Radial Shaft Seals

aerospace
climate control
electromechanical
filtration
fluid & gas handling
hydraulics
pneumatics
process control
sealing & shielding

Parker Prädifa

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Contents

Parker Safety Guidelines

Warning – User responsibility

This document and other information from Parker-Hannifin Corporation, its subsidiaries and authorized distributors provide product or system options for further investigation by users having technical expertise.

The user, through its own analysis and testing, is solely responsible for making the final selection of the system and components and assuring that all performance, endurance, maintenance, safety and warning requirements of the application are met. The user must analyze all aspects of the application, follow applicable industry standards, and follow the information concerning the product in the current product catalogue and in any materials provided from Parker or its subsidiaries or authorized distributors.
To the extent that Parker or its subsidiaries or authorized distributors provide component or system options based upon data or specifications provided by the user, the user is responsible for determining that such data and specifications are suitable and sufficient for all applications and responsibly foreseeable uses of the components or systems.

Range of Application

Our seals may only be used within the application parameters stated in our documents as regards compatibility with contact media, pressures, temperatures and time of storage. Application or use outside of the specified application parameters as well as the selection of different compounds by mistake may result in damage to life, the environment and/or equipment and facilities.

The information contained in our publications is based on know-how developed over decades of experience in the manufacturing and application of seals. Despite this experience, unknown factors arising out of the practical application of seals may considerably affect the overall applicability of this information in such a way that the recommendations provided herein are not to be considered generally binding.

The data for working pressure, working temperature, and surface speed stated in the columns represent maximum values and are interrelated. Under extreme working conditions it is recommended not to use all maximum values simultaneously.

For special requirements (pressure, temperature, speed, etc.) please contact our Consultancy Service, so that suitable materials and/or designs can be recommended.

Compatibility of Seals and Operating Media / Cleaning Agents

Due to the great diversity of operational parameters affecting fluidic devices and their impact on seals, it is absolutely imperative that manufacturers of these devices approve seals for functional and operational suitability under field conditions.

Furthermore, in view of the consistent increase of newly available media used as hydraulic oils, lubricants, and cleaning agents, special attention is invited to the aspect of compatibility with sealing elastomers currently in use.

Additives contained in base media in order to enhance certain functional characteristics may affect compatibility characteristics of sealing materials.

For this reason, it is imperative that any product equipped with our seals be tested for compatibility with operational media or cleaning agents approved or specified by you either at your plant or by means of field tests prior to any serial application.

We kindly ask you to comply with this notice since, as a manufacturer of seals, we are not in a position, as a matter of principle, to perform simulations regarding any and all conditions present in the final application nor of knowing the composition of the operational media and cleaning agents used.

Design modifications

We reserve the right to make design modifications without prior notification.

Prototypes and samples

Prototypes and samples are produced from experimental moulds. The subsequent series production may differ in production techniques from the prototype production unless specific agreement to the contrary was reached beforehand.

Delivery and services

The delivery guarantee (availability of moulds) for individual dimensions of our range of products is limited to a period of 7 years.

Damaged moulds, including standard items, can only be replaced in case of sufficient demand. Most of the dimensions stated in this catalogue are normally (but not as a matter of course) available ex stock.

For the production of smaller quantities, special compounds, and in case of special production procedures, we reserve the right of charging a prorated share of set-up costs.

All deliveries and services are subject to our terms.

Quality Systems

Our manufacturing sites are certified according to ISO 9001
resp. ISO/TS 16949.

Copyright

Validity

This edition supersedes all prior documents.

Rotary Seals – Introduction

The sealing of shaft ducts in hydraulically operated systems makes exacting demands on sealing technology.

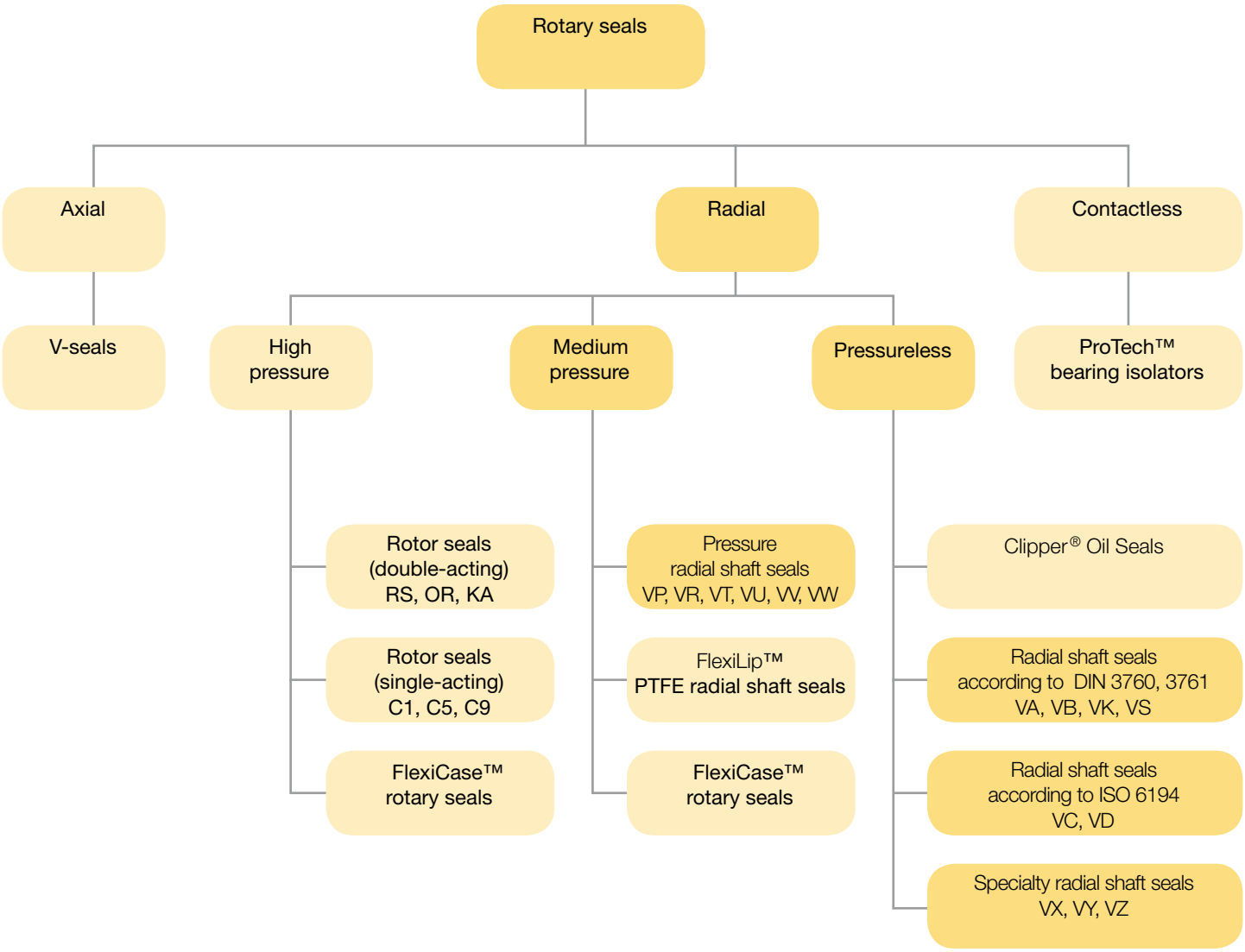
The high pressures and/or speeds may result in high thermal loads acting on the sealing areas of rotary seals. Therefore, special attention must be paid to the selection of a suitable seal design and appropriate compound.

This catalogue presents the product lines available at Parker together with their respective applications and performance data.

Essentially, radial shaft seals deliver long service life because a thin layer of lubricant is pressed and maintained between the sealing lip and the shaft when the system is in operation. When the shaft rotates, hydrodynamic processes, which may lead to a slight pumping effect, support the performance of the seal, particularly In case of radial shaft seals. Basic investigations by various universities have confirmed this effect.

In case of other seal designs this lubrication is generated by a suitable contour in the area of the sealing lip.

As shown in the illustration below, rotary seals are grouped into various types.



Rotary Seals – Introduction

The contact area of a rotary seal performs two essential functions. In most applications the contact area‘s primary function is to retain the bearing or system lubricant in the system to avoid leakage that would harm the environment. The relevant demands made on rotary seals by users and legislators are continually increasing. Furthermore, the large number of lubricants available on the market today poses particular challenges to seal manufacturers and seal users alike.

The second function of a rotary seal is to preclude any contamination of the system by external contaminants and to thereby prevent contamination of the lubricant and damage to the sensitive components in the system. The type of contamination depends on the particular application. Typical external contaminants include moisture and water as well as dry particles like dust, sand dirt or production residues.

Due to their ability to maintain the optimal amount of lubricant, to reduce frictional heat and to provide sealing against external contaminants rotary seals significantly affect the service life of all components which require lubrication – such as bearings and gearboxes – and thus the service life of the entire system.

The sliding contact between the sealing lip or the sealing contour and the rotating shaft generates friction. This friction may clearly increase the temperature beyond the level that is caused by the bearing and other components. The heat caused by friction accelerates the decomposition of the lubricant, particularly when mineral oils are used, and leads to the formation of deposits at the hot spots. Over time this results in an increasingly thick carbon layer with abrasive particles while the oil loses its lubricity. How fast the loss of lubricity occurs depends on the temperature. Particularly In case of radial shaft seals the carbon layer can lift or wear out the sealing lip, which ultimately leads to leakage. Experience has shown that the service life of a system can be cut in half by each 10 °C increase in temperature in the contact area. Consequently, a seal that would last for years in moderate conditions may fail within a very short period of time in case of significantly excessive temperatures.

The frictional heat generated when the seal operates may accelerate hardening of the elastomer compound or plastic, particularly in the contact area between the sealing lip and shaft. In case of NBR-based elastomer compounds this leads to axial cracks which become increasingly larger over time and ultimately result in seal failure.

Therefore, to maximize the service life of a rotary seal, as little frictional heat as possible should be generated in the contact area between the seal and the shaft surface.

The amount of frictional heat that is generated depends on numerous operating parameters. The type of shaft surface – including roughness and structure – operating pressure, surface speed, type of lubricant, seal geometry and seal material are just some of the factors to consider. The significant interactions between the individual parameters are of major importance as well. An increase in speed, for example, leads to a rise in oil temperature. Without ventilation, this temperature rise may lead to a pressure increase in the system. Higher pressure in turn puts a higher load on the seal, which results in additional forces acting between the sealing lip and the shaft. This results in a progressive, significant increase in temperature underneath the sealing lip until premature seal failure occurs within a very short period of time.

To increase the service life of seals in rotary applications, a basic understanding of the functional principle of rotary seals is equally indispensable as extensive knowledge of the available seal types including their performance data and specific characteristics.

The Parker Seal Group continuously acquires and enhances the relevant in-depth knowledge based on tests performed in its in-house physical lab and in the course of project work with external partners.

Radial Shaft Seals

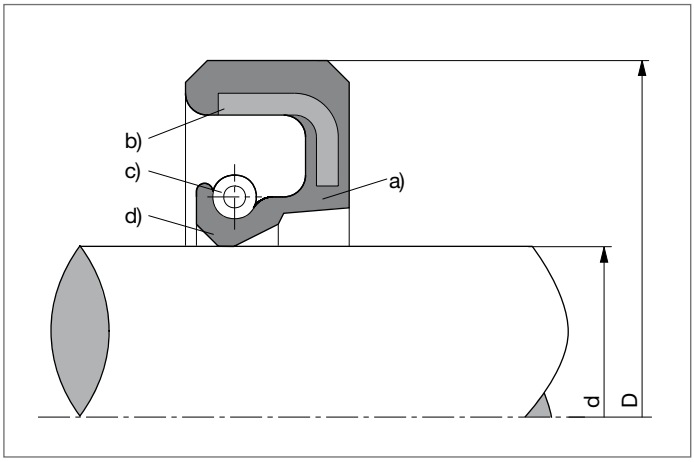
For decades, the radial shaft seal has been a widely used standard sealing element to seal rotating shafts in applications with non-pressurised injection of lubricating oil or full submersion of the seal and shaft. Furthermore, in hydraulic systems like pumps and motors special designs are used which enable reliable sealing of low or medium pressure differences. At the same time, these seals serve to prevent the intrusion of ambient dirt and water splash into the system. The sealing elements are used in hydraulic systems (hydraulic pumps and motors), industrial gearboxes, washing machines, drills, wind turbines, the automotive industry and in a wide range of other applications in mechanical and equipment engineering.

Radial shaft seals typically consist of a metal insert and an elastomer diaphragm with a spring-energised sealing lip. The sealing lip flex section is vulcanised to the metal insert inside the mould. The radial force of the sealing lip which is required for sealing is achieved by dilating the inner diameter in the area of the sealing edge of the radial shaft seal and via the inserted garter spring. The sealing lips of modern radial shaft seals have been designed to allow the seals to flexibly follow the radial motion of the rotating shaft without exerting an excessive radial force that may lead to increased friction and/or seal wear. Typically, the radial force related to the circumference of the radial shaft seal approximately ranges between 0.1 and 0.15 N/mm. In case of pressure-loaded radial shaft seals the radial force may increase by a factor of 2 to 5, which results in a higher development of heat in operating conditions.

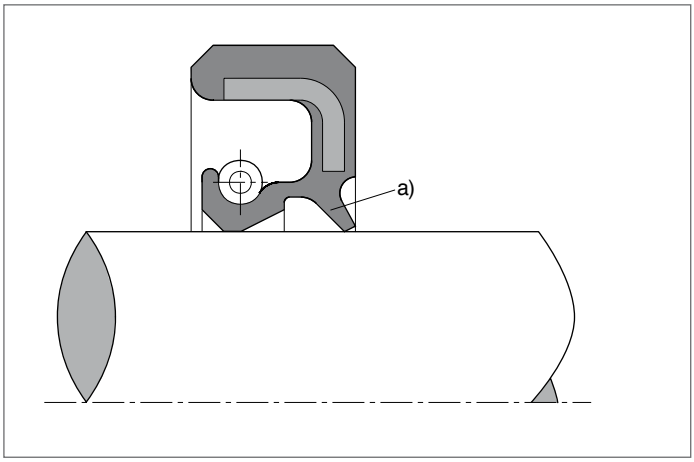
In many drive systems conditions may occur in which a higher incidence of external (ambient) dirt or dust must be anticipated. In these cases it is advisable to use radial shaft seals with one or more moulded-in dust lips. The dust lip prevents contaminants being dragged underneath the sealing lip, which would lead to faster seal wear. The dust lip thus considerably contributes to the functional reliability of the sealing system.

The preload of the dust lip is merely achieved by a dimensional overlap to the shaft diameter and the elastic properties of the seal compound. The dust lip is designed flexibly enough to allow it to follow the radial movements of the shaft without a radial gap occurring during operation.

Since in specified operating conditions dry running tends to occur at the dust lip the dust lip is designed with significantly less overlap and preload than the actual sealing lip. To avoid permanent dry operation, which would lead to wear of the dust lip, lubrication is recommended when the seal is installed. The space between the two lips can be used as a grease depot. However, when performing the initial lubrication it should be observed that only approximately 30 per cent of the available space between the two lips is filled since excessive filling of this space would lead to lubricant bleeding when the seal is under load. In case of a simultaneous pressure build-up this could result in leakage due to the sealing lip lifting up in extreme cases.



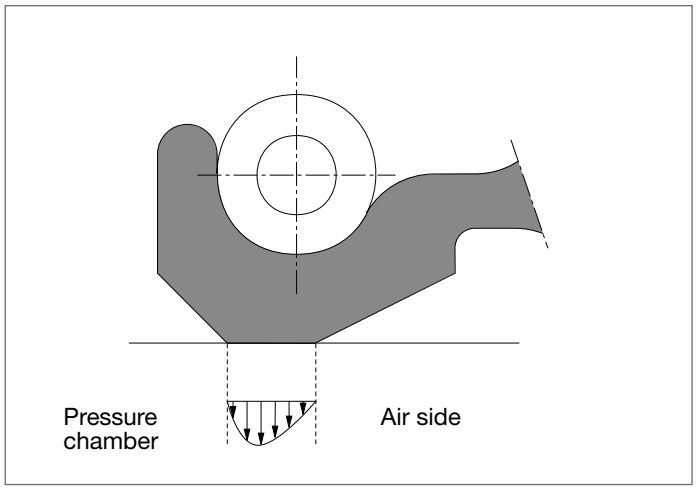
D Outer diameter
d Shaft diameter
a) Elastomer part
b) Metal insert
c) Garter spring
d) Sealing lip



a) Dust lip

Functional Principle

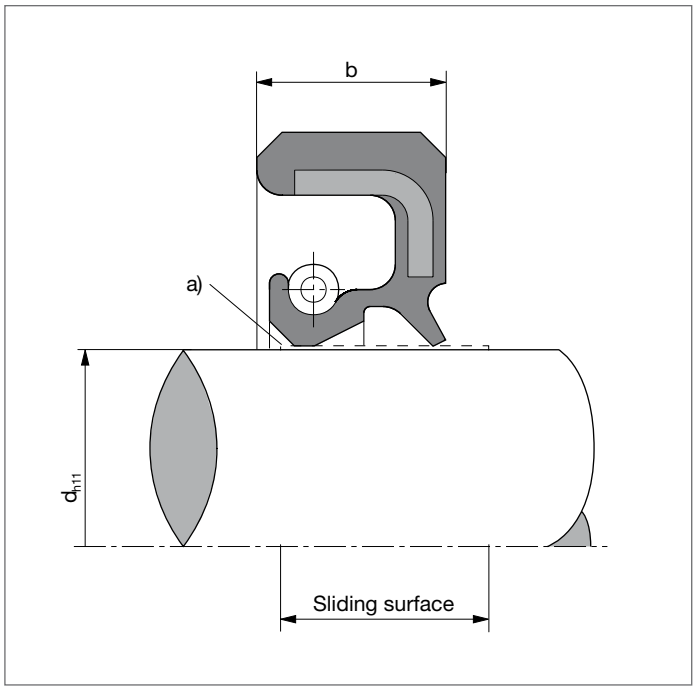
Radial shaft seals ensure dynamic and static sealing at the shaft by means of a specially shaped sealing lip, which is assisted by an inserted garter spring. Static sealing is achieved by the radial interference fit in the housing bore.



When the shaft is at rest the radial contact force ensures the sealing effect via the preload of the elastomer sealing lip and the inserted garter spring. When the shaft rotates a mixed-friction condition occurs in which the sealing lip partially lifts off of the shaft and lubricant can migrate into the resulting gap. As a result of micro-structures occurring in the contact area of the sealing lip, radial shaft seals have a certain pump-back capacity which ensures that the medium cannot escape in the contact area and can be pumped back into the pressure chamber. At the same time, there is always a sufficient amount of lubricant present in the sealing gap when the shaft rotates, which prevents dry running of the seal. This has a crucial influence on wear of the sealing lip and thus the service life of the sealing element.

Due to the radial preload in the contact area to the shaft the sealing edge is slightly oblate, which results in an axial contact area of an approximate length of 0.2 mm in which the sealing lip continuously bears against the shaft. In case of pressure-loaded shaft seals the contact width increases with rising pressure and may amount to as much as 1.5 mm or higher.

Due to the geometry of the sealing lip and the position of the spring effect line an asymmetric distribution of compression occurs in the contact area on the shaft with a steep gradient towards the pressure side. In addition to the sealing lip geometry, this distribution of compression has a crucial influence on the dynamic sealing capability of a radial shaft seal.



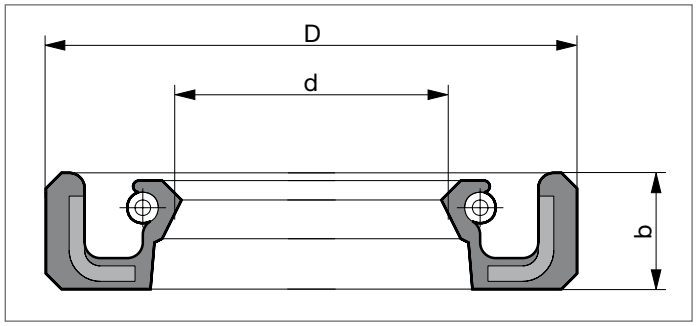
a) Contact area
b) Heigth of the radial shaft seal

Design and Installation

Press Fit Allowance and Diameter Difference for Outer Diameter D

Radial shaft seals have an interference fit in the housing bore, which ensures static sealing across the entire operating temperature range for all materials used. This even applies to housing materials with higher temperature coefficients of expansion such as aluminium. Depending on the type of shaft seal (rubber-covered or without rubber cover on the outer diameter), the diameter-relevant press fit allowances used are specified in applicable standards (e.g. DIN 3760/DIN 3791, Part 1 or ISO 6194, Part 1). For shaft seals with grooved outer contours on the outer diameter, a slightly larger press fit allowance has generally been selected.

Seal Outer Diameter Tolerance for Rubber-covered Shaft Seals

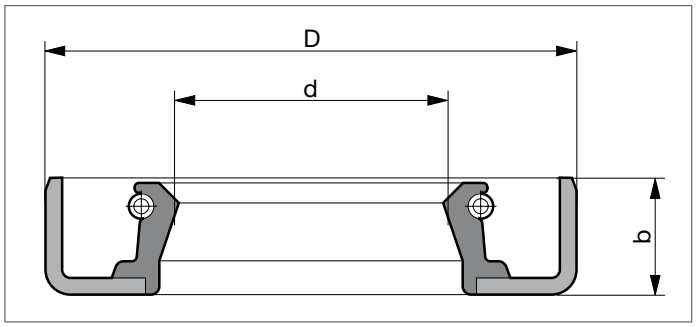


D Outer diameter
d Shaft diameter
b Heigth of the radial shaft seal

Outer Ø D (mm)		Press fit allowance [1] (mm)	Roundness tolerance [2] (mm)
>	≤		
	50	+0.30 +0.15	0.25
50	80	+0.35 +0.20	0.35
80	120	+0.35 +0.20	0.50
120	180	+0.45 +0.25	0.60
180	300	+0.45 +0.25	0.80
300	500	+0.55 +0.30	1.00

1) The total of the actual dimensions of D divided by the total of the measurements must be within the dimension of D + press fit allowance. For seals with a grooved surface, other press fit allowances are required and should be agreed between the manufacturer and the user.
2) The diameter difference (D_{max} – D_{min}) is obtained by three or more measurements which are evenly distributed on the circumference.

Seal Outer Diameter Tolerance for Shaft Seals without Rubber Cover



D Outer diameter
d Shaft diameter
b Heigth of the radial shaft seal

Outer Ø D (mm)		Press fit allowance [1] (mm)	Roundness tolerance [2] (mm)
>	≤		
	50	+0.20 +0.08	0.18
50	80	+0.23 +0.09	0.25
80	120	+0.25 +0.10	0.30
120	180	+0.28 +0.12	0.40
180	300	+0.35 +0.15	0.0025 x D
300	500	+0.45 +0.20	0.0025 x D

1) The total of the actual dimensions of D divided by the total of the measurements must be within the dimension of D + press fit allowance. For seals with a grooved surface, other press fit allowances are required and should be agreed between the manufacturer and the user.
2) The diameter difference (D_{max} – D_{min}) is obtained by three or more measurements which are evenly distributed on the circumference.

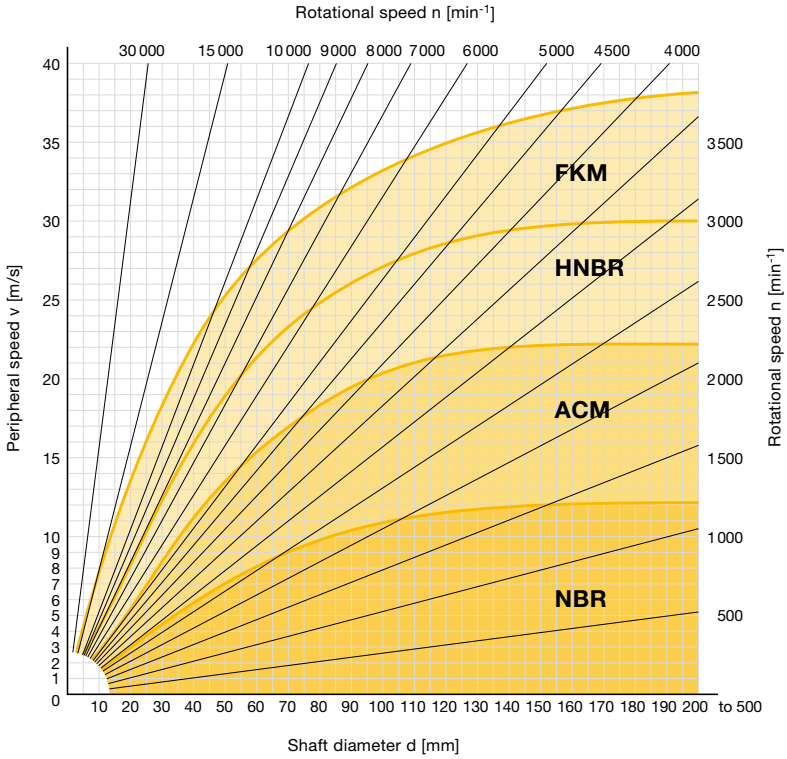
Permissible Speeds

Both DIN 3760/3761 and ISO 6194 provide permissible rotational and peripheral speeds for non-pressurised shaft seals according to the seal compound used. The performance limits of the compounds may vary, depending on the composition of the compound. Good heat removal from the sealed area must be ensured as a general rule.

Permissible Rotational Speeds (Pressure-Dependent)

Max. pressure difference (bar)	Shaft	
	Permissible rotational speed (min^{-1})	At max. peripheral speed (m/s)
0.50	≤ 1000	2.80
0.35	≤ 2000	3.15
0.20	≤ 3000	5.60

Permissible Peripheral Speed

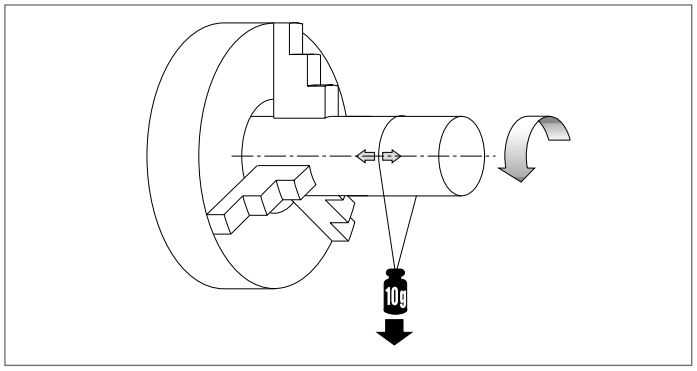


Shaft Machining

For final machining of the shaft in the area of the sliding surface, plunge-grinding followed by polishing is recommended. Sufficient spark-out time should be assured during the grinding process. This prevents the introduction or retention of conveying structures on the shaft surface. Conveying structures can be compared with a multiple-start thread which, depending on the rotational direction, delivers fluid to the air side and promotes leakage at the shaft seal. In case of doubt, a simple string test can be performed. This usually suffices to demonstrate the presence of conveying structures on the shaft surface. However, more modern optical measurement methods are much more accurate for this purpose and are therefore increasingly used in the field.

Description of the String Method:

A finished shaft is slightly wetted with oil and rotated in a lathe. A light weight is suspended from a string so that the string is slightly tensioned against the shaft surface. If, as a result of machining, the shaft surface exhibits a conveying structure the string is deflected towards one side. To achieve a clear result, the shaft must be accurately aligned in the lathe. Furthermore, it is recommended to repeat the measurement several times to receive a statistically valid result.



In addition to grinding, other machining and finishing techniques have proved to be suitable for industrial manufacturing.

When the required surface roughness and absence of helical structures have been confirmed, the shaft can be precision-turned, planished or blasted. After hardening, the sliding surface must be polished. For the shaft diameter d, the ISO tolerance zone h11 should be selected in the area of the sliding surface. In case of varying tolerance zones the seal supplier should be contacted.

Hardness of the Mating Surface

In the area of the mating surface of the radial shaft seal a minimum surface hardness of 45 HRC with a hardening depth of at least 0.3 mm is recommended. For peripheral speeds of more than 4 m/s, heavy dirt and/or pressures between 0.5 and 5 bar, a hardness of at least 55 HRC is recommended, in case of higher pressures shaft hardness should range between 60 and 65 HRC.

Surface Roughness of the Shaft
For standard radial shaft seals according to DIN 3760/ DIN3761:

- R_a 0.2 to 0.6 µm
- R_z 1.0 to 4.0 µm
- $R_{max.}$ < 6.3 µm

For pressure-loaded shaft seals:

- R_a 0.2 to 0.4 µm
- R_z 1.0 to 2.5 µm
- $R_{max.}$ < 4 µm

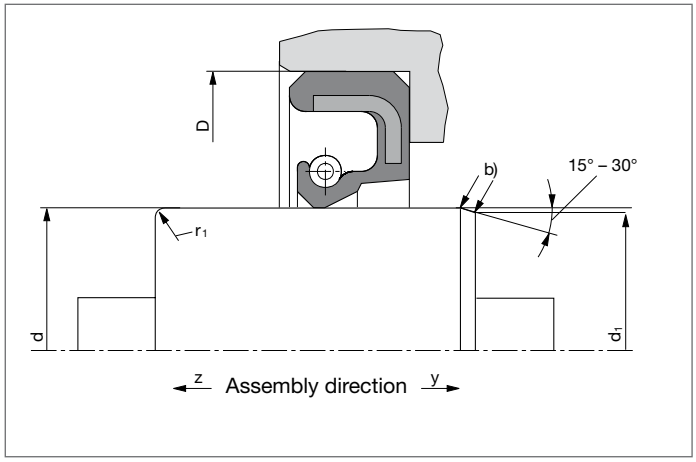
Surface Roughness in the Housing

- R_a 1.6 to 4 µm
- R_z 6.3 to 16 µm
- $R_{max.}$ < 25 µm

For the bore diameter D the ISO tolerance zone H8 should be selected. In case of varying tolerance zones the seal supplier should be contacted.

Installation

To protect the sealing edges, lead-in chamfers with smooth surfaces and rounded edges should be used.



b) Lead-in chamfer with rounded edge

The sealing lip must always face the side to be sealed and be exposed. The radial shaft seal must be in a centred and perpendicular position to the shaft during installation. The use of suitable press-fit insertion tools is recommended.

The radial shaft seal must not be axially strained and must not be used to transmit forces.

Lead-in Chamfer

d (mm)		$(d - d_1)^{1)}$
≥	<	
	10	1.5
10	20	2.0
20	30	2.5
30	40	3.0
40	50	3.5
50	70	4.0
70	95	4.5
95	130	5.5
130	240	7.0
240	500	11.0

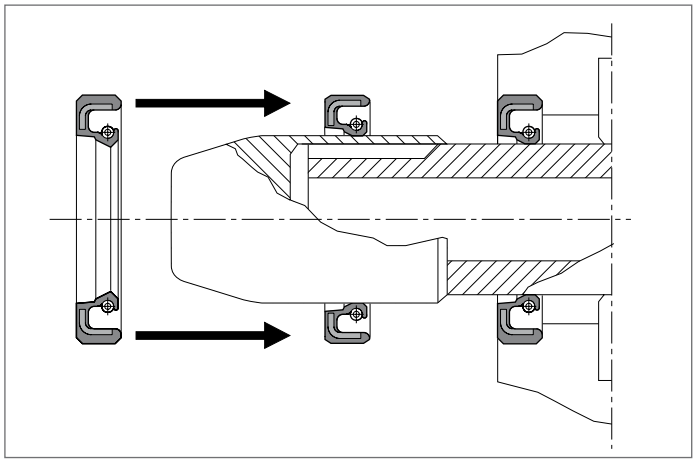
1) If a radius is used instead of a chamfer, the chamfer should be larger than the diameter difference ($d - d_1$).

Installation with Auxiliary Devices

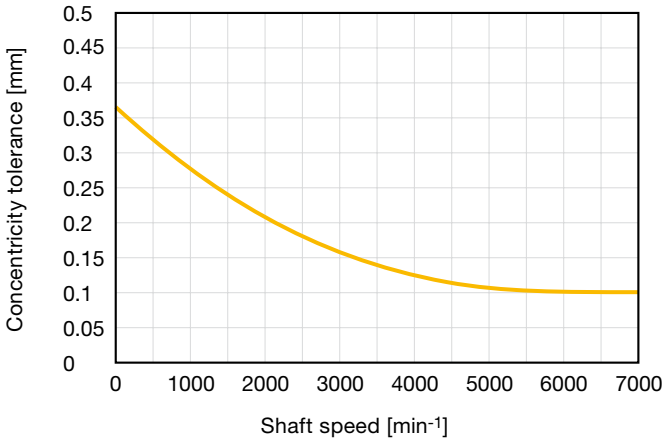
Sharp edges and corners across which the seal must be passed or pulled should be covered by means of auxiliary devices to prevent damage to the sealing lip or the dust lip.

Thin-walled plastic or aluminium sleeves with smooth surfaces, lead-in chamfers and rounded edges are suitable aids for this purpose.

A radial shaft seal should be installed using a press or clamp to assure that a uniform load acts on the seal.

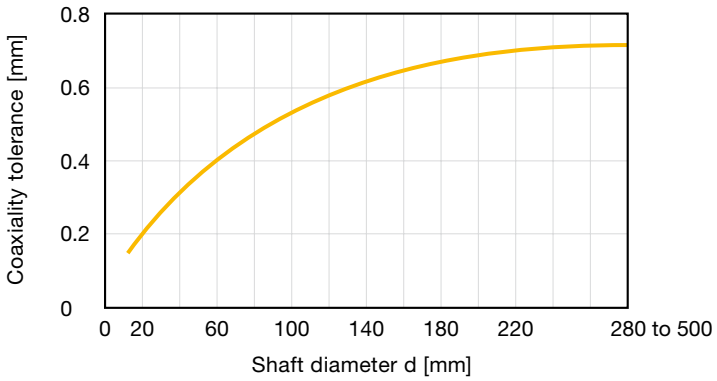


Concentricity Tolerance according to DIN 3760



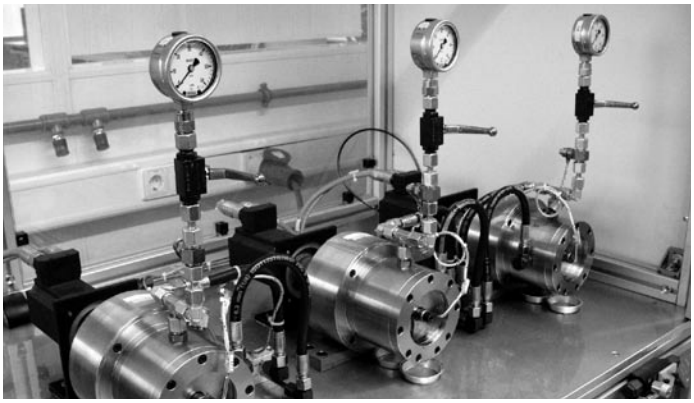
The diagram shows the concentricity tolerance of the shaft in the area of the sliding surface in relation to the axis of the point of bearing support. Particularly In case of high shaft speeds there is a risk that due to its inertia the sealing edge may not be able to follow the shaft. Shaft seal rings should be positioned as closely to the bearing as possible.
For pressure-loaded shaft seal rings, these parameters must be reduced by 50 to 70 per cent, depending on pressure. Please contact the seal manufacturer on a case by case basis.

Permissible Coaxiality according to DIN 3760



The diagram shows the coaxiality tolerance of the housing bore in relation to the shaft axis. For pressure-loaded shaft seal rings, these parameters must be reduced by 50 to 70 per cent, depending on pressure, due to the shorter sealing lips. Please contact the seal manufacturer on a case by case basis.

Radial Shaft Seals



Testing of Shaft Seal Rings

Dynamic tests of radial shaft seals are performed in accordance with the test equipment and test conditions shown in applicable standards. Depending on the application, varying test conditions may be agreed and realised between the seal manufacturer and the user.

Standards

The following national and international standards apply to production, testing and installation of radial shaft seals:

- DIN 3760, September 1996,
  Radial shaft seals
- DIN 3761 Part 1 to 15, edition 1984,
  Radial shaft seals for automotive
- ISO 6194/1, first edition 1982,
  Rotary shaft lip type seals – Nominal dimensions and tolerances
- ISO 6194/2, first edition 1991,
  Rotary shaft lip type seals – Vocabulary
- ISO 6194/3, first edition 1988,
  Rotary shaft lip type seals – Storage, handling and installation
- ISO 6194/4, first edition 1990,
  Rotary shaft lip type seals – Performance test procedures
- ISO 6194/5, first edition 1990,
  Rotary shaft lip type seals – Identification of visual imperfections
- SAE J111, edition 1997,
  Seals – Terminology of radial lip
- SAE J946, edition 1997 (R),
  Application guide to radial lip seals
- SAE J946, edition 2000,
  Lip force measurement – Radial lip seals

Standard Compounds for Radial Shaft Seals

Elastomer Compounds

Elastomer	Abbreviation	Colour	Temperature range	Hardness (Shore A)
Nitrile rubber	NBR	Black	–30 / +100 °C	75
Hydrogenated nitrile rubber	HNBR	Black	–35 / +140 °C	75
Fluororubber	FKM	Brown	–20 / +200 °C	75
Silicone rubber	MVQ	Reddish brown	–60 / +200 °C	70
Ethylene-propylene-rubber	EPDM	Black	–40 / +150 °C	70

For additional, non-standard compounds, please enquire.

Steels

Steel Reinforcement Ring

- Standard steel
- Stainless steel
- Stainless steel, salt-water-proof
- For additional materials, please enquire

Spring

- Standard spring
- Rust-, acid and heat-resistant spring
- For additional materials, please enquire

Ordering Numbers for Radial Shaft Seals

Ordering example: VB 1232 Z3015

- Radial shaft seal according to DIN 3760 with dust lip
- Dimensions: 12 x 32 x 7 mm
- Compound: Z3015 (corresponds to NBR, black, nitrosamine-free, 75 Shore A)
- Standard steel reinforcement ring
- Standard spring

- Design for grooves according to DIN 3760 / 3761 or ISO 6194.
- Lip ring with spiral spring for radial preloading.
- Interference fit on outer diameter.
- Cut sealing edge for high dynamic sealing effect.
- Elastomeric outer case for high static sealing effect.
- Easy installation.

Range of application

Primarily for sealing oil- and grease-lubricated shaft ducts with very little or no exposure to external (ambient) dirt.

Operating pressure	≤ 0.5 bar
Operating temperature	
NBR	-30 to +100 °C
HNBR	-30 to +140 °C
FKM	-20 to +180 °C
Sliding speed	
NBR	≤ 12 m/s
HNBR	≤ 25 m/s
FKM	≤ 40 m/s
Media	Mineral oil based hydraulic oils, PAO, synthetic esters

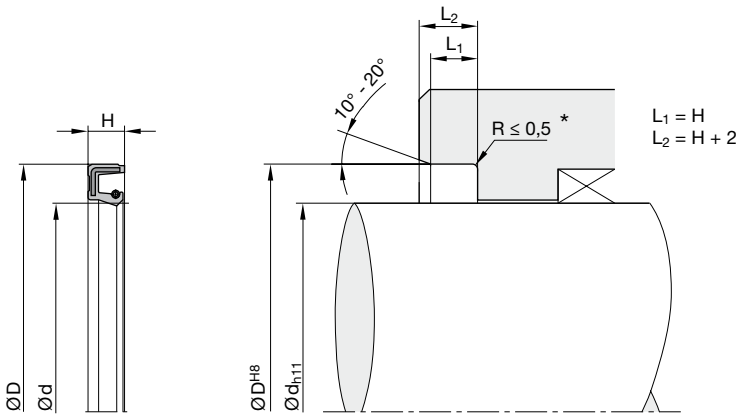
Compounds

Standard:	Z3015, NBR compound, nitrosamine-free (≈ 75 Shore A)
For higher requirements:	Z3011, HNBR compound (≈ 75 Shore A)
	Z3000, FKM compound (≈ 75 Shore A)

Installation

The axial groove depth should correspond to the specifications in DIN 3760/ 3761 and ISO 6194. To avoid damage to the sealing edge, the seals should not be pulled over sharp edges during installation.
Installation as recommended in the above standards is the prerequisite for proper performance of the seal.

In case of special operating conditions (specific pressure loads, temperature, speed, use in water, HFA, HFB fluids etc.), please contact our consultancy service for a selection of the material and design best suiting your particular application requirements.

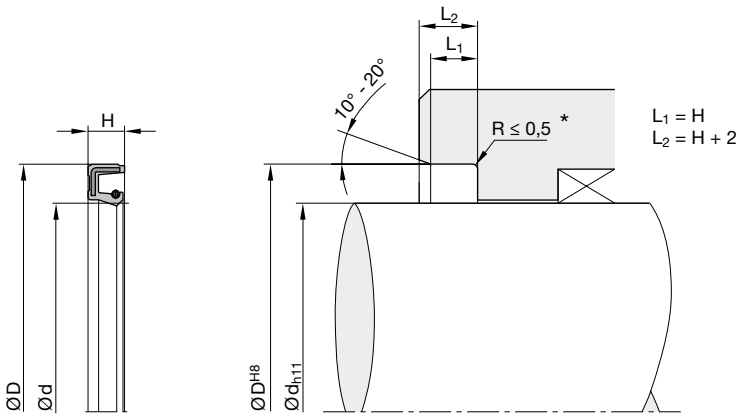


* In case of designs according to DIN and ISO, the radii given there should be used.

d	D	H	DIN[1]	ISO[2]	Order code
5.4	22	7			VA 0522 Z3015
6	15	4			VA 0615 Z3015
6	15	7			VA 1A06 Z3015
6	16	7	•	•	VA 0617 Z3015
6.35	16	4			VA 0616 Z3015
6	22	7	•	•	VA 0622 Z3015
8	14	4			VA 0814 Z3015
8	16	5			VA 0816 Z3015
8	18	4			VA 1A08 Z3015
8	18	6			VA 0818 Z3015
8	22	5			VA 0822 Z3015
9	17	5			VA 0917 Z3015
10	16	5			VA 1016 Z3015
10	18	4			VA 1019 Z3015
10	20	5			VA 1A10 Z3015
10	21	5			VA 1021 Z3015
10	22	7	•	•	VA 1022 Z3015
10	22	8			VA 1023 Z3015
10	24	6			VA 1024 Z3015
10	24	7			VA 1025 Z3015
10	26	4.5			VA 1026 Z3015
10	30	7			VA 1030 Z3015
11	17	4			VA 1117 Z3015
12	18	5			VA 1218 Z3015
12	19	5			VA 1219 Z3015
12	20	5			VA 1220 Z3015
12	22	4			VA 1222 Z3015
12	22	5			VA 1223 Z3015
12	24	7		•	VA 1224 Z3015
12	25	7	•	•	VA 1225 Z3015
12	26	4			VA 1B12 Z3015
12	26	5.5			VA 1226 Z3015
12	26	8			VA 1227 Z3015
12	28	7			VA 1228 Z3015

d	D	H	DIN[1]	ISO[2]	Order code
12	30	7			VA 1230 Z3015
12	32	7			VA 1232 Z3015
12	46	6			VA 1246 Z3015
12.5	20	6			VA 1320 Z3015
12.5	22	6			VA 1322 Z3015
14	21	4			VA 1420 Z3015
14	21	6			VA 1421 Z3015
14	22	4			VA 1422 Z3015
14	24	6			VA 1424 Z3015
14	24	7	•		VA 1426 Z3015
14	25	5			VA 1425 Z3015
14	28	7			VA 1428 Z3015
14	32	10			VA 1432 Z3015
14	35	7			VA 1435 Z3015
15	24	7			VA 1524 Z3015
15	27	7			VA 1527 Z3015
15	28	4			VA 1528 Z3015
15	30	7	•	•	VA 1530 Z3015
15	32	7			VA 1532 Z3015
15	35	7	•	•	VA 1535 Z3015
15	42	7			VA 1542 Z3015
15	46	6			VA 1546 Z3015
16	22	4			VA 1622 Z3015
16	26	7			VA 1626 Z3015
16	28	7			VA 1628 Z3015
16	30	6			VA 1629 Z3015
16	30	7	•	•	VA 1630 Z3015
16	35	7	•		VA 1635 Z3015
17	25	4			VA 1725 Z3015
17	27	7			VA 1727 Z3015
17	28	5.5			VA 1728 Z3015
17	28	7			VA 1729 Z3015
17	30	7			VA 1730 Z3015
17	32	7			VA 1732 Z3015

1) For housings according to DIN 3760/3761
2) For housings according to ISO 6194

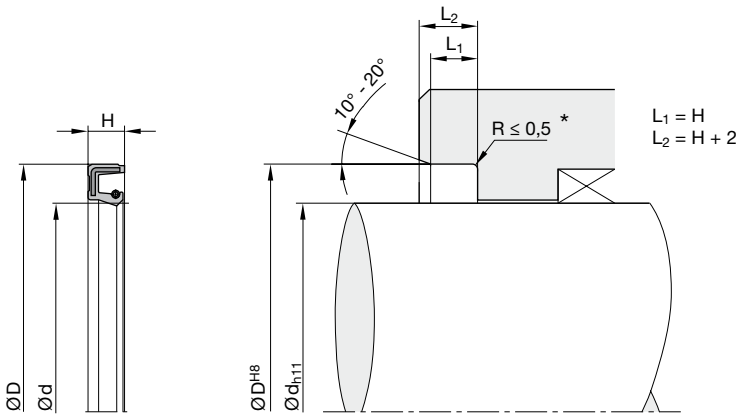


* In case of designs according to DIN and ISO, the radii given there should be used.

d	D	H	DIN[1]	ISO[2]	Order code
17	32	8			VA 1733 Z3015
17	34	4			VA 1734 Z3015
17	35	10			VA 1735 Z3015
17	40	6			VA 1A17 Z3015
17	40	7			VA 1740 Z3015
17	40	10			VA 1741 Z3015
17	42	7			VA 1742 Z3015
17	46	6			VA 1746 Z3015
17	47	7			VA 1747 Z3015
18	26	4			VA 1826 Z3015
18	28	4			VA 1827 Z3015
18	28	8			VA 1828 Z3015
18	28.5	4			VA 1829 Z3015
18	30	7	•	•	VA 1830 Z3015
18	32	5			VA 1831 Z3015
18	32	7			VA 1832 Z3015
18	35	7	•	•	VA 1835 Z3015
18	40	7			VA 1840 Z3015
19	42	7			VA 1942 Z3015
20	28	4			VA 1A20 Z3015
20	28	6			VA 2027 Z3015
20	28	7			VA 2028 Z3015
20	30	5			VA 2029 Z3015
20	30	5	•		VA 2030 Z3015
20	30	7			VA 1A20 Z3015
20	30	8			VA 2031 Z3015
20	32	5			VA 2032 Z3015
20	35	7	•	•	VA 2035 Z3015
20	38	8			VA 2038 Z3015
20	40	7	•	•	VA 2040 Z3015
20	40	10			VA 2041 Z3015
20	42	7			VA 2042 Z3015
20	42	10			VA 2043 Z3015
20	47	7			VA 2047 Z3015

d	D	H	DIN[1]	ISO[2]	Order code
20	47	10			VA 2048 Z3015
20	52	6			VA 2049 Z3015
20	52	7			VA 2052 Z3015
20	52	10			VA 2053 Z3015
21	31	7			VA 2131 Z3015
21	35	6.5			VA 2135 Z3015
22	30	4			VA 2230 Z3015
22	31	5			VA 2231 Z3015
22	32	5			VA 2232 Z3015
22	34	5			VA 2234 Z3015
22	35	7	•	•	VA 2235 Z3015
22	40	7	•	•	VA 2240 Z3015
22	42	10			VA 2242 Z3015
22	45	7			VA 2245 Z3015
23	40	10			VA 2340 Z3015
23	42	10			VA 2342 Z3015
24	32	4			VA 2432 Z3015
24	37	7			VA 2437 Z3015
24	40	7			VA 2440 Z3015
24	42	8			VA 2442 Z3015
25	32	6			VA 2532 Z3015
25	33	4			VA 1A25 Z3015
25	33	6			VA 2533 Z3015
25	35	7	•		VA 2535 Z3015
25	37	5			VA 2537 Z3015
25	38	5			VA 2539 Z3015
25	38	7			VA 2538 Z3015
25	40	7	•	•	VA 2540 Z3015
25	40	8			VA 2541 Z3015
25	40	10			VA 1B25 Z3015
25	42	7			VA 2542 Z3015
25	42	8			VA 1D25 Z3015
25	42	10			VA 1E25 Z3015
25	43	6			VA 2543 Z3015

1) For housings according to DIN 3760/3761
2) For housings according to ISO 6194

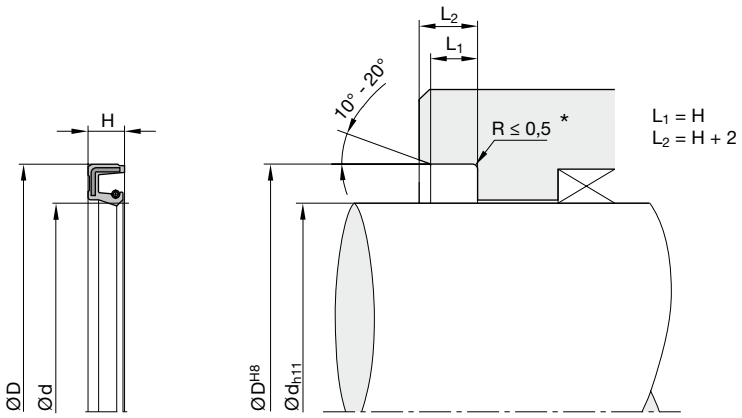


* In case of designs according to DIN and ISO, the radii given there should be used.

d	D	H	DIN[1]	ISO[2]	Order code
25	43	9			VA 2544 Z3015
25	47	7	•	•	VA 2547 Z3015
25	47	10			VA 2548 Z3015
25	52	7	•	•	VA 2552 Z3015
25	52	10			VA 2553 Z3015
25	62	6			VA 2562 Z3015
25	62	10			VA 2563 Z3015
25.4	41	6			VA 2641 Z3015
26	36	7			VA 2636 Z3015
26	38	8			VA 2638 Z3015
27	40	7			VA 2740 Z3015
27	47	7			VA 2747 Z3015
27	49	7.5			VA 2749 Z3015
28	38	7			VA 2838 Z3015
28	40	7	•	•	VA 2840 Z3015
28	43	10			VA 2843 Z3015
28	47	7	•	•	VA 2847 Z3015
28	52	7	•	•	VA 2852 Z3015
29	38	5			VA 2037 Z3015
29	38	7			VA 2938 Z3015
29	40	7			VA 2940 Z3015
29	43	7			VA 2943 Z3015
29	62	10			VA 2962 Z3015
30	38	4			VA 3038 Z3015
30	40	7	•		VA 3040 Z3015
30	42	8			VA 3042 Z3015
30	43	8			VA 3043 Z3015
30	45	8			VA 3045 Z3015
30	47	7	•	•	VA 3047 Z3015
30	47	10			VA 3048 Z3015
30	50	7			VA 3050 Z3015
30	50	10			VA 3051 Z3015
30	52	7	•	•	VA 3052 Z3015
30	52	8			VA 3053 Z3015

d	D	H	DIN[1]	ISO[2]	Order code
30	52	10			VA 1B30 Z3015
30	54	10			VA 3054 Z3015
30	55	7			VA 3055 Z3015
30	62	7			VA 3062 Z3015
30	62	10			VA 3063 Z3015
30	68	10			VA 3068 Z3015
30	72	6			VA 3072 Z3015
30	72	10			VA 3073 Z3015
32	42	5			VA 3241 Z3015
32	42	7			VA 3242 Z3015
32	43	6			VA 3243 Z3015
32	44	10			VA 3244 Z3015
32	45	7	•		VA 3245 Z3015
32	45	10			VA 3246 Z3015
32	50	7			VA 3250 Z3015
32	50	8			VA 3251 Z3015
32	52	7	•		VA 3252 Z3015
32	52	10			VA 3253 Z3015
34	46	8			VA 3446 Z3015
34	47	9			VA 3447 Z3015
34	50	10			VA 3450 Z3015
34	52	8			VA 3452 Z3015
34	57	6			VA 3457 Z3015
34	62	10			VA 3462 Z3015
35	45	7			VA 3545 Z3015
35	47	7			VA 3547 Z3015
35	50	7	•		VA 3550 Z3015
35	50	8	•	•	VA 3551 Z3015
35	50	10			VA 1B35 Z3015
35	52	7	•		VA 3552 Z3015
35	52	8	•	•	VA 3553 Z3015
35	55	7	•		VA 3555 Z3015
35	55	8	•	•	VA 3556 Z3015
35	62	7			VA 3562 Z3015

1) For housings according to DIN 3760/3761
2) For housings according to ISO 6194

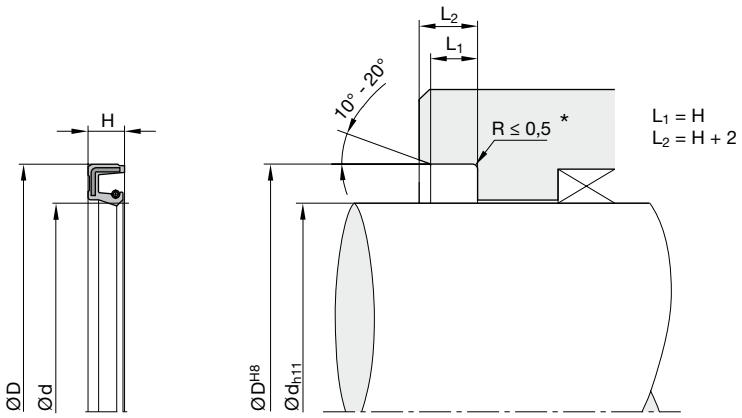


* In case of designs according to DIN and ISO, the radii given there should be used.

d	D	H	DIN[1]	ISO[2]	Order code
35	62	10			VA 3563 Z3015
35	65	10			VA 3565 Z3015
35	72	10			VA 3572 Z3015
35	80	13			VA 3580 Z3015
35	82	6			VA 3582 Z3015
36	45	7			VA 3645 Z3015
36	54	7.5			VA 3654 Z3015
37	62	10			VA 3762 Z3015
38	48	7			VA 3848 Z3015
38	50	7			VA 3850 Z3015
38	52	10			VA 3852 Z3015
38	53	8			VA 3853 Z3015
38	62	7	•		VA 3862 Z3015
38	80	10			VA 3880 Z3015
40	50	7			VA 4050 Z3015
40	50	8			VA 4051 Z3015
40	52	6			VA 1A40 Z3015
40	52	7	•		VA 4052 Z3015
40	55	6.5			VA 4054 Z3015
40	55	8	•	•	VA 1B40 Z3015
40	55	10			VA 4055 Z3015
40	58	7			VA 4058 Z3015
40	60	8			VA 4060 Z3015
40	60	10			VA 4061 Z3015
40	62	7	•		VA 4062 Z3015
40	62	10			VA 4063 Z3015
40	65	10			VA 4065 Z3015
40	68	12			VA 4068 Z3015
40	72	7			VA 4072 Z3015
40	80	10			VA 4080 Z3015
40	88	6			VA 4088 Z3015
40	90	12			VA 4090 Z3015
42	52	4			VA 4252 Z3015
42	55	7			VA 4255 Z3015

d	D	H	DIN[1]	ISO[2]	Order code
42	55	8	•	•	VA 4256 Z3015
42	62	8	•	•	VA 4262 Z3015
42	62	10			VA 4263 Z3015
42	64	7			VA 4264 Z3015
42	72	8			VA 4272 Z3015
42	72	10			VA 4273 Z3015
43	60	10			VA 4360 Z3015
45	55	7			VA 4555 Z3015
45	58	7			VA 4558 Z3015
45	59	10			VA 4559 Z3015
45	60	7			VA 4560 Z3015
45	60	8	•		VA 4561 Z3015
45	60	10			VA 1A45 Z3015
45	62	7			VA 4562 Z3015
45	62	8	•	•	VA 4563 Z3015
45	65	8	•	•	VA 4565 Z3015
45	65	10			VA 4566 Z3015
45	72	8			VA 4572 Z3015
45	80	8			VA 4580 Z3015
45	80	10			VA 4581 Z3015
46	72	10			VA 4672 Z3015
46.2	80	10			VA 4680 Z3015
47	62	7			VA 4762 Z3015
48	60	10			VA 4860 Z3015
48	61	10			VA 4861 Z3015
48	62	8	•		VA 4862 Z3015
48	65	10			VA 4865 Z3015
48	72	8			VA 4872 Z3015
48	72.5	10			VA 4873 Z3015
48	90	10			VA 4890 Z3015
50	60	7			VA 5060 Z3015
50	62	6			VA 5062 Z3015
50	65	7			VA 5065 Z3015
50	65	8	•		VA 5066 Z3015

1) For housings according to DIN 3760/3761
2) For housings according to ISO 6194

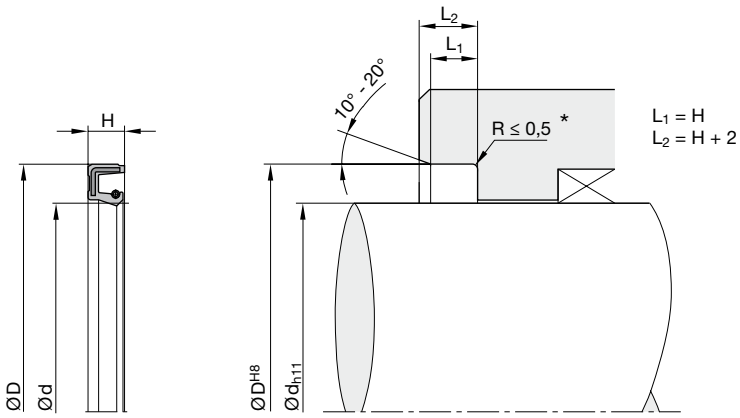


* In case of designs according to DIN and ISO, the radii given there should be used.

d	D	H	DIN[1]	ISO[2]	Order code
50	68	8	•	•	VA 5068 Z3015
50	68	10			VA 5069 Z3015
50	70	8			VA 5070 Z3015
50	70	10			VA 5071 Z3015
50	72	8	•	•	VA 5072 Z3015
50	72	10			VA 5073 Z3015
50	75	10			VA 5075 Z3015
50	80	8			VA 5080 Z3015
50	85	8			VA 5085 Z3015
50	90	10			VA 5090 Z3015
52	62	7			VA 5262 Z3015
52	72	8			VA 5272 Z3015
52	75	8			VA 5275 Z3015
53	68	10			VA 5368 Z3015
54	72	8			VA 5472 Z3015
55	70	8	•		VA 5570 Z3015
55	72	8	•	•	VA 5572 Z3015
55	72	10			VA 5573 Z3015
55	75	10			VA 5575 Z3015
55	80	8	•	•	VA 5580 Z3015
55	80	10			VA 5581 Z3015
55	80	12			VA 5582 Z3015
55	85	8			VA 5585 Z3015
55	90	8			VA 5590 Z3015
58	80	10			VA 5880 Z3015
58	90	10			VA 5890 Z3015
60	78	10			VA 6078 Z3015
60	80	8	•	•	VA 6080 Z3015
60	80	10			VA 6081 Z3015
60	85	8	•	•	VA 6085 Z3015
60	85	12			VA 6086 Z3015
60	95	10			VA 6095 Z3015
62	85	10			VA 6285 Z3015
65	80	8			VA 6580 Z3015

d	D	H	DIN[1]	ISO[2]	Order code
65	82	10			VA 6582 Z3015
65	85	8			VA 6585 Z3015
65	85	10	•	•	VA 6586 Z3015
65	85	13			VA 6587 Z3015
65	90	10	•	•	VA 6590 Z3015
65	90	13			VA 6591 Z3015
70	85	8			VA 7085 Z3015
70	95	10	•	•	VA 7095 Z3015
70	100	12			VA 1A70 Z3015
70	110	10			VA 1B70 Z3015
72	90	10			VA 7290 Z3015
75	95	10	•	•	VA 7595 Z3015
75	100	7			VA 7510 Z3015
75	100	10	•	•	VA 7511 Z3015
75	100	12			VA 7512 Z3015
80	100	10	•	•	VA 8010 Z3015
80	105	14			VA 8011 Z3015
80	110	10	•	•	VA 8012 Z3015
80	115	10			VA 8013 Z3015
85	100	10			VA 8510 Z3015
85	110	10			VA 8511 Z3015
85	110	12		•	VA 8512 Z3015
85	110	15			VA 8513 Z3015
85	115	10			VA 8514 Z3015
85	120	15			VA 8515 Z3015
90	105	10			VA 9010 Z3015
90	110	10			VA 9011 Z3015
90	110	12	•		VA 9012 Z3015
90	115	9			VA 9013 Z3015
90	115	13			VA 9014 Z3015
90	120	12	•	•	VA 9015 Z3015
90	125	14			VA 9016 Z3015
95	120	15			VA 9512 Z3015
95	125	12	•		VA 9513 Z3015

1) For housings according to DIN 3760/3761
2) For housings according to ISO 6194



* In case of designs according to DIN and ISO, the radii given there should be used.

d	D	H	DIN[1)]	ISO[2)]	Order code
95	130	12			VA 9514 Z3015
95	170	13			VA 9517 Z3015
96	140	13			VA 9614 Z3015
100	125	13			VA A125 Z3015
100	125	14			VA A001 Z3015
100	130	12			VA A130 Z3015
100	130	14			VA A004 Z3015
105	125	13			VA A006 Z3015
105	140	12			VA A140 Z3015
105	150	12			VA A002 Z3015
110	140	12	•	•	VA B140 Z3015
110	150	12			VA A150 Z3015
115	145	14			VA B001 Z3015
120	145	12			VA C145 Z3015
120	150	10			VA C150 Z3015
120	150	12	•	•	VA C003 Z3015
125	150	12	•		VA C004 Z3015
125	150	13			VA C005 Z3015
130	160	13			VA D160 Z3015
130	160	15			VA D001 Z3015
130	170	12			VA D170 Z3015
135	160	10			VA D002 Z3015
140	170	14			VA E170 Z3015
150	180	12			VA F180 Z3015
160	190	13			VA G190 Z3015
160	190	15	•	•	VA G001 Z3015
170	200	12			VA H200 Z3015
180	210	15	•	•	VA J210 Z3015
180	215	15			VA J215 Z3015
180	220	16			VA J220 Z3015
215	240	12			VA L240 Z3015
220	250	15	•		VA M250 Z3015
260	290	16			VA O290 Z3015

1) For housings according to DIN 3760/3761
2) For housings according to ISO 6194

- Design for grooves according to DIN 3760 / 3761 or ISO 6194.
- Lip ring with spiral spring for radial preloading.
- Interference fit on outer diameter.
- Cut sealing edge for high dynamic sealing effect.
- Elastomeric outer case for high static sealing effect.
- An additional protective lip (dirt lip) prevents intrusion of dirt particles and thus increases functional reliability.
- Easy installation.
- For use in extremely dirty ambient conditions, we recommend our special VY design with two dust lips.

Range of application

Primarily for sealing oil- and grease-lubricated shaft ducts with little exposure to external (ambient) dirt.

Operating pressure	≤ 0.5 bar
Operating temperature	
NBR	-30 to +100 °C
HNBR	-30 to +140 °C
FKM	-20 to +180 °C
Sliding speed	
NBR	≤ 12 m/s
HNBR	≤ 25 m/s
FKM	≤ 40 m/s
Media	Mineral oil based hydraulic oils, PAO, synthetic esters

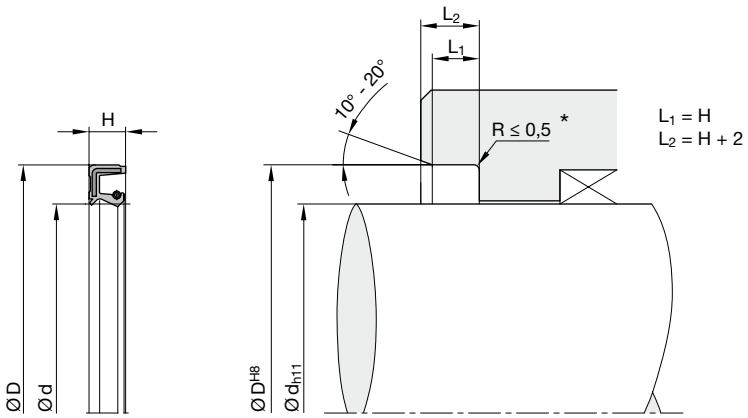
Compounds

Standard:	Z3015, NBR compound, nitrosamine-free (≈ 75 Shore A)
For higher requirements:	Z3011, HNBR compound (≈ 75 Shore A)
	Z3000, FKM compound (≈ 75 Shore A)

Installation

The axial groove depth should correspond to the specifications in DIN 3760/ 3761 and ISO 6194. To avoid damage to the sealing edge, the seals should not be pulled over sharp edges during installation.
The protective lip generates additional heat in the sealing area. Therefore, a small amount of lubricating grease to minimise friction should be placed between the sealing lip and the protective lip when installing the seal (maximum of 50 % of the empty volume between the sealing lip and the dust lip).
Installation as recommended in the above standards is the prerequisite for proper performance of the seal.

In case of special operating conditions (specific pressure loads, temperature, speed, use in water, HFA, HFB fluids etc.), please contact our consultancy service for a selection of the material and design best suiting your particular application requirements.

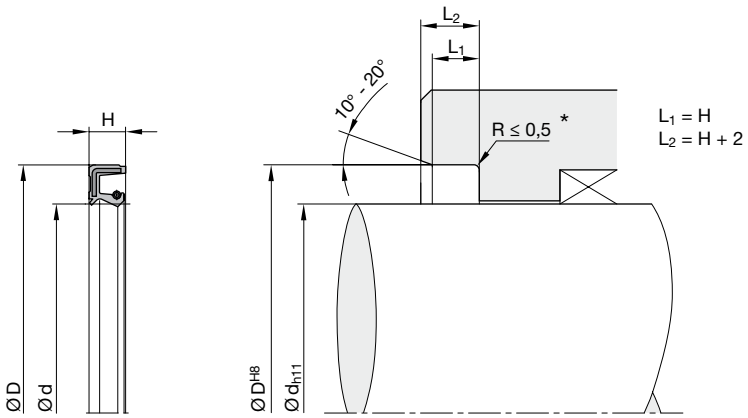


* In case of designs according to DIN and ISO, the radii given there should be used.

d	D	H	DIN[1]	ISO[2]	Order code
5	16	7			VB 0516 Z3015
5	17	7			VB 0517 Z3015
5	18	7			VB 0518 Z3015
6	12	4			VB 0612 Z3015
6	16	7	•	•	VB 0616 Z3015
6	20	4			VB 0620 Z3015
6	22	7	•	•	VB 0622 Z3015
7	14	4			VB 0714 Z3015
7	16	7			VB 0716 Z3015
7	22	7	•	•	VB 0722 Z3015
8	14	4			VB 0814 Z3015
8	16	5			VB 0816 Z3015
8	16	7			VB 0817 Z3015
8	18	5			VB 0818 Z3015
8	18	6			VB 0819 Z3015
8	20	5			VB 0820 Z3015
8	20	8			VB 0821 Z3015
8	22	4			VB 0822 Z3015
8	25	7			VB 0825 Z3015
9	18	5			VB 0918 Z3015
9	19	5			VB 0919 Z3015
9	22	7	•	•	VB 0922 Z3015
9	26	7			VB 0926 Z3015
10	17	5			VB 1017 Z3015
10	18	4			VB 1A10 Z3015
10	18	6			VB 1018 Z3015
10	19	4			VB 1019 Z3015
10	20	5			VB 1020 Z3015
10	21	7			VB 1021 Z3015
10	22	6			VB 1022 Z3015
10	23	7			VB 1023 Z3015
10	24	6			VB 1024 Z3015
10	25	7	•	•	VB 1025 Z3015
10	30	7			VB 1031 Z3015

d	D	H	DIN[1]	ISO[2]	Order code
10	30	10			VB 1031 Z3015
11	19	5			VB 1119 Z3015
11	23	7			VB 1123 Z3015
11	24	7			VB 1124 Z3015
11	25	7.0			VB 1125 Z3015
11	26	7			VB 1126 Z3015
12	19	5			VB 1218 Z3015
12	19	7			VB 1219 Z3015
12	20	5			VB 1A12 Z3015
12	20	6			VB 1B12 Z3015
12	20	7			VB 1220 Z3015
12	21	7.5			VB 1221 Z3015
12	22	5			VB 1C12 Z3015
12	22	6			VB 1D12 Z3015
12	22	7	•		VB 1222 Z3015
12	22	9			VB 1223 Z3015
12	24	4.5			VB 1E12 Z3015
12	24	6			VB 1224 Z3015
12	25	5			VB 1225 Z3015
12	26	8			VB 1226 Z3015
12	28	7			VB 1228 Z3015
12	30	7	•	•	VB 1230 Z3015
12	32	5			VB 1231 Z3015
12	32	7			VB 1232 Z3015
12	35	6			VB 1234 Z3015
12	35	7			VB 1235 Z3015
12.5	25	8			VB 1325 Z3015
13	22	5			VB 1321 Z3015
13	22	7			VB 1322 Z3015
13	30	7			VB 1330 Z3015
13	32	7			VB 1332 Z3015
14	22	4			VB 1420 Z3015
14	22	5			VB 1422 Z3015
14	24	7	•		VB 1424 Z3015

1) For housings according to DIN 3760/3761
2) For housings according to ISO 6194

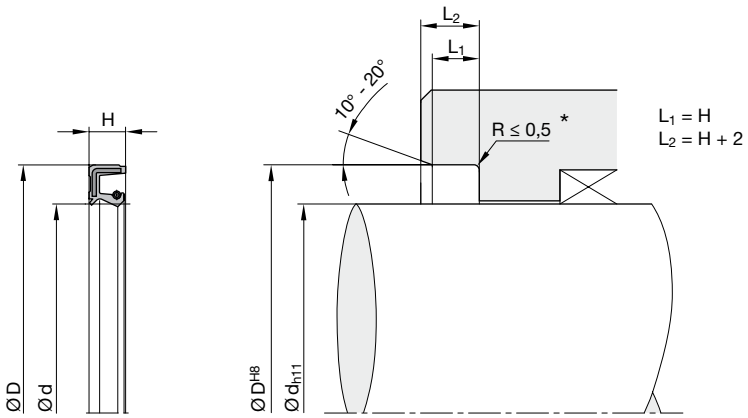


* In case of designs according to DIN and ISO, the radii given there should be used.

d	D	H	DIN[1]	ISO[2]	Order code
14	25	7			VB 1425 Z3015
14	26	7			VB 1426 Z3015
14	28	7			VB 1427 Z3015
14	28	8			VB 1428 Z3015
14	29	7			VB 1429 Z3015
14	30	7	•		VB 1430 Z3015
14	32	7			VB 1432 Z3015
14	35	7			VB 1435 Z3015
14	35	8			VB 1436 Z3015
15	21	4			VB 1520 Z3015
15	21	5			VB 1521 Z3015
15	22	7			VB 1522 Z3015
15	23	7			VB 1523 Z3015
15	24	7			VB 1524 Z3015
15	25	4			VB 1A15 Z3015
15	25	5			VB 1B15 Z3015
15	25	7			VB 1525 Z3015
15	25	8			VB 1C15 Z3015
15	26	4.5			VB 1D15 Z3015
15	26	5			VB 1E15 Z3015
15	26	7			VB 1526 Z3015
15	26	8			VB 1527 Z3015
15	30	6			VB 1529 Z3015
15	30	7	•	•	VB 1530 Z3015
15	31	7			VB 1531 Z3015
15	32	5			VB 1F15 Z3015
15	32	9			VB 1532 Z3015
15	32	10			VB 1533 Z3015
15	35	7	•	•	VB 1535 Z3015
15	35	10			VB 1536 Z3015
15	37	7			VB 1537 Z3015
15	40	10			VB 1540 Z3015
15	47	10			VB 1547 Z3015
16	22	4			VB 1622 Z3015

d	D	H	DIN[1]	ISO[2]	Order code
16	24	6.5			VB 1624 Z3015
16	26	7			VB 1626 Z3015
16	26	8			VB 1627 Z3015
16	28	8			VB 1628 Z3015
16	30	7	•	•	VB 1630 Z3015
16	30	10			VB 1631 Z3015
16	32	7			VB 1632 Z3015
16	32	10			VB 1633 Z3015
16	36	7			VB 1636 Z3015
16	38	7			VB 1638 Z3015
16	40	7			VB 1640 Z3015
16	40	10			VB 1641 Z3015
17	25	4			VB 1724 Z3015
17	25	6			VB 1725 Z3015
17	25.5	7			VB 1A17 Z3015
17	26	6			VB 1B17 Z3015
17	26	7			VB 1726 Z3015
17	27	6			VB 1C17 Z3015
17	27	7			VB 1727 Z3015
17	28	5			VB 1728 Z3015
17	28.5	7			VB 1729 Z3015
17	30	5			VB 1D17 Z3015
17	30	7			VB 1730 Z3015
17	30	8			VB 1731 Z3015
17	32	7			VB 1732 Z3015
17	32	8			VB 1733 Z3015
17	34	7			VB 1734 Z3015
17	35	7			VB 1735 Z3015
17	37	10			VB 1737 Z3015
17	38	7			VB 1738 Z3015
17	40	5			VB 1739 Z3015
17	40	7			VB 1740 Z3015
17	40	10			VB 1741 Z3015
17	42	7			VB 1742 Z3015

1) For housings according to DIN 3760/3761
2) For housings according to ISO 6194

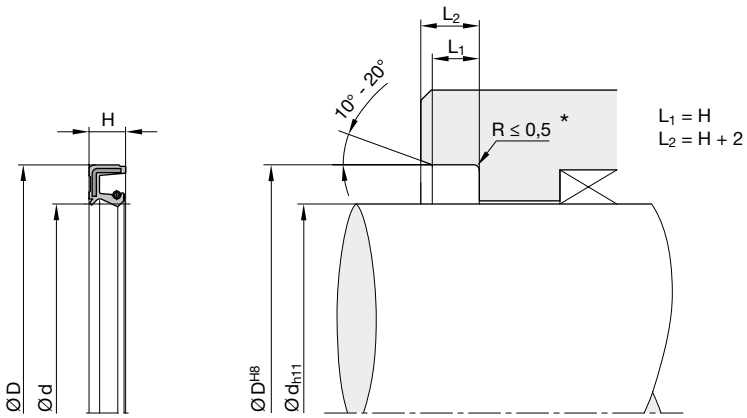


* In case of designs according to DIN and ISO, the radii given there should be used.

d	D	H	DIN[1]	ISO[2]	Order code
17	47	8			VB 1747 Z3015
18	24	4			VB 1824 Z3015
18	26	5			VB 1826 Z3015
18	27	7			VB 1827 Z3015
18	28	5			VB 1828 Z3015
18	28.5	7			VB 1829 Z3015
18	30	6			VB 1A18 Z3015
18	30	7	•	•	VB 1830 Z3015
18	30	8			VB 1831 Z3015
18	32	6			VB 1B18 Z3015
18	32	7			VB 1832 Z3015
18	34	7			VB 1834 Z3015
18	35	7	•	•	VB 1835 Z3015
18	35	10			VB 1C18 Z3015
18	36	8			VB 1836 Z3015
18	40	7			VB 1840 Z3015
19	28	7			VB 1928 Z3015
19	29	8			VB 1929 Z3015
19	30	7			VB 1930 Z3015
19	31	5			VB 1931 Z3015
19	35	7.5			VB 1935 Z3015
19	36	8			VB 1936 Z3015
19	37	8			VB 1937 Z3015
19	37	10			VB 1B19 Z3015
19	38	7			VB 1938 Z3015
19	47	7			VB 1947 Z3015
20	26	5			VB 2026 Z3015
20	27	5			VB 2027 Z3015
20	28	4			VB 1A20 Z3015
20	28	5			VB 1B20 Z3015
20	28	6			VB 2028 Z3015
20	30	7			VB 2030 Z3015
20	32	6			VB 2032 Z3015
20	34	10			VB 2034 Z3015

d	D	H	DIN[1]	ISO[2]	Order code
20	35	4			VB 1C20 Z3015
20	35	5			VB 1D20 Z3015
20	35	7	•	•	VB 2035 Z3015
20	35	8			VB 2036 Z3015
20	35	10			VB 1E20 Z3015
20	37	7			VB 2037 Z3015
20	37	8			VB 1F20 Z3015
20	38	5			VB 1G20 Z3015
20	38	7			VB 2038 Z3015
20	40	8			VB 2040 Z3015
20	40	11			VB 2041 Z3015
20	42	10			VB 2042 Z3015
20	45	7			VB 2045 Z3015
20	45	12			VB 2046 Z3015
20	47	7			VB 2047 Z3015
20	47	8			VB 2048 Z3015
20	50	10			VB 2050 Z3015
20	52	10			VB 2052 Z3015
20	60	7			VB 2060 Z3015
21	32	7			VB 2132 Z3015
21	33.7	9			VB 2133 Z3015
21	40	7			VB 2140 Z3015
22	25	5			VB 2225 Z3015
22	28	4			VB 2228 Z3015
22	29	6			VB 2229 Z3015
22	30	4			VB 1A22 Z3015
22	30	6			VB 1C22 Z3015
22	30	7			VB 2230 Z3015
22	31	6			VB 1D22 Z3015
22	31	7			VB 2231 Z3015
22	32	5			VB 1E22 Z3015
22	32	6			VB 1G22 Z3015
22	32	7			VB 2232 Z3015
22	35	7	•	•	VB 2235 Z3015

1) For housings according to DIN 3760/3761
2) For housings according to ISO 6194

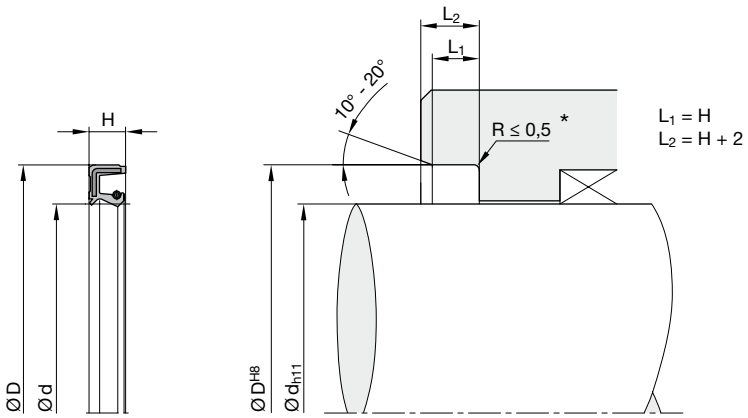


* In case of designs according to DIN and ISO, the radii given there should be used.

d	D	H	DIN[1]	ISO[2]	Order code
22	35	8			VB 2236 Z3015
22	35	10			VB 2234 Z3015
22	37	7			VB 2237 Z3015
22	38	7			VB 2238 Z3015
22	38	8			VB 2239 Z3015
22	40	4			VB 1J22 Z3015
22	40	8			VB 2240 Z3015
22	40	10			VB 1K22 Z3015
22	40	16			VB 1M22 Z3015
22	41.25	7			VB 2241 Z3015
22	42	6			VB 1N22 Z3015
22	42	7			VB 2242 Z3015
22	42	10			VB 1022 Z3015
22	43	9			VB 2243 Z3015
22	45	8			VB 2245 Z3015
22	47	7	•	•	VB 2247 Z3015
22	47	10			VB 2249 Z3015
22	48	7			VB 2248 Z3015
22	50	5			VB 2250 Z3015
22	56	8			VB 2256 Z3015
23	37	6			VB 2337 Z3015
23	38	7			VB 2338 Z3015
23	40	6			VB 2339 Z3015
23	40	8			VB 2340 Z3015
23	40	10			VB 2341 Z3015
23	43	8			VB 2343 Z3015
23	47	10			VB 2347 Z3015
24	34	7			VB 2434 Z3015
24	35	7			VB 2435 Z3015
24	37	7			VB 2437 Z3015
24	40	7			VB 2440 Z3015
24	40	8			VB 1424 Z3015
24	40	10			VB 1B24 Z3015
24	41.25	7			VB 2441 Z3015

d	D	H	DIN[1]	ISO[2]	Order code
24	42	7			VB 2442 Z3015
24	42	10			VB 1C24 Z3015
24	43	6			VB 2443 Z3015
24	45	11			VB 2445 Z3015
24	46	10			VB 2446 Z3015
24	46	11.5			VB 1D24 Z3015
24	47	7			VB 2447 Z3015
24	49	12			VB 2449 Z3015
24	52	7			VB 2452 Z3015
24	55	10			VB 2455 Z3015
25	32	4			VB 2532 Z3015
25	32	5			VB 2531 Z3015
25	32	7			VB 2530 Z3015
25	33	4			VB 1A25 Z3015
25	33	6			VB 2533 Z3015
25	35	5			VB 2534 Z3015
25	35	6			VB 2535 Z3015
25	35	8.5			VB 1B25 Z3015
25	35	10			VB 1C25 Z3015
25	37	5			VB 2537 Z3015
25	38	5			VB 1D25 Z3015
25	38	7			VB 2538 Z3015
25	38	8			VB 1E25 Z3015
25	38	10			VB 2539 Z3015
25	40	5			VB 1G25 Z3015
25	40	6			VB 2540 Z3015
25	40	8			VB 1H25 Z3015
25	40	10			VB 1J25 Z3015
25	41	6			VB 1K25 Z3015
25	41	7			VB 2541 Z3015
25	42	5			VB 1N25 Z3015
25	42	7		•	VB 2542 Z3015
25	42	8			VB 2543 Z3015
25	42	10			VB 1P25 Z3015

1) For housings according to DIN 3760/3761
2) For housings according to ISO 6194

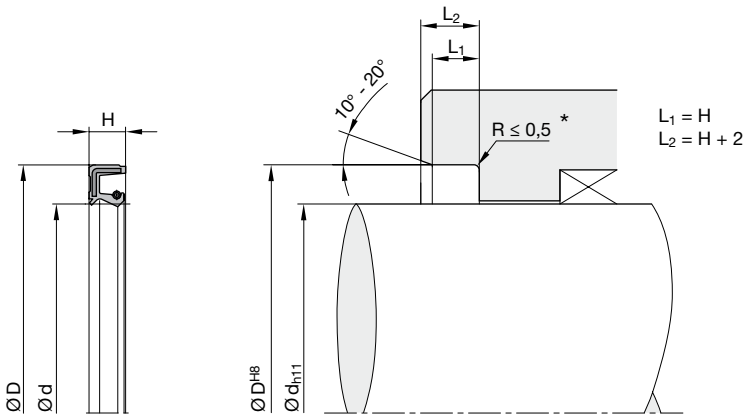


* In case of designs according to DIN and ISO, the radii given there should be used.

d	D	H	DIN[1]	ISO[2]	Order code
25	42	13			VB 2544 Z3015
25	45	7			VB 2545 Z3015
25	45	8			VB 1S25 Z3015
25	45	10			VB 1T25 Z3015
25	45	11			VB 1U25 Z3015
25	46	7			VB 2546 Z3015
25	46	10			VB 1V25 Z3015
25	47	7	•		VB 2547 Z3015
25	47	8			VB 1X25 Z3015
25	47	10			VB 2553 Z3015
25	48	7			VB 2548 Z3015
25	48	8			VB 2551 Z3015
25	49	15			VB 2549 Z3015
25	50	7			VB 2550 Z3015
25	52	8			VB 2552 Z3015
25	54	8			VB 2554 Z3015
25	55	8			VB 2555 Z3015
25	55	10			VB 2556 Z3015
25	62	8			VB 2562 Z3015
25	62	10			VB 2563 Z3015
26	34	4			VB 2634 Z3015
26	37	7			VB 2637 Z3015
26	38	6			VB 2636 Z3015
26	38	8			VB 2638 Z3015
26	40	5			VB 2640 Z3015
26	42	10			VB 2642 Z3015
26	47	5			VB 2646 Z3015
26	47	7			VB 2647 Z3015
26	47	7.3			VB 2648 Z3015
26	52	10			VB 2652 Z3015
26	72	10			VB 2672 Z3015
27	35	4			VB 2734 Z3015
27	35	7			VB 2735 Z3015
27	37	7			VB 2737 Z3015

d	D	H	DIN[1]	ISO[2]	Order code
27	38	7			VB 2738 Z3015
27	40	6			VB 2739 Z3015
27	40	7			VB 2740 Z3015
27	40	8			VB 1A27 Z3015
27	41	7			VB 2741 Z3015
27	41	10			VB 2742 Z3015
27	43	8			VB 2743 Z3015
27	43	9			VB 2744 Z3015
27	45	7			VB 2745 Z3015
27	45	10			VB 2746 Z3015
27	47	7			VB 2747 Z3015
27	47	8			VB 2748 Z3015
27	47	10			VB 2749 Z3015
27	53	8			VB 2753 Z3015
28	35	5			VB 2834 Z3015
28	35	10			VB 2835 Z3015
28	37	4			VB 2836 Z3015
28	37	7			VB 2837 Z3015
28	40	7	•		VB 2840 Z3015
28	40	8			VB 2839 Z3015
28	40	10			VB 2841 Z3015
28	42	7			VB 2842 Z3015
28	43	7			VB 2843 Z3015
28	43	8			VB 1A28 Z3015
28	43	10			VB 1B28 Z3015
28	44	8			VB 2844 Z3015
28	45	7			VB 2845 Z3015
28	45	10			VB 2846 Z3015
28	48	7			VB 2848 Z3015
28	48	8			VB 2847 Z3015
28	48	11			VB 2849 Z3015
28	50	5			VB 1C28 Z3015
28	50	6			VB 1D28 Z3015
28	50	8			VB 2850 Z3015

1) For housings according to DIN 3760/3761
2) For housings according to ISO 6194

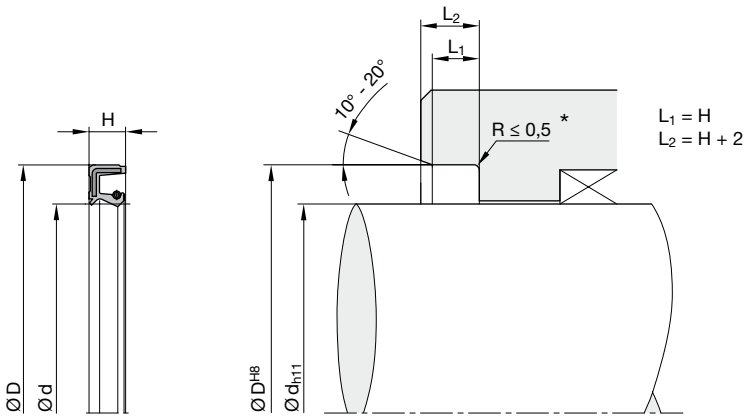


* In case of designs according to DIN and ISO, the radii given there should be used.

d	D	H	DIN[1]	ISO[2]	Order code
28	50	10			VB 1E28 Z3015
28	51	8			VB 2851 Z3015
28	51	10			VB 1F28 Z3015
28	52	10			VB 2852 Z3015
28	56	8			VB 2856 Z3015
28	62	10			VB 2862 Z3015
29	40	7			VB 2940 Z3015
29	42	5			VB 2941 Z3015
29	42	6			VB 2942 Z3015
29	47	10			VB 2947 Z3015
29	52	9			VB 2952 Z3015
30	37	4			VB 3036 Z3015
30	37	6			VB 3037 Z3015
30	40	4.5			VB 3038 Z3015
30	40	7	•		VB 3040 Z3015
30	40	10			VB 1A30 Z3015
30	42	5			VB 3041 Z3015
30	42	7	•	•	VB 3043 Z3015
30	42	8			VB 1B30 Z3015
30	42	10			VB 3042 Z3015
30	44	5			VB 3044 Z3015
30	45	6			VB 3045 Z3015
30	45	10			VB 1C30 Z3015
30	45	11			VB 1D30 Z3015
30	46	8			VB 3046 Z3015
30	47	6			VB 1E30 Z3015
30	47	7	•	•	VB 3047 Z3015
30	48	7			VB 3048 Z3015
30	50	6			VB 3049 Z3015
30	50	7			VB 3050 Z3015
30	50	8			VB 1F30 Z3015
30	50	11			VB 1G30 Z3015
30	51	7			VB 3051 Z3015
30	52	7	•	•	VB 3052 Z3015

d	D	H	DIN[1]	ISO[2]	Order code
30	54	10			VB 3054 Z3015
30	55	7			VB 3055 Z3015
30	55	8			VB 1H30 Z3015
30	56	10			VB 3056 Z3015
30	58	10			VB 3058 Z3015
30	60	10			VB 3060 Z3015
30	62	7			VB 3062 Z3015
30	62	8			VB 3063 Z3015
30	62	11			VB 3064 Z3015
30	62	12			VB 3066 Z3015
30	65	10			VB 3065 Z3015
30	70	10			VB 3070 Z3015
30	72	7			VB 3072 Z3015
30	72	10			VB 3073 Z3015
31	39	7			VB 3139 Z3015
31	43	8			VB 3143 Z3015
31	44	7			VB 3144 Z3015
31	45	8			VB 3145 Z3015
31	47	7			VB 3147 Z3015
31	48	10			VB 3148 Z3015
31	52	7			VB 3152 Z3015
32	40	7			VB 3240 Z3015
32	42	4			VB 3239 Z3015
32	42	5			VB 3241 Z3015
32	42	7			VB 3242 Z3015
32	44	9			VB 3244 Z3015
32	44	10			VB 3243 Z3015
32	45	8	•		VB 3245 Z3015
32	46	8			VB 3246 Z3015
32	47	7	•	•	VB 3247 Z3015
32	47	8	•		VB 1A32 Z3015
32	47	10			VB 1B32 Z3015
32	48	7			VB 3248 Z3015
32	48	8			VB 3249 Z3015

1) For housings according to DIN 3760/3761
2) For housings according to ISO 6194

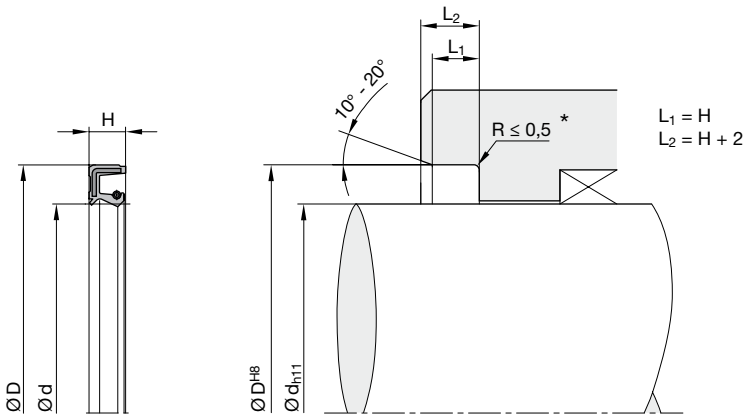


* In case of designs according to DIN and ISO, the radii given there should be used.

d	D	H	DIN[1]	ISO[2]	Order code
32	48	10			VB 1C32 Z3015
32	48	12			VB 1D32 Z3015
32	50	7			VB 3250 Z3015
32	50	8			VB 1E32 Z3015
32	50	10			VB 1F32 Z3015
32	50	12			VB 1G32 Z3015
32	51	8			VB 3251 Z3015
32	52	8	•		VB 3252 Z3015
32	52	9.5			VB 3253 Z3015
32	55	7			VB 3255 Z3015
32	55	10			VB 3256 Z3015
32	58	12			VB 3258 Z3015
32	59	8			VB 3259 Z3015
32	62	7			VB 3262 Z3015
32	65	10			VB 3265 Z3015
32	72	10			VB 3272 Z3015
33	48	7			VB 3348 Z3015
33	50	6			VB 3349 Z3015
33	50	7			VB 3350 Z3015
33	50	8			VB 1A33 Z3015
33	50	10			VB 3351 Z3015
33	52	6			VB 3352 Z3015
33	55	9.5			VB 3355 Z3015
33	62	10			VB 3362 Z3015
33	72	8			VB 3372 Z3015
34	42	7			VB 3442 Z3015
34	45	6			VB 3445 Z3015
34	46	8			VB 3401 Z3015
34	46	10			VB 3446 Z3015
34	48	7			VB 3448 Z3015
34	50	7			VB 3450 Z3015
34	52	7			VB 3452 Z3015
34	52	8			VB 1A34 Z3015
34	52	10			VB 3453 Z3015

d	D	H	DIN[1]	ISO[2]	Order code
34	54	8			VB 3454 Z3015
34	55	9			VB 3455 Z3015
34	55	11			VB 1B34 Z3015
34	56	10			VB 3456 Z3015
34	62	8			VB 3462 Z3015
34	62	10			VB 3463 Z3015
35	42	8			VB 3542 Z3015
35	44	7			VB 3544 Z3015
35	45	7			VB 3545 Z3015
35	45	10			VB 1A35 Z3015
35	46	8			VB 3546 Z3015
35	47	6			VB 3547 Z3015
35	47	10			VB 1B35 Z3015
35	47	8			VB 3548 Z3015
35	48	10			VB 1C35 Z3015
35	49	7			VB 3549 Z3015
35	50	7	•		VB 3550 Z3015
35	50	8	•	•	VB 1D35 Z3015
35	50	10			VB 1E35 Z3015
35	50	11			VB 1F35 Z3015
35	50	12			VB 1G35 Z3015
35	52	6			VB 3551 Z3015
35	52	7	•		VB 3552 Z3015
35	52	9			VB 3553 Z3015
35	52	12			VB 3554 Z3015
35	55	8	•	•	VB 3555 Z3015
35	55	11			VB 1K35 Z3015
35	55	12			VB 1L35 Z3015
35	56	7			VB 3556 Z3015
35	56	10			VB 1M35 Z3015
35	57	13			VB 3557 Z3015
35	58	6			VB 1N35 Z3015
35	58	10			VB 3558 Z3015
35	58	12			VB 3559 Z3015

1) For housings according to DIN 3760/3761
2) For housings according to ISO 6194

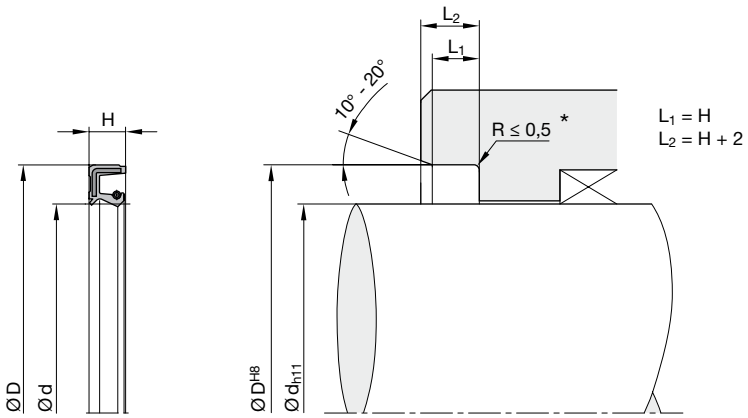


* In case of designs according to DIN and ISO, the radii given there should be used.

d	D	H	DIN[1]	ISO[2]	Order code
35	62	5			VB 3561 Z3015
35	62	7			VB 3562 Z3015
35	62	8			VB 3560 Z3015
35	62	10			VB 3563 Z3015
35	64	13			VB 3564 Z3015
35	65	7			VB 3565 Z3015
35	68	10			VB 3568 Z3015
35	70	10			VB 3570 Z3015
35	72	7			VB 3572 Z3015
35	72	8			VB 3573 Z3015
35	72	10			VB 3574 Z3015
35	75	12			VB 3575 Z3015
35	80	10			VB 3580 Z3015
35	80	12			VB 3581 Z3015
35	80	13			VB 3582 Z3015
36	48	7			VB 3648 Z3015
36	49	8			VB 3649 Z3015
36	50	7			VB 3650 Z3015
36	51	8			VB 3651 Z3015
36	52	7			VB 3652 Z3015
36	52	10			VB 3653 Z3015
36	54	8			VB 3654 Z3015
36	54	10			VB 3655 Z3015
36	54	11			VB 1A36 Z3015
36	56	10			VB 3656 Z3015
36	62	7			VB 3662 Z3015
36	62	12			VB 3663 Z3015
37	50	10			VB 3750 Z3015
37	56	10			VB 3756 Z3015
37	58	13			VB 3758 Z3015
37	60	12			VB 3760 Z3015
37	62	8			VB 3762 Z3015
37	62	9			VB 3763 Z3015
37	62	10			VB 3764 Z3015

d	D	H	DIN[1]	ISO[2]	Order code
38	47	7			VB 3847 Z3015
38	48	4			VB 3848 Z3015
38	50	7			VB 3850 Z3015
38	50	10			VB 3849 Z3015
38	51	8			VB 3851 Z3015
38	52	6			VB 1A38 Z3015
38	52	7			VB 3852 Z3015
38	52	10			VB 1C38 Z3015
38	53	7			VB 3853 Z3015
38	54	10			VB 3854 Z3015
38	55	10			VB 3855 Z3015
38	56	8			VB 3856 Z3015
38	56	10			VB 1D38 Z3015
38	56	12			VB 1E38 Z3015
38	57	10			VB 3857 Z3015
38	58	7			VB 3858 Z3015
38	58	8		•	VB 1F38 Z3015
38	58	11			VB 1G38 Z3015
38	59	9			VB 3859 Z3015
38	60	12			VB 3860 Z3015
38	62	7	•		VB 3862 Z3015
38	62	8	•	•	VB 1J38 Z3015
38	62	9			VB 1H38 Z3015
38	65	8			VB 3865 Z3015
38	65	10			VB 3866 Z3015
38	72	8			VB 3872 Z3015
38	72	10			VB 3873 Z3015
39	58	6			VB 3958 Z3015
40	47	4			VB 4047 Z3015
40	50	4			VB 4048 Z3015
40	50	5			VB 4049 Z3015
40	50	7			VB 4050 Z3015
40	50	8			VB 4051 Z3015
40	50	10			VB 1A40 Z3015

1) For housings according to DIN 3760/3761
2) For housings according to ISO 6194

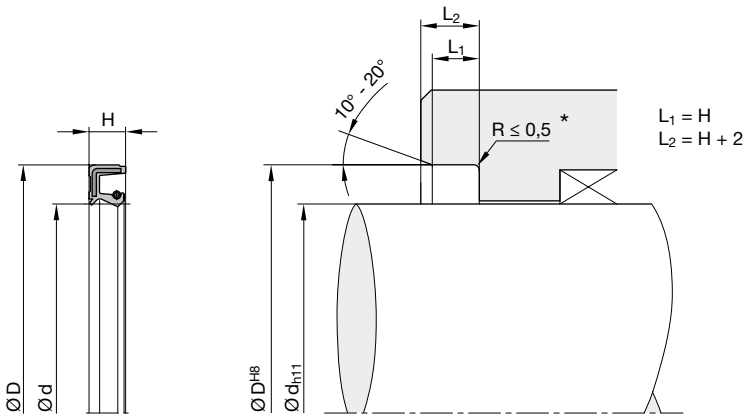


* In case of designs according to DIN and ISO, the radii given there should be used.

d	D	H	DIN[1]	ISO[2]	Order code
40	52	5			VB 4052 Z3015
40	52	8.5			VB 1B40 Z3015
40	52	10			VB 1C40 Z3015
40	53	7			VB 4053 Z3015
40	53	8			VB 1D40 Z3015
40	54	7			VB 4054 Z3015
40	55	7	•		VB 4055 Z3015
40	55	10			VB 1E40 Z3015
40	56	7			VB 4056 Z3015
40	56	8			VB 1F40 Z3015
40	56	10			VB 1G40 Z3015
40	56	12			VB 1H40 Z3015
40	57	10			VB 4057 Z3015
40	58	7			VB 4058 Z3015
40	58	8			VB 4059 Z3015
40	58	10			VB 1K40 Z3015
40	60	7			VB 4060 Z3015
40	60	10			VB 4061 Z3015
40	60	12			VB 1L40 Z3015
40	62	5			VB 4062 Z3015
40	62	7	•		VB 4063 Z3015
40	62	8	•	•	VB 4008 Z3015
40	62	11			VB 1M40 Z3015
40	64	12			VB 4064 Z3015
40	65	8			VB 4065 Z3015
40	67	10			VB 4067 Z3015
40	68	5			VB 4066 Z3015
40	68	7			VB 4068 Z3015
40	68	10			VB 4069 Z3015
40	70	7			VB 4070 Z3015
40	70	10			VB 4071 Z3015
40	72	7			VB 4072 Z3015
40	72	12			VB 4073 Z3015
40	74	10			VB 4074 Z3015

d	D	H	DIN[1]	ISO[2]	Order code
40	75	12			VB 4075 Z3015
40	80	7			VB 4080 Z3015
40	80	10			VB 4081 Z3015
40	85	10			VB 4085 Z3015
40	90	8			VB 4090 Z3015
40	90	12			VB 4091 Z3015
42	50	7			VB 4250 Z3015
42	51	7			VB 4251 Z3015
42	52	7			VB 4252 Z3015
42	55	6			VB 4254 Z3015
42	55	7			VB 4255 Z3015
42	55	8	•	•	VB 1A42 Z3015
42	55	9			VB 1B42 Z3015
42	56	7			VB 4256 Z3015
42	57	10			VB 4257 Z3015
42	58	7			VB 4258 Z3015
42	58	10			VB 1C42 Z3015
42	59	7			VB 4259 Z3015
42	60	7			VB 4260 Z3015
42	60	10			VB 4261 Z3015
42	62	7			VB 4262 Z3015
42	62	10			VB 1D42 Z3015
42	62	12			VB 1E42 Z3015
42	63	8			VB 4263 Z3015
42	64	10			VB 4264 Z3015
42	65	7			VB 4265 Z3015
42	65	8			VB 1G42 Z3015
42	65	9			VB 1H42 Z3015
42	65	10			VB 1J42 Z3015
42	66	8			VB 4266 Z3015
42	66	10			VB 4267 Z3015
42	66	12			VB 4269 Z3015
42	68	10			VB 4268 Z3015
42	72	7			VB 4272 Z3015

1) For housings according to DIN 3760/3761
2) For housings according to ISO 6194

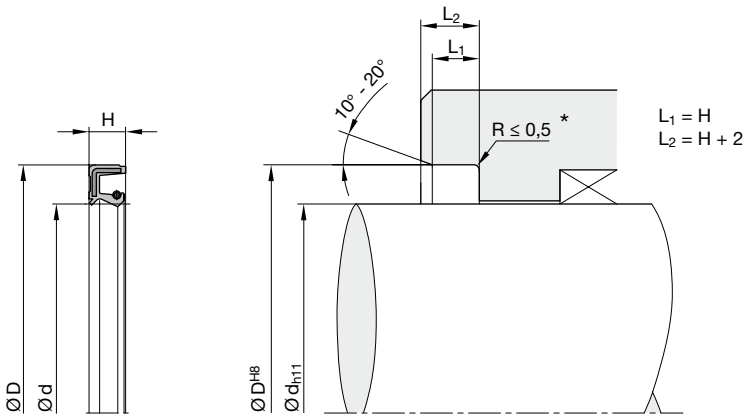


* In case of designs according to DIN and ISO, the radii given there should be used.

d	D	H	DIN[1]	ISO[2]	Order code
42	72	8			VB 4273 Z3015
42	72	10			VB 4274 Z3015
42	75	10			VB 4275 Z3015
43	58	7			VB 4358 Z3015
44	58	7			VB 4458 Z3015
44	58	8			VB 4459 Z3015
44	60	7			VB 4460 Z3015
44	62	9			VB 4462 Z3015
44	62	10			VB 4463 Z3015
44	62	14			VB 4464 Z3015
44	65	8			VB 4465 Z3015
44	72	9			VB 4472 Z3015
44	75	6			VB 4475 Z3015
45	52	8			VB 4552 Z3015
45	55	4			VB 4553 Z3015
45	55	5			VB 4554 Z3015
45	55	7			VB 4555 Z3015
45	55	10			VB 1A45 Z3015
45	56	7			VB 4556 Z3015
45	58	7			VB 4558 Z3015
45	58	8			VB 4557 Z3015
45	58	10			VB 1B45 Z3015
45	59.13	10			VB 4559 Z3015
45	60	8	•		VB 4560 Z3015
45	60	9			VB 1C45 Z3015
45	60	10			VB 1D45 Z3015
45	62	7			VB 4562 Z3015
45	62	8	•	•	VB 1E45 Z3015
45	62	9			VB 1F45 Z3015
45	62	12			VB 1G45 Z3015
45	63	8			VB 4563 Z3015
45	63	9			VB 1H45 Z3015
45	64	8			VB 4564 Z3015
45	65	7			VB 4565 Z3015

d	D	H	DIN[1]	ISO[2]	Order code
45	65	8	•	•	VB 4566 Z3015
45	65	9			VB 4567 Z3015
45	65	10			VB 1K45 Z3015
45	65	12			VB 1L45 Z3015
45	68	7			VB 4568 Z3015
45	68	8			VB 1M45 Z3015
45	68	10			VB 1N45 Z3015
45	68	12			VB 1O45 Z3015
45	69	10			VB 4569 Z3015
45	70	10			VB 4570 Z3015
45	70	12			VB 4571 Z3015
45	72	8			VB 4572 Z3015
45	72	12			VB 4573 Z3015
45	75	7			VB 4575 Z3015
45	75	10			VB 4576 Z3015
45	80	8			VB 4580 Z3015
45	80	10			VB 4581 Z3015
45	80	12			VB 4582 Z3015
45	80	13			VB 4583 Z3015
45	85	8			VB 4585 Z3015
45	85	10			VB 4586 Z3015
45	85	13			VB 4587 Z3015
45	90	10			VB 4590 Z3015
45	100	10			VB 4510 Z3015
46	60	8			VB 4660 Z3015
46	62	7			VB 4662 Z3015
46	65	10			VB 4665 Z3015
46	68	8			VB 4668 Z3015
46	70	8			VB 4670 Z3015
47	58	5			VB 4758 Z3015
47	58	10			VB 4759 Z3015
47	62	7			VB 4762 Z3015
48	58	4			VB 4858 Z3015
48	60	8			VB 4860 Z3015

1) For housings according to DIN 3760/3761
2) For housings according to ISO 6194

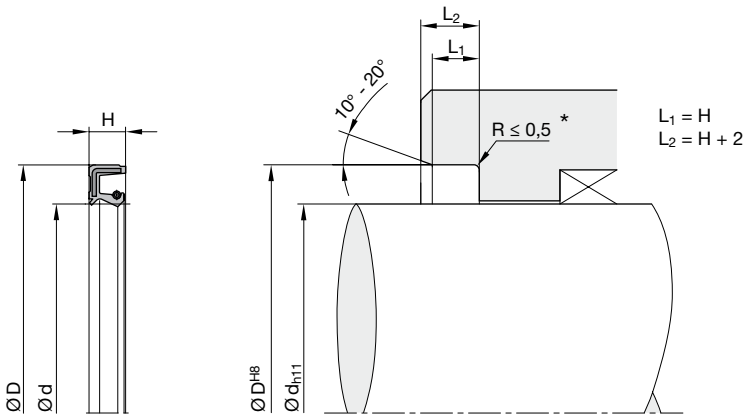


* In case of designs according to DIN and ISO, the radii given there should be used.

d	D	H	DIN[1]	ISO[2]	Order code
48	60	9			VB 4861 Z3015
48	60	10			VB 1A48 Z3015
48	62	7			VB 4862 Z3015
48	62	9			VB 4863 Z3015
48	62	10			VB 1B48 Z3015
48	64	12			VB 4864 Z3015
48	65	9			VB 4865 Z3015
48	67	11			VB 4867 Z3015
48	68	9			VB 4868 Z3015
48	69	10			VB 4869 Z3015
48	70	9			VB 4870 Z3015
48	70	10			VB 4871 Z3015
48	70	12			VB 1D48 Z3015
48	72	7			VB 4872 Z3015
48	72	8			VB 1E48 Z3015
48	72	10			VB 1F48 Z3015
48	73	10			VB 4873 Z3015
48	75	10			VB 4875 Z3015
48	80	8			VB 4880 Z3015
49	60	10			VB 4960 Z3015
50	60	10			VB 5060 Z3015
50	62	5			VB 5062 Z3015
50	62	10			VB 5063 Z3015
50	64	7			VB 5064 Z3015
50	65	7			VB 5065 Z3015
50	65	8	•		VB 5008 Z3015
50	65	9			VB 5066 Z3015
50	65	10			VB 1A50 Z3015
50	67	11			VB 1C50 Z3015
50	68	7			VB 5067 Z3015
50	68	8	•	•	VB 5068 Z3015
50	68	10			VB 5069 Z3015
50	68	12			VB 1D50 Z3015
50	70	8			VB 5070 Z3015

d	D	H	DIN[1]	ISO[2]	Order code
50	70	10			VB 5071 Z3015
50	70	12			VB 1E50 Z3015
50	72	7			VB 5072 Z3015
50	72	12			VB 5073 Z3015
50	75	10			VB 5075 Z3015
50	75	12			VB 5076 Z3015
50	78	12			VB 5078 Z3015
50	80	8			VB 5080 Z3015
50	80	12			VB 5081 Z3015
50	80	13			VB 1F50 Z3015
50	82	8			VB 5082 Z3015
50	82	10			VB 5083 Z3015
50	100	10			VB 5010 Z3015
50	120	12			VB 5012 Z3015
52	63	6			VB 5263 Z3015
52	63	8			VB 5264 Z3015
52	66	7			VB 5266 Z3015
52	68	8			VB 5268 Z3015
52	68	10			VB 5269 Z3015
52	70	8			VB 5270 Z3015
52	70	9			VB 5271 Z3015
52	70	10			VB 1A52 Z3015
52	72	8			VB 5272 Z3015
52	72	9			VB 5273 Z3015
52	72	12			VB 5274 Z3015
52	75	10			VB 5275 Z3015
52	75	12			VB 5276 Z3015
52	80	10			VB 5280 Z3015
52	85	10			VB 5285 Z3015
52	100	10			VB 5210 Z3015
53	66	5			VB 5366 Z3015
53	68	10			VB 5368 Z3015
54	65	12			VB 5465 Z3015
54	65	13			VB 5466 Z3015

1) For housings according to DIN 3760/3761
2) For housings according to ISO 6194

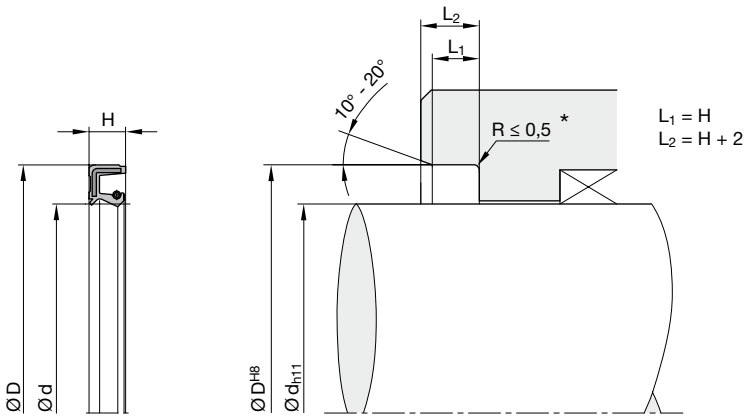


* In case of designs according to DIN and ISO, the radii given there should be used.

d	D	H	DIN[1]	ISO[2]	Order code
54	68	9			VB 5468 Z3015
54	72.5	9			VB 5472 Z3015
54	85	10			VB 5485 Z3015
55	62	8			VB 5562 Z3015
55	65	8			VB 5565 Z3015
55	67	6			VB 5567 Z3015
55	68	8			VB 5568 Z3015
55	68	8.5			VB 5569 Z3015
55	70	8	•		VB 5570 Z3015
55	70	9			VB 5571 Z3015
55	70	10			VB 1A55 Z3015
55	72	7			VB 5572 Z3015
55	72	8	•	•	VB 1B55 Z3015
55	72	9			VB 1C55 Z3015
55	72	12			VB 1D55 Z3015
55	73	10			VB 5573 Z3015
55	75	8			VB 5575 Z3015
55	75	9			VB 5576 Z3015
55	75	12			VB 5577 Z3015
55	78	10			VB 5578 Z3015
55	78	12			VB 5579 Z3015
55	80	10			VB 5580 Z3015
55	80	13			VB 5581 Z3015
55	82	12			VB 5582 Z3015
55	85	8			VB 5585 Z3015
55	85	10			VB 5586 Z3015
55	90	13			VB 5590 Z3015
55	90	15			VB 5591 Z3015
55	100	10			VB 5510 Z3015
55	100	12			VB 5511 Z3015
56	72	8			VB 5672 Z3015
56	76	10			VB 5676 Z3015
56	85	8			VB 5685 Z3015
56	90	10			VB 5690 Z3015

d	D	H	DIN[1]	ISO[2]	Order code
57	86	5			VB 5785 Z3015
57	86	6			VB 5786 Z3015
57	86	6.5			VB 5587 Z3015
58	75	9			VB 5875 Z3015
58	75	10			VB 5876 Z3015
58	80	12			VB 5880 Z3015
58	82	10			VB 5882 Z3015
58	85	10			VB 5885 Z3015
58	90	10			VB 5890 Z3015
58	90	13			VB 5891 Z3015
58	90	15			VB 5892 Z3015
59	78	10			VB 5978 Z3015
60	70	7			VB 6070 Z3015
60	72	8			VB 6072 Z3015
60	72	10			VB 6073 Z3015
60	72	12			VB 1A60 Z3015
60	74	10			VB 6074 Z3015
60	75	8	•		VB 6075 Z3015
60	75	10			VB 6076 Z3015
60	77	12			VB 6077 Z3015
60	80	7			VB 6080 Z3015
60	80	12			VB 6081 Z3015
60	82	12			VB 6082 Z3015
60	85	8	•	•	VB 6085 Z3015
60	85	13			VB 6086 Z3015
60	90	10			VB 6090 Z3015
60	92	10			VB 6092 Z3015
60	95	8			VB 6095 Z3015
60	95	10			VB 6096 Z3015
60	95	12			VB 6097 Z3015
60	100	10			VB 6010 Z3015
60	100	10			VB 6011 Z3015
60	100	13			VB 6012 Z3015
60	110	12			VB 6013 Z3015

1) For housings according to DIN 3760/3761
2) For housings according to ISO 6194

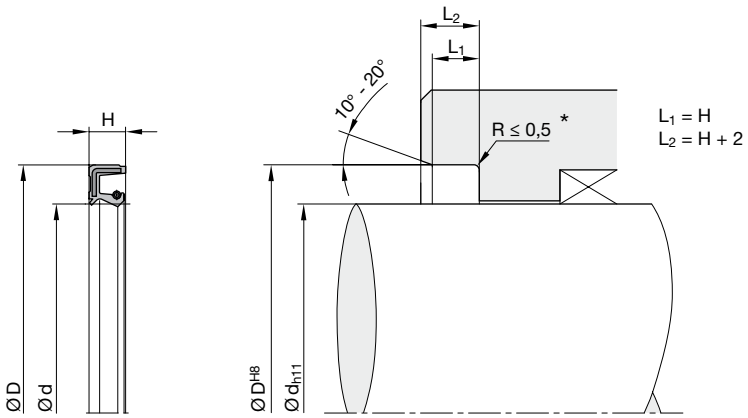


* In case of designs according to DIN and ISO, the radii given there should be used.

d	D	H	DIN[1]	ISO[2]	Order code
62	76	10			VB 6276 Z3015
62	80	8			VB 6280 Z3015
62	80	9			VB 6181 Z3015
62	80	10			VB 1A62 Z3015
62	82	10			VB 6282 Z3015
62	85	7			VB 6285 Z3015
62	85	10			VB 6286 Z3015
62	90	10			VB 6290 Z3015
62	90	13			VB 6291 Z3015
62	95	10			VB 6295 Z3015
62	95	13			VB 6296 Z3015
62	120	12			VB 6212 Z3015
63	88	12			VB 6388 Z3015
63	90	8			VB 6390 Z3015
63	90	10			VB 6391 Z3015
63	100	13			VB 6310 Z3015
63.5	95.2	12.7			VB 6395 Z3015
64	80	8			VB 6480 Z3015
64	80	13			VB 6481 Z3015
65	75	5			VB 6575 Z3015
65	75	10			VB 6576 Z3015
65	80	10			VB 6580 Z3015
65	80	12			VB 6581 Z3015
65	85	12			VB 6585 Z3015
65	85	13			VB 6586 Z3015
65	88	8			VB 6588 Z3015
65	88	12			VB 6589 Z3015
65	88	16.5			VB 1A65 Z3015
65	90	10	•	•	VB 6590 Z3015
65	90	13			VB 6591 Z3015
65	95	10			VB 6595 Z3015
65	95	12			VB 6596 Z3015
65	95	13			VB 6597 Z3015
65	105	12			VB 6510 Z3015

d	D	H	DIN[1]	ISO[2]	Order code
65	110	12			VB 6511 Z3015
65	120	12			VB 6512 Z3015
65	120	13			VB 6513 Z3015
66	90	10			VB 6690 Z3015
68	86	7			VB 6886 Z3015
68	86	8			VB 6887 Z3015
68	88	10			VB 6888 Z3015
68	90	7			VB 6890 Z3015
68	92	10			VB 6892 Z3015
68	100	13			VB 6810 Z3015
68	110	13			VB 6811 Z3015
69.85	88.9	9.525			VB 6889 Z3015
70	80	8			VB 7080 Z3015
70	80	10			VB 7081 Z3015
70	87	10			VB 7087 Z3015
70	88	8			VB 7088 Z3015
70	88	12			VB 7089 Z3015
70	90	12			VB 7090 Z3015
70	95	12			VB 7094 Z3015
70	95	13			VB 7095 Z3015
70	100	10			VB 7010 Z3015
70	100	13			VB 7011 Z3015
70	105	10			VB 7012 Z3015
70	105	12			VB 7013 Z3015
70	105	13			VB 7014 Z3015
70	110	8			VB 7015 Z3015
70	110	12			VB 7016 Z3015
70	120	10			VB 7017 Z3015
71	88	8			VB 7188 Z3015
72	84	7			VB 7284 Z3015
72	86	7			VB 7286 Z3015
72	90	10			VB 7290 Z3015
72	95	10			VB 7295 Z3015
72	100	10			VB 7210 Z3015

1) For housings according to DIN 3760/3761
2) For housings according to ISO 6194

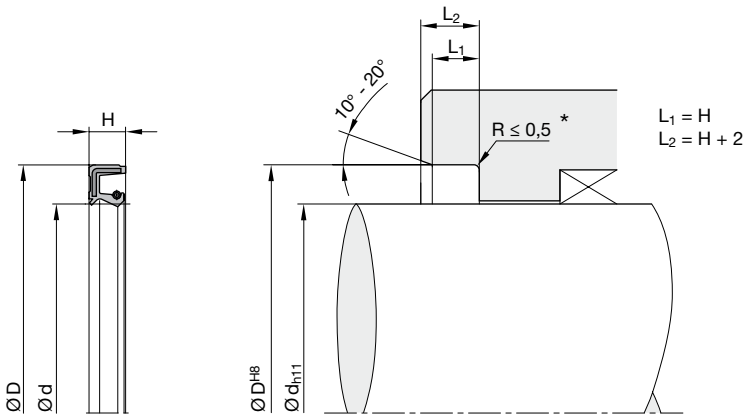


* In case of designs according to DIN and ISO, the radii given there should be used.

d	D	H	DIN[1]	ISO[2]	Order code
72	100	12			VB 7211 Z3015
72	105	12			VB 7212 Z3015
72	105	13			VB 7213 Z3015
74	95	10			VB 7495 Z3015
75	90	8			VB 7590 Z3015
75	90	10			VB 7591 Z3015
75	90	12			VB 7592 Z3015
75	95	5			VB 7595 Z3015
75	95	8			VB 7596 Z3015
75	95	12			VB 7597 Z3015
75	100	10	•	•	VB 7510 Z3015
75	100	12			VB 7511 Z3015
75	100	13			VB 7512 Z3015
75	105	10			VB 7520 Z3015
75	105	12			VB 7521 Z3015
75	105	13			VB 7522 Z3015
75	110	10			VB 7530 Z3015
75	110	13			VB 7531 Z3015
75	112	12			VB 7532 Z3015
75	115	13			VB 7540 Z3015
75	120	13			VB 7541 Z3015
75	121	13			VB 7542 Z3015
75	125	12			VB 7543 Z3015
76	98	12			VB 7698 Z3015
78	100	10			VB 7810 Z3015
78	100	13			VB 7811 Z3015
80	95	8			VB 8095 Z3015
80	96	9			VB 8096 Z3015
80	98	10			VB 8098 Z3015
80	100	7			VB 8010 Z3015
80	100	12			VB 8011 Z3015
80	105	10			VB 8012 Z3015
80	105	12			VB 8013 Z3015
80	105	13			VB 8014 Z3015

d	D	H	DIN[1]	ISO[2]	Order code
80	105	15			VB 8015 Z3015
80	115	12			VB 8016 Z3015
80	120	12			VB 8020 Z3015
80	120	13			VB 8021 Z3015
80	125	10			VB 8023 Z3015
80	130	13			VB 8024 Z3015
80	140	13			VB 8025 Z3015
82	100	12			VB 8210 Z3015
83	100	9			VB 8310 Z3015
83	110	13			VB 8311 Z3015
84	104	11			VB 8410 Z3015
85	100	9			VB 8510 Z3015
85	100	10			VB 8511 Z3015
85	102	13			VB 8512 Z3015
85	103	8			VB 8513 Z3015
85	105	10			VB 8515 Z3015
85	105	12			VB 8516 Z3015
85	110	10			VB 8517 Z3015
85	110	13			VB 8518 Z3015
85	110	15			VB 8519 Z3015
85	115	15			VB 8520 Z3015
85	120	12	•	•	VB 8525 Z3015
85	120	13			VB 8526 Z3015
85	125	12			VB 8530 Z3015
85	125	13			VB 8531 Z3015
85	130	10			VB 8540 Z3015
85	130	13			VB 8541 Z3015
85	140	12			VB 8542 Z3015
87	114.3	13			VB 8711 Z3015
88	110	13			VB 8811 Z3015
90	110	8			VB 9011 Z3015
90	110	9			VB 9012 Z3015
90	110	10			VB 9012 Z3015
90	110	12	•		VB 9013 Z3015

1) For housings according to DIN 3760/3761
2) For housings according to ISO 6194

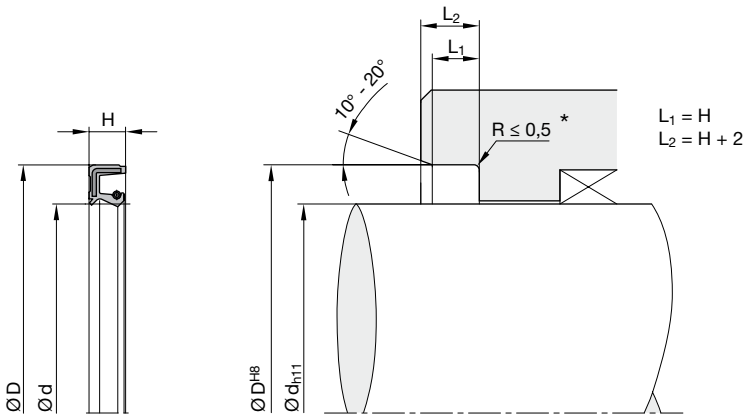


* In case of designs according to DIN and ISO, the radii given there should be used.

d	D	H	DIN[1]	ISO[2]	Order code
90	111	9			VB 9020 Z3015
90	115	9			VB 9025 Z3015
90	115	12			VB 9026 Z3015
90	118	12			VB 9027 Z3015
90	120	13			VB 9030 Z3015
90	120	15			VB 9031 Z3015
90	130	12			VB 9032 Z3015
92	110	10			VB 9211 Z3015
93	110	12			VB 9311 Z3015
95	115	12			VB 9511 Z3015
95	120	10			VB 9512 Z3015
95	120	12	•	•	VB 9513 Z3015
95	120	13			VB 9514 Z3015
95	125	12	•		VB 9520 Z3015
95	125	13			VB 9521 Z3015
95	125	15			VB 9522 Z3015
95	135	13			VB 9523 Z3015
96	117	12			VB 9611 Z3015
98	116	10			VB 9816 Z3015
100	115	9			VB A115 Z3015
100	120	10			VB A120 Z3015
100	120	12			VB A001 Z3015
100	120	15			VB A002 Z3015
100	130	13			VB A130 Z3015
100	130	15			VB A003 Z3015
100	135	12			VB A135 Z3015
100	140	12			VB A140 Z3015
100	150	13			VB A150 Z3015
100	162	12			VB A162 Z3015
101.01	127	12.7			VB A127 Z3015
105	125	13			VB A125 Z3015
105	130	12	•		VB A004 Z3015
105	135	12			VB A005 Z3015
105	135	14			VB A006 Z3015

d	D	H	DIN[1]	ISO[2]	Order code
105	140	13			VB A007 Z3015
105	140	15			VB A008 Z3015
110	125	12			VB B125 Z3015
110	135	12			VB B135 Z3015
110	140	12	•	•	VB B140 Z3015
110	150	15			VB B150 Z3015
110	160	12			VB B160 Z3015
114.3	139.7	12.7			VB B139 Z3015
115	130	12			VB B001 Z3015
115	135	12			VB B002 Z3015
115	140	12	•		VB B003 Z3015
115	140	15			VB B004 Z3015
115	142	14			VB B142 Z3015
115	145	12			VB B145 Z3015
115	145	15			VB B005 Z3015
115	150	12			VB B006 Z3015
115	165	15			VB B165 Z3015
117	143	13			VB B143 Z3015
120	130	13			VB C130 Z3015
120	140	7.5			VB C001 Z3015
120	140	12			VB C140 Z3015
120	140	15			VB C002 Z3015
120	145	12			VB C145 Z3015
120	146	13			VB C146 Z3015
120	150	12	•	•	VB C150 Z3015
120	150	15			VB C003 Z3015
120	160	12			VB C160 Z3015
120	170	14			VB C170 Z3015
120.65	146.05	12.7			VB C146 Z3015
122	138	12			VB C138 Z3015
125	143	13			VB C143 Z3015
125	145	13			VB C004 Z3015
125	150	12	•		VB C005 Z3015
125	150	15			VB C006 Z3015

1) For housings according to DIN 3760/3761
2) For housings according to ISO 6194

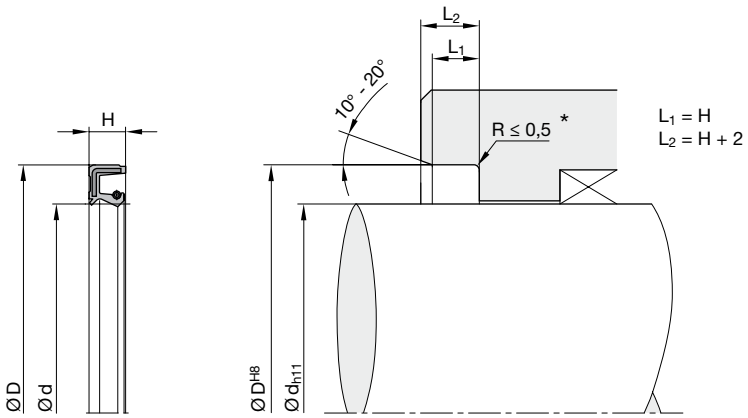


* In case of designs according to DIN and ISO, the radii given there should be used.

d	D	H	DIN[1]	ISO[2]	Order code
125	155	13			VB C155 Z3015
125	162	13			VB C162 Z3015
125	165	15			VB C165 Z3015
125	170	12			VB C170 Z3015
127	150	15			VB C007 Z3015
128	148	13			VB C148 Z3015
130	150	10			VB D150 Z3015
130	150	12			VB D001 Z3015
130	150	15			VB D002 Z3015
130	154	16			VB D154 Z3015
130	160	13			VB D160 Z3015
130	160	15			VB D003 Z3015
130	170	12			VB D170 Z3015
130	170	15			VB D004 Z3015
130	190	12			VB D190 Z3015
130	200	12			VB D200 Z3015
132	160	12			VB D005 Z3015
132	160	15			VB D006 Z3015
133.35	158.75	12.63			VB D158 Z3015
135	160	13			VB D007 Z3015
135	160	15			VB D008 Z3015
135	165	12			VB D165 Z3015
135	165	15			VB D009 Z3015
135	170	12	•		VB D010 Z3015
135	170	15			VB D011 Z3015
135	180	15			VB D180 Z3015
135	200	12			VB D012 Z3015
139.7	165.25	12.7			VB D166 Z3015
140	160	12			VB E001 Z3015
140	160	12			VB E160 Z3015
140	165	15			VB E165 Z3015
140	170	12			VB E170 Z3015
140	170	14			VB E002 Z3015
140	175	16			VB E175 Z3015

d	D	H	DIN[1]	ISO[2]	Order code
140	180	15			VB E180 Z3015
142	168	16			VB E168 Z3015
145	165	13			VB E165 Z3015
145	170	15			VB E003 Z3015
145	175	13			VB E175 Z3015
145	175	15	•		VB E004 Z3015
146	168.5	15			VB E169 Z3015
148	170	15			VB E005 Z3015
150	170	12			VB F170 Z3015
150	170	15			VB F001 Z3015
150	172	10			VB F172 Z3015
150	178	13			VB F178 Z3015
150	180	12			VB F180 Z3015
150	180	14			VB F002 Z3015
150	180	15	•	•	VB F003 Z3015
152.4	177.8	12.7			VB F177 Z3015
155	180	13			VB F004 Z3015
155	180	15			VB F005 Z3015
158.75	182.6	16			VB F183 Z3015
160	180	12			VB G180 Z3015
160	180	13			VB G001 Z3015
160	182	18			VB G182 Z3015
160	185	10			VB G185 Z3015
160	185	13			VB G002 Z3015
160	187.5	15			VB G188 Z3015
160	190	13			VB G190 Z3015
160	190	15	•	•	VB G003 Z3015
165	190	13			VB G004 Z3015
165	200	15			VB G200 Z3015
170	190	8.5			VB H001 Z3015
170	190	15			VB H002 Z3015
170	200	12			VB H003 Z3015
170	200	15			VB H200 Z3015
172	190	8.5			VB H190 Z3015

1) For housings according to DIN 3760/3761
2) For housings according to ISO 6194



* In case of designs according to DIN and ISO, the radii given there should be used.

d	D	H	DIN[1)]	ISO[2)]	Order code
175	200	13			VB H004 Z3015
175	200	15			VB H005 Z3015
175	230	20			VB H230 Z3015
180	200	13			VB J200 Z3015
180	200	15			VB J001 Z3015
180	205	15			VB J205 Z3015
180	210	15	•	•	VB J210 Z3015
185	210	15			VB J002 Z3015
185	215	15			VB J215 Z3015
190	215	16			VB J215 Z3015
190	220	10			VB K220 Z3015
190	220	15	•	•	VB K001 Z3015
190	225	12			VB K225 Z3015
190	225	12			VB K002 Z3015
195	230	20			VB K230 Z3015
200	230	15	•	•	VB L230 Z3015
200	250	15			VB L250 Z3015
210	240	15	•		VB L240 Z3015
220	250	16			VB M250 Z3015
220	255	16			VB M255 Z3015
230	260	15	•		VB M260 Z3015
240	270	15	•	•	VB N270 Z3015
240	280	15			VB N280 Z3015
250	280	15	•		VB N280 Z3015
260	290	16			VB O290 Z3015
270	310	15			VB O310 Z3015
300	332	16			VB Q332 Z3015
300	340	18			VB Q340 Z3015
300	340	20	•	•	VB Q302 Z3015
340	380	20	•	•	VB Q380 Z3015

1) For housings according to DIN 3760/3761
2) For housings according to ISO 6194

- Design for grooves according to ISO 6194.
- Lip ring with spiral spring for radial preloading.
- Cut sealing edge for high dynamic sealing effect.
- Metallic interference fit at the groove bottom diameter. Compared with the fully rubber-covered VA shaft seal ring, this results in higher protection from the seal being pressed out of the groove.
- Easy installation.

Range of application

Primarily for sealing oil- and grease-lubricated shaft ducts with very little or no exposure to external (ambient) dirt.

Operating pressure	≤ 0.5 bar
Operating temperature	
NBR	-30 to +100 °C
HNBR	-30 to +140 °C
FKM	-20 to +180 °C
Sliding speed	
NBR	≤ 12 m/s
HNBR	≤ 25 m/s
FKM	≤ 40 m/s
Media	Mineral oil based hydraulic oils, PAO, synthetic esters

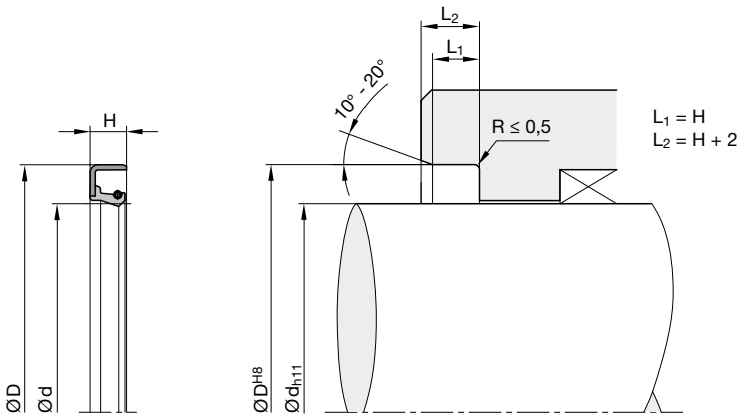
Compounds

Standard:	Z3015, NBR compound, nitrosamine-free (≈ 75 Shore A)
For higher requirements:	Z3011, HNBR compound (≈ 75 Shore A)
	Z3000, FKM compound (≈ 75 Shore A)

Installation

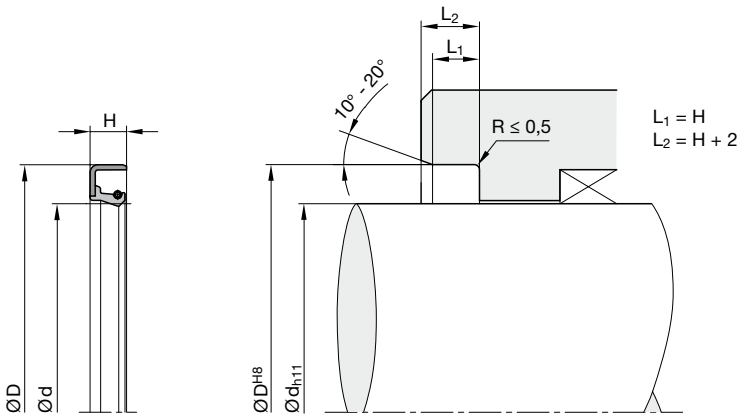
The axial groove depth should correspond to the specifications in ISO 6194. To avoid damage to the sealing edge, the seals should not be pulled over sharp edges during installation.
Installation as recommended in the above standard is the prerequisite for proper performance of the seal.

In case of special operating conditions (specific pressure loads, temperature, speed, use in water, HFA, HFB fluids etc.), please contact our consultancy service for a selection of the material and design best suiting your particular application requirements.



d	D	H	Order code
6	16	7	VC 0616 Z3015
6	22	7	VC 0622 Z3015
7	22	7	VC 0722 Z3015
8	22	7	VC 0822 Z3015
8	24	7	VC 0824 Z3015
9	22	7	VC 0922 Z3015
10	22	7	VC 1022 Z3015
10	25	7	VC 1025 Z3015
12	24	7	VC 1224 Z3015
12	25	7	VC 1225 Z3015
12	30	7	VC 1230 Z3015
15	26	7	VC 1526 Z3015
15	30	7	VC 1530 Z3015
15	35	7	VC 1535 Z3015
16	30	7	VC 1630 Z3015
18	30	7	VC 1830 Z3015
18	35	7	VC 1835 Z3015
20	35	7	VC 2035 Z3015
20	40	7	VC 2040 Z3015
22	35	7	VC 2235 Z3015
22	40	7	VC 2240 Z3015
22	47	7	VC 2247 Z3015
25	40	7	VC 2547 Z3015
25	47	7	VC 2547 Z3015
25	52	7	VC 2552 Z3015
28	40	7	VC 2840 Z3015
28	47	7	VC 2847 Z3015
28	52	7	VC 2852 Z3015
30	42	7	VC 3042 Z3015
30	47	7	VC 3047 Z3015
30	52	7	VC 3052 Z3015
32	45	7	VC 3245 Z3015
32	47	7	VC 3247 Z3015
32	52	8	VC 3252 Z3015

d	D	H	Order code
35	50	8	VC 3550 Z3015
35	52	8	VC 3552 Z3015
35	55	8	VC 3555 Z3015
38	55	8	VC 3855 Z3015
38	58	8	VC 3858 Z3015
38	62	8	VC 3862 Z3015
40	55	8	VC 4055 Z3015
40	62	8	VC 4062 Z3015
42	55	8	VC 4255 Z3015
42	62	8	VC 4262 Z3015
45	62	8	VC 4562 Z3015
45	65	8	VC 4565 Z3015
50	65	8	VC 5065 Z3015
50	72	8	VC 5072 Z3015
55	72	8	VC 5572 Z3015
55	80	8	VC 5580 Z3015
60	80	8	VC 6080 Z3015
60	85	8	VC 6085 Z3015
65	85	10	VC 6585 Z3015
65	90	10	VC 6090 Z3015
70	90	10	VC 7090 Z3015
70	95	10	VC 7095 Z3015
75	95	10	VC 7595 Z3015
75	100	10	VC 7501 Z3015
80	100	10	VC 8001 Z3015
80	110	10	VC 8010 Z3015
85	110	12	VC 8510 Z3015
85	120	12	VC 8512 Z3015
90	120	12	VC 9012 Z3015
95	120	12	VC 9512 Z3015
100	125	12	VC A125 Z3015
110	140	12	VC B140 Z3015
120	150	12	VC C120 Z3015
130	160	12	VC D160 Z3015



d	D	H	Order code
140	170	15	VC E170 Z3015
150	180	15	VC F180 Z3015
160	190	15	VC G190 Z3015
170	200	15	VC H200 Z3015
180	210	15	VC J210 Z3015
190	220	15	VC K220 Z3015
200	230	15	VC L230 Z3015
220	250	15	VC M250 Z3015
240	270	20	VC N270 Z3015
260	300	20	VC O300 Z3015
280	320	20	VC P320 Z3015
300	340	20	VC Q340 Z3015
320	360	20	VC Q360 Z3015
340	380	20	VC Q380 Z3015
360	400	20	VC Q400 Z3015
380	420	20	VC Q420 Z3015
400	440	20	VC R440 Z3015
450	500	25	VC R500 Z3015
480	530	25	VC R530 Z3015

- Design for grooves according to ISO 6194.
- Lip ring with spiral spring for radial preloading.
- Cut sealing edge for high dynamic sealing effect.
- Metallic interference fit at the groove bottom diameter. Compared with the fully rubber-covered VB shaft seal ring, this results in higher protection from the seal being pressed out of the groove.
- An additional protective lip (dirt lip) prevents intrusion of dirt particles and thus increases functional reliability.
- Easy installation.

Range of application

Primarily for sealing oil- and grease-lubricated shaft ducts with little exposure to external (ambient) dirt.

Operating pressure	≤ 0.5 bar
Operating temperature	
NBR	-30 to +100 °C
HNBR	-30 to +140 °C
FKM	-20 to +180 °C
Sliding speed	
NBR	≤ 12 m/s
HNBR	≤ 25 m/s
FKM	≤ 40 m/s
Media	Mineral oil based hydraulic oils, PAO, synthetic esters

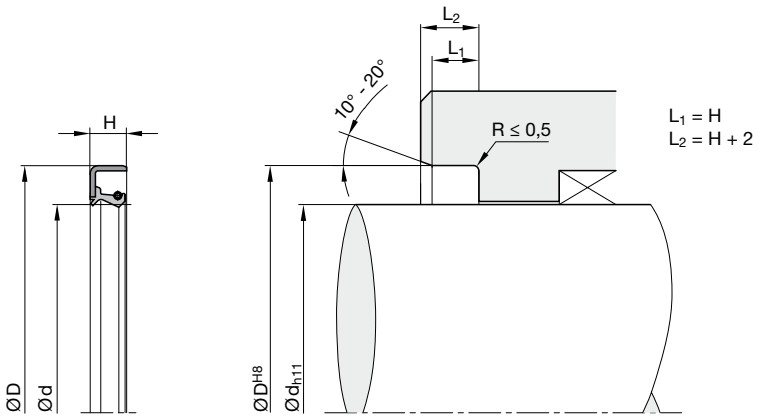
Compounds

Standard:	Z3015, NBR compound, nitrosamine-free (≈ 75 Shore A)
For higher requirements:	Z3011, HNBR compound (≈ 75 Shore A)
	Z3000, FKM compound (≈ 75 Shore A)

Installation

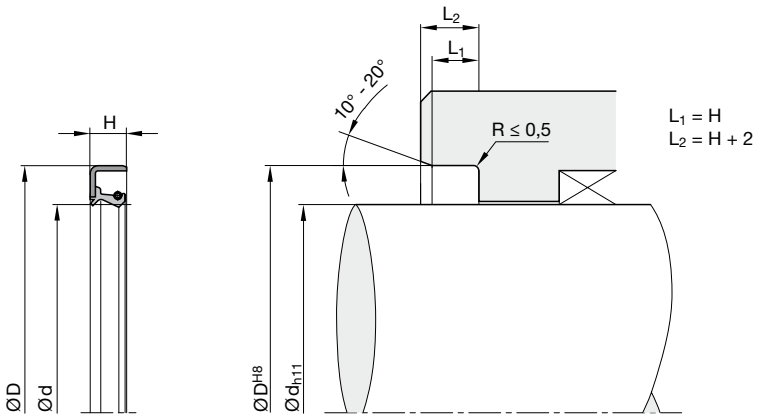
The axial groove depth should correspond to the specifications in ISO 6194. To avoid damage to the sealing edge, the seals should not be pulled over sharp edges during installation.
The protective lip generates additional heat in the sealing area. Therefore, a small amount of lubricating grease to minimise friction should be placed between the sealing lip and the protective lip when installing the seal seal (maximum of 50 % of the empty volume between the sealing lip and the dust lip). Installation as recommended in the above standard is the prerequisite for proper performance of the seal.

In case of special operating conditions (specific pressure loads, temperature, speed, use in water, HFA, HFB fluids etc.), please contact our consultancy service for a selection of the material and design best suiting your particular application requirements.



d	D	H	Order code
6	16	7	VD 0616 Z3015
6	22	7	VD 0622 Z3015
7	22	7	VD 0722 Z3015
8	22	7	VD 0822 Z3015
8	24	7	VD 0824 Z3015
9	22	7	VD 0922 Z3015
10	22	7	VD 1022 Z3015
10	25	7	VD 1025 Z3015
12	24	7	VD 1224 Z3015
12	25	7	VD 1225 Z3015
12	30	7	VD 1230 Z3015
15	26	7	VD 1526 Z3015
15	30	7	VD 1530 Z3015
15	35	7	VD 1535 Z3015
16	30	7	VD 1630 Z3015
18	30	7	VD 1830 Z3015
18	35	7	VD 1835 Z3015
20	35	7	VD 2035 Z3015
20	40	7	VD 2040 Z3015
22	35	7	VD 2235 Z3015
22	40	7	VD 2240 Z3015
22	47	7	VD 2247 Z3015
25	40	7	VD 2547 Z3015
25	47	7	VD 2547 Z3015
25	52	7	VD 2552 Z3015
28	40	7	VD 2840 Z3015
28	47	7	VD 2847 Z3015
28	52	7	VD 2852 Z3015
30	42	7	VD 3042 Z3015
30	47	7	VD 3047 Z3015
30	52	7	VD 3052 Z3015
32	45	7	VD 3245 Z3015
32	47	7	VD 3247 Z3015
32	52	8	VD 3252 Z3015

d	D	H	Order code
35	50	8	VD 3550 Z3015
35	52	8	VD 3552 Z3015
35	55	8	VD 3555 Z3015
38	55	8	VD 3855 Z3015
38	58	8	VD 3858 Z3015
38	62	8	VD 3862 Z3015
40	55	8	VD 4055 Z3015
40	62	8	VD 4062 Z3015
42	55	8	VD 4255 Z3015
42	62	8	VD 4262 Z3015
45	62	8	VD 4562 Z3015
45	65	8	VD 4565 Z3015
50	65	8	VD 5065 Z3015
50	72	8	VD 5072 Z3015
55	72	8	VD 5572 Z3015
55	80	8	VD 5580 Z3015
60	80	8	VD 6080 Z3015
60	85	8	VD 6085 Z3015
65	85	10	VD 6585 Z3015
65	90	10	VD 6090 Z3015
70	90	10	VD 7090 Z3015
70	95	10	VD 7095 Z3015
75	95	10	VD 7595 Z3015
75	100	10	VD 7501 Z3015
80	100	10	VD 8001 Z3015
80	110	10	VD 8010 Z3015
85	110	12	VD 8510 Z3015
85	120	12	VD 8512 Z3015
90	120	12	VD 9012 Z3015
95	120	12	VD 9512 Z3015
100	125	12	VD A125 Z3015
110	140	12	VD B140 Z3015
120	150	12	VD C120 Z3015
130	160	12	VD D160 Z3015



d	D	H	Order code
140	170	15	VD E170 Z3015
150	180	15	VD F180 Z3015
160	190	15	VD G190 Z3015
170	200	15	VD H200 Z3015
180	210	15	VD J210 Z3015
190	220	15	VD K220 Z3015
200	230	15	VD L230 Z3015
220	250	15	VD M250 Z3015
240	270	20	VD N270 Z3015
260	300	20	VD O300 Z3015
280	320	20	VD P320 Z3015
300	340	20	VD Q340 Z3015
320	360	20	VD Q360 Z3015
340	380	20	VD Q380 Z3015
360	400	20	VD Q400 Z3015
380	420	20	VD Q420 Z3015
400	440	20	VD R440 Z3015
450	500	25	VD R500 Z3015
480	530	25	VD R530 Z3015

- Low-friction sealing solution for sealing bearings.
- Can also be used as dirt wiper when inversely installed.
- Metallic housing.
- Cut sealing edge for high dynamic sealing effect.
- Low friction and heat development.
- Compact seal design.
- Easy installation.
- The dimensional range is oriented to the grooves according to DIN 3760.

Range of application

Primarily for sealing grease-lubricated bearings with very little or no exposure to external (ambient) dirt.

Operating pressure	≤ 0.1 bar
Operating temperature	
NBR	-30 to +100 °C
HNBR	-30 to +140 °C
FKM	-20 to +180 °C
Sliding speed	
NBR	≤ 12 m/s
HNBR	≤ 25 m/s
FKM	≤ 40 m/s
Media	Mineral oil based hydraulic oils, PAO, synthetic esters

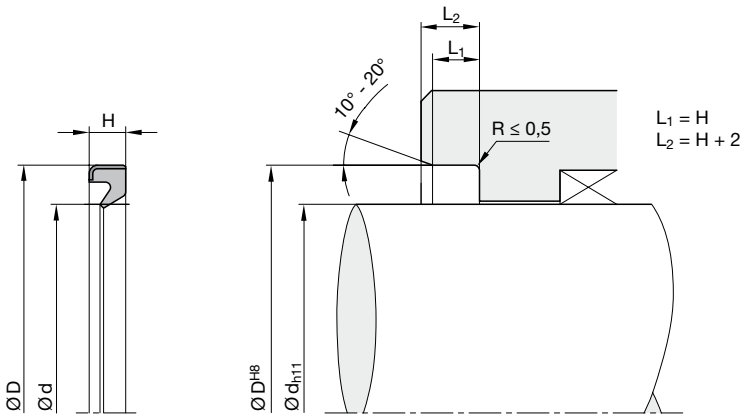
Compounds

Standard:	Z5199, NBR compound, nitrosamine-free (≈ 75 Shore A)
For higher requirements:	Z5198, HNBR compound (≈ 75 Shore A)
	Z5223, FKM compound (≈ 75 Shore A)

Installation

The axial groove depth should correspond to the specifications in DIN 3760/ 3761. To avoid damage to the sealing edge, the seals should not be pulled over sharp edges during installation.
Installation as recommended in the above standards is the prerequisite for proper performance of the seal.

In case of special operating conditions (specific pressure loads, temperature, speed, use in water, HFA, HFB fluids etc.), please contact our consultancy service for a selection of the material and design best suiting your particular application requirements.



d	D	H	Order code
6	14	4	VG 0614 Z5199
8	16	4	VG 0816 Z5199
10	20	4	VG 1020 Z5199
12	22	4	VG 1222 Z5199
15	25	4	VG 1525 Z5199
16	26	4	VG 1626 Z5199
18	28	4	VG 1828 Z5199
20	30	4	VG 2030 Z5199
20	32	5	VG 2032 Z5199
22	32	5	VG 2232 Z5199
25	35	5	VG 2535 Z5199
28	38	5	VG 2838 Z5199
30	40	5	VG 3040 Z5199
30	42	5	VG 3042 Z5199
32	42	5	VG 3242 Z5199
35	45	5	VG 3545 Z5199
38	48	5	VG 3848 Z5199
40	50	5	VG 4050 Z5199
40	52	5	VG 4052 Z5199
42	52	5	VG 4252 Z5199
45	55	5	VG 4555 Z5199
50	60	5	VG 5060 Z5199
60	72	6	VG 6072 Z5199
65	77	6	VG 6577 Z5199
70	82	6	VG 7082 Z5199
80	92	6	VG 8092 Z5199

- Low-friction sealing solution for sealing bearings.
- Can also be used as dirt wiper when inversely installed.
- Elastomeric outer case for high static sealing effect, also vis-à-vis rough groove surfaces.
- Cut sealing edge for high dynamic sealing effect.
- Low friction and heat development.
- Compact seal design.
- Easy installation.
- The dimensional range is oriented to the grooves according to DIN 3760.

Range of application

Primarily for sealing grease-lubricated bearings with very little or no exposure to external (ambient) dirt.

Operating pressure	≤ 0.1 bar
Operating temperature	
NBR	-30 to +100 °C
HNBR	-30 to +140 °C
FKM	-20 to +180 °C
Sliding speed	
NBR	≤ 12 m/s
HNBR	≤ 25 m/s
FKM	≤ 40 m/s
Media	Mineral oil based hydraulic oils, PAO, synthetic esters

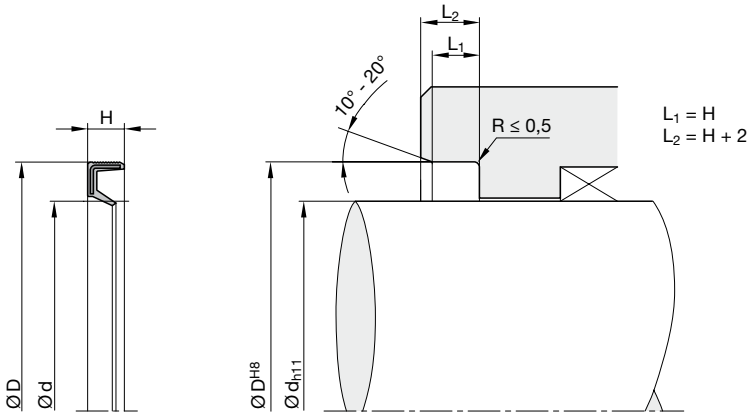
Compounds

Standard:	Z5199, NBR compound, nitrosamine-free (≈ 75 Shore A)
For higher requirements:	Z5198, HNBR compound (≈ 75 Shore A)
	Z5223, FKM compound (≈ 75 Shore A)

Installation

The axial groove depth should correspond to the specifications in DIN 3760/ 3761. To avoid damage to the sealing edge, the seals should not be pulled over sharp edges during installation.
Installation as recommended in the above standards is the prerequisite for proper performance of the seal.

In case of special operating conditions (specific pressure loads, temperature, speed, use in water, HFA, HFB fluids etc.), please contact our consultancy service for a selection of the material and design best suiting your particular application requirements.



d	D	H	Order code
4	8	2	VK 0408 Z5199
4	11	2	VK 0411 Z5199
5	10	2	VK 0510 Z5199
5	11	2	VK 0511 Z5199
6	11	3	VK 0611 Z5199
7	11	2	VK 0711 Z5199
10	14	3	VK 1014 Z5199
10	15	3	VK 1015 Z5199
12	16	3	VK 1216 Z5199
12	18	3	VK 1218 Z5199
12	19	5	VK 1219 Z5199
12	24	4	VK 1224 Z5199
14	18	3	VK 1418 Z5199
14	20	3	VK 1420 Z5199
14	22	5	VK 1422 Z5199
15	21	4	VK 1521 Z5199
15	27	5	VK 1526 Z5199
15	27	7	VK 1527 Z5199
15	30	5	VK 1530 Z5199
16	24	3	VK 1624 Z5199
16	25	3	VK 1625 Z5199
17	25	3	VK 1725 Z5199
17	32	6	VK 1731 Z5199
17	32	7	VK 1732 Z5199
17	35	5	VK 1735 Z5199
18	24	3	VK 1823 Z5199
18	24	4	VK 1824 Z5199
18	24	7	VK 1425 Z5199
18	40	7	VK 1840 Z5199
19	26	5	VK 1926 Z5199
19	27	4	VK 1927 Z5199
20	26	2	VK 2027 Z5199
20	26	4	VK 2026 Z5199
20	35	7	VK 2035 Z5199

d	D	H	Order code
22	28	4	VK 2228 Z5199
22	30	4	VK 2230 Z5199
24	32	4	VK 2432 Z5199
25	32	4	VK 2532 Z5199
25	33	4	VK 2533 Z5199
25	35	5	VK 2535 Z5199
28	50	7	VK 2850 Z5199
30	40	4	VK 3040 Z5199
32	42	4	VK 3242 Z5199
40	45	2	VK 4045 Z5199
40	50	4	VK 4050 Z5199
40	55	5	VK 4055 Z5199
40	55	7	VK 4055 Z5199
40	62	5	VK 4062 Z5199
45	55	4	VK 4555 Z5199
45	60	7	VK 4560 Z5199
52	75	8	VK 5275 Z5199
75	90	6	VK 7590 Z5199
80	95	4	VK 8095 Z5199

- Design for grooves according to DIN 3760 / 3761 or ISO 6194.
- For use in pressurised systems, particularly for hydraulic pumps and motors.
- Lip ring with spiral spring for radial preloading.
- Short, but pressure-stiff, flexible, spring-preloaded sealing lip.
- Interference fit on outer diameter.
- Cut sealing edge for high dynamic sealing effect.
- Elastomeric outer case for high static sealing effect.
- An additional protective lip (dirt lip) prevents intrusion of dirt particles and thus increases functional reliability.
- Easy installation.

Range of application

Primarily for sealing oil-lubricated shaft ducts with exposure to external (ambient) dirt.
For use in pressurised systems, particularly for hydraulic pumps and motors. Due to the engineering design of the systems a temporary excess pressure of up to 10 bar may occur at the seal.

Operating pressure	≤ 10 bar
Operating temperature	
NBR	-30 to +100 °C
HNBR	-30 to +140 °C
FKM	-20 to +180 °C
Sliding speed	
NBR	≤ 12 m/s
HNBR	≤ 25 m/s
FKM	≤ 40 m/s
Media	Mineral oil based hydraulic oils, PAO, synthetic esters

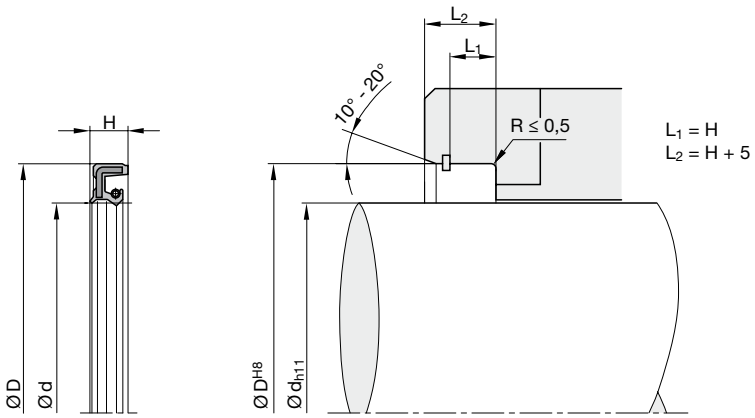
Compounds

Standard:	Z3015, NBR compound, nitrosamine-free 75 Shore A)
For higher requirements:	Z3011, HNBR compound (≈ 75 Shore A)
	Z3000, FKM compound (≈ 75 Shore A)

Installation

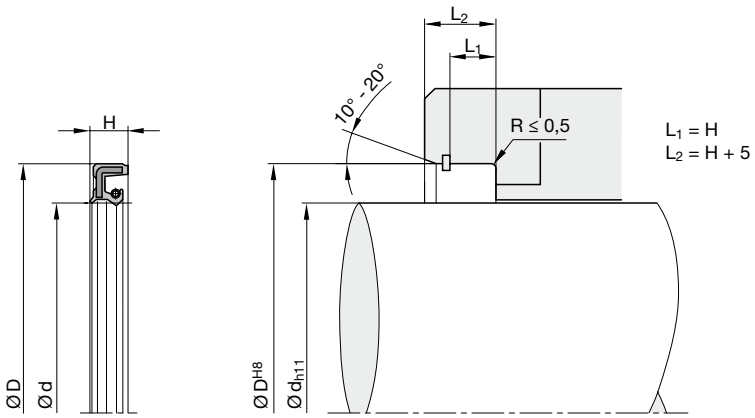
The axial groove depth should correspond to the specifications in DIN 3760/ 3761 and ISO 6194. To avoid damage to the sealing edge, the seals should not be pulled over sharp edges during installation.
With respect to the seal being pressed out of the groove under pressure loading an additional axial retention of the shaft seal ring should be provided.
The protective lip generates additional heat in the sealing area. Therefore, a small amount of lubricating grease to minimise friction should be placed between the sealing lip and the protective lip when installing the seal.
Installation as recommended in the above standards is the prerequisite for proper performance of the seal.

In case of special operating conditions (specific pressure loads, temperature, speed, use in water, HFA, HFB fluids etc.), please contact our consultancy service for a selection of the material and design best suiting your particular application requirements.



d	D	H	Order code
8	22	6/6.6	VP 0822 Z3015
10	22	6/6.6	VP 1022 Z3015
12	22	6/6.6	VP 1222 Z3015
12	24	6/6.6	VP 1224 Z3015
12	32	6/6.6	VP 1230 Z3015
14	24	6/6.6	VP 1424 Z3015
15	25	6/6.6	VP 1525 Z3015
15	30	6/6.6	VP 1530 Z3015
15	32	6/6.6	VP 1532 Z3015
15	35	6/6.6	VP 1535 Z3015
16	26	6/6.6	VP 1626 Z3015
16	32	6/6.6	VP 1632 Z3015
16	40	6/6.6	VP 1640 Z3015
17	30	6/6.6	VP 1729 Z3015
17	30	7/8	VP 1730 Z3015
17	32	7/8	VP 1732 Z3015
17	35	6/6.6	VP 1735 Z3015
17	40	6/6.6	VP 1740 Z3015
18	30	7/8	VP 1830 Z3015
18	32	6/6.6	VP 1832 Z3015
18	40	6/6.6	VP 1840 Z3015
19	31.66	6/6.6	VP 1931 Z3015
19	35	6/6.6	VP 1935 Z3015
20	30	6/6.6	VP 2030 Z3015
20	32	6/6.6	VP 2032 Z3015
20	35	6/6.6	VP 2035 Z3015
20	40	6/6.6	VP 2040 Z3015
22	32	6/6.6	VP 2232 Z3015
22	35	6/6.6	VP 2235 Z3015
24	40	6/6.6	VP 2440 Z3015
25	35	6/6.6	VP 2535 Z3015
25	37	6/6.6	VP 2537 Z3015
25	40	6/6.6	VP 2540 Z3015
25	42	6/6.6	VP 2542 Z3015

d	D	H	Order code
25	45	6/6.6	VP 2545 Z3015
25	47	6/6.6	VP 2547 Z3015
25.4	38.1	6/6.6	VP 2538 Z3015
26	40	6/6.6	VP 2640 Z3015
27	39	6/6.6	VP 2739 Z3015
28	40	6/6.6	VP 2840 Z3015
28	42	6/6.6	VP 2842 Z3015
28	45	6/6.6	VP 2845 Z3015
30	42	6/6.6	VP 3042 Z3015
30	45	6/6.6	VP 3045 Z3015
30	50	6/6.6	VP 3050 Z3015
30	52	6/6.6	VP 3051 Z3015
30	52	7/8	VP 3052 Z3015
30	55	6/6.6	VP 3055 Z3015
30	62	6/6.6	VP 3062 Z3015
31.7	44.5	6/6.6	VP 3244 Z3015
32	45	6/6.6	VP 3245 Z3015
32	47	6/6.6	VP 3247 Z3015
32	52	6/6.6	VP 3252 Z3015
35	47	6/6.6	VP 3547 Z3015
35	50	6/6.6	VP 3550 Z3015
35	52	6/6.6	VP 3552 Z3015
35	55	6/6.6	VP 3555 Z3015
38	50	6/6.6	VP 3850 Z3015
40	52	6/6.6	VP 4052 Z3015
40	55	7/8	VP 4055 Z3015
40	60	6/6.6	VP 4060 Z3015
40	62	6/6.6	VP 4062 Z3015
40	65	6/6.6	VP 4065 Z3015
42	62	6/6.6	VP 4262 Z3015
44.45	60	7/8	VP 4445 Z3015
45	58	7/8	VP 4558 Z3015
45	60	7/8	VP 4560 Z3015
45	62	7/8	VP 4562 Z3015



d	D	H	Order code
45	65	7/8	VP 4565 Z3015
45	68	7/8	VP 4568 Z3015
48	72	7/8	VP 4872 Z3015
50	62	7/8	VP 5062 Z3015
50	65	7/8	VP 5065 Z3015
50	70	7/8	VP 5070 Z3015
50	72	7/8	VP 5072 Z3015
50	75	7/8	VP 5075 Z3015
50	80	7/8	VP 5080 Z3015
52	68	7/8	VP 5268 Z3015
52	72	7/8	VP 5272 Z3015
55	70	7/8	VP 5570 Z3015
55	72	7/8	VP 5572 Z3015
55	75	7/8	VP 5575 Z3015
55	90	7/8	VP 5590 Z3015
60	72	7/8	VP 6072 Z3015
60	75	7/8	VP 6075 Z3015
60	80	7/8	VP 6080 Z3015
60	85	7/8	VP 6085 Z3015
60	90	7/8	VP 6090 Z3015
62	85	7/8	VP 6285 Z3015
65	80	7/8	VP 6580 Z3015
65	85	7/8	VP 6585 Z3015
65	90	7/8	VP 6590 Z3015
65	95	7/8	VP 6595 Z3015
70	82	7/8	VP 7082 Z3015
70	85	7/8	VP 7085 Z3015
70	90	7/8	VP 7090 Z3015
75	90	7/8	VP 7590 Z3015
75	100	7/8	VP 7510 Z3015
80	95	7/8	VP 8095 Z3015
80	100	7/8	VP 8010 Z3015
80	105	7/8	VP 8011 Z3015
85	105	7/8	VP 8510 Z3015

d	D	H	Order code
85	110	7/8	VP 8511 Z3015
85	120	7/8	VP 8512 Z3015
90	110	7/8	VP 9010 Z3015
90	115	7/8	VP 9011 Z3015
90	120	7/8	VP 9012 Z3015
95	120	7/8	VP 9512 Z3015
100	120	7/8	VP A120 Z3015
100	125	7/8	VP A125 Z3015
105	130	7/8	VP A130 Z3015
110	125	7/8	VP B125 Z3015
110	130	7/8	VP B130 Z3015
110	135	7/8	VP B135 Z3015
110	140	7/8	VP B140 Z3015
120	135	7/8	VP C135 Z3015
120	140	7/8	VP C140 Z3015
120	145	7/8	VP C145 Z3015
120	150	7/8	VP C150 Z3015
130	145	7/8	VP D145 Z3015
130	150	7/8	VP D150 Z3015
130	155	7/8	VP D155 Z3015
140	155	7/8	VP E155 Z3015
140	160	7/8	VP E160 Z3015
140	165	7/8	VP E165 Z3015
150	165	7/8	VP F165 Z3015
150	170	7/8	VP F170 Z3015
150	180	7/8	VP F180 Z3015
160	180	7/8	VP G180 Z3015
160	185	7/8	VP G185 Z3015
170	190	7/8	VP H190 Z3015
170	200	7/8	VP H200 Z3015
180	200	7/8	VP J200 Z3015
180	210	8.5/9.5	VP J210 Z3015
190	210	7/8	VP K210 Z3015
200	210	7/8	VP L210 Z3015

- Design for grooves according to DIN 3760 / 3761 or ISO 6194.
- For use in pressurised systems, particularly for hydraulic pumps and motors.
- Lip ring with spiral spring for radial preloading.
- Short, but pressure-stiff, flexible, spring-preloaded sealing lip.
- Interference fit on outer diameter.
- Cut sealing edge for high dynamic sealing effect.
- Elastomeric outer case for high static sealing effect.
- An additional protective lip (dirt lip) prevents intrusion of dirt particles and thus increases functional reliability.
- Two axial bores in the housing offset by 180° and sealed with an elastomer compound enable easier removal of the seal from the groove.
- Easy installation.
- Available with smooth or grooved outer contour.

Range of application

Primarily for sealing oil-lubricated shaft ducts with exposure to external (ambient) dirt.
For use in pressurised systems, particularly for hydraulic pumps and motors. Due to the engineering design of the systems a temporary excess pressure of up to 10 bar may occur at the seal.

Operating pressure	≤ 10 bar
Operating temperature	
NBR	-30 to +100 °C
HNBR	-30 to +140 °C
FKM	-20 to +180 °C
Sliding speed	
NBR	≤ 12 m/s
HNBR	≤ 25 m/s
FKM	≤ 40 m/s
Media	Mineral oil based hydraulic oils, PAO, synthetic esters

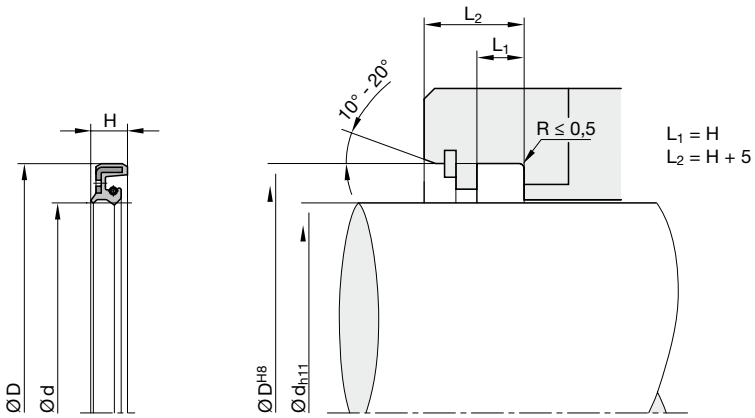
Compounds

Standard: Z3000, FKM compound (≈ 75 Shore A)

Installation

The axial groove depth should correspond to the specifications in DIN 3760/ 3761 and ISO 6194. To avoid damage to the sealing edge, the seals should not be pulled over sharp edges during installation.
With respect to the seal being pressed out of the groove under pressure loading an additional axial retention of the shaft seal ring should be provided.
The protective lip generates additional heat in the sealing area. Therefore, a small amount of lubricating grease to minimise friction should be placed between the sealing lip and the protective lip when installing the seal.
Installation as recommended in the above standards is the prerequisite for proper performance of the seal.

In case of special operating conditions (specific pressure loads, temperature, speed, use in water, HFA, HFB fluids etc.), please contact our consultancy service for a selection of the material and design best suiting your particular application requirements.



d	D	H	Order code
8	22	6/6.8	VR 0822 Z3000
10	22	6/6.8	VR 1022 Z3000
12	22	6/6.8	VR 1222 Z3000
12	24	6/6.8	VR 1224 Z3000
14	24	6/6.8	VR 1424 Z3000
15	32	6/6.8	VR 1532 Z3000
16	32	6/6.8	VR 1632 Z3000
17	30	6/6.8	VR 1730 Z3000
17	35	6/6.8	VR 1735 Z3000
18	32	6/6.8	VR 1832 Z3000
20	32	6/6.8	VR 2032 Z3000
20	35	6/6.8	VR 2035 Z3000
25	35	6/6.8	VR 2535 Z3000
25	40	6/6.8	VR 2540 Z3000
30	52	6/6.8	VR 3052 Z3000
30	62	6/6.8	VR 3062 Z3000
35	47	6/6.8	VR 3547 Z3000
35	52	6/6.8	VR 3552 Z3000
40	52	6/6.8	VR 4052 Z3000
40	55	6/6.8	VR 4055 Z3000
40	62	6/6.8	VR 4062 Z3000
40	65	6/6.8	VR 4065 Z3000
45	60	7/8	VR 4560 Z3000
45	65	7/8	VR 4565 Z3000
50	62	7/8	VR 5062 Z3000
50	65	7/8	VR 5065 Z3000
50	72	7/8	VR 5072 Z3000
50	80	7/8	VR 5080 Z3000
55	72	7/8	VR 5572 Z3000
60	72	7/8	VR 6072 Z3000
60	80	7/8	VR 6080 Z3000
65	85	7/8	VR 6585 Z3000
70	85	7/8	VR 7085 Z3000
70	90	7/8	VR 7090 Z3000

d	D	H	Order code
75	90	7/8	VR 7590 Z3000

- Low-friction sealing solution for sealing bearings.
- Also usable as dirt wiper.
- Elastomeric outer case for high static sealing effect, also vis-à-vis rough groove surfaces.
- Cut sealing edge for high dynamic sealing effect.
- Low friction and heat development.
- An additional protective lip (dirt lip) prevents intrusion of dirt particles and thus increases functional reliability.
- Small seal design.
- Easy installation.
- The dimensional range is oriented to the grooves according to DIN 3760.

Range of application

Primarily for sealing grease-lubricated bearings with very little or no exposure to external (ambient) dirt.

Operating pressure	≤ 0,1 bar
Operating temperature	
NBR	-30 to +100 °C
HNBR	-30 to +140 °C
FKM	-20 to +180 °C
Sliding speed	
NBR	≤ 12 m/s
HNBR	≤ 25 m/s
FKM	≤ 40 m/s
Media	Mineral oil based hydraulic oils, PAO, synthetic esters

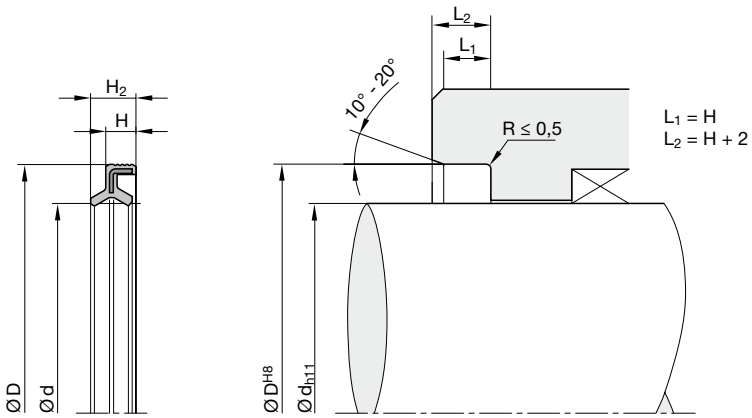
Compounds

Standard:	Z5199, NBR compound, nitrosamine-free (≈ 75 Shore A)
For higher requirements:	Z5198, HNBR compound (≈ 75 Shore A)
	Z5223, FKM compound (≈ 75 Shore A)

Installation

The axial groove depth should correspond to the specifications in DIN 3760/ 3761. To avoid damage to the sealing edge, the seals should not be pulled over sharp edges during installation.
The protective lip generates additional heat in the sealing area. Therefore, a small amount of lubricating grease to minimise friction should be placed between the sealing lip and the protective lip when installing the seal.
Installation as recommended in the above standards is the prerequisite for proper performance of the seal.

In case of special operating conditions (specific pressure loads, temperature, speed, use in water, HFA, HFB fluids etc.), please contact our consultancy service for a selection of the material and design best suiting your particular application requirements.



d	D	H	H_2	Order code
8	16	4	6	VS 0816 Z5199
10	18	4	6	VS 1018 Z5199
12	20	4	6	VS 1220 Z5199
14	22	4	6	VS 1422 Z5199
15	23	4	6	VS 1523 Z5199
16	24	4	6	VS 1624 Z5199
17	25	4	6	VS 1725 Z5199
18	26	4	6	VS 1826 Z5199
20	28	4	6	VS 2028 Z5199
20	30	4	6	VS 2030 Z5199
25	33	4	6	VS 2533 Z5199
25	35	4	6	VS 2535 Z5199
30	38	4	6	VS 3038 Z5199
30	40	4	6	VS 3040 Z5199
35	43	4	6	VS 3543 Z5199
35	45	4	6	VS 3545 Z5199
40	48	4	6	VS 4048 Z5199
40	50	4	6	VS 4050 Z5199
40	52	4	6	VS 4052 Z5199
45	60	4	6	VS 4560 Z5199
50	62	4	6	VS 5062 Z5199

- Design for grooves according to DIN 3760 / 3761 or ISO 6194.
- For use in pressurised systems, particularly for hydraulic pumps and motors.
- Metallic back-up ring to support the dynamic sealing lip in the inner diameter.
- Lip ring with spiral spring for radial preloading.
- Short, but pressure-stiff, flexible, spring-preloaded sealing lip.
- Interference fit on outer diameter.
- Cut sealing edge for high dynamic sealing effect.
- Elastomeric outer case for high static sealing effect.
- An additional protective lip (dirt lip) prevents intrusion of dirt particles and thus increases functional reliability.
- Two axial bores in the housing offset by 180° and sealed with an elastomer compound enable easier removal of the seal from the groove.
- Easy installation.
- Available with smooth or grooved outer contour.

Range of application

Primarily for sealing oil-lubricated shaft ducts with exposure to external (ambient) dirt.
For use in pressurised systems, particularly for hydraulic pumps and motors.

Operating pressure	≤ 30 bar
Operating temperature	
NBR	-30 to +100 °C
HNBR	-30 to +140 °C
FKM	-20 to +180 °C
Sliding speed	
NBR	≤ 12 m/s
HNBR	≤ 25 m/s
FKM	≤ 40 m/s
Media	Mineral oil based hydraulic oils, PAO, synthetic esters

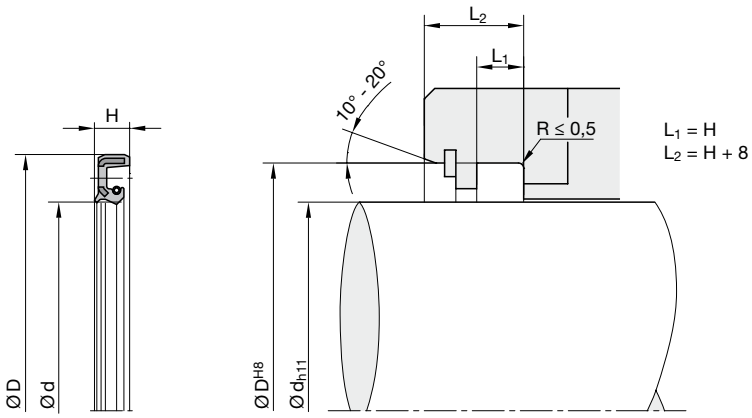
Compounds

Standard: Z3000, FKM compound (≈ 75 Shore A)

Installation

The axial groove depth should correspond to the specifications in DIN 3760/ 3761 and ISO 6194. To avoid damage to the sealing edge, the seals should not be pulled over sharp edges during installation.
With respect to the seal being pressed out of the groove under pressure loading an additional axial retention of the shaft seal ring should be provided.
The protective lip generates additional heat in the sealing area. Therefore, a small amount of lubricating grease to minimise friction should be placed between the sealing lip and the protective lip when installing the seal.
Installation as recommended in the above standards is the prerequisite for proper performance of the seal.

In case of special operating conditions (specific pressure loads, temperature, speed, use in water, HFA, HFB fluids etc.), please contact our consultancy service for a selection of the material and design best suiting your particular application requirements.



d	D	H	Order code
22	35	6/6.7	VT 2235 Z3000
25	35	6/6.7	VT 2535 Z3000
27	39	6/6.7	VT 2739 Z3000
30	52	6/6.7	VT 3052 Z3000
35	52	6/6.7	VT 3552 Z3000
40	62	6/6.7	VT 4062 Z3000
45	62	7/7.75	VT 4562 Z3000
45	65	6/6.7	VT 4565 Z3000
55	72	6/6.7	VT 5572 Z3000
55	72	7/7.75	VT 5573 Z3000
60	80	6/6.7	VT 6080 Z3000
70	90	7/7.75	VT 7090 Z3000

- Design for grooves according to DIN 3760 / 3761 or ISO 6194.
- For use in pressurised systems, particularly for hydraulic pumps and motors.
- Further development of the VP radial shaft seal ring for sealing of higher pressures. A metallic back-up ring supports the dynamic sealing lip in the inner diameter.
- Lip ring with spiral spring for radial preloading.
- Short, but pressure-stiff, flexible, spring-preloaded sealing lip.
- Interference fit on outer diameter.
- Cut sealing edge for high dynamic sealing effect.
- Elastomeric outer case for high static sealing effect.
- An additional protective lip (dirt lip) prevents intrusion of dirt particles and thus increases functional reliability.
- Easy installation.
- Available with smooth or grooved outer contour.

Range of application

Primarily for sealing oil-lubricated shaft ducts with exposure to external (ambient) dirt.
For use in pressurised systems, particularly for hydraulic pumps and motors.

Operating pressure	≤ 30 bar
Operating temperature	
NBR	-30 to +100 °C
HNBR	-30 to +140 °C
FKM	-20 to +180 °C
Sliding speed	
NBR	≤ 12 m/s
HNBR	≤ 25 m/s
FKM	≤ 40 m/s
Media	Mineral oil based hydraulic oils, PAO, synthetic esters

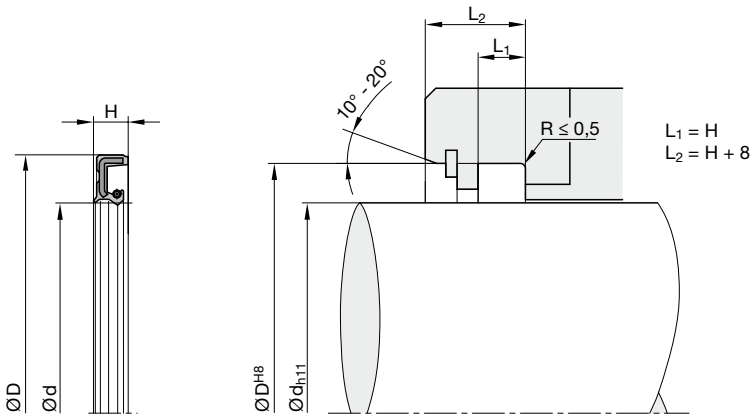
Compounds

Standard: Z3000, FKM compound (≈ 75 Shore A)

Installation

The axial groove depth should correspond to the specifications in DIN 3760/ 3761 and ISO 6194. To avoid damage to the sealing edge, the seals should not be pulled over sharp edges during installation.
With respect to the seal being pressed out of the groove under pressure loading an additional axial retention of the shaft seal ring should be provided.
The protective lip generates additional heat in the sealing area. Therefore, a small amount of lubricating grease to minimise friction should be placed between the sealing lip and the protective lip when installing the seal.
Installation as recommended in the above standards is the prerequisite for proper performance of the seal.

In case of special operating conditions (specific pressure loads, temperature, speed, use in water, HFA, HFB fluids etc.), please contact our consultancy service for a selection of the material and design best suiting your particular application requirements.



d	D	H	Order code
12	22	6/6.8	VU 1222 Z3000
17	30	7/8	VU 1730 Z3000
18	30	7/8	VU 1830 Z3000
18	35	7/8	VU 1835 Z3000
23	37	6/5.5	VU 2337 Z3000
30	42	6/6.6	VU 3042 Z3000
30	52	6/6.6	VU 3052 Z3000
32	47	6/6.6	VU 3247 Z3000
35	52	6/6.6	VU 3552 Z3000
45	62	6/6.6	VU 4562 Z3000
50	62	6/6.6	VU 5062 Z3000
50	65	6/6.6	VU 5065 Z3000
50	72	6/6.6	VU 5072 Z3000
60	72	6/6.6	VU 6072 Z3000
60	80	6/6.6	VU 6080 Z3000
70	82	6/6.6	VU 7082 Z3000
70	85	6/6.6	VU 7085 Z3000
70	90	6/6.6	VU 7090 Z3000

- Design for grooves according to DIN 3760 / 3761 or ISO 6194.
- For use in pressurised systems, particularly for hydraulic pumps and motors.
- Metallic back-up ring to support the dynamic sealing lip in the inner diameter.
- Lip ring with spiral spring for radial preloading.
- Short, but pressure-stiff, flexible, spring-preloaded sealing lip.
- An additional PTFE lip integrated into the dynamically sealing elastomeric sealing lip improves resistance against thermal and mechanical loads.
- Interference fit on outer diameter.
- Cut sealing edge for high dynamic sealing effect.
- Elastomeric outer case for high static sealing effect.
- An additional protective lip (dirt lip) prevents intrusion of dirt particles and thus increases functional reliability.
- Easy installation.
- Available with smooth or grooved outer contour.

Range of application

Primarily for sealing oil-lubricated shaft ducts with exposure to external (ambient) dirt.
For use in pressurised systems, particularly for hydraulic pumps and motors.

Operating pressure	≤ 60 bar
Operating temperature	
NBR	-30 to +100 °C
HNBR	-30 to +140 °C
FKM	-20 to +180 °C
Sliding speed	
NBR	≤ 12 m/s
HNBR	≤ 25 m/s
FKM	≤ 40 m/s
Media	Mineral oil based hydraulic oils, PAO, synthetic esters

Compounds

Standard: Z4006, FKM compound (≈ 75 Shore A)

Installation

The axial groove depth should correspond to the specifications in DIN 3760/ 3761 and ISO 6194. To avoid damage to the sealing edge, the seals should not be pulled over sharp edges during installation.
With respect to the seal being pressed out of the groove under pressure loading an additional axial retention of the shaft seal ring should be provided.
The protective lip generates additional heat in the sealing area. Therefore, a small amount of lubricating grease to minimise friction should be placed between the sealing lip and the protective lip when installing the seal.
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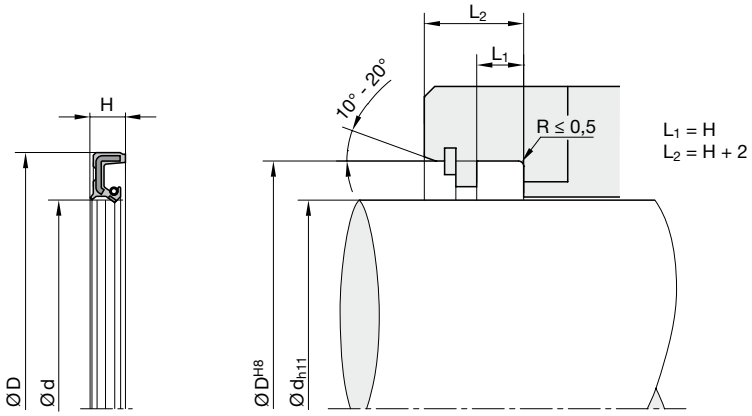

d	D	H	Order code
12	22	6/7	VV 1222 Z4006
19	30	6/6.5	VV 1930 Z4006
20	35	6/6.6	VV 2035 Z4006
22	35	6/6.6	VV 2235 Z4006
25	35	6/6.6	VV 2535 Z4006
25	36	5/5.6	VV 2536 Z4006
35.4	38.1	10.8/11.4	VV 2538 Z4006
27	39	6/6.6	VV 2739 Z4006
28	40	6/6.6	VV 2840 Z4006
30	42	6/6.6	VV 3042 Z4006
30	52	6/6.6	VV 3052 Z4006
32	47	6/6.6	VV 3247 Z4006
35	52	6/6.6	VV 3552 Z4006
35	55	6/6.6	VV 3555 Z4006
45	62	6/6.6	VV 4562 Z4006
50	62	6/6.6	VV 5062 Z4006
50	65	6/6.6	VV 5065 Z4006
50	72	6/6.6	VV 5072 Z4006
55	72	7/8	VV 5572 Z4006
60	72	6/6.6	VV 6072 Z4006
60	80	6/6.6	VV 6080 Z4006

- Design for grooves according to DIN 3760 / 3761 or ISO 6194.
- For use in pressurised systems, particularly for hydraulic pumps and motors.
- Metallic back-up ring to support the dynamic sealing lip in the inner diameter.
- Lip ring with spiral spring for radial preloading.
- Short, but pressure-stiff, flexible, spring-preloaded sealing lip.
- An additional PTFE lip integrated into the dynamically sealing elastomeric sealing lip improves resistance against thermal and mechanical loads.
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Installation

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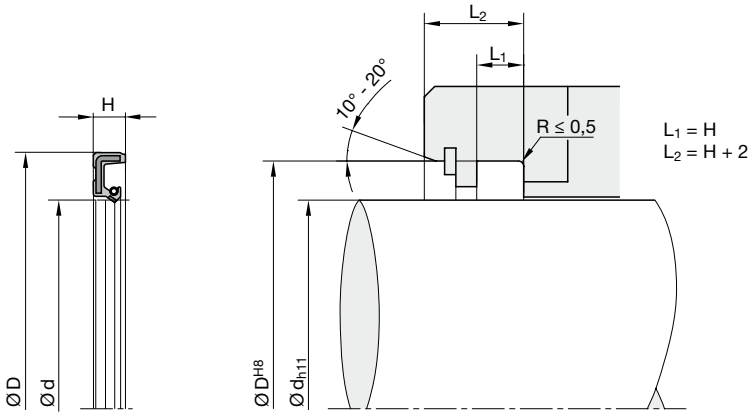

d	D	H	Order code
5	15	5	VW 0515 Z4006
20	35	6	VW 2035 Z4006
25	35	6	VW 2535 Z4006
30	62	6	VW 3062 Z4006
35	52	6	VW 3552 Z4006
45	65	6	VW 4565 Z4006
50	65	6	VW 5065 Z4006
60	75	6	VW 6075 Z4006

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