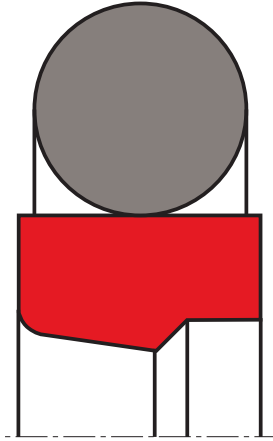


## rod seal S09-E

## seal spec



### application



### description

O-Ring activated asymmetric PTFE rod seal, low friction. in tandem design together with double acting wipers for extreme low or high speed or positioning functions. as primary seal in combination with secondary S01-P seal with good resistance to pressure shocks used in mobile hydraulics, machine tools, injection moulding machines, heavy hydraulics.

- asymmetric single-acting composite rod seals, with a gliding part made of low friction material and an elastic preload element.
- interference fit on the outside diameter.
- various materials are available for different purposes.
- mostly used in a sealing system, either in tandem arrangement with double wiper (A11-P/R) or in combination with a secondary sealing element (S01-P/R, S09-P).
- snaps into simple grooves (see notes on installation).
- the free space on the trailing side reduces the risk of gap extrusion.
- highest degree of sealing across a wide temperature range.
- sealing effect enhanced by high recovery.
- for pressures up to 400 bar (in special cases up to 800 bar) as a seal between pressurised space and atmosphere.
- good sealing in all pressure ranges.
- good static and dynamic sealing.
- suitable for short and long travel with extremely slow or quick movements.
- no stick-slip.
- small break-away load after prolonged periods of standstill.
- exact positioning due to little friction.
- high mechanical efficiency.
- insensitive to thermal damage caused by air in the oil.

### category of profile

machined or molded/standard/trade product.

### single acting

the S09-E seal is designed for use as a rod seal.

### area of application: hydraulics

- reciprocating rods on hydraulic cylinders, small swiveling motion permissible.
- as rod seal in tandem arrangement for positioning tasks for machine tools and robots.
- as rod seal in combination with lip seals as secondary seal for rough operations (e.g. construction machines, heavy machinery).
- for heavy-duty operating conditions, profile S09-ES is preferred.
- dimensions according to ISO 7425 part 2 are common, as well as standard types that differ slightly in the depth of the mounting space. for specific dimensions see "range of profile sizes".

### note

- the calculation program is based on mounting spaces according to ISO 7425, part 2. intermediate sizes are possible, with an O-ring for standard sizes. for deviating dimensions, use S09-ES. attention must be given to a balanced ratio between sealing part and preload element.
- there should be enough space for trailing oil.
- the recovery capacity depends on the sealing system.

### function

S09-E profiles are composite rod seals designed to seal pressurised space against the atmosphere; mainly for reciprocating movements. the design is based on application in standard hydraulic systems with conventional hydraulic oils. the operating parameters are as defined in the sealing data sheet and material data. requirements deviating from these parameters can be met to a certain degree by changing the geometry in the software program.



## operating parameters &amp; material

diameter range: up to 600 mm

material		temperature	max. surface speed	max. pressure <sup>1</sup>	hydrolysis	dry running	wear resistance
sealing element	energizer						
s-mart PTFE glass	s-mart NBR (70 shore A)	-30 °C ... +100 °C	10 m/s	400 bar (40 MPa)	-	++	+
s-mart PTFE bronze	s-mart NBR (70 shore A)	-30 °C ... +100 °C	10 m/s		-	++	+
s-mart PTFE carbon	s-mart NBR (70 shore A)	-30 °C ... +100 °C	10 m/s		-	++	+
s-mart PTFE glass	s-mart FKM (75 shore A)	-20 °C ... +200 °C	10 m/s		-	++	+
s-mart PTFE bronze	s-mart FKM (75 shore A)	-20 °C ... +200 °C	10 m/s		-	++	+
s-mart PTFE carbon	s-mart FKM (75 shore A)	-20 °C ... +200 °C	10 m/s		-	++	+
s-mart PTFE glass	s-mart EPDM <sup>2</sup> (70 shore A)	-50 °C ... +150 °C	10 m/s	800 bar (80 MPa) <sup>3</sup>	++	++	+
s-mart PTFE bronze	s-mart EPDM <sup>2</sup> (70 shore A)	-50 °C ... +150 °C	10 m/s		++	++	+
s-mart PTFE carbon	s-mart EPDM <sup>2</sup> (70 shore A)	-50 °C ... +150 °C	10 m/s		++	++	+
s-mart PTFE glass	s-mart MVQ (70 shore A)	-60 °C ... +200 °C	10 m/s		++	++	+
s-mart PTFE bronze	s-mart MVQ (70 shore A)	-60 °C ... +200 °C	10 m/s		++	++	+
s-mart PTFE carbon	s-mart MVQ (70 shore A)	-60 °C ... +200 °C	10 m/s		++	++	+
s-mart UHMWPE	s-mart MVQ (70 shore A)	-60 °C ... +80 °C	10 m/s	400 bar (40 MPa)	++	+	+
s-mart XPU	s-mart NBR (70 shore A)	-30 °C ... +110 °C	5 m/s	600 bar (40 MPa)			

the stated operation conditions represent general indications. it is recommended not to use all maximum values simultaneously.

surface speed limits apply only to the presence of adequate lubrication film.

<sup>1</sup> pressure ratings are dependent on the size of the extrusion gap.

<sup>2</sup> attention: not suitable for mineral oils!

<sup>3</sup> only in special cases (small extrusion gap, low surface speed).

++ ... particularly suitable

o ... conditional suitable

+ ... suitable

- ... not suitable

for detailed information regarding chemical resistance please refer to our "list of resistance". for decreased leakage rates elastomer materials (polyurethane or rubber) in other sealing systems are to be preferred.

note on special materials:

as temperature limit and chemical resistance are determined by the preload element, the temperature range can be increased and the resistance to chemical influences improved, if a special material is used for the preload element.

## gap dimension

operating pressure	cs = (ØD - Ød)/2 mm						
	2,45	3,65	5,35	7,55	10,25	12	13,65
	safe extrusion gap (mm)						
100 bar (10 MPa)	0,27	0,33	0,38	0,43	0,50	0,55	0,60
200 bar (20 MPa)	0,19	0,25	0,28	0,33	0,37	0,43	0,45
300 bar (30 MPa)	0,17	0,20	0,22	0,25	0,30	0,34	0,38
400 bar (40 MPa)	0,16	0,18	0,19	0,21	0,25	0,28	0,30

important note:

the above data are maximum values and cannot be used at the same time. e.g. the maximum operating speed depends on material type, pressure, temperature and gap value. temperature range also dependent on medium"

the table refers to a operating temperature of 80°C. temperatures below may increase the safe extrusion gap slightly, at temperatures above 80 °C, the gap dimensions has to be reduced or a stronger profile selected.

for extrusion gap sizes resulting from tolerance pair H8/f8 pressure ranges above 400 bar can be reached in special cases, influences due to thermal expansion have to be considered. we recommend to contact our technical department.

## surface quality

surface roughness	Rtmax [µm]	Ra [µm]
sliding surface	≤2	≤0,05-0,3
bottom of groove	≤6,3	≤1,6
groove face	≤15	≤3

## tolerance recommendation

seal housing tolerances	
Ød	h10
ØD	H9

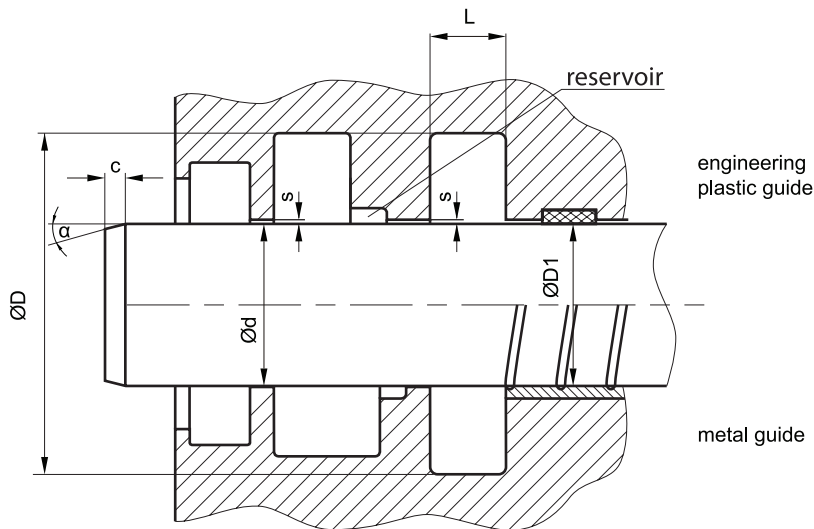
**mode of installation**

for inside diameters of 25 mm or more, and dependant on radial cross section (cs), seals may be snapped into a closed housing.

$\varnothing d$	type of installation
$\leq 6 \cdot cs$	open mounting space required
$> 6 \cdot cs \dots \leq 10 \cdot cs$	snap mounting with tool
$> 10 \cdot cs$	snap mounting by hand

**recommended mounting space:**

version 1



version 2

two types of mounting space are recommended depending on application:

	secondary seal	wiper
version 1	S09-E S09-P	A11-A A11-I A26-F A27-F
version 2	S01-P S01-R	all type possible

the choice of the sealing system does not depend on the guide elements.

**recommended guide tolerance D1:**

in most cases the guiding elements are integrated in the piston seal system on both sides. if not use below recommendations for D1 (=inside diameter of the guiding elements):

d f8 [mm]	$p \leq 100$ [bar]	$100 < p \leq 200$ [bar]	$p > 200$ [bar]
$\leq 100$	H10	H8	H8
$> 100 \leq 200$	H10	H8	H7
$> 200$	H9	H8	H7

**insertion chamfer:**

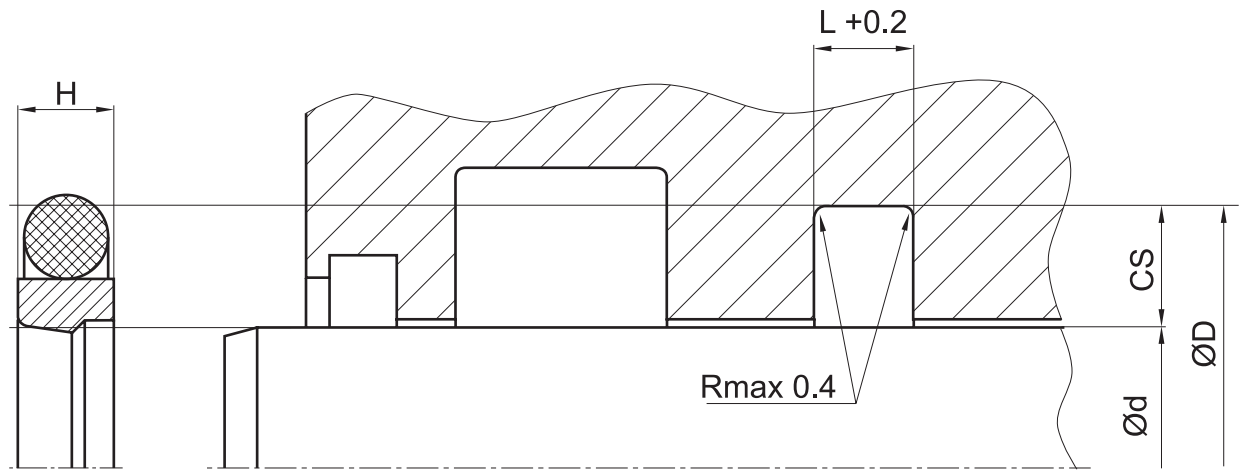
in order to avoid damage to the rod seal during installation, the piston rod is to be chamfered and rounded as shown in the "recommended mounting space" drawing. the size of chamfer depends on the seal type and profile width.

cs (mm)	c (mm)	
	$\alpha = 15^\circ \dots 20^\circ$	$\alpha = 20^\circ \dots 30^\circ$
2,45	2,5	1,5
3,5	3,5	2
5,35	4,5	3
7,55	5	3,5
10,25	6	5
12	8	6
13,65	10	7



**seal & housing recommendations**

*please note that we are able to produce those profiles to your specific need or any non standard housing. for detail measurements, please see seal-mart catalog...*

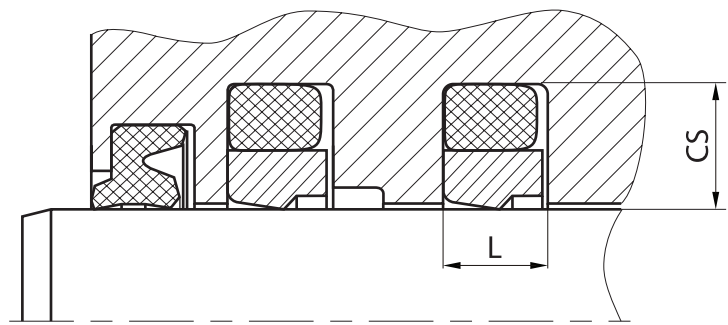


the ratio between nominal width and seal height should be in accordance to ISO 7425 part 1. we recommend the following values:

Ød [mm]	ØD [mm]	L [mm]	cs = (ØD - Ød)/2 [mm]
5 ~ 7,9	Ød + 4,9	2,2	2,45
8 ~ 18,9	Ød + 7,3	3,2	3,65
19 ~ 37,9	Ød + 10,7	4,2	5,35
38 ~ 199,9	Ød + 15,1	6,3	7,55
200 ~ 255,9	Ød + 20,5	8,1	10,25
256 ~ 649,9	Ød + 24	8,1	12
650 ~ 1.000	Ød + 27,3	9,5	13,65
> 1.000	Ød + 27,3	9,5	13,65

in case of large deviations of L use S09-ES.

**fitted:**



*don't hesitate to contact our technical department for further information or for special requirements (temperature, speed etc.), so that suitable materials and/or designs can be recommended.*