



## SAPAG

**A soft sealed atmospheric safety valve with large flow capacity and soft seat tightness for steam condenser and turbine applications**

### Features

- The Sapag Series 1100 steam safety valve is used for the overpressure protection of condensers normally operating under vacuum.
- The valve has been specially designed to limit the pressure that can incidentally occur into the condenser at a level below the value at which the condenser is to be considered by local code or regulation as a steam pressure vessel.
- This limit is 0.5 barg according to the requirements of Pressure Equipment Directive 97/23/EC for European Community or 10 psig (0.69 barg) according to the Heat Exchanger Institute (HEI).
- Although the SAPAG Series 1100 soft sealed atmospheric safety valve was intended for steam condenser and turbine applications, it can be used for various applications on gas and vapors, where its soft seat tightness performance and large flow capacity match the service requirements.



### Selection

The valve is selected according to the required flow. HEI stipulates directly the valve size as a function of the steam capacity of the condenser. Sizing can also be conducted using the valve steam output capacity.

#### Selection according to HEI

Steam capacity, lbs/hr	Steam capacity, kg/h	1100 Valve DN size
30200	13700	10"
45000	20400	12"
62000	28000	14"
82000	37200	16"
120000	54400	18"
170000	77100	20"
250000	113400	24"

# Safety Relief Valve Series 1100

## Selection based on valve flow

Size 1100	Flow at 0.1 barg + overpressure at 0.1 barg		Reaction force daN	Noise level dB(A)
	kg/h	lbs/hr		
4"	1 932	4 260	24	100
6"	4 794	10 570	60	106
8"	8 572	18 897	106	109
10"	12 727	28 057	158	112
12"	17 812	39 268	222	114
14"	21 531	47 467	269	115
16"	28 156	62 072	352	116
18"	41 115	90 642	511	119
20"	52 011	114 664	646	120
24"	76 129	167 832	945	122

Size 1100	Flow at 0.2 barg + overpressure at 0.1 barg		Reaction force daN	Noise level dB(A)
	kg/h	lbs/hr		
4"	2 324	5 122	30	101
6"	5 765	12 710	73	106
8"	10 308	22 724	131	110
10"	15 304	33 739	195	112
12"	21 419	47 219	273	114
14"	25 891	57 079	332	115
16"	33 858	74 642	434	117
18"	49 441	108 997	629	119
20"	62 544	137 883	795	121
24"	91 545	201 818	1 162	123

Size 1100	Flow at 0.3 barg + overpressure at 0.1 barg		Reaction force daN	Noise level dB(A)
	kg/h	lbs/hr		
4"	2 648	5 838	34	101
6"	6 571	14 486	85	107
8"	11 748	25 899	152	110
10"	17 442	38 453	226	113
12"	24 411	53 816	317	115
14"	29 508	65 054	386	116
16"	38 588	85 070	505	118
18"	56 349	124 225	730	120
20"	71 282	157 147	922	121
24"	104 335	230 015	1 348	124

Size 1100	Flow at 0.4 barg + overpressure at 0.1 barg		Reaction force daN	Noise level dB(A)
	kg/h	lbs/hr		
4"	2 930	6 459	39	102
6"	7 270	16 026	95	107
8"	12 997	28 653	170	111
10"	19 297	42 542	254	113
12"	27 007	59 540	356	115
14"	32 647	71 972	435	117
16"	42 692	94 118	569	118
18"	62 342	137 437	820	120
20"	78 863	173 861	1 036	122
24"	115 431	254 478	1 514	124

Size 1100	Flow at 0.45 barg + overpressure at 0.1 barg		Reaction force daN	Noise level dB(A)
	kg/h	lbs/hr		
4"	3 059	6 743	41	102
6"	7 589	16 731	100	108
8"	13 569	29 913	179	111
10"	20 146	44 413	267	114
12"	28 195	62 158	375	116
14"	34 082	75 138	458	117
16"	44 569	98 257	598	118
18"	65 083	143 481	863	121
20"	82 331	181 506	1 089	122
24"	120 507	265 668	1 592	124

Note: selection based on valve flow

## Service conditions

Recommended service conditions:

- $0.1 \text{ barg} \leq \text{Set pressure} \leq 0.45 \text{ barg}$
- $\text{overpressure} \geq 0.1 \text{ barg}$

Normal service conditions: vacuum (about 25 mb abs.)

Build-up back pressure at nominal flow rate:  $\leq 10\%$  of Set pressure.

## Standard tests & settings

### Hydrostatic test

For standard manufacturing, the components of type 1100 relief valves are not hydrostatically tested. However, if required, this test may be exceptionally performed on the nozzle which is the only part under pressure. The hydrostatic test pressure shall be applied at  $1 \text{ barg} \pm 0.15 \text{ barg}$ .

### Settings

The 1100 soft seated atmospheric relief valves are bubble tight from vacuum up to 90% of set pressure. Standard allowable tolerance for set pressure is  $\pm 0.14 \text{ barg}$  ( $\pm 2 \text{ psig}$ ).

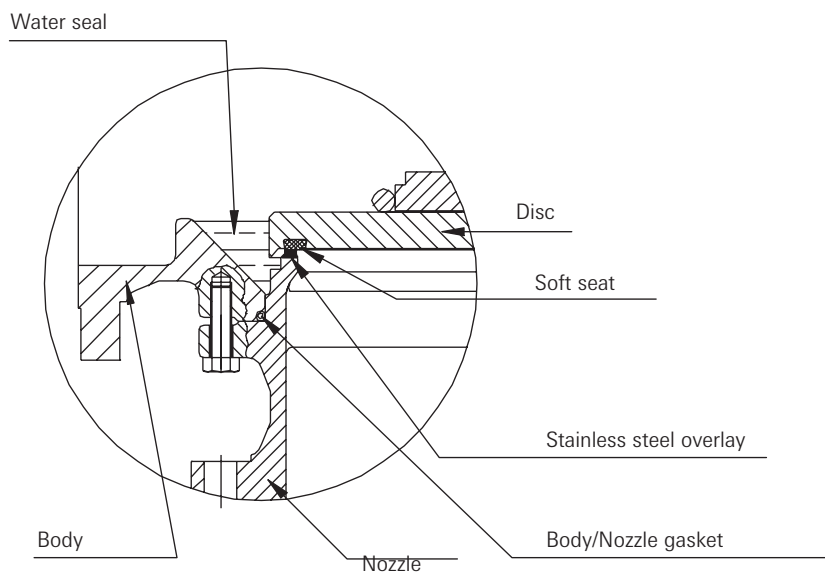
On special request only, this tolerance may be reduced to  $\pm 0.1 \text{ barg}$  ( $\pm 1.45 \text{ psig}$ ).

## Construction

The Sapag atmospheric relief valves Series 1100 are designed with a right angle body pattern and vertical inlet / horizontal outlet flange connections. They are dead weight loaded up to 100 mb (1.45 psig) and spring loaded up to 0.5 barg.

### Seat Tightness and Waterseal

Tightness is provided using an elastomer rubber seal for the disc in contact with a 316L stainless steel nozzle. The soft material is bonded with a specific groove machined onto the disc by high temperature with high pressure molding process. Therefore the soft material is totally adherent to the disc metal. Furthermore, a water ring is provided onto the disc to prevent any leak from atmosphere to the vessel when it is under vacuum.



### Accessories

- All 1100 atmospheric relief valves are fitted with a lifting lever allowing the disc opening when the pressure is at least 75% of set pressure.
- A constant feed of water to the seal ring is available by adding inlet and outlet flooded seat seal options (in case of natural evaporization), as well as a device for overflow and visual water gauge.

### Materials

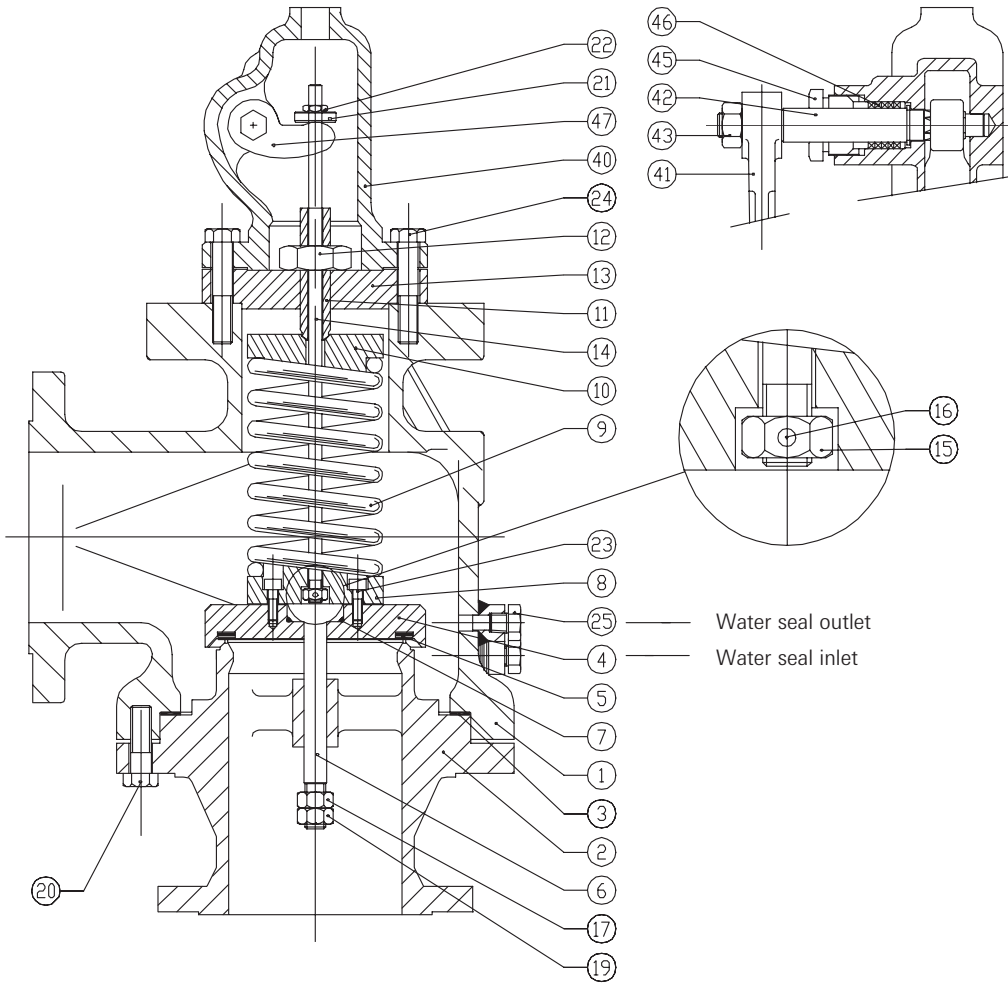
Standard:

- Body in SA-216 Gr. WCB/WCC Carbon steel
- Alloy steel spring with corrosion resistant coating
- Carbon steel disc with EPDM soft seat
- Nozzle in SA-216 Gr. WCB/WCC Carbon steel, 316L stainless steel overlay on seat

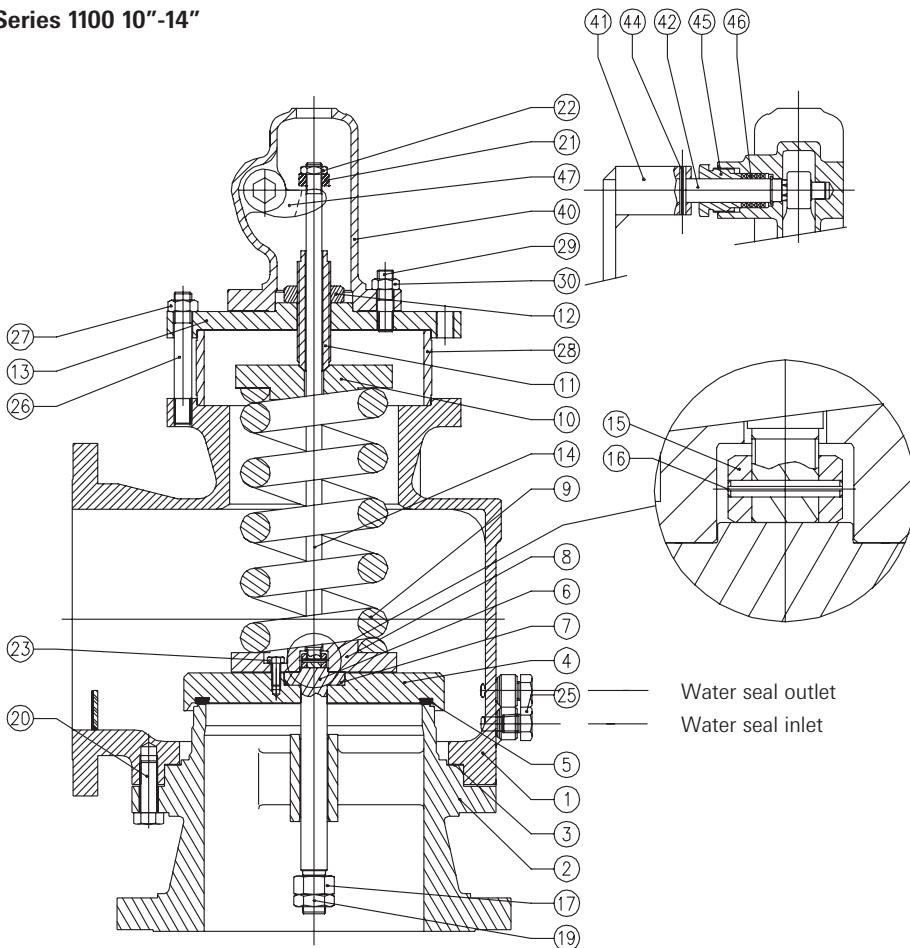
On request, various materials are available as stainless steel for body and trim.

Various elastomer types are available as well, according to specific service conditions.

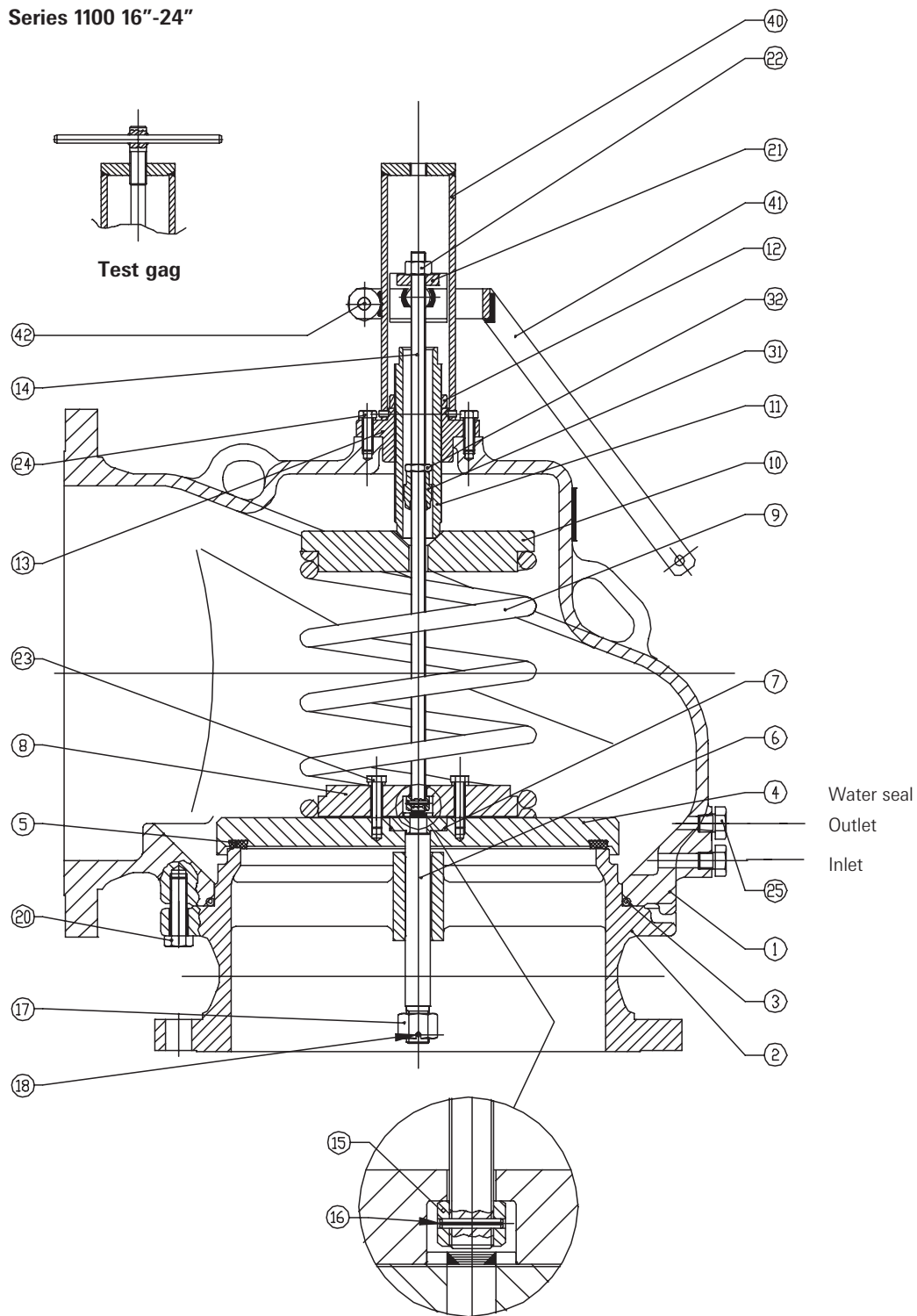
## Series 1100 4"-8"



## Series 1100 10"-14"



Series 1100 16"-24"

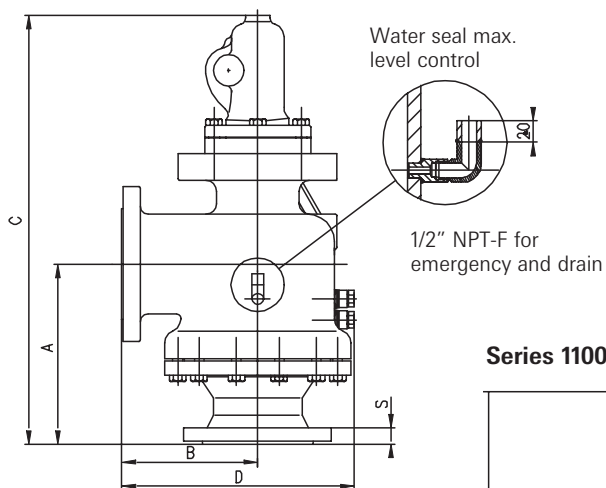


## Parts list

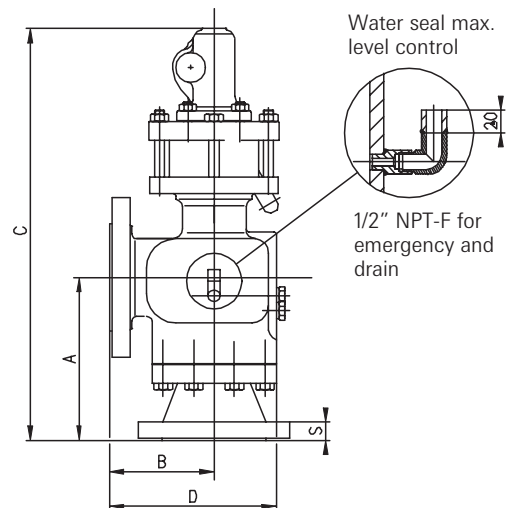
6"-8"	10"-14"	16"-24"	Rep.	Designation	Material
			1	Body	SA-216 Gr. WCB/WCC
			2	Nozzle	SA-216 Gr. WCB/WCC, 316L St.St. overlay on seat
			3	Body-Nozzle gasket	Nitrile (16" > 24") or Impregnated fiber non-asbestos (6" > 14")
			4	Disc	Carbon steel
			5	Disc Soft seat	EPDM
			6	Disc axle	13% Cr. Stainless steel
			7	Axle-Disc gasket	Nitrile
			8	Spring guide	Carbon steel
			9	Spring	Alloy steel
			10	Spring washer	Carbon steel
			11	Adjusting bolt	13% Cr. Stainless steel
			12	Adjusting bolt nut	13% Cr. Stainless steel
			13	Cover	Carbon steel
			14	Spindle	Carbon steel
			15	Spindle nut	Carbon steel
			16	Spindle nut pin	Stainless Steel
			17	Disc axle nut	SA-194 Gr. 2H
•	•		18	Disc axle nut pin	Stainless Steel
		•	19	Disc axle lock nut	SA-194 Gr. 2H
			20	Body-Nozzle bolt	SA-193 Gr. B7
			21	Release nut	13% Cr. Stainless steel
			22	Release lock nut	SA-194 Gr. 2H
			23	Spring guide bolt	SA-193 Gr. B7
	•		24	Cover bolt	SA-193 Gr. B7
			25	Plug	Carbon steel
•		•	26	Cover stud	SA-193 Gr. B7
•		•	27	Cover nut	SA-194 Gr. 2H
•		•	28	Spacer	Carbon steel
•		•	29	Cap stud	SA-193 Gr. B7
•		•	30	Cap nut	SA-194 Gr. 2H
•	•		31	Pre-compression nut	13% Cr. Stainless steel
•	•		32	Pre-compression lock nut	13% Cr. Stainless steel
			40	Cap	Carbon steel
			41	Lever	Carbon steel
			42	Lever axle	Stainless Steel
	•	•	43	Lever nut	SA-194 Gr. 2H
•		•	44	Lever axle pin	Stainless Steel
		•	45	Packing gland	13% Cr. Stainless steel
		•	46	Packing	Impregnated fiber non-asbestos
		•	47	Lifting fork	Carbon steel

• Not applicable

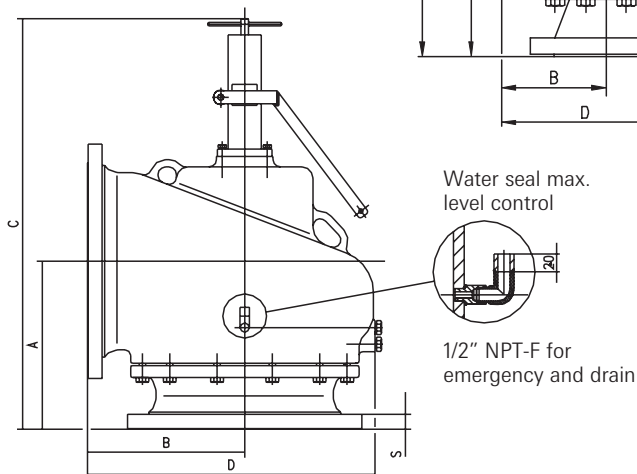
## Series 1100 4"-8"



## Series 1100 10"-14"



## Series 1100 16"-24"



### Dimensions and weights

Standard connections according to  
ANSI and ASME B16.5

Type	DN/NPS		Inlet		Outlet		Dimensions mm					Mass Kg
	Inlet	Outlet	Class Finish**	Class Finish**	Class Finish**	Class Finish**	A	B	C	D	S	
6"	150	150	150 RF	150 RF	150 RF	150 RF	335	254	825	427	25,5	155
	6"	6"										
8"	200	200	150 RF	150 RF	150 RF	150 RF	345	241	886	450	28,5	210
	8"	8"										
10"	250	250	150 RF	150 RF	150 RF	150 RF	319,5	279,5	960	489,5	31	300
	10"	10"										
12"	300	300	150 RF	150 RF	150 RF	150 RF	360	345	1050	621	32	380
	12"	12"										
14"	350	350	150 RF	150 RF	150 RF	150 RF	400	370	1070	621	35	417
	14"	14"										
16"	400	400	150 RF	150 RF	150 RF	150 RF	395	400	1085	720	36,6	430
	16"	16"										
18"	450	450	150 RF	150 RF	150 RF	150 RF	426	455	1112	779	39,7	670
	18"	18"										
20"	500	500	150 RF	150 RF	150 RF	150 RF	520	549	1327	884	43	750
	20"	20"										
24"	600	600	150 RF	150 RF	150 RF	150 RF	625	565	1280	1050	48	992
	24"	24"										

\*\* inlet and outlet flanges with Ra = 3.2/6.3

### Standard supply

- Epoxy zinc rich recoverable coating
- EN-10204 3.1.B material certificate for body
- Test report for set pressure, satisfactory tightness tests at 90% of set pressure and under vacuum.

### Maintenance

It is recommended to check the disc operability using the lifting lever on a regular basis. Caution! The disc cannot be lifted when the vessel is under vacuum. The lifting lever shall be used only if the pressure is at least 75% of set pressure.

The combination of a rubber soft seal with specific hardness for disc and the stainless steel seat of nozzle guarantee a long term tightness and a reduced maintenance cost.