

SAPAG CHECK VALVES

MODEL CLASAR®

CLASAR®: the high dynamic response check valve



FEATURES

- Closing time (dynamic response) is a fraction of a second
- Avoids pressure surges in the pipeline or minimizes them
- Suitable for high pressure applications (PN 50 - 725 psi)
- No risk of axial disc jamming as the CLASAR® does not have an axial shaft
- Short face to face, enabling easy installation
- Perfect disc sealing
- Excellent erosion resistance of the axial disc
- Corrosion free axial disc material
- No maintenance required
- Suitable for a wide range of applications due to the available materials
- In case of sudden pump emergency stops, CLASAR® check valve reduces pressure surges in the pipe line
- Silent and non-slam check valve
- Easy installation
- Suitable for vertical, horizontal and diagonal mounting
- Quick flow recovery

APPLICATIONS

- Water pumping stations:
 - potable water
 - irrigation
 - water process
 - seawater
- Chemical industries
- HVAC applications

TECHNICAL DATA

Size range:	DN 80 - DN 1800 (NPS 3 - NPS 72)
Maximum working pressure:	DN 80 - DN 500: 50 bar (725 psi) at ambient temperature DN 600 - DN 800: 25 bar (362 psi) at ambient temperature DN 900 - DN 1000: 20 bar (290 psi) at ambient temperature DN 1200 - DN 1800: 16 bar (232 psi) at ambient temperature
Temperature range:	-10°C to +130°C (+50°F to +266°F)
Flange accommodation:	EN 1092-1 ISO 2084 EN 1759 ASME B16.5 ASME B16-47 A MSS SP44 AWWAC207 Others on request

SAPAG CHECK VALVES

MODEL CLASAR®

DN 80 - DN 500 (NPS 3 - 20): Wafer body type
 DN 600 - DN 1800 (NPS 24 - 72): Flanged body type

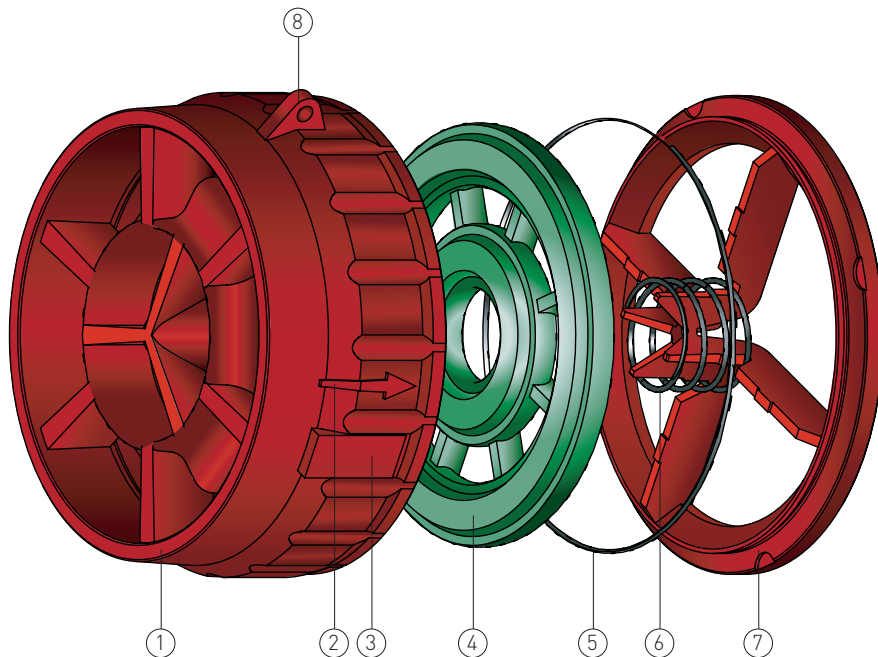




FIGURE 1
 Example shown is a DN 450 wafer check valve

- 1. Body** (or upstream body)
 - One piece precision casting.
 - The body profile is thoroughly developed and hydraulically tested in flow control laboratories. It allows quick recovery of the flow.
 - Body coating according to the latest regulations in force.
- 2. Arrows**
 - These visible marks are cast directly on the body. They warranty correct installation.
- 3. Tagplate**
 - In Stainless Steel, contains main information concerning the product.
- 4. Axial disc**
 - Available in different types of corrosion free materials.
 - Is the only moving part.
 - The mechanical properties allows:
 - * Very short closing time resulting from low inertia. This results in low pressure surges during closing.
 - * Perfect disc sealing.
 - * Noise free closing action.
 - * Excellent shock and vibration resistance.
 - * High erosion resistance
 - Profiled section enables flow guidance and auto centering of the disc
- 5. O-ring**
 - Ensures perfect sealing.
- 6. Spring**
 - Corrosion free materials.
- 7. Backing plate** (or downstream body)
 - One piece precision casting.
 - The body profile is thoroughly developed and hydraulically tested in flow control laboratories. It allows quick recovery of the flow.
 - Body coating according to the latest regulations in force.
- 8. Lifting lug**
 - For easy valve installation handling.

The Sapag plant is ISO 9001 approved



The CLASAR® is in compliance with the latest European directives:

CE - PED category 1
 - ATEX
 II 2 G/D EEx c

The CLASAR® range holds the following approvals and certificates:

Water: **ACS**




FIGURE 2
 Approvals and certificates

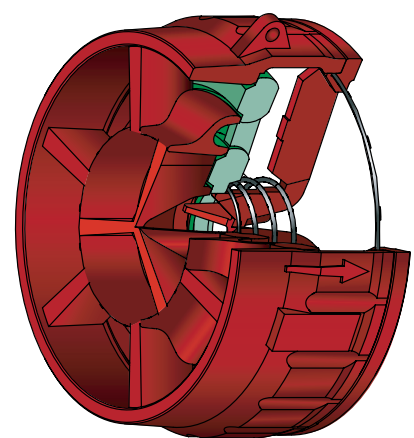


FIGURE 3
 Section of wafer check valve

SAPAG CHECK VALVES

MODEL CLASAR® CHARACTERISTICS

OPERATING PRINCIPLES

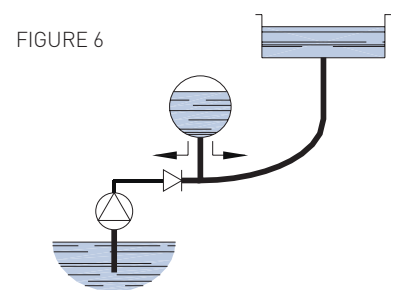
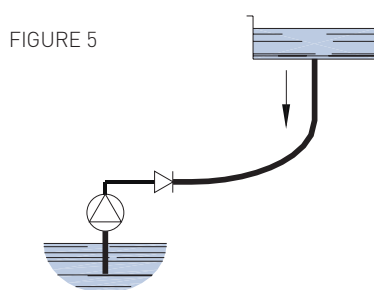
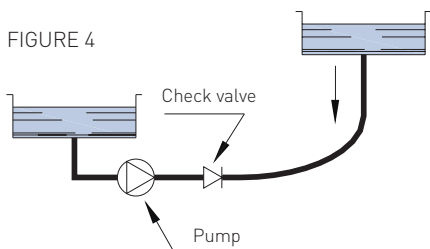
Non return valves mounted on large supply networks and in pumping station delivery lines are required to operate frequently. Statistics show that when serious pressure surge occurs, this is often due to the fact that an incorrect type of valve has been installed. For example, when a pump is switched off in a pumping station, the flow reduces the speed, stops and is subsequently reversed (Figure 4 and 5). The valve then closes under the effect of the disc's weight or a return spring, or by the reversal of the flow.

Experience and calculations show that this reversal can occur within an extremely short time (from 1/100 to 1/10 of a second). If the valve does not respond quickly, closure will occur sharply during reversed flow conditions, with the result that:

- the disc is slammed against the seating with a creation of a loud shock wave
- water hammer is created causing pressure surge

Shock waves and pressure surge stress installation which may result in mechanical failure of the valve components and pipeline.

These problems are even more emphasized if an air pressurized, water tank is inserted in the system (Figure 6). In this case, flow reversal in this short pipe between the tank and the pump occurs very rapidly. The valve must therefore operate even quicker in order to avoid serious damages.



DESCRIPTION OF HIGH DYNAMIC RESPONSE CHECK VALVE

The features of ideal check valve can be summarized in the graph (Figure 7)

$t = 0$ The pump stops

$t = t_0$ The velocity of the water is $V = 0$. It is the beginning of the reverse flow.

Usual values: $1/100 \text{ s} < t_0 < 1/10 \text{ s}$

$T = t_1$ The obturator of the check valve is positioned on the seat:

- The reverse velocity of the water is V_1
- The reverse flow is stopped immediately
- The overpressure is proportional to the reverse velocity (V_1)

The ideal check valve should close at $t = t_0$

CLASAR® fulfils this requirement as this check valve has:

- Short face to face, thus reducing the stroke of the axial disc
- No axial shaft that may increase the closing time (risk of jamming)
- Density of the axial disc material = 1 (no inertia of the axial disc in water, low weight of the axial disc)
- Spring enhancing the closing time
- No creation of shock at closing time due to metal/plastic contact

FIGURE 7
Fluid velocity towards time

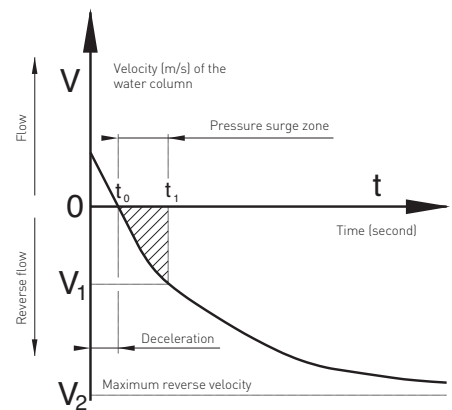
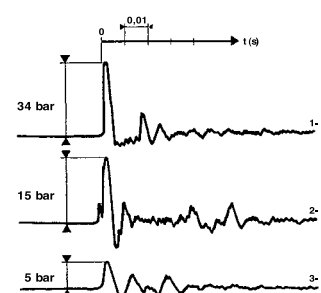


FIGURE 8
Pressure surge comparison



PRESSURE SURGE COMPARISON WITH DIFFERENT CHECK VALVES

Figure 8 shows the water hammer resulting from closure of various type of valves under identical operating conditions:

1. Single flap valve
2. Dual plate check valve
3. CLASAR®

SAPAG CHECK VALVES

MODEL CLASAR® CHARACTERISTICS

FLOW COEFFICIENTS (K_v, C_v)

K_v is the flow in m³/h of water, at an average temperature of 20°C, crossing the valve creating a headloss of 1 bar.

DN	80	100	125	150	200	250	300	350	400	450	500	600	700	800	900	1000	1200	1400	1600	1800
NPS	3	4	5	6	8	10	12	14	16	18	20	24	28	32	36	40	48	56	64	72
K _v	171	266	417	602	762	1186	1704	2312	3067	4003	4830	6937	13091	12170	21378	19319	38451	52549	68635	86861

(C_v = 1.16 K_v)

HEADLOSS (Δp)

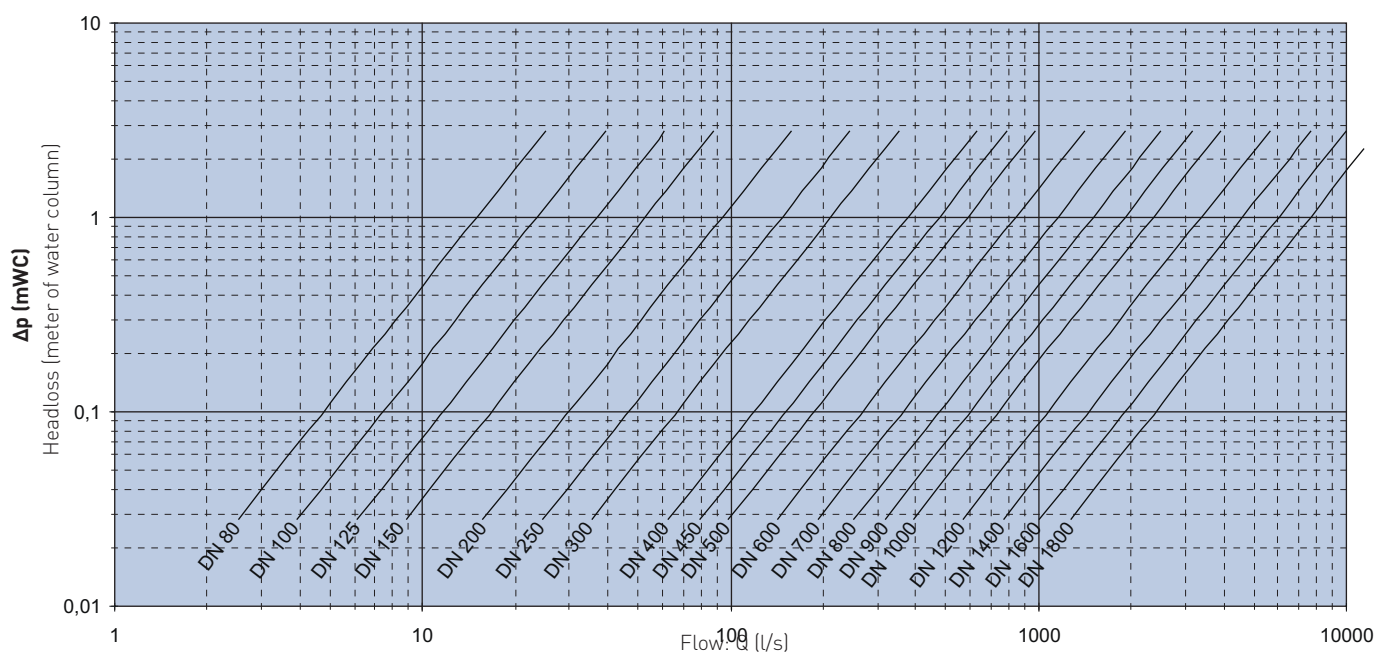
Simplified formula:

$$\Delta p = \rho \times \left(\frac{Q}{K_v} \right)^2$$

Definitions:

- Δp headloss (bar)
- ρ density (for water, ρ = 1)
- Q flow (m³/h)
- K_v flow coefficient (m³/h)
- 10 mWC 1 bar = 100 kPa = 14.5 psi

FIGURE 9: headloss towards flow



SELECTION TABLE FOR MATERIALS

Medium	Bodies					Axial disc		Spring	
	Ductile iron + Epoxy	Stainless steel	Aluminium bronze	Ductile NiResist alloy	Duplex	Polyurethane	PTFE	Stainless steel	Inconel
Cold water	•					•		•	
Hot water	•					•		•	
Deminerlized water		•				•		•	
Sea water			•	•	•	•			•
Drinking water	•	•				•		•	
Heating - HVAC	•					•		•	
Acids (low concentration)		•			•		•	•	
Alcohol		•					•	•	
Oils	•						•	•	
Hydrocarbons	•	•					•	•	

SAPAG CHECK VALVES

MODEL CLASAR®

PARTS LIST

Item	Quantity	Designation	Type	Available materials	Other materials
1a/1b	1	Body/Upstream body	Ductile iron	EN GJS 400-15 (JS1030)	ASTM A536 Gr.60.40.18
			Stainless steel	EN GX5CrNiMo-19-11-2 (1.4408)	ASTM A351 CF8M
			Ductile NiResist alloy	EN GJSA-XNiCr20-2 (JS3011)	ASTM A439 D2
			Aluminium bronze	EN CuAl10Fe5Ni5-C (CC333G)	ASTM B148 Gr.958
			Duplex	EN GX2CrNiMoN22-5-3 (1.4470)	ASTM A890 Gr.4A
2a/2b	1	Backing plate/Downstream body	Ductile iron	EN GJS 400-15 (JS1030)	ASTM A536 Gr.60.40.18
			Stainless steel	EN GX5CrNiMo-19-11-2 (1.4408)	ASTM A351 CF8M
			Ductile NiResist alloy	EN GJSA-XNiCr20-2 (JS3011)	ASTM A439 D2
			Aluminium bronze	EN CuAl10Fe5Ni5-C (CC333G)	ASTM B148 Gr.958
			Duplex	EN GX2CrNiMoN22-5-3 (1.4470)	ASTM A890 Gr.4A
3	1	Axial disc ⁽¹⁾	Polyurethane PTFE		
4	1	Spring	Stainless steel Inconel®		
5	1	O-ring	Nitrile EPDM		
6	1	Tagplate	Stainless steel		

VALVE DIMENSIONS (mm) WAFER BODY

Valve size DN	Valve size (NPS)	ØA	ØB	C	D	ØE	Weight (kg)
80	3	90	142	80	115	132	2
100	4	113	174	100	140	162	5.5
125	5	138	210	125	170	192	11
150	6	163	246	150	195	216	17
200	8	224	290	127	256	271	22
250	10	275	352	146	310	326	36
300	12	323	398	181	360	376	53
350	14	373	460	222	413	435	80
400	16	418	520	232	460	485	100
450	18	569	544	260	507	536	150
500	20	518	626	292	565	590	180

VALVE DIMENSIONS (mm) FLANGED BODY

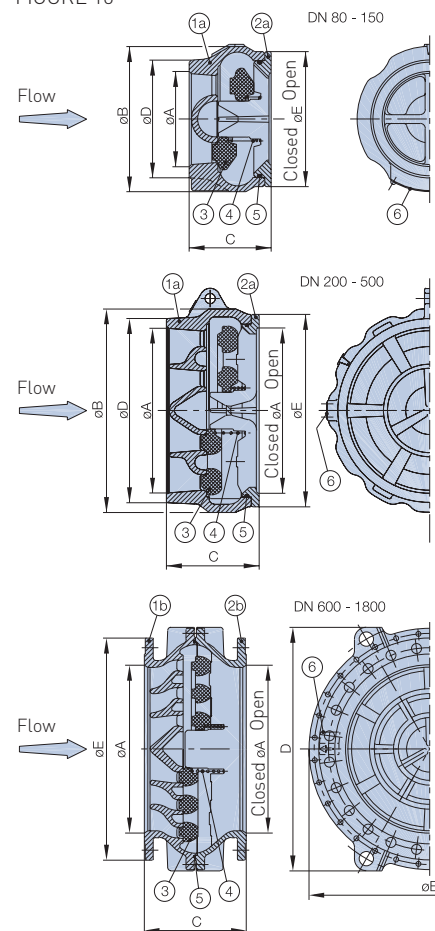
Valve size DN	Valve size (NPS)	ØA	ØB	C	D	ØE	Weight (kg)
600	24	615	920	435	930	^[2]	550
700	28	715	1120	500	1130	^[2]	875
800	32	820	1180	515	1190	^[2]	1100
900	36	930	1480	710	1490	^[2]	1600
1000	40	1030	1500	730	1510	^[2]	2050
1200	48	1230	1890	900	1900	^[2]	3400
1400	56	1430	2265	1120	2275	^[2]	5400
1600	64	1660	2520	1352	2540	^[2]	8100
1800	72	1860	2850	1440	2890	^[2]	11850

NOTES:

- The choice of the axial disc material depends on the application parameters, please contact factory.
- External diameter and drilling in accordance with the flange standards.

Dimensions in mm, weights in kg are given as guide

FIGURE 10



SAPAG CHECK VALVES

MODEL CLASAR® MOUNTING

MAXIMUM WORKING PRESSURE

DN	80	100	125	150	200	250	300	350	400	450	500	600	700	800	900	1000	1200	1400	1600	1800
NPS	3	4	5	6	8	10	12	14	16	18	20	24	28	32	36	40	48	56	64	72
MWP (bar)	50	50	50	50	50	50	50	50	50	50	50	25	25	25	20	20	16	16	16	16
MWP (psi)*	725	725	725	725	725	725	725	725	725	725	725	362	362	362	290	290	240	240	240	240

* at ambient temperature

MOUNTING BETWEEN FLANGES

DN	80	100	125	150	200	250	300	350	400	450	500	600	700	800	900	1000	1200	1400	1600	1800	
NPS	3	4	5	6	8	10	12	14	16	18	20	24	28	32	36	40	48	56	64	72	
EN 1092-1,	PN 6																				
DIN 2501,	PN 10																				
BS 4504,	PN 16																				
ISO 2084,	PN 25																				
ISO 7005	PN 40																				
EN 1759	Class 150																				
	Class 300																				
ASME B 16.5	Class 150																				
	Class 300																				
ASME B16.47 A	Class 150																				See ASME B16.47 A
MSS SP 44	Class 150																				
AWWA C207	Tables 2-3-4-5																				

NOTES:

Possible for all versions

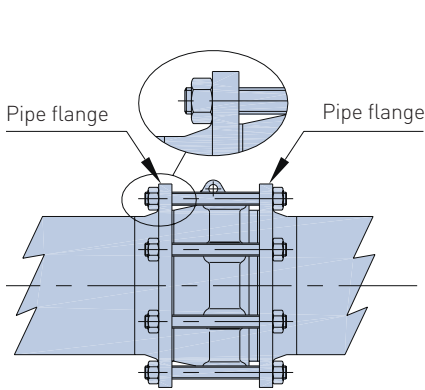


FIGURE 11: DN 80 to DN 500 (NPS 3 to 20)
Wafer mounting

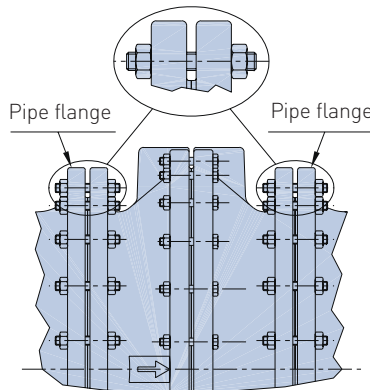


FIGURE 12: DN 600 to DN 1800 (NPS 24 to 72)
Flanged mounting (raised face type)

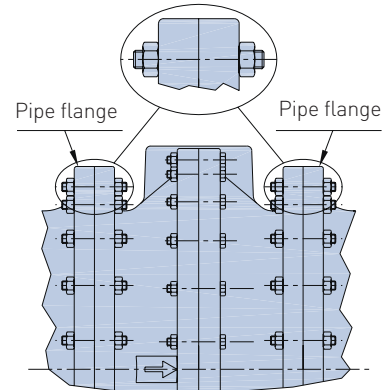


FIGURE 13: On request (DN 600 to DN 1800)
Flanged mounting (flat face type)



Example of a test on DN 700 (NPS 28) carried out on every single valve of our production

SAPAG CHECK VALVES

MODEL CLASAR® MOUNTING INSTRUCTION

GENERAL

CLASAR® check valves can be mounted in any position (horizontal, vertical and diagonal direction)

CLASAR® is supplied without flange gaskets and bolts

STORAGE

This equipment in storage should be adequately protected against weather influence, salt sea-air dust and moisture.
 Room temperature should not be below -10°C (+50°F)
 No special precautions are required for storage longer than 6 months.

MOUNTING INSTRUCTIONS

As for most valves and fittings, sliding flanges or similar on the pipework are recommended to provide the clearances needed to insert and remove the valve and to prevent unacceptable stressing due to inevitable misalignment.
 At least one of the pipes connected to the valve must be firmly bolted to withstand the thrust during valve closure.

Instructions before start up:

- Before mounting, carefully check the valve for cleanliness. Remove possible pollutions and particles from the pipework and flush the system thoroughly with water or compressed air as appropriate.
- Important!** Particular care should be taken to remove pieces of welding rod chips liable to damage the axial disc and sealing surfaces.
- Never weld the flanges to the pipe when the CLASAR® is in position because this might damage the axial disc.
- Provide a trash rack or strainer that will prevent particles from interfering the valve's functionality.
- Check that the flow takes place in the direction shown by the arrow on the valve
- CLASAR® wafer type valves must be perfectly aligned with the pipe centerline. Use spacer tubes mounted on tie-rods if necessary.

INSTALLATION RECOMMENDATION

FIGURE 14

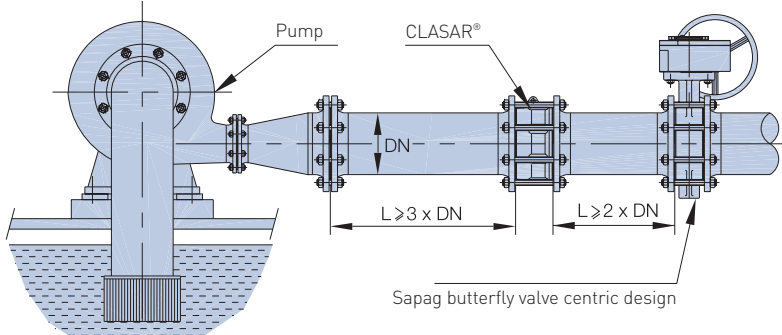


FIGURE 15

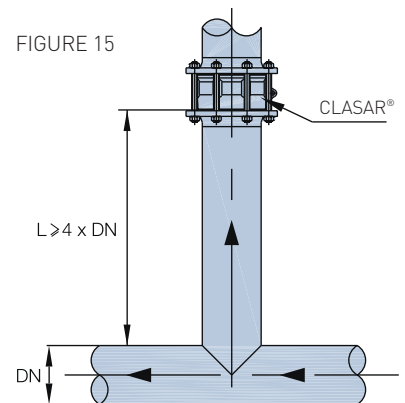
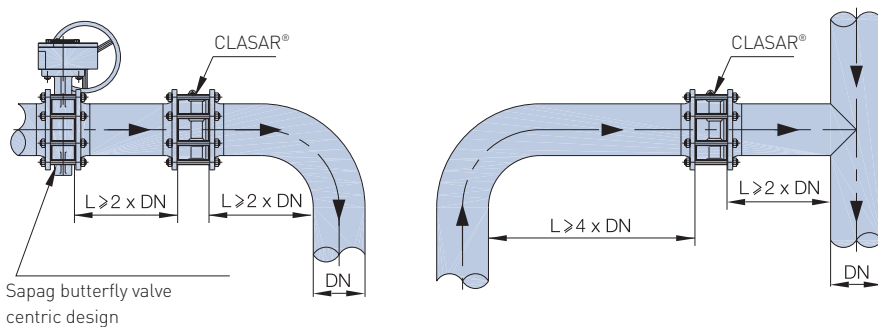


FIGURE 16



SAPAG CHECK VALVES

MODEL CLASAR® ORDERING CODE

ORDERING CODE

A code with the following basic information is marked on the tagplate:

5 characters defining type and materials

For the order, completing the below data with the following information:

- the nominal diameter (DN)
- the flange connection
- and, if applicable, the valve options

SELECTION GUIDE - CLASAR® 20111- 200 PN16 PS10

Example:	201	1	1	200	PN16	PS10
Body and backing plate (Ductile iron)						
201 Ductile iron						
202 Ductile NiResist alloy						
203 Stainless steel						
204 Aluminium bronze						
205 Duplex						
Axial disc ⁽¹⁾						
1 Polyurethane						
3 PTFE						
Spring ⁽¹⁾						
1 Standard stainless steel						
3 Inconel©						
DN (NPS)						
DN 80 (3) - DN 1800 (72)						
Flanges Type (EN 1092 PN16)						
(For class flanges, precise the standard) See page 6						
PS						
Working pressure (CWP, 10 bar max)						

NOTES:

1. The choice of the material depends on the application parameters, please contact factory.
CLASAR® with body and counter flange in ductile iron, axial disc in polyurethane, spring in stainless steel.
DN 200 for mounting between flanges defined by EN1092 in PN16, with a working pressure of 10 bar

Example of CLASAR's wide diameter range



Some manufacturing steps within the manufacturing process of CLASAR®



SAPAG CHECK VALVES

MODEL CLASAR® ORDERING CODE

SELECTION GUIDE - CLASAR® 20111- 200 PN16 PS10 P(ACS)

Example:	201	1	1	200	PN16	PS10	P(ACS)
Body and backing plate (Ductile iron)							
201 Ductile iron							
202 Ductile NiResist alloy							
203 Stainless steel							
204 Aluminium bronze							
205 Duplex							
Axial disc⁽¹⁾							
1 Polyurethane							
3 PTFE							
Spring ⁽¹⁾							
1 Standard stainless steel							
3 Inconel®							
DN (NPS)							
DN 80 (NPS 3) - DN 1800 (NPS 72)							
Flanges Type (EN 1092 PN16)							
(For class flanges, precise the standard) See page 6							
PS							
Working pressure (CWP, 10 bar max)							
Valve options							
FF Flat face							
Approvals and certificates:							
P Potable water approved (ACS)							
X ATEX approved							

NOTES:

1. The choice of the material depends on the application parameters, please contact factory. Same check valve but potable water approved (ACS) with a working pressure of 10 bar.



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