

API 682 4th edition Category 2/3 Configurations



Mechanical seals



Piping plans



Seal supply systems



Configuration

3NC-FB

Product	Configuration	Application	Material	Seal	Supply	Control	Monitoring
02004-001	API 682-32	API 682-32	WJSL 04 CC	API 682-32	02004-001		
RDS-00	RDS-0						
YF002							

Seal supply systems and components

- WEFG, WELG, SPTG
- WEFB, WELB, SPTB
- ZYAG
- WEFG, WELG, SPTG, ZYAG
- SPXB
- TSAG, TSBG
- Engineered
- TSAG, TSBG

EagleBurgmann mechanical seals applicable for this configuration

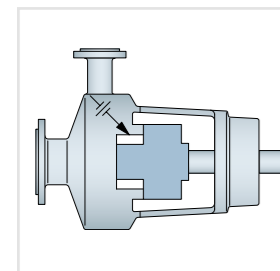
	Seal type A (Balanced pusher seals)	Seal type B (Metal bellows seals with O-Rings)	Seal type C (Metal bellows seals with flexible graphite)
ROTATING			
STATIONARY	<ul style="list-style-type: none"> ■ HRGS-DD ■ LNF992 		

Engineered seals

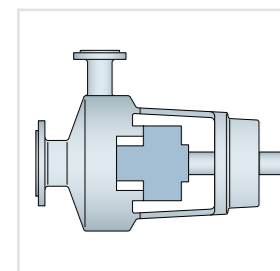
Beyond API specifications, EagleBurgmann offers a comprehensive range of engineered seals tailored to customer's specification. Please inquire.

API piping plans applicable for 3NC-FB configuration

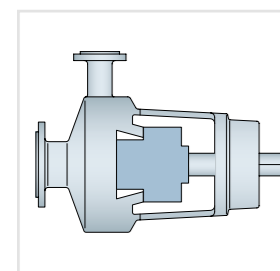
Process side



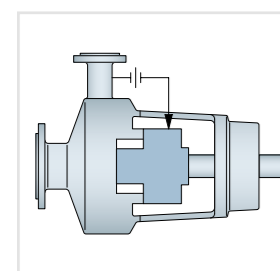
Plan 01*
Integral (internal) recirculation from the pump discharge to the seal chamber.



Plan 02
Dead-ended seal chamber with no recirculation of flushed fluid. Flush connections plugged.

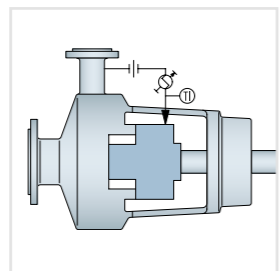


Plan 03
Circulation between the seal chamber and the pump created by the design of the seal chamber. Flush connections plugged.

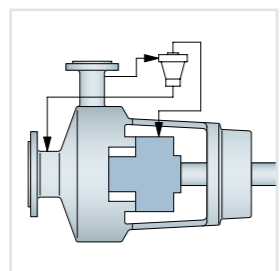


Plan 11 (12)*
Recirculation from the pump discharge through a flow control orifice (in Plan 12 through a strainer and a flow control orifice) into the seal chamber.

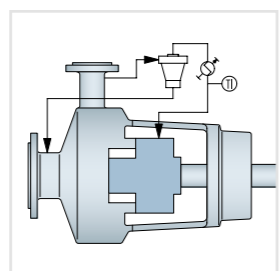
Between seals



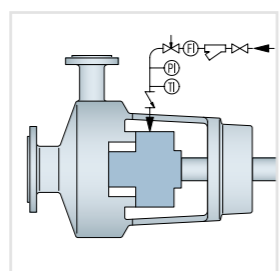
Plan 21 (22)*
Recirculation from pump discharge through a flow control orifice and cooler (in Plan 22 through a strainer, a flow control orifice and a cooler) into the seal chamber.



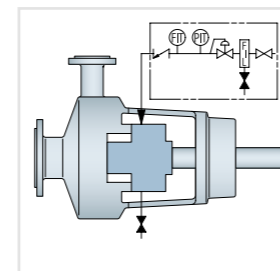
Plan 31*
Recirculation from the pump discharge through a cyclone separator delivering the clean fluid to the seal chamber. The solids are delivered to the pump suction line.



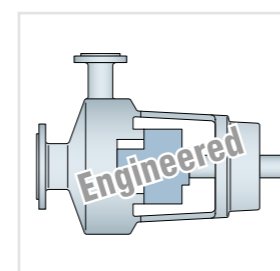
Plan 41*
Recirculation from the pump discharge through a cyclone separator delivering the clean fluid to a cooler and then to the seal chamber. The solids are delivered to the pump suction line.



Plan 32*
Injection of clean fluid into the seal chamber from an external source.



Plan 74
Externally supplied barrier gas for arrangement 3 dual pressurized non-contacting gas seals (3NC-FB, 3NC-BB, 3NC-FF).



Plan 99
Engineered piping plan not defined by other existing plans.

EagleBurgmann seal supply systems and components

Plans	Products
21 (22)	WEF6 Water cooler, WEL6 Air cooler, SPT6 Temperature indicator
31	ZYA6 Cyclone separator
41	WEF6 Water cooler, WEL6 Air cooler, SPT6 Temperature indicator, ZYA6 Cyclone separator
32	SPX6 Flush unit
74	GSS6001 Gas supply system
99	Engineered to customer's specifications

The API experts

EagleBurgmann is one of the leading international system providers of sealing technology. For more than 20 years we have been actively contributing our expertise to developing and implementing the API 682 standard for the selection and application of seals and supply systems in centrifugal and rotary pumps.

Solutions for more safety and productivity

The new 4th edition of API 682 is in line with the latest achievements and current developments. EagleBurgmann offers the widest portfolio of seals and seal supply systems acc. to API 682 4th edition, and consequently has the optimum product for each API-compliant requirement: technically mature, practical solutions that provide significantly greater safety and process reliability in refining technology, petrochemical, oil & gas and chemical industries.



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Important note

All the technical specifications are based on extensive tests and our many years of experience. However, the diversity of possible applications means that they can serve as guide values only.

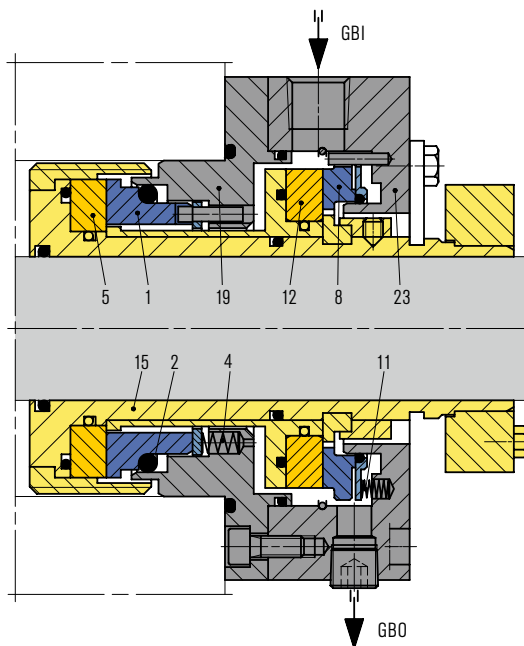
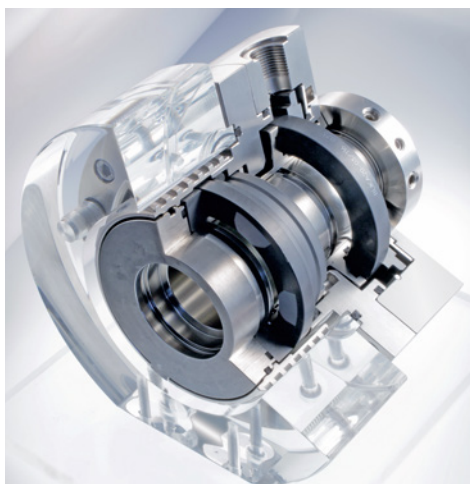
It should be noted that the extremal values of each operating parameter cannot be applied at the same time because of their interaction. Furthermore, the operating range of each specific product depends on the respective shaft diameter, materials used, mode of operation and on the medium to be sealed.

A guarantee can only be given in the individual case if the exact conditions of application are known and these are confirmed in a special agreement. When critical conditions of operation are involved, we recommend consulting with our specialist engineers.

Subject to change.

Seal type A

HRGS-DD



Features

- API 682 Category 2 and 3, Type A, Arrangement 3 seal
- Dual seal in face-to-back arrangement
- Gas-lubricated
- Balanced
- Cartridge unit
- Independent of direction of rotation
- Stationary springs
- Contact free operation, no friction

Advantages

- Universally applicable both for retrofits or original equipment
- Efficient stock keeping due to standardized components
- Extended selection of materials
- Metal parts also in special materials available

Recommended applications

- Refining technology
- Petrochemical industry
- Oil and gas industry
- Gases and liquids
- Media which require high purity
- Environmental harmful media
- API 610/ISO 13709 pumps
- Process pumps

Operating range (see note on page 3)

Shaft diameter: $d = 20 \dots 110 \text{ mm}$ (0.79" ... 4.33")
 Pressure : $p_1 = 42 \text{ bar}$ (609 PSI)
 Temperature: $t = -20 \text{ }^\circ\text{C} \dots +176 \text{ }^\circ\text{C}$ (-4 °F ... +350 °F)
 Sliding velocity: $v_g = 4 \dots 23 \text{ m/s}$ (13 ... 76 ft/s)
 Axial movement: $\pm 1.0 \text{ mm}$

Materials

Seal ring (product side): Silicon carbide Q19, SSiC (Q1)
 Seal ring (atmospheric side): Blister resistant carbon, Silicon carbide SSiC (Q1), Q19
 Mating rings: Silicon carbide SSiC (Q1), RBSiC (Q2)
 Secondary seals: EPDM (E), NBR (P), FKM (V), FFKM (K)
 Springs: Hastelloy® C-4 (M)* and C-276 (M5)
 Metal parts: CrNiMo steel 316 (G) or equivalent, optional materials on request.
 * EagleBurgmann standard

Recommended piping plans

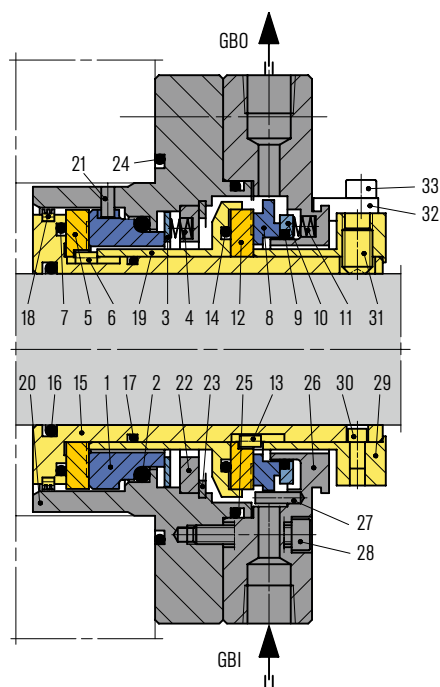
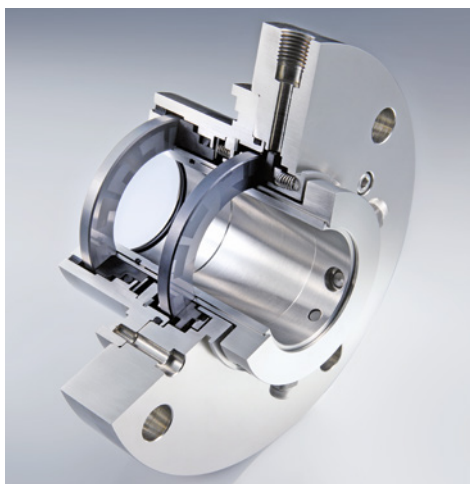
Process side: 01, 02, 03, 11, 12, 21, 22, 31, 32, 41
 Between seals: 74

Item Description

Item	Description
1, 8	Seal ring
4, 11	Spring
5, 12	Mating ring
15	Seal sleeve
19	Insert
23	Gland plate
GBI	Gas barrier IN
GBO	Gas barrier OUT

Seal type A

LNF992



Features

- API 682 Category 2 and 3, Type A, Arrangement 3 seal
- Dual seal in face-to-back arrangement
- Gas-lubricated
- Balanced
- Cartridge unit
- Stationary multiple springs
- Independent of direction of rotation
- Solid seal faces

Advantages

- Non-contacting stationary spring unit design
- No process fluid penetration into the seal faces, no leakage to the atmospheric side
- Appropriate to slurry fluid
- Applicable inboard seal design for reverse and positive pressure
- Low power consumption

Recommended applications

- Chemical industry
- Petrochemical industry
- Oil and gas industry
- Refining technology
- Gases and liquids
- Hazardous media
- Environmental harmful media
- Monomers
- API 610/ISO 13709 pumps
- Process pumps

Operating range (see note on page 3)

Shaft diameter: $d_1 = 20 \dots 110 \text{ mm}$ (0.79" ... 4.33")
 Pressure: $p = \text{vacuum} \dots 16 \text{ bar}$ (232 PSI)
 Temperature: $t = -40 \text{ }^\circ\text{C} \dots +160 \text{ }^\circ\text{C}$ (-40 °F ... +320 °F)
 Sliding velocity: $v_g = 23 \text{ m/s}$ (75 ft/s)

Materials

Seal rings: Silicon carbide SSiC (Q1),
 High density carbon graphite
 Mating rings: Silicon carbide SSiC (Q1)
 Secondary seals: FKM (V)
 Springs: Hastelloy® C-276 (M5)
 Metal parts: CrNiMo steel 316 (G)

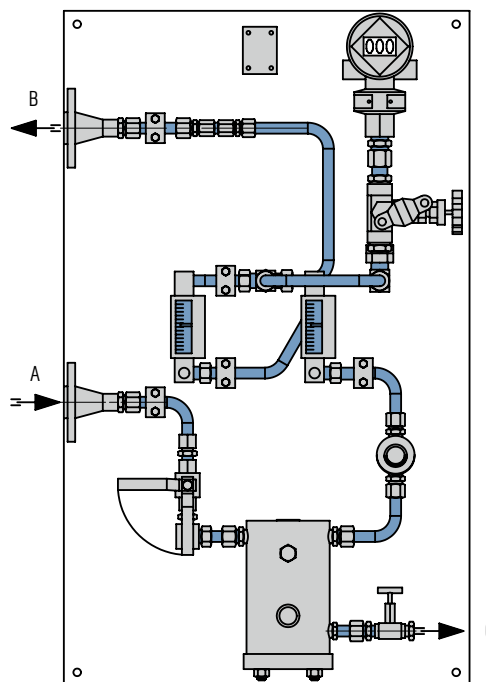
Recommended piping plans

Process side: 01, 02, 03, 11, 12, 21, 22, 31, 32, 41
 Between seals: 74

Item

Description

1, 8	Seal ring
2, 7, 9, 14, 16, 17, 24, 25	O-Ring
3, 10	Thrust ring
4, 11	Spring
5, 12	Mating ring
6, 13, 21, 27, 30	Pin
15	Seal sleeve
18	Labyrinth
19	Adapter sleeve
20, 26	Gland plate
22	Adapter
23	Retaining ring
28, 33	HSH cap screw
29	Drive collar
31	Set screw
32	Setting device
GBO	Gas barrier OUT
GBI	Gas barrier IN



Features

- Safe operation thanks to incorporated pressure regulator with upstream filter
- System mounted on a plate
- Easy wall or rack mounting

Advantages

- Coalescing filter with integrated sight-glass for monitoring liquid level to ensure safe operation even in case of poor gas quality.
- Rigid base frame for easy rack mounting.
- Wide range of flow monitoring to ensure utmost reliability of mechanical seals.

Recommended applications

- Refining technology
- Oil and gas industry
- Petrochemical industry
- Chemical industry
- Power plant technology

Product variants

Designation	GSS6001A4M001-D0
Pressure Equipment Directive	ASME
Allowable pressure ¹⁾	40 bar (580 PSI)
Allowable temperature ¹⁾	-20 °C ... +50 °C (-4 °F ... +122 °F)
Metal parts	316L
Process connections	Flange 1/2", 600 lbs

Other versions on request.

¹⁾ Design data, permissible working values depend on the actual conditions of service.

Functional description

Buffered, gas-lubricated mechanical seals may only be used in conjunction with adequately pressurized gas (e. g. from a closed circular nitrogen pipeline provided by the operator). For Plan 74 systems the barrier gas pressure level (p3) must always be higher than the pressure level (p1) of the sealed product, whatever the operational state of the machine. The minimum pressure overlay level (Δp) is specified for the individual seal types.

Main GSS functions:

- Filtering of the buffer and flushing gas
- Pressure monitoring and regulation
- Flow monitoring

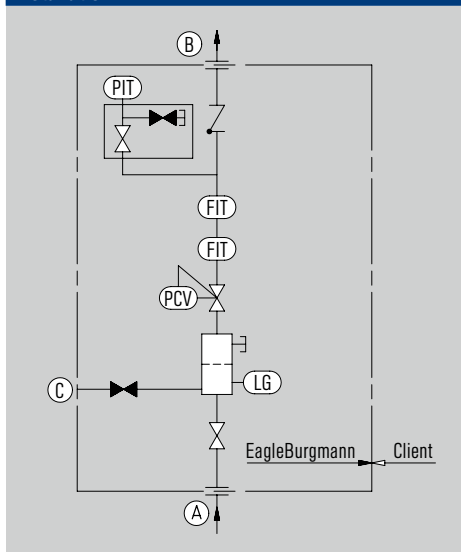
Typical tasks for the GSS:

- Barrier gas supply for dual seals
- Gas supply for tandem seals

Notes

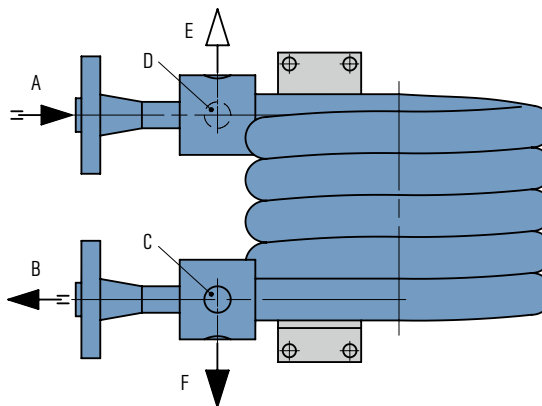
Design, calculation and production acc. to ASME VIII, Div. 1. 3rd party inspection and other certificates on request.

Installation



P&ID for GSS6001-A4 Gas supply system

- A Gas IN
- B Gas OUT
- C Drain



Features

Heat exchangers of the WEF6000-A4 range are used to cool process/barrier fluids in seal supply circuits. WEF6000-A4 heat exchangers are fully compliant with API 682 4th edition regulations. The process/barrier medium is directed through the tube, and the cooling medium is directed through the shell.

Venting and draining of the process/barrier medium side as well as the cooling water side is ensured. In addition, the heat exchangers can also be combined with a temperature instrument in the supply line to the mechanical seal (optional in accordance with API 682 4th edition).

Advantages

- Operating limits up to 45 bar/260 °C (653 PSI/500 °F) (tube side): suitable for a wide range of demanding operating conditions.
- Cooling water side and process side can be completely vented and drained
- Seamless pipes on process side
- Special design without welding inside the cooler
- Higher cooling water velocity due to innovative cooler design
- Stainless steel 316L: high resistance to corrosive media

Recommended applications

- Refining technology
- Oil and gas industry
- Petrochemical industry
- Chemical industry
- Power plant technology

Notes

Design and production in accordance with EU Pressure Equipment Directive PED 97/23 EC.
Design, calculation and production acc. to ASME VIII, Div. 1 (cooler not subject to ASME stamp requirements, piping <6")

Cleaning: Process/barrier medium side and cooling water side: flush with a suitable solvent.

Item Description

- A From mechanical seal
- B To mechanical seal
- C Cooling water IN
- D Cooling water OUT
- E Vent
- F Drain

Product variants

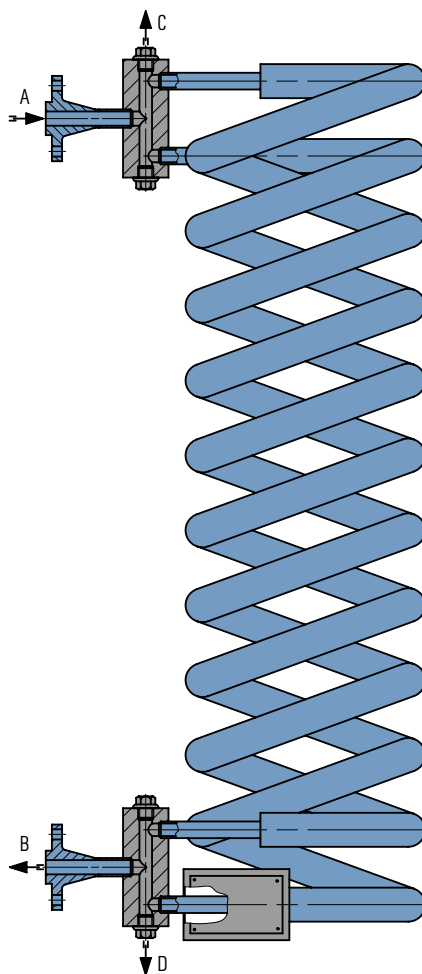
Designation	WEF6100-A4		WEF6100-A4		WEF6000-A4		WEF6000-A4	
	ASME	PED	ASME	PED	ASME	PED	ASME	PED
Type of heat exchanger	Tube	Shell	Tube	Shell	Tube	Shell	Tube	Shell
Process connections	Flange 3/4", 600 lbs	NPT 3/4"	Flange 3/4", 600 lbs	NPT 3/4"	Flange 3/4", 600 lbs	Flange 3/4", 300 lbs	Flange 3/4", 600 lbs	Flange 3/4", 300 lbs
Drain/vent connection	NPT 1/2"		NPT 1/2"		NPT 1/2"		NPT 1/2"	
Allowable pressure ¹⁾	45 bar (653 PSI)	16 bar (232 PSI)	45 bar (653 PSI)	16 bar (232 PSI)	45 bar (653 PSI)	16 bar (232 PSI)	45 bar (653 PSI)	16 bar (232 PSI)
Allowable temperature cooling water side (shell side) ¹⁾	-29 °C ... +150 °C (-20 °F ... +302 °F)		-29 °C ... +150 °C (-20 °F ... +302 °F)		-29 °C ... +150 °C (-20 °F ... +302 °F)		-29 °C ... +150 °C (-20 °F ... +302 °F)	
Allowable temperature process/barrier medium side (tube side) ¹⁾	-29 °C ... +260 °C (-20 °F ... +500 °F)		-29 °C ... +260 °C (-20 °F ... +500 °F)		-29 °C ... +260 °C (-20 °F ... +500 °F)		-29 °C ... +260 °C (-20 °F ... +500 °F)	
Cooling capacity (kW) ²⁾	10		10		10		10	
Cooling capacity (kW) ³⁾	3		3		3		3	
Required cooling water quantity (m ³ /h)	0.6		0.6		0.6		0.6	
Metal parts	316L		316L		316L		316L	

Other versions on request.

¹⁾ Design data, permissible working values depend on the actual conditions of service.

²⁾ Guidelines with buffer/barrier fluid water 60 °C (140 °F) – cooling water 20 °C (68 °F).

³⁾ Guidelines with buffer/barrier fluid oil 60 °C (140 °F) – cooling water 20 °C (68 °F).



Features

Heat exchangers of the WEL6000-A4 range (shown here: WEL6002-A4) are used to cool process/barrier fluids in seal supply circuits. The heat exchangers are made of helical, laserwelded finned tubes. The cooling medium is ambient air. It is important, therefore, for WEL heat exchangers to be installed in well ventilated places indoors or, ideally, outdoors. There is a choice of three different basic versions of the WEL6000-A4 range as well as supplied fully assembled together with valves, base frame and other system components.

Advantages

- Operating limits up to 44 bar/260 °C (638 PSI/500 °F) (tube side): suitable for a wide range of demanding operating conditions.
- Can be completely vented and drained
- Seamless pipes
- Stainless steel 316L: high resistance to corrosive media

Recommended applications

- Refining technology
- Oil and gas industry
- Petrochemical industry
- Chemical industry
- Power plant technology

Notes

Design and production in accordance with EU Pressure Equipment Directive PED 97/23 EC.
Design, calculation and production acc. to ASME VIII, Div. 1 (cooler not subject to ASME stamp requirements, piping < 6")

Item Description

- | Item | Description |
|------|----------------------|
| A | From mechanical seal |
| B | To mechanical seal |
| C | Vent |
| D | Drain |

Product variants

Designation	WEL6001-A4A001-DO		WEL6002-A4A001-DO		WEL6003-A4A001-DO	
	ASME	PED	ASME	PED	ASME	PED
Type of heat exchanger	ASME	PED	ASME	PED	ASME	PED
Number of finned tubes	1		2 finned tubes switched in parallel		2 finned tubes switched in parallel and doubled length	
Connections	Flange 3/4", 600 lbs		Flange 3/4", 600 lbs		Flange 3/4", 600 lbs	
Drain/vent connection	Flange 1/2", 600 lbs ⁴⁾		Flange 1/2", 600 lbs ⁴⁾		Flange 1/2", 600 lbs ⁴⁾	
Allowable pressure ¹⁾	44 bar (638 PSI)	44 bar (638 PSI)	44 bar (638 PSI)	44 bar (638 PSI)	44 bar (638 PSI)	44 bar (638 PSI)
Allowable temperature process/barrier medium side (tube side) ¹⁾	-29 °C ... +260 °C (-20 °F ... +500 °F)		-29 °C ... +260 °C (-20 °F ... +500 °F)		-29 °C ... +260 °C (-20 °F ... +500 °F)	
Cooling capacity (kW) ²⁾	1.5		2		3	
Cooling capacity (kW) ³⁾	1.2		1.5		2	
Volume (liters)	1.2		2.4		4.8	
Metal parts	316L		316L		316L	

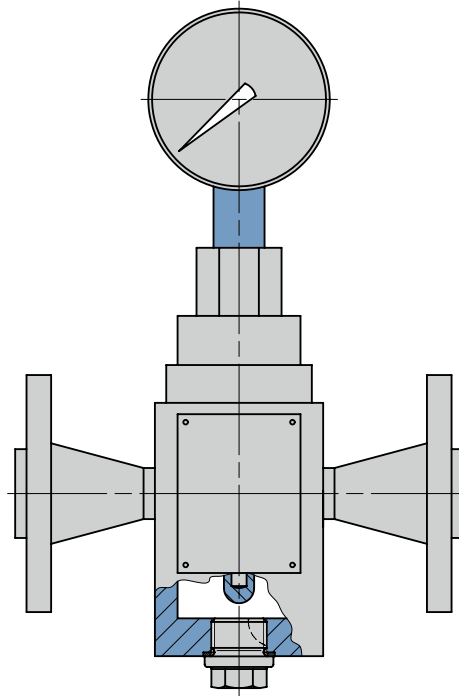
Other versions on request.

¹⁾ Design data, permissible working values depend on the actual conditions of service.

²⁾ Guidelines with buffer/barrier fluid water 60 °C (140 °F) – ambient temperature 20 °C (68 °F); moved air at min. 0.7 m/s (2.3 ft/s); product flow rate 8 l/min.

³⁾ Guidelines with buffer/barrier fluid oil 60 °C (140 °F) – ambient temperature 20 °C (68 °F); moved air at min. 0.7 m/s (2.3 ft/s); product flow rate 8 l/min.

⁴⁾ Version with screwed connection G1/2" available as an option.



Features

The measuring unit of the SPT6000-A4 range is used to visually monitor the operating temperature.

The measuring unit consists of a bi-metallic temperature gauge (NG100) with protective sleeve installed in a measuring block incl. drain connection.

Advantages

- Operating limits up to 45 bar/260 °C (653 PSI/500 °F) (design parameters)
- Temperature indicating range up to 200 °C (392 °F)
- Wetted parts: Stainless steel 316L for high resistance to corrosive media

Recommended applications

- Refining technology
- Oil and gas industry
- Petrochemical industry
- Chemical industry
- Power plant technology

Product variants

Designation	SPT6000-A4	SPT6000-A4
Connections – process	Flange 3/4", 600 lbs	Flange 3/4", 600 lbs
Connections – drain	G 1/2"	G 1/2"
Allowable pressure ¹⁾	45 bar (653 PSI)	45 bar (653 PSI)
Temperature range	0 °C ... +120 °C (+32 °F ... +248 °F)	0 °C ... +200 °C (+32 °F ... +392 °F)
Wetted parts	316L	316L

Other versions on request.

¹⁾ Design data, permissible working values depend on the actual conditions of service.



Features

The ZY6000-A4 range is available in three versions:

ZYA6000-A4:

Cyclone separator for high flow rates and high pressures.

ZYB6000-A4:

Cyclone separator for high flow rates and high pressures; 100 % X-ray capability.

ZYC6000-A4:

Cast version, block-type design with integral flanges.

Advantages

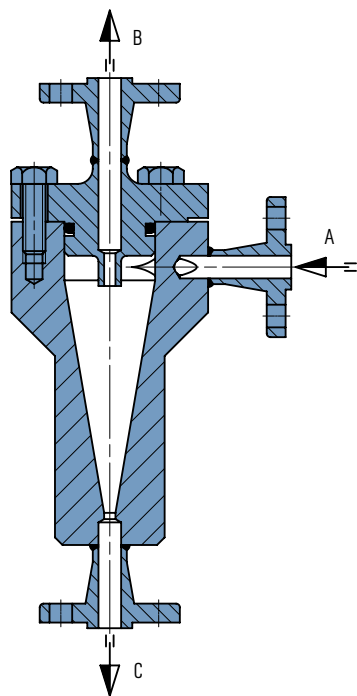
- Contamination is automatically conveyed to the suction nozzle of the pump: maintenance-free mode of operation for guaranteed reliability
- High filtration efficiency
- Wide range of products for the optimum solution for every application
- ZYA6000-A4 and ZYB6000-A4: available for operating pressures of up to 200 bar (2,900 PSI)
- ZYC6000-A4 in block-type design with integrated flange connections: low space requirements because of compact design

Functional description

Cyclone separators of the ZY6000-A4 range are used to clean mainly aqueous liquids containing contamination such as dirt and solids (e.g., in circulation systems of sewage, sludge or pipeline pumps).

The best possible filtration efficiency is achieved when the specific weight of the solids is much higher than that of the carrier liquid and when the differential pressure is as large as possible within the permissible pressure range (min. 1.7 bar (24.7 PSI) in accordance with API 682). The viscosity of the medium is a factor that also needs to be taken into account.

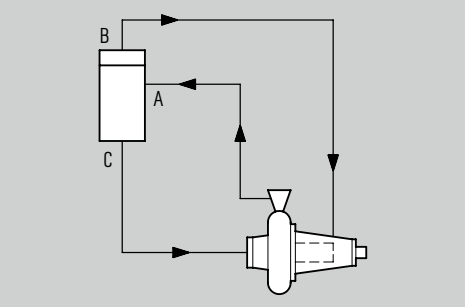
ZYA6000



Recommended applications

- Refining technology
- Oil and gas industry
- Petrochemical industry
- Chemical industry
- Power plant technology

Installation

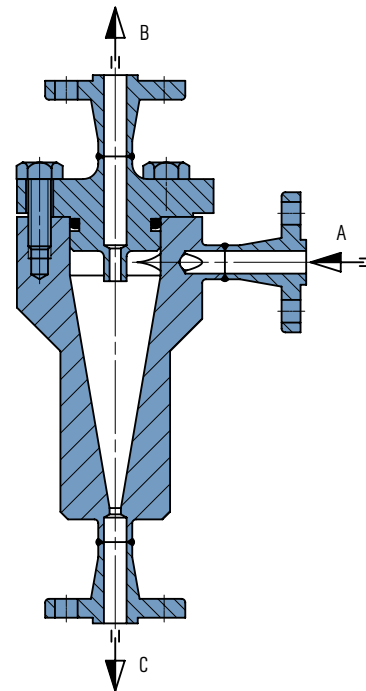


P&ID for ZY6000-A4 Cyclone separators

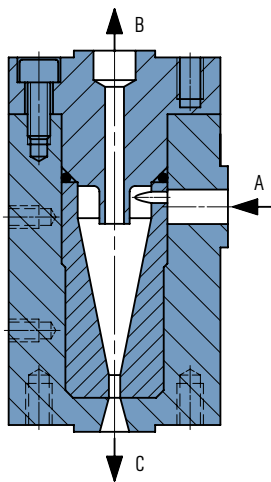
- A Contaminated liquid IN
- B Clean liquid OUT
- C Separated liquid OUT

Product variants

ZYB6000



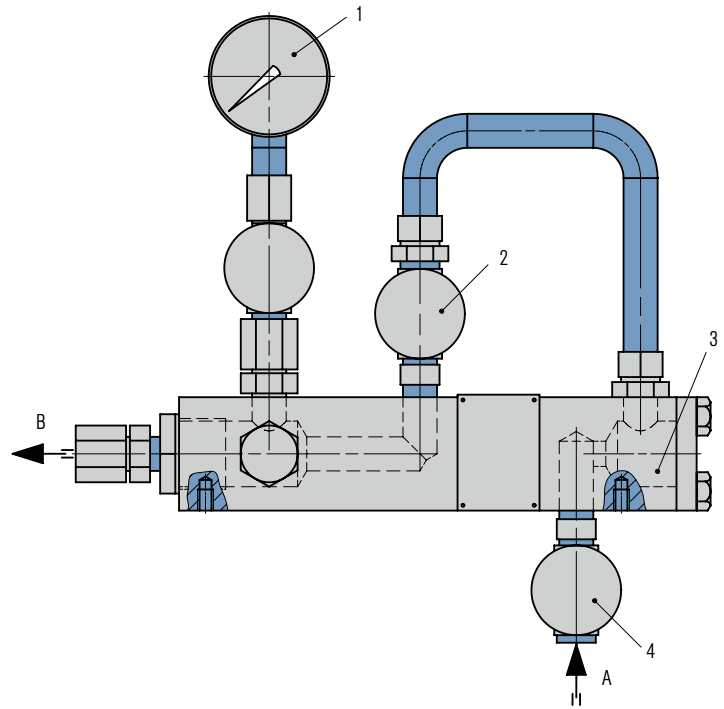
ZYC6000



Product variants

Designation	ZYA6000	ZYB6000	ZYC6000
Features	Standard	100 % X-ray capability	Cast version
Connections – product inlet	Flange 3/4", 600 lbs	Flange 3/4", 600 lbs	Integral flange 3/4", 600 lbs
Connections – clean product outlet	Flange 3/4", 600 lbs	Flange 3/4", 600 lbs	Integral flange 3/4", 600 lbs
Connections – contaminated product outlet	Flange 3/4", 600 lbs	Flange 3/4", 600 lbs	Integral flange 3/4", 600 lbs
Allowable pressure ¹⁾	60 bar (870 PSI)	60 bar (870 PSI)	60 bar (870 PSI)
Temperature range	-29 °C ... +150 °C (-20 °F ... +302 °F)	-29 °C ... +150 °C (-20 °F ... +302 °F)	-29 °C ... +150 °C (-20 °F ... +302 °F)
O-Ring ²⁾	Viton®	Viton®	Viton®
Wetted parts	316L	316L	316L

Other versions on request.
¹⁾ Max. permissible working values depend on version.
²⁾ Other materials on request, e.g. FKM, EPDM.



Features

The EagleBurgmann flush unit of the SPX6000-A4 range consists of a manifold with integrated inline filter supplied together with a needle valve and pressure gauge. Optional available with temperature gauge and/or flow indicator. The unit is used to control the flushing of a mechanical seal.

Advantages

- Compact design due to integral filter
- Modular concept – optimal monitoring equipment available

Recommended applications

- Refining technology
- Oil and gas industry
- Petrochemical industry
- Chemical industry
- Power plant technology

Functional description

The SPX6000-A4 flush unit continuously supplies flushing media from an external source to the mechanical seal. This plan is almost always used in combination with a throat bushing which serve as a throttle device to maintain a higher pressure in the stuffing box to isolate the pumped product from the seal chamber.

Item	Description
1	Pressure indicator
2	Needle valve
3	Integral filter
4	Valve
A	From external source
B	To mechanical seal

Product variants

Designation	SPX6000-A4
Allowable pressure ¹⁾	44 bar (638 PSI)
Allowable temperature ¹⁾	-20 °C ... +120 °C (-4 °F ... +248 °F)
Process connections	1/2" NPT
Metal parts	316L

Other versions on request.

¹⁾ Design data, permissible working values depend on the actual conditions of service.

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