



## INSTALLATION GUIDE

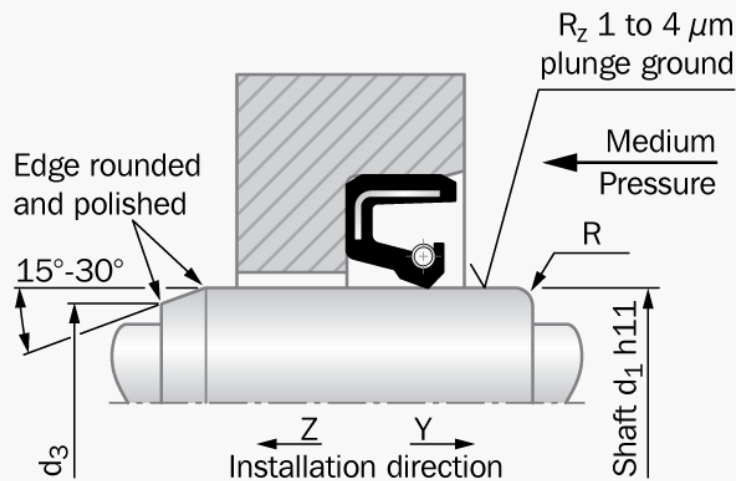
# Radial Oil Seals

### About Radial Oil Seals

Rotary seals operate between two surfaces in relative motion with each other. The rotary oil seal is typically pressed into a stationary bore while the inside of the rotary oil seal is in contact with a rotating shaft.

### Shaft Preparation

Depending on the installation direction (Y or Z), a chamfer or radius on the shaft is recommended. The dimensions for this are shown in the following figure and table.



### Chamfer length for shaft end

$d_1$	$d_3$	R
< 10	$d_1 - 1.5$	2
over 10 to 20	$d_1 - 2.0$	2
over 20 to 30	$d_1 - 2.5$	3
over 30 to 40	$d_1 - 3.0$	3
over 40 to 50	$d_1 - 3.5$	4
over 50 to 70	$d_1 - 4.0$	4
over 70 to 95	$d_1 - 4.5$	5
over 95 to 130	$d_1 - 5.5$	6
over 130 to 240	$d_1 - 7.0$	8
over 240 to 500	$d_1 - 11.0$	12



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### Characteristics of the shaft surface

The running surface for oil seals is specified in DIN 3760/61. The surface should meet the following requirements:

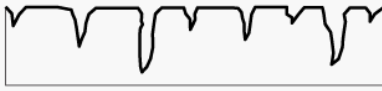

Surface roughness:

$R_a = 0.2$  to  $0.8 \mu\text{m}$

$R_z = 1$  to  $4 \mu\text{m}$

$R_{\text{max.}} = 6.3 \mu\text{m}$

Hardness 55 HRC or 600 HV, hardness depth min. 0.3 mm. The functional reliability and service life of a seal depends to a very great extent on the quality and surface finish of the mating surface to be sealed. Scores, scratches, pores, concentric or spiral machining marks are not permitted. Higher demands must be made on the surface finish of dynamic mating surfaces than to static mating surfaces. The characteristics most frequently used to describe the surface microfinish,  $R_a$ ,  $R_z$  and  $R_{\text{max.}}$ , are defined in ISO 4287. These characteristics alone, however, are not sufficient for assessing the suitability in seal engineering. In addition, the material contact area  $R_{\text{mr}}$  in accordance with ISO 4287 should be considered. The significance of these surface specifications is illustrated in the figure below. It shows clearly that specification of  $R_a$  or  $R_z$  alone does not describe the profile form accurately enough and is thus not sufficient for assessing suitability in seal engineering. The material contact area  $R_{\text{mr}}$  is essential for assessing surfaces, as this parameter is determined by the specific profile form. This in turn is directly depending on the machining process employed.

Surface profile	$R_a$	$R_z$	$R_{\text{mr}}$
closed profile form 	0.1	1.0	70%
open profile form 	0.2	1.0	15%

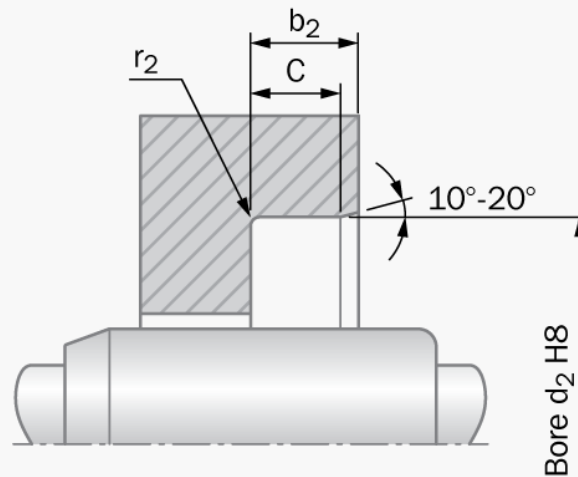


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### Housing bore

For metric sizes the tolerances are in accordance with the German Standard DIN 3760 which provides a suitable press fit for the bore tolerance ISO H8. The inch sizes are in accordance with American Standards. In cases where the housing bore has a different tolerance the seal can be made to a suitable size. For bearing housings made of soft materials, e.g. light metals, and for bearing housings with thin walls, a special fit between the seal and the housing may be necessary. The tolerances for the seal and housing should then be determined by practical assembly trials. If a component such as a bearing is assembled through the housing bore for the seal, the bore may be damaged. In order to avoid damaging the bore, a seal with a larger outside diameter than that of the bearing should be selected.



### Housing dimensions

Ring Width b	b <sub>1</sub> (0.85 x b) mm	b <sub>2</sub> (b + 0.3) mm	r <sub>2</sub> max.
7	5.95	7.3	0.5
8	6.80	8.3	0.5
10	8.50	10.3	0.5
12	10.30	12.3	0.7
15	12.75	15.3	0.7
20	17.00	20.3	0.7



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### Surface roughness of the housing

Values for the surface roughness in the gland are specified in ISO 6194/1.

General values:

$R_a$  = 1.6 - 6.3  $\mu\text{m}$

$R_z$  = 10 - 20  $\mu\text{m}$

$R_{\text{max}}$  = 16 - 25  $\mu\text{m}$

For metal/metal sealing or gas sealing, a good score-free and spiral-free surface finish is necessary. If the rotary shaft lip seal is bonded into the housing, ensure that no adhesive comes into contact with the sealing lip or the shaft.

### Notes on Installation

The following points must be observed when installing rotary shaft lip seals:

- Before installing, clean the installation grooves. Shaft and seal must be greased or oiled for rubber seals
- Sharp-edged transitions must either be chamfered or rounded or else covered
- When pressing in the seal, take care that the seal ring is not twisted
- The pressing force must be applied as close as possible to the outer circumference of the seal
- After installation, the seal must be concentric and at right angles to the shaft
- The end face of the mounting bore is generally used as the contact surface; the seal can also be fixed with a shoulder or a spacer washer

### Dismantling and replacement

The dismantling of seals does not normally present any problems. A screwdriver or similar tool can generally be used. The seal will then be deformed. After repair or maintenance of a machine a new rotary shaft lip seal must always be installed, even if the old ones seem to be still usable. The sealing edge of the new seal must not ride on the old contact area on the shaft. This can be achieved by:

- Replacement of shaft sleeves
- Fitting the seal into the bore to a different depth
- Rework of the shaft and assemble a wear sleeve

### Important Note

Installation suggestions, material recommendations, parameters and further data provided are always subject to the particular field of use and the application in which the seal is intended to be used, in particular the interaction of the seal with other components of the application. Therefore they neither constitute an agreement on the legal and factual nature nor a guarantee of quality. Technical changes and errors remain reserved.