



DIMER
YOUR SEALING PARTNER



HYDRAULIC SEALS

HYDRAULICS - INTRODUCTION

Sealing elements substantially influence design, function and durability of hydraulic and pneumatic cylinders. This applies both to seals for rods and seals for pistons. To provide a functional solution, a seal has to fulfil the following requirements: good sealing capacity; resistance to wear and gap extrusion; compatibility with operating media; resistance to high and low temperatures; low friction; compact design; and simple installation. The importance of individual parameters depends on the particular application. To this end, a series of seals has been developed, which, due to the optimized geometry, design and high-quality materials used, fully complies with both the technical and economical requirements for sealing elements. In order to determine the most suitable seal and material type, it is necessary to define the desired operating conditions first. When choosing a suitable seal, the main criteria are: operating pressure; temperature; speed; and sealed medium.

Without this information, it is not possible to decide on a suitable material and seal type, the two parameters that are most important with regard to good service and reliability.

ROUGHNESS OF SEALED SURFACES

The quality and finish of surfaces to be sealed also significantly influence the functional reliability and service life of seals. The sealed surfaces should not contain any scores, cuts, pores or traces of processing. Given this, the surface finish of dynamic surfaces (sealed area) is more important than that of static surfaces (groove surface).

PISTON RODS

Chromium-plated piston rods form the basic moveable part of hydraulic motors with linear drive. The quality of the chrome-plated surfaces significantly influences the service life length of sealing cups. Moreover, resistance against corrosion and lubrication quality play an important role. Minimum thickness of the chrome layer should be 20 µm. The values of the average surface roughness (Ra) should be lower than 0,2 µm. At values lower than 0,08µm, the so-called "mirror effect" can manifest, leading to impaired lubrication and subsequently, quick wear of sealing elements. The hardness of the chromium layer should reach values of 64 - 69 in HRC. Roundness tolerance is stated by the ISO standard in tolerance f7.

ACCURATE TUBES

Accurate steel tubes form the basic static part of hydraulic motors with direct drive. There are two technologies which may be used for final treatment of inner diameter of pipes for hydraulic and pneumatic cylinders: the traditional honing and skiving and roller burnishing. Honing is an older method, which is still widely used especially for treatment of worn cylinders, and its principle is based on processing of worn surface with grinding stones. As a result of grinding, the finished surface contains many grooves and surface roughness reaches values of $Ra < 0,4\mu\text{m}$.

The skiving and roller burnishing technique is completely different from honing. Skiving is performed during forward movement while roller burnishing takes place during the backward movement of the processing machine. This results in higher and more even surface quality of the whole area, with surface roughness of $Ra < 0,2\mu\text{m}$. Moreover, the surface material is densified and its hardness increases. High quality of tubes reached by employing this technique is important for cylinders working at high speeds, but also for exact opposite cases - for cylinders working at low speeds, this processing technique prevents the stick-slip phenomenon from occurring.

STORAGE OF SEALS

Seals, as spare parts, are often stored for long periods of time. Physical properties of most seals change with time, so that the seals become virtually useless. Changes can be caused by the impact of factors such as: ozone; light; oxygen; heat; humidity; deformation; and contact with oil and solvents, resulting in hardening or softening, formation of cracks, splits and other surface changes.

Seals should be stored at temperatures up to +25°C and relative humidity 65%. They must be kept away from direct sunlight and ultraviolet radiation. It is not allowed to store seals together with chemical substances, including solvents and diluents. In addition to these suggestions, basic instructions for storage, cleaning and maintenance of sealing elements can be found in international standards such as DIN 7716, DIN 9088 etc.

Recommended total storage length for individual materials are:

POLYURETHENE, THERMOPLASTIC SUBSTANCES - 4 years, NBR, HNBR - 6 years; EPDM - 8 years; FPM, MVQ - 10 years; TEFLONS - without time restriction

FITTING TABLE

Nominal diameter over		shaft diameter								bore diameter				
		e8	f7	f8	h8	h9	h10	h11	js11	H8	H9	H10	H11	Js11
1,6	3	-14	-6	-6	0	0	0	0	+30	+14	+25	+40	+60	+30
		-28	-16	-20	-14	-25	-40	-60	-30	0	0	0	0	0
3	6	-20	-10	-10	0	0	0	0	+37,5	+18	+30	+48	+75	37,5
		-38	-22	-28	-18	-30	-48	-75	-37,5	0	0	0	0	-45
6	10	-25	-13	-13	0	0	0	0	+45	+22	+36	+58	+90	+45
		-47	-28	-35	-22	-36	-58	390	-45	0	0	0	0	-45
10	18	-32	-16	-16	0	0	0	0	+55	+27	+43	+70	+110	+55
		-59	-34	-43	-27	-43	-70	-110	-55	0	0	0	0	-55
18	30	-40	-20	-20	0	0	0	0	+65	+33	+52	+84	+130	+65
		-73	-41	-53	-33	-52	-84	-130	-65	0	0	0	0	-65
30	50	-50	-25	-25	0	0	0	-160	+80	+39	+62	+100	+160	+80
		-89	-50	-64	-39	-62	-100	0	-80	0	0	0	0	-80
50	80	-60	-30	-30	0	0	0	-190	+95	+46	+74	+120	+190	+95
		-106	-60	-76	-46	-74	-120	0	-95	0	0	0	0	-95
80	120	-72	-36	-36	0	0	0	-220	+110	0	0	0	0	-110
		-126	-71	-90	-54	-87	-140	0	-110	0	0	0	0	-110
120	180	-85	-43	-43	0	0	0	-250	+125	+63	+100	+160	+250	+125
		-148	-83	-106	-63	-100	-160	0	-125	0	0	0	0	-125
180	250	-100	-50	-50	0	0	0	-290	+145	+72	+115	+185	+290	+145
		-172	-96	-122	-72	-115	-185	0	0-145	0	0	0	0	-145
250	315	-110	-56	-56	0	0	0	-320	+160	+81	+130	+210	+320	+160
		-191	-108	-137	-81	-130	-210	0	-160	0	0	0	0	-160
315	400	-125	-62	-62	0	0	0	-360	+180	-89	+140	+230	+360	+180
		-214	-119	-151	-89	-140	-230	0	-180	0	0	0	0	-180
400	500	-135	-68	-68	0	0	0	-400	+200	+97	+155	+250	+400	+200
		-232	-131	-156	-97	-155	-250	0	-200	0	0	0	0	-200
500	630	-145	-76	-76	0	0	0	-440	+220	+110	+175	+280	+440	+220
		-255	-146	-186	-110	-175	-280	0	-220	0	0	0	0	-220
630	800	-160	-80	-80	0	0	0	0	+250	+125	+200	+320	+500	+250
		-285	-160	-205	-125	-200	-320	-500	-250	0	0	0	0	-250
800	1000	-170	-86	-86	0	0	0	0	+280	+140	+230	+360	+560	+280
		-310	-176	-316	-140	-230	-360	-560	-280	0	0	0	0	-280

Material data			Polyurethanes							
Properties	DIN standard	Unit	PU	HPU	GPU	TPU	SPU	XPU	XHPU	XSPU
Colour			green	red	red	blue	grey	dark green	dark red	grey-black
Hardness	53505	Shore A	95 ± 2	95 ± 2	95 ± 2	95 ± 2	95 ± 2			
Hardness	53505	Shore D	48 ± 3	48 ± 3	48 ± 3	48 ± 3	48 ± 3	57 ± 3	60 ± 5	57 ± 3
Mass density	53479	g/cm ³	1,20	1,20	1,20	1,17	1,24	1,21	1,22	1,26
100% module	53504	N/mm ²	≥12	≥13	≥11	≥12	17	≥18	≥20	24
Tensile strength / yield strength	53504/53455	N/mm ²	≥40	≥50	≥45	≥50	50	≥50	≥50	45
Relative elongation at break	53504/53455	%	≥430	≥330	≥280	≥450	380	≥400	≥350	350
Elastic modulus - tensile strength	53457	N/mm ²								
Permanent deformation at 700°C/24 hours, 20% faults		%	≤30	≤27	≤30	≤27	25	24	26	24
at 1000°C/24 hours, 20% faults		%	≤35	≤33	≤40	≤33	30	29	30	30
1000°C/22 hours	53517	%								
1750°C/22 hours	53517	%								
Resilience	52512	%	42	29	43	50				
Tear strength	53515	N/mm ²	≥100	≥100	≥40	≥80	120	≥140	170	160
Abrasive action	53516	mm ³	18	17	25	15	17	18	20	20
Min. operating temperature		°C	-30	-20	-30	-50	-20	-30	-20	-20
Max. operating temperature		°C	+110	+110	+110	+110	+110	+110	+110	+110

Elastomeric materials (rubber)

Thermoplastic materials

HNBR	NBR	FKM	EPDM	TFE/P - ALFAS	VMQ	POM	PTFE	PTFE + 15% Glass Fibre + 5% MoS2	PTFE + 40% Bronze	PTFE + 25% Carbon	PA	PEEK
black	black	brown	black	black	ginger brown	black	white	grey	brown	black	black	beige
85 ± 2	85 ± 2	83 ± 2	85 ± 2	85 ± 2	85 ± 2							
						82	57	60	64	65	77	86
1,22	1,31	2,30	1,22	1,60	1,52	1,41	2,17	2,25	3,00	2,10	1,15	1,32
≥10	≥11	≥5	≥9	8	≥5							
≥18	≥16	≥8	≥12	13	≥7	62	27	18	22	15	65	97
≥180	≥130	200	≥110	200	≥130	40	300	200	280	180	120	≥50
						2600					1800	3600
≤22	≤22		≤15									
		≤20		29	≤15							
29	28	7	38		44							
20	21	15	21	19	8							
90	90	150	120	110								
-25	-30	-20	-50	-10	-60	-50	-200	-200	-200	-200	-40	
+150	+100	+200	+150	+200	+200	+100	+260	+260	+260	+260	+100	260

PROFILES

SEALS FOR PISTONS

K01-P	K01-R	K02-P	K02-PD	K02-R	K02-RD	K03-P	K03-F	K03-S	K04-P	K04-PD	K05-P
K05-R	K06-P	K06-R	K07-P	K08-E	K08-D	K08-P	K08-ES	K08-DS	K09-N	K09-D	K09-H
K09-F	K1012-T	K1012-M	K1315-T	K16-A	K16-B	K17-P	K17-R	K19-F	K20-R	K21-P	K22-P
K22-R	K23-N	K23-D	K23-H	K23-F	K24-P	K32-P	K35-P				

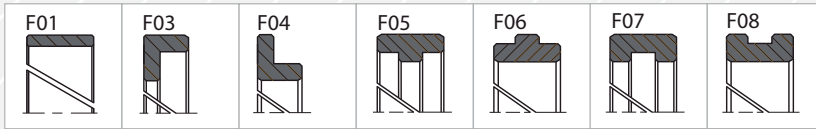
SEALS FOR RODS

S01-P	S01-R	S02-P	S02-PD	S02-R	S02-RD	S02-S	S03-P	S03-F	S03-S	S04-P	S04-PD
S05-P	S05-R	S06-P	S06-R	S07-P	S08-P	S08-PE	S08-R	S09-E	S09-D	S09-P	S09-ES
S09-DS	S1012-M	S1012-T	S1315-T	S16-A	S16-B	S17-P	S17-R	S18-P	S18-R	S19-F	S20-R
S21-P	S22-P	S22-R	S24-P	S2527-F	S2931-F	S32-P	S35-P				

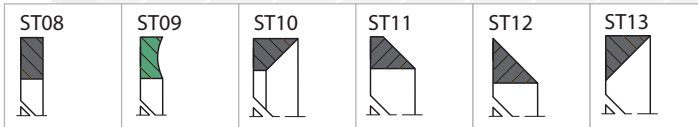
WIPER RINGS

A01-A	A01-B	A02-A	A02-B	A02-I	A03-A	A04-A	A04-B	A05-A	A05-B	A05-I	A06-A
A07-A	A07-SA	A08-A	A08-B	A09-A	A10-A	A11-A	A11-I	A12-A	A12-B	A13-A	A25-F
A26-F	A27-F										

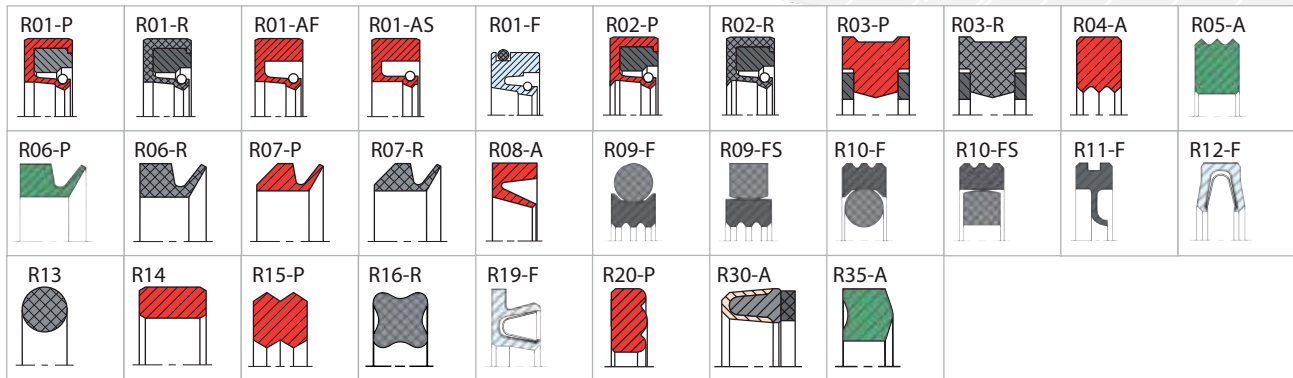
GUIDE RINGS



BACK-UP RINGS



ROTARY SEALS



PRODUCT RANGE

Hydraulic seals
Industrial gaskets
Gasket materials
Mechanical seals
Packings
Insulations
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