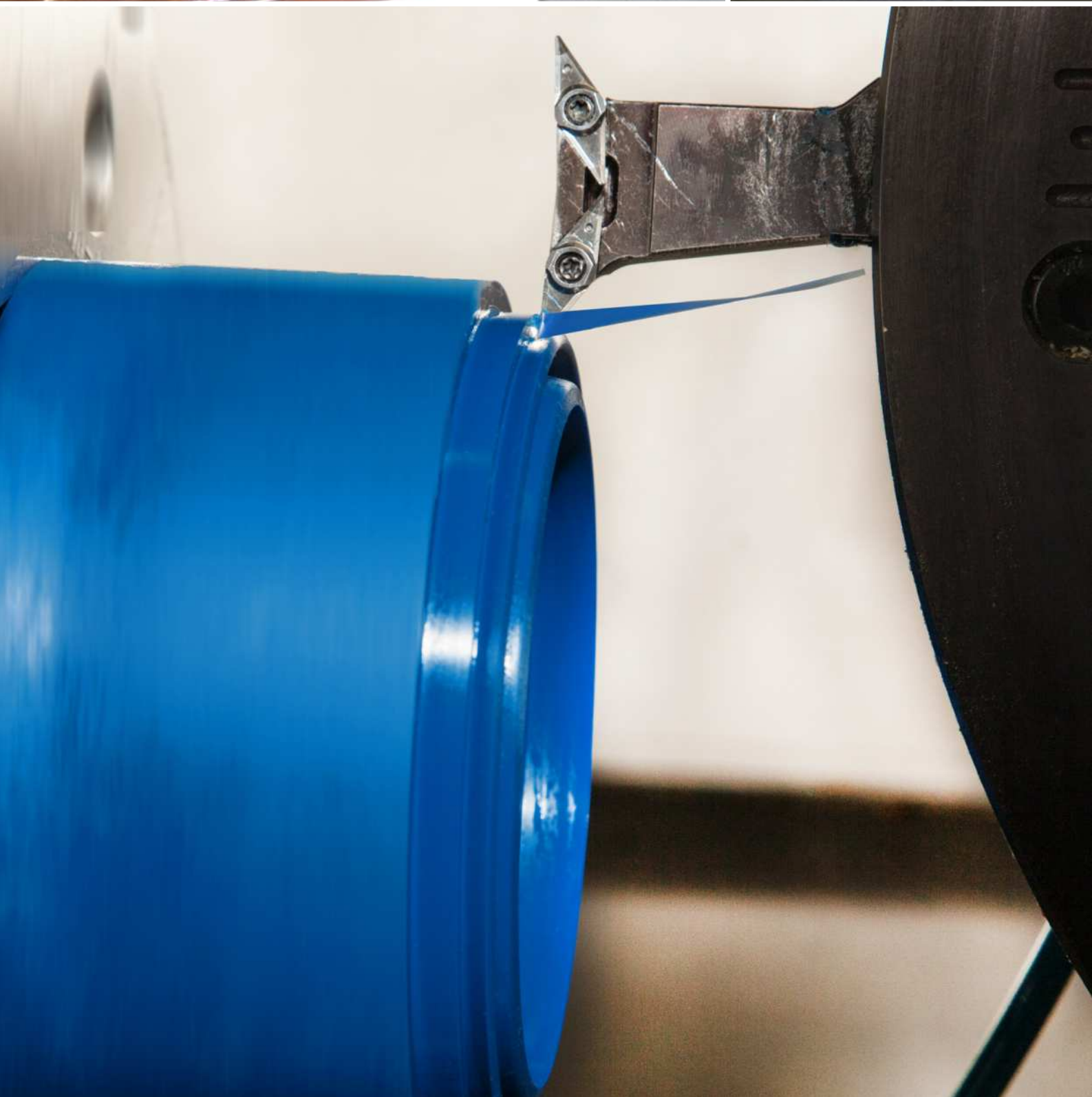


# Machined seals flexibility and standard range convenience

Sealing solutions for the food and beverage industry





# Food-grade seals made-to-order

A range of food-compliant sealing solutions effective in harsh environments

## The environment dictates seal performance

From extreme temperatures to moist, contamination-prone environments, seals for food and beverage processing equipment have to endure harsh operating conditions and cleaning regimes. All of this can take a heavy toll on the performance of the sealing solution.

## Proactive safeguarding is becoming the norm

FDA guidelines specify that even the smallest speck of metal or plastic in a food product renders it subject to recall. This can be a costly prospect and daunting in terms of brand reputation. Accordingly, industry demand is rising for more proactive solutions such as food-grade sealing materials with optically detectable debris.

To address similar concerns about bacteria, CIP and SIP systems help processors prevent bacterial growth. But caustic antibacterial cleaning agents and high-pressure washdowns increase the risk of failed seals, damaged sealing interfaces and unplanned downtime.

## Benefit from the seal engineering expertise of SKF

SKF has developed asset solutions for a range of industry application challenges. Drawing on this expertise has allowed SKF to take conventional seal designs several steps further and develop hygienic sealing solutions with food-grade materials.

The result is a standardized yet fully customizable range of seals that deliver superior performance in key food and beverage applications.

## The flexibility and speed you need for new designs or replacement

With our broad manufacturing footprint, we can offer seals in standard profiles or fully customized designs. Our moulded and machined seal production capabilities enable everything from rapid prototyping to serial production to replacement parts.

Whether you are an OEM who needs to create seal prototypes for testing, or an end-user who needs a replacement solution, SKF sealing solutions can help deliver:

- Increased productivity and reliability
- Reduced maintenance and downtime
- Extended seal and asset service life
- Reduced lifecycle operating costs
- Shorter product development times
- Reduced warranty costs



# An effective mix of sealing materials and designs



## The right materials for your requirements and industry regulations

Poor sealing material choices can lead to increased wear of the seal and counterface surface, and may require frequent seal replacements to prevent unplanned downtime and lost productivity. To help you avoid these issues, SKF develops sealing solutions that draw from one or more of the following material types to meet key industry regulations:

### Thermoplastic elastomers

High performance polyurethanes (TPU) from SKF combine excellent abrasion and wear resistance, low compression set and high tear strength, and outstanding pressure resistance.

### Elastomers

SKF offers high quality elastomer materials such as HNBR, FKM, EPDM and silicones (MVQ) that deliver excellent resistance to chemicals and other media. EPDM, for example, performs well in aqueous media, while HNBR and FKM are better suited for applications in greasy or fatty media environments.

### Thermoplastics

SKF's range of specialty plastic materials includes thermoplastics that can meet higher temperature, chemical and mechanical property requirements.

PTFE as an advanced, high performance plastic is engineered to handle extreme conditions and its compounds can withstand aggressive chemicals plus high temperatures and pressures.

### CIP/SIP

Cleaning in place or Sterilization in place means that it takes place without dismantling. It is an important process in guaranteeing food safety in food processing plants.

### COP/SOP

Cleaning out of place or Sterilization out of place means dismantling and cleaning the individual parts.

### FDA

The Food and Drug Administration (FDA) is a federal agency of the United States Department of Health and Human Services and is, amongst others, responsible for control and supervision of food safety. Materials specified as FDA-compliant are composed according to the positive lists for the respective material types, issued by the FDA.

### EU

European food safety regulations consist of general requirements laid out in EC1935/2004 and specific guidelines for material types, e.g. EC10/2011 for thermoplastic materials. Unless indicated otherwise, materials specified as EU-compliant are fully conformal to EC 1935/2004 which includes material composition and migration limits, as well as EC2023/2006 (Good manufacturing practice).

### 3A

3A Sanitary Standards, Inc. (3A SSI) is a US-based organization that provides sanitary standards and practices for dairy and food equipment. Materials specified as 3A compliant are composed according to the respective FDA positive lists and have been tested either by suppliers or at SKF internally to meet the required properties.

### Name appendix –FG

All materials without the appendix –FG in their name that are intended to be used in food & beverage applications need to be ordered as such, as this triggers additional processing routines to ensure compliance.

## See how SKF can help

SKF has solved some of the most common sealing challenges for some of the toughest food and beverage applications. In fact, SKF has worked with equipment manufacturers and operators to solve these challenges repeatedly. In the process we've evolved a highly effective mix of sealing materials and designs that also comply with key safety regulations, including those highlighted on the previous page.

Covered throughout the pages of this catalogue, our successes are now represented by a standardized range of SKF sealing solutions for harsh food and beverage applications. These include:

- Dosing pistons
- Homogenizers
- Rotary unions





# A range of food-grade sealing materials

Material	Polymer grade	Colour	Main properties		Hardness <sup>1)</sup>		F&B standards compliance				Resistance to cleaning processes							Resistance to food							
			Temperature, min	Temperature, max	Shore A	Shore D	FDA	3A	EU	ADI free	Nitric acid (acidic CIP) <sup>2)</sup>	Caustic soda (alkaline CIP) <sup>2)</sup>	Phosphoric acid (acidic CIP) <sup>2)</sup>	Sodium hypochlorite	Distilled water	Steam SOP	Steam, SIP	Dairy	Olive oil	Cocoa butter	Fruit and sugar mass	Sausage, meat	Alcoholic beverages <15%	Alcoholic beverages >15%	
			°C (°F)	°C (°F)			Tested at 80 °C (175 °F), 2%	Tested at 80 °C (175 °F), 3%	Tested at 80 °C (175 °F), 1%	Tested at 70 °C (158 °F), 3%	Tested at 100 °C (210 °F)	Tested at 121 °C (250 °F)	Tested at 121 °C (250 °F)	+	+	+	+	+	+	+	+	+	+	+	+
<b>■ Thermoplastic elastomers</b>																									
H-ECOPUR	TPU	red	-20 (-5)	+110 (+230)	95 ± 2	48 ± 3	YES <sup>3)</sup>	YES	YES	YES	+	+	+	+	+	+/0	0/-5)	+	+	+	+	+	+	+	+
H-ECOPUR 95A-NC	TPU	opaque	-20 (-5)	+110 (+230)	95 ± 2	48 ± 3	YES	YES	YES	YES	+	+	+	+	+	+/0	0/-5)	+	+	+	+	+	+	+	+
H-ECOPUR 95A-blue	TPU	blue	-20 (-5)	+110 (+230)	95 ± 2	48 ± 3	YES	YES	YES	YES	+	+	+	+	+	+/0	0/-5)	+	+	+	+	+	+	+	+
ECOPUR 95A-bl-FG	TPU	blue	-50 (-60)	+100 (+210)	95 ± 2	47 ± 3	YES	YES	YES	YES	-	+	+	+	0	-	-	+	+	+	+	+	+	0	0
H-ECOPUR 85A	TPU	red	-20 (-5)	+100 (+210)	85 ± 2	35 ± 3	NO	n.d.a.	NO	YES	n.d.a.	n.d.a.	n.d.a.	n.d.a.	+	0	-	+	+	+	+	+	+	+	0
<b>■ Elastomers</b>																									
SKF Ecorubber-H 85A-b-FG	HNBR	black	-25 (-15)	+150 (+300)	85 ± 5	n.a.	YES	YES	YES	YES	0	+	+	0	0	0	0	+	+	+	+	+	+	+	+
SKF Ecorubber-2 85A-w-FG	FKM	white	-20 (-5)	+200 (+390)	85 ± 5	n.a.	YES	YES	YES	YES	+	0	+	+	0	-	-	+	+	+	+	+	+	+	+
SKF Ecorubber-3 85A-w-FG	EPDM	white	-50 (-60)	+150 (+300)	85 ± 5	n.a.	YES	YES	YES	YES	+	+	+	+	+	+	0	-	-	+	+	+	+	+	+
SKF Ecorubber-3 85A-b-FG	EPDM	black	-50 (-60)	+150 (+300)	85 ± 5	n.a.	YES	YES	YES	YES	+	+	+	+	+	+	+	+	-	-	+	+	+	+	+
SKF Ecosil	MVQ /VMQ	reddish brown	-60 (-75)	+200 (+390)	85 ± 5	n.a.	YES	YES	YES	YES	+	+	+	+	+	-	-	+	+	+	+	+	+	+	0
<b>■ Thermoplastics</b>																									
SKF Ecotal	POM-C (Acetal)	black	-50 (-60)	+100 (+210)	n.a.	82	YES	n.d.a.	YES	YES	-	0	0	0	+	-	-	+	+	+	+	+	+	+	+
728	POM-C (Acetal)	white	-50 (-60)	+100 (+210)	n.a.	85	YES	YES	YES <sup>4)</sup>	YES	-	0	0	0	+	-	-	+	+	+	+	+	+	+	+
729	PET	white	-20 (-5)	+115 (+240)	n.a.	87	YES	YES	YES <sup>4)</sup>	YES	0	-	+	+	+	-	-	+	+	+	+	+	+	+	+
SKF Ecopaek	PEEK	cream	-100 (-150)	+260 (+500)	n.a.	87	YES	YES	YES	YES	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
SKF Ecoflon 1	Virgin, unfilled PTFE	white	-200 (-330)	+260 (+500)	n.a.	57	YES	n.d.a.	YES	YES	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
700	Virgin, unfilled PTFE	white	-200 (-330)	+260 (+500)	n.a.	56	YES	n.d.a.	YES <sup>4)</sup>	YES	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
SKF Ecoflon 5	Modified PTFE	white	-200 (-330)	+260 (+500)	n.a.	59	YES	YES	YES <sup>4)</sup>	YES	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
777	Modified PTFE	white	-200 (-330)	+260 (+500)	n.a.	60	YES	YES	YES <sup>4)</sup>	YES	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
SKF Ecoflon 14	PTFE (+ 10% Ekonol)	tan	-200 (-330)	+260 (+500)	n.a.	57	NO	n.d.a.	YES <sup>4)</sup>	YES	n.d.a.	n.d.a.	n.d.a.	n.d.a.	+	0	0	+	+	+	+	+	+	+	+
754	PTFE (+ 10% Ekonol)	tan	-200 (-330)	+260 (+500)	n.a.	63	NO	NO	NO	YES	n.d.a.	n.d.a.	n.d.a.	n.d.a.	+	0	0	+	+	+	+	+	+	+	+
SKF Ecoflon 16	PTFE (+ 25% PEEK)	cream	-200 (-330)	+260 (+500)	n.a.	63	YES	NO	YES <sup>4)</sup>	YES	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
721	PTFE (+ minerals)	white	-200 (-330)	+260 (+500)	n.a.	61	YES	n.d.a.	NO	YES	n.d.a.	n.d.a.	n.d.a.	n.d.a.	+	+	+	+	+	+	+	+	+	+	+
SKF Ecowear 1000	UHMWPE	white	-200 (-330)	+90 (+194)	n.a.	61	YES	YES	YES	YES	+	+	+	-	0	-	-	+	+	+	+	+	+	+	+
776	UHMWPE	white	-200 (-330)	+90 (+194)	n.a.	64	YES	YES	YES <sup>4)</sup>	YES	+	+	+	-	0	-	-	+	+	+	+	+	+	+	+
795	UHMWPE	white	-200 (-330)	+100 (+210)	n.a.	64	YES	YES	YES <sup>4)</sup>	YES	+	+	+	-	+	0	-	+	+	+	+	+	+	+	+

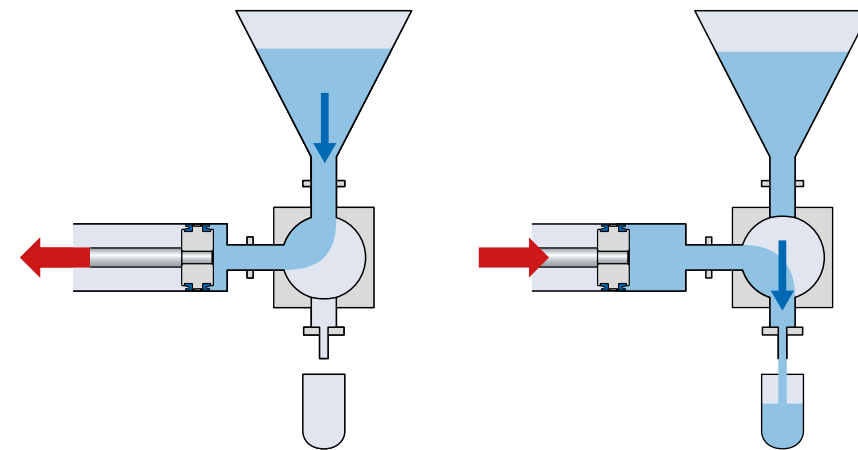
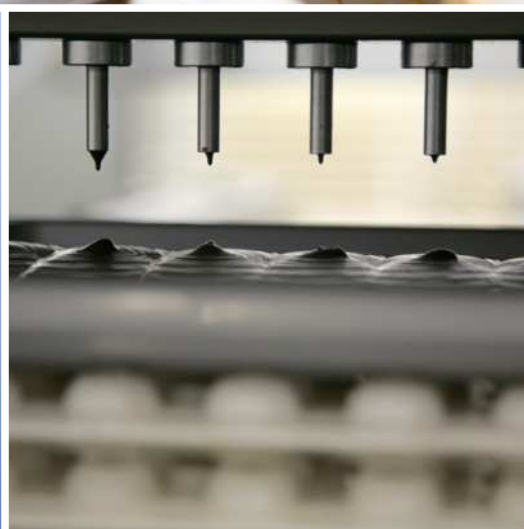
+	Resistant	YES	Compliant	n.d.a.	No data available
0	Limited resistance	NO	Not compliant	n.a.	Not applicable
-	Not recommended				

Material	Characteristics and applications
<b>■ Thermoplastic elastomers</b>	
H-ECOPUR	These wear-resistant materials enable self-activating solutions in applications with high pressures and temperatures up to 110°C (230°F).
H-ECOPUR 95A-NC	A polyurethane grade with outstanding chemical resistance.
H-ECOPUR 95A-blue	Version of H-ECOPUR in its natural colouring.
ECOPUR 95A-bl-FG	A blue-coloured version of H-ECOPUR; recommended for F&B applications for its detectability.
H-ECOPUR 85A	A special blue-coloured polyurethane grade with excellent low-temperature properties.
H-ECOPUR 85A	Only suitable for special applications that require low hardness.
<b>■ Elastomers</b>	
SKF Ecorubber-H 85A-b-FG	Elastomer materials are recommended for higher temperature applications with chemical resistance requirements that polyurethanes cannot meet.
SKF Ecorubber-2 85A-w-FG	An HNBR grade with good mechanical properties and wear resistance.
SKF Ecorubber-3 85A-w-FG	An FKM grade with outstanding temperature and chemical resistance.
SKF Ecorubber-3 85A-b-FG	Recommended for steam applications; not compatible with animal or vegetable oils/fats.
SKF Ecosil	Recommended for steam applications; not compatible with animal or vegetable oils/fats.
SKF Ecosil	Offers excellent low-temperature behaviour; used primarily in static applications.

<sup>1)</sup> Hardness value for thermoplastic polyurethanes (TPU) is recorded after a period of 3 seconds.  
<sup>2)</sup> Suitable for a typical CIP cleaning cycle of up to 50 minutes, complete rinse with water as subsequent treatment step is required.  
<sup>3)</sup> Compliance to FDA positive list and specific migration testing was performed and confirmed by an independent, accredited institute.  
<sup>4)</sup> The material composition is according to the positive list of EC10/2011.  
<sup>5)</sup> In case of self-energizing designs, SIP can lead to loss of preload and thus sealing functionality.

Material	Characteristics and applications
<b>■ Thermoplastics</b>	
SKF Ecotal	Thermoplastics operate with less friction and wear than elastomers and thermoplastic elastomers; thermoplastic seals require metal or elastomer springs/energizers.
728	A high-strength plastic material used primarily for bushings and plastic parts that require improved physical properties.
729	Essentially SKF Ecotal in its natural colouring.
SKF Ecopaek	A technical thermoplastic material comparable to SKF Ecotal and 728, but with better dimensional stability and lower sliding wear.
SKF Ecoflon 1, 700	A high performance material with significantly improved chemical resistance, higher operating temperature and improved creep and relaxation behaviour compared to SKF Ecotal, 728 and 729.
SKF Ecoflon 1, 700	Optimized for media compatibility; typically only used in static or light-duty dynamic sealing applications due to its low wear resistance.
SKF Ecoflon 5, 777	Similar to SKF Ecoflon 1 and 700, but with improved creep behaviour; 3A-approved.
SKF Ecoflon 14, 754	Good wear resistance and non-abrasive against non-hardened surfaces; steam-cleanable but not suitable for sealing steam continuously.
SKF Ecoflon 16	Similar to SKF Ecoflon 14 and 754, but offers better performance in steam applications; FDA-compliant.
721	An FDA-compliant, filled PTFE that offers improved wear resistance in high-temperature applications.
SKF Ecowear 1000, 776	Exceptional wear/abrasion resistance for sealing non-lubricating media. Extrusion resistance makes both materials suitable for homogenizers and other high-pressure applications.
795	Similar to SKF Ecowear 1000 and 776; improved oxidation resistance at high temperatures, tolerates steam cleaning for short periods.





## Dosing pistons

### Threats to uptime

The vast majority of liquid and dense food products are packed with dosing cylinders. Dosing pistons draw the product from the hopper into the dosing cylinder on the recharge stroke. The pistons then dispense the product into the container. Dosing volume is infinitely variable over the range of the cylinder size.

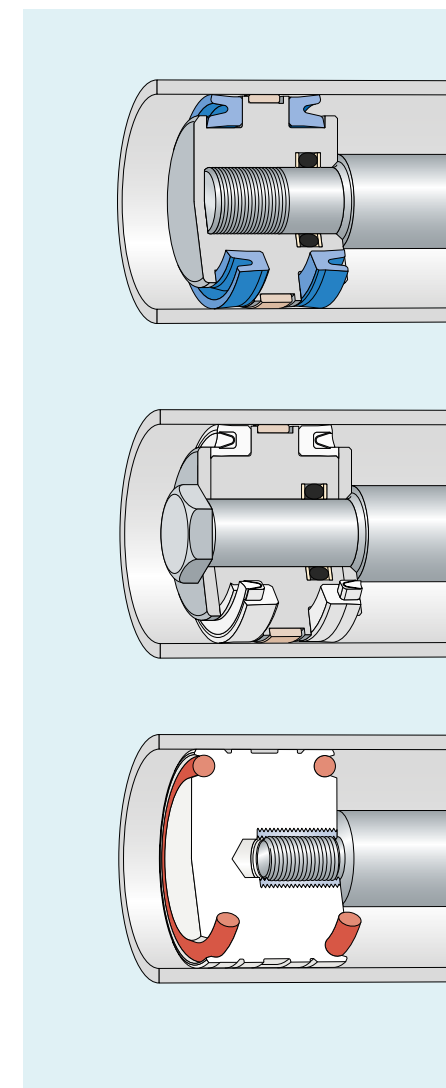
To function effectively and ensure a constant filling volume, dosing pistons need seals that are optimized to handle contact with abrasive products under substantial pressure. Given harsh CIP processes, seals for dosing pistons must also be easy to clean and withstand harsh washdowns.

### SKF sealing solutions

Seals from SKF provide the proven performance that dosing piston applications require. Despite exposure to abrasive food products and high pumping pressures, SKF seals deliver precise, reliable sealing to maintain constant filling volume.

Sealing solutions range from straightforward retrofits to a complete sealing piston that installs on the driving rod. Resulting benefits include:

- Higher productivity
- Reduced maintenance
- Less unplanned downtime
- Faster, easier washdowns due to lack of "dead spots" on seals

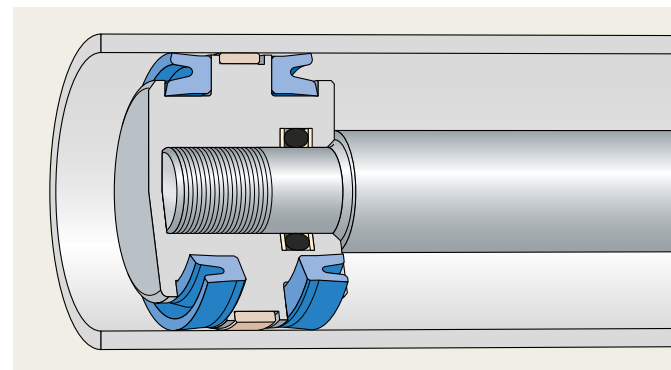




# Standardized sealing solutions for dosing pistons

## D1P

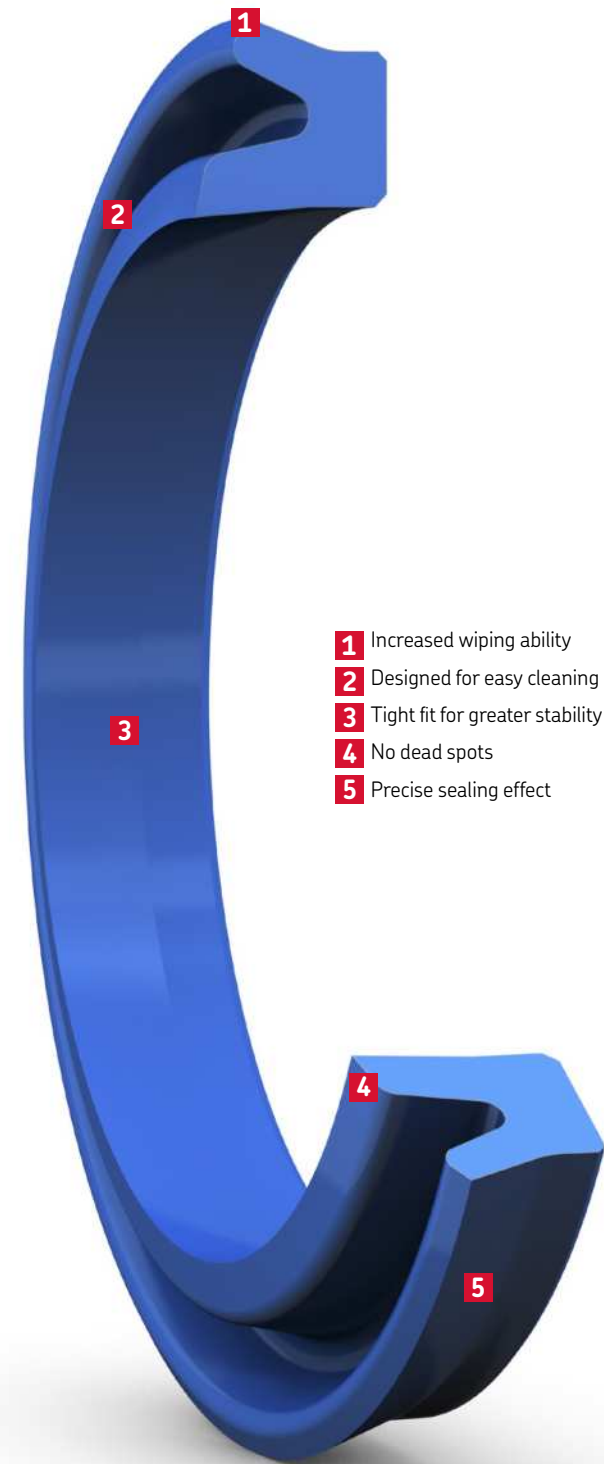
As our standard recommended offering for dosing pistons, D1P is a highly cleanable seal that offers precision sealing performance and a stable fit in the piston housing. Due to the elastomeric material characteristic, it is a self-energizing solution and easy to snap into closed piston housings. Featuring a thermoplastic elastomer sealing lip and an optimized design, D1P seals are capable of speeds up to 0,5 m/s and can handle pressures up to 10 bar\*. The seals can be installed back-to-back, or in standalone set-ups with low vacuum valves during the recharge stroke.



General dimensions					
D H9	d h10	L +0,2	d <sub>1</sub> ±0,2	R max.	C min.
mm					
15 – 25	D-8	6	D-5	0,4	3,5
25,1 – 50	D-10	7	D-6	0,4	4
50,1 – 75	D-12	8	D-7	0,4	4,5
75,1 – 150	D-15	10	D-9	0,4	5

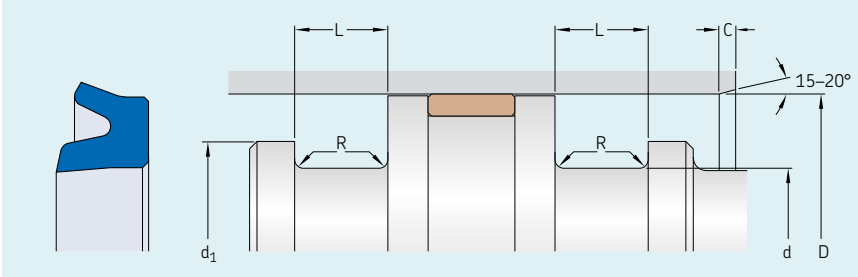
Typical materials for the D1P		
Material	Temperature range °C (°F)	
H-ECOPUR	-20 (-5)	+110 (+230)
H-ECOPUR 95A-NC	-20 (-5)	+110 (+230)
H-ECOPUR 95A-blue	-20 (-5)	+110 (+230)
ECOPUR 95A-bl-FG	-50 (-60)	+100 (+210)

NOTE: Available in elastomeric materials on request.



- 1 Increased wiping ability
- 2 Designed for easy cleaning
- 3 Tight fit for greater stability
- 4 No dead spots
- 5 Precise sealing effect

\* Max. values of application parameters (e.g. pressure, speed, temp. or e-gap) should not be applied continuously nor simultaneously.



**Ordering information key**  
**D1P**  
 Dosing piston design 1 (U-cup)  
**50 x 40 x 7**  
 Housing dimensions (D x d x L in mm)  
**Sealing material**  
 See the material matrix on page 6-7

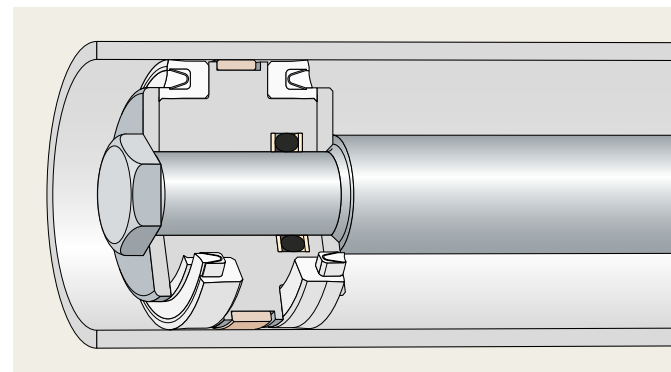
D H9	d h10	L +0,2	d <sub>1</sub> ±0,2	R max.	C min.	Ordering information
mm						
15	7	6	10	0,4	3,5	D1P 15x7x6 Sealing material
16	8	6	11	0,4	3,5	D1P 16x8x6 Sealing material
18	10	6	13	0,4	3,5	D1P 18x10x6 Sealing material
20	12	6	15	0,4	3,5	D1P 20x12x6 Sealing material
21	13	6	16	0,4	3,5	D1P 21x13x6 Sealing material
22	14	6	17	0,4	3,5	D1P 22x14x6 Sealing material
24	16	6	19	0,4	3,5	D1P 24x16x6 Sealing material
25	17	6	20	0,4	3,5	D1P 25x15x6 Sealing material
28	18	7	22	0,4	4	D1P 28x18x7 Sealing material
30	20	7	24	0,4	4	D1P 30x20x7 Sealing material
32	22	7	26	0,4	4	D1P 32x22x7 Sealing material
35	25	7	29	0,4	4	D1P 35x25x7 Sealing material
36	26	7	30	0,4	4	D1P 36x26x7 Sealing material
38	28	7	32	0,4	4	D1P 38x28x7 Sealing material
39	29	7	33	0,4	4	D1P 39x29x7 Sealing material
40	30	7	34	0,4	4	D1P 40x30x7 Sealing material
42	32	7	36	0,4	4	D1P 42x32x7 Sealing material
45	35	7	39	0,4	4	D1P 45x35x7 Sealing material
48	38	7	42	0,4	4	D1P 48x38x7 Sealing material
50	40	7	43	0,4	4	D1P 50x40x7 Sealing material
52	40	8	45	0,4	4,5	D1P 52x40x8 Sealing material
53	41	8	46	0,4	4,5	D1P 53x41x8 Sealing material
55	43	8	48	0,4	4,5	D1P 55x43x8 Sealing material
57	45	8	50	0,4	4,5	D1P 57x45x8 Sealing material
58	46	8	51	0,4	4,5	D1P 58x46x8 Sealing material
60	48	8	53	0,4	4,5	D1P 60x48x8 Sealing material
62	50	8	55	0,4	4,5	D1P 62x50x8 Sealing material
63	51	8	56	0,4	4,5	D1P 63x51x8 Sealing material
65	53	8	58	0,4	4,5	D1P 65x53x8 Sealing material
68	56	8	61	0,4	4,5	D1P 68x56x8 Sealing material
70	58	8	63	0,4	4,5	D1P 70x58x8 Sealing material
75	63	8	68	0,4	4,5	D1P 75x63x10 Sealing material
79	64	10	70	0,4	5	D1P 79x64x10 Sealing material
80	65	10	71	0,4	5	D1P 80x65x10 Sealing material
82,5	67,5	10	73,5	0,4	5	D1P 82.5x67.5x10 Sealing material
85	70	10	76	0,4	5	D1P 85x70x10 Sealing material
90	75	10	81	0,4	5	D1P 90x75x10 Sealing material
95	80	10	86	0,4	5	D1P 95x80x10 Sealing material
100	85	10	91	0,4	5	D1P 100x85x10 Sealing material
105	90	10	96	0,4	5	D1P 105x90x10 Sealing material
108	93	10	99	0,4	5	D1P 108x93x10 Sealing material
110	95	10	101	0,4	5	D1P 110x95x10 Sealing material
115	100	10	106	0,4	5	D1P 115x100x10 Sealing material
120	105	10	111	0,4	5	D1P 120x110x10 Sealing material
125	110	10	116	0,4	5	D1P 125x110x10 Sealing material
127	112	10	118	0,4	5	D1P 127x112x10 Sealing material
130	115	10	121	0,4	5	D1P 130x115x10 Sealing material
132	117	10	123	0,4	5	D1P 132x117x10 Sealing material
135	120	10	126	0,4	5	D1P 135x120x10 Sealing material
140	125	10	131	0,4	5	D1P 140x125x10 Sealing material
145	130	10	136	0,4	5	D1P 145x130x10 Sealing material
150	135	10	141	0,4	5	D1P 150x135x10 Sealing material

NOTE: Due to our flexible manufacturing process we are able to produce any other dimension on request

# Standardized sealing solutions for dosing pistons

## D2P

This meander spring-energized thermoplastic lip seal is filled with silicone to keep contaminants out of the spring cavity. D2P seals are suitable for pressures up to 10 bar and speeds up to 1,5 m/s\*, plus a range of abrasive products. The seals are very easy to clean and are installed in two-piece housings so that the static lip can be axially compressed to eliminate dead spots. When PTFE materials are used, D2P seals will resist high temperatures.



### General dimensions

D H9	d h10	L +0,13	d <sub>1</sub> ±0,2	R max.	c ±0,1	C min.
mm						
15 – 25	D-8	6	D-5	0,4	0,4	1
25,1 – 50	D-10	7	D-6,7	0,5	0,5	1,3
50,1 – 75	D-12	8	D-6,7	0,5	0,5	1,3
75,1 – 150	D-15	10	D-10,5	0,9	0,75	2

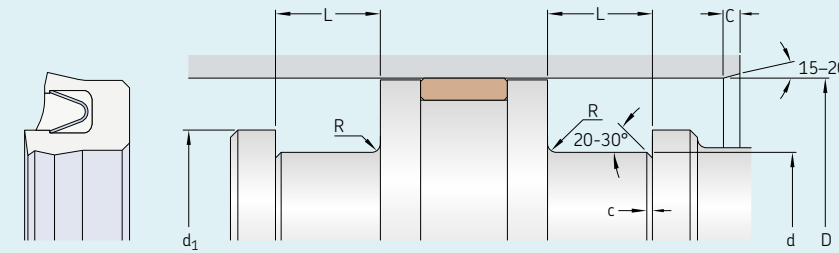
### Typical materials for the D2P

Material	Temperature range °C (°F)	
SKF Ecoflon 1, 700	-200 (-330)	+260 (+500)
SKF Ecoflon 5, 777	-200 (-330)	+260 (+500)
SKF Ecoflon 14, 754	-200 (-330)	+260 (+500)
SKF Ecoflon 16	-200 (-330)	+260 (+500)
721	-200 (-330)	+260 (+500)
SKF Ecowear 1000, 776	-200 (-330)	+90 (+194)
795	-200 (-330)	+100 (+210)



- 1** Excluding dynamic lip keeps abrasive materials away from sealing contact
- 2** Silicone filling prevents entrapment of media
- 3** Lip is compressed in housing to eliminate dead spots
- 4** Tight fit on piston
- 5** Meander spring energizes seal jacket
- 6** Additional clearance to bore for added flexibility

\* Max. values of application parameters (e.g. pressure, speed, temp. or e-gap) should not be applied continuously nor simultaneously.



Two-piece housings

### Ordering information key

**D2P**  
Dosing piston design 2  
(silicone-filled, spring-energized seal)

**50 x 40 x 7**  
Housing dimensions (D x d x L in mm)

**Sealing material**  
See the material matrix on page 6-7

D H9	d h10	L +0,13	d <sub>1</sub> ±0,2	R max.	c ±0,1	C min.	Ordering information
mm							
15	7	6	10	0,4	0,4	1	D2P 15x7x6 Sealing material
16	8	6	11	0,4	0,4	1	D2P 16x8x6 Sealing material
18	10	6	13	0,4	0,4	1	D2P 18x10x6 Sealing material
20	12	6	15	0,4	0,4	1	D2P 20x12x6 Sealing material
21	13	6	16	0,4	0,4	1	D2P 21x13x6 Sealing material
22	14	6	17	0,4	0,4	1	D2P 22x14x6 Sealing material
24	16	6	19	0,4	0,4	1	D2P 24x16x6 Sealing material
25	17	6	20	0,4	0,4	1	D2P 25x17x6 Sealing material
28	18	7	21,3	0,5	0,5	1,3	D2P 28x18x7 Sealing material
30	20	7	23,3	0,5	0,5	1,3	D2P 30x20x7 Sealing material
32	22	7	25,3	0,5	0,5	1,3	D2P 32x22x7 Sealing material
35	25	7	28,3	0,5	0,5	1,3	D2P 35x25x7 Sealing material
36	26	7	29,3	0,5	0,5	1,3	D2P 36x26x7 Sealing material
38	28	7	31,3	0,5	0,5	1,3	D2P 38x28x7 Sealing material
39	29	7	32,3	0,5	0,5	1,3	D2P 39x29x7 Sealing material
40	30	7	33,3	0,5	0,5	1,3	D2P 40x30x7 Sealing material
42	32	7	35,3	0,5	0,5	1,3	D2P 42x32x7 Sealing material
45	35	7	38,3	0,5	0,5	1,3	D2P 45x35x7 Sealing material
48	38	7	41,3	0,5	0,5	1,3	D2P 48x38x7 Sealing material
50	40	7	43,3	0,5	0,5	1,3	D2P 50x40x7 Sealing material
52	40	8	45,3	0,5	0,5	1,3	D2P 52x40x8 Sealing material
53	41	8	46,3	0,5	0,5	1,3	D2P 53x41x8 Sealing material
55	43	8	48,3	0,5	0,5	1,3	D2P 55x43x8 Sealing material
57	45	8	50,3	0,5	0,5	1,3	D2P 57x45x8 Sealing material
58	46	8	51,3	0,5	0,5	1,3	D2P 58x46x8 Sealing material
60	48	8	53,3	0,5	0,5	1,3	D2P 60x48x8 Sealing material
62	50	8	55,3	0,5	0,5	1,3	D2P 62x50x8 Sealing material
63	51	8	56,3	0,5	0,5	1,3	D2P 63x51x8 Sealing material
65	53	8	58,3	0,5	0,5	1,3	D2P 65x53x8 Sealing material
68	56	8	61,3	0,5	0,5	1,3	D2P 68x56x8 Sealing material
70	58	8	63,3	0,5	0,5	1,3	D2P 70x58x8 Sealing material
75	63	8	68,3	0,5	0,5	1,3	D2P 75x60x10 Sealing material
79	64	10	68,5	0,9	0,75	2	D2P 79x64x10 Sealing material
80	65	10	69,5	0,9	0,75	2	D2P 80x65x10 Sealing material
82,5	67,5	10	72	0,9	0,75	2	D2P 82.5x67.5x10 Sealing material
85	70	10	74,5	0,9	0,75	2	D2P 85x70x10 Sealing material
90	75	10	79,5	0,9	0,75	2	D2P 90x75x10 Sealing material
95	80	10	84,5	0,9	0,75	2	D2P 95x80x10 Sealing material
100	85	10	89,5	0,9	0,75	2	D2P 100x85x10 Sealing material
105	90	10	94,5	0,9	0,75	2	D2P 105x90x10 Sealing material
108	93	10	97,5	0,9	0,75	2	D2P 108x93x10 Sealing material
110	95	10	99,5	0,9	0,75	2	D2P 110x95x10 Sealing material
115	100	10	104,5	0,9	0,75	2	D2P 115x100x10 Sealing material
120	105	10	109,5	0,9	0,75	2	D2P 120x110x10 Sealing material
125	110	10	114,5	0,9	0,75	2	D2P 125x110x10 Sealing material
127	112	10	116,5	0,9	0,75	2	D2P 127x112x10 Sealing material
130	115	10	119,5	0,9	0,75	2	D2P 130x115x10 Sealing material
132	117	10	121,5	0,9	0,75	2	D2P 132x117x10 Sealing material
135	120	10	124,5	0,9	0,75	2	D2P 135x120x10 Sealing material
140	125	10	129,5	0,9	0,75	2	D2P 140x125x10 Sealing material
145	130	10	134,5	0,9	0,75	2	D2P 145x130x10 Sealing material
150	135	10	139,5	0,9	0,75	2	D2P 150x135x10 Sealing material

NOTE: Due to our flexible manufacturing process we are able to produce any other dimension on request

# Standardized sealing solutions for dosing pistons

## D3P

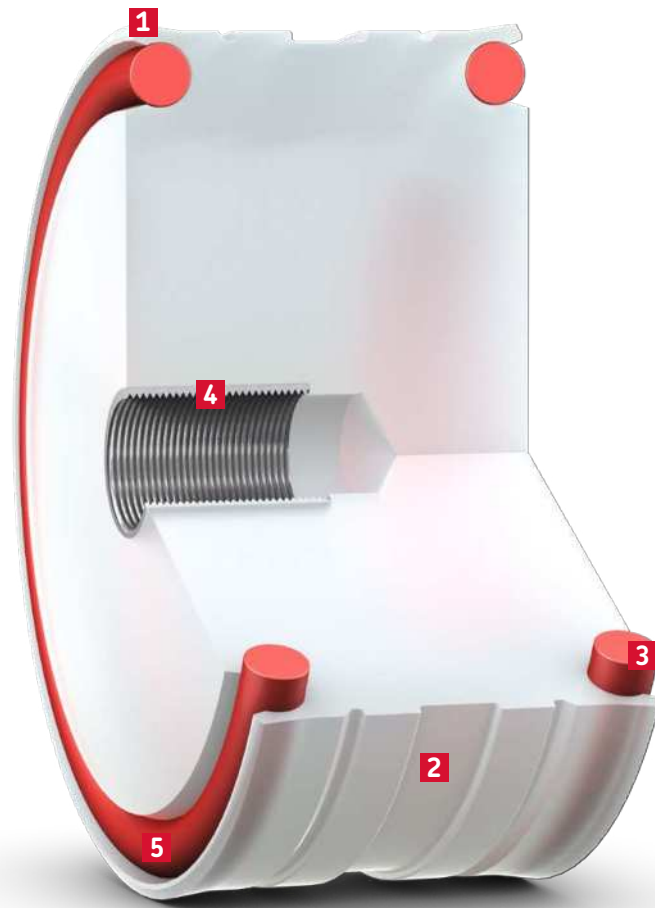
Installed directly on the driving rod, D3P is a complete thermoplastic piston for filling cylinders. Made of SKF Ecoflex and a variety of SKF Ecoflon compounds, D3P simultaneously provides a sealing and guiding effect for reduced maintenance. O-rings act as elastic energizing elements to keep contaminants from getting trapped, and can be manufactured in different elastomeric materials according to the application requirements. These seals are capable of speeds up to 1 m/s and can handle pressures up to 10 bar\*.

General dimensions				
D	M	H	t <sub>1</sub>	C min.
mm	-	mm		
12 - 18	M4*	25	8	3,5
18,1 - 22	M6	25	14	3,5
22,1 - 25	M8	25	15	3,5
25,1 - 30	M8	35	15	4
30,1 - 40	M10	35	18	4
40,1 - 50	M12	35	22	4
50,1 - 57	M12	40	22	4,5
57,1 - 65	M16	40	22	4,5
65,1 - 75	M16	40	22	4,5
75,1 - 150	M24	45	30	5

\* Without threaded insert

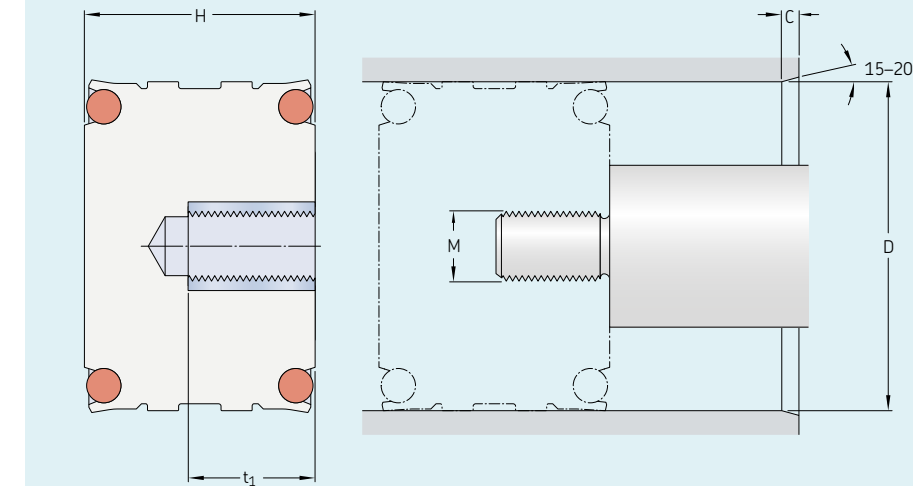
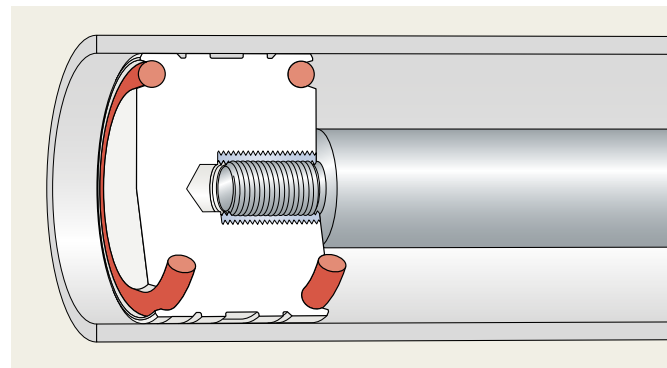
### Typical materials for the D3P

Material	Temperature range °C (°F)	
SKF Ecoflon 1, 700	-200 (-330)	+260 (+500)
SKF Ecoflon 5, 777	-200 (-330)	+260 (+500)
SKF Ecoflon 14, 754	-200 (-330)	+260 (+500)
SKF Ecoflon 16	-200 (-330)	+260 (+500)
721	-200 (-330)	+260 (+500)
SKF Ecoflex 1000, 776	-200 (-330)	+90 (+194)
795	-200 (-330)	+100 (+210)
SKF Ecosil	-60 (-75)	+200 (+390)



- 1** Excluding lip keeps contaminants out
- 2** Integrated guiding
- 3** O-ring for effective energizing
- 4** High strength thread insert
- 5** Hygienic design for easy cleaning

\* Max. values of application parameters (e.g. pressure, speed, temp. or e-gap) should not be applied continuously nor simultaneously.



### Ordering information key

**D3P**  
Dosing piston design 3 (unitized piston)

**50 x M12 x 35**  
Housing/thread dimensions  
50 bore x M12 thread x 35 tall  
(D x M x H)

**Sealing material**  
See the material matrix on [page 6-7](#);  
elastomers for energizer

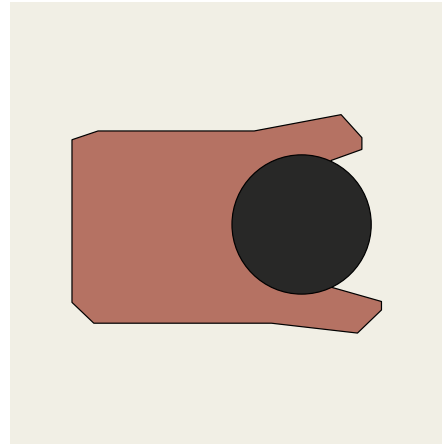
D	M	H	t <sub>1</sub>	C min.	Ordering information
mm	-	mm			-
12	M4	25	8	3,5	D3P 12xM4x25 Sealing material / Energizer material
13	M4	25	8	3,5	D3P 13xM4x25 Sealing material / Energizer material
14	M4	25	8	3,5	D3P 14xM4x25 Sealing material / Energizer material
15	M4	25	8	3,5	D3P 15xM4x25 Sealing material / Energizer material
16	M4	25	8	3,5	D3P 16xM4x25 Sealing material / Energizer material
18	M4	25	8	3,5	D3P 18xM4x25 Sealing material / Energizer material
20	M6	25	14	3,5	D3P 20xM6x25 Sealing material / Energizer material
22	M6	25	14	3,5	D3P 22xM6x25 Sealing material / Energizer material
24	M8	25	15	3,5	D3P 24xM8x25 Sealing material / Energizer material
25	M8	25	15	3,5	D3P 25xM8x25 Sealing material / Energizer material
28	M8	35	15	4	D3P 28xM8x35 Sealing material / Energizer material
30	M8	35	15	4	D3P 30xM8x35 Sealing material / Energizer material
32	M10	35	18	4	D3P 32xM10x35 Sealing material / Energizer material
35	M10	35	18	4	D3P 35xM10x35 Sealing material / Energizer material
36	M10	35	18	4	D3P 36xM10x35 Sealing material / Energizer material
38	M10	35	18	4	D3P 38xM10x35 Sealing material / Energizer material
40	M10	35	18	4	D3P 40xM10x35 Sealing material / Energizer material
42	M12	35	22	4	D3P 42xM12x35 Sealing material / Energizer material
45	M12	35	22	4	D3P 45xM12x35 Sealing material / Energizer material
48	M12	35	22	4	D3P 48xM12x35 Sealing material / Energizer material
50	M12	35	22	4,5	D3P 50xM12x35 Sealing material / Energizer material
52	M12	40	22	4,5	D3P 52xM12x40 Sealing material / Energizer material
53	M12	40	22	4,5	D3P 53xM12x40 Sealing material / Energizer material
55	M12	40	22	4,5	D3P 55xM12x40 Sealing material / Energizer material
58	M16	40	22	4,5	D3P 58xM16x40 Sealing material / Energizer material
60	M16	40	22	4,5	D3P 60xM16x40 Sealing material / Energizer material
63	M16	40	22	4,5	D3P 63xM16x40 Sealing material / Energizer material
65	M16	40	22	4,5	D3P 65xM16x40 Sealing material / Energizer material
68	M16	40	22	4,5	D3P 68xM16x40 Sealing material / Energizer material
70	M16	40	22	4,5	D3P 70xM16x40 Sealing material / Energizer material
75	M16	40	22	4,5	D3P 75xM16x40 Sealing material / Energizer material
79	M24	45	30	5	D3P 79xM24x45 Sealing material / Energizer material
80	M24	45	30	5	D3P 80xM24x45 Sealing material / Energizer material
82,5	M24	45	30	5	D3P 82.5xM24x45 Sealing material / Energizer material
85	M24	45	30	5	D3P 85xM24x45 Sealing material / Energizer material
90	M24	45	30	5	D3P 90xM24x45 Sealing material / Energizer material
95	M24	45	30	5	D3P 95xM24x45 Sealing material / Energizer material
100	M24	45	30	5	D3P 100xM24x45 Sealing material / Energizer material
120	M24	45	30	5	D3P 120xM24x45 Sealing material / Energizer material
125	M24	45	30	5	D3P 125xM24x45 Sealing material / Energizer material
150	M24	45	30	5	D3P 150xM24x45 Sealing material / Energizer material

NOTE: Due to our flexible manufacturing process we are able to produce any other dimension on request

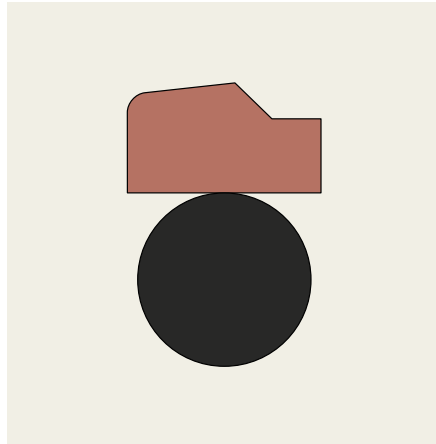


# Alternative solutions – standard and customized

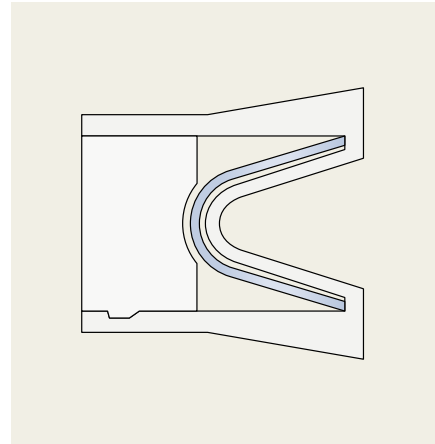
As these examples show, SKF can adapt any dosing piston sealing solution to meet your specific sealing requirements.



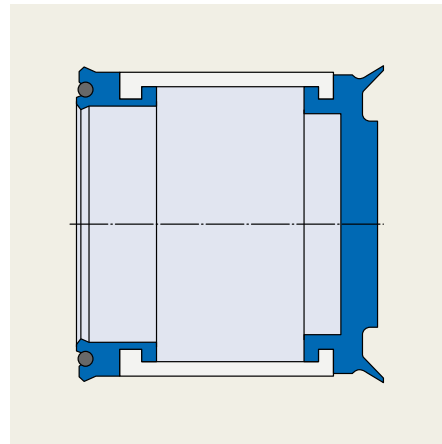
**Standard seal profile K03-F**  
O-ring energized lip seal



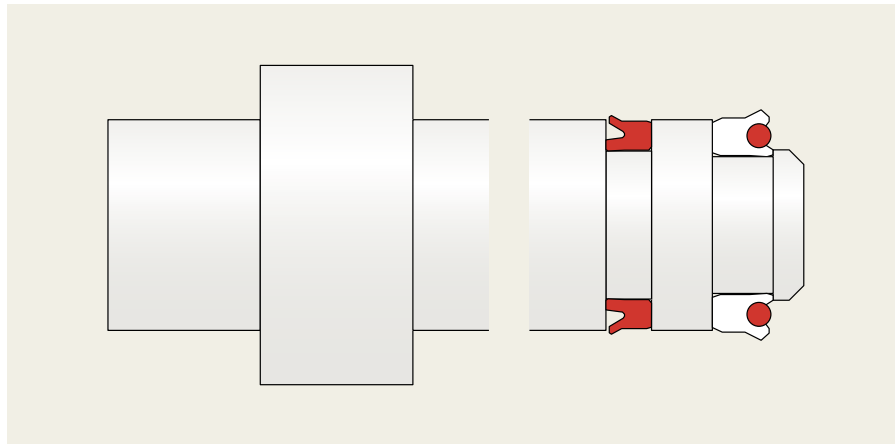
**Standard seal profile K08-E**  
O-ring energized compact seal



**Customized seal profile**  
Encapsulated meander-spring energized SKF Spectraseal



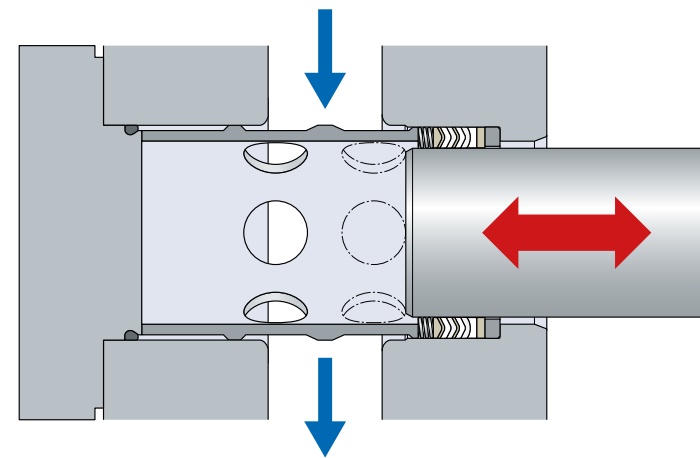
**Fully customized solution**  
Elastomer sealing parts anchored on piston by a split thermoplastic guide ring.



**Fully customized solution**  
Thermoplastic piston with snap-on sealing elements.







# Homogenizers

## High pressures and speeds

During homogenization, particles or droplets are subdivided into micron sizes to create a stable dispersion or emulsion. Plunger pistons under high pressure push the emulsified product through a combination of valves or nozzles, usually at high speeds.

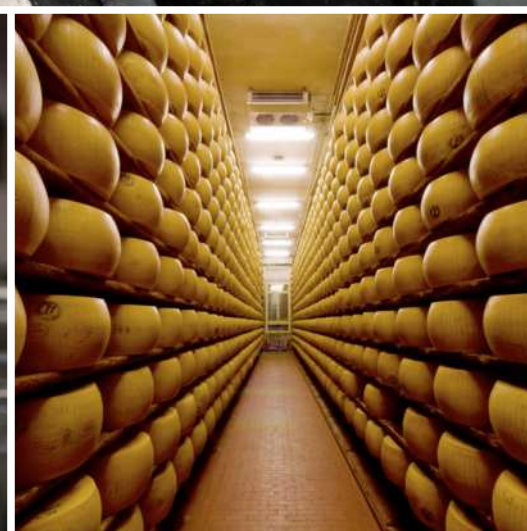
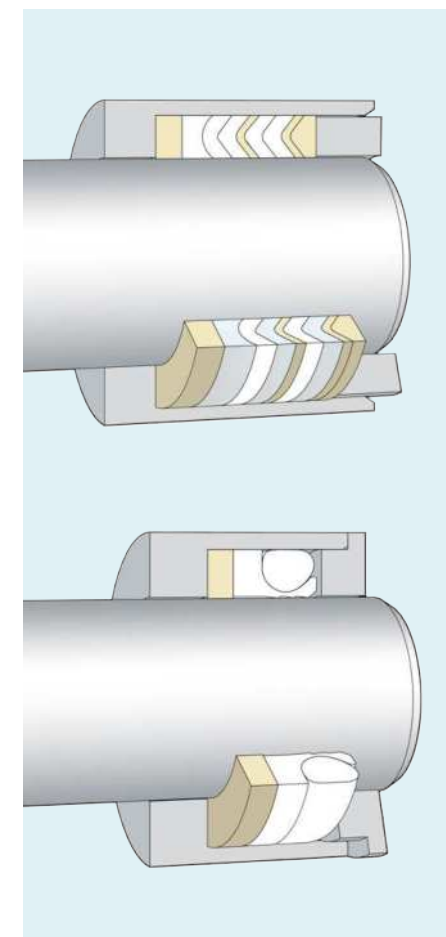
To provide effective sealing, seals must be able to resist high pressures and deliver excellent sliding properties. To handle abrasive food products and caustic cleaning agents, the seals must be made of materials with high chemical and abrasion resistance. Accordingly, the choice and combination of sealing materials is crucial to meet both performance demands and food safety regulations.

## SKF sealing solutions

SKF's H1R and H2R seals provide a performance upgrade compared to the conventional elastomer chevron style seal assemblies frequently used in homogenizers.

Benefits include:

- Excellent high-pressure sealing
- Reduced frequency and costs of planned sealing system replacements
- Easier to clean than conventional seal designs
- Less unplanned downtime
- Reduced maintenance

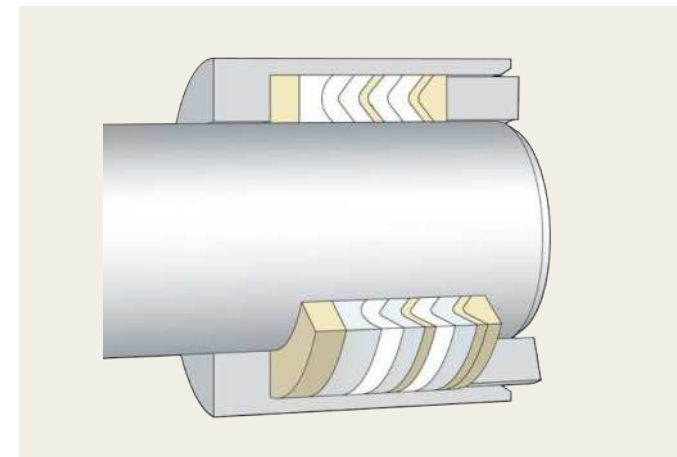




# Standardized sealing solutions for homogenizers

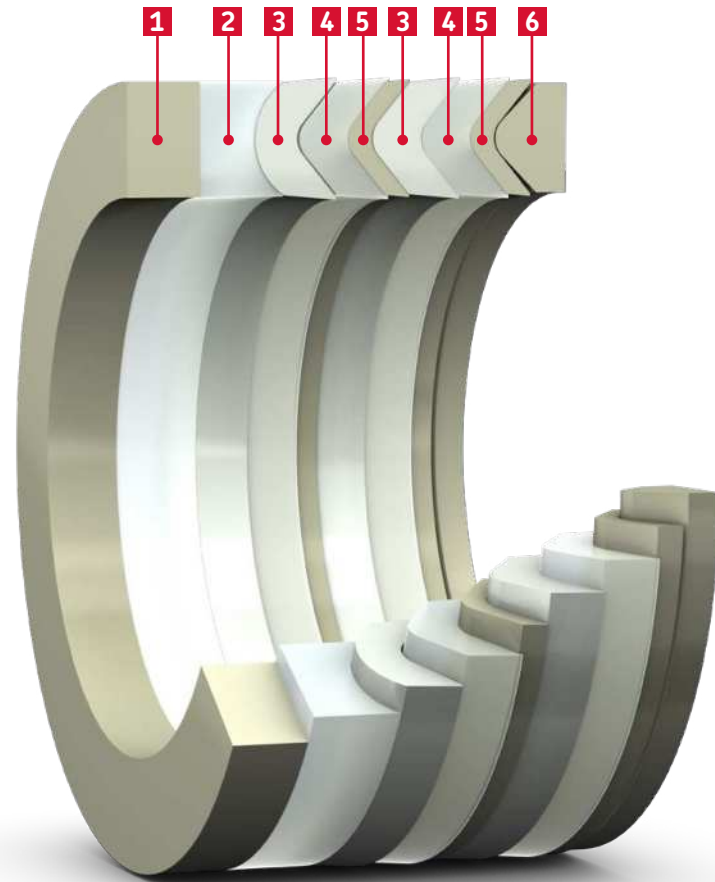
## H1R

This specially designed packing set for homogenizers prevents contaminants from entering into the packing while maintaining high-pressure loads up to 1 500 bar and speeds up to 0,3 m/s (higher speeds at lower pressures possible)\*. Offering a performance upgrade over conventional elastomer chevron style seal assemblies, H1R features a combination of materials to withstand abrasive, potentially non-lubricating products. H1R seals are installed in multiple-piece housings and are typically compressed with a spring.



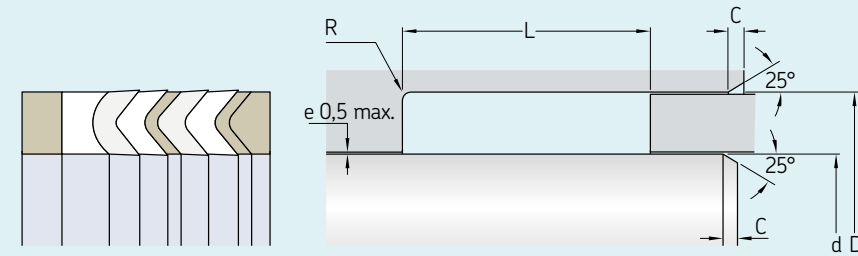
General dimensions				
d h10	D H9	L ref.	R max.	C min.
mm				
15 - 50	d+12	28	0,4	1,5
50,1 - 125	d+21	42	0,4	2,5
125,1 - 200	d+25	47	0,4	3

Typical materials for the H1R	
Material	Temperature range °C (°F)
721	-200 (-330) +260 (+500)
795	-200 (-330) +100 (+210)
SKF Ecopeak	-100 (-150) +260 (+500)



- 1** SKF Ecopeak back-up prevents extrusion
- 2** Profile ring resists cracking at high loads
- 3** Mineral-filled PTFE vees add redundant seal and reduce heat
- 4** High-temperature UHMWPE vees resist abrasion
- 5** SKF Ecopeak vee scrapes fluid and provides flexibility for installs
- 6** SKF Ecopeak adapter fits most springs

\* Max. values of application parameters (e.g. pressure, speed, temp. or e-gap) should not be applied continuously nor simultaneously.



### Ordering information key

**H1R**  
Homogenizer packing set

**50 x 62 x 28**  
Housing dimensions  
(d x D x L in mm)

**Sealing material**  
Seal assembly components produced from SKF Ecopeak, compounds 721 and 795; other materials available on request to meet specific application requirements

### Ordering information

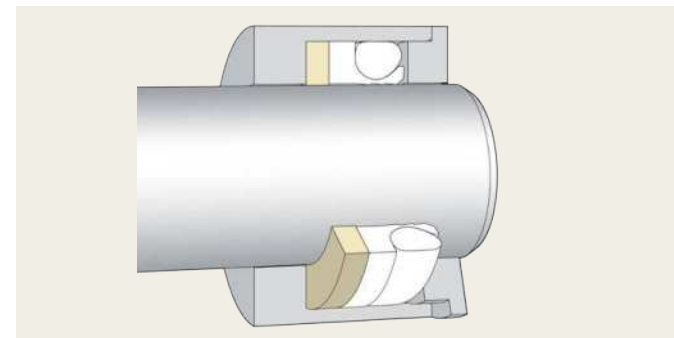
d h10	D H9	L ref.	R max.	C min.	Ordering information
mm					
15	27	28	0,4	1,5	H1R 15x27x28 Sealing materials
16	28	28	0,4	1,5	H1R 16x28x28 Sealing materials
18	30	28	0,4	1,5	H1R 18x30x28 Sealing materials
20	32	28	0,4	1,5	H1R 20x32x28 Sealing materials
21	33	28	0,4	1,5	H1R 21x33x28 Sealing materials
22	34	28	0,4	1,5	H1R 22x34x28 Sealing materials
24	36	28	0,4	1,5	H1R 24x36x28 Sealing materials
25	37	28	0,4	1,5	H1R 25x37x28 Sealing materials
28	40	28	0,4	1,5	H1R 28x40x28 Sealing materials
30	42	28	0,4	1,5	H1R 30x42x28 Sealing materials
32	44	28	0,4	1,5	H1R 32x44x28 Sealing materials
35	47	28	0,4	1,5	H1R 35x47x28 Sealing materials
36	48	28	0,4	1,5	H1R 36x48x28 Sealing materials
38	50	28	0,4	1,5	H1R 38x50x28 Sealing materials
39	51	28	0,4	1,5	H1R 39x51x28 Sealing materials
40	52	28	0,4	1,5	H1R 40x52x28 Sealing materials
42	54	28	0,4	1,5	H1R 42x54x28 Sealing materials
45	57	28	0,4	1,5	H1R 45x57x28 Sealing materials
48	60	28	0,4	1,5	H1R 48x60x28 Sealing materials
50	62	28	0,4	1,5	H1R 50x62x28 Sealing materials
52	73	42	0,4	2,5	H1R 52x73x42 Sealing materials
53	74	42	0,4	2,5	H1R 53x74x42 Sealing materials
55	76	42	0,4	2,5	H1R 55x76x42 Sealing materials
57	78	42	0,4	2,5	H1R 57x78x42 Sealing materials
58	79	42	0,4	2,5	H1R 58x79x42 Sealing materials
60	81	42	0,4	2,5	H1R 60x81x42 Sealing materials
62	83	42	0,4	2,5	H1R 62x83x42 Sealing materials
63	84	42	0,4	2,5	H1R 63x84x42 Sealing materials
65	86	42	0,4	2,5	H1R 65x86x42 Sealing materials
68	89	42	0,4	2,5	H1R 68x89x42 Sealing materials
70	91	42	0,4	2,5	H1R 70x91x42 Sealing materials
75	96	42	0,4	2,5	H1R 75x96x42 Sealing materials
79	100	42	0,4	2,5	H1R 79x100x42 Sealing materials
80	101	42	0,4	2,5	H1R 80x101x42 Sealing materials
82,5	103,5	42	0,4	2,5	H1R 82.5x103.5x42 Sealing materials
85	106	42	0,4	2,5	H1R 85x106x42 Sealing materials
90	111	42	0,4	2,5	H1R 90x111x42 Sealing materials
95	116	42	0,4	2,5	H1R 95x116x42 Sealing materials
100	121	42	0,4	2,5	H1R 100x121x42 Sealing materials
105	126	42	0,4	2,5	H1R 105x126x42 Sealing materials
108	129	42	0,4	2,5	H1R 108x129x42 Sealing materials
110	131	42	0,4	2,5	H1R 110x131x42 Sealing materials
115	136	42	0,4	2,5	H1R 115x136x42 Sealing materials
120	141	42	0,4	2,5	H1R 120x141x42 Sealing materials
125	146	42	0,4	2,5	H1R 125x146x42 Sealing materials
127	152	47	0,4	3	H1R 127x152x47 Sealing materials
130	155	47	0,4	3	H1R 130x155x47 Sealing materials
132	157	47	0,4	3	H1R 132x157x47 Sealing materials
135	160	47	0,4	3	H1R 135x160x47 Sealing materials
140	165	47	0,4	3	H1R 140x165x47 Sealing materials
145	170	47	0,4	3	H1R 145x170x47 Sealing materials
150	175	47	0,4	3	H1R 150x175x47 Sealing materials

NOTE: Due to our flexible manufacturing process we are able to produce any other dimension on request

# Standardized sealing solutions for homogenizers

## H2R

Unlike the H1R seal, the H2R has an elastomer energizer to load the ID sealing lip, thus the H2R is not axially compressed allowing the seal to be installed in a less complicated housing design. A pressure adaptive back-up ring provides excellent anti-extrusion support for the sealing element. Optimized design and advanced material selection of the sealing element gives H2R seals very high pressure resistance and outstanding sliding properties in water-based fluids and food products. This seals are capable of pressures up to 2 000 bar and can handle speeds up to 0,3 m/s (higher speeds at lower pressures possible)\*.

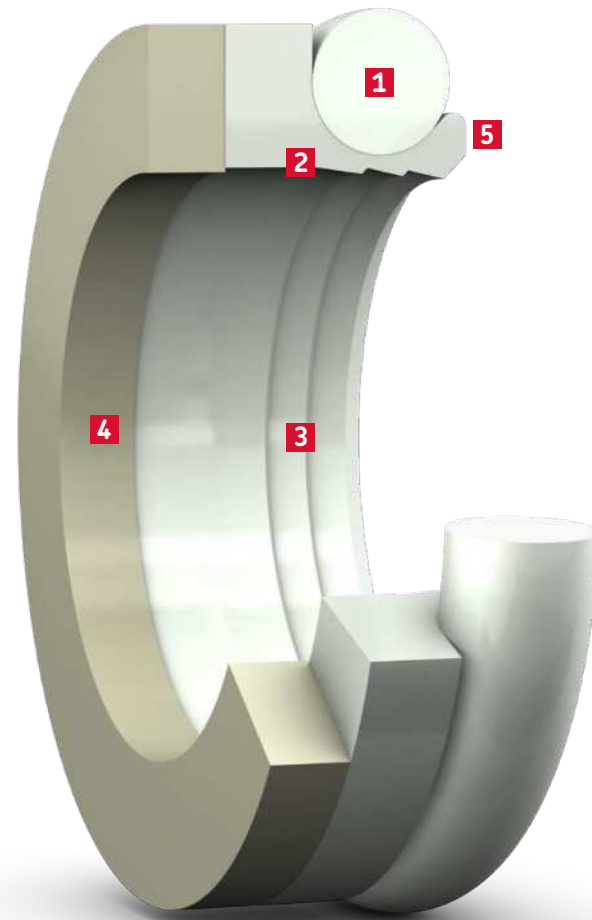


### General dimensions

d f8	D H10	L +0,2	R max.	c min.
mm				
10 - 40	d+10	15	0,4	4
40,1 - 80	d+15	20	0,4	5
80,1 - 150	d+20	25	0,4	6
150,1 - 200	d+25	30	0,4	8,5

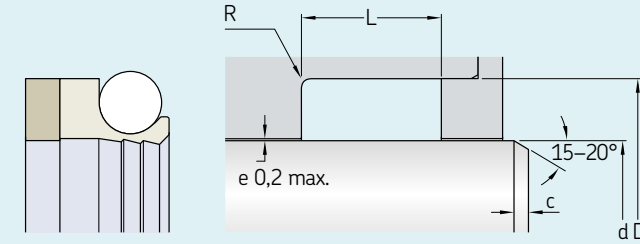
### Typical materials for the H2R

Material	Temperature range °C (°F)	
SKF Ecowear 1000, 776	-200 (-330)	+90 (+194)
SKF Ecopaek	-100 (-150)	+260 (+500)
SKF Ecorubber-H 85A-b-FG	-25 (-15)	+150 (+300)
SKF Ecorubber-2 85A-w-FG	-20 (-5)	+200 (+390)
SKF Ecorubber-3 85A-w-FG	-50 (-60)	+150 (+300)
SKF Ecorubber-3 85A-b-FG	-50 (-60)	+150 (+300)
SKF Ecosil	-60 (-75)	+200 (+390)



- 1** Food-grade o-ring energizer
- 2** High pressure design
- 3** Saw tooth pattern handles high and low pressure
- 4** Extrusion-resistant back-up ring
- 5** Raised front lip keeps o-ring in place

\* Max. values of application parameters (e.g. pressure, speed, temp. or e-gap) should not be applied continuously nor simultaneously.



### Ordering information key

**H2R**  
Homogenizer packing set

**50 x 65 x 20**  
Housing dimensions  
(d x D x L in mm)

**Sealing material**  
See the material matrix on page 6-7

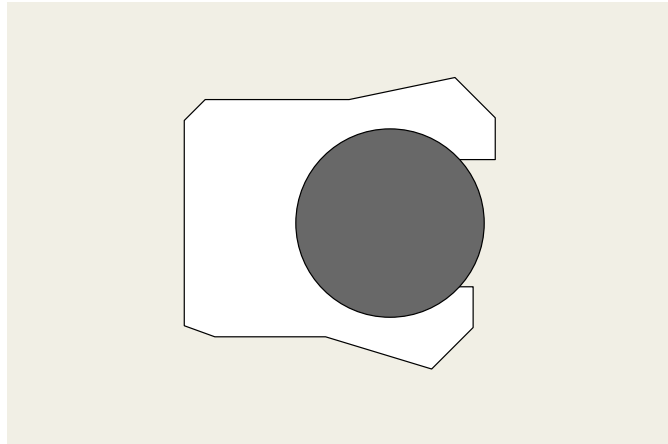
d f8	D H10	L +0,2	R max.	c min.	Ordering information
mm					
10	20	15	0,4	4	H2R 10x20x15 Sealing material / Energizer material
12	22	15	0,4	4	H2R 12x22x15 Sealing material / Energizer material
15	25	15	0,4	4	H2R 15x25x15 Sealing material / Energizer material
16	26	15	0,4	4	H2R 16x26x15 Sealing material / Energizer material
18	28	15	0,4	4	H2R 18x28x15 Sealing material / Energizer material
20	30	15	0,4	4	H2R 20x30x15 Sealing material / Energizer material
21	31	15	0,4	4	H2R 21x31x15 Sealing material / Energizer material
22	32	15	0,4	4	H2R 22x32x15 Sealing material / Energizer material
24	34	15	0,4	4	H2R 24x34x15 Sealing material / Energizer material
25	35	15	0,4	4	H2R 25x35x15 Sealing material / Energizer material
28	38	15	0,4	4	H2R 28x38x15 Sealing material / Energizer material
30	40	15	0,4	4	H2R 30x40x15 Sealing material / Energizer material
32	42	15	0,4	4	H2R 32x42x15 Sealing material / Energizer material
35	45	15	0,4	4	H2R 35x45x15 Sealing material / Energizer material
36	46	15	0,4	4	H2R 36x46x15 Sealing material / Energizer material
38	48	15	0,4	4	H2R 38x48x15 Sealing material / Energizer material
39	49	15	0,4	4	H2R 39x49x15 Sealing material / Energizer material
40	50	15	0,4	4	H2R 40x50x15 Sealing material / Energizer material
42	57	20	0,4	5	H2R 42x57x20 Sealing material / Energizer material
45	60	20	0,4	5	H2R 45x60x20 Sealing material / Energizer material
48	63	20	0,4	5	H2R 48x63x20 Sealing material / Energizer material
50	65	20	0,4	5	H2R 50x65x15 Sealing material / Energizer material
52	67	20	0,4	5	H2R 52x67x20 Sealing material / Energizer material
53	68	20	0,4	5	H2R 53x68x20 Sealing material / Energizer material
55	70	20	0,4	5	H2R 55x70x20 Sealing material / Energizer material
57	72	20	0,4	5	H2R 57x72x20 Sealing material / Energizer material
58	73	20	0,4	5	H2R 58x73x20 Sealing material / Energizer material
60	75	20	0,4	5	H2R 60x75x20 Sealing material / Energizer material
62	77	20	0,4	5	H2R 62x77x20 Sealing material / Energizer material
63	78	20	0,4	5	H2R 63x78x20 Sealing material / Energizer material
65	80	20	0,4	5	H2R 65x80x20 Sealing material / Energizer material
68	83	20	0,4	5	H2R 68x83x20 Sealing material / Energizer material
70	85	20	0,4	5	H2R 70x85x20 Sealing material / Energizer material
75	90	20	0,4	5	H2R 75x90x20 Sealing material / Energizer material
79	94	20	0,4	5	H2R 79x94x20 Sealing material / Energizer material
80	95	20	0,4	5	H2R 80x95x20 Sealing material / Energizer material
82,5	102,5	25	0,4	6	H2R 82.5x102.5x25 Sealing material / Energizer material
85	105	25	0,4	6	H2R 85x105x25 Sealing material / Energizer material
90	110	25	0,4	6	H2R 90x110x25 Sealing material / Energizer material
95	115	25	0,4	6	H2R 95x115x25 Sealing material / Energizer material
100	120	25	0,4	6	H2R 100x120x25 Sealing material / Energizer material
105	125	25	0,4	6	H2R 105x120x25 Sealing material / Energizer material
108	128	25	0,4	6	H2R 108x128x25 Sealing material / Energizer material
110	130	25	0,4	6	H2R 110x130x25 Sealing material / Energizer material
115	135	25	0,4	6	H2R 115x135x25 Sealing material / Energizer material
120	140	25	0,4	6	H2R 120x140x25 Sealing material / Energizer material
125	145	25	0,4	6	H2R 125x145x25 Sealing material / Energizer material
127	147	25	0,4	6	H2R 127x147x25 Sealing material / Energizer material
130	150	25	0,4	6	H2R 130x150x25 Sealing material / Energizer material
132	152	25	0,4	6	H2R 132x152x25 Sealing material / Energizer material
135	155	25	0,4	6	H2R 135x155x25 Sealing material / Energizer material
140	160	25	0,4	6	H2R 140x160x25 Sealing material / Energizer material
145	165	25	0,4	6	H2R 145x165x25 Sealing material / Energizer material
150	170	25	0,4	6	H2R 150x170x25 Sealing material / Energizer material

NOTE: Due to our flexible manufacturing process we are able to produce any other dimension on request

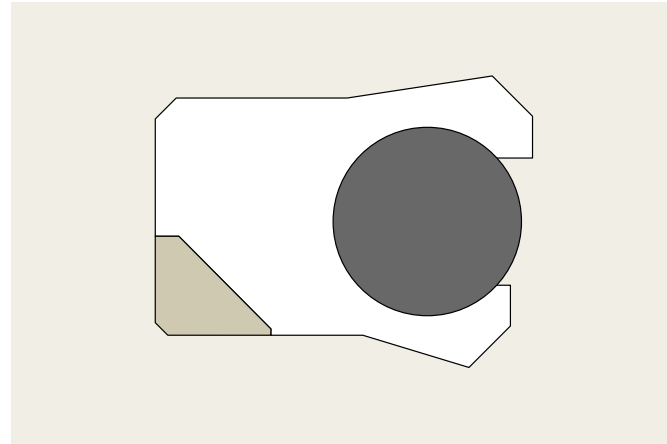


# Alternative solutions – standard and customized

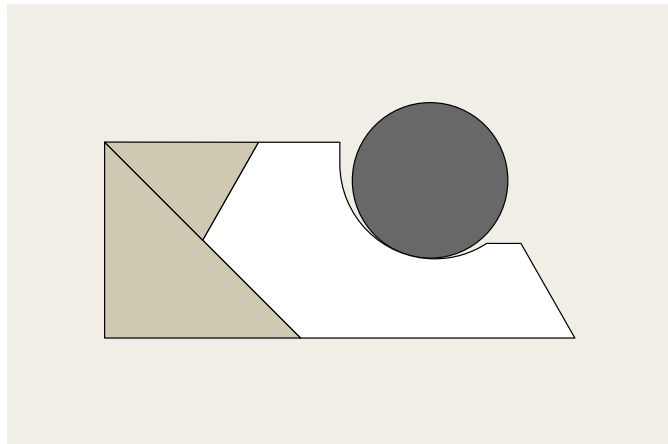
As these examples show, SKF can adapt any homogenizer sealing solution to meet your specific sealing requirements.



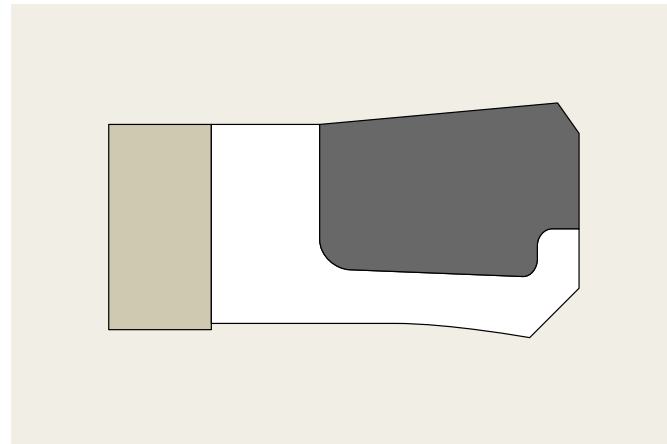
**Standard seal profile S03-F**  
O-ring energized compact seal



**Modified seal profile S04**  
O-ring energized compact seal with integrated anti-extrusion ring



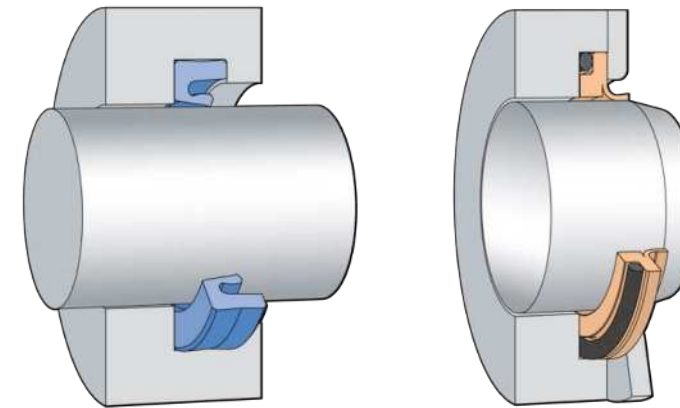
**Fully customized solution**  
Composite seal with pressure-adaptive, double-triangular anti-extrusion rings



**Fully customized solution**  
Special compact seal with anti-extrusion ring







## Rotary unions

### Friction and flow issues

In typical bottling and filling systems, rotary unions transfer one or multiple fluids from the stationary part of the machine to a series of rotating filling stations. Also known as swivel joints, rotary unions are subject to several factors that make effective sealing critical, but difficult to achieve.

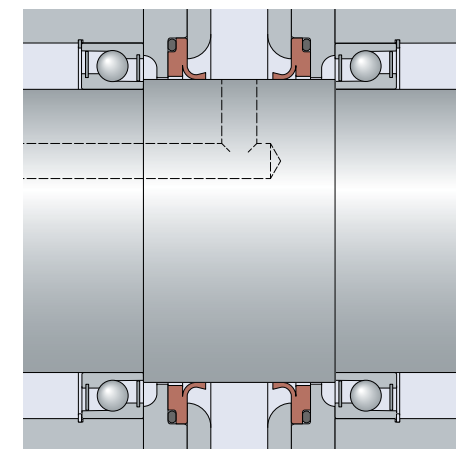
Continuous rotation and exposure to beverages and gases with low lubricant properties results in high friction, and with it seal wear. Caustic cleaning agents and soft counterfaces also make low-friction sealing materials and designs a necessity. But seals must also be flexible enough to compensate for coaxiality problems that affect rotating guidance systems.

### SKF sealing solutions

Seals from SKF deliver the flexible, low-friction performance that rotary union applications demand. Our springless sealing solutions include options for direct retrofits as well as high-speed, high-temperature conditions.

Benefits include:

- Reduced seal wear
- Greater operating stability
- Higher productivity
- Less unplanned downtime
- Reduced maintenance

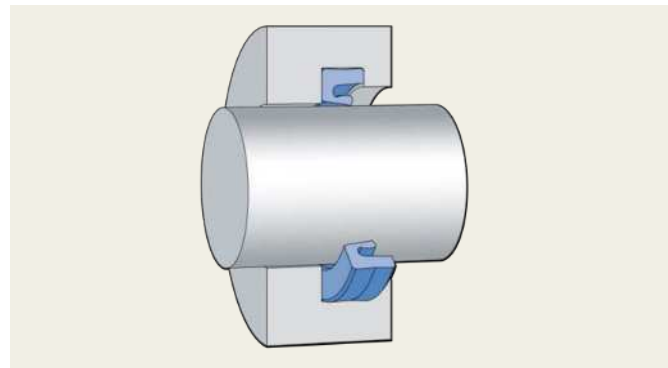




# Standardized sealing solutions for rotary unions

## R1U

This springless rotary lip seal features a flexible, low-friction lip design that delivers good lip tracking ability despite any eccentricities. The increased front section of the sealing lip compensates potential wear. The solid static lip and an oversized outside diameter helps prevent the seal from rotating in the housing. R1U seals do not require axially open housings, they can be easily snapped into closed seal grooves. This seals are suitable for speeds up to 0,5 m/s and pressures up to 10 bar\*.

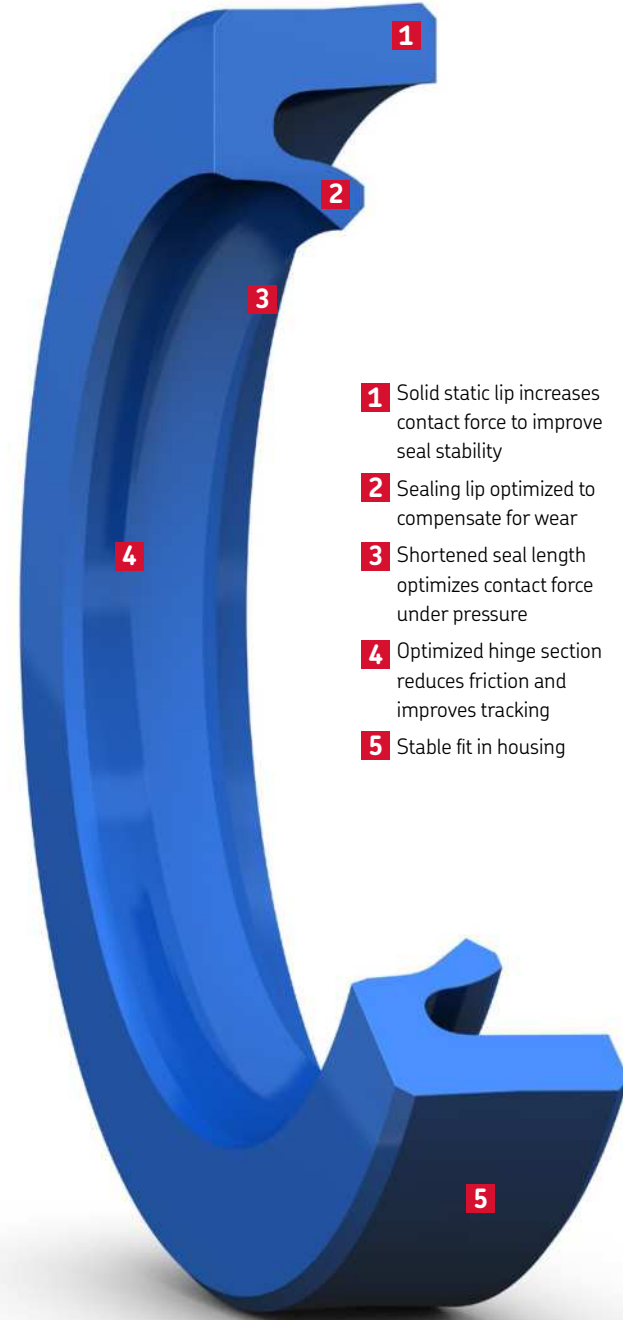


**General dimensions**

d f8	D H10	L +0,2	D <sub>1</sub> max.	R max.	c min.
mm					
20 - 50	d+10	8	d+6	0,4	4
50,1 - 150	d+15	10	d+9	0,4	5
150,1 - 250	d+20	14	d+12	0,4	6

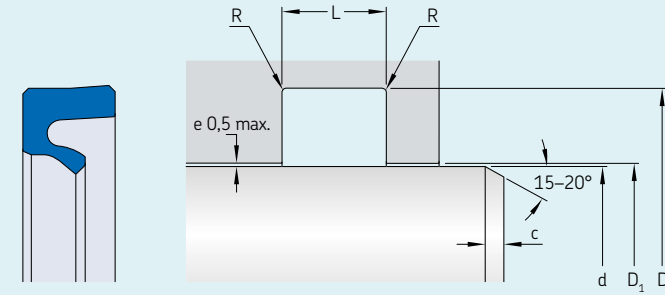
**Typical materials for the R1U**

Material	Temperature range °C (°F)	
H-ECOPUR	-20 (-5)	+110 (+230)
H-ECOPUR 95A-NC	-20 (-5)	+110 (+230)
H-ECOPUR 95A-blue	-20 (-5)	+110 (+230)
ECOPUR 95A-bl-FG	-50 (-60)	+100 (+210)



- 1** Solid static lip increases contact force to improve seal stability
- 2** Sealing lip optimized to compensate for wear
- 3** Shortened seal length optimizes contact force under pressure
- 4** Optimized hinge section reduces friction and improves tracking
- 5** Stable fit in housing

\* Max. values of application parameters (e.g. pressure, speed, temp. or e-gap) should not be applied continuously nor simultaneously.



**Ordering information key**

**R1U**  
Springless rotary lip seal

**50 x 60 x 8**  
Housing dimensions  
(d x D x L in mm)

**Sealing material**  
See the material matrix on page 6-7

d f8	D H10	L +0,2	D <sub>1</sub> max.	R max.	c min.	Ordering information
mm						
20	30	8	26	0,4	4	R1U 20x30x8 Sealing material
21	31	8	27	0,4	4	R1U 21x31x8 Sealing material
22	32	8	28	0,4	4	R1U 22x32x8 Sealing material
24	34	8	30	0,4	4	R1U 24x34x8 Sealing material
25	35	8	31	0,4	4	R1U 25x35x8 Sealing material
28	38	8	34	0,4	4	R1U 28x38x8 Sealing material
30	40	8	36	0,4	4	R1U 30x40x8 Sealing material
32	42	8	38	0,4	4	R1U 32x42x8 Sealing material
35	45	8	41	0,4	4	R1U 35x45x8 Sealing material
36	46	8	42	0,4	4	R1U 36x46x8 Sealing material
38	48	8	44	0,4	4	R1U 38x48x8 Sealing material
39	49	8	45	0,4	4	R1U 39x49x8 Sealing material
40	50	8	46	0,4	4	R1U 40x50x8 Sealing material
42	52	8	48	0,4	4	R1U 42x52x8 Sealing material
45	55	8	51	0,4	4	R1U 45x55x8 Sealing material
48	58	8	54	0,4	4	R1U 48x58x8 Sealing material
50	60	8	56	0,4	4	R1U 50x60x8 Sealing material
52	67	10	61	0,4	5	R1U 52x67x10 Sealing material
53	68	10	62	0,4	5	R1U 53x68x10 Sealing material
55	70	10	64	0,4	5	R1U 55x70x10 Sealing material
57	72	10	66	0,4	5	R1U 57x72x10 Sealing material
58	73	10	67	0,4	5	R1U 58x73x10 Sealing material
60	75	10	69	0,4	5	R1U 60x75x10 Sealing material
62	77	10	71	0,4	5	R1U 62x77x10 Sealing material
63	78	10	72	0,4	5	R1U 63x78x10 Sealing material
65	80	10	74	0,4	5	R1U 65x80x10 Sealing material
68	83	10	77	0,4	5	R1U 68x83x10 Sealing material
70	85	10	79	0,4	5	R1U 70x85x10 Sealing material
75	90	10	84	0,4	5	R1U 75x90x10 Sealing material
79	94	10	88	0,4	5	R1U 79x94x10 Sealing material
80	95	10	89	0,4	5	R1U 80x95x10 Sealing material
82,5	97,5	10	91,5	0,4	5	R1U 82.5x97.5x10 Sealing material
85	100	10	94	0,4	5	R1U 85x100x10 Sealing material
90	105	10	99	0,4	5	R1U 90x105x10 Sealing material
95	110	10	104	0,4	5	R1U 95x110x10 Sealing material
100	115	10	109	0,4	5	R1U 100x115x10 Sealing material
105	120	10	114	0,4	5	R1U 105x120x10 Sealing material
108	123	10	117	0,4	5	R1U 108x123x10 Sealing material
110	125	10	119	0,4	5	R1U 110x125x10 Sealing material
115	130	10	124	0,4	5	R1U 115x130x10 Sealing material
120	135	10	129	0,4	5	R1U 120x135x10 Sealing material
125	140	10	134	0,4	5	R1U 125x140x10 Sealing material
127	142	10	136	0,4	5	R1U 127x142x10 Sealing material
130	145	10	139	0,4	5	R1U 130x145x10 Sealing material
132	147	10	141	0,4	5	R1U 132x147x10 Sealing material
135	150	10	144	0,4	5	R1U 135x150x10 Sealing material
140	155	10	149	0,4	5	R1U 140x155x10 Sealing material
145	160	10	154	0,4	5	R1U 145x160x10 Sealing material
150	165	10	159	0,4	5	R1U 150x165x10 Sealing material
160	180	14	172	0,4	6	R1U 160x180x14 Sealing material
180	200	14	192	0,4	6	H2R 165x170x14 Sealing material
200	220	14	212	0,4	6	H2R 200x220x14 Sealing material
220	240	14	232	0,4	6	H2R 220x240x14 Sealing material
250	270	14	262	0,4	6	H2R 250x270x14 Sealing material

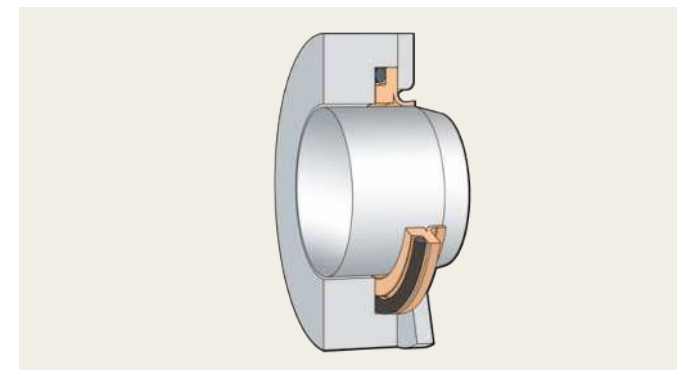
NOTE: Due to our flexible manufacturing process we are able to produce any other dimension on request



# Standardized sealing solutions for rotary unions

## R2U

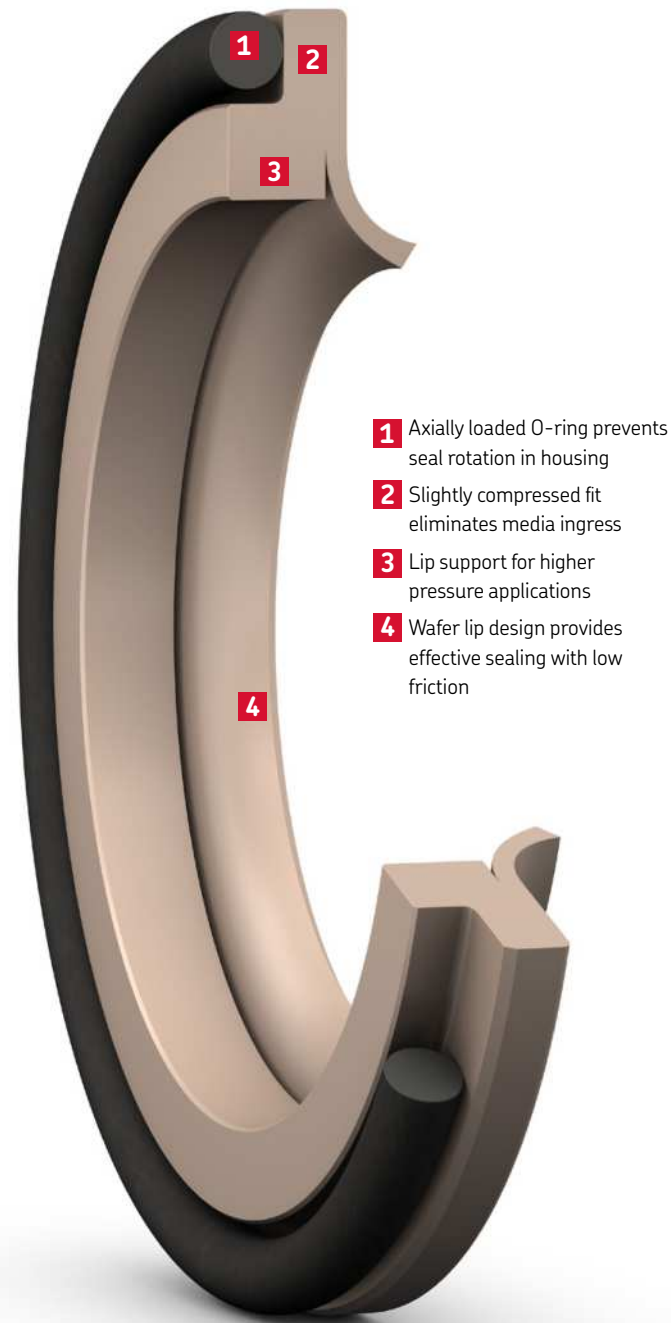
This low-friction rotary lip seal is recommended for applications with speeds and temperatures that exceed the capabilities of the R1U design. When produced from PTFE materials, R2U seals are suitable for speeds up to 3 m/s and pressures up to 10 bar\* (higher speeds are possible but may require the use of hardened, or plated shaft materials).



General dimensions							
d h8	D H8	L ±0,08	D <sub>1</sub> H9	R max.	c min.	C ±0,1	LE max.
mm							
18 – 25	d+13	3,5	d+6	0,4	4,5	0,5	3,5
25,1 – 50	d+14	4,25	d+6	0,4	5	0,5	4
50,1 – 75	d+14	4,25	d+6	0,4	5,5	0,5	4,25
75,1 – 150	d+16	5	d+6	0,4	6,5	0,5	4,75

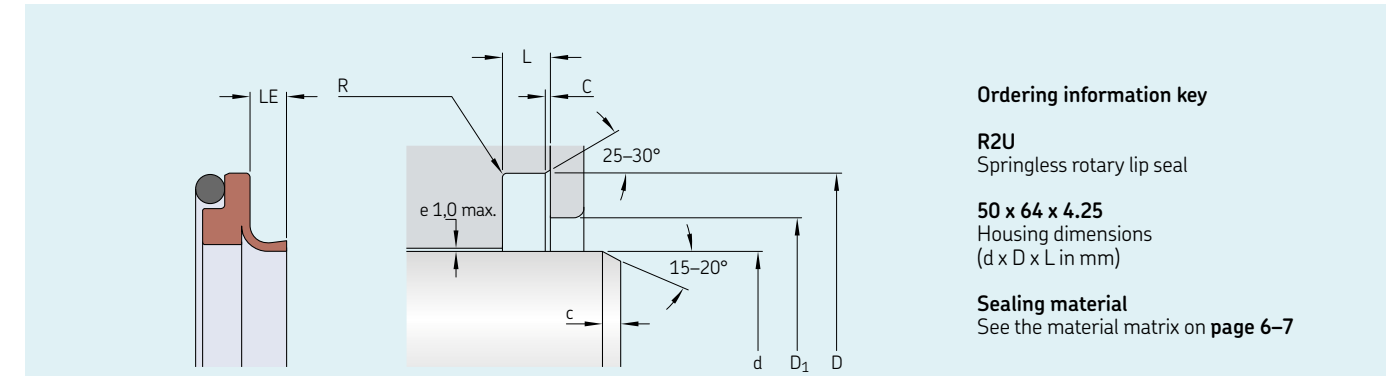
Typical materials for the R2U		
Material	Temperature range °C (°F)	
SKF Ecoflon 14, 754	-200 (-330)	+260 (+500)
SKF Ecoflon 16	-200 (-330)	+260 (+500)
721	-200 (-330)	+260 (+500)
SKF Ecowear 1000, 776	-200 (-330)	+90 (+194)
795	-200 (-330)	+100 (+210)

NOTE: O-rings are available in different food-grade elastomeric materials.



- 1** Axially loaded O-ring prevents seal rotation in housing
- 2** Slightly compressed fit eliminates media ingress
- 3** Lip support for higher pressure applications
- 4** Wafer lip design provides effective sealing with low friction

\* Max. values of application parameters (e.g. pressure, speed, temp. or e-gap) should not be applied continuously nor simultaneously.



### Ordering information key

R2U  
Springless rotary lip seal

50 x 64 x 4.25  
Housing dimensions  
(d x D x L in mm)

Sealing material  
See the material matrix on page 6-7

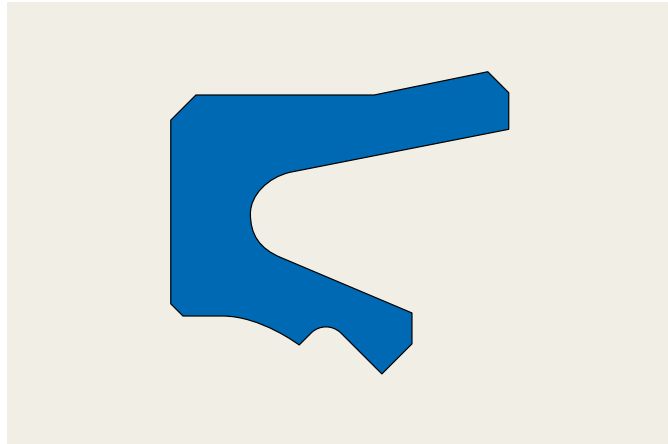
d h8	D H8	L ±0,08	D <sub>1</sub> H9	R max.	c min.	C ±0,1	LE max.	Ordering information
mm								
18	31	3,5	24	0,4	4,5	0,5	3,5	R2U 18x31x3.5 Sealing material
20	33	3,5	26	0,4	4,5	0,5	3,5	R2U 20x33x3.5 Sealing material
21	34	3,5	27	0,4	4,5	0,5	3,5	R2U 21x34x3.5 Sealing material
22	35	3,5	28	0,4	4,5	0,5	3,5	R2U 22x35x3.5 Sealing material
24	37	3,5	30	0,4	4,5	0,5	3,5	R2U 24x37x3.5 Sealing material
25	38	3,5	31	0,4	4,5	0,5	3,5	R2U 25x38x3.5 Sealing material
28	42	4,25	34	0,4	5	0,5	4	R2U 28x42x4.25 Sealing material
30	44	4,25	36	0,4	5	0,5	4	R2U 30x44x4.25 Sealing material
32	46	4,25	38	0,4	5	0,5	4	R2U 32x46x4.25 Sealing material
35	49	4,25	41	0,4	5	0,5	4	R2U 35x49x4.25 Sealing material
36	50	4,25	42	0,4	5	0,5	4	R2U 36x50x4.25 Sealing material
38	52	4,25	44	0,4	5	0,5	4	R2U 38x52x4.25 Sealing material
39	53	4,25	45	0,4	5	0,5	4	R2U 39x53x4.25 Sealing material
40	54	4,25	46	0,4	5	0,5	4	R2U 40x54x4.25 Sealing material
42	56	4,25	48	0,4	5	0,5	4	R2U 42x56x4.25 Sealing material
45	59	4,25	51	0,4	5	0,5	4	R2U 45x59x4.25 Sealing material
48	62	4,25	54	0,4	5	0,5	4	R2U 48x62x4.25 Sealing material
50	64	4,25	56	0,4	5	0,5	4	R2U 50x64x4.25 Sealing material
52	66	4,25	58	0,4	5,5	0,5	4,25	R2U 52x66x4.25 Sealing material
53	67	4,25	59	0,4	5,5	0,5	4,25	R2U 53x67x4.25 Sealing material
55	69	4,25	61	0,4	5,5	0,5	4,25	R2U 55x69x4.25 Sealing material
57	71	4,25	63	0,4	5,5	0,5	4,25	R2U 57x71x4.25 Sealing material
58	72	4,25	64	0,4	5,5	0,5	4,25	R2U 58x72x4.25 Sealing material
60	74	4,25	66	0,4	5,5	0,5	4,25	R2U 60x74x4.25 Sealing material
62	76	4,25	68	0,4	5,5	0,5	4,25	R2U 62x76x4.25 Sealing material
63	77	4,25	69	0,4	5,5	0,5	4,25	R2U 63x77x4.25 Sealing material
65	79	4,25	71	0,4	5,5	0,5	4,25	R2U 65x79x4.25 Sealing material
68	82	4,25	74	0,4	5,5	0,5	4,25	R2U 68x82x4.25 Sealing material
70	84	4,25	76	0,4	5,5	0,5	4,25	R2U 70x84x4.25 Sealing material
75	89	4,25	81	0,4	5,5	0,5	4,25	R2U 75x89x4.25 Sealing material
79	95	5	85	0,4	6,5	0,5	4,75	R2U 79x95x5 Sealing material
80	96	5	86	0,4	6,5	0,5	4,75	R2U 80x96x5 Sealing material
82,5	98,5	5	88,5	0,4	6,5	0,5	4,75	R2U 82.5x98.5x5 Sealing material
85	101	5	91	0,4	6,5	0,5	4,75	R2U 85x101x5 Sealing material
90	106	5	96	0,4	6,5	0,5	4,75	R2U 90x106x5 Sealing material
95	111	5	101	0,4	6,5	0,5	4,75	R2U 95x111x5 Sealing material
100	116	5	106	0,4	6,5	0,5	4,75	R2U 100x116x5 Sealing material
105	121	5	111	0,4	6,5	0,5	4,75	R2U 105x121x5 Sealing material
108	124	5	114	0,4	6,5	0,5	4,75	R2U 108x124x5 Sealing material
110	126	5	116	0,4	6,5	0,5	4,75	R2U 110x126x5 Sealing material
115	131	5	121	0,4	6,5	0,5	4,75	R2U 115x131x5 Sealing material
120	136	5	126	0,4	6,5	0,5	4,75	R2U 120x136x5 Sealing material
125	141	5	131	0,4	6,5	0,5	4,75	R2U 125x141x5 Sealing material
127	143	5	133	0,4	6,5	0,5	4,75	R2U 127x143x5 Sealing material
130	146	5	136	0,4	6,5	0,5	4,75	R2U 130x146x5 Sealing material
132	148	5	138	0,4	6,5	0,5	4,75	R2U 132x148x5 Sealing material
135	151	5	141	0,4	6,5	0,5	4,75	R2U 135x151x5 Sealing material
140	156	5	146	0,4	6,5	0,5	4,75	R2U 140x156x5 Sealing material
145	161	5	151	0,4	6,5	0,5	4,75	R2U 145x161x5 Sealing material
150	166	5	156	0,4	6,5	0,5	4,75	R2U 150x166x5 Sealing material

NOTE: Due to our flexible manufacturing process we are able to produce any other dimension on request

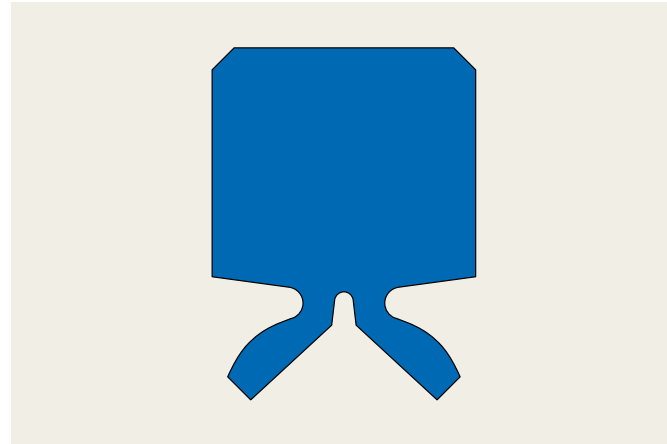


# Alternative solutions – standard and customized

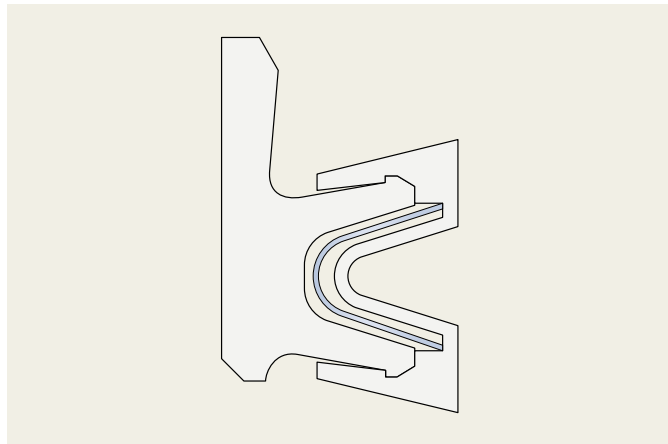
As these examples show, SKF can adapt any rotary union sealing solution to meet your specific sealing requirements.



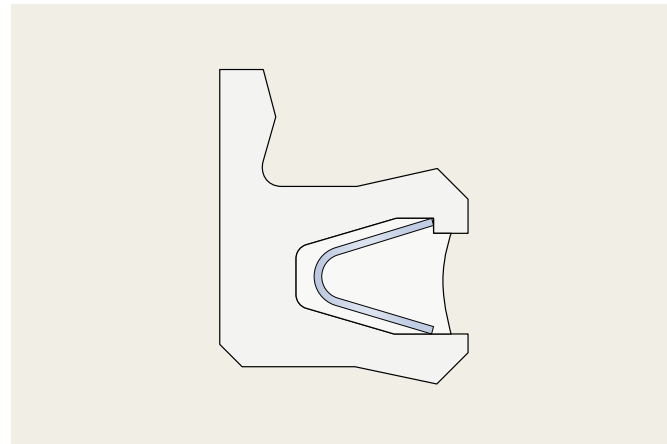
**Customized seal profile**  
Single-acting springless rotary seal



**Customized seal profile**  
Double-acting rotary seal



**Customized solution**  
Flanged encapsulated SKF Spectraseal



**Customized solution**  
Silicone-filled flanged SKF Spectraseal





# Design considerations

## Surface finish

To achieve maximum seal life, proper surface finish for both static and dynamic hardware is essential. Static mating hardware should have a maximum finish of  $\leq 0,8 R_a$ . For dynamic mating hardware surfaces,  $R_z$ ,  $R_{max}$  and  $R_{mr}$  are critical characteristics that must be considered as well.

- $R_a$ : Average roughness
- $R_z$ : Mean roughness depth
- $R_{max}$ : Maximum roughness depth
- $R_{mr}$ : Material ratio – the  $R_{mr}$  is a finish characteristic which is often not considered, but is extremely important for the wear life of the seal. This is the ratio of the width of the peaks at a given height to the width of the valley. If a finish is very open, an  $R_{mr}$  that is less than 50% the finish profile can be very abrasive.

## Hardness of dynamic mating surfaces

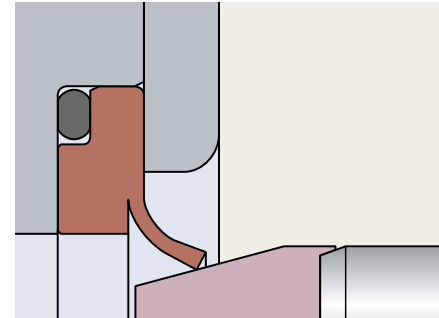
For dosing pistons and rotary unions, the typical speeds and lower pressures allow the use of non-hardened stainless steel mating surfaces.

Due to the high pressures and speeds of homogenizers, dynamic hardware surfaces must be heat-treated and/or plated to reach a minimum hardness of 58 HRC.

## Installation chamfers

To prevent damage to sealing lips during installation, the recommended installation chamfers on the housings and dynamic hardware surfaces should always be followed.

The chamfers specified for dynamic surfaces should be considered the minimum requirement and increased in length if possible.



On R2U lip seals, typically the shaft will be inserted through multiple seals. Some of these seals will be oriented so that the shaft enters the sealing lip going with the form of the sealing lip, while for other seals the shaft will be going against the sealing lip form.

The installation chamfers specified for the R2U rotary lip seal are large enough to ensure the shaft can be inserted through the seal going against the form of the sealing lip. For applications where it is not possible to incorporate this large of a chamfer, an installation tool should be used. SKF can design and supply this type of tool as required – see illustration above.

### Roughness for dynamic surfaces

	Thermoplastic elastomers	Thermoplastics
$R_a$	0,05 to 0,3 $\mu\text{m}$	0,05 to 0,2 $\mu\text{m}$
$R_z$	0,4 to 2,5 $\mu\text{m}$	0,4 to 1,3 $\mu\text{m}$
$R_{max}$	0,4 to 2,5 $\mu\text{m}$	0,4 to 2,5 $\mu\text{m}$
$R_{mr}$	50-95%*	50-95%*

\* (cutting depth 0,5  $R_z$  based  $c_{ref} = 0\%$ )

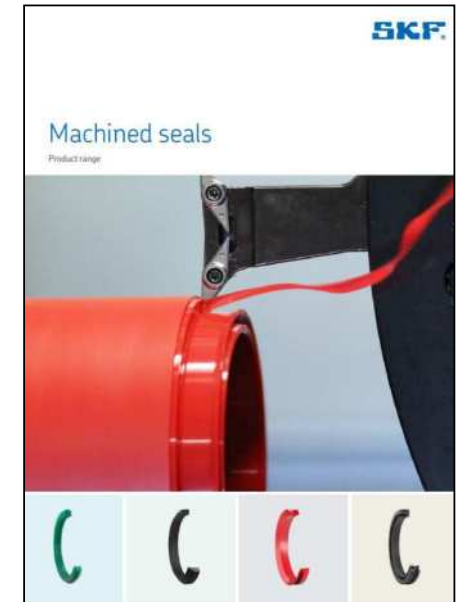
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SKF industrial shafts catalogue covers a very wide seal assortment of shaft seals and accessories. – 408 pages.



**12393 Hydraulic seals**  
This catalogue contains the standard assortment of SKF hydraulic seals and guides typically used in hydraulic cylinders. – 352 pages.



**15235 Machined seals**  
A 84-page brochure that describes the product range of machined seals from SKF, housing details and sealing materials.



**SKF Spectraseals**  
A 8-page look at SKF's sealing solutions for the most extreme environments and applications.



**12754 SKF capabilities for the food and beverage industry**  
An extensive, 100+ page guide to SKF solutions for food and beverage applications, including sealing systems.



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