

Zurcon® U-Cup RU2



Single-acting U-Cup

Asymmetric, Double Lip,
Compact

Material:
Zurcon®



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■ Zurcon® U-Cup RU2



■ Description

Today, U-Cups are used primarily as seals for piston rods in hydraulic cylinders. U-Cups in polyurethane are proven elements, due to their good mechanical properties, for standard cylinder construction, particularly for mobile hydraulics under rough operating conditions. The U-Cup RU2 is a double lip seal in a compact design.

TYPE RU2

The compact U-Cup type RU2 is designed for small grooves. It is thus particularly suitable for use in space-saving designs. The compact form provides a high sealing effect even with low system pressures.

The U-Cup has two sealing lips in the dynamic sealing zone. The compact form with two sealing lips provides an improvement in the leakage behavior at low system pressures. Due to the incorporation of an oil trap between the two sealing lips, friction at pressures above approximately 10 MPa is reduced. Furthermore, the second sealing lip prevents the entry of dirt from the atmosphere side.

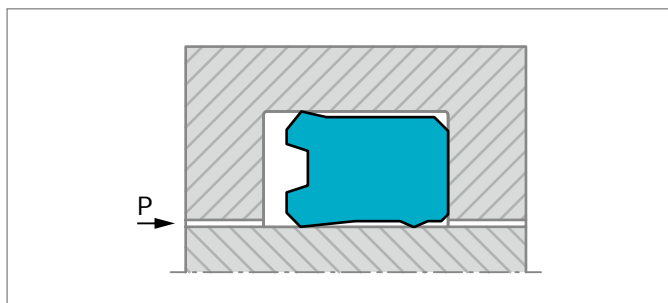


Figure 47: U-Cup, type RU2

METHOD OF OPERATION

The sealing effect of the U-Cup comes from the intrinsic preload of the seal body and from the compression of the seal lips during installation. In operating conditions, the radial mechanical contact forces are superimposed by the system pressure.

At low stroke speeds, U-Cups can tend to have a stick-slip effect due to an inadequate lubrication film formation in the seal clearance and to their material properties. This behavior corresponds to the Stribeck curve described in the relevant literature.

ADVANTAGES

- Good sealing effect at high and low pressures
- Good abrasion resistance, wear-resistant
- Unaffected by sudden loads
- Suitable for small grooves
- Simple installation

OPERATING CONDITIONS

Pressure:	Max. 35 MPa
Speed:	Up to 0.5 m/s
Temperature:	Use in mineral oils: -35 °C to +110 °C
Media:	Mineral oil-based hydraulic fluids.

IMPORTANT NOTE

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

MATERIAL

Standard Zurcon® :	Z20
Special Polyurethane:	93 Shore A
Temperature:	-35 °C to +110 °C
Color:	Turquoise



SEAL CLEARANCE

Guide values for the radial clearance between rod and gland in relation to the operating pressure and rod diameter can be found in the table below.

Table 31: Radial Clearance

Operating max. Pressure MPa	Radial Clearance $S_{\max}$	
	$d_N < 60 \text{ mm}$	$d_N > 60 \text{ mm}$
5	0.40	0.50
10	0.30	0.40
20	0.20	0.30
30	0.15	0.20
40	0.10	0.15

The values for $S_{\max}$ given in this table apply to all types for the low-pressure side of the U-Cup. They are designed for an operating temperature of 60 °C.

Table 32: Material Selection

Material Code	Material Description	Temperatur Range	Application
Zurcon® Z20	High performance Polyurethane 94 Shore A; standard grade for hydraulic	-35 °C to +110 °C	Excellent abrasion and extrusion resistance, minimal swelling in mineral oil, acceptable hydrolysis resistance.
Zurcon® Z22	High performance Polyurethane 93 Shore A; Premium grade for low temperature	-50 °C to +110 °C	Wide range of working temperatures with very good compression set performance at very low temperature. Excellent balance between swelling in mineral oil and hydrolysis resistance.



■ Installation Recommendation

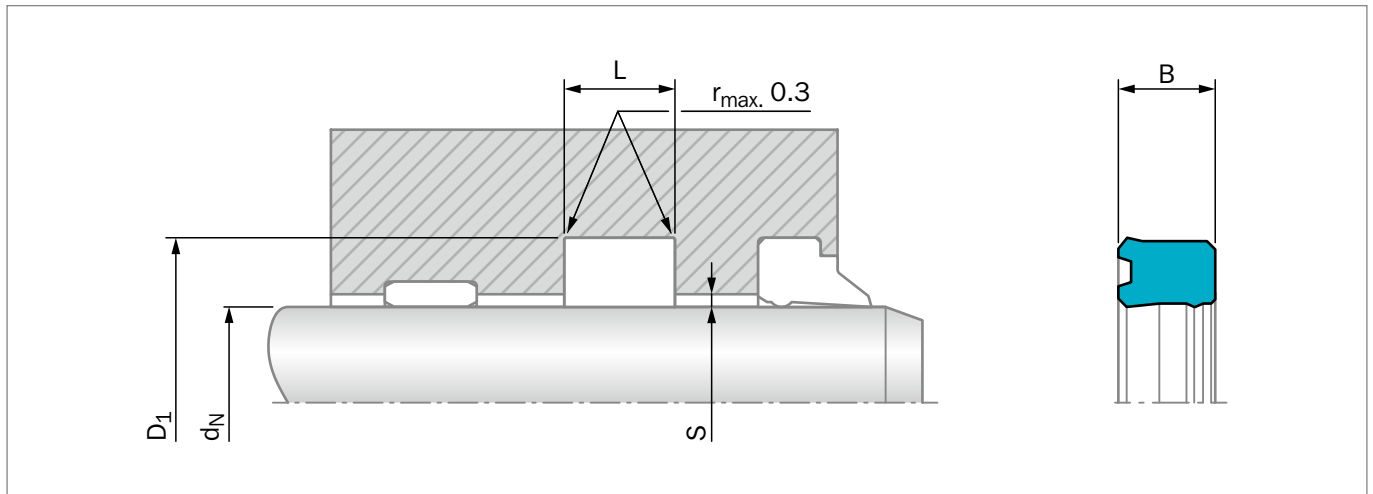


Figure 48: Installation Drawing

Dimensions "S" (see table on previous page)

ORDERING EXAMPLE

U-Cup Type RU2

Rod Diameter:	$d_N = 45.0$ mm
Groove Diameter:	$D_1 = 55.0$ mm
Groove Width:	$L = 6.3$ mm
TSS Part No.:	RU2300450 -

TSS Article No.

RU23 0 0450 - Z20

TSS Series No. _____

Type (Standard) _____

Rod Diameter x 10 _____

Quality Index (Standard) _____

Material Code _____

MATERIAL

Standard Zurcon® : Z20
 Special Polyurethane: 93 Shore A
 Color: Turquoise

Table 33: Installation Dimensions / TSS Article No.

Rod Diameter	Groove Diameter	Groove Width	Seal Width	TSS Part No.
d_N f8/h9	D_1 H10	L +0.2	B	
*6.0	14.0	6.3	5.8	RU2000060
*8.0	16.0	6.3	5.8	RU2200080
*10.0	18.0	6.3	5.8	RU2000100
*12.0	20.0	6.3	5.8	RU2100120
*14.0	22.0	6.3	5.8	RU2100140
*16.0	24.0	6.3	5.8	RU2000160
*18.0	26.0	6.3	5.8	RU2100180
20.0	28.0	6.3	5.8	RU2100200



Rod Diameter	Groove Diameter	Groove Width	Seal Width	TSS Part No.
d_N f8/h9	D_1 H10	L +0.2	B	
*20.0	30.0	8.0	7.0	RU2300200
22.0	30.0	6.3	5.8	RU2300220
24.0	32.0	6.3	5.7	RU2000240
25.0	33.0	6.3	5.7	RU2000250
*25.0	35.0	8.0	7.0	RU2400250
*25.0	35.0	9.0	8.0	RU2500250
28.0	36.0	6.3	5.8	RU2000280
*28.0	38.0	6.3	5.8	RU2300280
*28.0	38.0	8.0	7.0	RU2400280
32.0	42.0	8.0	7.0	RU2100320
36.0	44.0	6.3	5.8	RU2000360
36.0	46.0	8.0	7.3	RU2300360
40.0	50.0	8.0	7.0	RU2500400
45.0	53.0	6.3	5.8	RU2000450
45.0	55.0	6.3	5.7	RU2300450
45.0	55.0	8.0	7.0	RU2500450
50.0	60.0	8.0	7.0	RU2400500
56.0	66.0	7.5	6.5	RU2100560
56.0	71.0	12.5	11.5	RU2200560
63.0	78.0	12.5	11.5	RU2100630
70.0	80.0	7.5	6.5	RU2200700
80.0	95.0	12.5	11.5	RU2100800
90.0	100.0	7.5	6.5	RU2000900
90.0	105.0	12.5	11.4	RU2400900
110.0	125.0	10.5	9.5	RU2001100
110.0	130.0	16.0	15.0	RU2101100
140.0	160.0	16.0	15.0	RU2201400

Dimensions and TSS Part Numbers in bold according to ISO 5597. * Split groove
Additional dimensions can be delivered on request.

Zurcon® U-Cup RU6

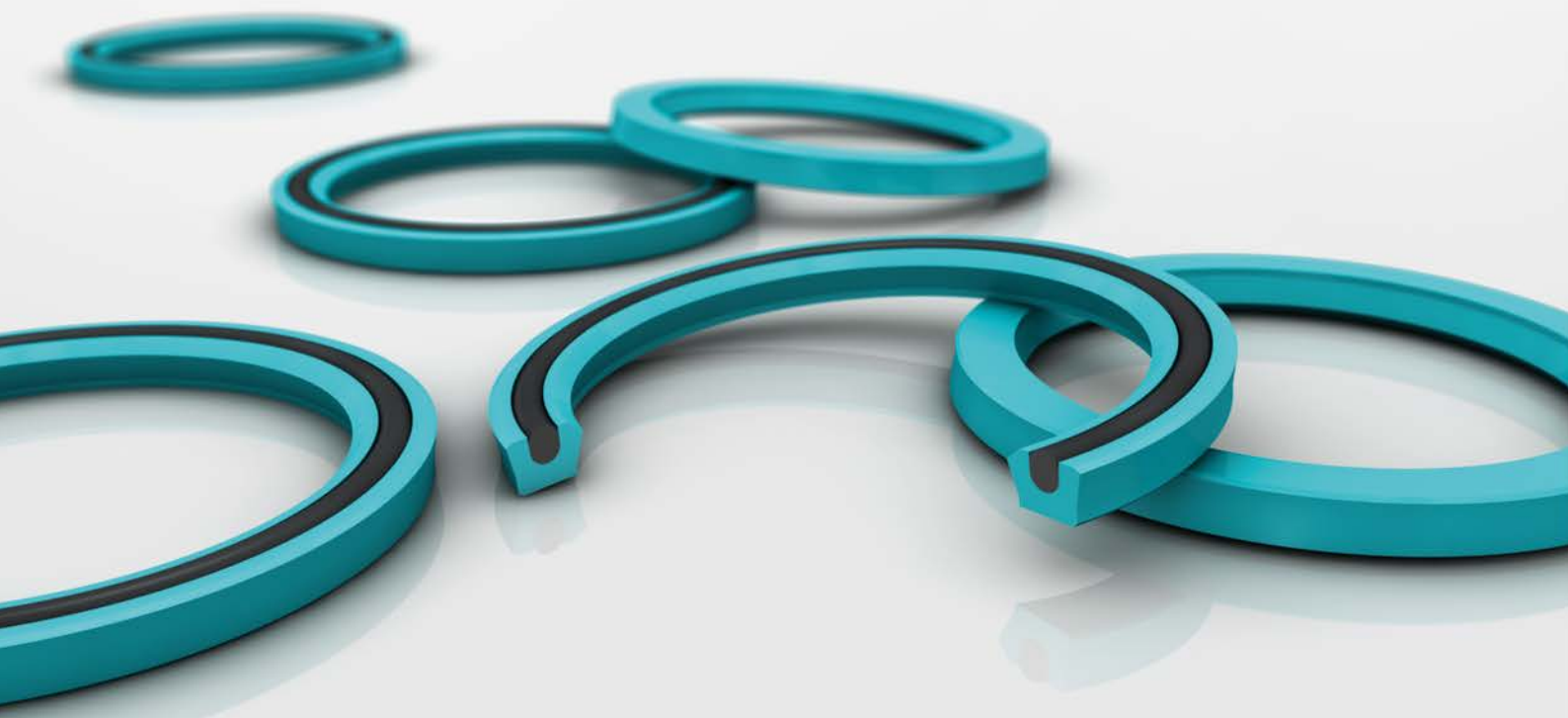


Single-acting U-Cup

Rubber Energized

Material:

Zurcon® + NBR



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■ U-Cup RU6



■ Description

Additional to the machined seals Stepseal® 2K and Rimseal for housings to ISO 7425/2 (rubber energised plastic seals) the U-Cup type RU6 has been developed as an injection molded seal of polyurethane material to fit in the same ISO housings. The integrated NBR O-Ring (only available for series RU62 - RU64) improves the performance at low pressure and low temperature applications. Polyurethane (Zurcon® Z20) is a proven material for U-cups due to their good mechanical properties.

TYPE RU6

The U-Cup type RU6 can be installed as a single seal for low to medium duty applications; for sealing systems, the U-Cup RU6 shall be installed mainly as a secondary seal together with the Turcon® Stepseal® 2K as primary seals.

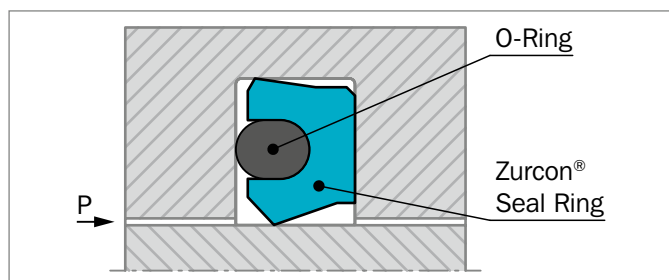


Figure 49: U-Cup, type RU6

METHOD OF OPERATION

The sealing effect of the U-Cup RU6 comes from the intrinsic preload of the seal body and from the compression of the seal lip and the O-Ring during installation. In operation conditions, the radial contact forces are superimposed by the system pressure.

Due to the special design and the integrated O-Ring the RU6 U-Cups have an excellent sealing behavior with and without pressure activation. The short sealing lip gives better friction values compared to common U-Cups.

ADVANTAGES

- Very good low pressure sealability
- Simple installation
- Lower friction compared with common U-Cups
- Installation in ISO 7475/2 grooves
- Very low compression set due to O-Ring

APPLICATION EXAMPLES

- General hydraulic cylinders
- Injection molding machines
- Lift trucks
- Agricultural machines

OPERATING CONDITIONS

Pressure:	Max. 25 MPa (as single element)
Speed:	Up to 0.5 m/s
Temperature:	Use in mineral oils: -35 °C to +110 °C
Media:	Mineral oil-based hydraulic fluids.

IMPORTANT NOTE

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

CLEARANCE

Table 34: Radial Clearance U-Cup RU6

Operating Pressure MPa max.	Radial Clearance S_{max}
16	0.60
25	0.50

The values for S_{max} given in this table apply to all types for the low-pressure side of the U-Cup. They are designed for an operating temperature of 60 °C. (for harsh conditions and high side loads the gap must be reduced by 50%)

MATERIAL

The thermoplastic polyurethane material Zurcon® Z20 has a high abrasion resistance, a low compression set and exhibits a high resistance to clearance extrusion. The integrated O-Ring is an NBR with 70 shore A and a very low compression set.

U-Cup: polyurethane 93 shore A
material code Z20

O-Ring: NBR 70 Shore A
material code N

Set code: Z20N

**Table 35: Materials**

Material Code	Material Description	Temp. Range	Application
Zurcon® Z20	High performance Polyurethane 94 Shore A; standard grade for hydraulic	-35 °C to +110 °C	Excellent abrasion and extrusion resistance, minimal swelling in mineral oil, acceptable hydrolysis resistance.



■ Installation Recommendation

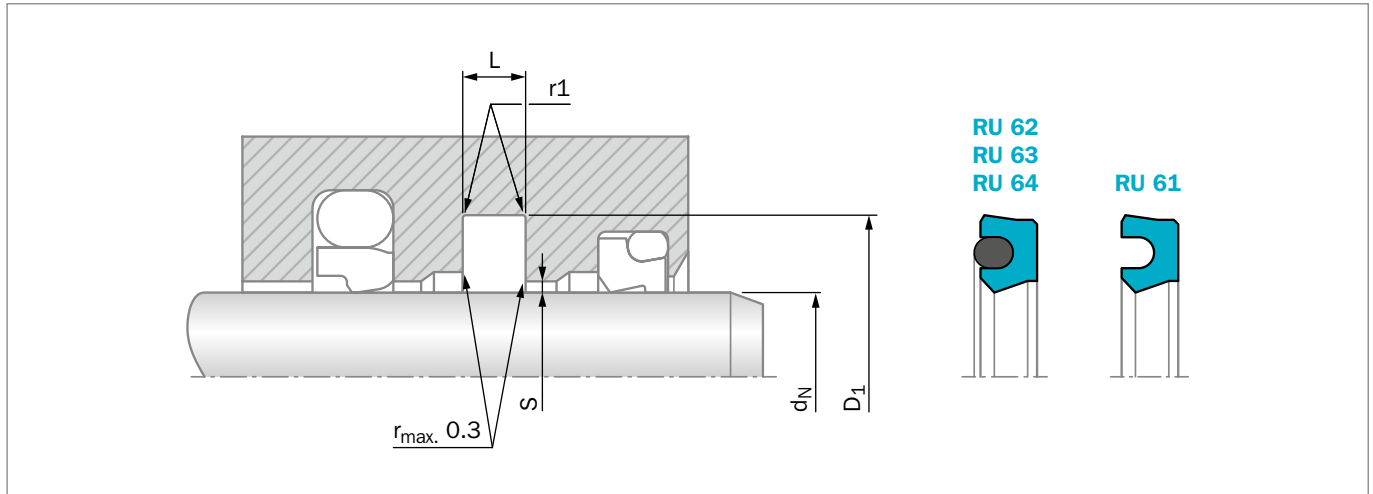


Figure 50: Installation Drawing

ORDERING EXAMPLE

U-Cup Type RU6

Rod Diameter:	$d_N = 70.0 \text{ mm}$
Groove Diameter:	$D_1 = 85.5 \text{ mm}$
Groove Width:	$L = 6.3 \text{ mm}$
TSS Part No.:	RU6300700 -
Compound code seal:	Z20 turquoise
Compound code O-Ring:	N
Material set code:	Z20N

TSS Article No. **RU63 0 0700 - Z20N**

TSS Series No. _____
 Type (Standard) _____
 Rod Diameter x 10 _____
 Quality Index (Standard) _____
 Material Set Code _____

Table 36: Installation Dimensions / TSS Part No.

Rod Diameter	Groove Diameter	Groove Width	Radius	TSS Part No.	O-Ring Size
d_N f8/h9	D_1 H10	L +0.2	r_1		
12.0	19.5	3.2	0.5	RU6100120	-
14.0	21.5	3.2	0.5	RU6100140	-
16.0	23.5	3.2	0.5	RU6100160	-
18.0	25.5	3.2	0.5	RU6100180	-
25.0	32.5	3.2	0.5	RU6100250	-
*28.0	39.0	4.2	0.5	RU6200280	31.42 x 2.62
36.0	47.0	4.2	0.5	RU6200360	39.34 x 2.62
*40.0	51.0	4.2	0.5	RU6200400	44.12 x 2.62
*45.0	56.0	4.2	0.5	RU6200450	48.90 x 2.62
50.0	61.0	4.2	0.5	RU6200500	53.64 x 2.62
55.0	66.0	4.2	0.5	RU6200550	58.42 x 2.62
56.0	71.5	6.3	0.9	RU6300560	59.92 x 3.53



Rod Diameter	Groove Diameter	Groove Width	Radius	TSS Part No.	O-Ring Size
d_N f8/h9	D_1 H10	L +0.2	$r1$		
63.0	74.0	4.2	0.5	RU6200630	66.34 x 2.62
63.0	78.5	6.3	0.9	RU6300630	66.27 x 3.53
70.0	85.5	6.3	0.9	RU6300700	75.79 x 3.53
80.0	95.5	6.3	0.9	RU6300800	85.32 x 3.53
90.0	105.5	6.3	0.9	RU6300900	94.84 x 3.53
100.0	115.5	6.3	0.9	RU6301000	104.37 x 3.53
110.0	125.5	6.3	0.9	RU6301100	113.89 x 3.53
120.0	135.5	6.3	0.9	RU6301200	126.59 x 3.53
150.0	165.5	6.3	0.9	RU6301500	158.34 x 3.53
160.0	175.5	6.3	0.9	RU6301600	164.69 x 3.53
190.0	205.5	6.3	0.9	RU6301900	196.44 x 3.53
200.0	221.0	8.1	0.9	RU6402000	208.92 x 5.33
210.0	231.0	8.1	0.9	RU6402100	221.62 x 5.33
260.0	281.0	8.1	0.9	RU6402600	266.07 x 5.33
300.0	321.0	8.1	0.9	RU6403000	329.57 x 5.33
350.0	371.0	8.1	0.9	RU6403500	354.97 x 5.33

Dimensions in **bold** according to ISO/DIN 7425/2. Is also suitable for Stepseal® groove.

* Split groove

Zurcon® U-Cup RU9

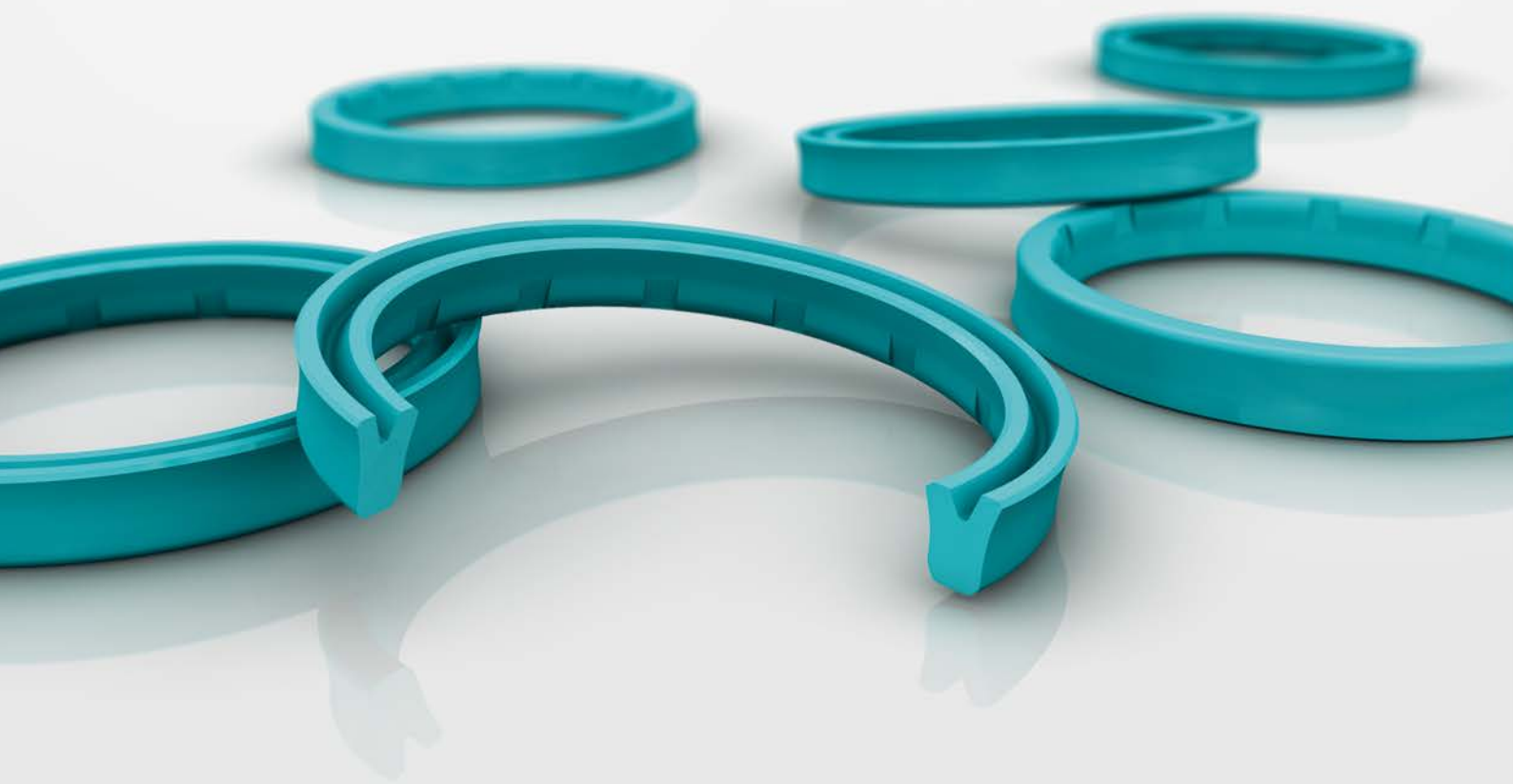


Single-acting U-Cup

New U-Cup Design

Material:

Zurcon®



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■ Zurcon® U-Cup RU9*



■ Introduction

Rod seals are particularly exposed to pressure and friction. A long service life is a specific requirement of piston rods. Features such as wear and extrusion resistance, media and temperature compatibility, low friction, compact Installation Dimensions and ease of assembly are also essential and require the introduction of new products and materials. It is against this background that we have developed the Zurcon® U-Cup RU9.

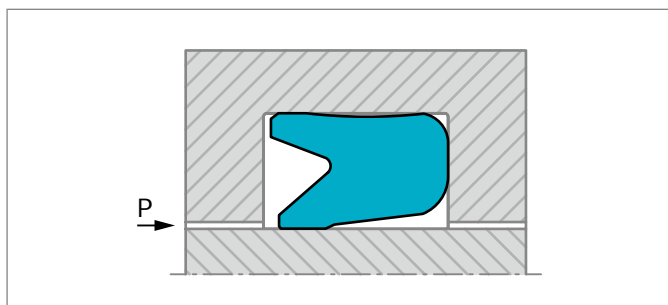


Figure 51: U-Cup, type RU9

DESCRIPTION

Due to its special design, behind the dynamic seal lip, the Zurcon® U-Cup RU9 with its structure of slide segments interspersed by back-pumping channels features excellent back-pumping ability across the entire pressure range. The dynamic seal slide segments also have a micro-structure with excellent tribological and sealing characteristics. As well as increasing the sealing ability of the U-Cup RU9, this also ensures a constant lubrication film underneath the seal sliding surface, reducing breakaway force even after prolonged periods of rest and reduces dynamic friction force.

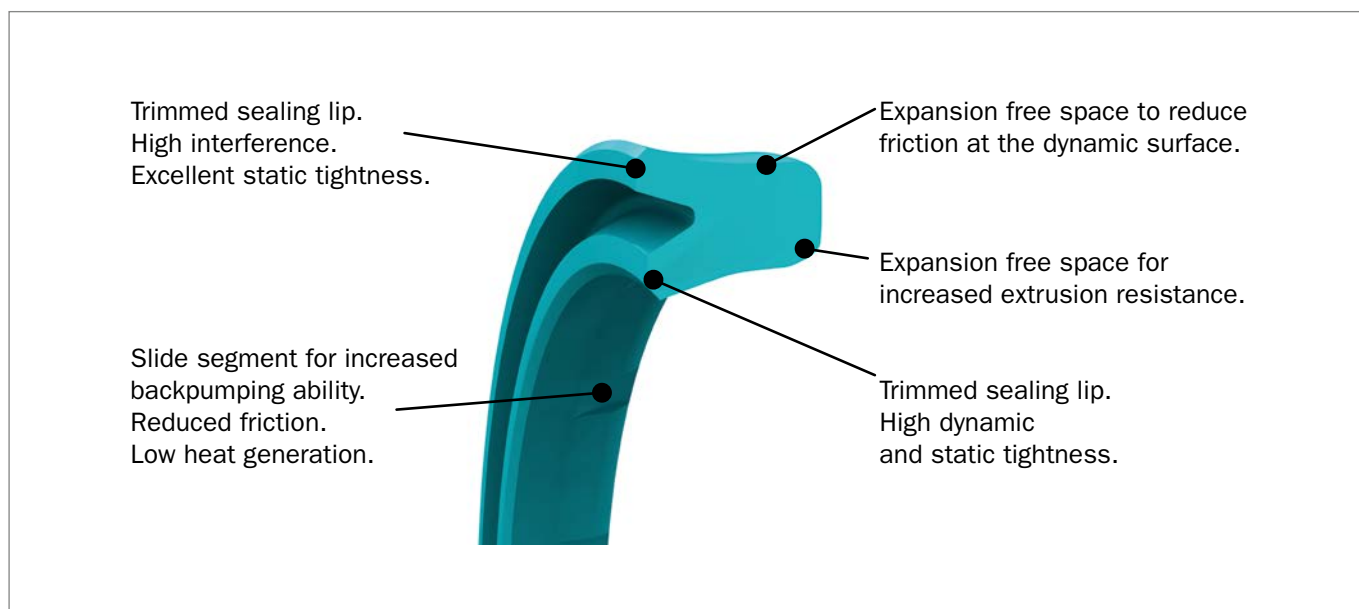


Figure 52: Zurcon® U-Cup RU9 design features

* Patent application: WO 2004/088182 A1



FRICITION

The friction force of U-Cups dramatically increases between 2.5 and 10 MPa. The Zurcon® U-Cup RU9 has a unique feature. As the system pressure increases, the contact surface between the U-Cup and the piston rod increases. Once a specific system pressure is reached, the seal deforms to such an extent that its entire friction-generating inside surface gets in contact with the piston rod. Due to the special design of Zurcon® U-Cup RU9 there is improved pressure distribution on the rod. The resulting tribological benefits restrict the increase in friction. When we compare the friction values of conventional U-Cups with those of the Zurcon® U-Cup RU9 the results are self-evident.

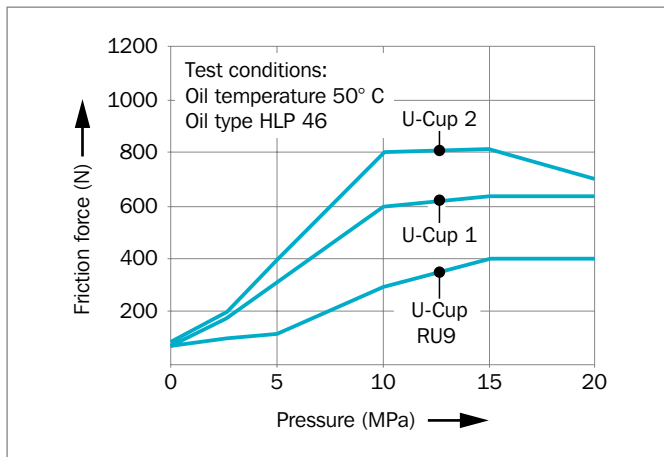


Figure 53: Friction dependent on pressure

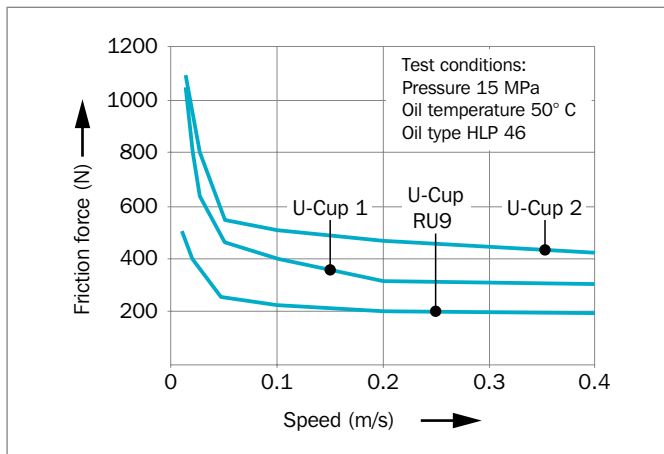


Figure 54: Friction dependent on speed

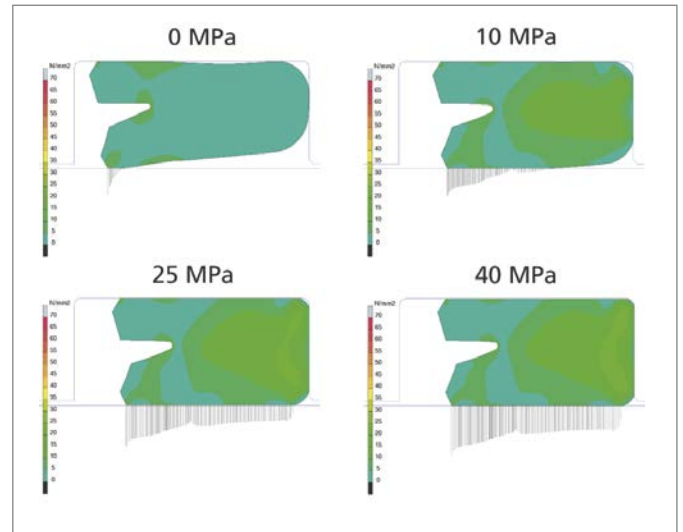


Figure 55: How the Zurcon® U-Cup RU9 performs underpressure

SEALING PERFORMANCE

The high sealing performance is achieved by:

- Interference fit at the external diameter
- Special shape of both trimmed seal lips
- Controlled pressure distribution and hydrodynamic backpumping ability over a wide pressure range

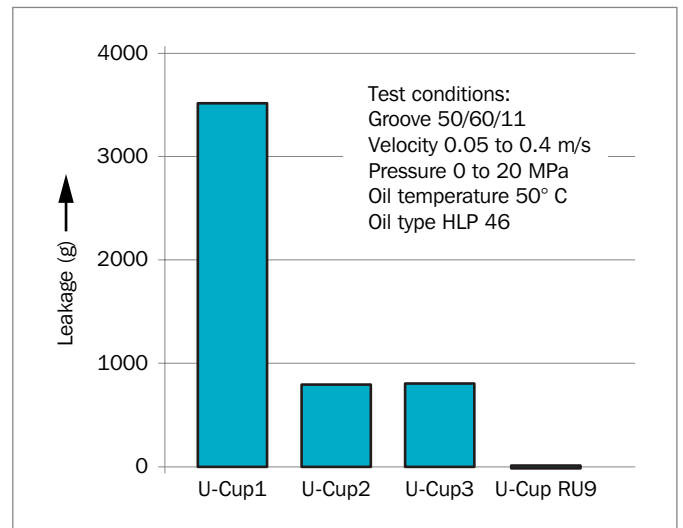


Figure 56: Leakage performance dependent on U-Cup type



RADIAL CLEARANCE

The new Zurcon® RU9 design combined with the special compound properties shows a better extrusion resistance compared to standard U-Cup under all working conditions. The hardware clearance can be increased significantly.

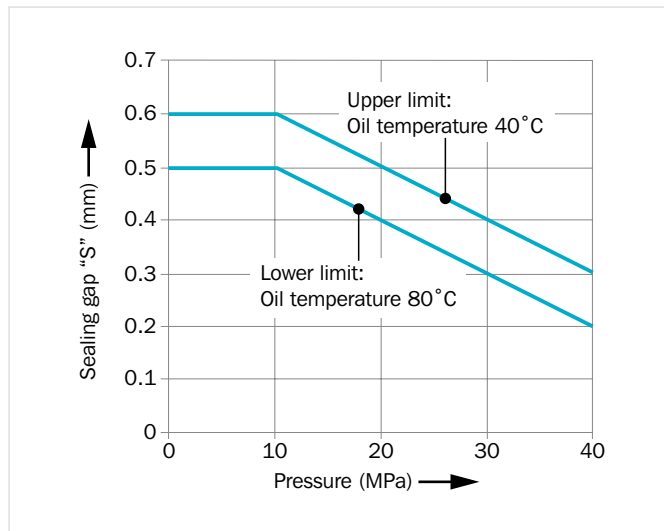


Figure 57: Radial clearance "S" as function of pressure

ADVANTAGES

- Lower friction than standard U-Cups
- Lower heat generation than standard U-Cups
- High extrusion resistance
- Excellent dynamic and static sealing
- Optimum environment protection
- Back pumping ability over the entire pressure range achieved by grooved profile
- Suitable with the Zurcon® Buffer Seal as secondary seal in "tandem design"
- Suitable for sealing systems with double scraper
- Seal stability within the groove

APPLICATION EXAMPLES

Zurcon® U-Cup RU9 can be used in all applications in which previously a conventional U-Cup was applied, such as:

- Hydraulic cylinders
- Construction machinery
- Fork lifts
- Truck cranes
- Telescopic cylinders
- Agricultural machines
- Machine tools
- Injection molding machines
- Hydraulic presses
- Gas spring

In medium/heavy duty applications the preferred solution for tandem rod sealing systems is the combination with the Zurcon® Buffer Seal primary seal and Zurcon® U-Cup RU9 in conjunction with a double acting scraper.

MATERIALS

Zurcon® Z20 Standard polyurethane 93 Shore A
 Temperature: -35 °C to +110 °C
 Color: Turquoise

Zurcon® Z22 Premium polyurethane 93 Shore A
 Temperature: -50 °C to +110 °C
 Color: Dark petrol

Zurcon® Z25 Premium polyurethane 93 Shore A
 Temperature: -35 °C to +130 °C
 Color: Black

The Zurcon® polyurethane has high abrasion resistance, a low compression set, high extrusion resistance and a wide temperature range.



OPERATING CONDITIONS

Pressure:	Up to 40 MPa
Velocity:	Up to 0.5 m/s
Temperature:	
Zurcon® Z20 Standard:	-35 °C to +110 °C
Media:	
Hydraulic fluids based on mineral oil:	-35 °C to +110 °C
Synthetic and natural ester HEES, HETG:	Up to +60 °C
Flame-retardant hydraulic fluids HFA/HFB:	Up to +40 °C

IMPORTANT NOTE

The above stated limits for pressure and speed are maximum values individually. Friction heat generated by the combination of pressure and speed may cause local heat built-up. Care should be taken not to apply high values for pressure and speed at the same time.

Table 37: Materials

Material Code	Material Description	Temperature Range	Application
Zurcon® Z20	High performance Polyurethane 94 Shore A; standard grade for hydraulic	-35 °C to +110 °C	Excellent abrasion and extrusion resistance, minimal swelling in mineral oil, acceptable hydrolysis resistance.
Zurcon® Z22	High performance Polyurethane 93 Shore A; Premium grade for low temperature	-50 °C to +110 °C	Wide range of working temperatures with very good compression set performance at very low temperature. Excellent balance between swelling in mineral oil and hydrolysis resistance.
Zurcon® Z25	High performance Polyurethane 95 Shore A; Premium grade for high temperature	-35 °C to +130 °C	Wide range of working temperatures with excellent mechanical properties at high temperature. Products: Ideal for use in heavy duty cylinder and cylinders exposed to high-temperature painting processes.



■ Installation Recommendation

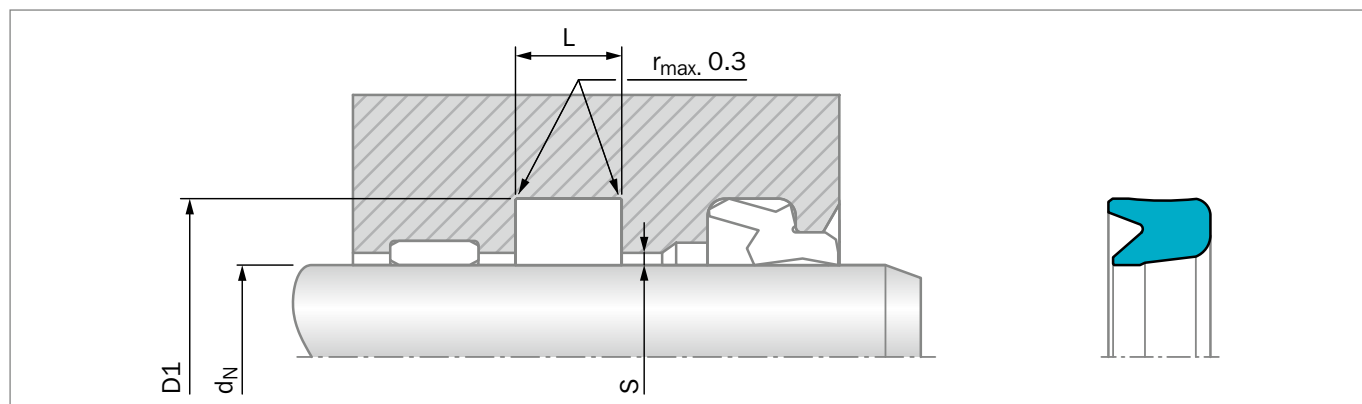


Figure 58: Installation Drawing, Dimension "S" see Figure 57

ORDERING EXAMPLE (METRIC)

Zurcon® U-Cup Type RU9

Rod Diameter:	$d_N = 20.0 \text{ mm}$
Groove Diameter:	$D1 = 28.0 \text{ mm}$
Groove Width:	$L = 6.3 \text{ mm}$
TSS Part No.:	RU9000200 -

TSS Article No.

	RU90	0	0200	-	Z20
TSS Series No.					
Type (Standard)					
Rod Diameter x 10					
Quality Index (Standard)					
Material Code					

MATERIAL

Standard Zurcon® :	Z20
Special polyurethane:	93 Shore A
Color:	Turquoise

Table 38: Preferred Series / TSS Article No.

Rod Diameter d_N f8/h9	Groove Diameter $D1$ H10	Groove Width L +0.25	TSS Part No.
*6.0	14.0	6.3	RU9000060
*8.0	16.0	6.3	RU9000080
12.0	19.0	6.0	RU9000120
15.0	20.0	5.0	RU9000150
*15.0	23.0	6.3	RU9100150
*16.0	22.0	6.0	RU9100160
*16.0	24.0	6.0	RU9200160
*16.0	24.0	6.3	RU9000160
18.0	25.0	5.3	RU9100180
*18.0	26.0	6.3	RU9000180
20.0	26.0	6.0	RU9100200
*22.0	30.0	6.3	RU9100220



Rod Diameter	Groove Diameter	Groove Width	TSS Part No.
d_N f8/h9	D1 H10	L +0.25	
*20.0	28.0	5.0	RU9300200
*20.0	30.0	8.0	RU9200200
*20.0	28.0	6.3	RU9000200
22.0	29.0	5.6	RU9200220
*22.0	30.0	6.3	RU9000220
25.0	31.0	6.3	RU9100250
25.0	33.0	6.3	RU9000250
28.0	36.0	6.3	RU9000280
*28.0	38.0	8.0	RU9100280
30.0	38.0	9.0	RU9100300
30.0	40.0	7.5	RU9200300
30.0	40.0	11.0	RU9000300
32.0	40.0	6.3	RU9200320
32.0	40.0	9.0	RU9100320
32.0	42.0	8.0	RU9000320
35.0	42.0	8.0	RU9100350
35.0	45.0	8.0	RU9000350
36.0	44.0	6.3	RU9100360
36.0	44.0	9.0	RU9000360
36.0	46.0	8.0	RU9200360
40.0	50.0	8.0	RU9000400
*45.0	53.0	8.5	RU9200450
45.0	55.0	6.3	RU9100450
45.0	55.0	8.0	RU9000450
50.0	60.0	8.0	RU9000500
50.0	60.0	11.0	RU9200500
50.0	65.0	12.5	RU9100500
55.0	65.0	8.0	RU9000550
56.0	68.0	11.0	RU9100560
56.0	71.0	12.5	RU9000560
60.0	68.0	7.0	RU9100600
60.0	70.0	8.0	RU9200600
60.0	75.0	12.5	RU9000600
63.0	75.0	13.0	RU9100630
63.0	78.0	12.5	RU9000630
65.0	75.0	8.0	RU9000650
65.0	85.0	12.5	RU9100650
70.0	82.0	9.6	RU9200700
70.0	85.0	12.5	RU9000700
75.0	83.0	7.0	RU9000750
80.0	93.0	12.5	RU9300800
80.0	95.0	10.0	RU9200800



Rod Diameter	Groove Diameter	Groove Width	TSS Part No.
d_N f8/h9	D1 H10	L +0.25	
80.0	95.0	12.5	RU9100800
80.0	100.0	12.5	RU9000800
85.0	100.0	10.0	RU9200850
85.0	100.0	12.5	RU9100850
90.0	100.0	7.5	RU9100900
90.0	102.0	9.6	RU9200900
90.0	105.0	12.5	RU9000900
95.0	110.0	10.0	RU9200950
95.0	110.0	12.5	RU9100950
95.0	115.0	13.0	RU9000950
100.0	108.0	12.0	RU9101000
100.0	115.0	13.0	RU9201000
100.0	120.0	16.0	RU9001000
105.0	120.0	12.5	RU9001050
110.0	120.0	11.0	RU9101100
110.0	125.0	12.0	RU9301100
110.0	125.0	12.5	RU9201100
110.0	130.0	16.0	RU9001100
115.0	125.0	11.0	RU9001150
120.0	135.0	12.5	RU9001200
125.0	145.0	16.0	RU9001250
130.0	140.0	7.5	RU9001300
130.0	145.0	13.0	RU9101300
140.0	160.0	16.0	RU9001400

Dimensions and TSS Part Numbers in bold according to ISO 5597. * splitted groove

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