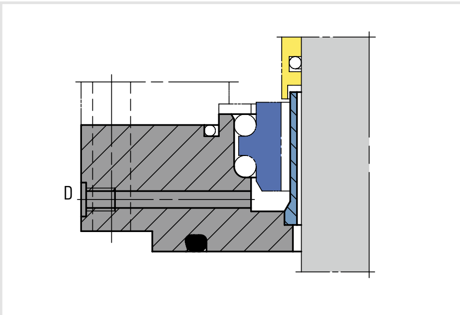
Additional options
0 – basic design
1 – leakage drain
2 – cooling flange
4 – leakage drain + cooling flange

Drive
1 – set screw
2 – shrink disk
3 – clamping collar
4 – key
5 – flange (shaft sleeve)
6 – shaft sleeve with flange and key
7 – clamping set
8 – muff coupling
9 – customer-specification

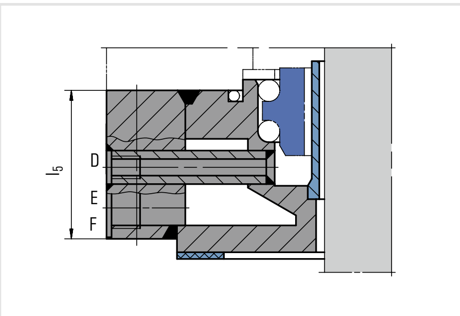
Additional options for agitator seals



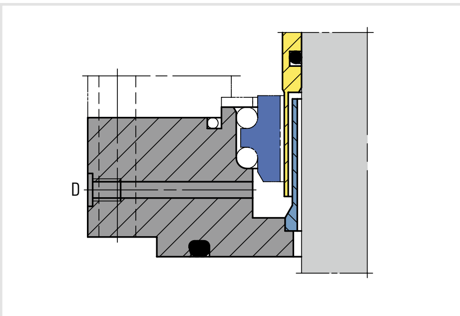
Cooling flange, can be used alternatively as a heating flange ($t_{max.}$ = 250 °C (482 °F)).



Leakage drain, can be used alternatively as a flush.



Leakage drain, can be used alternatively as a flush or as a heating flange.



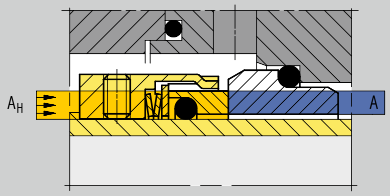
Polymerization barrier, can be used alternatively as a leakage drain or a flush.

Technical information

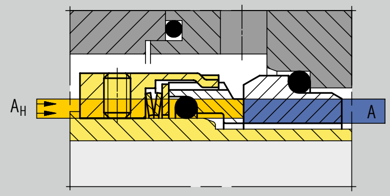
Balance ratio

The balance ratio is a non-dimensional factor of the mechanical seal and is defined as

$$k = \frac{\text{hydraul. loaded area } A_H}{\text{area of sliding face } A}$$

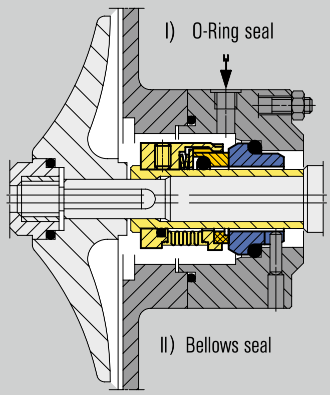


Unbalanced k > 1



Balanced k < 1

In practice k values are selected between 0.65 and 1.2. With a lower k value, the safety against thermal overload will increase, but the mechanical seal may also lift off more easily.



Unlike an O-Ring seal, the hydraulic diameter of a bellows seal is not a fixed geometric value. It is also influenced by the absolute level of the pressure to be sealed and by the direction of pressurization (internal or external pressure).

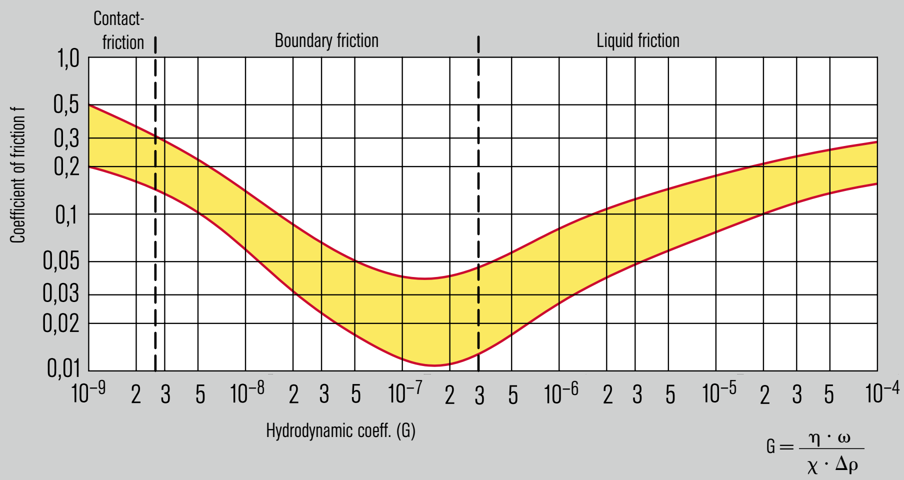
Sliding pressure p_G

The term “sliding pressure” is understood to be the surface pressure on the two sealing faces which remains after subtracting all those forces that act on the seal face and which are balanced by hydraulic pressures. The sliding pressure is conditional on the pressure differential to be sealed, the balance ratio, the pressure conditions inside the sealing gap i.e.gap between the seal faces (pressure gradient factor) and the spring pressure. The pressure gradient factor k_1 can assume values between 0 and 1, depending on the geometry of the two sealing faces. For sealing gap geometries which converge in leakage direction – V-gap for externally pressurized seals – the value of k_1 is > 0.5, while for sealing gap geometries which diverge in leakage direction – A-gap for externally pressurized seals – the value of k_1 < 0.5. For simplified calculations the value of k_1 is generally taken to be 0.5. Under unfavourable conditions the sliding pressure can become negative, causing the sealing faces to open resulting in excessive leakage.

$$p_G = \Delta p \cdot (k - k_1) + p_f$$

Coefficient of friction f

The coefficient of friction f is conditional on the materials that are in contact, the medium being sealed, the sliding velocity and the design-related conditions of contact between the sliding faces. For general considerations and calculations, a coefficient of friction of between 0.05 and 0.08 can be applied as a good approximation. As can be seen in the graph, a lower value is obtained under improved conditions of lubrication, e. g. due to partial build-up of hydrodynamic pressure in the sealing gap. On the other hand, when a mechanical seal is run under purely hydrodynamic conditions of operation, the coefficient of friction will rise as the speed increases – similar to hydrodynamic bearings.



Gap width h

Seals with contacting faces

In contact seals with a theoretically parallel sealing gap, the distance between the two sealing faces is conditional on the roughness of the surfaces. Numerous measurements taken in the laboratory and in practice with due allowance for external factors indicate that a mean gap width of less than 1 mm can be used as a basis for calculating the normal degree of leakage.

Seals with non-contacting faces

Hydrostatically or hydrodynamically balanced, non-contacting mechanical seals adjust automatically to a defined gap width during operation. The width of the gap depends mainly on the shape of the gap in radial as well as circumferential direction, on the operating conditions and on the medium.

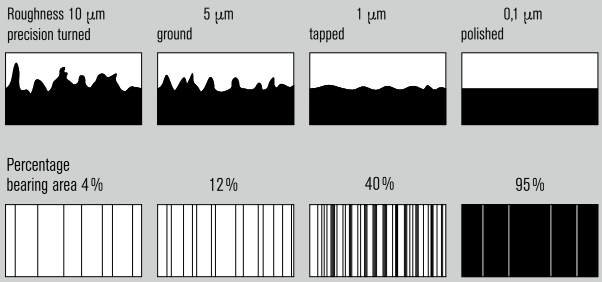
Load factor $\varkappa$

The balance ratio is just a non-dimensional factor used to assess a mechanical seal. A second one is the load factor $\varkappa$.

$$\varkappa = k + \frac{p_f \pm p_r}{\Delta p}$$

The balance ratio and the load factor are practically identical when the pressure differentials to be sealed are large. The friction at the dynamic secondary seals p_r is usually disregarded in the calculation.

Surface roughness



Degree of roughness in relation to the percentage bearing

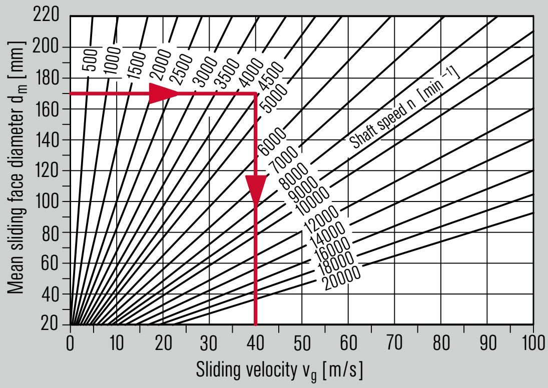
Microfinished sliding faces made of various materials display the following average, arithmetic mean roughness values (R_a):

Tungsten carbide, nickel-bonded: 0,01 µm
Silicon carbide (SiC): 0,04 µm
Special cast Cr-steel: 0,15 µm
Carbon graphite: 0,10 µm
Aluminium oxide: 0,15 µm
C-SiC-Si/C-SiC: 0,15 µm

The lower the roughness value, the higher the percentage bearing area and hence the higher load capacity of a mechanical seal.

Sliding velocity v_g

The sliding velocity is usually quoted in relation to the mean sliding face diameter.



Example:
d_m = 170 mm
n = 4,500 min^{-1}
v_g = 40 m/s

Turbulence losses Pv

The turbulence-related consumption of power is not significant until the circumferential speed reaches 30 m/s (98 ft/s). It must be given due consideration particularly with special seals.

Heat transfer

The total power consumption of a mechanical seal has to be dissipated into the medium or the buffer fluid by means of appropriate measures in order to stop the seal from overheating. The necessary fluid flow rate for removal of the power losses is calculated by

$$\dot{V} = \frac{P_R + P_V}{\Delta T \cdot c \cdot \varrho}$$

Under certain conditions of installation or operation heat may pass from the product to the sealing compartment and will need to be taken into account when calculating the circulation rate.

Example calculation:
P_R = 420 W (1 W = 1 $\frac{J}{s}$)
ΔT = 10 K
Fluid: Water;
c = 4200 J / (kg · K)
ϱ = 1 kg / dm^3

$$\dot{V} = \frac{420\ W \cdot kg \cdot K \cdot dm^3}{10\ K \cdot 4200\ Ws \cdot 1\ kg}$$
= 0.01 l/s = 0.6 l/min

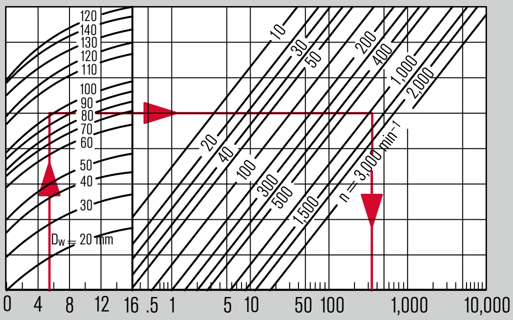
Cooling water requirements

When estimating the amount of cooling water required by heat exchangers it can be assumed that the temperature of the cooling water will increase by 5 K between the inlet and the outlet. This means that 1 l/min of cooling water dissipates 350 W.

Power consumption P_R of the sliding faces

The power consumption through friction of the sliding faces is calculated by the equation

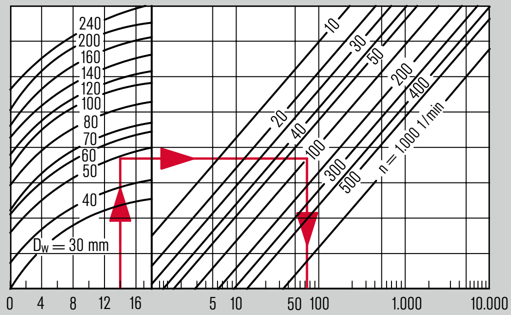
$$P_R = (\Delta p \cdot k + p_f) \cdot v_g \cdot A \cdot f$$



***Example M7:**

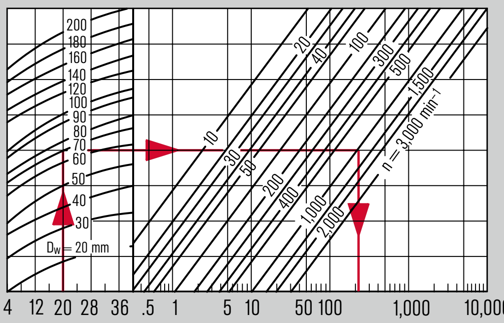
Δp = 5 bar
D_w = 100 mm
n = 1,000 min^{-1}
P_R = 310 W

* unbalanced rotating seal



Example M48-D:

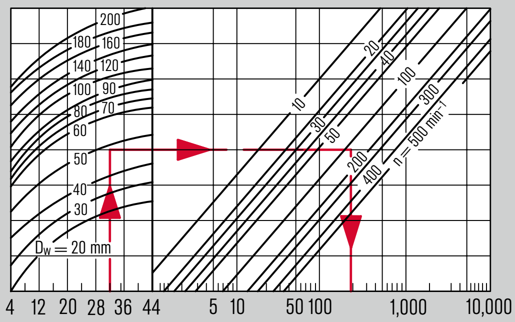
Δp = 14 bar
D_w = 50 mm
n = 100 min^{-1}
P_R = 70 W
Low-duty agitator seals (PN 16)



***Example H7:**

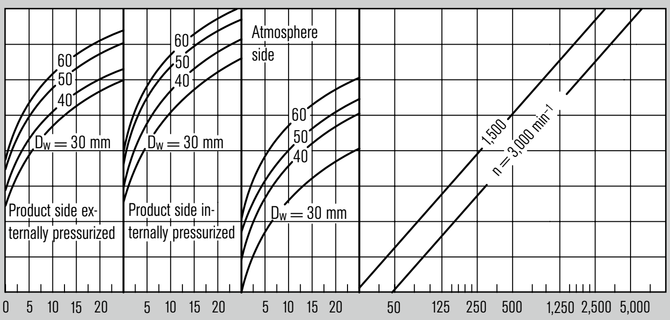
Δp = 20 bar
D_w = 70 mm
n = 1,000 min^{-1}
P_R = 215 W

* balanced rotating seal



Example HS-D:

Δp = 32 bar
D_w = 50 mm
n = 100 min^{-1}
P_R = 195 W
Heavy-duty agitator seals (PN 40)



Balanced stationary seal of the HRC series

Power consumption

The total power consumption of a mechanical seal is calculated from

- The power consumed by the sliding faces.
- The power consumption due to turbulence created by the rotating parts.

Surface technology for sliding faces

Combinations of face materials such as carbon graphite/SiC and SiC/SiC have proven excellently suitable for use in mechanical seal technology, but permanently problem-free functioning also requires adequate lubrication in the sealing gap or, where gas-lubricated mechanical seals are concerned, contactless operation.

Dry running as result of inadequate lubrication or, in the case of gas seals, contact between the sliding faces during operation, leads to massive temperature increases and possible damage to the sliding faces and secondary seals.

In order to significantly extend the service life and reliability of such seals or enable their use under extreme conditions in the first place, EagleBurgmann offers three special sliding face coatings, namely DiamondFace, Diamond-Like-Carbon (DLC) and Titanium Nitride (DM-TiN). Each of these coatings has its own particular strengths, and which of them is to be used depends on the application for which it is intended.

DiamondFace
The introduction of DiamondFace by EagleBurgmann in 2007 was a milestone in the history of mechanical seal technology. A micro-crystalline layer, which has all the attributes of natural diamond, is applied to the seal faces by means of a chemical vapor deposition (CVD) process in a vacuum reactor at a temperature of 2,000 °C (3,632 °F). Developed in cooperation with the Fraunhofer Institute for Surface Engineering and Thin Films in Braunschweig/Germany, the process produces high coating thicknesses and an extremely even seal face. Coating adhesion exceeds all known requirements in practical application.

Seal faces with DiamondFace coatings are extremely hard and wear-resistant, and exhibit low friction, excellent heat conductivity and extremely high chemical resistance. The technology increases the service life of mechanical seals used in pumps, agitators and compressors many times over. Time between maintenance calls increases considerably, and lifecycle costs are reduced significantly.

DLC (Diamond-Like-Carbon)
This hydrogenated amorphous carbon coating (a-C:H), applied by plasma enhanced chemical vapour deposition (PECVD), features excellent wear protection and friction reduction for silicon carbide seal faces. The high hardness and the specially designed surface offer great protection against scoring. DLC is used as standard coating for silicon carbide seal faces and is only surpassed by the extraordinary properties of the DiamondFace coating. In terms of material properties, the a-C:H DLC coating is to classify between diamond and carbon graphite.

DM-TiN Titanium Nitride
The DM-TiN titanium nitride coating (Standard: 1.4006/SU410, Japanese patent no. 2134661) is applied by means of an ion beam mixing process, and exhibits outstanding microhardness and excellent adhesive properties due to the fact that it penetrates the metal and forms a tight metallurgical bond.

Titanium nitride coatings are used as start-up protection for metallic seal faces on compressor seals (e. g. MDGS). DM titanium nitride/carbon graphite combinations have a good friction coefficient and exhibit excellent emergency running properties.

Leakage rate Q

Calculated rates of leakage and power losses are not guaranteed values. They are statistical and calculated mean values which are determined on the basis of experience and extensive testing. The leakage rates and power losses which actually arise in a particular seal can be several times higher on account of factors that are impossible to quantify theoretically. As can be seen from formula, the leakage rate is mainly conditional on the actual gap width during operation. This depends in turn on many factors (see also gap width).

Factors influencing leakage
The major factors with an influence on a mechanical seal's leakage rate, correct functioning and reliability include:

- Machined finish of the sliding faces
- Flatness of the sliding faces and flatness deviations caused by thermal or pressure-induced deformations
- Machine vibrations or stability
- Mode of operation of the plant
- Characteristics of the medium to be sealed
- Correct installation of the mechanical seal

Formula for externally pressurized mechanical seals

$$\mathbf{Q} = \frac{h^3}{\eta \cdot \ln\left(\frac{D}{d}\right)} \left[1{,}885 \cdot 10^{-4} \cdot \Delta p - 7{,}752 \cdot 10^{-19} \cdot \varrho \cdot n^2 \cdot (D^2 - d^2)\right]$$

Example calculation for a H7N/48 seal

$$\mathbf{Q} = \frac{0{,}27^3}{4{,}7 \cdot 10^{-4} \cdot \ln\left(\frac{56{,}9}{51{,}9}\right)}$$

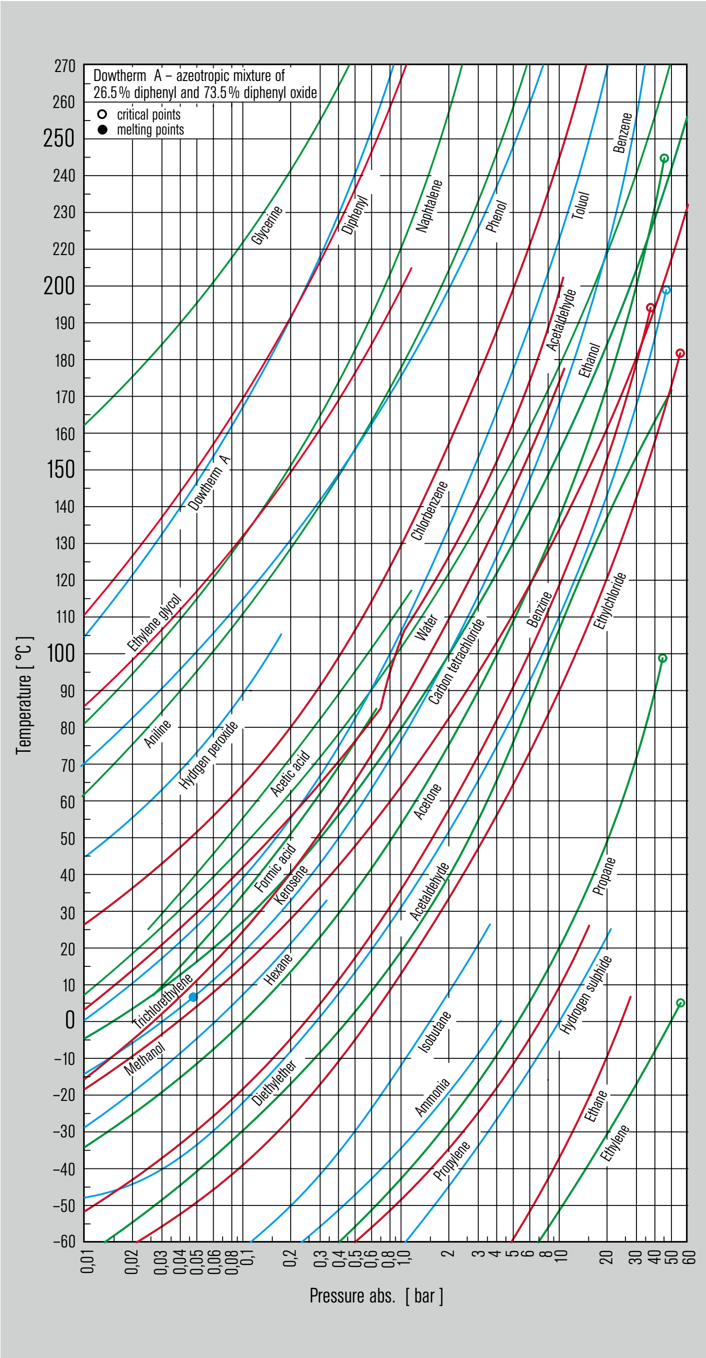
$D = 56{,}9$ mm $h = 0{,}27$ µm
$d = 51{,}9$ mm $\Delta p = 18$ bar
$n = 3000$ min^{-1} $\varrho = 983$ kg/m^3
$\eta = 4{,}7 \cdot 10^{-4}$ Pa · s

$$\left[1{,}885 \cdot 10^{-4} \cdot 18 - 7{,}752 \cdot 10^{-19} \cdot 983 \cdot 3000^2 \cdot (56{,}9^2 - 51{,}9^2)\right]$$

Q = 1,543 ml/h

Technical information

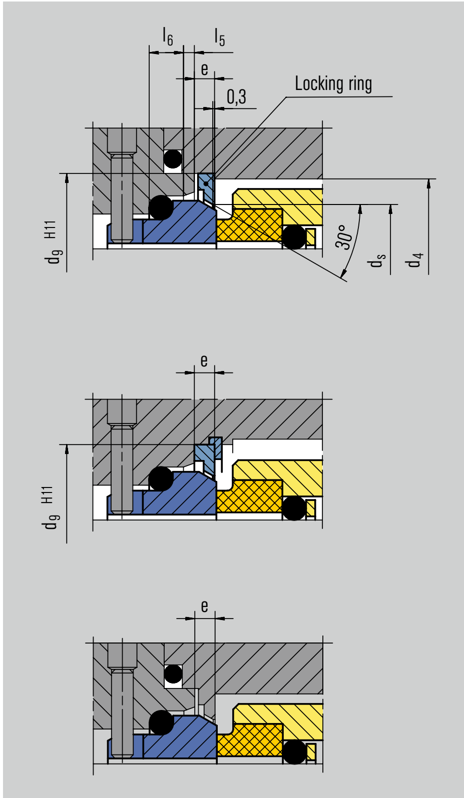
Vapor curves



Acetaldehyde
Acetone
Formic acid
Ammonia
Aniline
Benzine
Benzene
Chlorobenzene
Diethyl ether
Diphenyl
Dowtherm A
Acetic acid
Ethanol
Ethane
Ethylchloride
Ethylene
Ethylenre glycol
Glycerine
Isobutane
Hexane
Kerosene
Methanol
Naphtalene
Phenol
Propane
Propylene
Hydrogen sulphide
Carbon tetrachloride
Trichloroethylene
Toluol
Water
Hydrogen peroxide

A sealing system for hydrocarbons must often make allowance for partial dry running due to their low boiling points. However with the right design features and face materials, it is possible to guarantee failsafe operation of the mechanical seal. The operating temperature must be at least 5 K lower than the boiling point under operating pressure.

Seat locking*) to EN 12756

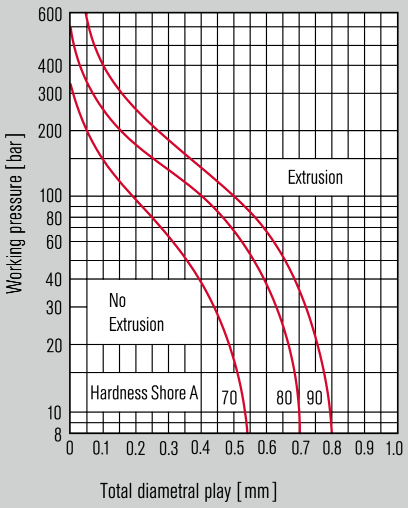


d_1	d_2	d_4		d_9		l_5	l_6	e	d_s
		U	B	U	B				
10	14	22	26	26	30	1.5	4	4	–
12	16	24	28	28	32	1.5	4	4	–
14	18	26	34	30	38	1.5	4	4	–
16	20	28	36	32	40	1.5	4	4	–
18	22	34	38	38	42	2.0	5	4	31.2
20	24	36	40	40	43	2.0	5	4	33.2
22	26	38	42	42	46	2.0	5	4	35.2
24	28	40	44	43	48	2.0	5	4	37.2
25	30	41	46	46	50	2.0	5	4	38.2
28	33	44	49	48	53	2.0	5	4	41.2
30	35	46	51	50	60	2.0	5	4	43.2
32	38	48	58	53	62	2.0	5	4	46.2
33	38	49	58	53	62	2.0	5	4	46.2
35	40	51	60	60	65	2.0	5	4	48.2
38	43	58	63	62	67	2.0	6	6	53.5
40	45	60	65	65	70	2.0	6	6	55.5
43	48	63	68	67	72	2.0	6	6	58.5
45	50	65	70	70	75	2.0	6	6	60.5
48	53	68	73	72	77	2.0	6	6	63.5
50	55	70	75	75	86	2.5	6	6	67.5
53	58	73	83	77	88	2.5	6	6	70.6
55	60	75	85	86	91	2.5	6	6	72.6
58	63	83	88	88	93	2.5	6	6	75.6
60	65	85	90	91	96	2.5	6	6	77.6
63	68	88	93	93	98	2.5	6	6	80.6
65	70	90	95	96	103	2.5	6	6	82.6
68	–	93	–	98	–	–	–	6	88.6
70	75	95	104	103	108	2.5	7	6	90.2
75	80	104	109	108	120	2.5	7	6	95.2
80	85	109	114	120	125	3.0	7	6	103.0
85	90	114	119	125	130	3.0	7	6	108.0
90	95	119	124	130	135	3.0	7	6	113.0
95	100	124	129	135	140	3.0	7	6	117.5
100	105	129	134	140	145	3.0	7	6	122.5

* not applicable for seats made of carbon

Extrusion characteristics of elastomeric O-Rings

The extrusion resistance of elastomeric O-Rings can be greatly enhanced by the use of support rings.

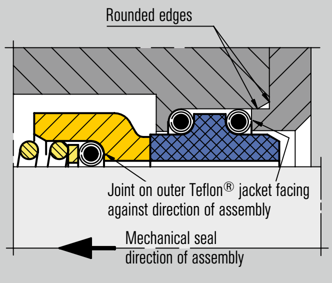


TTV O-Rings

Double PTFE-encapsulated O-Rings of the type used in EagleBurgmann mechanical seals combine the elasticity of the core materials (synthetic rubber) with the chemical and thermal resistance of the PTFE.

The material PTFE features good chemical and thermal resistance but it also displays a high degree of rigidity, a low coefficient of thermal conductivity, an unfavourable expansion characteristic and a tendency to cold flow. It is advisable therefore to avoid the use of O-Rings made of solid PTFE.

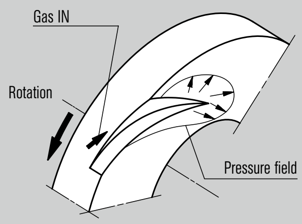
The assembly position of double PTFE-encapsulated elastomers is critical. Care must be taken to ensure that the joint on the outer jacket faces against the assembly direction, as otherwise there is a risk of the jacket opening and being pulled off. Bending of the jacket must be avoided at all costs to prevent leaks. Slip TTV rings onto tubes for safe storage.



Functional principle gas-lubricated seals

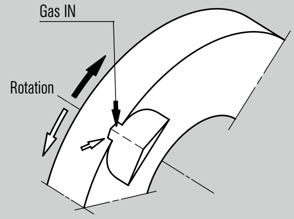
In its basic design and mode of operation, the EagleBurgmann Gas Seal is the same as a conventional mechanical seal except for two differences: a) the sliding faces are wider, and b) they are lubricated by gas rather than liquid.
This is assured in outstanding manner by the sophisticated geometry of V- and U-grooves in the sliding faces. Even at low speeds a stable gas film develops in the sealing gap to separate the sliding faces and guarantee non-contacting, wear-free operation, at a minimum level of power consumption that is 95 % below that of liquid-lubricated seals.
Elaborate buffer fluid oil systems for the lubrication and cooling of double seals are superfluous. Gas pressurization at a level of around 5 to 10 % above product pressure (p_1) makes sure that no process medium can escape to the atmosphere. A small gap height of approximately 3 µm between the sliding faces results in minimum consumption of buffer gas of a magnitude that depends largely on the pressure, speed and seal diameter.

V-grooves



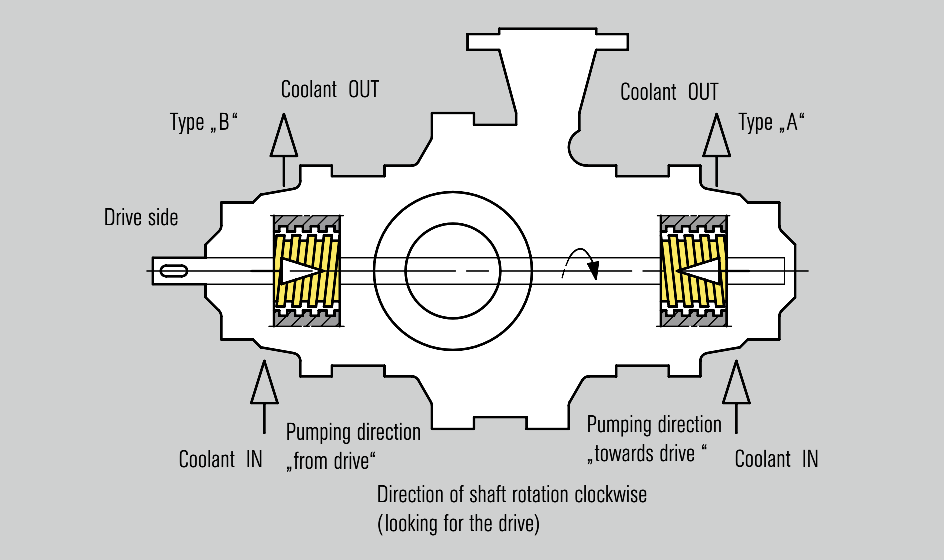
The V-grooves convey the gas by a rotary movement between the sliding faces. The resulting pressure rise causes the seal faces to lift off and ensures a contact-free operation. V-grooves are **dependent** on the direction of rotation.

U-grooves

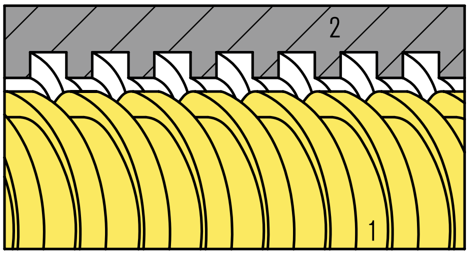


For sliding faces featuring U-grooves, the operating principle is similar to that for V-grooves, with one decisive difference: the direction of rotation is **independent.**

Technical information



Contra-rotating pumping screw.



1 Pumping screw
2 Pumping sleeve

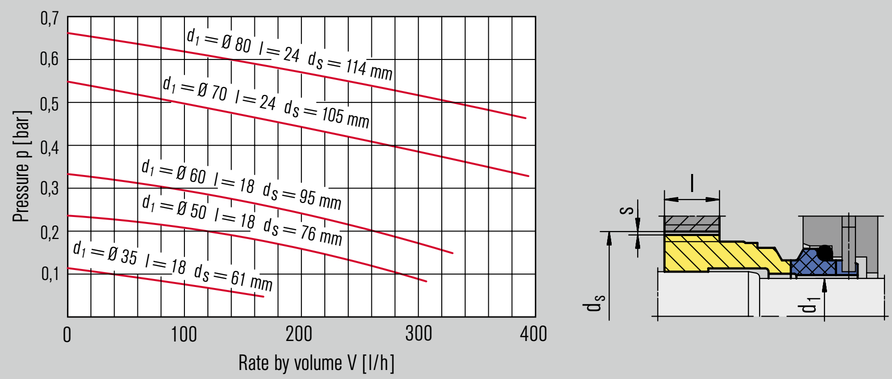
Pumping screw

Pumping screws are used to boost the circulation of coolant for single and double mechnical seals.
The direction of flow, delivery head and delivery rate can be adapted to the given operating conditions by suitable design measures.
Pumping screws are **dependent on the direction of rotation.** An **“F”** in the drawing number stands for a pumping screw. It follows after the type code. The optimum arrangement is afforded by the **contra-rotating pumping screw** where the thread of the stationary screw (pumping sleeve) faces in opposite direction to the rotating thread (pumping screw).

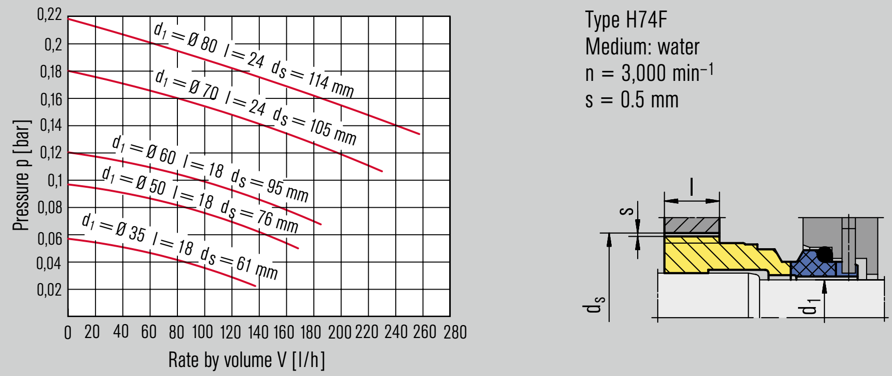
Explanation
The diagram shows a multi-stage centrifugal pump with **clockwise** rotation (looking from the drive side), a **type B** mechanical seal with pumping direction **“from drive”** on the drive side and a **type A** mechanical seal with pumping direction **“towards drive”** on the nondrive side.

Direction of shaft rotation (looking from drive)	Pumping direction	Pumping screw type	Coding of components
Right	Towards drive	A	Pumping screw AR
			Pumping sleeve AL
	From drive	B	Pumping screw BL
			Pumping sleeve BR
Left	Towards drive	B	Pumping screw BL
			Pumping sleeve BR
	From drive	A	Pumping screw AR
			Pumping sleeve AL

Pumping capacity of various pumping screws with pumping sleeve



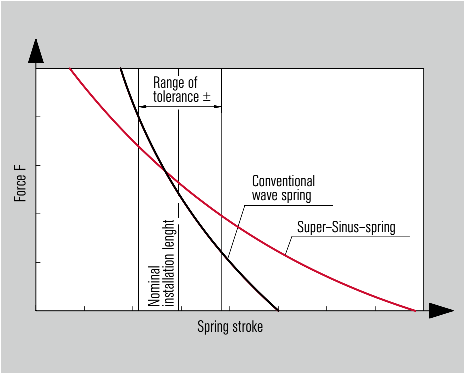
Pumping capacity of various pumping screws without pumping sleeve



Type H74F
Medium: water
n = 3,000 min^{-1}
s = 0.5 mm

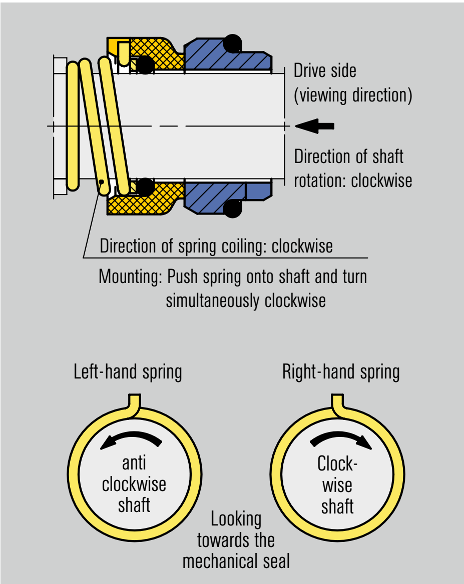
Super-Sinus spring

The Super-Sinus spring permits an almost uniform introduction of forces over the whole range of increased axial movement tolerances of mechanical seals, e. g. M7N/H7N. The one-piece spring is endless and has a very flat characteristic. The Super-Sinus spring has no welding spots to minimize corrosion. It is regularly made of 1.4571, optionally of Hastelloy®.



Conical spring

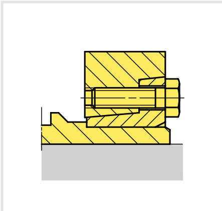
When a conical spring is used for driving the seal (e. g. in standard types M2 and M3), the mechanical seal becomes **dependent on the direction of rotation.** Looking toward the sliding face of the rotating parts of the seal, shafts rotating in clockwise direction require right-hand springs and shafts rotating in anticlockwise direction require left-hand springs. Mounting the conical spring is easier if you twist it onto the shaft with a screwing action in the same direction as the spring coiling. This screwing action will cause the spring to open. For brief reversals of the direction of rotation we recommend seal type "S30".

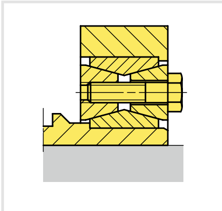


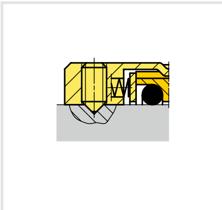
Types of drive

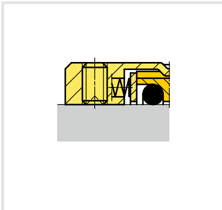
For a seal to function properly, the shaft torque must be transmitted uniformly to the shaft sleeve and/or rotating parts under all operating conditions. Depending on the seal design it is necessary to make allowance for centrifugal and axial forces and in some case to observe special installation instructions. Incorrect fitting can cause, for example, jamming and deformation of the seal.

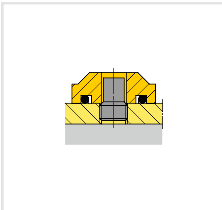
Typical arrangements

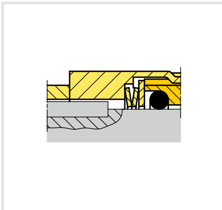

Shrink disk

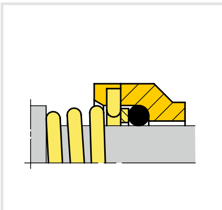

Clamping set

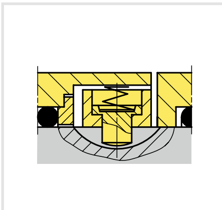

Set screw with cone point


Set screw with cup point


Allen set screw with full dog point


Drive key


Conical spring


Spring loaded drive pin

Shrink disk

The pressure necessary for the transmission of torque is generated through clamping force on lubricated conical surfaces.
The shrink disk couplings can be released at any time by slackening the tensioning screws. All the parts involved are subjected to elastic deformation only, so the original clearance is restored once the screws are released. Provided the conical surfaces are undamaged, the shrink disks can be retensioned any number of times (ensure correct lubrication). Shaft sleeves should not have a clearance diameter under the shrink disk and should make full contact with the shaft.

Prior to installation

To fit a seal you will need its installation and operating instructions with the correct drawing. Before starting, check the dimensions, the maximum acceptable deviations and the geometrical tolerances of the machine.

Edges and shoulders

All edges and shoulders onto or into which the mechanical seal is pushed during installation must be chamfered, deburred and rounded off to less than 30° x 2 mm.

Dimensional deviations

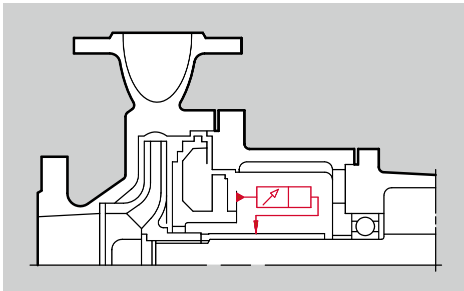
Acceptable deviations for dimensions having no tolerance specification:

- ISO 2768 Part 1, fine/medium for linear and angular dimensions
- Part 2, tolerance class K for general geometrical tolerances

Concentricity tolerance

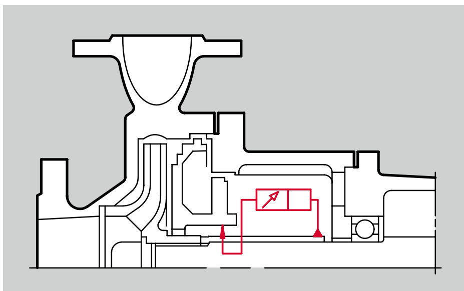
Shaft in accordance with ISO 5199

In the area of the mechanical seal the shaft concentricity tolerance must not exceed 50 µm for diameters <50 mm, 50 µm, 80 µm for diameters between 50 and 100 µm, and 110 µm for diameters > 100 mm.



Seal chamber bore

For sliding velocities of v_g < 25 m/s the concentricity tolerance of the seal chamber in relation to the shaft should not exceed 0.2 mm, and when pumping screws are used it should not exceed 0.1 mm due to the effect of the pumping characteristic. If these values are exceeded please contact EagleBurgmann.

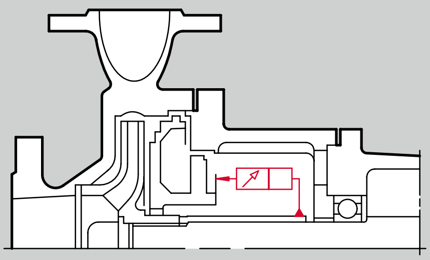


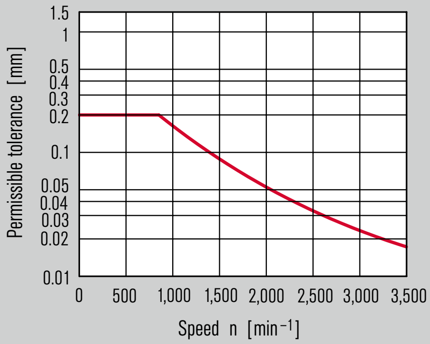
Technical information

Axial run-out

Mounting face

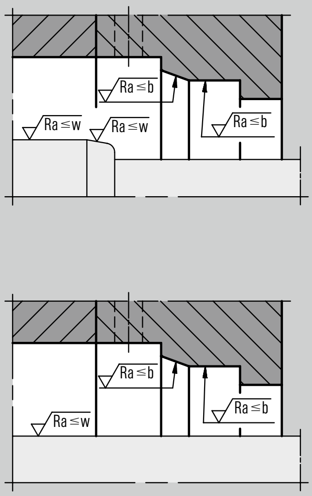
Axial run-out depends on the speed. Permissible values are indicated by the graph.





Surface finish

Finished surfaces according to EN 12756



Mean roughness index	R_a for secondary seal material	
	b	w
Elastomers	2.5 µm	0.8 µm
Non-elastomers or optional use of elastomers and non-elastomers	1.6 µm	0.2 µm

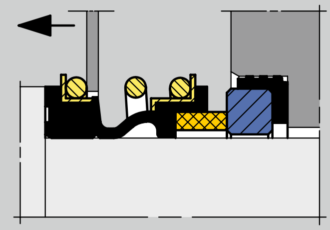
Mechanical seal installation

Absolute cleanliness and care are essential when fitting mechanical seals. Dirt and damage to sliding faces and O-Rings jeopardize a seal's function. Any protective covering on the sliding faces must be removed without trace. Never put lubricant on the sliding faces – mount only in a completely dry, dustfree and clean state. The accompanying installation instructions and the notes on the assembly drawings must be observed exactly.

Fitting advice

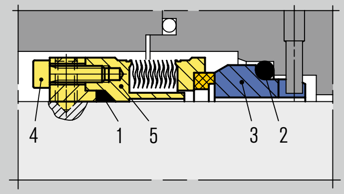
To reduce the friction an O-Rings when mounting seals on a shaft or when inserting seal cartridges in their housing, apply a thin coating of silicon grease or oil to the shaft or housing (N. B.: this does not apply to elastomer bellows seals). Never allow EP rubber O-Rings to come into contact with mineral oil or grease. When inserting stationary seats, be careful to apply even pressure and use only water or alcohol to reduce O-Ring friction.

Series MG



Use normal or soapy water (with a surfactant) to mount elastomer bellows seals of the MG series on the shaft. Wet the seal seat and the shaft thoroughly and keep wet if the distance to slide the seal is rather long. Never use oil or grease! After completing the assembly, check that the rings, springs and seal face sit correctly and tight.

Series MFL



Never over-compress metal bellows seals. Apply the axial mounting force needed to push the seal onto the shaft via the bellows drive collar.

Points to note when using Statotherm® moulded rings (e. g. MFLWT80):

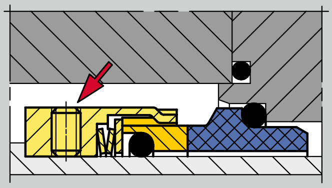
- Install moulded rings (Item 1 and 2) in the dry state only and compress in axial direction only (radial deformation would result in their destruction).
- Apply even pressure to insert the moulded ring (Item 2) and the stationary seat (Item 3) in the recess (concentricity tolerance!).
- Tighten the screws (Item 4) in the rotating part gradually and in circular succession (not cross-wise) in several steps, keeping the gap as even as possible.

Venting

To prevent damage to the sliding faces from dry running, the buffer space must be carefully vented **after you have installed the seal.** This is particularly important for those types of buffer/barrier fluid systems that do not vent themselves or are partially self venting (double seal with buffer/barrier fluid systems).

Screw locking

If no special provision is made for locking screw thread, use set screw with a suitable adhesive (e. g. Loctite®) after removing any grease.



Seal supply systems

Circulation

For single seals it is generally advisable to install a circulation pipe from the discharge nozzle of the pump to the seal chamber. A pipe size G 1/4 is normally sufficient. There should be a close fitting neck bush between the pump casing and the seal chamber.

Flushing

Flushing systems are installed in accordance with ISO 5199, Appendix E, Plan No. 08a or API 682, Appendix D, Plan 32. A clean and mostly cold external medium is injected into the stuffing box in the area of the sliding faces via on orifice (throttle) into the medium to be sealed. Flushing is used either to lower the temperature or to prevent deposits forming in the area of the mechanical seal. Again it is recommanded that a close fitting neck bush is employed.

Quench

Quench is the term commonly used in sealing engineering for an arrangement that applies a pressureless external medium (fluid, vapour, gas) to a mechanical seal's faces on the atmosphere side. A quench is used on the one hand when a single mechanical seal does not function at all or only within certain limits without auxiliary measures or when a double mechanical seal with pressurized barrier medium is unnecessary. When an integral stationary seat stop is fitted, the quench pressure should not exceed 1 bar. A quench performs at least one of the duties described below.

Fluid quench

- Absorption or removal of leakage by the quench medium
- Monitoring of the mechanical seal's leakage rate by periodic measurement of the level of the quench medium in the circulation vessel or thermosyphon vessel
- Lubrication and cooling of the standby mechanical seal
- Exclusion of air: For media which react with atmospheric oxygen the queching medium stops the leakage making contact with the atmosphere
- Protection against dry running: For applications subject to brief, periods of vacuum and operation of pumps without pumping liquid (submersible pumps) the quenching medium prevents dry running of the mechanical seal
- Stabilization of the lubrication film: For operation under vacuum and/or sealing pressures close to the vapour pressure, the quenching medium stabilizes the lubrication film
- Cooling or heating of the outboar side of the mechanical seal.

Steam quench

- Heating: For media with a high melting point the vapour quench prevents the leakage from solidifying in that area of the mechanical seal critical for its proper functioning
- Exclusion of air
- Removal of leakage

Gas quench

- Icing protection: With operating temperatures < 0 °C (cryogenic mechanical seals), the injection of nitrogen or dry air into the seal housing prevents the mechanical seal parts on the atmosphere side from icing up
- Exclusion of air
- Removal of leakage

Sealing the quench medium

- Outboard mini-gland – the preferred choice for steam, not so much for liquids
- Lip seals – the preferred choice for oils and water
- Mechanical seals – the preferred choice for all circulating quench fluids

Barrier system

To guarantee the correct working of double mechanical seals, the barrier interspace (between the product side and the atmosphere side of the mechanical seal) must be completely filled with clean barrier medium. Before starting up double mechanical seals it is vital, therefore, to ensure a sufficient rate of circulation of the barrier fluid. The barrier fluid pressure should lie 10 % or at least 2 ... 3 bar above the maximum pressure to be sealed. The flow rate must be controlled to ensure that the temperature of the barrier medium at the outlet lies below approximately 60 °C and that it does not exceed boiling point under any circumstances. The maximum acceptable inlet/outlet temperature differential is 15 K. The barrier fluid outlet lies at the highest point of the stuffing box for automatic venting of any vapour.
In view of the basic conditions of operation, a barrier system must perform the following functions:

- Build-up pressure in the barrier inter space
- Compensation of leakage
- Circulation of the barrier medium
- Cooling of the barrier medium
- Cooling of the seal

Barrier fluid systems for liquid-lubricated mechanical seals break down into two basic categories:

- **Open circuit** A circuit in which both the circulation and the pressurization take place through a single barrier fluid system (e. g. SPA). After each circuit the barrier fluid is relieved and collected in a pressureless tank.

- **Closed circuit** In this type of circuit all the components are kept under the same pressure. Pressure is applied by means of nitrogen (TS system) or the process medium pressure (DRU system), or via a refill system (SPN). Pressure loss in the circuit must be taken into account when drawing up the design.

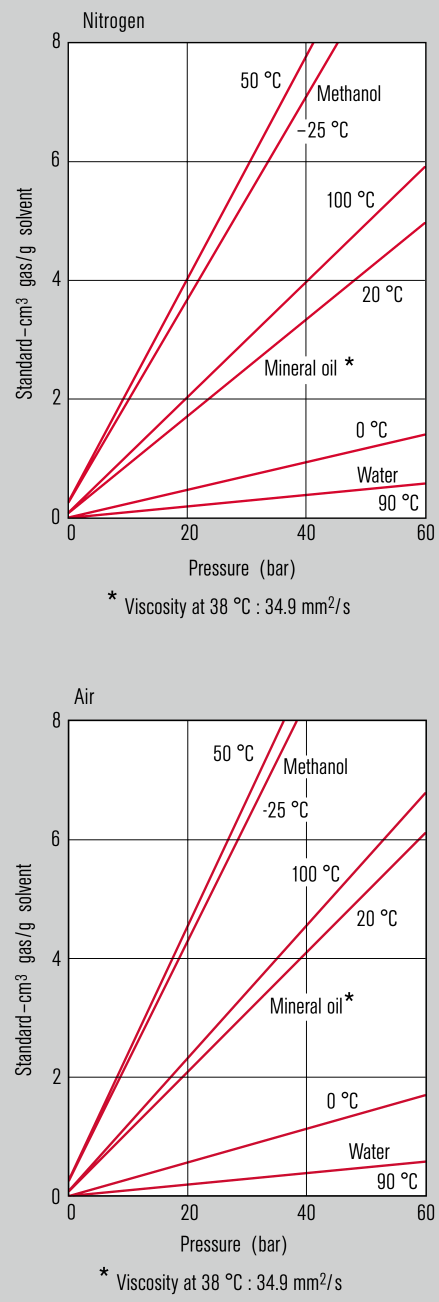
Pressure vessel regulations

Requirements imposed by the German Pressure Vessel Code on Group III pressure vessels (Section 8)

- Section 4 of the German Pressure Vessel Code orders that pressure vessels be built and operated in accordance with the generally valid rules of engineering (such as the German AD Code).
- AD Bulletin W2 requires every pressure- bearing part made of austenitic steel to be accompanied by a material certificate EN 10204 3.1 B or 3.1 C.
- The manufacturer must subject every pressure vessel to a pressure test.
- Every pressure vessel must be issued with a certificate confirming its correct production and pressure testing in accordance with the Pressure Vessel Code. This certificate is included with the delivery.

Barrier medium

The barrier medium fulfills two functions – it dissipates the heat generated by the seal and it prevents the product from penetrating the sealing gap to any appreciable degree. Any liquid and any gas can be chosen as barrier medium, with due consideration to the corrosion resistance of the parts it comes into contact with and to its compatibility with the process medium and surroundings. The barrier medium must not contain any solids. It is particularly important that liquid barrier media do not tend to precipitate and that they have a high boiling point, a high specific thermal capacity and good thermal conductivity. Clean, demineralised water satisfies these requirements to a high degree.
Hydraulic oil is often used in buffer fluid units and water in closed barrier fluid circuits. To prevent damage to the TS and sealing system, due allowance must be made for the coefficients of volumetric expansion of the barrier fluids used.

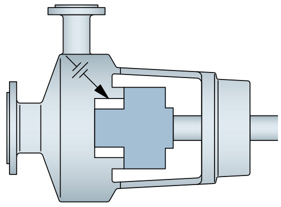


Gas solubility in typical barrier media

Piping plans in accordance with API 682 4th edition

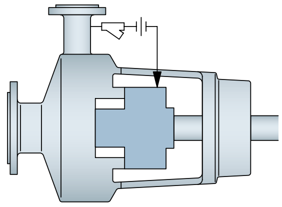
Process side

Plan 01



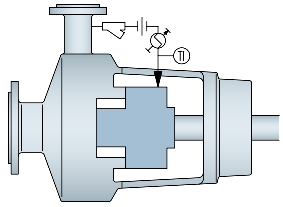
Integral (internal) recirculation from the pump discharge to the seal chamber.

Plan 12



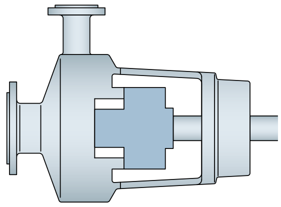
Recirculation from the pump discharge through a strainer and a flow control orifice into the seal chamber.

Plan 22



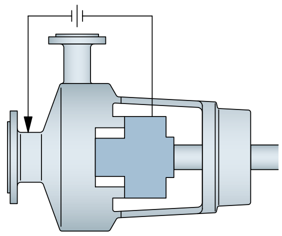
Recirculation from pump discharge through a strainer, a flow control orifice and a cooler into the seal chamber.

Plan 02



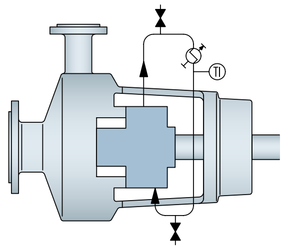
Dead-ended seal chamber with no recirculation of flushed fluid. Flush connections plugged.

Plan 13



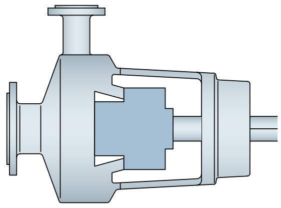
Recirculation from the seal chamber through a flow control orifice and back to the pump suction or pump suction piping.

Plan 23



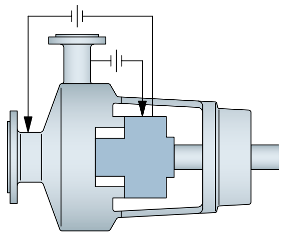
Recirculation from a circulation device in the seal chamber through a cooler and back into the seal chamber.

Plan 03



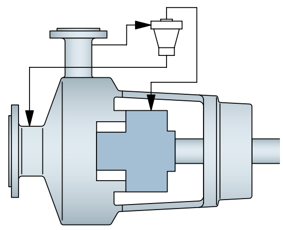
Circulation between the seal chamber and the pump created by the design of the seal chamber. Flush connections plugged.

Plan 14



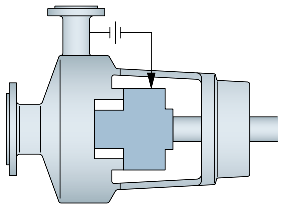
Recirculation from pump discharge through a flow control orifice to the seal and simultaneously from the seal chamber through a flow control orifice to pump suction.

Plan 31



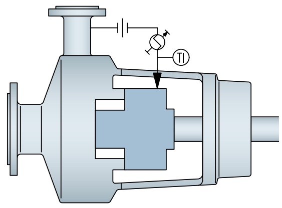
Recirculation from the pump discharge through a cyclone separator delivering the clean fluid to the seal chamber. The solids are delivered to the pump suction line.

Plan 11



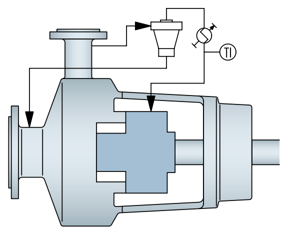
Recirculation from the pump discharge through a flow control orifice into the seal chamber.

Plan 21



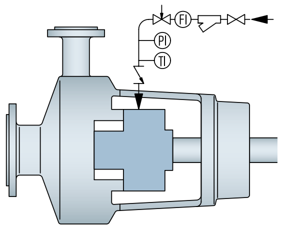
Recirculation from pump discharge through a flow control orifice and cooler into the seal chamber.

Plan 41



Recirculation from the pump discharge through a cyclone separator delivering the clean fluid to a cooler and then to the seal chamber. The solids are delivered to the pump suction line.

Plan 32



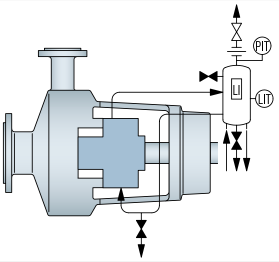
Injection of clean fluid into the seal chamber from an external source.

Instrument symbols

FO	Flow orifice	TI	Temperature indicator
LI	Level indicator	TIT	Temperature transmitter with local indicator
LIT	Level transmitter with local indicator	HLA	High level alarm set point
PDIT	Differential pressure transmitter with local indicator	LLA	Low level alarm set point
PI	Pressure indicator	NLL	Normal liquid level
PIT	Pressure transmitter with local indicator	FI	Flow indicator
		FIT	Flow transmitter with local indicator

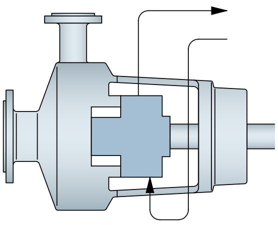
Between seals

Plan 52



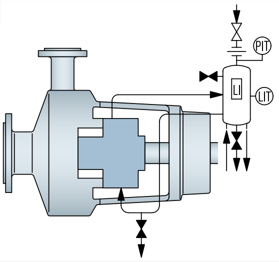
Reservoir providing buffer liquid for the outer seal of an arrangement 2 unpressurized dual seal. The buffer liquid shall be maintained at a pressure less than seal chamber pressure and less than 2.8 bar (40 PSI).

Plan 55



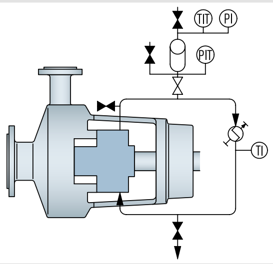
Unpressurized external buffer fluid system supplying clean buffer liquid for the outer seal of an arrangement 2 unpressurized dual seal. Buffer liquid is circulated by an external pump or pressure system.

Plan 53A



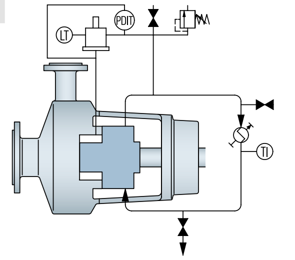
Pressurized barrier fluid reservoir supplying clean fluid for an arrangement 3 pressurized dual seal.

Plan 53B



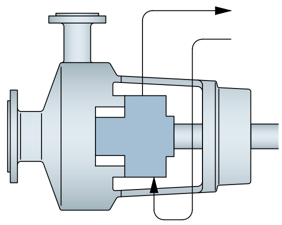
Barrier fluid system pressurized by a bladder accumulator supplying clean liquid for an arrangement 3 pressurized dual seal.

Plan 53C



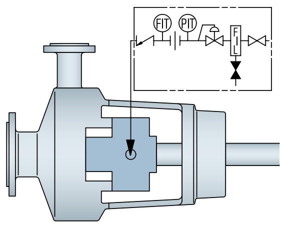
Barrier fluid system pressurized by a piston accumulator supplying clean liquid for an arrangement 3 pressurized dual seal. The barrier pressure is generated from the seal chamber pressure. The system is self-energizing and reacts to fluctuations in the seal chamber fluid pressure.

Plan 54



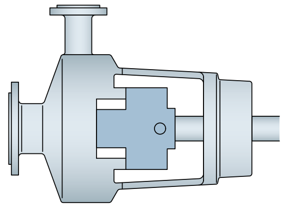
Pressurized external barrier fluid system supplying clean liquid for an arrangement 3 pressurized dual seal. The barrier liquid is maintained at a pressure greater than seal chamber pressure and is circulated by an external pump or pressure system.

Plan 72



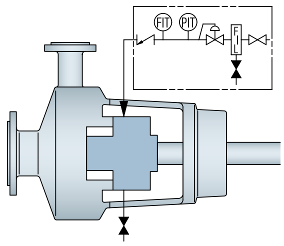
Externally supplied buffer gas for arrangement 2 unpressurized seals with a dry running containment seal (2CW-CS and 2NC-CS). Buffer gas is maintained at a pressure less than seal chamber pressure. The buffer gas pressure should not exceed 0.7 bar (10 PSI).

Plan 71



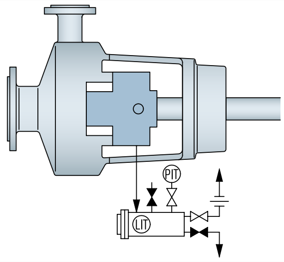
Tapped connections for the purchaser's use e. g., for future use of buffer gas.

Plan 74



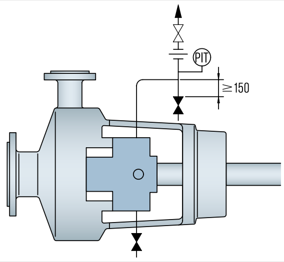
Externally supplied barrier gas for arrangement 3 dual pressurized non-contacting gas seals (3NC-FB, 3NC-BB, 3NC-FF).

Plan 75



A containment seal chamber leakage collection system for condensing or mixed phase leakage on arrangement 2 unpressurized seals with containment seals (2CW-CS and 2NC-CS).

Plan 76



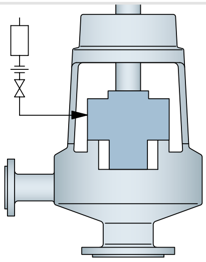
A containment seal chamber drain for non-condensing leakage on arrangement 2 unpressurized seals with containment seals (2CW-CS and 2NC-CS). Used if the pumped fluid does not condense at ambient temperatures.

Equipment symbols

Bladder accumulator	Valve, normally open
Cyclone separator	Valve, normally closed
Filter, coalescing	Valve, check
Flow orifice	Valve, needle
Seal cooler	Valve, pressure control
Strainer, Y	Valve, pressure relief

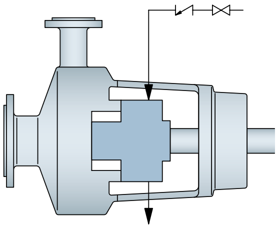
Atmospheric side

Plan 51



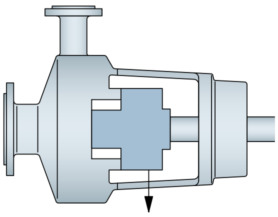
Reservoir providing a dead-ended blanket for fluid to the quench connection of the gland plate. Only recommended for vertical pumps.

Plan 62



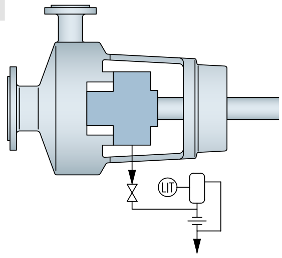
Quench stream from an external source to the atmospheric side of the seal faces. The quench stream can be low pressure steam, nitrogen or clean water.

Plan 61



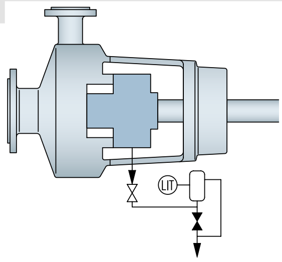
Tapped and plugged atmospheric-side connections for purchaser's use.

Plan 65A



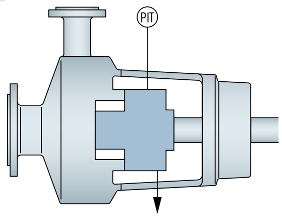
Atmospheric leakage collection and alarm system for condensing leakage. Failure of the seal will be detected by an excessive flow rate into the leakage collection system.

Plan 65B



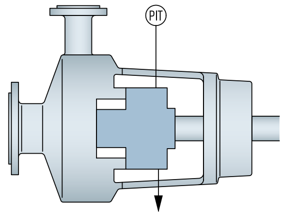
Atmospheric leakage collection and detection system for condensing leakage. Failure of the seal will be detected by a cumulative leakage into the system.

Plan 66A



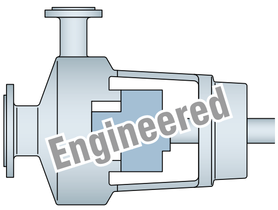
Throttle bushings in the seal gland minimize the seal leakage leaving the seal gland and allow for detection of a seal failure by an alarm of the monitoring pressure transmitter.

Plan 66B



An orifice plug in the drain port minimizes the seal leakage leaving the seal gland and allows for detection of a seal failure by an alarm of the monitoring pressure transmitter.

Plan 99



Engineered piping plan not defined by other existing plans.

Seal coding system according to API 682 4th edition

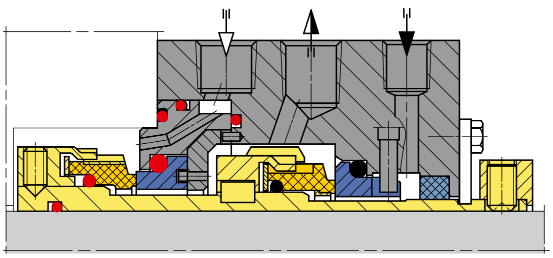
Mechanical seal			Design options			Size	Plans
Category	**Arrangement**	**Type**	**Containment device**	**Secondary seal material**	**Face material**	**Shaft size**	**Piping plan**
1 **2** **3**	**1** **2** **3**	**A** **B** **C** Dual seal with different seal types in the inner and outer position: Inner type / Outer type **e.g. C/B**	**P:** Plain gland for Arrangement 2 and 3 **L:** Floating throttle bushing for Arrangement 1, Category 1, 2, 3 **F:** Fixed throttle bushing for Arrangement 1, Category 1 **C:** Containment seal for 2CW-CS, 2NC-CS **S:** Floating, segmented carbon bushing **X:** Specified separately	**F:** FKM **G:** PTFE **H** Nitrile **I:** FFKM **R:** Flexible graphite **X:** Unspecified Dual seal with different secondary seal materials at the inner and outer position: Inner material/Outer material **e. g. I/F**	**M**:Carbon/Nickel bounded tungsten **N**: Carbon/RBSiC **O**: RBSiC/Nickel bounded tungsten **P**: RBSiC/RBSiC **Q**: SSiC/SSiC **R**: Carbon/SSiC **S**: Graphite loaded RBSiC/RBSiC **T**: Graphite loaded SSiC/SSiC **X**: Unspecified Dual seal with different face materials at the inner and outer position: Inner material/Outer material **e. g. P/N**	Three digits, rounded up to the next whole millimeter Examples: 25.00 mm: **025** 25.25 mm: **026** 25.90 mm: **026** **XXX:** Unspecified	Listed in numerical order, separated by a forward slash

Piping plans:

01	**51**	**61**	**99**
02	**52**	**62**	
03	**53A**	**65A**	
11	**53B**	**65B**	
12	**53C**	**66A**	
13	**54**	**66B**	
14	**55**		
21	**71**		
22	**72**		
23	**74**		
31	**75**		
32	**76**		
41			

Example

Mechanical seal			Design options			Size	Plans
Category	**Arrangement**	**Type**	**Containment device**	**Secondary seal material**	**Face material**	**Shaft size**	**Piping plan**
2	**2**	**A**	**X:** Specified separately	**I:** FFKM (Inner position) **F:** FKM (Outer position)	**N:** Carbon /RBSiC	**080**	**11/52/62**



Seal designation: 22A-XI/FN-080-11/52/62

Mechanical seal selection by media

The recommendations in the media tables are based on the “typical case” of a seal for a horizontal centrifugal pump. Other types of machine, installation conditions, modes of operation, designer’s, manufacturer’s and operator’s specifications, local regulations and so on can result in a different choice of mechanical seal.

For complex sealing duties it is always advisable for the user to consult with our specialist engineers.

Short legend:
Fold-out page at back cover

Mechanical seal selection by media

The recommendations in the media tables are based on the "typical case" of a seal for a horizontal centrifugal pump. Other types of machine, installation conditions, modes of operation, designer's, manufacturer's and operator's specifications, local regulations and so on can result in a different choice of mechanical seal. For complex sealing duties it is always advisable for the user to consult with our specialist engineer. Explanations to columns 1 to 16:

Column 1: Media designation

Designations of materials to be sealed comply as far as possible with IUPAC rules (IUPAC = International Union of Pure and Applied Chemistry). Where a material has several commonly used designations and common names, it is listed in accordance with IUPAC rules with cross-referencing of its other names. Designations are listed in alphabetical order.

Column 2: Notes on the media

G = mixture/group (compound)
The media is a mixture of various isomers of one substance or it is a group of substances having close chemical ties.

N = natural product
The medium is a natural product or the refined form of a natural product with changing proportions of its various constituents.

® = trade mark
The constituents of the media or their proportions in the medium are unknown or are not known exactly.

S = collective term
The generalized mechanical seal recommendation is no more than a pointer to a suitable mechanical seal.

TA = TA-Luft relevant medium.
The requirements of the TA-Luft air quality control directive have to be considered.

V = impurities
The medium contains large quantities of impurities due to the peculiarities of the process.

Column 3: Concentration

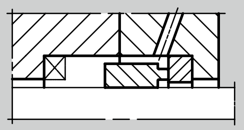
– = The media normally occurs in pure form and (as in the case of gases and other media requiring a double mechanical seal) – the concentration has no bearing on the mechanical seal selection.
< 10 = concentration less than 10 % by weight.
~ 10 = The designation in column 1 is the common name for approximately 10 % aqueous solution.
F10 = A solids content of up 10 % by weight.
L = Solution of defined composition
< L = Unsaturated solution
> L = Supersaturated solution
Sch = Melt
Sus = Suspension of defined composition

Column 4: Temperature

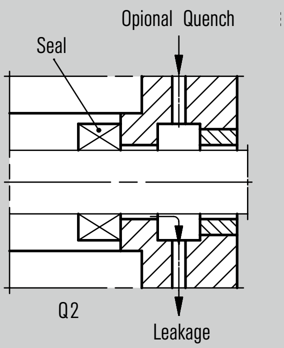
< 100 = less than 100 °C
< F = minimum of 10 °C above solidifying temperature
> K = minimum of 10 °C above crystallization temperature
< Kp = For aqueous solutions: Up to approximately 10 °C
below boiling point at atmospheric pressure.
For gases: 20 °C below boiling point of the liquefied gas; at the same time, the sealing pressure must be a minimum 3 bar higher than the vapor pressure.
For other media: Up to approx. 20 °C below boiling point at 1 bar
(but no higher than 400 °C)
> Pp = minimum 10 °C above pour point
TG = Up to the operating temperature limit of the mechanical seal's materials in contact with the product.

Column 5: Arrangement of shaft seal

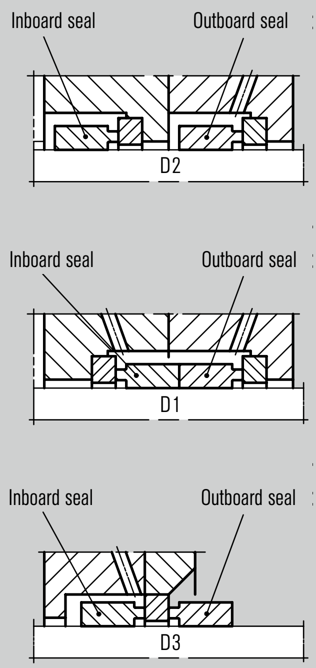
Designation in accordance with ISO 5199, Appendix E; explanations are modified in parts.



Single mechanical seal arrangement



Quench arrangement



Double mechanical seal arrangement

S = Single mechanical seal
These seals can be unbalanced, balanced, with or without circulation or flushing of seal faces, with or without throttle bushing.

D = Double mechanical seal
Either one of the seals can be unbalanced or balanced on its own, or both together.

Q = Quench arrangement for single and double mechanical seals.
Liquids are sealed by lip seal, gaseous media by.

Column 6: Auxiliary piping plans

Basic arrangements and alternatives see API 682/ISO 21049.

Column 7: Additional measures

D = Steam quench
(H), H = Heating (where necessary) of the seal housing, seal cover, buffer medium
kD = Conical stuffing box
SS = Splash guard necessary. Leakage pipe-away recommended.
SW = Regular replacement of buffer medium necessary.
Alternative is a constant through flow of buffer medium.
QW = Regular replacement of quench medium necessary.
An alternative is a constant through flow of quench medium; approximately 0.25 l/min is recommended.
ThE = Thermal buffer

Column 8: Mechanical seal type

In the case of double or tandem mechanical seals, the recommendation applies to the mechanical seal inboard. The choice of the outboard seal is dictated by the buffer/-quench medium.

1 = Mechanical seal having O-Ring secondary seals; unbalanced or balanced; rotating spring in contact with the product, e. g. M3N, M7N, H7N
2 = Mechanical seal having O-Ring secondary seals; unbalanced or balanced; rotating springs not in contact with the product, e. g. HJ ...
3 = Mechanical seal having O-Ring secondary seals; unbalanced or balanced; stationary springs not in contact with the product, e. g. HR ...

4 = Same as 3 but no metal parts in the product; e. g. HR31/d_H – G9
5 = Mechanical seal with elastomer bellows; bellows as, MG ...
6 = Mechanical seal with metal bellows; such as, MFL
X = Special design e. g. a modified MR-D

Column 9: Materials of construction

for inboard mechanical seals. For an explanation of the material codes and their indices, consult the material key.

Column 10: Hazard warnings and reasons for recommending a double mechanical seal or quench.

When compiling these seal selections and material recommendations, it was generally assumed that the machine in question is located in a sheltered building frequented occasionally or continually by persons coming into contact with liquid or vapor leakage of medium from all types of sealing points. As such, considerations of health and environmental protection had a strong bearing on the choice of seal category.
"Health hazard" and "Ignition/Explosion" can lose much of their significance if the machine is installed in the open or in areas rarely frequented by people and ringed with warning signs. If no mention is made to either of the reasons 1 to 5 for recommending a double mechanical seal or a single mechanical seal with quench, it is acceptable to use a single mechanical seal.
The decision in favor of a single mechanical seal must be taken by the user of the machine or the contractor. As he is the only one to know all conditions and regulations relating to the process and to assess the risks.

Letters in column 10: Health hazard warnings

T = Toxic
Media which in low quantities cause death or acute or chronic damage to health when inhaled, swallowed or absorbed via the skin.

T+ = Very toxic
Media which in very low quantities cause death or acute or chronic damage to health when inhaled, swallowed or absorbed via the skin.

Xn = Harmful
Media which may cause death or acute or chronic damage to health when inhaled, swallowed or absorbed via the skin.

Xi = Irritant
Non-corrosive media which, through immediate, prolonged or repeated contact with the skin or mucous membrane, may cause inflammation.

C = Corrosive
Media which may, on contact with living tissues, destroy them.

Carcinogenic:
Substances and preparations which, if they are inhaled or ingested or if they penetrate the skin, may induce cancer or increase its incidence.

Mutagenic:
Substances and preparations which, if they are inhaled or ingested or if they penetrate the skin, may induce heritable genetic defects or increase their incidence. Labeling of media with carcinogenic or mutagenic effect:

R 40: Limited evidence of a carcinogenic effect
R 45: May cause cancer
R 46: May cause heritable genetic damage
R 49: May cause cancer by inhalation

Toxic for reproduction:
Substances and preparations which, if they are inhaled or ingested or if they penetrate the skin, may produce, or increase the incidence of, non-heritable adverse effects in the progeny and/or an impairment of male or female reproductive functions or capacity. Labeling of media with a toxic effect for reproduction:

R 60: May impair fertility
R 62: Possible risk of impaired fertility
R 63: Possible risk of harm to the unborn child

Technical grounds and environmental protection

1 = Vapor pressure/gas
At normal working temperatures, the medium has a vapor pressure of > 1 bar. If the working temperature lies below boiling point (column 15) or if the sealing pressure lies clearly above the vapor pressure, a single mechanical seal may be used with consideration of the duty details.

2 = Corrosion
The medium attacks all standard metals. Mechanical seals with no metal parts on product side must therefore be used.

3 = Exclusion of air
If the medium contacts or mixes with the atmosphere, it forms an explosive or reacts with a damaging effect on the environment, the medium itself and the machine and mechanical seal.

4 = Lubricating properties
Under normal conditions, the medium has such poor lubricity that a single mechanical seal is at risk from dry running.

5 = Icing
Normally the medium is conveyed at temperature below 0 °C. Without auxiliary equipment, the proper functioning of a single mechanical seal is at risk from freezing atmospheric moisture.

6 = Leakage
Absorbed and/or flushed away by the quench, or prevented by a double mechanical seal necessary.

F = Highly flammable
Media which may become hot and finally catch fire in contact with air at ambient temperature without any application of energy, or solid media which may readily catch fire after brief contact with a source of ignition and which continue to burn or to be consumed after removal of the source of ignition, or liquid media having a very low flash-point, or media which, in contact with water or damp air, evolve extremely flammable gases in dangerous quantities.

F+ = Extremely flammable
Liquid media having an extremely low flash-point and a low boiling-point and gaseous media which are flammable in contact with air at ambient temperature and pressure

O = Oxidizing
Media which give rise to a highly exothermic reaction in contact with other substances, particularly flammable substances.

E = Explosive
Solid, liquid, pasty or gelatinous media which may also react exothermically without atmospheric oxygen thereby quickly evolving gases, and which, under defined test conditions, detonate, quickly deflagrate or upon heating explode when partially confined.

N = Dangerous for the environment
Media which, when they enter the environment, would or could present an immediate or delayed danger for one or more components of the environment. (The hazard symbols are according to the EU directive 67/548/EEC, "Classification, packaging and labeling of dangerous substances" of June 1967, status April 2004)

U = Insufficient information
The medium designation is imprecise or the available information on the medium is insufficient to assess the serviceability of a single mechanical seal.

Mechanical seal selection by media

Column 11: TLV

The values quoted in ml/m^3 = ppm (parts per million) are taken from Bulletin 30 published by the Senate Commission for Testing Hazardous Materials: "Threshold Limit Values and Biological Material Tolerances".

Additional symbols:
mg: TLVs are quoted in mg/m^3 instead of ppm
#, e. g. # 0.5 for barium …: 0.5 mg/m^3, calculated as Ba

* "According to the current level of knowledge, the action of this substance constitutes a distinct carcinogenic hazard for humans. No concentration values are given for this substance in the list because it is still impossible to quote any concentration as being safe. With some of these substances, there is even a great risk from absorption through healthy skin. If the use of such substances is unavoidable for technical reasons, special safety and monitoring measures must be taken."

The seal selection takes account of the TLV as follows:
- TLV <5 ppm or*: Use of a double mechanical seal is generally recommended, but see paragraphs 2 + 3 of the introductory note on column 10.
- TLV ≥5, ≤ 25 ppm: A double mechanical seal or a single mechanical seal with quench is recommended. If column 10 contains no further grounds other than "health hazard" for choosing a tandem or double mechanical seal, a single mechanical seal can be used, provided other measures rule out all risks to humans.

Column 12: Normal condition

of the pure medium at 20 °C and 1.013 bar:
ga = gaseous
fe = solid; no further details available
fl = liquid
kr = crystalline
pa = viscous

This column contains the following notes on aspects of sealing:
ga requires a double mechanical seal in most cases. If the pressure to be sealed lies distinctly above the vapor pressure at working temperature, a single mechanical seal with or without quench can be used under certain circumstances.

fl indicates the use of single mechanical seal, but other influencing factors such as the working temperature (vapor pressure at pumping temperature, health hazard, risk of explosion or corrosion can necessitate a tandem or double mechanical seal.

fe, kr indicates that the medium must be molten (e. g. sulphur, DMT), dissolved (e. g. salts) or suspended (e. g. limestone or gypsum in water), otherwise it cannot be pumped or stirred.

Column 13: Melting point

(= Fusion point F) in °C If there are unequal values for the solidifying point (setting temperature) and the melting point (liquefying temperature), or different values or modifications, the higher value is always quoted. For some mixtures of media, solidification ranges or pour points are quoted. With fusion points above room temperature and/or working temperatures close to fusion point, it is necessary to check (with due consideration of the other operating conditions such as intermittent mode, full stand-by pump) whether the machine or at least the seal housing requires heating.

Additional signs:
K …: Crystallization at temperatures below … °C
S …: Sublimation at … °C

If there is an additional %-figure, the quoted temperature applies to the … % aqueous solution.

Column 14: Boiling point

Boiling point of the medium in °C under normal pressure (1.013 bar). Different reference pressures are marked. If the working temperature is close to or above boiling point, the seal selection and material recommendation must be checked.

Additional signs:
A …: The azeotrope boils at … °C
Z …: Decomposition at … °C

(…): Reference pressure in mbar
If there is an additional %-figure, the quoted temperature applies to the … % aqueous solution.

Column 15: Density

For media that are liquid or solid under normal conditions, the density is quoted – where known – in g/cm^3 at 20 °C. Different reference temperatures are indicated.
For gases there is only an indication whether they are heavier than air (+) or lighter than air (–). This is also a pointer to their behavior in the event of leakage: sinking, rising or self-dissolving.

Additional signs:
(…): Reference temperature in °C
A …: The quote density applies to the azeotrope at … % weight. …
%: Density of … % aqueous solution

Media: Code of materials and legend see inside of back cover. Please observe the note on page 1.	Chemical formula	Remark	Concentration %	Temp. °C	Arrange-ment	Auxil. piping	Addit. measures	Seal type	Materials to EN 12756: 1 Seal face	2 Seal face	3 Sec. seal	4 Spring	5 Others	Hazard warnings	TLV-value	Normal condition	Melting temperature °C	Boiling point °C	Density g/cm³
1		2	3	4	5	6	7	8						10	11	12	13	14	15
A																			
Acetaldehyde (Ethanal)	CH_3CHOH	TA	–	100	D	53A		1	Q_1(S)	B	M_2	G	G	Xn,F+,R40,1,3	50	fl	–124	21	0,78
Acetates → *Acetic acid esters*																			
Acetic acid:	CH_3COOH	TA	–	<Kp	S,Q	62	QW	1	Q_1(V)	B	M_2	M	M	C	10	fl			
Acetic essence	CH_3COOH	TA	~25	<Kp	S	11		1	Q_1(V)	B	M_2	G	G	C	10	fl			
	CH_3COOH	TA	<90	25	S,Q	62	QW	1	Q_1(V)	B	E	G	G	C	10	fl			
Glacial acetic acid	CH_3COOH	TA	>96	<80	S,Q	62	QW	1	Q_1(V)	B	M_2	G	G	C	10	fl	17	~118	1,05
Vinegar	CH_3COOH	TA	~10	<60	S	11		1	Q_1(S)	B	E	G	G	Xi	10	fl			
Acetic anhydride	$C_4H_6O_3$	TA	–	<100	S,Q	62	QW	1	Q_1(V)	B	M_2	G	G	Xn,C	5	fl	–73	139	1,08
Acetic acid esters:																			
Acetic acid benzyl ester	$C_9H_{10}O_2$		–	<80	S	11		1	Q_1(S)	B	M_2	G	G	Xi		fl	–51	213	1,057
Acetic acid butyl esters:																			
Butyl acetate	$C_6H_{12}O_2$		–	<80	S,Q	62		1	Q_1(S)	B	M_2	G	G		200	fl	–77	126	0,882
sec. Butyl acetate	$C_6H_{12}O_2$	TA	–	<40	S,Q	62		1	Q_1(S)	B	M_2	G	G	F	200	fl	–99	112	0,865
tert. Butyl acetate	$C_6H_{12}O_2$	TA	–	<40	S,Q	62		1	Q_1(S)	B	M_2	G	G	F	200	fl		98	0,859
Isobutyl acetate	$C_6H_{12}O_2$	TA	–	<40	S,Q	62		1	Q_1(S)	B	M_2	G	G	F	200	fl	–99	118	0,87
Acetic acid cinnamyl ester	$C_{11}H_{12}O_2$		–	<80	S	11		1	Q_1(S)	B	M_2	G	G			fl		262	1,057
Acetic acid cyclohexyl ester	$C_8H_{14}O_2$		–	<80	S	11		1	Q_1(S)	B	M_2	G	G			fl	–83	173	0,969
Acetic acid ethyl ester	$CH_3COOC_2H_5$	TA	–	<60	S,Q	62		1	Q_1(S)	B	M_2	G	G	Xi,F	400	fl	–83	77	0,90
Acetic acid hexyl ester	$CH_3COOC_6H_{13}$		–	<80	S	11		1	Q_1(S)	B	M_2	G	G		50	fl	–81	171	0,878
Acetic acid isopropenyl ester	$C_5H_8O_2$	TA	–	<60	S	11		1	Q_1(S)	B	M_2	G	G	F		fl	–93	97	0,92
Acetic acid methyl ester	$C_3H_6O_2$	TA	–	<40	S,Q	62		1	Q_1(S)	B	M_2	G	G	Xi,F	200	fl	–98	58	0,928
Acetic acid pentyl esters (Pentyl-, Amyl acetate):																			
1-Pentyl acetate	$C_7H_{14}O_2$		–	<80	S	11		1	Q_1(S)	B	M_2	G	G			fl	–71	150	0,8756
2-Pentyl acetate	$C_7H_{14}O_2$		–	<80	S	11		1	Q_1(S)	B	M_2	G	G			fl	–79	134	0,864
3-Pentyl acetate	$C_7H_{14}O_2$		–	<80	S	11		1	Q_1(S)	B	M_2	G	G			fl		~135	0,8712
2-Methylbutyl acetate	$C_7H_{14}O_2$		–	<80	S	11		1	Q_1(S)	B	M_2	G	G			fl		138	0,8740
3-Methylbutyl acetate	$C_7H_{14}O_2$		–	<80	S	11		1	Q_1(S)	B	M_2	G	G			fl	–78	142	0,8670
Acetic acid propyl esters:																			
Isopropyl acetate	$C_5H_{10}O_2$	TA	–	<80	S,Q	62		1	Q_1(S)	B	M_2	G	G	F,Xi	200	fl	–73	90	0,872
Propyl acetate	$C_5H_{10}O_2$	TA	–	<80	S,Q	62		1	Q_1(S)	B	M_2	G	G	F,Xi	200	fl	–95	102	0,887
Acetic acid vinyl ester	$C_4H_6O_2$	TA	–	<60	S,Q	62		1	Q_1(S)	B	M_2	G	G	F	10	fl	–100	73	0,932
Acetone	$(CH_3)_2CO$	TA	–	30	S,Q	62		1	Q_1(S)	B	E	G	G	Xi,F,4	1000	fl	–95	56	0,791
	$(CH_3)_2CO$	TA	–	TG	D	53A		1	Q_1(S)	A	M_2	G	G	Xi,F,1,4					
Acetone cyanohydrin (ACH)	C_4H_7NO	TA	–	TG	D	53A		1	Q_1(S)	B	M_2	G	G	T+,N		fl	–20	95(Z)	0,932
Acetyl acetone	$CH_3COCH_2COCH_3$		–	<Kp	S	11		1	Q_1(S)	B	M_2	G	G	Xn		fl	–21	140	0,975
Acetyl chloride	CH_3COCl	TA	–	TG	D	53A		1	Q_1(V)	B	M_1	G	G	C,F,2,3		fl	–112	51	1,104
Acetylene	C_2H_2	TA	–	TG	D	53A		1	Q_1(S)	B	M_1	G	G	F+,1		ga	–84	–81	(–)
Acetylene chlorides → *Di-*, → *Trichloroethylene*, → *Tetrachloroethane*																			
ACH → *Acetone cyanohydrin*																			
Acidic tar			–	>F<200	D	53A	(H)	1	Q_1(V)	B	M_1	G	G	U		fl			
Acrylic acid	$C_3H_4O_2$	TA	–	<Kp	S,Q	62		1	Q_1(V)	B	M_2	G	G	C,N		fl	13	141	1,051
Acrylic esters:																			
Acrylic acid ethyl ester (Ethyl acrylate)	$CH_2CHCO_2C_2H_5$	TA	–	<Kp	S,Q	62		1	Q_1(S)	B	M_2	G	G	Xn,Xi,F	5	fl	–71	99	0,924
Acrylic acid methyl ester (Methyl acrylate)	$CH_2CHCO_2CH_3$	TA	–	<Kp	S,Q	62		1	Q_1(S)	B	M_2	G	G	Xn,Xi,F	5	fl	–76,5	80	0,956
Acrylonitrile	C_3H_3N	TA	–	TG	D	53A		1	Q_1(V)	B	M_1	G	G	T,F,N,R45	*	fl	–82	77	0,806
Adipic acid	$C_6H_{10}O_4$		<L	<Kp,>K	S	11		1	Q_1(V)	B	V	G	G	Xi		kr	153	330,5	1,360
			>L	<Kp	S	11		1	Q_1	Q_1	V	G	G						
Alcohol → *Ethanol*																			
Alkyd resins and lacquers		S	–	<Kp	D	53A		1	Q_1(V)	B	M_1	G	G	3,4,U		fl			
Alkylaluminum compounds		S	–	<Kp	D	53A		1	Q_1(S)	A	M_1	G	G	C,F,3		fl			0,8...1,8
Allyl alcohol (2-Propene-1-ol)	C_3H_6O	TA	–	<80	D	53A		1	Q_1(S)	B	E	G	G	T,N	2	fl	–129	97	0,852
Alum (Potassium aluminum sulphate, 48,4 % aqueous solution)	$KAl(SO_4)_2{*}12H_2O$		<L	<Kp,>K	S	11		1	Q_1(V)	B	V		G	C		kr	–16	101	1,76
			>L	<Kp	S	11		1	Q_1	Q_1	V		G						
Aluminum chlorate	$N(ClO_3)_3$		<L	<Kp,>K	D	53A		1	Q_1(V)	B	M_1	G	G	3,O		kr			
Aluminum chloride	$AlCl_3$		<L	<30,>K	S,Q	62	QW	1	Q_1(V)	B	V	M	M	C,3		kr		183(S)	2,44
	$AlCl_3$		–	>30	D	53A	SW	1	Q_1(V)	B	M_1	G	G	C,2,3					
Aluminum fluoride	AlF_3		<L	<30,>K	S	11		1	Q_1(V)	B	E	G	G	Xi		kr	1260(S)		2,88
	AlF_3		>L	<Kp	S	02		3	Q_1	Q_1	M_1	M	G						
Aluminum hydroxide diacetate (aluminum acetate basic)			<L	<40	S	11		1	Q_1(V)	B	E	G	G	Xi		fl			
Aluminum nitrate	$Al(NO_3)_3$		<L	<Kp,>K	S	11		1	Q_1(V)	B	E	G	G	Xi,O		kr	73	135(Z)	
Aluminum sulfate	$Al_2(SO_4)_3$		<L	<Kp,>K	S,Q	62		1	Q_1(V)	B	E	G	G	Xn,3,6		kr	770(Z)		2,71

Mechanical seal selection by media

Media					Mechanical Seal									Additional information on the medium					
Code of materials and legend see inside of back cover. Please observe the note on page 1.	Chemical formula	Remark	Concentration %	Temp. °C	Arrange-ment	Auxil. piping	Addit. measures	Seal type	Materials to EN 12756: 1 Seal face	2 Seal face	3 Sec. seal	4 Spring	5 Others	Hazard warnings	TLV-value	Normal condition	Melting temperature °C	Boiling point °C	Density g/cm³
1		2	3	4	5	6	7	8						10	11	12	13	14	15
Amidosulfuric acid (Amidosulfonic-, Sulfamidic, Sulfamic acid)			<L	<Kp,>K	S	11		1	Q_1(V)	B	M_1	G	G	Xi		kr		205(Z)	2,1
Amines (not specified)		S	–	<Kp	S,Q	62		1	Q_1(V)	B	M_2	G	G	U		fl			
Aminoethanols:																			
1-Aminoethanol	$(CH_2)_2NH_2OH$		<L	<Kp,>K	S	11		1	Q_1(V)	B	M_2	G	G			kr	95...99	110	
2-Aminoethanol (Ethanolamine)	$(CH_2)_2NH_2OH$	TA	–	<Kp	D	53A		1	Q_1(V)	B	M_2	G	G	Xn,C	3	fl	10	171	1,022
Aminosulfonic acid			–	<Kp,>K	D	53A		1	Q_1(V)	B	M_1	G	G	Xi		kr	205(Z)		2,1
Ammonia	NH_3		–	<40	D	53A		1	Q_1(S)	B	E	G	G	T,C,1,N	50	ga	−78	−33	(–)
	NH_3		–	TG	D	53A		1	Q_1(S)	B	M_2	G	G	T,C,1,N					
Ammonia aqu. solutions:																			
Caustic ammonia	NH_4OH		~29	<Kp	D	53A		1	Q_1(S)	B	M_2	G	G	C,N		fl			0,9
Spirits of salmiac	NH_4OH		~10	<40	S,Q	62		1	Q_1(S)	B	E	G	G	C,N		fl			0,957
Ammonium acetate	$H_3CCOONH_4$		<L	<60,>K	S	11		1	Q_1(S)	B	E	G	G			fe	113		1,171
	$H_3CCOONH_4$		<L	<Kp	S	11		1	Q_1(S)	B	M_2	G	G				(Z90 °C)		
Ammonium alum	$NH_4Al(SO_4)_2{*}12H_2O$		<L	<60,>K	S	11		1	Q_1(V)	B	V	G	G			kr	109		1,64
Ammonium bromide	NH_4Br		<L	<Kp,>K	S,Q	11		1	Q_1(V)	B	M_1	G	G	Xi,6		kr	452(S)		2,55
Ammonium carbamate → *Urea*																			
Ammonium carbonate	$(NH_4)_2CO_3$		<L	<60,>K	S	11		1	Q_1(V)	B	E	G	G	Xn		kr			
Ammonium chloride (Salmiac)	NH_4Cl		<L	<30,>K	S	11		1	Q_1(V)	B	E	G	G	Xn,Xi		kr		338(S)	1,531
	NH_4Cl		<L	<60	S	11		5	Q_1	Q_1	E	M	M						
	NH_4Cl		<L	<Kp	D	53A		1	Q_1(V)	B	M_2	G	G	2					
	NH_4Cl		>L	<Kp	S	01		4	Q_1	Q_1	M_2	M	G						
Ammonium fluorides:																			
Ammonium hydrogen fluoride	$(NH_4)HF_2$		<L	>Kp	D	54		1	Q_1	B	M_2	G	G	T,C,2		kr	126	238(Z)	1,5
Neutral ammonium fluoride	NH_4F		<L	<Kp	D	54		1	Q_1	B	M_2	G	G	T,2		kr	160		1,0
Ammonium hydrogen carbonate	$(NH_4)HCO_3$		<L	<Kp,>K	S	11		1	Q_1(V)	B	E	G	G	Xn		kr	106 (Z60 °C)		1,58
Ammonium hydroxide → *Ammonia aqu. Solutions*																			
Ammonium nitrate	NH_4NO_3		<L	<Kp,>K	S,Q	62	D	1	Q_1(V)	B	E	G	G	3,O		kr	170		1,73
Ammonium oxalate monohydrate	$(COONH_4)_2{\cdot}H_2O$		<10	<Kp	D	53A		1	Q_1	Q_1	M_2	G	G	Xn,3		kr	70(Z)		1,5
Ammonium persulfate (Ammonium peroxodisulfate)	$(NH_4)_2S_2O_8$		<L	<Kp,>K	S,Q	62		1	Q_1	Q	M_2	G	G	Xn,Xi,3,O		kr	120(Z)		1,98
Ammonium phosfate, secondary	$(NH_4)_2HPO_4$		<L	<60,>K	S	11		1	Q_1(V)	B	E	G	G			kr	155(Z)		1,619
Ammonium sulfate	$(NH_4)_2SO_4$		<L	<Kp,>K	S	11		1	Q_1(V)	B	E	G	G			kr	235...280(Z)		1,77
Ammonium thiocyanate (Ammonium rhodanide)	NH_4SCN	TA	<L	<Kp,>K	S	11		1	Q_1(V)	B	M_1	G	G	Xn		kr	149	170(Z)	1,3
Amyl acetate → *Acetic acid pentyl esters*																			
Amyl alcohols → *Pentanols*																			
Aniline dyes		S	–	<80	S	11		1	Q_1(S)	B	M_2	G	G	U		fl			
Aniline hydrochloride (aniline salt)	$C_6H_5NH_3Cl$	TA	<L	<Kp	D	53A		1	Q_1(V)	B	M_1	G	G	T,Xi,R40,2,3,N		kr	198	245	1,22
Aniline, aniline oil	C_6H_7N	TA	–	TG	D	53A		1	Q_1(S)	B	M_2	G	G	T,Xi,R40,3,N	2	fl	−6	184	1,023
Anthracene	$C_{14}H_{10}$	TA	Sch	>F<Kp	S,Q	62	H,D	6	A	Q_1	G	M_6	T4	Xn,6		kr	217	342	1,25
Anthracene oil		TA,G	Sch	>F<Kp	S,Q	62	H,D	6	A	Q_1	G	M_6	T4	T,R45,6		kr			
Antichlor → *Sodium thiosulfate*																			
Apple juice, sauce, cider, wine		N	–	<Kp	S	11		1	Q_1(S)	B	P	G	G						
Arcton → *Refrigerants*																			
Argon	Ar		–	>−20	D	53A		1	Q_1(S)	B	M_1	G	G	1		ga	−189	−186	
Aromatic hydrocarbons → *BTX*																			
Arrack			–	<60	S	11		1	Q_1(S)	B	E	G	G			fl			
Arsenic acid	H_3AsO_4	TA	–	<Kp	D	53A	SW	1	Q_1	Q_1	M_1	G	G	T,R45,2,N	*	fl	35,5	120	2,5
Asphalts (molten)		N	–	<120	S	02	H	1	Q_1(S)	B	V	G	G			fe	70...150	>370	1,0...1,2
			–	<200	S	01	H	1	Q_1(S)	B	M_1	G	G						
			–	>200	S,Q	62	H,D	6	A	Q_1	G	M_6	T4	6					
ASTM test oils No. 1 to 4			–	<100	S	11		1	Q_1(S)	B	V	G	G	U		fl			
Aviation petrol, av. gasoline		TA,G	–	<Kp	S	11		1	Q_1(S)	B	V	G	G	T,Xn,R45		fl	bis <−58	40...160	0,7...0,75

Media: Code of materials and legend see inside of back cover. Please observe the note on page 1. (1)	Chemical formula	Remark (2)	Concentration % (3)	Temp. °C (4)	Arrange-ment (5)	Auxil. piping (6)	Addit. measures (7)	Seal type (8)	Mechanical Seal – Materials to EN 12756: 1 Seal face	2 Seal face	3 Sec. seal	4 Spring	5 Others	Hazard warnings (10)	TLV-value (11)	Normal condition (12)	Melting temperature °C (13)	Boiling point °C (14)	Density g/cm³ (15)
B																			
Barium chloride	$BaCl_2$		<L	<60	S,Q	62		1	Q_1(V)	B	V	G	G	T,Xn,6	#0,5	kr	960	1560	3,86
Barium chromate suspension	$BaCrO_4$		<10	<60	S,Q	62	QW	5	Q_1	Q_1	V	G	G	Xn,6	#0,5	kr			4,5
Barium hydroxide	$Ba(OH)_2$		<L	<60	S,Q	62	QW	1	Q_1(V)	B	E	G	G	C,6	#0,5	kr			4,5
	$Ba(OH)_2$		<10	<10	S,Q	62	QW	5	Q_1	Q_1	E	G	G	C,6					
Barium nitrate	$Ba(NO_3)_2$		<L	<80	S,Q	62	QW	1	Q_1(V)	B	V	G	G	Xn,6,O	#0,5	kr	593	600(Z)	3,24
	$Ba(NO_3)_2$		<20	<80	S,Q	62	QW	5	Q_1	Q_1	V	G	G	Xn,6,O					
Battery acid → *Sulfuric acid*																			
Beer		N	–	<80	S	01		1	Q_1	Q_1	V	G	G			fl			
Beer yeast, -wort, -mash		N	–	<80	S	01		1	Q_1	Q_1	V	G	G			fl			
Beet sugar → *Saccharose*																			
Benfield solution (30 % K_2CO_3 +3 % DEA + H_2O + CO_2)		G		<110	S	32		X	Q_{32}	Q_3	E	G	G	Xi			~60(K)		1,2...1,3
Benzene	C_6H_6	TA	–	<Kp	D	53A		1	Q_1(S)	B	M_1	G	G	T,Xn,Xi,R45,R46,F,6	*	fl		80	0,879
Benzoic acid	$C_7H_6O_2$		<L	<100	S	11		1	Q_1(S)	B	V	G	G	Xn		kr	122	249	1,266
	$C_7H_6O_2$		<10	<100	S	11		2	Q_1	Q_1	V	G	G						
	$C_7H_6O_2$		–	>F<200	S	02	(H)	3	Q_1	Q_1	M_1	M	G						
Benzotrichloride	$C_7H_5Cl_3$	TA	–	<200	D	53A		1	Q_1	Q_1	M_1	G	G	T,Xn,Xi,R45,2		fl	−4,8	221	1,38
Benzotrifluoride	$C_7H_5F_3$	TA	–	<60	S,Q	62		1	Q_1(V)	B	V	G	G	6,F,N		fl	−29	104	1,189
Benzyl alcohol	C_7H_8O		–	<100	S	11		1	Q_1(S)	B	M_2	G	G	Xn		fl	−15	205	1,045
	C_7H_8O		–	<30	S	11		1	Q_1(S)	B	V	G	G						
Benzyl butyl phthalate (BBP) → *Phthalic acid esters*																			
Biphenyl	$C_{12}H_{10}$	TA	–	>75<Kp	D	53A		6	A	Q_1	G	M_6	T_4	Xi,3,N	0,2	kr	69	255	1,04
Bitumen		G	–	>F<200	S	01	H	1	Q_1(S)	B	M_1	G	G			fe		>370	0,95...1,1
			–	<200	S	01	H	6	A	Q_1	G	M_6	T_4						
Black liquor → *Digester liquor, basic*																			
Blast furnace gas			–	<200	D	53A		1	Q_1(V)	B	M_1	G	G	1		ga			
Bleaching earth suspension		G	<10	<100	S	11		5	Q_1	Q_1	V	G	G			fe			
Bleaching lye → *Sodium hypochlorite*, → *Calcium hypochlorite*																			
Blood		N	–	<60	S	11		1	Q_1(S)	B	P	G	G			fl			
Boiler feed water → *Water*																			
Bone fats		N	–	<Kp	S	11		1	Q_1(S)	B	V	G	G			fl			
Borax (Disodium tetraborate)	$Na_2B_4O_7*10H_2O$		<L	<60	S	11		1	Q_1(V)	B	P	G	G	Xn,R62		kr	75	1575(Z)	1,72
Boric acid	$B(OH)_3$		<L	<60	S,Q	62		1	Q_1(V)	B	V	G	G	T,6		kr	169(Z)		1,52
Boron trichloride (Trichloroborane)	BCl_3		–	TG	D	53A		1	Q_1(V)	B	M_1	G	G	T+,C,1		ga	−107	12,5	1,43 (0°C)
Boron trifluoride (Trifluoroborane)	BF_3		–	TG	D	53A		1	Q_1	Q_1	M_1	G	G	T+,C,1	1	ga	−127	−100	(+)
Brackish water → *Water*																			
Bread dough		N			D	53A		1	Q_1(S)	B	V	G	G						
Brine → *Sodium chloride*																			
Bromic acid	$HBrO_3$		–	<Kp	D	53A		1	Q_1	Q_1	M_1	G	G	T,C,2,6		fl			
Bromine	Br_2		–	<Kp	D	53A		1	Q_1	Q_1	M_1	G	G	T+,C,2,3,N	0,1	fl	−7	58	3,12
Bromine, aqueous (aqueous solution of bromine)	Br_2		<L	<Kp	D	53A		1	Q_1	Q_1	M_1	G	G	T+,C,3,6,N		fl			
BTX (benzene-toluene- xylene mixture)		TA	–	<Kp	S,Q	62		1	Q_1(S)	B	M_1	G	G	T,Xn,Xi,R45,R46,R63,6,F	*	fl			
Bunker oil and fuel		TA/N	–	120	S	11		1	Q_1(S)	B	V	G	G	T,R45		fl			
1,3-Butadiene		TA	–	TG	D	53A		1	Q_1(S)	B	V	G	G	T,R45,R46,1,3,6,F+	*	ga	−109	−4,5	(+)
Butanal → Butyraldehyde																			
Butane:																			
Isobutane (2-methyl propane)	C_4H_{10}	TA	–	<Kp	S,Q	62		1	Q_1(S)	A	V	G	G	4,F+	1000	ga	−159	−12	(–)
n-Butane	C_4H_{10}	TA	–	<Kp	S,Q	62		1	Q_1(S)	A	V	G	G	4,F+	1000	ga	−135	−1	(–)
Butanediols (Butylene glycols):																			
1,2-Butanediol	$C_4H_{10}O_2$		–	<Kp	S	11		1	Q_1(S)	B	M_1	G	G			fl	−114	192	1,019
1,3-Butanediol	$C_4H_{10}O_2$		–	<Kp	S	11		1	Q_1(S)	B	M_1	G	G			fl	<−50	207	1,005
1,4-Butanediol	$C_4H_{10}O_2$		–	<200	S	11		1	Q_1(S)	B	M_1	G	G	Xn		fl	20	230	1,020
2,3-Butanediol	$C_4H_{10}O_2$		–	<Kp	S	11		1	Q_1(S)	B	M_1	G	G			fl	19	182	1,033
Butanic acid → *Butyric acid*																			

Mechanical seal selection by media

Media: Code of materials and legend see inside of back cover. Please observe the note on page 1. (1)	Chemical formula	Remark (2)	Concentration % (3)	Temp. °C (4)	Arrange-ment (5)	Auxil. piping (6)	Addit. measures (7)	Seal type (8)	Mechanical Seal – Materials to EN 12756: 1 Seal face	2 Seal face	3 Sec. seal	4 Spring	5 Others	Additional information on the medium: Hazard warnings (10)	TLV-value (11)	Normal condition (12)	Melting temperature °C (13)	Boiling point °C (14)	Density g/cm³ (15)
Butanol:																			
1-Butanol	$C_4H_{10}O$		–	<60	S	11		1	Q_1(S)	B	E	G	G	Xn,Xi	100	fl	–90	118	0,813
2-Butanol	$C_4H_{10}O$	TA	–	<80	S	11		1	Q_1(S)	B	E	G	G	Xi	100	fl	–115	100	0,811
Isobutanol	$C_4H_{10}O$		–	<60	S	11		1	Q_1(S)	B	E	G	G	Xi	100	fl	–108	108	0,806
tert. Butyl alcohol	$C_4H_{10}O$	TA	–	<60,<K	S	11		1	Q_1	B	E	G	G	Xn,F	100	kr	26	82	0,776
Butanone (Ethyl methyl ketone)	C_4H_8O		–	<Kp	S	11		1	Q_1	B	M_2	G	G	7	200	fl	–86	80	0,805
Butene (Butylene):																			
1-Butene	C_4H_8	TA	–	<Kp	S,Q	62		6	A	Q_1	U_1	T_1	G_1	4,5,F+		ga	–185	–7	(–)
cis-2-Butene	C_4H_8	TA	–	<Kp	S,Q	62		6	A	Q_1	U_1	T_1	G_1	4,5,F+		ga	–139	3	(–)
Isobutene	C_4H_8	TA	–	<Kp	S,Q	62		6	A	Q_1	U_1	T_1	G_1	4,5,F+		ga	–140	–7	(–)
trans-2-Butene	C_4H_8	TA	–	<Kp	S,Q	62		6	A	Q_1	U_1	T_1	G_1	4,5,F+		ga	–105	1	(–)
Butter		N	–	<80	S	11		1	Q_1(S)	B	P	G	G			pa			
Buttermilk		N	–	<80	S	11		1	Q_1(S)	B	P	G	G			fl			
Butyl acetate → *Acetic acid esters*																			
Butyl alcohol → *Butanol*																			
Butylamines:																			
1-Butylamine (1-Aminobutane)	$C_4H_{11}N$	TA	–	<Kp	S,Q	62		1	Q_1	B	M_1	G	G	Xn,C,F,3,6	5	fl	–50	78	0,733
Isobutylamine (2-Methyl-1-propylamine)	$C_4H_{11}N$	TA	–	<Kp	S,Q	62		1	Q_1	B	M_1	G	G	C,F,3,6	5	fl	–85	66	0,736
sec. Butylamine (2-Aminobutane)	$C_4H_{11}N$	TA	–	<Kp	S,Q	62		1	Q_1	B	M_1	G	G	Xn,C,F,3,6,N	5	fl	–104	63	0,724
Butylene → *Butene*																			
Butyraldehydes:																			
Butyraldehyde (Butanal)	C_4H_8O		–	<Kp	S,Q	62		1	Q_1(V)	B	M_2	G	G	3,6,F		fl	–99	75	0,802
Isobutyraldehyde (2- Methylpropanal)	C_4H_8O		–	<Kp	S,Q	62		1	Q_1(V)	B	M_2	G	G	3,6,F		fl	–66	64	0,794
Butyrates → *Butyric acid esters*																			
Butyric acid:																			
Isobutyric acid	$C_4H_8O_2$		–	<60	S	11		1	Q_1(S)	B	M_1	G	G	C		fl	–47	155	0,950
n-Butyric acid	$C_4H_8O_2$		–	<60	S	11		1	Q_1(S)	B	M_1	G	G	C		fl	–6	163	0,959
Butyric acid esters (Butyrates)		S	–	<100	S	11		1	Q_1(S)	B	M_2	G	G	U		fl	<0	<100	
C																			
Cable sealing compounds		S	–	<220	S	02	H	6	A	Q_1	U_1	M_6	G_1			fe			
		S	–	>220	S	02	H	6	A	Q_1	G	M_6	T_4			fe			
Calcium acetate	$Ca(OCOCH_3)_2$		<L	<100	S	11		1	Q_1(V)	B	E	G	G			fe	160(Z)		1,50
Calcium bisulfite (lye) → *Calcium hydrogen sulfite*																			
Calcium carbonate → *Lime powder suspension*																			
Calcium chlorate	$Ca(ClO_3)_2$		<L	<100	S,Q	62		1	Q_1(V)	B	V	G	G	6,O		kr	340(Z)		2,711
Calcium chloride	$CaCl_2$		<L	<25	S	11		1	Q_1(V)	B	V	G	G						
	$CaCl_2$		<L	<100	S,Q	62		1	Q_1(V)	B	M_1	M	M	Xi,3,6		kr	782	>1600	1,68
Calcium hydrogen sulfite	$Ca(HSO_3)_2$	V	L	<Kp	D	53A		1	Q_1(V)	B	M_1	G	G	3,6		fl			
('Digester lye')	$Ca(HSO_3)_2$	V	L	<Kp	S,Q	01	kD	3	Q_1	Q_1	M_1	G	G	3,6		fl			
Calcium hydroxide → *Hydrated lime*																			
Calcium hypochlorite	$Ca(OCl)_2$		<L	<30	S,Q	62		1	Q_1(V)	Q_1(V)	M_2	M	M	Xn,C,2,6,O,N					
	$Ca(OCl)_2$		–	<Kp	S,Q	62		4	Q_1	Q_1	M_2	M	G	Xn,C,2,6,O,N		kr	100(Z)		2,35
Calcium nitrate	$Ca(NO_3)_2$		<L	<Kp	S,Q	62		1	Q_1(S)	B	V	G	G	Xi,6,O					
	$Ca(NO_3)_2$			<100	S	62		5	Q_1	Q_1	V	G	G	Xi,6,O		kr	45		1,82
Calcium phosphates (sludges)	$Ca(PO_4)_2$	G	F25	<Kp	S	01	kD	3	Q_1	Q_1	M_1	G	G			kr	1670		3,14
Calcium sulfate (suspension)	$CaSO_4$		F25	<Kp	S	01	kD	3	Q_1	Q_1	V	G	G			kr			
Calgon (Polyphosphates), Calfort		®	<L	<Kp	S	11		1	Q_1(V)	B	E	G	G			kr			
Calgonit R (Sodium phosphate silicates)		®	<L	<Kp	S	11		1	Q_1(V)	B	E	G	G			kr			
Calgonit S (Urea nitrate)	$CH_5N_3O_4$	®	<L	<Kp	S	11		1	Q_1(V)	B	E	G	G			kr	152(Z)		1,69
Cane sugar (solution)			<L	<Kp	D	53A		1	Q_1(S)	B	V	G	G	3,4		fl			
Caprolactam, ε-	$C_6H_{11}NO$	TA		<Kp	S,Q	62		1	Q_1(S)	B	M_1	G	G						
	$C_6H_{11}NO$	TA	<L	<200	S	01	H	6	Q_1	Q_1	U_1	M_6	G_1	Xn,Xi,6	5 mg	kr	69	268	1,013(80)
Carbamates (Urethanes)		TA,S	F<5	<180	D	53A		1	Q_1	B	M_2	G	G						
		N	–	<200	D	53A	(H)	1	Q_1(S)	A	M_1	G	G	T,Xi,3,6		fl			
Carbamides → *Urea*																			
Carbolic acid → *Phenol*																			
Carbon dioxide (aqueous solution)	CO_2		<L	<Kp	S	11		1	Q_1(S)	B	P	G	G			fl			

Media					Mechanical Seal									Additional information on the medium					
Code of materials and legend see inside of back cover. Please observe the note on page 1.	Chemical formula	Remark	Concentration %	Temp. °C	Arrange-ment	Auxil. piping	Addit. measures	Seal type	Materials to EN 12756 1 Seal face	2 Seal face	3 Sec. seal	4 Spring	5 Others	Hazard warnings	TLV-value	Normal condition	Melting temperature °C	Boiling point °C	Density g/cm³
1		2	3	4	5	6	7	8						10	11	12	13	14	15
Carbon dioxide (gas)	CO_2		–	<60	D	53A		1	Q_1(S)	B	P	G	G	1	5000	ga		−78(S)	(+)
Carbon dioxide (liquefied, min. 3 bar above PD)	CO_2		–	<Kp	S,Q	11		X	Q_1	A	P	G	G	4,6	5000	fl			0,766
Carbon disulfide	CS_2	TA	–	<Kp	D	62		1	Q_1	Q_1	M_1	G	G	T,Xi,R62,R63,F,3	10	fl	−111	46	1,261
Carbon monoxide	CO		–	<60	D	53A		1	Q_1(S)	B	P	G	G	T,1,4,F+	30	ga	−205	−191	(–)
Carbon tetrachloride (Tetrachloromethane)	CCl_4	TA	–	<60	S,Q	62		1	Q_1(V)	B	V	G	G	T,R40,N	10	fl	−23	76	1,5924
Castor oil			–	<100	S	11		1	Q_1(S)	B	V	G	G			fl	−10 … −18		0,96
Caustic ammonia → *Ammonia aqu. Solutions*																			
Caustic potash solution (Potassium hydroxide in aqueous solution)	KOH		<10	<25	S	11		1	Q_1	Q_1	E	G	G	C,Xn		fl			
	KOH		<20	<60	S	11		5	Q_1	Q_1	E	G	G	C,Xn		fl			
	KOH		–	<Kp	D	53A		1	Q_1	Q_1	M_2	G	G	C,Xn,2,4		fl			
Caustic soda solution (Sodium hydroxide in aqueous solution)	NaOH		<10	<80>K	S,Q	62		5	Q_1	Q_1	E	G	G	C			10%~10	10%~105	10% 1,109
	NaOH		<20	<100>K	S,Q	62		5	Q_1	Q_1	E	G	G	C			20%~25	20%~110	20% 1,219
	NaOH		<50	<100>K	S,Q	62	QW	5	Q_1	Q_1	E	G	G	C,3			30%~0	30%~120	30% 1,327
	NaOH		<50	<100>K	S,Q	62	QW	1	Q_1	Q_1	E	G	G	C,3			40%~15	40%~130	40% 1,430
	NaOH		<50	<100>K	D	53A	SW	1	Q_1	Q_1	E	G	G	C,3			50%~12	50%~150	50% 1,524
	NaOH		<50	<180	D	53A	SW	1	Q_1	Q_1	M_2	G	G	C,2			60%~50	60%~160	60% 1,109
Cellosolve (Ethylene glyol monoethyl ether)	$C_4H_{10}O_2$	TA,®	–	<Kp	S,Q	62		1	Q_1(S)	B	M_1	G	G	T,Xn,R60	20	fl	−100	135	0,9311
Cellulose → *Pulp*																			
Cement sludge			<60	<40	S,Q	62	kD	3	Q_1	Q_1	V	G	G	3,6					
Cheese (cream)		N	–	<60	D	53A		1	Q_1	Q_1	V	G	G	4		pa			
Chemical pulp → *Cellulose*																			
Chinese wood oil → *Wood oil*																			
Chloroacetic acid	$C_2H_3ClO_2$	TA	<L	<100	D	53A	SW	1	Q_1(V)	B	M_2	G	G	T,C,2,N		kr	61	188	1,40
Chlorinated biphenyls		TA,S	–	<60	D	53A		1	Q_1(V)	B	M_1	G	G	T	0,2	fl			
Chlorine	Cl_2		–	<60	D	54		1	Q_1	Q_1	M_1	G	G	T,Xi,1,2,3,6,N	0,5	ga	−101	−34	(+)
Chlorine bleaching lye → *Sodium hypochlorite, Calcium hypochlorite*																			
Chlorine dioxide	ClO_2		–	<60	D	53A	SW	1	Q_1	Q_1	M_1	G	G	T+,C,1,2,6,O,N	0,1	ga	−59	11	(+)
Chlorine lye → *Sodium hypochlorite*																			
Chlorine water	Cl_2+H_2O		L	<Kp	D	54		1	Q_1(V)	B	M_1	G	G	C,2,6		fl			
Chloroacetone (1-Chlorine- 2-propanone)	C_3H_5ClO	TA	–	<60	S,Q	62		1	Q_1(V)	B	M_1	G	G	T,3,N		fl	−44	119	1,123
Chlorobenzene	C_6H_5Cl	TA	–	<Kp	D	53A		1	Q_1(V)	B	M_1	G	G	Xn,N	50	fl	−46	132	1,106
Chlorofluorocarbons (CFC) → *Refrigerants*																			
Chloroform	$CHCl_3$	TA	–	<Kp	D	62		1	Q_1(S)	B	M_1	G	G	Xn,Xi,R40	10	fl	−63	61	1,48
Chloromethane → *Methyl chloride*																			
Chloropicrine → *Trichloronitromethane*																			
Chlorosulfuric acid (Chlorosulfonic acid)	$HOSO_2Cl$		–	<Kp	D	54		1	Q_1	Q_1	M_1	G	G	C,Xi		fl	−80	152(Z)	1,75
Chlorothene → *Trichloroethane*																			
Chrome alum (Potassium chrome alum)	$KCr(SO_4)_2*12H_2O$		<L	<Kp	S,Q	62		1	Q_1(V)	B	M_1	G	G	6		kr	89		1,83
Chromic acid (Chromic anhydride) → *Chromium trioxide*																			
Chromium trioxide	CrO_3		<L	<Kp	D	53A		1	Q_1	Q_1	M_1	G	G	T+,C,R45,R46,R62,2,6,O,N	mg 0,1	kr	197	>230(Z)	2,7
Citric acid	$C_6H_8O_7$		<L	<Kp	S	11		1	Q_1(S)	B	V	G	G	Xi		kr	153	200(Z)	1,66
Citrus juices		N	–	<Kp	S	11		1	Q_1(S)	B	V	G	G			fl			
Clairce → *Sugar juices*																			
Clophen → *Chlorinated biphenyls*																			
Coal sludge				<60	S	32		1	U_1	U_1	P	G	G			pa			
Coal tar (remove leakage selectively)		TA,G	–	<180	S,Q	11	(H)	1	Q_1(S)	B	M_1	G	G	T,R45,1,6	*	fl		1,1…1,2	
Cocoa butter (Cacao butter)		N	Sch	<100	S	11		1	Q_1(S)	B	V	G	G			pa	33…35		0,975

Mechanical seal selection by media

Media					Mechanical Seal									Additional information on the medium					
Code of materials and legend see inside of back cover. Please observe the note on page 1.	Chemical formula	Remark	Concentration %	Temp. °C	Arrange-ment	Auxil. piping	Addit. measures	Seal type	Materials to EN 12756					Hazard warnings	TLV-value	Normal condition	Melting temperature °C	Boiling point °C	Density g/cm³
									1	2	3	4	5						
									Seal face	Seal face	Sec. seal	Spring	Others						
1		2	3	4	5	6	7	8						10	11	12	13	14	15
Coconut fat		N	–	>30<TG	S	11		1	Q_1(S)	B	V	G	G			pa	20...23		0,88...0,9
Coconut oil		N	–	<160	S	11		1	Q_1(S)	B	V	G	G			fl			
Cod-liver oil		N	–	<Kp	S	11		1	Q_1(S)	B	V	G	G			fl			0,92...0,93
Coffee (extract)		N	L	<60	S	11		1	Q_1	Q_1	V	G	G			fe			
Coin		®	–	<30	S	11		1	Q_1(S)	B	V	G	G			fl			
Coke oven gas			–	<160	D	53A		1	Q_1(V)	B	V	G	G	1,U	*	ga			
Cold zinc paint		G	<L	<60	D	53A		1	Q_1(S)	B	E	G	G	3,4		fe			
Colza oil (Rapeseed oil)		N	–	<100	S	11		1	Q_1(S)	B	V	G	G			fl	–10...–2	350	0,91
Condensed milk		N	–	<Kp	S	11		1	Q_1(S)	B	V	G	G			fl			
Cooling brine → *Calcium chloride*																			
Copper (II) acetate	$C_4H_6CuO_4$		<L	<40	S	11		1	Q_1(V)	B	E	G	G	Xn		kr	115	~240(Z)	1,882
Copper chlorides:																			
Copper chloride	CuCl		<L	<Kp	D	53A		1	Q_1(V)	B	E	G	G	Xn,N,2,3		kr	430	1490	4,14
Copper (II) chloride	$CuCl_2$		<L	<Kp	D	53A		1	Q_1(V)	B	E	G	G	Xn,N,2,3		kr	>300(Z)		3,386
Copper (I) cyanide suspension		TA	<10	<Kp	D	53A		1	Q_1(V)	B	M_1	G	G	T+,N	5	kr	473		2,92
Copper (II) nitrate	$Cu(NO_3)_2$		<L	<60	S	11		5	Q_1	Q_1	E	G	G	Xn,O		kr		>150(S)	
	$Cu(NO_3)_2$		<L	<Kp	D	53A		1	Q_1	Q_1	M_2	G	G	Xn,O					
Corn mash		N	–	<Kp	S	11		1	Q_1(S)	B	V	G	G			fl			
Corn oil		N	–	<100	S	11		1	Q_1(S)	B	V	G	G			fl	–18...–10		0,91...0,93
Cottonseed oil		N	–	<120	S	11		1	Q_1(S)	B	V	G	G			fl	–2		0,92
Cream		N	–	<60	S	11		1	Q_1(S)	B	V	G	G			fl			
Creosot		TA	–	<Kp	S	11		1	Q_1(S)	B	M_1	G	G	T,R45		fl	<–20	200...220	1,08...1,09
Cresols:																			
m-Cresol	C_7H_8O	TA	Sch	<Kp	D	53A		1	Q_1(V)	A	M_1	G	G	T,C	5	kr	31	191	1,05
o-Cresol	C_7H_8O	TA		<Kp	D	53A		1	Q_1(V)	A	M_1	G	G	T,C	5	fl	11	203	1,03
p-Cresol	C_7H_8O	TA	Sch	<Kp	D	53A		1	Q_1(V)	A	M_1	G	G	T,C	5	fe	36	202	1,018
Crude oil, free from solid particles		TA,N	–	<100	S	11		1	Q_1(S)	B	V	G	G	T,R45		fl			
Crude oil, refined		TA,N	–	<80	S	11		1	Q_1(S)	B	V	G	G	T,R45		fl			
Crude oil, with sand		TA,N	–	<100	S	11		1	Q_1	Q_1	V	G	G	T,R45		fl			
Crude oil + salt water		TA,N	–	<25	S	11		1	Q_1(V)	B	V	G	G	T,R45		fl			
Crude soap			–	>F<100	S	11		1	Q_1(S)	B	V	G	G			fl			
Cryolith (suspension)	$Na_3(AlF_6)$		<30	<Kp	S	02	kD	3	Q_1	Q_1	E	G	G	T,Xn,N		kr	~1000		2,95
Cumene (Isopropylbenzene)	C_9H_{12}	TA	–	<Kp	D	53A		1	Q_1(V)	B	M_1	G	G	Xn,N	50	fl	–96	152 ... 153	0,864
Cupric sulphate (Blue vitriol)	$CuSO_4$*$5H_2O$		<L	<Kp	S	11		5	Q_1	Q_1	E	G	G	Xn		kr	560(Z)		3,603
Curd		N	–	<60	S	11		1	Q_1(S)	B	V	G	G			pa			
Cutting fluid → *Metal working lubricants*																			
Cyanide of potassium → *Potassium cyanide*																			
Cyclohexane	C_6H_{12}	TA	–	<Kp	S	11		1	Q_1(S)	B	V	G	G	F,Xn,Xi,N	300	fl	7	80	0,788
Cyclohexanol	$C_6H_{12}O$		–	>F<Kp	S,Q	62		1	Q_1(S)	B	M_1	G	G	Xn,Xi,6	50	fe	25	161	0,962
Cyclohexanone	$C_6H_{10}O$		–	<Kp	S,Q	62		1	Q_1(S)	B	M_1	G	G	Xn	*	fl	–26	155	0,964
Cyclopentadiene	C_5H_6	TA	–	<Kp	S,Q	62		1	Q_1(S)	B	M_1	G	G	1,6	75	fl	–97	40	0,802
Cymene, p-; (1-Isopropyl-4-methyl-benzene)	$C_{10}H_{14}$		–	<60	S	11		1	Q_1(V)	B	V	G	G	Xi		fl	–68	177	0,86
D																			
Decahydronaphthalene → *Decalin*																			
Decalin (Decahydronaphthalene):	$C_{10}H_{18}$																		
cis-Decalin	$C_{10}H_{18}$	TA	–	<Kp	S,Q	62		1	Q_1(S)	B	M_1	G	G	C,N		fl	–43	196	0,896
trans-Decalin	$C_{10}H_{18}$	TA	–	<Kp	S,Q	62		1	Q_1(S)	B	M_1	G	G	C,N		fl	–30	187	0,870
Denatured alcohol → *Ethanol*																			
Desalinated water → *Water*																			
Desmodur R		®	–	<Kp	D	53A		1	Q_1(S)	B	M_1	G	G	Xn,U		fl			
Desmodur T		TA,®	–	<Kp	D	53A		1	Q_1(S)	B	M_1	G	G	T+,Xi,R40		fl	21	251	1,22
Desmophen		®	–	<Kp	D	53A		1	Q_1(S)	B	M_1	G	G	U		fl			
Detergents		S			S	11		1	Q_1(S)	B	V	G	G						
Dextrin (Starch gum)		G	<L	<Kp	D	53A		1	Q_1(S)	B	V	G	G			fe			
Dextrose → *Glucose*																			

Media Code of materials and legend see inside of back cover. Please observe the note on page 1. 1	Chemical formula	Remark 2	Concentration % 3	Temp. °C 4	Arrangement 5	Auxil. piping 6	Addit. measures 7	Seal type 8	Mechanical Seal – Materials to EN 12756 1 Seal face	2 Seal face	3 Sec. seal	4 Spring	5 Others	Additional information on the medium Hazard warnings 10	TLV-value 11	Normal condition 12	Melting temperature °C 13	Boiling point °C 14	Density g/cm³ 15
Diacetone alcohol (4-Hydroxy-4-methyl-2-pentanone)	$C_6H_{12}O_2$		–	<Kp	S,Q	62		1	Q_1(S)	B	M_1	G	G	Xi,6	50	fl	–47	168	0,93
Diallyl phthalate → *Phthalic acid esters*																			
Diammonium hydrogen phosphate → *Ammonium phosphate, secondary*																			
Dibromoethane (Ethylene bromide)	$C_2H_4Br_2$		–	<100	D	53A		1	Q_1(V)	B	M_2	G	G	T,Xi,R45,N	*	fl	10	132	2,2
Dibutyl ether	$C_8H_{18}O$		–	<Kp	S,Q	62		1	Q_1(V)	B	M_1	G	G	R,6		fl	–98	142	0,769
Dibutyl phthalate (DBP) → *Phthalic acid esters*																			
Dichlorobenzenes:																			
1,2-Dichlorobenzene (ortho-dichlorobenzene)	$C_6H_4Cl_2$	TA	–	<Kp	S,Q	62		1	Q_1(S)	B	M_1	G	G	Xn,Xi,N	50	fl	–17	180	1,306
1,3-Dichlorobenzene (meta-dichlorobenzene)	$C_6H_4Cl_2$	TA	–	<Kp	S,Q	11		1	Q_1(S)	B	M_1	G	G	Xn,N		fl	–25	173	1,288
1,4-Dichlorobenzene (para-dichlorobenzene)	$C_6H_4Cl_2$	TA	–	>F<Kp	S,Q	62		1	Q_1(S)	B	M_1	G	G	Xn,Xi,R40,N	50	fe	53	174	1,46
Dichloroethanes:																			
1,1-Dichloroethane	$C_6H_4Cl_2$	TA	–	<Kp	S,Q	62		1	Q_1(V)	B	M_1	G	G	Xn,Xi,F	100	fl	–97	57	1,175
1,2-Dichloroethane	$C_6H_4Cl_2$	TA	–	<Kp	S,Q	62		1	Q_1(V)	B	M_1	G	G	T,Xn,Xi,R45,F	*	fl	–36	83	1,26
Dichloroethenes:																			
1,1-Dichloroethene	$C_6H_4Cl_2$	TA	–	<Kp	D	53A		1	Q_1(S)	B	V	G	G	Xn,R40,3,F+	2	fl	–122	32	1,213
1,2-Dichloroethene (cis-)	$C_6H_4Cl_2$	TA	–	<Kp	S	11		1	Q_1(S)	B	V	G	G	Xn,F,N	200	fl	–81	60	1,284
1,2-Dichloroethene (trans-)	$C_6H_4Cl_2$	TA	–	<Kp	S	11		1	Q_1(S)	B	V	G	G	Xn,F,N	200	fl	–50	47*	1,257
Dichloromethan → *Methylene chloride*																			
Didecyl phthalat → *Phthalic acid esters*																			
Diesel fuel		TA,G	–	<80	S	11		1	Q_1(S)	B	V	G	G			fl		170...390	0,83...0,88
Diethanolamine (DEA, 2,2'-Iminodiethanol)	$C_4H_{11}NO_2$		–	>F<180	S	11		1	Q_1(V)	B	M_2	G	G	Xn,Xi		kr	28	268	1,093
Diethyl ether ('Ether', Ethyl ether)	$C_4H_{10}O$	TA	–	<Kp	S,Q	11		1	Q_1(S)	B	M_2	G	G	Xn,F+		fl	–116	34	0,715
Diethyl phthalate (DEP) → *Phthalic acid esters*																			
Diethylamine	$(H_5C_2)_2NH$	TA	–	<Kp	S,Q	62		1	Q_1(V)	B	M_2	G	G	Xn,C,F	10	fl	–50	55	0,711
Diethylene glycol → *Ethylene glycols*																			
Diethylenetriamine	$C_4H_{13}N_3$	TA	–	<180	S	11		1	Q_1(V)	B	M_2	G	G	Xn,C		fl	–39	207	0,959
Digester liquor, acidic		V		<140	S	02	kD	3	Q_1	Q_1	V	M	G			fl			
(Sulfite chemical pulp)		V		>140	D	53A		1	Q_1(V)	B	M_2	G	G	1,4					
Digester liquor, basic		V		<120	S	02	kD	3	Q_1	Q_1	E	M	G			fl			
(Sulfate chemical pulp)		V		>120	D	53A		1	Q_1(V)	B	M_2	G	G	1,4					
Diglycolic acid (2.2'-Oxydiacetic acid)	$C_4H_6O_5$		<L	<60	S	11		1	Q_1(V)	B	E	G	G	Xn,Xi		fe	148		
Diisobutyl phthalate (DIBP) → *Phthalic acid esters*																			
Diisodecyl phthalate (DIDP) → *Phthalic acid esters*																			
Diisononyl phthalate (DINP) → *Phthalic acid esters*																			
Diisooctyl phthalate (DIOP) → *Phthalic acid esters*																			
Diluents (solvents for paints and lacquers)		S	–	<40	S	11		1	Q_1(S)	A	M_1	G	G	U		fl			
Dimethyl formamide (DMF)	C_3H_7NO	TA	–	<Kp	S,Q	62		1	Q_1(S)	B	M_2	G	G	T,Xn,Xi	10	fl	–61	153	0,9445
Di-(methyl glycol)-phthalate → *Phthalic acid esters*																			
Dimethyl phthalate (DMP) → *Phthalic acid esters*																			
Dimethyl sulfate	$C_2H_6O_4S$	TA	–	<Kp	D	53A		1	Q_1(S)	B	M_1	G	G	T+,C,R45	*	fl	–32	191	1,33
Dimethyl sulfoxide (DMSO)	C_2H_6OS		–	<60	S	11		1	Q_1(S)	B	V	G	G			fl	19	189	1,104
Dimethyl terephthalate (DMT)	$C_{10}H_{10}O_4$		<L	<60	S	11		1	Q_1(S)	B	M_1	G	G			kr	141	282	1,35
	$C_{10}H_{10}O_4$		Sch	>F<Kp	S	01	(H)	6	A	Q1	G	M_6	T_4						
Dinonyl phthalate → *Phthalic acid esters*																			
Dioctyl phthalate (DOP) → *Phthalic acid esters*																			
Dipentene	$C_{10}H_{16}$	TA	–	<60	S	11		1	Q_1(S)	B	V	G	G	Xi,N		fl	–95	178	0,841

Mechanical seal selection by media

Media					Mechanical Seal									Additional information on the medium					
Code of materials and legend see inside of back cover. Please observe the note on page 1.	Chemical formula	Remark	Concentration %	Temp. °C	Arrange-ment	Auxil. piping	Addit. measures	Seal type	Materials to EN 12756					Hazard warnings	TLV-value	Normal condition	Melting temperature °C	Boiling point °C	Density g/cm³
									1	2	3	4	5						
									Seal face	Seal face	Sec. seal	Spring	Others						
1		2	3	4	5	6	7	8						10	11	12	13	14	15
Dipentyl phthalate → *Phthalic acid esters*																			
Diphenyl, diphenyl oxide → *Heat transfer oils*																			
Diphyl → *Heat transfer oils*		®																	
Distilled water → *Water*																			
Disulfurdecafluoride → *Sulfur fluorides*																			
Disulfur dichloride → *Sulfur chlorides*																			
Disulfur difluoride → *Sulfur fluorides*																			
Divinylbenzene (m-), (Vinylstyrene)	$C_{10}H_{10}$	TA	–	<Kp	S,Q	62		1	Q_1(V)	B	M_1	G	G	Xi,N		fl	–67	199	0,9289
Dodecyl benzene	$C_{18}H_{30}$		–	<60	S	11		1	Q_1(S)	B	V	G	G			fl	–7	331	0,863
Dowtherm → *Heat transfer oils*		®																	
Drinking water, industrial water → *Water*																			
Dye liquor with bleaching additives		G	–	<160	S	11		1	Q_1	B	M_1	G	G			fl			
Dye liquor without bleaching additives		G	–	<140	S	11		1	Q_1(S)	B	V	G	G			fl			
E																			
Edible oil		N	–	<100	S	11		1	Q_1(S)	B	V	G	G			fl			
Egg liqueur		N	–	<Kp	D	53A		1	Q_1(S)	B	V	G	G	3,4		fl			
Egg yolk		N	–	<Kp	S,Q	62		1	Q_1(S)	B	V	G	G	3,4		fl			1,08
Electrophoretic varnishes		G	Sus		D			X	Q_1	Q_1	V	T_6	F						
Enamel slip			Sus	<40	D	53A		5	Q_1	Q_1	P	G	G	4					
Engobes (special clays)			Sus	<40	D	53A		5	Q_1	Q_1	P	G	G	4					
Epichlorohydrine (ECH)	C_3H_5ClO	TA	–	<Kp	D	53A		1	Q_1(S)	B	M_2	G	G	T,C,R45	*	fl	–48	117	1,18
Epoxy resins and lacquers		TA	Sus	<Kp	D	53A		1	Q_1(V)	B	M_1	G	G	Xi,3,4,N		fl			
Essential oils → *Volatile oils*																			
Essotherm → *Heat transfer oils*		®																	
Esters (not specified); also refer to → *Acetic acid esters*		S	–	<Kp,TG	S,Q	53A		1	Q_1(S)	B	M_2	G	G	(F),U		fl			
Ethanal → *Acetaldehyde*																			
Ethane	C_2H_6	TA	–	<60	D	53A		1	Q_1(S)	B	V	G	G	F+,1		ga	–183	–88	(+)
Ethanediamine → *Ethylenediamine*																			
Ethanediol → *Ethylene glycol*																			
Ethanol	C_2H_5OH	TA	–	<Kp	S	11		1	Q_1(S)	B	E	G	G	F	1000	fl	–114	78	0,794
Ethanolamines → *Amino ethanols*																			
Ethene → *Ethylene*																			
Ethenyl ... → *Vinyl ...*																			
Ether → Diethyl ether																			
Ether sulfates		S	–	<60	S	11		1	Q_1(S)	B	V	G	G	U		fl			
Ethyl acetate → *Acetic acid ethyl ester*																			
Ethyl acetoacetate	$CH_3COCH_2CO_2C_2H_5$		–	100	S	11		1	Q_1(V)	B	M_2	G	G	Xi		fl	–45	180	1,025
Ethyl acrylate → *Acrylic esters*																			
Ethyl alcohol → *Ethanol*																			
Ethylamine (Aminoethane)	C_2H_7N	TA	–	<60	D	53A		1	Q_1(S)	B	E	G	G	F+,Xi,1	10	ga	–80	17	(+)
Ethylbenzene	C_8H_{10}		–	<Kp	S,Q	62		1	Q_1(S)	B	M_1	G	G	Xn,F	100	fl	–94	136	0,867
Ethylchloride (Chloroethane)	C_2H_5Cl	TA	–	<60	D	53A		1	Q_1(V)	B	M_1	G	G	Xn,R40,F+,1	1000	ga		–138	12(+)
Ethylene (Ethene)	C_2H_4	TA	–	<–20	D	53A	ThE	6	A	Q_1	V	M_6	M	F+,1		ga	–169	–104	(–)
Ethylene bromide → *Dibromoethane*																			
Ethylene chloride → *Dichloroethenes*																			
Ethylene chlorohydrin (2-Chloroethanol)	C_2H_5ClO	TA	–	<Kp	D	53A		1	Q_1(S)	B	M_1	G	G	T+	1	fl	–70	129	1,21
Ethylenediamine	$C_2H_8N_2$	TA	–	<60	S,Q	62		1	Q_1(S)	B	E	G	G	Xn,C	10	fl	9	116	0,9

Media: Code of materials and legend see inside of back cover. Please observe the note on page 1.	Chemical formula	Remark	Concentration %	Temp. °C	Arrange-ment	Auxil. piping	Addit. measures	Seal type	Materials to EN 12756: 1 Seal face	2 Seal face	3 Sec. seal	4 Spring	5 Others	Hazard warnings	TLV-value	Normal condition	Melting temperature °C	Boiling point °C	Density g/cm³
1		2	3	4	5	6	7	8						10	11	12	13	14	15
Ethylene dichloride → *Dichloroethenes*																			
Ethylene glycols:																			
Diethylene glycol	$C_4H_{10}O_3$		–	<100	S	11		1	Q_1(S)	B	E	G	G	Xn		fl	−6	245	1,12
Ethylene glycol (1,2-Ethanediol, 'Glycol')	$C_2H_6O_2$		–	<100	S,Q	62		1	Q_1(S)	B	E	G	G	Xn	10	fl	−16	198	1,113
Tetraethylene glycol	$C_8H_{18}O_5$		–	<100	S	11		1	Q_1(S)	B	E	G	G			fl	−6	328	1,128
Triethylene glycol	$C_6H_{14}O_4$		–	<100	S	11		1	Q_1(S)	B	E	G	G			fl	−4	291	1,1274
Ethylene oxide	C_2H_4O	TA	–	<60	D	53A		1	Q_1(S)	B	M_2	G	G	T,Xi,R45,R46,F+,6	*	ga	−111	10	(–)
Ethyl ether → *Diethyl ether*																			
Ethyl formiate → *Formic acid ethyl esters*																			
2-Ethylhexanol (Isooctanol)	$C_8H_{18}O$		–	<100	S	11		1	Q_1(S)	B	V	G	G	Xi		fl	<−76	182	0,834
F																			
Faeces (feces)		N	–	<60	S	11		1	Q_1	Q_1	V	G	G			fl			
Fats and fatty oils		N	–	<200	S	11		1	Q_1(S)	B	M_1	G	G			fl			
Fatty acids		G	–	>F,<Kp	S	11		1	Q_1(V)	B	M_1	G	G			fl			
Fatty alcohol sulfates		G	<L	<Kp,>K	S	11		1	Q_1(V)	B	V	G	G			fe			
Fatty alcohols		G	–	<100	S	11		1	Q_1(S)	B	V	G	G			fl			
Ferric phosphate solution in mineral acids			L	<100	D	53A	SW	1	Q_1(V)	B	M_1	G	G	2,U		kr			2,87
Ferricyanides		G	<L	<Kp,>K	S	11		1	Q_1(V)	B	E	G	G			kr			
Finishing agents, dressing agents		S	–	<Kp	S	11		1	Q_1(S)	B	V	G	G	U		fl			
Fir needle oils		G	–	<60	S	11		1	Q_1(S)	B	V	G	G			fl			0,87...0,88
Fish glue		N	–	<60	S,Q	11		1	Q_1(S)	B	V	G	G	3		fl			
Fish liver oils		N	–	<100	S	11		1	Q_1(S)	B	V	G	G			fl			
Fish meal		N	Sus	<60	S	02		1	Q_1	Q_1	V	G	G			fe			
Fish offals		N	Sus	<60	S	02		1	Q_1	Q_1	V	G	G			fe			
Fish oils		N	–	<100	S	11		1	Q_1(S)	B	V	G	G			fl			
Fish slurry		N	Sus	<60	S	02		1	Q_1	Q_1	V	G	G			fe			
Fixative		G	<L	<60	S,Q	11		1	Q_1(S)	B	M_1	G	G	3		fe			
Fixing bath, acidic			–	<60	S	11		1	Q_1(S)	B	V	G	G			fl			
Flue gas desulphurization plants (FGD): all acid suspensions		V	<25	<80	S	02	kD	3	Q_1	Q_1	V	M	M			fl			
Fluoroacetic acid	$C_2H_3FO_2$	TA	<L	<Kp	D	53A		1	Q_1(V)	B	M_1	G	G	T+,2,N		kr	35	165	1,369
Fluoroboric acid	HBF_4		–	<60	D	54		1	Q_1	Q_1	M_1	G	G	C,2		fl	−78	130(Z)	1,4
Fluorosilicic acid	$H_2(SiF_6)$		–	<60	D	54		1	Q_1	B	M_1	G	G	C,2		fl		(Z)	1,3
	$H_2(SiF_6)$		<30	<25	S	11		5	Q_1	Q_1	V	M	M						
Formaldehyde (Methanal)	HCHO	TA	–	<100	D	53A		1	Q_1(V)	B	M_2	G	G	T,C,R40,R43,1,3	0,5	ga	−117	−19	(+)
Formalin	HCHO	TA,®	~40	<Kp	S,Q	62		1	Q_1(V)	B	M_2	G	G	T,C,R40,R43,1,3		fl			1,122 (40%)
Formamide	CH_3NO	TA	–	<60	S	11		1	Q_1(S)	B	E	G	G	T,R61		fl	3	210	1,13
Formic acid	HCOOH	TA	100	TG	D	53A	SW	1	Q_1(V)	B	M_2	G	G	C,2	5	fl	8(100%)	101(100%)	1,22 (100%)
	HCOOH	TA	–	<80	S	11	SS	1	Q_1(V)	B	M_2	M	M	C					
	HCOOH	TA	<30	<60	S	11	SS	1	Q_1(V)	B	M_2	G	G	C					
	HCOOH	TA	>30	<30	S	11	SS	1	Q_1(V)	B	M_2	G	G	C					
	HCOOH	TA	>80	<40	S	11	SS	1	Q_1(V)	B	M_2	G	G	C					
	HCOOH	TA	>90	<50	S	11	SS	1	Q_1(V)	B	M_2	G	G	C					
Formic acid ethyl ester (Ethyl formiate)	$C_5H_{10}O_2$	TA	–	<Kp	S,Q	62		1	Q_1(S)	B	M_2	G	G	Xn,F	100	fl	−80	54	0,917
Formic acid methyl ester (Methyl formiate)	$C_2H_4O_2$	TA	–	<Kp	S,Q	62		1	Q_1(S)	B	M_2	G	G	Xn,F+	100	fl	−100	32	0,97
Formylmorpholine, n- (4-Morpholine-carboxaldehyde, NFM)	$C_5H_9NO_2$		–	<80	S	11		1	Q_1(S)	B	M_1	G	G			fl	23	240	1,15
Freon → *Refrigerants*		®																	
Fresh sludge (sewage works)			–	<60	S	02	kD	2	Q_{12}	Q_{12}	V	G	G			fl			
Frigen → *Refrigerants*		®																	
Fruit juices		N	–	<60	S	11		1	Q_1(S)	B	V	G	G			fl			
Fruit mash → *Mashes*																			
Fruit pulp → *Mashes*																			
Fuel oils:																			
Fuel oil (bottoms)		TA	–	<120	S	11		1	Q_1	Q_1	V	G	G	Xn,R40,N		fl			
Fuel oil EL		TA	–	<120	S	11		1	Q_1(S)	B	V	G	G	Xn,R40,N		fl	Pp< −6	155...390	<0,86(15)
Fuel oil L		TA	–	<120	S	11		1	Q_1(S)	B	V	G	G	Xn,R40,N		fl			<1,10(15)
Fuel oil M		TA	–	<120	S	11		1	Q_1(S)	B	V	G	G	Xn,R40,N		fl			<1,20(15)
Fuel oil S		TA	–	<120	S	11		1	Q_1(S)	B	V	G	G	Xn,R40,N			−10... +40		

Mechanical seal selection by media

Media					Mechanical Seal									Additional information on the medium					
Code of materials and legend see inside of back cover. Please observe the note on page 1.	Chemical formula	Remark	Concentration %	Temp. °C	Arrange-ment	Auxil. piping	Addit. measures	Seal type	Materials to EN 12756					Hazard warnings	TLV-value	Normal condition	Melting temperature °C	Boiling point °C	Density g/cm³
									1	2	3	4	5						
									Seal face	Seal face	Sec. seal	Spring	Others						
1		2	3	4	5	6	7	8						10	11	12	13	14	15
Fumaric acid	$C_4H_4O_4$		<L	<100	S	11		1	$Q_1(V)$	B	V	G	G	Xi		kr		290(S)	1,625
Furfurol (Furfural, Furaldehyde)	$C_5H_4O_2$	TA	–	<100	D	53A		1	$Q_1(S)$	B	M_2	G	G	T,Xn,Xi,R40	5	fl	–36	162	1,159
Furfuryl alcohol	$C_5H_6O_2$		–	<100	S,Q	62		1	$Q_1(S)$	B	M_2	G	G	Xn	10	fl	–31	170	1,13
G																			
Gallic acid	$C_7H_6O_5$		<L	<100	S	11		1	$Q_1(S)$	B	V	G	G	Xi		kr	253(Z)		1,69
Galvanic baths			–	<60	S	11		1	$Q_1(V)$	B	V	G	G			fl			
Gas → *Petrol*																			
Gas oil		 TA	– –	<140 <220	S S,Q	11 62		1 1	$Q_1(S)$ $Q_1(S)$	B A	V M_1	G G	G G	T,R45		fl fl			200...360
Gas scrubber water			–	<60	S	11		1	$Q_1(S)$	B	V	G	G			fl			
Gasoline → *Petrol*																			
Gasoline-methanol mixture → *Petrol-methanol mixture*																			
Gelatin			–	<100	S	11		1	$Q_1(S)$	B	V	G	G			fl			
Gilotherm → *Heat transfer oils*		®																	
Gingerbread dough			–	<60	D	53A		1	$Q_1(S)$	B	V	G	G	4		pa			
Glacial acetic acid → *Acetic acid*																			
Glauber's salt → *Sodium sulphate*																			
Glazing slip			<50	<60	D	53A		5	Q_1	Q_1	V	G	G	4		pa			
Glucose D- (Dextrose, Grape sugar)	$C_6H_{12}O_6$		<L	<100	S	11		1	$Q_1(S)$	B	V	G	G			kr	146		1,56
Glue			–	<Kp	D	53A		1	$Q_1(S)$	B	V	G	G	3,4		fl			
Glutamic acid (2-Aminoglutaric acid)	$C_5H_9NO_4$		<L	<100	S	11		1	$Q_1(V)$	B	M_1	G	G			kr	205(Z)		
Glutaric acid (Pentene diacid)	$C_5H_8O_4$		<L	<Kp	S	11		1	$Q_1(V)$	B	M_1	G	G	Xi		kr	97	303	1,43
Glycerol (1,2,3-Propan- etriol, Glycerine)	$C_3H_8O_3$		–	<120	S	11		1	$Q_1(S)$	B	V	G	G			fl	19	290(Z)	1,261
Glycol → *Ethylene glycol*																			
Glycol ethers		G	–	<100	S	11		1	$Q_1(S)$	B	E	G	G			fl			
Glycolic acid (Hydroxyacetic acid)	$HOCH_2COOH$	TA	<L	<60	S	11		1	$Q_1(V)$	B	E	G	G	C		kr	80	100(Z)	1,26
Glycols (diols), general		G	–	<100	S	11		1	$Q_1(S)$	B	E	G	G			fl			
Grape sugar → *D-Glucose*																			
Gypsum sludge	$CaSO_4*2H_2O$		<50	<60	D	53A		5	Q_1	Q_1	V	G	G	4		pa			
Gypsum suspensions (from FGD, all of them)	$CaSO_4*2H_2O$		<25	<80	S	02	kD	3	Q_1	Q_1	V	M	G			fl			
H																			
Hair lotions		G	–	<40	S	11		1	$Q_1(S)$	B	V	G	G			fl			
Hair oils		G	–	<40	S	11		1	$Q_1(S)$	B	V	G	G			fl			
Hair shampoos		G	–	<60	D	53A		1	$Q_1(V)$	B	V	G	G			fl			
Halocarbon		®	–	<200	S	11		1	$Q_1(S)$	B	M_1	G	G			fl			
Heat transfer oils:		G																	
Vapour pressure at operating temperature <1 bar			– –	<100 <220	S S,Q	11 62		1 1	$Q_1(S)$ $Q_1(S)$	B A	V M_1	G G	G G	 3		fl fl			
Vapour pressure at operating temperature < 2 bar			–	<400	S,Q	62		6	A	Q_1	G	M_6	T_4	3		fl			
Vapour pressure at operating temperature > 2 bar			–	<400	D	53A		6	A	Q_1	G	M_6	T_4	3		fl			
Helium	He		–	<80	D	53A		1	$Q_1(S)$	B	M_1	G	G	1		ga	–272	–268	(–)
Heptane	C_7H_{16}	TA	–	<Kp	S	11		1	$Q_1(S)$	B	V	G	G	Xn,Xi,3,4,T,N	500	fl	–90	98	0,681
Hexachlorobenzene (HCB, Perchlorobenzene)	C_6Cl_6	TA	Sch	<Kp	D	53A		6	Q_{22}	Q_1	G	M_5	M	T,R45,N		kr	231	323...326	2,044
Hexachlorobutadiene (Perchlorobutadiene)	C_4Cl_6	TA	–	<80	D	53A		1	$Q_1(V)$	B	V	G	G	T,R40		fl	–20	215	1,68
Hexachloroethane (Perchloroethane)	C_2Cl_6	TA	<L	<80	D	53A		1	$Q_1(S)$	B	V	G	G	Xn,R40	1	kr		187(S)	2,09
Hexane, -n	C_6H_{14}	TA	–	<Kp	D	11		1	$Q_1(S)$	B	V	G	G	Xn,Xi,R62,F,N	50	fl	–95	68	0,66
Hexan-2-one	$C_6H_{12}O$	TA	–	Kp	S,Q	62		1	$Q_1(S)$	B	M_1	G	G	T,R62	5	fl	–57	127	0,83
Honey		N	–	<100	D	53A		1	$Q_1(S)$	B	V	G	G	3,4		pa			

Media: Code of materials and legend see inside of back cover. Please observe the note on page 1. 1	Chemical formula	Remark 2	Concentration % 3	Temp. °C 4	Mechanical Seal: Arrange-ment 5	Auxil. piping 6	Addit. measures 7	Seal type 8	Materials to EN 12756: 1 Seal face	2 Seal face	3 Sec. seal	4 Spring	5 Others	Additional information on the medium: Hazard warnings 10	TLV-value 11	Normal condition 12	Melting temperature °C 13	Boiling point °C 14	Density g/cm³ 15
Hop mash → *Mashes*																			
Hot water → *Water*																			
Hydrated lime (Suspension of calcium hydroxide)	$Ca(OH)_2$		<10	<80	S	11	kD	5	Q_1	Q_1	V	G	G	Xi		kr			2,23
Hydraulic fluids HFA, HFB, HFC, HFD			–	<70	S	11		1	Q_1(S)	B	V	G	G	U		fl			
Hydraulic oils H, HL, HLP			–	<80	S	11		1	Q_1(S)	B	V	G	G	U		fl			
Hydrazine	N_2H_4		–	<Kp	D	53A		1	Q_1(S)	B	E	G	G	T,C,R45,N	*	fl	2	113	1,011
Hydroiodic acid	HI		–	<Kp	D	53A		1	Q_1	Q_1	M_1	G	G	C,2		fl		127(A)	1,7 (A57%)
Hydrobromic acid solution	HBr		–	<Kp	D	53A	SW	1	Q_1	Q_1	M_1	G	G	C,Xi,2,6		fl		126	1,5
Hydrochloric acid	HCl HCl HCl HCl HCl HCl HCl		0,04 <2 <10 <35 –	<20 <65 <25 <20 <80	S,Q S,Q S,Q S,Q D	62 62 62 62 53A		1 1 1 1 1	Q_1(V) Q_1(V) Q_1(V) Q_1(V) Q_1(V)	B B B B B	V V V V V	G M M M M	G M M M M	Xi,2 Xi,2 Xi,2 C,2 C,2	#7 #7 #7 #7 #7	fl fl fl fl fl		5%~101 10%~103 20%~110 25%~107 30%~95 35%~80 40%~20	10,5% 1,05 20,4% 1,10 24,3% 1,12 28,2% 1,14 32,1% 1,16 36,2% 1,18 40,4% 1,20
Hydrocyanic acid	HCN	TA	–	<Kp	D	53A		1	Q_1(V)	B	E	G	G	T+,F+,N	10	fl	−14	26	0,687
Hydrofluoric acid	HF HF HF HF		<40 <20 – –	<20 <30 <10 <Kp	S,Q S,Q S,Q D	62 62 62 54		1 1 1 1	Q_1 Q_1 Q_1 Q_1	B B B Q_1	M_1 M_1 M_1 M_1	M M M G	M M M G	T+,C T+,C T+,C T+,C,2	3 3 3 3	fl fl fl fl		112(A) 20%103 60%80 100%20	1,13 A38
Hydrofluosilicic acid → *Fluorosilicic acid*																			
Hydrogen	H_2		–	<60	D	53A		1	Q_1(S)	B	E	G	G	F+,1		ga	−259	−252	(–)
Hydrogen chloride anhydrous	HCl		–	<60	D	54		1	Q_1(V)	B	M_1	G	G	T,C,1,2,3	5	ga	−114	−85	(+)
Hydrogen fluoride (gas)	HF		–	<60	D	54		1	Q_1	B	M_2	G	G	T+,C,1,2	3	ga	−83	19	(+)
Hydrogen iodide anhydrous	HI		–	>−20	D	53A		1	Q_1	Q_1	M_1	G	G	C,1		ga	−51	−35	(+)
Hydrogen peroxide	H_2O_2 H_2O_2		<90 <60	<Kp <60	D S	53A 11		1 1	Q_1 Q_1	Q_1 Q_1	M_1 V	G G	G G	Xn,C,O,1	1	fl	0	150	1,4467
Hydrogen phosphide (Phosphine)	PH_3		–	<60	D	53A		1	Q_1(V)	B	M_1	G	G	T+,1,F+,N	0,1	ga	−133	−87	(+)
Hydrogen sulfide	H_2S		–	<100	D	62		1	Q_1(V)	B	M_2	G	G	T+,1,F+,N	10	ga	−85	−60	(+)
Hydroxymethyl propionitril → *Acetone cyanohydrin*																			
Hypochlorous acid	HOCl		–	<40	D	53A		1	Q_1(V)	B	V	G	G			fl			
I																			
Ice cream		N	–		S	01		1	Q_1(S)	B	V	G	G			pa			
Insecticides (Aqueous solution)		S	<L	<Kp	S,Q	62	QW	1	Q_1(S)	B	V	G	G	6,U					
Insulating lacquers		S	Sch	<200	D	53A		1	Q_1(S)	A	M_1	G	G	3,4		fe			
Iodine	I_2		Sch	<Kp	D	53A		1	Q_1	Q_1	M_1	G	G	Xn,4,6,N	0,1	fe	114	184	4,93
Iodoform (Triiodomethane)	CHI_3		Sch	<200	D	53A		1	Q_1	Q_1	M_1	G	G	Xn,4,6		fe	119	~218	4,008
Iron chlorides ($FeCl_2$ or $FeCl_3$)			<15 <L	<25 <Kp	S D	11 11		1 1	Q_1 Q_1(V)	Q_1 B	E E	M G	M G	Xn Xn		kr kr			
Iron sulfates:																			
Iron (II) sulfate (Ferrous sulfate, Iron vitriol)	$FeSO_4$		<L	<80	S	11		5	Q_1	Q_1	V	G	G	Xn		kr	>400(Z)		
Iron (III) sulfate (Ferric sulfate)	$Fe_2(SO_4)_3$		<L	<80	S	11		5	Q_1	Q_1	V	G	G	Xn		kr	480(Z)		3,1
Iso ... also see → ...																			
Isoborneol (2-Exo-bornanol)	$C_{10}H_{18}O$		<L	<Kp	S	11		1	Q_1(S)	B	M_1	G	G	Xi		fe	212(Z)		
Isobutyl acetate → *Acetic acid esters*																			
Isocyanates		S	Sch	<200	D	53A		1	Q_1(V)	B	M_1	G	G	U					
Isooctane (2,2,4-Trimethylpentane)	C_8H_{18}	TA	–	<40	S	11		1	Q_1(S)	B	V	G	G	Xn,Xi,F,N		fl	−110	117	0,692
Isooctanol (2-Ethyl-1-hexanol) → *2-Ethyl hexanol)*																			
Isopentane → *Pentanes*																			
Isophorone (3,5,5-Trimethylcyclohex-2-enone)	$C_9H_{14}O$	TA	–	<40	S,Q	62		1	Q_1(S)	B	E	G	G	Xn,Xi,R40	5	fl	−8	215	0,92
Isopropanol → *2-Propanol*																			
Isopropyl ... → *Propyl ...*																			

Mechanical seal selection by media

Media: Code of materials and legend see inside of back cover. Please observe the note on page 1.	Chemical formula	Remark	Concentration %	Temp. °C	Arrange-ment	Auxil. piping	Addit. measures	Seal type	Mechanical Seal – Materials to EN 12756: 1 Seal face	2 Seal face	3 Sec. seal	4 Spring	5 Others	Additional information on the medium: Hazard warnings	TLV-value	Normal condition	Melting temperature °C	Boiling point °C	Density g/cm³
1		2	3	4	5	6	7	8						10	11	12	13	14	15
Isopropyl alcohol → *2-Propanol*																			
Isopropyl methylbenzene → *Cymene*																			
Isopropylbenzene → *Cumene*																			
J																			
Jams, marmalades			–	<100	S	11		1	Q_1(V)	B	V	G	G			pa			
Jet fuel IP4, IP5		G	–	<40	S	11		1	Q_1(S)	B	V	G	G	F		fl		100...280	0,75...0,84
K																			
Kaurit → *Glues*																			
Kerosene			–	<100	S	11		1	Q_1(S)	B	V	G	G	Xn		fl		175...325	~0,8
Ketchup		N	–	<80	S,Q	62		1	Q_1(V)	B	E	G	G	3		fl			
Krypton	Kr		–	<160	D	53A		1	Q_1(S)	B	M_1	G	G	1		ga	−157	−154	(+)
L																			
Lacquer solvents		S	–	<Kp	S	11		1	Q_1(S)	B	M_1	G	G	U		fl			
Lacquers		S	–	<Kp	D	53A		1	Q_1(V)	B	M_1	G	G	3,4		fl			
Lactic acid	$C_3H_6O_3$		<L	<80	S	11		1	Q_1(S)	B	V	G	G	Xi		kr	53		1,206
Lactose (milk sugar)	$C_{12}H_{22}O_{11}$ $C_{12}H_{22}O_{11}$		<L <20	<Kp <Kp	S S	11 11		1 5	Q_1(V) Q_1	B Q_1	V V	G G	G G			kr	223		1,525
Lard		N	Sch	<100	S	11		1	Q_1(S)	B	V	G	G			pa	36...42		
Latex (specification necessary)		N	–	<100	S,Q	53A		X	U_2	Q_1(V)	M	G	G	3,4		fl			
Lavender oil		TA,N	–	<Kp	S	11		1	Q_1(S)	B	V	G	G	Xi,T		fl		204	0,88...0,90
Lead (II) acetate (lead sugar)	$(CH_3COO)_2Pb$	TA	<L	<100	S	11		1	Q_1(S)	B	E	G	G	T,Xn,R62,N		kr	75	~200(Z)	2,5
Lead sugar → *Lead (II) acetate*																			
Lecithine		N	–	<100	S	11		1	Q_1(S)	B	M_1	G	G			pa	~200(Z)		
Lemonade syrup			–	<60	S	11		1	Q_1(V)	B	V	G	G			fl			
Lemonades			–	<60	S	11		1	Q_1(S)	B	V	G	G			fl			
Lignosulfonic acid			<L	<100	D	11		1	Q_1(V)	B	M_1	G	G	4		fe			
Lignite tar		N, TA	– –	<140 <200	S S	11 11	(H) (H)	1 1	Q_1(S) Q_1(S)	B A	V M_1	G G	G G	T,R45		pa		250 ... 350	0,85 ... 1,0
Lime water ($Ca(OH)_2+H_2O$)	$Ca(OH)_2$ $Ca(OH)_2$		<10 <50	<80 <80	S,Q S	62 02	QW kD	2 3	Q_{12} Q_1	Q_{12} Q_1	V V	G G	G G	Xi,6 Xi,6					
Lime powder suspension (Calcium carbonate)	$CaCO_3$ $CaCO_3$ $CaCO_3$		<10 <10 <50	<80 <80 <80	S S,Q S	11 62 02	kD QW kD	5 2 3	Q_4 Q_{12} Q_1	Q_4 Q_{12} Q_1	V V V	G G G	G G G	6		kr	825(Z)		2,95
Linseed oil		N	–	<60	S	11		1	Q_1(S)	B	V	G	G			fl			0,92...0,94
Linters		N	Sus	<Kp	D	53A		1	Q_1(V)	B	V	G	G			fe			
Liquefied gases acc. to DIN 51622		G	–	<Kp	S	11		1	Q_{12}	A	V	G	G	F		ga			
Liqueurs, liqueur wines			–	<60	S	11		1	Q_1(S)	B	V	G	G			fl			
Liquid ... → ... *,liquid*																			
Liquor → *Ethanol*																			
Liquorice		N	–	<Kp	D	53A		1	Q_1(S)	B	V	G	G	4		pa			
Lithium bromide	LiBr		<L	<40	S	11		1	Q_1	B	V	G	G	Xn		kr	547	1265	3,465
Lithium chloride	LiCl LiCl		<L <L	<20 <Kp	S D	11 53A		1 1	Q_1(V) Q_1(V)	B B	V M_1	G G	G G	Xn Xn,2		kr	613	1360	2,068
Liver sausage mass			–	<60	S	11		1	Q_1(S)	B	V	G	G			pa			
Lubrication oils		S	–	>F<140	S	11		1	Q_1(S)	B	V	G	G	U		fl			
Lysoform = 7,7-% → *Formaldehyde*																			
Lysol		®	–	<60	S	11		1	Q_1(V)	B	V	G	G			fl			
M																			
m- ..., meta- ... → ...																			
Magnesium bisulfite → *Magnesium hydrogen sulfite*																			
Magnesium chloride	$MgCl_2$ $MgCl_2$		<30 <L	<20 <80	S S	11 11		1 1	Q_1(V) Q_1(V)	B B	V V	G M	G M			kr	708	1412	2,31...2,33
Magnesium hydrogen sulfite			<L	<Kp	D	53A		1	Q_1(V)	B	M_1	G	G			kr			

Media: Code of materials and legend see inside of back cover. Please observe the note on page 1.	Chemical formula	Remark	Concentration %	Temp. °C	Arrange-ment	Auxil. piping	Addit. measures	Seal type	Materials to EN 12756: 1 Seal face	2 Seal face	3 Sec. seal	4 Spring	5 Others	Hazard warnings	TLV-value	Normal condition	Melting temperature °C	Boiling point °C	Density g/cm³
1		2	3	4	5	6	7	8						10	11	12	13	14	15
Magnesium hydroxide	$Mg(OH)_2$ $Mg(OH)_2$ $Mg(OH)_2$		<10 <20 <40	<25 <40 <80	S S D	11 11 53A		1 1 1	U_1 Q_1 Q_1	U_1 Q_1 Q_1	E E E	G G G	G G G			kr			2,36
Magnesium nitrate	$Mg(NO_3)_2{*}_6H_2O$		<L	<25	S	11		1	Q_1(V)	B	M_1	G	G	O		fe	89		1,64
Magnesium sulfate	$MgSO_4$		<L	<Kp	S	11		1	Q_1(V)	B	V	G	G			kr	1124		2,66
Maleic acid	$C_4H_4O_4$		<L	<100	S	11		1	Q_1(V)	B	V	G	G	Xn,Xi		kr	140	160(Z)	1,590
Malic acid (Hydroxysuccinic acid)	$C_4H_6O_5$		<L	<60>K	S	11		1	Q_1(S)	B	E	G	G	Xi		kr	132		1,6
Malonic acid	$C_3H_4O_4$		<L	<60	S	53A		1	Q_1(V)	B	M_2	G	G	Xn		kr	135		1,62
Manganese(II)-chloride	$MnCl{*}_4H_2O$		<L	<Kp	D	53A		1	Q_1(V)	B	M_1	G	G	Xn,2		kr	58		2,01
Manganese(II)-nitrate	$Mn(NO_3)_2{*}_6H_2O$		<L	<Kp	S	11		1	Q_1(V)	B	E	G	G	O		kr	37	129	2,13
Manganese sulfates: Manganese(II)-sulfate Manganese(III)-sulfate Manganese(IV)-sulfate	 $MnSO_4$ $Mn_2(SO_4)_3$ $Mn(SO_4)_2$		 <L <L <L	 <60 <60 <60	 S S S	 11 11 11		 1 1 1	 Q_1(V) Q_1(V) Q_1(V)	 B B B	 M_1 M_1 M_1	 G G G	 G G G	 Xn,N U U		 fe kr kr	 700 160(Z)	 850(Z)	 3,25
Manure, liquid		N	–	<60	S	11		1	Q_1	Q_1	P	G	G			fl			
Marlotherm → *Heat transfer oils*		®																	
Mashes: Fruit mash Fruit pulp Hop mash Mustard mash Potato mash Salt mash			 Sus Sus Sus Sus Sus <L	 <Kp <Kp <Kp <Kp <Kp <Kp	 S S S S S S,Q	 11 11 11 11 11 62		 1 1 1 1 1 4	 Q_1(S) Q_1(S) Q_1(S) Q_1(V) Q_1(S) Q_1	 B B B B B Q_1	 V V V V V V	 G G G G G M	 G G G G G M	 2,4,6		 fl fl fl fl fl fl			
Masut			– –	<100 <200	S S	11 11		1 1	Q_1(S) Q_1(S)	B A	V M_1	G G	G G	U U		fl fl			
Mayonnaise			–	<40	S	11		1	Q_1(V)	B	V	G	G			pa			
MDEA → *N-Methyl-2,2'-iminodiethanol*																			
MEA → *N-Methyl ethanolamine*																			
Meat juice, meat broth		N	–	<60	S	11		1	Q_1(S)	B	V	G	G			fl			
MEK → *Butanone*																			
Melamine resins		S	–	<100	D	53A		1	Q_1(V)	B	M_1	G	G	U,3,4		fl			
Mercaptanes → *Thiols*																			
Mercuric chlorides: Mercuric chloride Mercurous chloride (Calomel)	 $HgCl_2$ Hg_2Cl_2		 <L <L	 <Kp <100	 D D	 53A 53A		 1 1	 Q_1(V) Q_1(V)	 B B	 V V	 G G	 G G	 T+,C,2,N Xn,Xi,2,N		 kr kr	 280	 302 385(S)	 5,44 7,15
Mercury	Hg		–	<60	D	53A		1	Q_1(S)	B	V	G	G	T,4,6,N	0,01	fl	−38	356	13,5939
Mercury (I) nitrate	$Hg_2(NO_3)_2$		<L	<Kp	S,Q	62		1	Q_1(V)	B	V	G	G	T+,N		kr		70(Z)	
Mesityl oxide	$C_6H_{10}O$		–	<Kp	D	53A		1	Q_1(S)	B	M_1	G	G	Xn,3	25	fl	−59	130	0,854
Metal working lubricants: for finishing machines for other machine tools			 – –	 <80 <80	 D D	 53A 11		 5 5	 Q_1 Q_1	 Q_1 Q_1	 V V	 G G	 G G	 U U		 fl fl			
Methacrylic acid methylester (Methyl methacrylate)	$C_5H_8O_2$	TA	–	<Kp	D	53A		1	Q_1(V)	B	M_2	G	G	Xi,F	50	fl	−48	100	0,944
Methanal → *Formaldehyde*																			
Methane	CH_4		–	<60	D	53A		1	U_2	A	V	G	G	F+,1		ga	−182	−161	(–)
Methanol (Methyl alcohol)	CH_3OH	TA	–	<60	S,Q	62		1	Q_1(S)	B	E	G	G	F,T	200	fl	−98	64	0,787
Methyl acetate → *Acetic acid methyl ester*																			
Methyl acrylate (Acrylic acid methyl ester)	$C_4H_6O_2$	TA	–	<Kp	D	53A		1	Q_1(V)	B	M_2	G	G	Xn,Xi,F	5	fl	−75	80	0,954
Methyl alcohol → *Methanol*																			
Methyl bromide (Bromomethane)	CH_3Br	TA	–	<60	D	53A		1	Q_1(V)	B	M_1	G	G	T,Xn,Xi,1,2,N	5	ga	−94	4	(+)
3-Methylbutan-2-one (Methyl isopropyl ketone)	$C_5H_{10}O$	TA	–	<Kp	S,Q	62		1	Q_1(V)	B	M_2	G	G	F		fl	−92	95	0,80
Methyl butyrate → *Butyric acid esters*																			
Methyl cellosolve → *Ethylene glycol*																			
Methyl chloride	CH_3Cl	TA	–	<80	D	53A		1	Q_1(V)	B	M_1	G	G	Xn,R40,F+	50	ga	−97	−25	(+)
Methyl chloroform → *1,1,1-Trichloroethane*																			
Methyl cyclohexanone, mixture of isomers	$C_7H_{12}O$		–	<Kp	S,Q	62		1	Q_1(S)	B	M_2	G	G	Xn	50	fl	−73...−14	165...170	0,92...0,93

Mechanical seal selection by media

Media					Mechanical Seal									Additional information on the medium					
Code of materials and legend see inside of back cover. Please observe the note on page 1.	Chemical formula	Remark	Concentration %	Temp. °C	Arrange-ment	Auxil. piping	Addit. measures	Seal type	Materials to EN 12756 1 Seal face	2 Seal face	3 Sec. seal	4 Spring	5 Others	Hazard warnings	TLV-value	Normal condition	Melting temperature °C	Boiling point °C	Density g/cm³
1		2	3	4	5	6	7	8						10	11	12	13	14	15
Methylene chloride	CH_2Cl_2	TA	–	<80	D	53A		1	$Q_1(V)$	B	M_1	G	G	Xn,R40,1,3,4	100	fl	–96	40	1,325
Methyl ethanolamine, N-	C_3H_9NO		–	Kp	S,Q	62		1	Q_1	B	M_2	G	G	Xn,C		fl	–3	158	0,937
Methyl ethyl ketone → *Butanone*																			
Methyl formiate → *Formic acid methyl ester*																			
Methyl-2,2'-imino-diethanol, N (N-methyldiethanolamine)	$C_5H_{13}NO_2$		–	<180	S,Q	62		1	Q_1	B	M_2	G	G	Xi		fl	–21	243	1,04
Methyl isobutyl ketone (MIBK) → *4-Methylpentan-2-one*																			
Methyl isopropyl ketone → *3-Methylbutan-2-one*																			
Methyl methacrylate (MMA) → *Methacrylic acid methyl ester*																			
Methylnaphthalenes:																			
1-Methylnaphthalene	$C_{11}H_{10}$	TA	–	<160	S	11		1	$Q_1(S)$	B	M_1	G	G	Xn,N		fl	–30	245	1,020
2-Methylnaphthalene	$C_{11}H_{10}$	TA	Sch	<160	S	11	(H)	1	$Q_1(S)$	B	M_1	G	G	Xn,N		kr	35	241	1,005
4-Methylpentan-2-one	$C_6H_{12}O$	TA	–	<100	S	11		1	Q_1	B	M_2	G	G	Xn,Xi,F	100	fl	–80	117	0,80
Methyl pyrrolidone, N- (1-Methyl-2-pyrrolidinone, NMP)	C_5H_9NO		–	<100	S	11		1	Q_1	B	M_2	G	G	Xi	20	fl	–24	206	1,028
Milk		N	–	<40	S	11		1	$Q_1(S)$	B	V	G	G			fl			
Milk sugar → *Lactose*																			
Mineral oils		S	–	<80	S	11		1	$Q_1(S)$	B	V	G	G			fl			
Miscella			–	<60	S	11		1	$Q_1(S)$	B	V	G	G			fl			
Mobiltherm → *Heat transfer oils*		®																	
Molasse			–	<100	S,Q	62		1	Q_{12}	Q_{12}	V	G	G	3,4		fl			
Mono … → …																			
Monoethanolamine → *2-Aminoethanol*																			
Mud			Sus	<40	S,Q	62	kD	3	Q_2	Q_2	V	M	G			fl			
Mustard			–	<60	S,Q	62		1	Q_1	Q_1	V	G	G			pa			
Mustard mash → *Mashes*																			
N																			
Naphtha		TA,G	–	<Kp	S	11		1	$Q_1(S)$	B	M_1	G	G	T,R45,F,N		fl		30 … >200	
Naphthalene	$C_{10}H_8$	TA	Sch	<Kp	S,Q	62	(H)	1	$Q_1(S)$	B	M_1	G	G	Xn,R40,N	10	kr	81	218	1,14
Naphthenic acids		G	–	<60	S	11		1	$Q_1(V)$	B	V	G	G	Xi		fl	~30	132…243	0,94…1,03
Naphthol dyes		G	<L	<140	S	11		1	$Q_1(V)$	B	V	G	G	U		kr			
Naphthylamines:																			
1-Naphthylamine	$C_{10}H_9N$	TA	Sch	<150	S	11	(H)	1	$Q_1(V)$	B	M_2	G	G	Xn,N		kr	50	301	1,13
2-Naphthylamine	$C_{10}H_9N$	TA	<L	<Kp	D	53A		1	$Q_1(V)$	B	M_2	G	G	T,Xn,R45,N	*	kr	110	306	1,216
Natural gas			–	<60	D	53A		1	$Q_1(S)$	A	V	G	G	1,F		ga			
Neon	Ne		–	<80	D	53A		1	$Q_1(S)$	B	N	G	G	1		ga	–248	–247	(–)
Neopentane (2,2-Dimethylpropane) → *Pentanes*																			
NFM → *n-Formylmorpholine*																			
Nickel (II) chloride	NiCl		<L	<Kp	D	53A		1	$Q_1(V)$	B	M_1	G	G	T,R45,2,N		kr	1030		3,55
Nickel (II) sulfate	$NiSO_4$		<L	<Kp	D	53A		1	$Q_1(V)$	B	M_1	G	G	Xn,R40,N		kr	>840(Z)		3,68
Nitrating acid		G	–	<80	D	53A		1	$Q_1(V)$	B	M_1	G	G	C,2,O		fl			
Nitric acid	HNO_3		<40	<20	S,Q	62	QW	1	$Q_1(V)$	B	M_1	G	G	C	2	fl	10%–6	10% 102	10% 1,054
	HNO_3		<30	<90	S,Q	62	QW	1	Q_1	Q_1	M_1	G	G	C	2	fl	20%–18	20% 104	20% 1,115
	HNO_3		<50	<80	S,Q	62	QW	1	Q_1	Q_1	M_1	G	G	C	2	fl	30%–36	30% 107	30% 1,180
	HNO_3		<60	<70	S,Q	62	QW	1	Q_1	Q_1	M_1	G	G	C	2	fl	40%–28	40% 111	40% 1,246
	HNO_3		<70	<60	S,Q	62	QW	1	Q_1	Q_1	M_1	M	M	C	2	fl	50%–19	50% 115	50% 1,310
	HNO_3		<80	<50	S,Q	62	QW	1	Q_1	Q_1	M_1	M	M	C	2	fl	60%–21	60% 118	60% 1,367
	HNO_3		<90	<30	S,Q	62	QW	1	Q_1	Q_1	M_1	M	M	C	2	fl	70%–41	70% 120	70% 1,413
Nitric acid, fuming	HNO_3		>90	<120	D	53A	SW	1	Q_1	Q_1	M_1	M	M	C,O,2	2	fl	80%–38	80% 113	80% 1,452
	HNO_3																90%–65	90% 96	90% 1,483
	HNO_3																100%–41	100% 83	100% 1,513
Nitrobenzene	$C_6H_5NO_2$	TA	–	<80	D	53A		1	$Q_1(V)$	B	M_1	G	G	T,R40,R62,N	1	fl	5…6	211	1,19867
Nitrochloroform → *Trichloronitromethane*																			
Nitrogen	N_2		–	<100	D	53A		1	$Q_1(S)$	B	E	G	G	1		ga	–210	–196	(–)
Nitroglycerine	$CH_5(NO_3)_3$	TA	–	<60	D	53A		1	$Q_1(S)$	B	E	G	G	T+,E,N	0,05	fl	14		1,59

Media: Code of materials and legend see inside of back cover. Please observe the note on page 1.	Chemical formula	Remark	Concentration %	Temp. °C	Mechanical Seal: Arrange-ment	Auxil. piping	Addit. measures	Seal type	Materials to EN 12756: 1 Seal face	2 Seal face	3 Sec. seal	4 Spring	5 Others	Additional information on the medium: Hazard warnings	TLV-value	Normal condition	Melting temperature °C	Boiling point °C	Density g/cm³
1		2	3	4	5	6	7	8						10	11	12	13	14	15
Nitromethane	CH_3NO_2	TA	–	<Kp	D	53A		1	Q_1(V)	B	M_1	G	G	Xn		fl	−29	101	1,13
Nitrosylsulfuric acid	$NOHSO_4$		<L	<80	D	53A		1	Q_1(V)	B	M_1	G	G	C,O		kr	73(Z)		
NMP → *N-Methyl pyrrolidone*																			
4-Nonylphenol	$C_{15}H_{24}O$	TA	Sch	<220	S,Q	01	(H)	6	A	Q_1(S)	M_7	T_6	G_1	C,N		pa	2	295...304	0,95
O																			
o-..., ortho... → ...																			
Octane	C_8H_{18}	TA	–	<Kp	S	11		1	Q_1(S)	B	V	G	G	Xn,Xi,F,N	500	fl	−57	126	0,703
4-Octylphenol	$C_{14}H_{22}O$	TA	Sch	<220	S,Q	01	(H)	6	A	Q_1	U_1	M_6	G_1	C,N		fe	~80	277	0,95
Oil lacquer paints		G	–	<40	D	53A		1	Q_1(S)	B	M_1	G	G	U,3,4		fl			
Oils (not specified)		S	–	<100	S	11		1	Q_1(S)	B	V	G	G	U		fl			
Oleic acid			–	<Z	S,Q	62		1	Q_1(S)	B	M_1	G	G	3		fl	16	360	0,8935
Oleum → *Sulfuric acid, fuming*																			
Olive oil		N	–	<100	S	11		1	Q_1(S)	B	V	G	G			fl	~6		0,91...0,92
Oxalic acid (Ethanedioic acid)	$C_2H_2O_4$ $C_2H_2O_4$	TA TA	<L <L	<Kp <25	S,Q S,Q	62 62		1 1	Q_1(V) Q_1(V)	B B	V E	M G	M M	Xn Xn		kr		>100(S)	1,901(25)
2-Oxazolidinone (2-Oxazolidone)	$C_3H_5NO_2$	TA	Sch	<200	D	53A	(H)	1	Q_1	Q_1	M_1	G	G	Xn,3,4,R40		kr	85...89	220(64)	
Ozone	O_3		–	<40	D	53A		1	Q_1	Q_1	K_{13}	G	G	T+,C,1,O	0,1	ga	−192	−112	(+)
P																			
p-..., para-... → ...																			
Palatal		®,G	–	<60	S,Q	62		1	Q_1(S)	B	V	G	G	U,3		fl			
Palatinol® → *Phthalic acid esters:* Palatinol A (DEP) Palatinol AH (DOP) Palatinol C (DBP) Palatinol M (DMP) Palatinol N (DINP) Palatinol O (DIBP) Palatinol Z (DIDP)																			
Palmitic acid	$C_{16}H_{32}O_2$		Sch	<200	S	01	(H)	6	B	Q_1	M_7	M_6	G_1			kr	63	351	0,8577(62)
Paradichlorobenzene → *Dichlorobenzene*																			
Paraffin waxes		TA,G	Sch	<160	S	11	(H)	1	Q_1(S)	B	V	G	G	T,R45		pa			
Paraffins, paraffin oil		S	–	<160	S	11		1	Q_1(S)	B	V	G	G			fl			
Paraterphenyl → *Terphenyls*																			
Paste (for gluing)		G		<Kp	D	53A		1	Q_1(S)	B	V	G	G	3,4		pa			
Peanut oil		N	–	<150	S	11		1	Q_1(S)	B	V	G	G			fl			
Pentanes: Isopentane (2-Methylbutane)	C_5H_{12}	TA	–	<Kp	S	11		1	Q_1(S)	B	V	G	G	Xn,F+,N	1000	fl	−160	27	0,62
Neopentane (2,2-Dimethylpropane)	C_5H_{12}	TA	–	<Kp	S	11		1	Q_1(S)	B	V	G	G	F+,N	1000	ga	−16	9	
n-Pentane	C_5H_{12}	TA	–	<Kp	S	11		1	Q_1(S)	B	V	G	G	Xn,F+,N	1000	fl	−130	36	0,6262
3-Pentanol	$C_5H_{12}O$	G	–	<60	S,Q	62		1	Q_1(S)	B	E	G	G	Xn,Xi	$100	fl	<−50	116	0,82
Pentyl acetate → *Acetic acid pentyl esters*																			
Perchlorobenzene → *Hexachlorobenzene*																			
Perchloroethane → *Hexachloroethane*																			
Perchloroethylene → *Tetrachloroethylene*																			
Perhydrol → *Hydrogen peroxide, 30% solution*																			
Petrol (Gasoline) unleaded, regular and supergrade		TA,G	–	<40	S	11		1	Q_1(S)	B	V	G	G	T,Xn,R45,F+,N		fl		40...200	0,72...0,76
Petrol ether → *Petrol, Gasoline*																			
Petrolatum		G	Sch	<160	S	11		1	Q_1(S)	B	V	G	G			pa	38...60	>300	0,82...0,88
Petroleum		G	–	<160	S	11		1	Q_1(S)	B	V	G	G			fl	−20	150...280	
Petrol-methanol mixture		TA,G	–	<40	S	11		1	Q_1(S)	B	M_1	G	G	T,Xn,R45,F+,N		fl			

Mechanical seal selection by media

Media					Mechanical Seal									Additional information on the medium					
Code of materials and legend see inside of back cover. Please observe the note on page 1.	Chemical formula	Remark	Concentration %	Temp. °C	Arrange-ment	Auxil. piping	Addit. measures	Seal type	Materials to EN 12756					Hazard warnings	TLV-value	Normal condition	Melting temperature °C	Boiling point °C	Density g/cm³
									1	2	3	4	5						
									Seal face	Seal face	Sec. seal	Spring	Others						
1		2	3	4	5	6	7	8						10	11	12	13	14	15
Phenol (Carbolic acid)	C_6H_5OH	TA	Sch	<Kp	D	53A		1	Q_1(V)	A	M_1	G	G	T,Xn,C	5	fe	41	182	1,06
Phenol-cresol mixtures		TA	Sch	<180	D	53A		1	Q_1(V)	A	M_1	G	G	T,C	5				
Phenol ether (phenyl ether)		TA, S	–	<100	D	53A		1	Q_1(S)	B	M_1	G	G	Xi,N		fl	27		1,07
Phenolic resins		S		<200	D	53A		1	Q_1(S)	A	M_1	G	G	3,U		fl			
Phenyl ethylene → *Styrene*																			
Phenylacetic acid	$C_8H_8O_2$		<L	<Kp	S,Q	62		1	Q_1(V)	B	M_2	G	G	Xi,3		kr	76	266	1,08
Phenylenediamines (Diaminobenzenes):																			
m-Phenylenediamine	$C_6H_8N_2$	TA	<L	<Kp	S,Q	62		1	Q_1(S)	B	M_1	G	G	T,Xi,N	*	kr	63	287	1,11
o-Phenylenediamine	$C_6H_8N_2$	TA	<L	<Kp	S,Q	62		1	Q_1(S)	B	M_1	G	G	F,Xi,R40,N	*	kr	103	257(S)	1,14
p-Phenylenediamine	$C_6H_8N_2$	TA	<L	<Kp	D	53A		1	Q_1(S)	B	M_1	G	G	T,Xi,N	0,1 mg	kr	140	267	1,135
Phosgene (Carbonyl dichloride, Carbon oxychloride)	$COCl_2$	TA	–	<60	D	53A		1	Q_1(V)	B	M_1	G	G	T+,C	0,1	ga	−128	7	(+)
Phosphatizing baths:			<L	<60	D	53A		1	Q_1	Q_1	M_1	G	G			fl			
'Iron phosphatizing solution'			<L	<60	S	11		5	Q_1	Q_1	V	G	G			fl			
'Zinc phosphatizing solution'			<L	<60	D	53A		1	Q_1	Q_1	M_1	G	G			fl			
Phosphoric acids (conc. given in % P_2O_5; 1 % P_2O_5 ≙ 1.38 % H_3PO_4):			<65	<40	S,Q	62		1	Q_1(V)	B	V	G	G	C,6		fl			
Pure acid			<65	<80	S,Q	62		1	Q_1(V)	B	V	M	M	C,6		fl			
Raw acid, produced thermally			<55	<80	S	02	KD	3	Q_1	Q_1	V	M	G			fl			
			<55	<120	D	54		1	Q_1(V)	B	M_1	G	G	C,2,6		fl			
Raw acid, produced wet			<65	<80	S	02		4	Q_1	Q_1	V	M	G			fl			
			<65	<160	D	53A		1	Q_1	Q_1	M_1	G	G	C,2,6		fl			
Superphosphoric acid			<85	<160	D	53A		1	Q_1	Q_1	M_1	G	G	C,2,6		fl			
Phosphorus pentachloride	PCl_5		<L	<60	D	53A	SW	1	Q_1(V)	B	M_1	G	G	T+,Xn,2,3	1 mg	kr	100(S)		2,114
Phthalic acid	$C_8H_6O_4$		<L	<Kp	S,Q	62		1	Q_1(V)	B	M_1	G	G	Xi		kr	191(Z)		1,59
Phthalic acid esters (phthalates):																			
Benzyl butyl phthalate (BBP)	$C_{19}H_{20}O_4$	TA	–	<100	S	11		1	Q_1(S)	B	M_1	G	G	T,R62,N		fl	<−35	370	1,12
–(2-ethyl hexyl)-phthalate (DEHP)	$C_{24}H_{38}O_4$	TA	–	<100	S,Q	62		1	Q_1(S)	B	M_1	G	G	V	10 mg	fl	−45	385	0,99
Diallyl phthalate	$C_{14}H_{14}O_4$	TA	–	<100	S	11		1	Q_1(S)	B	M_1	G	G	Xn,N		fl	−70	320	1,122
Dibutyl phthalate (DBP)	$C_{16}H_{22}O_4$	TA	–	<100	S	11		1	Q_1(S)	B	M_1	G	G	T,R62,N		fl	−35	34	1,047
Didecyl phthalate	$C_{28}H_{46}O_4$		–	<100	S	11		1	Q_1(S)	B	M_1	G	G			fl	3...5		
Diethyl phthalate (DEP)	$C_{12}H_{14}O_4$		–	<100	S	11		1	Q_1(S)	B	M_1	G	G			fl	−40	298	1,118
Diisobutyl phthalate (DIBP)	$C_{16}H_{22}O_4$	TA	–	<100	S	11		1	Q_1(S)	B	M_1	G	G	Xn,R62,N		fl	−64	305...315	1,049
Diisodecyl phthalate (DIDP)	$C_{28}H_{46}O_4$		–	<100	S	11		1	Q_1(S)	B	M_1	G	G			fl	−50	50...267(Z)	0,96...0,97
Diisononyl phthalate (DINP)	$C_{26}H_{42}O_4$		–	<100	S	11		1	Q_1(S)	B	M_1	G	G			fl		270(27)	~0,97
Diisooctyl phthalate (DIOP)	$C_{24}H_{38}O_4$	TA	–	<100	S,Q	62		1	Q_1(S)	B	M_1	G	G	Xn,R62,R63,6	10 mg	fl	−43	370	~0,985
Dimethyl glycol phthalate	$C_{14}H_{18}O_6$	TA	–	<100	S	11		1	Q_1(S)	B	M_1	G	G	T,R62		fl	−40	230	1,17
Dimethyl phthalate (DMP)	$C_{10}H_{10}O_4$		–	<100	S	11		1	Q_1(S)	B	M_1	G	G			fl	5,5	284	1,191
Dinonyl phthalate	$C_{26}H_{42}O_4$		–	<100	S	11		1	Q_1(S)	B	M_1	G	G			fl		413	0,978
Dioctyl phthalate (DOP)	$C_{24}H_{38}O_4$		–	<100	S	11		1	Q_1(S)	B	M_1	G	G	6		fl	−49	385	0,98
Dipentyl phthalate	$C_{18}H_{26}O_4$	TA	–	<100	S	11		1	Q_1(S)	B	M_1	G	G	T,R60,N		fl	−55	340...345	1,026
Diphenyl phthalate	$C_{20}H_{14}O_4$		–	<100	S	11		1	Q_1(S)	B	M_1	G	G			kr	70...73		1,28
Phthalic anhydride		TA	<L	<180	S,Q	62		1	Q_1(V)	B	M_1	G	G	Xn,Xi	1 mg	kr	131	285	1,527
Pickling brine (agu. sol. of 15 ... 20 % NaCl)	C_2			<25	S	11		1	Q_1(V)	B	V	G	G			fl			
Picric acid (2,4,6-Trinitrophenol)	$C_6H_3N_3O_7$	TA	<L	<40	D	53A		1	Q_1(V)	B	V	G	G	T,E	0,1 mg	kr	122...123		1,69
Pine oil		TA	–	<100	S	11		1	Q_1(S)	B	V	G	G	Xi,N		fl		180...230	0,90...0,97
Polyglycols (Polyalkylene glycols)		S		<100	S	11		1	Q_1(S)	B	V	G	G			fl			
Potash → *Potassium carbonate*																			
Potash alum → *Alum*																			
Potash bleaching lye → *Potassium hypochlorite*																			
Potash lye → *Caustic potash solution*																			
Potassium bromide	KBr		<L	<25	S,Q	62		1	Q_1(V)	B	P	M	M	6		kr	732	1380	2,75
	KBr		<L	<Kp	D	53A		1	Q_1(V)	B	V	G	G	2,6					
Potassium carbonate (Potash), also see → *Benfield solution*			<L	<100	S,Q	62		1	Q_1(V)	B	E	G	G	Xi,6		kr	52,5	891	2,428
Potassium chlorate	$KClO_3$		<L	<Kp	D	53A		1	Q_1(V)	B	M_1	G	G	Xn,2,O,N		kr	356	400(Z)	2,34
	$KClO_3$		<L	<60	S,Q	62		1	Q_1(V)	B	V	G	G	Xn,2,O,N					
Potassium chloride	KCl		<L	<60	S,Q	62		1	Q_1(V)	B	E	M	M	6		kr	790	1500(S)	1,984
	KCl		<50	<Kp	D	53A		1	Q_1(V)	B	M_2	G	G						
Potassium cyanate	KOCN		<L	<60	S	11		1	Q_1(V)	B	M_1	G	G	Xn		kr	315	>700(Z)	2,056
Potassium cyanide (Cyanide of potassium)	KCN		<L	<80	D	53A		1	Q_1(V)	B	E	G	G	T+,N		kr	634	1625	1,56

Media					Mechanical Seal									Additional information on the medium					
Code of materials and legend see inside of back cover. Please observe the note on page 1.	**Chemical formula**	**Remark**	**Concentration %**	**Temp. °C**	**Arrange-ment**	**Auxil. piping**	**Addit. measures**	**Seal type**	**Materials to EN 12756**					**Hazard warnings**	**TLV-value**	**Normal condition**	**Melting temperature °C**	**Boiling point °C**	**Density g/cm³**
									1	**2**	**3**	**4**	**5**						
									Seal face	**Seal face**	**Sec. seal**	**Spring**	**Others**						
1		**2**	**3**	**4**	**5**	**6**	**7**	**8**						**10**	**11**	**12**	**13**	**14**	**15**
Potassium dichromate	$K_2Cr_2O_7$ $K_2Cr_2O_7$		<L <L	<40 <Kp	S,Q D	62 53A		1 1	Q_1(V) Q_1(V)	B B	E M_1	G G	G G	T+,Xn,C,R45,R46,R60,6,N T+,C,R45,R46,R60,2,6,N		kr		500(Z)	2,7
Potassium hydrogen carbonate (Potassium bicarbonate)	$KHCO_3$		<L	<60	S,Q	62		1	Q_1(V)	B	E	G	G	6		kr	200(Z)		2,17
Potassium hydroxide → *Caustic potash solution*																			
Potassium hypochlorite	KOCl		<L	<60	S	11		1	Q_1(V)	Q_1(V)	M_2	M	M	C,O		fl			
Potassium nitrate	KNO_3		<L	<60	S,Q	62		1	Q_1(V)	B	P	G	G	6,O		kr	334	400(Z)	2,109
Potassium permanganate E: 93°C; V: 60°C	KM_nO_4 KM_nO_4		<L <L	<80 <Kp	S,Q S,Q	62 62		1 1	Q_1(V) Q_1(V)	B B	E M_2	G G	G G	Xn,3,O,N Xn,3,O,N		kr	>240(Z)		2,703
Potassium peroxodisulfate (Potassium persulfate)	$K_2S_2O_8$		<20	<60	S,Q	62		1	Q_1	Q_1	V	G	G	Xn,Xi,3,O		kr	~100(Z)		2,48
Potassium phosphates			<L	<Kp	S,Q	62		1	Q_1(V)	B	V	G	G	3		kr			
Potassium silicates			<20	<Kp	D	53A		1	Q_1(S)	B	E	G	G	3,4		kr			
Potassium sulfate	K_2SO_4		<L	<60	S,Q	62		1	Q_1(V)	B	V	G	G	3		kr	1069	1689	2,67
Potato mash → *Mashes*																			
Potato scrapings		N	<30	<60	S	02	kD	1	Q_1(S)	B	V	G	G			pa			
Potato starch		N	–	<Kp	D	53A		1	Q_1(S)	B	V	G	G	3,4					
Propane, liquefied	C_3H_8	TA	–	>–20	S	11		1	Q_1	A	V	G	G	F+	1000	ga	–187	–42	(+)
Propanediols: 1,2-Propanediol (Propylene glycol) 1,3-Propanediol (Trimethylene glycol)	 $C_3H_8O_2$ $C_3H_8O_2$		 – –	 <100 <100	 S S	 11 11		 1 1	 Q_1(S) Q_1(S)	 B B	 E E	 G G	 G G			 fl fl	 –68 –26	 188 214	 1,0381 1,0597
Propanols: 1-Propanol (n-Propyl alcohol) 2-Propanol (Isopropyl alcohol)	 C_3H_7OH C_3H_7OH	 TA TA	 – –	 <Kp <Kp	 S S	 11 11		 1 1	 Q_1(S) Q_1(S)	 B B	 E E	 G G	 G G	 F,Xi F,Xi		 fl fl	 –127 –89	 97 82	 0,804 0,7855
Propene, liquefied	C_3H_6	TA	–	>–20	S	11		1	Q_1	A	V	G	G	F+		ga	–185	–48	(+)
Propine, liquefied	C_3H_4	TA	–	>–20	S	11		1	Q_1	A	V	G	G	F+	1000	ga	–103	–23	(+)
Propionaldehyde (Propanal, Propaldehyde)	C_3H_6O	TA	–	<Kp	S	11		1	Q_1(S)	B	M_1	G	G	F,Xi		fl	–81	49	0,807
Propionic acid	$C_3H_6O_2$		–	<Kp	D	53A		1	Q_1(V)	B	M_2	G	G	C	10	fl	–22	141	0,992
Propyl acetates: 1-Propyl acetate (n-Propyl acetate) 2-Propyl acetate (Isopropyl acetate)	 $C_5H_{10}O_2$ $C_5H_{10}O_2$	 TA TA	 – –	 <80 <80	 S,Q S,Q	 62 62		 1 1	 Q_1(S) Q_1(S)	 B B	 M_2 M_2	 G G	 G G	 F,Xi F,Xi	 200 200	 fl fl	 –92 –73	 102 90	 0,887 0,872
Propyl alcohols → *Propanols*																			
Propylene → Propene																			
Propylene glycols → *Propanediols*																			
Propylene oxide	C_3H_6O	TA	–	<Kp	D	53A		1	Q_1(S)	B	K	G	G	T,R45,R46,Xi,F+		fl	–112	35	0,83
Prussic acid → *Hydrocyanic acid*																			
Pulp, cellulose < 1.5 % dry weight < 3 % dry weight > 3 % dry weight				 <90 <90 <90	 S S S	 11 02 02	 KD kD	 2 2 3	 B Q_{12} Q_1	 Q_1 Q_{12} Q_1	 V V V	 G G G	 G G G						
Pydraul		®	–	<80	S	11		1	Q_1(S)	B	E	G	G	U		fl			
Pyridine	C_5H_5N	TA	–	<40	S,Q	62		1	Q_1(S)	B	M_2	G	G	Xn,F	5	fl	–42	115	0,982
Pyrogallol (Pyrogallic acid)		TA	<L	<100	S,Q	62		1	Q_1(V)	B	M_1	G	G	Xn,3		kr	133...134	309	1,453
Pyrrolidone	C_4H_9NO		<L Sch	<100 <100	S S			1 1	Q_1(S) S	B B	M_3 M_3	G G	G G			kr	25	245	1,116
P-3 lye, clean			–	<60	S	11		1	Q_1(V)	B	E	G	G			fl			
P-3 lye; containing fats, oils and dirt		V	–	<100	S	11		1	Q_1	Q_1	M_1	G	G			fl			
Q																			
Quench oil		G	–	<200	S	32		1	Q_1	Q_1	M_1	G	G			fl			

Mechanical seal selection by media

Media: Code of materials and legend see inside of back cover. Please observe the note on page 1.	Chemical formula	Remark	Concentration %	Temp. °C	Arrange-ment	Auxil. piping	Addit. measures	Seal type	Mechanical Seal – Materials to EN 12756: 1 Seal face	2 Seal face	3 Sec. seal	4 Spring	5 Others	Additional information on the medium: Hazard warnings	TLV-value	Normal condition	Melting temperature °C	Boiling point °C	Density g/cm³
1		2	3	4	5	6	7	8	1	2	3	4	5	10	11	12	13	14	15
R																			
Rapeseed oil → *Colza oil*																			
Raw juice → *Sugar juices*																			
'Refrigerant oil' saturated with R...		G	–	<100	S	11		1	Q_1	A	M_4	G	G	U		fl			
Refrigerants, DIN 8962																			
R 12B2 (Dibromodi-fluoromethane)	CBr_2F_2	TA	–	<25	S	11		1	Q_1	A	M_1	G	G	Xi	100	fl	–110	23	2,215
R 14 (Tetrafluoromethane)	CF_4		–	>–40	S	53A		1	Q_1(S)	B	M_4	G	G	1,4		ga	–184	–128	(+)
R 21 (Fluorodichloromethane)	$CHCl_2F$	TA	–	>–40	D	53A		1	Q_1(S)	B	M_4	G	G	N,1,4	10	ga	–135	9	(+)
R 22 (Chlorodifluoromehane)	$CHClF_2$	TA	–	>–40	D	53A		1	Q_1(S)	B	M_4	G	G	N,1,4	V	ga	–160	–41	(+)
R 23 (Trifluoromethane)	CHF_3	TA	–	>–40	D	53A		1	Q_1(S)	B	M_4	G	G	1,4		ga	–155	–82	(+)
R 32 (Difluoromethane)	CH_2F_2	TA	–	>–40	D	53A		1	Q_1(S)	B	M_4	G	G	F+,1,4		ga	–136	–52	(+)
R 116 (Hexafluoroethane)	CF_6	TA	–	>–40	D	53A		1	Q_1(S)	B	M_4	G	G	1,4		ga	–101	–78	(+)
R 133a (2-Chloro-1,1,1-trifluoroethane)	CH_2ClF_3	TA	–	>–40	D	53A		1	Q_1(S)	B	M_4	G	G	N,1,4		ga	–105	6	(+)
R 142b (1-Chloro-1,1-difluoroethane)	CH_3ClF_3	TA	–	>–40	D	53A		1	Q_1(S)	B	M_4	G	G	1,4,F+,N	1000	ga	–131	–10	(+)
R 143a (1,1,1-Trifluoroethane)	$C_2H_3F_3$	TA		>–40	D	53A		1	Q_1(S)	B	M_4	G	G	1,4,F+		ga	–111	–47	(+)
R 152a (1,1-Difluoroethane)	F_2HCCH_3	TA	–	>–40	D	53A		1	Q_1(S)	B	M_4	G	G	F+,1,4		ga	–117	–25	(+)
R 218 (Octafluoropropane)	C_3F_8	TA	–	>–40	D	53A		1	Q_1(S)	B	M_4	G	G	1,4		ga	–183	–37	(+)
R 610 (Decafluorobutane)	C_4F_{10}	TA	–	>–40	D	53A		1	Q_1(S)	B	M_4	G	G	1,4		ga			–2 (+)
R 1112a			–	<20	S	11		1	Q_1	B	M_4	G	G			fl	–127	20	1,555
			–	>20	D	53A		1	Q_1(S)	B	M_4	G	G	1,4					
R 1113 (Chlorotrifluoroethylene)	$CClF_3$	TA	–	>–40	D	53A		1	Q_1(S)	B	M_4	G	G	T,1,4,F+		ga	–158	–28	(+)
R 1122 (Chlorodifluoroethylene)	$CHClF_2$	TA	–	>–40	D	53A		1	Q_1(S)	B	M_4	G	G	1,4,F+,N		ga	–138	–18	(+)
R 1132a (1,1-Difluoroethylene)	$C_2H_2F_2$	TA	–	>–40	D	53A		1	Q_1(S)	B	M_4	G	G	Xn,R40,1,4,F+		ga	–144	–86	(+)
RC 318 (Octafluorocyclobutane)	C_4F_8	TA	–	<–40	D	53A		1	Q_1(S)	B	M_4	G	G	1,4		ga	–41	–6	(+)
Rinsing agent (industrial)			–	<100	S	11		1	Q_1(S)	B		G	G						
					<80	S	S	1	Q_1(S)	B	M_4	G	G						
S																			
Saccharose (sugar)	$C_{12}H_{22}O_{11}$		<L	<Kp	D	53A		1	Q_1(S)	B	V	G	G	3,4		kr	185...186		1,588
Salicylic acid	$C_7H_6O_3$		<L	<25	S	11		1	Q_1(V)	B	E	G	G	Xn		kr	157...159	211(27)	1,44
	$C_7H_6O_3$		Sch	<180	S	53A	(H)	1	Q_1(V)	B	M_2	G	G	Xn,2,3					
Salmiac → *Ammonium chloride*																			
Salt mashes → *Mashes*																			
Santotherm → *Heat transfer oils*		®																	
Sea water → *Water*																			
Sewage sludge		G		<80	S	32		1	Q_1	Q_1	V	G	G			pa			
Sewage water → *Water*																			
Shampoo → *Hair shampoos*																			
Silicon chlorides:																			
Disilicon hexachloride (Hexachlorodisilane)	Si_2Cl_6		–	<Kp	D	53A		1	Q_1(V)	B	M_1	G	G	C,3		fl	–1	147	1,58
Silicon tetrachloride (Tetrachlorosilane)	$SiCl_4$		–	<Kp	D	53A		1	Q_1(V)	B	M_1	G	G	Xi,3		fl	–70	57	1,483
Silicones, silicone oils			–	<100	S	11		1	Q_1(S)	B	E	G	G			fl			
Silver nitrate	$AgNO_3$		<L	<Kp	S,Q	62		1	Q_1	Q_1	M_2	G	G	C,N		kr	212	>250(Z)	4,352
Skin creams		G	–	<60	S	11		1	Q_1(S)	B	V	G	G			pa			
Skydrol → *Hydraulic fluids HFC*		®																	
Soap solution			–	<Kp	S	11		1	Q_1(S)	B	V	G	G			fl			
Soda → *Sodium carbonate*																			
Soda lye → *Caustic soda solution*																			
Sodium acetate	$C_2H_3NaO_2$		<L	<Kp	S	11		1	Q_1(V)	B	M_2	G	G			kr	58	324(Z)	1,54
Sodium bi ... → *Sodium hydrogen ...*																			
Sodium bleaching lye → *Sodium hypochlorite*																			
Sodium carbonate (Soda)	Na_2CO_3		<L	<80	S,Q	62		1	Q_1(S)	B	E	G	G	Xi,4		kr	854	>400(Z)	2,532
Sodium chlorate	$NaClO_3$		<L	<Kp	D	53A		1	Q_1(V)	B	M_1	G	G	Xn,3,O,N		kr	255(Z)		2,49

Media					Mechanical Seal									Additional information on the medium					
Code of materials and legend see inside of back cover. Please observe the note on page 1.	Chemical formula	Remark	Concentration %	Temp. °C	Arrange-ment	Auxil. piping	Addit. measures	Seal type	Materials to EN 12756: 1 Seal face	2 Seal face	3 Sec. seal	4 Spring	5 Others	Hazard warnings	TLV-value	Normal condition	Melting temperature °C	Boiling point °C	Density g/cm³
1		2	3	4	5	6	7	8						10	11	12	13	14	15
Sodium chloride	NaCl		<L	<80	S,Q	11		5	Q_1	Q_1	E	M	M			kr	801	1461	2,164
	NaCl		<5	<30	S	11		1	Q_1(V)	B	E	G	G						
Sodium chlorite	$NaClO_2$		<L	<25	S	11		5	Q_1	Q_1	V	G	G	T,O		kr	>150(Z)		
Sodium cyanide	NaCN		<L	<Kp	D	53A		1	Q_1(V)	B	M_2	G	G	T+,N	5	kr	564	1496	1,546
Sodium dichromate (VI)	$Na_2Cr_2O_7$		<L	<Kp	D	53A		1	Q_1(V)	B	M_1	G	G	C,T+,Xn,R45,R46,O,N	*	kr	357	>400(Z)	2,52
Sodium disulfite	$Na_2S_2O_5$		<L	<100	S	11		5	Q_1	Q_1	V	G	G	Xn,Xi		kr	>150(Z)		1,48
Sodium dithionite	$Na_2S_2O_4$		<L	<60	S,Q	62		5	Q_1	Q_1	E	G	G	Xn,3		kr	>100(Z)		2,37
Sodium hydrogen carbonate (Bicarbonate of sodium, Sodium bicarbonate)	$NaHCO_3$		<L	<60	S	11		5	Q_1	Q_1	E	G	G			kr	270(Z)		2,22
Sodium hydrogen sulfate	$NaHSO_4$		<L	<Kp	S	11		5	Q_1	Q_1	V	G	G	Xi		kr	>315(Z)		2,103
Sodium hydrogen sulfide	NaHS		<L	<Kp	D	53A		1	Q_1(V)	B	V	G	G	T,3		kr	350		1,79
Sodium hydrogen sulfite = aqueous solution of → *Sodium disulfite*																			
Sodium hydrosulfate → *Sodium hydrogen sulfate*																			
Sodium hydroxide → *Caustic soda solution*																			
Sodium hypochlorite ('Chlorine bleaching lye')	NaOCl		<L	<30	S	11		1	Q_1	Q_1	M_2	M	M	C,N		kr			
Sodium metaaluminate	$NaAlO_2$		<L	<60	S	11		5	Q_1	Q_1	E	G	G	C		kr	1650		
Sodium nitrate	$NaNO_3$		<L	<80	S	11		1	Q_1(S)	B	E	G	G	O		kr	307	380(Z)	2,261
Sodium nitrite	$NaNO_2$		<L	<Kp	D	53A		1	Q_1(V)	B	M_2	G	G	T,3,O,N		kr	271	>320(Z)	2,17
Sodium perborate	$NaBO_3 \cdot 4H_2O$ $NaBO_3 \cdot 4H_2O$		<10 <10	<25 <Kp	S,Q D	62 53A		5 1	Q_1 Q_1(V)	Q_1 B	E M_2	G G	G G	Xn,3,6,O Xn,2,3,6,O		kr	>60(Z)		1,731
Sodium perchlorate	$NaClO_4$		<L	<Kp	D	53A		1	Q_1(V)	B	M_2	G	G	Xn,2,3,O		kr	482(Z)		2,50
Sodium peroxide (Sodium superoxide)	Na_2O_2		<L	<Kp	D	53A		1	Q_1	Q_1	M_2	G	G	C,2,3,O		kr	460	657(Z)	2,8
Sodium phosphates			<L	<Kp	S,Q	62		5	Q_1	Q_1	E	G	G	3,6		kr	1018		1,39
Sodium silicate (Water glass)			<L	<Kp	D	53A		1	Q_1(S)	B	E	G	G	Xi,3,4		kr			
Sodium sulfate (Glauber's salt)	Na_2SO_4		<L	<80	S,Q	62		1	Q_1(V)	B	P	G	G	3		kr	888		2,68
Sodium sulfite	Na_2SO_3		<L	<Kp	S	11		5	Q_1	Q_1	E	G	G			kr	150		2,633
Sodium thiocyanate	NaSCN		<L	<Kp	D	53A		1	Q_1(V)	B	E	G	G	Xn	5	kr	287		1,73
Sodium thiosulfate	$Na_2S_2O_3 * 5H_2O$		<L	<80	S,Q	62		1	Q_1(V)	B	E	G	G	3		kr	48		1,73
Soft soap			–	>F<100	S	11		1	Q_1(S)	B	V	G	G			pa			
Softener → *Phthalic acid esters*																			
Soiled water → *Water*																			
Soot-water mixture			<10	<Kp	S	11		1	U_1	U_1	V	G	G			fl			
Soybean oil		N	–	<100	S	11		1	Q_1(S)	B	V	G	G			fl	−16...−10		0,92
Spinach mash		N	–	<80	S	11		1	Q_1(S)	B	V	G	G			pa			
Spirits of salmiac → *Ammonia aqu. Solutions*																			
Spirit of wine → *Ethanol*																			
Spirit → *Ethanol*																			
Steam	H_2O		–	<180	D	53A		1	Q_1(S)	B	E	G	G	1		fl		100	
Stearic acid (Octadecanoic acid)	$C_{18}H_{36}O_2$		Sch	<130	S	11		1	Q_1(V)	B	M_2	G	G			fe	69	370	0,94
Strontium chloride	$SrCl_2$		<L	<Kp	D	53A		1	Q_1(V)	B	M_1	G	G	Xn,2		kr	872		3,094
Strontium nitrate	$Sr(NO_3)_2$		<L	<Kp	D	53A		1	Q_1(V)	B	M_2	G	G	Xi,2,O		kr	570		2,93
Styrene (Vinylbenzene, Phenylethylene)	C_8H_8		–	<80	S,Q	53A		X	Q_1(S)	B	M_1	G	G	Xn,Xi,3,4	20	fl	−33	146	0,909
Succinic acid	$C_4H_6O_4$		<L	<Kp	S	11		1	Q_1(S)	B	M_1	G	G	Xi		kr	186	235	1,56
Sugar juices (conc. data in Brix): Clairce Raw juice Thick juice Thin juice			>70 <20 >70 <20	<95 <70 <95 <100	D D D D	53A 11 53A 11		1 1 1 2	Q_{12} Q_{12} Q_{12} Q_{12}	Q_{12} Q_{12} Q_{12} Q_{12}	V V V V	G G G G	G G G G						
Sulfamic acid → *Amidosulfuric acid*																			
Sulfite lye → *Calcium hydrogen sulfite*																			
Sulfolan → *Tetrahydro-thiophene-1,1-dioxide*																			
Sulfur chlorides: Disulfur dichloride Sulfur dichloride	 S_2Cl_2 SCl_2		 – –	 <Kp <Kp	 D D	 53A 53A		 1 1	 Q_1(V) Q_1(V)	 B B	 M_1 M_1	 G G	 G G	 T,C,2,N C,2,N	 1	 fl fl	 −80 −122	 136 59	 1,678 1,621
Sulfur dioxide	SO_2		–	<80	D	53A		1	Q_1(V)	B	E	G	G	T,1	2	ga	−75	−10	(+)

Mechanical seal selection by media

Media					Mechanical Seal									Additional information on the medium					
Code of materials and legend see inside of back cover. Please observe the note on page 1.	Chemical formula	Remark	Concentration %	Temp. °C	Arrange-ment	Auxil. piping	Addit. measures	Seal type	Materials to EN 12756					Hazard warnings	TLV-value	Normal condition	Melting temperature °C	Boiling point °C	Density g/cm³
									1	2	3	4	5						
									Seal face	Seal face	Sec. seal	Spring	Others						
1		2	3	4	5	6	7	8						10	11	12	13	14	15
Sulfur fluorides:																			
Disulfur decafluoride (Sulfur pentafluoride)	S_2F_{10}		–	<Kp	S,Q	62		1	$Q_1(V)$	B	M_2	G	G			fl	–92	29	2,08(0)
Disulfur difluoride (Thiothionylfluoride)	S_2F_2		–	<60	D	53A		1	$Q_1(V)$	B	M_2	G	G	1	0,025	ga	–164	~–11	(+)
Sulfur hexafluoride	SF_6		–	<60	D	53A		1	$Q_1(V)$	B	M_2	G	G	1	1000	ga	–51	–64(S)	(+)
Sulfur tetrafluoride	SF_4		–	<60	D	53A		1	$Q_1(V)$	B	M_2	G	G	T+,C,1		ga	–121	–40	(+)
Sulfur tetrafluoride → *Sulfur fluorides*																			
Sulfur trioxide (molten or gaseous)	SO_3		–	>F<160	D	54		1	Q_1	Q_1	M_1	G	G	C,1,2,3,4		kr	17...62	45	1,97...2,00
Sulfur, molten	S		Sch	<220	S	01	(H)	6	A	Q_1	U_1	M_6	G_1	F		kr	110...119	444	1,96...2,07
	S		Sch	<200	S	01	H	1	Q_1	A	M_1	G	G						
Sulfuric acid	H_2SO_4		<10	<30	S,Q	62		1	$Q_1(V)$	B	V	G	G	Xi			5% –2	5% 101	5% 1,032
	H_2SO_4		<10	<30	S,Q	62		1	$Q_1(V)$	B	M_1	M	M	Xi,2			10% –5	10% 102	10% 1,066
	H_2SO_4		<20	<30	S,Q	62		1	$Q_1(V)$	B	M_1	M	M	C,2			20% –14	20% 105	20% 1,139
	H_2SO_4		<96	<30	S,Q	62		1	$Q_1(V)$	B	V	M	M	C,2			40% –68	40% 113	40% 1,303
	H_2SO_4		>80	<30	S,Q	62		1	Q_1	Q_1	V	G	G	C			60% –29	60% 140	60% 1,498
	H_2SO_4		>90	<30	S,Q	62		1	Q_1	Q_1	V	G	G	C			80% –1	80% 205	80% 1,727
	H_2SO_4		>90	<30	S,Q	62		1	Q_1	Q_1	M_1	M	M	C,2			96% –11	96% 310	96% 1,835
	H_2SO_4			<20													98% +2	98% 330	98% 1,836
Sulfuric acid, fuming																			
(= Oleum = conc.	$H_2SO_4+SO_3$		<40	<30	S,Q	62		4	Q_1	Q_1	M_1	M	M					40%~100	
H_2SO_4 + free SO_3)	$H_2SO_4+SO_3$		<60	<30	S,Q	62		1	Q_1	Q_1	M_1	M	M	C,Xi				60%~70	
Sulfurous acid (aqueous	H_2SO_3		<L	<Kp	S,Q	62		1	$Q_1(V)$	B	M_2	M	M			fl			
solution of SO_2)	H_2SO_3		<L	<20	S,Q	11		1	$Q_1(V)$	B	E	G	G	C,2					
Synthetic resin laquers and glues		S	–	<Kp	D	53A		1	$Q_1(S)$	B	M_1	G	G	3,4		fl			

Media	Chemical formula	2	3	4	5	6	7	8	1	2	3	4	5	10	11	12	13	14	15
T																			
Table salt → *Sodium chloride*																			
Table vinegar → *Acetic acid*																			
Tall oil fatty acids			Sch	<200	S,Q	62		1	Q_1	A	M_1	M	M	3		fe			
			Sch	>200	S,Q	62		6	A	Q_1	G	M_5	M	3					
Tall oil pitch			Sch	<150	S,Q	62		1	Q_1	A	M_1	M	G	Xi,3		fe			
Tall oil resin (acids)			Sch	<200	S,Q	62		1	Q_1	A	M_1	M	M	3		fe			
			Sch	>200	S,Q	62		6	A	Q_1	G	M_5	M	3					
Tall oil, crude			Sch	<120	S,Q	62		1	Q_1	A	M_1	G	G	3		pa			0,95
Tallow			Sch	<100	S	11		1	$Q_1(S)$	B	V	G	G			fe	40...70		
Tannery waste water, pH = 9 – 11			–	<40	S	11		1	$Q_1(V)$	B	V	G	G			fl			
Tannic acids → *Tannines*																			
Tannines (natural Polyphenols)		G	<L	<100	S	11		1	$Q_1(S)$	B	V	G	G			fe			
Tar, tar oil → *Coal tar*																			
Tartaric acid			<L	<60	S	11		1	$Q_1(S)$	B	V	G	G	Xi		kr	~170		1,76...1,79
Taurine (2-Aminoethan-esulfonic acid)	$C_2H_7NO_3S$		<L	<80	S	11		1	Q_1	B	M_1	G	G	Xi		kr	328(Z)		
Terphenyls (diphenyl benzenes):	$C_{18}H_{14}$																		
m-Terphenyl (1,3-Diphenyl benzene)	$C_{18}H_{14}$		Sch	<180	S,Q	62	(H)	1	$Q_1(S)$	B	M_1	G	G	Xi,3		kr	89	365	
o-Terphenyl (1,2-Diphenyl benzene)	$C_{18}H_{14}$		Sch	<180	S,Q	62	(H)	1	$Q_1(S)$	B	M_1	G	G	Xn,3		kr	57...58	332	
p-Terphenyl (1,4-Diphenyl benzene)	$C_{18}H_{14}$		Sch	<Kp	S,Q	62	(H)	6	A	Q_1	G	M_6	T4	Xi,3		kr	213	404	1,234
Tetrabromoethane (Acetylene tetrabromide)	$C_2H_2Br_4$	TA	–	<160	D	53A		1	$Q_1(V)$	B	M_1	G	G	T+,Xi	1	fl	0	135	2,9673
Tetrachloroethane (Acetylene tetrachloride)	$C_2H_2Cl_4$	TA	–	<Kp	D	53A		1	$Q_1(V)$	B	M_1	G	G	T+,N	1	fl	–42	146	1,5953
Tetrachloroethylene (Perchloroethylene)	C_2Cl_4	TA	–	<60	S	11		1	$Q_1(S)$	B	M_1	G	G	Xn,R40,N	50	fl	–23	121	1,63
Tetrachloroethylene, contaminated		TA	–	<60	S	11		1	$Q_1(V)$	B	M_1	G	G	Xn,R40,N					
Tetrachloromethane → *Carbon tetrachloride*																			
Tetraethylene glycol → *Ethylene glycols*																			
Tetrahydrofuran (Tetramethylene oxide, Oxolane)	C_4H_8O	TA	–	<40	S,Q	62		1	$Q_1(V)$	B	M_2	G	G	Xi,F,6	200	fl	–108	65	0,8892

Media: Code of materials and legend see inside of back cover. Please observe the note on page 1.	Chemical formula	Remark	Concentration %	Temp. °C	Arrange-ment	Auxil. piping	Addit. measures	Seal type	Materials to EN 12756: 1 Seal face	2 Seal face	3 Sec. seal	4 Spring	5 Others	Hazard warnings	TLV-value	Normal condition	Melting temperature °C	Boiling point °C	Density g/cm³
1		2	3	4	5	6	7	8						10	11	12	13	14	15
Tetrahydrothiophene-1,1-dioxide ('Sulfolan')	$C_4H_8O_2S$		Sch	<60	S	11	(H)	1	Q_1(V)	B	M_1	G	G	Xn		kr	27	285	1,26
Thick juice → *Sugar juices*																			
Thick liquor (Sulfite chemical pulp)		G	–	<Kp	D	53A		1	Q_1(V)	B	M_1	G	G						
Thin juice → *Sugar juices*																			
Thiols		G	–	<Kp	D	53A		1	Q_1(V)	B	M_1	G	G	U	0,5	fl			
Thiothionyl fluoride → *Sulfur fluorides*																			
Throat gas → *Blast furnace gas*																			
Titanium chlorides: Titanium(IV) chloride (Titanium tetrachloride)	$TiCl_4$		–	<Kp	D	53A		1	Q_1(V)	B	M_1	G	G	C,2,3		fl	−25	136	1,726
Titanium(III) chloride (Titaniumtrichloride)	$TiCl_3$		<L	<Kp	D	53A		1	Q_1(V)	B	M_1	G	G	C,2,3,F		kr	440(Z)		2,64
Titanium dioxide – Solution in sulfuric acid	TiO_2		<L	<180	S	02	kD	X	Q_1	Q_1	T	M	G	C,2					
Titanium dioxide – Suspension in water			<40	<Kp	S,Q	53A		X	U_2	Q_1(V)	E	G	G	4		kr	>1800		3,9...4,26
Tobacco emulsion			–	<60	S	11		1	Q_1	Q_1	V	G	G			fl			
Toluene	C_7H_8	TA	–	<60	S	11		1	Q_1(S)	A	K	G	G	Xn,Xi,R63,F	100	fl	−95	111	0,866
Tomato juice → *Ketchup*																			
Tooth pastes		G	–	<40	S	11		1	Q_1	Q_1	V	G	G			pa			
Tributyl phosphat (TBP, Phosphoric acid tributyl ester)	$C_{12}H_{27}O_4P$	TA	–	<60	S	11		1	Q_1(V)	B	M_1	G	G	Xn,Xi,R40		fl	−79	293	0,979
Trichloroacetic acid (TCA)	$C_2HCl_3O_2$	TA	Sch	<Kp	D	53A	SW,H	1	Q_1(V)	B	M_2	G	G	C,2,3,N		kr	59	198	1,63(60)
Trichloroborane → *Boron trichloride*																			
1,1,2-Trichloroethane	$C_2H_3Cl_3$	TA	–	<60	S,Q	62		1	Q_1(V)	B	M_1	G	G	Xn,R40	10	fl	−35	113...114	1,4416
Trichloroethylene	C_2HCl_3	TA	–	<25	S	11		1	Q_1(V)	B	V	G	G	T,Xi,R45	50	fl	−86	87	1,4649
		TA	–	<60	S,Q	62		1	Q_1(S)	B	M_1	G	G	T,Xi,R45,6					
Trichloronitromethane (Chloropicrine)	CCl_3NO_2	TA	–	<60	S,Q	62		1	Q_1(V)	B	M_1	G	G	T+,Xi,6	0,1	fl	−64	112	1,6566
Tricresyl phosphate (TCP)	$C_{21}H_{21}O_4P$	TA	–	<100	S	11		1	Q_1(S)	B	M_2	G	G	T,N		fl	−28	435	1,17...1,18
Triethanolamine	$C_6H_{15}NO_3$		–	<60	S	11		1	Q_1(S)	B	M_2	G	G			fl	21	360	1,1242
Triethylamine	$C_6H_{15}N$	TA	–	<60	S,Q	62		1	Q_1(S)	B	M_2	G	G	Xn,C,F	10	fl	−115	89	0,728
Triethylene glycol → *Ethylene glycols*																			
Trifluoroborane → *Boron trifluoride*																			
Triglycol → *Ethylene glycols*																			
Trisodium phosphate → *Sodium phosphates*	S																		
Tung oil → *Wood oil*																			
Turbine oils			–	<100	S	11		1	Q_1(S)	B	V	G	G	U		fl			
Turkey red oil			–	<140	S	11		1	Q_1(S)	B	M_1	G	G			fl			1,03
Turpentine, oil		TA,G	–	<60	S	11		1	Q_1(S)	B	V	G	G	Xn,Xi,R46,N	100	fl		155...180	0,85...0,87
Tutogen		®	–	<60	S	11		1	Q_1(S)	B	V	G	G			fl			
U																			
Urea (Carbamide)	CH_4N_{20}		<L	<100	D	53A		1	Q_{22}	Q_1(V)	E	G	G	3,4		kr	132		1,323
	CH_4N_{20}		<L	<100	D	53A		5	Q_1	Q_1	E	G	G	3,4					
Urea nitrate	$CH_5N_3O_4$		<10	<60	S	11		1	Q_1	Q_1	M_2	G	G			kr	152(Z)		1,69
Urea phosphate	$CH_7N_2O_5P$		<10	<60	S	11		1	Q_1	Q_1	M_2	G	G	Xi		kr	119		
Urea resins (DIN 7728: abbr. UF)		G	–	<100	D	53A		1	Q_{22}	Q_1(V)	M_2	G	G	3,4		pa			
Urine			–	<40	S	11		5	Q_1	Q_1	E	G	G			fl			

Mechanical seal selection by media

Media					Mechanical Seal									Additional information on the medium					
Code of materials and legend see inside of back cover. Please observe the note on page 1.	Chemical formula	Remark	Concentration %	Temp. °C	Arrange-ment	Auxil. piping	Addit. measures	Seal type	Materials to EN 12756					Hazard warnings	TLV-value	Normal condition	Melting temperature °C	Boiling point °C	Density g/cm³
									1	2	3	4	5						
									Seal face	Seal face	Sec. seal	Spring	Others						
1		2	3	4	5	6	7	8						10	11	12	13	14	15
V																			
Varnishes		G	–	TG	D	53A		1	Q_1(V)	B	M_1	G	G	3,4		fl			
Vaseline → *Petrolatum*																			
Vegetable oils		G	0	<150	S	11		1	Q_1(S)	B	V	G	G			fl			
Vegetable mash			–	<100	S	11		1	Q_1(S)	B	V	G	G			pa			
Vinyl acetate → *Acetic acid vinyl ester*																			
Vinyl acetylene (Butenyne)	C_4H_4	TA	–	<60	D	53A		1	Q_1(V)	B	M_2	G	G	1,3		ga	–92	5	(+)
Vinylbenzene → *Styrene*																			
Vinyl chloride	C_2H_3Cl	TA	–	<40	D	53A		1	Q_1(V)	B	M_1	G	G	T,R45,F+,1	*	ga	–154	–14	(+)
Vinylidene chlorides → *Dichloroethenes*																			
Volatile oils		S	–	<Kp	S	11		1	Q_1(S)	B	M_1	G	G	U		fl			
W																			
Walnut oil		N	–	<100	S	11		1	Q_1(S)	B	V	G	G			fl			~0,92
Washing lye		S	–	<Kp	S	11		1	Q_1(S)	B	M_1	G	G			fl			
Washing lye, dirty		S	–	<Kp	S	11		1	Q_1	Q_1	M_1	G	G			fl			
Wastewater → *Water*																			
Water from pressed fish		N	Sus	<60	S	02		1	Q_1	Q_1	V	G	G			fe			
Water glass → *Sodium silicates*																			
Water vapour (Steam)	H_2O		–	<180	D	53A		1	Q_1(S)	B	E	G	G	1					
Water:	H_2O																		
Wastewater, sewage water, pH>6<10			–	<50	S	11		1	Q_1	Q_1	P	G	G			fl			
Wastewater, sewage water, pH>3<10			–	<50	S	11		5	Q_1	Q_1	V	G	G			fl			
Drinking water, industrial water			–	<50	S	11		1	Q_1(S)	B	E	G	G			fl			
Drinking water, industrial water			–	<100	S	11		1	Q_1(S)	B	E	G	G			fl			
Hot water with additives Boiler feed water			*As compositions and applications vary considerably, a general recommendation would not be adequate. Please contact EagleBurgmann.*																
Sea and brackish water			–	<50	S	11		5	A	Q_1	V	M	M			fl			
Waxes		S	–	>F<180	S	11		1	Q_1(S)	B	V	G	G			pa			
Whale oil		N	–	<100	S	11		1	Q_1(S)	B	V	G	G			fl			
Whey		N	–	<60	S	11		1	Q_1(S)	B	V	G	G			fl			
Whiskey			–	<30	S	11		1	Q_1(V)	B	E	G	G			fl			
White spirit		TA	–	<60	S	11		1	Q_1(S)	B	V	G	G	Xn,N		fl	<–15	153...198	
Wine			–	<40	S	11		1	Q_1(S)	B	P	G	G			fl			
Wine vinegar → *Acetic acid*																			
Wood oil (Tung oil)		N	–	<80	S	11		1	Q_1(S)	B	V	G	G	Xi		fl	<0		0,89...0,93
Wood pulp, ground pulp → *Pulp, (cellulose)*																			
Wood spirit → *Methanol*																			
Wood tar		G	–	<100	S	11		1	Q_1(S)	B	M_1	G	G	U		fl			0,90...1,11
Wood turpentine oil → *Tall oil*																			
X																			
Xanthogenates		S	<10	<60	D	53A		1	Q_1	Q_1	M_1	G	G	3,4		kr			
Xenon	Xe		–	<40	D	53A		1	Q_1(S)	B	P	G	G	1		ga	–112	–108	(+)
Xylenes (Dimethylbenzenes):																			
technical Xylene (mixture)	C_8H_{10}		–	<60	S	11		1	Q_1(S)	B	M_1	G	G	Xn,Xi	100	fl	–63	137...140	~0,86
m-Xylene	C_8H_{10}		–	<60	S	11		1	Q_1(S)	B	M_1	G	G	Xn,Xi	100	fl	–48	139	0,866
o-Xylene	C_8H_{10}		–	<60	S	11		1	Q_1(S)	B	M_1	G	G	Xn,Xi	100	fl	–25	144	0,881
p-Xylene	C_8H_{10}		–	<60	S	11		1	Q_1(S)	B	M_1	G	G	Xn,Xi	100	fl	13	138	0,861

Media: Code of materials and legend see inside of back cover. Please observe the note on page 1. (1)	Chemical formula	Remark (2)	Concentration % (3)	Temp. °C (4)	Mechanical Seal: Arrangement (5)	Auxil. piping (6)	Addit. measures (7)	Seal type (8)	Materials to EN 12756: 1 Seal face	2 Seal face	3 Sec. seal	4 Spring	5 Others	Additional information on the medium: Hazard warnings (10)	TLV-value (11)	Normal condition (12)	Melting temperature °C (13)	Boiling point °C (14)	Density g/cm^3 (15)
Y																			
Yeast mash		N	–	<60	S	11		1	Q_1(S)	B	V	G	G			pa			
Yoghurt with fruits etc.		N	–	<60	S	11		5	Q_1	Q_1	V	G	G			pa			
Yoghurt without fruits etc.		N	–	<60	S	11		1	Q_1	B	V	G	G			pa			
Z																			
Zapon lacquer		TA	–	<60	D	53A		1	Q_1(V)	B	M_1	G	G	Xn,3,4,F,N		fl			
Zinc chloride	$ZnCl_2$		<L	<25	S	11		5	Q_1	Q_1	V	G	G	C,Xn,4,6,N		kr	318	732	2,91
	$ZnCl_2$		<L	<Kp	D	53A		1	Q_1(V)	B	M_1	G	G	C,Xn,2,4,N					
Zinc cyanide (suspension)	$Zn(CN)_2$		<20	<Kp	S	02	kD	3	Q_1	Q_1	P	G	G	T+,N		kr	~800(Z)		1,852
Zinc nitrate	$Zn(NO_3)_2*6H_2O$		<L	<60	S,Q	62		5	Q_1	Q_1	V	G	G	Xn,6,O		kr	36	105...131	2,065
Zinc oxide (suspension)	ZnO		<50	<Kp	S,Q	53A	kD	3	Q_1	Q_1	V	G	G	3,4,N	5 mg	kr	1975		5,606
Zinc paints, water soluble			<L	<60	S,Q	62		5	Q_1	Q_1	V	G	G	6		fl			
Zinc phosphate	$Zn_2(PO_4)_2$		<10	<100	D	53A		1		B	M_1	G	G	3,4,N		kr	>900		
Zinc sulfate (Zinc vitriol)	$Zn_2SO_4{\cdot}7H_2O$		<L	<60	S,Q	62		5	Q_1	Q_1	V	G	G	Xn,6,N		fe	100		1,97

EagleBurgmann product lines

Mechanical seals

Mechanical seals for pumps

EagleBurgmann offers a complete range of liquid and gas-lubricated pump shaft seals including standard and engineered seals in single and multi-seal versions. We also offer a complete range of solutions for all API 682 categories and arrangements. The portfolio includes a broad selection of material and surface technologies such as DiamondFace coatings.

Cartridge seals
- Easy to install
- Inboard/outboard variants
- For all standard modes of circulation
- O-ring, metal bellows and elastomer bellows seals
- Gas-lubricated versions
- Special versions, e.g. for sterile applications
- Split versions available
- Diameter: 20 ... 110 (250) mm (0.79" ... 4.33 (9.84)")
- Pressure: ... 42 (150) bar (... 609 (2,175) PSI)
- Temperature: −40 °C ... +220 °C (−40 °F ... +428 °F)

Elastomer bellows seals
- Compact design
- Straightforward installation
- Stationary and rotating designs
- Approvals: e.g., FDA, WRAS, KTW, ACS, W270, NST
- Diameter: 6 ... 100 mm (0.24" ... 4")
- Pressure: ... 16 bar (... 230 PSI)
- Temperature: ... +140 °C (... +284 °F)

Component seals
- Designed for universal applications
- Versions for high-viscosity media and media containing solids
- Versions for high-performance pumps
- Diameter: ... 400 mm (... 16")
- Pressure: ... 150 bar (... 2,176 PSI)
- Temperature: −50 °C ... +220 °C (−58 °F ... +428 °F)

Metal bellows seals
- For extreme temperature ranges
- For high-viscosity media and media containing solids
- Diameter: 16 ... 100 mm (0.62" ... 4")
- Pressure: vacuum ... 25 bar (... 363 PSI)
- Temperature: −100 °C ... +400 °C (−148 °F ... +752 °F)

Other sizes and engineered seals on request.

Typical applications:
Centrifugal pumps, positive displacements pumps, high-performance pumps, multi-phase and slurry pumps, circulation pumps, hydraulic pumps

Mechanical seals for agitators

Sealing solutions for normal and sterile applications. The design and selection of materials ensure that the seals are rugged enough to deliver excellent cost and engineering performance in all major applications.

Dry-running agitator seals
- Dry-running, contacting seal faces
- For steel and glass lined vessels
- DIN connections or according to customer request
- No seal supply system needed
- FDA-approved face materials
- Diameter: 25 ... 200 mm (1" ... 7.87")
- Pressure: vacuum ... 6 bar (... 87 PSI)
- Temperature: −20 °C ... +250 °C (−4 °F ... +482 °F)

Gas-lubricated agitator seals
- For steel and glass lined vessels
- DIN connections or according to customer request
- FDA-approved face materials
- Non-contacting operation
- Versions for sterile applications
- Diameter: 40 ... 220 mm (1.58" ... 8.7")
- Pressure: vacuum ... 14 bar (... 203 PSI)
- Temperature: -40 °C ... +250 °C (-40 °F ... +482 °F)

Liquid-lubricated agitator seals
- For steel and glass lined vessels
- DIN connections or according to customer request
- FDA-approved face materials
- Designed for all applications
- Diameter: 15 ... 500 mm (0.59" ... 19.69")
- Pressure: vacuum ... 250 bar (... 3,626 PSI)
- Temperature: −80 °C ... +350 °C (−112 °F ... +662 °F)

Typical applications:
Agitators, mixers, dryers, kneaders, reactors, separators, filters

Mechanical seals for compressors

A complete range of products compressors from a single source. Single, double and tandem versions and tandem seals with intermedia labyrinths available.

DGS series
- Standard product series with a proven track record
- Diameter: 29 ... 264 mm (1.14" ... 10.39")
- Pressure: 0 ... 120 bar (0 ... 1,740 PSI)
- Temperature: −20 °C ... +200 °C (−4 °F ... +392 °F)

PDGS high pressure seals
- Elastomer-free, DLC-coated sliding faces
- Diameter: 29 ... 355 mm (1.14" ... 13.98")
- Pressure: 0 ... 450 bar (0 ... 6,526 PSI)
- Temperature: −170 °C ... +230 °C (−274 °F ... +446 °F)

MDGS series for screw compressors
- Seat materials: ductile steel with DM-TiN coating
- Diameter: 40 ... 280 mm (1.57" ... 8.66")
- Pressure: 0 ... 50 bar (0 ... 725 PSI)
- Temperature: −20 °C ... +200 °C (−4 °F ... +392 °F)

TDGS series for steam turbines
- Metal bellows
- Diameter: 40 ... 140 mm (1.5" ... 5.5")
- Pressure: ... 10 bar (... 145 PSI)
- Temperature: −50 °C ... +450 °C (−58 °F ... +842 °F)

Separation seals CSR and CSE
- Very low gas consumption
- Diameter: 29.5 ... 379.5 mm (1.16" ... 14.94")

CobaSeal separation seal
- Insensitive to oil contamination
- Low N2 consumption
- Face materials: ductile steel with special EagleBurgmann high performance iDLC coating
- Diameter: 29.5 ... 210 mm (1.16" ... 8.27")
- Pressure: 0 ... 15 bar (0 ... 218 PSI)
- Temperature: −20 °C ... +50 °C (−4 °F ... +122 °F)

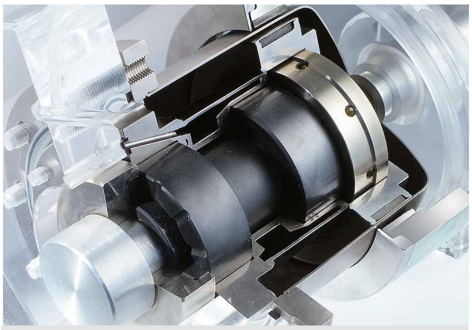
WRS oil-lubricated seals
- Optimized design due to FEM and computational fluid dynamics
- Diameter: 30 ... 300 mm (1.18" ... 11.81")
- Pressure: ... 50 bar (725 PSI)
- Temperature: -20 °C ... +200 °C (-4 °F ... +392 °F)

Typical applications:
Centrifugal compressors, expanders, turbines, integrally geared compressors, screw compressors, roots compressors, special machines

For detailed information please inquire.

EagleBurgmann product lines

Magnetic couplings



Uncompromising sealing technology for very demanding applications. Hermetically sealed magnetic couplings guarantee leakage-free and maintenance-free pumping and mixing.
The media remains within closed system circulation loops.

MAK series
- Modular design
- Integrated sliding bearing
- Compact dimensions
- Torque transmission ... 462 Nm
- Speed: 3,600 min−1
- Pressure: ... 40 bar (... 580 PSI)
- Temperature: ... +250 °C (...+482 °F)
- Versions for sterile agitator applications
- Optional ceramic or carbon PEEK can

NMB high-efficiency series
- Patented laminated can
- Reduced eddy current losses
- Optional sliding bearing
- Torque transmission: ... 1,879 Nm
- Pressure: ... 45 bar (... 653 PSI)
- Temperature: ... +250 °C (... +482° F)

LMF1 Bearing for magnetic couplings
- Sliding bearing with ceramic or carbon materials for the shaft end of magnetic coupled pumps
- Suitable for MAK66, MAK685 and NMB HE magnetic couplings and others
- Self lubrication through pump liquid
- Compact dimensions
- Version for increased usage conditions on request

Typical applications:
Centrifugal pumps, positive displacements pumps, vacuum pumps, agitators, mixers, compressors, blowers, special machines

Seal supply systems

Depending on the design, application and mode of operation, supply systems are required to flush, cool and pressurize mechanical seals and magnetic couplings and provide leakage compensation. EagleBurgmann supplies a complete range of solutions from a single source including design, production, commissioning and service. The portfolio includes a complete range of API compliant supply systems.

Quench systems
- Versions with polyethylene or stainless steel tanks
- API 682 versions
- Circulation of buffer fluid possible

Thermosiphon systems
- Comprehensive modularized product range
- Sterilizable versions
- API 682 versions for Plan 52 and 53A

Heat exchangers
- Comprehensive standard range
- Extremely efficient cooling
- Compact design
- API 682 versions

SPO (SPB/SPC) closed-circuit barrier fluid systems
- Suitable for applications with high pressure
- No connection to nitrogen supply necessary
- API 682 versions

SPA open-circuit buffer/barrier fluid systems
- High cooling capacity
- Combined supply of various seals

SPN refill units
- Manual, automatic and mobile versions

Gas supply systems
- Customized versions for all types and requirements in gas-lubricated mechanical seal applications
- Seal management system
- API 682 / 614

RoTechBooster
- Ensures seal gas flow to the gas seal when the differential pressure across a compressor is insufficient to provide adequate flow.

Typical applications:
Liquid and gas lubricated mechanical seals, magnetic couplings

Carbon floating ring seals

Carbon floating ring seals are supplied as maintenance-free compact labyrinth cartridge seals with low leakage. The floating self-adjusting sealing rings provide radial sealing on the shaft with a very small gap. The seal requires no additional lubrication, and it is designed for dry running. Besides pure gas, carbon floating ring seals are also suitable for Atex applications, toxic media, media containing solids, flue gas, dust, powder, vapor, liquid mist, oil mist and penetrating oil.

Espey WD series (split housing)
- Split housing and seal rings allow easy installation
- Pressure: vacuum ... 20 bar (... 290 PSI)
- Shaft diameter: 40 ... 340 mm (1.57" ... 13.39")
- Radial clearance: max. ±5.0 mm (0.2")
- Axial movement: theoretically unlimited
- Temperature: −120 °C ... +800 °C (−184 °F ... +1,472 °F)
- Sliding velocity: 40 ... 150 m/s (131 ... 492 ft/s)

Espey WDK-BHS for bulkhead shaft penetrations
- Split housing and seal rings allow easy installation
- Verified leakage rates
- International type approvals
- Pressure: max. 3 bar (44 PSI)
- Shaft diameter: 40 ... 800 mm (1.57" ... 31.5")
- Radial play: max. 5 mm (0.2")
- Axial movement: theoretically unlimited
- Temperature: max. 225 °C (437 °F)
- Sliding velocity: 40 m/s (131 ft/s)

Special Espey WD series variants
- Seals for top driven agitators and DIN seal chambers
- Blast furnace seals, shaft ... 4,000 mm (... 157.48")
- Seals for mills and centrifuge feed heads

Espey WKA series
- Chamber seal (modular design – can be combined in any order), optional with housing and lid
- Pressure: vacuum ... 250 bar (... 3,626 PSI)
- Shaft diameter: 20 ... 340 mm (0.79" ... 13.39")
- Radial play: max. ± 2.0 mm (0.08")
- Axial movement: theoretically unlimited
- Temperature: −120 °C ... +500 °C (−184 °F ... +932 °F)
- Sliding velocity: 150 ... 240 m/s (492 ... 787 ft/s)

Espey shaft sleeves
- Metallic or ceramic coating
- One-piece or split design
- Shaft diameter: 45 ... 340 mm (1.77" ... 13.39")
- Temperature: ... +1,000 °C (...+1,832 °F)

Typical applications:
Blowers, compressors, turbines, centrifuges, mills, agitators, dryers, bulkheads, steam turbines, throttle/control valves, gear units, motors

For detailed information please inquire.

EagleBurgmann product lines

Compression packings

A cost effective and reliable method for sealing pump shafts, valve spindles and rotating shafts in process equipment. Manufactured from a range of material combinations – traditional and innovative – using state-of-the-art production techniques. Supplied in boxed lengths or pre-cut rings. Approvals/certification includes BAM, DVGW, FDA, API, ISO, TA-Luft. Fire-safe, low leakage, low emission and nuclear grades are available with full documentation and certification.

Rotatherm graphite rings
An accepted industry-standard for valves and pumps in high pressure and high temperature service. Manufactured as moulded rings (with and without steel reinforcement) or special seals. Suits all industry applications including the power and nuclear industries. Approvals/certification includes: BAM, DVGW, API, ISO, TA-Luft.

BuraTAL Fugitive emission products
A comprehensive range of low leakage packing sets manufactured in graphite or our unique non-woven materials. All current fugitive emission standards are met with outstanding performance, low friction, ease of installation, and a long service life. Approvals/certification includes: API 622, ISO 15848, TA-Luft.

Burajet Injectable packings
The Burajet Injectable packing system offers a wide range of injectable compounds for pumps, valves, and process equipment. An ideal product for the mining and paper & pulp industries. Approvals/Certification includes: FDA

Buraglas Glass packings
Manufactured from non-ceramic materials and fibres, BuraGlas packings are suitable for sealing of vessels, coal mills, industrial furnaces, oven doors, hatches and covers. Produced in lengths in sizes up to 150 mm section. Approvals/Certification: Hydrolytische Klasse 1; DIN 12111.

Packing cartridges
Packing cartridges combine quick and easy installation with robust simple construction to provide minimum downtime and maximum reliability in critical process applications. Manufactured to individual requirements to fit into DIN/ASME standard equipment e.g. agitators. Cartridges can be supplied with live-loading and additional bellows containment for maximum environmental safety.

Typical applications:
Pumps, agitators, mixers, kneaders, dryers, fans, blowers, filters, refiners, pulpers, mills, valves

Gaskets

Fibre gasket sheets
Burasil-Basic, -Universal and Buratherm N gasket sheets for service in low to medium pressure and temperature applications for process equipment and pipework in industry and for utility applications like gas and water supply. Approvals/certification includes: DVGW, KTW, HTB, WRAS, WRC, TA-Luft, BAM (Oxygen max. = 120 °C / 130 bar)

PTFE gasket sheets and tapes
Burachem is a highly chemical resistant modified PTFE gasket material range offering varying properties of mechanical strength and chemical resistance depending upon application. Approvals/certification includes: DVGW, KTW, HTB, WRAS, WRC, BAM (Oxygen max. = 120 °C / 130 bar), TA-Luft.
Quick-Seal MultiTex tape is the latest development in the field of expanded PTFE sealing materials for in-place sealing of vessel and pipe flanges.

Graphite seals and tapes
Statotherm Graphite gasket sheets, tapes
Soft, flexible, graphite gasket sheets ideal for pump, valve, and equipment gaskets.
Statotherm R Profile rings for static sealing in high temperature applications, e.g. in heat exchangers, valves or pumps.
Statotherm V and V-Flex cover seals are used as self-sealing gaskets in high-pressure valves e.g. for power plants at high temperatures. Statotherm V-Flex is supplied by the meter.

Metal gaskets
Approvals/certification include BAM, DVGW, TA-Luft
Spiraltherm spiral wound gaskets. Available to suit all international flange standards and in a wide choice of materials.
Corratherm corrugated gaskets are for heavy duty applications.
Kammprofile serrated gaskets are for applications with high demands for operating safety and tightness.
Buralloy metal jacketed gaskets are produced in a wide variety of different materials (in various combinations), in many styles for heat exchangers, pipe flanges, boilers, and process equipment.
Buralloy ring type joints are available to suit all ASME and DIN flanges from stock. Sizes: 15 ... 900 mm (0.5" ... 36"); manufactured to ASME B16.20 and to API 6A.

Typical applications:
Stationary machine parts, flanges, flange-like joints, bulkheads

For detailed information please inquire.

EagleBurgmann product lines

Expansion joints

Expansion joints are vital components in most industrial plants. They are installed as flexible connections in pipe and duct systems to take up or compensate for thermal expansion, vibration and misalignments. Advancements in processing and generating technologies are being combined with high demands for efficiency. This, along with a clear orientation towards environmental protection, puts high demands on expansion joint designs.

Customized expansion joints made of fabric or metal are the solution of choice.

Fabric expansion joints
- Single and multilayer designs
- Dimensions: according to customer specifications
- Temperature -35 °C ... +1,000 °C (-31 °F ... + 1,832 °F) (higher temperature, on request)
- Pressure: +/-0.35 bar
- Versions with wiremesh reinforcement
- Versions with high chemical resistance
- Versions with Nekal-tight design
- Fabric expansion joint are available as units, including bolster and steel parts.

Metal expansion joints
- Dimensions: Circular: DN40 and up.
- Rectangular: According to customer specifications
- Temperature: −198 °C ... +1,371 °C (−324 °F ... + 2,500 °F)
- Pressure: vacuum ... 172 bar (... 2,500 PSI)
- Materials: stainless steel, Incoloy® Inconel®, Hastelloy®, titanium, special materials
- Single and universal designs
- Metal expansion joints are available with for example tie rods, hinges, gimbals, refractory lining, elbow, pantograph.

Dimensions and pressure range depends on design, material selection, type of expansion joint and duct insulation.

Typical applications:
Air and flue gas ducts, pipelines, sewer systems

Special products

For particular applications, innovative, customized solutions are the only answer. The supplier must have a wealth of in-depth expertise, many years of experience and above all the willingness and ability to translate ideas into solutions that work in practical application.

Contoured diaphragm couplings
For demanding rotating equipment such as turbines and compressors in the oil and gas industries as well as petrochemicals, conventional and nuclear power generation, marine applications and the aerospace industry.

They are lightweight, easy to install and maintain, and demonstrate high reliability in stress analysis. Low bearing load, best dynamic balance repeatability and no fretting or wearing are advantages of the coupling. Uniquely shaped flexible elements in the metal diaphragms located at each end of the spacers attain optimum performance. Additional features:

- Couplings acc. to API 671 / ISO10441 or API 610 / ISO13709
- Multi diaphragms, compensation for large misalignments
- Low (reduced) moment
- Electrically insulatet
- Spark resistant materials
- Tuned for rotor dynamics
- Torque overload releasing device
- Torque measuring system

Operating range: Max. torque: 2,700 kNm,
max. speed: 100,000 min^{-1}

High-grade metal bellows
for specialized applications in the nuclear power, semi conductor and medical equipment industries, etc.

Dynamic and static sealing elements
for the aerospace industry which meet extremely demanding quality requirements.

Stern tube and marine seals
with various approvals and certifications, for marine outfitters and users.

Rotary kiln sealing systems
as single and double seals in drying, calcination, combustion and pyrolysis applications.

Typical applications:
Engineered solutions designed to meet customer requirements

For detailed information please inquire.

Table of materials

Material code 1)EN 12756	Material code EagleBurgmann	Description
Face materials (Item 1/2)		
Synthetic carbons		
▶ A	Buko 03	Carbon graphite antimony impregnated
▶ B	Buko 1	Carbon graphite resin impregnated, approved for foodstuffs
B3	Buko 02	Carbon graphite resin impregnated
B5	Buko 34	Carbon, resin bonded
C	Buko 22	Electrographite antimony impregnated
Metals		
▶ E	Bume 20	Cr steel
G	Bume 17	CrNiMo steel
▶ S	Bume 5	Special cast CrMo steel
T41	Bube 281	1.4462 DLC-coated
Carbides		
U = Tungsten carbides		
▶ U1	Buka 1 brazed	Tungsten carbide, Co-binder
▶ U2	Buka 16 solid	Tungsten carbide, Ni-binder
▶ U22	Buka 16 shrunk-in	Tungsten carbide, Ni-binder
U3	Buka 15 solid	Tungsten carbide, NiCrMo-binder
U37	Buka 15 shrunk-in	Tungsten carbide, NiCrMo-binder
U7	Buka 17 solid	Tungsten carbide, binder-free
Q = Silicon carbides		
▶ Q1	Buka 22 solid	SiC, silicon carbide, sintered pressureless
▶ Q12	Buka 22 shrunk-in	SiC, sintered pressureless
▶ Q2	Buka 20 solid	SiC-Si, reaction bonded
▶ Q22	Buka 20 shrunk-in	SiC-Si, reaction bonded
Q3	Buka 30 solid	SiC-C-Si, carbon silicon impr.
Q32	Buka 30 shrunk-in	SiC-C-Si, carbon silicon impr.
Q6	Buka 32 solid	SiC-C, SiC sintered pressureless with carbon
Q4	Buka 24 solid	C-SiC, carbon surface silicated
Q19	Buka 221	SiC, DLC-coated
Q15	Buka 225	SiC, DiamondFace
Metal oxides (Ceramics)		
V	Buke 5	Al-Oxide > 99 %
V2	Buke 3	Al-Oxide > 96 %
X	Buke 8	Steatite (Magnesia silicate)
Plastics		
▶ Y1	Buku 2	PTFE glassfibre reinforced
Y2	Buku 3	PTFE carbon reinforced

Material code 1)EN 12756	Material code EagleBurgmann	Description
Secondary seal components (Item 3)		
Elastomers, not wrapped		
▶ E	E	Ethylene propylene rubber (EPDM[2]) e. g. Nordel®
▶ K	K	Perfluorocarbon rubber (FFKM[2]) e. g. Kalrez®, Chemraz®, Simriz®
N	N	Chloroprene rubber (CR[2]) e. g. Neopren®
▶ P	P	Nitrile-butadiene-rubber (NBR[2]) e. g. Perbunan®
S	S	Silicone rubber (VMQ[2]) e. g. Silopren®
▶ V	V	Fluorocarbon rubber (FKM[2]) e. g. Viton®
X	X4	Hydrogenated Nitrile-rubber (HNBR[2])
X	X5	Tetrafluoroethylene propylene rubber (FEPM[2]) e. g. Aflas®, Fluoraz®
Elastomers, wrapped		
▶ M1	TTV	FKM, double PTFE wrapped
▶ M2	TTE	EPDM, double PTFE wrapped
M3	TTS	VMQ, double PTFE wrapped
M4	TTN	CR, double PTFE wrapped
M5	FEP	FKM, FEP wrapped
M7	TTV/T	FKM double PTFE wrapped/ PTFE solid
Differing materials		
U1	K/T	Perfluorocarbon rubber/PTFE
Non-Elastomers		
G	Statotherm	Pure graphite
T	T	PTFE (Polytetrafluoroethylene)
T2	T2	PTFE glass fiber reinforced
T3	T3	PTFE carbon reinforced
T12	T12	PTFE carbon-graphite reinforced
Y1	Burasil-U	Plastic fiber/Aramid

Material code 1)EN 12756	Material code EagleBurgmann	Description
Spring and construction materials (Item 4/5)		
Spring materials		
▶ G	1.4571	CrNiMo steel
▶ M	2.4610	Hastelloy® C-4 Nickel-base alloy
Construction materials		
D	St	C steel
▶ E	1.4122	Cr steel
F	1.4301	CrNi steel
F	1.4308	CrNi cast steel
F1	1.4313	Special cast CrNi steel
▶ G	1.4401	CrNiMo steel
▶ G	1.4404	CrNiMo steel
▶ G	1.4571	CrNiMo steel
G	1.4581	CrNiMo cast steel
▶ G1	1.4462	CrNiMo steel – Duplex
G2	1.4439	CrNiMo steel
G3	1.4539	NiCrMo steel
▶ G4	UNSS32760-Nor	CrNiMoCu steel - Superduplex
M = Nickel-base alloy		
▶ M	2.4610	Hastelloy® C-4
M1	2.4617	Hastelloy® B-2
M3	2.4660	Carpenter® 20 Cb3
M4	2.4375	Monel® alloy K500
M5	2.4819	Hastelloy® C-276
M6	2.4668	Inconel® 718
T = Other materials		
T1	1.4505	CrNiMoCuNb steel
T2	3.7035	Pure titanium
T3	2.4856	Inconel® 625
T4	1.3917	Carpenter® 42
T5	1.4876	Incoloy® 800

▶ Preferred materials
1) Standard following EN 12756, Dec. 2000
2) Abbreviations acc. to ISO 1629, Nov. 2004

Color code

- Shaft
- Housing, installation chamber
- Elastomers
- Stationary seal parts
- Stationary seal faces
- Rotary seal parts
- Rotating seal faces

Short legend for seal selection by media

Notes on the medium (2)

G	=	Mixture/group
N	=	Natural product
®	=	Trade mark
S	=	Collective term
TA	=	TA-Luft relevant
V	=	Impurities

Concentration (3)

–	=	"any"
< 10	=	less than 10 weight %
~ 10	=	approx. 10 %
F10	=	Solids up to 10 %
L	=	Defined solution
< L	=	Unsaturated solution
> L	=	Supersaturated sol.
Sch	=	Melt
Sus	=	Suspension

Temperature (4)

< 100	=	less than 100 °C
> F	=	> Solidifying temp.
> K	=	> Crystallization temperature
< Kp	=	< Boiling temperature
> Pp	=	> Pour point
TG	=	< Material temperature limit

Arrangement of shaft seal (5)

S	=	Single mechanical seal
D	=	Dual mechanical seal
Q	=	Quench

Auxiliary piping (6)
Arrangements see API 682/ISO 21049

Auxiliary measures (7)

D	=	Steam quench
(H), H	=	Heating (if necessary)
kD	=	Conical stuffing box
SS	=	Splash guard
SW	=	Replacement of buffer medium
QW	=	Replacement of quench medium
ThE	=	Thermal buffer

Mechanical seal type on product side (8)

1	=	with elastomer O-Rings, rotating springs in contact with the product
2	=	same as 1 but springs not in contact with the product
3	=	same as 2 but stationary springs
4	=	same as 2 but metal free on product side
5	=	with elastomer bellows
6	=	with metal bellows
X	=	special design

Material selection (9)
For designations acc. to EN 12756 see table of materials.

Health hazard warnings (10)

T	=	Toxic
T+	=	Very Toxic
Xn	=	Harmful
R..	=	Carcinogenic/mutagenic
Xi	=	Irritant
C	=	Corrosive
1	=	Vapor pressure/gas
2	=	Corrosion
3	=	Exclusion of air
4	=	Lubricating properties
5	=	Icing
6	=	Leakage
F	=	Highly flammable
F+	=	Extremely flammable
O	=	Oxidizing
E	=	Explosive
N	=	Dangerous
U	=	Insufficient information

TLV (11)

a fig.	=	TLV in ppm
mg	=	TLV in mg/m^3
#	=	mg/m^3 of base substance
*****	=	No TLV because it is dearly carcinogenic

Normal condition (12)

ga	=	Gaseous
fe	=	Solid
fl	=	Liquid
kr	=	Crystalline
pa	=	Viscous

Melting point (13)

K ...	=	Efflorescence temperature
S ...	=	Sublimation temperature
... %	=	Values for ... % aqueous solution

Boiling point (14)

A ...	=	Boiling point of the azeotrope
Z	=	Decomposition temperature
(...)	=	Reference pressure in mbar
... %	=	Values for ... % aqueous solution

Density (g/cm^3) (15)

(+)	=	Heavier then air
(–)	=	Lighter than air
(...)	=	Reference temp. in °C
A ...	=	Density of the azeotrope at ... %
... %	=	Values for ... % aqueous solution

TotalSealCare Service

TotalSealCare service modules

The modular seal service offered through TotalSealCare is as individual as are the demands of our customers. The range of services spans complete maintenance of all installed seals, through to stock management, as well as engineering, training and electronic data documentation.

Our TotalSealCare services consist of individual modules from which we assemble individualized service packages.

You can benefit from our many years of experience and expertise in all areas of seal technology, and our major store of practical knowledge.

Consulting & engineering

After establishing and analyzing all of the seals in a system, we work out standardization concepts based on the as-is status. The results we are hoping for are to reduce the number of seal types, sizes and materials used, and to improve the key figures of the system. We advise you relating to codes of practice and statutory regulations, and indicate what actions need to be taken.

Maintenance

In the plant or in the service center, qualified fitters and technicians look after all the aspects of seal maintenance: installation, startup, servicing, conversion, overhaul and repair. We record and document functionally relevant data (fault causes, measures for repair, costs). This means it is possible to assess seal operating times and maintenance costs on a continuous basis, thereby defining measures for extending service intervals.

On-site service

Our on-site service includes the components of an overhaul service, conversions and service container. We deploy a service unit directly on your premises: equipped with the basic suite of seals or a stock of seals discussed with you in advance, and staffed by qualified personnel. On-site, our work includes producing the necessary gaskets, ensuring that the documentation is complete and advising our customers on selecting and installing seals. Our range of services is rounded off by complete conversions (e. g. acc. to TA-Luft).

Inventory management

Based on your individual requirements and the applicable quality regulations, we develop a concept for inventory management of complete seals and spare parts. Furthermore, we optimize stocking on site or in the EagleBurgmann service center. In this way, you can reduce your administration overhead and concentrate on your key operations.

Seminars & training

We offer an extensive range of continuing education programs in seal technology.
For service and maintenance personnel, skilled staff and engineers from various branches of industry such as refining, chemicals, power generation, foodstuffs, paper and pharmaceuticals. Our range includes group seminars, individual training and seminars specifically tailored to your requirements. At our premises or at a location of your choice.

Technical analysis & support

A team of seal specialists is responsible for rectifying process malfunctions or “bad actors”. The latest methods such as thermography or data logging are used for diagnosing positions that are critical for the operation of the system and for working out measures to rectify them. In our research and development centers, we perform realistic tests on test rigs or in original pumps. The objective is to extend the MTBF and to increase system serviceability by individual and constructive solutions.

Service agreements

We offer our customers specific agreements that can be combined from the six service modules. Whether for individual seal systems, critical process elements, specific system areas or an extensive seal service for complete plants: the modular structure of our service makes it possible to satisfy individual requirements.
With our tried-and-tested monitoring instrument, SEPRO, we can also record all data relevant for the seals for documentation and evaluation purposes.

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EagleBurgmann, a joint venture of the German Freudenberg Group and the Japanese Eagle Industry Group, is one of the internationally leading companies for industrial sealing technology. Our products are used everywhere where safety and reliability are important: in the oil and gas industry, refining technology, the petrochemical, chemical and pharmaceutical industries, food processing, power, water, mining, pulp & paper, aerospace and many other spheres. Every day, more than 6,000 employees in more than 60 subsidiaries contribute their ideas, solutions and commitment towards ensuring that customers all over the world can rely on our seals. Our modular TotalSealCare service underlines our strong customer orientation and offers tailor-made services for every application.

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a member of EKK and FREUDENBERG

EagleBurgmann®
Rely on excellence