

HS Static radial seal

Static sealing for high-pressure applications

aerospace
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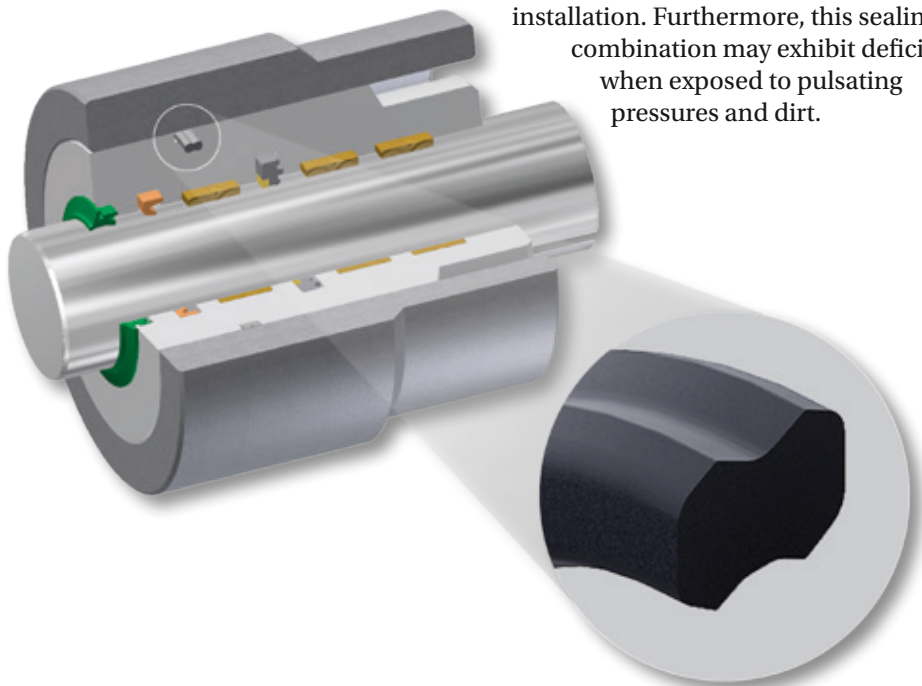


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Parker has developed the HS seal profile as a viable alternative to conventionally used O-ring/back-up ring combinations for static sealing applications at high pressures. The robust symmetrical seal geometry and use of particularly extrusion-resistant Parker polyurethane compounds not only simplifies installation but also enhances the sealing effect in pulsating pressure conditions. As a result, service life is significantly extended.

O-ring/back-up ring combinations have thus far been considered the industry standard for static applications at high pressures. In field use, however, they may show weaknesses with respect to their installation and operation in the application. Standard O-rings, for instance, are often prone to twisting while back-up rings are not installed in the proper position or damaged during installation. Furthermore, this sealing combination may exhibit deficits when exposed to pulsating pressures and dirt.



Advantages

The HS seal, compared to the conventional O-ring/back-up ring combinations, offers the following advantages:

- Easy installation
- No twisting
- High extrusion resistance of the polyurethane materials
- Extrusion resistance many times higher than that of conventional O-rings
- Longer service life
- Suitable for standard O-ring grooves with back-up rings

Range of application

The Ultrathan® seal HS is suitable for radial, static applications at high pressures such as:

- Hydraulic valves
- Hydraulic cylinders
- Machine tools
- Injection-moulding machines
- Any static sealing point requiring radial sealing

Performance data

Operating pressure:

≤ 600 bar / 60 MPa ¹⁾

Operating temperature:

-35 to +110 °C

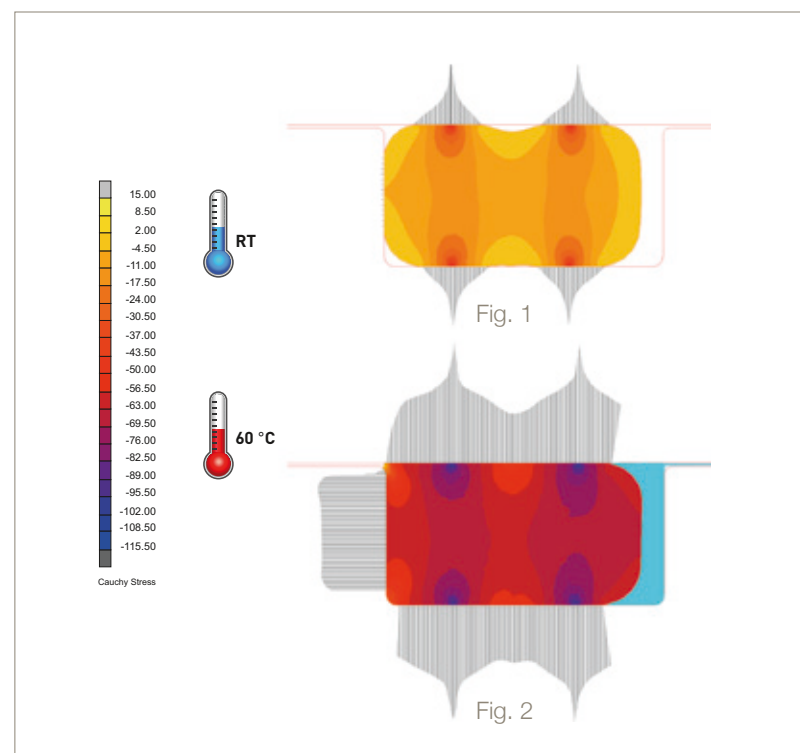
¹⁾ In the case of reduced extrusion gaps and suitable cross-sections.

Reliable operation at high pressures

The figures show the results of finite elements calculations on the HS profile in two operating conditions, i.e. when installed at room temperature, in pressure-less conditions (Fig. 1), and after pressure loading of 600 bar plus heating to 60 °C (Fig. 2), each time with a reduced extrusion gap. The colour scale shows the stress levels in the seal in radial direction whereas the length of the vertical lines in the contact area between the seal and the groove represents the level of the surface pressure or sealing pressure that acts there.

The compression areas of the sealing edge pairs of the HS profile can be clearly detected in both figures. This compression leads to a distribution of the sealing pressure with two peaks where the pressure amounts to around 20 MPa. In Fig. 2, it is overlapped by the hydrostatic pressure of 600 bar, with the curve essentially remaining unchanged.

The advantages of the HS seal result from the serial configuration of the two sealing areas, which doubles the protection against leakage compared to a single seal. In addition, with two sealing areas or sealing



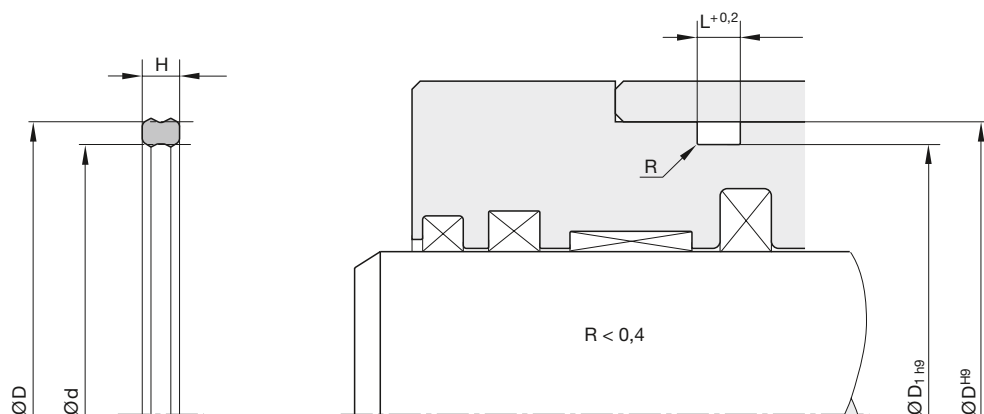
edge pairs backing up the seal, exceptional protection against twisting of the seal is achieved, both during installation and in operation at pulsating pressures, for instance in combination with breathing components and coaxiality defects of the groove. The use of particularly extrusion-resistant materials, especially the P6000 polyurethane compound

with 94 Shore A hardness, eliminates the need for back-up rings. This is illustrated in Fig. 2 as here, in the area of the sealing gap on the non-pressurised side, only minor extrusion can be expected even at a pressure of 600 bar and increased temperature. Furthermore, the elimination of back-up rings provides advantages due to simplified installation.

Compound selection

Name	Hardness [Shore A]	Colour	Media	Temperature range [°C]
Standard				
P6000	94±5	grey	Mineral oil based pressure media	-35 to +110
Special compounds				
P5009	94±5	grey	Mineral oil based pressure media; excellent low-temperature performance	-45 to +95
P5001	94±5	orange	HEES (synthetic esters), HETG (rapeseed oil); very good hydrolysis resistance, suitable for high-humidity conditions	-35 to +100

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D ^{H9}	D ₁ ^{H9}	H	L ^{+0.2}	Part-No.
31.75	27.60	4.80	5.80	HS2731P6000
32.00	27.80	3.84	4.70	HS2732P6000
52.00	32.30	3.84	4.70	HS3252P6000
39.67	35.30	3.84	4.70	HS3539P6000
36.50	32.40	2.80	3.20	HS3632P6000
40.00	34.40	4.00	5.00	HS4034P6000
42.00	36.40	4.00	5.00	HS4236P6000
45.00	40.00	4.40	5.40	HS4550P6000
48.00	42.30	4.30	5.30	HS4840P6000
48.00	43.00	3.20	4.00	HS4843P6000
50.00	44.40	4.60	5.60	HS5044P6000
50.00	45.80	3.60	4.40	HS5045P6000
55.00	50.00	4.30	5.30	HS5550P6000
57.00	52.20	3.30	4.10	HS5752P6000
63.00	57.40	4.20	5.20	HS5763P6000
60.00	54.30	4.60	5.60	HS6054P6000
65.00	59.40	4.00	5.00	HS6559P6000
68.00	62.70	4.00	5.00	HS6862P6000
70.00	65.00	4.00	5.00	HS7065P6000
72.00	66.40	4.00	5.00	HS7266P6000
75.00	69.40	4.60	5.60	HS7569P6000
76.20	70.20	4.80	5.80	HS7670P6000
80.00	73.60	6.00	7.00	HS8073P6000
80.00	74.40	4.80	5.80	HS8074P6000
84.70	78.58	4.00	5.00	HS8478P6000
85.00	79.40	4.50	5.50	HS8579P6000
90.00	83.00	5.50	6.50	HS9083P6000
100.00	94.50	4.70	5.70	HSA094P6000
110.00	101.40	8.00	9.00	HSB110P6000

Further sizes on request.