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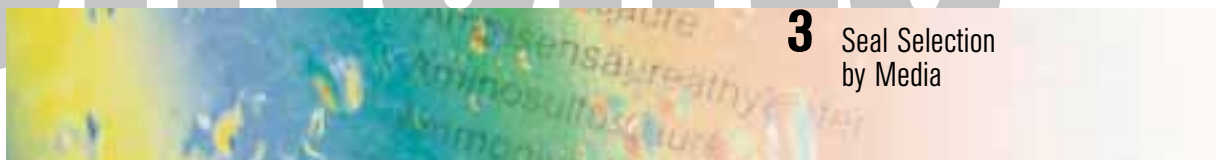
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The Burgmann Design Manual for Mechanical Seals is now available in the **Internet.** At **www.burgmann.com** you will not only find all the main seals covered by this catalogue but also the CASS Seal Selection Program and a great deal more besides.

Important Note:
All the technical references are based on extensive tests and our many years of experience. The diversity of possible applications means, that they can serve as guide values only. No guarantee can be given for a specific case unless the exact conditions of application are know to use and confirmed in a special agreement. For particularly critical conditions of operation, e. g. involving a mixture of products, we recommend you consult with our specialist engineers. It should be noted that the maximum values of each operating parameter cannot be applied at the same time. Subject to change.

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Media

Media

3 Seal Selection by Media

Media

Seal selection and material recommendation by media.

The recommendations in the **media tables** on **pages 7 to 24** 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.

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

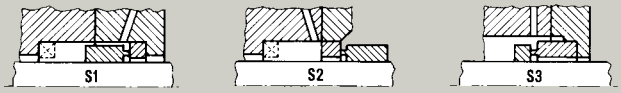
<F = minimum of 10 °C above solidifying temperature

>K = minimum of 10 °C above crystallization temperature

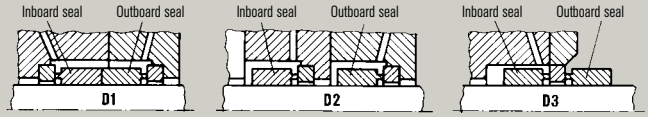
<Kp = For aqueous solutions: Up to approximately 10 °C below boiling point at atmospheric pressure.
For gases: 20 °C below boiling point of the liquefied gas; at the same time, the sealing pressure must be a minimum 3 bar higher than the vapour pressure.
For other media: Up to approx. 20 °C below boiling point at 1 bar (but no higher than 400 °C)

>Pp = minimum 10 °C above pour point

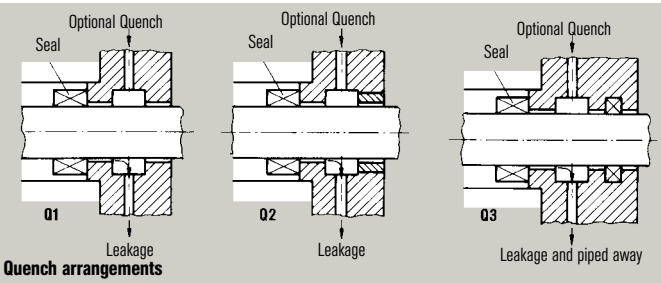
TG = Up to the operating temperature limit of the mechanical seal's materials in contact with the product.



Single mechanical seal arrangement



Double mechanical seal arrangements



Quench arrangements

Column 5: Arrangement of shaft seal

Designation in accordance with DIN ISO 5199 (February 1987), Appendix D; explanations are modified in parts.

S = Single mechanical seal
These seals can be unbalanced, balanced, with or without circulation or flushing of seal faces, with or without throttle bushing.
S1 = Internal arrangement
S2 = External arrangement
S3 = Internal arrangement with rotating counter ring

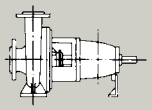
D = Double mechanical seal
Either one of the seals can be unbalanced or balanced on its own, or both together.
D1 = Back-to-back arrangement
D2 = Tandem arrangement. An alternative, when permissible, is Q3.
D3 = Face-to-face arrangement. The same arrangements are possible for the rotating seal face.

Q = Quench arrangement for single and double mechanical seals
Q1 = Seal without throttle bushing or auxiliary seal
Q2 = Seal with throttle bushing
Q3 = Seal with auxiliary seal or packing; D2 is an alternative. (See diagram above).

Column 6: Auxiliary piping plans

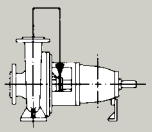
Code nos. in accordance with DIN ISO 5199 (February 1987), Appendix E. Excerpt from DIN ISO 5199:

Basic arrangements

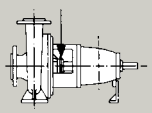


No. 00
No connections
No circulation

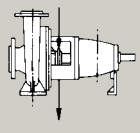
No. 01
No connections
internal circulation



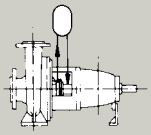
Nr. 02
Circulation of fluid from pump discharge nozzle to the shaft stuffing box (with internal recycling)
Alternative: 01



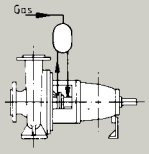
No. 08
Supply of external fluid
a) to the shaft stuffing box, with internal recycling into the pump
b) for quenching



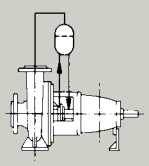
No. 09
External fluid (e.g. flushing or buffer fluid) to the shaft stuffing box or quenching. Discharge into an external system



No. 10
Buffer or quench fluid from an elevated vessel; circulation of fluid by thermosyphon effect or pumping system



No. 11
Buffer or quench fluid from a pressurized vessel; circulation by thermosyphon effect or pumping system



No. 12
Buffer fluid from a pressurized vessel; circulation by thermosyphon effect or pump system; pressure is generated in the vessel from the pump outlet through a pressure accumulator or booster system (e.g. a vessel with diaphragm or pressure transmitter).
Inboard sealOutboard seal

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 throughflow of buffer medium (arrangement 09).

QW = Regular replacement of quench medium necessary. An alternative is a constant through flow of quench medium (arrangement 09); 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 (inside the back cover of this manual).

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 vapour 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 favour 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

A = Corrosive. In its liquid, vapour or gas form, the medium attacks the skin, eyes or mucous membrane.

C = Carcinogenic. The carcinogens are classified in:

C1 = "Substances known by experience to be capable of causing cancer in humans"

C2 = "Substances clearly proven so far in animal experiments only ... of causing cancer ..."

C3 = "Substances whose cancer-causing potential is suspected for good reason"

G = Toxic. Together with air, the medium forms gases, vapours or dusts capable of causing acute or chronic health disorders or death.

H = Skin resorption. "With many industrial materials, skinresorption of substances capable of penetrating the skin with ease constitutes a far greater risk of poisoning than inhalation. Skin contact, e.g. with aniline, nitrobenzene, phenol and many other substances, can give rise to potentially fatal poisoning, often without warning symptoms."

R = Irritant. Substances which – without being toxic – can cause inflammation through prolonged or repetitive direct contact with the skin, mucous membrane or eyes.

S = Sensitization. "After sensitization, e. g. of the skin or respiratory tracts, allergic reactions can be triggered at varying speed and in varying intensity depending on a person's disposition. Reactions of this type cannot be prevented with certainty, even when the threshold limit values are observed."

X = Hazardous to health (moderately toxic)

Technical grounds and environmental protection

1 = Vapour pressure/gas
At normal working temperatures, the medium has a vapour pressure of >1 bar. If the working temperature lies below boiling point (column 15) or if the sealing pressure lies clearly above the vapour 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.

7 = The medium is easily ignited

8 = The medium is flammable

9 = The medium is potentially explosive

(Hazard symbols taken from the German regulation concerning hazardous materials (GefStoffV) published on 26 August 1986, Federal Law Gazette I, page 1470).

0 = 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. Please notify us of your experiences.

Media

Column 11: TLV

The values quoted in ml/m^3 = ppm (parts per million) are taken from Bulletin 30 published by the SenateCommission for Testing Hazardous Materials on 1st September 1994: "Threshold Limit Values and Biological Material Tolerances 1994".

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 $\geq$ 5, $\leq$ 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 vapour 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 (vapour 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: Solubility in water

For solids (kr or fe in column 12), the solution equilibrium is quoted in weight per cent of the aqueous solution at 20 °C, in those cases where the evaluated literature specifies data. Different reference temperatures are stated. For example: 11 (25) means: The saturated aqueous solution contains 11% weight of the dissolved substance at 25 °C. Solubility usually increases with rising temperature.
Other specifications and additional signs:

– following the %-figure: Solubility decreases with rising temperature.

++ following the %-figure: Solubility is more than double at 80 °C

sll = of very high solubility
= soluble in less than 1 part water

ll = of high solubility
= soluble in 1–10 parts water

l = soluble
= soluble in 10–30 parts water

w |= of low solubility
= soluble in 30–100 parts water

sl = of very low solubility
= soluble in 100–1000 parts water

ssl = of extremely low solubility
= soluble in 1000–10000 parts water

unl = virtually insoluble
= soluble in more than 10000 parts water

Substances of low solubility (wl) to virtual insolubility (unl in water are dissolved in other solvents (mostly hydrocarbons), unless they have to be sealed aqueous suspension. In these cases, the solvent ("carrier liquid") must be given due consideration in the choice of mechanical seal and material.
For the media marked in column 12 with ga, it is assumed that the pure medium is pumped in gas or liquid form.
The working fluid influences the choice of mechanical seal for sealing liquid-ring vacuum pumps or compressors.

Column 14: 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 ...: Crystallisation at temperatures below ... °C

S ...: Sublimation at ... °C

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

Column 15: 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 16: 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 behaviour 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					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 reference	TLV-value	Normal condition	Solu-bility	Melting temperature ° C	Boiling point ° C	Density g/cm³
									1	2	3	4	5								
									Seal face	Stat. face	Sec. seal	Spring	Others								
1		2	3	4	5	6	7	8							10	11	12	13	14	15	16
A																					
Acetaldehyde (Ethanal)	CH_3CHO		–	100	D1	11		1	S	B	M_2	G	G		C3,1,3,7	50	fl		–124	21	0,78
Acetates → *Acetic acid esters*																					
Acetic acid:			–	<Kp	S1,Q3	10	QW	1	V	B	M_2	M	M		A,7	10	fl				
Acetic essence	CH_3COOH		~25	<Kp	S1	02		1	V	B	M_2	G	G		A	10	fl				
	CH_3COOH		<90	25	S1,Q3	10	QW	1	V	B	E	G	G		A,7	10	fl				
Glacial acetic acid	CH_3COOH		>96	<80	S1,Q3	10	QW	1	V	B	M_2	G	G		A,7	10	fl		17	~118	1,05
Vinegar	CH_3COOH		~10	<60	S1	02		1	S	B	E	G	G			10	fl				
Acetic acid anhydride	$C_4H_6O_3$		–	<100	S1,Q3	10	QW	1	V	B	M_2	G	G		A,R	5	fl		–73	139	1,08
Acetic acid esters:																					
Acetic acid benzyl ester	$C_9H_{10}O_2$		–	<80	S1	02		1	S	B	M_2	G	G				fl		–51	213	1,057
Acetic acid butyl esters:	$C_6H_{12}O_2$																				
butyl acetate	$C_6H_{12}O_2$		–	<80	S1,Q3	10		1	S	B	M_2	G	G		7	200	fl		–77	126	0,882
sec. Butyl acetate	$C_6H_{12}O_2$		–	<40	S1,Q3	10		1	S	B	M_2	G	G		7	200	fl		–99	118	0,865
tert. Butyl acetate	$C_6H_{12}O_2$		–	<40	S1,Q3	10		1	S	B	M_2	G	G		7	200	fl			98	0,859
Isobutyl acetate	$C_6H_{12}O_2$		–	<40	S1,Q3	10		1	S	B	M_2	G	G		7	200	fl		–99	118	0,87
Acetic acid cinnamil ester	$C_{11}H_{12}O_2$		–	<80	S1	02		1	S	B	M_2	G	G				fl			262	1,057
Acetic acid cyclohexyl ester	$C_8H_{14}O_2$		–	<80	S1	02		1	S	B	M_2	G	G				fl			173	0,969
Acetic acid ethyl ester	$CH_3COOC_2H_5$		–	<60	S1,Q3	10		1	S	B	M_2	G	G		7	400	fl		–83	77	0,90
Acetic acid hexyl ester	$CH_3COOC_6H_{13}$		–	<80	S1	02		1	S	B	M_2	G	G			50	fl		–81	171	0,878
Acetic acid isopropenyl ester	$C_5H_8O_2$		–	<60	S1	02		1	S	B	M_2	G	G				fl		–93	97	0,92
Acetic acid methyl ester	$C_3H_6O_2$		–	<40	S1,Q3	10		1	S	B	M_2	G	G		7	200	fl		–98	58	0,928
Acetic acid pentyl esters																					
(Pentyl-, Amyl acetate):	$C_7H_{14}O_2$																				
1-Pentyl acetate	$C_7H_{14}O_2$		–	<80	S1	02		1	S	B	M_2	G	G				fl		–71	150	0,8756
2-Pentyl acetate	$C_7H_{14}O_2$		–	<80	S1	02		1	S	B	M_2	G	G				fl			123...145	0,864
3-Pentyl acetate	$C_7H_{14}O_2$		–	<80	S1	02		1	S	B	M_2	G	G				fl			~135	0,8712
2-Methyl-2-butyl acetate	$C_7H_{14}O_2$		–	<80	S1	02		1	S	B	M_2	G	G				fl			124	0,8740
3-Methyl-butyl acetate	$C_7H_{14}O_2$		–	<80	S1	02		1	S	B	M_2	G	G				fl		–78	142	0,8670
Acetic acid propyl esters:	$C_5H_{10}O_2$																				
Isopropyl acetate	$C_5H_{10}O_2$		–	<80	S1,Q3	10		1	S	B	M_2	G	G		7	200	fl		–73	90	0,872
Propyl acetate	$C_5H_{10}O_2$		–	<80	S1,Q3	10		1	S	B	M_2	G	G		7	200	fl		–92	102	0,887
Acetic acid vinyl ester	$C_4H_6O_2$		–	<60	S1,Q3	10		1	S	B	M_2	G	G		7	10	fl		–93	73	0,932
Acetoacetate → *Ethyl acetoacetate*																					
Acetone	$(CH_3)_2CO$		–	30	S1,Q3	10		1	S	B	E	G	G		4,7	1000	fl		–95	56	0,791
	$(CH_3)_2CO$		–	TG	D1	11		1	S	A	M_2	G	G		1,4,7						
Acetone cyanohydrin (ACH)	C_4H_7NO		–	TG	D1	11		1	S	B	M_2	G	G		G		fl		–20	82(30)	0,932
Acetyl acetone	$CH_3COCH_2COCH_3$		–	<Kp	S1	02		1	S	B	M_2	G	G				fl		–21	140	0,975
Acetyl chloride	CH_3COCl		–	TG	D1	11		1	V	B	M_1	G	G		A,R,2,3,7		fl		–112	51	1,104
Acetylene	C_2H_2		–	TG	D1	11		1	S	B	M_1	G	G		1,7		ga		–84	–81	(–)
Acetylene chlorides → *Di-*, → *Trichloroethylene*, → *Tetrachloroethane*																					
ACH → *Acetone cyanohydrin*																					
Acidic tar			–	>F<200	D1	11	(H)	1	V	B	M_1	G	G				fl				
Acrylic acid	$C_3H_4O_2$		–	<Kp	S1,Q3	10		1	V	B	M_2	G	G		A,3,7		fl		13	141	1,051
Acrylic esters:																					
Acrylic acid ethyl ester (ethyl acrylate)	$CH_2CHCO_2C_2H_5$		–	<Kp	S1,03	10		1	S	B	M_2	G	G		S,7	5	fl			99	0,924
Acrylic acid methyl ester (methyl acrylate)	$CH_2CHCO_2CH_3$		–	<Kp	S1,03	10		1	S	B	M_2	G	G		S,7	5	fl			80	0,956
Acrylonitrile	C_3H_3N		–	TG	D1	11		1	V	B	M_1	G	G		C2,H,7	*	fl		–82	77	0,806
Adipic acid	$C_6H_{10}O_4$		<L	<Kp,>K	S1	02		1	V	B	V	G	G				kr	1,7++	153	205(13)	1,360
			>L	<Kp	S1	02		1	Q_1	Q_1	V	G	G								
Alkohol → *Ethanol*																					
Alkyd resins and lacquers		S	–	<Kp	D1	11		1	V	B	M_1	G	G		3,4,0		fl				
Alkylaluminum compounds		S	–	<Kp	D1	11		1	S	A	M_1	G	G		A,3,7		fl				0,8...1,8
Allyl alcohol (2-propene-1-ol)	C_3H_6O		–	<80	D1	11		1	S	B	E	G	G		G,H,A,7	2	fl		–129	97	0,852
Alum (potassium aluminum sulphate, aqueous solution)	$KAl(SO_4)_2*12H_2O$		<L	<Kp,>K	S1	02		1	V	B	V	G	G				kr	5,5++			1,76
			>L	<Kp	S1	02		1	Q_1	Q_1	V	G	G								
Aluminum chlorate	$AL(CLO_3)_3$		<L	<Kp,>K	D1	11		1	V	B	M_1	G	G		3,8		kr	II			
Aluminum chloride	$AlCl_3$		<L	<30,>K	S1,Q3	10	QW	1	V	B	V	M	M		R,3		kr	31,6	S183	S183	2,44
	$AlCl_3$		–	>30	D1	11	SW	1	V	B	M_1	G	G		R,2,3						
Aluminum fluoride	AlF_3		<L	<30,>K	S1	02		1	V	B	E	G	G				kr	0,4	S1260	S1260	2,88
	AlF_3		>L	<Kp	S3	00		3	Q_1	Q_1	M_1	M	G								
Aluminum hydroxide diacetate (basic aluminum acetate)			<L	<40	S1	02		1	V	B	E	G	G				fl				
Aluminum nitrate	$Al(NO_3)_3$		<L	<Kp,>K	S1	02		1	V	B	E	G	G				kr	41,9	73	Z135	
Aluminum sulfate	$Al_2(SO_4)_3$		<L	<Kp,>K	S1,Q3	10		1	V	B	E	G	G		3,6		kr	26,9	Z770		2,71
Amido sulfuric acid (amido sulfonic-, sulfamine-, sulfamide-, sulfamic acid)			<L	<Kp,>K	S1	02		1	V	B	M_1	G	G				kr	17,6		Z205	2,06
Amines (not specified)		S	–	<Kp	S1,Q3	10		1	V	B	M_2	G	G		partly H,S,R		fl				
Amino ethanols:																					
1-Amino ethanol	$(CH_2)_2NH_2OH$		<L	<Kp,>K	S1	02		1	V	B	M_2	G	G				kr	sII	95...99	110	
2-Amino ethanol (ethanolamine)	$(CH_2)_2NH_2OH$		–	<Kp	D1	11		1	V	B	M_2	G	G		R	3	fl		10	171	1,022

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 Stat. face	3 Sec. seal	4 Spring	5 Others		Hazard reference	TLV-value	Normal condition	Solu-bility	Melting temperature °C	Boiling point °C	Density g/cm³
1		2	3	4	5	6	7	8							10	11	12	13	14	15	16
Amino sulfonic acids		S	–	TG	D1	11		1	V	B	M_1	G	G		O						
Ammonia	NH_3		–	<40	D1	11		1	S	B	E	G	G		G,R,1	50	ga		–78	–33	(–)
Ammonia aqu. solutions:	NH_4OH																				
Caustic ammonia	NH_4OH		~29	<Kp	D1	11		1	S	B	M_2	G	G		A,R		fl				0,9
Spirit of salmiac	NH_4OH		~10	<40	S1,Q3	10		1	S	B	E	G	G		A,R		fl				0,957
	NH_3		–	TG	D1	11		1	S	B	M_2	G	G		G,R,1						
Ammonium acetate	$H_3CCOONH_4$		<L	<60,>K	S1	02		1	S	B	E	G	G				fe	sll	113		1,171
Ammonium acetate	$H_3CCOONH_4$		<L	<Kp	S1	02		1	S	B	M_2	G	G								
Ammonium alum	$NH_4Al(SO_4)_2*12H_2O$		<L	<60,>K	S1	02		1	V	B	V	G	G				kr	li	109		1,64
Ammonium bromide	NH_4Br		<L	<Kp,>K	S1,Q3	02		1	V	B	M_1	G	G		6		kr	42,0			2,55
Ammonium carbamate → *Urea*																					
Ammonium carbonate	$(NH_4)_2CO_3$		<L	<60,>K	S1	02		1	V	B	E	G	G				kr	21,5			
Ammonium chloride (sal ammoniac)	NH_4Cl		<L	<30,>K	S1	02		1	V	B	E	G	G				kr	27	Z350		1,531
	NH_4Cl		<L	<60	S1	02		5	Q_1	Q_1	E	M	M								
	NH_4Cl		<L	<Kp	D1	11		1	V	B	M_2	G	G		2						
	NH_4Cl		>L	<Kp	S3	01		4	Q_1	Q_1	M_2	M	G								
Ammonium fluorides:																					
Ammonium hydrogen fluoride	$(NH_4)HF_2$		<L	>Kp	D1	09		1	Q_1	B	M_2	G	G		A,G,2		kr	37,5	126		1,21
Neutral ammonium fluoride	NH_4F		<L	<Kp	D1	09		1	Q_1	B	M_2	G	G		A,G,2		kr	45,0			1,32
Ammonium hydrogen carbonate	$(NH_4)HCO_3$		<L	<Kp,>K	S1	02		1	V	B	E	G	G				kr	17,6++	Z60		1,58
Ammonium hydrogen fluoride → *Ammonium fluorides*																					
Ammonium hydroxide → *Ammonia aqu. solutions*																					
Ammonium nitrate	NH_4NO_3		<L	<Kp,>K	S1,Q2	10	D	1	V	B	E	G	G		3,9		kr	65,4	170		1,73
Ammonium oxalate	$(COONH_4)_2$		<10	<Kp	D1	11		1	Q_1	Q_1	M_2	G	G		A,R,3		kr	wl	Z70		1,5
Ammonium persulfate (ammonium peroxodisulfate)	$(NH_4)_2S_2O_8$		<L	<Kp,>K	S1,Q3	10		1	Q_1	Q_1	M_2	G	G		3		kr	38,0	Z120		1,98
Ammonium phosphate, secondary	$(NH_4)_2HPO_4$		<L	<60,>K	S1	02		1	V	B	E	G	G				kr	40,8			1,619
Ammonium sulphate	$(NH_4)_2SO_4$		<L	<Kp,>K	S1	02		1	V	B	E	G	G				kr	43,0	513		1,77
Ammonium thiocyanate (ammonium rhodanide)	NH_4SCN		<L	<Kp,>K	S1	02		1	V	B	M_1	G	G				kr	61,0	149		1,3
Amyl acetate → *Acetic acid pentyl esters*																					
Amyl alcohols → *Pentanols*																					
Aniline dyes		S	–	<80	S1	02		1	S	B	M_2	G	G				fl				
Aniline hydrochloride (aniline salt)	$C_6H_5NH_2HCl$		<L	<Kp	D1	11		1	V	B	M_1	G	G		G,R,H,2,3		kr	ll	198	245	1,22
Aniline, aniline oil	C_6H_7N		–	TG	D1	11		1	S	B	M_2	G	G		C3,H,3	2	fl		–6	184	1,023
Anthracene	$C_{14}H_{10}$		Sch	>Fy<Kp	S1,Q2	09	H,D	6	A	Q_1	G	T6	F		6		kr	0	217	342	1,25
Anthracene oil		G	Sch	>Fy<Kp	S1,Q2	09	H,D	6	A	Q_1	G	T6	F		6		kr	0			
Antichlor → *Sodium thiosulfate*																					
Apple juice, sauce, cider, wine		N	–	<Kp	S1	02		1	S	B	P	G	G								
Arcton → *Refrigerants*																					
Argon	Ar		–	>–20	D1	11		1	S	B	M_1	G	G		1		ga		–189	–186	
Aromatic hydrocarbons → *BTX*																					
Arrack			–	<60	S1	02		1	S	B	E	G	G				fl				
Arsenic acid	H_3AsO_4		–	<Kp	D1	11	SW	1	Q_1	Q_1	M_1	G	G		C1,2	*	fl				
Asphalts (molten)		N	–	<120	S1	00	H	1	S	B	V	G	G				fe		70...150		1,0...1,2
			–	<200	S1	01	H	1	S	B	M_1	G	G								
			–	>200	S1,Q2	09	H,D	6	A	S	G	T6	F		6						
ASTM test oils No. 1 to 4			–	<100	S1	02		1	S	B	V	G	G				fl				
Aviation petrol, av. gasoline		G	–	<Kp	S1	02		1	S	B	V	G	G		7		fl		bis <–58	40...160	
B																					
Barium chloride	$BaCl_2$		<L	<60	S1,Q3	10		1	V	B	V	G	G		G,6	#0,5	kr	26,0	960		3,86
Barium chromate suspension	$BaCrO_4$		<10	<60	S1,Q3	10	QW	5	Q_1	Q_1	V	G	G		G,6	#0,5	kr	<0,001			4,5
Barium hydroxide	$Ba(OH)_2$		<L	<60	S1,Q3	10	QW	1	V	B	E	G	G		G,6	#0,5	kr	3,9			4,5
	$Ba(OH)_2$		<10	<60	S1,Q3	10	QW	5	Q_1	Q_1	E	G	G		G,6						
Barium nitrate	$Ba(NO_3)_2$		<L	<80	S1,Q3	10	QW	1	V	B	V	G	G		G,6	#0,5	kr	8,0++			3,24
	$Ba(NO_3)_2$		<20	<80	S1,Q3	10	QW	5	Q_1	Q_1	V	G	G		G,6						
Battery acid → *Sulfuric acid*																					
Beer		N	–	<80	S1	01		1	Q_1	Q_1	V	G	G				fl				
Beer yeast, -wort, -mash		N	–	<80	S1	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	S1	08a		X	Q_{32}	Q_3	E	G	G						K~60		1,2...1,3
Benzene	C_6H_6		–	<Kp	D1	11		1	S	B	M_1	G	G		C1,H,6,7	*	fl		6	80	0,879
Benzoic acid	$C_7H_6O_2$		<L	<100	S1	02		1	S	B	V	G	G				kr	0,3++	122	249	1,266
	$C_7H_6O_2$		<10	<100	S1	02		2	Q_1	Q_1	V	G	G								
	$C_7H_6O_2$		–	>F<200	S3	00	(H)	3	Q_1	Q_1	M_1	M	G								
Benzotrichloride	$C_7H_5Cl_3$		–	<200	D1	11		1	Q_1	Q_1	M_1	G	G		C3,R,2		fl		–8	221	1,38
Benzotrifluoride	$C_7H_5F_3$		–	<60	S1,Q3	09		1	V	B	V	G	G		X,7,6		fl		–29	104	1,189
Benzyl alcohol	C_7H_8O		–	<100	S1	02		1	S	B	M_2	G	G				fl		–15	205	1,045
	C_7H_8O		–	<30	S1	02		1	S	B	V	G	G								

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 reference	TLV-value	Normal condition	Solu-bility	Melting temperature ° C	Boiling point ° C	Density g/cm³
									1	2	3	4	5								
									Seal face	Stat. face	Sec. seal	Spring	Others								
1		2	3	4	5	6	7	8							10	11	12	13	14	15	16
Benzyl butyl phalate (BBP) → *Phthalic acid esters*	$C_{19}H_{20}O_4$																				
Biphenyl	$C_{12}H_{10}$		–	>75<Kp	D1	11		6	A	S	G	T_6	F		3	0,2	kr	0	69...71	255	1,04
Bitumen (asphalt)		G	–	>F<200	S1	01	H	1	S	B	M_1	G	G		C3		fe				
Bitumen (asphalt);			–	>200	S1	01	H	6	A	S	G	T_6	F								
Black liquor → *Digester liquor, basic*																					
Blast furnace gas			–	<200	D1	11		1	V	B	M_1	G	G		1		ga				
Bleaching earth suspension		G	<10	<100	S1	02		5	Q_1	Q_1	V	G	G				fe				
Bleaching lye → *Sodium hypochlorite*, → *Calcium hypochlorite*																					
Blood		N	–	<60	S1	02		1	S	B	P	G	G				fl				
Boiler feed water → *Water*																					
Bone fats		N	–	<Kp	S1	02		1	S	B	V	G	G				fl				
Borax (sodium tetraborate)	$Na_2B_4O_7*10H_2O$		<L	<60	S1	02		1	V	B	P	G	G				kr	2,5++			1,72
Boric acid	$B(OH)_3$		<L	<60	S1,Q3	10		1	V	B	V	G	G		G,6		kr	4,9++			1,52
Boron trichloride (trichloroborane)	BCl_3		–	TG	D1	11		1	V	B	M_1	G	G		G,A,R,1		ga		–107	12,5	1,43 (0°C)
Boron trifluoride (trifluoroborane)	BF_3		–	TG	D1	11		1	Q_1	Q_1	M_1	G	G		G,A,R,1	1	ga		–127	–100	(+)
Brackish water → *Water*																					
Bread dough		N			D1	11		1	S	B	V	G	G								
Brine → *Sodium chloride*																					
Bromic acid	$HBrO_3$		–	<Kp	D1	11		1	Q_1	Q_1	M_1	G	G		R,2,6		fl				
Bromine	Br		–	<Kp	D1	11		1	Q_1	Q_1	M_1	G	G		A,2,3	0,1	fl	0,78	–7	58	3,12
Bromine, aqueous (aqueous solution of bromine)	Br_2		<L	<Kp	D1	11		1	Q_1	Q_1	M_1	G	G		3,6		fl				
BTX (benzene-toluene-xylene mixture)			–	<Kp	S1,Q3	10		1	S	B	M_1	G	G		C1,H,6,7	*	fl				
Bunker oil and fuel		N	–	120	S1	02		1	S	B	V	G	G				fl				
1,3-Butadiene			–	TG	D1	11		1	S	B	V	G	G		C2,R,1,3,6,7	*	ga		–109	–4,5	(+)
Butanal → *Butyraldehyde*																					
Butane:	C_4H_{10}																				
Isobutane (2-methyl propane)	C_4H_{10}		–	<Kp	S1,Q3	10		1	S	A	V	G	G		4,7	1000	ga		–139	–12	(–)
n-Butane	C_4H_{10}		–	<Kp	S1,Q3	10		1	S	A	V	G	G		4,7	1000	ga		–135	–1	(–)
Butanediols (butylene glycols):																					
1,2-Butanediol	$C_4H_{10}O_2$		–	<Kp	S1	02		1	S	B	M_1	G	G				fl			192 ... 194	1,019
1,3-Butanediol	$C_4H_{10}O_2$		–	<Kp	S1	02		1	S	B	M_1	G	G				fl			207	1,005
1,4-Butanediol	$C_4H_{10}O_2$		–	<200	S1	02		1	S	B	M_1	G	G				fl		16	230	1,020
2,3-Butanediol	$C_4H_{10}O_2$		–	<Kp	S1	02		1	S	B	M_1	G	G				fl		8	182	1,033
Butanic acid →*Butyric acid*																					
Butanol:	$C_4H_{10}O$																				
1-Butanol	$C_4H_{10}O$		–	<60	S1	02		1	S	B	E	G	G		7	100	fl		–90	117 ... 118	0,813
2-Butanol	$C_4H_{10}O$		–	<80	S1	02		1	S	B	E	G	G		7	100	fl		–115	100	0,811
Isobutanol	$C_4H_{10}O$		–	<60	S1	02		1	S	B	E	G	G		7	100	fl		–108	108	0,806
tert. Butyl alcohol	$C_4H_{10}O$		–	<60,<K	S1	02		1	Q_1	B	E	G	G		7	100	kr		26	82	0,776
Butanone (methyl ethyl ketone, MEK)	C_4H_8O		–	<Kp	S1	02		1	Q_1	B	M_2	G	G		7	200	fl		–86	80	0,805
Butene (butylene):	C_4H_8																				
1-Butene	C_4H_8		–	<Kp	S1,Q3	10		6	A	Q_1	M_7	T_6	F		7,4,5		ga		–185	–7	(–)
cis-2-Butene	C_4H_8		–	<Kp	S1,Q3	10		6	A	Q_1	M_7	T_6	F		7,4,5		ga		–139	3	(–)
Isobutene (isobutylene, methyl propene)	C_4H_8		–	<Kp	S1,Q3	10		6	A	Q_1	M_7	T_6	F		7,4,5		ga		–140	–7	(–)
trans-2-Butene	C_4H_8		–	<Kp	S1,Q3	10		6	A	Q_1	M_7	T_6	F		7,4,5		ga		–105	0	(–)
Butter		N	–	<80	S1	02		1	S	B	P	G	G				pa				
Buttermilk		N	–	<80	S1	02		1	S	B	P	G	G				fl				
Butyl acetate → *Acetic acid esters*																					
Butyl alcohol → *Butanol*																					
Butylamines:																					
1-Butylamine (1-aminobutane)	$C_4H_{11}N$		–	<Kp	S1,Q3	10		1	Q1	B	M1	G	G		H,R,3,6,7	5	fl		–50	78	0,733
Isobutylamine (2-methyl-1-propylamine)	$C_4H_{11}N$		–	<Kp	S1,Q3	10		1	Q1	B	M1	G	G		H,R,3,6,7	5	fl		–85	68 ... 69	0,736
sec. Butylamine (2-aminobutane)	$C_4H_{11}N$		–	<Kp	S1,Q3	10		1	Q1	B	M1	G	G		H,R,3,6,7	5	fl		–104	63	0,724
Butylene → *Butene*																					
Butyraldehyde:	C_4H_8O																				
Butyraldehyde (butanal)	C_4H_8O		–	<Kp	S1,Q3	10		1	V	B	M2	G	G		3,6,7		fl		–99	75	0,802
Isobutyraldehyde (2-methyl propionic aldehyde)	C_4H_8O		–	<Kp	S1,Q3	10		1	V	B	M2	G	G		3,6,7		fl		–66	64	0,794
Butyrates → *Butyric acid esters*																					
Butyric acid:																					
Isobutyric acid	$C_4H_8O_2$		–	<60	S1	02		1	S	B	M1	G	G				fl		–47	155	0,950
n-Butyric acid	$C_4H_8O_2$		–	<60	S1	02		1	S	B	M1	G	G				fl		–6	163	0,959
Butyric acid esters (butyrates)		S	–	<100	S1	02		1	S	B	M2	G	G				fl		<0	<100	
C																					
Cable sealing compounds		S	–	<220	S1	00	H	6	A	S	M7	T6	G1				fe				
		S	–	>220	S1	00	H	6	A	S	G	T6	F				fe				
Calcium acetate	$Ca(OCOCH_3)_2$		<L	<100	S1	02		1	V	B	E	G	G				fe	28,9–		Z160	1,50
Calcium bisulphite (lye) → *Calcium hydrogen sulphite*																					

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** Stat. face	**3** Sec. seal	**4** Spring	**5** Others	Hazard reference	TLV-value	Normal condition	Solu-bility	Melting temperature °C	Boiling point °C	Density g/cm³
1		2	3	4	5	6	7	8						10	11	12	13	14	15	16
Calcium carbonate → *Lime powder suspension*																				
Calcium chlorate	$Ca(ClO_3)_2$		<L	<100	S1,Q3	10		1	V	B	V	G	G	6,7		kr		100		2,711
Calcium chloride	$CaCl_2$		<L	<25	S1	02		1	V	B	V	G	G			kr	42,5	30		1,68
	$CaCl_2$		<L	<100	S1,Q3	10		1	V	B	M_1	M	M	3,6						
Calcium hydrogen sulphite ('digester lye')	$Ca(HSO_3)_2$	V	L	<Kp	D1	11		1	V	B	M_1	G	G	3,6		fl				
	$Ca(HSO_3)_2$	V	L	<Kp	S3,Q3	01	kD	3	Q_1	Q_1	M_1	G	G	3,6		fl				
Calcium hydroxide → *Lime milk*																				
Calcium hypochlorite	$Ca(OCl)_2$		<L	<30	S1,Q3	09		1	V	V	M_2	M	M	A,2,6,8		kr				
	$Ca(OCl)_2$		–	<Kp	S3,Q3	09		4	Q1	Q1	M_2	M	G	A,2,6,8						
Calcium nitrate	$Ca(NO_3)_2$		<L	<Kp	S1,Q3	10		1	S	B	V	G	G	6		kr	56	45		1,82
	$Ca(NO_3)_2$			<100	S1	10		5	Q_1	Q_1	V	G	G	6						
Calcium phosphates (sludges)	$Ca(PO_4)_2$	G	F25	<Kp	S3	01	kD	3	Q_1	Q_1	M_1	G	G			kr				
Calcium sulphate (suspension)	$CaSO_4$		F25	<Kp	S3	01	kD	3	Q_1	Q_1	V	G	G			kr				
Calgon (polyphosphates), Calfort		®	<L	<Kp	S1	02		1	V	B	E	G	G			kr				
Calgonit R (sodium phosphate silicates)		®	<L	<Kp	S1	02		1	V	B	E	G	G			kr				
Calgonit S (urea nitrate)	$CH_5N_3O_4$	®	<L	<Kp	S1	02		1	V	B	E	G	G			kr				
Cane sugar (solution)			<L	<Kp	D1	11		1	S	B	V	G	G	3,4		fl				
Caprolactam ε-	$C_6H_{11}NO$		<L	<Kp	S1,Q3	10		1	S	B	M_1	G	G	X,6	5 mg	kr	sll	69	268	1,013(80)
	$C_6H_{11}NO$			<200	S1	01	H	6	A	S	M_7	T_6	F							
Carbamates (urethanes)		S	F<5	<180	D1	11	(H)	1	Q_1	B	M_2	G	G	3,6						
		N	–	<200	D1	11		1	S	A	M_1	G	G	(C1), R		fl				
Carbamides → *Urea*																				
Carbolic acid → *Phenol*																				
Carbon dioxide (aqueous solution)	CO_2		<L	<Kp	S1	02		1	S	B	P	G	G			fl				
Carbon dioxide (gas)	CO_2		–	<60	D1	11		1	S	B	P	G	G	1	5000	ga		S–78		(+)
Carbon dioxide (liquefied, min. 3 bar above P_D)	CO_2		–	<Kp	S1,Q3	02		X	Q_1	A	P	G	G	4,6	5000	ga				0,766
Carbon disulfide	CS_2		–	<Kp	D1	10		1	Q_1	Q_1	M_1	G	G	G,H,3,7	10	fl		–111	46	1,261
Carbon (mon)oxide	CO		–	<60	D1	11		1	S	B	P	G	G	G,H,1,4,7	30	ga		–199	–191	(–)
Carbon tetrachloride (tetrachloro-methane, 'Tetra')	CCl_4		–	<60	S1,Q3	10		1	V	B	V	G	G	C3,H	10	fl		–23	76	1,5924
Castor oil			–	<100	S1	02		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	S1	02		1	Q_1	Q_1	E	G	G			fl	53,2			
			<20	<60	S1	02		5	Q_1	Q_1	E	G	G			fl				
	KOH		–	<Kp	D1	11		1	Q_1	Q_1	M_2	G	G	2,4		fl				
Caustic soda solution (sodium hydroxide in aqueous solution)	NaOH		<10	<80>K	S1	02		5	Q_1	Q_1	E	G	G	A				10%–10	10% ~ ~ 105	10% 1,109
	NaOH		<20	<100>K	S1	02		5	Q_1	Q_1	E	G	G	A				20%–25	20% ~ ~ 110	20% 1,219
	NaOH		<50	<100>K	S1,Q3	10	QW	5	Q_1	Q_1	E	G	G	A,3				30% ~ ~ 0	30% ~ ~ 120	30% 1,327
	NaOH		<50	<100>K	S1,Q3	10	QW	1	Q_1	Q_1	E	G	G	A,3				40% ~ ~ 15	40% ~ ~ 130	40% 1,430
	NaOH		<50	<100>K	D1	11	SW	1	Q_1	Q_1	E	G	G	A,3				50% ~ ~ 12	50% ~ ~ 150	50% 1,524
	NaOH		<50	<180	D1	11	SW	1	Q_1	Q_1	M_2	G	G	A,2				60% ~ ~ 50	60% ~ ~ 160	% 1,109
Cellosolve (ethyl glycol)	$C_4H_{10}O_2$	®	–	<Kp	S1,Q3	10		1	S	B	M_1	G	G	R,H	20	fl		–100	135	0,9311
Cellulose → *Pulp*																				
Cement sludge			<60	<40	S3,Q3	09	kD	3	Q_1	Q_1	V	G	G	3,6						
Cheese (cream)		N	–	<60	D1	11		1	Q_1	Q_1	V	G	G	4		pa				
Chemical pulp → *Cellulose*																				
Chinese wood oil → *Wood oil*																				
Chloracetic acid	$C_2H_3ClO_2$		<L	<100	D1	11	SW	1	V	B	M_2	G	G	G,A,2		kr	II	53 ... 63	188	1,40
Chlorinated biphenyls		S	–	<60	D1	11		1	V	B	M_1	G	G	G,C3	0,2	fl				
Chlorine	Cl_2		–	<60	D1	09		1	Q_1	Q_1	M_1	G	G	G,1,2,3,6,8	0,5	ga		–101	–34	(+)
Chlorine bleaching lye → *Sodium hypochlorite, calcium hypochlorite*																				
Chlorine dioxide	ClO_2		–	<60	D1	11	SW	1	Q_1	Q_1	M_1	G	G	G,1,2,6	0,1	ga		–59	11	(+)
Chlorine lye → *Sodium hypochlorite*																				
Chlorine water	Cl_2		L	<Kp	D1	09		1	V	B	M_1	G	G	A,2,6		fl				
Chloroacetone (1-clorine-2-propanone)	C_3H_5ClO		–	<60	S1,Q3	10		1	V	B	M_1	G	G	R,3		fl		–44	119	1,123
Chlorobenzene	C_6H_5Cl		–	<Kp	D1	11		1	V	B	M_1	G	G	X,7	50	fl		–46	132	1,106
Chlorofluorocarbons (CFC) → *Refrigerants*																				
Chloroform	$CHCl_3$		–	<Kp	D1	10		1	S	B	M_1	G	G	X,C3	10	fl		–97	57	1,175
Chloromethane → *Methyl chloride*																				
Chloropicrine → *Trichloronitro-methane*																				
Chlorosulfuric acid (chlorosulfonic acid)	$HOSO_2Cl$		–	<Kp	D1	09		1	Q_1	Q_1	M_1	G	G	A		fl			152	1,75
Chlorothene → *Trichloroethane*																				
Chrome alum (potassium chrome alum)	$KCr(SO_4)_2*12H_2O$		<L	<Kp	S1,Q3	10		1	V	B	M_1	G	G	6		kr	11(25)	89		1,83
Chromic acid (anyhydride) → *Chromium trioxide*																				
Chromium trioxide	CrO_3		<L	<Kp	D1	11		1	Q_1	Q_1	M_1	G	G	C3,G,A,2,6	mg 0,1	kr	62,8	197		2,7

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 reference	TLV-value	Normal condition	Solu-bility	Melting temperature ° C	Boiling point ° C	Density g/cm³
									1	2	3	4	5								
									Seal face	Stat. face	Sec. seal	Spring	Others								
1		2	3	4	5	6	7	8							10	11	12	13	14	15	16
Citric acid	$C_6H_8O_7$		<L	<Kp	S1	02		1	S	B	V	G	G				kr	73,3	100		1,542
Citrus juices		N	–	<Kp	S1	02		1	S	B	V	G	G				fl				
Clairce → *Sugar juices*																					
Clophen → *Chlorinated biphenyls*																					
Coal sludge				<60	S1	08a		1	U_1	U_1	P	G	G				pa				
Coal tar (remove leakage selectively)		G	–	<180	S1,Q2	02	(H)	1	S	B	M_1	G	G	C1,6	*		fl				1,1…1,2
Cocoa butter (cacao butter)		N	Sch	<100	S1	02		1	S	B	V	G	G				pa		33...35		0,975
Coconut fat		N	–	>30<TG	S1	02		1	S	B	V	G	G				pa		20...23		0,88...0,9
Coconut oil		N	–	<160	S1	02		1	S	B	V	G	G				fl				
Cod-liver oil		N	–	<Kp	S1	02		1	S	B	V	G	G				fl				0,92...0,93
Coffee (extract)		N	L	<60	S1	02		1	Q_1	Q_1	V	G	G				fe				
Coin		®	–	<30	S1	02		1	S	B	V	G	G				fl				
Coke oven gas			–	<160	D1	11		1	V	B	V	G	G	C1,1	*		ga				
Cold zink paint		G	<L	<60	D1	11		1	S	B	E	G	G	3,4			fe				
Colza oil		N	–	<100	S1	02		1	S	B	V	G	G				fl		0... –2		0,91
Condensated milk		N	–	<Kp	S1	02		1	S	B	V	G	G				fl				
Cooling brine → *Calcium chloride*																					
Copper chlorides:																					
Cupric acetate	$C_4H_6CuO_4$		<L	<40	S1	02		1	V	B	E	G	G				kr	II	115	Z~240	1,882
Cuprous chloride	CuCl		<L	<Kp	D1	11		1	V	B	E	G	G	2,3			kr	1,5	430	1490	4,14
Cupric chloride	$CuCl_2$		<L	<Kp	D1	11		1	V	B	E	G	G	2,3			kr	42,2		Z510	3,386
Cupric cyanide suspension			<10	<Kp	D1	11		1	V	B	M_1	G	G	G,H	5		kr	unl	473		2,92
Cupric nitrate	$Cu(NO_3)_2$		<L	<60	S1	02		5	Q_1	Q_1	E	G	G				kr	57,0		S>150	
	$Cu(NO_3)_2$		<L	<Kp	D1	11		1	Q_1	Q_1	M_2	G	G								
Cupric sulphate (blue vitriol)	$CuSO_4*5+H_2O$		<L	<Kp	S1	02		5	Q_1	Q_1	E	G	G				kr	16,9			3,603
Corn mash		N	–	<Kp	S1	02		1	S	B	V	G	G				fl				
Corn oil		N	–	<100	S1	02		1	S	B	V	G	G				fl		–18 ... –10		0,91...0,93
Cottonseed oil		N	–	<120	S1	02		1	S	B	V	G	G				fl		–2		0,92
Cream		N	–	<60	S1	02		1	S	B	V	G	G				fl				
Creosot			–	<Kp	S1	02		1	S	B	M_1	G	G				fl			200...220	1,08...1,09
Cresols:	C_7H_8O																				
p-Cresol	C_7H_8O		Sch	<Kp	D1	11		1	V	A	M_1	G	G	G,H,R	5		fe		36	202	1,018
m-Cresol	C_7H_8O		Sch	<Kp	D1	11		1	V	A	M_1	G	G	G,H,R	5		kr	2,6	31	191	1,046
o-Cresol	C_7H_8O			<Kp	D1	11		1	V	A	M_1	G	G	G,H,R	5		fl		12	203	1,035
Crude oil, free from solid particles		N	–	<100	S1	02		1	S	B	V	G	G				fl				
Crude oil, refined		N	–	<80	S1	02		1	S	B	V	G	G				fl				
Crude oil, with sand		N	–	<100	S1	02		1	Q_1	Q_1	V	G	G				fl				
Crude oil + salt water		N	–	<25	S1	02		1	V	B	V	G	G				fl				
Crude soap			–	>F<100	S1	02		1	S	B	V	G	G				fl				
Cryolith (suspension)	$Na_3(AlF_6)$		<30	<Kp	S3	00	kD	3	Q_1	Q_1	E	G	G				kr	unl	~1000		2,95
Cumol (isopropylbenzene)	C_9H_{12}		–	<Kp	D1	11		1	V	B	M_1	G	G	H,R	50		fl		–96	152 ... 153	0,864
Curd		N	–	<60	S1	02		1	S	B	V	G	G				pa				
Cutting fluid → *Metal working lubricants*																					
Cyanide of potassium → *Potassium cyanide*																					
Cyclohexane	C_6H_{12}		–	<Kp	S1	02		1	S	B	V	G	G		300		fl		7	80	0,788
Cyclohexanol	$C_6H_{12}O$		–	>F<Kp	S1,Q3	10		1	S	B	M_1	G	G	X,H,R,6	50		fe		25	161	0,962
Cyclohexanone	$C_6H_{10}O$		–	<Kp	S1,Q3	10		1	S	B	M_1	G	G	C3,H,R,X	*		fl		–45	155	0,964
Cyclopentadiene	C_5H_6		–	<Kp	S1,Q3	10		1	S	B	M_1	G	G	1,6	75		fl		–97	40	0,802
Cymene *p-*; (Isopropyl-methyl-benzene)	$C_{10}H_{14}$		–	<60	S1	02		1	V	B	V	G	G	7			fl		–68	177	0,86
D																					
Decahydronaphthalene → *Decalin*																					
Decalin (decahydronaphthalene):	$C_{10}H_{18}$																				
cis-Decalin	$C_{10}H_{18}$		–	<Kp	S1,Q3	10		1	S	B	M_1	G	G	R,7			fl		–43	196	0,896
trans-Decalin	$C_{10}H_{18}$		–	<Kp	S1,Q3	10		1	S	B	M_1	G	G	R,7			fl		–30	187	0,870
Denatured alcohol → *Ethanol*																					
Desalinated water → *Water*																					
Desmodur R		®	–	<Kp	D1	11		1	S	B	M_1	G	G	G,0			fl				
Desmodur T		®	–	<Kp	D1	11		1	S	B	M_1	G	G	G,0			fl				
Desmophen		®	–	<Kp	D1	11		1	S	B	M_1	G	G	0			fl				
Detergents		S			S1	02		1	S	B	V	G	G								
Dextrin (starch gum)		G	<L	<Kp	D1	11		1	S	B	V	G	G				fe	sll			
Dextrose → *Glucose*																					
Diacetone alcohol (4-hydroxy-4-methyl-2-pentanone)	$C_6H_{12}O_2$		–	<Kp	S1,Q3	10		1	S	B	M_1	G	G	R,6	50		fl		–54	168	0,93...0,94
Diallyl phthalate → *Phthalic acid esters*																					
Diammonium hydrogen phosphate → *Ammonium phosphate, secondary*																					
Dibromomethane (ethylene bromide)	$C_2H_4Br_2$		–	<100	D1	11		1	V	B	M_2	G	G	C2,H,R,G	*		fl		10	132	2,2
Dibuthyl ether	$C_8H_{18}O$		–	<Kp	S1,Q3	10		1	V	B	M_1	G	G	R,6			fl		–98	142	0,769

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** Stat. face	**3** Sec. seal	**4** Spring	**5** Others	Hazard reference	TLV-value	Normal condition	Solu-bility	Melting temperature ° C	Boiling point ° C	Density g/cm³
1		2	3	4	5	6	7	8						10	11	12	13	14	15	16
Dibutyl phthalate (DBP) → *Phthalic acid esters*																				
Dichlorobenzenes:																				
1,2-Dichlorobenzene (ortho-dichlorobenzene)	$C_6H_4Cl_2$		–	<Kp	S1,Q3	10		1	S	B	M_1	G	G		50	fl		–17	180	1,306
1,3-Dichlorobenzene (meta-dichlorobenzene)	$C_6H_4Cl_2$		–	<Kp	S1,Q3	02		1	S	B	M_1	G	G			fl		–25	173	1,288
1,4-Dichlorobenzene (para-dichlorobenzene)	$C_6H_4Cl_2$		–	>F<Kp	S1,Q3	10		1	S	B	M_1	G	G		50	fe		53	174	1,248
Dichloroethanes:																				
1,1-Dichloroethane	$C_2H_4Cl_2$		–	<Kp	S1,Q3	09		1	V	B	M_1	G	G	X,7	100	fl		–97	57	1,175
1,2-Dichloroethane	$C_2H_4Cl_2$		–	<Kp	S1,Q3	09		1	V	B	M_1	G	G	C2,R,7	*	fl		–36	83	1,26
Dichloroethylenes:	$C_2H_2Cl_2$																			
1,1-Dichloroethylene	$C_2H_2Cl_2$		–	<Kp	D1	11		1	S	B	V	G	G	C3,R,3,7	2	fl		–122	32	1,213
1,2-Dichloroethylene (cis-)	$C_2H_2Cl_2$		–	<Kp	S1	02		1	S	B	V	G	G		200	fl		–81	60	1,284
1,2-Dichloroethylene (trans-)	$C_2H_2Cl_2$		–	<Kp	S1	02		1	S	B	V	G	G		200	fl		–50	47*	1,257
Dichloromethane → *Methylene chloride*																				
Didecyl phthalate → *Phthalic acid esters*																				
Diesel fuel		G	–	<80	S1	02		1	S	B	V	G	G			fl			200...360	0,83...0,88
Diethanolamine (DEA, 2,2'-iminodiethanol)	$C_4H_{11}NO_2$		–	>F<180	S1	02		1	V	B	M_2	G	G			kr		28	268	1,093
Diethyl ether ('ether', ethyl ether)	$C_4H_{10}O$		–	<Kp	S1,Q3	02		1	S	B	M_2	G	G			fl		–116	34	0,715
Diethyl phthalate (DEP) → *Phthalic acid esters*																				
Diethylamine	$(H_5C_2)_2NH$		–	<Kp	S1,Q3	10		1	V	B	M_2	G	G	R,7	10	fl		–50	55	0,711
Diethylene glycol → *Ethylene glycols*																				
Diethylene triamine	$C_4H_{13}N_3$		–	<180	S1	02		1	V	B	M_2	G	G			fl		–39	207	0,959
Digester liquor, acid (sulfite chemical pulp)		V		<140	S3	00	kD	3	Q_1	Q_1	V	M	G			fl				
		V		>140	D1	11		1	V	B	M_2	G	G	1,4						
Digester liquor, basic (sulfate chemical pulp)		V		<120	S3	00	kD	3	Q_1	Q_1	E	M	G			fl				
		V		>120	D1	11		1	V	B	M_2	G	G	1,4						
Diglycolic acid (2.2'-oxidiacetic acid)	$C_4H_6O_5$		<L	<60	S1	02		1	V	B	E	G	G			fe	I	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	S1	02		1	S	A	M_1	G	G			fl				
Dimethyl formamide (DMF)	C_3H_7NO		–	<Kp	S1,Q3	10		1	S	B	M_2	G	G	X,H,R	10	fl		–61	153...154	0,9445
Di-(methyl glycol)-phthalate → *Phthalic acid esters*																				
Dimethyl phthalate (DMP) → *Phthalic acid esters*																				
Dimethyl sulfate	$C_2H_6O_4S$		–	<Kp	D1	11		1	S	B	M_1	G	G	C2,H,A,G	*	fl		–32	191	1,33
Dimethyl sulfoxide (DMSO)	C_2H_6OS		–	<60	S1	02		1	S	B	V	G	G			fl		19	189	1,104
Dimethyl terephthalate (DMT)	$C_{10}H_{10}O_4$		<L	<60	S1	02		1	S	B	M_1	G	G			kr		141	288	
	$C_{10}H_{10}O_4$		Sch	>F<Kp	S1	01	(H)	6	A	S	G	T_6	F							
Dinonyl phthalate → *Phthalic acid esters*																				
Dioctyl phthalate (DOP) → *Phthalic acid esters*																				
Dipentene	$C_{10}H_{16}$		–	<60	S1	02		1	S	B	V	G	G	R		fl		–89	178	0,841
Dipentyl phthalate → *Phthalic acid esters*																				
Diphenyl, diphenyl ether → *Heat transfer oils*																				
Diphyl → *Heat transfer oils*		®																		
Distilled water → *Water*																				
Disulfur decafluoride → *Sulfur fluorides*																				
Disulfur dichloride → *Sulfur chlorides*																				
Disulfur difluoride → *Sulfur fluorides*																				
Divinyl benzene (m-), (vinyl styrene)	$C_{10}H_{10}$		–	<Kp	S1,Q3	10		1	V	B	M_1	G	G	X,R		fl		–67	199	0,9289
Dodecyl benzene	$C_{18}H_{30}$		–	<60	S1	02		1	S	B	V	G	G			fl			280...310	0,863
Dowtherm → *Heat transfer oils*		®																		
Drinking water, industrial water → *Water*																				
Dye liquor with bleaching additives		G	–	<160	S1	02		1	Q_1	B	M_1	G	G			fl				
Dye liquor without bleaching additives		G	–	<140	S1	02		1	S	B	V	G	G			fl				

Media					Mechanical seal										Additional information on the medium						
Code of Materials and legend seeinside 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 reference	TLV-value	Normal condition	Solu-bility	Melting temperature ° C	Boiling point ° C	Density g/cm³
									1	2	3	4	5								
									Seal face	Stat. face	Sec. seal	Spring	Others								
1		2	3	4	5	6	7	8							10	11	12	13	14	15	16
E																					
Edible oil		N	–	<100	S1	02		1	S	B	V	G	G				fl				
Egg flip		N	–	<Kp	D1	11		1	S	B	V	G	G		3,4		fl				
Egg yolk		N	–	<Kp	S1,Q3	10		1	S	B	V	G	G		3,4		fl				1,08
Electrophoretic varnishes		G	Sus		D2			X	Q_1	Q_1	V	T_6	F								
Enamel slip			Sus	<40	D1	11		5	Q_1	Q_1	P	G	G		4						
Engobes (special clays)			Sus	<40	D1	11		5	Q_1	Q_1	P	G	G		4						
Epichlorohydrine (ECH)	C_3H_5ClO		–	<Kp	D1	11		1	S	B	M_2	G	G		C2,H,R,G	*	fl		–48	117	1,18
Epoxy resins and lacquers			Sus	<Kp	D1	11		1	V	B	M_1	G	G		4,3		fl				
Essential oils → *Volatile oils*																					
Essotherm → *Heat transfer oils*		®																			
Esters (not specified); also refer to → *Acetic acid esters*		S	–	<Kp,TG	S1,Q3	11		1	S	B	M_2	G	G		(7),0		fl				
Ethanal → *Acetaldehyde*																					
Ethane	C_2H_6		–	<60	D1	11		1	S	B	V	G	G		1,7		ga		–171	–88	(+)
Ethane diamine → *Ethylene diamine*																					
Ethanediol → *Ethylene glycol*																					
Ethanol	C_2H_5OH		–	<Kp	S1	02		1	S	B	E	G	G		7	1000	fl		–114	78	0,794(15)
Ethanolamines → *Amino ethanols*																					
Ethene → *Ethylene*																					
Ethenyl ... → *Vinyl ...*																					
Ether → *Diethyl ether*																					
Ether sulfates		S	–	<60	S1	02		1	S	B	V	G	G				fl				
Ethyl acetate → *Acetic acid ethyl ester*																					
Ethyl acetoacetate	$CH_3COCH_2CO_2C_2H_5$		–	100	S1	02		1	V	B	M_2	G	G				fl		–45	180	1,025
Ethyl acrylate → *Acrylic esters*																					
Ethyl alcohol → *Ethanol*																					
Ethyl amine (amino ethane)	C_2H_7N		–	<60	D1	11		1	S	B	E	G	G		R,1,7	10	ga		–80	17	(+)
Ethyl benzene	C_8H_{10}		–	<Kp	S1,Q3	10		1	S	B	M_1	G	G		H,R,7	100	fl		–94	136	0,867
Ethyl chloride (chloroethane, 'chloroethyl')	C_2H_5Cl		–	<60	D1	11		1	V	B	M_1	G	G		1,7	1000	ga		–138	12	(+)
Ethyl ether → *Diethyl ether*																					
Ethyl formiate → *Formic acid ethyl esters*																					
Ethyl hexanol (isooctanol)	$C_8H_{18}O$		–	<100	S1	02		1	S	B	V	G	G				fl		<–76	183	0,834
Ethylene (ethene)	C_2H_4		–	<–20	D1	11	ThE	6	A	Q_1	V	T_6	G_1		1,7		ga		–169	–104	(–)
Ethylene bromide → *Dibromomethane*																					
Ethylene chloride → *Dichloroethanes*																					
Ethylene chlorohydrine (2-chloroethanol)	C_2H_5ClO		–	<Kp	D1	11		1	S	B	M_1	G	G		G,H,R	1	fl		–63	129	1,197
Ethylene diamine	$C_2H_8N_2$		–	<60	S1,Q3	10		1	S	B	E	G	G		A,X	10	fl		9	116	0,9
Ethylene dichloride → *Dichloroethanes*																					
Ethylene glycols:																					
Diethylene glycol	$C_4H_{10}O_3$		–	<100	S1	02		1	S	B	E	G	G				fl		–10	245	1,12
Ethylene glycol (1,2-ethanediol, 'glycol')	$C_2H_6O_2$		–	<100	S1,Q3	10		1	S	B	E	G	G		H,X	10	fl		–11	198	1,113
Tetraethylene glycol	$C_8H_{18}O_5$		–	<100	S1	02		1	S	B	E	G	G				fl		–6	328	1,128
Triethylene glycol	$C_6H_{14}O_4$		–	<100	S1	02		1	S	B	E	G	G				fl		–7	285	1,1274
Ethylene oxide	C_2H_4O		–	<60	D1	11		1	S	B	M_2	G	G		C2,G,H,R,6,7	*	ga		–111	10	(–)
F																					
Faeces (feces)		N	–	<60	S1	02		1	Q_1	Q_1	V	G	G				fl				
Fats and fatty oils		N	–	<200	S1	02		1	S	B	M_1	G	G				fl				
Fatty acids		G	–	>F,<Kp	S1	02		1	V	B	M_1	G	G				fl				
Fatty acids (tall oil-)		G	–	>200	S1,Q3	10		6	A	Q_1	G	M_5	M				fl				
Fatty alcohol sulfates		G	<L	<Kp,>K	S1	02		1	V	B	V	G	G				fe				
Fatty alcohols		G	–	<100	S1	02		1	S	B	V	G	G				fl				
Ferric-phosphate solution in mineral acids			L	<100	D1	11	SW	1	V	B	M_1	G	G		2,0		kr				2,87
Ferricyanides		G	<L	<Kp,>K	S1	02		1	V	B	E	G	G				kr				
Finishing agents, dressing agents		S	–	<Kp	S1	02		1	S	B	V	G	G				fl				
Fir needle oils		G	–	<60	S1	02		1	S	B	V	G	G				fl				0,87...0,88
Fish glue		N	–	<60	S1,Q3	02		1	S	B	V	G	G		3		fl				
Fish liver oils		N	–	<100	S1	02		1	S	B	V	G	G				fl				
Fish meal		N	Sus	<60	S3	00		1	Q_1	Q_1	V	G	G				fe				
Fish offals		N	Sus	<60	S3	00		1	Q_1	Q_1	V	G	G				fe				
Fish oils		N	–	<100	S1	02		1	S	B	V	G	G				fl				
Fish slurry		N	Sus	<60	S3	00		1	Q1	Q_1	V	G	G				fe				
Fixative		G	<L	<60	S1,Q3	02		1	S	B	M_1	G	G		3		fe				
Fixing bath, acidous			–	<60	S1	02		1	S	B	V	G	G				fl				
Flue gas desulphurization plants (FGD): all acid suspensions		V	<25	<80	S3	00	kD	3	Q_1	Q_1	V	M	M				fl				
Fluoroacetic acid	$C_2H_3FO_2$		<L	<Kp	D1	11		1	V	B	M_1	G	G		G,2		kr	l	35	165	1,369
Fluoroboric acid	HBF_4		–	<60	D1	09		1	Q_1	Q_1	M_1	G	G		G,A,2		fl	sll			
Fluorosilicic acid	$H_2(SiF_6)$		–	<60	D1	09		1	Q_1	B	M_1	G	G		A,2		fl	sll			
	$H_2(SiF_6)$		<30	<25	S1	02		5	Q_1	Q_1	V	M	M								
Formaldehyde (methanal)	HCHO		–	<100	D1	11		1	V	B	M_2	G	G		C3,S,1,3	0,5	ga		–92	–19	(+)
Formalin	HCHO	®	~40	<Kp	S1,Q3	10		1	V	B	M_2	G	G		G,R		fl				1,122 40 %

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 reference	TLV-value	Normal condition	Solu-bility	Melting temperature ° C	Boiling point ° C	Density g/cm³
									1	2	3	4	5								
									Seal face	Stat. face	Sec. seal	Spring	Others								
1		2	3	4	5	6	7	8							10	11	12	13	14	15	16
Formamide	CH_3NO		–	<60	S1	02		1	S	B	E	G	G				fl		3	2210	1,13
Formic acid	HCOOH		100	TG	D1	11	SW	1	V	B	M_2	G	G		A,2	5	fl		100%8	100%101	100%1,22
Formic acid ethyl esters (ethyl formiate)	$C_5H_{10}O_2$		–	<Kp	S1,Q3	10		1	S	B	M_2	G	G		7	100	fl		–80	54	0,917
Formic acid methyl ester (methyl formiate)	$C_2H_4O_2$		–	<Kp	S1,Q3	10		1	S	B	M_2	G	G		G,7	100	fl		–100	32	0,976
	HCOOH		–	<80	S1	02	SS	1	V	B	M_2	M	M		A						
	HCOOH		<30	<60	S1	02	SS	1	V	B	M_2	G	G		A						
	HCOOH		>30	<30	S1	02	SS	1	V	B	M_2	G	G		A						
	HCOOH		>80	<40	S1	02	SS	1	V	B	M_2	G	G		A						
	HCOOH		>90	<50	S1	02	SS	1	V	B	M_2	G	G		A						
Formyl morpholine n-(4-morpholine aldehyde, NFM)	$C_5H_9NO_2$		–	<80	S1	02		1	S	B	M_1	G	G				fl		20...23	240	1,15
Freon → *Refrigerants*		®																			
Fresh sludge (sewage works)			–	<60	S1	00	kD	2	Q_{12}	Q_{12}	V	G	G				fl				
Frigen → *Refrigerants*		®																			
Fruit juices		N	–	<60	S1	02		1	S	B	V	G	G				fl				
Fruit mash → *Mashes*																					
Fruit pulp → *Mashes*																					
Fuel oils:																					
Fuel oil (bottoms)			–	<120	S1	02		1	Q_1	Q_1	V	G	G				fl				
Fuel oil EL			–	<120	S1	02		1	S	B	V	G	G				fl		Pp< –6	155...390	<0,86(15)
Fuel oil L			–	<120	S1	02		1	S	B	V	G	G				fl				<1,10(15)
Fuel oil M			–	<120	S1	02		1	S	B	V	G	G				fl				<1,20(15)
Fuel oil S			–	<120	S1	02		1	S	B	V	G	G						–10... +40		
Fumaric acid	$C_4H_4O_4$		<L	<100	S1	02		1	V	B	V	G	G				kr	0,7++	S200		1,625
Fuming ... acid → *...acid, fuming*																					
Furfurol (furfural, furaldehyde)	$C_5H_4O_2$		–	<100	D1	11		1	S	B	M_2	G	G		G,H,R	5	fl		–36	162	1,159
Furfuryl alcohol (2-furane methanol)	$C_5H_6O_2$		–	<100	S1,Q3	10		1	S	B	M_2	G	G		X,R	10	fl		–31	170	1,13
G																					
Gallic acid	$C_7H_6O_5$		<L	<100	S1	02		1	S	B	V	G	G				kr	1,2++	Z253		1,69
Galvanic baths			–	<60	S1	02		1	V	B	V	G	G				fl				
Gas → *Petrol*																					
Gas oil			–	<140	S1	02		1	S	B	V	G	G				fl			200...360	
			–	<220	S1,Q3	10		1	S	A	M_1	G	G				fl				
Gas scrubber water			–	<60	S1	02		1	S	B	V	G	G				fl				
Gasoline → *Petrol*																					
Gasoline-methanol mixture → *Petrol-methanol mixture*																					
Gelatin			–	<100	S1	02		1	S	B	V	G	G				fl				
Gilotherm → *Heat transfer oils*		®																			
Gingerbread dough			–	<60	D1	11		1	S	B	V	G	G		4		pa				
Glacial acetic acid → *Acetic acid*																					
Glauber salt → *Sodium sulphate*																					
Glazing slip			<50	<60	D1	11		5	Q_1	Q_1	V	G	G		4		pa				
Glucose D- (dextrose, grape sugar)	$C_6H_{12}O_6$		<L	<100	S1	02		1	S	B	V	G	G				kr	sll			1,56
Glues			–	<Kp	D1	11		1	S	B	V	G	G		3,4		fl				
Glutamic acid (2-aminoglutaric acid)	$C_5H_9NO_4$		<L	<100	S1	02		1	V	B	M_1	G	G				kr	wl	Z ~ 220		
Glutaric acid (pentene diacid)	$C_5H_8O_4$		<L	<Kp	S1	02		1	V	B	M_1	G	G				kr		97	303	1,43
Glycerol (1,2,3-propane triol, glycerin)	$C_3H_8O_3$		–	<120	S1	02		1	S	B	V	G	G				fl		19	Z290	1,261
Glycol → *Ethylene glycol*																					
Glycol ethers		G	–	<100	S1	02		1	S	B	E	G	G				fl				
Glycolic acid (hydroxyacetic acid)	$HOCH_2COOH$		<L	<60	S1	02		1	V	B	E	G	G				kr	ll	80	198	
Glycols (diols), general		G	–	<100	S1	02		1	S	B	E	G	G				fl				
Grape sugar → *D-Glucose*																					
Gypsum sludge	$CaSO_4*2H_2O$		<50	<60	D1	11		5	Q_1	Q_1	V	G	G		4		pa				
Gypsum suspensions (from FGD, all of them)	$CaSO4*2H_2O$		<25	<80	S3	00	kD	3	Q_1	Q_1	V	M	G				fl				
H																					
Hair lotions		G	–	<40	S1	02		1	S	B	V	G	G				fl				
Hair oils		G	–	<40	S1	02		1	S	B	V	G	G				fl				
Hair shampoos		G	–	<60	D1	11		1	V	B	V	G	G				fl				
Halocarbon		®	–	<200	S1	02		1	S	B	M_1	G	G				fl				
Heat transfer oils:		G																			
Vapour pressure at operating temperature < 2 bar			–	<400	S1,Q3	10		6	A	S	G	T_6	F		3		fl				
Vapour pressure at operating temperature <1 bar			–	<100	S1	02		1	S	B	V	G	G				fl				
			–	<220	S1,Q3	10		1	S	A	M_1	G	G		3		fl				
Vapour pressure at operating temperature > 2 bar			–	<400	D1	11		6	A	S	G	T_6	F		3		fl				
Helium	He		–	<80	D1	11		1	S	B	M_1	G	G		1		ga			–268	(–)
Heptane	C_7H_{16}		–	<Kp	S1	02		1	S	B	V	G	G		7	500	fl		–90	98	0,681
Hexachlorobenzene (HCB, perchlorobenzene)	C_6Cl_6		Sch	<Kp	D1	11		6	Q_{22}	Q_1	G	M_5	M		G,R,3,4		kr		231	323...326	2,044
Hexachlorobutadiene (perchlorobutadiene)	C_4Cl_6		–	<80	D1	11		1	V	B	V	G	G		C3,H		fl		–20	215	1,68

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 reference	TLV-value	Normal condition	Solu-bility	Melting temperature ° C	Boiling point ° C	Density g/cm³
									1 Seal face	2 Stat. face	3 Sec. seal	4 Spring	5 Others							
1		2	3	4	5	6	7	8						10	11	12	13	14	15	16
Hexachloroethane (perchloroethane)	C_2Cl_6		<L	<80	D1	11		1	S	B	V	G	G	G	1	kr		S187		2,09
Hexane -n	C_6H_{14}		–	<Kp	S1	02		1	S	B	V	G	G	X,7	50	fl		–95	68	0,66
Hexanone	$C_6H_{12}O$		–	Kp	S1,Q3	10		1	S	B	M_1	G	G	G	5	fl		–57	127	0,83
Honey		N	–	<100	D1	11		1	S	B	V	G	G	3,4		pa				
Hop mash → *Mashes*																				
Hot water → *Water*																				
Hydraulic fluids HFA, HFB, HFC			–	<70	S1	02		1	S	B	V	G	G			fl				
Hydraulic oils H, HL, HLP			–	<80	S1	02		1	S	B	V	G	G			fl				
Hydrazine	N_2H_4		–	<Kp	D1	11		1	S	B	E	G	G	A,C2,G,H,S	*	fl		2	113	1,011
Hydriodic acid	HI		–	<Kp	D1	11		1	Q_1	Q_1	M_1	G	G	A,R,2		fl			A127	1,7 A57
Hydrobromic acid	$HBr*2H_2O$		–	<Kp	D1	11	SW	1	Q_1	Q_1	M_1	G	G	G,A,R,2,6		fl			A126	1,5 A47,8
Hydrochloric acid	HCl		0,04	<20	S1,Q3	09		1	V	B	V	G	G	A,2	#7	fl			5%~101	10,5% 1,05
	HCl		<2	<65	S1,Q3	09		1	V	B	V	M	M	A,2	#7	fl			10%~103	20,4% 1,10
	HCl		<10	<25	S1,Q3	09		1	V	B	V	M	M	A,R,2	#7	fl			20%~110	24,3% 1,12
	HCl		<35	<20	S1,Q3	09		1	V	B	V	M	M	A,R,2	#7	fl			25%~107	28,2% 1,14
	HCl		–	<80	D1	09		1	V	B	V	G	G	A,R,2	#7	fl			30%~95	32,1% 1,16
	HCl																		35%~80	36,2% 1,18
	HCl																		40%~20	40,4% 1,20
Hydrocyanic acid	HCN		–	<Kp	D1	11		1	V	B	E	G	G	H,G,7	10	fl		–14	26	0,687
Hydrofluoric acid	HF		<40	<20	S1,Q3	09		1	Q_1	B	M_1	M	M	G,A	3	fl			A112	1,13 A38
	HF		<20	<30	S1,Q3	09		1	Q_1	B	M_1	M	M	G,A	3	fl			20%103	
	HF		–	<10	S1,Q3	09		1	Q_1	B	M_1	M	M	G,A	3	fl			60%80	
	HF		–	<Kp	D1	09		1	Q_1	Q_1	M_1	G	G	G,A,2	3	fl			100%20	
Hydrofluosilicic acid → *Fluorosilicic acid*																				
Hydrogen	H_2		–	<60	D1	11		1	S	B	E	G	G	1,7		ga		–259	–252	(–)
Hydrogen chloride	HCl		–	<60	D1	09		1	V	B	M_1	G	G	G,1,2,3	5	ga		–114	–85	(+)
Hydrogen fluoride (gas)	HF		–	<60	D1	09		1	Q_1	B	M_2	G	G	G,A,1,2	3	ga		–83	19	(+)
Hydrogen iodide	HI		–	>–20	D1	11		1	Q_1	Q_1	M_1	G	G	G,A,1		ga		–51	–35	(+)
Hydrogen peroxide	H_2O_2		<90	<Kp	D1	11		1	Q_1	Q_1	M_1	G	G		1	fl		0	150	1,4467
	H_2O_2		<60	<60	S1	02		1	Q_1	Q_1	V	G	G							
Hydrogen phosphide (phosphane, phosphine)	PH_3		–	<60	D1	11		1	V	B	M_1	G	G	G,1	0,1	ga		–133	–87	(+)
Hydrogen sulfide	H_2S		–	<100	D1	10		1	V	B	M_2	G	G	G,7,1	10	ga		–85	–60	(+)
Hydroxymethyl propionitril → *Acetone cyanohydrin*																				
Hypochloric acid	HOCl		–	<40	D1	11		1	V	B	V	G	G			fl				
I																				
Ice cream		N	–		E1	01		1	S	B	V	G	G			pa				
Insecticides (aqueous solution)		S	<L	<Kp	S1,Q3	10	QW	1	S	B	V	G	G	G/X,6						
Insulating lacquers		S	Sch	<200	D1	11		1	S	A	M_1	G	G	3,4		fe				
Iodine	I		Sch	<Kp	D1	11		1	Q_1	Q_1	M_1	G	G	X,4,6	0,1	fe	0,03	114	184	4,93
Iodoform (triiodine methane)	CHI_3		Sch	<200	D1	11		1	Q_1	Q_1	M_1	G	G	4,6		fe	unl	123	~218	4,008
Iron chlorides ($FeCl_2$ or $FeCl_3$)			<15	<25	S1	02		1	Q_1	Q_1	E	M	M			kr				
			<L	<Kp	D1	02		1	V	B	E	G	G			kr				
Iron sulfates:																				
Iron (II) sulfate (ferrous sulfate, iron vitriol)	$FeSO_4$		<L	<80	S1	02		5	Q_1	Q_1	V	G	G			kr	21,0			
Iron (III) sulfate (ferric sulfate)	$Fe_2(SO_4)_3$		<L	<80	S1	02		5	Q_1	Q_1	V	G	G			kr	I			
Iso ... also see → ...																				
Isoborneol (2-exo-bornanol)	$C_{10}H_{18}O$		<L	<Kp	S1	02		1	S	B	M_1	G	G			fe	unl	212		
Isobutyl acetate → *Acetic acid esters*																				
Isocyanates		S	Sch	<200	D1	11		1	V	B	M_2	G	G	G,R						
Isooctane (2,2,4-trimethyl pentane)	C_8H_{18}		–	<40	S1	02		1	S	B	V	G	G	7		fl		–107	99	0,692
Isooctanol (2-ethyl-1-hexanol) → *Ethyl hexanol*)	$C_8H_{18}O$																			
Isopentane → *Pentanes*	C_5H_{12}																			
Isophoron (3,5,5-trimethyl-2-cyclohexene-1-on)	$C_9H_{14}O$		–	<40	S1,Q3	10		1	S	B	E	G	G	R	5	fl		–8	215	0,92
Isopropanol → *2-Propanol*	C_3H_8O																			
Isopropyl ... →*Propyl ...*																				
Isopropyl alcohol → *2-Propanol*																				
Isopropyl methyl benzenes → *Cymenes*																				
Isopropylbenzene → *Cumol*																				
J																				
Jams, marmalades			–	<100	S1	02		1	V	B	V	G	G			pa				
Jet fuel IP4, IP5		G	–	<40	S1	02		1	S	B	V	G	G	7		fl			100...280	0,75...0,84
K																				
Kaurit → *Glues*																				
Kerosene			–	<100	S1	02		1	S	B	V	G	G			fl			175...325	~0,8
Ketchup		N	–	<80	S1,Q3	10		1	V	B	E	G	G	3		fl				
Kitchen salt → *Sodium chloride*																				
Krypton	Kr		–	<160	D1	11		1	S	B	M_1	G	G	1		ga		–157	–154	(+)

Media

Media					Mechanical seal										Additional information on the medium						
Code of Materials and legend see inside of back cover. Please observe the note	Chemical Formula	Remark	Concentration %	Temp. °C	Arrange-ment	Auxil. piping	Addit. measures	Seal type	Materials to EN 12756 1 Seal face	2 Stat. face	3 Sec. seal	4 Spring	5 Others		Hazard reference	TLV-value	Normal condition	Solu-bility	Melting temperature °C	Boiling point °C	Density g/cm³
1		2	3	4	5	6	7	8							10	11	12	13	14	15	16
L																					
Lacquer solvents		S	–	<Kp	S1	02		1	S	B	M_1	G	G				fl				
Lacquers		S	–	<Kp	D1	11		1	V	B	M_1	G	G		3,4		fl				
Lactic acid	$C_3H_6O_3$		<L	<80	S1	02		1	S	B	V	G	G		konz.: A		kr	sll	53		1,206
Lactose (milk sugar)	$C_{12}H_{22}O_{11}$		<L	<Kp	S1	02		1	V	B	V	G	G				kr	5,5–	233/252		1,525
	$C_{12}H_{22}O_{11}$		<20	<Kp	S1	02		5	Q_1	Q_1	V	G	G								
Lard		N	Sch	<100	S1	02		1	S	B	V	G	G				pa		36...42		
Latex (specification necessary)		N	–	<100	S3,Q3	11		X	U_2	V	M	G	G		3,4		fl				
Lavender oil		N	–	<Kp	S1	02		1	S	B	V	G	G				fl				0,88...0,90
Lead (II) acetate (lead sugar)	$(CH_3COO)_2Pb$		<L	<100	S1	02		1	S	B	E	G	G		G		kr	56(25)	75	Z~200	2,5
Lead sugar → *Lead (II) acetate*																					
Lecithine		N	–	<100	S1	02		1	S	B	M_1	G	G				pa			Z~200	
Lemonade syrup			–	<60	S1	02		1	V	B	V	G	G				fl				
Lemonades			–	<60	S1	02		1	S	B	V	G	G				fl				
Lignine sulfonic acid (lignine hydrogen sulfite)			<L	<100	D1	02		1	V	B	M_1	G	G		4		fe				
Lignite tar oil		N	–	<140	S1	02	(H)	1	S	B	V	G	G				pa			250 ... 350	0,85 ... 1,0
			–	<200	S1	02	(H)	1	S	A	M_1	G	G								
Lime milk (suspension of calcium hydroxide)	$Ca(OH)_2$		<10	<80	S1	02	kD	5	Q_1	Q_1	V	G	G				kr	0,17–			2,23
	$Ca(OH)_2$		<10	<80	S1,Q3	10	QW	2	Q_{12}	Q_{12}	V	G	G		6						
	$Ca(OH)_2$		<50	<80	S3	00	kD	3	Q_1	Q_1	V	G	G								
Lime powder suspension (calcium carbonate)	$CaCO_3$		<10	<80	S1	02	kD	5	Q_4	Q_4	V	G	G				kr	0,001	Z825		2,95
	$CaCO_3$		<10	<80	S1,Q3	10	QW	2	Q_{12}	Q_{12}	V	G	G		6						
	$CaCO_3$		<50	<80	S3	00	kD	3	Q_1	Q_1	V	G	G								
Limed juice → *Sugar juices*																					
Linseed oil		N	–	<60	S1	02		1	S	B	V	G	G				fl				0,92...0,94
Linters		N	Sus	<Kp	D1	11		1	V	B	V	G	G				fe				
Liquefied gases acc. to DIN 51622		G	–	<Kp	S1	02		1	Q_{12}	A	V	G	G		7		ga				
Liqueurs, liqueur wines			–	<60	S1	02		1	S	B	V	G	G				fl				
Liquid ... → ... ,*liquid*																					
Liquor → *Ethanol*																					
Liquorice		N	–	<Kp	D1	11		1	S	B	V	G	G		4		pa				
Lithium bromide	$LiBr*H_2O$		<L	<40	S1	02		1	Q_1	B	V	G	G				kr	61,5	547	1265	3,465
Lithium cloride	LiCl		<L	<20	S1	02		1	V	B	V	G	G				kr	45,0	613	1360	2,068
	LiCl		<L	<Kp	D1	11		1	V	B	M_1	G	G		2						
Liver sausage mass			–	<60	S1	02		1	S	B	V	G	G				pa				
Lubrication oils		S	–	>F<140	S1	02		1	S	B	V	G	G				fl				
Lysoform = 7,7-% → *Formaldehyde*																					
Lysol		®	–	<60	S1	02		1	V	B	V	G	G				fl				
M																					
m- ..., meta- ... → ...																					
Magnesium bisulfite → *Magnesium hydrogen sulfite*																					
Magnesium chloride	$MgCl_2$		<30	<20	S1	02		1	V	B	V	G	G				kr	35,2	708	1412	2,31...2,33
	$MgCl_2$		<L	<80	S1	02		1	V	B	V	M	M								
Magnesium hydrogen sulfite			<L	<Kp	D1	11		1	V	B	M_1	G	G				kr				
Magnesium hydroxide	$Mg(OH)_2$		<10	<25	S1	02		1	U_1	U_1	E	G	G				kr	sl			2,36
	$Mg(OH)_2$		<20	<40	S1	02		1	Q_1	Q_1	E	G	G								
	$Mg(OH)_2$		<40	<80	D1	11		1	Q_1	Q_1	E	G	G								
Magnesium nitrate	$Mg(NO_3)_2*6H_2O$		<L	<25	S1	02		1	V	B	M_1	G	G				fe	41,5	89		1,64
Magnesium sulfate	$MgSO_4$		<L	<Kp	S1	02		1	V	B	V	G	G				kr	25,8	1124		2,66
Maleic acid	$C_4H_4O_4$		<L	<100	S1	02		1	V	B	V	G	G				kr	79(25)	130...140		1,590
Malic acid (hydroxysuccinic acid)	$C_4H_6O_5$		<L	<60>K	S1	02		1	S	B	E	G	G				kr	II	100...132		
Malonic acid	$C_3H_4O_4$		<L	<60	S1	11		1	V	B	M_2	G	G		R		kr	78(25)	Z135		1,519
Manganese sulfates:																					
Manganese(II)-chloride	$MnCl*4H_2O$		<L	<Kp	D1	11		1	V	B	M_1	G	G		2		kr	42,3	650	1190	2,977
Manganese(II)-nitrate	$Mn(NO_3)_2*6H_2O$		<L	<Kp	S1	02		1	V	B	E	G	G				kr	56,7	26		1,82
Manganese(II)-sulfate	$MnSO_4$		<L	<60	S1	02		1	V	B	M_1	G	G				fe	38,7	700	Z850	3,25
Manganese(III)-sulfate	$Mn_2(SO_4)_3$		<L	<60	S1	02		1	V	B	M_1	G	G				kr		Z160		3,24
Manganese(IV)-sulfate	$Mn(SO_4)_2$		<L	<60	S1	02		1	V	B	M_1	G	G				kr				
Manure, liquid		N	–	<60	S1	02		1	Q_1	Q_1	P	G	G				fl				
Marlotherm → *Heat transfer oils*		®																			
Mashes:																					
Fruit mash			Sus	<Kp	S1	02		1	S	B	V	G	G				fl				
Fruit pulp			Sus	<Kp	S1	02		1	S	B	V	G	G				fl				
Hop mash			Sus	<Kp	S1	02		1	S	B	V	G	G				fl				
Mustard mash			Sus	<Kp	S1	02		1	V	B	V	G	G				fl				
Potato mash			Sus	<Kp	S1	02		1	S	B	V	G	G				fl				
Salt mash			<L	<Kp	S3,Q3	09		4	Q_1	Q_1	V	M	G		2,4,6		fl				
Masut			–	<100	S1	02		1	S	B	V	G	G				fl				
			–	<200	S1	02		1	S	A	M_1	G	G				fl				
Mayonnaise			–	<40	S1	02		1	V	B	V	G	G				pa				

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 Stat. face	3 Sec. seal	4 Spring	5 Others		Hazard reference	TLV-value	Normal condition	Solu-bility	Melting temperature ° C	Boiling point ° C	Density g/cm³
1		2	3	4	5	6	7	8							10	11	12	13	14	15	16
MDEA → *N-Methyl-2,2'-imino diethanole*	$C_5H_{13}NO_2$																				
MEA → *N-Methyl ethanolamine*	C_3H_9NO																				
Meat juice, meat broth		N	–	<60	S1	02		1	S	B	V	G	G				fl				
MEK → *Butanone*																					
Melamine resins		S	–	<100	D1	11		1	V	B	M	G	G		3,4		fl				
Mercaptanes → *Thiols*																					
Mercuric chlorides:																					
Mercuric chloride	$HgCl_2$		<L	<Kp	D1	11		1	V	B	V	G	G		G,A,2		kr	6,2++	276	302	5,44
Mercurous chloride (dissolved in benzene)	Hg_2Cl_2		<L	<100	D1	11		1	V	B	M_1	G	G		X,2		kr	unl	S383		7,15
Mercuric nitrates	$Hg_2(NO_3)_2$*$2H_2O$; $Hg_2(NO_3)_2$*H_2O		<L	<Kp	S1,Q3	10		1	V	B	V	G	G		G		kr	sll			
Mercury	Hg		–	<60	D1	11		1	S	B	V	G	G		G,4,6	0,01	fl		–38	356	13,5939
Mesityl oxide	$C_6H_{10}O$		–	<Kp	D1	11		1	S	B	M_1	G	G		X,3	25	fl		–42	130	0,854
Metal working lubricants:																					
for finishing machines			–	<80	D1	11		5	Q_1	Q_1	V	G	G				fl				
for other machine tools			–	<80	S1	02		5	Q_1	Q_1	V	G	G				fl				
Methacrylic acid methyl ester (methyl methacrylate)	$C_5H_8O_2$		–	<Kp	D1	11		1	V	B	M_2	G	G		S,R,7	50	fl		–48	100	0,944
Methanal → *Formaldehyde*																					
Methane	CH_4		–	<60	D1	11		1	U_2	A	V	G	G		1,7		ga		–182	–161	(–)
Methanol (methyl alcohol)	CH_3OH		–	<60	S1,Q3	10		1	S	B	E	G	G		G,H,7	200	fl		–98	64	0,787(25)
Methyl acetate → *Acetic acid methyl ester*																					
Methyl acrylate (acrylic acid methyl ester)	$C_4H_6O_2$		–	<Kp	D1	11		1	V	B	M_2	G	G		G,R,S,7	5	fl		–75	80	0,954
Methyl alcohol → *Methanol*																					
Methyl bromide (bromomethane)	CH_3Br		–	<60	D1	11		1	V	B	M_1	G	G		C3,G,H,1,2	5	ga		–94	4	(+)
3-Methyl-2-butanone (methyl isopropyl ketone)	$C_5H_{10}O$		–	<Kp	S1,Q3	10		1	V	B	M_2	G	G		R,7		fl		–92	95	0,80
Methyl butyrate → *Butyric acid esters*																					
Methyl cellosolve → *Ethylene glycol*																					
Methyl chloride	CH_3Cl		–	<80	D1	11		1	V	B	M_1	G	G		C3,X,7	50	ga		–97	–25	(+)
Methyl cyclohexanone	$C_7H_{12}O$		–	<Kp	S1,Q3	10		1	S	B	M_2	G	G		H,X	50	fl		–73...–14	165...170	0,92...0,93
Methyl ethanolamine N-	C_3H_9NO		–	Kp	S1,Q3	09		1	Q_1	B	M_2	G	G		A,R		fl		–3	158	0,937
Methyl ethyl ketone → *Butanone*																					
Methyl formiate → *Formic acid methyl ester*																					
Methyl isobutyl ketone (MIBK) → *4-Methyl-2-pentanone*																					
Methyl isopropyl ketone → *3-Methyl-2-butanone*																					
Methyl methacrylate (MMA) → *Methacrylic acid methyl ester*																					
Methyl naphthalenes:																					
1-Methyl naphthalene	$C_{11}H_{10}$		–	<160	S1	02		1	S	B	M_1	G	G				fl		–22	245	1,020
2-Methyl naphthalene	$C_{11}H_{10}$		Sch	<160	S1	02	(H)	1	S	B	M_1	G	G				kr	unl	35	241	1,005
Methyl pyrrolidone N- (1-methyl-2-pyrrolidinone, NMP)	C_5H_9NO		–	<100	S1	02		1	Q_1	B	M_2	G	G		H,R	20	fl		–24	206	1,028
Methylchloroform → *1,1,1-Trichloroethane*																					
Methylene chloride (dichloromethane)	CH_2Cl_2		–	<80	D1	11		1	V	B	M_1	G	G		C3,X,1,3,4	100	fl		–96	40	1,325
N-Methyl-2,2'-imino diethanole (methyl diethanolamine)	$C_5H_{13}NO_2$		–	<180	S1,Q3	09		1	Q_1	B	M_2	G	G		R		fl			246–249	1,04
Milk		N	–	<40	S1	02		1	S	B	V	G	G				fl				
Milk sugar → *Lactose*																					
Mineral oils		S	–	<80	S1	02		1	S	B	V	G	G				fl				
Miscella			–	<60	S1	02		1	S	B	V	G	G				fl				
Mobiltherm → *Heat transfer oils*		®																			
Molasses			–	<100	S1,Q3	10		1	Q_{12}	Q_{12}	V	G	G		3,4		fl				
Mono ... → ...																					
Monoethanolamine → *2-amino ethanol*																					
Mud			Sus	<40	S3,Q3	10	kD	3	Q_2	Q_2	V	M	G				fl				
Mustard			–	<60	S1,Q3	09		1	Q_1	Q_1	V	G	G				pa				
Mustard mash → *Mashes*																					
N																					
Naphtha		G	–	<Kp	S1	02		1	S	B	M_1	G	G				fl			30 ... >200	
Naphthalene	$C_{10}H_8$		Sch	<Kp	S1,Q3	10	(H)	1	S	B	M_1	G	G		R	10	kr	unl	81	218	1,02...1,25
Naphthenic acids		G	–	<60	S1	02		1	V	B	V	G	G				fl				
Naphthol dyes		G	<L	<140	S1	02		1	V	B	V	G	G				kr				

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** Stat. face	**3** Sec. seal	**4** Spring	**5** Others	Hazard reference	TLV-value	Normal condition	Solu-bility	Melting temperature ° C	Boiling point ° C	Density g/cm³
1		2	3	4	5	6	7	8						10	11	12	13	14	15	16
Naphthol dyes			<L	<140	S1	02		1	V	B	V	G	G			kr				
Naphthylamines:																				
1-Naphthylamine	$C_{10}H_9N$		Sch	<150	S1	02	(H)	1	V	B	M_2	G	G	X		kr	0,17	50	301	1,13
2-Naphthylamine	$C_{10}H_9N$		<L	<Kp	D1	11		1	V	B	M_2	G	G	C1,H,G	*	kr	wl++	113	306	1,216
Natural gas			–	<60	D1	11		1	S	A	V	G	G	1,7		ga				
Neon	Ne		–	<80	D1	11		1	S	B	N	G	G	1		ga		–248	–247	(–)
Neopentane (2,2-dimethyl propane) → *Pentanes*																				
NFM → *n-Formyl morpholine*																				
Nickel (II)-chloride	NiCl		<L	<Kp	D1	11		1	V	B	M_1	G	G	G,2		kr	38,0	1030		3,55
Nickel (II)-sulfate	$NiSO_4$		<L	<Kp	D1	11		1	V	B	M_1	G	G	G		kr	27,5	Z>840		3,68
Nitrating acid		G	–	<80	D1	11		1	V	B	M_1	G	G	2		fl				
Nitric acid	HNO_3		<40	<20	S1,Q3	10	QW	1	V	B	M_1	G	G	A,8	2	fl		10%–6	10% 102	10% 1,054
	HNO_3		<30	<90	S1,Q3	10	QW	1	Q_1	Q_1	M_1	G	G	A,8	2	fl		20%–18	20% 104	20% 1,115
	HNO_3		<50	<80	S1,Q3	10	QW	1	Q_1	Q_1	M_1	G	G	A,8	2	fl		30%–36	30% 107	30% 1,180
	HNO_3		<60	<70	S1,Q3	10	QW	1	Q_1	Q_1	M_1	G	G	A,8	2	fl		40%–28	40% 111	40% 1,246
	HNO_3		<70	<60	S1,Q3	10	QW	1	Q_1	Q_1	M_1	G	G	A,8	2	fl		50%–19	50% 115	50% 1,310
	HNO_3		<80	<50	S1,Q3	10	QW	1	Q_1	Q_1	M_1	G	G	A,8	2	fl		60%–21	60% 118	60% 1,367
	HNO_3		<90	<30	S1,Q3	10	QW	1	Q_1	Q_1	M_1	G	G	A,8	2	fl		70%–41	70% 120	70% 1,413
Nitric acid, fuming	HNO_3		>90	<120	D1	11	SW	1	Q_1	Q_1	M_1	G	G	A,2,8	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	$C_6H_5NO_2$		–	<80	D1	11		1	V	B	M_1	G	G	G,H	1	fl		5...6	211	1,19867
Nitrochloroform → *Trichloronitromethane*																				
Nitrogen	N_2		–	<100	D1	11		1	S	B	E	G	G	1		ga		–210	–196	(–)
Nitroglycerin			–	<60	D1	11		1	S	B	E	G	G	G,H,9	0,05	fl		14	Expl256	1,59
Nitromethane	CH_3NO_2		–	<Kp	D1	11		1	V	B	M_1	G	G	X,R,7		fl		–29	101	1,13
Nitrosyl sulfuric acid (nitrosyl hydrogen sulfate)	$NOHSO_4$		<L	<80	D1	11		1	V	B	M_1	G	G	G,A		kr		Z73		
NMP → *N-Methyl pyrrolidone*																				
Nonyl phenol	$C_{15}H_{24}O$		Sch	<220	S1,Q2	01	(H)	6	A	S	M_7	T_6	G_1	A		pa			295...304	0,968
O																				
o-..., ortho... → ...																				
Octane	C_8H_{18}		–	<Kp	S1	02		1	S	B	V	G	G	7	500	fl	unl	–57	126	0,703
4-tert.-Octyl phenol	$C_{14}H_{22}O$		Sch	<220	S1,Q2	01	(H)	6	A	S	M_7	T_6	G_1			fe		72...74	280...283	0,89(90)
Oil lacquer paints		G	–	<40	D1	11		1	S	B	M_1	G	G	3,4		fl				
Oils (not specified)		S	–	<100	S1	02		1	S	B	V	G	G			fl				
Oleic acid (9-octadecanoic acid)			–	<Z	S1,Q3	10		1	S	B	M_1	G	G	3		fl		16	Z80...100	0,8935
Oleum → *Sulfuric acid, fuming*																				
Olive oil		N	–	<100	S1	02		1	S	B	V	G	G			fl		~6		0,91...0,92
Oxalic acid (ethanedioic acid)	$C_2H_2O_4$		<L	<Kp	S1,Q3	10		1	V	B	V	M	M	A,H,R,X		kr	9,0++	S ab 100		1,901(25)
	$C_2H_2O_4$		<L	<25	S1,Q3	10		1	V	B	E	G	G	A,H,R,X						
2-Oxazolidinones (oxazolidones)	$C_3H_5NO_2$		Sch	<200	D1	11	(H)	1	Q_1	Q_1	M_1	G	G	3,4		kr		85...89	220(64)	
Ozon	O_3		–	<40	D1	11		1	Q_1	Q_1	K_5	G	G	G,1	0,1	ga		–192	–112	(+)
P																				
p-..., para-... → ...																				
Palatal		®	–	<60	S1,Q3	09		1	S	B	V	G	G	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	S1	01	(H)	6	B	Q_1	M_7	M_5	G_1			kr		63	390	0,8577
Paper pulp → *Pulp*																				
Paradichlorobenzene → *Dichlorobenzenes*																				
Paraffin waxes		G	Sch	<160	S1	02	(H)	1	S	B	V	G	G			pa				
Paraffins, paraffin oil		S	–	<160	S1	02		1	S	B	V	G	G			fl				
Paraterphenyl → *Terphenyls*																				
Paste (for gluing)		G		<Kp	D1	11		1	S	B	V	G	G	3,4		pa				
Peanut oil		N	–	<150	S1	02		1	S	B	V	G	G			fl				
Pentanes:	C_5H_{12}																			
Isopentane (2-methylbutane)	C_5H_{12}		–	<Kp	S1	02		1	S	B	V	G	G	7	1000	fl		–158	27	
Neopentane (2,2-dimethylpropane)	C_5H_{12}		–	<Kp	S1	02		1	S	B	V	G	G	7	1000	ga		–19	9	
n-Pentane	C_5H_{12}		–	<Kp	S1	02		1	S	B	V	G	G	7	1000	fl		–130	36	0,6262
Pentanols	$C_5H_{12}O$	G	–	<60	S1,Q3	10		1	S	B	E	G	G	R,X	$100	fl		§–75	$116	>0,81
Pentyl acetate → *Acetic acid pentyl esters*																				

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 reference	TLV-value	Normal condition	Solu-bility	Melting temperature ° C	Boiling point ° C	Density g/cm³
									1	2	3	4	5								
									Seal face	Stat. face	Sec. seal	Spring	Others								
1		2	3	4	5	6	7	8							10	11	12	13	14	15	16
Perchlorobenzene → *Hexachlorobenzene*																					
Perchloroethane → *Hexachloroethane*																					
Perchloroethylene → *Tetrachloroethylene*																					
Perhydrol ± → *Hydrogen peroxide, 30-% solution*																					
Petrol (gasoline, gas) unleaded, regular and supergrade		G	–	<40	S1	02		1	S	B	V	G	G		7		fl			40...200	0,72...0,76
Petrol ether → *Petrol, Gasoline*																					
Petrolatum		G	Sch	<160	S1	02		1	S	B	V	G	G				pa		38...60	>300	0,82...0,88
Petroleum		G	–	<160	S1	02		1	S	B	V	G	G				fl			150...280	
Petrol-methanol mixture		G	–	<40	S1	02		1	S	B	M_1	G	G		7		fl				
Phenol (carbolic acid)	C_6H_5OH		Sch	<Kp	D1	11		1	V	A	M_1	G	G		A,G,H	5	fe		33	182	1,06
Phenol-cresol mixtures			Sch	<180	D1	11		1	V	A	M_1	G	G		A,G,H,R	5					
Phenol ether (phenyl ether)		S	–	<100	D1	11		1	S	B	M_1	G	G		teilw. G;O		fl				
Phenolic resins		S		<200	D1	11		1	S	A	M_1	G	G		3,0		fl				
Phenyl ethylene → *Styrene*																					
Phenylacetic acid	$C_8H_8O_2$		<L	<Kp	S1,Q3	10		1	V	B	M_2	G	G		3		kr	1,8++	76	266	1,08
Phenylene diamines (diaminobenzenes):																					
m-Phenylene diamine	$C_6H_8N_2$		<L	<Kp	S1,Q3	10		1	S	B	M_1	G	G		C3,G,R	*	kr	sll	63	287	1,11
o-Phenylene diamine	$C_6H_8N_2$		<L	<Kp	S1,Q3	10		1	S	B	M_1	G	G		C2,G	*	kr	wl	102...104	256...258	1,27
p-Phenylene diamine	$C_6H_8N_2$		<L	<Kp	D1	11		1	S	B	M_1	G	G		C3,G,H,R,S	0,1 mg	kr	4,7	145...147	267	1,135
Phosgene (carbonyl dichloride, chlorocarbonic acid)	$COCl_2$		–	<60	D1	11		1	V	B	M_1	G	G		G	0,1	ga		–128	7	(+)
Phosphatizing baths:			<L	<60	D1	11		1	Q_1	Q_1	M_1	G	G				fl				
'Iron phosphatizing solution'			<L	<60	S1	02		5	Q_1	Q_1	V	G	G				fl				
'Zinc phosphatizing solution'			<L	<60	D1	11		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):																					
Pure acid			<65	<40	S1,Q3	09		1	V	B	V	G	G		6		fl				
			<65	<80	S1,Q3	09		1	V	B	V	M	M		6		fl				
Raw acid, produced thermally			<55	<80	S1	00		3	Q_1	Q_1	V	M	G				fl				
			<55	<120	D1	09		1	V	B	M_1	G	G		2,6		fl				
Raw acid, produced wet			<65	<80	S3	00	kD	4	Q_1	Q_1	V	M	G				fl				
			<65	<160	D1	11		1	Q_1	Q_1	M_1	G	G		2,6		fl				
Superphosphoric acid			<85	<160	D1	11		1	Q_1	Q_1	M_1	G	G		2,6		fl				
Phosphorus pentachloride	PCl_5		<L	<60	D1	11	SW	1	V	B	M_1	G	G		A,G,2,3	1 mg	kr	sll			2,114
Phthalic acid	$C_8H_6O_4$		<L	<Kp	S1,Q3	10		1	V	B	M_1	G	G		R		kr	0,57++	~208		1,59
Phthalic acid anhydride	$C_8H_4O_3$		<L	<180	S1,Q3	10		1	V	B	M_1	G	G		R	1 mg	kr	I	131	295	1,527
Phthalic acid esters (phthalates):																					
Benzyl butyl phalate (BBP)	$C_{19}H_{20}O_4$		–	<100	S1	02		1	S	B	M_1	G	G				fl			280(27)	1,093
Diallyl phthalate	$C_{14}H_{14}O_4$		–	<100	S1	02		1	S	B	M_1	G	G				fl			190(23)	1,122
Dibutyl phthalate (DBP)	$C_{16}H_{22}O_4$		–	<100	S1	02		1	S	B	M_1	G	G				fl			340	1,047
Didecylphthalat	$C_{28}H_{46}O_4$		–	<100	S1	02		1	S	B	M_1	G	G				fl		3...5		
Diethyl phthalate (DEP)	$C_{12}H_{14}O_4$		–	<100	S1	02		1	S	B	M_1	G	G				fl			298	1,118
Diisobutyl phthalate (DIBP)	$C_{16}H_{22}O_4$		–	<100	S1	02		1	S	B	M_1	G	G				fl			305...315	1,049
Diisodecyl phthalate (DIDP)	$C_{28}H_{46}O_4$		–	<100	S1	02		1	S	B	M_1	G	G				fl			255(7)	0,96...0,97
Diisononyl phthalate (DINP)	$C_{26}H_{42}O_4$		–	<100	S1	02		1	S	B	M_1	G	G				fl			270(27)	~0,97
Diisooctyl phthalate (DIOP)	$C_{24}H_{38}O_4$		–	<100	S1,Q3	10		1	S	B	M_1	G	G		6	10 mg	fl			228(7)	~0,985
Di-(methyl glycol)-phthalate	$C_{14}H_{18}O_6$		–	<100	S1	02		1	S	B	M_1	G	G				fl			204(7)	1,17
Dimethyl phthalate (DMP)	$C_{10}H_{10}O_4$		–	<100	S1	02		1	S	B	M_1	G	G				fl			284	1,191
Dinonyl phthalate	$C_{26}H_{42}O_4$		–	<100	S1	02		1	S	B	M_1	G	G				fl			275(27)	0,978
Dioctyl phthalate (DOP) = di (2-ethyl hexyl)-phthalate (DEHP)	$C_{24}H_{38}O_4$		–	<100	S1,Q3	10		1	S	B	M_1	G	G		6	10 mg	fl			216(7)	0,986
Dipentyl phthalate	$C_{18}H_{26}O_4$		–	<100	S1	02		1	S	B	M_1	G	G				fl			340...345	1,026
Diphenyl phthalate	$C_{20}H_{14}O_4$		–	<100	S1	02		1	S	B	M_1	G	G				fl			405	1,28
Pickling brine (agu. sol. of 15 ... 20 % NaCl)				<25	S1	02		1	V	B	V	G	G				fl				
Picric acid (2,4,6-trinitrophenol)	$C_6H_3N_3O_7$		<L	<40	D1	11		1	V	B	V	G	G		G,H,9	0,1 mg	kr	1,14++	122...123		1,69
Pine oil			–	<100	S1	02		1	S	B	V	G	G				fl			180...230	0,90...0,97
Polyglycols (polyalkylene glycols)				<100	S1	02		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	S1,Q3	10		1	V	B	P	M	M		6		kr	39,4	732	1435	2,75
	KBr		<L	<Kp	D1	11		1	V	B	V	G	G		2,6						
Potassium carbonate (potash), also see → *Benfield solution*			<L	<100	S1,Q3	09		1	V	B	E	G	G		6		kr	52,5	891		2,428
Potassium chlorate	$KClO_3$		<L	<Kp	D1	11		1	V	B	M_1	G	G		X,2,8		kr	6,5++	370		2,34
	$KClO_3$		<L	<60	S1,Q3	10		1	V	B	V	G	G		X,8						

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 reference	TLV-value	Normal condition	Solu-bility	Melting temperature ° C	Boiling point ° C	Density g/cm³
									1	2	3	4	5								
									Seal face	Stat. face	Sec. seal	Spring	Others								
1		2	3	4	5	6	7	8							10	11	12	13	14	15	16
Potassium chloride	KCl		<L	<60	S1,Q3	09		1	V	B	E	M	M		6		kr	25,5	776		1,984
	KCl		<50	<Kp	D1	11		1	V	B	M_2	G	G								
Potassium cyanate	KOCN		<L	<60	S1	02		1	V	B	E	G	G				kr	41,1	315		2,056
Potassium cyanide (cyanide of potassium)	KCN		<L	<80	D1	11		1	V	B	E	G	G		G		kr	40,4	605		1,56
Potassium dichromate	$K_2Cr_2O_7$		<L	<40	S1,Q3	10		1	V	B	E	G	G		R,6		kr	11,3	396		2,7
	$K_2Cr_2O_7$		<L	<Kp	D1	11		1	V	B	M_1	G	G		R,2,6						
Potassium hydrogen carbonate (potassium bicarbonate)	$KHCO_3$		<L	<60	S1,Q3	10		1	V	B	E	G	G		6		kr	25,0	Z~200		,17
Potassium hydroxide → *Caustic potash solution*	KOH																				
Potassium hypochlorite	KOCl		<L	<60	S1	02		1	V	V	M_2	M	M				fl				
Potassium nitrate	KNO_3		<L	<60	S1,Q3	10		1	V	B	P	G	G		6		kr	24,0	334		2,109
Potassium permanganate	$KMnO_4$		<L	<80	S1,Q3	10		1	V	B	E	G	G		X,3,8		kr	6,0++	Z~240		2,703
E: 93 °C; V: 60 °C	$KMnO_4$		<L	<Kp	S1,Q3	10		1	V	B	M_2	G	G		X,3,8						
Potassium peroxodisulphate (potassium persulfate)	$K_2S_2O_8$		<20	<60	S1,Q3	10		1	Q_1	Q_1	V	G	G		3,8		kr	4,5++	Z~100		
Potassium phosfates			<L	<Kp	S1,Q3	10		1	V	B	V	G	G		3		kr	II			
Potassium silicates			<20	<Kp	D1	11		1	S	B	E	G	G		3,4		kr				
Potassium sulfate	K_2SO_4		<L	<60	S1,Q3	10		1	V	B	V	G	G		3		kr	10,0	1069	1689	2,67
Potato mash → *Mashes*																					
Potato scrapings		N	<30	<60	S1	00	kD	1	S	B	V	G	G				pa				
Potato starch		N	–	<Kp	D1	11		1	S	B	V	G	G		3,4						
Propane, liquefied	C_3H_8		–	>–20	S1	02		1	Q_1	A	V	G	G		7	1000	ga		–187	–42	(+)
Propanediols:																					
1,2-Propanediol (propylene glycol)	$C_3H_8O_2$		–	<100	S1	02		1	S	B	V	G	G				fl		–60	188	1,0381
1,3-Propanediol (trimethylene glycol)	$C_3H_8O_2$		–	<100	S1	02		1	S	B	V	G	G				fl			214	1,0597
Propanols:																					
1-Propanol (n-propyl alcohol)	C_3H_7OH		–	<Kp	S1	02		1	S	B	E	G	G		7		fl		–127	97	0,804
2-Propanol (isopropyl alcohol)	C_3H_7OH		–	<Kp	S1	02		1	S	B	E	G	G		7		fl		–89	82	0,7855
Propene, liquefied	C_3H_6		–	>–20	S1	02		1	Q_1	A	V	G	G		7		ga		–185	–48	(+)
Propinaldehyde (propanal, propylaldehyde)	C_3H_6O		–	<Kp	S1	02		1	S	B	M_1	G	G		R,7		fl		–81	49	0,807
Propine, liquefied	C_3H_4		–	>–20	S1	02		1	Q_1	A	V	G	G			1000	ga		–103	–23	(+)
Propionic acid	$C_3H_6O_2$		–	<Kp	D1	11		1	V	B	M_2	G	G		A,R	10	fl		–22	141	0,992
Propyl acetates:	$C_5H_{10}O_2$																				
1-Propyl acetate (n-propyl acetate)	$C_5H_{10}O_2$		–	<80	S1,Q3	10		1	S	B	M_2	G	G		7	200	fl		–92	102	0,887
2-Propyl acetate (isopropyl acetate)	$C_5H_{10}O_2$		–	<80	S1,Q3	10		1	S	B	M_2	G	G		7	200	fl		–73	90	0,872
Propyl alcohols → *Propanols*																					
Propylene → Propene																					
Propylene glycols → *Propanediols*																					
Propylene oxide	C_3H_6O		–	<Kp	D1	11		1	S	B	K	G	G		C2,G,7		fl		–112	35	0,859
Prussic acid → *Hydrocyanic acid*																					
Pulp, cellulose < 1.5 % dry weight				<90	S1	02		2	B	Q_1	V	G	G								
< 3 % dry weight				<90	S1	00	kD	2	Q_{12}	Q_{12}	V	G	G								
>3 % dry weight				<90	S3	00	kD	3	Q_1	Q_1	V	G	G								
Pydraul		®	–	<80	S1	02		1	S	B	E	G	G				fl				
Pyridine	C_5H_5N		–	<40	S1,Q3	10		1	S	B	M_2	G	G		X,7	5	fl		–42	115	0,982
Pyrogallol (pyrogallic acid)			<L	<100	S1,Q3	10		1	V	B	M_1	G	G		X,3		kr	30(13)	133...134	309	1,453
Pyrrolidone	C_4H_9N		<L	<100	S1	02		1	S	B	M_3	G	G				kr	sll	25	Z~250	1,116
		Sch	<100	S1	02		1	S	B	M_3	G	G								
P-3 lye, clean			–	<60	S1	02		1	V	B	E	G	G				fl				
P-3 lye; containing fats, oils and dirt		V	–	<100	S1	02		1	Q_1	Q_1	M_1	G	G				fl				
Q																					
Quenching oil		G	–	<200	S1	08a		1	Q_1	Q_1	M_1	G	G				fl				
R																					
Rapeseed oil → *Colza oil*																					
Raw juice → *Sugar juices*																					
'Refrigerant oil' saturated with R...		G	–	<100	S1	02		1	Q_1	A	M_4	G	G				fl				
Refrigerants, DIN 8962																					
R 12B2			–	<25	S1	02		1	Q_1	A	M_1	G	G			100	fl		–141	23	2,215
R 14			–	>–40	D1	11		1	S	B	M_4	G	G		1,4		ga		–184	–128	(+)
R 21			–	>–40	D1	11		1	S	B	M_4	G	G		X,1,4	10	ga		–135	9	(+)
R 22	$CHClF_2$		–	>–40	D1	11		1	S	B	M_4	G	G		1,4	500	ga		–160	–41	(+)
R 23			–	>–40	D1	11		1	S	B	M_4	G	G		1,4		ga		–155	–82	(+)
R 32			–	>–40	D1	11		1	S	B	M_4	G	G		1,4		ga		–136	–52	(+)
R 116			–	>–40	D1	11		1	S	B	M_4	G	G		1,4		ga		–101	–78	(+)
R 133a			–	>–40	D1	11		1	S	B	M_4	G	G		1,4		ga		–101	6	(+)
R 142b			–	>–40	D1	11		1	S	B	M_4	G	G		1,4	1000	ga		–131	–10	(+)
R 143			–	>–40	D1	11		1	S	B	M_4	G	G		1,4		ga		–111	–47	(+)
R 152a	F_2HCCH_3		–	>–40	D1	11		1	S	B	M_4	G	G		1,4		ga		–117	–25	(+)
R 218			–	>–40	D1	11		1	S	B	M_4	G	G		1,4		ga		–183	–37	(+)
R 610			–	>–40	D1	11		1	S	B	M_4	G	G		1,4		ga			–2	(+)

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 reference	TLV-value	Normal condition	Solu-bility	Melting temperature ° C	Boiling point ° C	Density g/cm³
									1 Seal face	2 Stat. face	3 Sec. seal	4 Spring	5 Others								
1		2	3	4	5	6	7	8							10	11	12	13	14	15	16
R 1112a			–	<20	S1	02		1	Q_1	A	M_4	G	G			fl		–127	20	1,555
			–	>20	D1	11		1	S	B	M_4	G	G	1,4						
R 1113			–	>–40	D1	11		1	S	B	M_4	G	G	1,4		ga		–158	–28	(+)
R 1122			–	>–40	D1	11		1	S	B	M_4	G	G	1,4		ga		–138	–18	(+)
R 1132a			–	>–40	D1	11		1	S	B	M_4	G	G	C3,1,4		ga		–144	–86	(+)
RC 318			–	<–40	D1	11		1	S	B	M_4	G	G	1,4		ga		–41	–6	(+)
Rinsing agent (industrial)			–	<100	S1	02		1	S	B	V	G	G							
				<80	S1	02		1	S	B	P	G	G							
S																					
Saccharose (sugar)	$C_{12}H_{22}O_{11}$		<L	<Kp	D1	11		1	S	B	V	G	G	3,4		kr	66,7	185...186		1,588
Sal ammoniac, salmiac → *Ammonium chloride*																					
Salicylic acid	$C_7H_6O_3$		<L	<25	S1	02		1	V	B	E	G	G			kr	sl	157...159	211(27)	1,44
	$C_7H_6O_3$		Sch	<180	D1	11	(H)	1	V	B	M_2	G	G	2,3						
Salt mashes → *Mashes*																					
Santotherm → *Heat transfer oils*		®																			
Sea water → *Water*																					
Sewage sludge		G		<80	S1	08a		1	Q_1	Q_1	V	G	G			pa				
Sewage water → *Water*																					
Shampoo → *Hair shampoos*																					
Silicon chlorides:																					
Disilicon Hexachloride (hexachlorodisilane)	Si_2Cl_6		–	<Kp	D1	11		1	V	B	M_1	G	G	R,3		fl		–1	147	1,58
Silicon Tetrachloride (tetrachlorosilane)	$SiCl_4$		–	<Kp	D1	11		1	V	B	M_1	G	G	R,3		fl		–70	57	1,483
Silicones, silicone oils			–	<100	S1	02		1	S	B	E	G	G			fl				
Silver nitrate	$AgNO_3$		<L	<Kp	S1,Q3	09		1	Q_1	Q_1	M_2	G	G	A		kr	68,3	212	Z444	4,352
Skin creams		G	–	<60	S1	02		1	S	B	V	G	G			pa				
Skydrol → *Hydraulic fluids HFC*		®																			
Soap solution			–	<Kp	S1	02		1	S	B	V	G	G			fl				
Soda → *Sodium carbonate*																					
Soda lye → *Caustic soda solution*																					
Sodium	Na		Sch	<200	D1	11	(H)	1	Q_1	Q_1	M_1	G	G	A,7		fe		98	892	0,971
Sodium acetate	$C_2H_3NaO_2$		<L	<Kp	S1	02		1	V	B	M_2	G	G			kr	II	58		1,54
Sodium bi ... → *Sodium hydrogen ...*																					
Sodium bleaching lye → *Sodium hypochlorite*																					
Sodium carbonate (soda)	Na_2CO_3		<L	<80	S1,Q3	10		1	S	B	E	G	G	R,4		kr	17,9	854		2,532
Sodium chlorate	$NaClO_3$		<L	<Kp	D1	11		1	V	B	M_1	G	G	X,3,8		kr	49,5	248...261		2,49
Sodium chloride	NaCl		<L	<80	S1,Q3	02		5	Q_1	Q_1	E	M	M			kr	26,5	801	1440	2,164
	NaCl		<5	<30	S1	02		1	V	B	E	G	G							
Sodium chlorite	$NaClO_2$		<L	<25	S1	02		5	Q_1	Q_1	V	G	G	X		kr	II	Z ~ 180		
Sodium cyanide	NaCN		<L	<Kp	D1	11		1	V	B	M_2	G	G	G,H	5	kr	36,7	564	1496	1,546
Sodium dichromate (VI)	$Na_2Cr_2O_7$		<L	<Kp	D1	11		1	V	B	M_1	G	G	C2,G,R	*	kr	65,0	357	Z>400	2,52
Sodium disulfite	$Na_2S_2O_5$		<L	<100	S1	02		5	Q_1	Q_1	V	G	G			kr	39,0	Z>150		1,48
Sodium dithionite	$Na_2S_2O_4$		<L	<60	S1,Q3	10		5	Q_1	Q_1	E	G	G	R,X,3		kr	18,3	Z ~ 80		2,37
Sodium hydrogen carbonate (bicarbonate of sodium, sodium bicarbonate)	$NaHCO_3$		<L	<60	S1	02		5	Q_1	Q_1	E	G	G			kr	8,6	Z>65		2,159
Sodium hydrogen sulfate	$NaHSO_4$		<L	<Kp	S1	02		5	Q_1	Q_1	V	G	G			kr	22,2++	186		2,103
Sodium hydrogen sulfide	NaSH		<L	<Kp	D1	11		1	V	B	V	G	G	A,R,3,7		kr	sll	350		1,79
Sodium hydrogen sulfite = aqueous solution of → *Sodium disulfite*	$NaHSO_3$																				
Sodium hydrosulfat → *Sodiumhydrogen sulfate*																					
Sodium hydroxide → *Caustic soda solution*																					
Sodium hypochlorite ('chlorine bleaching lye')	NaOCl		<L	<30	S1	02		1	Q_1	Q_1	M_2	M	M	A		kr	34,6			
Sodium metaaluminate	$NaAlO_2$		<L	<60	S1	02		5	Q_1	Q_1	E	G	G			kr	I	1650		
Sodium nitrate	$NaNO_3$		<L	<80	S1	02		1	S	B	E	G	G			kr	46,4	307		2,261
Sodium nitrite	$NaNO_2$		<L	<Kp	D1	11		1	V	B	M_2	G	G	G,3,8		kr	45,0	271	Z320	2,17
Sodium perborate	$NaBO_2*H_2O_2*3H_2O$		<10	<25	S1,Q3	10		5	Q_1	Q_1	E	G	G	3,6		kr	wl	65		1,731
Sodium perborate;	$NaBO_2*H_2O_2*3H_2O$		<10	<Kp	D1	11		1	V	B	M_2	G	G	2,3,6						
Sodium perchlorate	$NaClO_4$		<L	<Kp	D1	11		1	V	B	M_2	G	G	X,2,3,8		kr	66,5	Z482		2,50
Sodium peroxide (sodium superoxide)	Na_2O_2		<L	<Kp	D1	11		1	Q_1	Q_1	M_2	G	G	A,2,3,8		kr	I	660	Z750	,805
Sodium phosphates			<L	<Kp	S1,Q3	10		5	Q_1	Q_1	E	G	G	3,6		kr	wl...sll			
Sodium silicates (water glass)			<L	<Kp	D1	11		1	S	B	E	G	G	3,4		kr	I			
Sodium sulphate (glauber salt)	Na_2SO_4		<L	<80	S1,Q3	10		1	V	B	P	G	G	3		kr	16,2	884		2,68
Sodium sulphite	Na_2SO_3		<L	<Kp	S1	02		5	Q_1	Q_1	E	G	G			kr	20,9			2,633
Sodium thiocyanate	NaSCN		<L	<Kp	D1	11		1	V	B	E	G	G	R,H	5	kr	57,5	323		1,73
Sodium thiosulfate	$Na_2S_2O_3*5H_2O$		<L	<80	S1,Q3	10		1	V	B	E	G	G	3		kr	41,0			2,119
Soft soap			–	>F<100	S1	02		1	S	B	V	G	G			pa				
Softener → *Phthalic acid esters*																					

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 Stat. face	3 Sec. seal	4 Spring	5 Others		Hazard reference	TLV-value	Normal condition	Solu-bility	Melting temperature ° C	Boiling point ° C	Density g/cm³
1		2	3	4	5	6	7	8							10	11	12	13	14	15	16
Soiled water → *Water*																					
Soot-water mixture			<10	<Kp	S1	02		1	U_1	U_1	V	G	G				fl				
Soybean oil		N	–	<100	S1	02		1	S	B	V	G	G				fl		−16...−10		0,92
Spinach mash		N	–	<80	S1	02		1	S	B	V	G	G				pa				
Spirit of salmiac → *Ammonia aqu. solutions*																					
Spirit of wine → *Ethanol*																					
Spirits → *Ethanol*																					
Steam	H_2O		–	<180	D1	11		1	S	B	E	G	G		1		fl			100	
Stearic acid (octadecanic acid)	$C_{18}H_{36}O_2$		Sch	<130	S1	02		1	V	B	M_2	G	G				fe	0,03	69...71	359...383	0,845
Strontium chloride	$SrCl_2$		<L	<Kp	D1	11		1	V	B	M_1	G	G		2		kr	34,5	872		3,094
Strontium nitrate	$Sr(NO_3)_2$		<L	<Kp	D1	11		1	V	B	M_2	G	G		2		kr	41,0	645		2,93
Styrene (vinyl benzene, phenyl ethylene)	C_8H_8		–	<80	S3,Q3	11		X	S	B	M_1	G	G		R,7,3,4	20	fl		−33	146	0,909
Succinic acid	$C_4H_6O_4$		<L	<Kp	S1	02		1	S	B	M_1	G	G				kr	6,5++	186	235	1,56
Sugar juices (conc. data in Brix):																					
Clairce			>70	<95	D2	11		1	Q_{12}	Q_{12}	V	G	G								
Raw juice			<20	<70	D2	02		2	Q_{12}	Q_{12}	V	G	G								
Thick juice			>70	<95	D2	11		1	Q_{12}	Q_{12}	V	G	G								
Thin juice			<20	<100	D2	02		2	Q_{12}	Q_{12}	V	G	G								
Sulfinol (Sulfolan) → *Tetrahydro-thiophene-1,1-dioxide*																					
Sulfite lye → *Calcium hydrogen sulphite*																					
Sulfolan → *Tetrahydro-thiophene-1,1-dioxide*																					
Sulfur chlorides:																					
Disulfur dichloride	S_2Cl_2		–	<Kp	D1	11		1	V	B	M_1	G	G		A,R,2	1	fl		−80	136	1,678
Sulfur dichloride	SCl_2		–	<Kp	D1	11		1	V	B	M_1	G	G		A,2		fl		−78	Z59	1,621(15)
Sulfur dioxide	SO_2		–	<80	D1	11		1	V	B	E	G	G		G,1	2	ga		−75	−10	(+)
Sulfur fluorides:																					
Disulfur decafluoride (sulfur pentafluoride)	S_2F_{10}		–	<Kp	S1,Q3	10		1	V	B	M_2	G	G				fl		−92	29	2,08(0)
Disulfur difluoride (thiothionyl fluoride)	S_2F_2		–	<60	D1	11		1	V	B	M_2	G	G		1	0,025	ga		−164	~−11	(+)
Sulfur hexafluoride	SF_6		–	<60	D1	11		1	V	B	M_2	G	G		1	1000	ga		S−64		(+)
Sulfur tetrafluoride	SF_4		–	<60	D1	11		1	V	B	M_2	G	G		G,1		ga		−121	−40	(+)
Sulfur tetrachloride → *Sulfur chlorides*																					
Sulfur tetrafluoride → *Sulfur fluorides*																					
Sulfur trioxide (molten or gaseous)	SO_3		–	>F<160	D1	09		1	Q_1	Q_1	M_1	G	G		1,2,3,4		kr		17...62	45	1,97...2,00
Sulfur, molten	S		Sch	<220	S1	01	(H)	6	A	S	M_7	T_6	G_1	7	bei ~260°C		kr		110...119		2,07
	S		Sch	<200	S1	01	H	1	Q_1	A	M_1	G	G								
Sulfuric acid	H_2SO_4		<10	<20	S1,Q3	09		1	V	B	V	G	G						5% −2	5% 101	5% 1,032
	H_2SO_4		<10	<80	S1,Q3	09		1	V	B	M_1	M	M						10% −5	10% 102	10% 1,066
	H_2SO_4		<20	<70	S1,Q3	09		1	V	B	M_1	M	M						20% −14	20% 105	20% 1,139
	H_2SO_4		<96	<50	S1,Q3	09		1	V	B	V	M	M						40% −68	40% 113	40% 1,303
	H_2SO_4		>80	<30	S1,Q3	09		1	Q_1	Q_1	V	G	G						60% −29	60% 140	60% 1,498
	H_2SO_4		>90	<40	S1,Q3	09		1	Q_1	Q_1	V	G	G						80% −1	80% 205	80% 1,727
	H_2SO_4		>90	<80	S1,Q3	09		1	Q_1	Q_1	M_1	M	M						96% −11	96% 310	96% 1,835
	H_2SO_4																		98% +2	98% 330	98% 1,836
Sulfuric acid, fuming (= Oleum = conc. H_2SO_4 + free SO_3)	$H_2SO_4+SO_3$		<40	<90	S3,Q3	09		4	Q_1	Q_1	M_1	M	G							40%~100	
	$H_2SO_4+SO_3$		<60	<60	S1,Q3	09		1	Q_1	Q_1	M_1	M	M							60%~70	
Sulfurous acid (aqueous solution of SO_2)	SO_2		<L	<Kp	S1,Q3	09		1	V	B	M_2	M	M		(G), 2		fl	18,6			
	SO_2		<L	<20	S1,Q2	02		1	V	B	E	G	G								
Sulphamic acid → *Amidosulfuric acid*																					
Synthetic resin laquers and glues			–	<Kp	D1	11		1	S	B	M_1	G	G		3,4		fl				
T																					
Table vinegar → *Acetic acid*																					
Tall oil fatty acids			Sch	<200	S1,Q3	10		1	Q_1	A	M_1	M	M		3		fe				
			Sch	>200	S1,Q3	10		6	A	Q_1	G	M_5	M		3						
Tall oil pitch			Sch	<150	S1,Q3	10		1	Q_1	A	M_1	M	G		3		fe				
Tall oil resin (acids)			Sch	<200	S1,Q3	10		1	Q_1	A	M_1	M	M		3		fe				
			Sch	>200	S1,Q3	10		6	A	Q_1	G	M_5	M		3						
Tall oil, crude			Sch	<120	S1,Q3	10		1	Q_1	A	M_1	G	G		3		pa				
Tallow			Sch	<100	S1	02		1	S	B	V	G	G				fe		40...70		
Tannery waste water, pH = 9 – 11			–	<40	S1	02		1	V	B	V	G	G				fl				
Tannic acids → *Tannines*																					
Tannines (natural polyphenols)		G	<L	<100	S1	02		1	S	B	V	G	G				fe	II			
Tar, tar oil → *Coal tar*																					
Tartaric acid			<L	<60	S1	02		1	S	B	V	G	G				kr	~8(0)	159...206		1,76...1,79
Taurine (2-aminoethanesulfonic acid)	$C_2H_7NO_3S$		<L	<80	S1	02		1	Q_1	B	M_1	G	G				kr	II	Z328		
Technical Xylol → *Xylols*																					

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 reference	TLV-value	Normal condition	Solu-bility	Melting temperature ° C	Boiling point ° C	Density g/cm³
									1	2	3	4	5								
									Seal face	Stat. face	Sec. seal	Spring	Others								
1		2	3	4	5	6	7	8							10	11	12	13	14	15	16
Terphenyls (diphenyl benzenes):	$C_{18}H_{14}$																				
m-Terphenyl (1,3-diphenyl benzene)	$C_{18}H_{14}$		Sch	<180	S1,Q3	10	(H)	1	S	B	M_1	G	G		3		kr		86...89	365	
o-Terphenyl (1,2-diphenyl benzene)	$C_{18}H_{14}$		Sch	<180	S1,Q3	10	(H)	1	S	B	M_1	G	G		3		kr		57...58	332	
p-Terphenyl (1,4-diphenyl benzene)	$C_{18}H_{14}$		Sch	<Kp	S1,Q3	10	(H)	6	A	S	G	T_6	F		3		kr		209...215	376...388	1,234
Test petrols, test gasolines			–	<60	S1	02		1	S	B	V	G	G				fl			130...220	
Tetrabromoethane (acetylene tetrabromide)	$C_2H_2Br_4$		–	<160	D1	11		1	V	B	M_1	G	G			1	fl		0	151(72)	2,9673
Tetrachloroethane (acetylene tetrachloride)	$C_2H_2Cl_4$		–	<Kp	D1	11		1	V	B	M_1	G	G		C3,H	1	fl		–36	146	1,5953
Tetrachloroethylene (perchloroethylene)	C_2Cl_4		–	<60	S1	02		1	S	B	M_1	G	G			50	fl		–23	121	1,63
Tetrachloroethylene, contaminated			–	<60	S1	02		1	V	B	M_1	G	G								
Tetrachloro-methane → *Carbon tetrachloride*																					
Tetraethylene glycol → *Ethylene glycols*																					
Tetrahydrofurane (tetramethylene oxide, Oxolan)	C_4H_8O		–	<40	S1,Q3	10		1	V	B	M_2	G	G		7,6	200	fl		–108	65	0,8892
Tetrahydrothiophene-1,1-dioxide ('Sulfolan')	$C_4H_8O_2S$		Sch	<60	S1	02	(H)	1	V	B	M_1	G	G		X		kr		27	285	1,26
Thick juice → *Sugar juices*																					
Thick liquor (sulfite chemical pulp)		G	–	<Kp	D1	11		1	V	B	M_1	G	G								
Thin juice → *Sugar juices*																					
Thiols		G	–	<Kp	D1	11		1	V	B	M_1	G	G			0,5	fl				
Thiothionyl fluoride → *Sulfur fluorides*																					
Throat gas → *Blast furnace gas*																					
Titanium chlorides:																					
Titanic chloride (titanium tetrachloride)	$TiCl_4$		–	<Kp	D1	11		1	V	B	M_1	G	G		2,3		fl		–25	136	1,762
Titanous chloride (titanium trichloride)	$TiCl_3$		<L	<Kp	D1	11		1	V	B	M_1	G	G		2,3		kr	II	Z440		2,64
Titanium dioxide – solution in sulfuric acid	TiO_2		<40	<Kp	S3,Q3	11		X	U_2	V	E	G	G		4		kr		>1800		3,90...4,26
Titanium dioxide – suspension in water			<L	<180	S3	00	kD	X	Q_1	Q_1	T	M	G								
Tobacco emulsion			–	<60	S1	02		1	Q_1	Q_1	V	G	G				fl				
Toluene	C_7H_8		–	<60	S1	02		1	S	A	K	G	G		7	100	fl		–95	111	0,866
Tomato juice → *Ketchup*																					
Tooth pastes		G	–	<40	S1	02		1	Q_1	Q_1	V	G	G				pa				
Tributyl phosphate (TBP, phosphoric acid tributyl ester)	$C_{12}H_{27}O_4P$		–	<60	S1	02		1	V	B	M_1	G	G		R		fl			Z289	0,979
Trichlorethylen (trichloroethene, 'Tri')	C_2HCl_3		–	<25	S1	02		1	S	B	V	G	G		C3,R	50	fl		–73	87	1,4649
	C_2HCl_3		–	<60	S1,Q3	10		1	S	B	M_1	G	G		6						
Trichloroacetic acid (TCA)	$C_2HCl_3O_2$		Sch	<Kp	D1	11	SW,H	1	V	B	M_2	G	G		A,2,3		kr		58...59	198	1,63(60)
Trichloroborane → *Boron trichloride*																					
1,1,2-Trichloroethane	$C_2H_3Cl_3$		–	<60	S1,Q3	10		1	V	B	M_1	G	G		C3,H,R	10	fl		–35	113...114	1,4416
Trichloronitromethane (chloropicrine)	CCl_3NO_2		–	<60	S1,Q3	10		1	V	B	M_1	G	G		G,6	0,1	fl		–64	112	1,6566
Tricresyl phosphate (TCP)	$C_{21}H_{21}O_4P$		–	<100	S1	02		1	S	B	M_2	G	G				fl		–28	435	1,17...1,18
Triethanolamine	$C_6H_{15}NO_3$		–	<60	S1	02		1	S	B	M_2	G	G				fl		21	360	1,1242
Triethylamine	$C_6H_{15}N$		–	<60	S1,Q3	10		1	S	B	M_2	G	G			10	fl		–115	89	0,728
Triethylene glycol → *Ethylene glycols*																					
Trifluoroborane → *Boron trifluoride*																					
Triglycol → *Ethylene glycols*																					
Tripene → *Hexachlorobutadiene*																					
Trisodium phosphate → *Sodium phosphates*																					
Tung oil → *Wood oil*																					
Turbine oils			–	<100	S1	02		1	S	B	V	G	G				fl				
Turkey red oil ('Sulforicinate')			–	<140	S1	02		1	S	B	M_1	G	G				fl				
Turpentine oils		G	–	<60	S1	02		1	S	B	V	G	G		G	100	fl			155...180	0,85...0,87
Tutogene		®	–	<60	S1	02		1	S	B	V	G	G				fl				
U																					
Urea (carbamide)	CH_4N_2O		<L	<100	D1	11		1	Q_{22}	V	E	G	G		3,4		kr	40 (0)	132		1,323
	CH_4N_2O		<L	<100	D1	11		5	Q_1	Q_1	E	G	G		3,4						
Urea nitrate	$CH_5N_3O_4$		<10	<60	S1	02		1	Q_1	Q_1	M_2	G	G				kr	I	Z152		
Urea phosphate	$CH_7N_2O_5P$		<10	<60	S1	02		1	Q_1	Q_1	M_2	G	G				kr	I	119		
Urea resins (DIN 7728: abbr. UF)		G	–	<100	D1	11		1	Q_{22}	V	M_2	G	G		3,4		pa				
Urine			–	<40	S1	02		5	Q_1	Q_1	E	G	G				fl				
V																					
Varnish		G	–	TG	D1	11		1	V	B	M_1	G	G		3,4		fl				
Vaseline → *Petrolatum*																					
Vegetable oils		G	0	<150	S1	02		1	S	B	V	G	G				fl				
Vegetable paste			–	<100	S1	02		1	S	B	V	G	G				pa				
Vinyl acetate → *Acetic acid vinyl ester*																					
Vinyl acetylene (1-butene-3-in)	C_4H_4		–	<60	D1	11		1	V	B	M_2	G	G		1,3		ga		5		(+)
Vinyl benzene → *Styrene*																					

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** Stat. face	**3** Sec. seal	**4** Spring	**5** Others		Hazard reference	TLV-value	Normal condition	Solu-bility	Melting temperature °C	Boiling point °C	Density g/cm³
1		2	3	4	5	6	7	8							10	11	12	13	14	15	16
Vinyl chloride	C_2H_3Cl		–	<40	D1	11		1	V	B	M_1	G	G		C1,1	*	ga		–160	–14	(+)
Vinylidene chlorides → *Dichloroethylenes*																					
Volatile oils		S	–	<Kp	S1	02		1	S	B	M_1	G	G				fl				
W																					
Walnut oil		N	–	<100	S1	02		1	S	B	V	G	G				fl				~0,92
Washing lye		S	–	<Kp	S1	02		1	S	B	M_1	G	G				fl				
Washing lye, dirty		S	–	<Kp	S1	02		1	Q_1	Q_1	M_1	G	G				fl				
Wastewater → *Water*																					
Water from pressed fish		N	Sus	<60	S3	00		1	Q_1	Q_1	V	G	G				fe				
Water glass → *Sodium silicates*																					
Water vapour	H_2O		–	<180	D1	11		1	S	B	E	G	G		1						
Water:	H_2O																				
Wastewater, sewage water, pH>6<10			–	<50	S1	02		1	Q_1	Q_1	P	G	G				fl				
pH>3<10			–	<50	S1	02		5	Q_1	Q_1	V	G	G				fl				
Desalinated water, distilled water			–	<50	S1	02		1	S	B	E	G	G				fl				
Drinking water, industrial water			–	<100	S1	02		1	S	B	E	G	G				fl				
Hot water with additives			As compositions and applications vary considerably, a general recommendation would not be adequate.																		
Boiler feed water			Please contact BURGMANN.																		
Sea and brackish water			–	<50	S1	02		5	A	Q_1	V	M	M				fl				
Waxes		S	–	>F<180	S1	02		1	S	B	V	G	G				pa				
Whale oil, whale train		N	–	<100	S1	02		1	S	B	V	G	G				fl				
Whey		N	–	<60	S1	02		1	S	B	V	G	G				fl				
Whiskey			–	<30	S1	02		1	V	B	E	G	G				fl				
Wine			–	<40	S1	02		1	S	B	P	G	G				fl				
Wine vinegar → *Acetic acid*																					
Wood oil (Tung oil)		N	–	<80	S1	02		1	S	B	V	G	G				fl		<0		0,89...0,93
Wood pulp, ground pulp → *Pulp, (cellulose)*																					
Wood spirit	CH_3OH	G	–	<40	S1	02		1	S	B	E	G	G				fl				
Wood tar		G	–	<100	S1	02		1	S	B	M_1	G	G				fl				0,90...1,11
Wood turpentine oil → *Tall oil*																					
X																					
Xanthogenates		S	<10	<60	D1	11		1	Q_1	Q_1	M_2	G	G		3,4		kr				
Xenone	Xe		–	<40	D1	11		1	S	B	P	G	G		1		ga		–112	–108	(+)
Xylols (dimethyl benzenes):	C_8H_{10}																				
technical xylol (mixture)	C_8H_{10}		–	<60	S1	02		1	S	B	M_1	G	G		7	100	fl			137...140	~0,86
m-Xylol	C_8H_{10}		–	<60	S1	02		1	S	B	M_1	G	G		7	100	fl		–48	139	0,866
o-Xylol	C_8H_{10}		–	<60	S1	02		1	S	B	M_1	G	G		7	100	fl		–25	144	0,881
p-Xylol	C_8H_{10}		–	<60	S1	02		1	S	B	M_1	G	G		7	100	fl		13	138	0,861
Y																					
Yeast paste		N	–	<60	S1	02		1	S	B	V	G	G				pa				
Yoghurt with fruit etc.		N	–	<60	S1	02		5	Q_1	Q_1	V	G	G				pa				
Yoghurt without fruit etc.		N	–	<60	S1	02		1	Q_1	B	V	G	G				pa				
Z																					
Zapon lacquer			–	<60	D1	11		1	V	B	M_1	G	G		3,4		fl				
Zinc chloride	$ZnCl_2$		<L	<25	S1	02		5	Q_1	Q_1	V	G	G		4,6		kr	78,3	283	732	2,91
	$ZnCl_2$		<L	<Kp	D1	11		1	V	B	M_1	G	G		2,4						
Zinc cyanide (suspension)	$Zn(CN)_2$		<20	<Kp	S3	00	kD	3	Q_1	Q_1	P	G	G		G		kr	unl	Z~800		1,852
Zinc nitrate	$Zn(NO_3)_2*6H_2O$		<L	<60	S1,Q3	09		5	Q_1	Q_1	V	G	G		6		kr	54,0	36	Z>140	2,065
Zinc oxide (suspension)	ZnO		<50	<Kp	S3,Q3	11	kD	3	Q_1	Q_1	V	G	G		3,4	5 mg	kr	unl	>1300	>1300	5,606
Zinc paints, water soluble			<L	<60	S1,Q3	09		5	Q_1	Q_1	V	G	G		6		fl				
Zinc phosphates			<10	<100	D1	11		1	V	B	M_1	G	G		3,4		kr				

Standard Seals

25 Mechanical Seals for Pumps and Compressors

Plain shafts, rotating spring, unbalanced

M2N 27
M3N 28/29
M7N 30/31
M74-D 32/33
MG9 . . . . . 34/35
MG1 . . . . . 36/37
MF95N 39

Plain shafts, rotating spring, balanced

MFL85N 40/41
HJ92N 42/43

Stepped shafts, rotating spring, balanced

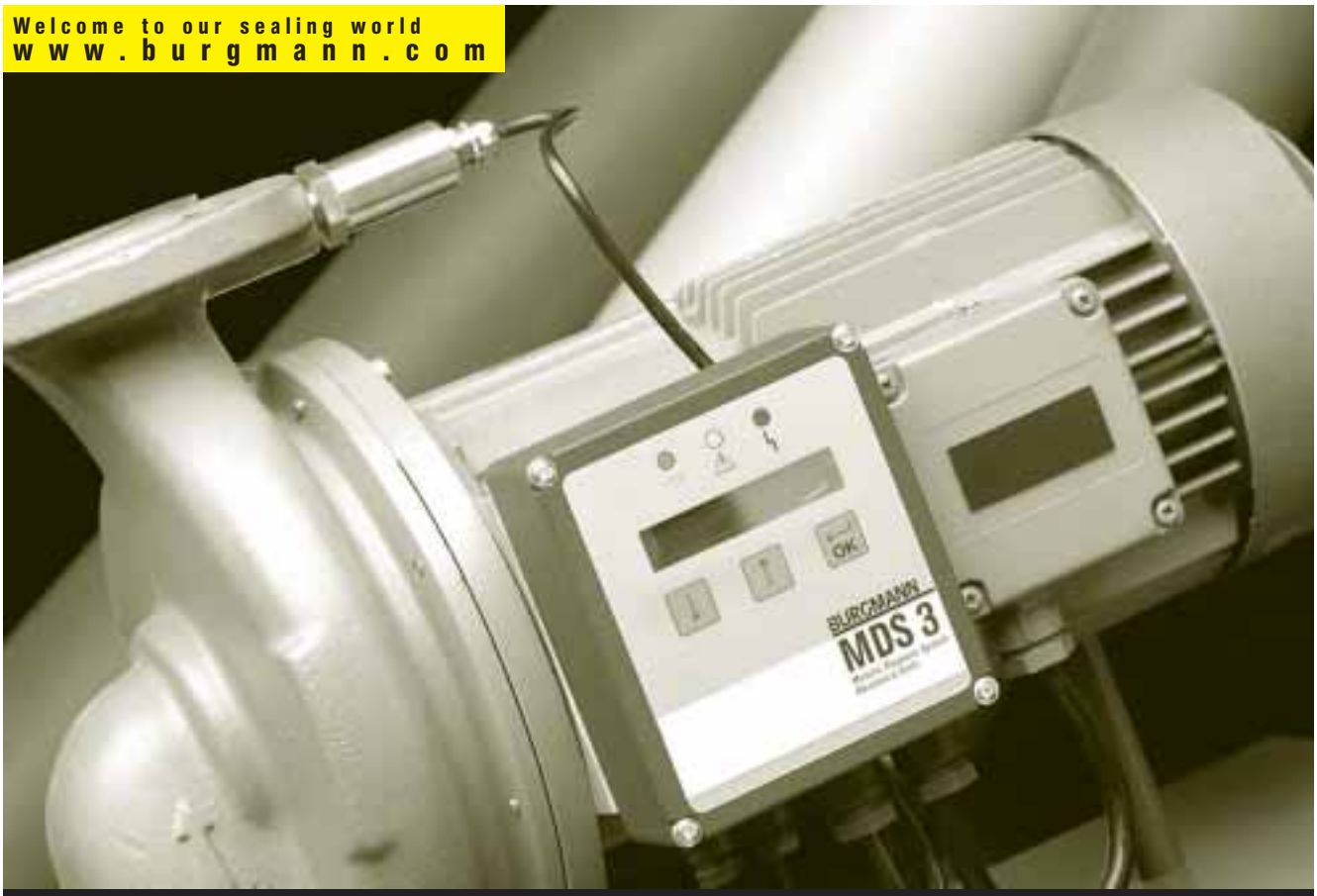
H12N 44/45
H7N 46/47
H74-D 48/49

Stationary spring, balanced

HR 52/53
HRC..N 54/55
Cartex 56/57
Mtex 58/59
SH 60
SH (-D) 61
HRN 62
MFL65 63
H10/H8 64

Split seal

HGH 50/51

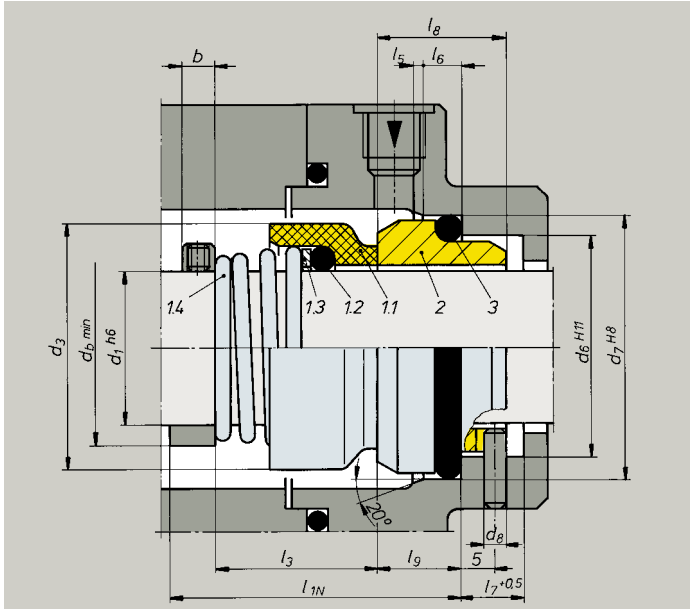


Everything under control around the clock: Seal diagnosis in pumps

You never used to know that a mechanical seal was damaged until you saw its leakage, which was usually too late. Today, permanent seal monitoring by the Burgmann MDS guards against unwelcome surprises. Because you always know the seal's current state of performance.
A simple warning system – plus automatic deactivation of the pump if required – provides additional safety.

BURGMANN

M2N



[1] l_3 valid for M2N,
[1] for M2 series l_{21} is valid (see table)

- **Single seal**
- **Unbalanced**
- **Conical spring**
- **Dependent on direction of rotation**
- **To EN 12756***

The M2 mechanical seal range features a spring loaded solid carbon graphite seal face. They are cost effective for basic applications such as circulating pumps for water and heating systems.

Operating limits (see note on page 1)

d_1 = 6 ... 38 mm *0.25" ... 1.5"*
p_1 = 10 bar 145 PSI
t = –20 ... 180 °C *–4 °F ... 355 °F*
v_g = 15 m/s 50 ft/s
Axial movement: ±1.0 mm

M2N

Item no.	Part no. to DIN 24250	Description
1.1	472	Seal face
1.2	412.1	O-ring
1.3	474	Thrust ring
1.4	478	Righthand spring
1.4	479	Lefthand spring
2	475	Type G9 stationary seat
3	412.2	O-ring

Seal designations

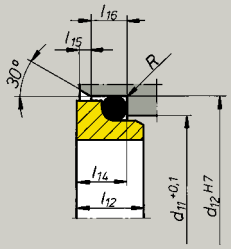
	Stationary seats		
Rotating unit	G4	G6	G9
M2	M2	M2N4	M2N

Materials (to EN 12756)

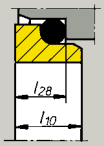
Seal face: B
Stationary seats G4: Q_1; S (Q_1; V)
G6: Q_1; S (Q_1; V)
G9: Q_1; Q_2; S; V

Stationary seats

G4



G6
EN 12756



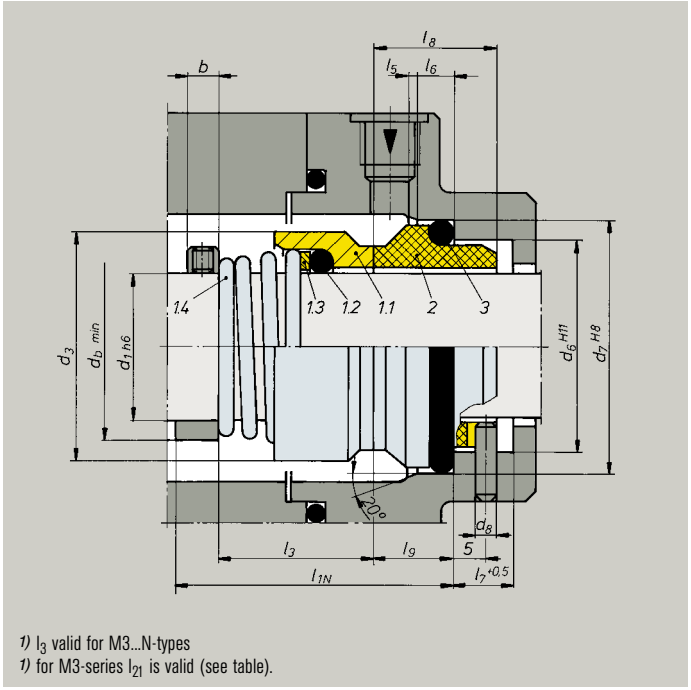
Unquoted dimensions as per Item 2

d_1	d_3	d_6	d_7	d_8	d_{11}	d_{12}	d_b	l_{1N}	l_3	l_5	l_6	l_7	l_8	l_9	l_{10}	l_{12}	l_{14}	l_{15}	l_{16}	l_{21}	l_{28}	b	R
6	15	–	–	–	11.8	16.0	8	–	–	–	–	–	–	–	–	6.5	5.6	1.2	3.8	10.9	–	–	1.2
8	18	–	–	–	15.5	19.2	11	–	–	–	–	–	–	–	–	8.0	7.0	1.2	3.8	15.5	–	–	1.2
10*	20	17	21	3	15.5	19.2	13	40	17.5	1.5	4	8.5	17.5	10.0	7.5	7.5	6.6	1.2	3.8	15.9	6.6	8	1.2
12*	22	19	23	3	17.5	21.6	16	40	17.5	1.5	4	8.5	17.5	10.0	7.5	8.0*	7.0*	1.2	3.8	16.0	6.6	8	1.2
14*	25	21	25	3	20.5	24.6	18	40	17.5	1.5	4	8.5	17.5	10.0	7.5	8.0*	7.0*	1.2	3.8	16.0	6.6	8	1.2
15	27	–	–	–	20.5	24.6	19	–	–	–	–	–	–	–	–	7.5	6.6	1.2	3.8	17.4	–	–	1.2
16*	27	23	27	3	22.0	28.0	21	40	19.5	1.5	4	8.5	17.5	10.0	7.5	8.5	7.5	1.5	5.0	19.0	6.6	8	1.5
18*	30	27	33	3	24.0	30.0	23	45	20.5	2.0	5	9.0	19.5	11.5	8.5	9.0	8.0	1.5	5.0	20.5	7.5	8	1.5
20*	32	29	35	3	29.5	35.0	26	45	22.0	2.0	5	9.0	19.5	11.5	8.5	8.5	7.5	1.5	5.0	22.0	7.5	8	1.5
22*	35	31	37	3	29.5	35.0	28	45	23.5	2.0	5	9.0	19.5	11.5	8.5	8.5	7.5	1.5	5.0	23.5	7.5	8	1.5
24*	38	33	39	3	32.0	38.0	30	50	25.0	2.0	5	9.0	19.5	11.5	8.5	8.5	7.5	1.5	5.0	25.0	7.5	8	1.5
25*	40	34	40	3	32.0	38.0	31	50	26.5	2.0	5	9.0	19.5	11.5	8.5	8.5	7.5	1.5	5.0	26.5	7.5	8	1.5
26	41	–	–	–	34.0	40.0	32	–	–	–	–	–	–	–	–	9.0	8.0	1.5	5.0	26.5	–	–	1.5
28*	43	37	43	3	36.0	42.0	35	50	26.5	2.0	5	9.0	19.5	11.5	8.5	10.0	9.0	1.5	5.0	26.5	7.5	8	1.5
30	47	–	–	–	39.2	45.0	37	–	–	–	–	–	–	–	–	11.5	10.5	1.5	5.0	25.0	–	–	1.5
32	48	–	–	–	42.2	48.0	39	–	–	–	–	–	–	–	–	13.0	10.5	1.5	5.0	28.5	–	–	1.5
35	53	–	–	–	46.2	52.0	43	–	–	–	–	–	–	–	–	13.5	11.0	1.5	5.0	28.5	–	–	1.5
38	56	–	–	–	49.2	55.0	47	–	–	–	–	–	–	–	–	13.0	10.3	1.5	5.0	32.0	–	–	1.5

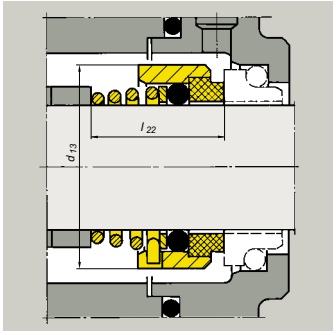
*) Installation length differs from G4-seats

For plain shafts, spring rotating

M3N



1) l_3 valid for M3...N-types
1) for M3-series l_{21} is valid (see table).



M32

Item no's and descriptions as for type M3N, but with the **seal face (carbon)** shrink-fitted into the seal face carrier (Item no. 1.1).

- **Single seal**
- **Unbalanced**
- **Conical spring**
- **Dependent on direction of rotation**
- **To EN 12756***

The M3 mechanical seals are immensely popular. Extremely rugged and reliable, they cover a wide spectrum of applications – in water pumps, sewage pumps, submerged pumps, chemical pumps, etc.

M3N

Item no.	Part no. to DIN 24250	Description
1.1	472	Seal face
1.2	412.1	O-ring
1.3	474	Thrust ring
1.4	478	Righthand spring
1.4	479	Lefthand spring
2	475	Type G9 stationary seat
3	412.2	O-ring

Operating limits (see note on page 1)

d_1 = 6 ... 80 mm *0.25" ... 3.125"*
(M37G from d_1 = 16 mm / M37 up to d_1 = 55 mm)
p_1 = 10 bar *145 PSI*
t = –20 ... 180 °C *–4 °F... 355 °F*
(M37 up to 120 °C)
v_g = 10 (15) m/s *33 (50) ft/s*
Axial movement: ±1.0 mm

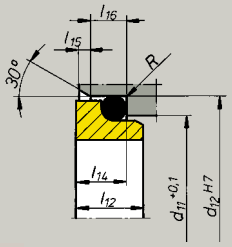
Combination of materials and seal types

Rotating unit (seal face)	Stationary seats									
	G4			G13	G6[3]			G9		
	S	V	Q_2	A;B	S	V	Q_1 (Q_2)	A;B	V	Q_1 (Q_2)
M3 (S)	–	–	–	M3	–	–	–	M3N	–	–
M32 (A;B)	M32	M32	M32	–	M32N4	M32N4	M32N4	–	M32N	M32N
M37 (U_1)	–	–	M37	M37	–	–	M37N4	M37N	–	M37N
M37G (Q_{12}; Q_{22}; U_{22})	–	–	M37G	M37G	–	–	M37GN4	M37GN	–	M37GN

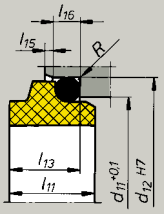
[3] Stationary seat G6 is also available in materials A and B (as style G30) (longer overall length than G6!).
All material designations according to EN 12756. See back cover.

Stationary seats

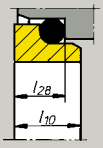
– G4



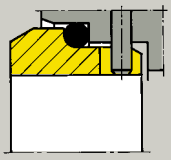
– G13



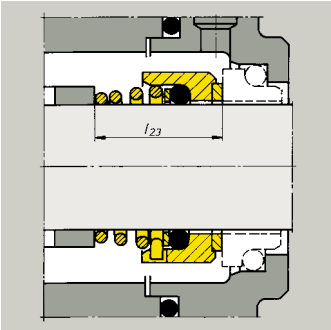
– G6 (G30) EN 12756

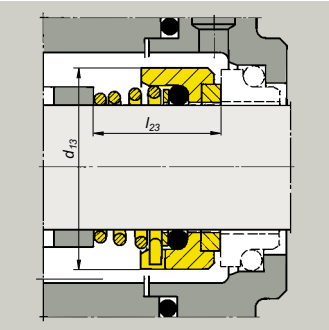


– G9 EN 12756



Unquoted dimensions as for Item 2.





M37

(d_1 max. 55 mm)
Item no's and descriptions as for type M3N, but with the **seal face brazed** (tungsten carbide) to the seal face carrier (Item no. 1.1).

M37G

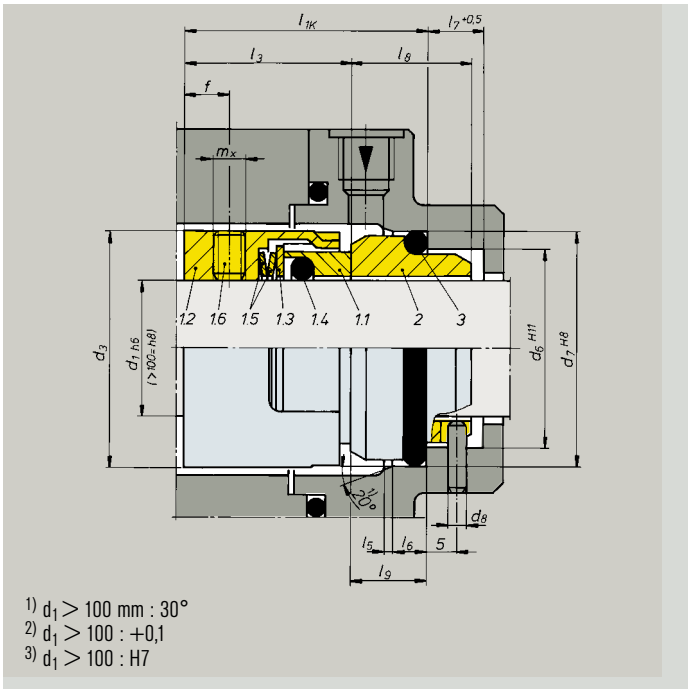
(d_1 min. 16 mm)
Item no's and descriptions as for type M3N, but with the **seal face shrink-fitted** (silicon carbide) into the seal face housing (Item no. 1.1).

d_1	d_3	d_6	d_7	d_8	d_{11} [1]	d_{12} [1]	d_{13}	d_b	l_{1N}	l_3	l_5	l_6	l_7	l_8	l_9	l_{10}	l_{11}	l_{12}	l_{13}	l_{14}	l_{15}	l_{16}	l_{21}	l_{22}	l_{23}	l_{28}	b [2]	R
6	14	–	–	–	11.5	16.0	16	8	–	–	–	–	–	–	–	–	9.0	6.5	7.1	5.6	1.2	3.8	10.5	11.9	–	–	–	1.2
8	18	–	–	–	15.5	19.2	18	11	–	–	–	–	–	–	–	–	9.0	8.0	7.1	7.0	1.2	3.8	15.5	16.9	–	–	–	1.2
10*	19	17	21	3	15.5	19.2	20	13	40	15.5	1.5	4	8.5	17.5	10.0	7.5	9.0	7.5	7.1	6.6	1.2	3.8	15.5	16.9	–	6.6	(8)	1.2
12*	21	19	23	3	17.5	21.6	22	16	40	16.0	1.5	4	8.5	17.5	10.0	7.5	10.0	6.5	7.6	5.6	1.2	3.8	15.5	17.4	–	6.6	(8)	1.2
14*	23	21	25	3	20.5	24.6	24	18	40	16.5	1.5	4	8.5	17.5	10.0	7.5	10.0	6.5	7.6	5.6	1.2	3.8	15.5	17.4	16.5	6.6	(8)	1.2
15	24	–	–	–	20.5	24.6	25	19	–	–	–	–	–	–	–	–	11.0	7.5	8.6	6.6	1.2	3.8	15.5	17.4	–	–	–	1.2
16*	26	23	27	3	22.0	28.0	26	21	40	18.0	1.5	4	8.5	17.5	10.0	7.5	11.5	8.5	9.0	7.5	1.5	5.0	17.5	19.5	16.5	6.6	(8)	1.5
18*	29	27	33	3	24.0	30.0	31	23	45	19.5	2.0	5	9.0	19.5	11.5	8.5	12.5	9.0	10.0	8.0	1.5	5.0	18.5	20.5	18.0	7.5	(8)	1.5
20*	31	29	35	3	29.5	35.0	34	26	45	22.0	2.0	5	9.0	19.5	11.5	8.5	12.5	8.5	9.5	7.5	1.5	5.0	20.0	22.0	19.0	7.5	(8)	1.5
22*	33	31	37	3	29.5	35.0	36	28	45	21.5	2.0	5	9.0	19.5	11.5	8.5	12.5	8.5	9.5	7.5	1.5	5.0	21.5	23.5	20.5	7.5	(8)	1.5
24*	35	33	39	3	32.0	38.0	38	30	50	23.5	2.0	5	9.0	19.5	11.5	8.5	12.5	8.5	9.5	7.5	1.5	5.0	23.0	25.0	22.0	7.5	(8)	1.5
25*	36	34	40	3	32.0	38.0	39	31	50	26.5	2.0	5	9.0	19.5	11.5	8.5	12.5	8.5	9.5	7.5	1.5	5.0	24.5	26.5	23.5	7.5	(8)	1.5
26	37	–	–	–	34.0	40.0	40	32	–	–	–	–	9.0	–	–	–	13.0	9.0	10.0	8.0	1.5	5.0	24.5	26.5	23.5	–	–	1.5
28*	40	37	43	3	36.0	42.0	42	35	50	26.5	2.0	5	9.0	19.5	11.5	8.5	14.0	10.0	11.0	9.0	1.5	5.0	24.5	26.5	24.5	7.5	(8)	1.5
30*	43	39	45	3	39.2	45.0	44	37	50	26.5	2.0	5	9.0	19.5	11.5	8.5	14.0	11.5	11.0	10.5	1.5	5.0	24.5	25.0	24.5	7.5	(8)	1.5
32*	46	42	48	3	42.2	48.0	46	39	55	28.5	2.0	5	9.0	19.5	11.5	8.5	14.0	11.5	11.0	10.5	1.5	5.0	28.0	28.5	28.0	7.5	(8)	1.5
33*	47	42	48	3	–	–	47	40	55	28.5	2.0	5	9.0	19.5	11.5	8.5	–	12.0	–	–	–	–	.–	–	–	7.5	(8)	1.5
35*	49	44	50	3	46.2	52.0	49	43	55	28.5	2.0	5	9.0	19.5	11.5	8.5	14.5	12.0	11.5	11.0	1.5	5.0	28.0	28.5	28.0	7.5	(8)	1.5
38*	53	49	56	4	49.2	55.0	54	45	55	33.5	2.0	6	9.0	22.0	14.0	10.0	14.5	11.3	11.5	10.3	1.5	5.0	31.0	32.2	31.0	9.0	7,5	1.5
40*	56	51	58	4	52.2	58.0	56	49	55	36.0	2.0	6	9.0	22.0	14.0	10.0	14.5	11.8	11.5	10.8	1.5	5.0	34.0	34.7	34.0	9.0	(8)	1.5
42	59	–	–	–	53.3	62.0	58	52	–	–	–	–	9.0	–	–	–	17.0	13.2	14.3	12.0	2.0	6.0	35.0	37.3	35.0	–	–	2.5
43*	59	54	61	4	–	–	59	52	60	38.5	2.0	6	9.0	22.0	14.0	10.0	–	13.2	–	–	2.0	–	.–	–	–	9.0	7,5	2.5
45*	61	56	63	4	55.3	64.0	61	55	60	39.5	2.0	6	9.0	22.0	14.0	10.0	17.0	12.8	14.3	11.6	2.0	6.0	36.5	39.2	36.5	9.0	(8)	2.5
48*	64	59	66	4	59.7	68.4	64	58	60	46.0	2.0	6	9.0	22.0	14.0	10.0	17.0	12.8	14.3	11.6	2.0	6.0	42.0	44.7	42.0	9.0	(8)	2.5
50*	66	62	70	4	60.8	69.3	66	61	60	45.0	2.5	6	9.0	23.0	15.0	10.5	17.0	12.8	14.3	11.6	2.0	6.0	43.0	45.7	43.0	9.5	(8)	2.5
53*	69	65	73	4	–	–	69	64	70	47.0	2.5	6	9.0	23.0	15.0	12.0	–	13.5	–	–	–	–	.–	–	–	11.0	8,0	2.5
55*	71	67	75	4	66.5	75.4	71	66	70	49.0	2.5	6	9.0	23.0	15.0	12.0	18.0	14.5	15.3	13.3	2.0	6.0	47.0	49.0	47.0	11.0	(8)	2.5
58*	76	70	78	4	69.5	78.4	78	69	70	55.0	2.5	6	9.0	23.0	15.0	12.0	18.0	14.5	15.3	13.3	2.0	6.0	50.0	52.0	50.0	11.0	(8)	2.5
60*	78	72	80	4	71.5	80.4	79	71	70	55.0	2.5	6	9.0	23.0	15.0	12.0	18.0	14.5	15.3	13.3	2.0	6.0	51.0	55.0	51.0	11.0	(8)	2.5
63*	83	75	83	4	–	–	83	74	70	55.0	2.5	6	9.0	23.0	15.0	12.0	–	14.2	–	–	–	–	.–	–	–	11.0	(8)	2.5
65*	84	77	85	4	76.5	85.4	85	77	80	55.0	2.5	6	9.0	23.0	15.0	12.0	18.0	14.2	15.3	13.0	2.0	6.0	52.0	54.3	52.0	11.0	(8)	2.5
68*	88	81	90	4	82.7	91.5	88	80	80	55.0	2.5	7	9.0	26.0	18.0	12.5	19.0	14.9	16.0	13.7	2.0	6.0	53.0	55.3	52.7	11.3	(8)	2.5
70*	90	83	92	4	83.0	92.0	90	83	80	57.0	2.5	7	9.0	26.0	18.0	12.5	18.0	14.2	15.3	13.0	2.0	6.0	54.0	56.3	54.0	11.3	(10)	2.5
75*	98	88	97	4	90.2	99.0	98	88	80	62.0	2.5	7	9.0	26.0	18.0	12.5	18.0	15.2	15.3	14.0	2.0	6.0	55.0	56.3	54.0	11.3	(10)	2.5
80*	100	95	105	4	95.2	104.0	103	93	90	61.8	3.0	7	9.0	26.2	18.2	13.0	19.0	16.2	16.3	15.0	2.0	6.0	58.0	59.3	58.0	12.0	10,0	2.5

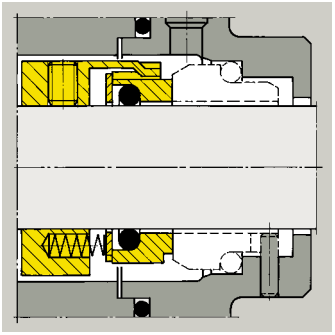
[1] Fitting dimensions d_{11} and d_{12} only apply to type M37G with $D_1 > 16$ mm
[2] Dimensions in brackets lie either above or below L_{1N}
*) According to EN 12756

For the spring-loaded units the following measures apply:
M3-series: l_{21}; M32-series: l_{22}; M37..-series: l_{23}; M3..N-series: l_3.

M7N



1) $d_1 > 100$ mm : 30°
2) $d_1 > 100$: +0,1
3) $d_1 > 100$: H7



M74

Dimensions, item no's and descriptions as for M7N, but with **multiple springs** (Item no. 1.5). Preferably for $d_1 > 100$ mm.

- **Single seal**
- **Unbalanced**
- **Independent of direction of rotation**
- **To EN 12756***

The M7 mechanical seal range is designed for universal application and ideal suited for standardisation. The loosely inserted seal faces are easily exchanged, permitting all combinations of materials and stock rationalisation. With Super-Sinus spring (see page 139).

Operating limits (see note on page 1)

d_1 = 14 ... 200 mm *0.55" ... 8"*
p_1 = 16 (25) bar *230 (360) PSI*
t = –50 ... 220 °C
–58 °F ... 430 °F
v_g = 20 m/s *66 ft/s*

Axial movement:
d_1 up to 25 mm: ± 1.0 mm
d_1 28 bis 63 mm: ± 1.5 mm
d_1 ab 65 mm and above: ± 2.0 mm

Seal code explanation

– d_1 = 53 mm
– Seal face made of cast Cr-steel (S)
– Type G13 stationary seat made of carbon graphite (B)
– Viton® O-rings (V)
– Metal parts including spring material 1.4571 (G)
– Rotating unit M74
→ M74/53–G13–SBVGG

The basic description M74N/53 – SBVGG indicates a G9 seat, installation dimensions to EN 12756.

M7N

(d_1 = max. 100 mm)

Item no.	Part no. to DIN 24250	Description
1.1	472	Seal face
1.2	485	Drive collar
1.3	474	Thrust ring
1.4	412.1	O-ring
1.5	477	Spring
1.6	904	Set screw
2	475	Type G9 stationary seat
3	412.2	O-ring

Combination of materials

Seal faces	Stationary seals				
	G4	G13	G9		G6
	Q_1 (Q_2)	A;B	A;B	Q_1 (Q_2)	Q_1 (Q_2)
S	–	●	●	–	–
V	–	●	●	–	–
Q_1	●	●	●	●	●
Q_2	●	●	●	●	●

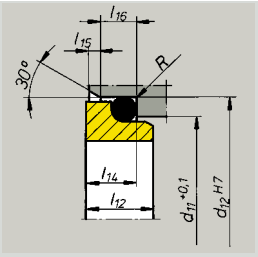
Only M78N:

	G9		
	S	V	Q_1
B	●	●	●
A	●	●	●
Q_1	–	–	●

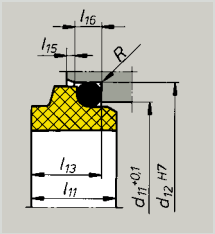
(Designations to EN 12756, see inside the back cover of this manual)

Stationary seats

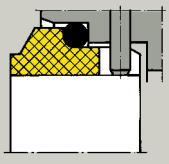
– G4



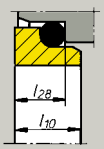
– G13



– G9
EN 12756 (DIN 24960)



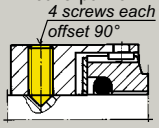
– G6
EN 12756 (DIN 24960)

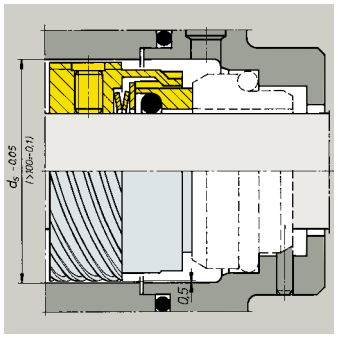


Unquoted dimensions as for item no. 2

Torque transmission d_1 >100 mm

4 set screws with cone points (standard arrangement).





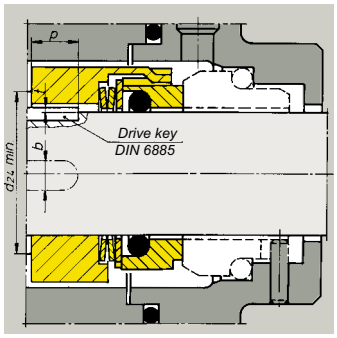
M7F

d_1 max. 100 mm

M74F

d_1 = 14 ... 200 mm

Dimensions, item no's and descriptions as for type M7N, but with **pumping screw.** Dependent on direction of rotation!



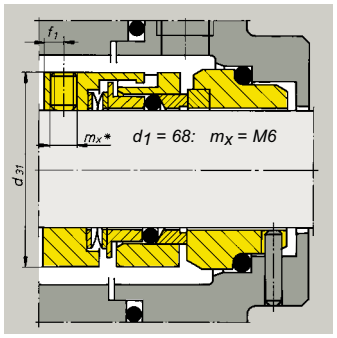
M7 S2

d_1 max. 100 mm

M74 S2

d_1 = 28 ... 200 mm

Dimensions, item no's and descriptions as for type M7N, but with **drive key.** (without item no. 1.6)



M78N

d_1 = 18 ... 100 mm
t max. 180 °C

Items no's, description and unspecified dimensions as for M7N. Design of the rotating portion especially for secondary sealing element made of PTFE (T).

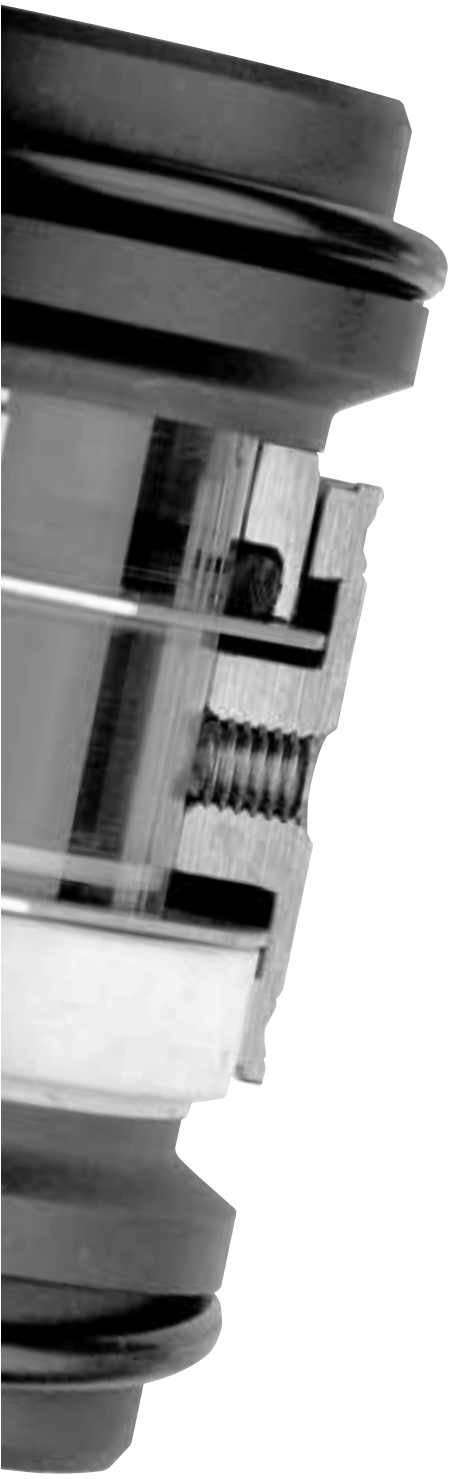
M7N

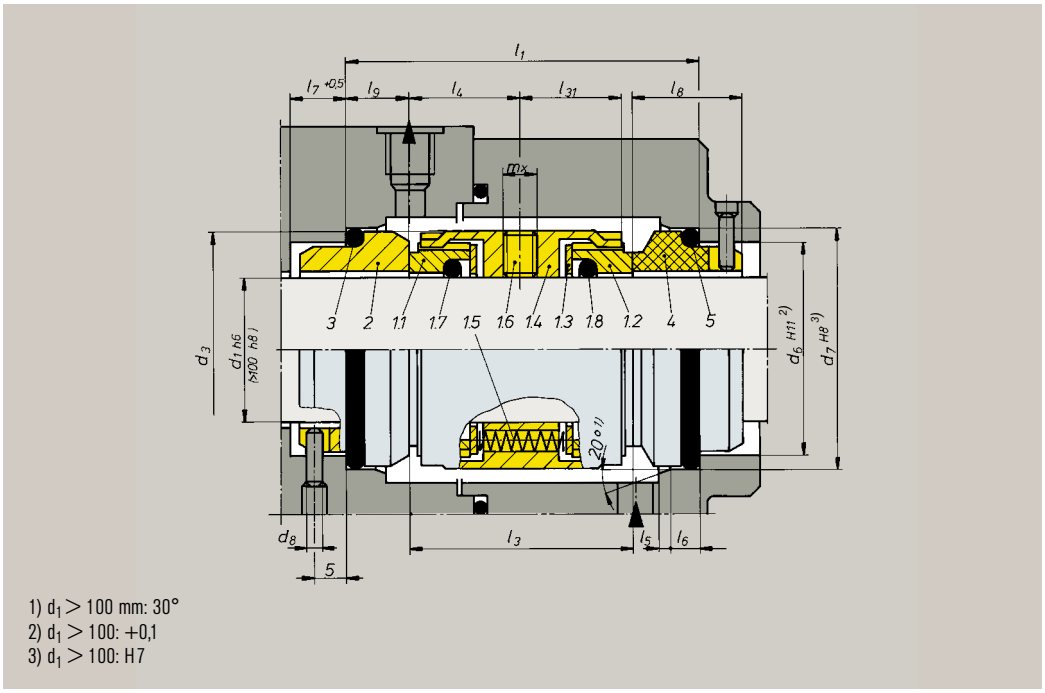
d_1	d_3	d_6	d_7	d_8	d_{11}	d_{12}	d_{24}	d_{31}	d_5	l_{1K}	l_3	l_5	l_6	l_7	l_8	l_9	l_{10}	l_{11}	l_{12}	l_{13}	l_{14}	l_{15}	l_{16}	l_{28}	b	f	f_1	m_x	$p_{max.}$	t	
14*	25	21.0	25.0	3	20.5	24.6	16	–	34	35.0	25.0	1.5	4	8.5	17.5	10.0	7.5	10.0	6.5	7.6	5.6	1.2	3.8	6.6	4	6	–	M5	10	1.5	
16*	27	23.0	27.0	3	22.0	28.0	18	–	36	35.0	25.0	1.5	4	8.5	17.5	10.0	7.5	11.5	8.5	9.0	7.5	1.2	3.8	6.6	4	6	–	M5	10	1.5	
18*	33	27.0	33.0	3	24.0	30.0	20	32	38	37.5	26.0	2.0	5	9.0	19.5	11.5	8.5	12.5	9.0	10.0	8.0	1.5	5.0	7.5	5	7	3.5	M5	10	1.1	
20*	35	29.0	35.0	3	29.5	35.0	22	34	40	37.5	26.0	2.0	5	9.0	19.5	11.5	8.5	12.5	8.5	9.5	7.5	1.5	5.0	7.5	5	7	3.5	M5	10	1.1	
22*	37	31.0	37.0	3	29.5	35.0	24	36	42	37.5	26.0	2.0	5	9.0	19.5	11.5	8.5	12.5	8.5	9.5	7.5	1.5	5.0	7.5	6	7	3.5	M5	10	1.5	
24*	39	33.0	39.0	3	32.0	38.0	26	38	44	40.0	28.5	2.0	5	9.0	19.5	11.5	8.5	12.5	8.5	9.5	7.5	1.5	5.0	7.5	6	8	3.5	M5	13	1.5	
25*	40	34.0	40.0	3	32.0	38.0	27	39	45	40.0	28.5	2.0	5	9.0	19.5	11.5	8.5	12.5	8.5	9.5	7.5	1.5	5.0	7.5	6	8	3.5	M5	13	1.5	
28*	43	37.0	43.0	3	36.0	42.0	30	42	47	42.5	31.0	2.0	5	9.0	19.5	11.5	8.5	14.0	10.0	11.0	9.0	1.5	5.0	7.5	6	8	4.0	M6	13	1.5	
30*	45	39.0	45.0	3	39.2	45.0	32	44	49	42.5	31.0	2.0	5	9.0	19.5	11.5	8.5	14.0	11.5	11.0	10.5	1.5	5.0	7.5	6	8	4.0	M6	13	1.5	
32*	47	42.0	48.0	3	42.2	48.0	34	46	51	42.5	31.0	2.0	5	9.0	19.5	11.5	8.5	14.0	11.5	11.0	10.5	1.5	5.0	7.5	6	8	4.0	M6	13	1.5	
33*	48	42.0	48.0	3	44.2	50.0	35	47	51	42.5	31.0	2.0	5	9.0	19.5	11.5	8.5	14.5	12.0	11.5	10.5	1.5	5.0	7.5	6	8	4.0	M6	13	1.5	
35*	50	44.0	50.0	3	46.2	52.0	37	49	54	42.5	31.0	2.0	5	9.0	19.5	11.5	8.5	14.5	12.0	11.5	11.0	1.5	5.0	7.5	6	8	4.0	M6	13	1.5	
38*	55	49.0	56.0	4	49.2	55.0	40	54	59	45.0	31.0	2.0	6	9.0	22.0	14.0	10.0	14.5	11.3	11.5	10.3	1.5	5.0	9.0	6	8	4.0	M6	13	1.5	
40*	57	51.0	58.0	4	52.2	58.0	42	56	61	45.0	31.0	2.0	6	9.0	22.0	14.0	10.0	14.5	11.8	11.5	10.8	1.5	5.0	9.0	6	8	4.0	M6	13	1.5	
43*	60	54.0	61.0	4	53.3	62.0	45	59	65	45.0	31.0	2.0	6	9.0	22.0	14.0	10.0	17.0	13.2	14.3	12.0	2.0	6.0	9.0	6	8	4.0	M6	13	1.5	
45*	62	56.0	63.0	4	55.3	64.0	47	61	66	45.0	31.0	2.0	6	9.0	22.0	14.0	10.0	17.0	12.8	14.3	11.6	2.0	6.0	9.0	6	8	4.0	M6	13	1.5	
48*	65	59.0	66.0	4	59.7	68.4	50	64	69	45.0	31.0	2.0	6	9.0	22.0	14.0	10.0	17.0	12.8	14.3	11.6	2.0	6.0	9.0	6	8	4.0	M6	13	1.5	
50*	67	62.0	70.0	4	60.8	69.3	52	66	71	47.5	32.5	2.5	6	9.0	23.0	15.0	10.5	17.0	12.8	14.3	11.6	2.0	6.0	9.5	6	8	4.5	M6	13	1.5	
53*	70	65.0	73.0	4	63.8	72.3	55	69	75	47.5	32.5	2.5	6	9.0	23.0	15.0	12.0	17.0	13.5	14.3	12.3	2.0	6.0	11.0	6	8	4.5	M6	13	1.5	
55*	72	67.0	75.0	4	66.5	75.4	57	71	76	47.5	32.5	2.5	6	9.0	23.0	15.0	12.0	18.0	14.5	15.3	13.3	2.0	6.0	11.0	6	8	4.5	M6	13	1.5	
58*	79	70.0	78.0	4	69.5	78.4	60	78	83	52.5	37.5	2.5	6	9.0	23.0	15.0	12.0	18.0	14.5	15.3	13.3	2.0	6.0	11.0	8	9	5.5	M8	13	1.9	
60*	81	72.0	80.0	4	71.5	80.4	62	80	85	52.5	37.5	2.5	6	9.0	23.0	15.0	12.0	18.0	14.5	15.3	13.3	2.0	6.0	11.0	8	9	5.5	M8	13	1.9	
63*	84	75.0	83.0	4	74.5	83.4	65	83	88	52.5	37.5	2.5	6	9.0	23.0	15.0	12.0	18.0	14.2	15.3	13.3	2.0	6.0	11.0	8	9	5.5	M8	13	1.9	
65*	86	77.0	85.0	4	76.5	85.4	67	85	95	52.5	37.5	2.5	6	9.0	23.0	15.0	12.0	18.0	14.2	15.3	13.0	2.0	6.0	11.0	8	9	5.5	M8	13	1.9	
68*	89	81.0	90.0	4	82.7	91.5	70	88	93	52.5	34.5	2.5	7	9.0	26.0	18.0	12.5	19.0	14.9	16.0	13.7	2.0	6.0	11.3	8	9	4.0	M8	13	1.9	
70*	91	83.0	92.0	4	83.0	92.0	72	90	95	60.0	42.0	2.5	7	9.0	26.0	18.0	12.5	18.0	14.2	15.3	13.0	2.0	6.0	11.3	8	9	5.5	M8	16	1.9	
75*	99	88.0	97.0	4	90.2	99.0	77	99	105	60.0	42.0	2.5	7	9.0	26.0	18.0	12.5	18.0	15.2	15.3	14.0	2.0	6.0	11.3	8	10	5.5	M8	16	1.9	
80*	104	95.0	105.0	4	95.2	104.0	82	104	109	60.0	41.8	3.0	7	9.0	26.2	18.2	13.0	19.0	16.2	16.3	15.0	2.0	6.0	12.0	8	10	5.5	M8	16	1.9	
85*	109	100.0	110.0	4	100.2	109.0	87	109	114	60.0	41.8	3.0	7	9.0	26.2	18.2	15.0	19.0	16.0	16.3	14.8	2.0	6.0	14.0	8	10	5.5	M8	16	1.9	
90*	114	105.0	115.0	4	105.2	114.0	92	114	119	65.0	46.8	3.0	7	9.0	26.2	18.2	15.0	19.0	16.0	16.3	14.8	2.0	6.0	14.0	10	10	8.0	M8	22	2.3	
95*	119	110.0	120.0	4	111.6	120.3	97	119	124	65.0	47.8	3.0	7	9.0	25.2	17.2	15.0	20.0	17.0	17.3	15.8	2.0	6.0	14.0	10	10	8.0	M8	22	2.3	
100*	124	115.0	125.0	4	114.5	123.3	102	124	129	65.0	47.8	3.0	7	9.0	25.2	17.2	15.0	20.0	17.0	17.3	15.8	2.0	6.0	14.0	10	10	8.0	M8	22	2.3	
105	138	122.2	134.3	5	–	–	108	–	143	67.0	47.0	2.0	10	–	30.0	20.0	–	–	–	–	–	–	–	–	10	10	–	M8	20	2.3	
110	143	128.2	140.3	5	–	–	113	–	148	67.0	47.0	2.0	10	–	30.0	20.0	–	–	–	–	–	–	–	–	10	10	–	M8	20	2.3	
115	148	136.2	148.3	5	–	–	118	–	153	67.0	47.0	2.0	10	–	30.0	20.0	–	–	–	–	–	–	–	–	10	10	–	M8	20	2.3	
120	153	138.2	150.3	5	–	–	123	–	158	67.0	47.0	2.0	10	–	30.0	20.0	–	–	–	–	–	–	–	–	10	10	–	M8	20	2.3	
125	158	142.2	154.3	5	–	–	128	–	163	67.0	47.0	2.0	10	–	30.0	20.0	–	–	–	–	–	–	–	–	10	10	–	M8	20	2.3	
130	163	146.2	158.3	5	–	–	133	–	168	67.0	47.0	2.0	10	–	30.0	20.0	–	–	–	–	–	–	–	–	10	10	–	M8	20	2.3	
135	168	152.2	164.3	5	–	–	138	–	173	67.0	47.0	2.0	10	–	30.0	20.0	–	–	–	–	–	–	–	–	10	10	–	M8	20	2.3	
140	173	156.2	168.3	5	–	–	143	–	178	67.0	47.0	2.0	10	–	30.0	20.0	–	–	–	–	–	–	–	–	10	10	–	M8	20	2.3	
145	178	161.2	173.3	5	–	–	148	–	183	67.0	47.0	2.0	10	–	30.0	20.0	–	–	–	–	–	–	–	–	10	10	–	M8	20	2.3	
150	183	168.2	180.3	5	–	–	153	–	188	69.0	47.0	2.0	10	–	32.0	22.0	–	–	–	–	–	–	–	–	10	10	–	M8	20	2.3	
155	191	173.2	185.3	5	–	–	158	–	196	80.0	56.0	2.0	12	–	34.0	24.0	–	–	–	–	–	–	–	–	12	12	–	M8	24	2.1	
160	196	178.2	190.3	5	–	–	163	–	201	80.0	56.0	2.0	12	–	34.0	24.0	–	–	–	–	–	–	–	–	12	12	–	M8	24	2.1	
165	201	183.2	195.3	5	–	–	168	–	206	80.0	56.0	2.0	12	–	34.0	24.0	–	–	–	–	–	–	–	–	12	12	–	M8	24	2.1	
170	206	188.2	200.3	5	–	–	173	–	211	80.0	56.0	2.0	12	–	34.0	24.0	–	–	–	–	–	–	–	–	12	12	–	M8	24	2.1	
175	211	193.2	205.3	5	–	–	178	–	216	80.0	56.0	2.0	12	–	34.0	24.0	–	–	–	–	–	–	–	–	12	12	–	M8	24	2.1	
180	216	207.5	219.3	5	–	–	183	–	221	84.0	56.0	2.0	12	–	38.0	28.0	–	–	–	–	–	–	–	–	12	12	–	M8	24	2.1	
185	221	212.5	224.3	5	–	–	188	–	226	84.0	56.0	2.0	12	–	38.0	28.0	–	–	–	–	–	–	–	–	12	12	–	M8	24	2.1	
190	226	217.5	229.3	5	–	–	193	–	231	84.0	56.0	2.0	12	–	38.0	28.0	–	–	–	–	–	–	–	–	12	12	–	M8	24	2.1	
195	231	222.5	234.3	5	–	–	198	–	236	84.0	56.0	2.0	12	–	38.0	28.0	–	–	–	–	–	–	–	–	12	12	–	M8	24	2.1	
200	236	227.5	239.3	5	–	–	203	–	241	84.0	56.0	2.0	12	–	38.0	28.0	–	–	–	–	–	–	–	–	12	12	–	M8	24	2.1	

d_1 > 200 on request

For plain shafts, springs rotating

M74-D





1) $d_1 > 100$ mm: 30°
2) $d_1 > 100$: +0,1
3) $d_1 > 100$: H7

- **Double seal**
- **Unbalanced**
- **Independent of direction of rotation**
- **Multiple springs**

Double seals in the M74-D series have the same design-features as the "M7" family of single seals (easy-to-replace seal faces, etc.). Apart from the installation length of the drive collar, all fitting dimensions ($d_1 < 100$ mm) conform with EN 12756.

Operating limits (see note on page 1)

d_1 = 18 ... 200 mm *0.625" ... 8"*
p_1 = 16 (25) bar *230 (360) PSI*
t = –50 ... 220 °C (–20 ... 180 °C*)
v_g = 20 m/s (10 m/s*) *66 (33) ft/s*
*) Limit for shrink-fitted carbide seal faces with $d_1 \geqq 105$ mm
Axial movement
$d_1 \leqq 100$ mm ±0.5 mm
$d_1 > 100$ mm ±2.0 mm

Combination of materials

Dimensions are identical throughout the M7 series, so it is possible to use the same face materials as for type M7N (see page 30).

Double seals to EN 12756

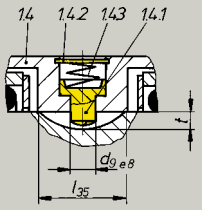
EN specifies single seals in a back-to-back arrangement. It is possible, therefore, to choose from the following combinations:
– unbalanced/unbalanced
– (e. g. M7N/M7N)
– balanced/balanced (e. g. H7N/H7N)
– unbalanced/balanced (e. g. M7N/H7N). Please consult the single-seal tables for dimensions.

M74-D

Item no.	Part no. to DIN 24250	Description
1.1	472.1	Seal face
1.2	472.2	Seal face
1.3	474	Thrust ring
1.4	485	Drive collar
1.5	477	pring
1.6	904	Set screw
1.7	412.1	O-ring
1.8	412.2	O-ring
2	475.1	Type G9 stationary seat
3	412.3	O-ring
4	475.2	Type G9 stationary seat
5	412.4	O-ring

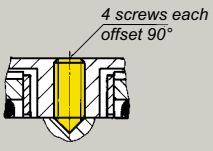
Torque transmission

Spring loaded drive pin: M74-D22



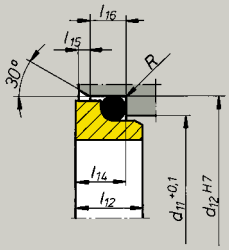
– drive pin – 1.4.1
– disk – 1.4.2
– thrust spring – 1.4.3

For $d_1 > 100$ mm: 4 set screws with cone points (standard arrangement)

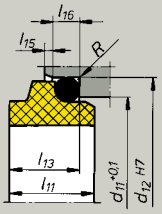


Stationary seats

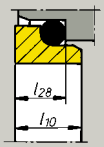
– G4



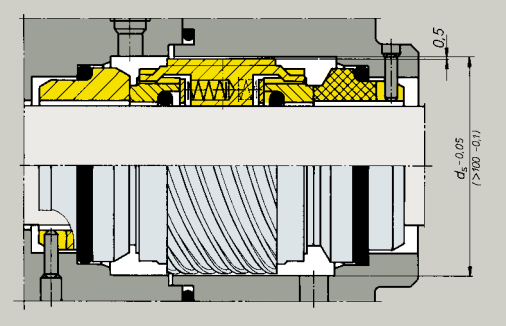
– G13



– G6
EN 12756
DIN 24960



Unquoted dim. as for item 2 + 4.



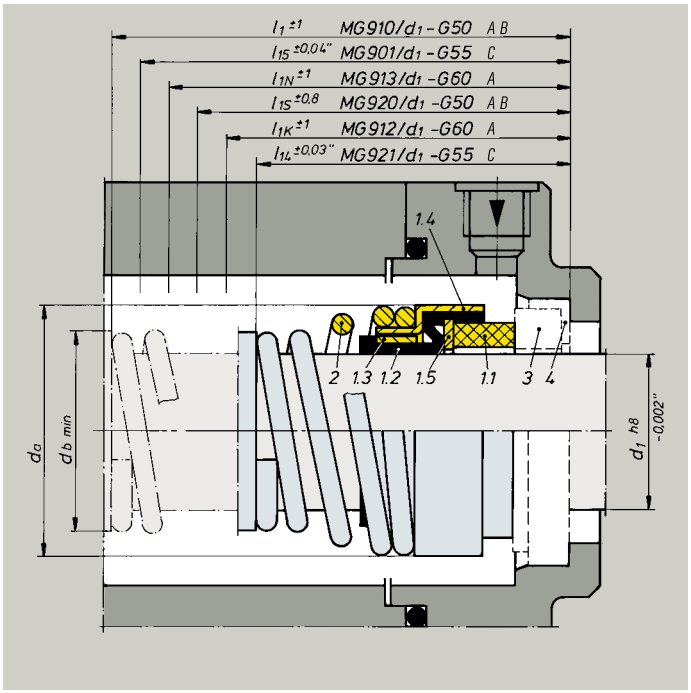
M74F-D

Dimensions, item no's and descriptions as for type M74-D, but with **pumping screw** (Item no. 1.4). Dependent on direction of rotation!
Torque transmission via set screws with cone points.

d_1	d_3	d_6	d_7	d_8	d_9	d_{11}	d_{12}	d_5	l_1	l_3	l_4	l_5	l_6	l_9	l_8	l_9	l_{10}	l_{11}	l_{12}	l_{13}	l_{14}	l_{15}	l_{16}	l_{28}	l_{31}	l_{35}	m_x	t
18	33	27.0	33.0	3	4	24.0	30.0	–	61.0	38	19.0	2.0	5	9	19.5	11.5	8.5	12.5	9.0	10.0	8.0	1.5	5	7.5	17.0	15	M5	3.5
20	35	29.0	35.0	3	4	29.5	35.0	–	61.0	38	19.0	2.0	5	9	19.5	11.5	8.5	12.5	8.5	9.5	7.5	1.5	5	7.5	17.0	15	M5	3.5
22	37	31.0	37.0	3	4	29.5	35.0	42	61.0	38	19.0	2.0	5	9	19.5	11.5	8.5	12.5	8.5	9.5	7.5	1.5	5	7.5	17.0	15	M5	3.5
24	39	33.0	39.0	3	4	32.0	38.0	44	61.0	38	19.0	2.0	5	9	19.5	11.5	8.5	12.5	8.5	9.5	7.5	1.5	5	7.5	17.0	15	M5	3.5
25	40	34.0	40.0	3	4	32.0	38.0	45	61.0	38	19.0	2.0	5	9	19.5	11.5	8.5	12.5	8.5	9.5	7.5	1.5	5	7.5	17.0	15	M5	3.5
28	43	37.0	43.0	3	4	36.0	42.0	47	62.0	39	19.5	2.0	5	9	19.5	11.5	8.5	14.0	10.0	11.0	9.0	1.5	5	7.5	17.5	15	M6	3.5
30	45	39.0	45.0	3	4	39.2	45.0	49	62.0	39	19.5	2.0	5	9	19.5	11.5	8.5	14.0	11.5	11.0	10.5	1.5	5	7.5	17.5	15	M6	3.5
32	47	42.0	48.0	3	4	42.2	48.0	51	62.0	39	19.5	2.0	5	9	19.5	11.5	8.5	14.0	11.5	11.0	10.5	1.5	5	7.5	17.5	15	M6	3.5
33	48	42.0	48.0	3	4	44.2	50.0	51	62.0	39	19.5	2.0	5	9	19.5	11.5	8.5	14.5	12.0	11.5	10.5	1.5	5	7.5	17.5	15	M6	3.5
35	50	44.0	50.0	3	4	46.2	52.0	54	62.0	39	19.5	2.0	5	9	19.5	11.5	8.5	14.5	12.0	11.5	11.0	1.5	5	7.5	17.5	15	M6	3.5
38	55	49.0	56.0	4	4	49.2	55.0	59	69.0	41	20.5	2.0	6	9	22.0	14.0	10.0	14.5	11.3	11.5	10.3	1.5	5	9.0	18.5	15	M6	3.5
40	57	51.0	58.0	4	4	52.2	58.0	61	70.0	42	21.0	2.0	6	9	22.0	14.0	10.0	14.5	11.8	11.5	10.8	1.5	5	9.0	19.0	15	M6	3.5
43	60	54.0	61.0	4	4	53.3	62.0	65	70.0	42	21.0	2.0	6	9	22.0	14.0	10.0	17.0	13.2	14.3	12.0	2.0	6	9.0	19.0	15	M6	3.5
45	62	56.0	63.0	4	4	55.3	64.0	66	70.0	42	21.0	2.0	6	9	22.0	14.0	10.0	17.0	12.8	14.3	11.6	2.0	6	9.0	19.0	15	M6	3.5
48	65	59.0	66.0	4	4	59.7	68.4	69	70.0	42	21.0	2.0	6	9	22.0	14.0	10.0	17.0	12.8	14.3	11.6	2.0	6	9.0	19.0	15	M6	3.5
50	67	62.0	70.0	4	4	60.8	69.3	71	73.0	43	21.5	2.5	6	9	23.0	15.0	10.5	17.0	12.8	14.3	11.6	2.0	6	9.5	19.5	15	M6	3.5
53	70	65.0	73.0	4	4	63.8	72.3	75	73.0	43	21.5	2.5	6	9	23.0	15.0	12.0	17.0	13.5	14.3	12.3	2.0	6	11.0	19.5	15	M6	3.5
55	72	67.0	75.0	4	4	66.5	75.4	76	73.0	43	21.5	2.5	6	9	23.0	15.0	12.0	18.0	14.5	15.3	13.3	2.0	6	11.0	19.5	15	M8	3.5
58	79	70.0	78.0	4	5	69.5	78.4	83	86.0	56	28.0	2.5	6	9	23.0	15.0	12.0	18.0	14.5	15.3	13.3	2.0	6	11.0	23.5	19	M8	3.5
60	81	72.0	80.0	4	5	71.5	80.4	85	86.0	56	28.0	2.5	6	9	23.0	15.0	12.0	18.0	14.5	15.3	13.3	2.0	6	11.0	23.5	19	M8	3.5
63	84	75.0	83.0	4	5	74.5	83.4	88	85.0	55	27.5	2.5	6	9	23.0	15.0	12.0	18.0	14.2	15.3	13.3	2.0	6	11.0	24.5	19	M8	3.5
65	86	77.0	85.0	4	5	76.5	85.4	95	85.0	55	27.5	2.5	6	9	23.0	15.0	12.0	18.0	14.2	15.3	13.0	2.0	6	11.0	24.5	19	M8	3.5
68	89	81.0	90.0	4	5	82.7	91.5	93	91.0	55	27.5	2.5	7	9	26.0	18.0	12.5	19.0	14.9	16.0	13.7	2.0	6	11.3	24.5	19	M8	3.5
70	91	83.0	92.0	4	5	83.0	92.0	95	92.0	56	28.0	2.5	7	9	26.0	18.0	12.5	18.0	14.2	15.3	13.0	2.0	6	11.3	23.5	19	M8	3.5
75	99	88.0	97.0	4	5	90.2	99.0	105	92.0	56	28.0	2.5	7	9	26.0	18.0	12.5	18.0	15.2	15.3	14.0	2.0	6	11.3	25.5	19	M8	3.5
80	104	95.0	105.0	4	5	95.2	104.0	109	92.5	56	28.0	3.0	7	9	26.2	18.2	13.0	19.0	16.2	16.3	15.0	2.0	6	12.0	25.5	19	M8	3.5
85	109	100.0	110.0	4	5	100.2	109.0	114	92.5	56	28.0	3.0	7	9	26.2	18.2	15.0	19.0	16.0	16.3	14.8	2.0	6	14.0	25.0	19	M8	3.5
90	114	105.0	115.0	4	5	105.2	114.0	119	92.5	56	28.0	3.0	7	9	26.2	18.2	15.0	19.0	16.0	16.3	14.8	2.0	6	14.0	25.5	19	M8	3.5
95	119	110.0	120.0	4	5	111.6	120.3	124	90.5	56	28.0	3.0	7	9	25.2	17.2	15.0	20.0	17.0	17.3	15.8	2.0	6	14.0	25.0	19	M8	3.5
100	124	115.0	125.0	4	5	114.5	123.3	129	90.5	56	28.0	3.0	7	9	25.2	17.2	15.0	20.0	17.0	17.3	15.8	2.0	6	14.0	25.0	19	M8	3.5
105	138	122.2	134.3	5	7	–	–	143	108.0	68	34.0	2.0	10	–	30.0	20.0	–	–	–	–	–	–	–	–	30.5	22	M8	3.5
110	143	128.2	140.3	5	7	–	–	148	110.0	70	35.0	2.0	10	–	30.0	20.0	–	–	–	–	–	–	–	–	31.5	22	M8	3.5
115	148	136.2	148.3	5	7	–	–	153	110.0	70	35.0	2.0	10	–	30.0	20.0	–	–	–	–	–	–	–	–	31.5	22	M8	3.5
120	153	138.2	150.3	5	7	–	–	158	110.0	70	35.0	2.0	10	–	30.0	20.0	–	–	–	–	–	–	–	–	31.5	22	M8	3.5
125	158	142.2	154.3	5	7	–	–	163	110.0	70	35.0	2.0	10	–	30.0	20.0	–	–	–	–	–	–	–	–	31.5	22	M8	3.5
130	163	146.2	158.3	5	7	–	–	168	110.0	70	35.0	2.0	10	–	30.0	20.0	–	–	–	–	–	–	–	–	31.5	22	M8	3.5
135	168	152.2	164.3	5	7	–	–	173	110.0	70	35.0	2.0	10	–	30.0	20.0	–	–	–	–	–	–	–	–	31.5	22	M8	3.5
140	173	156.2	168.3	5	7	–	–	178	110.0	70	35.0	2.0	10	–	30.0	20.0	–	–	–	–	–	–	–	–	31.5	22	M8	3.5
145	178	161.2	173.3	5	7	–	–	183	110.0	70	35.0	2.0	10	–	30.0	20.0	–	–	–	–	–	–	–	–	31.5	22	M8	3.5
150	183	168.2	180.3	5	7	–	–	188	114.0	70	35.0	2.0	10	–	32.0	22.0	–	–	–	–	–	–	–	–	31.5	22	M8	3.5
155	191	173.2	185.3	5	7	–	–	196	127.0	79	39.5	2.0	12	–	34.0	24.0	–	–	–	–	–	–	–	–	35.5	22	M8	3.5
160	196	178.2	190.3	5	7	–	–	201	127.0	79	39.5	2.0	12	–	34.0	24.0	–	–	–	–	–	–	–	–	35.5	22	M8	3.5
165	201	183.2	195.3	5	7	–	–	206	127.0	79	39.5	2.0	12	–	34.0	24.0	–	–	–	–	–	–	–	–	35.5	22	M8	3.5
170	206	188.2	200.3	5	7	–	–	211	127.0	79	39.5	2.0	12	–	34.0	24.0	–	–	–	–	–	–	–	–	35.5	22	M8	3.5
175	211	193.2	205.3	5	7	–	–	216	127.0	79	39.5	2.0	12	–	34.0	24.0	–	–	–	–	–	–	–	–	35.5	22	M8	3.5
180	216	207.5	219.3	5	7	–	–	221	135.0	79	39.5	2.0	12	–	38.0	28.0	–	–	–	–	–	–	–	–	35.5	22	M8	3.5
185	221	212.5	224.3	5	7	–	–	226	135.0	79	39.5	2.0	12	–	38.0	28.0	–	–	–	–	–	–	–	–	35.5	22	M8	3.5
190	226	217.5	229.3	5	7	–	–	231	135.0	79	39.5	2.0	12	–	38.0	28.0	–	–	–	–	–	–	–	–	35.5	22	M8	3.5
195	231	222.5	234.3	5	7	–	–	236	135.0	79	39.5	2.0	12	–	38.0	28.0	–	–	–	–	–	–	–	–	35.5	22	M8	3.5
200	236	227.5	239.3	5	7	–	–	241	135.0	79	39.5	2.0	12		38.0	28.0	–	–	–	–	–	–	–	–	35.5	22	M8	3.5

For plain shafts, rotating spring

MG9



- **Single seal**
- **Unbalanced**
- **Independent of direction of rotation**
- **Elastomer bellows**

The MG9 is (US Patent No. 6,220,601) designed for medium-range pressures and loads. Within its operating limits it can be put to universal use in pumps thanks to the following attributes:

- for all fitting lengths only one bellows unit for each size of diameter
- length compensation by means of a conical spring of required length, with single easy-to-fit clamp-type connector
- no need to change existing pump installation spaces
- smallest external diameter of all bellows seals on the world market
- no torsion on bellows and spring
- no adhesive joints
- self-centering conical spring (supported directly on the shaft collar without an additional washer)
- technical approval issued by a top-name, global pump manufacturer
- compact, unsplit bellows unit with stationary seal face for reliable installation and operation (deposits between the bellows and the seal face are impossible, ruling out all risk of misalignment)

MG9

Item	Part No. DIN 24250	Description
1.1	472	Seal face
1.2	481	Bellows
1.3	485	Driver collar
1.4	484.1	"L" ring
1.5	474	Washer
2	477	Spring
3	475	Seat
4	412	Corner sleeve

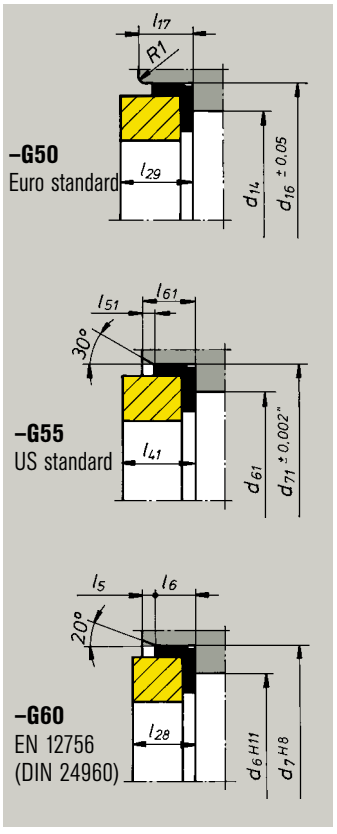
Operating limits (see note on page 1)

d_1 = 10 ... 100 mm *0.375 ... 4"*
p_1*= 8 (12) bar *116 (174) PSI*
t* = –20 ... +90 (140) °C
–4 ... +194 (284) °F
v_g = 10 m/s *33 ft/s*
permissible axial movement: ± 0.5 mm
*) dependent on the medium, size and materials

Materials

Seal component	Material (DIN)	Standard	Special
Seal face	Carbon (B)	●	
	SiC (Q1)		●
Seat	Ceramic (V)	●	
	SiC (Q1)		●
Bellows / Corner sleeve	Perbunan (P)	●	
	Viton® (V)		●
	EPDM (E)		●
Spring	1.4310 (F)	●	
	1.4571 (G)		●
Driver collar / "L" ring	1.4301 (F)	●	
	1.4571 (G)		●
	1.4401		

Seats



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d_1	d_6	d_7	d_{14}	d_{16}	d_a	d_b	l_1	l_{1K}	l_{1N}	l_{1S}	l_5	l_6	l_{17}	l_{28}	l_{29}
10	17	21	11.0	24.60	19.6	13.0	53.0	32.5	40	34.0	1.5	4	7.5	6.6	9.0
12	19	23	13.5	27.80	21.6	15.0	53.0	32.5	40	34.0	1.5	4	7.5	6.6	9.0
14	21	25	17.0	30.95	24.0	18.0	54.5	35.0	40	35.5	1.5	4	9.0	6.6	10.5
15	–	–	17.0	30.95	25.0	19.0	54.5	–	–	35.5	–	–	9.0	–	10.5
16	23	27	17.0	30.95	26.5	20.0	54.5	35.0	40	35.5	1.5	4	9.0	6.6	10.5
18	27	33	20.0	34.15	29.0	22.0	54.5	37.5	45	35.5	2.0	5	9.0	7.5	10.5
20	29	35	21.5	35.70	31.5	24.5	54.5	37.5	45	35.5	2.0	5	9.0	7.5	10.5
22	31	37	23.0	37.30	33.0	27.0	54.5	37.5	45	35.5	2.0	5	9.0	7.5	10.5
24	33	39	26.5	40.50	37.0	29.0	54.5	40.0	50	35.5	2.0	5	9.0	7.5	10.5
25	34	40	26.5	40.50	38.0	30.0	54.5	40.0	50	35.5	2.0	5	9.0	7.5	10.5
28	37	43	29.5	47.65	41.0	34.0	72.0	42.5	50	45.0	2.0	5	10.5	7.5	12.0
30	39	45	32.5	50.80	43.0	36.0	72.0	42.5	50	45.0	2.0	5	10.5	7.5	12.0
32	42	48	32.5	50.80	45.0	38.0	72.0	42.5	55	45.0	2.0	5	10.5	7.5	12.0
33	42	48	36.5	54.00	46.0	39.0	72.0	42.5	55	45.0	2.0	5	10.5	7.5	12.0
35	44	50	36.5	54.00	48.0	41.0	72.0	42.5	55	45.0	2.0	5	10.5	7.5	12.0
38	49	56	39.5	57.15	52.5	44.5	72.0	45.0	55	45.0	2.0	6	10.5	9.0	12.0
40	51	58	42.5	60.35	55.5	47.5	72.0	45.0	55	45.0	2.0	6	10.5	9.0	12.0
43	54	61	46.0	63.50	58.5	50.5	83.0	45.0	60	53.0	2.0	6	10.5	9.0	12.0
45	56	63	46.0	63.50	60.5	52.5	83.0	45.0	60	53.0	2.0	6	10.5	9.0	12.0
48	59	66	49.0	66.70	64.0	56.0	83.0	45.0	60	53.0	2.0	6	10.5	9.0	12.0
50	62	70	52.0	69.85	66.0	58.0	84.5	47.5	60	54.5	2.5	6	12.0	9.5	13.5
53	65	73	55.5	73.05	69.0	61.0	84.5	47.5	70	54.5	2.5	6	12.0	11.0	13.5
55	67	75	58.5	76.20	71.0	63.0	84.5	47.5	70	54.5	2.5	6	12.0	11.0	13.5
58	70	78	61.5	79.40	76.0	66.0	84.5	52.5	70	54.5	2.5	6	12.0	11.0	13.5
60	72	80	61.5	79.40	78.0	68.0	84.5	52.5	70	54.5	2.5	6	12.0	11.0	13.5
63	75	83	–	–	82.0	71.5	–	52.5	70	–	2.5	6	–	11.0	–
65	77	85	68.0	92.10	84.0	73.5	86.0	52.5	80	65.0	2.5	6	14.5	11.0	16.0
68	81	90	71.0	95.25	87.0	76.5	86.0	52.5	80	65.0	2.5	7	14.5	11.3	16.0
70	83	92	71.0	95.25	89.0	79.0	86.0	60.0	80	65.0	2.5	7	14.5	11.3	16.0
75	88	97	77.5	101.60	95.0	85.0	89.0	60.0	80	68.0	2.5	7	14.5	11.3	16.0
80	95	105	84.0	114.30	101.5	91.5	99.0	60.0	90	76.0	3.0	7	18.5	12.0	20.0
85	100	110	87.0	117.50	–	–	99.0	60.0	90	76.0	3.0	7	18.5	14.0	20.0
90	105	115	93.5	123.85	111.5	103.0	103.0	65.0	90	79.0	3.0	7	18.5	14.0	20.0
95	110	120	96.5	127.00	–	–	103.0	65.0	90	79.0	3.0	7	18.5	14.0	20.0
100	115	125	103.0	133.35	122.5	114.0	106.0	65.0	90	82.0	3.0	7	18.5	14.0	20.0

MG9 … the alternative

Burgmann*	Crane*	Sealol*	Dimensions	Table
MG910/d_1-G50	1A	43 CE long	inch / mm	Ⓑ
	1A	43 CE long	mm	Ⓐ
MG920/d_1-G50	2	43 CE short	inch / mm	Ⓑ
	2	43 CE short	mm	Ⓐ
MG901/d_1-G55	1	43 CU long	inch (USA only)	Ⓒ
MG921/d_1-G55	2	43 CU short	inch (USA only)	Ⓒ
	21	43 CU short	inch (USA only)	Ⓒ
MG912/d_1-G60	502	43 DIN	mm	Ⓐ
	521	43 DIN	mm	Ⓐ
	2100-l_{1k}	43 DIN	mm	Ⓐ
MG913/d_1-G60	2100-l_{1N}		mm	Ⓐ

* identical fitting dimensions

Ⓑ Dimensions in inches / mm

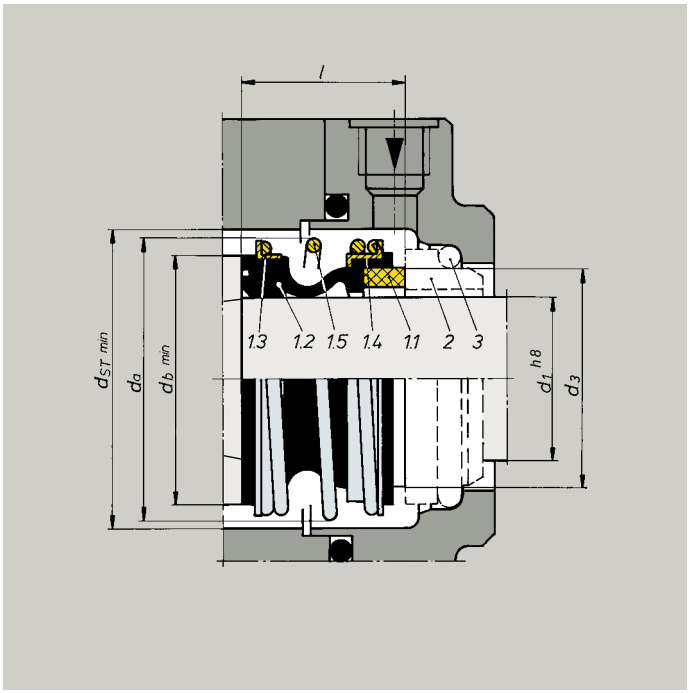
d_1	d_1	d_{14}	d_{16}	d_a	d_b	l_1	l_{1S}	l_{17}	l_{29}
0.375"	9.53	11.0	24.60	18.8	12.5	53.0	34.0	7.5	9.0
0.500"	12.70	13.5	27.80	22.3	16.0	53.0	34.0	7.5	9.0
0.625"	15.88	17.0	30.95	26.5	20.0	54.5	35.5	9.0	10.5
0.750"	19.05	20.0	34.15	29.5	23.0	54.5	35.5	9.0	10.5
0.875"	22.23	23.0	37.30	33.0	27.0	54.5	35.5	9.0	10.5
1.000"	25.40	26.5	40.50	38.0	30.5	54.5	35.5	9.0	10.5
1.125"	28.58	29.5	47.65	41.5	34.5	72.0	45.0	10.5	12.0
1.250"	31.75	32.5	50.80	45.0	38.0	72.0	45.0	10.5	12.0
1.375"	34.93	36.5	54.00	48.0	41.0	72.0	45.0	10.5	12.0
1.500"	38.10	39.5	57.15	52.5	44.5	72.0	45.0	10.5	12.0
1.625"	41.28	42.5	60.35	57.0	48.5	72.0	45.0	10.5	12.0
1.750"	44.45	46.0	63.50	60.5	51.5	83.0	53.0	10.5	12.0
1.875"	47.63	49.0	66.70	64.0	55.0	83.0	53.0	10.5	12.0
2.000"	50.80	52.0	69.85	66.0	58.0	84.5	54.5	12.0	13.5
2.125"	53.98	55.5	73.05	71.0	61.5	84.5	54.5	12.0	13.5
2.250"	57.15	58.5	76.20	76.5	65.0	84.5	54.5	12.0	13.5
2.375"	60.33	61.5	79.40	78.5	68.5	84.5	54.5	12.0	13.5
2.500"	63.50	65.0	82.55	82.0	72.0	84.5	54.5	12.0	13.5
2.625"	66.68	68.0	92.10	84.0	75.0	86.0	65.0	14.5	16.0
2.750"	69.85	71.0	95.25	89.0	79.0	86.0	65.0	14.5	16.0
2.875"	73.03	74.5	98.45	92.5	82.0	89.0	68.0	14.5	16.0
3.000"	76.20	77.5	101.60	95.5	85.5	89.0	68.0	14.5	16.0
3.125"	79.38	80.5	111.15	101.5	91.0	99.0	76.0	18.5	20.0
3.250"	82.55	84.0	114.30	–	–	99.0	76.0	18.5	20.0
3.375"	85.73	87.0	117.50	–	–	99.0	76.0	18.5	20.0
3.500"	88.90	90.5	120.65	111.5	100.0	99.0	76.0	18.5	20.0
3.625"	92.08	93.5	123.85	–	–	103.0	79.0	18.5	20.0
3.750"	95.25	96.5	127.00	118.0	108.0	103.0	79.0	18.5	20.0
3.875"	98.43	100.0	130.20	–	–	106.0	82.0	18.5	20.0
4.000"	101.60	103.0	133.35	125.0	116.0	106.0	82.0	18.5	20.0

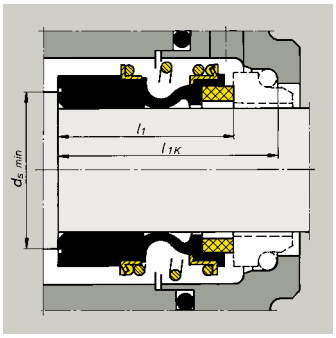
Ⓒ Dimensions in inches

d_1	d_{61}	d_{71}	d_a	d_b	l_{14}	l_{15}	l_{41}	l_{51}	l_{61}
0.375	0.625	0.875	0.740	0.492	1.125	1.500	0.313	0.050	0.250
0.500	0.750	1.000	0.878	0.630	1.125	1.500	0.313	0.050	0.250
0.625	0.937	1.250	1.043	0.787	1.281	1.718	0.406	0.050	0.344
0.750	1.062	1.375	1.161	0.905	1.281	1.718	0.406	0.050	0.344
0.875	1.187	1.500	1.299	1.063	1.343	1.781	0.406	0.050	0.344
1.000	1.312	1.625	1.496	1.200	1.437	2.000	0.437	0.050	0.375
1.125	1.437	1.750	1.634	1.358	1.500	2.062	0.437	0.050	0.375
1.250	1.563	1.875	1.772	1.496	1.500	2.062	0.437	0.050	0.375
1.375	1.687	2.000	1.890	1.614	1.562	2.124	0.437	0.050	0.375
1.500	1.813	2.125	2.067	1.752	1.562	2.124	0.437	0.050	0.375
1.625	2.000	2.375	2.244	1.909	1.875	2.500	0.500	0.050	0.437
1.750	2.125	2.500	2.382	2.028	1.875	2.500	0.500	0.050	0.437
1.875	2.250	2.625	2.520	2.165	2.000	2.625	0.500	0.050	0.437
2.000	2.375	2.750	2.598	2.283	2.000	2.625	0.500	0.050	0.437
2.125	2.375	3.000	2.795	2.421	2.249	2.937	0.562	0.050	0.500
2.250	2.437	3.125	2.992	2.559	2.249	2.937	0.562	0.050	0.500
2.375	2.563	3.250	3.071	2.697	2.375	3.062	0.562	0.050	0.500
2.500	2.687	3.375	3.228	2.834	2.375	3.062	0.562	0.050	0.500
2.625	2.812	3.375	3.307	2.953	2.562	3.375	0.625	0.100	0.562
2.750	2.937	3.500	3.504	3.110	2.562	3.375	0.625	0.100	0.562
2.875	3.062	3.750	3.642	3.228	2.687	3.500	0.625	0.100	0.562
3.000	3.187	3.875	3.760	3.366	2.687	3.500	0.625	0.100	0.562
3.125	3.312	4.000	4.000	3.583	2.968	3.906	0.781	0.100	0.656
3.250	3.437	4.125	–	–	2.968	3.906	0.781	0.100	0.656
3.375	3.562	4.250	–	–	2.968	3.906	0.781	0.100	0.656
3.500	3.687	4.375	4.390	3.937	2.968	3.906	0.781	0.100	0.656
3.625	3.812	4.500	–	–	3.093	4.031	0.781	0.100	0.656
3.750	3.937	4.625	4.646	4.252	3.093	4.031	0.781	0.100	0.656
3.875	4.062	4.750	–	–	3.218	4.156	0.781	0.100	0.656
4.000	4.187	4.875	4.921	4.567	3.218	4.156	0.781	0.100	0.656

For plain shafts, spring rotating

MG 1





MG12

Dimensions, items and designations same as for MG1, but with an extended bellows tail to achieve the **fitting length l_{1K}** according to EN 12756 in combination with seat G6 or G60. ($d_{4\ min}$ acc. to EN 12756 is exceeded).

- **Single seal**
- **Unbalanced**
- **Independent of direction of rotation**
- **Elastomer bellows**

Mechanical seals of the MG series are amongst the most commonly used. The bellows is not subjected to any torsional stress and its ingenious design incorporates several functions, as seal face carrier, secondary sealing element and drive collar. The seal face is driven through the spring and "L"-rings. There are no bonded joints and all the face materials are interchangeable without having to modify any dimensions. Highly recommended for duties with media containing solids eg. in waste water and sewage applications.

MG1

Item	Part No. DIN 24250	Description
1.1	472	Seal face
1.2	481	Bellows
1.3	484.2	"L"-ring (spring collar)
1.4	484.1	"L"-ring (spring collar)
1.5	477	Spring
2	475	Seat
3	412	O-ring or cup rubber

Operating limits (see note on page 1)

d_1 = 10 ... 100 mm
p_1 = 12 (16) bar *170 (230) PSI*
vacuum up to 0.5 bar (up to 1 bar with seat locking)
t = −20 ... +120 (140) °C
−4 °F ... +250 (284) °F
v_g = 10 m/s *33 ft/s*

Materials

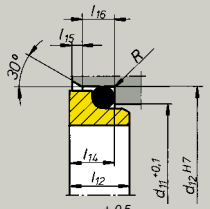
Seal faces	Seats								
	G4, G6			G9			G50	G60	G606
	Q_1	S	V	Q_1	S	V	V	Q_1	B
A	●	●	●	●	●	●	●	●	–
Q_1	●	–	–	●	–	–	–	●	–
U_3	–	–	–	–	–	–	–	–	●

Seal faces and seats (see table for combinations):
- ● Silicon carbide SiC (Q_1)
- ● Carbon graphite, antimony-impregnated (A)
- ● Tungsten carbide (U_3)
- ● Special cast chromium-molybdenum steel (S)
- ● Aluminium oxide (V)
- ● Carbon graphite, resin-impregnated (B)

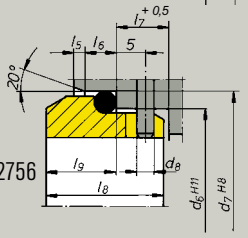
Bellows: FPM (V), EPDM (E), NBR (P)
Springs, "L"-rings: 1.4571 (G), Hastelloy® C4 possible, please inquire.
Designations ( ) according to EN 12756.

Stationary seats

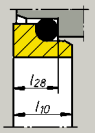
– G4



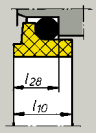
– G9
EN 12756



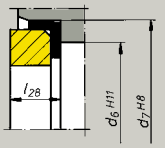
– G6*
EN 12756



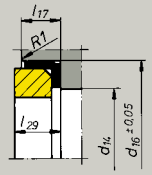
– G606*
EN 12756



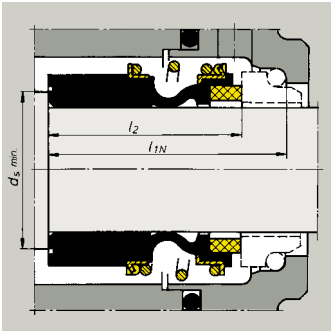
– G60*
EN 12756



– G50

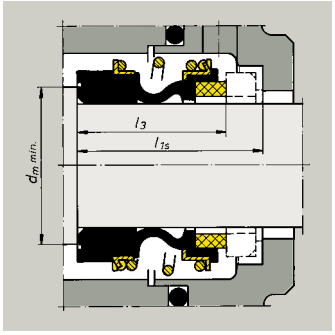


*) Unquoted dimensions as for G9



MG 13

Dimensions, items and designations same as for MG 1, but with an extended bellows tail to achieve the **fitting length l_{1N}** according EN 12756 in combination with seat G6 or G60. ($d_{4\ min}$ acc. to EN 12756 is exceeded).



MG 1S20

Dimensions, items and designations same as for MG 1, but with an extended bellows tail to achieve the **special fitting length l_{1S}** in combination with seat G50.

RMG 12 (not illustrated)

Identical to MG1, but with a special bellows surface on the shaft side. For use in **hot-water pumps at up to 120 °C and 25 bar and/or 140 °C/16 bar.** Only in combination with seat G606.
d_1 = 12 ... 38 mm

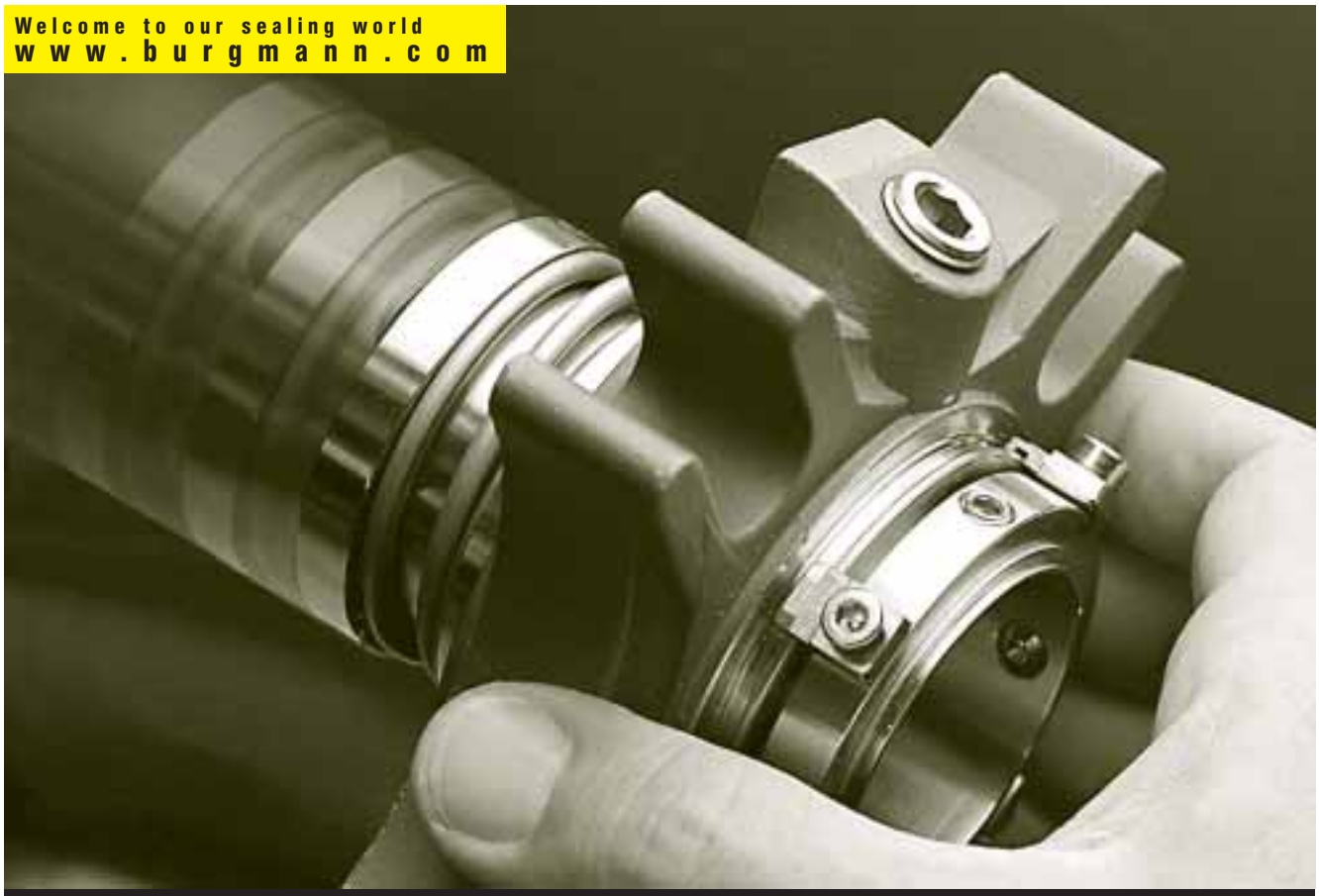
MG 1 multiple seal

The MG1 can also be used as a double seal in tandem or back-to-back arrangement. Installation proposals can be supplied on request.

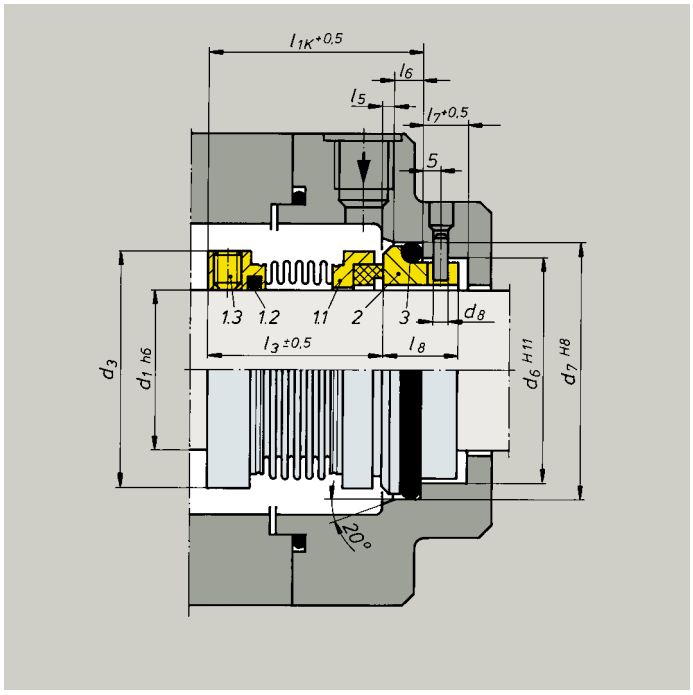
d_1	d_3	d_6	d_7	d_8	d_{11}	d_{12}	d_{14}	d_{16}	d_a	d_b*)	d_m*)	d_s*)	d_{ST}	l	l_1	l_{1K}	l_{1N}	l_{1S}	l_2	l_3	l_5	l_6	l_7	l_8	l_9	l_{10}	l_{12}	l_{14}	l_{15}	l_{16}	l_{17}	l_{28}	L_{29}	R
10	15.7	17	21	3	15.5	19.2	11.0	24.60	22.5	20.5	18	18	24	14.5	25.9	32.5	40	34.0	33.4	25	1.5	4	8.5	17.5	10.0	7.5	7.5	6.6	1.2	3.8	7.5	6.6	9.0	1.2
12	17.7	19	23	3	17.5	21.6	13.5	27.80	25.0	22.5	20	20	26	15.0	25.9	32.5	40	34.0	33.4	25	1.5	4	8.5	17.5	10.0	7.5	6.5	5.6	1.2	3.8	7.5	6.6	9.0	1.2
14	19.7	21	25	3	20.5	24.6	17.0	30.95	28.5	26.5	22	22	30	17.0	28.4	35.0	40	35.5	33.4	25	1.5	4	8.5	17.5	10.0	7.5	6.5	5.6	1.2	3.8	9.0	6.6	10.5	1.2
15	20.8	–	–	–	20.5	24.6	17.0	30.95	28.5	26.5	22	22	30	17.0	28.4	–	–	35.5	33.4	25	–	–	–	–	–	–	7.5	6.6	1.2	3.8	9.0	–	10.5	1.2
16	21.0	23	27	3	22.0	28.0	17.0	30.95	28.5	26.5	22	22	30	17.0	28.4	35.0	40	35.5	33.4	25	1.5	4	8.5	17.5	10.0	7.5	8.5	7.5	1.5	5.0	9.0	6.6	10.5	1.5
18	23.7	27	33	3	24.0	30.0	20.0	34.15	32.0	29.0	29	26	33	19.5	30.0	37.5	45	35.5	37.5	25	2.0	5	9.0	19.5	11.5	8.5	9.0	8.0	1.5	5.0	9.0	7.5	10.5	1.5
19	26.7	–	–	–	–	–	20.0	34.15	37.0	33.0	33	28	38	21.5	30.0	–	–	35.5	37.5	25	–	–	–	–	–	–	–	–	–	–	9.0	–	10.5	–
20	26.7	29	35	3	29.5	35.0	21.5	35.70	37.0	33.0	33	28	38	21.5	30.0	37.5	45	35.5	37.5	25	2.0	5	9.0	19.5	11.5	8.5	8.5	7.5	1.5	5.0	9.0	7.5	10.5	1.5
22	27.7	31	37	3	29.5	35.0	23.0	37.30	37.0	33.0	33	28	38	21.5	30.0	37.5	45	35.5	37.5	25	2.0	5	9.0	19.5	11.5	8.5	8.5	7.5	1.5	5.0	9.0	7.5	10.5	1.5
24	31.2	33	39	3	32.0	38.0	26.5	40.50	42.5	38.0	38	32	44	22.5	32.5	40.0	50	35.5	42.5	25	2.0	5	9.0	19.5	11.5	8.5	8.5	7.5	1.5	5.0	9.0	7.5	10.5	1.5
25	31.2	34	40	3	32.0	38.0	26.5	40.50	42.5	38.0	38	32	44	23.0	32.5	40.0	50	35.5	42.5	25	2.0	5	9.0	19.5	11.5	8.5	8.5	7.5	1.5	5.0	9.0	7.5	10.5	1.5
28	35.0	37	43	3	36.0	42.0	29.5	47.65	49.0	44.0	37	37	50	26.5	35.0	42.5	50	45.0	42.5	33	2.0	5	9.0	19.5	11.5	8.5	10.0	9.0	1.5	5.0	10.5	7.5	12.0	1.5
30	37.0	39	45	3	39.2	45.0	32.5	50.80	49.0	44.0	37	37	50	26.5	35.0	42.5	50	45.0	42.5	33	2.0	5	9.0	19.5	11.5	8.5	11.5	10.5	1.5	5.0	10.5	7.5	12.0	1.5
32	40.2	42	48	3	42.2	48.0	32.5	50.80	53.5	46.0	41	41	55	27.5	35.0	42.5	55	45.0	47.5	33	2.0	5	9.0	19.5	11.5	8.5	11.5	10.5	1.5	5.0	10.5	7.5	12.0	1.5
33	40.2	42	48	3	44.2	50.0	36.5	54.00	53.5	46.0	41	41	55	27.5	35.0	42.5	55	45.0	47.5	33	2.0	5	9.0	19.5	11.5	8.5	12.0	11.0	1.5	5.0	10.5	7.5	12.0	1.5
35	43.2	44	50	3	46.2	52.0	36.5	54.00	57.0	50.0	44	44	59	28.5	35.0	42.5	55	45.0	47.5	33	2.0	5	9.0	19.5	11.5	8.5	12.0	11.0	1.5	5.0	10.5	7.5	12.0	1.5
38	46.2	49	56	4	49.2	55.0	39.5	57.15	59.0	53.0	53	47	61	30.0	36.0	45.0	55	45.0	46.0	33	2.0	6	9.0	22.0	14.0	10.0	11.3	10.3	1.5	5.0	10.5	9.0	12.0	1.5
40	48.8	51	58	4	52.2	58.0	42.5	60.35	62.0	55.0	55	49	64	30.0	36.0	45.0	55	45.0	46.0	33	2.0	6	9.0	22.0	14.0	10.0	11.8	10.8	1.5	5.0	10.5	9.0	12.0	1.5
42	51.8	–	–	–	–	–	46.0	63.50	65.5	58.0	53	53	67	30.0	36.0	–	–	53.0	51.0	41	–	–	–	–	–	–	13.2	12.0	2.0	6.0	10.5	–	12.0	2.5
43	51.8	54	61	4	53.3	62.0	46.0	63.50	65.5	58.0	53	53	67	30.0	36.0	45.0	60	53.0	51.0	41	2.0	6	9.0	22.0	14.0	10.0	13.2	12.0	2.0	6.0	10.5	9.0	12.0	2.5
45	53.8	56	63	4	55.3	64.0	46.0	63.50	68.0	60.0	55	55	70	30.0	36.0	45.0	60	53.0	51.0	41	2.0	6	9.0	22.0	14.0	10.0	12.8	11.6	2.0	6.0	10.5	9.0	12.0	2.5
48	56.8	59	66	4	59.7	68.4	49.0	66.70	70.5	63.0	58	58	74	30.5	36.0	45.0	60	53.0	51.0	41	2.0	6	9.0	22.0	14.0	10.0	12.8	11.6	2.0	6.0	10.5	9.0	12.0	2.5
50	58.8	62	70	4	60.8	69.3	52.0	69.85	74.0	65.0	60	60	77	30.5	38.0	47.5	60	54.5	50.5	41	2.5	6	9.0	23.0	15.0	10.5	12.8	11.6	2.0	6.0	12.0	9.5	13.5	2.5
53	62.2	65	73	4	63.8	72.3	55.5	73.05	78.5	70.0	63	63	81	33.0	36.5	47.5	70	54.5	59.0	41	2.5	6	9.0	23.0	15.0	12.0	13.5	12.3	2.0	6.0	12.0	11.0	13.5	2.5
55	64.2	67	75	4	66.5	75.4	58.5	76.20	81.0	72.0	65	65	83	35.0	36.5	47.5	70	54.5	59.0	41	2.5	6	9.0	23.0	15.0	12.0	14.5	13.3	2.0	6.0	12.0	11.0	13.5	2.5
58	67.2	70	78	4	69.5	78.4	61.5	79.40	85.5	75.0	68	68	88	37.0	41.5	52.5	70	54.5	59.0	41	2.5	6	9.0	23.0	15.0	12.0	14.5	13.3	2.0	6.0	12.0	11.0	13.5	2.5
60	70.0	72	80	4	71.5	80.4	61.5	79.40	88.5	79.0	70	70	91	38.0	41.5	52.5	70	54.5	59.0	41	2.5	6	9.0	23.0	15.0	12.0	14.5	13.3	2.0	6.0	12.0	11.0	13.5	2.5
65	75.0	77	85	4	76.5	85.4	68.0	92.10	93.5	84.0	77	77	96	40.0	41.5	52.5	80	65.0	69.0	49	2.5	6	9.0	23.0	15.0	12.0	14.2	13.0	2.0	6.0	14.5	11.0	16.0	2.5
68	78.0	81	90	4	82.7	91.5	71.0	95.25	96.5	88.0	80	80	100	40.0	41.2	52.5	80	65.0	68.7	49	2.5	7	9.0	26.0	18.0	12.5	14.9	13.7	2.0	6.0	14.5	11.3	16.0	2.5
70	80.0	83	92	4	83.0	92.0	71.0	95.25	99.5	90.0	82	82	103	40.0	48.7	60.0	80	65.0	68.7	49	2.5	7	9.0	26.0	18.0	12.5	14.2	13.0	2.0	6.0	14.5	11.3	16.0	2.5
75	85.5	88	97	4	90.2	99.0	77.5	101.60	107.0	95.0	87	87	110	40.0	48.7	60.0	80	68.0	68.7	52	2.5	7	9.0	26.0	18.0	12.5	15.2	14.0	2.0	6.0	14.5	11.3	16.0	2.5
80	90.5	95	105	4	95.2	104.0	84.0	114.30	112.0	100.0	92	92	116	40.0	48.0	60.0	90	76.0	78.0	56	3.0	7	9.0	26.2	18.2	13.0	16.2	15.0	2.0	6.0	18.5	12.0	20.0	2.5
85	96.0	100	110	4	100.2	109.0	87.0	117.50	120.0	107.0	97	97	124	41.0	46.0	60.0	90	76.0	76.0	56	3.0	7	9.0	26.2	18.2	15.0	16.0	14.8	2.0	6.0	18.5	14.0	20.0	2.5
90	102.0	105	115	4	105.2	114.0	93.5	123.85	127.0	114.0	104	104	131	45.0	51.0	65.0	90	79.0	76.0	59	3.0	7	9.0	26.2	18.2	15.0	16.0	14.8	2.0	6.0	18.5	14.0	20.0	2.5
95	107.0	110	120	4	111.6	120.3	96.5	127.00	132.0	119.0	109	109	136	46.0	51.0	65.0	90	79.0	76.0	59	3.0	7	9.0	25.2	17.2	15.0	17.0	15.8	2.0	6.0	18.5	14.0	20.0	2.5
100	112.0	115	125	4	114.5	123.3	103.0	133.35	137.0	124.0	114	114	140	47.0	51.0	65.0	90	82.0	76.0	62	3.0	7	9.0	25.2	17.2	15.0	17.0	15.8	2.0	6.0	18.5	14.0	20.0	2.5

Dimensions in mm.
Fitting length tolerances: d_1 10 ... 12 mm ±0.5; d_1 14 ... 18 mm ±1.0; d_1 20 ... 26 mm ±1.5; d_1 = 28 ... 100 mm ±2.0
*) Minimum diameter of the mating collar

Dimensions adaptations for specific conditions, e.g. shaft in inches or special seat dimensions are available on request..



MF95N



- **Single seal**
- **Balanced**
- **Independent of direction of rotation**
- **Metal roller bellows**
- **EN 12756***

Roller bellows seals in the MF95N series have a very wide field of application and are particularly ideal for pumps in the waste water sector, the chemical industry, refineries and any areas needing to meet sterile requirements such as in the pharmaceutical and food industries. These seals are rugged and insensitive to solids in the medium. The combination of highly resistant materials and standardized dimensions offers great potential for standardization projects.

Materials

Bellows: M_5 Hastelloy® C
Bellows support: G_1
Seal faces: Q_{12}, B, A
Seat: Q_1

MF95N

Item	Part no. DIN 24250	Description
1.1	472/481	Seal face with bellows unit
1.2	412.1	O-ring
1.3	904	Threaded pin
2	475	Type G 16 seat
3	412.2	O-ring

Operating limits (see note on page 1)

d_1 = 14 ... 100 mm *0.55" ... 3.94"*
t = –40 ...+220 °C *–40 °F ... 428 °F*
(SiC against carbon)
–40 ...+180 °C *–40 °F ... 356 °F*
(SiC against SiC)
p = 16 bar *232 PSI*
v_g = 20 m/s *66 ft/s*
permissible axial movement: ± 0.5 mm

Technical features

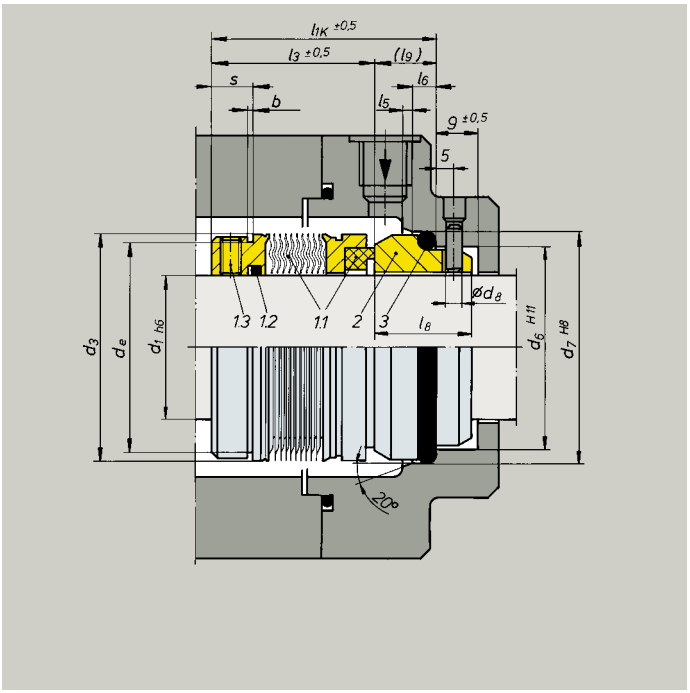
- MF95N mechanical seals have no dynamic O-ring and are therefore insensitive to deposits on the shaft. The flexibility of the bellows does not deteriorate in any way, ensuring that the sealing gap remains closed.
- The seal face carrier has an amplitude limiter to guarantee trouble-free and smooth running (important when there is any risk of dry running).
- A favourable bellows geometry prevents the cavities becoming clogged by media containing solids. An open structure and smooth surface enables easy cleaning if necessary.
- The bellows has very good spring characteristics. Its longitudinal weld seam has no negative impact. Axial pressure is evenly distributed by the roller bellows, guaranteeing reliable adaptation of the sliding face even when there are axial deflections.

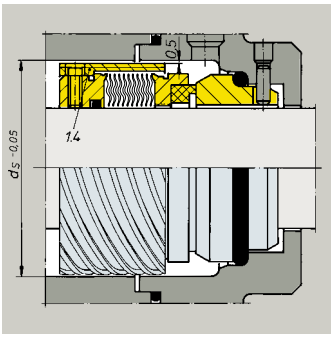
d_1	d_3	d_6	d_7	d_8	l_{1k}	l_3	l_5	l_6	l_7	l_8
14	24	21	25	3	35.0	30.5	1.5	4	8.5	15.0
16	26	23	27	3	35.0	29.5	1.5	4	8.5	15.0
18	32	27	33	3	37.5	30.5	2.0	5	9.0	15.0
20	34	29	35	3	37.5	30.5	2.0	5	9.0	15.0
22	36	31	37	3	37.5	30.5	2.0	5	9.0	15.0
24	39	33	39	3	40.0	33.0	2.0	5	9.0	15.0
25	39	34	40	3	40.0	33.0	2.0	5	9.0	15.0
28	42	37	43	3	42.5	35.5	2.0	5	9.0	15.0
30	44	39	45	3	42.5	35.5	2.0	5	9.0	15.0
32	46	42	48	3	42.5	35.5	2.0	5	9.0	15.0
33	47	42	48	3	42.5	35.5	2.0	5	9.0	15.0
35	49	44	50	3	42.5	35.5	2.0	5	9.0	15.0
38	54	49	56	4	45.0	37.0	2.0	6	9.0	16.0
40	56	51	58	4	45.0	37.0	2.0	6	9.0	16.0
43	59	54	61	4	45.0	37.0	2.0	6	9.0	16.0
45	61	56	63	4	45.0	37.0	2.0	6	9.0	16.0

d_1	d_3	d_6	d_7	d_8	l_{1k}	l_3	l_5	l_6	l_7	l_8
48	64	59	66	4	45.0	37.0	2.0	6	9.0	16.0
50	66	62	70	4	47.5	38.0	2.5	6	9.0	17.0
53	69	65	73	4	47.5	38.0	2.5	6	9.0	17.0
55	71	67	75	4	47.5	38.0	2.5	6	9.0	17.0
58	78	70	78	4	52.5	42.0	2.5	6	9.0	18.0
60	80	72	80	4	52.5	42.0	2.5	6	9.0	18.0
63	83	75	83	4	52.5	42.0	2.5	6	9.0	18.0
65	85	77	85	4	52.5	42.0	2.5	6	9.0	18.0
68	87	81	90	4	52.5	41.5	2.5	7	9.0	18.5
70	90	83	92	4	60.0	48.5	2.5	7	9.0	19.0
75	99	88	97	4	60.0	48.5	2.5	7	9.0	19.0
80	104	95	105	4	60.0	48.5	3.0	7	9.0	19.0
85	109	100	110	4	60.0	48.5	3.0	7	9.0	19.0
90	114	105	115	4	65.0	52.0	3.0	7	9.0	20.5
95	119	110	120	4	65.0	52.0	3.0	7	9.0	20.5
100	124	115	125	4	65.0	52.0	3.0	7	9.0	20.5

For plain shafts, rotating bellows

MFL 85 N





MFL 85 F

Dimensions, item no's and descriptions as for MFL85N, but with **pumping screw** (item no. 1.4). Dependent on direction of rotation!
The pumping screw can be retrofitted.

- **Single seal**
- **Balanced**
- **Independent**
- **of direction of rotation**
- **Metal bellows**

To EN 12756

Mechanical seals in the MFL series have a universal field of application. They are designed for extreme ranges of temperature and for high-viscosity media. There is no dynamic O-ring and therefore a bellows seal will never hang-up. (See page 63 for details of the MFL65 stationary bellows seal.)

Operating limits

d_1 = 16 ... 100 mm *0.64" ... 4"*
p_1 = with external pressurization[1)]
25 bar 360 PSI
with internal pressurization[2)]
<120 °C 10 bar *145 PSI*
<220 °C 5 bar *72 PSI*
v_g = 20 m/s *66 ft/s*

MFL85N:
t = −40 ... +220 °C
(−40 °F ... +428 °F)

MFLWT80:
t = −20 ... +400 °C
(−4 °F ... +752 °F)

MFLCT80:
t = −100 ... +100 °C
(−148 °F ... +212 °F)

[1)] Higher pressures possible with special designs – please refer to Burgmann.
[2)] Positively retained stationary seat necessary.

MFL 85 N

With vibration damper for optimum running characteristics (important when there is a risk of dry running).

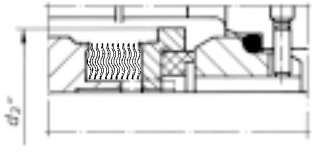
Item	Part no. to DIN 24250	Description
1.1	472/481	Seal face with bellows unit
1.2	412.1	O-ring
1.3	904	Set screw
2	475	Type G9 stationary seat
3	412.2	O-ring

MFL 85 GS

Gas-lubricated seal faces. For application options never thought possible before now. Same dimensions as MFL 85 N. See page 72 for more details.

Combination of materials

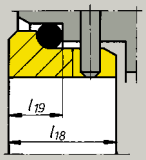
Bellows: M_6 - Inconel® 718 hardened, 2.4819
M_5 - Hastelloy® C
Seal face: A, Q_{12}
Stationary seat: Q_1
Other metal parts:
1.4571, 1.4462, 1.3917, 2.4610
MFLCT 80: only A Q_1 G M_6 M/G



Execution in Hastelloy® C MFL WT/CT80

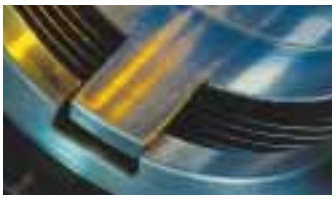
Stationary seat alternative

– G16

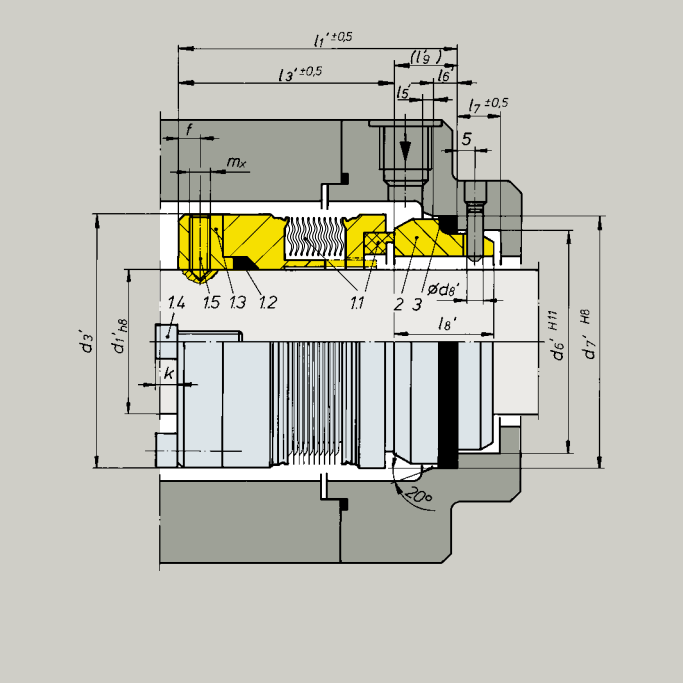


l_{1K} is shorter than specified by EN 12756 (MFL85N).
Unquoted dim. same as for G9.

Vibration damper for type MFL 85 N



Torque transmission for type MFL WT80



MFL WT 80 / MFL CT 80

Dimensions are not to EN 12756. Seal face positively driven to protect bellows from torsional stress. Secondary seals made of Burgmann Statotherm®.

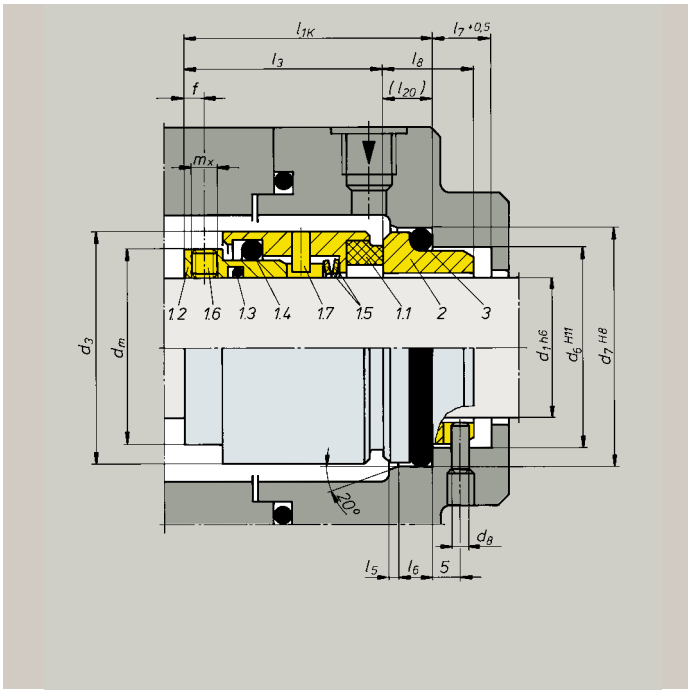
Item	Part no. to DIN 24250	Description
1.1	472/481	Seal face with bellows unit
1.2	410	Sealing ring
1.3	474	Drive collar
1.4		Socket head screw
1.5	904	Set screw
2	475	Stationary seat
3	412	Sealing ring

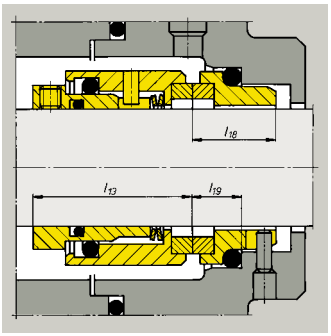
	MFL 85 N/MFL 85 F															MFL WT 80/MFL CT 80												
d_1	d_3	d_6	d_7	d_8	d_e	d_s	l_{1K}	l_3	l_5	l_6	l_8	l_9	l_{18}	l_{19}	b	s	d_3'	d_3''[2]	d_6'	d_7'	d_8'	l_1'	l_3'	l_5'	l_6'	l_7'	l_8'	l_9'	f	k	m_x
16	30.0	23	27	3	25.0	38	42.5[1]	32.5	1.5	4	17.5	10.0	–	–	1.6	9.0	38	–	29.0	35.0	3	58.0	46.5	2.0	5	9	19.5	11.5	5	5	M5
18	32.0	27	33	3	28.0	39	37.5	30.5	2.0	5	14.0	11.5	15.0	7.0	1.6	10.0	40	–	31.0	37.0	3	58.0	46.5	2.0	5	9	19.5	11.5	5	5	M5
20	33.5	29	35	3	29.5	41	37.5	30.5	2.0	5	14.0	11.5	15.0	7.0	1.6	10.0	42	–	34.0	40.0	3	58.0	46.5	2.0	5	9	19.5	11.5	5	5	M5
22	36.5	31	37	3	32.0	44	37.5	30.5	2.0	5	14.0	11.5	15.0	7.0	1.6	10.0	44	–	37.0	43.0	3	58.0	46.5	2.0	5	9	19.5	11.5	5	5	M5
24	39.0	33	39	3	34.5	47	40.0	28.5	2.0	5	19.5	11.5	15.0	7.0	1.6	8.2	46	49.8	37.0	43.0	3	58.0	46.5	2.0	5	9	19.5	11.5	5	5	M5
25	39.6	34	40	3	35.5	48	40.0	28.5	2.0	5	19.5	11.5	15.0	7.0	1.6	8.5	47	51.7	39.0	45.0	3	58.0	46.5	2.0	5	9	19.5	11.5	5	5	M5
28	42.8	37	43	3	38.5	51	42.5	31.0	2.0	5	19.5	11.5	15.0	7.0	1.6	9.0	50	54.5	42.0	48.0	3	58.0	46.5	2.0	5	9	19.5	11.5	5	5	M6
30	45.0	39	45	3	40.5	53	42.5	31.0	2.0	5	19.5	11.5	15.0	7.0	1.6	8.5	52	56.6	44.0	50.0	3	58.0	46.5	2.0	5	9	19.5	11.5	5	5	M6
32	46.0	42	48	3	42.0	55	42.5	31.0	2.0	5	19.5	11.5	15.0	7.0	1.6	9.2	54	59.5	49.0	56.0	4	60.5	46.5	2.0	6	9	22.0	14.0	5	5	M6
33	48.0	42	48	3	43.0	56	42.5	31.0	2.0	5	19.5	11.5	15.0	7.0	1.6	9.2	55	59.5	49.0	56.0	4	60.5	46.5	2.0	6	9	22.0	14.0	5	5	M6
35	49.2	44	50	3	45.5	58	42.5	31.0	2.0	5	19.5	11.5	15.0	7.0	1.6	9.5	57	62.5	51.0	58.0	4	60.5	46.5	2.0	6	9	22.0	14.0	5	5	M6
38	52.3	49	56	4	48.0	61	45.0	31.0	2.0	6	22.0	14.0	16.0	8.0	1.6	9.2	60	65.7	54.0	61.0	4	60.5	46.5	2.0	6	9	22.0	14.0	5	5	M6
40	55.5	51	58	4	50.0	64	45.0	31.0	2.0	6	22.0	14.0	16.0	8.0	1.6	9.2	66	65.7	56.0	63.0	4	61.5	47.5	2.0	6	9	22.0	14.0	5	6	M6
43	57.5	54	61	4	53.0	67	45.0	31.0	2.0	6	22.0	14.0	16.0	8.0	1.6	9.2	69	68.6	59.0	66.0	4	61.5	47.5	2.0	6	9	22.0	14.0	5	6	M6
45	58.7	56	63	4	55.0	69	45.0	31.0	2.0	6	22.0	14.0	16.0	8.0	1.6	9.5	71	71.5	62.0	70.0	4	62.5	47.5	2.5	6	9	23.0	15.0	5	6	M6
48	61.9	59	66	4	58.0	72	45.0	31.0	2.0	6	22.0	14.0	16.0	8.0	1.6	9.2	74	75.1	65.0	73.0	4	62.5	47.5	2.5	6	9	23.0	15.0	5	6	M6
50	65.0	62	70	4	60.5	74	47.5	32.5	2.5	6	23.0	15.0	17.0	9.5	1.6	10.5	76	76.1	67.0	75.0	4	62.5	47.5	2.5	6	9	23.0	15.0	5	6	M6
53	68.2	65	73	4	64.0	77	47.5	32.5	2.5	6	23.0	15.0	17.0	9.5	1.6	10.5	79	80.8	70.0	78.0	4	62.5	47.5	2.5	6	9	23.0	15.0	5	6	M6
55	70.0	67	75	4	65.5	80	47.5	32.5	2.5	6	23.0	15.0	17.0	9.5	1.6	10.0	81	80.8	72.0	80.0	4	62.5	47.5	2.5	6	9	23.0	15.0	5	6	M6
58	71.7	70	78	4	67.0	83	52.5	37.5	2.5	6	23.0	15.0	18.0	10.5	3.0	14.0	85	84.0	75.0	83.0	4	68.0	53.0	2.5	6	9	23.0	15.0	5	6	M6
60	74.6	72	80	4	69.5	85	52.5	37.5	2.5	6	23.0	15.0	18.0	10.5	3.0	14.0	87	92.3	77.0	85.0	4	68.0	53.0	2.5	6	9	23.0	15.0	6	6	M8
63	79.0	75	83	4	72.5	88	52.5	37.5	2.5	6	23.0	15.0	18.0	10.5	3.0	14.0	90	95.5	81.0	90.0	4	71.0	53.0	2.5	7	9	26.0	18.0	6	6	M8
65	84.1	77	85	4	78.0	95	52.5	37.5	2.5	6	23.0	15.0	18.0	10.5	3.0	14.0	92	95.5	83.0	92.0	4	71.0	53.0	2.5	7	9	26.0	18.0	6	6	M8
68	87.3	81	90	4	82.0	96	52.5	34.5	2.5	7	26.0	18.0	18.5	11.0	1.6	10.0	95	101.3	88.0	97.0	4	71.0	53.0	2.5	7	9	26.0	18.0	6	6	M8
70	87.3	83	92	4	81.0	96	60.0	42.0	2.5	7	26.0	18.0	19.0	11.5	3.0	17.0	97	101.3	88.0	97.0	4	71.0	53.0	2.5	7	9	26.0	18.0	6	6	M8
75	95.0	88	97	4	87.0	104	60.0	42.0	2.5	7	26.0	18.0	19.0	11.5	3.0	16.0	102	105.0	95.0	105.0	4	71.0	52.8	3.0	7	9	26.2	18.2	6	6	M8
80	98.4	95	105	4	91.0	109	60.0	41.8	3.0	7	26.2	18.2	19.0	11.5	3.0	16.0	107	110.6	100.0	110.0	4	71.0	52.8	3.0	7	9	26.2	18.2	6	6	M8
85	104.7	100	110	4	96.0	114	60.0	41.8	3.0	7	26.2	18.2	19.0	11.5	3.0	16.0	112	117.0	105.0	115.0	4	71.0	52.8	3.0	7	9	26.2	18.2	6	6	M8
90	111.0	105	115	4	103.0	119	65.0	46.8	3.0	7	26.2	18.2	20.5	13.0	3.0	21.0	117	120.2	110.0	120.0	4	71.0	53.8	3.0	7	9	25.2	17.2	6	6	M8
95	114.0	110	120	4	106.0	124	65.0	47.8	3.0	7	25.2	17.2	20.5	13.0	3.0	21.0	122	125.2	115.0	125.0	4	71.0	53.8	3.0	7	9	25.2	17.2	6	6	M8
100	117.4	115	125	4	111.0	129	65.0	47.8	3.0	7	25.2	17.2	20.5	13.0	3.0	20.0	127	130.2	122.2	134.3	5	74.0	54.0	3.0	9	11	30.0	20.0	6	6	M8

1) Installation length is longer than l_{1K} specified by EN 12756
2) d_3'' Executed in Hastelloy®

For plain shafts, rotating spring

HJ92N





HJ977GN

Item no's and descriptions as for HJ92N, but with the seal face (Item No. 1.1) and the stationary seat (Item No. 2) made of silicon carbide and shrink-fitted. The stationary seat is type G46.
Unquoted dimensions as for HJ92N.

- **Single seal**
- **Balanced**
- **Independent on direction of rotation**
- **Spring, product protected**
- **To EN 12756**

Mechanical seals of the HJ series are designed for media containing solids or with high viscosity e.g. sugar, paper, sewage and waste water industry. The springs are product protected. There is no sticking or clogging making the design rugged and reliable.

Operating limits (see note on page 1)

d_1 = 18 ... 100 mm *0.625" ... 4"*
p_1*) = 0.8 ... 25 bar *11 ... 360 PSI*

HJ92N:
t = –50 ... +220 °C
–58 °F ... +430 °F
v_g = 20 m/s *66 ft/s*

HJ977GN:
t = –20 ... +180 °C
–4 °F ... +356 °F
v_g = 10 m/s *33 ft/s*

*) An integral stationary seat lock is not needed within the permissible low pressure range. For prolonged operation under vacuum it is necessary to arrange for quenching on the atmospheric side.
Axial movement ± 0.5 mm.

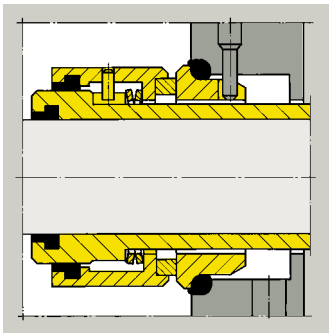
HJ92N

Item	Part no. to DIN 24250	Description
1.1	472/473	Seal face (carbon graphite) shrink-fitted into the seal face housing
1.2	485	Drive collar
1.3	412.2	O-ring
1.4	412.1	O-ring
1.5	477	Spring
1.6	904	Set screw
2	475	Stationary seat (type G16)
3	412.3	O-ring

Combination of materials and seal types

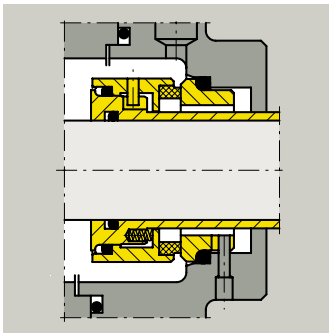
Rotating unit (seal face material)	Stationary seats	
	G16	G46
	V; Q_1	Q_{12}
HJ92 (A; B_1)	HJ92N	HJ927GN[2)]
HJ97G (Q_{12})	HJ97GN5[1)]	HJ977GN

[1)] Installation length l_{12} is shorter than l_{1K}
[2)] Installation length l_{11} is longer than l_{1K}
All material designations to EN 12756.
See inside the back cover of this manual.



Special design (example) SHJ97G

For use in sterile processes. With smooth surfaces (electropolishing on request) specially designed O-ring grooves for special elastomeric seal-rings and O-rings bearing no gaps, plus many other features. Also available as SHJ92 design. Please enquire for details.



Special design HJ42

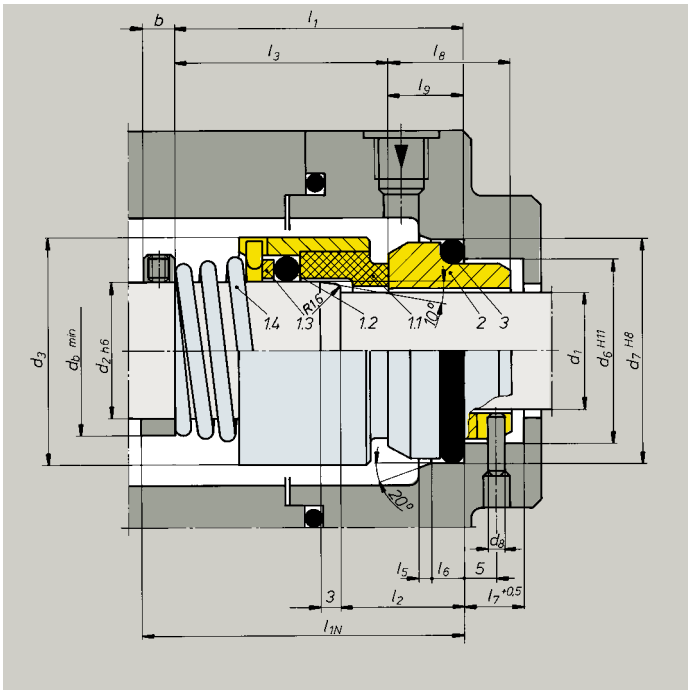
Mechanical seal in the HJ series with product-protected multiple springs, for applications involving operating pressures of up to 50 bar.

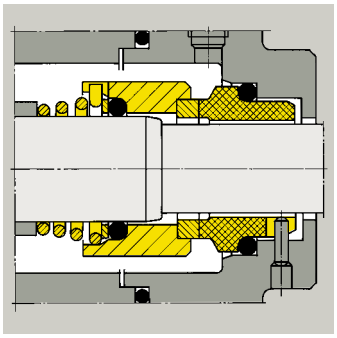
Please contact us for details of dimensions.

d_1	d_3	d_6	d_7	d_8	d_m	l_{1K}	l_3	l_5	l_6	l_7	l_8	l_{20}	l_{11} [1)]	l_{12} [2)]	l_{13}	l_{18}	l_{19}	f	m_x
18	32	27	33	3	26.0	37.5	30.5	2.0	5	9	15.0	7.0	39.5	35.5	28.5	17.0	9.0	3.0	M4
20	34	29	35	3	28.0	37.5	30.5	2.0	5	9	15.0	7.0	39.5	35.5	28.5	17.0	9.0	3.0	M4
22	36	31	37	3	30.0	37.5	30.5	2.0	5	9	15.0	7.0	39.5	35.5	28.5	17.0	9.0	3.0	M4
24	38	33	39	3	32.5	40.0	33.0	2.0	5	9	15.0	7.0	42.0	38.0	31.0	17.0	9.0	3.5	M5
25	39	34	40	3	33.5	40.0	33.0	2.0	5	9	15.0	7.0	42.0	38.0	31.0	17.0	9.0	3.5	M5
28	42	37	43	3	36.5	42.5	35.5	2.0	5	9	15.0	7.0	45.0	40.0	33.0	17.5	9.5	3.5	M5
30	44	39	45	3	38.5	42.5	35.5	2.0	5	9	15.0	7.0	45.0	40.0	33.0	17.5	9.5	3.5	M5
32	47	42	48	3	41.5	42.5	35.5	2.0	5	9	15.0	7.0	45.0	40.0	33.0	17.5	9.5	3.5	M5
33	47	42	48	3	41.5	42.5	35.5	2.0	5	9	15.0	7.0	45.0	40.0	33.0	17.5	9.5	3.5	M5
35	49	44	50	3	43.5	42.5	35.5	2.0	5	9	15.0	7.0	45.0	40.0	33.0	17.5	9.5	3.5	M5
38	54	49	56	4	47.5	45.0	37.0	2.0	6	9	16.0	8.0	47.5	42.5	34.5	18.5	10.5	4.0	M5
40	56	51	58	4	49.5	45.0	37.0	2.0	6	9	16.0	8.0	47.5	42.5	34.5	18.5	10.5	4.0	M5
43	59	54	61	4	52.5	45.0	37.0	2.0	6	9	16.0	8.0	47.5	42.5	34.5	18.5	10.5	4.0	M5
45	61	56	63	4	54.5	45.0	37.0	2.0	6	9	16.0	8.0	47.5	42.5	34.5	18.5	10.5	4.0	M5
48	64	59	66	4	57.5	45.0	37.0	2.0	6	9	16.0	8.0	47.5	42.5	34.5	18.5	10.5	4.0	M5
50	66	62	70	4	59.5	47.5	38.0	2.5	6	9	17.0	9.5	50.0	45.0	35.5	19.5	12.0	4.5	M6
53	69	65	73	4	62.5	47.5	38.0	2.5	6	9	17.0	9.5	50.0	45.0	35.5	19.5	12.0	4.5	M6
55	71	67	75	4	64.5	47.5	38.0	2.5	6	9	17.0	9.5	50.0	45.0	35.5	19.5	12.0	4.5	M6
58	78	70	78	4	68.5	52.5	42.0	2.5	6	9	18.0	10.5	55.0	50.0	39.5	20.5	13.0	4.5	M6
60	80	72	80	4	70.5	52.5	42.0	2.5	6	9	18.0	10.5	55.0	50.0	39.5	20.5	13.0	4.5	M6
63	83	75	83	4	73.5	52.5	42.0	2.5	6	9	18.0	10.5	55.0	50.0	39.5	20.5	13.0	4.5	M6
65	85	77	85	4	75.5	52.5	42.0	2.5	6	9	18.0	10.5	55.0	50.0	39.5	20.5	13.0	4.5	M6
68	88	81	90	4	78.5	52.5	41.5	2.5	7	9	18.5	11.0	55.0	50.0	39.0	21.0	13.5	4.5	M6
70	90	83	92	4	80.5	60.0	48.5	2.5	7	9	19.0	11.5	62.5	57.5	46.0	21.5	14.0	5.0	M6
75	99	88	97	4	89.0	60.0	48.5	2.5	7	9	19.0	11.5	62.5	57.5	46.0	21.5	14.0	5.5	M8
80	104	95	105	4	94.0	60.0	48.5	3.0	7	9	19.0	11.5	62.5	57.5	46.0	21.5	14.0	5.5	M8
85	109	100	110	4	99.0	60.0	48.5	3.0	7	9	19.0	11.5	62.5	57.5	46.0	21.5	14.0	5.5	M8
90	114	105	115	4	104.0	65.0	52.0	3.0	7	9	20.5	13.0	67.5	62.5	49.5	23.0	15.5	5.5	M8
95	119	110	120	4	109.0	65.0	52.0	3.0	7	9	20.5	13.0	67.5	62.5	49.5	23.0	15.5	5.5	M8
100	124	115	125	4	114.0	65.0	52.0	3.0	7	9	20.5	13.0	67.5	62.5	49.5	23.0	15.5	5.5	M8

For stepped shafts, rotating spring

H12N





H17GN

Dimensions, item no's and descriptions as for H12N, but with the seal face (carbide) shrink-fitted into the seal face housing (Item no. 1.1).

- **Single seal**
- **Balanced**
- **Conical spring**
- **Dependent on direction of rotation**
- **To EN 12756**

Mechanical seals of the H12N series are a cost effective version of a balanced seal. They feature the same rugged and reliable construction as the unbalanced spring seals (see M3 pages 28 and 29) in the Burgmann range. These seals are primarily used in the chemical sector and in water pumps.

Operating limits (see note on page 1)

d_1 = 10 ... 80 mm *0.4" ... 3.125"*
p_1 = 25 bar *360 PSI*

H12N:
t = –80 ... +220 °C
= *–175 °F ... +430 °F*

H17GN:
t = –20 ... +180 °C
= *–4 °F ... +356 °F*
v_g = 15 m/s *50 ft/s*
Axial movement ±1.0 mm

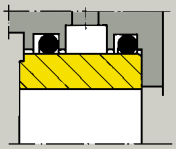
H12N

Item	Part no. to DIN 24250	Description
1.1	472/473	Seal face (carbon graphite) shrink-fitted into the seal face housing
1.2	412.1	O-ring
1.3	474	Thrust ring
1.4	478	Righthand spring
1.4	479	Lefthand spring
2	475	Type G9 stationary seat
3	412.2	O-ring

Combination of materials and seal types

Rotating unit	G9 stationary seats				
	S	V	Q_1 (Q_2)	A	B
H12N (A)	●	●	–	–	
H17GN (Q_{12})	–	–	●	●	●

Stationary seat alternative



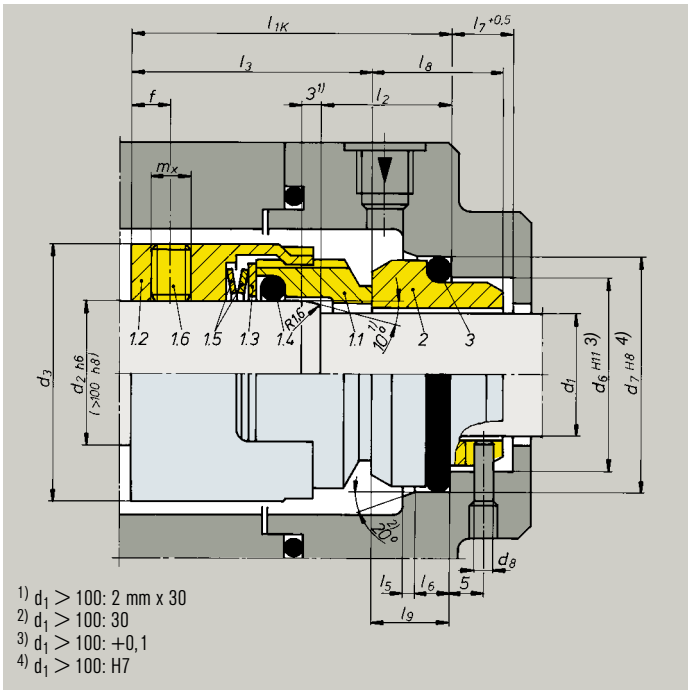
The H12N is delivered with a type G9 stationary seat. Especially for hot water applications the type G115 for seat cooling is available. In this case, the dimensions of the H12N rotating unit are modified. Please ask about seal designation H127G115.

d_1	d_2	d_3	d_6	d_7	d_8	d_b	l_{1N}	l_1	l_2	l_3	l_5	l_6	l_7	l_8	l_9	b[2)]
10	14	24	17	21	3	18	50	35.5	18	25.5	1.5	4	8.5	17.5	10.0	8.0
12	16	26	19	23	3	21	50	36.5	18	26.5	1.5	4	8.5	17.5	10.0	8.0
14	18	31	21	25	3	23	55	39.5	18	29.5	1.5	4	8.5	17.5	10.0	8.0
16	20	34	23	27	3	26	55	41.0	18	31.0	1.5	4	8.5	17.5	10.0	8.0
18	22	36	27	33	3	28	55	44.0	20	32.5	2.0	5	9.0	19.5	11.5	8.0
20	24	38	29	35	3	30	60	44.0	20	32.5	2.0	5	9.0	19.5	11.5	8.0
22	26	40	31	37	3	31	60	44.0	20	32.5	2.0	5	9.0	19.5	11.5	8.0
24	28	42	33	39	3	35	60	44.0	20	32.5	2.0	5	9.0	19.5	11.5	8.0
25	30	44	34	40	3	37	60	45.0	20	33.5	2.0	5	9.0	19.5	11.5	8.0
28	33	47	37	43	3	40	65	47.0	20	35.5	2.0	5	9.0	19.5	11.5	8.0
30	35	49	39	45	3	43	65	47.0	20	35.5	2.0	5	9.0	19.5	11.5	8.0
32	38	54	42	48	3	45	65	51.0	20	39.5	2.0	5	9.0	19.5	11.5	7.5
33	38	54	42	48	3	45	65	51.0	20	39.5	2.0	5	9.0	19.5	11.5	7.5
35	40	56	44	50	3	49	65	55.0	20	43.5	2.0	5	9.0	19.5	11.5	8.0
38	43	59	49	56	4	52	75	60.0	23	46.0	2.0	6	9.0	22.0	14.0	7.5
40	45	61	51	58	4	55	75	62.0	23	48.0	2.0	6	9.0	22.0	14.0	8.0
43	48	64	54	61	4	58	75	65.0	23	51.0	2.0	6	9.0	22.0	14.0	8.0
45	50	66	56	63	4	61	75	69.0	23	55.0	2.0	6	9.0	22.0	14.0	(8)
48	53	69	59	66	4	64	85	69.0	23	55.0	2.0	6	9.0	22.0	14.0	8.0
50	55	71	62	70	4	66	85	73.0	25	58.0	2.5	6	9.0	23.0	15.0	8.0
53	58	78	65	73	4	69	85	75.0	25	60.0	2.5	6	9.0	23.0	15.0	8.0
55	60	79	67	75	4	71	85	75.0	25	60.0	2.5	6	9.0	23.0	15.0	8.0
58	63	83	70	78	4	74	85	75.0	25	60.0	2.5	6	9.0	23.0	15.0	8.0
60	65	85	72	80	4	77	95	75.0	25	60.0	2.5	6	9.0	23.0	15.0	8.0
63	68	88	75	83	4	80	95	75.0	25	60.0	2.5	6	9.0	23.0	15.0	8.0
65	70	90	77	85	4	83	95	76.0	25	61.0	2.5	6	9.0	23.0	15.0	10.0
68[1)]																
70	75	98	83	92	4	88	95	81.0	28	63.0	2.5	7	9.0	26.0	18.0	10.0
75	80	103	88	97	4	93	105	86.0	28	68.0	2.5	7	9.0	26.0	18.0	10.0
80	85	109	95	105	4	98	105	86.0	28	68.0	3.0	7	9.0	26.2	18.2	10.0

1) No provision for balanced type to DIN
2) Figure in brackets means installation length is longer than L_{1N} specified by EN 12756.

For stepped shafts, rotating spring

H7N



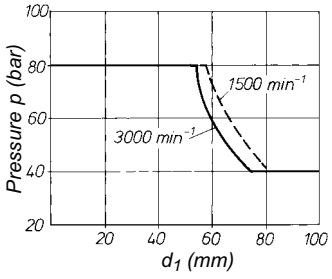
- **Single seal**
- **Balanced**
- **Independent of direction of rotation**
- **To EN 12756***

The H7N mechanical seal range is designed for universal application and the interchangeable parts concept is ideal for stock rationalisation. The seal faces are loosley inserted and can be easily exchanged, the thrust ring is retained by the drive lugs preventing the springs falling out. New: H7N with Super-Sinus spring (see page 139).

Operating limits (see note on page 1)

d_1 = 14 ... 200 mm *0.55" ... 8"*
p_1 = 25 (40) bar*) *360 (580) PSI*
t = –50 ... 220 °C *–58 °F ... 430 °F*
v_g = 20 m/s *66 ft/s*

*) With a shrink-fitted carbon graphite seal face (A), a stationary seat in Q_1, secondary seals made of V, P (90 Shore) or E (80 Shore), and a product temperature of a maximum 100 °C, the pressure operating limits are as shown in the graph:



H7N

Single spring (d_1 max. 100 mm)

Axial movement:
d_1 up to 22 mm: ± 1.0 mm
d_1 24 to 58 mm: ± 1.5 mm
d_1 60 mm and above: ± 2.0 mm

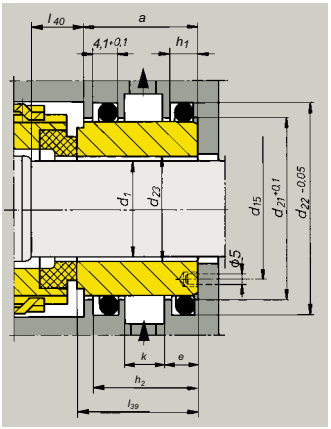
Item	Part no. to DIN 24250	Description
1.1	472	Seal face
1.2	485	Drive collar
1.3	474	Thrust ring
1.4	412.1	O-ring
1.5	477	Spring
1.6	904	Set screw
2	475	Stationary seat
3	412.2	O-ring

Combination of materials

Seal faces	Stationary seats			
	–G9			–G115
	A, B	Q_2	Q_1	Q_1
A*)	–	●	●	●
Q_1	●	●	●	–
Q_2	●	●	●	–
V	●	–	–	–
S	●	–	–	–

*) only in the shrink-fitted version for H75N, H76N, H75G16

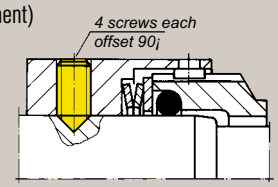
Stationary seat alternative



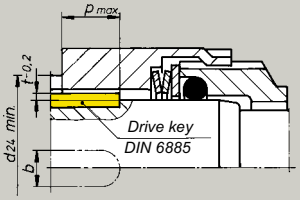
The standard H7N range only features the stationary seat with the G9 shape. It can be combined with the stationary seat G115 specifically for hot water application (cooling of the seat). Example of description: H75G 115/d_1 (v_g = 20 m/s max.).

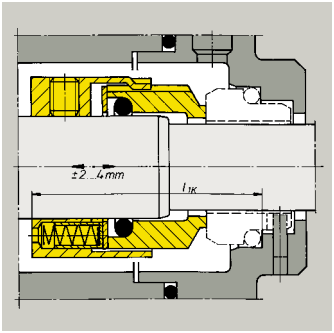
Torque transmission

For $d_2 > 100$ mm: via 4 set screws with cone points (standard arrangement)



Torque transmission by key is possible for all types in the H7 range (no item no. 1.6). Seal code e.g. H7S2/d_1



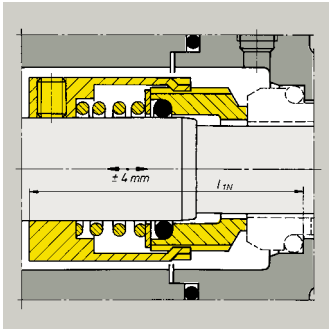


H75

d_1 = 28 ... 200 mm
As H7N, but with **multiple springs in sleeves** (Item no. 1.5) axial movements ± 2 to 4 mm, dependent on diameter.

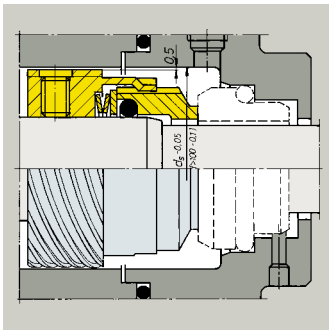
H75VN

Same as H75 but with a solid carbon seal face. Certified in accordance with API 682 for use in volatile hydrocarbons. Meets the requirements for "Low Emission Seals" based on American STLE limit values.



H76

d_1 = 14 ... 100 mm
Dimensions, item no's and descriptions as for H7N, but with special **single spring** (Item no. 1.5) for compensating large axial movements (± 4 mm).



H7F

d_1 max.100 mm

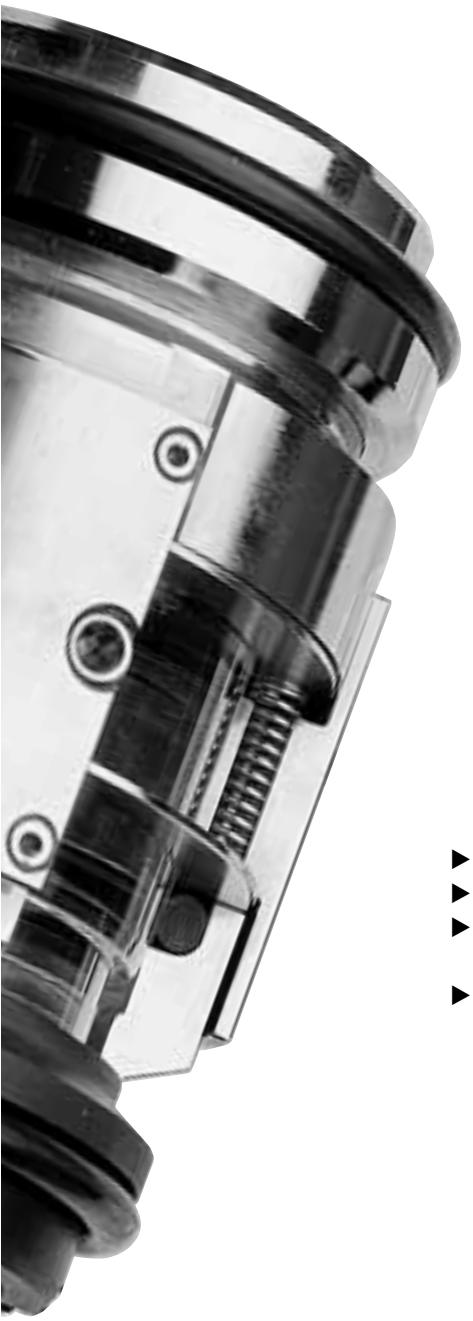
H75F

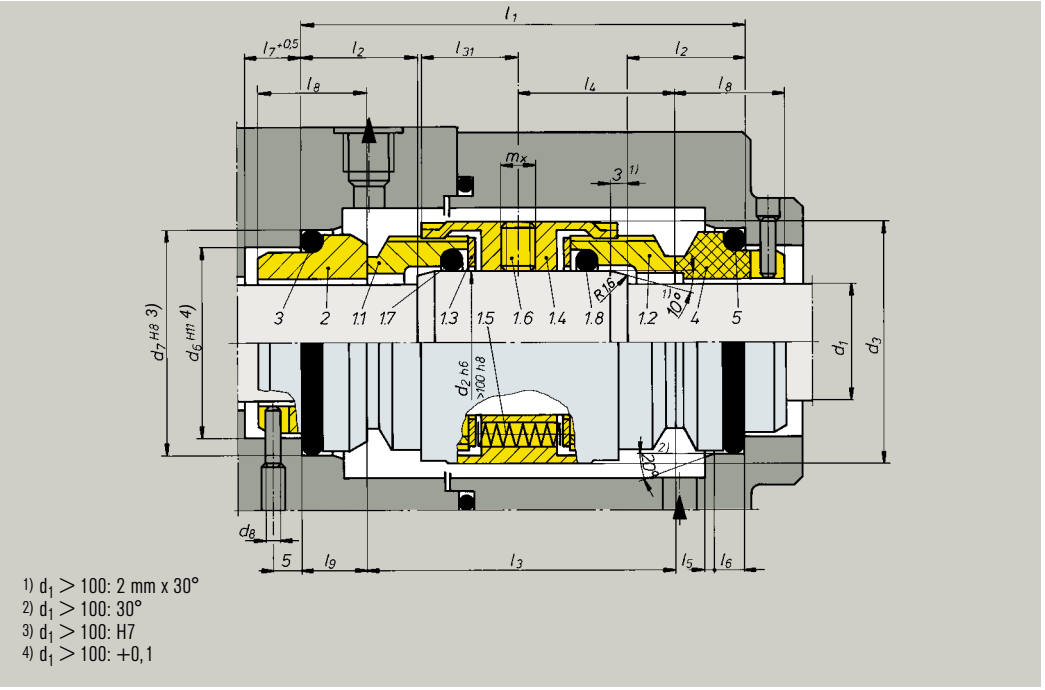
d_1 = 28 ... 200 mm
Axial movement d_1 28... 55 = ±2 mm.
d_1 58...100 = ±3 mm.
d_1 105...200 = ±4 mm.
Item no's and descriptions as for H7N, but with **pumping screw.** Dependent on direction of rotation!
Unquoted dimensions as for H7N.

d_1	d_2	d_3	d_6	d_7	d_8	d_{24}	d_{31}	d_{32}	d_5	l_{1K}	l_{1N}	l_2	l_3	l_5	l_6	l_7	l_8	l_9	l_{39}	l_{40}	a	b	e	f	h_1	h_2	k	m_x	$p_{max.}$	t
14*	18	33	21.0	25.0	3	20	–	–	38	42.5	–	18	32.5	1.5	4	8.5	17.5	10.0	–	–	–	5	–	6.0	–	–	–	M5	9	1.1
16*	20	35	23.0	27.0	3	22	–	–	40	42.5	–	18	32.5	1.5	4	8.5	17.5	10.0	–	–	–	5	–	6.0	–	–	–	M5	9	1.1
18*	22	37	27.0	33.0	3	24	–	–	42	45.0	55	20	33.5	2.0	5	9.0	19.5	11.5	–	–	–	6	–	7.0	–	–	–	M5	9	1.5
20*	24	39	29.0	35.0	3	26	–	–	44	45.0	60	20	33.5	2.0	5	9.0	19.5	11.5	–	–	–	6	–	5.5	–	–	–	M5	9	1.5
22*	26	41	31.0	37.0	3	28	–	–	45	45.0	60	20	33.5	2.0	5	9.0	19.5	11.5	–	–	–	6	–	8.0	–	–	–	M5	9	1.5
24*	28	43	33.0	39.0	3	30	–	–	47	47.5	60	20	36.0	2.0	5	9.0	19.5	11.5	–	–	–	6	–	5.5	–	–	–	M6	9	1.5
25*	30	45	34.0	40.0	3	32	–	–	49	47.5	60	20	36.0	2.0	5	9.0	19.5	11.5	–	–	–	6	–	5.5	–	–	–	M6	9	1.5
28*	33	48	37.0	43.0	3	35	44.65	50.57	51	50.0	65	20	38.5	2.0	5	9.0	19.5	11.5	24.0	8.5	24.0	6	8.0	8.0	6.6	22.6	9	M6	12	1.5
30*	35	50	39.0	45.0	3	37	47.83	53.75	54	50.0	65	20	38.5	2.0	5	9.0	19.5	11.5	24.5	9.0	24.0	6	8.0	8.0	6.6	22.6	9	M6	12	1.5
32*	38	55	42.0	48.0	3	40	47.83	53.75	59	50.0	65	20	38.5	2.0	5	9.0	19.5	11.5	24.5	9.0	24.0	6	8.0	8.0	6.6	22.6	9	M6	12	1.5
33*	38	55	42.0	48.0	3	40	47.83	53.75	59	50.0	65	20	38.5	2.0	5	9.0	19.5	11.5	24.5	9.0	24.0	6	8.0	8.0	6.6	22.6	9	M6	12	1.5
35*	40	57	44.0	50.0	3	42	51.00	56.92	61	50.0	65	20	38.5	2.0	5	9.0	19.5	11.5	24.5	9.0	24.0	6	8.0	8.0	6.6	22.6	9	M6	12	1.5
38*	43	60	49.0	56.0	4	45	54.18	60.10	65	52.5	75	23	38.5	2.0	6	9.0	22.0	14.0	26.0	11.0	24.0	6	8.0	8.0	6.6	22.6	9	M6	12	1.5
40*	45	62	51.0	58.0	4	47	60.53	66.45	66	52.5	75	23	38.5	2.0	6	9.0	22.0	14.0	26.0	11.0	24.0	6	8.0	8.0	6.6	22.6	9	M6	12	1.5
43*	48	65	54.0	61.0	4	50	63.70	69.62	69	52.5	75	23	38.5	2.0	6	9.0	22.0	14.0	26.0	11.0	24.0	6	8.0	8.0	6.6	22.6	9	M6	12	1.5
45*	50	67	56.0	63.0	4	52	63.70	69.62	71	52.5	75	23	38.5	2.0	6	9.0	22.0	14.0	26.0	11.0	24.0	6	8.0	8.0	6.6	22.6	9	M6	12	1.5
48*	53	70	59.0	66.0	4	55	66.88	72.80	75	52.5	85	23	38.5	2.0	6	9.0	22.0	14.0	26.0	11.0	24.0	6	8.0	8.0	6.6	22.6	9	M6	12	1.5
50*	55	72	62.0	70.0	4	57	70.05	75.97	76	57.5	85	25	42.5	2.5	6	9.0	23.0	15.0	26.5	12.5	24.0	6	8.0	8.0	6.6	22.6	9	M6	12	1.5
53*	58	79	65.0	73.0	4	60	76.40	82.32	83	57.5	85	25	42.5	2.5	6	9.0	23.0	15.0	26.5	12.5	24.0	8	8.0	9.0	6.6	22.6	9	M8	11	1.9
55*	60	81	67.0	75.0	4	62	76.40	82.32	85	57.5	85	25	42.5	2.5	6	9.0	23.0	15.0	28.5	12.5	26.0	8	8.0	9.0	6.6	24.6	11	M8	12	1.9
58*	63	84	70.0	78.0	4	65	79.58	85.50	88	62.5	85	25	47.5	2.5	6	9.0	23.0	15.0	28.5	12.5	26.0	8	8.0	9.0	6.6	24.6	11	M8	15	1.9
60*	65	86	72.0	80.0	4	67	82.75	88.67	95	62.5	95	25	47.5	2.5	6	9.0	23.0	15.0	28.5	12.5	26.0	8	8.0	9.0	6.6	24.6	11	M8	15	1.9
63*	68	89	75.0	83.0	4	70	85.93	91.85	93	62.5	95	25	47.5	2.5	6	9.0	23.0	15.0	28.5	12.5	26.0	8	8.0	9.0	6.6	24.6	11	M8	14	1.9
65*	70	91	77.0	85.0	4	72	85.93	91.85	95	62.5	95	25	47.5	2.5	6	9.0	23.0	15.0	28.5	12.5	26.0	8	8.0	9.0	6.6	24.6	11	M8	15	1.9
70*	75	99	83.0	92.0	4	77	89.10	95.02	105	70.0	95	28	52.0	2.5	7	9.0	26.0	18.0	30.5	14.5	26.0	8	8.0	10.0	6.6	24.6	11	M8	15	1.9
75*	80	104	88.0	97.0	4	82	98.63	104.55	109	70.0	105	28	52.0	2.5	7	9.0	26.0	18.0	30.5	14.5	26.0	8	8.0	10.0	6.6	24.6	11	M8	15	1.9
80*	85	109	95.0	105.0	4	87	101.80	107.72	114	70.0	105	28	51.8	3.0	7	9.0	26.2	18.2	30.2	14.0	26.0	8	8.0	10.0	6.6	24.6	11	M8	15	1.9
85*	90	114	100.0	110.0	4	92	108.15	114.07	119	75.0	105	28	56.8	3.0	7	9.0	26.2	18.2	30.2	14.0	26.0	10	8.0	10.0	6.6	24.6	11	M8	23	2.3
90*	95	119	105.0	115.0	4	97	114.50	120.42	124	75.0	105	28	56.8	3.0	7	9.0	26.2	18.2	30.2	14.0	26.0	10	8.0	10.0	6.6	24.6	11	M8	23	2.3
95*	100	124	110.0	120.0	4	102	117.68	123.60	129	75.0	105	28	57.8	3.0	7	9.0	25.2	17.2	29.2	14.0	26.0	10	8.0	10.0	6.6	24.6	11	M8	23	2.3
100*	105	129	115.0	125.0	4	107	124.03	129.95	134	75.0	105	28	57.8	3.0	7	9.0	25.2	17.2	29.2	14.0	26.0	10	8.0	10.0	6.6	24.6	11	M8	23	2.3
105	115	148	122.2	134.3	5	118	128.98	134.90	153	73.0	–	32	53.0	2.0	10	–	30.0	20.0	29.2	15.2	26.0	10	8.0	10.0	6.6	24.6	11	M8	18	2.3
110	120	153	128.2	140.3	5	123	135.30	141.20	158	73.0	–	32	53.0	2.0	10	–	30.0	20.0	32.5	14.5	30.0	10	9.5	10.0	6.6	28.6	13	M8	18	2.3
115	125	158	136.2	148.3	5	128	140.30	146.20	163	73.0	–	32	53.0	2.0	10	–	30.0	20.0	32.5	14.5	30.0	10	9.5	10.0	6.6	28.6	13	M8	18	2.3
120	130	163	138.2	150.3	5	133	145.30	151.20	168	73.0	–	32	53.0	2.0	10	–	30.0	20.0	32.5	14.5	30.0	10	9.5	10.0	6.6	28.6	13	M8	18	2.3
125	135	168	142.2	154.3	5	138	150.30	156.20	173	73.0	–	32	53.0	2.0	10	–	30.0	20.0	32.5	14.5	30.0	10	9.5	10.0	6.6	28.6	13	M8	18	2.3
130	140	173	146.2	158.3	5	143	155.30	161.20	178	73.0	–	32	53.0	2.0	10	–	30.0	20.0	32.5	14.5	30.0	10	9.5	10.0	6.6	28.6	13	M8	18	2.3
135	145	178	152.2	164.3	5	148	160.30	166.20	183	73.0	–	32	53.0	2.0	10	–	30.0	20.0	32.5	14.5	30.0	10	9.5	10.0	6.6	28.6	13	M8	18	2.3
140	150	183	156.2	168.3	5	153	165.30	171.20	188	73.0	–	32	53.0	2.0	10	–	30.0	20.0	32.5	14.5	30.0	10	9.5	10.0	6.6	28.6	13	M8	18	2.3
145	155	191	161.2	173.3	5	158	172.30	178.20	196	83.0	–	34	63.0	2.0	10	–	30.0	20.0	34.5	16.5	32.0	12	10.0	12.0	7.1	30.1	14	M8	22	2.1
150	160	196	168.2	180.3	5	163	177.30	183.20	201	85.0	–	36	63.0	2.0	10	–	32.0	22.0	34.5	16.5	32.0	12	10.0	12.0	7.1	30.1	14	M8	22	2.1
155	165	201	173.2	185.3	5	168	182.30	188.20	206	87.0	–	38	63.0	2.0	12	–	34.0	24.0	34.5	16.5	32.0	12	10.0	12.0	7.1	30.1	14	M8	22	2.1
160	170	206	178.2	190.3	5	173	187.30	193.20	211	87.0	–	38	63.0	2.0	12	–	34.0	24.0	34.5	16.5	32.0	12	10.0	12.0	7.1	30.1	14	M8	22	2.1
165	175	211	183.2	195.3	5	178	192.30	198.20	216	87.0	–	38	63.0	2.0	12	–	34.0	24.0	34.5	16.5	32.0	12	10.0	12.0	7.1	30.1	14	M8	22	2.1
170	180	216	188.2	200.3	5	183	197.30	203.20	221	87.0	–	38	63.0	2.0	12	–	34.0	24.0	37.0	16.5	34.5	12	10.0	12.0	7.1	32.1	16	M8	22	2.1
175	185	221	193.2	205.3	5	188	202.30	208.20	226	87.0	–	38	63.0	2.0	12	–	34.0	24.0	37.0	16.5	34.5	12	10.0	12.0	7.1	32.1	16	M8	22	2.1
180	190	226	207.5	219.3	5	193	207.30	213.20	231	91.0	–	42	63.0	2.0	12	–	38.0	28.0	37.0	16.5	34.5	12	10.0	12.0	7.1	32.1	16	M8	22	2.1
185	195	231	212.5	224.3	5	198	212.30	218.20	236	91.0	–	42	63.0	2.0	12	–	38.0	28.0	37.0	16.5	34.5	12	10.0	12.0	7.1	32.1	16	M8	22	2.1
190	200	236	217.5	229.3	5	203	217.30	223.20	241	91.0	–	42	63.0	2.0	12	–	38.0	28.0	37.0	16.5	34.5	12	10.0	12.0	7.1	32.1	16	M8	22	2.1
195	205	245	222.5	234.2	5	208	225.30	231.20	250	94.0	–	43	66.0	2.0	12	–	38.0	28.0	37.0	17.5	34.5	12	10.0	14.0	7.1	32.1	16	M10	22	2.1
200	210	250	227.5	239.3	5	213	230.30	236.20	255	94.0	–	43	66.0	2.0	12	–	38.0	28.0	37.0	17.5	34.5	12	10.0	14.0	7.1	32.1	16	M10	22	2.1

For stepped shafts, rotating spring

H74-D





1) $d_1 > 100$: 2 mm x 30°
2) $d_1 > 100$: 30°
3) $d_1 > 100$: H7
4) $d_1 > 100$: +0,1

- **Double seal**
- **Balanced**
- **Independent of direction of rotation**
- **Multiple springs**

Double seals of the M74-D series have the same design-features as the "H7" family of single seals (easy-to-replace seal faces, etc.). Apart from the installation length of the drive collar, all fitting dimensions (d_1 <100 mm) conform with EN 12756.

Operating limits (see note on page 1)

d_1 = 14 ... 200 mm *0.55" ... 8"*
p_1 = 25 (40) bar *360 (580) PSI*
t = –50 ... 220 °C *–58 °F ... 430 °F*
(–20 ... 180 °C) *–4 °F ... 355 °F*
v_g = 20 m/s (10 m/s*) *66 (33) ft/s*

*) Limit for shrink-fitted carbide seal faces with $d_1 \geqq 105$ mm

Axial movement:
$d_1 \leqq 100$ mm ± 0.5 mm
$d_1 > 100$ mm ± 2.0 mm

Double seals to EN 12756

EN specifies single seals in a back-to-back arrangement. It is possible, therefore, to choose from the following combinations:
– unbalanced/unbalanced (e.g. M7N/M7N)
– balanced/balanced (e.g. H7N/H7N)
– unbalanced/balanced (e.g. M7N/H7N)
Please consult the single seal tables for dimensions.

H74-D

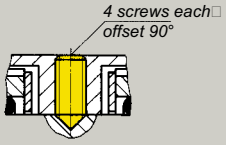
Item no.	Part no. to DIN 24250	Description
1.1	472.1	Seal face
1.2	472.2	Seal face
1.3	474	Thrust ring
1.4	485	Drive collar
1.5	477	Spring
1.6	904	Set screw
1.7	412.1	O-ring
1.8	412.2	O-ring
2	475.1	Stationary seat
3	412.3	O-ring
4	475.2	Stationary seat
5	412.4	O-ring

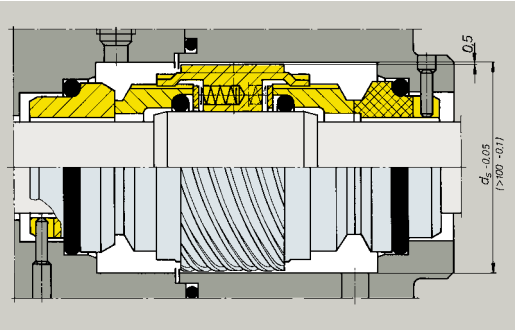
Combination of materials

Dimensions are identical throughout the H7 series, so it is possible to use the same face materials as for type H7N (see page 46).

Torque transmission

$d_2 \geqq 105$ mm: via 4 set screws with cone points (standard arrangement)



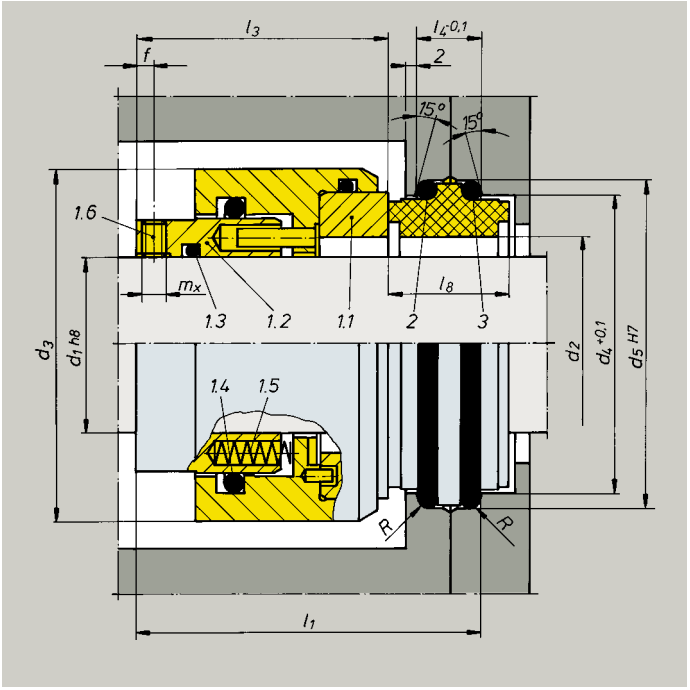


H 74 F-D

Dimensions, item no's and descriptions as for H 74-D, but with a **pumping screw** (Item no. 1.4). Dependent on the direction of rotation!

d_1	d_2	d_3	d_6	d_7	d_8	d_5	l_1	l_2	l_3	l_4	l_5	l_6	l_7	l_8	l_9	l_{31}	m_x
14	18	33	21.0	25.0	3	–	73.0	18	53.0	26.5	1.5	4	8.5	17.5	10.0	17.0	M5
16	20	35	23.0	27.0	3	–	73.0	18	53.0	26.5	1.5	4	8.5	17.5	10.0	17.0	M5
18	22	37	27.0	33.0	3	42	76.0	20	53.0	26.5	2.0	5	9.0	19.5	11.5	17.0	M5
20	24	39	29.0	35.0	3	44	76.0	20	53.0	26.5	2.0	5	9.0	19.5	11.5	17.0	M5
22	26	41	31.0	37.0	3	45	76.0	20	53.0	26.5	2.0	5	9.0	19.5	11.5	17.0	M5
24	28	43	33.0	39.0	3	47	77.0	20	54.0	27.0	2.0	5	9.0	19.5	11.5	17.5	M6
25	30	45	34.0	40.0	3	49	77.0	20	54.0	27.0	2.0	5	9.0	19.5	11.5	17.5	M6
28	33	48	37.0	43.0	3	51	77.0	20	54.0	27.0	2.0	5	9.0	19.5	11.5	17.5	M6
30	35	50	39.0	45.0	3	54	77.0	20	54.0	27.0	2.0	5	9.0	19.5	11.5	17.5	M6
32	38	55	42.0	48.0	3	59	79.0	20	56.0	28.0	2.0	5	9.0	19.5	11.5	18.5	M6
33	38	55	42.0	48.0	3	59	79.0	20	56.0	28.0	2.0	5	9.0	19.5	11.5	18.5	M6
35	40	57	44.0	50.0	3	61	80.0	20	57.0	28.5	2.0	5	9.0	19.5	11.5	19.0	M6
38	43	60	49.0	56.0	4	65	85.0	23	57.0	28.5	2.0	6	9.0	22.0	14.0	19.0	M6
40	45	62	51.0	58.0	4	66	85.0	23	57.0	28.5	2.0	6	9.0	22.0	14.0	19.0	M6
43	48	65	54.0	61.0	4	69	85.0	23	57.0	28.5	2.0	6	9.0	22.0	14.0	19.0	M6
45	50	67	56.0	63.0	4	71	84.0	23	56.0	28.0	2.0	6	9.0	22.0	14.0	19.5	M6
48	53	70	59.0	66.0	4	75	84.0	23	56.0	28.0	2.0	6	9.0	22.0	14.0	19.5	M6
50	55	72	62.0	70.0	4	76	93.0	25	63.0	31.5	2.5	6	9.0	23.0	15.0	19.5	M6
53	58	79	65.0	73.0	4	83	97.0	25	67.0	33.5	2.5	6	9.0	23.0	15.0	23.5	M8
55	60	81	67.0	75.0	4	85	97.0	25	67.0	33.5	2.5	6	9.0	23.0	15.0	23.5	M8
58	63	84	70.0	78.0	4	88	104.0	25	74.0	37.0	2.5	6	9.0	23.0	15.0	24.5	M8
60	65	86	72.0	80.0	4	95	104.0	25	74.0	37.0	2.5	6	9.0	23.0	15.0	24.5	M8
63	68	89	75.0	83.0	4	93	109.0	25	79.0	39.5	2.5	6	9.0	23.0	15.0	24.5	M8
65	70	91	77.0	85.0	4	95	98.0	25	68.0	34.0	2.5	6	9.0	23.0	15.0	23.5	M8
70	75	99	83.0	92.0	4	105	112.5	28	76.4	38.2	2.5	7	9.0	26.0	18.0	25.5	M8
75	80	104	88.0	97.0	4	109	112.5	28	76.4	38.2	2.5	7	9.0	26.0	18.0	25.5	M8
80	85	109	95.0	105.0	4	114	112.5	28	76.0	38.0	3.0	7	9.0	26.2	18.2	25.0	M8
85	90	114	100.0	110.0	4	119	112.5	28	76.0	38.0	3.0	7	9.0	26.2	18.2	25.5	M8
90	95	119	105.0	115.0	4	124	112.5	28	76.0	38.0	3.0	7	9.0	26.2	18.2	25.0	M8
95	100	124	110.0	120.0	4	129	110.5	28	76.0	38.0	3.0	7	9.0	25.2	17.2	25.0	M8
100	105	129	115.0	125.0	4	134	110.5	28	76.0	38.0	3.0	7	9.0	25.2	17.2	25.5	M8
105	115	148	122.2	134.3	5	153	122.0	32	82.0	41.0	2.0	10	–	30.0	20.0	31.5	M8
110	120	153	128.2	140.3	5	158	122.0	32	82.0	41.0	2.0	10	–	30.0	20.0	31.5	M8
115	125	158	136.2	148.3	5	163	122.0	32	82.0	41.0	2.0	10	–	30.0	20.0	31.5	M8
120	130	163	138.2	150.3	5	168	122.0	32	82.0	41.0	2.0	10	–	30.0	20.0	31.5	M8
125	135	168	142.2	154.3	5	173	122.0	32	82.0	41.0	2.0	10	–	30.0	20.0	31.5	M8
130	140	173	146.2	158.3	5	178	122.0	32	82.0	41.0	2.0	10	–	30.0	20.0	31.5	M8
135	145	178	152.2	164.3	5	183	122.0	32	82.0	41.0	2.0	10	–	30.0	20.0	31.5	M8
140	150	183	156.2	168.3	5	188	122.0	32	82.0	41.0	2.0	10	–	30.0	20.0	31.5	M8
145	155	191	161.2	173.3	5	196	133.0	34	93.0	46.5	2.0	10	–	30.0	20.0	35.5	M8
150	160	196	168.2	180.3	5	201	137.0	36	93.0	46.5	2.0	10	–	32.0	22.0	35.5	M8
155	165	201	173.2	185.3	5	206	141.0	38	93.0	46.5	2.0	12	–	34.0	24.0	35.5	M8
160	170	206	178.2	190.3	5	211	141.0	38	93.0	46.5	2.0	12	–	34.0	24.0	35.5	M8
165	175	211	183.2	195.3	5	216	141.0	38	93.0	46.5	2.0	12	–	34.0	24.0	35.5	M8
170	180	216	188.2	200.3	5	221	141.0	38	93.0	46.5	2.0	12	–	34.0	24.0	35.5	M8
175	185	221	193.2	205.3	5	226	141.0	38	93.0	46.5	2.0	12	–	34.0	24.0	35.5	M8
180	190	226	207.5	219.3	5	231	149.0	42	93.0	46.5	2.0	12	–	38.0	28.0	35.5	M8
185	195	231	212.5	224.3	5	236	149.0	42	93.0	46.5	2.0	12	–	38.0	28.0	35.5	M8
190	200	236	217.5	229.3	5	241	149.0	42	93.0	46.5	2.0	12	–	38.0	28.0	35.5	M8
195	205	245	222.5	234.3	5	250	151.0	43	95.0	47.5	2.0	12	–	38.0	28.0	–	M10
200	210	250	227.5	239.3	5	255	151.0	43	95.0	47.5	2.0	12	–	38.0	28.0	–	M10

HGH



- **Semi-split**
- **Balanced**
- **Independent of direction of rotation**
- **Single seal**

Semi-split mechanical seals are used if there is a sufficient axial clearance to pull off the seal housing and seat housings until the sliding parts are accessible. i.e. only the wearing parts proper, such as the seal face and stationary seat as well as O-rings are split. The seal face and stationary seat, springs and O-rings can thus be replaced without requiring complete disassembly.
Springs are arranged to be protected from the medium. The split stationary seat can be used in either side.

Operating limits (see note on page 1)

d_1 = 50 ... 310 mm[1)]
p_1 = 25 (40) bar
t_1 = 150 °C
v_g = 20 m/s
Adm. axial offset ± 2 mm

1) Larger diameters on request.

HGH 201

Unsplit as original equipment:
Description HGH 200.

Item	Description
1.1	Seal face[2)]
1.2	Driver collar
1.3	O-ring
1.4	O-ring[2)]
1.5	Spring
1.6	Set screw
2	Stationary seat[2)]
3	O-ring[2)]

2) For disassembly of unsplit seal faces, seats and O-ring these should be broken or cut.

Materials

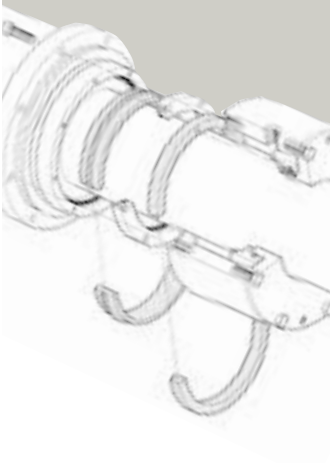
Combination of sliding materialas:
Q_1 (silicon carbide) against Q_1
B_1 (carbon graphite) against Q_1

O-rings:
V (FPM, e.g. Viton®)
E (EPDM)
P (NBR, e.g. Perbunan®)

Other components:
G (CrNi-Mo-steel, 1.4571)

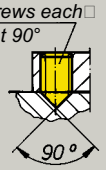
Split or semisplit mechanical seals ... for time is sometimes money.

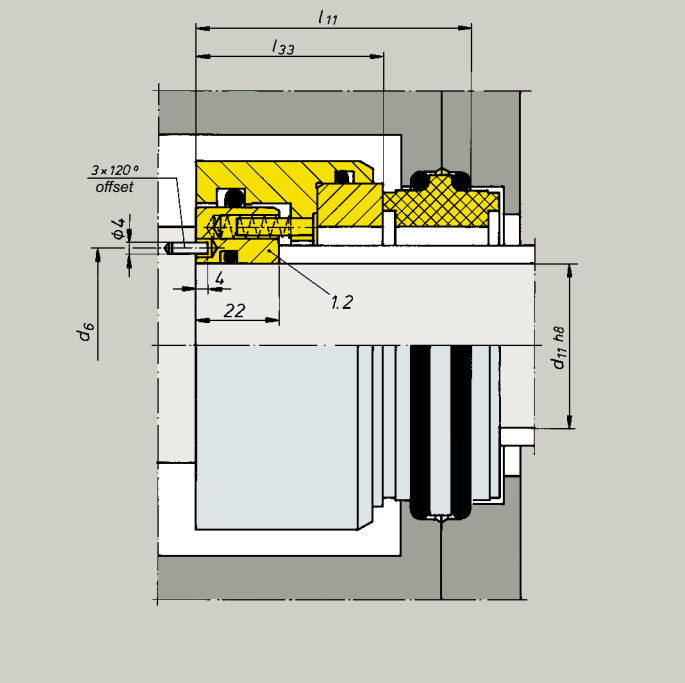
If the sealing compartment does not leave sufficient space axially for mounting or replacing a seal, if no quick-changing devices are available, or if a pump is operated without standby, mounting or dismountying a mechanical seal in case of an inspection or repair may cause expensive downtimes. Whether they are used e.g. in turbines of hydroelectric plants, in pumps of seawater desalination plants, in stern tubes, gears, defibrators or cooling water pumps: split seal housings or components can help you to save costs.



Torque transmission

$d_1 \geqq 105$ mm standard
via 4 set screws with cone points





HGH 211

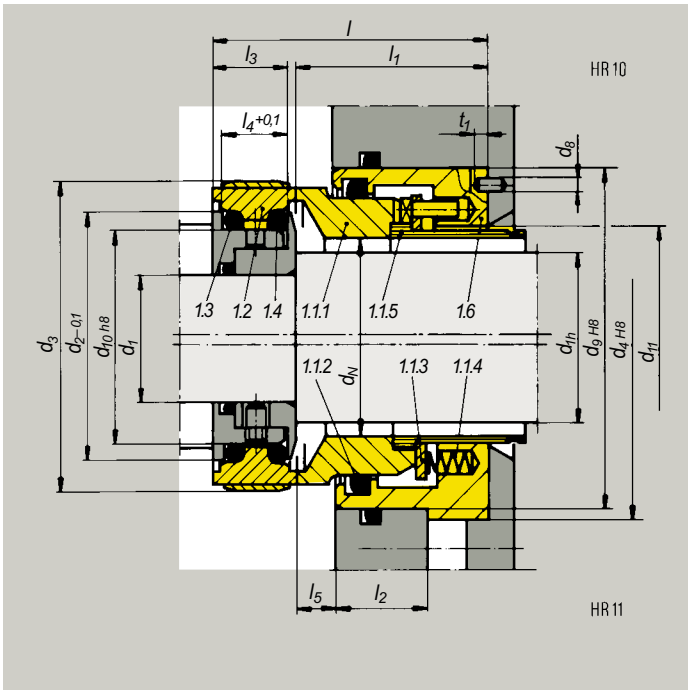
Unsplit as original equipment: Designation HGH 210.

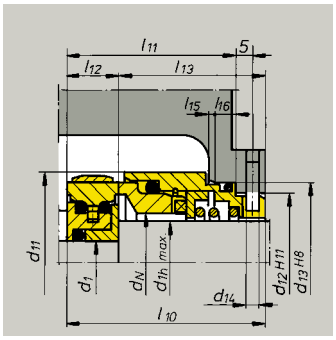
Operating limits, item numbers with description and unquoted dimensions as for HGH 201.

Item. 1.2 Driver collar, modified for securing on stepped shafts.

d_1	d_{11}	d_2	d_3	d_4	d_5	d_6	l_1	l_{11}	l_3	l_{33}	l_4	l_8	R	f	m_x
50	40	60	95	80.5	89.6	55	95.3	75.3	70	50	18.8	31.8	2.5	6	M8
55	45	65	100	85.5	94.6	60	95.3	75.3	70	50	18.8	31.8	2.5	6	M8
60	50	70	105	90.5	99.6	65	95.3	75.3	70	50	18.8	31.8	2.5	6	M8
65	55	75	110	95.5	104.6	70	95.3	75.3	70	50	18.8	31.8	2.5	6	M8
70	60	80	115	100.5	109.6	75	95.3	75.3	70	50	18.8	31.8	2.5	6	M8
75	65	85	120	105.5	114.6	80	95.3	75.3	70	50	18.8	31.8	2.5	6	M8
80	70	90	125	110.5	119.6	85	95.3	75.3	70	50	18.8	31.8	2.5	6	M8
85	75	95	130	115.5	124.6	90	95.3	75.3	70	50	18.8	31.8	2.5	6	M8
90	80	100	135	120.5	129.6	95	95.3	75.3	70	50	18.8	31.8	2.5	6	M8
95	85	105	140	125.5	134.6	100	95.3	75.3	70	50	18.8	31.8	2.5	6	M8
100	90	110	145	130.5	139.6	105	95.3	75.3	70	50	18.8	31.8	2.5	6	M8
105	95	115	150	135.5	144.6	110	95.3	75.3	70	50	18.8	31.8	2.5	6	M8
110	100	120	155	140.5	149.6	115	95.3	75.3	70	50	18.8	31.8	2.5	6	M8
115	105	125	160	145.5	154.6	120	95.3	75.3	70	50	18.8	31.8	2.5	6	M8
120	110	130	165	150.5	159.6	125	95.3	75.3	70	50	18.8	31.8	2.5	6	M8
125	115	135	170	155.5	164.6	130	95.3	75.3	70	50	18.8	31.8	2.5	6	M8
130	120	140	175	160.5	169.6	135	95.3	75.3	70	50	18.8	31.8	2.5	6	M8
135	125	145	180	165.5	174.6	140	95.3	75.3	70	50	18.8	31.8	2.5	6	M8
140	130	150	185	170.5	179.6	145	95.3	75.3	70	50	18.8	31.8	2.5	6	M8
145	135	155	190	175.5	184.6	150	95.3	75.3	70	50	18.8	31.8	2.5	6	M8
150	140	160	195	180.5	189.6	155	95.3	75.3	70	50	18.8	31.8	2.5	6	M8
155	145	165	200	185.5	194.6	160	95.3	75.3	70	50	18.8	31.8	2.5	6	M8
160	150	170	205	190.5	199.6	165	95.3	75.3	70	50	18.8	31.8	2.5	6	M8
165	155	175	210	195.5	204.6	170	95.3	75.3	70	50	18.8	31.8	2.5	6	M8
170	160	180	215	200.5	209.6	175	95.3	75.3	70	50	18.8	31.8	2.5	6	M8
175	165	185	220	205.5	214.6	180	95.3	75.3	70	50	18.8	31.8	2.5	6	M8
180	170	192	225	212.5	224.6	185	104.2	84.2	72	52	26.4	38.0	3.5	6	M8
185	175	197	230	217.5	229.6	190	104.2	84.2	72	52	26.4	38.0	3.5	6	M8
190	180	202	235	222.5	234.6	195	104.2	84.2	72	52	26.4	38.0	3.5	6	M8
195	185	207	240	227.5	239.6	200	104.2	84.2	72	52	26.4	38.0	3.5	6	M8
200	190	212	245	232.5	244.6	205	104.2	84.2	72	52	26.4	38.0	3.5	6	M8
205	195	217	255	237.5	249.6	210	109.2	84.2	77	52	26.4	38.0	3.5	8	M10
210	200	222	260	242.5	254.6	215	109.2	84.2	77	52	26.4	38.0	3.5	8	M10
220	210	232	270	252.5	264.6	225	109.2	84.2	77	52	26.4	38.0	3.5	8	M10
230	220	242	280	262.5	274.6	235	109.2	84.2	77	52	26.4	38.0	3.5	8	M10
240	230	252	290	272.5	284.6	245	109.2	84.2	77	52	26.4	38.0	3.5	8	M10
250	240	262	300	282.5	294.6	255	109.2	84.2	77	52	26.4	38.0	3.5	8	M10
260	250	272	310	295.5	307.6	265	109.2	84.2	77	52	26.4	38.0	3.5	8	M10
270	260	282	320	305.5	317.6	275	109.2	84.2	77	52	26.4	38.0	3.5	8	M10
280	270	292	330	315.5	327.6	285	109.2	84.2	77	52	26.4	38.0	3.5	8	M10
290	280	302	340	325.5	337.6	295	109.2	84.2	77	52	26.4	38.0	3.5	8	M10
300	290	312	350	335.5	347.6	305	109.2	84.2	77	52	26.4	38.0	3.5	8	M10
310	300	322	360	345.5	357.5	315	109.2	84.2	77	52	26.4	38.0	3.5	8	M10

HR





HRZ1

Single seal with **cylindrical spring** and type G 76 seat. For installation in covers with installation dimensions according to **EN 12756** B or U. Installation length l_{11} corresponds to max. l_{1k}. For dimensions see separate table at the bottom of page 53 (intermediate sizes on request).

- **Single seal**
- **Independent of direction of rotation**
- **Balanced**

Mechanical seals of the HR series are special-purpose seals for use in media containing solids without external flushing or product circulation. Key features are a rotating seat positioned immediately next to the pump impeller and a spring protection sleeve which has proven to be effective in actual service. HR mechanical seals find application mainly in the scrubbing sections of power station flue gas desulphurization systems, and they are also used successfully in the paper industry.

HR 1 ..

Direction of installation:
– from the impeller side HR 10
– from the bearing side HR 11

Item	Part no. to DIN 24250	Description
1.1.1	472	Seal face
1.1.2	412.1	O-ring
1.1.3	474	Thrust ring
1.1.4	477	Spring
1.1.5	520	Sleeve
1.2	475	Rotating seat type G11
1.3	412.2	O-ring
1.4	412.3	O-ring
1.6	441	Housing

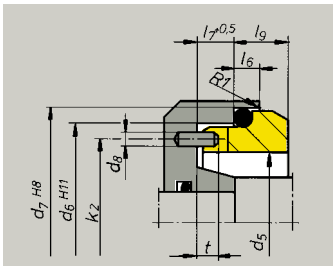
Operating limits (see note on page 1)

d_N = 36 ... 200 (400) mm
1.4" ... 8" (16")
p_1 = 16 bar *230 PSI*
t = –20 ... 160 °C *–4 °F ... 320 °F*
v_g = 10 m/s *33 ft/s*

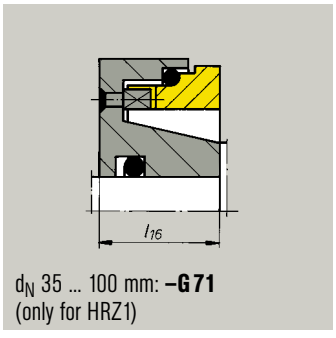
Materials

High-wear-resistant and corrosion-proof silicon carbide is used exclusively as face seat material.

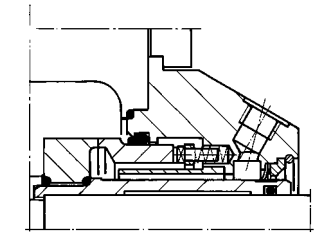
Rotating seat alternatives



d_N 36 ... 90 mm: **–G 2**
95 ... 200 mm: **–G 9**

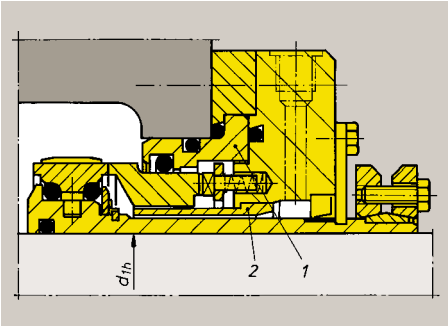


d_N 35 ... 100 mm: **–G 71**
(only for HRZ1)



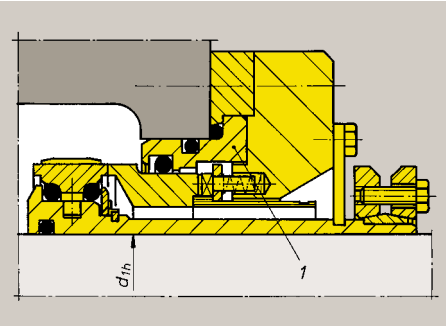
SHR

Special model for use in **sterile processes.** Electropolished surfaces, and specially designed O-ring grooves for special elastomeric seal rings and O-rings leaving no gaps plus many other features, please enquire for details.



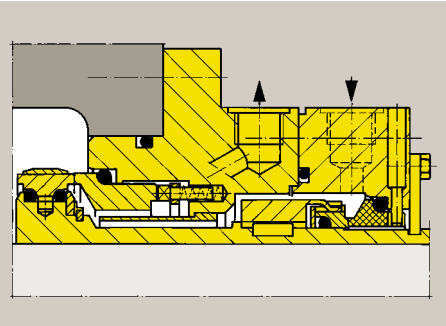
HR2 ...

Cartridge-type single seal with guide sleeve (Item no. 2) for use with quench. Insert (Item no. 1) either metallic or SiC.



HR3 ...

Cartridge-type single seal. Insert (Item no. 1) either metallic or SiC.



HRK-D

Double seal of cartridge design for operation in buffer pressure or quench mode (does not open if buffer pressure fails), available alternatively with a pumping screw for a higher rate of circulation. Torque transmission e.g. by means of a shrink disk.

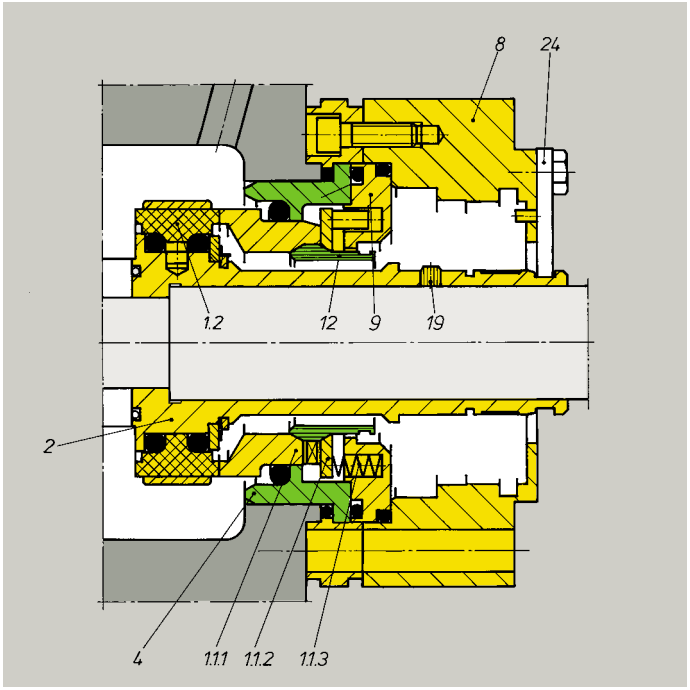
d_1	d_{1h}	d_N	d_2	d_3	d_4	d_5	d_6	d_7	d_8	d_9	d_{10}	d_{11} $^{+0,2}_{min}$	l	l_1	l_2	l_3	l_4	l_5	l_6	l_7	l_9	k_2	t	t_1
20	28	36	47.1	64	75	46	56.0	63.0	4	70	38	40	75	53	20	19.5	17	10.5	6	9	8.0	51.0	4.5	3
25	33	41	52.1	69	80	51	62.0	70.0	4	75	43	45	75	53	20	19.5	17	10.5	6	9	9.5	56.5	4.5	3
28	38	46	57.1	74	85	56	67.0	75.0	4	80	48	50	75	53	20	19.5	17	10.5	6	9	9.5	61.5	4.5	3
33	43	51	62.1	79	90	61	72.0	80.0	4	85	53	55	75	53	20	19.5	17	10.5	6	9	10.5	66.5	4.5	3
38	48	56	67.1	84	95	66	77.0	85.0	4	90	58	60	75	53	20	19.5	17	10.5	6	9	10.5	71.5	4.5	3
43	53	61	72.1	89	100	69	81.0	90.0	4	95	63	65	75	53	20	19.5	17	10.5	7	9	11.0	75.0	4.5	3
48	58	66	77.1	94	105	76	88.0	97.0	4	100	68	70	75	53	20	19.5	17	10.5	7	9	11.5	82.0	4.5	3
53	63	71	82.1	100	110	81	95.0	105.0	4	105	73	75	75	53	20	19.5	17	10.5	7	9	11.5	88.0	4.5	3
55	65	75	87.1	105	115	86	100.0	110.0	4	110	78	79	75	53	20	19.5	17	10.5	7	9	11.5	93.0	4.5	3
60	70	80	92.1	110	120	91	105.0	115.0	4	115	83	84	75	53	20	19.5	17	10.5	7	9	13.0	98.0	4.5	3
65	75	85	97.1	115	125	96	110.0	120.0	4	120	88	89	75	53	20	19.5	17	10.5	7	9	13.0	103.0	4.5	3
70	80	90	102.1	120	130	101	115.0	125.0	4	125	93	94	75	53	20	19.5	17	10.5	7	9	13.0	108.0	4.5	3
75	85	95	107.1	125	135	107	122.2	134.3	5	130	98	99	75	53	20	19.5	17	10.5	10	12	20.0	114.5	7.0	3
80	90	100	112.1	130	140	107	122.2	134.3	5	135	103	104	75	53	20	19.5	17	10.5	10	12	20.0	114.5	7.0	3
90	100	110	126.1	146	163	117	136.2	148.3	5	155	117	116	98	73	30	22.0	19	16.0	10	12	20.0	126.5	7.0	4
100	110	120	136.1	156	173	132	146.2	158.3	5	165	127	126	98	73	30	22.0	19	16.0	10	12	20.0	139.0	7.0	4
110	120	130	145.1	166	183	142	156.2	168.3	5	175	136	136	98	73	30	22.0	19	16.0	10	12	20.0	149.0	7.0	4
120	130	140	154.1	176	193	152	168.2	180.3	5	185	145	146	98	73	30	22.0	19	16.0	10	12	22.0	160.0	7.0	4
130	140	150	163.9	187	203	162	178.2	190.3	5	195	155	156	98	73	30	22.0	19	16.0	12	12	24.0	170.0	7.0	4
140	150	160	174.9	188	213	172	188.2	200.3	5	205	166	166	98	73	30	22.0	19	16.0	12	12	24.0	180.0	7.0	4
160	170	180	193.9	219	238	187	212.5	224.3	5	230	185	186	98	73	30	22.0	19	16.0	12	12	28.0	199.5	7.0	4
180	190	200	213.9	239	265	207	232.8	244.3	5	255	205	206	98	73	30	22.0	19	16.0	12	12	30.0	219.5	7.0	4

Dimensions for shaft diameters up to 300 mm on request.

HRZ1

d_N	d_{1h}	d_1	d_{11}	d_{12}	d_{13}	d_{14}	l_{10}	l_{11}	l_{12}	l_{13}	l_{15}	l_{16}
35	33	20	56	42	48	3	57.7	49.2	15.0	42.7	2.0	5
43	39	27	67	54	61	4	57.7	49.2	15.0	42.7	2.0	6
54	50	35	78	65	73	4	59.8	52.1	15.5	44.3	2.5	6
66	60	47	91	77	85	4	66.0	58.0	16.5	49.5	2.5	6
77	72	55	103	88	97	4	74.5	66.0	17.5	57.0	2.5	7
100	90	70	125	110	120	4	82.0	73.0	21.0	61.0	3.0	7

HRC ... N



- **Cartridge seal**
- **Balanced**
- **Independent of direction of rotation**
- **To DIN 24960 C**

Mechanical seals of the HRC series were developed specially for use in standard chemical pumps. The radial and axial space has been optimized to provide ideal conditions for maximum operational reliability. The ingenious modular system allows the HRC to be adapted for a wide range of applications which enhances the opportunities for your pumps. Perfect for standardization purposes.

Seal features:

- Springs protected from the product and leakage
- Axial compensation of movement ± 1 mm
- Very well suited for abrasive media and media containing solids.

HRC 1000 N

Single seal with spring protection sleeve

Item no.	Part no. to DIN 24250	Description
1.1.1	472.1	Seal face
1.1.2	474	Thrust ring
1.1.3	477.1	Spring
1.2	475.1	Rotating seat
2	523	Shaft sleeve
4	513	Insert
8	160	Cover plate
9	509	Spring carrier
12		Spring protection sleeve
19		Plug
24		Assembly fixture

Operating limits (see note on page 1)

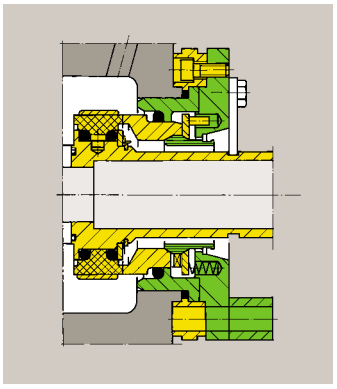
Nominal diameter d_{10} = 30 ... 60 mm
1.181"... 2.362"
p_1 = 25 bar *360 PSI*
t = –20 ... 160 (200*) °C
–4 °F ... 320 (382) °F
v_g = 20 m/s (66 ft)

Materials

Seal face: Q_1; Q_2
Rotating seat: A; Q_1; Q_2

*) due to shrinking

Variant

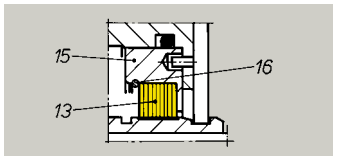


HRC 1100 N

Same design as HRC1000N, but with a shorter cover plate featuring integral spring and drive pin pockets (Item no. 8). No adapter (Item no. 9). Shaft sleeve (Item no. 2) uncoated. Differs from modular system!

Optional features

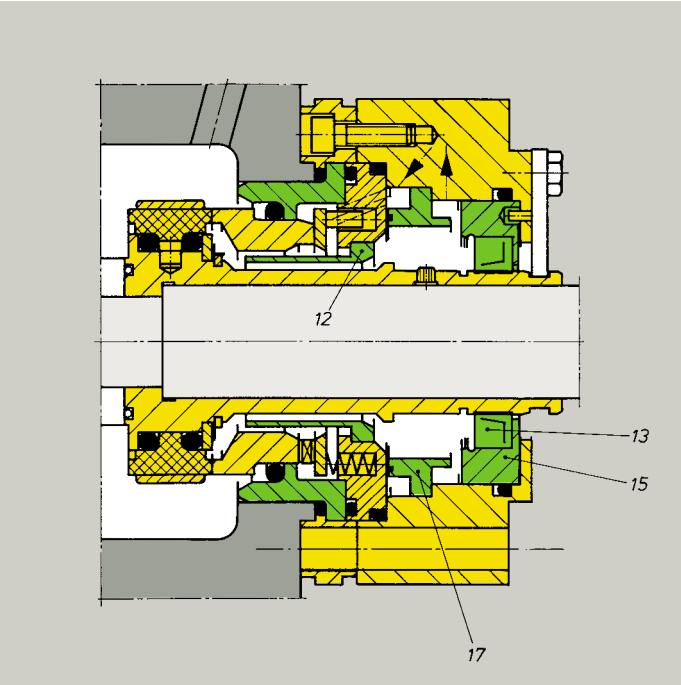
for basic types within the modular system.



Throttle ring (Item no. 13) for sealing steam quench on the atmosphere side (for type HRC 2000 N). Item no. 15 adapter; Item no. 16 locking ring.

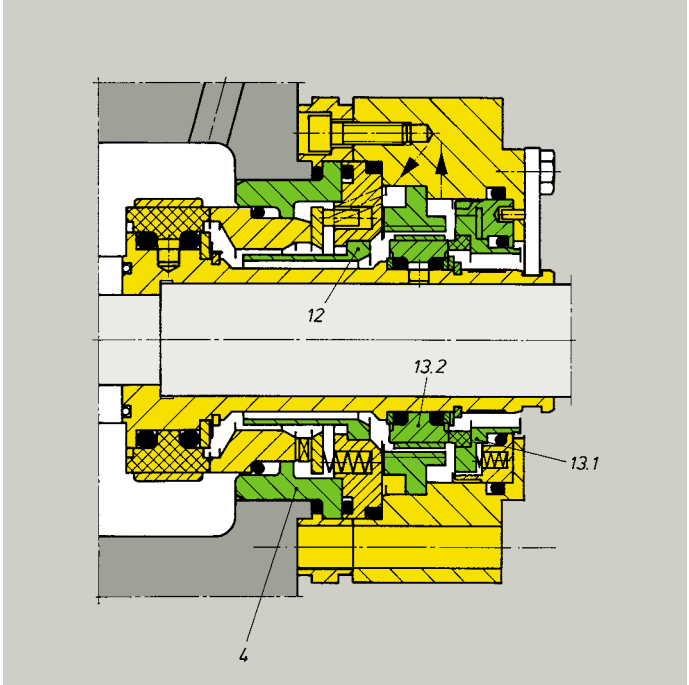
HRC-GS 3000

Double seal with **gas-lubricated** sealing faces. Installation dimensions according to DIN 24960 C. See also page 60, 61.



HRC 2000 N

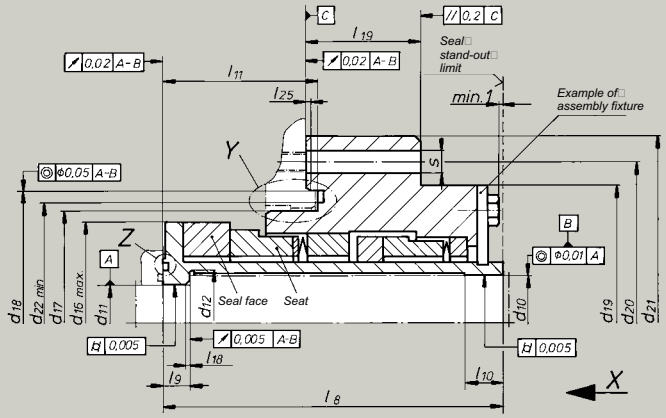
A single seal with pressureless quench for cooling, featuring guide sleeve (Item no. 12) baffle (Item no. 17), adapter (Item-no. 15) and lip seal (Item no. 13) on the atmosphere side.

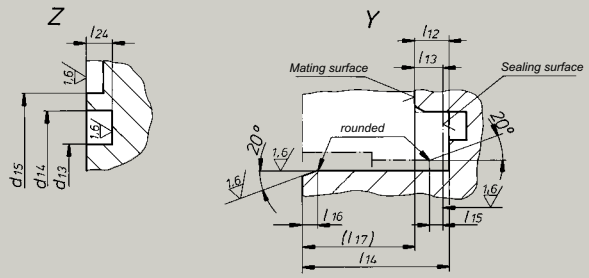


HRC 3000 NF

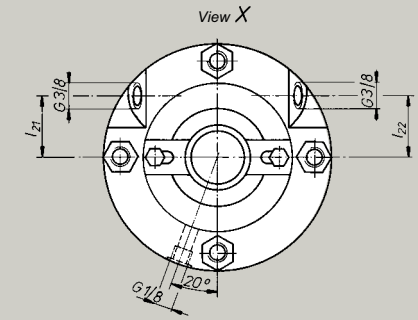
with pumping screw **dependent on direction of rotation.** A double seal, double pressure balanced (inboard seal does not open in the event of buffer pressure failure; closes automatically in the event of pressure reversal), with guide sleeve (Item no. 12), alternative insert as Item no. 4, and balanced mechanical seal on the atmosphere side (Item nos. 13.1, 13.2). Operation as single seal with quench is possible.

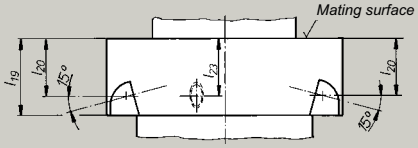
d_{10} H7	d_{11} H7	d_{12} +0,2	d_{13} −0,2	d_{14} +0,2	d_{15} +0,5	d_{16}	d_{17} h_8	d_{18} H7 +7	d_{19}	d_{20}	d_{21}	d_{22}	l_8 +0,1	l_9	l_{10}	l_{11} +0,2 +0,1	l_{12} +0,2 +0,1	l_{13} −0,1	l_{14}	l_{15}	l_{16}	l_{17}	l_{18}	l_{19}	l_{20}	l_{21}	l_{22}	l_{23}	l_{24} ±0.05	l_{25}	S
30	24	31	35	41	44	82	85	95		110	129	86	115	10	15	50	4	4	20	1	16	0.5	55	39	35	35	39	2	0.5	M10
40	32	41	45	51	54	92	95	110	$d_{19} < d_{20}$	130	155	96	130	10	15	52	4	4	22	1	18	0.5	60	44	40	40	44	2	0.5	M12
50	42	51	55	61	66	105	110	125		145	168	111	140	12	15	55	4	4	25	1	21	0.5	60	44	45	45	44	2	0.5	M12
60	50	61	61	67	76	120	125	140		160	185	126	166	14	20	70	4	4	30	1	26	0.5	60	44	50	50	44	2	0.5	M12





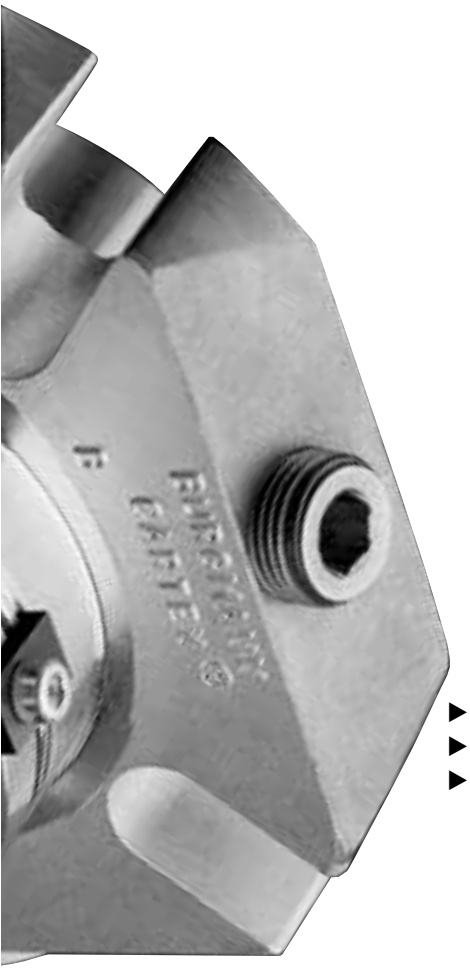
Mechanical seal with stationary spring unit, design C.
The drawing shows a double mechanical seal.

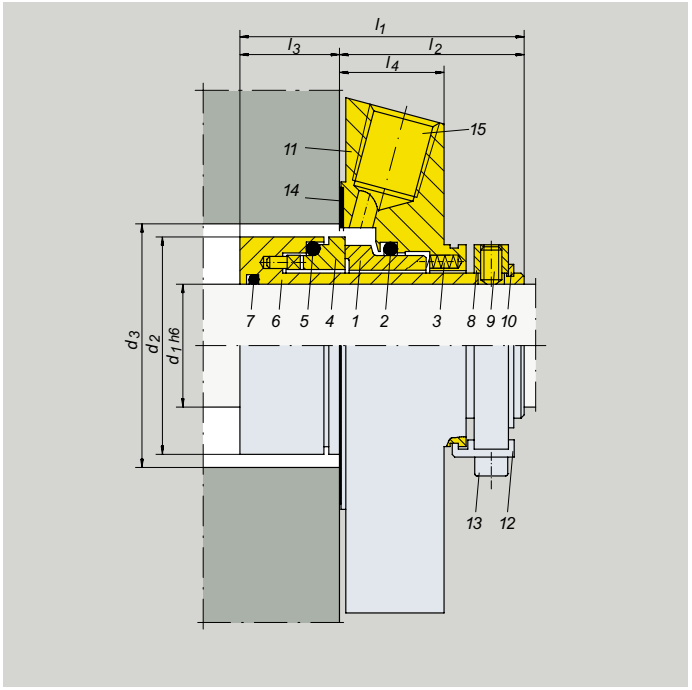


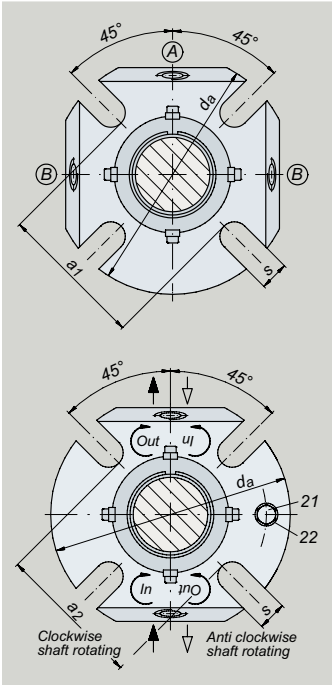


1) The axial position of the sealing surface of the secondary seals are determined by the dimension l_{13} of the pump.

Cartex®







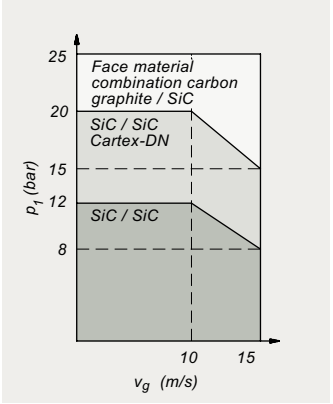
- **Cartridge seal**
- **Balanced**
- **Independent of direction of rotation**

Cartex® mechanical seals are fully pre-assembled. They are balanced, can be used in either direction of rotation and come with all the connections you need for the most common modes of operation.

Operating limits

d_1 = 25 ... 100 mm (1“ ... 4“)
t = –40 ... +220 °C
(check O-ring temperature resistance)
p_1, v_g see diagramm below
p_3 = 25 bar
Δp (p_3 – p_1) ... 25 bar
(1,5 ... 2 bar, 7 bar for buffer media with poor lubrication characteristics recommended)

Axial movement max. ± 1.0 mm
from d_1 = 75 ± 1.5 mm



Pressure and sliding velocity measurements were taken using demineralized water.

Cartex-SN

Single seal with flushing connection (A)

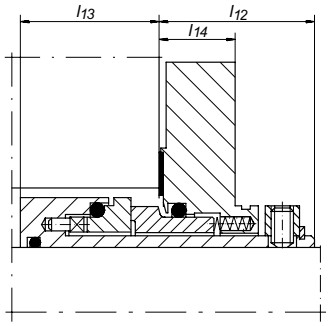
Item	Description
1	Seal face
2, 5, 7	O-ring
3	Spring
4	Seat
6	Shaft sleeve
8	Drive collar
9	Set screw
10	Snap ring
11	Cover
12	Assembly fixture (remove after intallation)
13	Screw
14	Gasket
15	Screw plug
16	Radial seal (-QN), throttle ring (-TN)

Materials

Seal face: Q_1, B_1
Seat: Q_1
Components: G
Springs: M
O-rings: V, E, K, U_1, HNBR
Radial seal: P, T_3
Throttle ring: T_{12}

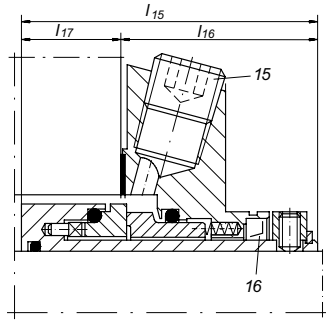
Cartex-SNO

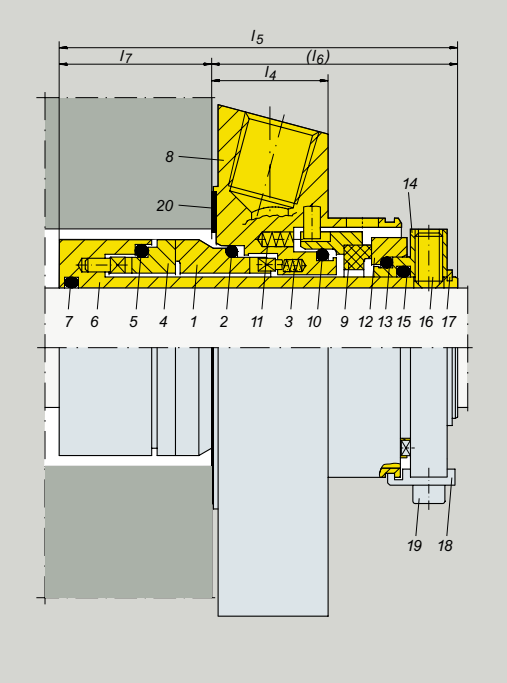
Single seal without connections, for "dead-end" operation.



Cartex-QN/TN

Single seal for operation with unpressurized fluid quench. Same as "-SN' version but with outboard lip seal (longer fitting length). The cover has auxiliary connections for flushing (A) and quench (B). The Cartex-TN version has a throttle ring (item 17) made of carbon graphite or PTFE reinforced with carbon fiber.





Cartex-DN

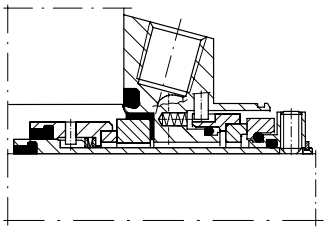
Double seal, double pressure balanced (the seal remains closed in case of buffer fluid pressure failure or reverse pressure); buffer fluid system required; integrated circulation system eliminates the need for an additional circulating device.
If used as a double seal, a buffer fluid system will be required (e.g. Burgmann TS 2000 - both seals are always internally pressurized). In tandem operation, the quenching fluid is, depending on operating conditions, used in dead-end (API 610, Plan 51) or throughflow mode (API 610, Plan 52 or 54 - inboard seal externally pressurized).

Item	Description	Item	Description
1	Seal face	14	Drive collar
2, 5, 7, 10, 13, 15	O-ring	16	Set screw
3	Spring	17	Snap ring
4	Seat	18	Assembly fixture (remove after installation)
6	Shaft sleeve	19	Hex socket head screw
8	Cover	20	Gasket
9	Seal face	22	Screw plug
11	Spring	23	Gasket
12	Seat		

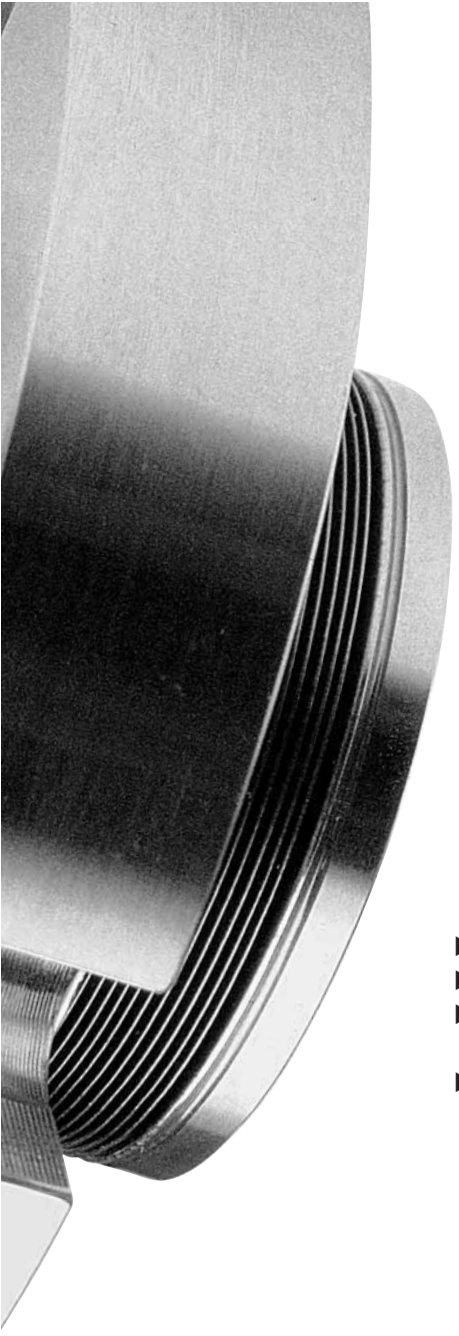
Cartex-HDN

Double seal for sterile process applications. Specially formed secondary seals eliminate dead space on the inboard side. EHEDG compliant; FDA approved materials; suitable for CIP/SIP applications. Can also be used for quench operation up to 0.5 bar max.

p_1 = 0.5...16 (25) bar
t = –20 ...140 (160) °C
v_g = 10 m/s.



d_1	d_2	$d_{3min.}$	$d_{3max.}$	l_1	l_2	l_3	l_4	l_5	l_6	l_7	l_{12}	l_{13}	l_{14}	l_{15}	l_{16}	l_{17}	a_1	a_2	d_a	s
25	43.0	44.0	51.5	67	42.4	24.6	25.4	86.5	53.4	33.1	35.0	32.0	17.5	79.5	53.4	26.1	62	62	105	13.2
28	46.0	47.0	52.0	67	42.4	24.6	25.4	86.5	53.4	33.1	35.0	32.0	17.5	79.5	53.4	26.1	62	65	105	13.2
30	48.0	49.0	56.0	67	42.4	24.6	25.4	86.5	53.4	33.1	35.0	32.0	17.5	79.5	53.4	26.1	65	67	105	13.2
32	49.8	51.0	57.0	67	42.4	24.6	25.4	86.5	53.4	33.1	35.0	32.0	17.5	79.5	53.4	26.1	67	70	108	13.2
33	49.8	51.0	57.0	67	42.4	24.6	25.4	86.5	53.4	33.1	35.0	32.0	17.5	79.5	53.4	26.1	67	70	108	13.2
35	53.0	54.0	61.5	67	42.4	24.6	25.4	86.5	53.4	33.1	35.0	32.0	17.5	79.5	53.4	26.1	70	72	113	13.2
38	56.0	57.0	66.0	67	42.4	24.6	25.4	86.5	53.4	33.1	35.0	32.0	17.5	79.5	53.4	26.1	75	75	123	13.2
40	58.0	59.0	68.0	67	42.4	24.6	25.4	86.5	53.4	33.1	35.0	32.0	17.5	79.5	53.4	26.1	75	77	123	14.2
42	60.5	61.5	69.5	67	42.4	24.6	25.4	86.5	53.4	33.1	35.0	32.0	17.5	79.5	53.4	26.1	80	80	133	14.2
43	60.5	61.5	70.5	67	42.4	24.6	25.4	86.5	53.4	33.1	35.0	32.0	17.5	79.5	53.4	26.1	80	80	133	14.2
45	62.5	64.0	73.0	67	42.4	24.6	25.4	86.5	53.4	33.1	35.0	32.0	17.5	79.5	53.4	26.1	81	82	138	14.2
48	65.6	67.0	75.0	67	42.4	24.6	25.4	86.5	53.4	33.1	35.0	32.0	17.5	79.5	53.4	26.1	84	85	138	14.2
50	68.0	69.0	78.0	67	42.4	24.6	25.4	86.5	53.4	33.1	35.0	32.0	17.5	79.5	53.4	26.1	87	87	148	14.2
53	72.0	73.0	87.0	67	42.4	24.6	25.4	86.5	53.4	33.1	35.0	32.0	17.5	79.5	53.4	26.1	97	97	148	18.0
55	73.0	74.0	83.0	67	42.4	24.6	25.4	86.5	53.4	33.1	35.0	32.0	17.5	79.5	53.4	26.1	90	92	148	18.0
60	78.0	79.0	91.0	67	42.4	24.6	25.4	86.5	53.4	33.1	35.0	32.0	17.5	79.5	53.4	26.1	102	102	157	18.0
65	84.8	85.7	98.5	67	42.4	24.6	25.4	86.5	53.4	33.1	35.0	32.0	17.5	79.5	53.4	26.1	109	109	163	18.0
70	93.0	95.0	108.0	67	42.4	24.6	25.4	86.5	53.4	33.1	35.0	32.0	17.5	79.5	53.4	26.1	118	118	178	18.0
75	100.0	101.6	118.0	84	57.4	26.6	28.0	108.0	63.9	44.1	46.1	37.9	22.0	–	–	–	129	129	190	18.0
80	106.4	108.0	124.0	84	57.4	26.6	28.0	108.0	63.9	44.1	46.1	37.9	22.0	–	–	–	135	135	195	18.0
85	109.5	111.1	128.0	84	57.4	26.6	28.0	108.0	63.9	44.1	46.1	37.9	22.0	–	–	–	139	139	198	22.0
90	115.9	117.5	135.0	84	57.4	26.6	28.0	108.0	63.9	44.1	46.1	37.9	22.0	–	–	–	145	145	205	22.0
95	119.1	120.7	138.0	84	57.4	26.6	28.0	108.0	63.9	44.1	46.1	37.9	22.0	–	–	–	148	148	208	22.0
100	125.4	127.0	144.0	84	57.4	26.6	28.0	108.0	63.9	44.1	46.1	37.9	22.0	–	–	–	154	154	218	22.0
1.000	1.693	1.750	2.000	2.640	1.669	0.969	1.000	3.400	2.102	1.303	1.378	1.260	0.689	3.130	2.102	1.028	2.440	2.440	4.134	0.520
1.125	1.811	1.875	2.050	2.640	1.669	0.969	1.000	3.400	2.102	1.303	1.378	1.260	0.689	3.130	2.102	1.028	2.440	2.560	4.134	0.520
	1.712	1.750	Diameter for ANSI pumps, other dimensions unchanged. Order code: Cartex-SNOT, -SNT, -DNT.																	
1.250	1.960	2.000	2.250	2.640	1.669	0.969	1.000	3.400	2.102	1.303	1.378	1.260	0.689	3.130	2.102	1.028	2.640	2.760	4.330	0.520
1.375	2.086	2.125	2.420	2.640	1.669	0.969	1.000	3.400	2.102	1.303	1.378	1.260	0.689	3.130	2.102	1.028	2.750	2.840	4.449	0.520
	1.960	2.000	Diameter for ANSI pumps, other dimensions unchanged. Order code: Cartex-SNOT, -SNT, -DNT.																	
1.500	2.200	2.250	2.625	2.640	1.669	0.969	1.000	3.400	2.102	1.303	1.378	1.260	0.689	3.130	2.102	1.028	2.950	2.950	4.842	0.520
1.625	2.340	2.375	2.700	2.640	1.669	0.969	1.000	3.400	2.102	1.303	1.378	1.260	0.689	3.130	2.102	1.028	3.030	3.090	4.842	0.599
1.750	2.460	2.500	2.812	2.640	1.669	0.969	1.000	3.400	2.102	1.303	1.378	1.260	0.689	3.130	2.102	1.028	3.190	3.230	5.433	0.599
1.875	2.582	2.625	2.940	2.640	1.669	0.969	1.000	3.400	2.102	1.303	1.378	1.260	0.689	3.130	2.102	1.028	3.190	3.350	5.433	0.599
2.000	2.677	2.750	3.190	2.640	1.669	0.969	1.000	3.400	2.102	1.303	1.378	1.260	0.689	3.130	2.102	1.028	3.430	3.430	5.827	0.599
2.125	2.834	2.875	3.437	2.640	1.669	0.969	1.000	3.400	2.102	1.303	1.378	1.260	0.689	3.130	2.102	1.028	3.820	3.820	5.827	0.709
2.250	2.960	3.000	3.560	2.640	1.669	0.969	1.000	3.400	2.102	1.303	1.378	1.260	0.689	3.130	2.102	1.028	3.940	3.940	6.181	0.709
2.375	3.070	3.125	3.590	2.640	1.669	0.969	1.000	3.400	2.102	1.303	1.378	1.260	0.689	3.130	2.102	1.028	4.020	4.020	6.181	0.709
2.500	3.212	3.250	3.800	2.640	1.669	0.969	1.000	3.400	2.102	1.303	1.378	1.260	0.689	3.130	2.102	1.028	4.170	4.180	6.417	0.709
2.625	3.338	3.375	3.937	2.640	1.669	0.969	1.000	3.400	2.102	1.303	1.378	1.260	0.689	3.130	2.102	1.028	4.290	4.300	6.417	0.709
2.750	3.660	3.750	4.250	2.640	1.669	0.969	1.000	3.400	2.102	1.303	1.378	1.260	0.689	3.130	2.102	1.028	4.650	4.660	7.008	0.709
2.875	3.811	3.875	4.567	3.307	2.260	1.047	1.000	4.250	2.516	1.736	1.815	1.492	0.866	–	–	–	4.960	4.960	7.283	0.709
3.000	3.937	4.000	4.646	3.307	2.260	1.047	1.102	4.250	2.516	1.736	1.815	1.492	0.866	–	–	–	5.079	5.079	7.480	0.709
3.125	4.063	4.125	4.764	3.307	2.260	1.047	1.102	4.250	2.516	1.736	1.815	1.492	0.866	–	–	–	5.197	5.197	7.677	0.709
3.250	4.189	4.250	4.882	3.307	2.260	1.047	1.102	4.250	2.516	1.736	1.815	1.492	0.866	–	–	–	5.315	5.315	7.677	0.709
3.375	4.311	4.375	5.039	3.307	2.260	1.047	1.102	4.250	2.516	1.736	1.815	1.492	0.866	–	–	–	5.472	5.472	7.795	0.866
3.500	4.437	4.500	5.157	3.307	2.260	1.047	1.102	4.250	2.516	1.736	1.815	1.492	0.866	–	–	–	5.591	5.591	7.795	0.866
3.625	4.563	4.625	5.315	3.307	2.260	1.047	1.102	4.250	2.516	1.736	1.815	1.492	0.866	–	–	–	5.709	5.709	8.071	0.866
3.750	4.689	4.750	4.433	3.307	2.260	1.047	1.102	4.250	2.516	1.736	1.815	1.492	0.866	–	–	–	5.827	5.827	8.189	0.866
4.000	4.937	5.000	5.669	3.307	2.260	1.047	1.102	4.250	2.516	1.736	1.815	1.492	0.866	–	–	–	6.063	6.063	8.583	0.866



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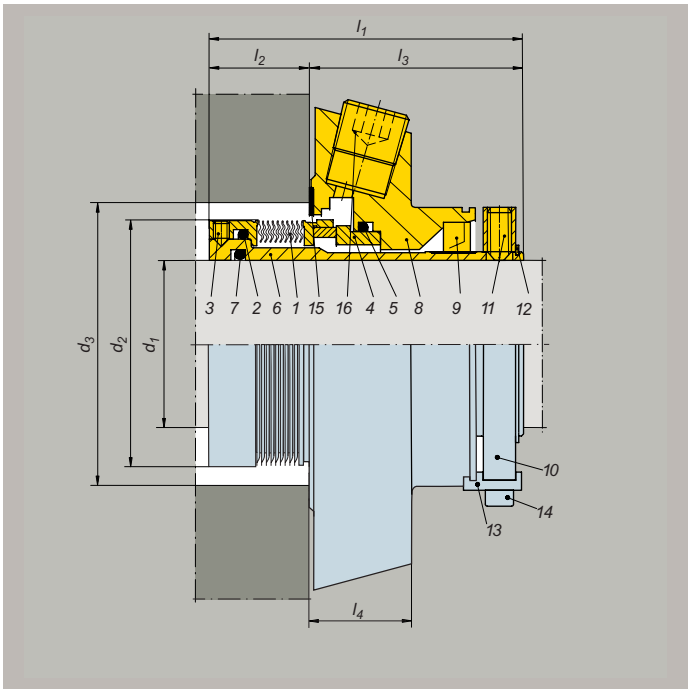
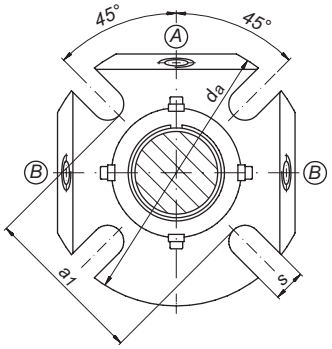




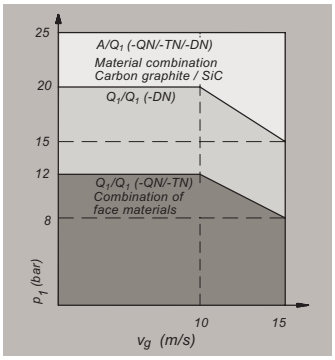
Connections: 1/4“ NPT (d_1 <38 mm)
3/8“ NPT (d_1 >38 mm)

- **Cartridge seal**
- **Balanced**
- **Independent of direction of rotation**
- **Metal bellows**

Mtex is a special type of cartridge seal for pumps and applications in which temperature plays an important role, e.g. in refineries and the petrochemical industry. Be it for the conversion of packings, retrofits or original equipment, the Mtex concept is ideal for standardization projects. It fits in any centrifugal pump with a conventional stuffing box (generally without having to modify any dimensions). The bellows unit has an amplitude limiter to guarantee trouble-free running (important when there is any risk of dry running).

Operating limits (see note on page 1)

d_1 = 25 ... 80 mm
$t^{*)}$ = –40 ... +250 (280: -DN) °C
–40 ... +482 (536: -DN) °F
Δp (p_3 - p_1) = 10 bar (<120 °C)
5 bar (<280 °C)
recommended 1.5 ... 2 bar
p_3 = 27 bar



Mtex-QN

Single seal for liquid quench. Cover with outboard shaft seal and supply connection for flush Ⓐ and quench Ⓑ

Item	Designation
1	Bellows unit
2, 5, 7	O-ring
3, 11	Set screw
4	Seat
6	Shaft sleeve
8	Cover
9	Shaft seal
10	Drive collar
12	Retaining ring
13	Assembly fixture
14	Hex socket head screw
15	Gasket
16	Screw plug

Materials*)

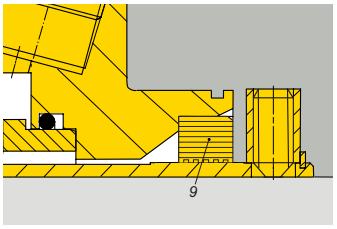
Mtex-QN/-TN, Mtex-DN (inboard)

Seal face	A (carbon graphite) or Q_1 (silicon carbide)
Seat	Q_1
O-Ring	V (FPM, e. g. Viton®) E (EPDM) K (perfluorocarbon rubber)
Bellows	M_6 (Inconel®718)
Components	G_1/G (CrNiMo steel, 1.4462, 1.4571)
Throttle	T_{12} (PTFE, carbon graphite reinforced)

Mtex-DN	(outboard)
Seal face	B (carbon graphite)
Seat	Q_1 U2 (tungsten carbide)
Spring	M (Hastelloy® C4)

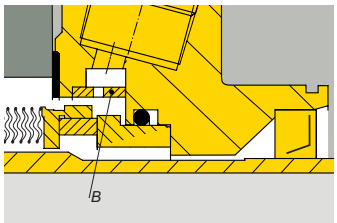
*) note operating limits of the O-rings

Mtex-TN

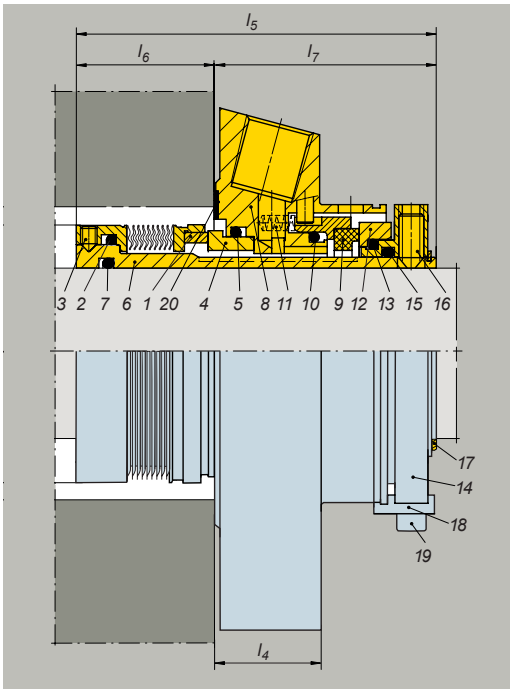


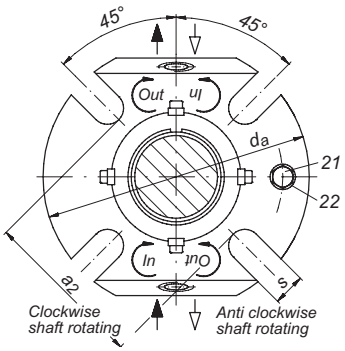
Single seal for steam quench. Cover with outboard throttle ring (Item 9).
Operating limits, dimensions same as for Mtex-QN.

Mtex-QNM, Mtex-TNM



Single seals as described, but with multi-point injection ring in addition (Item B).





Connections: 1/4“ NPT (d_1 <38 mm)
3/8“ NPT (d_1 >38 mm)

Mtex-DN

Double seal, inboard rotating metal bellows, outboard stationary O-ring seal. With pumping device independent of the direction of rotation, cover with supply connections for buffer medium or quench and inboard flush.
Pressurized operation (Plan 53 or 54) requires a buffer system (e.g. Burgmann TS2000). In pressureless mode the quench fluid can be used as either a dead-end quench (Plan 51) or a through-flow quench (Plan 52), depending on the operating conditions.
Missing mounting dimensions are the same as for Mtex-QN.

d_1	d_2	$d_{3min.}$	d_{3max}	l_1	l_2	l_3	l_4	l_5	l_6	l_7	d_a	a_1	s
25	45.0	47.0	51.0	79.5	26.1	53.4	25.4	87.0	33.6	53.4	105.0	62.0	13.2
30	49.4	52.0	56.0	78.4	25.0	53.4	25.4	86.5	33.1	53.4	105.0	67.0	13.2
32	52.3	54.5	57.0	78.4	25.0	53.4	25.4	86.5	33.1	53.4	108.0	70.0	13.2
33	52.3	54.5	57.0	78.4	25.0	53.4	25.4	86.5	33.1	53.4	108.0	70.0	13.2
35	54.8	58.0	61.5	78.4	25.0	53.4	25.4	86.5	33.1	53.4	113.0	72.0	13.2
38	57.5	60.0	66.0	78.4	25.0	53.4	25.4	86.5	33.1	53.4	123.0	75.0	14.0
40	58.8	62.0	68.0	78.2	24.8	53.4	25.4	86.3	32.9	53.4	123.0	77.0	14.2
43	61.9	64.5	70.5	78.4	25.0	53.4	25.4	86.5	33.1	53.4	133.0	80.0	14.2
45	65.0	68.5	73.0	78.4	25.0	53.4	25.4	86.5	33.1	53.4	138.0	82.0	14.2
48	68.4	71.0	75.0	78.7	25.3	53.4	25.4	86.8	33.4	53.4	138.0	85.0	14.2
50	70.0	73.0	78.0	79.1	25.7	53.4	25.4	87.2	33.8	53.4	148.0	87.0	14.2
53	71.9	75.0	87.0	77.8	24.4	53.4	25.4	87.4	34.0	53.4	148.0	97.0	18.0
55	74.6	77.0	83.0	78.9	25.5	53.4	25.4	87.0	33.6	53.4	148.0	92.0	18.0
60	83.9	87.0	91.0	80.1	26.7	53.4	25.4	88.2	34.8	53.4	157.0	102.0	18.0
65	87.5	90.0	98.5	80.0	26.6	53.4	25.4	88.1	34.7	53.4	163.0	109.3	18.0
70	93.0	98.0	108.0	81.5	28.1	53.4	25.4	89.6	36.2	53.4	178.0	118.3	18.0
75	96.8	101.6	118.0	94.4	30.5	63.9	28.0	107.4	43.5	63.9	190.0	129.0	18.0
80	104.7	108.0	124.0	94.4	30.4	64.0	28.0	106.8	42.9	63.9	195.0	135.0	18.0

Item	Designation
1	Bellows unit
2	O-ring
3	Set screw
4	Seat
5	O-ring
6	Shaft sleeve
7	O-ring
8	Cover
9	Seal face
10	O-ring
11	Spring
12	Seat
13	O-ring
14	Drive collar
15	O-ring
16	Set screw
17	Retaining ring
18	Assembly fixture
19	Hex socket head screw
20	Gasket

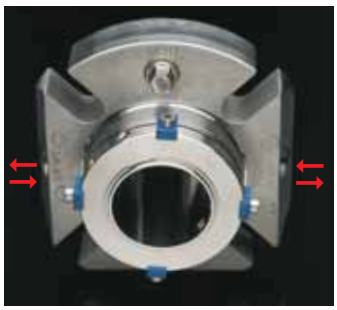
Multipoint injection

Optimum sliding face cooling through multipoint injection. Uniform radial feeding of the cooling medium (distributed over 360°) to the sliding faces prevents thermally induced and irregular distortions. The mechanical seal runs with high stability and low leakage. Multipoint injection has proven successful at extreme temperatures.
Optional for Mtex-QN and -TN.
Retrofitting is also possible.

Optimized assembly fixtures

The exact factory-end adjustment of the seal with regard to the bellows (spring) tension and in relation to the cover is 100 % secure until final attachment to the shaft and pump housing:

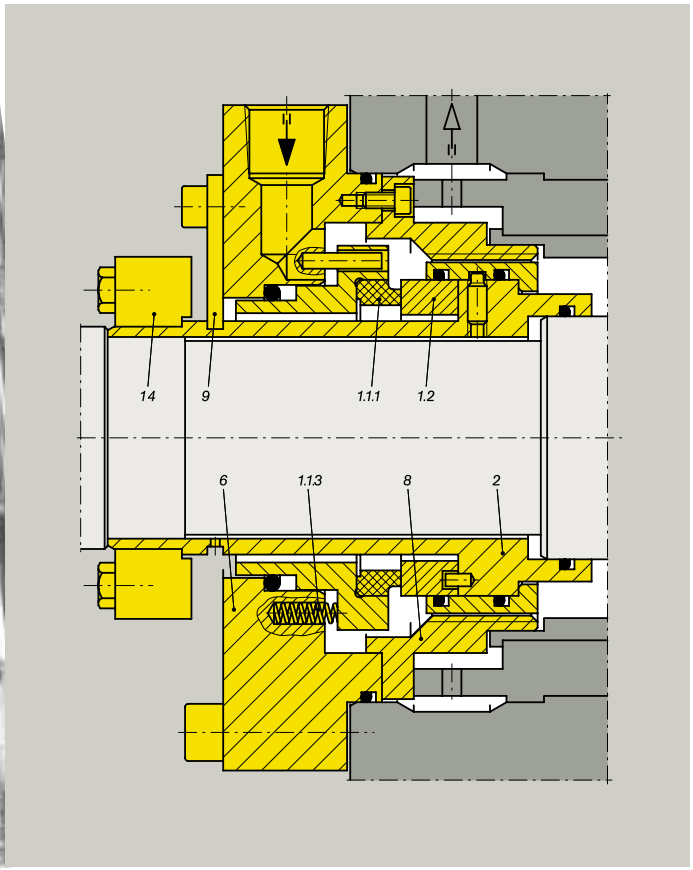
- No installation errors; mounting „fully compressed“ is impossible
- Assembly fixtures can be removed easily and quickly from any mounting position



Variable installation

Thanks to an additional venting hole the Mtex-DN can also be installed in a 90° offset position. The connections for the buffer fluid are then horizontal the buffer fluid are then horizontal and easier to reach in cramped conditions in the pump latern.

SH



SHF

Single seal
Application: Boiler feed water pumps

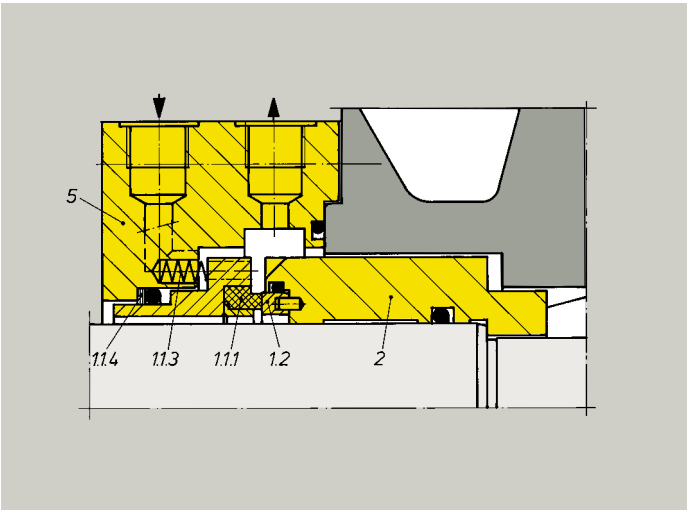
d_1 = 40 ... 250 mm *1.57"... 9.84"*
p_1 = 50 bar *725 PSI*
t = 300 °C*) *572 °F*
v_g = 60 m/s *197 ft/s*

Item	Designation
1.1.1	Seal face
1.1.3	Spring
1.2	Seat
2	Shaft sleeve
6	Cover
8	Pumping screw with flow guide
9	Assembly fixture
14	Shrink disk

- **Balanced**
- **Pumping device optional**
- **Unindirectional**

Mechanical seals in the SH range were developed for applications involving high pressures and sliding velocities. The deformation behavior of this latest generation of seals has been optimized on the basis of extensive FE analyses. The largely standardized inside components are matched to the respective pump installation spaces by means of special adapters. Currently, static pressures of up to 500 barg and dynamic pressures of up to 150 barg can be sealed. The sliding face materials are generally carbon graphite/SiC or SiC/SiC.

Please contact us for details of dimensions.



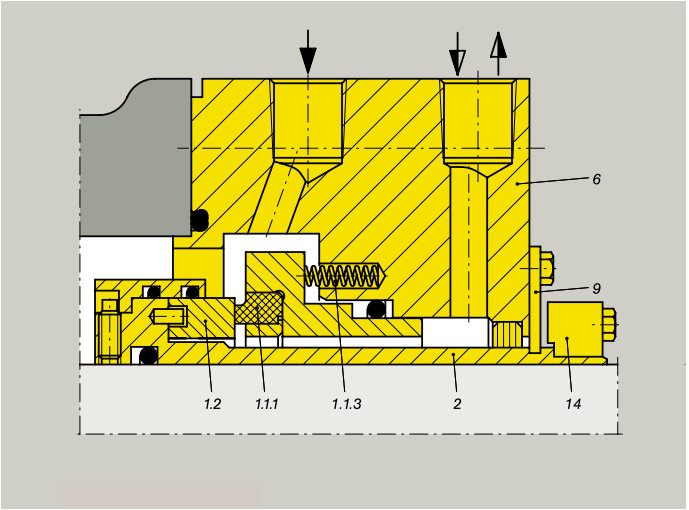
SHPV/SHFV

Single seal
Application: Boiler circulating pumps

d_1 = 40 ... 250 mm *1.57"... 9.84"*
p_1 = 150 bar *725 PSI*
t = 300 °C*)/200 °C *572 °F/392 °F*
v_g = 60 m/s *196 ft/s*

Item	Designation
1.1.1	Seal face pressure-stabilized
1.1.3	Spring
1.1.4	Back-up ring
1.2	Rotating seat
2	Rotating seat housing with pumping screw (F) or pumping ring (P)
6	Cover

*) refer to diagram on page 124 (temperature of the medium)

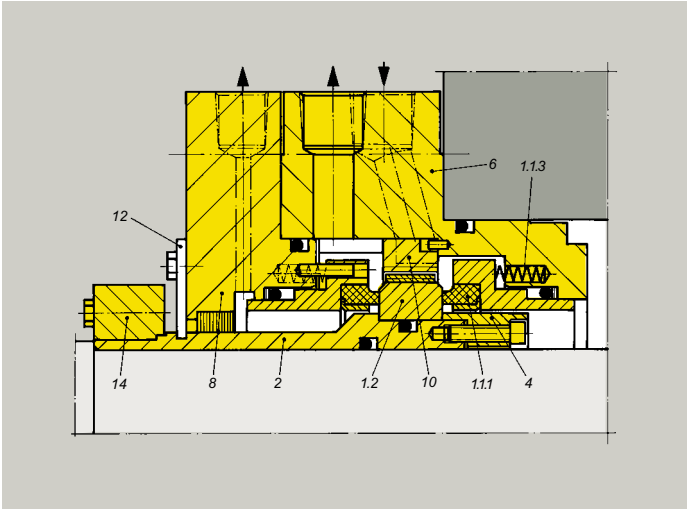


SHV

Single seal
Application: Oil production and transport

d_1 = 40 ... 250 mm *1.57"... 9.84"*
p_1 = 150 bar *725 PSI*
t = 200 °C*) *392 °F*
v_g = 50 m/s *164 ft/s*

Item	Designation
1.1.1	Seal face
1.1.3	Spring
1.2	Seat
6	Cover
9	Assembly fixture
14	Shrink disk



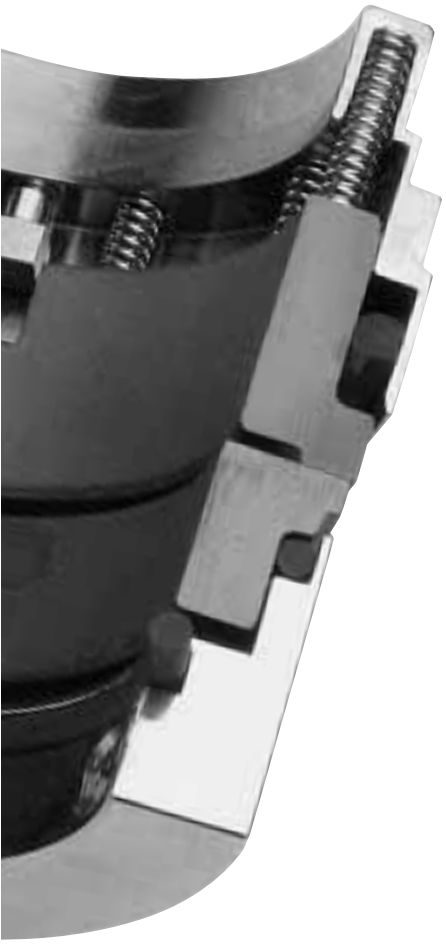
SHFV-D

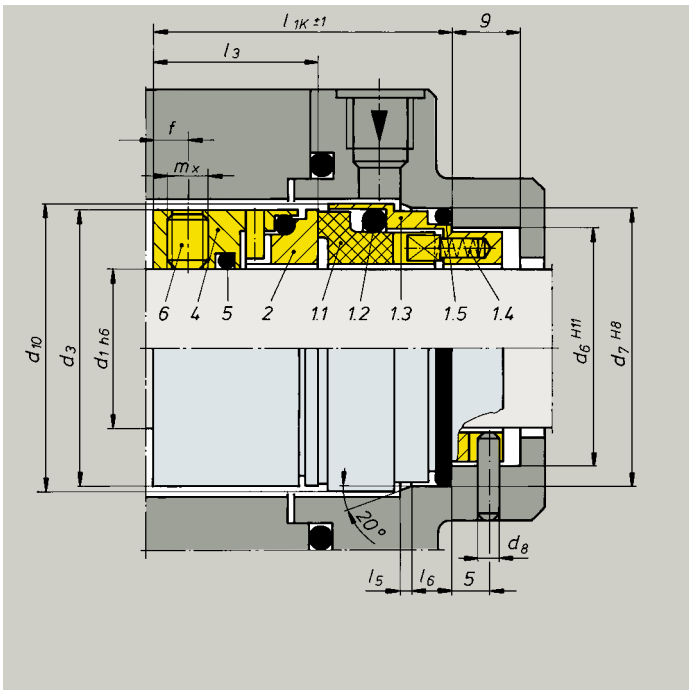
Double seal
Application: Oil production and transport

d_1 = 40 ... 250 mm *1.57"... 9.84"*
p_1 = 150 bar *2176 PSI*
t = 200 °C *392 °F*
v_g = 50 m/s *164 ft/s*

Item	Designation
1.1.1	Seal face
1.1.3	Spring
1.2	Rotating seat
2	Shaft sleeve
4	Clamping sleeve
6	Housing
8	Cover
12	Assembly fixture
14	Shrink disk

HRN





- **Single seal**
- **Balanced**
- **Independent of direction of rotation**
- **EN 12756**

The new stationary mechanical seal for DIN installation spaces is ideal for use in dirty, abrasive media containing solids, e.g. in waste water systems and the chemicals industry. The stationary part has multiple springs and faces away from the product. It is thus protected from possible effects of the medium such as sticking and clogging. The seal is suitable for pressure reversals and can be operated in tandem as well as back-to-back arrangements. In vacuum mode there is no need for a separate stationary seat stop. No dynamically loaded O-ring on the shaft means there is no loading of the secondary seal by run-out caused by bending of the shaft. Distributed torque input and stationary seat locking by square pin.

HRN

Item	Part DIN 24250	Designation
1.1	472	Seal face
1.2	412.1	O-ring
1.3	485	Retainer
1.4	477	Spring
1.5	412.2	O-ring
2	475	Seat
3	412.3	O-ring
4	485	Drive collar
5	412.4	O-ring
6	904	Threaded pin

Operating limits (see note on page 1)

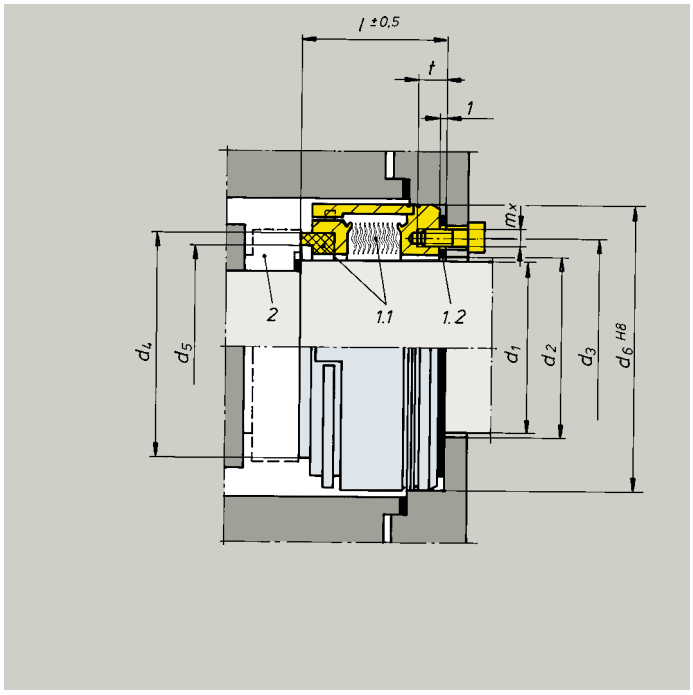
d_1 = 18 ... 100 mm *0.71" ... 3.94"*
p_1 = 25 bar *363 PSI*
t = +220 °C *428 °F*
v_g = 20 m/s 66 ft/s
Permissible axial offset ± 1 mm

Materials

Seal face: silicon carbide Q_1
Seat: carbon graphite, resin-impregnated (B, Q_1)
O-rings: V, P, K, T
Components: 1.4571 (G)
Springs: Hastelloy®C-4 (M)

d_1	d_3	d_6	d_7	d_8	d_{10}	l_{1k}	l_3	l_5	l_6	f	m_x	d_1	d_3	d_6	d_7	d_8	d_{10}	l_{1k}	l_3	l_5	l_6	f	m_x
18	33	27	33	3	34.7	37.5	19.5	2.0	5	3.0	4	**50**	70	62	70	4	71.7	47.5	25.0	2.5	6	4.0	6
20	35	29	35	3	36.7	37.5	19.5	2.0	5	3.0	4	**53**	73	65	73	4	74.7	47.5	25.0	2.5	6	4.0	6
22	37	31	37	3	38.7	37.5	19.5	2.0	5	3.0	4	**55**	75	67	75	4	76.7	47.5	25.0	2.5	6	4.0	6
24	39	33	39	3	40.7	40.0	20.5	2.0	5	3.5	5	**58**	78	70	78	4	80.5	52.5	28.0	2.5	6	4.0	6
25	40	34	40	3	41.7	40.0	20.5	2.0	5	3.5	5	**60**	80	72	80	4	82.5	52.5	28.0	2.5	6	4.0	6
28	43	37	43	3	44.7	42.5	21.5	2.0	5	3.5	5	**63**	83	75	83	4	85.5	52.5	28.0	2.5	6	4.0	6
30	45	39	45	3	46.7	42.5	21.5	2.0	5	3.5	5	**65**	85	77	85	4	87.5	52.5	28.0	2.5	6	4.0	6
32	48	42	48	3	49.7	42.5	21.5	2.0	5	3.5	5	**68**	90	81	90	4	92.5	52.5	28.0	2.5	7	4.0	6
33	48	42	48	3	49.7	42.5	21.5	2.0	5	3.5	5	**70**	92	83	92	4	94.5	60.0	34.0	2.5	7	6.0	8
35	50	44	50	3	51.7	42.5	21.5	2.0	5	3.5	5	**75**	97	88	97	4	100.5	60.0	34.0	2.5	7	6.0	8
38	56	49	56	4	57.7	45.0	24.0	2.0	6	4.0	6	**80**	105	95	105	4	108.5	60.0	34.0	3.0	7	6.0	8
40	58	51	58	4	59.7	45.0	24.0	2.0	6	4.0	6	**85**	110	100	110	4	113.5	60.0	34.0	3.0	7	6.0	8
43	61	54	61	4	62.7	45.0	24.0	2.0	6	4.0	6	**90**	115	105	115	4	118.5	65.0	39.0	3.0	7	10.0	8
45	63	56	63	4	64.7	45.0	24.0	2.0	6	4.0	6	**95**	120	110	120	4	123.5	65.0	39.0	3.0	7	10.0	8
48	66	59	66	4	67.7	45.0	24.0	2.0	6	4.0	6	**100**	125	115	125	4	128.5	65.0	39.0	3.0	7	10.0	8

MFL 65



- **Single seal**
- **Balanced**
- **Independent of direction of rotation**
- **Metal bellows**

The MFL65 mechanical seal was specially developed for high temperature ranges and sliding velocities. Its torque transmission exerts no strain on the bellows. The seal design requires no elastomer secondary seals.

Operating limits (see note on page 1)

d_1 = 16 ... 100 mm *0.64" ... 4"*
(>100 mm on request)
p_1 = with external pressurization[1]:
= 25 bar *360 PSI*
with internal pressurization[2]:
<60h °C 10 bar *145 PSI*
<125h °C 7 bar *100 PSI*
<220h °V 5 bar *72 PSI*
t = –20 ... 400 °C *–30 ° F ... 755 °F*
v_g = 50 m/s *165 ft/s*

1) Higher pressures possible with special designs – please refer to Burgmann.
2) Positively retained stationary seat.

MFL65

Item	Part DIN 24250	Description
1.1	472 and 481	Seal face and bellows unit
1.2	400.1	Flat gasket
2	475	Stationary seat

Combination of materials

Bellows:
M_6 - Inconel® 718. 2.4819
M_5 - Hastelloy® C
Seal face: A. Q_{12}
Rotating seat: Q_1, S

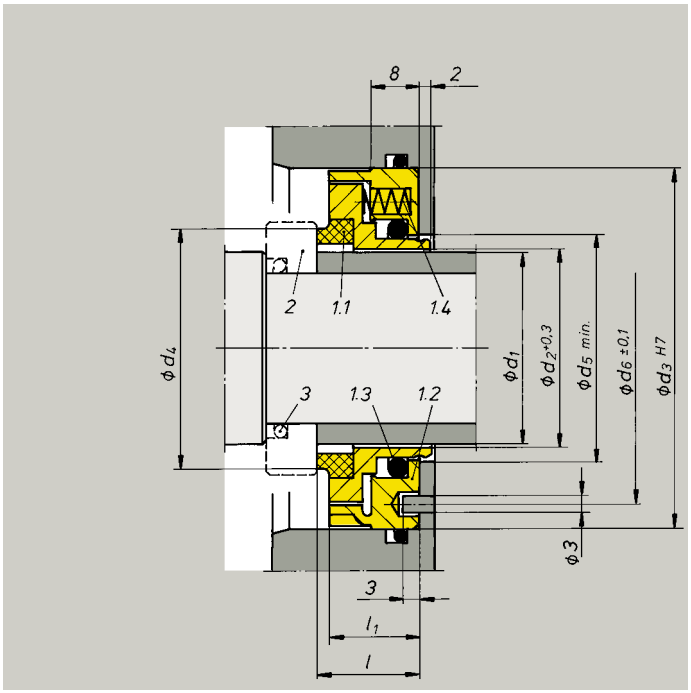
Other metal parts:
1.4462. 1.3917, 2.4610

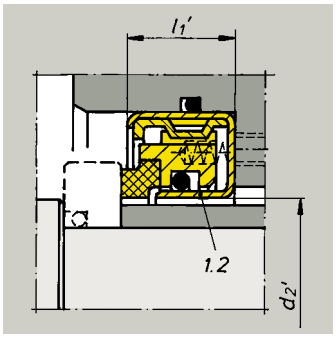
Stationary seats

The stationary seat design is chosen according to the specific requirements and conditions of operation.

Nenn-∅	d_1	d_2	d_3	d_4	d_5	d_6	l	n x m_x	t
19	**16–19**	20.5	29	30.3	25.3	45.0	33.5	4xM4	6
24	**20–24**	25.5	35	38.8	33.8	49.0	33.5	4xM4	6
30	**25–30**	31.5	40	43.6	38.6	55.0	34.5	6xM4	6
35	**31–35**	36.0	45	45.8	40.8	59.0	33.0	6xM4	6
40	**36–40**	41.0	50	51.5	46.5	65.0	30.5	6xM4	6
45	**41–45**	46.0	55	55.2	50.2	69.0	35.5	6xM4	6
51	**46–51**	52.0	63	64.7	59.7	76.5	40.5	6xM5	7
60	**52–60**	61.0	70	70.6	65.6	84.0	32.0	6xM5	7
70	**61–70**	71.0	80	82.8	76.8	95.0	38.0	6xM5	7
82	**71–82**	83.5	95	98.0	92.0	112.0	41.0	6xM6	7
88	**83–88**	89.5	100	107.7	101.7	120.0	47.0	6xM6	7
100	**89–100**	101.0	112	112.7	106.7	130.0	47.0	6xM6	7

H 10 / H 8





H8

Operating limits, items and descriptions same as H10.
If any fitting dimensions are not shown they are the same as for H10.
Drive collars and housings for item 1.2 are made of deep-drawn stainless steel sheet.

- **Single seal**
- **Balanced**
- **Independent of direction of rotation**
- **Multiple springs**

Mechanical seals of the H8 and H10 range have a short (axial) installation length. They are compact ready-to-fit seals which can be installed in the same axial length as a lip-seal and can be used to seal differential pressures of up to 25 bar.

Operating limits (see note on page 1)

d_1 = 15 ... 100 mm *0.6" ... 4"*
p_1 = 25 bar *360 PSI*
t = –20 ... +180 °C *–4 °F ... 355 °F*
v_g = 35 m/s *115 ft/s*

H10

Item	Part no. DIN 24250	Description
1.1	472	Seal face
	473	Seal face housing
1.2	485	Driver collar
1.3		O-ring
1.4	477	Sping
2	475	Stationary seat*)
3	412.2	O-ring

*) The stationary seat design is chosen according to the specific requirements and conditions of operation.

Materials

Seal face (carbon): A, B

H 10

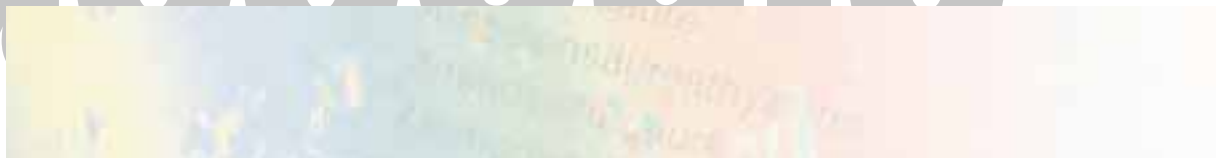
d_1	d_2	d_2'	d_3	d_4	d_5	d_6	l	l_1	l_1'
15	16	17	42	22.6	21	34	17	15.0	16
18	19	–	45	25.6	24	37	17	15.0	–
20	21	22	48	27.6	26	40	17	15.0	16
22	23	24	50	29.6	28	42	17	15.0	16
25	26	27	52	32.8	31	44	17	15.0	16
28	29	–	55	35.8	34	47	17	15.0	–
30	31	32	58	37.8	36	50	17	15.0	16
32	33	34	60	39.8	38	52	17	15.0	16
35	36	37	62	42.8	41	54	17	15.0	16
38	39	40	65	45.9	44	57	17	15.0	16
40	41	42	68	47.9	46	60	17	15.0	16
42	43	44	72	49.9	48	64	17	15.0	16
45	46	47	75	52.9	51	67	17	15.0	16
48	49	–	80	55.9	54	72	17	15.0	–

Axial tolerances: l ± 0.5 H10
l ± 0.2 H8

d_1	d_2	d_2'	d_3	d_4	d_5	d_6	l	l_1	l_1'
50	51	52	80	58.2	56	72	17	15.0	16
52	53	–	82	60.2	58	74	17	15.0	–
55	56	57	85	63.2	61	77	17	15.0	16
58	59	–	90	66.7	64	82	17	15.0	–
60	61	62	90	68.7	66	82	17	15.0	16
65	66	67	95	73.7	71	87	19	16.5	18
68	69	70	100	76.7	74	92	19	16.5	18
70	71	72	100	78.7	76	92	19	16.5	18
75	76	77	108	83.7	81	100	19	16.5	18
80	81	82	112	88.7	86	104	19	16.5	18
85	86	87	118	93.7	91	110	19	16.5	18
90	91	92	122	99.5	96	114	19	16.5	18
95	96	97	128	104.5	101	120	19	16.5	18
100	101	102	132	109.5	106	124	19	16.5	18

Gasseals

Gas-lubricated Mechanical Seals

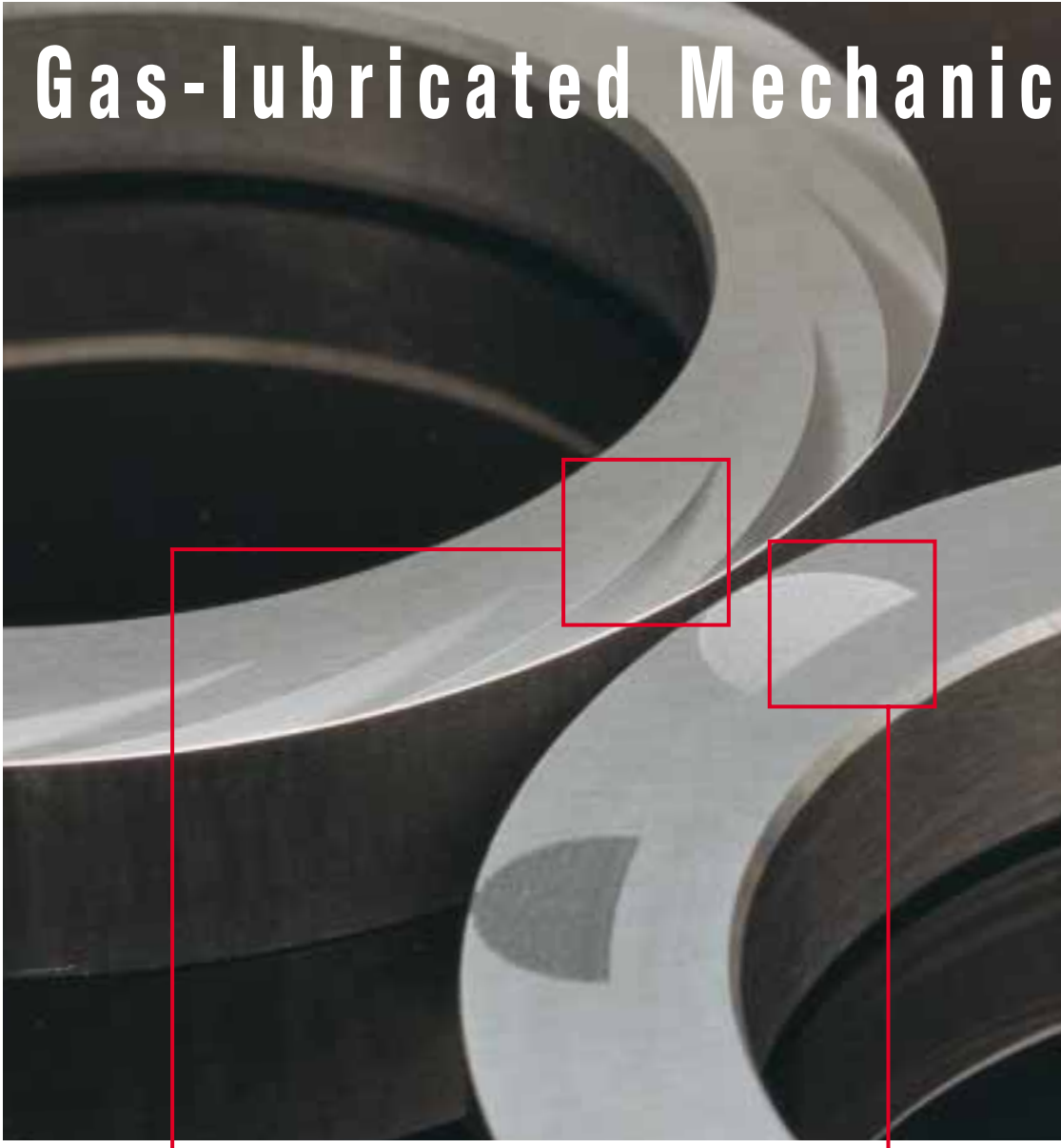


65 Gas-lubricated Seals for Pumps, Mixers, Compressors. Gas Supply Systems

Operation and Technology 66/67
Supply System GSS 67
CGS-KD 68/69
Cartex-GSD 70
GSO 71
MFL85GS 72
Mtex-GSD 72
HRGS-D 73
AGS 74
AGSR 75
DGS 76/77
PDGS 78
TDGS 78
CSR 79

Seal Management System
SMS 79

Gas-lubricated Mechanic



Burgmann Gas-lubricated Seals. Running dry as if greased.

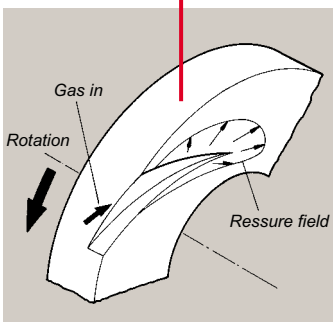
Unmatched for their efficiency and high degree of safety and environmental protection. To be used in almost any industrial sector and field of application.

Until only recently, use of the gas seal was limited more or less to compressors. Today it can be variously used to seal machines of the most diverse types:

- Liquid-conveying pumps, e. g. for media containing solids or for media with poor lubricating properties, such as hydrocarbons.
- as a downstream safety seal.
- for low-speed shafts in mixers and reactors in the chemical and pharmaceutical industries where sterility is required, or when leakage of buffer fluid into the product must be prevented (so-called dry-running applications).

Burgmann GS technology is also able to meet the requirements of the German Clean Air Act as well as demands for zero emission, and to a very profitable degree:

Lower investment costs are matched by a longer service life and lower operating expenses.



V-grooves

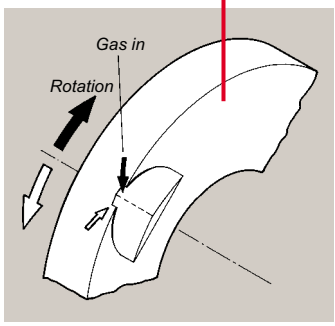
The V-grooves convey the gas by a rotary movement between the sliding faces. The resulting pressure rise causes the seal faces to lift off and ensures a contact-free operation. V-grooves are dependent on the direction of rotation.

The operating principle

In its basic design and mode of operation, the Burgmann 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.



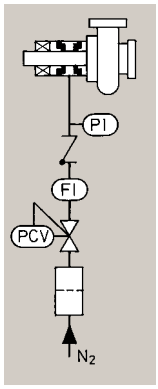
U-grooves

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.

Supply systems for gas-lubricated, gas barriered seals for pumps and agitators*)

Buffered, gas-lubricated seals may only be used in conjunction with adequately pressurized buffer gas (for example from a closed circular nitrogen pipeline), and the buffer gas pressure level p_3 must be higher than the pressure level p_1 of the sealed product, irrespective of which operating state the machine is in. The minimum pressure overlay level (Δp) is specified for the individual seal types.

Gas **S**upply **S**ystems of the GSS series were specially developed for contact-free operated, gas-lubricated mechanical seals. The gas drawn from a supply network (e.g. air or nitrogen) is regulated and monitored by the GSS in accordance with the requirements of the seals to be supplied. GSS systems are equipped with alarm and switch-off points in line with safety regulations. Values can be monitored centrally on request. As a rule, every GSS system is individually designed to take account of the specific application parameters. This applies in particular to gas supply systems needed to operate DGS compressor seals.



Block diagram of the GSS

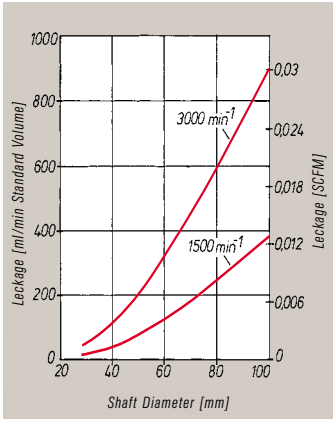
Overview of GSS Standard for pumps and agitators (p_1 = 16 bar)

Designation GSS401 6/A...-00		Version**)							
		100 200 300	110 210 310	101 201 301	111 211 311	102 202 302	112 212 312	103 203 303	113 213 313
Pressure gauge		PI	PI	PIA L	PIA L	PI	PI	PIA L	PIA L
Flow meter for	**small range**	–	FI	–	FI	–	FI	–	FI
	large range	FI	FI	FI	FI	FIAH	FIAH	FIAH	FIAH

PI = Pressure gauge
PIA L = Pressure gauge with MIN contact
FI = Flow meter
FIA H = Flow meter with MAX contact
**) Series 100: System mounted on plate
Series 200: System in box
Series 300: System of stainless steel in housing

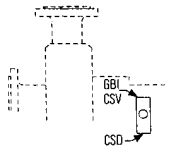
Main functions of a GSS:
- Filtering of buffer and flushing gas
- Pressure monitoring and regulation
- Flow monitoring
- Leakage control and discharge

Typical duties of a GSS
- Buffer gas supply for double seals
- Gas flushing for single seals
- Gas quenching for tandem seals

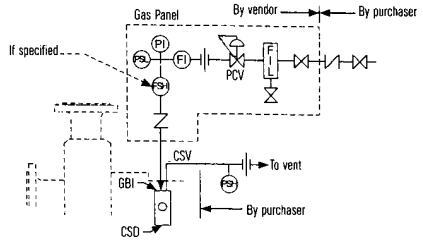


Buffer gas consumption CGS-D with U-groove (medium: air; p = 5 bar; t = 50 °C

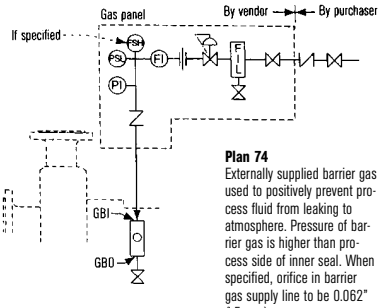
Circulation systems for gas-lubricated mechanical seals (API 682, 2nd Edition)



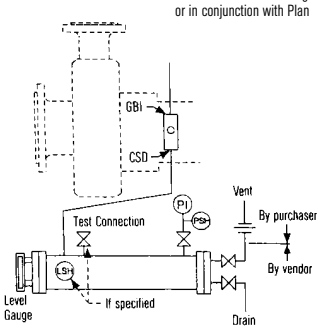
Plan 71
Tapped connections for purchaser's use. Typically this plan is used when the purchaser may use buffer gas in the future.



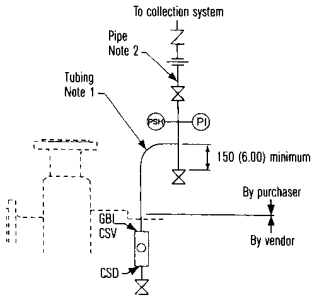
Plan 72
Externally supplied gas buffer for Arrangement 2 seals. Buffer gas may be used alone to dilute seal leakage or in conjunction with Plan 75 or 76 to help sweep leakage into a closed collection system. Pressure of buffer gas is lower than process side pressure of inner seal.



Plan 74
Externally supplied barrier gas used to positively prevent process fluid from leaking to atmosphere. Pressure of barrier gas is higher than process side of inner seal. When specified, orifice in barrier gas supply line to be 0.062" (1.5 mm).



Plan 75
Containment seal chamber drain for condensing leakage on Arrangement 2 seals. This plan is used when pumped fluid condenses at ambient temperatures. System is supplied by vendor.
Valves to be installed per figure and must be accessible for operator use relative to ground clearance and other obstructions.



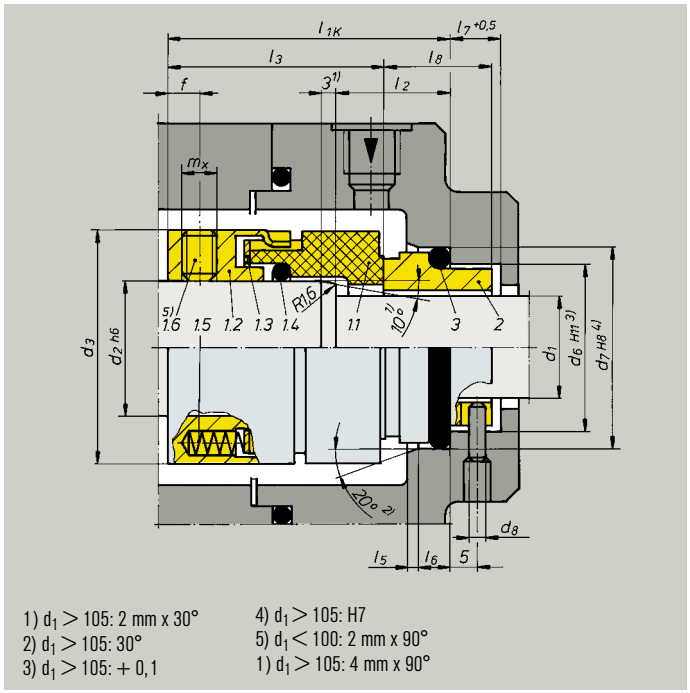
Plan 76
Containment seal chamber drain for non-condensing leakage or Arrangement 2 seals. This plan is used when pumped fluid does not condense at ambient temperatures. System is supplied by purchaser.
1. Tubing shall be 13 mm (1/2") minimum and shall rise continuously from the CSV connection to the piping/instrument harness.
2. Harness shall be DN 15 (1/2") minimum pipe. Harness shall be supported from overhead structure or side stand such that no strain is put on tubing connected to seal gland.

Legend:
F = flush
GBI = gas buffer inlet
GBO = gas barrier outlet
CSV = containment seal vent
CSD = containment seal drain
FI = flow indicator
FIL = Coalescing Filter, used to ensure slids and/or liquids might be present in buffer gas supply do not contaminate seals.
FSH = flow swith high
LSH = level swith high
PCV = pressure control valve, used to limit buffer gas pressure to pre vent reverse pressurization of inner seal and/or limit pressure applied to containment seal.
PI = pressure indicator
PSL = pressure switch low
PSH = pressure switch high
V = vent

*) Supply systems for compressor seals see SMS on page 79.

For stepped shafts, rotating springs

CGS-KN



1) $d_1 > 105$: 2 mm x 30°
2) $d_1 > 105$: 30°
3) $d_1 > 105$: + 0,1
4) $d_1 > 105$: H7
5) $d_1 < 100$: 2 mm x 90°
1) $d_1 > 105$: 4 mm x 90°

- **Balanced**
- **Gas-lubricated**
- **Independent of the direction of rotation[1)]**
- **EN 12756***

[1)] Regularly available with U-grooves, on request with V-grooves (dependent on the direction of rotation).

The CGS runs contact-free. With soft/hard material combination no pressure differential is required. The U- or V-grooves are located in the stationary seat. The CGS is adequate for sealing gases and liquids e.g. in ventilators, small steam turbines, blowers, roots compressors and pumps at low and medium sliding velocities, pressures and temperatures. Adequate for pressure reversal.

Operating limits (see note on page 1)

d_1 = 28 ... 125 mm *1.10" ... 4.92"*
p_1 = 25 bar *363 PSI*
(dependent on the shaft diameter)
t = –20 ... 200 °C *–4 °F ... 392 °F*
(note resistance of secondary seals and sliding materials)
v_g = 4 ... 25 m/s 13 ... *82 ft/s*

CGS-KN

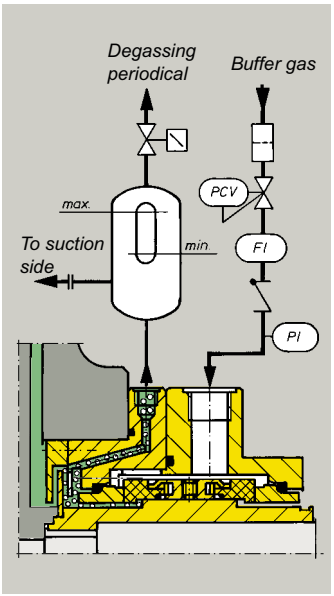
Single seal

Only for use in ventilators, blowers and the like, with nonpolluting gases or as a secondary safety sael (see page 69).

Item	Parts DIN 24250	Description
1.1	472	Slide face
1.2	485	Driver collar
1.3	474	Thrust ring
1.4	412.1	O-ring
1.5	477	Spring
1.6	904	Grub screw
2	475.1	Stationary seat
3	412.3	O-ring

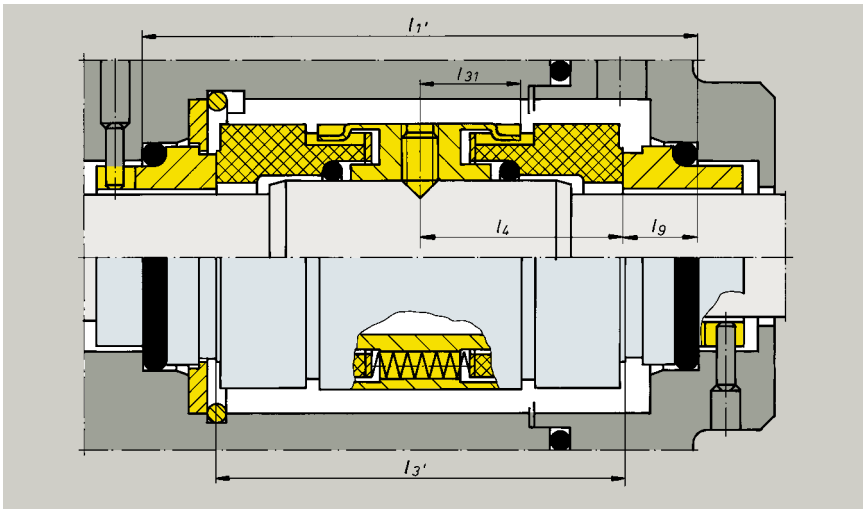
Materials

Seal face: A, B, Q_1
Stationary seat: Q_1, Q_{19}
Construction materials, spring: G



Degassing

For processes where no buffer gas, e.g. N_2, may enter the product, degassing is possible (DGM No. 296007072, US Patent No. 5722671). The leakage gas enters an annular chamber which is arranged on the product side of a double gas seal and is equipped with a pumping means. The medium mixed with the leakage gas flows from this chamber into a separating receptacle where the medium collects below and the leakage gas in the top area. From the lower part of the receptacle, the degassed medium then returns to the process while the separated gas can be removed from the upper part.



CGS-KD

Double seal

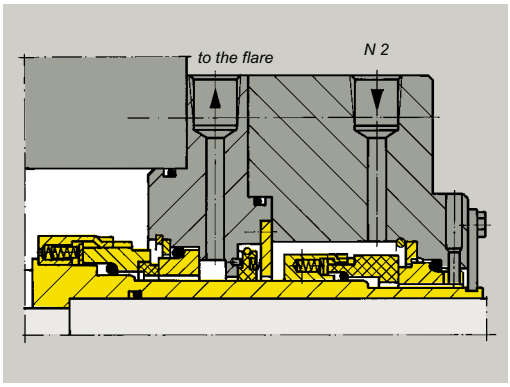
For sealing applications involving liquids, e.g. in pumps, and gases that are not to escape into the environment, e.g. in ventilators and blowers. No product emissions to the atmosphere. Buffer gas supply is required (see page 67). Items, descriptions and unspecified dimensions as for CGS-KN.

Operating limits (see note on page 1)

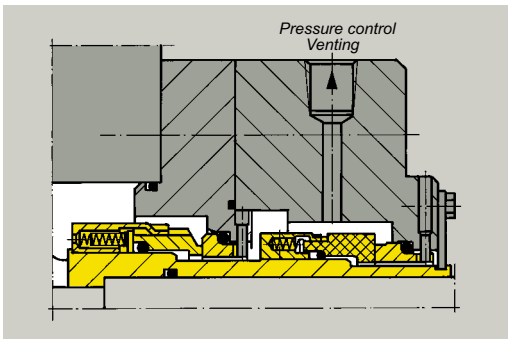
p_1 = ... 23 bar *333 PSI*
p_3 = ... 25 bar *362 PSI*
Δp = min. 2 bar *30 PSI*
other operating limits as CGS-KN

d_1	d_2	d_3	d_6	d_7	d_6	l_{1K}	l_1'	l_2	l_3	l_3'	l_4	l_5	l_6	l_7	l_8	l_9	l_{31}	f	m_x
28*	33	48	37.0	43.0	3	50.0	89	20	38.5	66.0	33.0	2.0	5	9	19.5	11.5	16.5	5	M6
30*	35	50	39.0	45.0	3	50.0	89	20	38.5	66.0	33.0	2.0	5	9	19.5	11.5	16.5	5	M6
32*	38	55	42.0	48.0	3	50.0	89	20	38.5	66.0	33.0	2.0	5	9	19.5	11.5	16.5	5	M6
33*	38	55	42.0	48.0	3	50.0	89	20	38.5	66.0	33.0	2.0	5	9	19.5	11.5	16.5	5	M6
35*	40	57	44.0	50.0	3	50.0	89	20	38.5	66.0	33.0	2.0	5	9	19.5	11.5	16.5	5	M6
38*	43	60	49.0	56.0	4	52.5	95	23	38.5	67.0	33.5	2.0	6	9	22.0	14.0	16.5	5	M6
40*	45	62	51.0	58.0	4	52.5	95	23	38.5	67.0	33.5	2.0	6	9	22.0	14.0	16.5	5	M6
43*	48	65	54.0	61.0	4	52.5	95	23	38.5	67.0	33.5	2.0	6	9	22.0	14.0	16.5	5	M6
45*	50	67	56.0	63.0	4	52.5	95	23	38.5	67.0	33.5	2.0	6	9	22.0	14.0	16.5	5	M6
48*	53	70	59.0	66.0	4	52.5	95	23	38.5	67.0	33.5	2.0	6	9	22.0	14.0	16.5	5	M6
50*	55	72	62.0	70.0	4	57.5	99	25	42.5	69.0	34.5	2.5	6	9	23.0	15.0	16.5	5	M6
53*	58	79	65.0	73.0	4	57.5	104	25	42.5	74.0	37.0	2.5	6	9	23.0	15.0	17.0	5	M6
55*	60	81	67.0	75.0	4	57.5	106	25	42.5	76.0	38.0	2.5	6	9	23.0	15.0	17.0	5	M6
58*	63	84	70.0	78.0	4	62.5	112	25	47.5	82.0	41.0	2.5	6	9	23.0	15.0	19.0	7	M8
60*	65	86	72.0	80.0	4	62.5	112	25	47.5	82.0	41.0	2.5	6	9	23.0	15.0	19.0	7	M8
63*	68	89	75.0	83.0	4	62.5	112	25	47.5	82.0	41.0	2.5	6	9	23.0	15.0	19.0	7	M8
65*	70	91	77.0	85.0	4	62.5	112	25	47.5	82.0	41.0	2.5	6	9	23.0	15.0	19.0	7	M8
70*	75	99	83.0	92.0	4	70.0	118	28	52.0	82.0	41.0	2.5	7	9	26.0	18.0	19.0	7	M8
75*	80	104	88.0	97.0	4	70.0	120	28	52.0	84.0	42.0	2.5	7	9	26.0	18.0	19.0	7	M8
80*	85	109	95.0	105.0	4	70.0	120	28	51.8	83.6	41.8	3.0	7	9	26.2	18.2	19.0	7	M8
85*	90	114	100.0	110.0	4	75.0	120	28	56.8	83.6	41.8	3.0	7	9	26.2	18.2	19.0	7	M8
90*	95	119	105.0	115.0	4	75.0	120	28	56.8	83.6	41.8	3.0	7	9	26.2	18.2	19.0	7	M8
95*	100	124	110.0	120.0	4	75.0	120	28	57.8	85.6	42.8	3.0	7	9	25.2	17.2	19.0	7	M8
100*	105	129	115.0	125.0	4	75.0	120	28	57.8	85.6	42.8	3.0	7	9	25.2	17.2	19.0	7	M8
105	115	148	122.2	134.3	5	73.0	133	32	53.0	93.0	46.5	2.0	10	–	30.0	20.0	22.5	7	M8
110	120	153	128.2	140.3	5	73.0	133	32	53.0	93.0	46.5	2.0	10	–	30.0	20.0	22.5	7	M8
115	125	158	136.2	148.3	5	73.0	133	32	53.0	93.0	46.5	2.0	10	–	30.0	20.0	22.5	7	M8
120	130	163	138.2	150.3	5	73.0	133	32	53.0	93.0	46.5	2.0	10	–	30.0	20.0	22.5	7	M8
125	135	168	142.2	154.3	5	73.0	133	32	53.0	93.0	46.5	2.0	10	–	30.0	20.0	22.5	7	M8

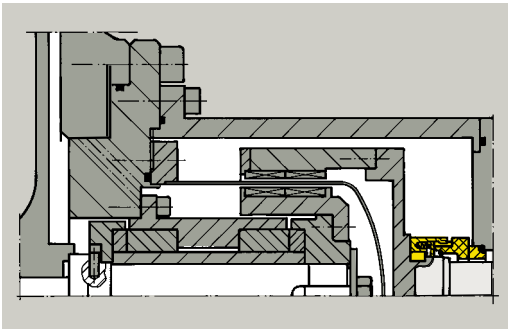
CGS as a safety seal



Multiple seal in tandem arrangement with intermediate throttle CSR for all media with a gaseous leakage. Provided on the product side with a liquid-lubricated H75K. Normally, the CSR is pressurized with nitrogen at an excess pressure of 0.5 to 3 bar. Dissipation of the product leakage via a flare is ensured by means a pressure differential regulator. The CGS runs contact-free in case of a failure, The CGS assumes sealing of the product. Only a little nitrogen leakage reaches the atmosphere. Here too, the product leakage is dissipated via the flare.

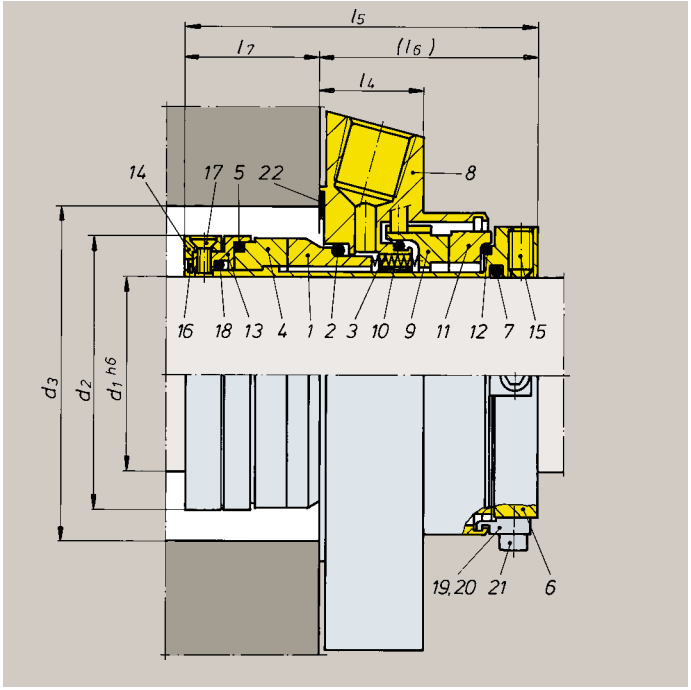


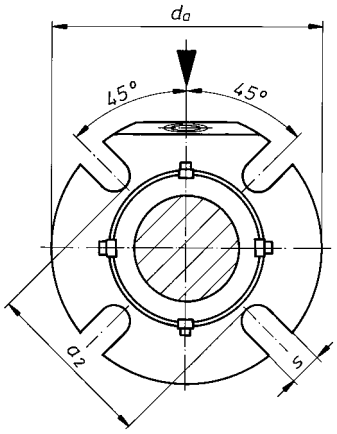
Tandem arrangement with pressure control
for media with a gaseous leakage. H75VN on the product side. In case of a failure, the CGS on the atmosphere side works as a liquid seal.



Magnetic coupling
with a down-stream CGS acting as safety seal. In case of damages in the can, the CGS assumes the sealing and prevents uncontrolled emission.

Cartex-GSD / GSO-D





- **Cartridge seal**
- **Gas-lubricated, gas barriered**
- **Independent of direction of rotation*)**

The Cartex-GSD has all the attributes of modern sealing technology. It is equally suitable for the conversion of centrifugal pumps previously fitted with conventional seals or packings as for the standardization of original equipment. Made of quality materials it is largely resistant to media, including those containing solids. Suitable for pressure reversals.

*) with U grooves as standard

Operating limits (see note on page 1)

d_1 = 28 ... 100 mm *1.10" ... 3.94"*
p_1 = ... 13 bar *189 PSI*
p_3 = ... 16 bar *232 PSI*
t = –20 °C ... +200 °C
–4 °F ... 392 °F
(note resistance of secondary seals)
v_g = 4 ...15 m/s *13 ... 49 ft/s*
Axial movement ± 1.0 mm
Δp = min. 3 bar *45 PSI*

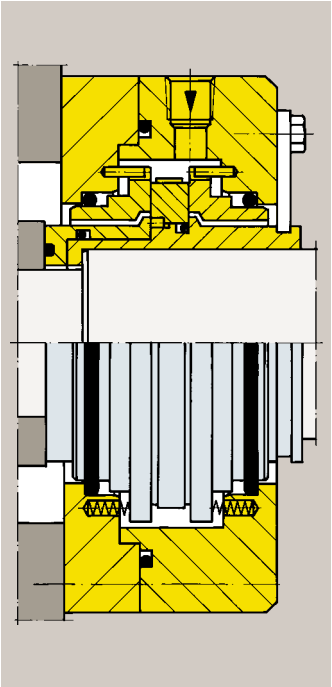
Cartex-GSD

Double seal with barrier gas connection

Item	Description
1, 9	Seal face
2, 5, 7,	10, 12, 18 O-ring
3	Spring
4, 11	Seat
6	Shaft sleeve
8	Cover
13	Retainer
14	Ring
15	Threaded pin
16	Snap ring
17	Counter-sunk socket screw
19,20	Assembly fixture
21	Socket head screw
22	Gasket

Materials

Face materials:
Product side: Q_{19}/Q_1
Atmosphere side: Q_1/U_2
Components: G
Springs: M
O-rings: V, E, K, U_1



GSO-D

Double seal in face-to-face arrangement, with outboard cartridge unit.

The GSO-D packs a maximum of seal technology into the shortest of spaces. Hardly longer than a conventional seal cover it fits in practically all standard seal compartments without the need for modifications or conversions.
Especially suitable for fans and ventilators to seal pure gases.

Operating limits (see note on page 1)

d_1 = 25 ... 100 mm *0.98" ... 3.94"*
(please inquire about dimensions)
p_1 = ... 10 bar 145 PSI
(dependent on the shaft diameter and the sliding materials)
p_3 = 12 bar *174 PSI*
Δp = min. 12 bar *30 PSI*
t = –20 °C ... +200 °C *–4 °F... 428 °F*
v_g = 16 m/s *52 ft/s*
Axial movement ± 1.5 mm

Materials

Seal face: Q_1
Seat: Q_{19}, U_2
O-rings: V, E, K, U_1
Components: G, M
Springs: M

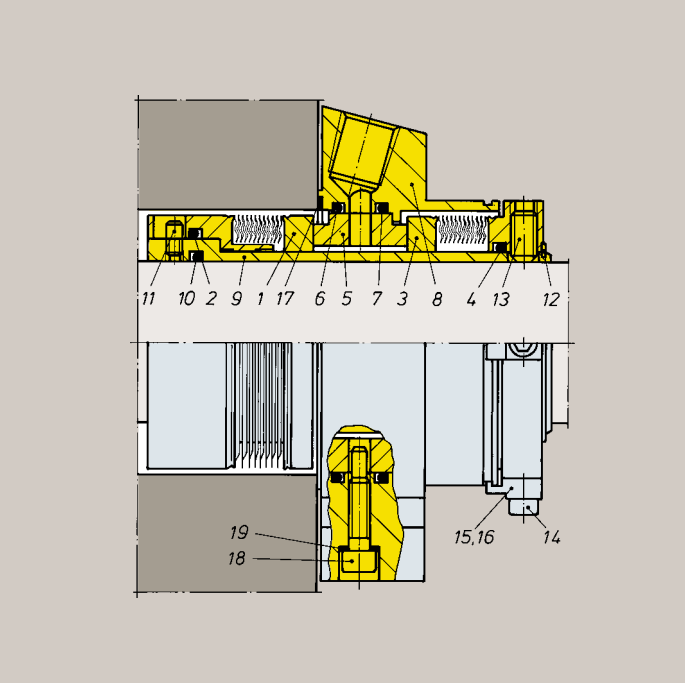
Dimensions in mm

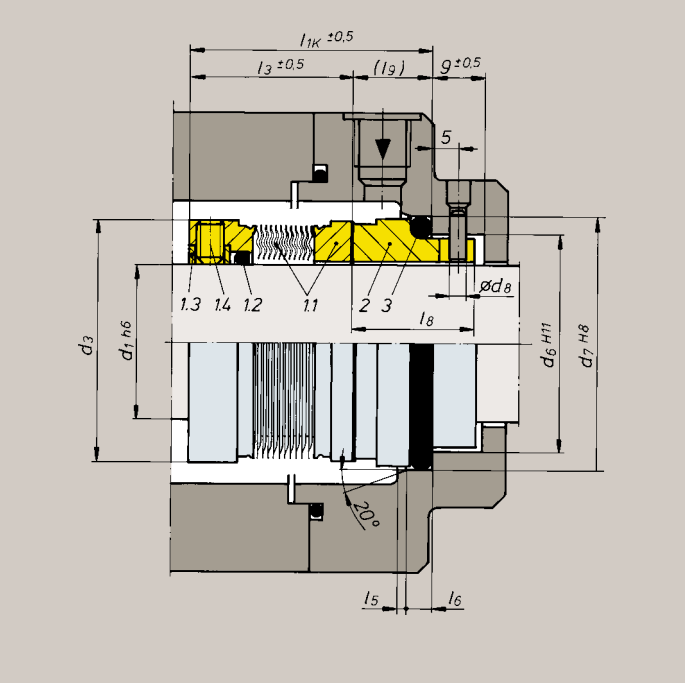
d_1	d_2	d_3 min.	d_3 max.	l_4	l_5	l_6	l_7	a_2	d_a	s
28	46.0	47.0	52.0	25.4	86.5	53.4	33.1	65	105	14
30	48.0	49.0	56.0	25.4	86.5	53.4	33.1	67	105	14
32	49.8	51.0	57.0	25.4	86.5	53.4	33.1	70	108	14
33	49.8	51.0	57.0	25.4	86.5	53.4	33.1	70	108	14
35	53.0	54.0	61.5	25.4	86.5	53.4	33.1	72	113	14
38	56.0	57.0	66.0	25.4	86.5	53.4	33.1	75	123	14
40	58.0	59.0	68.0	25.4	86.5	53.4	33.1	77	123	16
42	60.5	61.5	69.5	25.4	86.5	53.4	33.1	80	133	16
43	60.5	61.5	70.5	25.4	86.5	53.4	33.1	80	133	16
45	62.5	64.0	73.0	25.4	86.5	53.4	33.1	82	138	16
48	66.0	67.0	75.0	25.4	86.5	53.4	33.1	85	138	16
50	68.0	69.0	78.0	25.4	86.5	53.4	33.1	87	148	16
53	72.0	73.0	87.0	25.4	86.5	53.4	33.1	97	148	18
55	73.0	74.0	83.0	25.4	86.5	53.4	33.1	92	148	18
60	78.0	79.0	91.0	25.4	86.5	53.4	33.1	102	157	18
65	83.0	84.5	98.5	25.4	86.5	53.4	33.1	109	163	18
70	93.0	95.0	108.0	25.4	86.5	53.4	33.1	118	178	18
75	100.0	101.6	118.0	28.0	108.0	63.9	44.1	129	190	18
80	106.4	108.0	124.0	28.0	108.0	63.9	44.1	135	195	18
85	109.5	111.1	129.0	28.0	108.0	63.9	44.1	139	198	22
90	115.9	117.5	135.0	28.0	108.0	63.9	44.1	145	205	22
95	119.1	120.7	138.0	28.0	108.0	63.9	44.1	148	208	22
100	125.4	127.0	144.0	28.0	108.0	63.9	44.1	154	218	22

Dimensions in inches

d_1	d_2	d_3 min.	d_3 max.	l_4	l_5	l_6	l_7	a_2	d_a	s
1.125	1.811	1.850	2.047	1.000	3.400	2.102	1.303	2.560	4.134	0.551
1.250	1.960	2.000	2.250	1.000	3.400	2.102	1.303	2.760	4.330	0.551
1.375	2.086	2.125	2.420	1.000	3.400	2.102	1.303	2.840	4.449	0.551
1.500	2.200	2.250	2.625	1.000	3.400	2.102	1.303	2.950	4.842	0.551
1.625	2.380	2.375	2.700	1.000	3.400	2.102	1.303	3.090	4.842	0.650
1.750	2.460	2.520	2.874	1.000	3.400	2.102	1.303	3.228	5.433	0.650
1.875	2.598	2.638	2.952	1.000	3.400	2.102	1.303	3.346	5.433	0.650
2.000	2.677	2.750	3.190	1.000	3.400	2.102	1.303	3.430	5.827	0.650
2.125	2.834	2.875	3.437	1.000	3.400	2.102	1.303	3.820	5.827	0.709
2.250	2.960	3.000	3.560	1.000	3.400	2.102	1.303	3.940	6.181	0.709
2.375	3.070	3.125	3.590	1.000	3.400	2.102	1.303	4.020	6.181	0.709
2.500	3.212	3.250	3.800	1.000	3.400	2.102	1.303	4.180	6.417	0.709
2.625	3.338	3.375	3.937	1.000	3.400	2.102	1.303	4.300	6.417	0.709
2.750	3.660	3.750	4.250	1.000	3.400	2.102	1.303	4.660	7.008	0.709
2.875	3.811	3.875	4.567	1.000	4.250	2.516	1.736	4.960	7.283	0.709
3.000	3.937	4.000	4.646	1.102	4.250	2.516	1.736	5.079	7.480	0.709
3.125	4.063	4.125	4.764	1.102	4.250	2.516	1.736	5.197	7.677	0.709
3.250	4.189	4.250	4.882	1.102	4.250	2.516	1.736	5.315	7.677	0.709
3.375	4.311	4.375	5.039	1.102	4.250	2.516	1.736	5.472	7.795	0.866
3.500	4.437	4.500	5.157	1.102	4.250	2.516	1.736	5.591	7.795	0.866
3.625	4.563	4.625	5.315	1.102	4.250	2.516	1.736	5.709	8.071	0.866
3.750	4.689	4.750	5.433	1.102	4.250	2.516	1.736	5.827	8.189	0.866
4.000	4.937	5.000	5.669	1.102	4.250	2.516	1.736	6.063	8.583	0.866

Mtex-GSD / MFL 85 GS





- **Cartridge seal**
- **Gas-lubricated, gas barriered**
- **Metal bellows**
- **Independent of direction of rotation*)**

The Mtex-GSD opens up wide-ranging possibilities for the use of gas-lubricated mechanical seals in low and high temperature ranges. Ideally suited for gaseous or volatile media in pumps and compressors. Designed for original equipment and conversions. Metal bellows with a reduced spring rate and hydraulic balancing. Suitable for reversed pressure. No dynamic O-rings.

*) with U grooves as standard

Operating limits (see note on page 1)

d_1 = 25 ... 100 mm *0.98" ... 3.94"*
(please inquire about dimensions)
p_1 = ... 13 bar *188 PSI*
p_3 = ... 16 bar *232 PSI*
(internal pressure)
Δp = min. 3 bar *45 PSI*
t = –40 °C ...+300 °C *–40 °F... 572 °F*
(dependent on secondary seals)
v_g = 20 m/s *66 ft/s*

Materials

Bellows: M_6
Seal face: T_{41}
Seat: Q_1
Components: G, G_1
Secondary seals: all elastomers

Mtex-GSD

Double seal (face-to-face) with barrier gas connection

Item	Description
1, 3	Bellows unit
2, 4, 6, 7, 10	O-ring
5	Seat
8	Housing
9	Shaft sleeve
11, 13	Set screw
12	Retaining ring
14	Socket head screw
15, 16	Assembly fixture
17	Gasket
18	Socket head screw
19	Gasket

- **Single seal**
- **Gas-lubricated**
- **Balanced**
- **Independent of direction of rotation*)**
- **EN 12756 Elastomer-free**

The MFL 85 GS is suitable for extreme temperature ranges. All types of secondary seal can be used thanks to the special drive collar ring. The bellows has a reduced spring rate. The solid seal face is hard-coated and welded to the bellows. No dynamic O-rings.

*) with U grooves as standard

Operating limits (see note on page 1)

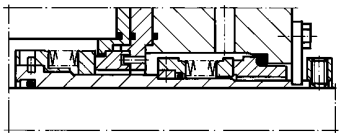
d_1 = 28 ... 100 mm *1.10" ... 3.94"*
(Also refer to page 41 "MFL85N" for dimensions)
p_1 = 16 bar *232 PSI*
(externally pressurized)
t = –40 °C ...+300 °C *–40 °F... 572 °F*
(dependent on secondary seals)
v_g = 20 m/s *66 ft.*

Materials

Bellows: M_6
Seal face: Q_1, T_{41}
Seat: A, Q_1
Components: G, G_1
Secondary seals: all elastomers, massive PTFE, pure graphite

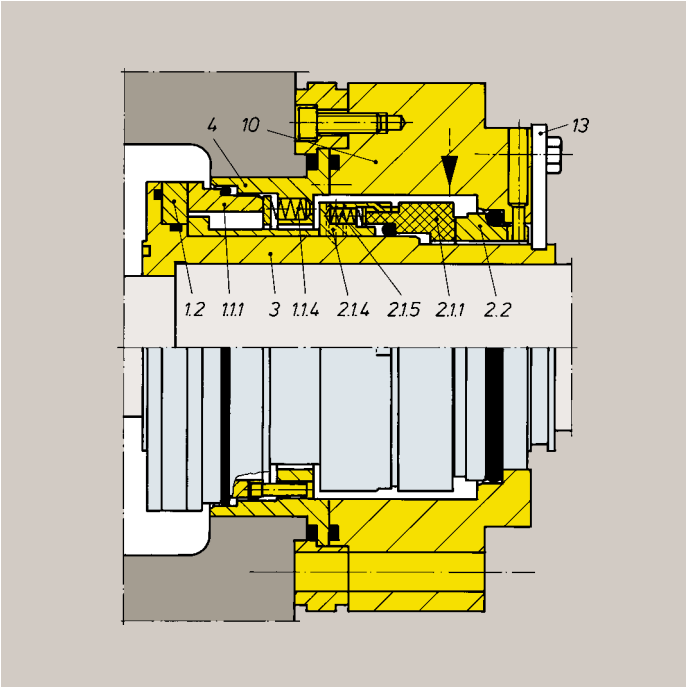
MFL 85 GS

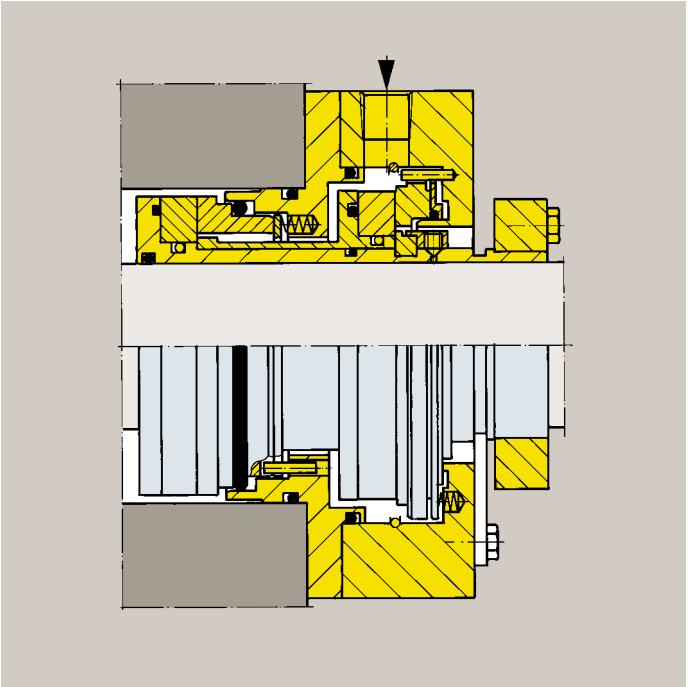
Item	Description
1.1	Seal face with bellows unit
1.2	O-ring
1.3	Ring
1.4	Set screw
2	Type G9 seat
3	O-ring



Seal arrangements
Following seal arrangements are possible with the MFL85GS:
- tandem (see drawing)
- back-to-back
- as safety seal on the atmosphere side

HRGS-D





- **Cartridge seal**
- **Gas-lubricated, gas-buffered**
- **Balanced**
- **Bi-directional*)**

The HRGS-D is the gas-lubricated version of the HR. An open sealing compartment is ideal for this concept. Rotating seat located directly behind the pump impeller, springs outside of the product. Very well suited to applications involving media containing solids. Does not open on pressure reversal. Two variants available, depending on the sealing pressure and shaft diameter involved.

*) with U-grooves as standard, on request also available with uni-directional V-grooves.

Operating limits (see note on page 1)

d_w = 20 ... 200 mm *0,787"... 7,874"*
p_1 = ... 23 bar (HRGS-DC) *333 PSI*
... 40 bar (HRGS-DD) *580 PSI*
p_3 = ... 25 bar (HRGS-DC) *362 PSI*
... 42 bar (HRGS-DD) *609 PSI*
v_g = 4 ... 25 m/s *13 ... 82 ft/s*
Δp = min. 2 bar *(29 PSI)*, max. 16 bar *(232 PSI)* (internal pressure)

Materials

Face materials:
Atmosphere side: A, B, Q_{19}, Q_1/U_2
Product side: Q_{19}/Q_1
Springs: G, M
Components: G, M

HRGS-DC

Gas-buffered double seal

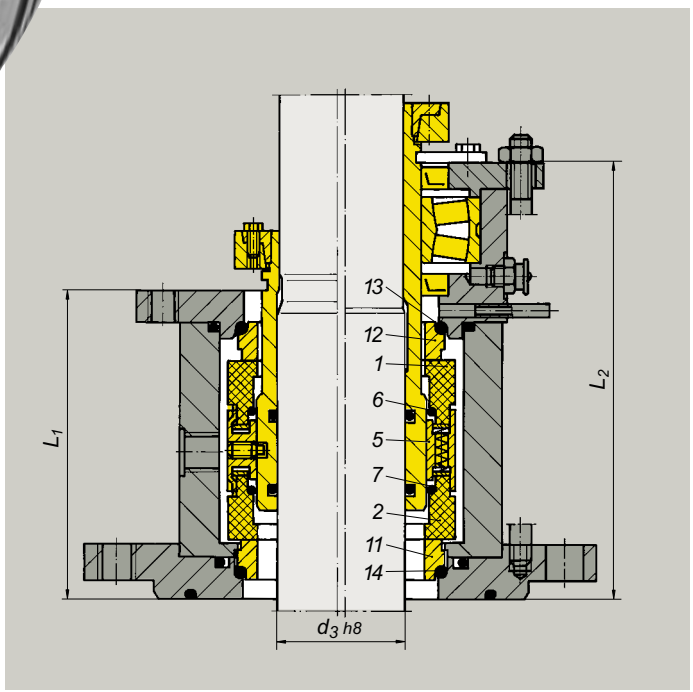
The HRGS-DC is designed for applications involving fitting dimensions in line with DIN 24960 C or ANSI Big Bore Standard, but can also be used even when the fitting dimensions are not of standardized nature if large, open spaces are available for installation. The CGS is used as outboard seal up to nominal width 125.

Item	Part No. DIN 24250	Description
1.1.1	472.1	Seal face
1.1.4	477	Spring
1.2	475.1	Seat
2.1.1	472.2	Seal face
2.1.4	485	Drive collar
2.1.5	477	Spring
2.2	475.2	Seat
3	523	Shaft sleeve
4	513	Insert
10	441	Housing
13		Assembly fixture

HRGS-DD

The HRGS-DD corresponds to the HRGS-DC in terms of design principal and materials. It is designed for applications involving large shaft dimensions of up to d_w 200 mm) or fairly high pressure levels of up to 40 bar. The outboard seal used in such cases is the DGS.

AGS/AGSR



Test reactor (EHW Thale) of glass-lined design for fermentation and other material processing operations. The top entry drive is sealed by a gas-lubricated Burgmann AGS461L-D20 designed with no metal on the product side.

- **Gas-lubricated**
- **Balanced**
- **Independent of direction of rotation*)**
- **Cartridge unit**

*) version dependent on the direction of rotation available on request

Up to now it was thought that the gas film required between the seal's sliding faces for non-contact running could only be created on highspeed machines. Thanks to a combination of specially dimensioned gas inlet grooves and the GSS buffer gas supply system, the Burgmann AGS (Agitator Gas Seal) now guarantees a stable gas film between the sliding faces even at low sliding velocities (see the diagram "Lifting curve").

Areas of application

Dryers, mixers, reactors, etc.. The AGS is suitable for processes in which barrier gas but no barrier fluid is allowed to enter the product. It is ideal for dry-running applications. The AGSR ("R" stands for rotating seat in the product) is particularly suitable for sterile applications in the pharmacy, biotechnology and food industries.

AGS 481K-D

Double seal

AGS 481KL-D

Double seal with floating bearing

- for top entry drives
- connections according to DIN

Also refer to page 82 to 85 (M481/M461) for dimensions. Installation lengths L1, L2 (larger but still within the DIN dimension range).

For use on steel and stainless steel tanks according to DIN 28136. Connection flanges conforming to DIN 28141, shaft ends to DIN 28154.

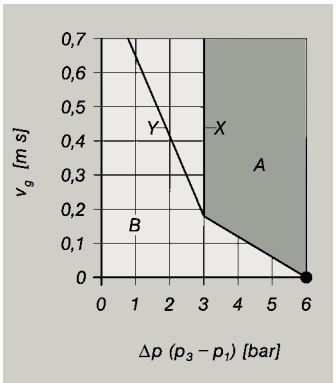
Item	Description
1, 2	Seal face (B, Q_1, Q_2)
5	Drive collar
6, 7	O-ring
11, 12	Seat (Q_1, Q_2)
13, 14	O-ring

Operating limits (see note on page 1)

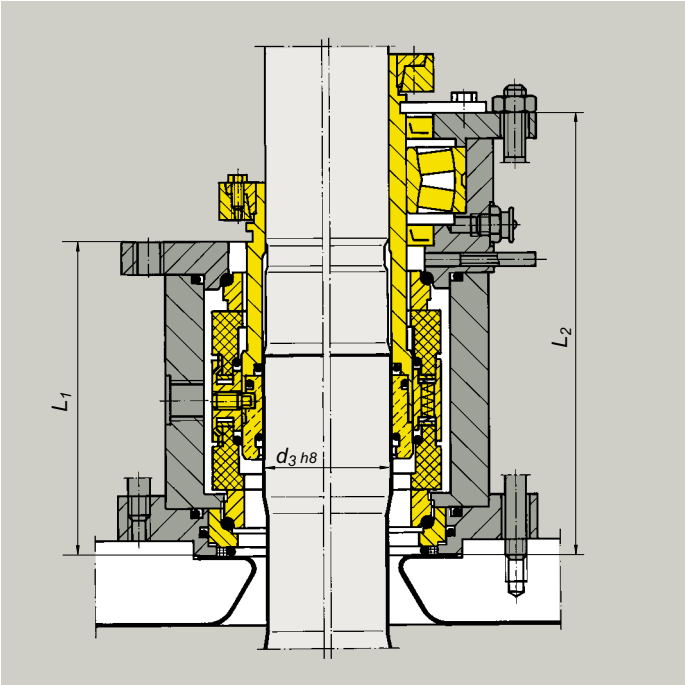
d_3 = 40 ... 200 mm *1.57"... 7.87"*
p_1 = ... 6 bar *87 PSI*
t_1 = –30 (–80) °C ... +200 (–350) °C
–22 (–112) ... 292 (662) °F
v_g = 10 m/s *33 ft/s*

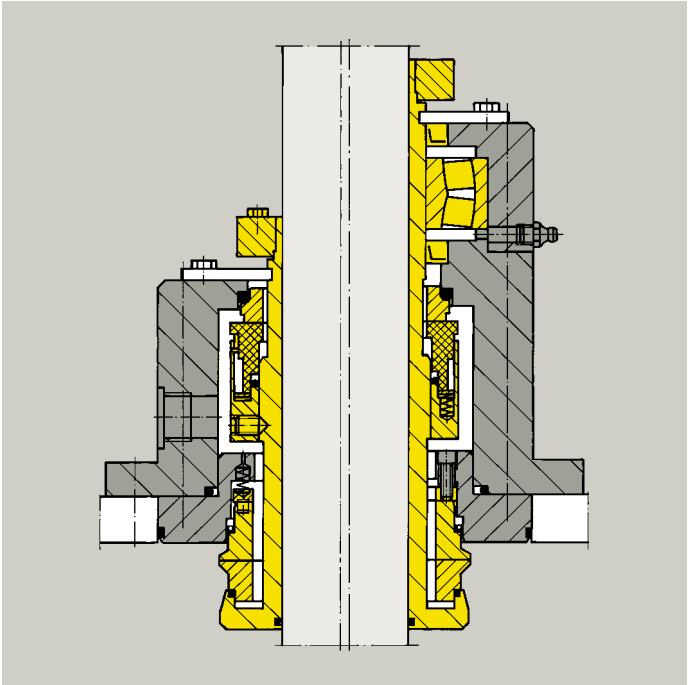
Seal supply system

All it takes to operate the AGS/AGSR is a simple connection to a gas supply network (or cylinder) using the upstream Burgmann GSS gas supply and control system.
We recommend using the GSS4016 / A213-DO gas supply system with alarm FIAH and PIAL, together with two flow meters for a large measuring range.



A Seal supply system
B Operating range only after consultation
X Minimum barrier gas pressure required
Y Range of application





AGS 461 K-D

Double seal

AGS 461 KL-D

Double seal with floating bearing

- for top entry drives
- connections according to DIN

For use on glass-lined tanks according to DIN 28136.
Connection flanges conforming to DIN 28137-T2, shaft ends to DIN 28159.

Operating limits (see note on page 1)

d_3 = 40 ... 160 mm *1.57" ... 6.30"*
p_1 = ... 6 bar *87 PSI*
t_1 = −30 (−80) °C ... +150 (200) °C
−22 (−112) °F ... +302 (392) °F
v_g = ... 10 m/s *33 ft/s*

AGSR 5-D

Double seal

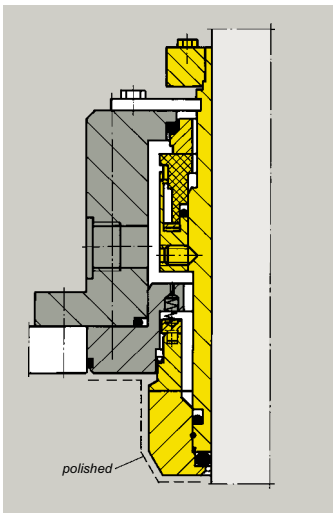
AGSR 5 L-D

Double seal with floating bearing

Seat rotates in the tank. If the seal has to run in the product, please inquire.

Operating limits (see note on page 1)

d_3 = 20 ... 200 mm *0.79" ... 7.87"*
p_1 = ... 6 bar *87 PSI*
t_1 = −30 (−80) °C ... +120 °C
−22 (−112) ... +356 °F
v_g = 10 m/s *33 ft/s*



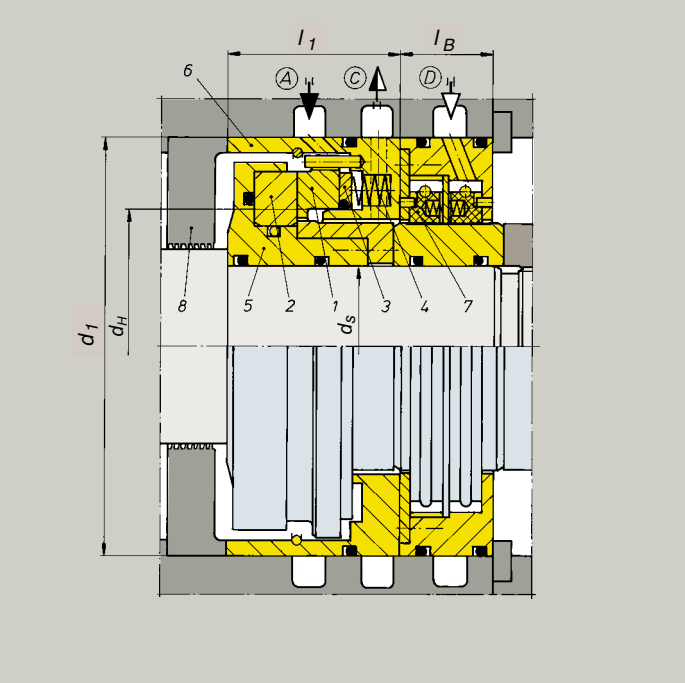
AGSR 3-D

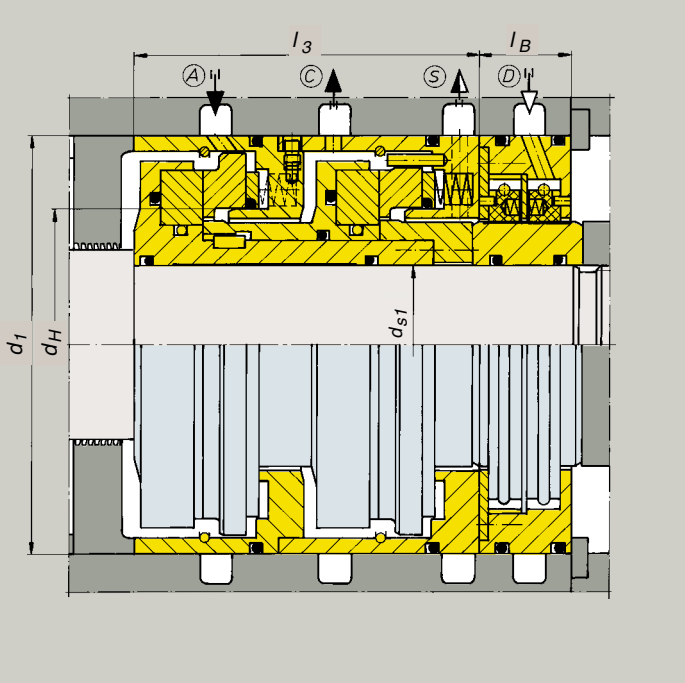
Double seal

AGSR 3 L-D

Double seal with floating bearing for sterile applications.

DGS





▶ Cartridge units
▶ Gas-lubricated

Gas-lubricated seals of the DGS series were developed specially for sealing turbo compressors. They are distinguished by broad sliding faces and three-dimensional U or V grooves in the rotating seat.

Combination of face materials: silicon carbide against silicon carbide with diamond-like carbon coating featuring excellent emergency running properties. The DGS offers a range of technical and economical advantages: low investment and operating costs, a low level of power consumption, high safety in operation and long service life, low leakage rates, no oil contamination of the product and, last but not least, an increase of the compressor's efficiency.

Operating limits (see note on page 1)

d_N = 25 ... 320 mm *0.98" ... 12.60"*
p_1 = 1 ... 120 bara *15 ... 1740 PSI*
t = –30 °C ...+200 °C *–22 ... 392 °F*
v_g = ... 200 m/s *656 ft/s*

DGS
Single seal

Application: Where product leakages to the atmosphere are recognized as safe, e.g. with air, nitrogen or CO_2 compressors.

Labyrinth to the gas side and CSR radial clearance seal to the bearing side are optional. This version is used as an emission-free arrangement with a corresponding flare/vent connection. Primary leakage is then discharged with the separating gas to the flare/vent.

In the case of dirty gases the gas to be sealed has to be filtered in addition and conveyed to the seal chamber via connection "A". The resulting current from the sealing compartment prevents impurities reaching the seal.

Item	Description
1	Seal face, stationary
2	Seat, rotating
3	Thrust ring
4	Spring
5	Shaft sleeve and seat retainer
6	Housing (adapted in size to the installation space)
7	CSR radial clearance seal
8	Labyrinth
A	Product flushing
B	Buffer gas
C	Flare
D	Separating gas
S	Vent

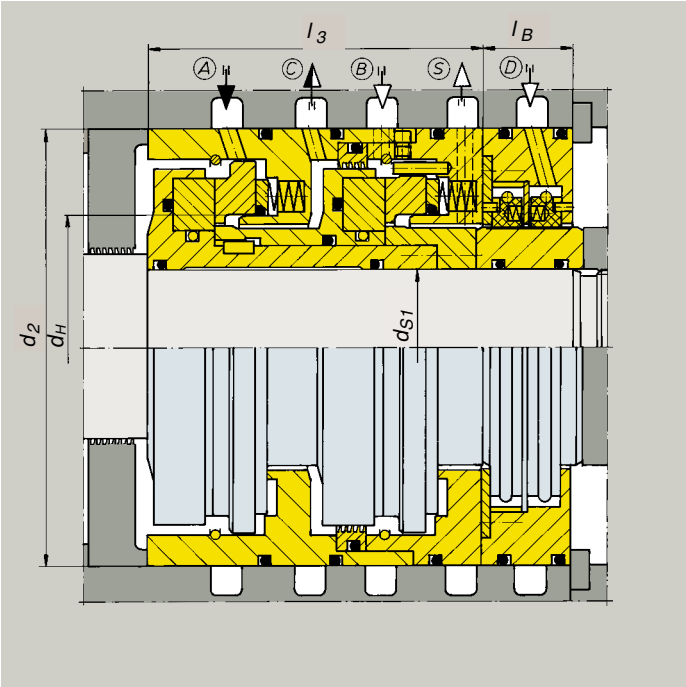
DGS
Tandem seal

Application: Where small product leakages of process gas are admissible, e.g. on gas pipeline compressors.

Seal on the atmosphere side acting as a safety seal.

The tandem arrangement provides a particularly high degree of operational safety. The seal on the product side and the seal on the atmosphere side are able to absorb the complete pressure differential. In normal operating conditions the full pressure is reduced only by the seal on the product side.

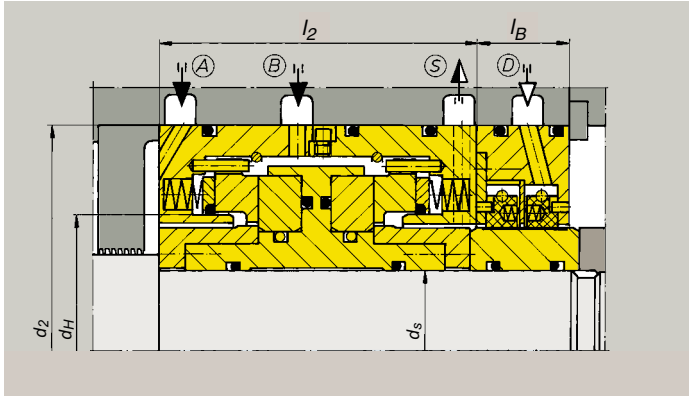
The space between the seal on the product side and the seal on the atmosphere side is cleared by a connection "C" to the flare. The pressure differential to be sealed by the seal on the atmosphere side equals the flare pressure, so the leakage to the atmosphere side or to the vent is very low. If the main seal fails, the second seal acts as a safety seal.



DGS
Tandem seal with intermediate labyrinth

Application: Where product leakages to the atmosphere as well as buffer gas leakages to the product are inadmissible, e. g. on H_2, ethylene or propylene compressors.

With this version the product pressure to be sealed is reduced via the seal on the product side. The entire process gas leakage is discharged via connection "C" to the flare. The seal on the atmosphere side is pressurized with buffer gas (nitrogen or air) via connection "B". The pressure of the buffer gas ensures that a current flows via the labyrinth to the flare outlet.



DGS
Double seal

Application: Where product leakages to the atmosphere are inadmissible. Buffer gas leakages into the product must be admissible (buffer pressure $p_3 > p_1$).
This seal is used when a neutral buffer gas of suitable pressure is available but no flare. Typical applications are to be found mainly in the petrochemical industry, e. g. on HC gas compressors.
A buffer gas, e. g. nitrogen, is fed between the seals via connection "B" at a higher pressure than the product pressure. One part of the buffer gas leakage escapes to the atmosphere side and the other part to the product.

d_n	d_s max.	d_{s1} max.	d_H	d_1 min.	d_2 min.	l_1 min.	l_2 min.	l_3 min.	l_B min.
49	37	31	61.7	102	106	40.0	73.0	81.0	25.5
56	44	38	69.9	111	115	40.0	73.0	81.0	25.5
63	51	45	76.8	118	122	40.0	73.0	81.0	25.5
68	58	52	83.9	129	133	40.0	73.0	81.0	25.5
73	63	56	88.8	134	138	48.0	89.0	98.0	25.5
78	68	61	93.8	139	143	48.0	89.0	98.0	29.5
83	73	66	98.7	144	148	48.0	89.0	98.0	29.5
88	78	71	103.7	149	153	51.0	95.5	104.5	29.5
93	82	76	108.7	155	159	51.0	95.5	104.5	29.5
98	87	81	113.7	160	164	51.0	95.5	104.5	29.5
103	92	86	118.6	165	169	51.0	95.5	104.5	29.5
108	97	91	123.6	170	174	51.0	95.5	104.5	29.5
113	102	96	128.6	175	179	51.0	95.5	104.5	29.5
118	107	101	133.6	180	184	51.0	95.5	104.5	29.5
123	112	106	138.6	185	189	52.5	99.0	108.0	29.5
130	119	113	150.5	197	201	52.5	99.0	108.0	29.5
135	124	118	155.5	202	206	55.5	99.0	113.0	29.5
140	129	123	160.5	207	211	55.5	99.0	113.0	29.5
145	134	128	165.5	212	216	55.5	99.0	113.0	29.5
150	139	133	170.5	218	222	55.5	99.0	113.0	29.5
155	144	138	175.5	223	227	55.5	99.0	113.0	29.5
160	148	141	181.4	233	237	59.5	109.0	121.0	29.5
165	153	146	186.4	238	242	59.5	109.0	121.0	32.5
170	158	151	191.4	243	247	59.5	109.0	121.0	32.5
180	168	161	201.4	253	257	59.5	109.0	121.0	32.5
190	178	171	211.4	263	267	64.0	118.0	130.5	32.5
200	185	178	221.3	273	277	64.0	118.0	130.5	32.5
210	195	188	231.3	283	287	67.0	120.0	135.5	32.5
220	205	198	241.3	293	297	72.0	129.0	145.5	32.5
230	215	208	251.3	303	307	72.0	129.0	145.5	32.5
240	225	218	261.3	313	317	72.0	129.0	145.5	32.5
250	235	228	271.3	323	335	77.0	138.0	155.5	32.5
260	245	236	282.2	338	350	82.0	145.0	165.0	32.5
270	255	246	292.2	348	360	82.0	145.0	165.0	32.5
280	264	256	302.2	358	370	87.0	154.0	175.0	32.5
290	274	266	312.2	368	380	87.0	154.0	175.0	32.5
300	284	276	322.2	378	390	87.0	154.0	175.0	32.5

PDGS / TDGS

PDGS

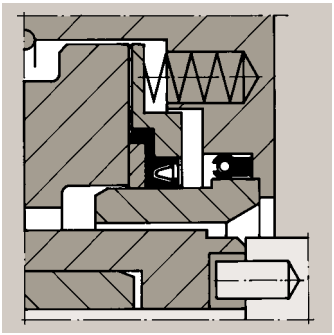
Elastomer-free, gas-lubricated compressor seal for **high pressure** and **low pressure** applications. The secondary sealing elements specially developed by Burgmann for this purpose are particularly effective in terms of automatic alignment and resistance to extrusion, temperature and chemicals. The operational reliability of the PDGS is accordingly very high.
Available as a single, tandem and double seal of cartridge design.

Special features

- no explosive decompression due to the use of a special PTFE compound
- controlled sliding forces prevent "catching" of the dynamic secondary seal; back-up ring and balancing sleeve made of tungsten carbide
- Material in compliance with NACE
- Optimal aerodynamic gas grooves ensure maximal stability of the gas film
- Diamond-coated sliding face

Operating limits (see note on page 1)

d_w = 25 ... 320 mm *0.98" ... 12.60"*
p_1 = 1 ... 350 bara *15 ... 5076 PSI*
t = –170 °C ...+230 °C *–274...446 °F*
v_g = ... 200 m/s *656 ft/s*



A dynamic secondary seal made of special PTFE compound, with back-up ring and balancing sleeve, of the type used in the PDGS.

TDGS

Elastomer-free, gas-lubricated **metal bellows seal** for single-stage **steam turbines.** The TDGS impresses with its wear-free operation and extremely low leakage rates.

Advantages

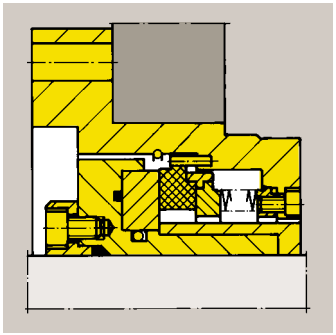
- No steam condensate in the bearing oil
- reduction of the temperature gradient between the seal and the bearing
- higher efficiency
- no or only minimal changes to the turbine necessary for conversion
- amortization in less than 1 year

Special features

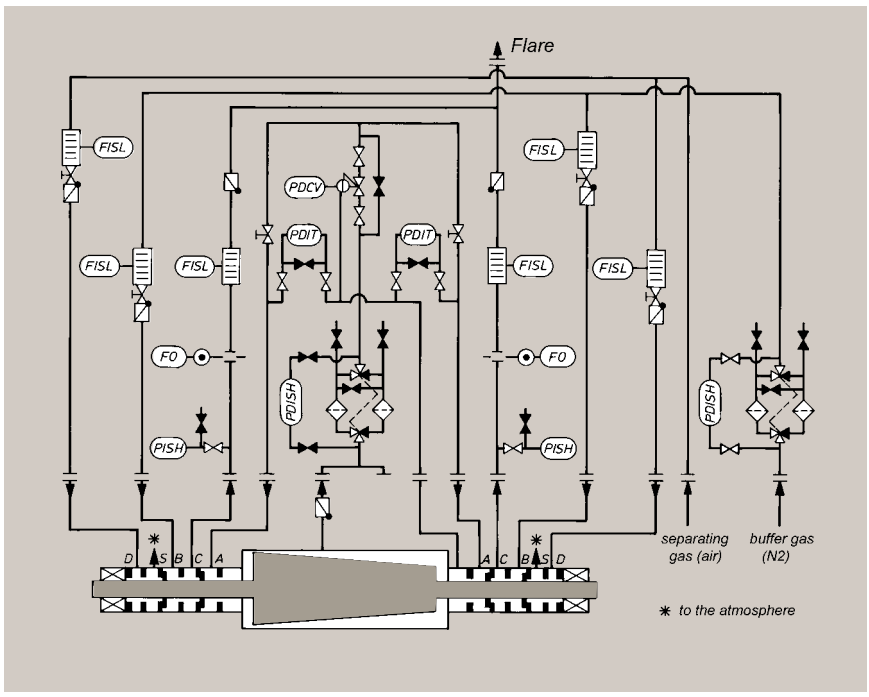
- stationary metal bellows
- combination of face materials SiC-Si/carbon graphite
- Statotherm® secondary seals
- bellows made of Inconel®
- open gas seal grooves (with self-cleaning effect resp. no clogging with contaminants)
- suitable for pressure reversals (vacuum mode)
- designed as a cartridge unit

Operating limits (see note on page 1)

d_w = 20 ... 180 mm *0.79" ... 7.09"*
p_1 = 25 bar *363 PSI*
t = –50 °C ...+450 °C *–58 ... 842 °F*
v_g = ... 130 m/s *427 ft/s*



CSR / SMS



CSR

Gas-lubricated **radial clearance** seal for compressors, gas turbines and other gas-conveying machines.The aerodynamic CSR consists of a segmented carbon graphite ring with a circumferential spring. Pockets worked into the inner face produce a radial lifting force, automatically resulting in a concentric gap of a few micrometers. In standstill mode the seal and the shaft are in contact with each other and have a good static sealing effect.

Features

- Contact-free operation with aero-dynamic groove pattern.
- Reduced gas consumption due to an extremely narrow gap.
- Segmented high duty salt-impregnated Electrographite Carbon ring.
- High start/stop wear resistance due to hard faced running surface such as, Tungsten Carbide.
- Comes as a ready-to-fit cartridge unit.

Operating limits (see note on page 1)

DN = 17 ... 320 mm
p_2 dynamic = 1.5 ... 2.2 bara
p_2 static = up to 11 bara
v_g = 10 ... 200 m/s
t = –20 ... +200 °C
Barrier gas = Air or Nitrogen
Barrier gas dew point
at operating pressure = –50 ... +20 °C
Runout of assembled shaft: 20 µm
Max. vibration peak to peak (in the area of the compressor bearing):
$S_{max} = 3.5 \cdot 25.4 \sqrt{12000/n_{max}}$
S_{max} = 275 µm (short term)

Inside a CSR-U radial clearance seal, independent of the direction of rotation
Fig. top: Cartridge version of the CSR radial clearance seal, dependent on the direction of rotation

SMS
Seal Management System

Today, more than 80% of all process machines in turbo compressor construction are equipped with gas seal systems comprising a gas-lubricated seal and a control system. The seal is buffered with clean inert gas to ensure reliable operation. Volumes of leaking gas are monitored, regulated and discharged in a controlled manner to ensure the seal's correct and efficient operation. The complete Burgmann sealing system comprises of the DGS dry gas seal and the SMS. For economical reasons a standard SMS is available which can be easily adapted to meet customers requirements.

The SMS performs the following functions:

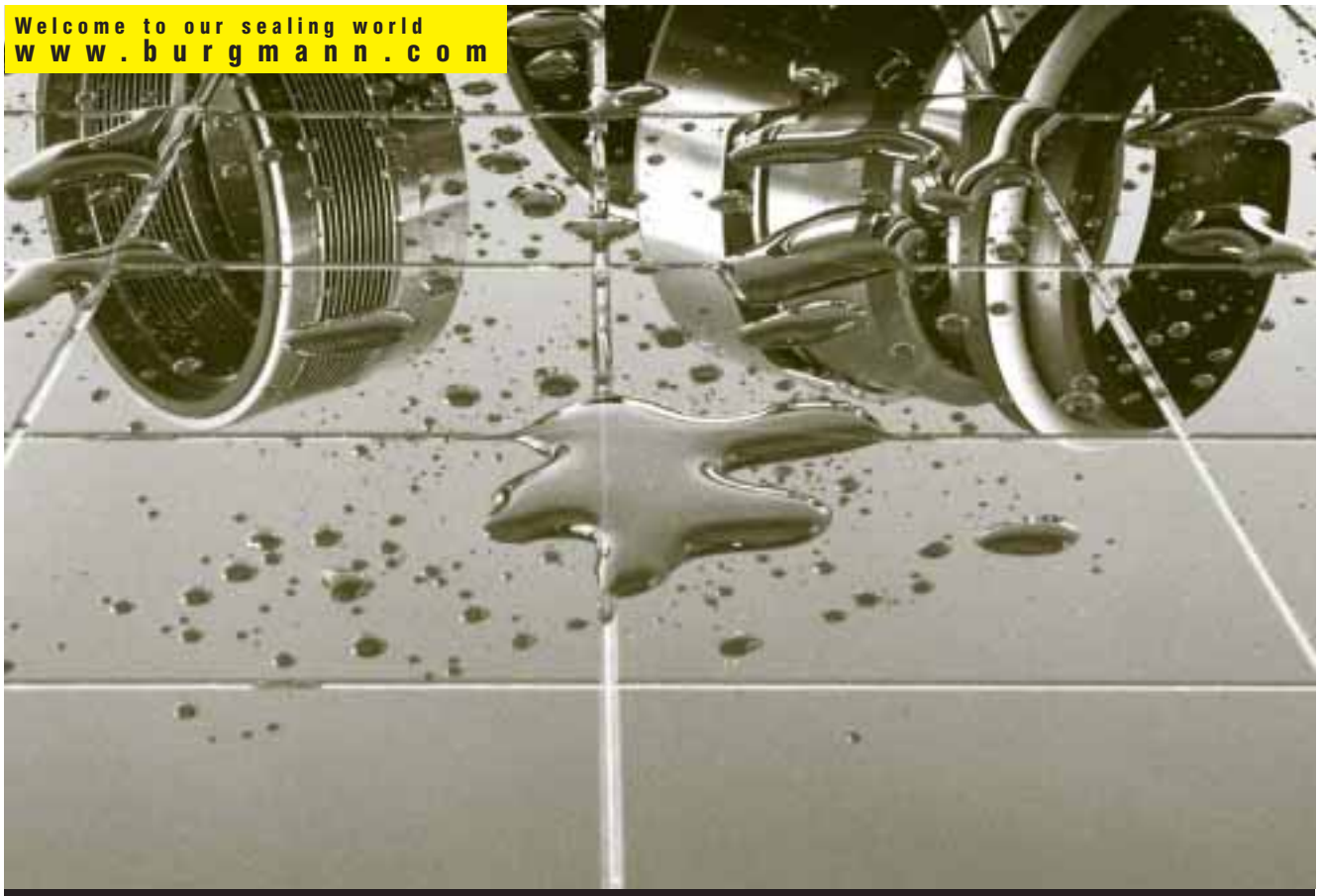
- Clean gas module:
  Supply of flushing gas
- Buffer gas module:
  Supply of buffer gas
- Leakage module:
  Monitoring of leakage
- Separation gas module:
  Monitoring of buffer seal

Operating principle

To prevent soiling of the sliding faces, gas is drawn from a higher pressure stage of the compressor, is filtered and injected onto the gas seal as clean "flushing gas". The leakage from the first gas seal stage is discharged to the flare for disposal. To prevent bearing oil from contaminating the gas seal, a further nitrogen or air buffer ("separating gas") is provided between the bearing and the gas seal.

Schematic diagram: Example of a gas supply system with differential pressure regulation for a tandem gas seal with intermediate labyrinth.

Photo below: SMS panel for an ammonia compressor (Sulzer Turbo).



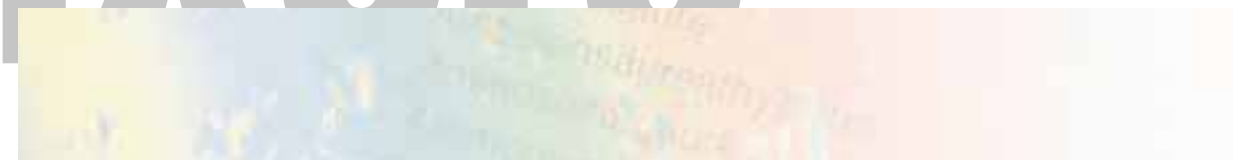
Leakproof for a clean environment.

To supply a good product is one thing. But what happens next...? The range of services offered by Burgmann goes way beyond the norm: from engineering, standardizations, application tests, installation, repairs, failure and damage analyses and seminars on sealing technology for your staff right through to software (SPIR) for flexible, economical replacement-part management.

BURGMANN

Mixers

Agitators, Mixers, Reactors



81 Mechanical Seals for Agitators, Mixers, Kneaders and Reactors

For top entry drives to DIN, PN 16
M481 (for steel/stainless steel tanks) 82
M461 (for glass-lined tanks) 84

For top/bottom/side entry drives
MR-D 86
MR33-D (for sterile processes) 87
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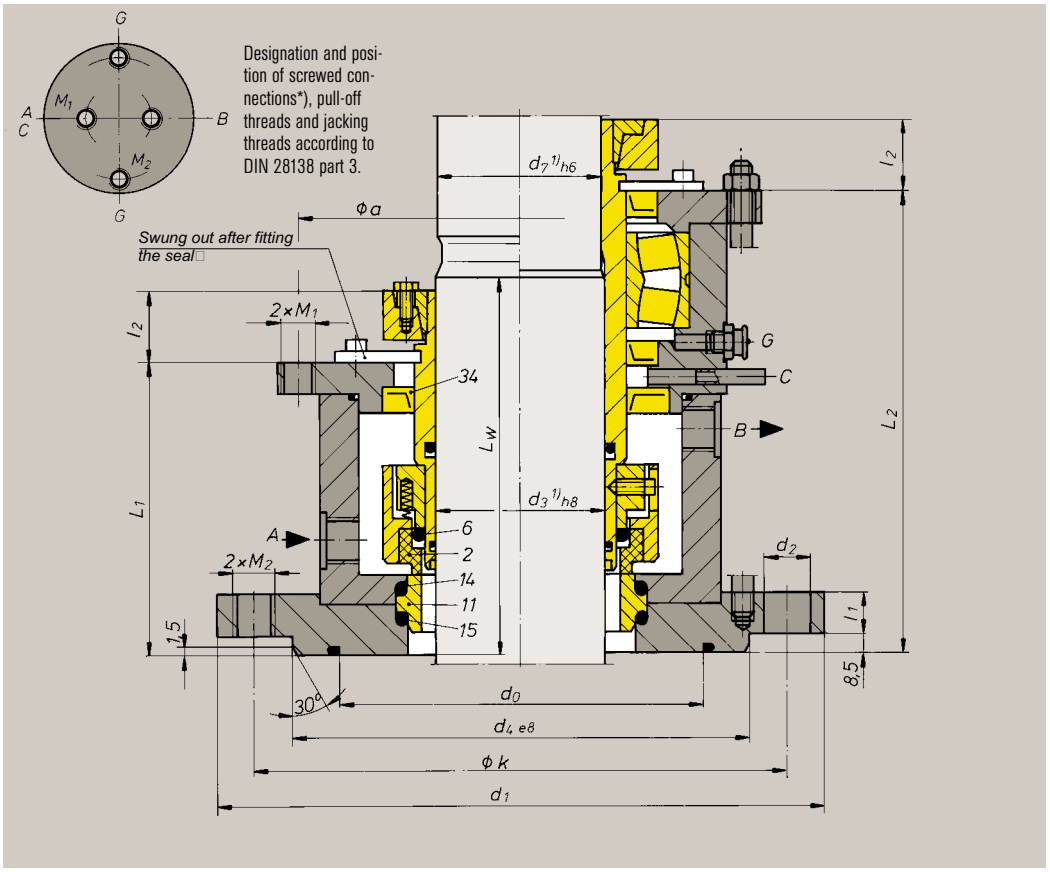
For top entry drives up to PN40
HS-D 88

For top/bottom entry drives up to PN250
HSH-D 89

Extras
STD shut-down seal 90
Special features 90
Code system 90

For top entry drives to DIN

M 481



- **Unbalanced**
- **Independent of direction of rotation**
- **Cartridge unit**
- **Connections according to DIN**

Agitator seals of the M481 range are factory assembled and tested units. For use on carbon steel and stainless steel vessels in conformance with **DIN 28136.** The fitting dimensions of the mounting flanges are in accordance with **DIN 28141.** The sleeve dimensions comply with shaft details given in **DIN 28154.** Torque transmission (according to DIN only by clamp connections) and additional options conform to the code system page 90.

Operating limits DIN 28138 Part 1 (see note on page 1)

d_1 = 40 ... 220 mm
p_1 = vacuum ... 6 bar (M 481 K-D and M481 KL-D: up to 16 bar)
t_1 = –30 (–80 °C...+200 (350) °C
–22 *(–112) °F ...+392 (662) °F*
(M481 K and M481 KL:
up to 150 (250) °C
v_g = 2 (5) m/s *6.6 (16.4) ft/s*

M 481 K

Single seal

M 481 KL

Single seal with integrated floating bearing

Operation of single seals only with pressureless quench

Item no.	Description
1	Seal face, on the atmosphere side
2	Seal face, on the product side
6	O-ring
7	O-ring
11	Stationary seat, on the product side
12	Stationary seat, on the atmosphere side
13	O-ring
14	O-ring
15	O-ring
34	Shaft seal

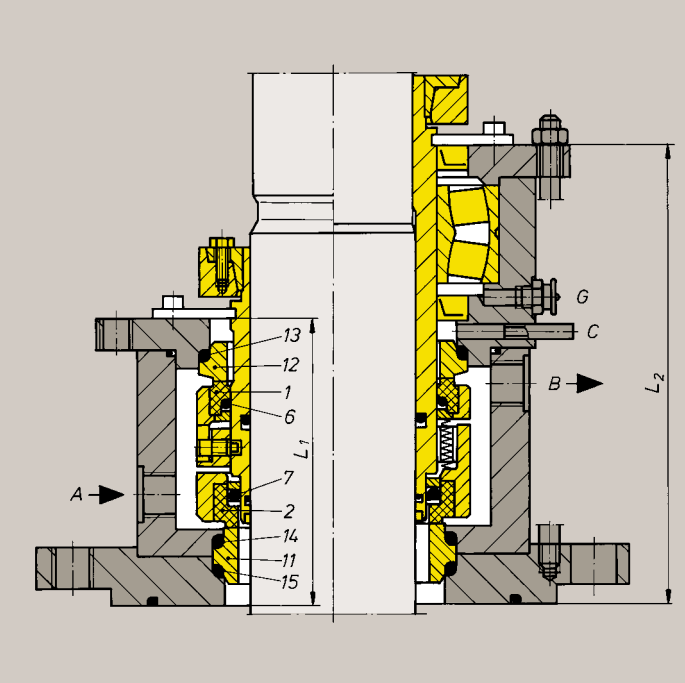
*) For reasons of standardization, the supply connections of single seals are matched to those of the double seals (in deviation from DIN 28138T3).

M 451 range

All types of the M481 range available for **straight, non-collared shafts** (all diameters). Seal identification: M451...! Customized design or e.g. different drives (torque transmissions) are possible.

Gas-lubricated sliding faces

Agitator seals of the 481 range are also available as gas-lubricated versions for DIN connections (AGS 481K-D, AGS 481KL-D). See page 66 and page 74.



M 481 K-D

Double seal

M 481 KL-D

Double seal with integrated floating bearing

These seals are designed to be self-closing on the product side, i.e. they will remain closed even with pressure variations or a pressure reversal.

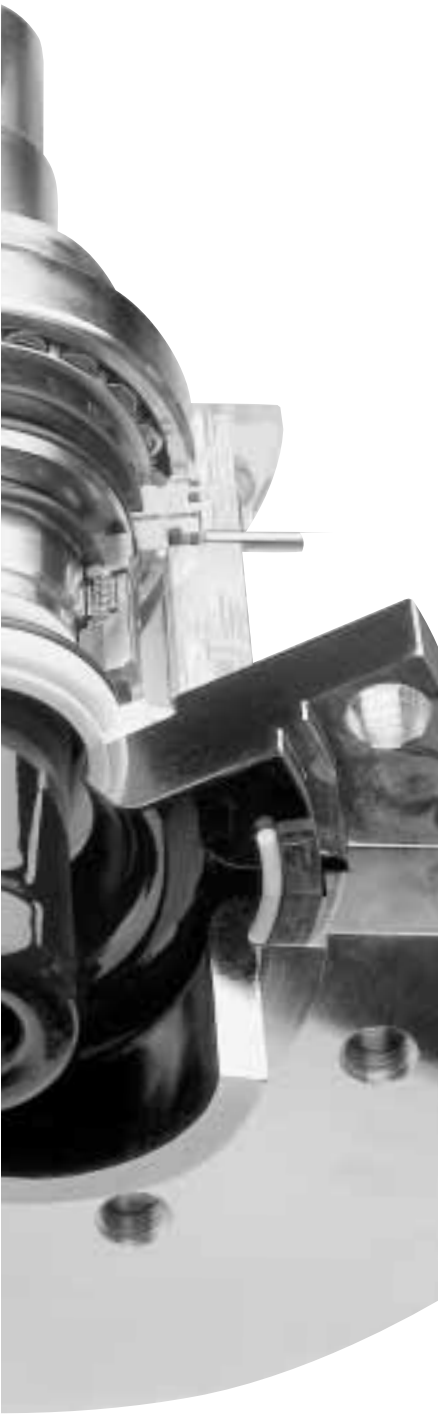
Operation is optionally the same as for the single version ($p_{max} = 6$ bar or $\Delta p_{max} = 6$ bar at $p_1 > p_3$). In view of the mechanical seal on the atmosphere side it can be used as a buffer pressurized double seal $p_1 = 16$ bar.

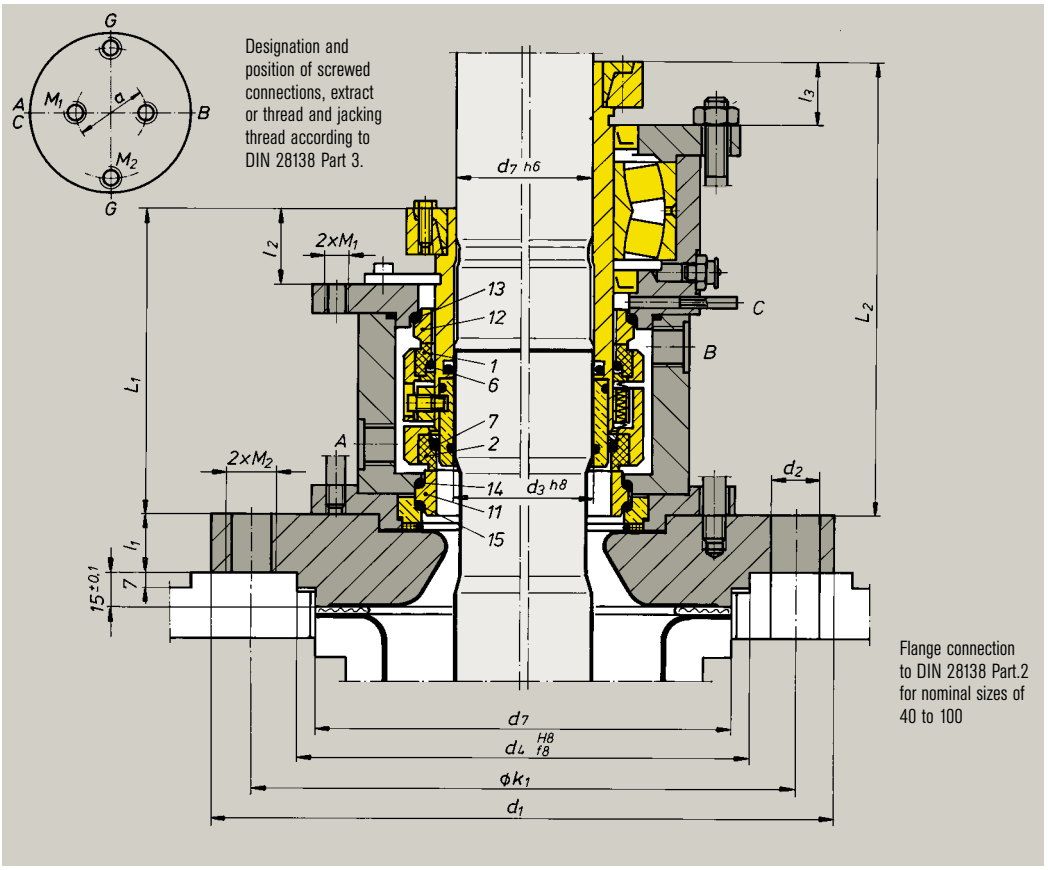
d_3 1)	d_7 1)	d_1	n x d_2	d_4	d_0	∅k	L_1	L_2	Lw 2)	l_1	l_2	a	M_1	M_2	A, B
40	38	175	4x18	110	90	145	110.5	159.5	143	15	28	122	M12	M16	G 3/8
50	48	240	8x18	176	135	210	114.5	174.5	148	17	28	157	M12	M16	G 3/8
60	58	240	8x18	176	135	210	119.0	181.5	158	17	28	168	M12	M16	G 3/8
80	78	275	8x22	204	155	240	133.0	217.5	168	20	34	203	M16	M20	G 1/2
100	98	305	8x22	234	190	270	137.5	218.5	178	20	34	228	M16	M20	G 1/2
125	120	330	8x22	260	215	295	138.5	233.5	203	20	40	268	M20	M20	G 1/2
140	135	395	12x22	313	250	350	152.5	250.5	208	20	40	285	M20	M20	G 1/2
160	150	395	12x22	313	265	350	161.0	253.0	213	25	40	297	M20	M20	G 1/2
180	170	445	12x22	364	310	400	166.0	263.5	233	25	45	332	M24	M20	G 1/2
200	190	445	12x22	364	310	400	171.0	271.0	243	25	45	352	M24	M20	G 1/2
220	210	505	16x22	422	340	460			263	25			M24	M20	G 1/2

1) Shaft diameters d_3 and d_7 to DIN 28154
2) Shaft step to DIN 28154

For top entry drives to DIN

M 461





- **For glass-lined vessels**
- **Unbalanced**
- **Independent of direction of rotation**
- **Cartridge unit**
- **Connections to DIN**

Vessel seals of the M461 range are factory assembled and tested cartridge units ready for fitting in special applications on glass-lined vessels to **DIN 28136.** The fitting dimensions of the mounting flange are in accordance with **DIN 28137 Part 2.** The sleeve dimensions comply with shaft details given in **DIN 28159.** All parts exposed to the product are of non-metallic construction. Torque transmission (acc. to DIN only by clamp connections) and additional options (with the exception of leakage drain) conform to the code system on page 90.

Operating limits to DIN 28138-T2 Part 2 (see note on page 1)

d_3 = 40 ... 160 mm *1.6" ... 6.3"*
p_1 = vacuum ... 16 bar *vac...230 PSI*
M461K(L) ... 6 bar *87 PSI*
t = –30 (–80) °C ...+200 (250) °C
–22 (–112) °F ... +392 (482) °F
v_g = 2 (5) m/s *6.6 (16.4) ft/s*

M461K-D

Double seal

M461KL-D

Double seal with integrated floating bearing

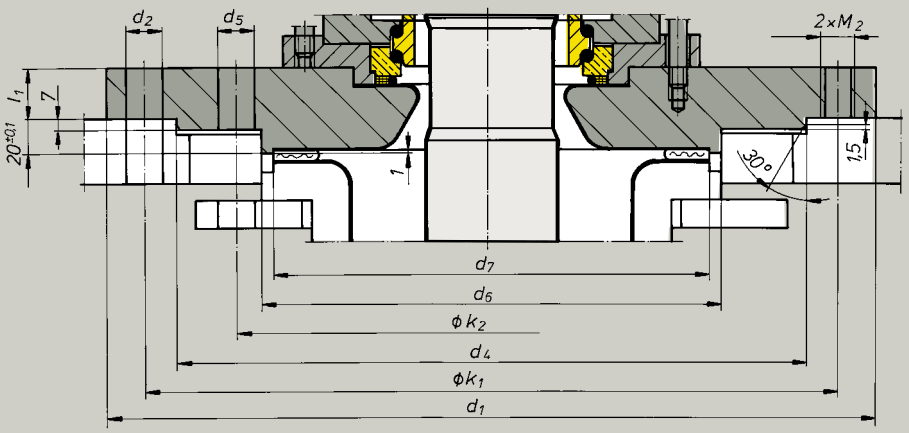
M56K(L)-D

Double seal with/without a floating bearing for PN25 (please refer to Burgmann for special version). Not illustrated.

Item	Description
1	Seal face, atmosphere side
2	Seal face, product side
6	O-ring
7	O-ring
11	Seat, product side
12	Seat, atmosphere side
13	O-ring
14	O-ring
15	O-ring
34	Lip seal

These seals are designed to be self-closing on the product side, i.e. they will remain closed even with pressure variations or a pressure reversal.
Operation optional as single seal ($p_{1\ max}$ = 6 bar or $\Delta\ p_{max}$ = 6 bar at $p_1 > p_3$.
In view of the mechanical seal on the atmosphere side, it can be used as a buffer pressurized double seal ($p_{1\ max}$ = 16 bar).
A ceramic intermediate sleeve is provided on the product side. This enables a pressure test of the seal cartridge to be made before assembly.
Due to the specific configuration of the seal flange, the seal can be lifted off the glass-lined flange ring as a complete cartridge. The sensitive glass lined flange remains mounted on the vessel. This avoid any damaging of the glass lined surface.

Gas-lubricated sliding faces
Agitator seals of the 461 series are also available as gas-lubricated versions for DIN connections (AGS 461 K-D, AGS 461 KL-D). See page 66 and page 74.



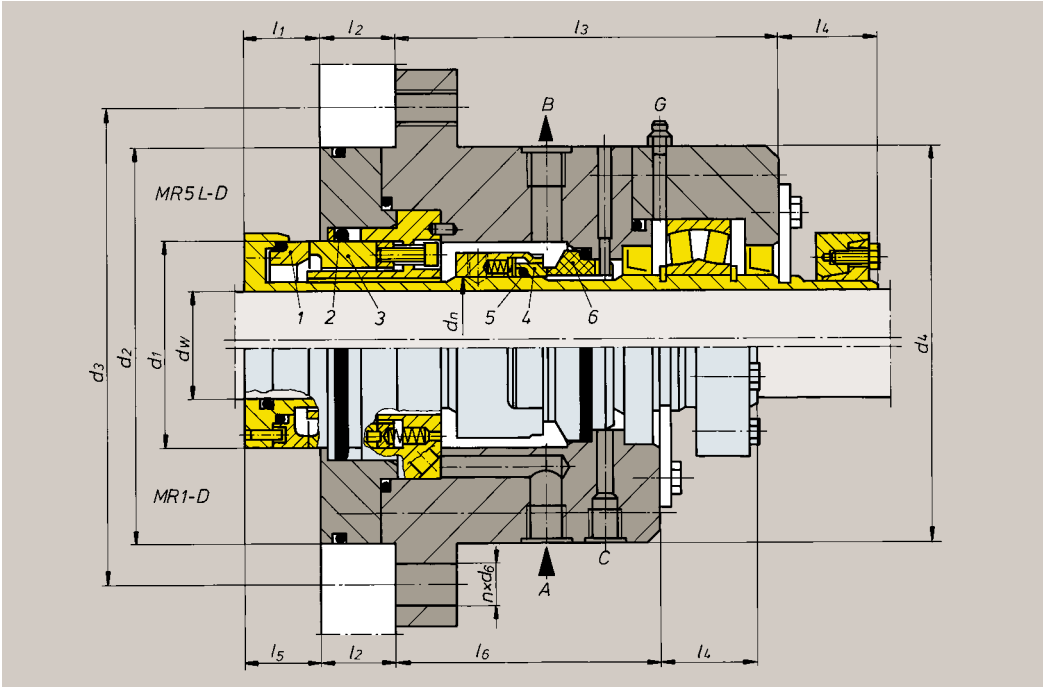
Flange connection to DIN 28138 Part 2 for nominal size 125 to 161.

d_3[1]	d_7[1]	Nominal size	Flange size[2]	d_1	n x d^2	d_4	n x d_5	d_6	d_7	∅k_1	∅k_2	L_1	L_2	l_1	l_2	l_3	l_4	l_5	M_1	M_2	A, B
40	38	40	E125	175	4x18	110	–	–	102	145	–	142	184	25	35	28	50	50	M12	M16	G3/8
50	48	50	E200	240	8x18	176	–	–	138	210	–	147	195	25	40	28	50	50	M12	M16	G3/8
60	58	60	E250	275	8x22	204	–	–	188	240	–	158	203	25	42	28	50	60	M12	M20	G3/8
80	78	80	E300	305	8x22	234	–	–	212	270	–	170	240	30	45	34	60	60	M16	M20	G1/2
100	98	100	E400	395	12x22	313	–	–	268	350	–	177	240	30	52	34	60	60	M16	M20	G1/2
100	98	100	E500	395	12x22	313	–	–	268	350	–	177	240	30	52	34	60	60	M16	M20	G1/2
125	120	125	E700	505	4x22	422	12x22	320	306	460	350	208	266	30	75	40	60	80	M20	M20	G1/2
140	135	140	E700	505	4x22	422	12x22	320	306	460	350	223	282	30	79	40	60	80	M20	M20	G1/2
160	150	160	E700	505	4x22	422	12x22	320	306	460	350	228	282	30	77	40	60	85	M20	M20	G1/2
160	150	160	E900	505	4x22	422	12x22	320	306	460	350	228	282	30	77	40	60	85	M20	M20	G1/2
160	150	161	E901	565	4x26	474	12x22	370	356	515	400	228	282	30	77	40	60	85	M20	M20	G1/2

1) Shaft diameters **d_3** and **d_7** to **DIN 28159**
2) Flange size to **DIN 28137T2**

For top, bottem and side entry drivers

MR-D



- **Double seal**
- **Independent of direction of rotation**
- **Rotating seat**
- **Cartridge unit**

Agitator seals of the MR-D range are ideal for applications involving sticky, pasty and dry media. They have been used successfully for many years already to seal all kinds of mixers, dryers, mills, mills, masticators and reactors in the plastic, paint, food and pharmaceutical industries.

The inboard seal features a rotating seat with a smooth profile without crevices where product can lodge and cause contamination. A special version is suitable for large axial shaft movements (up to 500 mm) and shaft deflections (please enquire).

Operating limits (see note on page 1)

d_1 = 15 ... 200 (500) mm
0.59" ... 7.87" (19.69")
p_1 = vacuum ... 14 (23) bar
203 (334) PSI
p_3 = 16 (25) bar *232 (363) PSI*
Δ_p (p_3 – p_1)
= max. 6 (10) bar, min. 2 bar
max. 87 (145) PSI,
min. 2 bar 29 PSI
t = –20 °C ... +200 (300) °C
–4 °F ... +392 (572) °F
v_g = 10 (20) m/s *33 (66) ft/s*

MR..-D
MR..L-D

with integrated floating bearing

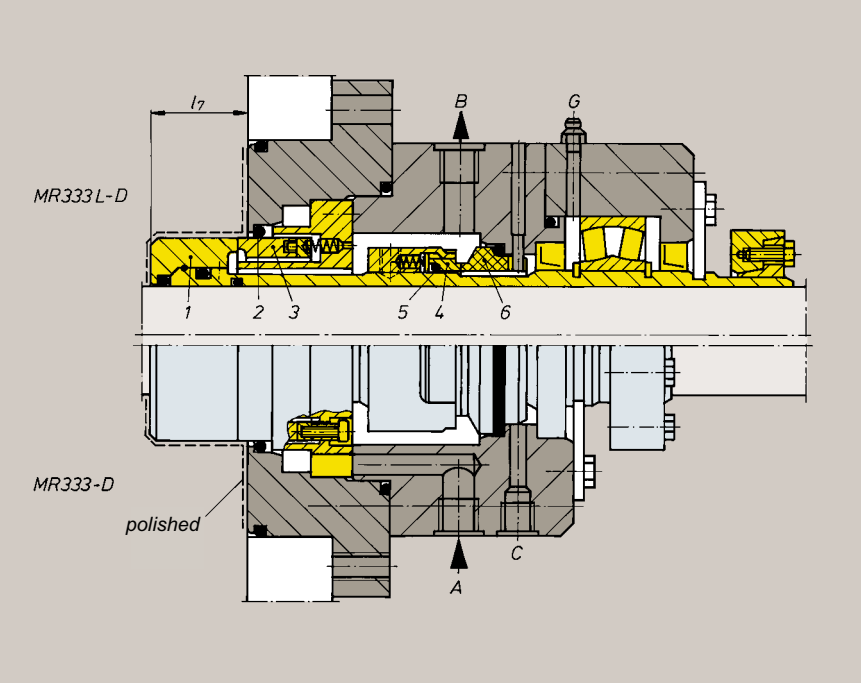
HSMR..(L)-D

rotating seat (Item 1) on product side, with hydrodynamic grooves

Item	**Description** (materials)
1	Seat, product side (U_2, Q_1, Q_2)
2	O-ring
3	Seal face, productside (A, B, V, Q_1, Q_2)
4	Seal face, atmosphere side (S, Q_1, Q_2)
5	O-ring
6	Seat (B, A, Q_1, Q_2)

Gas-lubricated sliding faces

Agitator seals for the MR-D series are also available as gas-lubricated designs (AGSR) for comparable applications as well as for sterile duty.
(Also refer to page 75)



MR333.-D

Version for sterile processes

MR333.L-D

with integrated floating bearing

HSMR333.-D

Rotating seat on product side, with hydrodynamic grooves.
Operating limits, dimensions, items and descriptions same as MR-D.

The MR333 series satisfies all criteria for sterile processes: polished faces on the product side, smooth surface structure without crevices.

Materials

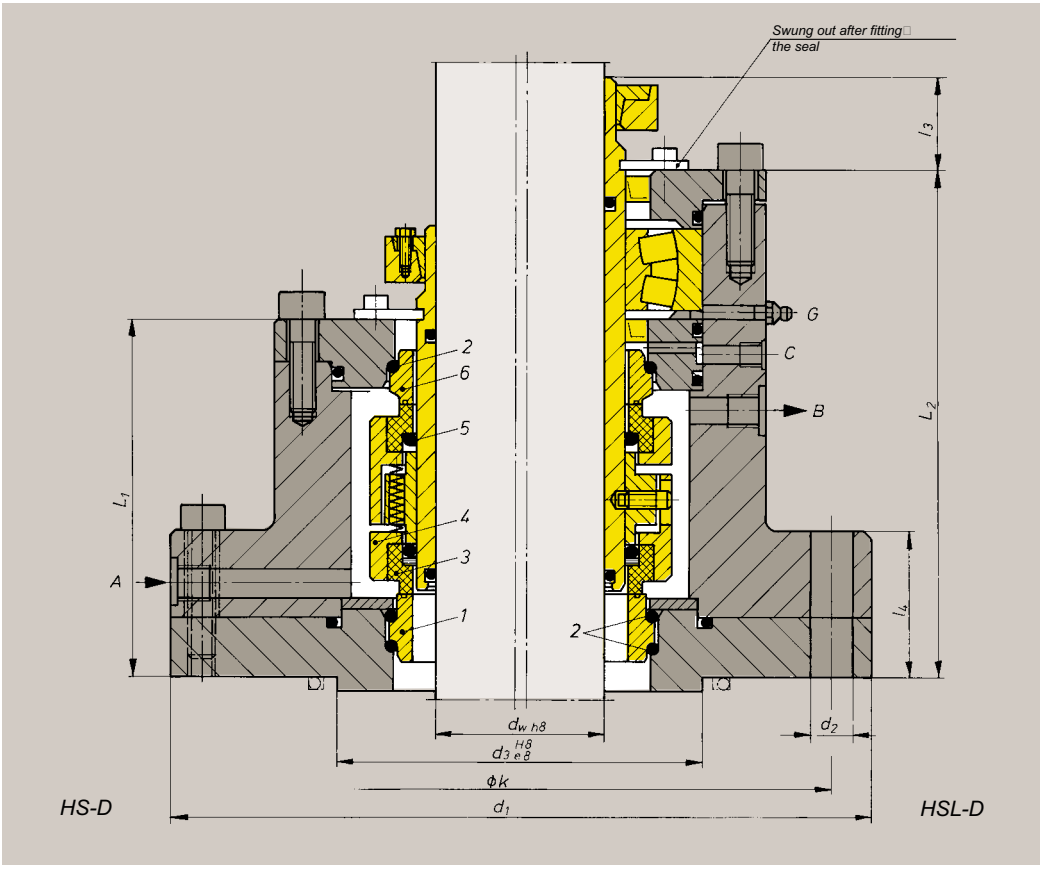
CiP/SiP-resistant and in accordance with FDA guidelines. Connections as aseptic threaded couplings, e.g. according to DIN 11851.

d_N	d_w	d_1	d_2	d_3	d_4	l_1	l_2	l_3	l_4	l_5	l_6	l_7	A, B	C	n x d_6
30	20	52	117	140	118	22	30	114	30	35	75	41	G 3/8	G 1/8	6 x 12
35	25	58	124	150	128	22	30	127	30	35	85	41	G 3/8	G 1/8	6 x 12
40	30	62	134	165	138	24	30	129	30	35	87	41	G 3/8	G 1/8	6 x 12
45	35	68	140	175	148	24	30	130	30	35	87	41	G 3/8	G 1/8	6 x 12
50	40	75	146	175	148	26	30	133	34	35	90	41	G 3/8	G 1/8	8 x 12
55	45	82.7	150	175	148	26	30	135	34	35	90	41	G 3/8	G 1/8	8 x 12
65	50	90	170	195	168	30	30	160	34	41	105	41	G 3/8	G 1/8	8 x 12
70	55	95	175	205	178	30	30	160	34	41	105	41	G 3/8	G 1/8	8 x 12
75	60	100	180	205	178	30	30	160	34	41	105	41	G 3/8	G 1/8	8 x 12
80	65	110	190	220	188	30	40	190	44	41	105	41	G 3/8	G 1/8	8 x 14
85	70	115	195	230	198	30	40	190	44	41	105	41	G 3/8	G 1/8	8 x 14
90	75	120	200	230	198	30	40	190	44	41	105	41	G 3/8	G 1/8	8 x 14
100	80	130	210	240	208	30	40	190	44	41	105	45	G 3/8	G 1/4	8 x 14
105	85	135	215	250	218	30	40	190	44	41	105	45	G 1/2	G 1/4	8 x 14
110	90	140	230	260	228	31	40	190	44	41	110	45	G 1/2	G 1/4	8 x 14
115	95	145	235	270	238	31	40	190	44	41	110	45	G 1/2	G 1/4	8 x 14
120	100	150	240	270	238	31	40	200	44	42	120	46	G 1/2	G 1/4	8 x 14
130	110	160	255	290	258	31	40	200	50	42	120	46	G 1/2	G 1/4	8 x 14
140	120	172	265	305	268	41	50	220	50	43	130	46	G 1/2	G 1/4	8 x 18
150	130	185	275	315	278	41	50	220	50	43	130	46	G 1/2	G 1/4	8 x 18
160	140	195	290	335	298	41	50	220	50	43	130	46	G 1/2	G 1/4	8 x 18
170	150	205	300	335	298	45	50	220	50	47	130	46	G 1/2	G 1/4	8 x 18
180	160	220	330	355	323	45	50	250	50	47	140	46	G 1/2	G 1/4	8 x 18
190	170	230	343	375	358	45	50	250	55	47	140	46	G 1/2	G 1/4	8 x 18
200	180	240	363	395	358	45	50	250	55	47	140	51	G 1/2	G 1/4	8 x 18
220	190	270	393	425	388	45	50	250	55	50	140	51	G 1/2	G 1/4	12 x 18
230	200	280	393	425	388	45	50	300	55	50	160	51	G 1/2	G 1/4	12 x 18

The MR5LF-D with integrated bearing and directly mounted chopper (knife mill) for tanks with bottom entry drive.

For top entry drives

HS-D



- **Double seal**
- **Independent of direction of rotation**
- **Cartridge unit**

Agitator seals of the HS-D range are designed for medium-to-high pressure applications. HS(L)-D, unbalanced, for up to PN25. Operation only with pressurised buffer fluid. **The code system shown on page 90 does not apply,** but the additional options and drives described on page 90 are available. Please specify separately.

HS ... -D

Double seal, unbalanced.

HSL-D

Double seal, unbalanced, with integrated floating bearing.

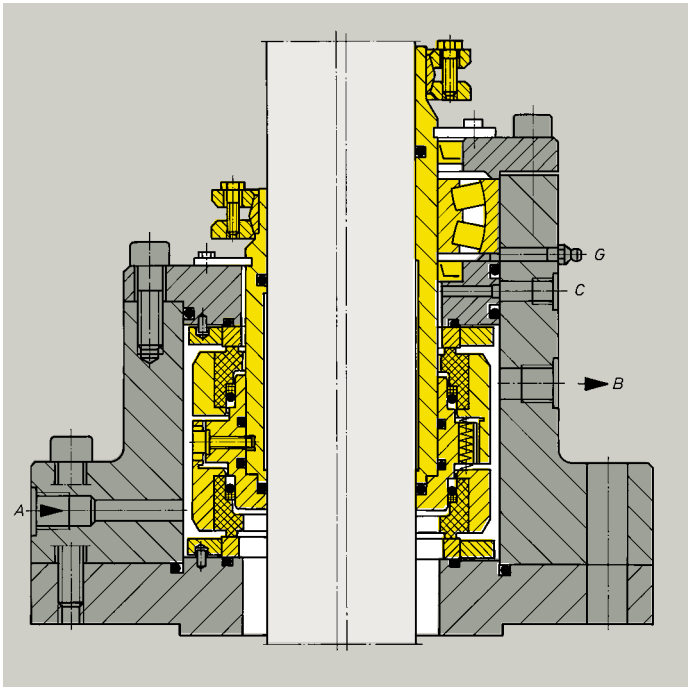
Item no.	Description
1	Stationary seat
2	O-ring's
3	Seal face
4	Seal face housing
5	O-ring
6	Stationary seat on the atmosphere side

Operating limits (see note on page 1)

d_w = 20 ... 500 mm *0.8" ... 20"*
p_1 = vacuum ... 25 (40) bar
vac. ... 362 (580) PSI
t = –30 (80) °C ... +200 (350) °C
–86 (176) °F ... +392 (662) °F
v_g = 5 m/s *16.5 ft/s*

d_w	d_1	n x d_2	d_3	∅k	L_1	L_2	l_3	l_4
40	200	6 x 18	80	170	115	170	35	45
50	230	8 x 18	100	200	120	185	35	55
60	255	8 x 18	120	225	140	210	35	60
80	295	8 x 23	145	260	145	230	44	60
100	315	8 x 23	170	280	160	245	44	65
120	345	8 x 23	190	310	160	250	50	65
140	380	12 x 23	215	345	165	265	50	65
160	440	12 x 27	240	395	185	300	50	75
180	475	12 x 27	260	430	185	310	55	75
200	465	12 x 27	290	420	190	290	55	75

HSH-D

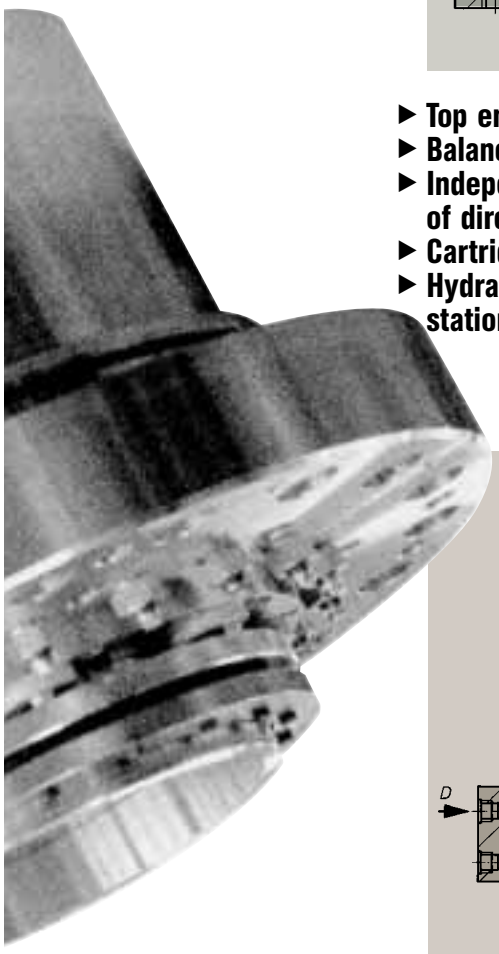


Agitator seals of the HSH-D range are designed and built specially for high-pressure applications. They are operated solely with pressurised buffer fluid. Dimensions available on request.

Operating limits

d_w = 20 ... 350 mm *0.8" ... 13.8"*
p_1 = ... 250 bar*) *... 3625 PSI*
t = –30 (–80) °C ... 200 (350) °C
–22 (–176) °F ... 392 (662) °F

*) according to the size as from 100 ... 150 bar tandem seal design (pressure reduction in 2 stages)



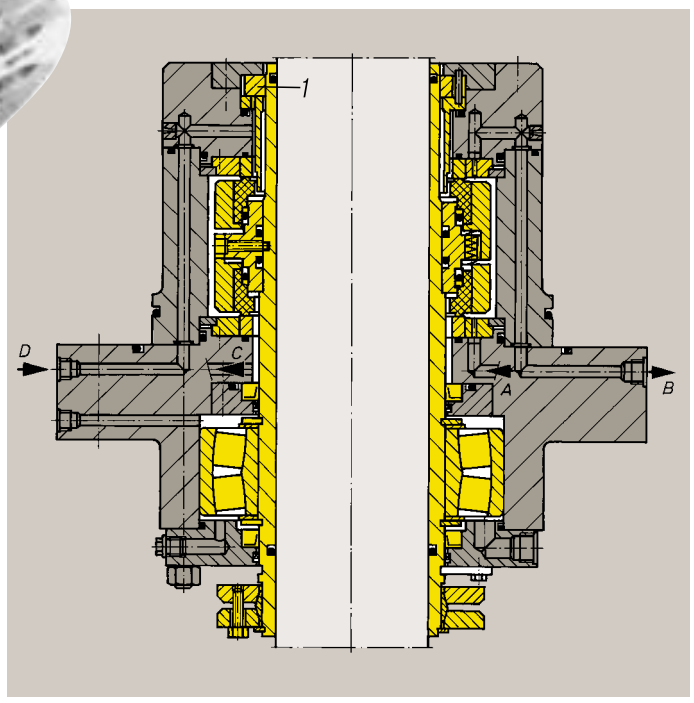
- **Top entry drive**
- **Balanced**
- **Independent of direction of rotation**
- **Cartridge unit**
- **Hydraulically balanced stationary seats**

HSH(V)-D

Double seal

HSH(V)L-D

Double seal with integrated floating bearing (axial thrust bearing on request)



Agitator seal of the HSHU-D range are typical of the kind often used in the production of plastics. On the product side the combination of floating throttle ring (1) and flush (D) prevents plastic powder entering the primary sealing area.

Operating limits (see note on page 1)

(guide values)
d_w = ... 350 mm *... 13.8"*
p_1 = 60 bar *870 PSI*
t = –60 ... +200 °C
–76 °F ... +392 °F

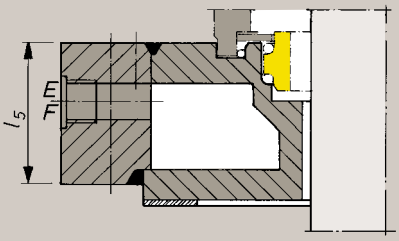
- **Bottom entry drive**
- **Balanced**
- **Independent of direction of rotation**
- **Cartridge unit**

HSHLU-D

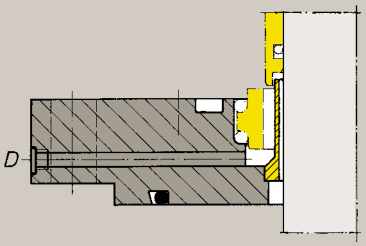
Double seal for bottom entry drive

Optional extras

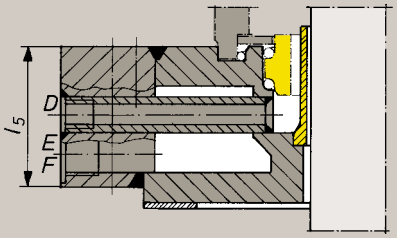
Additional options



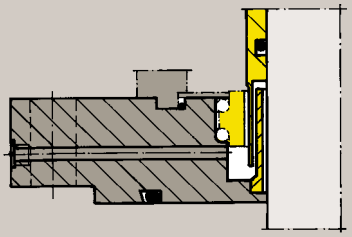
Cooling flange t_{max} = 350 °C
(can also be used as a heating flange)



Leakage drain
(can also be used as a flush)

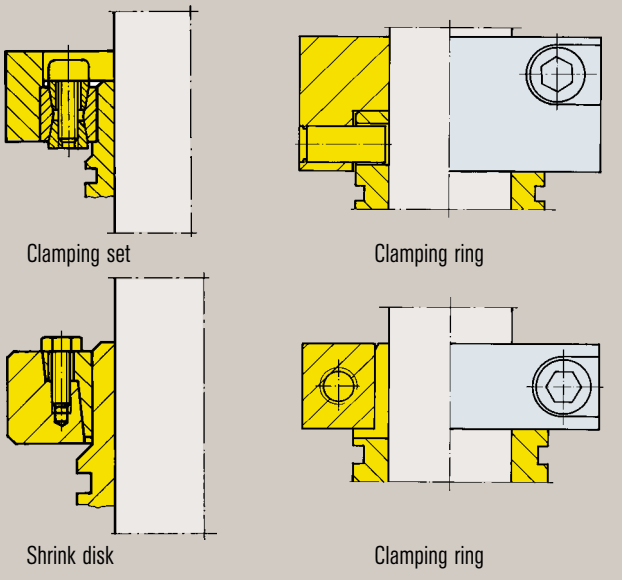


Leakage drain and cooling flange



Polymerization buffer
(can also be used as a leakage drain or flush)

Types of drive



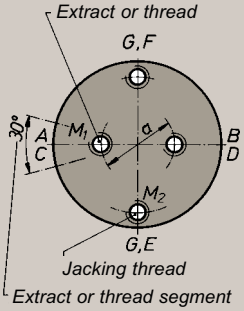
Clamping set

Clamping ring

Shrink disk

Clamping ring

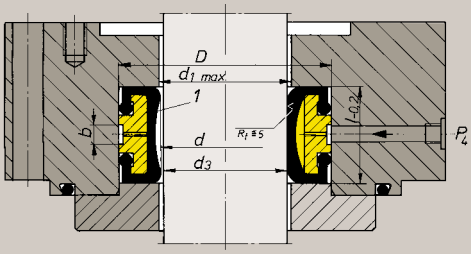
Screwed connections



Designation and position in accordance with DIN 28138 T3.

A = Buffer fluid resp. quench IN
B = Buffer fluid resp. quench OUT
C = Drainage
D = Leakage drain G 1/8
E = Coolant IN G 3/8
F = Coolant OUT G 3/8
G = Grease point

Shut-down seal (vessel containment)



STD1

If an STD is employed, it is possible to change seals with the vessel loaded and under pressure (shaft must be stationary!) This seal is only used if the product does not harden or congeal during the shut down period. It cannot be used if PTFE is required or for sterile operation (fermenting vessels).
Can be installed in all aspects. Fitting dimensions in accordance with DIN 28138 Part 1 are possible.

Operating limits

d_w = 40 ... 200 mm
1.6" .. 8"
p_1 = 16 bar *232 PSI*
t = 100 °C *212 °F*
Elastomer sealing element (Item no. 1) with pneumatic or hydraulic actuation (closing pressure $p_4 > p_1$).

d_3	D	d	d_1	l	b
40	76	42.5	42	38.0	8
50	84	52.5	52	38.0	8
60	95	62.5	62	44.5	10
80	118	82.5	82	45.0	10
100	138	102.5	102	45.0	10
125	160	127.5	127	45.0	10
140	180	143.5	143	50.0	12
160	200	163.5	163	50.0	12
180	215	183.5	183	50.0	12
200	240	203.5	203	50.0	12

Code system for DIN seals

M . . . – . . . / d_w – . .

Range
(M45 ... 56)

Customer-specification

Shaft diameter

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

Type
D = double seal

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

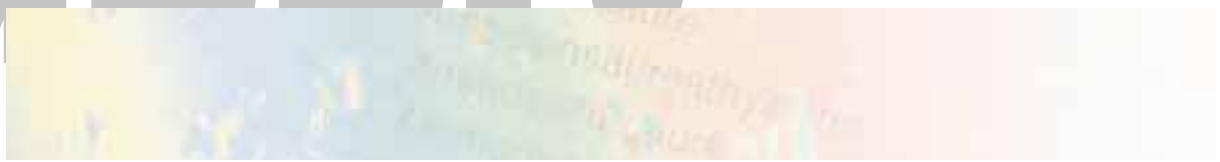
Drive
1 – set screw
2 – shrink disk
3 – clamping collar
4 – key
5 – flange (shaft sleeve)
6 – shaft sleeve with flange and key
7 – clamping set
8 – muff coupling
9 – customer-specification

1) If several features apply, the code letters are listed one after the other.

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

Supply

Supply Systems



91 Supply Systems and Components for Liquid-lubricated Mechanical Seals

Function and technology data . . .92/93
QFT quench system 94/95
TS1000 thermosiphon system 96
TS2000 thermosiphon system 97
TS3016 thermosiphon system 98
TS3000 thermosiphon system 99
TS6050 thermosiphon system 100
DRU2000 pressure booster 101
SPU circulating pump 102
SPN manual refill pump 102
SP23-... measuring unit 102
SPI measuring unit 103
SPL level indicator 103
SPS level switch 103
SPK contact unit 103
SPN1000/3000 refill units 104
HPS screw pump 105
WDK heat exchanger 105
WED, WEL heat exchanger 106
ZY cyclone separator 107
MAF magnetic filter 108
MAA magnetic separator 108

SPA/SPO buffer fluid system 109

DHE pressure retaining unit 110
DRE pressure control unit 110
VTE distributor unit 110

Supply systems

In some cases, for mechanical seals to function correctly the conditions in which they operate must be altered. This depends on the seal type, the duty conditions including environmental protection, and the type of equipment into which the seals are fitted.
A simple change to a single seal's operating conditions in a dead-end arrangement can be made, for instance, by adding a recirculation line from the pump discharge to the seal chamber (API Plan 1).

As operational demands increase, so too must the capabilities of the supply units to support the mechanical seal.
The following section contains the necessary information for the correct selection of supply systems and auxiliary equipment to ensure reliable operation of your mechanical seals.

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 DIN ISO 5199, Appendix E, Plan No. 08a or API 610, 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 buffer 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

Burgmann mechanical seal type MFLWT80/S1-FD/58-E3 with thermosiphon system TS2000/M073-A1 to seal ethylene oxide (Sulzer pumps).

- Cooling or heating of the outboar side of the mechanical seal.

Steam quench

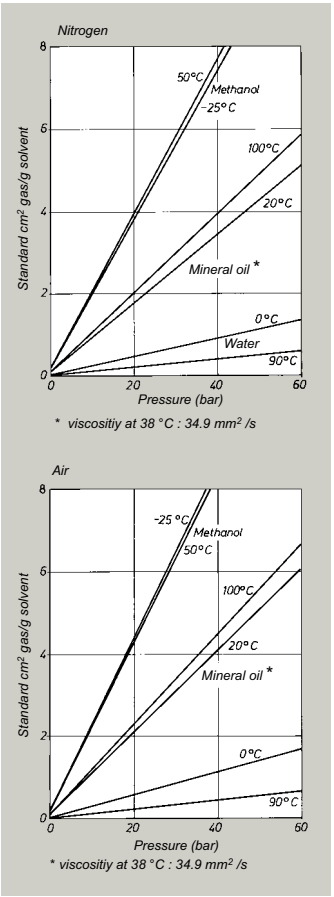
- Heating: For media with a high melting point the vapour quench prevents the leakage from solidifying in that area of the mechanical seal critical for its proper functioning
- Exclusion of air
- Removal of leakage

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



Buffer systems

To guarantee the correct working of double mechanical seals, the buffer interspace (between the product side and the atmosphere side of the mechanical seal) must be completely filled with clean buffer medium.
Before starting up double mechanical seals it is vital, therefore, to ensure a sufficient rate of circulation of the buffer fluid The buffer fluid pressure should lie 10 % or at least 1.5 to 2 bar above the maximum pressure to be sealed. The flow rate must be controlled to ensure that the temperature of the buffer 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 buffer 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 buffer system must perform the following functions:

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

Buffer 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 buffer fluid system (e.g. SPA). After each circuit the buffer fluid is relieved and collected in a pressureless tank.

● Closed circuit

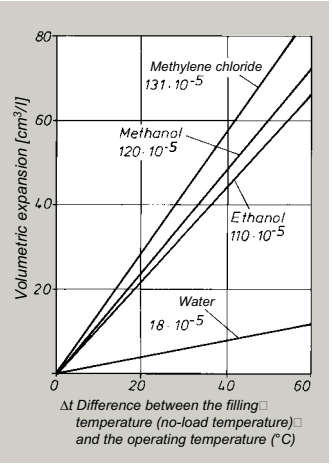
In this type of circuit all the components are kept under the same pressure. Pressure is applied by means of nitrogen (TS system) or the process medium pressure (DRU system), or via a refill system (SPN). Pressure loss in the circuit must be taken into account when drawing up the design.

Buffer medium

The buffer 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 buffer 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 buffer medium must not contain any solids. It is particularly important that liquid buffer 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 buffer fluid circuits.

To prevent damage to the TS and sealing system, due allowance must be made for the coefficients of volumetric expansion of the buffer fluids used.



Volumetric expansion of various buffer media

Systems and Components

The table shows which systems and/or components we recommend for the various operating modes of mechanical seals to conform with the most common API plans.

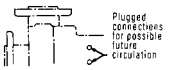
The actual operating and duty conditions also play a key role in selection. It is imperative, therefore, to consult one of Burgmann's experienced specialists before taking any final decisions about an application for which you have inadequate experience.

	Type	Page	Circulation system to API 610/682 Plan …										
			21	22	23	31	41	51	52	53A	53B	53C	54
Systems	QFT	94						●					
	TS1000	96							●	●			
	TS2000	97							●	●			
	TS3000	98							●	●			
	TS6000	100							●	●			
	DRU	101										●	
	SPO	104									●		
	SPA	109											●
Components	WDK	105	●	●	●		●				●		
	WED	106	●	●	●		●				●		
	WEL	106	●	●	●		●				●		
	ZY	107				●	●						
	MAF	108			●								
	MAA	108			●								
	HPS	105								●	●	●	
	SPU	102								●	●	●	
	SPN autom.	104								●	●		
	SPN manual	104								●	●	●	
	VTE	110											●
	DRE	110											●
	DHE	110											●
	SPK	103								●		●	
	SPS	103								●			
	SPL	103								●			
	SPI	103								●	●	●	
	SP23	102		●	●					●	●	●	

Circulation Systems to API 610/682

Clean pumping media

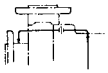
Plan 1
Internal circulation from the pump case to the seal.



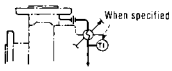
Plan 2
Dead end seal chamber with no circulation. Stuffing box cooling and a neck bush are necessary, unless otherwise specified.

Plan 11
Circulation from the pump case, through an orifice and to the seal.

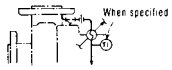
Plan 12
Circulation from the pump discharge, through a strainer and an orifice to the seal.



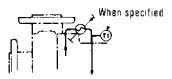
Plan 13
Circulation from the seal chamber, through an orifice and back to pmp suction.



Plan 21
Circulation from the pump case, through an orifice and a cooler to the seal.



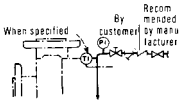
Plan 22
Circulation from the pump case, through a strainer, an orifice and a cooler to the seal.



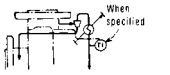
Plan 23
Circulation by means of a pumping ring from the seal, through a cooler and back to the seal.

Contaminated and special pumping media

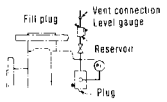
Plan 31
Circulation from the pump case through a cyclone separator.



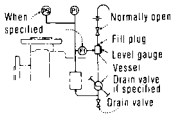
Plan 32
Injection of clean fluid into the seal chamber from an external source.



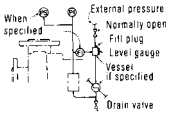
Plan 41
Circulation from the pump case through a cyclone separator, and clean fluid through a cooler to the seal.



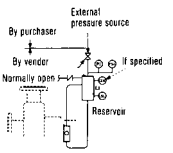
Plan 51
Dead-end quench (usually methanol)



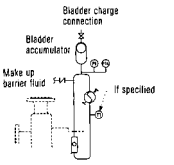
Plan 52
External fluid reservoir, pressureless, thermosiphon or forced circulation as required.



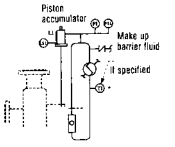
Plan 53
External fluid reservoir, pressurized, thermosiphon or forced circulation as required.



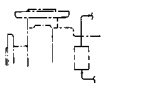
Plan 53A
Circulaton with thermosiphon system, pressurized. Forced circulation by pumping ring or circulation pump.



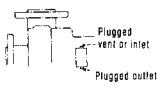
Plan 53B
Circulation with bladder accumulator and cooler, pressurized. Forced circulation by pumping ring or circulation pump.



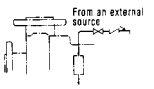
Plan 53C
Circulation with pressure booster (DRU) and cooler. Pressurized by reference pressure of seal chamber. Forced circulation by pumping ring or circulation pump.



Plan 54
Circulation of clean fluid from an external system.



Plan 61
Tapped connections for the customer's use.



Plan 62
External fluid quench (steam, gas, water, etc.).

Legend:

- Cooler
- Cyclone separator
- Strainer
- Flow control valve
- Block valve
- Nonreturn valve
- Orifice

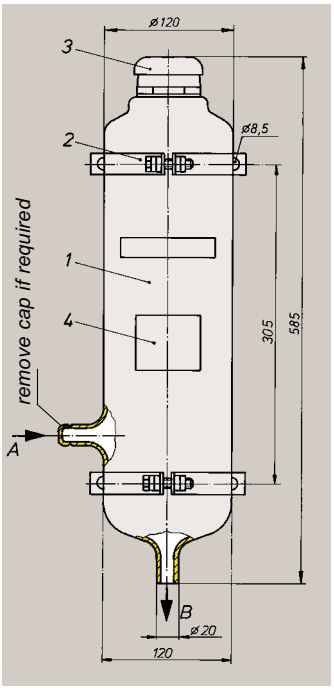
FI	Flow indicator
LI	Level indicator
LSH	Level switch MAX
LSL	Level switch MIN
PI	Pressure indicator
PS	Pressure switch
PSL	Pressure switch MIN
TI	Temperature indicator

Quenching fluid system

QFT

Quenching fluid systems are used to supply single or tandem mechanical seals. They act as a convenient fluid reservoir. The exchange of fluid takes place by the thermosiphon principle or by forced circulation, e.g. with a pumping screw. Quenching fluid systems are employed:

- **to absorb leakage**
- **to monitor the leakage rate (e.g. through periodic reading of the level in the tank)**
- **to lubricate and to cool the outboard mechanical seal in a tandem arrangement**
- **to prevent icing**
- **to protect against dry running**
- **to stabilize the lubricating film**
- **to exclude air from the media in order to prevent a reaction with oxygen in the air.**



QFT 1000

Quenching fluid tank

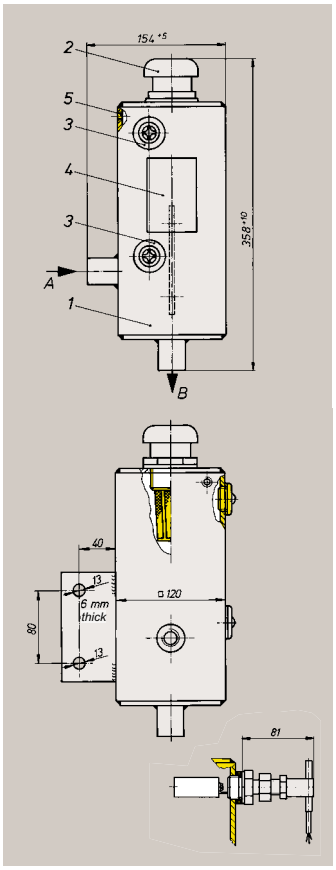
made of transparent polyethylene, complete with clips made of stainless steel. Resistant to water, glycerine, glycols and methanol; not resistant to mineral oils and toluene.

Item	Description
1	Storage tank (capacity 4 l)
2	Clip
3	Inlet filter with vented cap
4	Name plate

Versions

QFT 1000-A004-00
with external level indicator

QFT 1000-M001-00
with threaded coupling for connecting a pipe Ø 10 mm

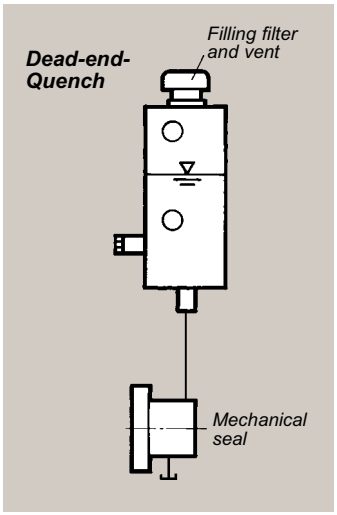


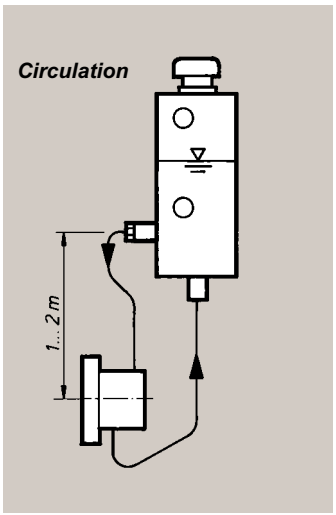
Technical data

Operating pressure: pressureless
Operating temperature:
–30 °C ... +70 °C (OFT 1000)
–30 °C ... +200 °C (QFT 2000 with metal filter, QFT 3000)

Connections

A to the mechanical seal
B from the mechanical seal
C filling





QFT 2000

Quenching fluid tank

made of stainless steel with sight-glasses for MIN/MAX levels. Lug fixture, overflow for the selective discharge of leakage.

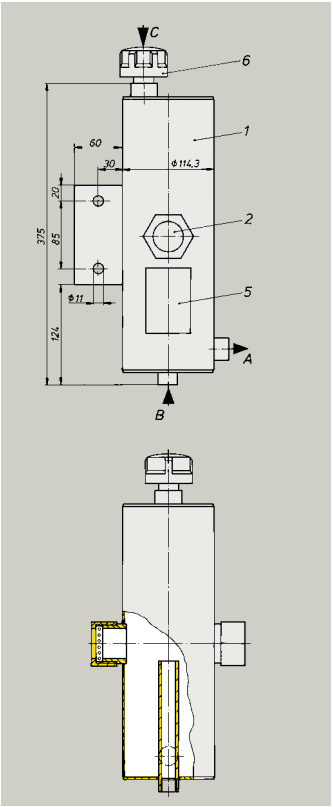
Item	Description
1	Storage tank (capacity 3 l)
2	Inlet filter with vented cap
3	Sight-glass or level switch
4	Name plate
5	Overflow G 1/8

Level switch (Item 3)
Contact points when using the level switch as a

- MAX contact: 1.8 l above the centre of the bottom sight-glass
- MIN contact: 0.25 l above the centre of the return pipe

Accessories
Instead of the sight-glass it is possible to use a level switch to monitor the fluid volume.

MIN level	SPS 2000-A051-00
MAX level	SPS 2000-A052-00
MIN/MAX level	SPS 2000-A053-00



QFT 3000 / M001

Quenching fluid tank

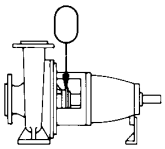
made of stainless steel with a sight-glass for monitoring MIN level. Return flow via rising pipe for selective current control. Version QFT 3000-A001 with elongated sight-glass and filling connection via removable lid.

Item	Description
1	Storage tank (capacity 3 l)
2	Sight-glass
3	Lid
4	Vent
5	Name plate
6	Inlet filter with vented cap

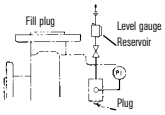
Installation, modes of operation

Quenching fluid systems can be operated in two different modes:

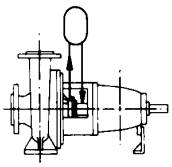
- Dead-end quench; DIN ISO 5199, Plan 13, quenching fluid from elevated tanks, and API 610 Plan 51*). The characteristic feature of this principle is that no heat is dissipated by the system.
- Circulation, DIN ISO 5199, Plan 10 (quenching fluid from an elevated tank; circulation by thermosiphon action or pump in the seal), and API 610 Plan 52*) (external tank, pressureless; thermosiphon or forced circulation). In this case heat is dissipated by the circulation. Cooling capacity by convection is minimal however.



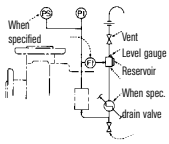
DIN ISO 5199
Plan 13
... quenching fluid from an elevated tank



API 610/692
Plan 51*)
dead-end quench (normally methanol)



DIN ISO 5199
Plan 10
... quenching fluid from an elevated tank; circulation of the fluid by thermosiphon action or pump.



API 610/682
Plan 52*)
external quenching fluid tank, pressureless. Thermosiphon or forced circulation if required.

*) is cited only as an example since this QFT configuration does not comply with Section 3.4.4.9 of API Standard 610/682

QFT 1000-00	QFT 1000/A004-00	QFT 1000/M001-00	QFT 2000-00	QFT 2000/A001	QFT 2000/A002	QFT 2000/A500	QFT 2000/A501	QFT 2000/A502	QFT 3000/M001	
										Tank material
●	●	●								Polyethylen
			●	●	●	●	●	●	●	1.4571
										Filling filter material
●	●	●	●	●		●	●			Polyamid
					●			●	●	1.4571
										Sight-class material
			●			●				Acryl/NBR
				●	●		●	●	●	Borosilikat/PTFE
										Connection
●	●									Hose
			●	●	●				●	G 1/2"
						●	●	●		1/2 NPT
		●								Fitting for tube 10 mm

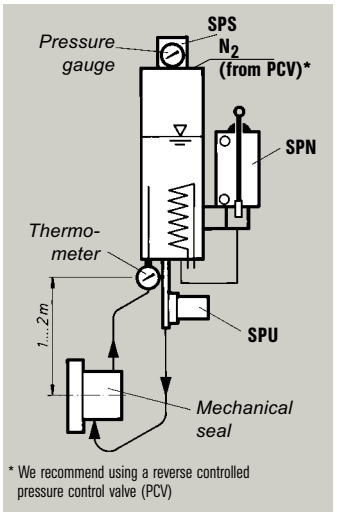
Thermosiphon system

TS 1000

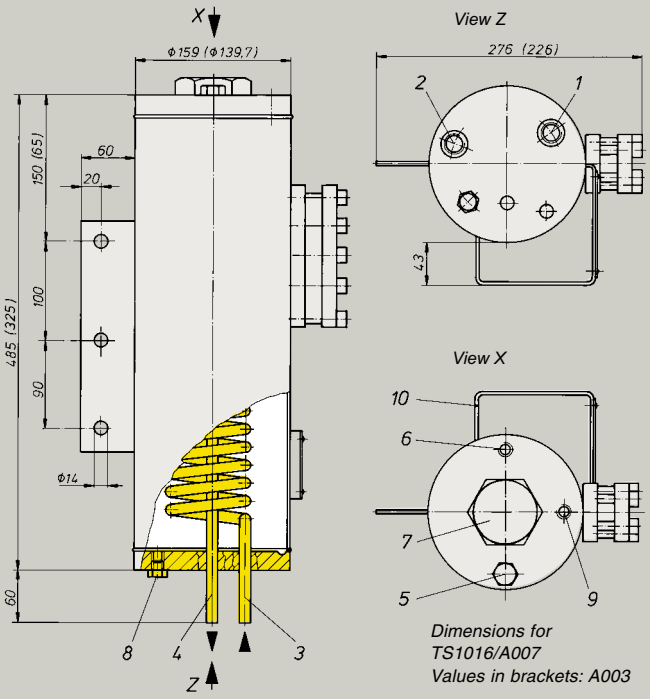
With the Burgmann TS system it is possible to supply buffer fluid to double and tandem seal arrangements for a broad range of applications. The buffer fluid flows via the rising pipe into the vessel and is cooled. Particularly with natural circulation, the level should always be higher than the rising pipe to maintain the circulation and to provide the specified cooling capacity.
Connection pipes to the seal should be designed with as little resistance as possible. Use compressed air or nitrogen for pressurization.

TS vessels are equipped as standard with all the necessary connections and brackets. System components (see pages 102/ 103) can be installed to suit new requirements or seal retrofits at a later date.
The vessel is used for the storage, pressure maintenance and cooling of buffer fluid in a sealing circuit. Design and production according to EU Pressure Equipment Directive (97/23 EG).

Operating and installation diagram of the TS system (mounting and operating instructions to be strictly observed). ▶



* We recommend using a reverse controlled pressure control valve (PCV)



Dimensions for TS1016/A007
Values in brackets: A003

TS1016

Thermosiphon vessel with flat ends, sight-glass for level monitoring and incorporated cooling coil.

1 Buffer fluid IN ($G^1/_2$)
2 Buffer fluid OUT ($G^1/_2$)
3 Cooling water IN (pipe 12 x 1.5 mm)
4 Cooling water OUT (pipe 12 x 1.5 mm)
5 Filling connection with cap ($G^1/_2$)
6 Pressure gas connection ($^1/_4$ NPT)
7 Connection for level switch (G 2)
8 Connection for refill unit ($G^1/_8$)
9 Connection for pressure gauge ($^1/_4$ NPT)
10 Bracket for refill unit

All threaded connections to DIN/ISO 228 exept for NPT connections.

Technical data

	TS1016/A003		TS1016/A007	
	Vessel	Pipe	Vessel	Pipe
Volume (litres)	4	0,2	8	0,2
Permissible operating pressure (bar)[1]	16	16	16	16
Permissible operation temperature (°C)[1]	120		−60...+200	
Operating volume MAX-MIN (Liter)	1,2		1,3	
Cooling cap. – w/o cool. water (kW)[3]	0,2		0,3	
Cooling cap. – natural circulation (kW)[2]	1,0		1,2	
Cooling cap. - forced circulation (kW)[2]	2,0		2,5	
Required cooling water rate (m^3/h)	0,25		0,3	
Metal parts	1.4571		1.4571	
Sight-glass	Round sight-glass Borosilicate		Reflex sight-glass Borosilicate	
Seal	PTFE		PTFE	

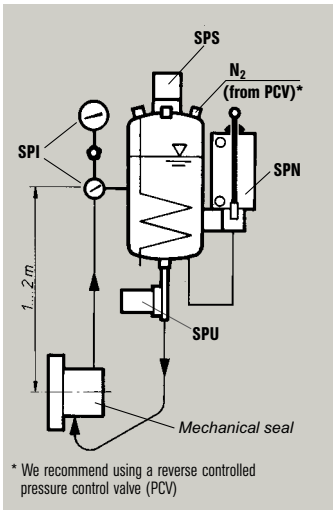
1) Design data - permissible working values depend on the actual conditions of service
2) Guide lines with buffer fluid water 60 °C – cooling water/20 °C
3) Guide line with buffer fluid water 60 °C – ambient temperature 20 °C

TS 2000

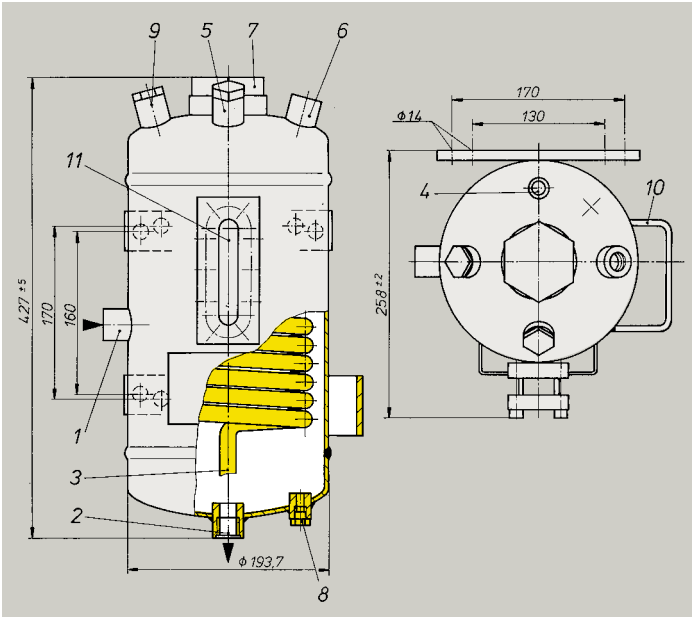
With the Burgmann TS system it is possible to supply buffer fluid to double and tandem seals. Equipped as standard with all necessary system connections and brackets. Components (pages 102/103) can be installed to suit new requirements or seal retrofits at a later date. The vessel is used for the storage, pressure maintenance and cooling of buffer fluid in a sealing circuit. Design and production according tu EU Pressure Equipment Directive (97/23 EG).

- **Pressure-loaded welds butt-welded or counter butt-welded by MIG and TIG process.**
- **Sockets with recessed gasket (no contamination of the circuit by thread sealant).**
- **Cooling water connection OUT at the top and IN at the bottom, for venting and draining.**

Operating and installation diagram of ▶ the TS 2000 system (mounting and operating instructions to be strictly observed).



* We recommend using a reverse controlled pressure control valve (PCV)



TS 2000

Thermosiphon vessel

Pressure vessel with torispherical heads, sight-glass for level monitoring and incorporated cooling coil. (All threaded connections to DIN/ISO 228. Assembly holes also in accordance with DIN 28162).
Net weight approx. 15.5 kg

TS 2001

Thermosiphon vessel
without cooling coil.
Net weight approx. 12.5 kg

TS 2063/A002

Thermosiphon vessel
with cooling coil.
Net weight approx. 28.5 kg

TS 2063/A001

Thermosiphon vessel
without cooling coil.
Net weight approx. 26 kg

1 Buffer fluid IN ($G^1/_2$)
2 Buffer fluid OUT ($G^1/_2$)
3 Cooling water IN ($G^1/_2$ B)
4 Cooling water OUT ($G^1/_2$ B)
5 Filling connection with plug ($G^1/_2$)
6 Pressure gas connection (G 172)
7 Connection for level switch or level indicator (G 2)
8 Connection for refill unit ($G^1/_8$)
9 Universal connection ($G^1/_2$ for safety valve, flare, etc.)
10 Bracket for refill unit
11 Sight-glass

Technical data

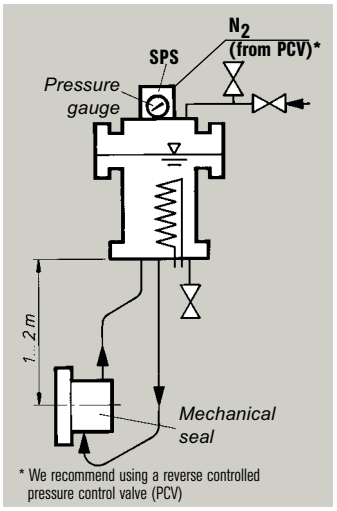
Volume: 9 litres
Cooling coil volume: 0.5 litres
Permissible operating pressure:
30 (20)[3] bar
63 (52)[3] bar
Permissible operating temperature:
–60 ... +200 °C[1]
(–29 ... +160 °C[3])
Working volume MAX-MIN: 1.8 litres
Cooling capacity - natural circulation:
1.5 kW
Cooling capacity - forced circulation:
4 kW
Required cooling water rate: 0.4 m^3/h
Metal parts: 1.4571
Sight-glass: Borosilicate
Seals: PTFE

1) Design data - permissible working values depend on the actual conditions of service
2) Guide lines with buffer fluid water 60 °C – cooling water 20 °C
3) Limit values according to ASME Section VIII calculation
4) Guide line with buffer fluid water 60 °C – cooling water 20 °C

Thermosiphon system

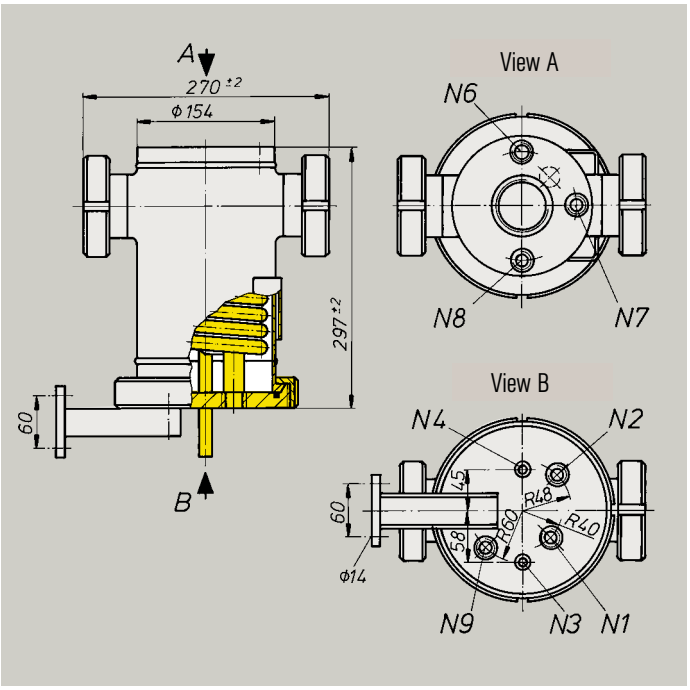
TS 3016

The Burgmann TS 3016/A001 thermosiphon system presents a simple and quick way to clean the vessel interior. For this purpose it is designed for easy dismantling. A quick-release coupling should be used to connect the pressure gas to the vessel. To clean the inside of the vessel you simply have to open the union nut, disconnect the gas supply and the level switch, and lift off the vessel case. There is no need to dismantle the seal connections, cooling water connections or base. Two sight-glasses fitted on opposite sides enable optimum reading of the fluid level. It is also possible to flush the piping system and the seal without disconnecting the tubes.



Operating and installation diagram of ▶ the TS 3016 system (mounting and operating instructions to be strictly observed).

* We recommend using a reverse controlled pressure control valve (PCV)



TS3016

Thermosiphon vessel with cooling coil

N1 Buffer fluid IN, G1/2"
N2 Buffer fluid OUT, G1/2"
N3 Cooling water IN, pipe 15 x 1.5 mm
N4 Cooling water OUT, pipe 15 x 1.5 mm
N5 Level switch, G 2"
N6 Auxiliary components, G1/2"
N7 Auxiliary components, G1/2"
N8 Filling connection, G1/2"
N9 Drain, G1/2"

Features

- Flat heads
- Two sight-glasses on opposite sides for monitoring the level
- Easy dismantling
- Easy cleaning of the vessel interior
- All connections for essential auxiliary components

Design, pressure test

Design, material selection and testing in accodance to the German Pressure Vessel Regulations and the AD Code.

Test pressure = 1.3 · max. permissible operating pressure

Technical data

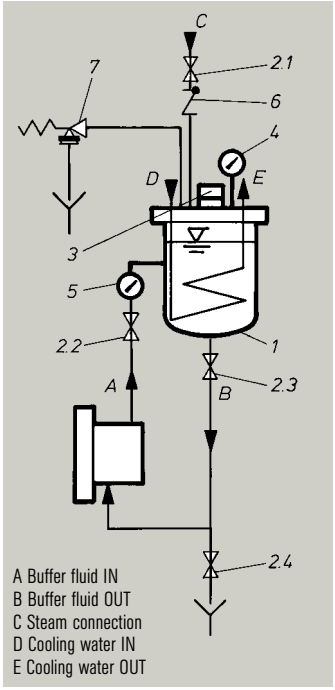
Max. pressure: Vessel 16 bar
Cooling coil 16 bar
Max. Temperature: 150 °C
Volume: Vessel 4.0 litres
Cooling coil 0.4 litres
Cooling capacity:
Natural circulation 1.0 kW
Forced circulation 2.0 kW
Net weight: 12 kg
Metal parts: 1.4571
Sight-glass: Borosilicate
Gaskets: PTFE
Welding filler: 1.4576/1.4430

TS 3000

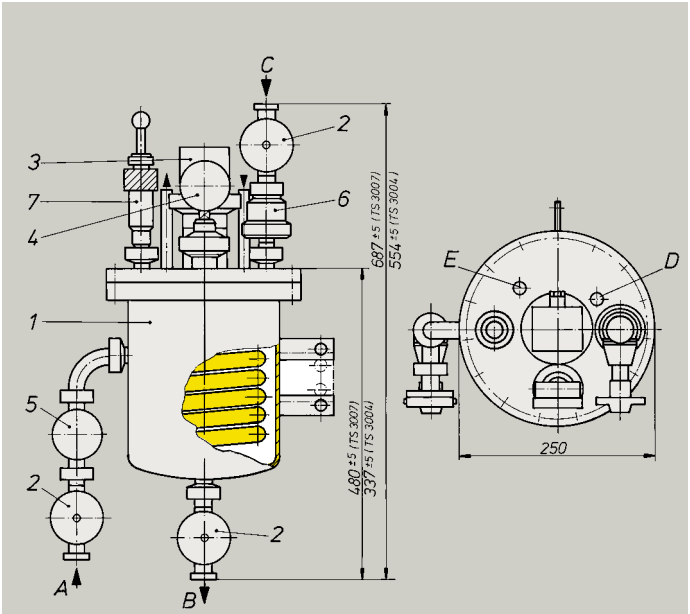
Thermosiphon systems of the TS 3000 range are designed specially for the operation and supply of mechanical seals in sterile processes. In addition to performing the four basic functions of a buffer system, the TS 3000 can also be used to make condensate, provided it is connected up to a steam line.

● Sterilization
After the agitator drive and the cooling water supply are switched off, the condensate drain valve (2.4) is opened until steam emerges (the steam forces the entire condensate out of the TS system and the seal circuit). For the duration of the sterilization cycle (approx. 30 minutes), the shut-off valve (2.3) is closed just enough to make most of the steam flow via the seal.

● Making condensate
At the end of the sterilization cycle, valve 2.4 is closed, valve 2.3 is fully opened, and the cooling water supply is switched on again – condensate will be made. The level switch (3) responds when the TS vessel is full. The agitator can be started up again.



Operating and installation diagram of the TS 3000 system (mounting and operating instructions to be strictly observed).



TS 3007/M 301

TS3004 (volume 4 l)
TS3007 (volume 7 l)

Thermosiphon vessels for sterile processes

1 TS vessel with cooling coil
2 Shut-off valve
3 Level switch
4 Pressure gauge (membrane transducer)
5 Thermometer
6 Check valve
7 Safety valve (set pressure 8 bar)

Design features

- The TS 3000 supply system, including all its components and pipe couplings, can be fully sterilized.
- Surfaces are electropolished on all sides.
- Design and production according to EU Pressure Equipment Directive (972/23 EG)
- Vessel can be split. The joint is sealed at the inner diameter by an O-ring without any gaps.

Technical data

Permissible operating pressure = 8 bar
Permissible operating temperature = 140 °C
All metal parts: 1.4571
Elastomers: EPDM

Connections

Pressure gauge DN 25 (screw connection); float switch DN 50 (DIN 11851); all other connections DN 15 with welding end. (Dairy pipe work connections).

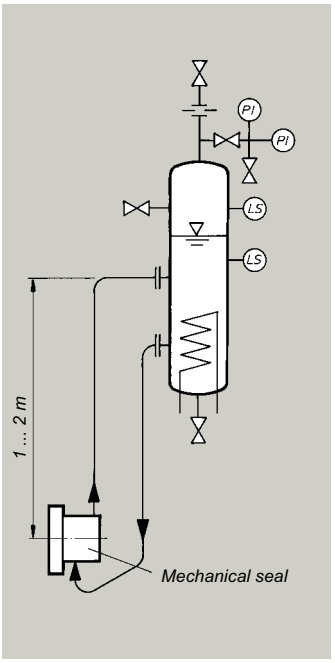
Thermosiphon system to API 682

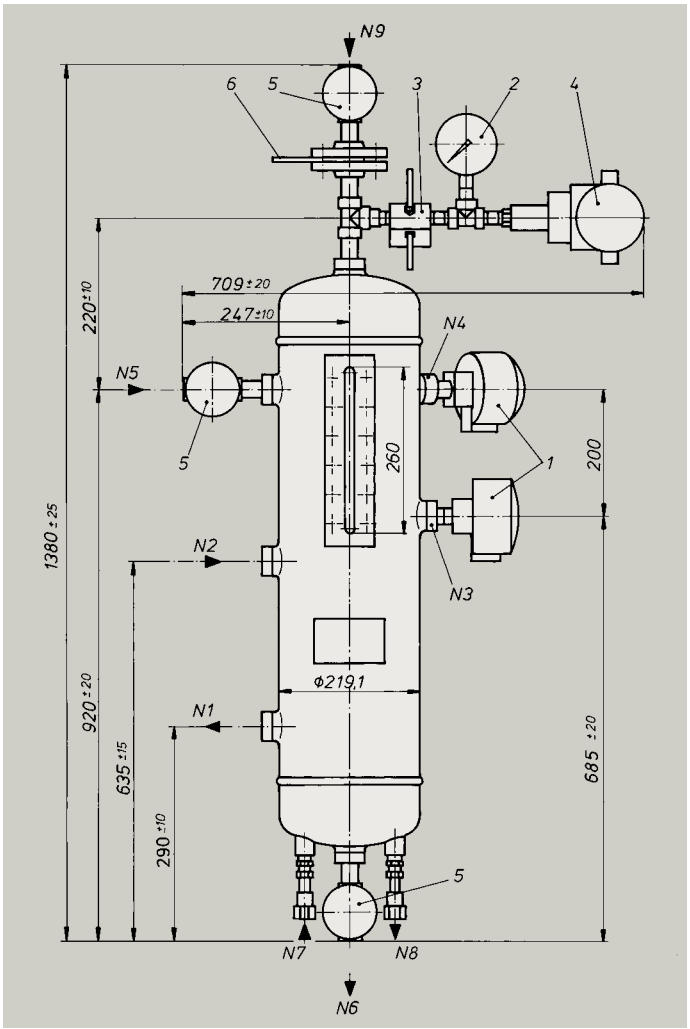
TS 6050

The Burgmann thermosiphon system TS 6050/M001 meets all requirements to supply mechanical seals in accordance with the guidelines laid down in API 682. The vessel is equipped with all essential connections for fitting additional components. It is used for the storage, pressure maintenance and cooling of buffer fluid in the sealing circuit. Pressurization is monitored by a pressure switch. The incorporated level switch issues a signal whenever the level of buffer fluid is too low.

- **Design, calculation, material selection, material testing and production in accordance with ASME VIII, Div. 1**
- **No U-Stamp!**
- **Test pressure = 1.5 · max. permissible operating pressure**
- **Torispherical heads**
- **Weldpad type sight-glass for optimum level monitoring**

Operating and installation diagram of ▶ the TS 6050 system (mounting and operating instructions to be strictly observed).





Technical data

Pressure: Vessel 50 bar
Cooling coil 16 bar
Temperature: 200 °C
Volume: Vessel 28 litres
Cooling coil 1.4 litres
Cooling capacity:
Without cooling water 1 kW
Natural circulation 2.5 kW
Forced circulation 6.5 kW
Net weight: 75 kg
Metal parts: AISI 316L / 1.4404
Sight-glass: Borosilicate
Seals: PTFE
Welding filler: 1.4576/1.4430

Item	Description
1	Level switch
2	Manometer
3	Manifold
4	Pressure switch
5	Shuttoff valve
6	Orifice

TS 6050 / M052-D0

Thermosiphon vessel (API Plan 52)

N1 to the mechanical seal
N2 from the mechanical seal
N3 Level switch MIN $^3/_4$" NPT
N4 Level switch MAX $^3/_4$" NPT
N5 Filling connection

Bottom

N6 Drain
N7 Cooling water IN, pipe 15 x 1.5
N8 Cooling water OUT, pipe 15 x 1.5

Cover

N9 Connection to flare (for API Plan 52)
Connection for nitrogen (for API Plan 53)

TS 6050 / M053-D0

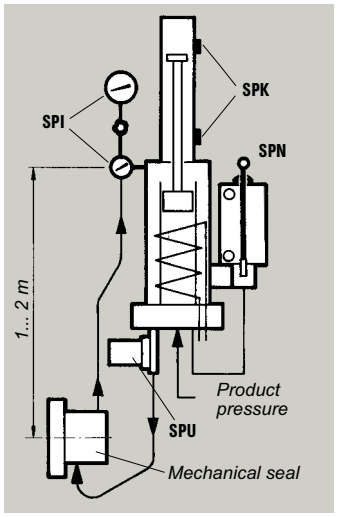
Thermosiphon vessel (API Plan 53A)

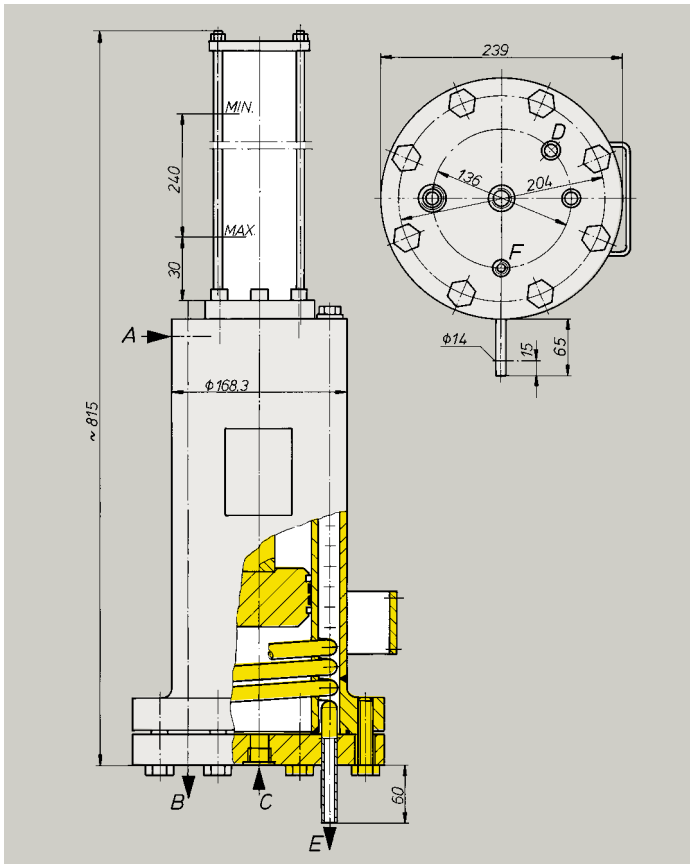
Design as for Plan 52 but connection N4 closed by threaded plug.

DRU 2000

With the Burgmann DRU system it is possible to supply buffer fluid to double and tandem seals for a broad range of applications. The function of the DRU-system is similar to the TS-system. The difference is the pressure booster is creating the buffer pressure without a nitrogen supply. Pres-sure boosters are equipped as standard with all the necessary connections and brackets. System components (see pages 102/103) can thus be installed to suit new requirements or seal retrofits at a later date.
Pressure boosters for storing and cooling buffer fluid. Pressurization by means of a piston from the process/medium pressure. Pressure increase in accordance with the transmission ratio. The maximum operating pressure of 63 bar applies to the buffer pressure. Therefore the process/medium pressure at the connection must be lower and is conditional on the transmission ratio:
DRU2063/A001 up to 57 bar
DRU2063/A002 up to 42 bar

Operating and installation diagram of ▶ the DRU system (mounting and operating instructions to be strictly observed).





DRU2063/A001

Pressure booster
Transmission ratio: 1:1.1
Working volume: 2 litres

DRU 2063/A002

Transmission ratio: 1:1.5
Working volume: 1.5 litres

A Buffer medium IN ($G^1/_2$)
connection possible for SPI 2063
B Buffer medium OUT ($G^1/_2$)
C Process medium ($G^1/_2$)
D Coolant IN (tube 15 x 1.5)
E Coolant OUT (tube 15 x 1.5)
F Connection for SPN ($G^1/_8$)

Features

- All pressure-loaded welds are butt-welded or counter butt-welded by the MAG and TIG process.
- Sockets with recessed gasket (no contamination of the circuit by thread sealant).
- Housing is easy to dismantle. All parts are readily accessible for cleaning.
- Design and production according to EU Pressure Equipment Directive (97/23 EG).

Technical data

Permissible operating pressure: 63 bar[1)]
Permissible operating temperature:
−60 ... +200 °C
Volume: Vessel 4 litres
Colling coil 0.7 litres
Cooling capacity:
Natural circulation 1.5 kW[2)]
Forced circulation 4 kW[2)]
Required cooling water rate: 0.4 m^3/h
Approx. net weight: 51 kg
Metal parts in contact with buffer fluid:
1.4571
Seals: PTFE
Protective pipe for piston rod:
Borosilicate glass

1) Design data – permissible working values depend on the actual conditions of service
2) Guide lines with buffer fluid water/60 °C – cooling water/20 °C

Components

SPU

Circulating pump

for circulating the buffer fluid (to increase the cooling capacity). Suitable for water and other liquids of similarly low viscosity.

SPU 1010/A001

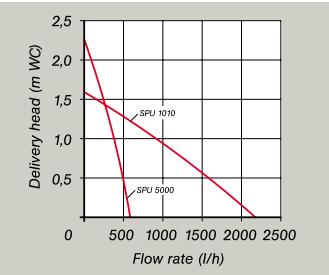
Max. permissible viscosity: 10 mm²/s
Permissible operating pressure: 10 bar
Permissible operating temperature: 65 °C
Type of protection: IP 42
Voltage connection: 380 V/50 Hz
Power consumption: 75 W
Weight: 2.1 kg

Materials: Parts in contact with the buffer fluid are made of 1.4301.

SPU 5000

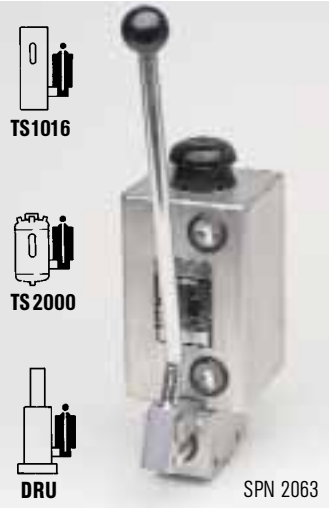
Seal-less circulation pump for inline assembly
Max. permissible viscosity: 10 mm²/s
Max. operating pressure: 40 bar
Max. operating temperature: 80 °C
Explosion protection: EExd IICT4
Voltage connection: 230/400 V / 50 Hz
Power consumption: 180 W
Weight: 5,0 kg

Materials: Metallic parts in contact with the buffer fluid made of 1.4571.



Performance curves SPU

Please enquire about circulating units for a higher capacity or for different media and/or viscosities.



SPN 2063-00

Hand refill pump

for manual refilling during operation in case of buffer fluid losses.
The refill pump consists of a storage vessel with level indicator, filler neck and a hand pump. It is mounted directly on the thermosiphon vessel or pressure booster.

SPN 4016

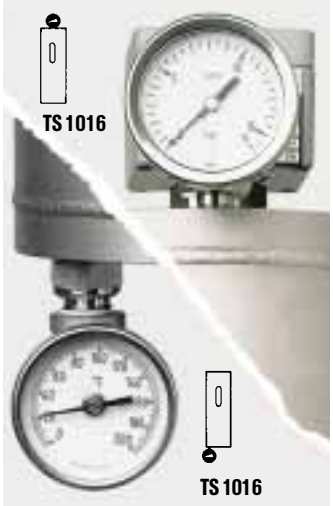
As SPN 2063, but especially for application with TS 1016.

Storage vessel

Capacity: 2 l
Permissible operating pressure: 0 bar
Permissible operating temperature: 60 °C

Materials:

SPN 2030	SPN 2063	SPN 2063 / A015	SPN 2063 / A100	SPN 2063 / A200	SPN 4016	
						Type
						Sight-glass seal materials
●	●	●			●	Acrylic, Perbunan
			●	●		Borosilicate glass, T2
						Inlet filter materials
●	●	●	●		●	Polyamide
				●		Stainless steel
						Material of vessel
●	●	●	●	●		Stainless steel
					●	Polyethylene
						Pressure control valve
●						30 bar
	●					63 bar
	●		●	●		None
					●	16 bar



SP 23-...

Measuring instrument (pressure gauge)

for visual monitoring of the operating pressure.

Materials:
Parts in contact with the buffer fluid are made of 1.4571.

SP 23-092	SP 23-094	SP23-095	SP 23-097	
				Type
				Pressure range
			●	0 – 6 bar
●	●	●		0 – 16 bar
				Size
●	●		●	NG63
		●		NG100
				Shut-off valve for pressure gauge
●			●	without
	●	●		with
				Proximity contact acc. to NAMUR
		●		Pressure min.
				Hazardous duty approval
		●		ATEX Exia

SP23-093

Measuring instrument (thermometer)

for visual monitoring of the operating temperature.

Materials:
Parts in contact with the buffer fluid are made of 1.4571.
Size: NG 63
Measuring range: 0 – 120 °C

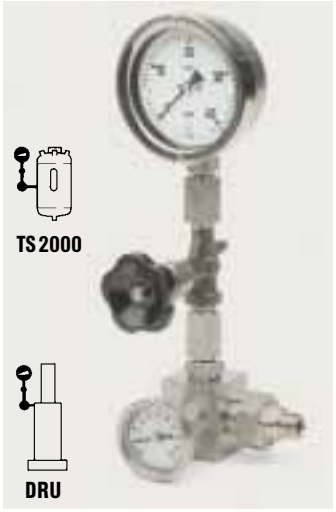
SP23-...

Measuring instrument (flow meter)

for checking the amount of fluid used to refill the buffer fluid circuit in closed systems (SPN 1000/3000). The indicated volume equals the amount lost from the circuit through leakage.

SP23-26	SP23-41	SP23-42	SP23-46	
				Measurement range
	●	●		01 ... 1 l/h*)
●			●	0.4 ... 4 l/h*)
				Type of contact
●	●	●	●	Proximity cont. acc. to NAMUR
				Hazardous duty approval
●	●	●	●	ATEX Exia
●	●			**Control valve**
				(needle valve)
				Max. operating pressure
●	●			40 bar
		●	●	100 bar

*) With water as buffer fluid, other media on request



SPI

Measuring unit

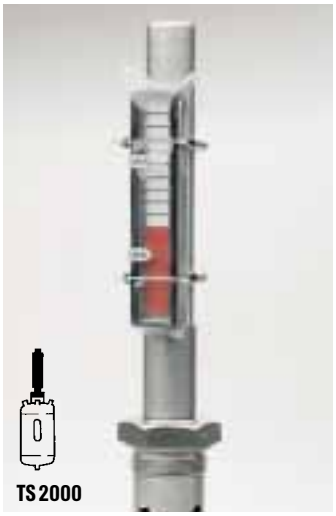
for visual monitoring of the operating temperature and the operating pressure. The measuring unit consists of a pressure gauge (NG 100) with a gauge shut- off valve in accordance with DIN 16270, a bi-metallic thermometer gauge with protective sleeve, and a connector.

Materials: Parts in contact with the buffer fluid are made of 1.4571.

Weight: approx. 2.9 kg

SPI2000	SPI2000 / A003	SPI2000 / A012	SPI2000 / A013	SPI2000 / A049	SPI2063	SPI2100 / A002
Type						
Pressure meas. range						
0–40 bar	●	●	●	●	●	
0–100 bar						●
Temperature meas. range						
0–20			●			
0–200	●	●		●	●	●
Proximity switch according to NAMUR						
min. pressure	●	●		●		●
max. pressure	●					●
min. temperature	●					
max. temperature	●	●	●			
Hazardous duty approval						
ATEX Exia	●	●	●	●		●

Please enquire about other measurement ranges and gauges and about thermometers with contacts.



SPL

Level indicator

for visual monitoring under difficult service conditions.
It functions by means of a floating ball and a magnetic system. The indicator strip can be positioned through 360h. It consists of movable two-colour plates that are turned by the magnet system.

SPL 2000

Max. operating pressure: 63 bar
Max. operating temperature: 200 °C
Minimum density of fluid: 0.7 g/cm^3

Materials: Parts in contact with the buffer fluid are made of 1.4571 or titanium (float).

Weight: approx. 5 kg.

N.B.: Please quote the density of the buffer fluid when placing your order.

Available on request with the SPK 2000 **contact unit.**

SPL 2000/A020	SPL 2000/A021	SPL 2000/A022
Type		
Proximity contact acc. to NAMUR	●	●	●
Contact position			
Min. level	●		●
Max. level		●	●
Hazardous duty approval			
ATEX Exib	●	●	●

SPS

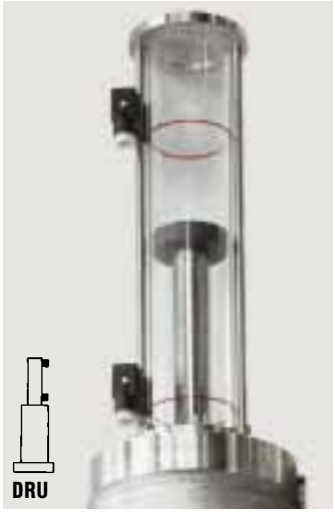
Level switch

for buffer fluid level monitoring with alarm and/or control of automatic refill units.

Materials: Parts in contact with the buffer fluid are made of 1.4571.

Weight: approx. 1.7 kg.

SPS2000 / A201	SPS2000 / A202	SPS2000-00	SPS2000 / A002	SPS2000 / A101	SPS2000 / A102	SPS2100 / A101	SPS2100 / A002
Type							
Float switch with reed contact	●	●	●	●			
Float switch with 2 reed contacts		●		●	●		
Contact function							
Min. leve	●	●	●	●	●	●	●
Max. level		●		●	●		
Contact function							
Switch contac	●	●	●	●			
Contact breaker (closed cont. principle)	●	●			●	●	●
Hazardous duty approval							
Not			●	●			●
ATEX Exd	●	●					
ATEX Exia					●	●	●
Permissible contact load							
Max. 250 V / 40 VA		●	●				
Max. 250 V / 12 VA							●
max. 230 V / 40 VA	●	●					
Permissible operating pressure							
30 bar			●	●	●	●	
40 bar	●	●					
100 bar						●	●
Permissible operating temp.							
120 °C	●	●					
150 °C					●	●	
180 °C			●	●			
200 °C						●	●
Min. density of buffer fluid							
0.7 g/cm^3			●	●	●	●	
0.4 g/cm^3						●	●



SPK

Contact unit

for buffer fluid level monitoring through magnetic or proximity contact.
The contact unit consists of one or several magnetic elements which transmit the position of the fluid level or of the pressure booster piston rod to the switches without touching. The switches are reed contacts or inductive contacts in accordance with NAMUR.

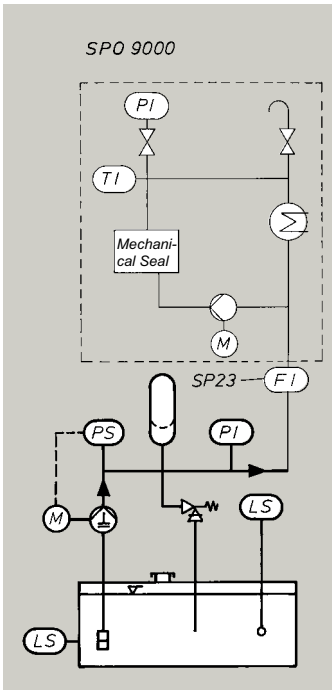
SPK2000 / A004	SPK2000 / A005	SPK2000 / A006	SPK2000 / A012	SPK2000 / A101	SPK2000 / A102	SPK2000 / A103
Type						
Reed contact	●	●	●		●	●	●
Proximity contact acc. to NAMUR				●			
Contact position							
Min. level	●	●	●	●	●	●	●
Normal level				●			●
Max. level	●		●	●	●	●	
Contact function							
Contact breaker	●	●	●				
Flipflop (reversible function)					●	●	●
Hazardous duty approval							
None	●	●	●		●	●	●
ATEX Exib				●			
Contact load							
Max. 1A / 20W / 150V	●	●	●				
Max. 0.5A /12VA / 70V					●	●	●

** – Approved within Germany
*** – Not in the hazardous duty area
With inductive loads, contact protective measures are necessary.

SPN

▲ SPN100 with pneumatic drive.

◀ SPN3000 with electric pump drive.



Operating and installation diagram for the SPN (mounting and operating instructions to be strictly observed).

General features

All connecting threads G 1/2 in accordance with DIN ISO 228. Tank with level switch and sight-glass (automatic refill unit available; please enquire).

Materials (standard)

Parts in contact with the medium are made of stainless steel. Secondary seals and elastomers are resistant to water, demineralized water and hydraulic oil.

SPN 1000

Automatic refill unit

Buffer fluid pressure regulation via pressure switch to the pump control.

SPN 3000

Automatic refill unit

with pressure control valve for manual regulation of buffer fluid pressure. This maintains constant buffer pressure irrespective of hysteresis-induced pressure fluctuations.

Should the pump be switched off, the buffer fluid pressure will be maintained for a limited time by an accumulator. Several outputs available for setting different buffer fluid pressures (please enquire).

Automatic refill units of the SPN range differ from an SPA in that they perform just two of the four functions of a buffer fluid system, namely buffer fluid pressurization and leakage compensation. It is possible to use pneumatic or electric power or a combination of both for the pressurization (piston pump).

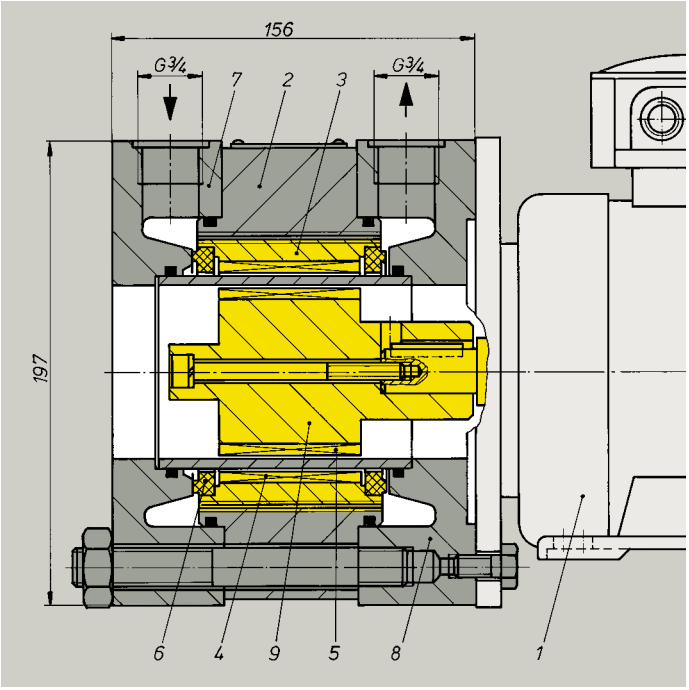
Separate components are installed in the seal buffer circuit to cool and to circulate the buffer medium.

Designation	Buffer fluid pressure adjustable from ... to (bar)	Max. flow rate (l/h)	Vessel capacity (litres)	Number of pumps	Type of drive	Nominal output (kW)	Max. air rate (Nm^3/h)	Approx. overall dimensions in cm H x W x B	Net weight approx. (kg)
SPN1020/E002	0,5–20	10	20	1	E	0.18	–	69 x 37 x 36	40
SPN1020/L002	5–20	60	20	1	L	–	26	58 x 37 x 36	30
SPN1063/E002	5–63	10	20	1	E	0.18	–	69 x 37 x 36	40
SPN1063/L002	20–63	60	20	1	L	–	26	58 x 37 x 36	30
SPN1063/E004	5–63	10	40	1	E	0.18	–	69 x 69 x 36	50
SPN1063/L004	20–63	60	40	1	L	–	26	58 x 69 x 36	40
SPN1063/EE04	5–63	20	40	2	E	2 x 0.18	–	69 x 69 x 36	60
SPN1063/LL04	20–63	120	40	2	L	–	52	58 x 69 x 36	50
SPN1063/EL04	20–63	70	40	2	EL	0.18	26	69 x 69 x 36	60
SPN3035/E004	4–35	10	40	1	E	0.18	–	69 x 69 x 36	70
SPN3035/L004	4–35	60	40	1	L	–	30	58 x 69 x 36	60
SPN3035/EL06	4–35	70	60	2	EL	0.18	30	69 x 100 x 37	80
SPN3035/EE06	4–35	20	60	2	EE	2 x 0.18	–	69 x 100 x 37	80
SPN3035/LL06	4–35	120	60	2	LL	–	60	58 x 100 x 37	70
SPN3063/E020	0–63	130	200	1	E	1.1	–	110 x 175 x 100	420
SPN3063/L020	0–63	300	200	1	L	–	175	100 x 130 x 70	300
SPN3063/EL20	0–63	430	200	2	EL	1.1	175	110 x 175 x 100	450
SPN3063/EE20	0–63	260	200	2	EE	2 x 1.1	–	110 x 175 x 100	500
SPN3063/LL20	0–63	600	200	2	LL	–	350	100 x 130 x 170	400
SPN3120/E020	0–120	130	200	1	E	2.5	–	110 x 175 x 100	450
SPN3120/L020	0–120	300	200	1	L	–	175	100 x 130 x 70	300
SPN3120/EL20	0–120	430	200	2	EL	2.5	175	110 x 175 x 100	480
SPN3120/EE20	0–120	260	200	2	E	2 x 2.5	–	110 x 175 x 100	500
SPN3120/LL20	0–120	600	200	2	L	–	350	100 x 130 x 70	400

SPO 9000

Closed circuit with pressure accumulator and cooler. Please inquire.

Components



HPS 4100

Screw pump for a max. permissible operating pressure of 100 bar

HPS 4200

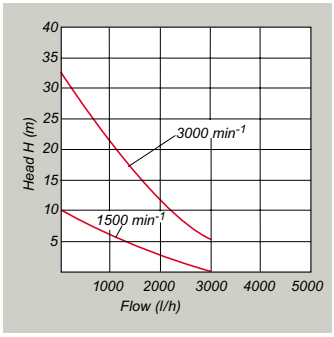
Screw pump for a max. permissible operating pressure of 200 bar

Screw pumps of the HPS range are canned pumps. They are hermetically tight and require by and large no maintenance. Their ideal area of application is closed high-pressure circuits within hydraulic process engineering systems. Here the HPS represents a genuine, low-price alternative to the centrifugal pump without stuffing box.

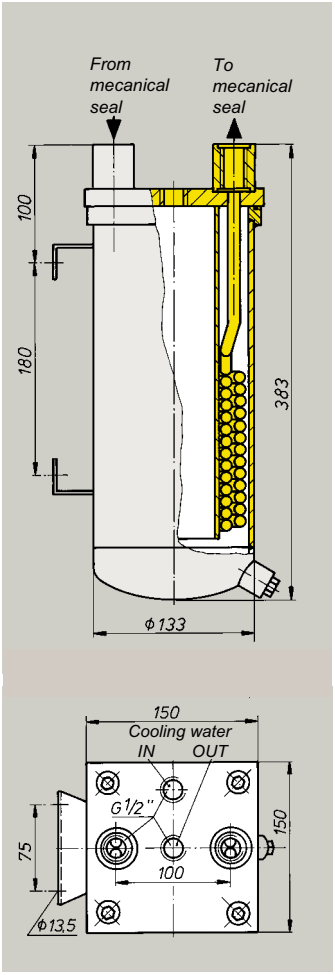
Additional features

- Small overall size
- Axial and radial bearings (with the pump in operation they are extensively relieved by hydrodynamic centering of the pumping screw and pumping sleeve)
- Pumping direction dependent on direction of rotation
- pumping in both directions
- Not self-priming (pump circuit must be vented)

1 Three-phase AC motor
2 Pumping sleeve, stationary
3 Pumping screw, rotating
4 Magnet pump rotor
5 Solenoid actuator
6 Sliding bearing
7 Housing cover plate
8 Housing flange
9 Shaft



Pumping characteristic with water as medium



WDK 5120 / A003

Heat exchanger

with wound double helix around a guide tube.

Buffer medium in the tubes, cooling medium around the tubes. Design, material selection andd testing in accordance with the German Pressure Vessel Regulations and the AD Code.

Operating instructions

- Mount vertically with connections pointing up. Provide for external venting on the buffer medium side (the user has to install a vent at the highest point of the pipe work).
- Cleaning

Cooling water side: The area around the tubes can be cleaned mechanically after the housing is removed.

Buffer medium side: Flush with a suitable sovent.

Technical data

Cooling water side
Design pressure: 16 bar[1)]
Design temperature: 95 °C[1)]
Inlet temperature: 25 °C[2)]
Volume: 1,13 Liter
Rate: 1,8 m^3/h[2)]

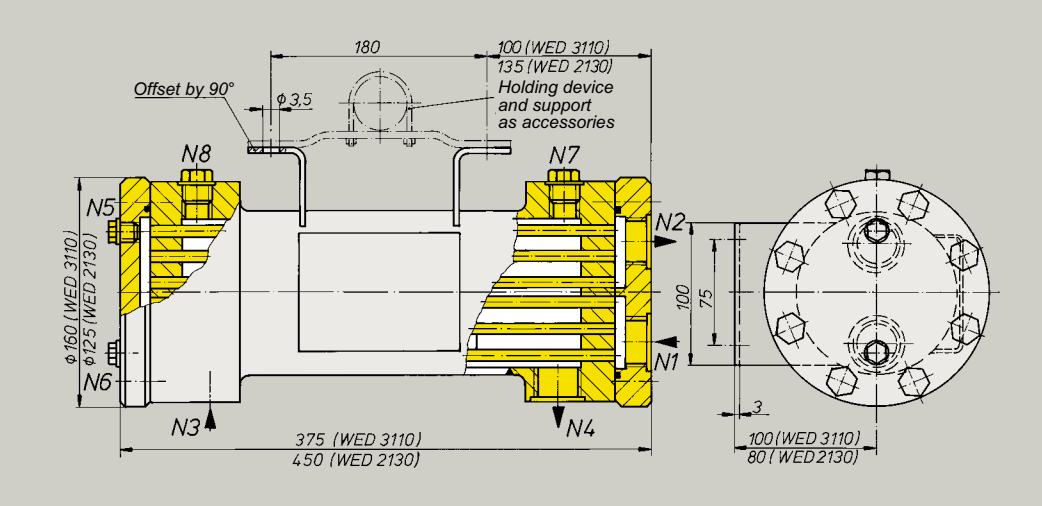
Buffer medium side
Design pressure: 120 bar[1)]
Design temperature: 160 °C[1)]
Inlet temperature: 70 °C[2)]
Capacity: 0.34 litres
Rate: 10 l/min[2]
Cooling capacity: 10.5 kW
Cooling area: 0.3 m^2 [2)]
Weight (empty): 10.3 kg
Weight (full): 11.8 kg

1) These values are based on the calculation of strength
2) These values are based on the calculation of heat

Materials

Parts in contact with buffer medium: Stainless steel 1.4571
Housing: Carbon steel ST 37.0, primed on the outside
O-ring: Viton®
Screws: A 4-70 stainless steel

Components



WED 2130/A100
WED 3110/A100

Heat exchangers

Heat exchangers of the WED range are used to cool buffer fluids in seal supply circuits. Designed as a tubular heat exchanger, the WED is outstanding for its high cooling capacity yet compact dimensions. Design, production and material selection conform with the German Pressure Vessel Regulations and with the AD Code. Quality assured.

Features

- The buffer medium is directed through the jacket and the cooling water through the tubes.
- The heat exchanger can be installed either in **horizontal or vertical** position.
- It is possible to clean the cooling water area (mechanically after removing the cover) and the buffer medium area (by flushing with a suitable solvent).

Connections

N2	Cooling water OUT
N1	Cooling water IN
N4	Buffer medium OUT
N3	Buffer medium IN
N7/N8	Buffer circuit vent
N5	Cooling circuit vent
N6	Cooling water drain

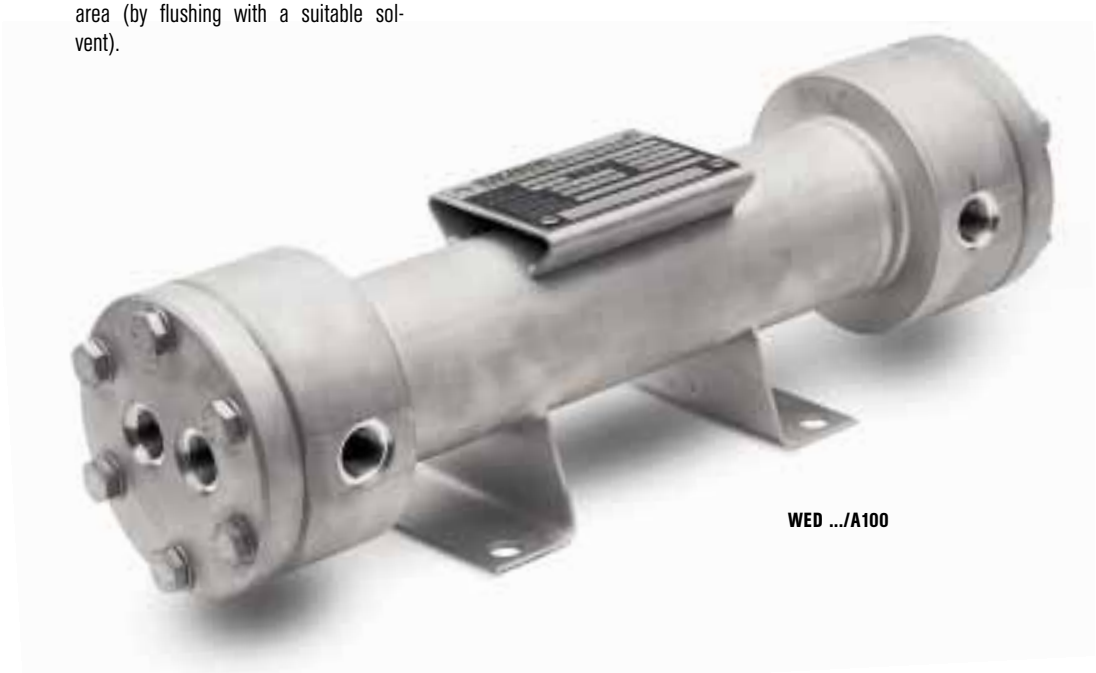
Materials

Parts in contact with the medium: 1.4571
Secondary seals:
– O-rings: Viton®
– Gaskets: PTFE
Screws: A4-70 stainless steel

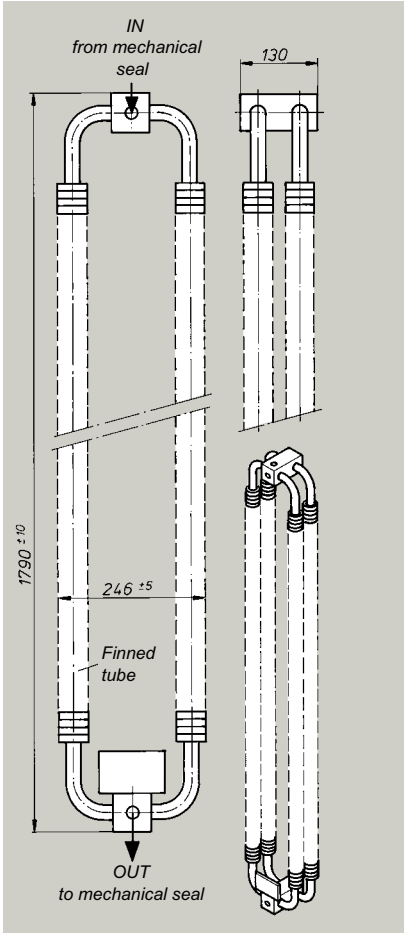
Technical data

	WED 2130/A100		WED 3110/A100	
	Tube	Shell	Tube	Shell
Design pressure (bar)[1]	16	130	16	110
Inlet temperature (°C)[2]	30	65	30	65
Flow rate (m^3/h)[2)*]	1	ca. 0.5	6	ca. 3
Capacity (l)	0.23	1.4	0.75	1.8
Cooling capacity (kW)[*]	6		36	
Cooling surface (m^2)	0.2		0.6	
Net weight (kg)	14		24	
Design temperature (°C)[1]	150			

*) Related to water on both sides
1) These values are based on the calculation of strength
2) These values are based on the calculation of heat



WED .../A100



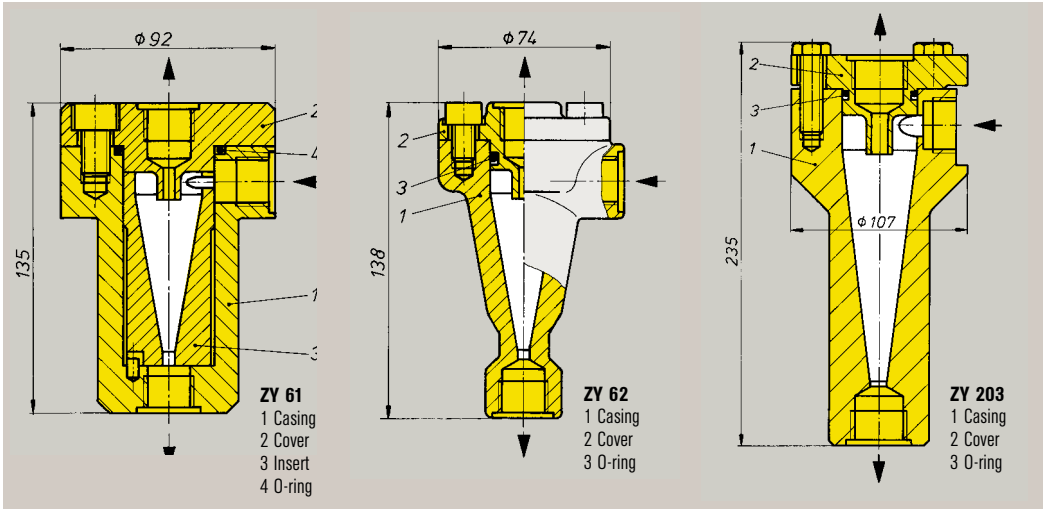
WEL 1000

Heat exchanger (air cooler)

These heat exchanges are made of finned tubes without gaps for cooling buffer fluids in seal circuits. The cooling medium is ambient air. It is important, therefore, for WEL heat exchangers to be installed in well ventilated places indoors or, ideally, outdoors. Vertical installation is essential. Design, material selection and testing in accordance with the German Pressure Vessel Regulations and the AD Code.

Technical data

Max. operating pressure: 100 bar[*]
Max. Operating pressure: 95 bar[*]
Connecting thread: G1/2
*) higher values on request



ZY 61

Cyclone separator with replaceable insert made of elastomer or ceramic

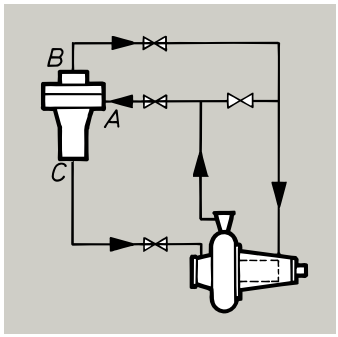
ZY 62

Cyclone separator with cast casing and cover

ZY 203

Cyclone separator for high flow rates and high pressures

Cyclone separators of the ZY range are used to clean mainly aqueous liquids containing dirt and solids (e.g. in circulations of sewage, sludge, crude etc.). The best possible filtration efficiency is achieved when the specific weight of the solids is much higher than that of the carrier liquid, and when the differential pressure is as large as possible within the pressure range. The viscosity of the medium is also a factor that needs to be taken into account.



◀ **Installation diagram for cyclone separators.**
The cyclone separator must always be installed in the vertical position. The pressure at outlets (C) and (B) must be lower than at inlet (A). Cleaned liquid is conveyed to the top (B) and the separated dirt to the suction port of the pump (C).

Technical data

	ZY61	ZY62	ZY203
Operating pressure max.. (bar)	64	64	200
Operating temperature max.. (°C)	125 (60*)	125	150
Connections	G/NPT1/2	G/NPT1/2	G/NPT3/4,1
Weight approx. (kg)	3,5	2,0	8,0
Materials: casing/cover	1.4571	1.4408	1.4571
O-ring	Viton®	Viton®	Viton®

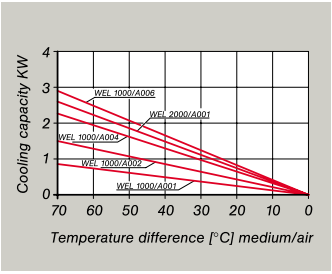
*) with elastomer insert

Technical data

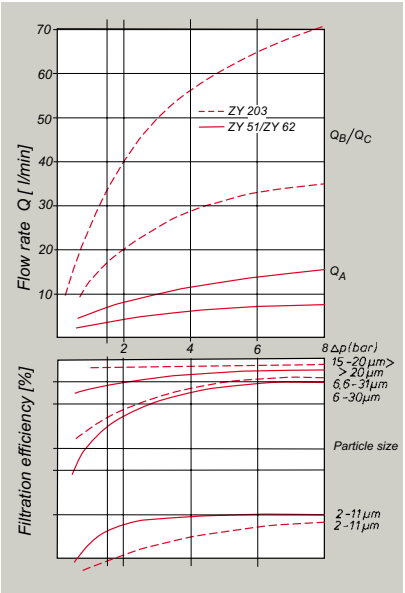
Max. operating pressure: 100 bar*)
Max. operating temperature: 95 °C*)
Parts in contact with medium: 1.4571
Connecting thread: G1/2

Capacities:
WEL 1000/A001: 0.7 litres
WEL 1000/A002: 1.4 litres
WEL 1000/A003: 2.1 litres
WEL 1000/A004: 2.8 litres
WEL 1000/A006: 4.2 litres

*) higher values on request

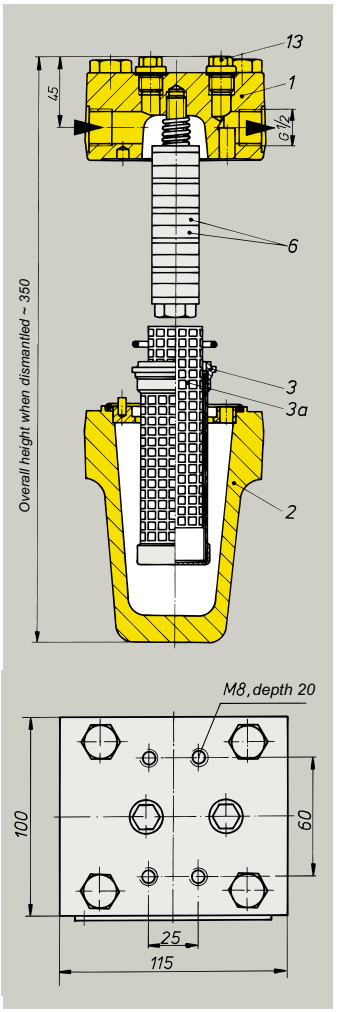


Cooling capacity: Values based on air moved at min. 0.7 m/sec.



◀ **Filtration efficiency, flow rates and grain sizes for water as medium**

Components



MAF 2000

Magnetic filter

MAF 2001

Magnetic filter with internal mesh
to protect the filter element for reverse currents (Item 3a)

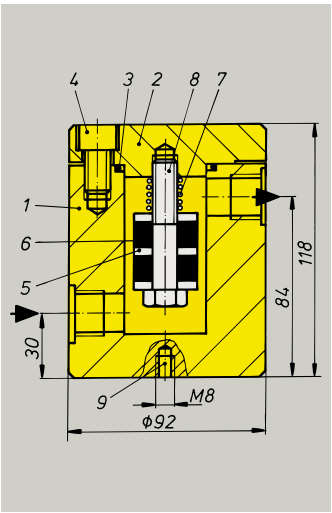
Magnetic filters of the MAF range are throughflow filters for installation inside pipe lines. The combination of magnetic rod and filter element guarantees a high level of efficiency. Magnetic filters are used in seal supply systems and any other such systems in which a liquid has to be cleaned of magnetic and non-magnetic impurities up to a certain size.

1 Filter cover
2 Filter barrel
3 Element insert
3a Internal mesh
6 Ring magnet
13 Venting screwn

Features

- All pressure-loaded parts are forged components
- Venting screws (Item 13) in the filter inlet and outlet can be used as connections for maintenance or differential pressure indicator.
- Pipe connections can be either G1/2 to G1 (DIN ISO 228) or with NPT internal thread.
- Two types of contamination indicator are available as accessories: visual mo-nitoring and/or in combination with a switch.

Technical data
Permissible operating pressure: 63 bar
Permissible operating temperature: 150°C (higher temperatures on request).
Filter mesh: 50 µm
Weight: approx. 7.8 kg
Cover and filter barrel: 1.4571
Filter insert and element: 1.4301, 1.4401
O-rings: Viton®
Gaskets: PTFE



MAA 2120

Magnetic separator

Magnetic candle in a pressure casing for installation in a pipe line.
The magnetic candle can be removed for cleaning by opening the cover (with the line depressurized!). Maintenance intervals depend on the degree of soiling. We recommend checking and if necessary cleaning the magnet candle several hours after using for the first time and each time after flushing the pipes because experience indicates that much of the dirt is flushed out of the pipe lines at this time.

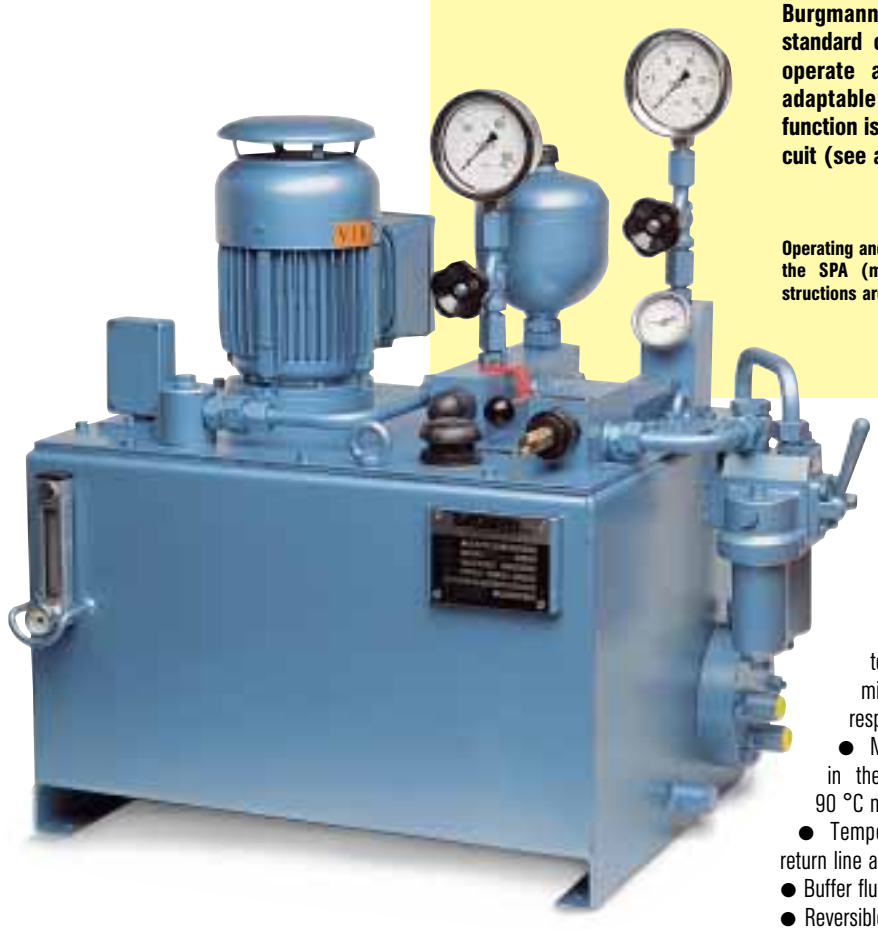
1+2 Casing and cover: 1.4571
3 O-ring: E
4+8 Screws: A4 – 70 stainless steel
5 Washers: T2
6 Ring magnets: corrosion-resistant
7 Spring: 1.4301
9 Fixing hole

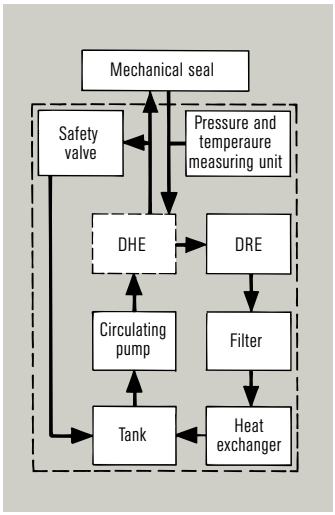
Technical data
Permissible operating pressure: 120 bar
Test pressure: 180 bar
Permissible operating temperature: 160 °C
Capacity: 0.08 litres

- Pipe connections G1/2 or NPT internal thread.

SPA

Buffer fluid units of the SPA range perform all four functions of a buffer system essential for operating double seals – circulation and cooling of the buffer medium, pressurization of buffer fluid and compensation for leakage – in a standard package. Burgmann SPAs have a high standard of quality, are easy to operate and service, and are adaptable and rugged. Their function is based on the open circuit (see also page 92).





Operating and installation diagram for ▶ the SPA (mounting and operating instructions are to be strictly observed).

PA1000

Standard buffer pressure unit
Tank capacity 40 l
Flow rate 6 l/min.

SPA2000/3000

Standard buffer fluid unit
Tank capacity 100 l
Flow rate 12 (23) l/min

Features

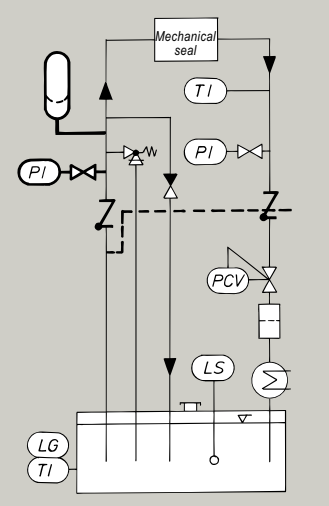
- Designed for hydraulic oil with viscosity values from 12 to 90 mm/s at operating temperature (tank temperature). The optimum viscosity of the class of the oil to be used has to be determined in accordance with the respective application.
- Max. operating temperature in the tank 80 °C (return line 90 °C max.)
- Temperature monitoring with a return line and tank thermometer
- Buffer fluid directed through oil cooler
- Reversible double filter (SPA 1000 = single filter)
- Manual control of buffer fluid pressure
- Automatic relief valve for reducing buffer fluid pressure at standstill
- Level switch with contact for Min. level
- Measuring instrument connections suitable for fitting contact switching devices (NG 160)
- Provision of an additional pressure connection for monitoring the pump discharge pressure (outside of the circuit)

Materials

Storage tanks, measuring instruments, cooler and piping are made of stainless special steel.
Fittings, distributor units, shut-off valves and tank lid are made of galvanized steel.

Version, Designation	Nominal pressure max. buffer press. (bar)	Flow rate (l/min)	Cooling capacity (kW) with hydraulic oil $\Delta t = 10K$	Pressure accumulator DHE	Tank		Dimensions overall (mm)			Net weight approx. (kg)	Motor data			
					Nominal capacity (litres)	Circulation volume (litres)	Height	Width	Depth		Nominal power (kW)	Voltage, Frequency	Speed (min^{-1})	Enclosure
SPA 1015/A01	15	6	1.8	–	40	12	650	610	380	125	1	400 V 50 Hz	1500	EEPe II T3 IP54
SPA 1015/A02	15	6	1.8	●	40	12	650	610	380	125	1			
SPA 1040/A01	40	6	1.8	–	40	12	650	610	380	125	1			
SPA 1040/A02	40	6	1.8	●	40	12	650	610	380	125	1			
SPA 1090/A01	90	6	1.8	–	40	12	650	610	380	125	2			
SPA 1090/A02	90	6	1.8	●	40	12	650	610	380	125	2			
SPA 2020/A01	20	12	3.6	–	100	20	750	800	555	140	1			
SPA 2020/A02	20	12	3.6	●	100	20	750	800	555	140	1			
SPA 2050/A01	50	12	3.6	–	100	20	750	800	555	140	2			
SPA 2050/A02	50	12	3.6	●	100	20	750	800	555	140	2			
SPA 2120/A01	120	12	3.6	–	100	20	750	800	555	140	3.6			
SPA 2120/A02	120	12	3.6	●	100	20	750	800	555	140	3.6			
SPA 3020/A01	20	23	6.9	–	100	20	750	800	555	140	2			
SPA 3020/A02	20	23	6.9	●	100	20	750	800	555	140	2			
SPA 3050/A01	50	23	6.9	–	100	20	750	800	555	140	3.6			
SPA 3050/A02	50	23	6.9	●	100	20	750	800	555	140	3.6			
SPA 3120/A01	120	23	6.9	–	100	20	750	800	555	140	6.8			
SPA 3120/A02	120	23	6.9	●	100	20	750	800	555	140	6.8			

Components



DHE

Pressure accumulator unit

This is used to maintain the buffer fluid pressure for a limited period after the SPA circulating pump has failed or been switched off. It prevents a loss of pressure on the mechanical seal and stops it from opening. The seal, however, is no longer cooled and must therefore be brought to an immediate stop. How long the pressure is maintained will depend on the following two actors: The rate of leakage of the mechanical seal and the amount of buffer fluid stored in the accumulator.

The DHE accumulator comes with a pressure gauge with shut-off valve, and a check valve.

The DHE can also be retrofitted to an SPA which is not equipped with this device. (Conversion kit drawing No. DHE140/R001-00).

DRE

Pressure control unit

A component for setting different levels of buffer fluid pressure when supplying several individual mechanical seals via an SPA with a VTE. Suitable for hydraulic oil. Max. flow rate 23 l/min. There is a choice of 4 basic types with max. setting pressure and measuring range of 0 ... 25, 0 ... 60, 0 ... 100 and 0 ... 160 bar.

VTE

Distributor unit

A component for when two or more mechanical seals are to be supplied from a single buffer fluid unit. The VTE is suitable for hydraulic oil as buffer medium. It is delivered as a separate unit which the customer must install in the pipe work at a suitable position.

VTE 02/M ...

A distributor unit for supplying two mechanical seals in between bearing pumps.

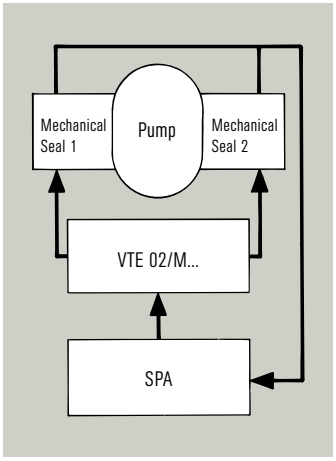
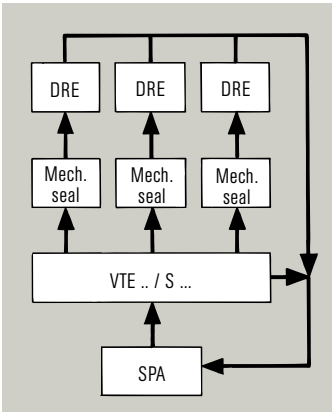


Diagram of the VTE 02/M ...

VTE .. / S ...

A distributor unit for supplying two and more mechanical seals in different pumps. It contains an overflow valve and one flow control valve per seal. DRE pressure control units are necessary if different buffer pressures are used on the mechanical seals.



A diagrammatic example for three mechanical seals

Application

Applied Technology

111 Case Examples and Recommendations for Industrial Applications

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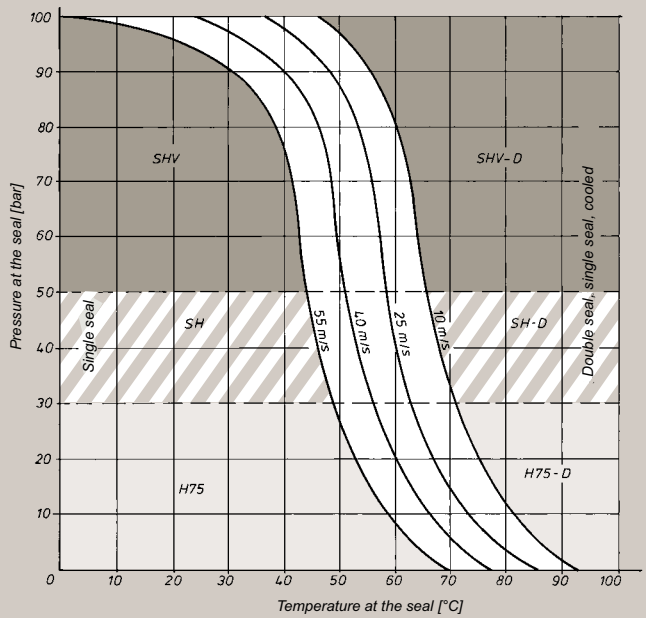
Offshore

To be able to cope with the sand, water and gases found in crude oil, mineral oil pumping systems require heavy-duty pumps with reliable, hard-wearing mechanical seals that feature durable sliding faces with good emergency running characteristics. Often it is necessary to seal pressures in excess of 100 bar and sliding velocities of over 60 m/s. The ideal combination for such conditions has proven to be high-strength carbons running against silicon carbide. It also scores high marks for resistance to chemicals and erosion as well as for its emergency running characteristics. These seals are designed not to clog even if affected by solid deposits. Use is made of materials resistant to sea water such as the standard 1.4462 (similar to Duplex, AISI 329), but also specialty materials such as Carpenter 20, Monel K 500, Hastelloy® C and B, Inconel® 625 and Titanium.



Seal selection for dirty water and sea water

The diagram is meant solely as a rough aid to selection. You should always contact your Burgmann representative before making your final decision.
Assumed modes of operation: ● Single seals according to API 610, Plan 01, 11, 12, 13, 31 or 62.● Double seals according to API 610 Plan 54. ● Single seals, cooled, according to API 610 Plan 21, 22, 23, 32, 41, 53 or 54. ● Tandem seals according to Plan 52 or 53. In this case the temperature of the medium can be raised by around 10 to 15 K.
Explanation: A double seal or a cooled single seal must be used if the pressure and temperature curves intersect to the right of the sliding velocity; use a single seal if the point of intersection lies to the left.

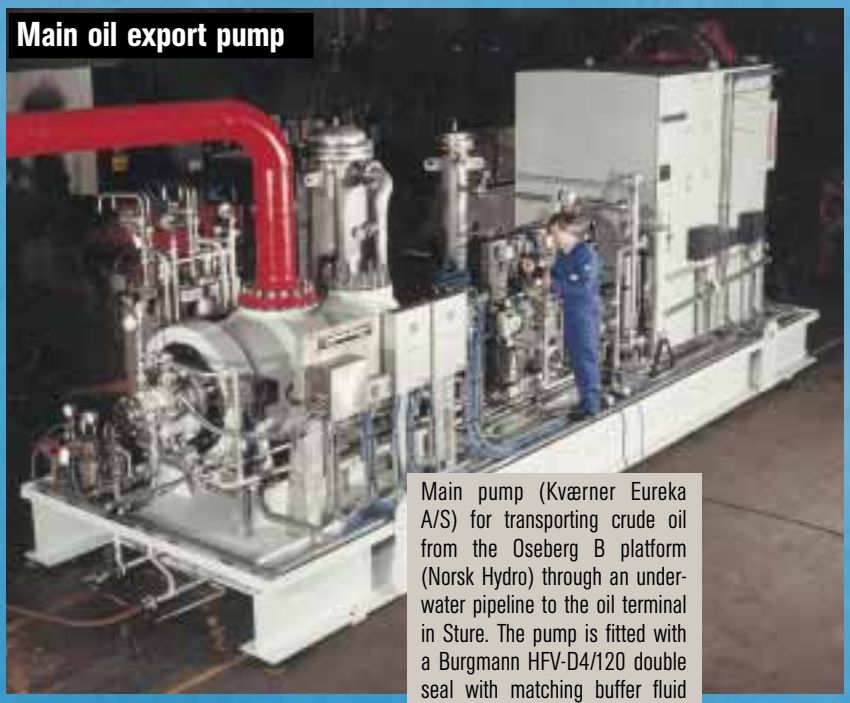
Multiphase technology

With multiphase technology it is possible to pump the oil-gas-water mixture called "multiphase" from the well, compress it and then convey it over long distances without previous separation. Multiphase pumps may be used to pump mixtures with a gas content of up to 98 %. This technology is mainly used for wells with a low inherent pressure. Extraction is increased, and even wells closed due to insufficient inherent pressure can produce oil again at a profitable level.

On a production platform of the Amoco Trinidad Oil Company, a Bornemann multiphase pump type MPC 208-67 has been working for over 6,000 hours under the most adverse conditions. Seal: Burgmann SHV3/80. Medium: multiphase mixture, gas share 78 %, $n = 1{,}200\ min^{-1}$; $p_1 = 70$ bar; $t = 70$ °C

Onshore multiphase application (Chevron, Canada) with screw pump (Leistritz). Seal: Burgmann SH 6/90, 6/90. $p_1 = 18$ bar; $v_g = 3{,}600\ min^{-1}$; $t = 25$ °C; gas share 87 %.

Main oil export pump

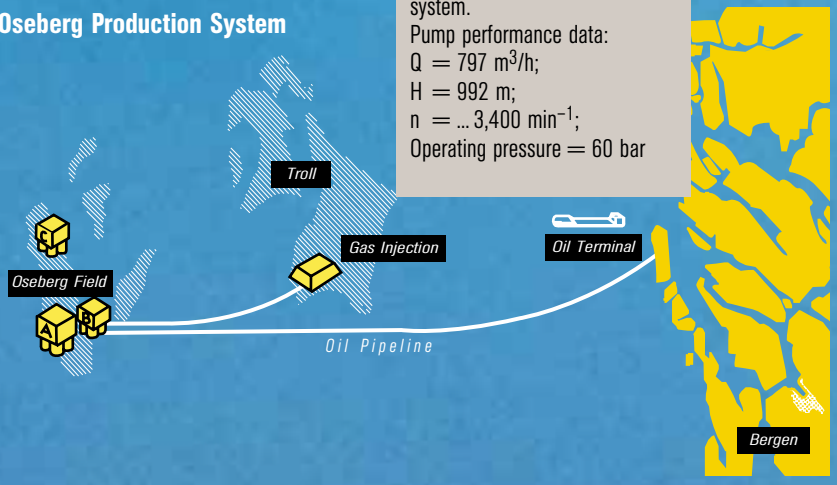


Main pump (Kværner Eureka A/S) for transporting crude oil from the Oseberg B platform (Norsk Hydro) through an underwater pipeline to the oil terminal in Sture. The pump is fitted with a Burgmann HFV-D4/120 double seal with matching buffer fluid system.
Pump performance data:
Q = 797 m^3/h;
H = 992 m;
n = ... 3,400 min^{-1};
Operating pressure = 60 bar

Oseberg A oil platform

A high-speed pump (Frank Mohn A/S) is being used on the Draugen platform (operator: Norske Shell) sealed with Burgmann SH 3/62.
Q = 750 m^3/h; discharge pressure 235 bar (g); $NPHS_R$ 13.7 m; n = 12,000 min^{-1}.

Oseberg Production System



Waterinjection pump

The BP Gyda production platform in the North Sea is equipped with multistage water injection pumps (Weir Pumps) with intake pressures up to max. 335 bar; successful sealing them with over 10,000 hours of problem-free operation behind it already is the Burgmann HST 1/119-TA2, a hydrostatic primary seal that runs contact-free in operation and sinks the pressure level from 235 bar to approximately 20 bar. The downstream mechanical seal employs a hard/hard material combination.

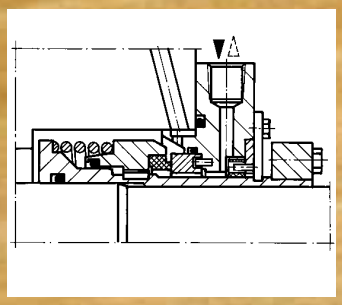
Onshore

Water injection pumps

A pump station for water injection in the Buhasa oil field (UAE, shown also in the main photo at the top). It is fitted with Burgmann HF-D4/93 seals and SPN085/E002 refil unit.

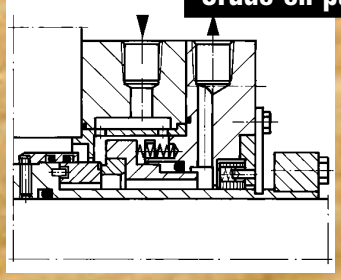
Pipeline pumps

Pipeline-Pumpe (Ruhrpumpen SMI300) sealed with Burgmann SH7/80.

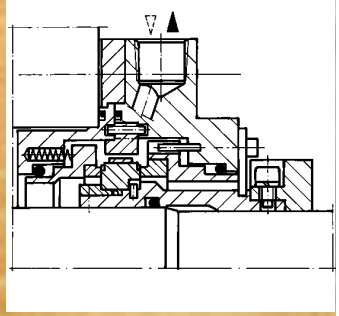


SH7/80 mechanical seal for crude oil pumps used on the Quinghai Petroleum Project (China). The seal has a single rotating spring which is insensitive to solids. Mode of operation in accordance with API 610/682, Plan 11.
(p_1 = 40 bar; t_1 = ...80 °C; n = 2,980 min^{-1})

Crude oil pump



Burgmann SH1/147 for crude oil pumps (Byron Jackson, DVMF) used in Saudi Aramco oil fields. The crude oil contains paraffin wax, volatile constituents and occasionally large quantities of abrasive solids (when a new well is started). The solution: SiC/SiC combination of face materials with HS grooves, flushing of the spring compartment, multipoint injection and a baffle to prevent a gas ring forming in the area of the sliding faces (API 682, Plan 11). Further pumps have since been converted to the SH concept following the success of this retrofit project.
p_1 = 14 bar; t_1 = 71 °C; n = 1,790 min^{-1}.



SH1-D/120 double seals in injection pumps (IDP, CA-8) used in gas-oil separation applications for Saudi Aramco, Saudi Arabia.
The pumped medium consists of so-called brine water with up to 30 % salt content and additional solids and gases (e.g. up to 500 mg/l of H_2S). All parts in contact with the product are made of Inconel 625 on account of the high risk of corrosion. Face materials: SiC-Si on the product side, SiC-C-Si/SiC-Si on the atmosphere side.
(p_1 = 11.5 bar; p_3 = 17 bar; t_1 = 60 °C; n = 3,580 min^{-1})

Compressors

Compressors are high-speed machines whose trouble-free availability constitutes a major precondition for many process engineering operations.

Key criteria for the selection and design of compressors are the working medium, the compression ratio, the volume flow, the number of intermediate inputs and outputs, and the design of the shaft seal. In all cases a rotating shaft passes through a casing wall, so the choice of sealing system – which today is usually of gas-lubricated design – assumes central importance.

CO compressor (Atlas Copco) at Alkos, Yochon/Korea, with a Burgmann DGS2/49 gas seal. p_1 = 2.2 ... 28 bar a; n = 21,700/34,800 min^{-1}; medium: carbon monoxide.

Compressor (Nuovo Pignone) on the Njord offshore platform (Norsk Hydro) with a Burgmann DGS9/130 gas seal (tandem arrangement) and a CSR to seal the bearing oil. In operation without trouble since 1998. p_1 = 26 ... 48 bar a; n = 12,495 min^{-1}; medium: natural gas.

Ammonia compressor (Sulzer-Turbo) at Norsk Hydro, Trinidad. The compressor system was equipped with a Burgmann DGS, independent of the direction of rotation, in a tandem arrangement with internal intermediate labyrinth and a Burgmann buffer gas system. The system has been running without trouble since 1995. d_1 = 100 mm; p = 4.7 bar a; n = 15,850 min^{-1}; medium: ammonia.

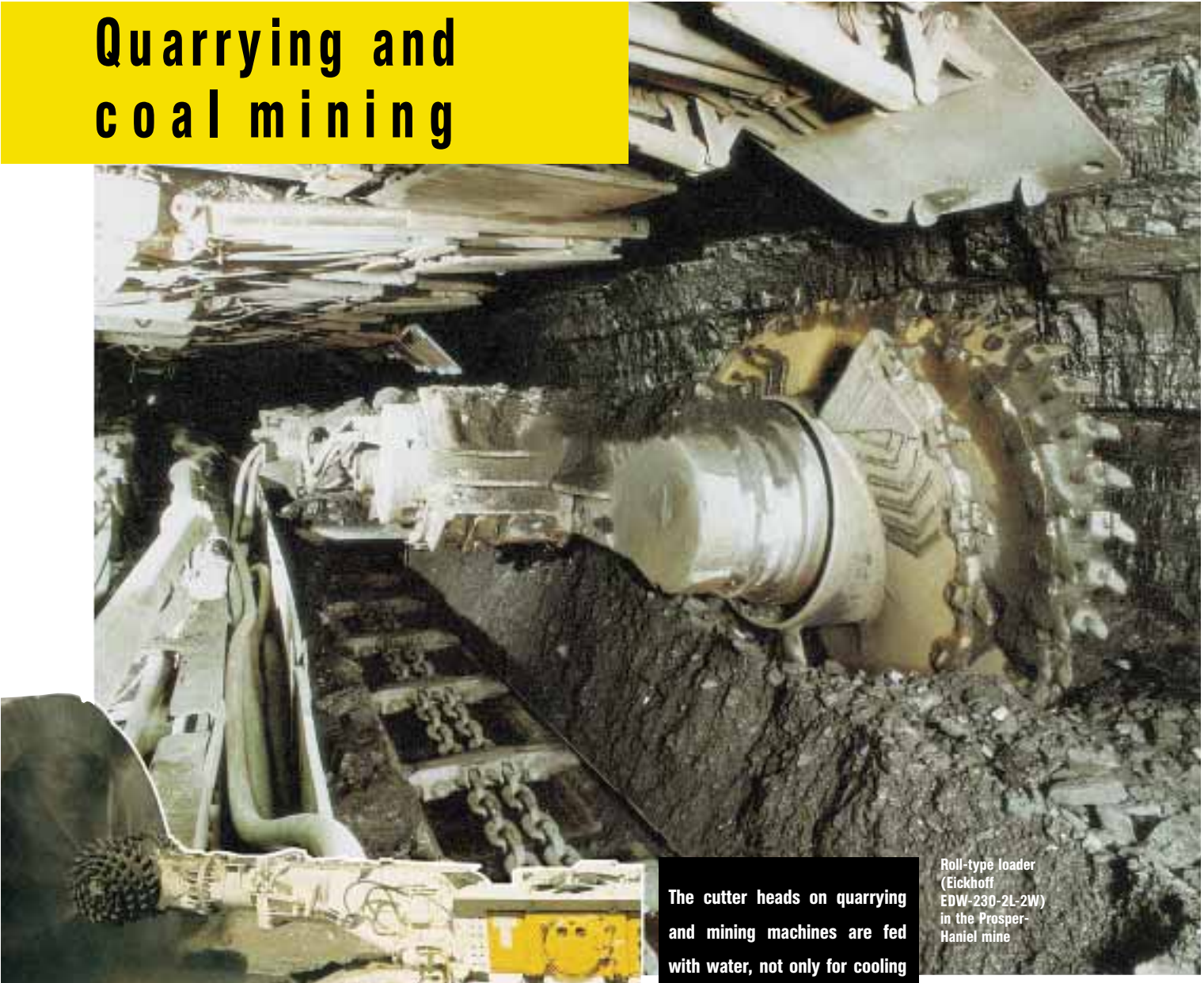
Flash turbine
The specially designed elastomer-free PDGS achieves optimal operating results at extremely low sealing temperatures on flash turbines: low leakage rates in operating and shutdown modes, improved efficiency and higher reliability. p_1 = 100 barg, static and dynamic; t = –170 ... +230 °C; v_g = 200 m/s.

Coking oven gas compressor
(Mannesmann Demag) at Wintershall AG, Lingen. Built in 1954 with labyrinth seals, the turbine-driven single-shaft radial compressor plant with twin housing has been converted to the Burgmann type DGS seal of a double arrangement with buffer gas supply system. d_1 = 88/134.8 mm; p_1 = 0.01/2.2 ... 5.6 bar; v_g = 65.7/84.8 m/s; n = 7,300/12,800 min^{-1}; medium = coking oven gas with H_2S content; buffer gas = nitrogen.

Ethylene compressor (Demag Delaval) at the Yanshan Petrochemical Plant (China). Sealed with Burgmann PDGS1/195, elastomer-free. p_1 = 3.8 bara; t = -80 °C; v_g = 100 m/s; n = 7,830 min^{-1}.

The two-stage screw compressor (Aerzen VR0825) used to compress coking oven gas in this coking plant is the biggest ever built. It is sealed with a Burgmann type HSH2/215.

Quarrying and coal mining

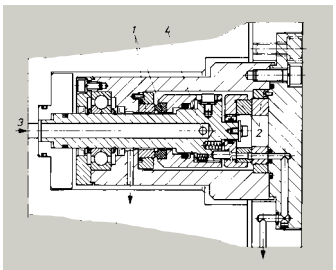


Roll-type loader (Eickhoff EDW-230-2L-2W) in the Prosper-Haniel mine

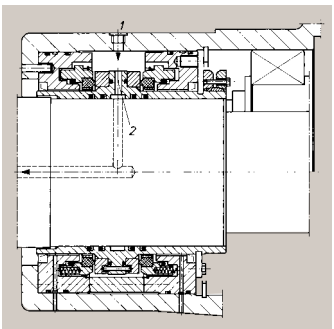
Tunelling machine (Paurat) with cutter head

The cutter heads on quarrying and mining machines are fed with water, not only for cooling purposes but also for settling the dust and extinguishing any sparks produced by the cutting tools.

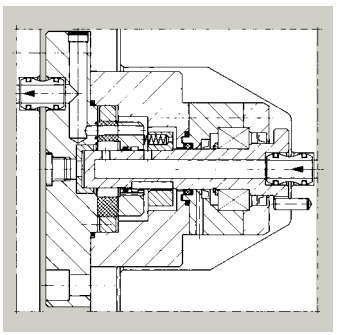
Mechanical seals perform the dual function of rotary joint and seal for the cutter and roller heads.



Roller head seal
type H427GS1/35 with segmental spray jets, used in the front section of a cutter arm. To restrict the water jet to just the cutters actually working the rock, a segmental distributor (Item 2) is fitted ahead of the mechanical seal (Item 1). Item 3 = cooling water inlet; item 4 = feed bores.
(d_1 = 35 mm; p_1 = 50 ... 150 bar; n = 36 min^{-1}).



Cutter head seal
type HRSV-D201/254 (double) with cooling water supply for the spraying system. The spray water is first cleaned by a 100 mm filter. Item 1 = water feed; Item 2 = distributor bores to the cutter head. (d_1 = 254 mm; p_1 = 150 (250) bar; n = 41 min^{-1}).

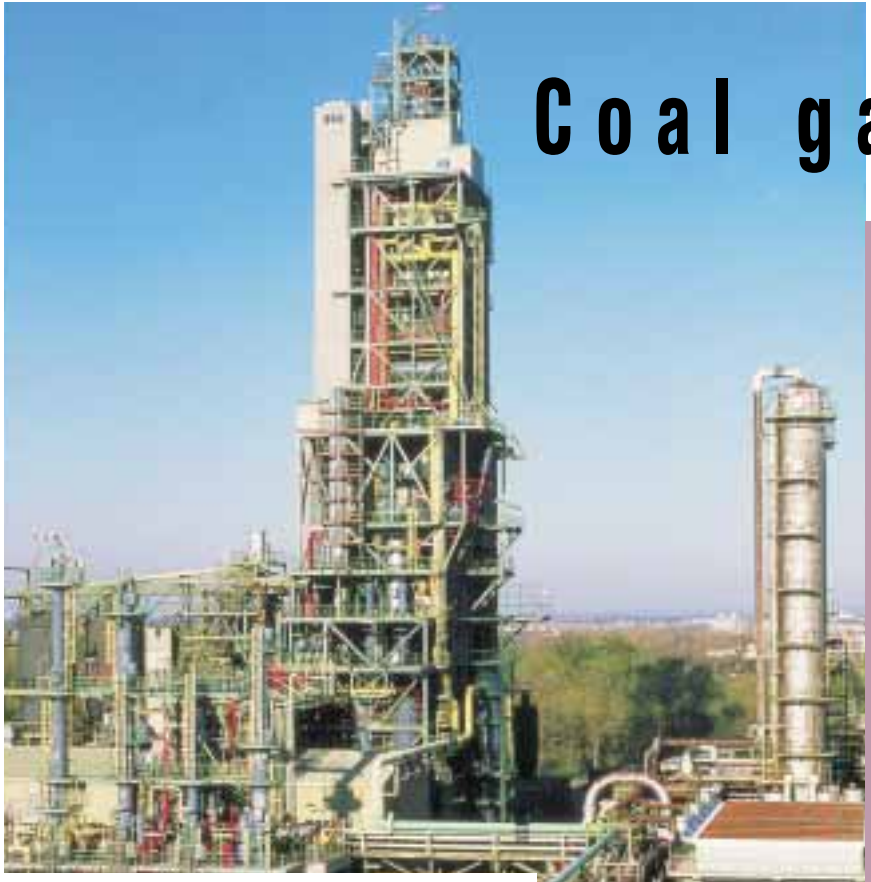


Rotary joint
S14/48 with segmental distributor (Item 1) for internal spraying of the carbide cutters on twin-roller loaders. Medium: pit water with solids (25 µm). Flow rate: approx. 150 l/min.
(d_1 = 35 mm; p_1 = 50 ... 250 bar; t = 25 ... 35 °C; n = 25 ... 60 min^{-1})

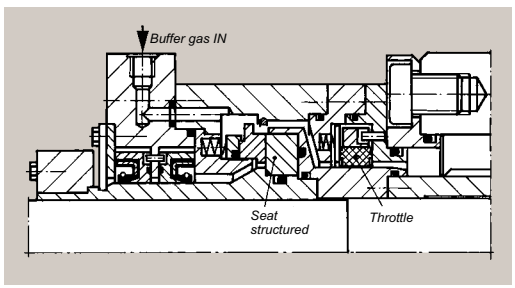
Rotary joint
S2/45 with segmental spraying.
Designed for the cutter head of a mining machine (Voest Alpine).
Medium: filtered pit water with solids < 50 µm, p_1 = 150 bar;
n = 70 min^{-1}.

Photo: Rotating seat of the S2/245 with special surface structure.

Coal gasification



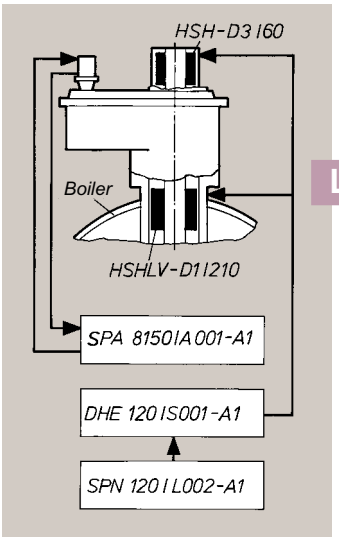
There were times, particularly during the oil-crisis years, when coal gasification centred on the process of hydrogenation, e.g. to produce motor fuels. Nowadays the driving force behind its further development is the generation of electricity by combination-type power stations with integrated coal gasification. Here the main objectives are to lower CO_2 emissions, to raise fuel efficiency and to stretch existing resources. Burgmann has considerable experience at its disposal for this highly demanding technology, for Burgmann mechanical seals and buffer fluid systems have been used in all the coal gasification processes implemented in the past few decades.



Gas-lubricated AGS1/220 for the coal feed screw. Photo above: the seal being installed.

Rheinbraun-HTW

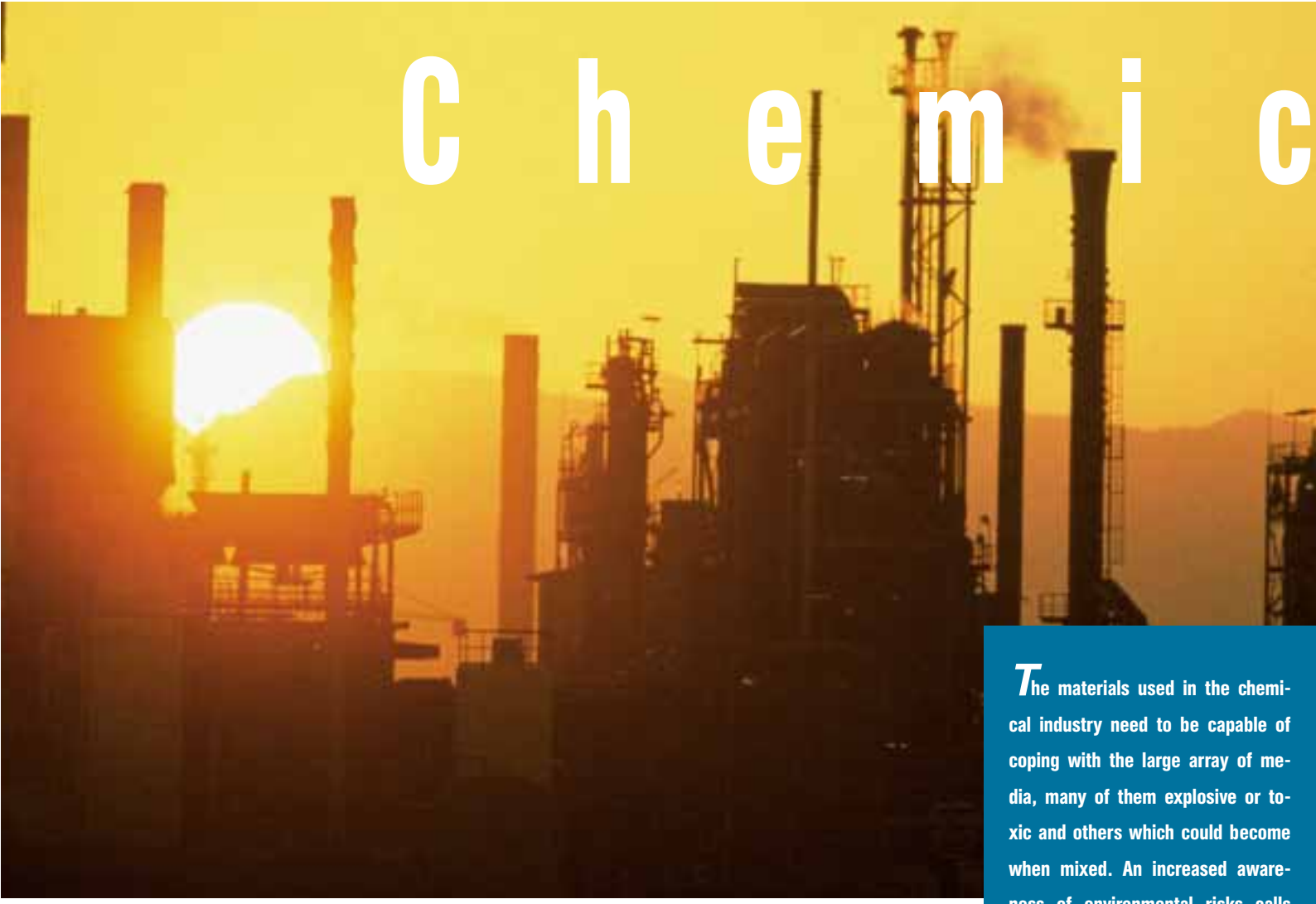
A Burgmann AGS1/220 gas-lubricated mechanical seal for the coal feed screw at the Rheinbraun coal gasification plant in Hürth/Germany. In order to increase efficiency the plant had to be operated in the area of the feed screw at 30 bar according to a new concept. The previously used lip seals on PTFE basis were unsuited, so were replaced by the AGS1/220 developed specially for this application; it proved so successful that further systems of this type were ordered.
(p_1 = 30 bar; p_3 = 0,2 ... 0,5 bar above p_1; t = 200 °C; n = 3 ... 50 min^{-1}).



Lurgi plant in Scotland

For a pilot plant for coal gasification in Scotland Burgmann supplied the mechanical seals (type HSHLV-D1/210 to seal the boiler and type HSH-D3/60 to seal a hollow shaft for taking samples; Lurgi process), the necessary hydraulic system (SPA) and further supply units for the seals (SPN, DHE), and installed the complete electric and electronic control system.
(p_1 = 70 bar; p_3 = 80 bar; t = 90 °C).

C h e m i c



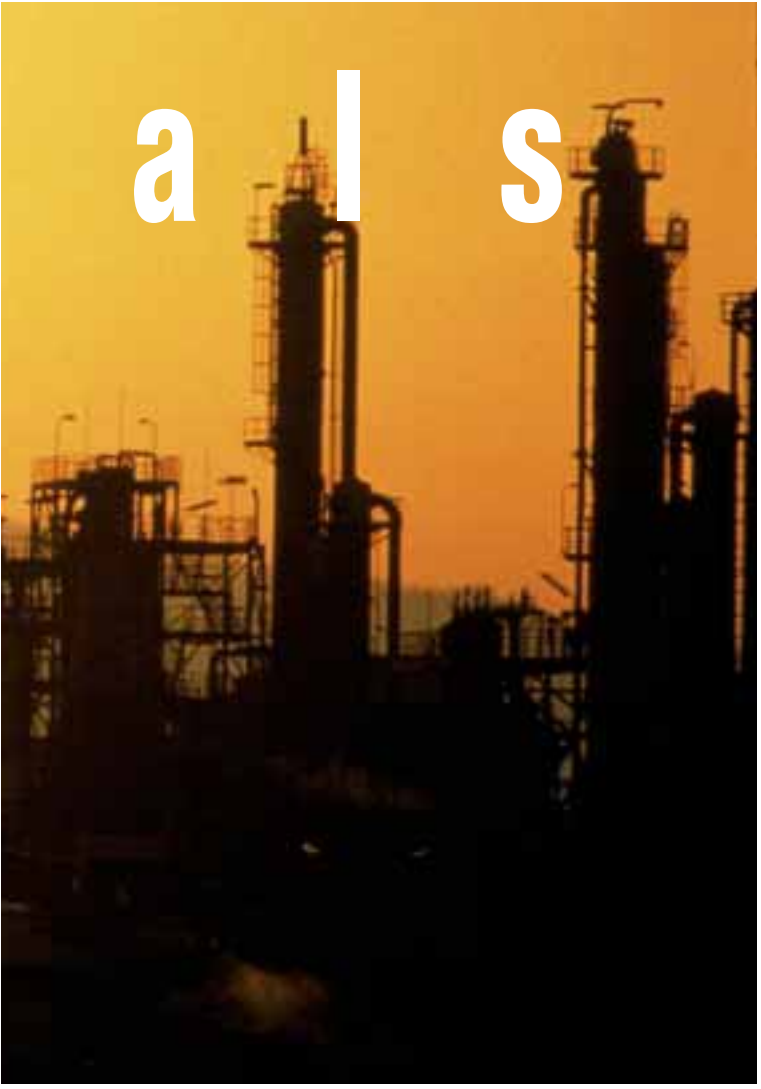
The materials used in the chemical industry need to be capable of coping with the large array of media, many of them explosive or toxic and others which could become when mixed. An increased awareness of environmental risks calls for a maximum reliability and operational safety, especially from sealing systems.

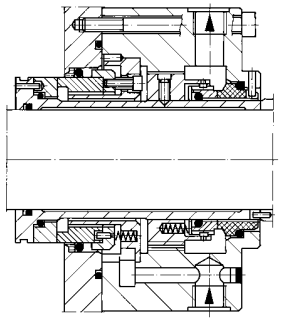
Standard chemical pumps
(Photo right: KSB-CPKN; bottom: Allweiler CNH-B) which are used in a wide range of chemical processes. Depending on the requirements or environmental restrictions, they are fitted with Burgmann standard seals in accordance with DIN 24960 (e.g. M7N) or DIN 24960 Part C (e.g. HRC).

Combustion of residues
HRC-GS3000N gas-lubricated mechanical seals are used by BASF AG in its pump system for loading this rotary kiln with liquid, pasty and solid residues. The sophisticated solution has prolonged the useful life of the liquid residue pumps used. As the result, stoppage time have been shortened and less maintenance work is required on the pump systems.

Gear pumps (Steimel) for circulating printing inks (viscosity: 500 ... 15,000 mm^2/s). Sealed with a Burgmann type M7N seal (TTV O-rings) and downstream stuffing box packing of the type Araflon, also from Burgmann.
(p_1 = ... 15 bar; t = 0 ... 30 °C; n = approx. 350 min^{-1}).

Chemical pump (KSB, CPK) for pumping crystallizing caustic soda in a chlo-rine absorption plant at Hoechst. Sealed with a Burgmann type H74-D in a double arrangement.





Multiprocessors (Drais) with fitted blade mills are employed for an assortment of processes, from food production to the drying of leather dyes. The blade mills are sealed with Burgmann type MRF-D seals and TS 2000 supply systems.

Agitator bead mills (Vollrath) with two mill cells arranged in series in the lacquer production department. Sealed with a Burgmann type MFR-D17/65 double seal. (p_1 = 0,5 ... 3 bar, t = 60 °C; n = 1,045 min^{-1}; p_3 = 4.5 bar; buffer medium = 30:70 glycerine water mix.)

Great efforts are being made on an international scale to meet the rising demand for polypropylene. The most popular solutions are the **polypropylene reactors** built under licence from BASF and sealed with Burgmann type HSHU-D1 bottom entry drive seals and Burgmann buffer fluid systems. Burgmann sealing systems for these processes are acknowledged to be the world leaders, not least in view of such impressive figures as up to 80,000 hours operation without reconditioning.

Vertical ammonia pump (IDP 14 WUG-8) with the Burgmann CGS-KD/43-U gas-lubricated seal and the GSS 4010 seal supply system at the SKW Prestritz nitrogen works in Wittenberg. The cartridge seal runs successfully with zero leakage and zero wear. (p_1 = 23 bar; t = –33 °C; n = 2,980 min^{-1}).

Standard centrifugal pump (Lowara Germany) made of AISI 304 chromium nickel steel, which is used in many different applications in the chemical sector. Sealed with the Burgmann MG1 elastomer bellows mechanical seal.

Rotary piston pump (Lederle), equipped with a Burgmann type M 74-D seal and the TS 2000 buffer fluid system for chemical applications.

Eccentric screw pump (Seepex 10-6 LNS) with Burgmann MG1-45/66 in back-to-back arrangement for conveying sulfide slurry. (p_1 = 4 bar; t = approx. 90 °C; n = 335 min^{-1}).

Plastic centrifugal pumps (KT Troisdorf, BP32-160) for pure or contaminated acids and lyes. The example in the picture is an application involving 10 % caustic potash solution. Sealed with MFL85N single seal in a dead-end arrangement. Metallic materials are in Hastelloy, seal faces are made of SiC. (p_1 = ... 6 bar; t = ... 80 °C; n = 2,800 min^{-1}).

Refinery

The processing of crude oil in refineries is a complex, multi-stage process in which crude oil is transformed into refined, high-quality end products or feed materials for the petrochemical industry. Sealing technology for this area faces special challenges in various respects: Risk of insufficient lubrication and dry running due to volatile material constituents and low boiling points, media with a diversity of physical properties (from liquefied gas to bitumen), high and low temperature ranges, and the handling of hazardous substances (harmful, polluting and potentially explosive) are all conditions which need to be controlled with absolute reliability.

Low-temperature applications

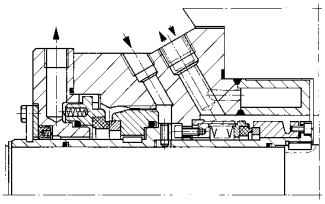
Vertical in-line pump (Worthington) for emptying an ethylene liquefied gas depot. Double sealing system with Burgmann MFLWT80F-D1/53 (API 610, Plan 53).
(p_1 = 2 bar; intake pressure = 23 bar; p_3 = 6 bar; t_1 = –103 °C;
n = 3,000 min^{-1}).

Return pump with tandem seal type H75S2-H75F1 according to API 682 Plan 52 for the sealing of hydrocarbon. Buffer medium: methanol. Temperature: –13 °C.

Discharge pumps (KSB, WKR-65-3) in a transfer station for propylene (C3) run by Hoechst AG, Frankfurt. They are equipped with Burgmann type H7N/H7F3 seals as tandem cartridges with TS 2000 thermosiphon system. (p_1 = 18 bar; t = -10 ... +40 °C;
n = 2,950 min^{-1}; d_1 = 38 mm.)

Nitrogen pump in a loading station run by Linde AG. The gas-lubricated MFLC-GS seal from Burgmann has been running without trouble since April 1998. p_1 = 5 bar; t = –196 °C; n = 2,950 min^{-1}. Further mobile pumps (n = up to 11,000 min^{-1}) in tanker trucks are also being successfully sealed with the MFLC-GS.

Burgmann mechanical seal type MFLW85S20 for sealing gas oil with sulfur in a Ruhrpumpen pump. Temperature 217 °C, pressure 2.3 bar.



Gas oil pump (Byron Jackson) with Burgmann type MFL65 and type HSHF1 seals in a tandem arrangement. To keep the carbide seal face housing of the MFL65 on the product side free of stress, it has a balancing groove. Buffer fluid is cooled by a Burgmann heat exchanger. Modes of operation in accordance with API 610, Plan 02 + C, 23, 53 and 61. (p_1 = 3.5 ... 15 bar; t = 280 °C; n = 5,900 min^{-1}.)

▲ Burgmann MFLWT80S3/90Ta1 seal and 3020/A22 supply system in accordance with API Plan 54 + 2 in pumps (Byron Jackson) used to convey residual oil. t = 332 °C, p = 8.5 bar.

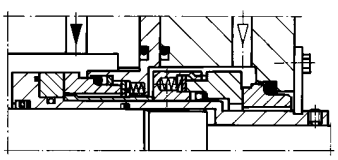
◀ Residual oil pump (Thyssen-Ruhrpumpen) with Burgmann MFL W80-D1/70 and SPA 3020/A22. Mode of operation according to API Plan 54 + 2. Temp. 375 °C, pressure 3 bar.

GLP delivery pump ▶ (Sulzer Weise, RP37) at the Henrique Lage Petrobas Refinery in Revap, Brazil. Approx. 30,000 tons are conveyed by the pump in a month, saving around 1,650 truck deliveries. Sealed with a SHFV-D1/150 supplied by the SPA66. p_1 = 25 bar; t_1 = 30 °C; v_g = 28 m/s; media: hydrocarbons.

▲ Mobile Burgmann SPN2063 refill units for WICOOM at the MIDER 2000 oil refinery in Leuna. Of the 900 pumps in the complex, around 700 are supplied by this mobile, universal refill unit (with selector for choosing between 5 different buffer media).

Sulfolan pump (KSB, RPK-Cm) in an aromatics station at the Cologne-Godorf refinery of Deutsche Shell. Sealed with the gas-lubricated Cartex-GSD. Operating mode in accordance with API 682, Plan 11 with steam quench on the atmosphere side.
p_1 = ... 2 bar a; p_3 = 3 ... 5 bar; t_1 = 165 °C; n = 2,950 min^{-1}; medium: sulfolan, crystalizes at +26 °C; buffer gas: N_2.

Quench oil pump (Ruhrpumpen, ZM-II-530) at DSM, Holland, converted to the Burgmann gas-lubricated RGS-D1/143 with GSS buffer gas supply system. The plant has been running without trouble - with one brief inspection - since it was restarted in January 1999. p_1 = 1 bar; t_1 = +191 °C ... 215 °C; n = 1,500 min^{-1}; medium: quenching oil with 3 % solid content.



API 682

"Sealing systems for centrifugal pumps, API 682" is the title of the standard issued by the American Petroleum Institute for pumps in the hydrocarbon processing industry. The API 682, 2nd edition, to ISO/NP 21049, contains sealing and supply systems for applications in refineries and the chemical industry.

Pump (Ruhrpumpen) with Burgmann tandem seal type H75S2-H75F2 according to API 682 Plan 52. Medium: C_3 fraction; buffer medium: methanol.

Return pump (KSB) with Burgmann tandem seal type H75S2/60-H75F2/55 according to API 682 Plan 52 for sealing C_4 hydrocarbon. Buffer medium: methanol.

API 682 covers the following ranges:
Shaft sizes: 20 to 110 mm
Temperatures: –40 °C to +400 °C
Pressures: 0 bar absolute to 42 bar absolute

- API 682 includes a seal selection procedure as well as an aid for selecting buffer/quench fluids, seal supply systems and modes of operation.
- Cartridge solutions are specified for all applications. API 682 requires all parts of the seal (including its cover and shaft sleeve) to be supplied by the seal manufacturer.
- For the purposes of qualifying the seals, all standard types and arrangements have to be put through stipulated dynamic trial runs under defined conditions.

Seal types

Type A O-ring seal

- Rotating O-ring seal with multiple springs
- Sliding faces: reaction-bonded silicon carbide against blistering-resistant carbon
- Fluoroelastomer O-rings
- Hastelloy® C-springs
- Metallic components (cover, shaft sleeve etc.) made of stainless steel (type 316)
- Floating carbon throttle in the seal cover on the atmosphere side

Type B Bellows seal

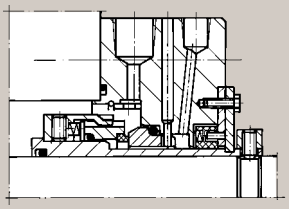
- Rotating metal bellows seal with O-ring secondary seals
- Sliding faces: reaction-bonded silicon carbide against blistering-resistant carbon
- Fluoroelastomer O-rings
- Hastelloy® C bellows
- Metallic components (cover, shaft sleeve etc.) made of stainless steel (type 316)
- Floating carbon throttle in the seal cover on the atmosphere side

Type C Bellows seal

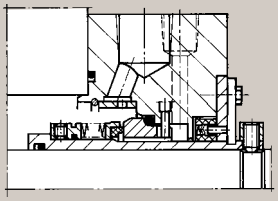
- Stationary metal bellows seal with graphite secondary seals
- Sliding faces: reaction-bonded silicon carbide against blistering-resistant carbon
- Graphite secondary seals
- Inconel® 718 bellows
- Metallic components (cover, shaft sleeve etc.) made of stainless steel (type 316)
- Floating carbon throttle in the seal cover on the atmosphere side

Type ES

- Special seal design

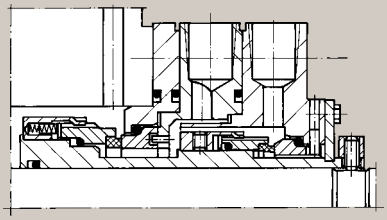


H75VN
t = –40 ... +260 °C
p = 0 ... 40 (80) bar
v_g = 25 m/s



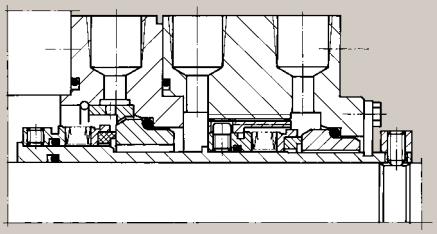
MFL85
t = –40 ... +260 °C
p = 0 ... 25 bar
v_g = 20 m/s

Single seal
Type A/B
Arrangement 1



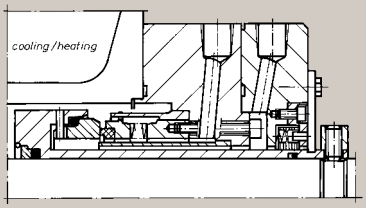
Double seal
Type A
Arrangement 2 or 3

H75VK/H75F
t = –40 ... +260 °C
p = 0 ... 40 (80) bar
v_g = 25 m/s



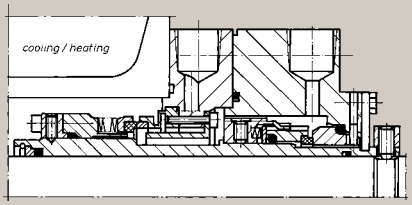
Double seal
Type B
Arrangement 2 or 3

MFL85/MFL85F
t = –45 ... +260 °C
p = 0 ... 25 bar
v_g = 20 m/s



Single seal
Type C
Arrangement 1

MFL65
t = –40 ... +400 °C
p = 0 ... 25 bar
v_g = 50 m/s



Double seal
Type ES
Arrangement 2 or 3

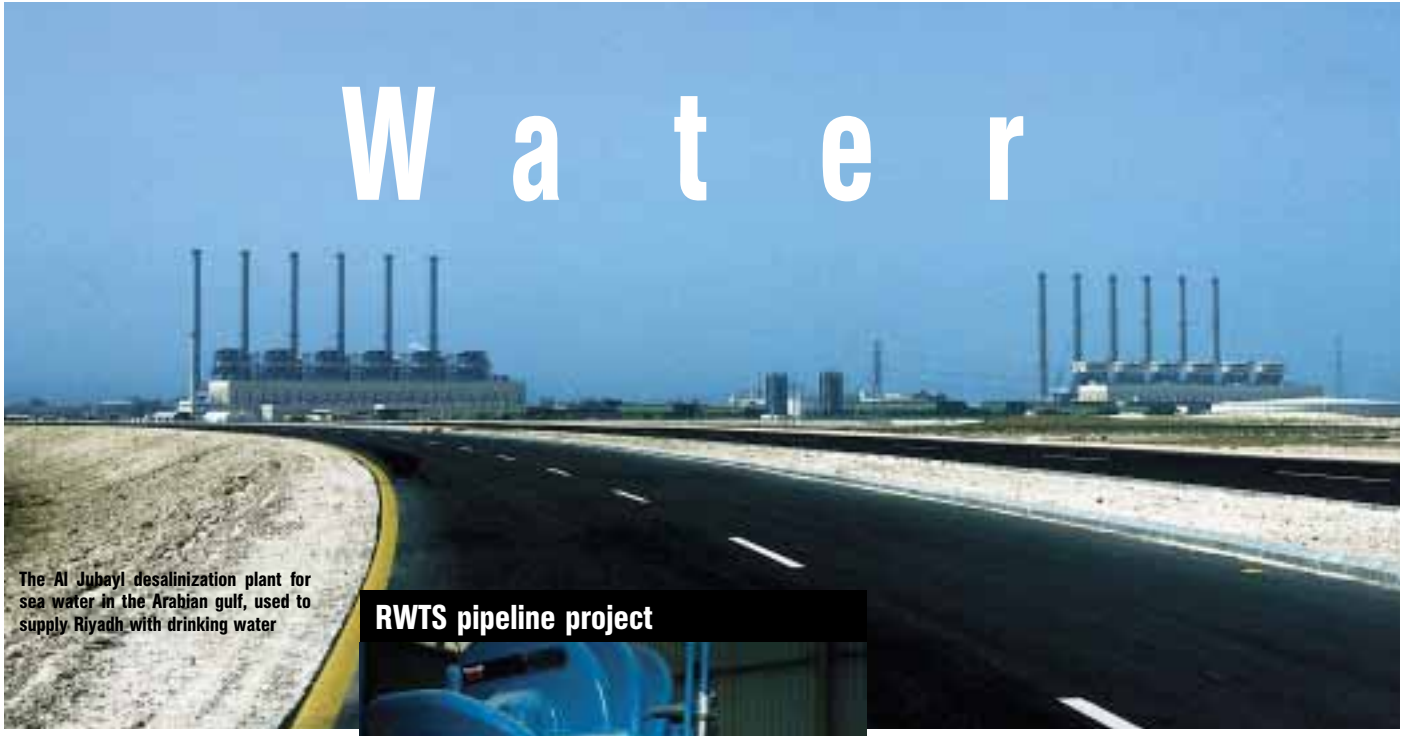
MFLWT80/H75F
t = –40 ... +400 °C
p = 0 ... 25 (40) bar
v_g = 20 m/s

Arrangement 1: single seal
Arrangement 2: double seal, unpressurized
Arrangement 3: double seal, pressurized

For circulation systems according to API 682 refer to page 93.

Burgmann MFL WT80. A typical cartridge mechanical seal of the type used as standard in refineries.

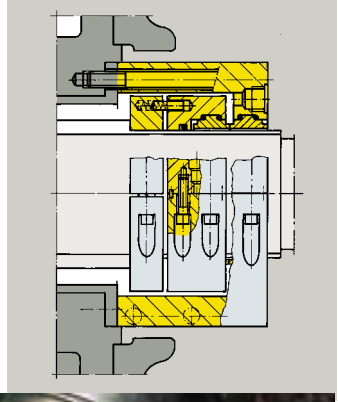
Water



The Al Jubayl desalinization plant for sea water in the Arabian gulf, used to supply Riyadh with drinking water

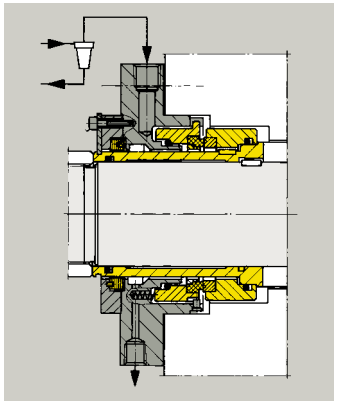
RWTS pipeline project

Desalinization of sea water



Burgmann VGM single seal of fully split design (top). Mounting the seal on a turbine shaft (below).

Half-split and fully split sealing units are a great advantage when pumps are operated without a standby and the sealing compartment offers too little space in axial and/or radial direction to fit or replace the mechanical seal. Effort and downtimes are reduced considerably for inspection and repair jobs. Burgmann half-split and fully split mechanical seals type HGH and VGM are working successfully in numerous pumps in sea water desalinization plants and hydropower station turbines.



Main Pumps (Worthington) in the RWTS project, sealed with Burgmann HSHV1/220 seals (left)

The Riyadh Water Transmission System (RWTS) project consists of a 460 km twin pipeline with the necessary pumping stations. It extends from the Al Jubayl desalinization plant in the Arabian Gulf to Riyadh (A Mannesmann project).
The main pumps and the booster pumps (Worthington) used in the project are equipped with Burgmann HSHV single seals of cartridge design, with type ZY203 cyclone separators and type SP23-04 leakage controllers (API 610, Plan 31). (d_1 = ... 250 mm; p_1 = ... 50 bar; v_g = ... 25 m/s).

The drinking water supply system of the Peroxid company in Höllriegelskreuth. A between-bearing pump (Klaus Union) with Burgmann type M74N/90 seals (hard carbon/cast Cr-steel) on both ends are being used successfully in continuous service. (d_1 = 90 mm; p_1 = 10 bar; t = 8 °C; n = ... 1,600 min^{-1}; product circulation).

Drinking water supply

Multi-stage pumps (Vogel MP) in water supply and water treatment systems. Delivery rates ...340 m^3/h, delivery heights ...500 m. t = ...140 °C; p_1 =16 bar. Sealed by M7N (on the drive side) and the MG912 (on the non-drive side).

Swimming pool

Drinking water pump (KSB, MTC D 100) with a Burgmann type H17GN/50 seal.

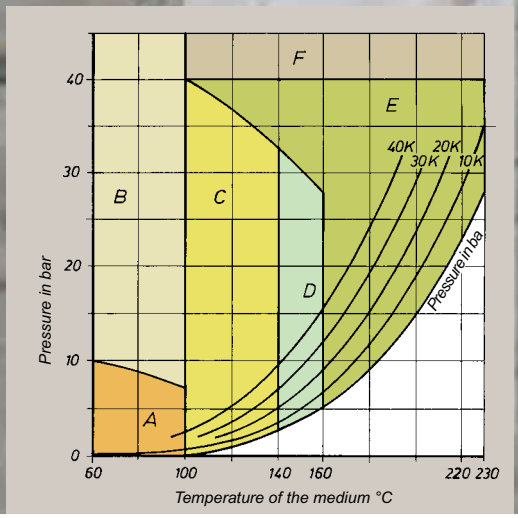
◀ Swimming-pool water circulating pump (Herborner Pumpenfabrik), equipped with an MG1 single mechanical seal

Hot water

Hot water is conveyed by pumps for a variety of purposes in thermal energy generating systems, district heating systems, home heating systems and so on. The suitability of a mechanical seal for such applications depends on many different parameters, e. g.:

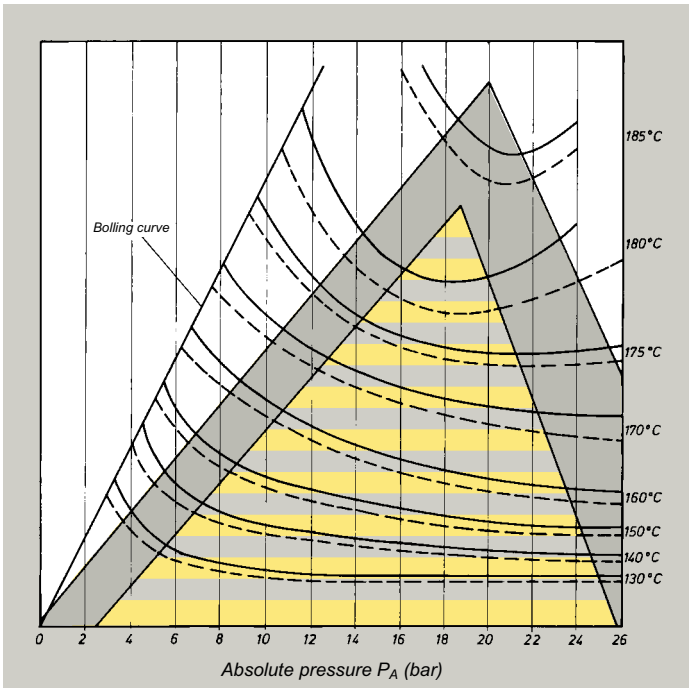
- pressure to be sealed
- temperature at the seal
- sliding velocity
- power consumption
- water quality (pH-value, O_2-dose, conductivity, operating mode)
- water additives such as corrosion inhibitors

In the diagram and in the table you will find recommendations for seals, with operating limits quoted for low-mineral and demineralized water as defined in Vd TÜV Guideline 09.87 TCH 1466.



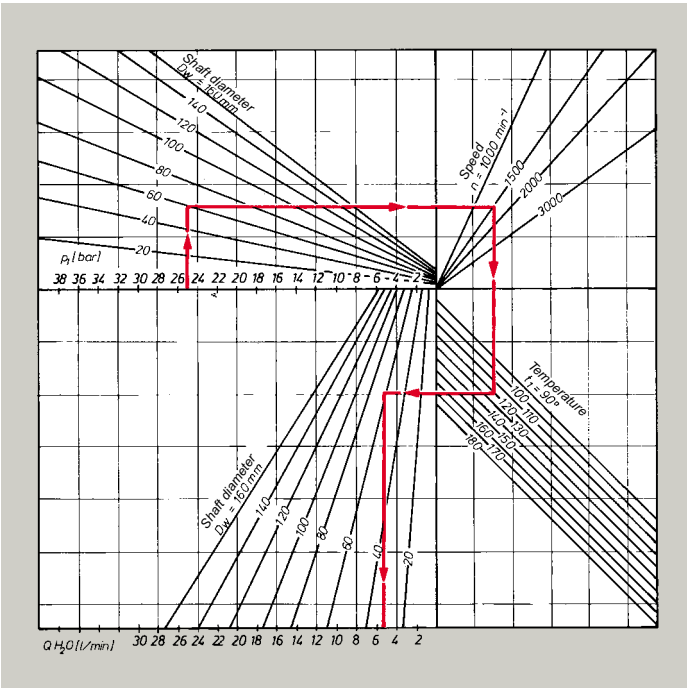
Area	v_g [m/s]	$p \cdot v_g$ [bar m/s]	Seal type	Werkstoffe nach DIN 24960	Mode of operation[1]					Temperature °C at the seal
					Without cooling	Product circulation[3]	Sationary seat cooling	Jacket cooling	External cooling	
A	<10	<100	MG1, M7, H7	SAEGG	●	●				<100
B	<20	<400	H7, H75	Q_1AEGG	●	●				<100
	<20	<800[5]	H75	AQ_1EGG	●	●				<100
C	<10	<250	H7	Q_1AEGG	●	●				<140
			H75	AQ_1EGG						
	<20	<250	H75 G115	AQ_{12}EGG			●			<120
	<20	<400	H7	Q_1AEGG				●		<100
			H75	AQ_1EGG						
	<20	<800[5]	H75	AQ_1EGG	●	●				<100
D	<10	<200[2]	H75	AQ_1M_2GG	●	●				<160
			H74-D[4]	Q_1AM_2GG						
	<20	<250	H75 G115	AQ_{12}EGG			●	●		<120
E	<10	<250	H75 G115	AQ_{12}EGG			●	●		<140[6]
	<20	<400	H7F	Q_1AEGG				●	●	<100[6]
			H75F, SHF75	AQ_1EGG						
F	<50	<2500	HSHF, HF (V), SHF	AQ_{12}EGE				●	●	<75[7]

[1] Boundary condition: Δ t erf. ≧10K minimum differential to boiling pointt
[2] p_1 ≧16 bar
[3] Product circulation rate ≧ 0.4 m³/h
[4] See HTS system
[5] p_1 ≦ 80 bar; d_w ≦ 50 mm
[6] Temperature at standstill 150 °C max.
[7] Temperature at standstill 75 °C max.



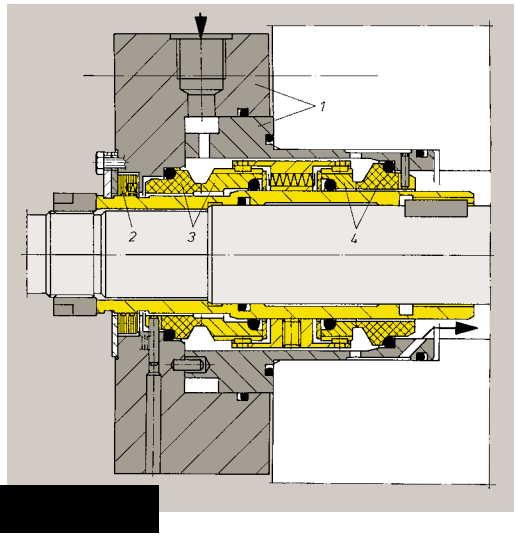
Permissible operating ranges for the H7 series of seals in hot-water applications with product circulation, no additional cooling, demineralized water or similar as the medium, and Q_1/A face material combination.

——— = v_g 18,4 m/s
– – – = v_g 7 m/s



Cooling water for the stationary seat cooling system
The frictional heat generated by the seal faces is dissipated by cooling of the type **G115** stationary seat. Inlet temperature of the cooling water: 30 °C max.

Example: p_1 = 25 bar; D_W = 60 mm; n = 1.500 min^{-1}; t = 120 °C
Cooling water rate: **Q = 5.2 l/min**



HTS – Hot water sealing without cooling

No environmental pollution and a higher efficiency of operation for hot-water pumps are major arguments in favour of using the uncooled HTS sealing system, quite apart from its various technical advantages.

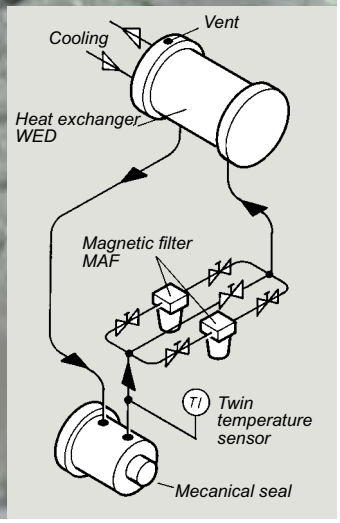
Without cooling water means no supply system and none of the elaborate pipework, controls or treatment equipment which go with it. You have no heat loss and no cooling arrangements. Temperature levels are therefore negligible, which in turn makes for a higher level of operational reliability.

The system

If the operating point (see seal selection diagram) of the medium to be sealed lies close to the vapour curve, the pressure in the seal chamber is raised by a controlled amount. Vaporization of the medium in the sealing gap is prevented, and so is the risk of dry running. Through the special seal chamber design and improvement to the pump-internal circulation, a large enough differential over the vapour pressure is maintained under all operating conditions, without the sliding faces being loaded with unduly high pressure.
(d_1 = ... 120 mm; p_1 = 25 bar;
t = 160 °C; v_g = 10 m/s).

HTS seal system:
1 Seal cartridge cover plates are modified to suit the given conditions of installation
2 Safety throttle on the atmosphere side
3 Mechanical seal on the atmosphere side
4 Mechanical seal on the product side, for maintaining pressure

Left: A set of booster pumps (KSB) at the Scholven power station (740 MW) which was converted to the HTS seal system



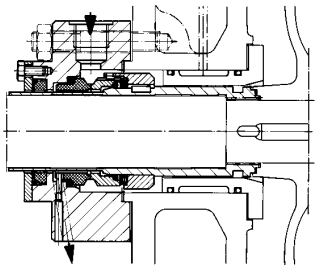
Notes on installation

For mechanical seals with a cooling system to function properly

- the stuffing box and the pump housing must be separated by a close clearence neck bush between the shaft/shaft sleeve and the pump casing in front of the seal
- the heat transfer from the hot pump body to the stuffing box must be prevented by jacket cooling and an appropriate design of the shaft sleeve
- the seal cooling circuit must be correctly installed and the heat exchanger must be of adequate size. Allowance must be made for correct venting. Turbulence losses inside the mechanical seal chamber must be taken into account along with production of heat in the sealing gap.

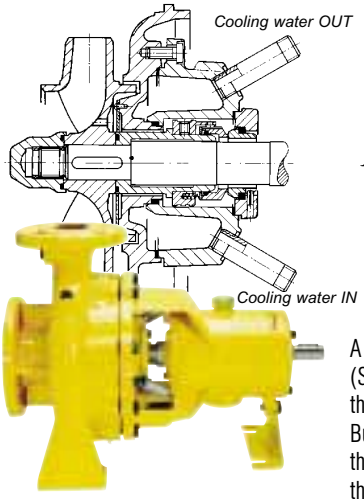
Hot water pumps

▶ Without cooling



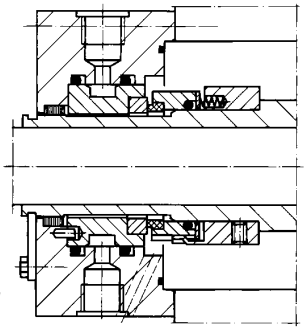
Type RBS80/32 pumps (HALBERG) are being used with Burgmann **H7 S2** seals **without any cooling system** in the hot-water circuit of the BASF company's ether plant in Ludwigshafen. To prevent vaporization in the sealing gap, which would result in dry running, the pressure in the stuffing box is raised by means of a circulation line with orifice (API 610 Plan 11) coming from the discharge nozzle via by a throttle on the product side.
(d_1 = 48 mm; p_1 = 6 ... 15 bar (supply);
p_2 = 28 bar (at pressure port);
t_1 = 128 ... 170 °C; n = 2,900 min^{-1}).

▶ With jacket cooling



A hot water pump (Allweiler, CNH) according to DIN 25256, with a cooled seal chamber. Equipped with a Burgmann type H74F1 seal. (p_1 = 25 bar; t_1 = 207 °C).

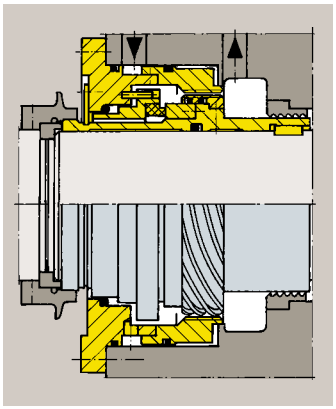
▶ With stationary seat cooling



A speed-controlled hot-water pump (Sulzer-Weise, ZF) at Munich-North thermal power station. Sealed with a Burgmann type H74G15 seal. The long throttle bush from the pump casing to the seal chamber allows for efficient cooling but requires a vent hole in the area of the seal as there is no exchange of liquid.
(d_1 = 95 mm;
p_1 = 22 bar; t_1 = 180 °C;
n = 500 ... 1,800 min^{-1}).

Feed pumps

Sealing systems featuring maximum operational reliability, convenient maintenance and low leakage rates with necessary environmental protective measures are standard requirements in modern power stations. Sliding velocities in power station feed pumps can be as high as 60 m/s, so more often than not the only way to satisfy these demands is with special designs.



A type SHF5/147 mechanical seal for a **water feed pump** (Weir Pumps, FK4) at the Ghazlan power station, Saudi Arabia.
(p_1 = 34 bar; t_1 = 181 °C; n = 5,650 min^{-1}; v_g = 47 m/s)

Main feed pump (CCM Sulzer) at St. Laurent nuclear power station (EDF), France. Equipped with a Burgmann type HSHFB 11/191 seal and WE 120 heat exchanger. (p_1 = 28 bar; t_1 = 188 °C; n = 4,610 min^{-1}; v_g = 48.2 m/s)

▲
Feed pump (Halberg) at Isar 1 nuclear power station with a Burgmann type SHV1/165 mechanical seal.
(p_1 = 20 bar; t_1 = 185 °C; n = 5,000 min^{-1}; v_g = 47 m/s)

Boiler feed pump (KSB, CHTA) with a Burgmann type SHV1/200-E1 mechanical seal. ▶
(p_1 = ... 30 bar; t_1 = 190 °C; n = 5,020 min^{-1}, v_g = 57 m/s)

Boiler feed pump (Weller) at the 15,000 kW Bergkamen A power station run jointly by STEAG and VEW with Burgmann type SAF 2/165-E1 ▶
(p_1 = 23.5 bar; t_1 = 163 °C; n = 5,100 min^{-1}; v_g = 46 m/s)

Boiler circulation pumps

Boiler circulation pump (Halberg) in the Paka combined power station (Pasir Gudang, Malaysia) sealed with type SHPV2/90. (p_1 = 75 bar; t_1 = 288 °C; n = 1,450 min^{-1}).

Boiler circulation pump (IDP) in the San Antonio power station (Texas, USA) with a Burgmann SHV3/125 (photo right) and a closed-loop flush system. Running successfully since March 1999.
(p_1 = 170 bar; t_1 = 340 °C).

Flue gas desulphurization

Modern coal-fired power stations are equipped nowadays with flue gas desulphurization plants. The scrubbing systems used by these plants work with a desulphurizing efficiency of better than 95 %. In preparing the absorption medium, lime or limestone and water are mixed to form a suspension which is fed continually into the scrubber washing solution circuit. Sulphur dioxide and flue-dust in the flue gas become attached to the drops of washing solution and are removed from the flue gas exhaust.

The media to be sealed (absorber liquid, sulphite and sulphate solution, filtrate, lime slurry, etc.) are usually highly corrosive and laden with solids (grain sizes < 1 µm ... 200 µm), lie between 4 and 10 in the pH scale, and have a chloride content of between 10,000 and 30,000 ppm (rising to 100,000 ppm in concentrators). All the materials used are therefore highly resistant to wear and corrosion.
More than 2,500 seals from the Burgmann HR series ($d_1 = 20$ ... 250 mm) have been installed in Germany and neighbouring countries since 1985 to seal pumps for flue gas desulphurization plants (Allweiler, Düchting, Friedrichsfeld, Habermann, Halberg, KSB, Netzsch, Seeberger, Sulzer, Warmann, Wernert).
Many of the original mechanical seals, e.g. those in the flue gas desulphurization plant run by Bremen Utilities, have had a useful life of more than 20,000 hours.

Residue evacuation pump (Habermann) with HR222 S1/140 tandem seal and QFT 2000.

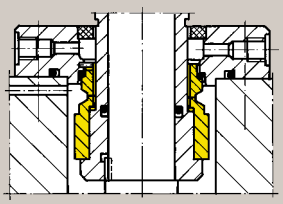
Washing suspension circulating pump (KSB-KWP) with a Burgmann type HR321/290 mechanical seal.

Tank agitator (Hoesch) with Burgmann HRLS1/80 for horizontal installation in scrubbers and oxidizers.

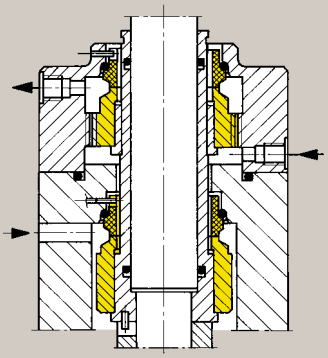
Boiler circulation pump (PRNR, ENSIVAL) with SHV1/57-EF1 seal and WED20 heat exchanger. ($t = 325$ °C; $H = 122.95$ kg/cm^2; $p = 120.5$ bar)

Vertical condensate pumps

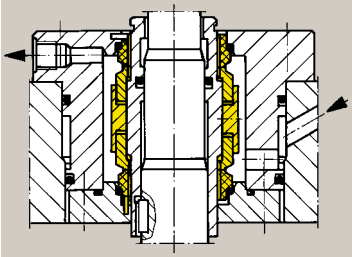
Sealing systems for vertical condensate pumps must be designed in such a way as to ensure there is always liquid in the area of the seal faces, e.g. with a quench or buffer fluid pressurization. If, for example, the level of the medium drops, dry running will thus be prevented. Example arrangements are shown to the right.



H7N single seal with throttle and quench on the atmosphere side



H75NN/H75F1 tandem seal with liquid quench

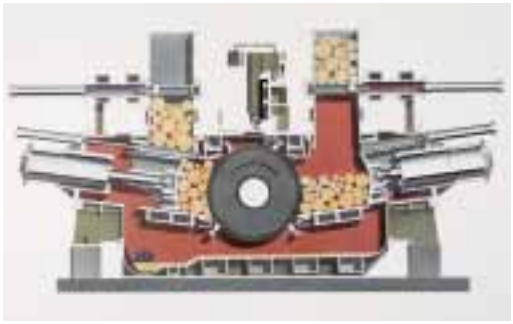


H74-D double seal with pressurized buffer medium

Pulp & Pap

Wood is the most important raw material for the pulp and paper industry. It is either digested to chemical pulp in digesters or reduced to mechanical pulp in grinders or refiners. The pulp produced this way is then graded, bleached and washed, and conveyed to the paper machine. There it passes through the various stages, such as headbox, wire part, press section, drying section and reeling section.

Treating the raw material



Pressure grinder (Metso) for producing ground wood. By increasing the pressure the pulp structure can be loosened gently, increasing simultaneously the temperature and the degree of moisture. Today most pressure grinders are equipped, therefore, with double seals.
Example: HSSHR S8-D
(d_1 = 470 mm; p_1 = max. 7 bar;
t = 160 °C; n = ... 375 min^{-1}; radial displacement max. 1 mm).

Refiner (Andritz) with Burgmann H-D mechanical seals.

A TMP (thermo-mechanical pulp) plant with more 20 **refiners** (Metso) at the United Paper Mills in Kaipola, Finland. First the hogged wood is steamed at a temperature of approximately 130 °C. Then it is decomposed in pressure refiners into its various fibres. The complete plant is equipped with Burgmann type HSH-D double seals. Seals of this type have been employed with great succes in refiners since 1975.

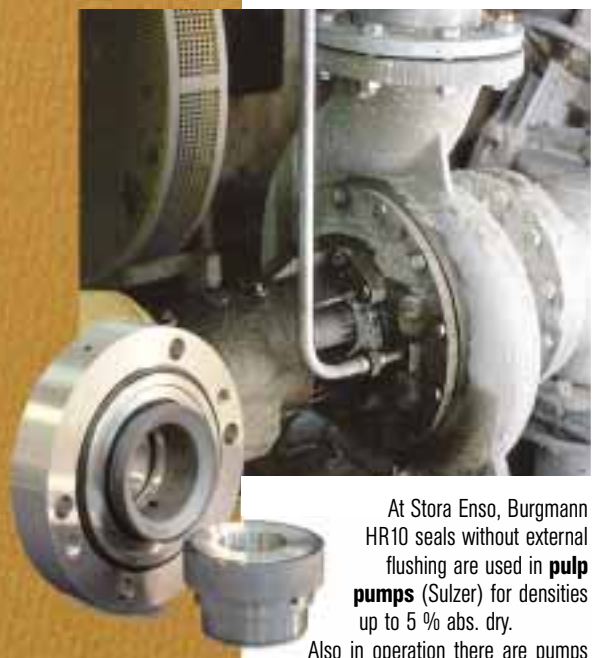
A useful life of 3 years continuous operation without recondition-ing is the norm.
(d_1 = 325 mm; p_1 = 15 bar;
t = 207 °C; v_g = ca 40 m/s)

Treating used paper

Material recycling must be a priority aim of every modern, economically orientated industrial society. In no other sector has the collection and re-use of second-hand materials attained such significance as in the paper industry.

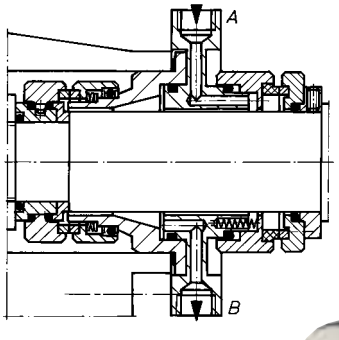
Deinking (flotation principle)
(see picture above)
Pulp pumps and graders in the Deinking plant of Stora Enso Werke are sealed with Burgmann type HR10 seals (in dead-end arrangement). Flushing with circuit water (return water) is carried out only when the medium has an excessively high solids content. The face material combination is SiC/SiC.
(d_1 = 46 ... 130 mm; p_1 = 2 mWS;
t = 60 °C; n = 980 min^{-1};
medium = pulp [0,2 ... 5 % abs. dry] with a high content of air.)

Treatment and transportation of finished pulp



At Stora Enso, Burgmann HR10 seals without external flushing are used in **pulp pumps** (Sulzer) for densities up to 5 % abs. dry.
Also in operation there are pumps (Voith Paper, Andritz, ABS, Goulds) fitted with Burgmann HJ 977, LP, MG 12 seals for densities up to 4 % abs. dry and operating predominantly with pump-internal circulation or white/black water system.

Pulp pump (Egger) with Burgmann HJ977GN



Principle of the LP-D dead-end. Ⓐ Industrial water IN Ⓑ Outlet closed. The water circulates in the seal, the seal acts as heat exchanger. Only the natural but slight leakage needs to be replaced.

Pulp pumps (Ahlström) with LP dead-end seal

Pulp box propellers (Bellmer), **pressure graders** (Lamort, Voith Paper, Sulzer, Andritz, Metso), **fiberizers and vertical spreaders** are sealed with type HJ977GN, MFL85N, HR10 or LP mechanical seals, according to the pulp concentration (5 % abs. dry and above). Silicon carbide is used as sliding material.

Digesting and bleaching plant

In view of the chemicals used in this area and the governing environmental provisions, Pumps are equipped with double seals. At PWA Kehlheim, for example, around 40 pumps (Allweiler) have been equipped successfully with type M7N seals in back-to-back arrangement.

Pulpers

Woodpulp is disintegrated in additional water to form a pulp suspension capable of being pumped. The rotor shaft/through interface is sealed with double and single arrangements. The face material combination on the product side of the Burgmann seal is carbide/carbide. Pulp density is approx. 4 to 8 % abs. dry.

LP-D double seal in dead-end operation

Burgmann LP seals are used in a diversity of applications in the paper and pulp industry (pumps, agitators, pulp dissolvers, shredders, etc.). Huge volumes of water are consumed wherever double seals are required. However, the new buffer water-saving method of operation of the specially designed LP-D in dead-end arrangement means that up to 2,600 m^3 of water and sealing area (e. g. d_1 = 50 mm) can be saved. Further savings are enabled because buffer systems and water treatment are no longer necessary.

Paper finishing

For a smoother and glossier finish, the paper leaving a papermaking machine is conveyed to a calender. Any irregularities in the paper are leveled out by the combination of an assortment of rolls in the calender, heat and high line pressures. Burgmann type MFLW80 S1/475 mechanical seals are used to seal off from the atmosphere the oil that serves to heat the rolls and lubricate the bearings. These seals are running successfully in, for example, rolls built by Voith Paper, Kleinewefers and Küsters.
(p_1 = 0 ... 6 bar;
t_1 = 20 ... 300 °C; n = 600 min^{-1};
Axial displacement max. ± 7 mm)
(The above picture shows a Voith Paper calender sealed with Burgmann mechanical seals)

Eccenter screw pumps (Netzsch) with MG155 in paper finishing.

The special leaflet:
„Sealing technology in the pulp and paper Industry"
contains in-depht information about this subject. Please ask for a copy.

Waste w

Sewage works

Municipal and industrial sewage is conveyed by waste water pumps into collection tanks at the sewage works. Raw sludge from the settling basins is then pumped into digestion towers where it is circulated by so-called digested sludge pumps through heat exchangers. The methane gas released during the digestion process is used for heating purposes, as is the sewage sludge itself to an ever greater degree.
Sewage works pumps are usually operated with single seals in either a dead-end arrangement (conical) seal chamber or with product circulation or external flushing (cylindrical seal chamber). Depending on the requirements, the following seals have proven successful: MG1, HJ977GN, MFL85N, HR.

Raw sludge pumps (KSB, KRK 150–37), equipped with Burgmann type HJ977GN mechanical seals (dead-end arrangement) in the Grosslappen sewage works run by Munich Utilities.
(d_1 = 72 mm; p_1 = 3 bar; t = 15 °C; v_g = 6.5 m/s).

A submersible aerator (Frings) for oxygen enrichment of sewage basins. Units of this type are sealed successfully with Burgmann MFL85N and MG1 mechanical seals.

Sewage block pump (Herborner, Type Unipump) for pumping contaminated fluids containing solids up to 80 mm with a double mechanical seal (MG1/M3S35 on the product side) in tandem arrangement. Quenching fluid: oil.

Non-clogging pumps (KSB, KWP) with Burgmann type MFL85N mechanical seals ($Q_{12}Q_1$,V T_6G_1) in a 5-stage biological sewage works run by DEA Union-Kraftstoff AG, Wesseling, for the biochemical elimination of nitrogen in ammonium-enriched refinery waste water. The useful life of these seals in dead-end arrangement is between 3 and 4 years in the 30 pumps installed at the works.
(d_1 = 53 ... 90 mm; p_1 = 2 ... 4.5 bar; t = 20 ...40 °C; n = 950 ...1,450 min^{-1}).

◀ **Non-clogging pumps** (Schulte type VP) at the special waste incineration plant in Nuremberg. Equipped with Burgmann type HR cartridge seals (pressureless quench), the pumps convey liquid digested sludge to the treatment station or to the incinerator. (t = 20 ... 90 °C; n = 1,450 min^{-1}).

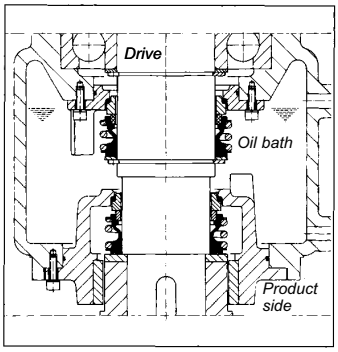
a t e r s y s t e m s

Biological sewage works in Ludwigshafen/Rhein. The sewage sludge incinerator can be seen in the background (Photo: BASF)

Submersible pumps

The building industry makes intensive use of submersible pumps because of their mobility. Thanks to their liquid- tight and pressure-proof design they are equally popular in waste water systems. Pumping capacities of up to 5000 m^3/h and pumping heads up to 70 m are possible with these pumps.

Particularly in buildings pits, the pumping medium consists of dirty water severely contaminated with sand and stones. The solids content is often as high as 50%, with particles of up to 30 mm in diameter and with soft items such as rags, paper and so on.



A reliable and proven shaft seal solution for submersible motors in pumps, aerators, agitators, etc. is the MG1 series of elastomer bellows seals in tandem arrangement. Silicon carbide/silicon carbide is mostly used as the face material combination in the primary seal. Dry running is prevented by an oil quench.

◀ **Submersible pump** (ORPU "Söffel") for pumping pure water and water contaminated with solids of up to 5 mm grain size. Sealed with the Burgmann type MG1.

Submersible pump (ABS) installed in stationary position in a sewerage overflow tank. It is sealed with a Burgmann MG1 in tandem arrangement.
(Q = ... 6500 m^3/h; H = ... 60 m)

◀ **Submersible agitators** (ABS, RW10–40S) for use as flow accelerators and for the mixing of activation basins in sewage works. Type MG1 mechanical seals with the face material combination SiC/SiC are being used with success.

◀ **Non-clogging pump** (Ritz, series 38) For domestic and industrial sewage containing solids (Q = ... 2000 m^3/h, H = ... 90 m), sealed by Burgmann mechanical seal MG1 in single design without flush.

Submersible pump (HOMA, type A) for fixed-site pumping of waste water, sewage and sludge. It is sealed with a Burgmann Type MG1 seal in tandem arrangement. (Q = ... 1800 m^3/h; H = ... 60 m).

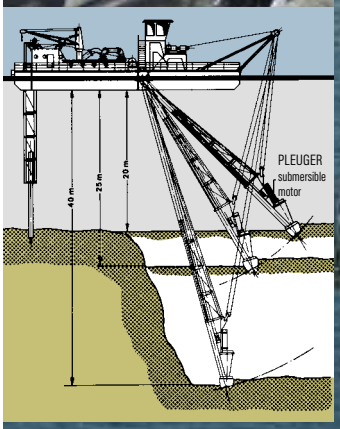
Submersible pump (Jung, UAK) with a type MG1 mechanical seal. (d_1 = 45 mm; p_1 = 10 bar; t = 120 °C; n = 2920 min^{-1}; Q = 500 m^3/h).

Shipping

With automations in marine applications and the protection of our seas, the sealing technology is becoming increasingly important. Burgmann seals meet these high economical and ecological demands and have been certified or authorised by many shipping institutions.

Lubricating oil pumps

Vertical screw pumps (Allweiler, SNS) used to convey lubricating oil to the ship's power drive system. They are sealed by Burgmann M7N seals with SiC/SiC as the face material combination. (p_1 = 6 bar; t = 160 °C; Q = 27 m^3/h).

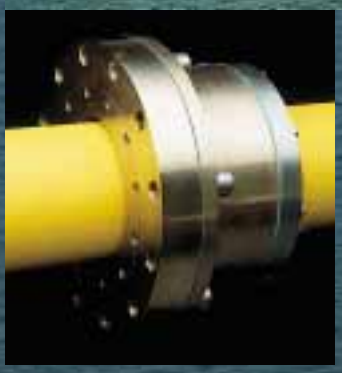


Dredging pumps

A submersible motor (Pleuger, VN RW 30-130-4) used to drive dredging pumps and cutter heads. The motor/pump coupling is sealed by a type M74/130 mechanical seal in a back-to-back arrangement. Tap water is used as buffer fluid and the face material combination is TC/TC. These seals have an average life of 15,000 h. (n = 1,500 min^{-1}).

Cooling water pumps, etc.

Pumps are put to many different uses on a ship. Waste water pumps, ballast pumps, bilge pumps and trimming pumps are just some of the many possibilities. A typical example is the vertical centrifugal pump (Allweiler) pictured above, with the often used Burgmann type M32N seal featuring carbon graphite/SiC as the face material combination. Metallic parts are made of 1.4571 and O-rings of Viton®.

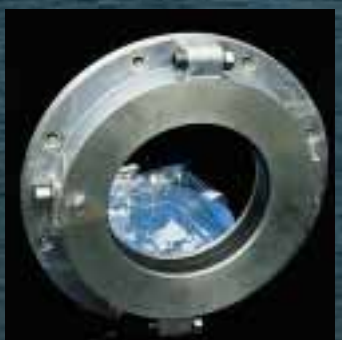


Stern tube

Reliability, a long service life and en-vironmental protection were the decisive arguments for using the **water-lubricated** stern tube seal 4600 (fig. on the left) in the motor ship "Raab Karcher 105" (shown above). The integrated pneumostop permits maintenance of the seal with the ship afloat.

"Water-Jet"

A "foil cat" katamaran (Kværner-Fjellstrand) with a waterjet drive. The input shaft is sealed by a semi-split Burgmann HGH (also refer to page 56).



Bulkhead pipe fitting

Burgmann 3200 seals ensure a reliable sealing against an inrush of water into neighbouring ship compartments when drive shafts are passed through several bulkheads, increasing the safety from being flooded.

Sugar industry

Flume water pump, mash pumps for unloading and transporting beets to the washing plant. The water is heavily contaminated with sand and earth, imposing high requirements on the wear resistance of the face materials and on the ruggedness of the seal. The Burgmann **MG1,** used as a single seal in a dead-end arrangement, has an excellent track record in this area.

Thick juice pumps for transporting thick juice (70 ... 75% sugar content) from the evaporator station to the granulation station. Seals in tandem arrangement **(HJ977GN** or **HRZ/MG1)** with pressureless quench.

Worm-type agitators in the boiler of the granulation station keep the magma (approx. 45% sugar granule content) moving. Double seal with seat rotating in the product, Burgmann **MR-D.**

Sugar campaigns are over in a relatively short time. For optimum economy and ecology it is all the more important, therefore, to have a reliable sealing system. In the past it was normal for juice pumps to be equipped with double seals to cope with the tendency to crystallization and carbonation. Today the use of single seals is possible in most cases due to the availability of modern materials and new seal compartment geometries.

Multi-stage evaporator station where the clarified juice is evaporated in several phases to form thick juice (70 ... 75% sugar content). The **juice circulating** pumps used for the circulation are equipped with tandem seals MG1-G6/MG1-G6 and HRZ/MG1.

Recommended seals

e.g. for standardization projects in the sugar industry

MG1-G6. The elastomer bellows seal. Rugged and equipped with a freely rinsed spring. Seat connection according to EN 12756. Can be used as single, tandem and double seals.

HJ977GN. The standard seal with encapsulated spring.

HRZ. Mechanical seal with rotating seat. Rugged single spring facing away from the product. Can be used as a single seal and in tandem with an MG1-G6 on the atmosphere side.

MR-D. Double agitator seal with seat rotating in the product. With bearing.

Sterile processes

In addition to meeting technical requirements a seal has to display many other characteristics in connection with cleanliness, health and general legislation. These include for example:

● Materials which are compatible with food ● Smooth and abrasion-proof surfaces which are easy to clean ● Complete units which can be sterilized and cleaned without having to be dismantled (SIP/CIP). Burgmann mechanical seals have been used world-wide with great success in sterile processes for over 20 years.

◄ Filter dryer (Rosenmund Gueda) with Burgmann M451 KL(T)-D and AGS451 KL-D (p_1 = vacuum ... 6 bar; t_1 = –20 ... 200 °C; n = 5 ... 50 min^{-1}; axial movement) 100 ... 700 mm)

Agglomerator

The agglomerator (Harrislee) is used to convert crystals into micropellets with good filling properties. X-ray contrast media are then produced from the pellets and an injection solution (Schering, Berlin). The tilting agitator shaft is sealed by a Burgmann MR 33 S1-D seal with the sterile supply system TS 3004. All materials are CIP/SIP-resistant and come with FDA approval.
p_1 = vacuum ...3 bar; t_1 = 120 °C;
n = 30 min^{-1}.

Spherical dryer (Rosenmund Gueda) for the production of pharmaceutical powders, with Burgmann HSMR5L-D (main and chopper shafts).
Operating data: p_1 = vacuum ... 6 bar; t = –20 ... 200 °C; n = 3 ... 35 min^{-1} main shaft; = 900 min^{-1} chopper shaft

Centrifugal pump (KSB, Vitachrom) for conveying liquid foods, equipped with a Burgmann SHJ92GS4 seal (pump and seal with EHDEG certification).

Aseptic pump (Fristam) with the Burgmann TS 3004 sterile supply system..

Burgmann MR33-D – the standard agitator seal for sterile processes

Dairy

Eccentric pumps (e.g. Allweiler, Netzsch) are a favourite choice for pumping and filling applications be- cause they exert little stress on the product. Depending on the specific conditions they are sealed with seals of the Burgmann M3 range or SHJ977G.

Food pumps

Pumps with hydraulic components made of deep-drawn stainless steel plate are typical for the food industry. Additional electropolishing produces high-quality surfaces as the basis for trouble-free cleaning.

A special leaflet **"Sterile Processes"** provides detailed information about this subject. Please ask for a copy.

Sterile pump (Hilge Euro-Hygia-CN) for diverse applications according to FDA/ GMP standards, equipped with a Burgmann SHJ97GS3 seal (pump and seal with EHDEG certification).

Technics

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Technical Information

Within the scope of this manual it is only possible to provide a brief outline of the major prin-ciples and features of mechanical seals. We shall be glad to give you more detailed documentation on request.

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 besealed
- **t_3** Temperature of the buffer medium
- **v_g** Sliding velocity
- η Dynamic viscosity
- $\varkappa$ 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) DIN specifies the short type only.

Single seal

Designation — **Description** — **Position** 1 2 3 4 5 (Seal face; Stationary seat; Secondary seals; Spring; Other metal parts (except seal cover and shaft sleeve))

N = standard type with l_{1N}
K = short type with l_{1K}
C = type C

U = no shaft step
B = with shaft step
C = O

Nominal diameters **d_1** and **d_{10}** of the mechannical seal
Shaft/shaft sleeve diameters are always three-digit numbers beneath the stationary seat for types U and B

Direction of rotation of the mechanical seal

Type N and K (is also the spring winding direction)	Type C
R = clockwise	
Looking from the stationary seat toward the seal face with the seal face rotating in clockwise direction	Looking from the drive side with the shaft rotating in clockwise direction
L = anti clockwise	
Looking from the stationary seat toward the seal face with the seal face rotating in anticlockwise direction	Looking from the drive side with the shaft rotating in anticlockwise direction
S = independent of direction of rotation	

Spring type (state single spring or multiple springs in your order)

Pinned stationary seat
0 = no torsion lock, without anti-rotation pin
1 = with torsion lock, with anti-rotation pin
2 = for type C

Materials (see inside end cover of manual for the material code)

Double seal

Designation — **Description** — **Position** 1 2 3 4 5 1 2 3 (Seal face inboard; Stationary seat inboard; Secondary seals inboard; Spring; Other metal parts; Sliding face outboard; Stationary seat outboard; Secondary seals outboard)

U = no shaft step
B = with shaft step
C = type C
} on product side

U = no shaft step
B = with shaft step
C = type C
} on atmosphere side

Nominal diameters **d_1** and **d_{10}** (always three-digit numbers)

Direction of rotation (see single seal)

Anti-rotation pin for stationary seat on the atmosphere and/or product side
0 = without anti-rotation pin
1 = with anti-rotation pin for stationary seat on atmosphere side
2 = with anti-rotation pin for stationary seat on product side
3 = with anti-rotation pin for stationary seat on the atmosphere and product sides
4 = for type C

Positive retention for stationary seat on the product side
0 = without
D = with
E = for type C

Materials (see inside end cover of the manual for the material code)

Seal and Material Code to API 610[1)]

Mechanical seals are identified in terms of their materials and design features on the basis of the following classification system:

1st letter:
B = balanced
U = unbalanced

2nd letter:
S = single
T = unpressurized, dual
D = pressurized, dual

3rd letter:
Seal gland type:
P = plain, no throttle bushing,
T = throttle bushing with quench, leakage and/or drain connections
A = auxiliary sealing device, (type tot be specified)

4th letter:
Gasket materials (see Table H-4)

5th letter:
Face materials (see Table H-5)

Example: BSTFM = balanced single seal with throttle bushing seal gland, stationary and sealring-to-sleeve gasket made of FKM, with carbon against tungsten carbide 2 as face materials

Notes

Hastelloy® C is to be used as spring material for seals with multiple springs. Single springs and other metal parts are to be made of austenitic stainless steel (AISI Standard type 316 or equal).

Metal bellows are to be made of a material recommended by the manufacturer and should have a maximum yearly corrosion loss of 50 µm.

A metal seal ring shall not have sprayed overlay in place of a solid face.

Tabelle H-4 – 4th letter

	Secondary seals	
	stationary	dynamic
E	FKM	PTFE
F	FKM	FKM
G	PTFE	PTFE
H	Nitrile	Nitrile
I	FFKM	FFKM elastomer
R	Graphite foil	Graphite foil
X	As specified	As specified
Z	Spiral shaped	Graphite foil

Tabelle H-5 – 5th letter

	Face materials	
	Seal face	Seat
L	Carbon	Tungsten carbide 1 Co*
M	Carbon	Tungsten carbide 2 Ni*
N	Carbon	Silicon carbide
O	Tungsten carbide 2 Ni*	Silicon carbide
P	Silicon karbide	Silicon carbide
X	As specified	As specified

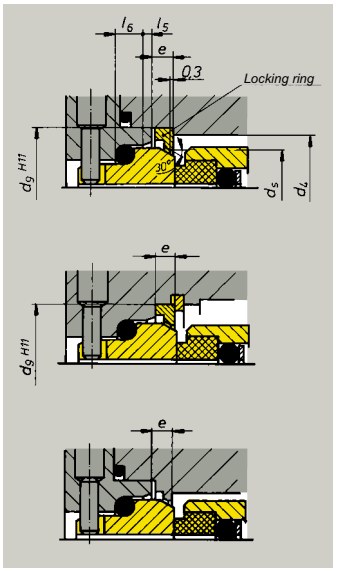
*) binder material

Tabelle H-6 – Temperature limits for seal materials and bellows

	Ambient or medium temperature			
	min. °C	°F	max. °C	°F
PTFE	– 75	– 100	200	400
Nitrile	– 40	– 40	120	250
Neoprene	– 20	0	90	200
FKM	– 20	0	200	400
Metal bellows[a)]	–	–	–	–
FFKM	– 12	10	260	500
Graphite foil	– 240	– 400	400[b)]	750[b)]
Glass-filled PTFE	– 212	– 350	230	450
Mica/grapite	– 240	– 400	700	1300
Ethylene propylene	– 57	– 70	180	350

1) 8th edition, August 1995
a) Consulte manufacturer
b) The maximum temperature in a non-oxidizing atmosphere is 870 °C (1,600 °F).

Seat locking*) to EN 12756



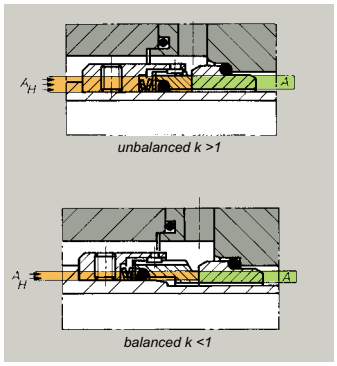
		d_4		d_9					
d_1	d_2	U	B	U	B	l_5	l_6	e	d_s
10	14	22	26	26	30	1.5	4	4	–
12	16	24	28	28	32	1.5	4	4	–
14	18	26	34	30	38	1.5	4	4	–
16	20	28	36	32	40	1.5	4	4	–
18	22	34	38	38	42	2.0	5	4	31.2
20	24	36	40	40	43	2.0	5	4	33.2
22	26	38	42	42	46	2.0	5	4	35.2
24	28	40	44	43	48	2.0	5	4	37.2
25	30	41	46	46	50	2.0	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.

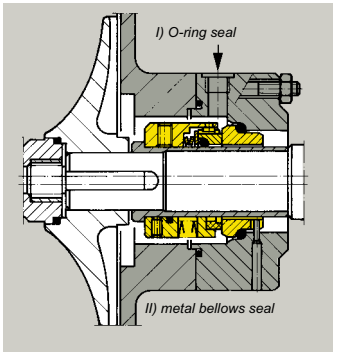
Balance ratio

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

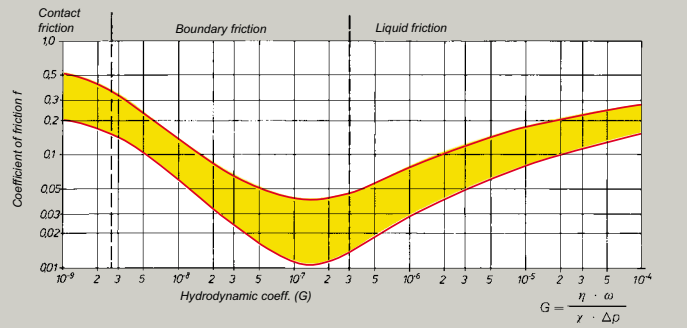
$$k = \frac{\text{hydraul. loaded area } A_H}{\text{area of sliding face A}}$$



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 conditional an the absolute level of the pressure to be sealed and on the direction of pressurization (internal or external pressure).



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 pr is usually disregarded in the calculation.

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.

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

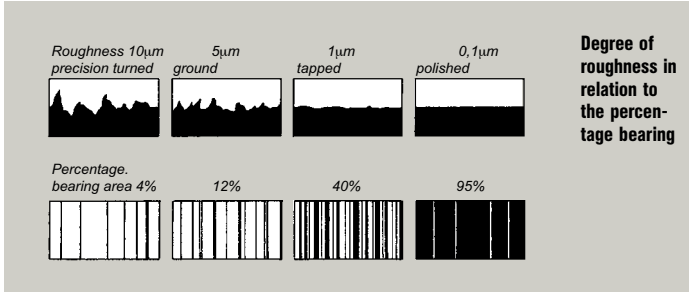
Coefficient of friction f

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 (see following sections), 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.



Degree of roughness in relation to the percentage bearing

Surface roughness

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

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

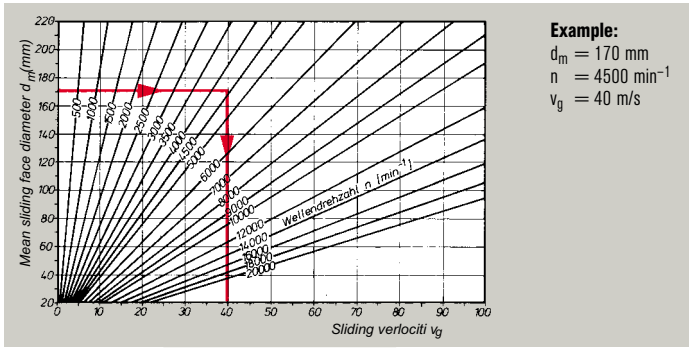
The lower the roughness value, the higher the percentage bearing area and hence the higher load capacity of a mechanical seal.

Turbulence losses P_v

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

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.



Example:
$d_m = 170$ mm
$n = 4500\ min^{-1}$
$v_g = 40$ m/s

Sliding velocity v_g

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

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.

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

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

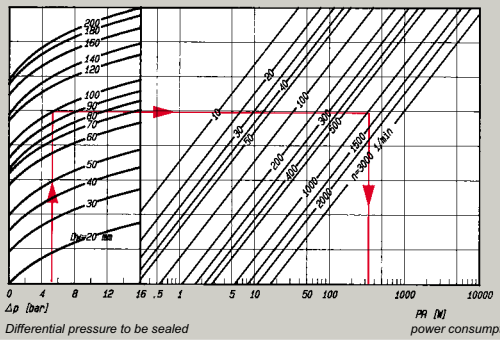
Under certain conditions of installation or operation heat may pass from the product to the sealing compartment and will need to be taken into account when calculating the circulation rate.

Example calculation:
$P_R = 420\ W\ (1\ W = 1\ \frac{J}{s})$
$\Delta T = 10\ K$
Fluid: Water;
$c = 4200\ J\ (kg \cdot K)$
$\varrho = 1\ kg / dm^3$
$\dot{V} = \frac{420\ W \cdot kg \cdot K \cdot dm^3}{10\ K \cdot 4200\ Ws \cdot 1\ kg}$
$= 0.01\ l/s = 0.6\ l/min$

Power consumption P_R of the sliding faces

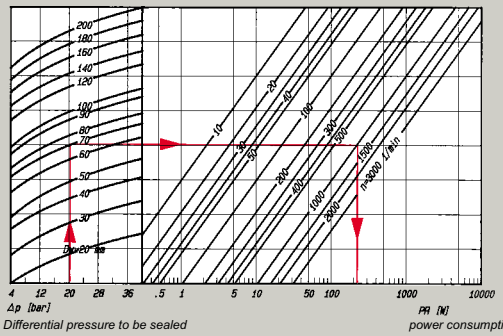
The power consumption through friction of the sliding faces is calculated by the equation

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



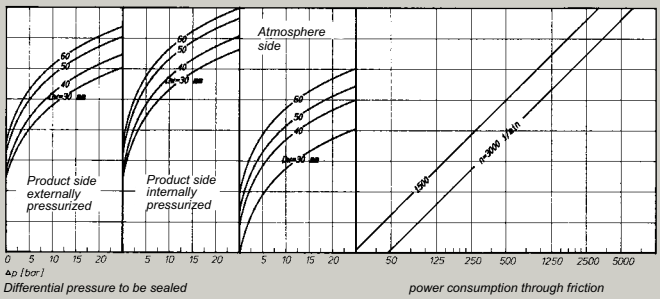
***Example M7:**
Δp = 5 bar
D_w = 100 mm
n = 1000 min^{-1}
P_R = 310 W

***unbalanced rotating seal**

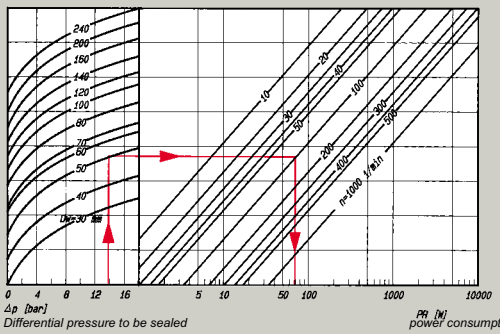


***Example H7:**
Δp = 20 bar
D_w = 70 mm
n = 1000 min^{-1}
P_R = 215 W

***balanced rotating seal**

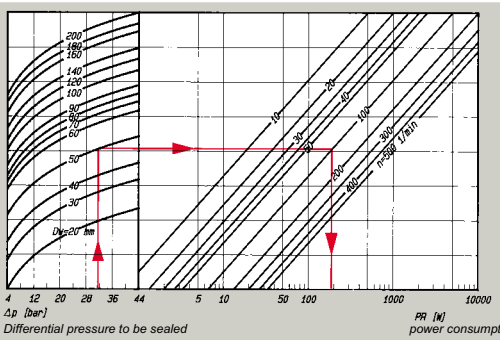


Balanced stationary seal of the HRC series



Example M48-D:
Δp = 14 bar
D_w = 50 mm
n = 100 min^{-1}
P_R = 70 W

Light-duty agitator seals (PN 16)



Example HS-D:
Δp = 32 bar
D_w = 50 mm
n = 100 min^{-1}
P_R = 195 W

Heavy-duty agitator seals (PN 40)

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 the section on 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

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

Example calculation for a H7N/48 seal

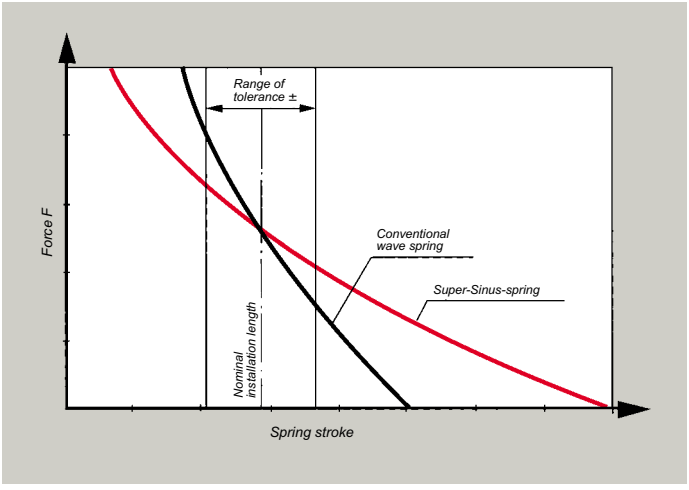
$$Q = \frac{0{,}27^3}{4{,}7 \cdot 10^{-4} \cdot \ln \left(\frac{56{,}9}{51{,}9}\right)}$$

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

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

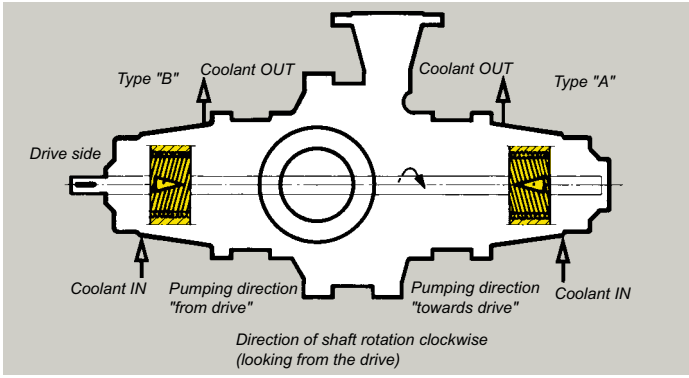
Q = 1,543 ml/h

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®.

Pumping screws



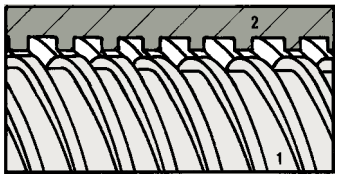
Direction of shaft rotation clockwise (looking from the drive)

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).

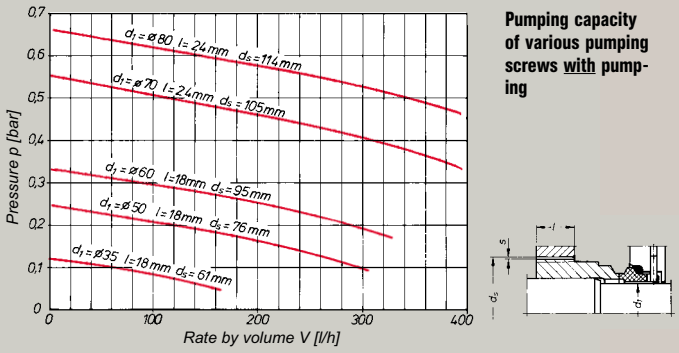
Explanation

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 non-drive side.

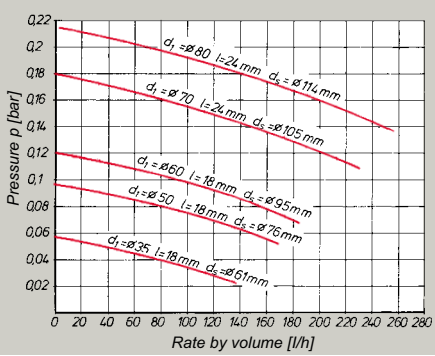
Direction of shaft rotation (looking from drive)	Pumping direction	Pumping screw type	Coding for the various components
right	**towards drive**	A	pumping screw Ar
			pumping sleeve Al
	from drive	B	pumping screw Bl
			pumping sleeve Br
left	towards drive	B	pumping screw Bl
			pumping sleeve Br
	from drive	A	pumping screw Ar
			pumping sleeve Al



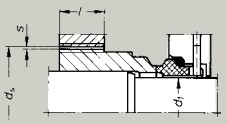
◀ **Contra-rotating pumping screw**
Item 1 Pumping screw
Item 2 Pumping sleeve



Pumping capacity of various pumping screws with pumping

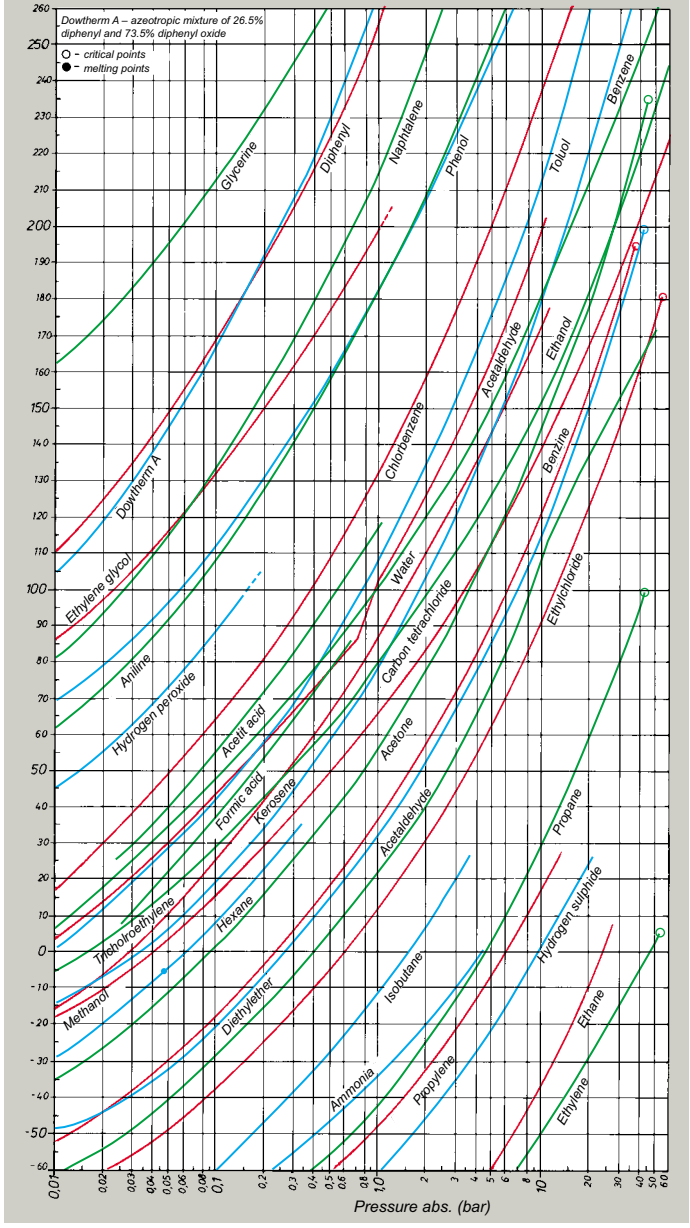


... without pumping sleeve



Type H74F
Medium: water
n = 3000 min^{-1}
s = 0.5 mm

Vapour curves



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.

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

Technical Information

We wish to draw attention to the installation and operating instructions which are available for the various sealing systems. The information in the following sections is intended as no more than a general guideline.

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:
DIN ISO 2768

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

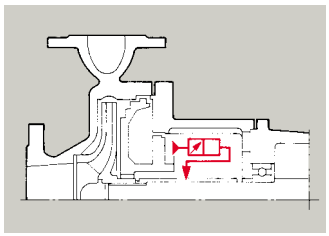
Concentricity tolerance

Shaft in accordance with DIN ISO 5199

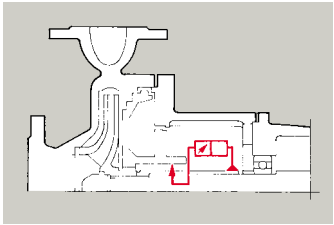
In the area of the mechanical seal the shaft concentricity tolerance must not exceed 50 µm for diameters < 50 mm 50 µm, 80 µm for diameters between 50 and 100 µm, and 110 µm for diameters > 100 µm.

Seal chamber bore

For sliding velocities of v_g < 25 m/s the



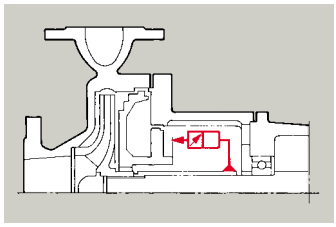
concentricity tolerance of the seal chamber in relation to the shaft should not exceed 0.2 mm, and when pumping screws are used it should not exceed 0.1 mm due to the effect of the pumping characteristic. If these values are exceeded please contact Burgmann.

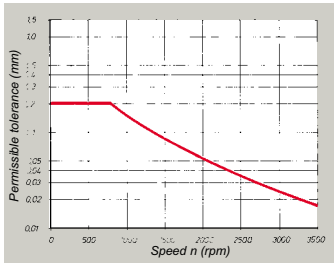


Axial run-out

Mounting face

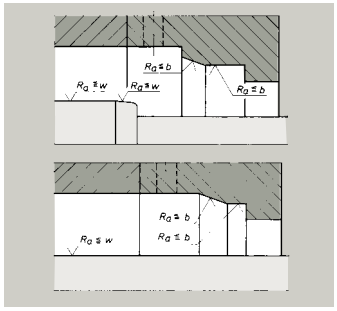
Axial run-out depends on the speed. Permissible values are indicated by the graph.





Surface finish

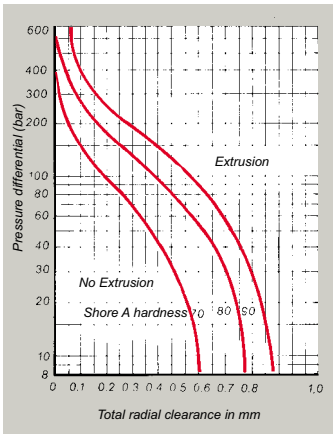
Finished surfaces according to EN 12756



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

Extrusion characteristics of elastomeric O-rings

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



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.

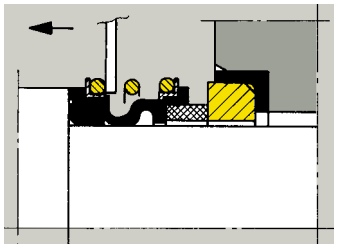
Fitting advice

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.

Screw locking

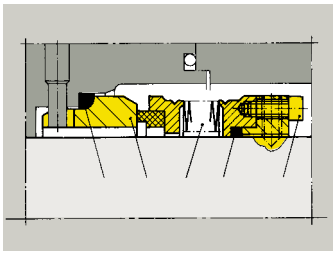
If no special provision is made for locking screw threads, use set screws with a suitable adhesive (e.g. Loctite) after removing any grease.

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 (MFL WT80):

- 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.

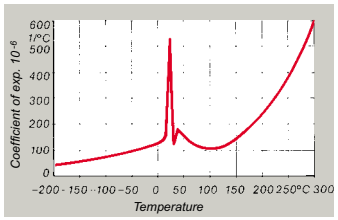
Venting

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 fluid systems that do not vent themselves or are partially self venting (double seal with buffer fluid systems).

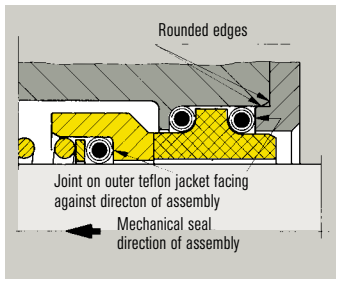
Technical Information

TTV-O-Rings

Double PTFE-encapsulated O-rings of the type used in BURGMANN 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 dis-



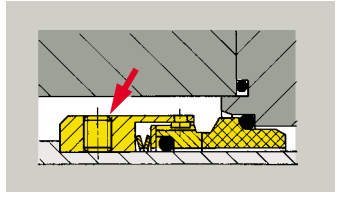
plays a high degree of rigidity, a low coefficient of thermal conductivity, an unfavourable expansion characteristic (see graph) and a tendency to cold flow. It is advisable, therefore, to avoid the use of **O-rings made of solid PTFE.**
The assembly position of double PTFE-en-



capsulated 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.

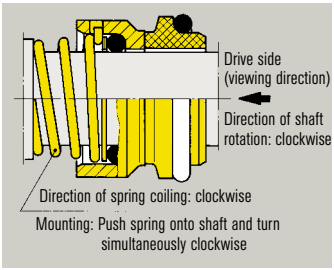
Screw locking

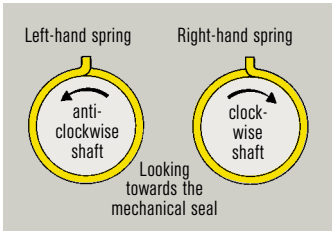
If no special provision is made for locking screw thread, use set screw with a suitable adhesive (e.g. Loctite) after removing any grease.



Conical springs

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 anti-clockwise 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".





Pressure vessel regulations

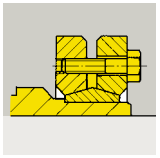
Requirements imposed by the German Pressure Vessel Code on Group III pressure vessels (Section 8)

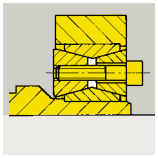
- Section 4 of the German Pressure Vessel Code orders that pressure vessels be built and operated in accordance with the generally valid rules of engineering (such as the German AD Code).
- AD Bulletin W2 requires every pressure-bearing part made of austenitic steel to be accompanied by a material certificate DIN 50049 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.

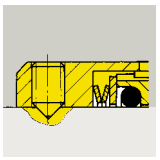
Types of drive

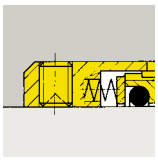
For a seal to function properly, the shaft torque must be transmitted uniformly to the shaft sleeve and/or rotating parts under all operating conditions. Depending on the seal design it is necessary to make allowance for centrifugal and axial forces and in some case to observe special installation instructions.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

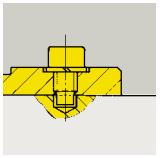
Typical arrangements


Shrink disk

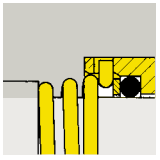

Clamping set


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.

Viscosity ν

Conversion table*

The following conversion table shows the kinematic viscosity n in terms of conventional units of measurement at the same temperature.

ν mm²/s	°E –	R.I sec	SU sec
1.0	1.00	–	–
1.5	1.06	–	–
2.0	1.12	30.4	32.6
2.5	1.17	31.5	34.4
3.0	1.22	32.7	36.0
3.5	1.26	34.0	37.6
4.0	1.31	35.3	39.1
4.5	1.35	36.6	40.8
5.0	1.39	38.0	42.4
5.5	1.44	39.3	44.0
6.0	1.48	40.6	45.6
6.5	1.52	42.0	47.2
7.0	1.57	43.3	48.8
7.5	1.61	44.7	50.4
8.0	1.65	46.1	52.1
8.5	1.70	47.5	53.8
9.0	1.74	49.0	55.5
9.5	1.79	50.4	57.2
10.0	1.83	51.9	58.9
11.0	1.93	54.9	62.4
11.5	1.98	56.4	64.2
12.0	2.02	58.0	66.0
12.5	2.07	59.6	67.9
13.0	2.12	61.2	69.8
13.5	2.17	62.9	71.7
14.0	2.22	64.5	73.6
14.5	2.27	66.2	75.7
15.0	2.33	67.8	77.4
15.5	2.38	69.5	79.3
16.0	2.43	71.2	81.3
16.5	2.49	72.9	83.3
17.0	2.54	74.6	85.3
17.5	2.59	76.3	87.4
18.0	2.65	78.1	89.4
18.5	2.71	79.8	91.5
19.0	2.76	81.6	93.6
19.5	2.82	83.4	95.7
20.0	2.88	85.2	97.8
25.0	3.47	103.9	119.3
30.0	4.08	123.5	141.3
35.0	4.71	143.4	163.7
40.0	5.35	163.5	186.3
50.0	6.65	203.9	232.1
60.0	7.95	244.3	278.3
70.0	9.26	284.7	324.4
80.0	10.58	325.1	370.8
90.0	11.89	365.6	417.1
100.0	13.20	406.0	463.5
150.0	19.80	609.0	695.2
200.0	26.40	812.0	926.9
250.0	33.00	1015.0	1158.7
300.0	39.60	1218.0	1390.4
350.0	46.20	1421.0	1622.1
400.0	52.80	1624.0	1853.9
500.0	66.00	2030.0	2317.4
600.0	79.20	2436.0	2781.0
700.0	92.40	2842.0	3244.5
800.0	105.60	3248.0	3708.0
900.0	118.80	3654.0	4171.5
1000.0	132.00	4060.0	4635.0

Conventional units of measurement:
°E = degrees Engler
R = Redwood Seconds I and II
SU = Saybolt Universal seconds
* according to Ubbelohde mm²/s ≙ cSt

Research and Development

Private "backroom" developments which subsequently become huge successes have become a rarity nowadays. The focus is firmly on finding and creating interdisciplinary solutions and meeting customer requirements, and the foundation for achieving these objectives lies in sound basic knowledge, a wealth of experience and, above all, the possibility to convert ideas into reality - from the test phase right through to readiness for series production. We maintain close collaboration in terms of research, development, experimentation and testing with our customers, suppliers, research institutes and university institutions to ensure successful completion of the tasks we are set. This also involves converting the results of pure research into useful technology within the framework of publicly sponsored development projects.
With 840 m^2 of floor space, our Mechanical Seals R&D unit's new center contains a large number of test facilities designed to help meet the above objectives. The following data shows their extensive operational scope:

- Shaft diameters up to 500 mm
- Sliding velocities up to 200 m/s
- Rotational speeds of up to 40,000 min^{-1}
- Pressures from 0.01 to 400 bar
- Temperatures up to 300 °C

High-pressure test rigs for performance-testing face materials

High-speed test rig for small-diameter seals and clearance seals

High-pressure test rig for high speed running seals, with separate control desk (photo at right)

R&D

Basic test stand for high speed running gas seals and segmental radial seals for turbocompressors and drive mechanisms

Test stand for automotive mechanical seals

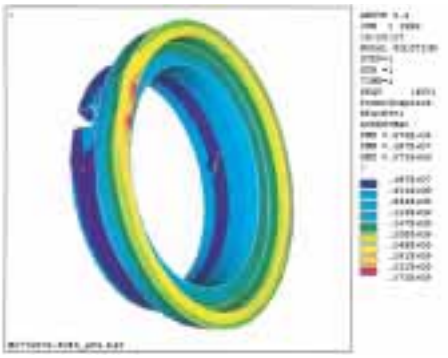
Laboratory for chemico-physical analyses

Test facility for qualifying mechanical seals to API standard

View of the precision measuring room with its many test facilities through to photo and video documentation

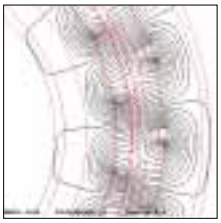
Measurement data printout

Design calculation



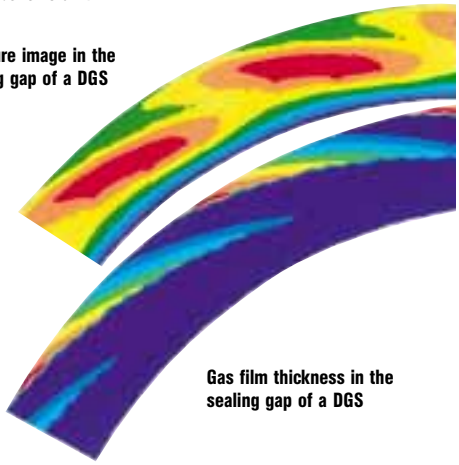
Comparative stress

Natural vibration of a metal bellows unit



MAK magnetic field lines

Pressure image in the sealing gap of a DGS



Gas film thickness in the sealing gap of a DGS

The prerequisites for optimal functioning of mechanical seals include a dimensionally stable sealing gap. In many cases this means optimizing the form of seal components during the design phase in order to minimize deformation caused by pressure and temperature. To this end our design calculation engineers use the very latest finite element programs. Mathematical considerations are also called for where the optimal design of components for supply systems and accessories is concerned, e.g. heat exchangers, thermosiphon vessels or flow-related elements. Documented strength verification in line with the respective standards also has to be supplied for pressure vessels. The design calculation staff also update and look after the further development of the CASS Expert System for selecting mechanical seals.

Table of

Materials

Face Materials (Item 1/2)

Synthetic Carbons

Material code 1)EN 12756	Material code BURGMANN	Description
▶A	Buko 03	Carbon graphite, antimony impreg.
▶B	Buko 1	Carbon graphite, resin impreg. approved for foodstuffs
B3	Buko 02	Carbon graphite, resin impreg.
B5	Buko 34	Carbon, resin bonded
C	Buko 22	Electrographite, antimony impreg.

Metalle

▶E	Bume 20	Cr-Steel
G	Bume 17	CrNiMo-Steel
▶S	Bume 5	Special cast CrMo-Steel
T_{41}	Bube 281	1.4462 DLC-coated

Carbides

U =Tungsten carbides

▶U_1	Buka 1 brazed	Tungsten carbide, Co-binder
▶U_2	Buka 16 solid	Tungsten carbide, Ni-binder
▶U_{22}	Buka 16 shrunk-in	Tungsten carbide, Ni-binder
U_3	Buka 15 solid	Tungsten carbide, NiCrMo-binder
U_{37}	Buka 15 shrunk-in	Tungsten carbide, NiCrMo-binder
U_7	Buka 17 solid	Tungsten carbide, binder-free

Q = Silicon carbides

▶Q_1	Buka 22 solid	SiC, silicon carbide, sintered pressureless
▶Q_{12}	Buka 22 shrunk-in	SiC, sintered pressureless
▶Q_2	Buka 20 solid	SiC-Si, reaction bonded
▶Q_{22}	Buka 20 shrunk-in	SiC-Si, reaction bonded
Q_3	Buka 30 solid	SiC-C-Si, carbon silicon impr.
Q_{32}	Buka 30 shrunk-in	SiC-C-Si, carbon silicon impr.
Q_4	Buka 24 solid	C-SiC, carbon surface silicated
Q_{19}	Buka 221	SiC, DLC-coated

Metal Oxides (Ceramics)

▶V	Buke 5	Al-Oxide >99%
V_2	Buke 3	Al-Oxide >96%
X	Buke 8	Steatite (Magnesia silicate)

Plastics

▶Y_1	Buku 2	PTFE, glassfibre reinforced
Y_2	Buku 3	PTFE, carbon reinforced

Secondary Seal Components (Item 3)

Elastomers, not wrapped

B	B	Butyl rubber (IIR[2])
▶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 (MVQ[2]), e.g. Silopren®
▶V	V	Fluorcarbon rubber (FKM[2]), e.g. Viton®

Elastomers, wrapped

▶M_1	TTV	FKM, double PTF wrapped
▶M_2	TTE	EPDM, double PTF wrapped
M_3	TTS	MVQ, double PTFE wrapped
M_4	TTN	CR, double PTF wrapped
M_5	FEP	FKM, FEP-wrapped
M_7	TTV/T	FKM, double PTFE wrapped/ PTFE, solid

Differing Materials

U_1	K/T	Perfluorocarbon rubber/ PTFE

Non-Elastomers

G	Statotherm®	Pure graphite
T	T	PTFE (Polytetrafluorethylene)
T_2	T2	PTFE, glassfibre reinforced
T_3	T3	PTFE, carbon reinforcedt
T_{12}	T12	PTFE, carbon-graphite reinforced
Y_1	Burasil®-U	Static seal, non-asbestos

Spring and Construction Mat. (Item 4/5)

Spring Materials

▶G	1.4571	CrNiMo-steel
▶M	Hast. C4	Hastelloy® C-4 (2.4610) 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
F_1	1.4313	special CrNi-cast steel
▶G	1.4401	CrNiMo-steel
▶G	1.4571	CrNiMo-steel
G	1.4581	CrNiMo-cast steel
▶G_1	1.4462	CrNiMo-steel
G_2	1.4439	CrNiMo-steel
G_3	1.4539	NiCrMo-steel

M = Nickel-base alloy

▶M	Hast. C4	Hastelloy® C-4 (2.4610)
M_1	Hast. B2	Hastelloy® B-2 (2.4617)
M_3	Carp.	Carpenter® 20 Cb3 (2.4660)
M_4	Monel K500	Monel® alloy K500 (2.4375)
M_5	Hast. C-276	Hastelloy® C-276 (2.4819)
M_6	Incon. 718	Inconel® 718 (2.4819)

T = Other materials

T_1	1.4505	CrNiMoCuNb-steel
T_2	Titan	Pure titanium (3.7035)
T_3	Incon. 625	Inconel® 625 (2.4856)
T_4	Carp. 42	Carpenter® 42 (1.3917)
T_5	Incon. 800	Incoloy® 800 (1.4876)

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

Legend for seal selection by media (starting page 3)

Notes on the medium (2)

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

Concentration (3)

– = "any"
< 10 = less than 10 weigth %
~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

Arrangem. of shaft seal (5)

S = Single mechanical seal
S1 = Internal arrangement
S2 = External arrangement
S3 = Internal arrangement with rotating counter ring
D = Dual mechanical seal
D1 = Back-to-back
D2 = Tandem
D3 = Face-to-face
Q = Quench
Q1 = Without throttle bushing
Q2 = With throttle bushing
Q3 = With auxiliary seal

Auxiliary piping (6)

00 = None ("dead end")
01 = Internal circulation
02 = Connection from pump case
08 = Supply of external fluid
08a = Flushing
08b = Quench (static)
09 = Throughflowing quench or buffer fluid
10 = Circulating quench or buffer fluid, pressureless
11 = Same as 10, but pressurized
12 = Pressure transmitter

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)

A = Corrosive
C = Carcinogenic
C1 = Proven in humans
C2 = Proven in animal experiments
C3 = Suspected for good reason
G = Toxic
H = Skin resorption
R = Irritant
S = Sensitization
X = Moderately toxic
1 = Vapour pressure/gas
2 = Corrosion
3 = Exclusion of air
4 = Lubricating properties
5 = Icing risk
6 = Leakage
7 = Readily flammable
8 = Flame-promoting
9 = Potentially explosive
0 = Insufficient information

TLV (11)

a fig. = TLV in ppm
mg = TLV in mg/m³
# = mg/m³ of base substance
* = No TLV because it is dearly carcinogenic

Normal cond. (12)

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

Melting point (14)

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

Boiling point (15)

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

Density (g/cm³) (16)

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

Solubility in water (13)

(...) = Deviating reference temperature
– = Solubility decrease with rising temperature
++ = Solubility increases greatly with rise in temperature
sll = Soluble in less than 1 part water
ll = Soluble in 1 – 10 parts water
l = Soluble in 10 – 30 parts water
wl = Soluble in 30 – 100 parts water
sl = Soluble in 100 – 1 000 parts water
ssl = Soluble in 1 000 – 10 000 parts water
unl = Soluble in more than 10 000 parts water

Burgmann in Profile

ISO 14001

QHD
Qualified Hygienic Design
VDMA

DIN/EN 729-2
HPO
Certified

KTA 1401
Certified for Nuclear Power Plants

Quality Management System
QS 9000

TÜV

VDA 6.1
Certified

WHG
Fachbetrieb (§ 19)

Germanischer Lloyd
Approvals

IHK
Prüfungsbetrieb

UMWELTPAKT BAYERN









BURGMANN is international
With 16 sales offices in Germany, more than 50 subsidiaries and joint ventures on all continents, and 3,100 employees Burgmann Industries GmbH & Co. KG are one of the leading seal manufacturers. With effect of March 2004 the company with head offices in Wolfratshausen is one of ten independent operative Business Groups in the Freudenberg group, Weinheim/Germany.

BURGMANN is quality
As one of Europe's very first seal manufacturers to do so, Burgmann set up an independent quality assurance system which is recognized by many international organizations and has contributed significantly to the company's global success. Burgmann products guarantee the very highest standards in terms of safety, efficiency and reliability and are employed in virtually all sectors of industry.

BURGMANN and environmental protection
Environmental protection has always played a key role in corporate policy at Burgmann. True to our governing principle "Leakproof for a clean environment", we aim to be leaders in terms of in-plant environmental protection as well.

BURGMANN is customer proximity
Under the motto "Closer to our customers" we are constantly expanding our international sales and customer service network. This is reflected in the over 90 well-equipped, highly competent and efficient Service Centers at the service of our customers worldwide.

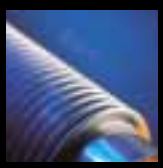
BURGMANN in the future
Our development from a small family-run business into a company the size it is today is the result of far-sighted research and development and, not least of all, an excellent team of employees. This is why the training of young people is a priority mission at Burgmann to make sure that nothing is left to chance in the future either.

EBI The worldwide Alliance for Sealing Technology








BURGMANN
Mechanical Seals
Design Manual

15.3

KM15E/E6/10.000/03.05/7.2.1

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