

Turcon® Variseal® M2



Single-acting

Spring-energized plastic-U-Cup

Material:

Turcon® and Zurcon®





Turcon® Variseal® M2



Description

Turcon® Variseal® M2 is a single-acting seal consisting of a U-shaped jacket and a V-shaped corrosion resistant spring. Variseal® M2 has an asymmetric seal profile. The optimized front angle offers good leakage control, reduced friction and long service life.

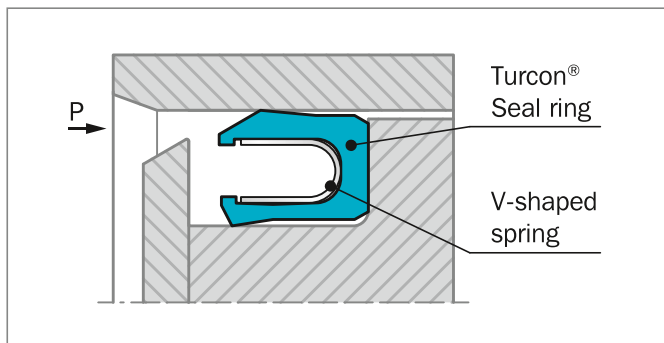


Figure 133: Turcon® Variseal® M2

AREAS OF APPLICATION

- Hydraulic components, e.g. cylinders, valves, pumps, etc.
- Chemical processing equipment
- Pharmaceutical processing
- Food and beverage processing
- Spindle seals for machine tools
- Pneumatics, cylinders and valves

ADVANTAGES

- Suitable for reciprocating and rotary applications
- Low coefficient of friction
- Stick-slip free operating
- High abrasion resistance
- Dimensionally stable
- Resistant to most fluids, chemicals and gases
- Withstands rapid changes in temperature
- No vulcanizing between seal and hardware
- Excellent resistance to aging
- Can be sterilized
- Available in Hi-Clean version
- Interchangeable with O-Ring and Back-up Ring combinations to AS4716 and ISO 6194

OPERATING CONDITIONS

Operating Pressure:	Maximum dynamic load: 20 MPa Maximum static load: 40 MPa (200 MPa with back-up ring)
Speed:	Reciprocating up to 15 m/s Rotating up to 1.3 m/s
Operating Temperature:	-70 °C to +300 °C Special Turcon® and Zurcon® materials as well as alternative spring materials are available for applications outside this temperature range.
Media Compatibility:	Virtually all fluids, chemicals and gases

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 value.

Temperature range also dependent on media.



GENERAL

Turcon® Variseal® are single acting, spring-energized seals which are used for dynamic and static applications.

Variseal® are effective in a wide range of applications. They are chosen when higher resistance to chemical media is required, if the seal is required to operate in extremes of temperature and/or where good extrusion and compression characteristics are needed.

Turcon® Variseal® designs have three main characteristics:

- Application specific U-shaped seal profile
- Spring geometry suited to the particular application
- Proven high-performance Turcon® or Zurcon® polymers

Standard or custom geometries available in metric, inch and intermediate sizes ranging from 2 to 3,300 mm.

METHOD OF OPERATION

All Variseal® designs included in this catalog have the same operating principle and differ only in their profile form and type of metallic spring used.

The Variseal® spring supplies the load required for sealing at low pressures (Figure 134). The "U" shaped jacket allows fluid pressure to energize the sealing lips, so total sealing pressure rises with increasing operating pressure (Figure 135).

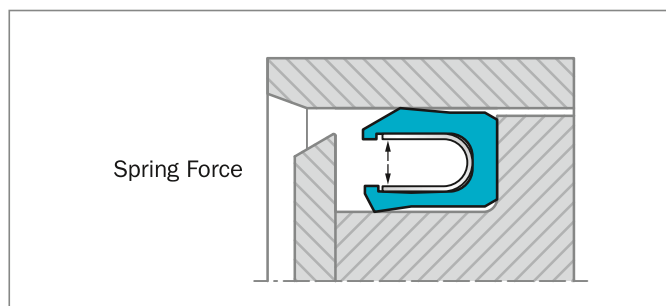


Figure 134: Turcon® Variseal® without system pressure

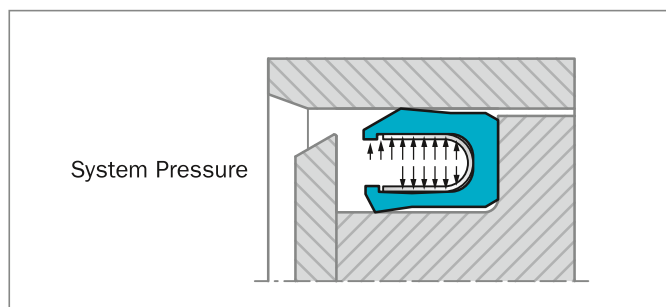


Figure 135: Turcon® Variseal® with system pressure

PERFORMANCE

The different types of Variseal® designs combined with the properties of Turcon® and Zurcon® materials offer design engineers a wide range of solutions to a large number of applications.

The most important characteristics of Variseal® designs are listed below:

- Very low coefficient of friction
- Good dynamic and static sealing
- Capable of sealing at high speeds up to 15 m/s
- Almost universal chemical compatibility
- Operating temperature of -253 °C up to +300 °C
- Very good thermal resistance
- Properties unaffected by contact with chemicals
- Good aging characteristics
- Low compression set
- Capable of withstanding high pressures above 200 MPa (2,000 bar) when using Back-up Rings
- Very good dry-running properties
- Can be installed in grooves according to AS4716 (Mil-G-5514 is an old spec) and DIN 3771



MATERIALS

All materials used are physiologically safe. They contain no odor or taste-affecting substances.

The following material combination has proved effective for most fluid applications:

Seal ring: Turcon® T40
 Spring: Stainless steel, Material No. AISI 301
 Material code S

For gas applications use:
 Seal ring: T05 or Z80

For use in accordance with the demands of the Food and Drug Administration, suitable materials are available on request.

Table 122: Turcon® and Zurcon® Materials for Variseal® M2

Material Code Material Description	Operating Temperature* °C	Mating Surface Material	MPa max.
Turcon® T05 Premium grade modified PTFE. Light duty material with greater wear resistance than Turcon T01. Reciprocating and slow rotary applications. Color: Turquoise	-200 to + 260	Steel Steel chrome plated Cast iron Stainless steel Aluminum Bronze Alloys	20
Turcon® T40 High-grade formulation of virgin polytetrafluoroethylene (PTFE) based material compounded with carbon fiber additive. Excellent wear and low friction characteristics. Suited to reciprocating and rotary applications. Suitable for use in media with poor lubricating properties and for dry-running situations. Color: Black / gray	-60 to + 300	Steel Steel hardened Steel chrome plated	40
Zurcon® Z80 UHMW Polyethylene. Excellent wear and abrasion resistance. Very good lubricity in water based media. Color: Translucent white	-253 to +80	Steel Steel chrome plated Stainless steel Aluminum Bronze Ceramic coating	40

* Depending on media.

Highlighted material is standard.

Installation of Spring Energized Seals

See page 247



SPRING MATERIALS

The standard spring material for Turcon® Variseal® is stainless steel (spring code S).

Table 123: Spring Material

Media	Spring materials	Spring order code
For General use e.g. Oil Grease Air Water, steam Solvents Food, drugs Gas	Stainless steel DIN Mat No. 1.4310/1.4319 AISI 301/302 UNS 30100	S (Standard spring material)
For use in corrosive media e.g. Acids Caustics Seawater	Hastelloy® C-276 DIN Mat No. 2.4819 UNS N10276	H
For petrochemical use e.g. Crude oil Sour gas	Elgiloy® 1) DIN Mat No. 2.4711 UNSR30003	E

* Hastelloy is a registered trademark of Haynes International, Inc.

* Elgiloy is a registered trademark of the Elgiloy Specialty Metals
Alternative brand may be used.

1) NACE-approval



Groove Design – Metric

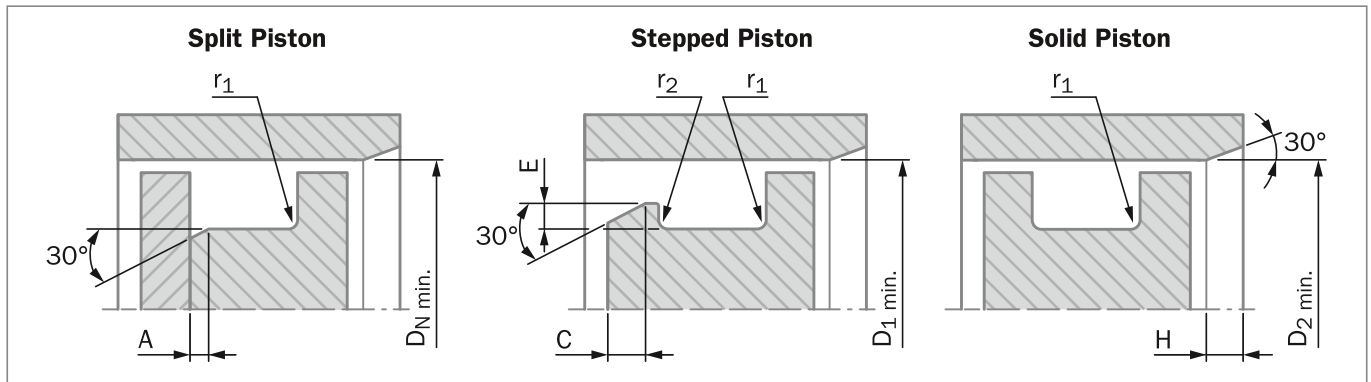


Figure 136: Variseal Groove Configurations

Installation lead-in chamfers and steps to include blend radii and are to be polished.

Table 124: Dimensions for Groove Designs – Metric

Series	Rod / Piston Groove Dimensions					
	A Chamfer	r ₁ Maximum Radius	C Minimum Chamfer	r ₂ Maximum Radius	E Minimum Step Height	H Minimum Chamfer
000	0.25 / 0.38	0.25	0.70	0.13	0.40	1.20
100	0.38 / 0.51	0.38	1.10	0.13	0.60	1.50
200	0.38 / 0.51	0.38	1.25	0.18	0.70	2.50
300	0.51 / 0.69	0.38	1.40	0.25	0.80	4.50
400	0.51 / 0.69	0.51	1.60	0.25	0.90	6.00
500	0.76 / 1.02	0.51	2.60	0.38	1.50	11.00

Table 125: Dimensions for Groove Designs

Series	Piston Diameter Recommendations		
	Split Groove Ø D _N Minimum	Stepped Groove Ø D ₁ Minimum	Solid Groove Ø D ₂ Minimum
000	6.00	11.50	34.93
100	10.00	17.50	50.80
200	16.00	20.00	69.85
300	28.00	28.00	104.78
400	45.00	45.00	139.70
500	100.00	100.00	254.00



■ Installation Recommendation

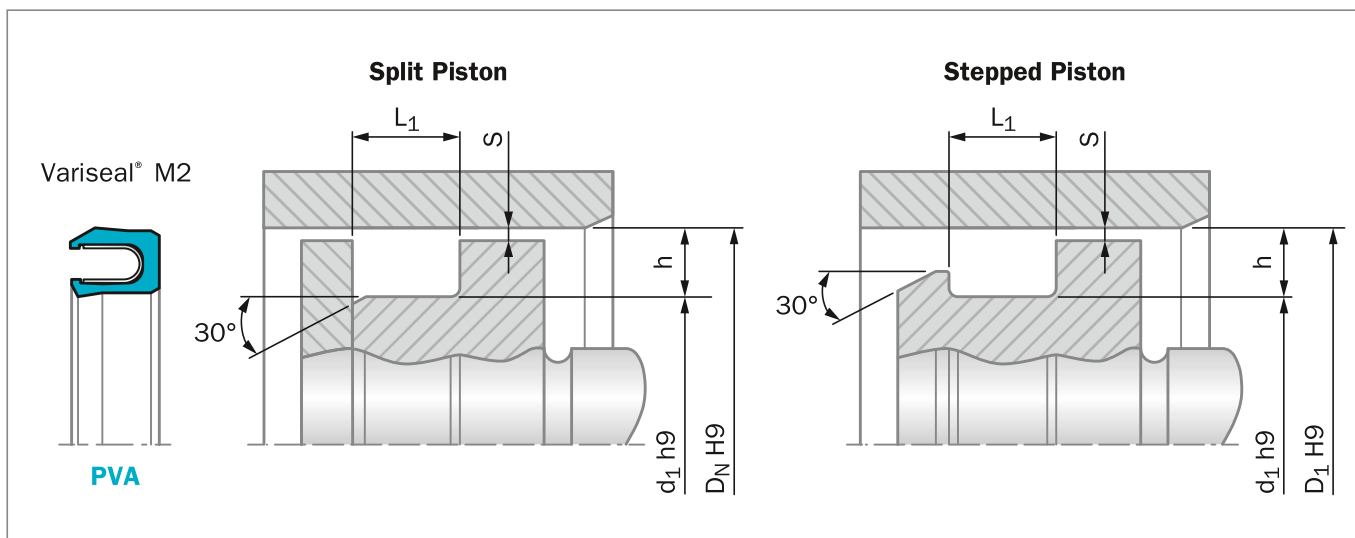


Figure 137: Installation Drawing, see Figure 136 for addition groove details

Table 126: Installation Dimensions

Series No.	Bore Diameter D_N/D_1 H9		Groove Diameter d_1 h9	Groove Width L_1 +0.2	Radial Clearance S_{max} *			
	Standard Range	Extended** Range			<2 MPa	<10 MPa	<20 MPa	<40 MPa
PVA0	6 - 13.9	6 - 40	$D_N/D_1 - 2.9$	2.4	0.20	0.10	0.08	0.05
PVA1	14 - 24.9	10 - 200	$D_N/D_1 - 4.5$	3.6	0.25	0.15	0.10	0.07
PVA2	25 - 45.9	16 - 400	$D_N/D_1 - 6.2$	4.8	0.35	0.20	0.15	0.08
PVA3	46 - 124.9	28 - 700	$D_N/D_1 - 9.4$	7.1	0.50	0.25	0.20	0.10
PVA4	125 - 999.9	45 - 1,600	$D_N/D_1 - 12.2$	9.5	0.60	0.30	0.25	0.12
PVA5	1,000 - 2,500	100 - 2,500	$D_N/D_1 - 19.0$	15.0	0.90	0.50	0.40	0.20

* We recommend that the gap dimensions be reduced for temperatures ≥ 80 °C.

At pressures > 40 MPa a Back-up Ring would be incorporated and the extrusion gap would not be considered.

** Available on request.

**Table 127: Installation Dimensions / TSS Part No.**

D_N	d_1	TSS Part No.	D_N	d_1	TSS Part No.	D_N	d_1	TSS Part No.
6.0	3.1	PVA0_0060	45.0	38.8	PVA2_0450	115.0	105.6	PVA3_1150
8.0	5.1	PVA0_0080	48.0	38.6	PVA3_0480	120.0	110.6	PVA3_1200
10.0	7.1	PVA0_0100	50.0	40.6	PVA3_0500	125.0	112.8	PVA4_1250
12.0	9.1	PVA0_0120	52.0	42.6	PVA3_0520	130.0	117.8	PVA4_1300
14.0	9.5	PVA1_0140	55.0	45.6	PVA3_0550	135.0	122.8	PVA4_1350
15.0	10.5	PVA1_0150	60.0	50.6	PVA3_0600	140.0	127.8	PVA4_1400
16.0	11.5	PVA1_0160	63.0	53.6	PVA3_0630	150.0	137.8	PVA4_1500
18.0	13.5	PVA1_0180	65.0	55.6	PVA3_0650	160.0	147.8	PVA4_1600
20.0	15.5	PVA1_0200	70.0	60.6	PVA3_0700	170.0	157.8	PVA4_1700
22.0	17.5	PVA1_0220	75.0	65.6	PVA3_0750	180.0	167.8	PVA4_1800
25.0	18.8	PVA2_0250	80.0	70.6	PVA3_0800	190.0	177.8	PVA4_1900
28.0	21.8	PVA2_0280	85.0	75.6	PVA3_0850	200.0	187.8	PVA4_2000
30.0	23.8	PVA2_0300	90.0	80.6	PVA3_0900	210.0	197.8	PVA4_2100
32.0	25.8	PVA2_0320	95.0	85.6	PVA3_0950	220.0	207.8	PVA4_2200
35.0	28.8	PVA2_0350	100.0	90.6	PVA3_1000	230.0	217.8	PVA4_2300
40.0	33.8	PVA2_0400	105.0	95.6	PVA3_1050	240.0	227.8	PVA4_2400
42.0	35.8	PVA2_0420	110.0	100.6	PVA3_1100	250.0	237.8	PVA4_2500

ORDERING EXAMPLE

Turcon® Variseal® M2, standard range:

Series:	PVA3 from Table 126
Bore Diameter:	$D_N = 80.0$ mm
TSS Part No.:	PVA300800
Spring Material:	Stainless steel
Spring Load:	Medium

Select the material from Table 122. The corresponding code numbers are appended to the TSS Part No. from Table 127. Together they form the TSS Article No. For all intermediate sizes not shown in Table 127, the TSS Article No. can be determined from the example opposite.

TSS Article No. PVA3 0 0800 - T40 S M

TSS Series No.	PVA3
Type (Standard)	0
Bore Diameter x 10**	0800
Quality Index (Standard)	-
Material Code (Seal Ring)	T40
Material Code (Spring)	S
Spring Load***	M

** For diameters $D_N \geq 1,000.0$ mm multiply only by factor 1.Example: PVA5 for diameter $D_N = 1,200.0$ mm

TSS Article No.: PVA5X1200 - T40SM

*** M Medium, R Hi Clean