



PETROCHEMICALS

FOOD & PHARMA

FERTILIZERS

POWER GENERATION

PUMPS

COMPRESSOR

AGITATORS

BLOWERS



MECHANICAL SEALS & SEALING SYSTEM

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Welcome to the world of Mechanical Seal.

This product Brochure is designed to make you familiar with the latest Seal Group products and services.

Velmake Seal has focused on seal selection based on application and industry. Application engineering based sealing technology helps you to decide on the right type of seal.

You will have an immediate impression of the Mechanical Seal's main application target and operating window by just looking at the content of sections provided in this brochure. Further more, we



have incorporated a basic explanation on seal operation and additional technical background information.

Velmake Liquid Engineering solutions mission is to be the best premier provider of sealing solutions, providing you with a well balanced range of high quality sealing products and services to satisfy all your sealing requirements. Velmake LES represents not only a collection of trusted products, but also a single source that can help you to reduce your total cost of ownership.

SYNERGY

Velmake Technologies can help you to reduce the cost of plant ownership through enhanced sealing reliability and reduce maintenance, comprehensive technical services and lower transaction costs. As a pioneer in developing application based tailor made solutions, Velmake can offer various different commercial agreements where ARC on supply of various seals and spares existing in your plant can be designed as per your need.

TECHNOLOGY

Greater depth of experience and the blending of technological perspective positions Velmake Technologies to introduce superior technologies and quickly apply these technologies as practical sealing products.

QUALITY

We mean what we say when we talk about quality. Designing and manufacturing seals and auxiliaries that exceeds our customer's expectations is an important part of our dedication of total quality

SERVICE

Round the clock and all over India, Velmake staff is available to resolve customer's problems. Our Engineers have great experience and technical knowledge of mechanical seals, support system and rotating equipments, which enables them to quickly point out the root cause accurately.





VELMAKE a promise... and a pledge

It is the policy of Velmake Seals to distinguish itself as the industry leader by providing superior, cost effective quality products and services to its customers. To achieve this we will :

Provide each Associate with the training, tools, skills, and motivation to produce the high quality products and services which meet or exceed our customer's needs.

Empower the work force so that everyone is responsible and accountable for achieving the goal of superior quality products and services.

Give quality and customer service the same emphasisi as the financial and productivity aspects of the business,



Velmake Seals



Product development and manufacture strictly following the company's philosophy.

- Using and developing key performance indicators
- Being innovative
- Investing in new technology
- Continually developing the expertise, professionalism and integrity of our people

QUALITY CONFIDENCE



Part No.	Description
А	Seal Face
В	O-ring
С	Thrustring
D	Spring
Е	Retainer
F	Grub Screw
G	Snap ring
Н	Stationary Seat
I	O-ring

Type VT-9/VT-9W

Type VT-9/VT-9W are multi spring, pusher type unbalanced seals used for universal applications. The seals are compact in design suiting all types of rotating equipments, pumps and mixers. Drive lugs in the retainer will provide torque transmission and reduce slippage on shaft and sleeve. A snap ring holds all components together, helping in easy installation. The parts are interchangeable, VT-9 can be converted to VT-9W by just changing the seal ring and the secondary member.



Type VT-9B/VT-9WB

VT-9B/VT-9WB mechanical seals are multi spring pusher type balanced seals suitable for high pressure application

Seal Characteristics

- Single Seal
- Unbalanced
- Independent of direction

Operating Limits

- Shaft Diameter d1 : 18...100mm
- Pressure p : 10 bar (max)
- Temperature t :-20...240°C
- Velocity v : 20 m/sec

Materials

- Seal Faces : Carbon, SiC,Tung. Carbide
- Metal Parts : SS316,Hastelloy-C,Alloy 20
- O-ring : Elastomers / PTFE Wedge

Applications

- General Chemicals
- Petrochemicals
- Refineries
- Light hydrocarbons, Water



Part No.	Description
А	Seal Face
В	V-Packing
С	Seal Adapter
D	Spring
Е	Drive Collar
F	Grub Screw
G	Stationary Seat
Н	Stationary Packing



Type VSS

Type VSS is single coil spring seal developed for light contamination, dirty media and clogging type application. The mechanical drive of this seal is realised by grub screw which lock onto the shaft. Seal is not dependent on direction of shaft rotation.

Seal Characteristics

- Single Seal
- Balanced
- Helical Coil spring
- Independent of direction of rotation

Performance Range

- Shaft Diameter d1 : 10...100mm
- Pressure p : 30 bar (max)
- Temperature
- t :-20...140^oC
- Velocity
- v : 15 m/sec

Materials

- Seal Faces : Carbon, Ceramic, SiC, Tung. Carbide
- Metal Parts : SS304, SS316, Special Alloy
- O-ring : Elastomers, PTFE



Type - VSS-W

Applications

General Chemicals

Light Hyrocarbons

Petrochemicals

Solid seal ring construction

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Description
Retainer
Seal Ring
0-Ring
Thrust Ring
Snap Ring
Spring
Grub Screw
Stationary Seat
Stationary Packing

Type VCB

Type VCB multi spring, pusher type unbalanced seals used for universal applications. The seals are compact in design suiting all types of rotating equipments, pumps and mixers. It is externally mounted completely out of the fluid area and are not exposed to any corrosive action. Seal is inherently balanced, hence no need for stepping shaft or sleeve.



Seal Characteristics

- Single Seal
- Unbalanced
- Independent of direction of rotation.

Performance Range

- Shaft Diameter d1 : 18...150mm
- Pressure
 p : 10 bar (max)
- Temperature t :-20...180°C
- Velocity v : 20 m/sec

Applications

- General Chemicals
- Petrochemicals
- Refineries
- Light Hyrocarbons, Water

Materials

- Seal Faces : Carbon, SiC, Tung. Carbide
- Metal Parts : SS316, SS304
- O-ring : Elastomers, PTFE Wedge



Type VM-20 / VM-20RS

Type VM-20 & VM-20RS are external mounted seal designed for extremely corrosive application such as acids, salts, organic compounds and reducing agents. All materials coming in contact with the liquid are made of chemically inert material. Metallic components are isolated from the liquid.

Type VM-20

Seal faces not replaceable. Glass field PTFE face is composite moulded with flexible PTFE bellow.





Seal faces are replaceable and can be supplied with hard materials suitable for abrasive services.

Seal Characteristics

- Single Seal
- **Outside Mounted**
- Independent of direction of rotation.

Performance Range

- Shaft Diameter d1:18...100mm
- Pressure
- p:6 bar (max) t :-45...120°C Temperature
- - Velocity v : 20 m/sec

Materials

- Seal Faces : GFT, SiC, Ceramic
- Metal Parts : SS304, Ss316, Hast-C
- PTFE Bellow

Applications

Extremely Corrosive application



Description
Seal Face
Face Housing
O-ring
Spring
Drive Collar
Grub Screw
O-ring
Stationary Seat
O-ring

Type VTC

Type VTC is the balanced seal without need for step sleeve. This seals are designed for media containing solids or with high viscosity. The springs are protected from media, thus no clogging of springs or springs compartment, resulting in high reliability.



Seal Characteristics

- Single Seal
- Balanced
- Capsulated Spring
- Independent of direction of rotation.

Materials

- Seal Faces : Carbon, SiC, Tung. Carbide
- Metal Parts : SS304, Ss316, Hastelloy-C Alloy 20
- Elaastomers : Viton, Nitrile

Performance Range

- Shaft Diameter d1 : 18...100mm
- Pressure p : 25 bar (max)
- Temperature t : -20...140[°]C
- Velocity v : 15 m/sec

Applications

- General Chemicals
- Food Industries
- Media Containing Solids





Type VMH-21

Type VMH-21 is a compact cartridgised balanced seal specially developed for handling slurries, sludges, thick syrups and polymerising fluids. In the cartridge construction the springs are isolated from the fluid enhancing the seal life. After detaching of the location plates provided, the seal can be easily installed straight away without setting measurements. Type VMH-21 is a sturdy, robust, seal capable of maintenance free runs for years together.

Seal Characteristics

- Single Seal
- Balanced
- Dependent of direction of rotation.
- Cartridge Unit

Performance Range

- Shaft Diameter d1 : 20...100mm
- Pressure
- p : 10 bar (max)
- TemperatureVelocity
- t :-20...180°C v :20 m/sec

Materials

- Seal Faces : Carbon, SiC, Tung. Carbide
- Metal Parts : SS316, Ss304, Hastelloy-C Alloy 20
- O-ring : Elastomers

- ApplicationsPulp & Paper
- Slurry pumps
- Sludge pumps

Part No.	Description
А	Seal Face
В	O-ring
С	Pin
D	Sleeve
Е	Stationary Seat
F	O-ring
G	Spring
Н	Washer
I	Throttle Bush
J	Assembly Fixture
К	Shrink Disc
L	Gland



Slurry Seals





Type VMB-50G		
Part No.	Description	
А	Seal Face	
В	Face Housing	
С	Bellows	

Collar

Packing

Drive Collar

Grub Screw

Head Screw

Packing

Stationary Seat

D

Е

F

G

Н

L

J

Type VMB-50G

Type VMB-50G seals specially designed for high temperature application and suitable for high start-up toque since the bellows unit is independent of torque transmission. Grafoil is used as a secondary member having excellent temperature range upto 400°C. Shrunk fit seal face design minimize face distortion restricting leakage and wear rate to very low level under a wide range of condition.



Type VMB-50

Type VMB-50 seals are widely used in refinery,petrochemicals and chemical industries. Static o-ring is used as a secondary member. The absence of dynamic o-ring prevents possibility of seal hang-up. Centroid loaded face design increases seal life by avoiding seal face distortion caused due to thermal expansion and also ensures optimum face flatness over a wide operating condition. As a standard,AM350 bellow cores are used. For chemical compatibility Alloy C-276 or Alloy 718 bellow cores can be used.

Seal Characteristics

- Single Seal
- Balanced
- Metal Bellows
- Independent of direction of rotation.

Materials

- Seal Faces : Carbon, SiC, Tung. Carbide
- Metal Parts : SS316, Ss304 Carpenter 42,
 - Alloy 20, Hastelloy-C
- Packing : Grafoil

Performance Range

- Shaft Diameter d1 : 18...100mm
- Pressure p : 10 bar (max)
 - Temperature t :-20...400°C
 - -20...200°C (VMB-50) v : 20 m/sec
- Velocity

Applications

- High temperature applications
- Petrochemicals
- Refineries

Type VMB-50

Part No. Description

- A Seal Face
- B Face Housing
- C Metal Bellows
- D Collar
- E 0-ring
- F Grub Screw
- G Stationary Seat
- H O-ring







Part No. Description

- A Seal Face
- B O-ring
- C Thrust ring
- D Conical Spring
- E Stationary Seat
- F O-ring

Type VBSM-3

Type VBSM-3 is single conical spring, unbalanced seal with O-ring provided for secondary sealing. Since the Torque transmission is done by the single coil springs the seals are dependent on the directions of rotation, which is seen from the drive end of the shaft. Right handed spring and left handed springs are provided for clockwise and anticlockwise rotating shafts respectively. These seals can carry a variety of seals faces, serving applications in submersible, sewage, chemical transfer, water pumps etc.



Conical Spring Seals

Seal Characteristics

- Single Seal
- Unbalanced
- Conical spring
- Dependent of direction of rotation.

Performance Range

- Shaft Diameter d1 : 10...100mm
- Pressure p : 10 bar (max)
- Temperature t : -20...180°C
- Velocity v : 10 m/sec

Applications

- Water pumps
- Submersible pump
- Sewage pump

Materials

- Seal Faces : Carbon, Ceramic, SiC, Tung. Carbide
 - Metal Parts : SS304, SS316
- O-ring : Elastomers, TTV

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art No.	Description	Part No.	Description
А	Seal Face	I	0-ring
В	O-ring	J	Pin
С	Backup ring	К	Throttle bush
D	Retainer	L	Assembly fixture
E	Spring	М	Drive Collar
F	Sleeve	Ν	Grub Screw
G	O-ring	0	Gland
Н	Seat		

Type VC-108B

Type VC-108B mechanical seals are designed for heavy duty service involving high pressure and sliding velocities. This seal has positive drive arrangement and sturdy construction making the seal suitable for high pressure application. Multiple spring design provides uniform face loading. The seal is supplied as a cartridge unit and can be directly bolted to stuffing box. These seals are normally used in main oil pipelines,water injection pumps and boiler feed water pumps.



Seal Characteristics

- Single Seal
- Balanced
- Independent of direction of rotation

Performance Range

- Shaft Diameter d1 : 25...150mm
- Pressure p : 80 bar (max)
- Temperature t :-20...220°C
- Velocity v : 20 m/sec

Applications

- Main Oil Pipeline
- Water Injection Pumps
- Boiler Feed Water Pumps

Materials

- Seal Faces : Carbon, SiC, Tung. Carbide
- Metal Parts : \$\$316, \$\$304, Hastelloy-C,
 - Alloy 20
- O-ring : Elastomers



Part No.	Description
А	Seal Face
В	O-ring
С	Seal Ring Housing
D	O-ring
Е	Grub Screw
F	Stationary Unit
G	Stationary Packing
Н	Stationary Shell
I	Stationary Shell Packing

Stationary Shell Packing

Type VHP-4

Type VHP-4 series are designed to handle liquids of varying contamination including sluries, sludges, sewage, viscous or abrasive media etc. The Type VHP-4 Cartridge Seal combines the advantage of easy installation and simple maintenance with total reliability. The Compactness of the design ensure that the seal fit all ANSI and DIN stuffing boxes. This Seal is specially design for high pressure application.



Seal Characteristics

- Single Seal
- Balanced
- Independent of direction of rotation

Performance Range

- Shaft Diameter d1 : 25...150mm
- p : 70 bar (max) Pressure
- t :-20...220°C Temperature
- Velocity v : 20 m/sec

Applications

- Main Oil Pipeline
- Water Injection Pumps
- **Boiler Feed Water Pumps**

Materials

- Seal Faces : Carbon, SiC, Tung. Carbide
- Metal Parts : \$\$316, \$\$304, Hastelloy-C, Alloy 20
- O-ring : Elastomers

Type VCB-SH/C1 Type VS 200

Type VCB-SH/C1 are preset factory assembled cartridge seals for use in Agitators, Mixers and Reactor Vessels. The seals construction vary slightly for top entry vessels, side entry vessels and bottom entry vessels. The seals are designed to the shortest shaft length and the bearings are located as close to the vessel body to minimize the deflection.





Type VS 200 Double seal back to back arrangement

Performance Range

- Shaft Diameter d1 : 25...150mm Pressure
 - : vaccum40 bar (max) р
- Temperature Velocity
- : -20...220°C t
- : 4 m/sec v

Applications

- General Chemicals and its vapours.
- Petrochemicals and its vapours.
- Light Hydrocarbons and its vapours.

Materials

- Seal Faces : Carbon, SiC, Tung. Carbide
- Metal Parts : SS316, Hastelloy-C, Alloy 20
- O-ring : Elastomers,PTFE

Seal Characteristics

- Single Seal/Double Seal
- Unbalanced/Balanced
- Independent on direction of rotation

Heat Exchanger

Velmake Heat Exchangers are incorporated in API Plans 21,23,41 to bring down the temperature of buffer fluid before it enters into seal chamber. Heat Exchanger may be mounted either vertically or horizontally, the vertical mounting being preferred because of better thermosyphon effects



Thermosyphon Vessel

With Velmake's Thermosyphon system it is possible to supply barrier fluid to double seal arrangement. The pressure of barrier fluid is higher than the pressure of the fluid being sealed. Thus seal faces remain in contact with each other and sealing area temperature is controlled. Thermosyphon system is as per API682.



Cyclone Separator

Cyclone Separator are designed for removing dirt, sand and solid particles from injection flow to mechanical seal. The separation is obtained by centrifugal force generated by differential pressure across the cyclone.

- Size
- 1/2" NPT / 1/2" BSP ure 120 bar
- Pressure 120 ba
- Temperature 200°C



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The technology has come off the age and proved to be environmental protection system. API 682 standard is devoted standard for mechanical seals. The new sealing technologies are based on advanced computer programs used to optimize the seal designs. Combined with advancements in the seal face materials the equipment availability and reliability has increased substantially. Other related standards are: API 610,DIN 24960,ISO 3609,DIN EN 12756 and ISO 21049.



BASIC SEAL CONSTRUCTION

Sealing Mechanism: Two lapped faces, one rotating with shaft and another stationary in gland are brought in contact with each other by means of spring force. The surfaces are separated by micron thickness of film of fluid being sealed. The generation of this film is automatic due to micro asperities on the lapped surfaces.

Thus the film acts as a lubricant and reduces the friction and heat generation well within the limits of seal face materials. Generally the lubrication regime is mixed one. Typical coefficient of friction is 0.07 for general purpose seals and 0.015 for well designed high pressure seals. Seal Balance $=\frac{A_{h}}{A_{f}}$ and is >1

Seal is unbalanced because a high proportion of the hydraulic load is applied to the fluid film.





Hydraulic

Sealing

Line

Seal Balancing: For seal to perform, the seal faces must be in contact with each other in dynamic conditions. The heat generation due to interface pressure load must not vaporize the liquid film. Seal balancing is a geometrical feature provided to seal face that avoids such condition.

Interface Pressure = Pf = p(b-k)+PspDiff. pressure across seal = pk = Seal face press. Variation constant = 0.5 generally

Psp = Spring load pressure on face = 1.8 to 2.8 kg/ cm².

BALANCED SEAL



MATERIALS

Most of the seal designs have stood the test of time and are still in regular usage. The improvements, however, have been tremendous in the seal face materials. The development of superior and highly reliable resin impregnated carbon as also antimony impregnated carbon has enable successful seal operation even in marginal lubrication conditions particularly in light hydrocarbon and high temperature water applications.

For corrosive liquids resin impregnated carbon and sintered silicon carbide grades have proved the ideal solutions. The hardness and thermal conductivity of silicon carbide is extremely high as shown in the table below.

ELASTOMERS

Generally seal face materials easily withstand high temperatures, typically 330°C. However temperature limitations on the part of secondary elastomers decide the seal temperature capability.

So while selecting the seal these limits are to be taken into account.

Material description	min	Temperature limits	max
Fluoroelastomer	0°F/-18°C		400°F/204°C
Ethylene Propylene (EPDM)	-40°F/-40°C		300°F/149°C
Neoprene	-40°F/-40°C		300°F/140°C
Nitrile Butadiene (Buna N)	-40°F/-40°C		300°F/125°C
Kalrez [®] 1050LF	240°F/-7°C		550°F/288°C
PTFE	-100°F/-73°C		450°F/232°C
Flexible graphite	-320°F/-196°C	;	800°F/427°C
Chemraz®	-20°F/-29°C		450°F/310°C

Material	Compressive Strength N/mm ²	Density g/cm ³	Modulus elasticity of kN/mm²	Coeff. of Thermal Expansion x10- ^{6/0} C	Thermal Conductivity W/mºC	Hardness
Carbon, resin impregnated	250	1.83	234	2.88	6	100*
Carbon, antimony impregnated	350	2.15	262	3.96	8	115*
Tungsten Carbide	4750	15	635	5	100	1500*
Silicon Carbide	2750	3.1	365	4.5	145	2400*
Alumina Oxide	2620	3.9	385	4.32	25	1800**





Lapped sliding face made out of different materials having the following average, arithmetic mean roughness values (Ra)

Tungsten carbide	0.01	mm
Silicon carbide	0.04	mm
Carbon graphite	0.10	mm
Aluminium oxide	0.15	mm



Extrusion characteristics of elastomeric 0-rings The extrusion resistance of elastomeric 0-rings can be greatly enhanced by use of support rings.



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Equipment Checkpoints



Shaft end play - Axial shaft movement (end play) must not exceed 0.004" (0.10 mm) full indicator movement (F.I.M.) on ball type thrust bearings.



Shaft radial deflection - must not exceed 0.002" (0.5 mm) full indicator movement at any point along the shaft.



Shaft run out - must not exceed 0.002" (0.5 mm) full indicator movement at any point along the shaft.



Seal Chamber face run out - Seal Chamber face should be square to shaft centre line within 0.005" (0.13 mm) full indicator movement.



Seal Chamber bore concentricity - Shaft concentricity to seal chamber bore should not exceed 0.005" (0.13 mm) full indicator movement.

API Flush Plans

Circulation from discharge

Plan 11















TABLE OF MATERIALS

CODE	MATING RING	SEAL RING	SECONDARY SEAL	SPRING	HARDWARE
A	TC/SS304	TC/SS304	PTFE	SS316	SS316
В	TC/ALLOY-20	TC/ALLOY-20		ALLOY-20	ALLOY-20
B1	TC/TITANIUM	TC/TITANIUM			
С	TC/HAST-C	TC/HAST-C		SS304	SS304
D	SIL.CAR./HAS-C	SIL.CAR./HAS-C	EPR (PTFE Coated)	MONEL	MONEL
E	SS410	SS410	EPDM	HASTELLOY-C	HASTELLOY-C
F	VELCHROME	VELCHROME		SS410	SS410
G	NIRESIST	NIRESIST	NEOPR		
Н	CASTIRON	CASTIRON			STEEL/C.I.
I	VELBRO	VELBRO	BUTYL		
J	CHROME OXIDE/SS316	CHROME OXIDE/SS316	EPR		CHROME OXIDE/SS316
К	STELLITE (Co.)	STELLITE (Co.)		AM 350	
L	STELLITE (Ni.)	STELLITE (Ni.)			HASTELLOY-B
L1	SIL. CAR./SS904L	SIL. CAR./SS904L			SS904L
М	SIL. CAR./SS316	SIL. CAR./SS316			NICKLE
M1	SIL. CAR/SS316L	SIL.CAR./SS316L			
N	TC (Co.)/SS316	TC (Co.) SS316	VITON		SS316L
0	TC (Ni.)/SS316	TC (Ni.)/SS316	VITON (PTFE Coated)		
01	SIC/NICKLE	SIC/NICKLE			
Р	SIL.CAR. SOLID	SIL.CAR. SOLID	SILICON	SS316 (PTFE Coated)	
Q	TC (Co.) SOLID	TC (Co.) SOLID			
R	TC (Ni.) SOLID	TC (Ni.) SOLID	NITRILE (BUNA-N)		CARP. 42/17-APH
R1	TC/17-4PH	TC/17-4PH			
S	CERAMIC	CERAMIC			
Т	CARBON-M	CARBON-M	FEP		BRONZ
T1	CARBON-M/SS316	CARBON-M/SS316			
U	CARBON-R	CARBON-R			SS304L
U1	CARBON-R/SS316	CARBON-R/SS316			
V	CARBON-R/HAST-C	CARBON-R/HAST-C			TITANIUM
V1	CARBON-R/NICKLE	CARBON-R/NICKLE			
V2	CARBON-R/ALLOY-20	CARBON-R/ALLOT-20			
W	GFT	GFT	GFT		
Х	SIL.CAR,/SS304	SIL.CAR/SS304			M.S,
Y	SIL.CAR,/ALLOY-20	SIL.CAR/ALLOY-20			
Y1	SIL.CAR./TITANIUM	SIL.CAR./TITANIUM	FLEXIBLE GRAPHITE		
Y2	CARBON-R/TITANIUM	CARBON-R/TITANIUM			
Z	RULON	RULON	KALREZ & CHEMRAZ		NON-METALLIC
Z1	CFT	CFT			







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