

HYDRAULIC SEALING SOLUTIONS





Hydraulic - Sealing Solutions

From a technological point of view, hydraulics (derived from the Greek “hydro” – water and “aulos” – pipe) alongside pneumatics (“pneuma” – air) is a system to transmit energy, signals or forces through fluids.

Hydraulic systems work with a fluid, which is set under pressure in a closed pipe system.

In these systems, sealing elements play a particularly critical role because only the correct sealing enables the build-up of pressure and thereby the transmission of the energy.

In addition to that, they are crucial for the protection of our environment because they prevent fluid leakage from the system.

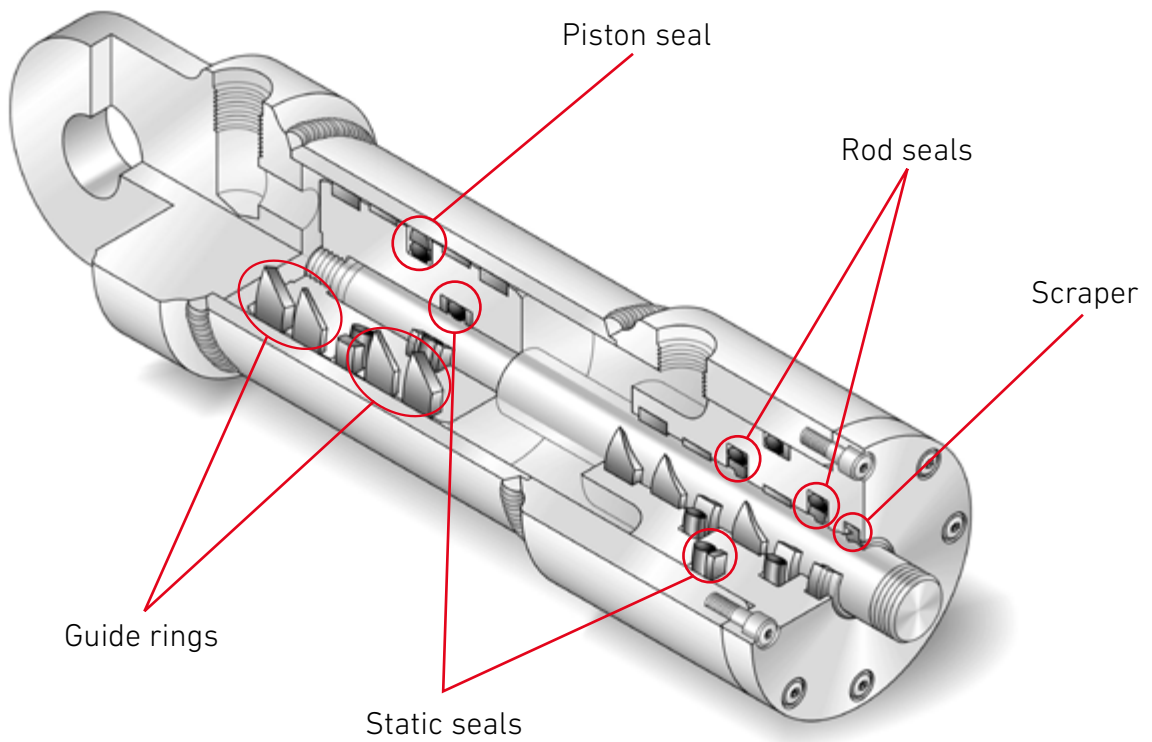
In hydraulic cylinders or other hydraulic aggregates, we find various different dynamic and static seals that work either translational or rotatory. Hydraulic cylinders are a part of many different applications.

The sealing system is made of several components: (see figure p.3)

- **Guide rings:** they guide and prevent metallic contact between the piston and the bore in e.g. the cylinder
- **Piston and rod seals:** they prevent internal and external leakage of the system’s fluid
- **Rotary seals:** they seal rotating shafts so that the fluid cannot escape from the housing
- **Scrapers:** they prevent adhering dirt or dust from entering the hydraulic system
- **Static seals:** they seal machine components that do not perform any relative movements to one another



Hydraulic Cylinder



Index

4	Requirements for Hydraulic Seals // Our Product Range
5	Piston Seals
6	Rod Seals
7	Scrapers
8	Rotary Seals
8	Guide Rings
9	U-cups
10	Elastomers
11	PTFE-based Materials with Fillers
11	Thermoplastic Polyurethane (TPU)
12	About ULMAN

Requirements for Hydraulic Seals:

- Free from leakage
- Wear and extrusion resistance
- High-temperature resistance
- Media compatibility
- Cost-efficient

Our Product Range:

- Standard sealing elements for hydraulic applications
- Development of individual sealing solutions according to customer requirements
- Optimised machine components
- Application-oriented materials
- Low-friction solutions









Piston Seals

	Series Type	Materials	Properties / Application area
	KG Gleitef TG	· Elastomers · PTFE with fillers	Double-acting sealing element for piston seal housings according to e.g. ISO 7425-1; usage in high and low pressure applications; particularly suitable for hydraulic and pneumatic cylinders, valves, compactors, machine tools
	KS Stuftef TS	· Elastomers · PTFE with fillers	Single-acting sealing element for piston seal housings according to e.g. ISO 7425-1 for general hydraulic applications; particularly suitable for hydraulic and pneumatic cylinders, valves, compactors, machine tools; also applicable for tandem arrangement sealing systems
	KQ Gleitef TQ	· Elastomers · PTFE with fillers	Double-acting sealing element for piston seal housings according to e.g. ISO 7425-1; with an additional X-ring on the dynamic sealing side to improve the static seal tightness; particularly suitable for hydraulic and pneumatic cylinders, piston accumulators, compactors, stabilisers, machine tools
	KW Gleitef TW	· Elastomers · TPU	Double-acting sealing element for applications up to a medium pressure range, with specially developed sealing edge profile; particularly suitable for hydraulic cylinders, agricultural machinery, hydraulic lifts, machine tools
	KF Gleitef TF	· Elastomers · PTFE with fillers	Double-acting sealing element for reduced installation space compared to Gleitef TG; particularly suitable for hydraulic and pneumatic cylinders, machine tools
	KD Gleitef TD	· Elastomers · PTFE with fillers	Double-acting sealing element for use in existing O-ring grooves; requires the smallest installation space; suitable for piston seal housings according to e.g. ISO 6194 and AS 4716; particularly suitable for hydraulic and pneumatic cylinders, valves, machine tools
	KX Gleitef TX	· Elastomers · PTFE with fillers	Double-acting sealing element for piston seal housings according to e.g. ISO 7425-1, similar to Gleitef TQ; with two O-rings for optimisation of the pressure profile and an additional X-ring on the dynamic sealing side to improve the static seal tightness; application area analogue to Gleitef TQ
	KV Varitef TV	· Metals · PTFE · PTFE with fillers	Single-acting sealing element which consists of a PTFE seal and a stainless steel spring as preload element; suitable for hydraulic applications; low friction coefficient; runs stick-slip free; hygienic design possible for applications in food and medical sector; exceptionally high temperature and media resistance










Note: Special designs are available on request

Rod Seals

	Series Type	Materials	Properties / Application area
	SG Gleitef TG	<ul style="list-style-type: none"> · Elastomers · PTFE with fillers 	Double-acting sealing element for rod seal housings according to e.g. ISO 7425-2; installation in closed grooves from a rod diameter of approximately 30mm possible; particularly suitable for hydraulic and pneumatic cylinders, valves, compactors, machine tools
	SS Stuftef TS	<ul style="list-style-type: none"> · Elastomers · PTFE with fillers 	Single-acting sealing element for rod seal housings according to e.g. ISO 7425-2; installation in closed grooves from a rod diameter of approximately 30mm possible; particularly suitable for hydraulic and pneumatic cylinders, valves, compactors, machine tools
	SR Stuftef TR	<ul style="list-style-type: none"> · Elastomers · TPU 	Single-acting sealing element for rod seal housings according to e.g. ISO 7425-2; installation in closed grooves from a rod diameter of approximately 30mm possible; particularly suitable for hydraulic and pneumatic cylinders, valves, compactors, machine tools; also applicable for tandem arrangement sealing systems
	SF Gleitef TF	<ul style="list-style-type: none"> · Elastomers · PTFE with fillers 	Double-acting sealing element for reduced installation space compared to Gleitef TG; particularly suitable for hydraulic and pneumatic cylinders, machine tools
	SD Gleitef TD	<ul style="list-style-type: none"> · Elastomers · PTFE with fillers 	Double-acting sealing element for use in existing O-ring grooves; requires the smallest installation space; suitable for rod seal housings according to e.g. ISO 6194 and AS 4716; particularly suitable for hydraulic and pneumatic cylinders, valves, machine tools
	SV Varitef TV	<ul style="list-style-type: none"> · Metals · PTFE · PTFE with fillers 	Single-acting sealing element which consists of a PTFE seal and a stainless steel spring as preload element; suitable for hydraulic applications; low friction coefficient; runs stick-slip free; hygienic design possible for applications in food and medical technology; exceptionally high temperature and media resistance

Note: Special designs are available on request





Scrapers

	Series	Materials	Properties / Application area
	A1	<ul style="list-style-type: none"> · Elastomers · PTFE with fillers 	Single-acting scraper; runs stick-slip free; good media resistance; ideal for small installation spaces
	A2	<ul style="list-style-type: none"> · Elastomers · PTFE with fillers 	Double-acting scraper; runs stick-slip free; good media resistance; ideal for applications with low to medium dirt contamination
	A3	<ul style="list-style-type: none"> · Elastomers · PTFE with fillers 	Double-acting scraper; runs stick-slip free; good media resistance; ideal for applications with high dirt occurrence, especially suitable for heavy-duty applications
	A4	<ul style="list-style-type: none"> · TPU 	Double-acting scraper suitable for mobile hydraulics with high dirt occurrence; pressure-loaded; high abrasion resistance and particularly good durability through the advantages of TPU (elastomer available on request)
	A5	<ul style="list-style-type: none"> · Elastomers · TPU 	Double-acting scraper made of NBR for use in hydraulic and pneumatic applications, made of FKM for use in high temperature applications, made of TPU for use in mobile hydraulics; additional step on the outer diameter for a better fit and improved performance
	A6	<ul style="list-style-type: none"> · Elastomers · TPU 	Single-acting scraper for hydraulic and pneumatic applications; particularly suitable for high stroke speeds; additional studs on the inner diameter to safeguard the function; it also prevents tilting in the groove
	A7	<ul style="list-style-type: none"> · Elastomers · Metals 	Single-acting scraper with a vulcanised metal supporting ring for greater stability; installation in open grooves only; made of NBR for use in hydraulic and pneumatic applications, made of FKM for use in high temperature applications
	A8	<ul style="list-style-type: none"> · Elastomers · TPU 	Single-acting scraper for use in general hydraulics; additional step on the outer diameter for a better fit and improved performance
	A9	<ul style="list-style-type: none"> · Elastomers · Metals · TPU 	Single-acting scraper with a vulcanised metal reinforcing ring for greater stability and heat dissipation; installation in open grooves only; made of NBR for use in hydraulic and pneumatic applications, made of FKM for use in high temperature applications, made of TPU for use in mobile hydraulics

Note: Special designs are available on request

Rotary Seals

The preload element depends on the prevailing conditions

	Series Type	Materials	Properties / Application area
	TK Tortef TT	· Elastomers · PTFE with fillers	Double-acting sealing element (external sealing) for slow rotating and swivelling movements in association with high pressures; depending on the profile with one or two grooves, particularly suitable for machine tools, swivel motors, axles and shafts
	TW Tortef TT	· Elastomers · PTFE with fillers	Double-acting sealing element (internal sealing) for slow rotating and swivelling movements in association with high pressures; depending on the profile with one or two grooves, particularly suitable for machine tools, swivel motors, axles and shafts
	TC Tortef TS	· Polyethylene · PE · PEHD · PU	Double-acting sealing element (external sealing) for slow rotating and swivelling movements of shafts and pins or for rotary transmissions at medium and high pressures
	TB Tortef TS	· Polyethylene · PE · PEHD · PU	Double-acting sealing element (internal sealing) for slow rotating and swivelling movements of shafts and pins or for rotary transmissions at medium and high pressures

Note: Special designs are available on request

Guide Rings

Function:

- absorption of all occurring lateral forces and preventing mechanical contact between pistons, bores and rods
- limiting the deflection of the piston rod
- absorption of dirt

Our Highlight:

- guide rings made of PTFE, thermoplastic or fabric-based laminate
- surface smooth or with diamond structure
- available by the meter or cut to the required length
- available with step-, 90° or 45° cut



Smooth surface



Diamond structure

U-cups

	Series	Materials	Properties / Application area
	N1	· Elastomers · TPU	Single-acting sealing element with symmetrical sealing lips; for rod and piston sealing use
	N2	· Elastomers · TPU	Single-acting sealing element with symmetrical sealing lips; for rod and piston sealing use in general stationary and mobile hydraulics
	N3	· Elastomers · TPU	Single-acting sealing element with asymmetrical sealing lips; for rod sealing use in general stationary and mobile hydraulics; capable of absorbing high shear forces
	N4	· Elastomers · TPU	Single-acting sealing element with asymmetrical sealing lips; for piston sealing use in general stationary and mobile hydraulics; capable of absorbing high shear forces
	N5	· TPU	Single-acting sealing element with asymmetrical sealing lips and additional second sealing edge; for rod sealing use in general stationary and mobile hydraulics
	N6	· TPU	Single-acting sealing element with symmetrical sealing lips; for rod and piston sealing use in general stationary and mobile hydraulics; shortened sealing lip for a better sealing effect concerning low-pressure or pressureless motion
	N7	· TPU	Single-acting sealing element with symmetrical sealing lips and additional second sealing edge; for rod sealing use in general stationary and mobile hydraulics; shortened sealing lip for a better sealing effect concerning low-pressure or pressureless motion
	N8	· TPU · POM	Single-acting sealing element with symmetrical sealing lips and additional second sealing edge; for rod sealing use in general stationary and mobile hydraulics; design like N7 with an integrated Back-up ring which prevents gap extrusion also at higher pressures

Note: Special designs are available on request

Elastomers

Standard abbreviation according to ISO 1629 / ASTM 1418

	Chemical designation	Properties / Application area
NBR	Acrylonitrile-Butadiene Elastomer	Frequently used material with a wide range of applications and good compatibility properties
EPDM	Ethylene-Propylene-Diene Elastomer	Suitable for hot water, vapour and phosphate ester; not suitable for mineral oil and esters
HNBR	Hydrogenated Acrylonitrile-Butadiene Elastomer	Higher heat resistance and better mechanical properties than NBR
FKM	Fluoro Elastomer	Good temperature and chemical resistance; some types also resistant to water and vapour; increased setting behaviour
FEPM	Tetrafluoro-Ethylene-Propylene Elastomer (Aflas®)	Good temperature and chemical resistance; suitable for water, vapour, amine; increased setting behaviour; higher tensile strength and elongation at break compared to FKM

International abbreviation	NBR	EPDM	HNBR	FKM	FEPM
Hardness Shore A	30-95	25-85	40-90	50-90	70-75
Tensile strength up to [N/mm ²]	20	20	25	20	15
Elongation at break until [%]	500	450	500	400	300
Operating temperature [°C]	-30 / +100	-40 / +130	-30 / +150	-20 / +200	-15 / +200
Abrasion resistance	+	+	++	o	o
Tear resistance	+	++	+	o	o
Elasticity	+	+	+	-	-
Aging, oxidation	o	++	+	++	++
Weather / ozone resistance	+	++	++	++	++
Vapour impact	+	++	++	o	++
Oil and grease resistance	++	-	++	++	++
Gasoline resistance	+	-	o	++	++

++ = very good + = good o = acceptable - = poor

Note: Maximum values are determined under ideal conditions. They do not apply simultaneously. They may vary depending on the application. Special designs with extended properties are available on request.



PTFE-based Materials with Fillers

An overview of our highlights

Materials	Colour	Temperature area [°C]	<ul style="list-style-type: none"> Application area Properties 	Counter surface
PTFE + bronze	grey green	- 200 / + 260	<ul style="list-style-type: none"> standard material for hydraulic applications high compressive strength; good sliding and abrasion behaviour 	steel, hardened steel, chrome-plated steel, cast iron
PTFE + mineral fibre	white	- 200 / + 260	<ul style="list-style-type: none"> pharmaceutical and food industry good sliding properties and chemical resistance 	steel, hardened steel, chrome-plated steel, cast iron
PTFE + mineral fibre	dark grey	- 200 / + 260	<ul style="list-style-type: none"> suitable for a broad spectrum of hydraulic media hardwearing; very good abrasion behaviour; replacement for many PTFE materials because it is also suitable for media without zinc 	steel, hardened steel, chrome-plated steel, cast iron, stainless steel, titanium
PTFE + carbon + graphite	black	- 200 / + 260	<ul style="list-style-type: none"> oil hydraulics, water hydraulics and pneumatics, lubricating and non-lubricating fluids high extrusion resistance; good chemical resistance; hardwearing 	steel, corrosion-resistant steel, aluminium, bronze, alloys
PTFE + carbon fibre	dark grey / black	- 200 / + 260	<ul style="list-style-type: none"> water hydraulics, lubricating and non-lubricating fluids good abrasion behaviour in water; soft counter surfaces; suitable for short strokes and high frequency applications 	steel, corrosion-resistant steel, cast iron aluminium, bronze, alloys

Thermoplastic Polyurethane (TPU)

	Material	Properties / Application area
AU	Polyester-Urethane Elastomer	Thermoplastic material with elastic properties; higher / better chemical and mechanical resistance in comparison to elastomers; higher gas-tightness; high abrasion resistance; very good tear resistance; limited upper operating temperature
EU	Polyether-Urethane Elastomer	Better hydrolysis resistance than AU



About ULMAN

The ULMAN Dichtungstechnik GmbH is one of the leading providers of technically sophisticated products and solutions in the complex and diverse world of seals.

With over 50 years of experience, we are a full-service provider with a wide range of high-quality products that exceed standard application sealing technology. We provide custom-built solutions to meet our customers' requirements. In doing so, we develop high-performance sealing elements that go beyond technological limitations.

We set great value on establishing customer relationships based on partnership. We are active in numerous industrial sectors all over the world.



INNOVATION



RELIABILITY



QUALITY

Do you have questions?

Our application engineers would be happy to advise and support you. We cover every topic in the general and specific sealing technology.

Do you need further support?

No problem. We provide customised solutions and individual service wherever you need support.

Please contact us at:

ULMAN Dichtungstechnik GmbH

Max-Planck-Straße 32

71116 Gärtringen

Germany

+49 (0) 70 34 / 2518 - 0

info@ulman.de

www.ulman.de

