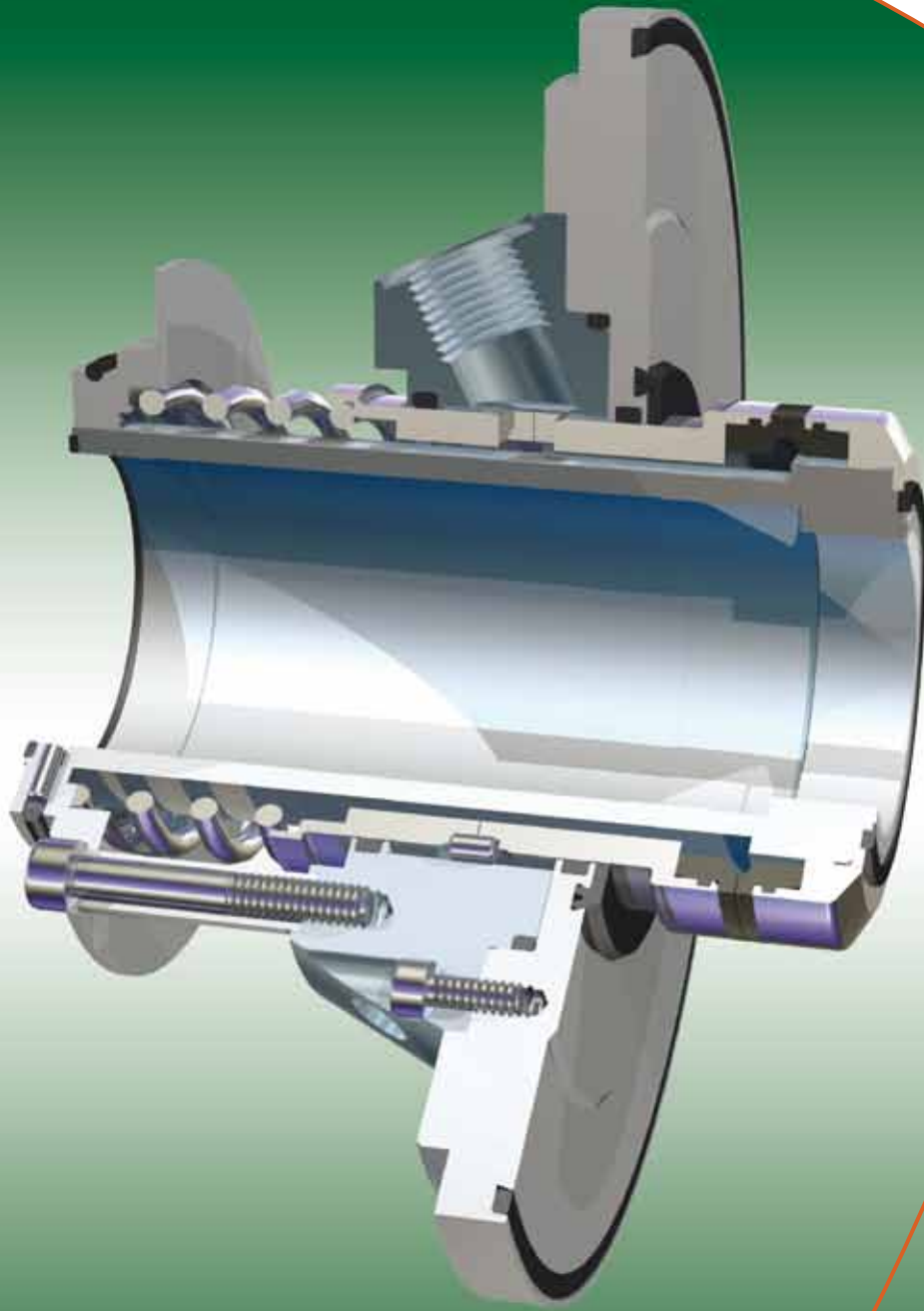


# Mechanical slurry seal





### H3 Design

# Mechanical slurry seal

For over seven years Metso have been successfully supplying mechanical slurry seals to various industry segments.

While the unique designs utilised have provided excellent results in all light to medium slurry applications, the growing demand for advanced and reliable sealing solutions on even the heaviest of slurry applications, has resulted in the development of the improved H3 design of single and double mechanical seals.

The seals are of complete “ready to fit” cartridge type and are completely interchangeable with any Metso standard shaft sealing arrangement. The cartridge seal is a pre-adjusted “slide on unit” and require no further settings.

## Features

A new flexible fixing of the seal face and unique locking pin allow the seal to tolerate both vibration and excessive shaft deflection.

Static and rotating seal parts exposed to slurry have been geometrically harmonised to minimize turbulence and secondary flow streams, thus reducing wear in heavy slurry applications.

Patented design with the springs located on the atmospheric side, protected from both slurry and barrier liquid, eliminates hang-up problems or clogging of the springs. The design also accepts axial movements of up to  $\pm 9$  mm, enabling operators to take advantage of the Metso adjustment features without resetting the assembly.

The dual balanced design can operate with pressurised barrier liquids, either higher or lower than the slurry pressure, while its unique hydraulic arrangement also allows the seal to operate under vacuum conditions.

Seals are supplied with metal parts in AISI 316, springs in HASTELLOY™, O-rings in Viton™ and seal faces in a unique Silicon Carbide compound.

## Options

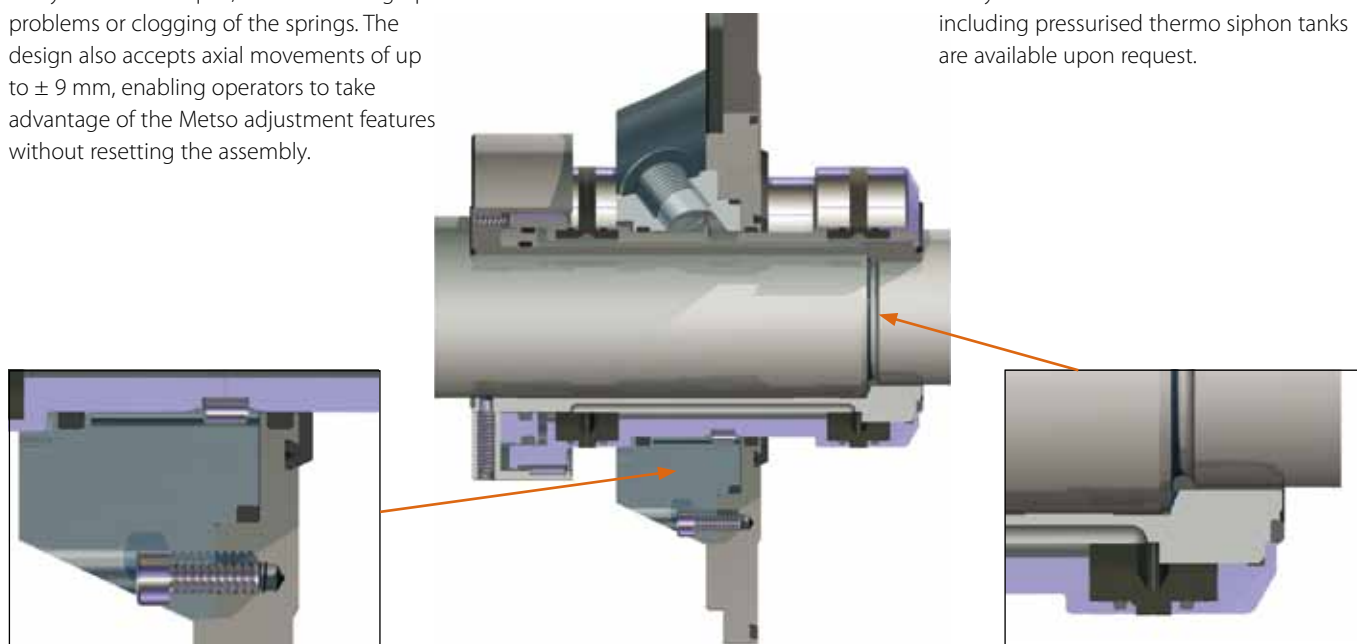
Material options include metallic components in Duplex SS or Titanium and elastomers such as Chloroprene or Kalrez™.

For extremely corrosive and abrasive slurries applications a full range of special coatings are also available.

All Metso Slurry Seals can be supplied to an ATEX approved design, ensuring suitability for use in hazardous areas.

## Accessories

Various flow control devices and barrier liquid systems including pressurised thermo siphon tanks are available upon request.



### Shaft deflection - Horizontal pin

Unique locking pin design, enables the two stationary sealing rings to effectively compensate for shaft deflection.

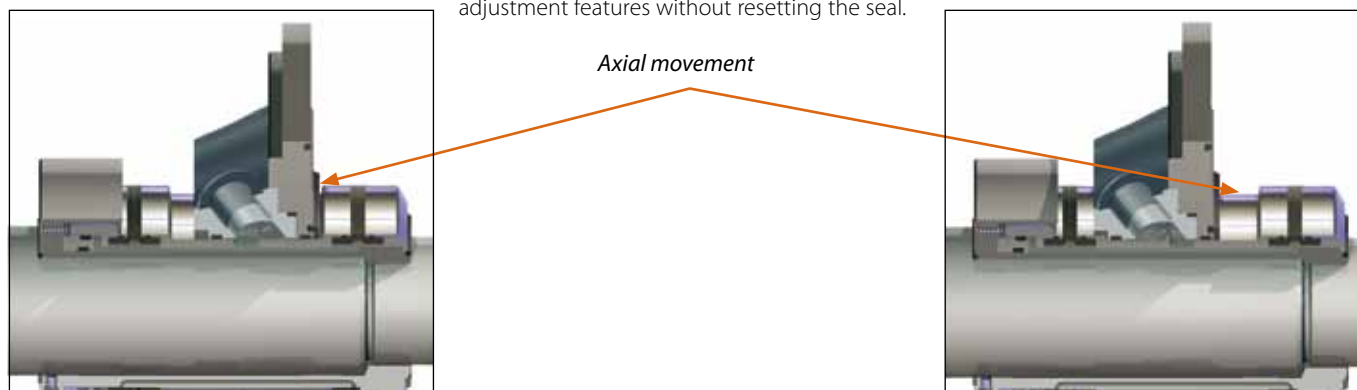
Due to wide tolerances in the locking pin groove, the vertical contact faces of the holder rings may move relatively to each other allowing moderate shaft deflection without building up forces over the seal faces.

### New H3 seal face design

Static and rotating seal parts exposed to slurry have been geometrically harmonised having the same outer diameter. This prevents build up of turbulence and secondary flow streams which may cause wear in heavy slurry applications with abrasive particles.

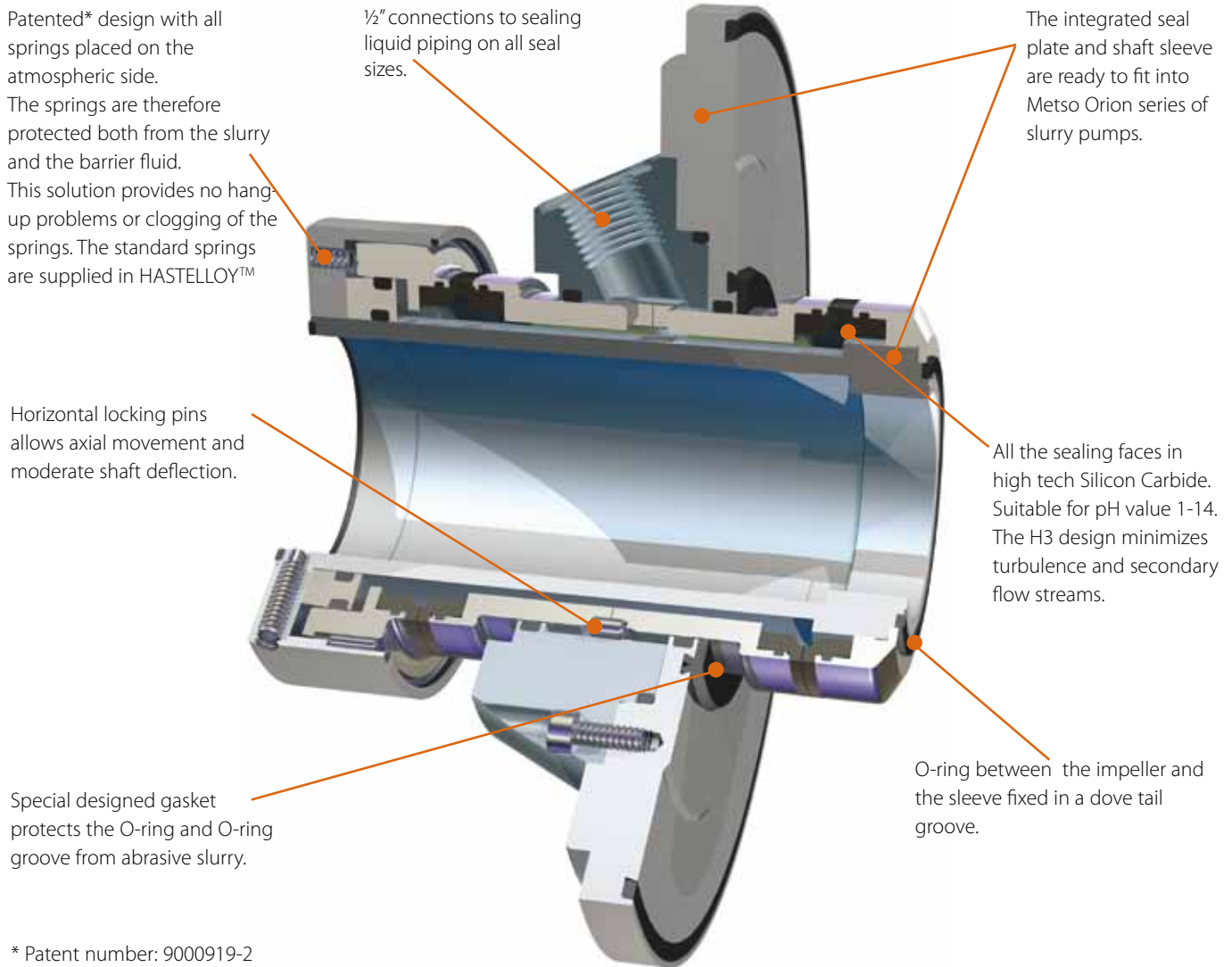
### Axial movement of seal

The seal also allows axial movement of  $\pm 9$  mm, enabling operators to take advantage of the Metso impeller adjustment features without resetting the seal.



# The BA-H3 seal - features

The double mechanical cartridge seal type BA-H3 is a seal for the toughest slurry applications. The basic principle of a double mechanical seal is that a sealing liquid inside the seal is provided. This liquid lubricates and cools the seal faces. The lubricating function becomes more efficient when the sealing liquid is kept at a higher pressure than the slurry in the seal chamber.



Patented\* design with all springs placed on the atmospheric side. The springs are therefore protected both from the slurry and the barrier fluid. This solution provides no hang-up problems or clogging of the springs. The standard springs are supplied in HASTELLOY™

½" connections to sealing liquid piping on all seal sizes.

The integrated seal plate and shaft sleeve are ready to fit into Metso Orion series of slurry pumps.

Horizontal locking pins allows axial movement and moderate shaft deflection.

All the sealing faces in high tech Silicon Carbide. Suitable for pH value 1-14. The H3 design minimizes turbulence and secondary flow streams.

Special designed gasket protects the O-ring and O-ring groove from abrasive slurry.

O-ring between the impeller and the sleeve fixed in a dove tail groove.

\* Patent number: 9000919-2

All O-rings in VITON™, other materials available on request.

## Applications

The BA-H3 double mechanical seal with high pressure sealing liquid will always be the safest sealing solution for total heavy slurry applications. Whenever dealing with small abrasive particles (early process stages), a double seal will always provide for reliability and longer service life.

The BA-H3 double mechanical seal is also the natural choice when pumping most hazardous liquids.

Repair kits available for convenient repair of seal on site or in local Metso's workshop

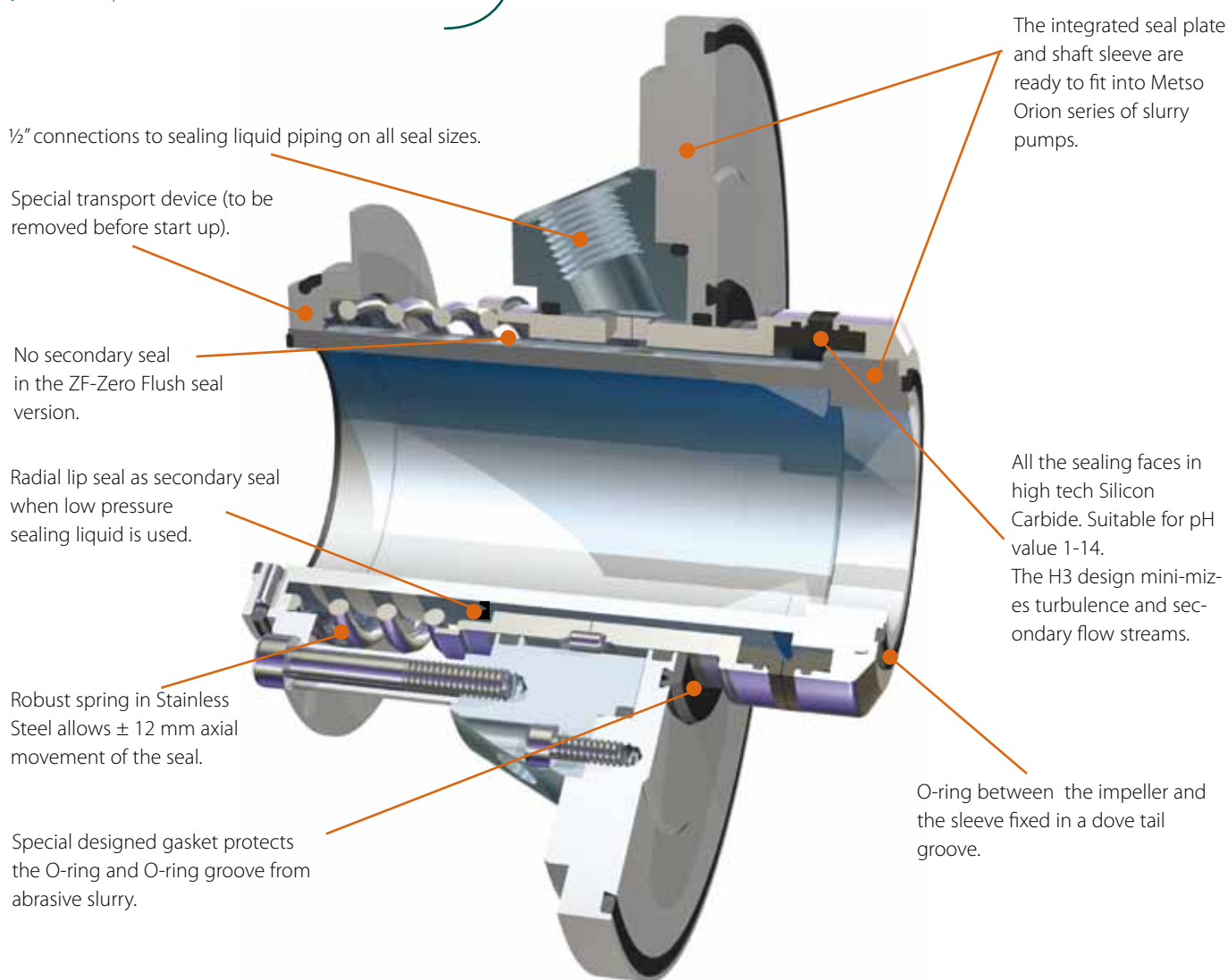
# The BF-H3 seal - features

The single mechanical cartridge seal type BF is recommended for lighter slurry applications.

There are two main versions of the BF-H3 slurry seal.

In the first, (ZF-Zero Flush) the seal is run without sealing water/flushing liquid. In this case the slurry itself lubricates and cools the seal faces. In the second version the interior of the seal is flushed with low pressure sealing liquid. In this case the secondary seal is a normal radial lip seal.

The technical features and dimensions on the product side, are exactly the same as in the BA-H3 type seal. Details specific to the BF-H3 are shown below.



## Applications

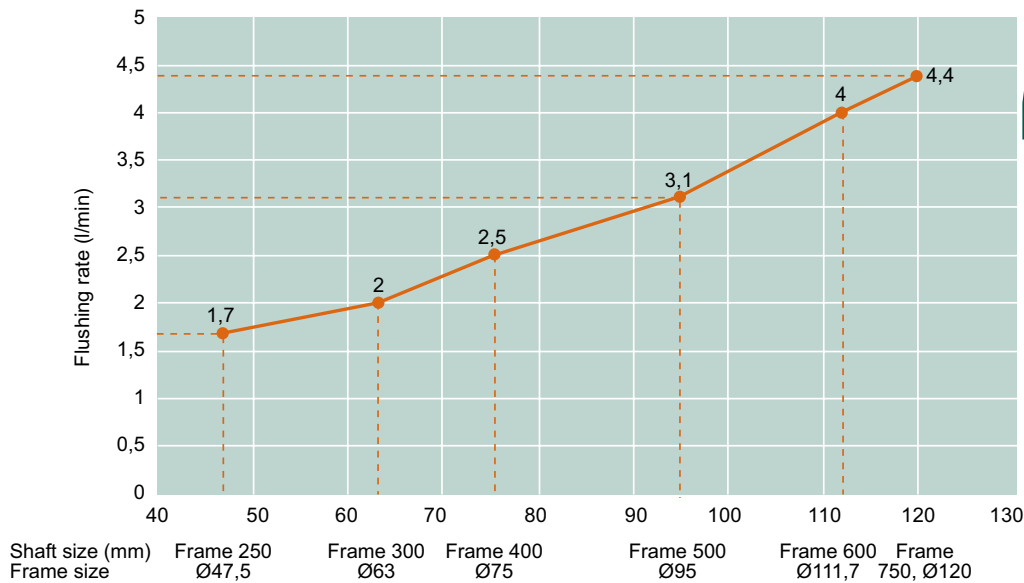
The BF-H3 type seal is a robust mechanical seal recommended for light slurry applications. The seal is not recommended in applications with high quantities of small abrasive particles (critical size 1-5 microns). Particles of these sizes will penetrate the gap between the seal faces causing wear and leakage. For these types of applications, the double mechanical seal type BA-H3 with high pressure sealing liquid should be installed.

Repair kits available for convenient repair of seal on site or in local Metso's workshop

# Technical characteristics

Technical data		Material selection	
<b>BA-H3 Double Seals</b>		<b>Seal Faces</b>	
Temperature:	Maximum 110°C*	Sintered Silicon Carbide - resistant to pH 1-14	
Max. pump pressure:	40 bar	<b>Elastomers</b>	
Speed:	≤3000 rpm	Elastomers standard (FPM) maximum 110°C.*	
<b>BF-H3 Single Seals</b>		<b>Springs</b>	
Temperature:	Maximum 110°C*	Hastelloy™	
Max. pump pressure:	30 bar	<b>Metal Parts (Standard)</b>	
Speed:	≤3000 rpm	AISI 316/329	EN 1.4436 / 1.4460

## Recommended Quench / Barrier Liquid Flow



Use this table calculate actual flush water quantity required

		rpm	Factor	rpm	Factor
Solid particles:	max 10 mg/l	700	0,2	2 450	0,7
Particle size:	10 - 50 µm	1 150	0,3	2 800	0,8
Critical particle size:	2-5 µm (to be avoided)	1 400	0,4	3 150	0,9
Permanganate value:	max 30 (free from humus)	1 750	0,5	3 500	1,0
Ferro content:	max 1 mg/l	2 100	0,6		
Hardness value:	max 10° dH				
Minimum flushing rate:	0,5 l/min				
Max. quench/barrier liquid temp.:	110 °C				
		l/min x rpm factor = total flushing rate			

## Elastomers

\*O-ring materials in Ethylene-Propylene (EPDM) and Perflouric elastomer (Kalrez™) are available on request for high temperature and/or slurries with aggressive chemical content.

## Options

### Materials

Due to the wide range of different slurry applications, Metso offers the slurry seal in different materials available on request. Depending on the slurry itself and the general environmental conditions on site, an optimal solution should be developed. The various materials are also available with different coatings in order to increase wear protection.

## Construction materials selection guide

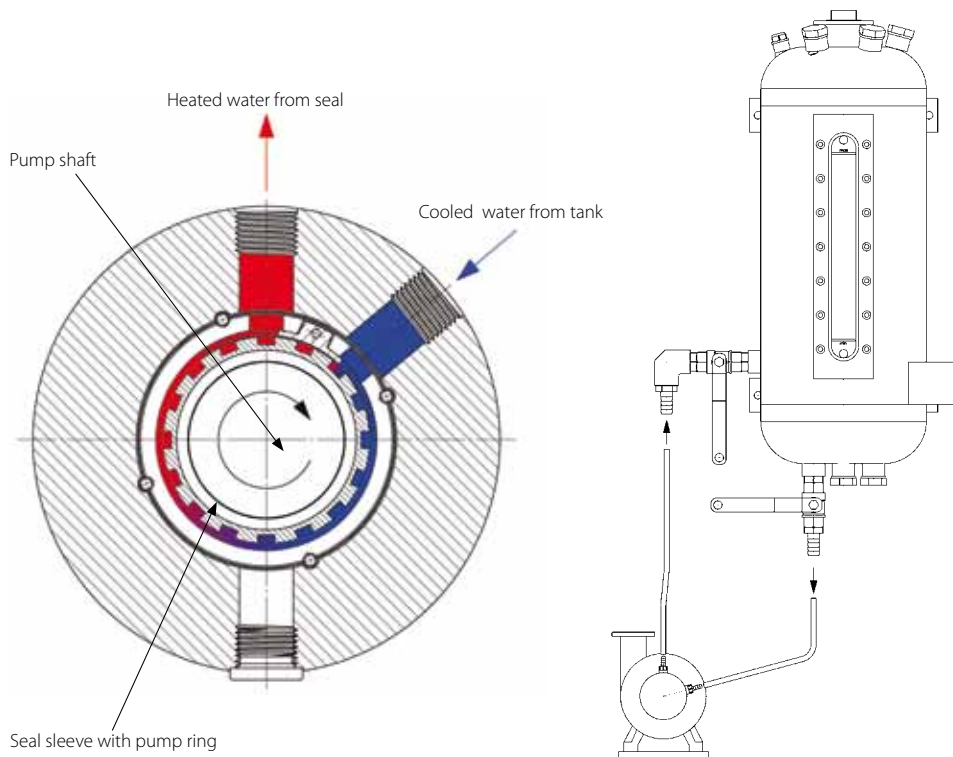
	<i>Slurry abrasiveness</i> ↑			
Extreme	AISI 318L+ Coating EN 1.4462 + Coating	AISI 318L + Coating EN 1.4462 + Coating	Titanium Nitride TiN	
Normal	Standard AISI 316 / 329 EN 1.4436 / 1.4460	AISI 318L EN 1.4462	Titanium Ti	
	None / Low	High	Extreme	<i>Slurry corrosiveness</i> →

# BA-H3 and BF-H3 with thermo siphon and internal pumping device

The BA-H3 mechanical seal may be combined with a special Thermo Siphon based sealing liquid system. The system consists of a 12-litre Stainless Steel tank, pressure tested for 16 bar. A limited amount of sealing liquid in the tank siphons or circulates due to the temperature difference of the sealing liquid inside the seal and in the tank, thus providing lubrication and cooling. To induce more liquid to circulate and hence increase the cooling effect, the seal is equipped with a pumping ring inside the seal. In this way the sealing liquid reaches a flow of approximately 2 litres/min at 1850 rpm.

Wherever seal water quality is poor, or indeed non-existent, the Thermo Siphon system with internal pumping device provides an ideal solution.

## Principle sketch of seal interior with pumping device



### ATEX approved seals for Hazardous areas

Metso also offer the mechanical seals, BA-H3 and BF-H3, in classified models for hazardous areas according to ATEX Directive 94/9/EC. Depending on the zone for explosive atmosphere there are different combinations of safety systems.

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