PENTAIR

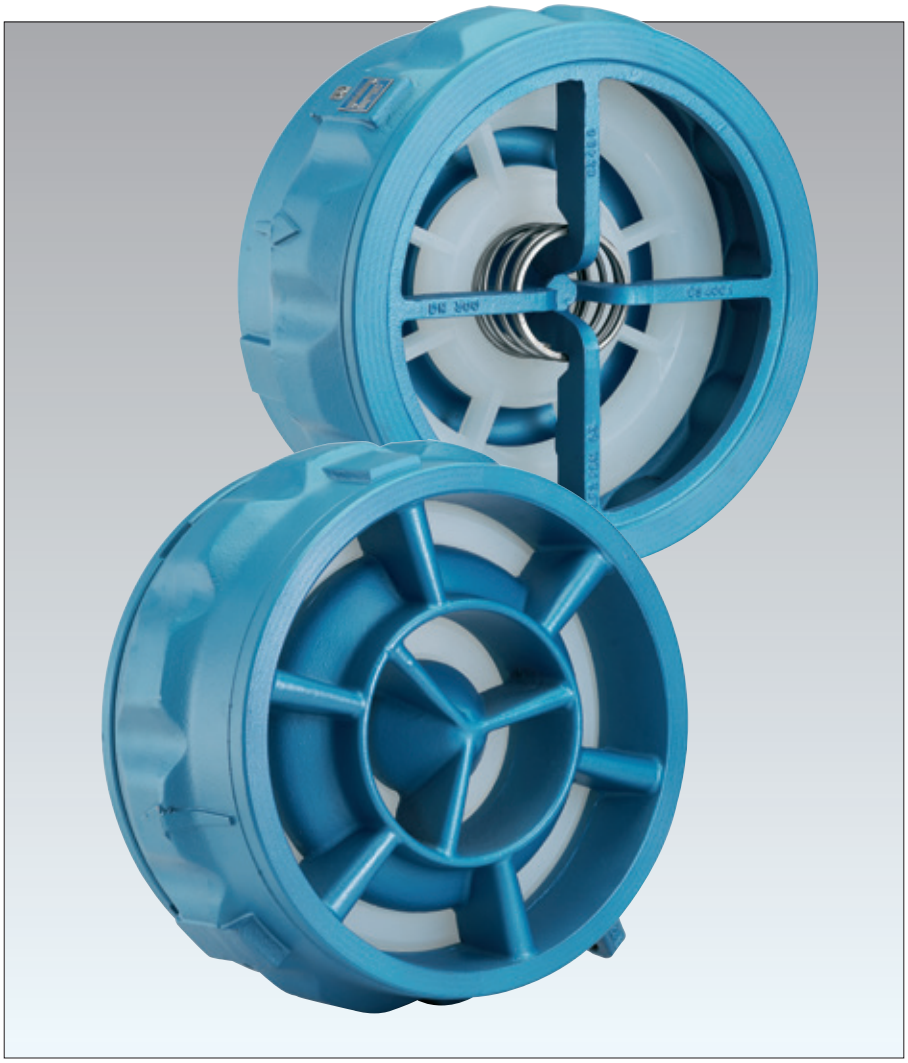
SAPAG

CLASAR®: the high dynamic response check valve

Benefits
- 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

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 (PN50 - 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

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



DN1400 (56") CLASAR® installation

Technical data
- Size range: DN80 - DN1800 (3" - 72")
- Maximum working pressure:
  - DN80 - DN500: 50 bar (725 psi) at ambient temperature
  - DN600 - DN800: 25 bar (362 psi) at ambient temperature
  - DN900 - DN1000: 20 bar (290 psi) at ambient temperature
  - DN1200 - DN1800: 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
  - ANSI B16.5
  - ANSI B16-47 A
  - MSS SP44
  - AWWAC207

  Others on request

SAHSB-0006-EN-1306

DN80 - DN500 (3" - 20"): Wafer body type
DN600 - DN1800 (24" - 72"): Flanged body type

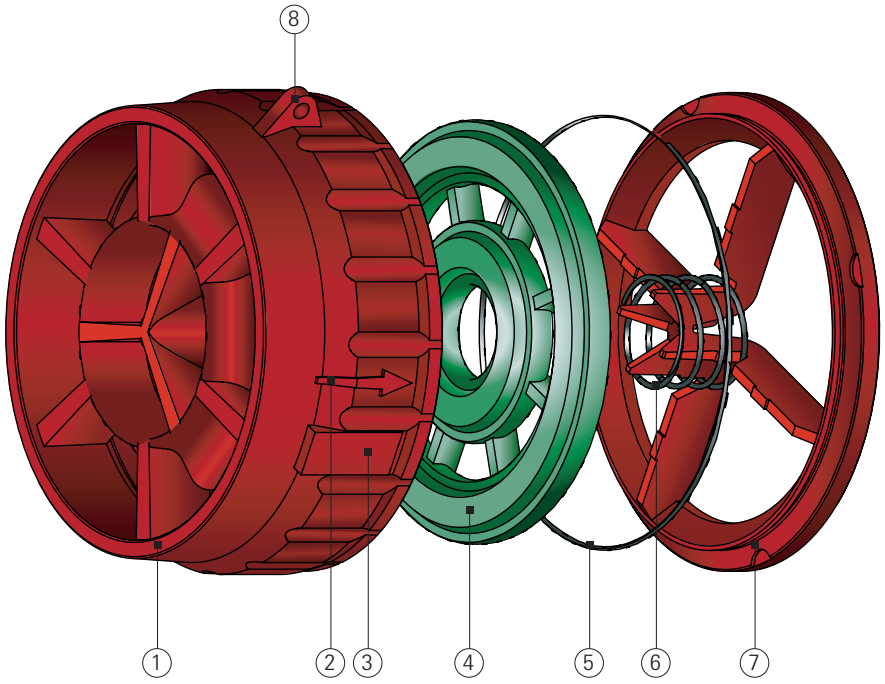


Figure 1: Example shown is a DN450 wafer check valve

The Sapag plant is ISO 9001 approved

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

- 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

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.

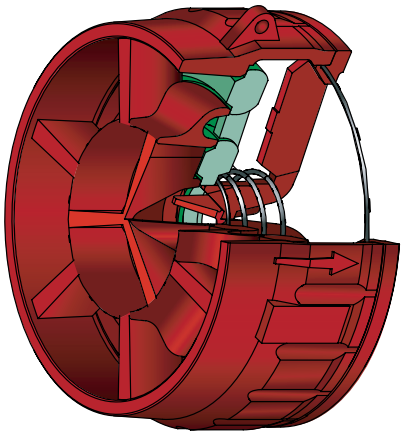


Figure 3:
Section of wafer check valve

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.

Figure 4

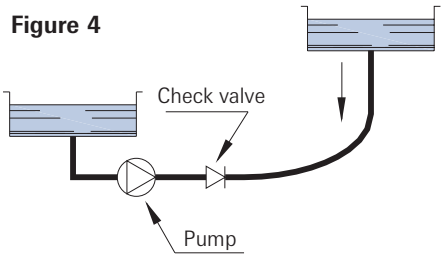


Figure 5

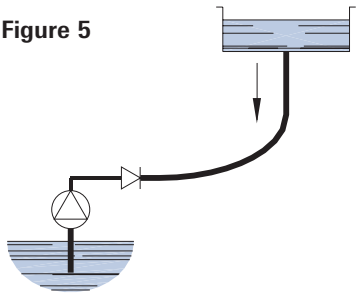
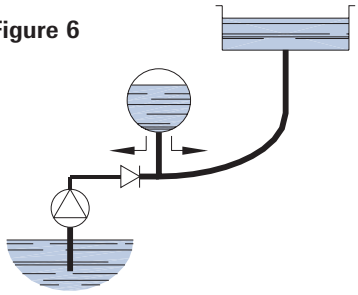


Figure 6



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 s < t_0 < 1/10 s

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

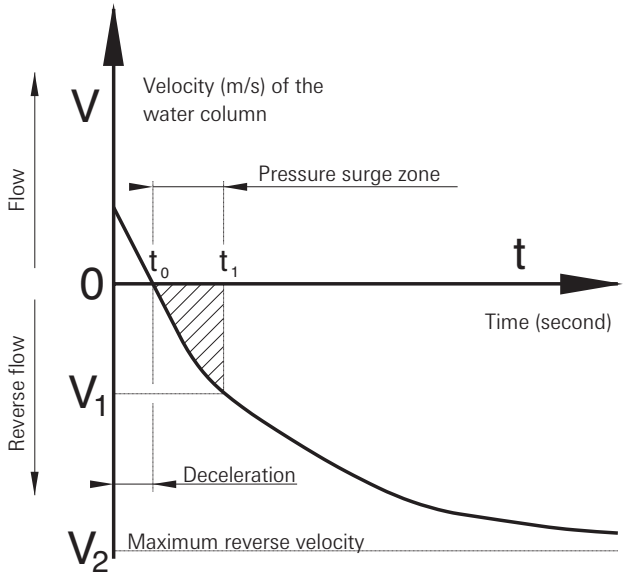
- The reverse velocity of the water is V_1
- The reverse flow is stopped immediately
- The overpressure is proportional to the reverse velocity (V_1)

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

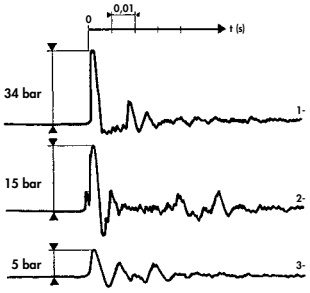


Pressure surge comparison with different check valves

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®

Figure 8:
Pressure surge comparison



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 (mm)	80	100	125	150	200	250	300	350	400	450	500	600	700	800	900	1000	1200	1400	1600	1800
Size (inch)	**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:

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

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

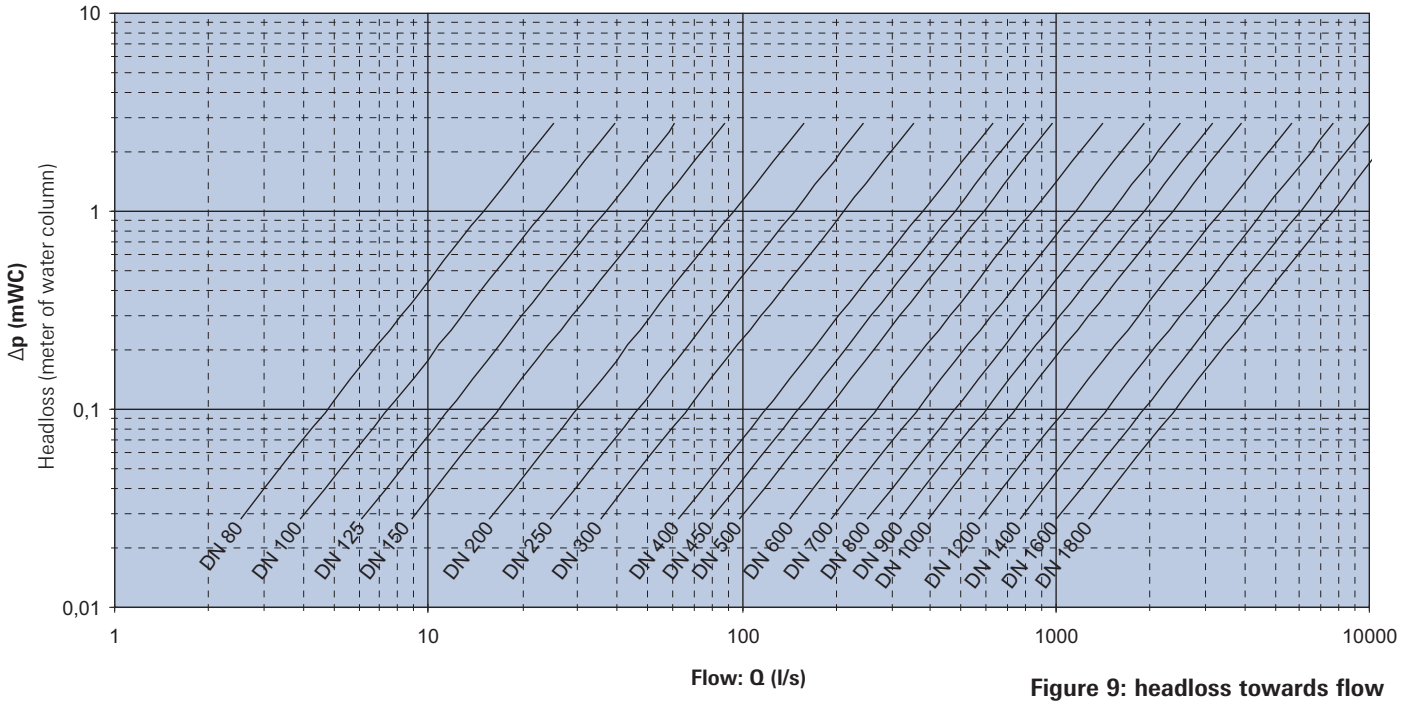


Figure 9: headloss towards flow

Selection table for materials

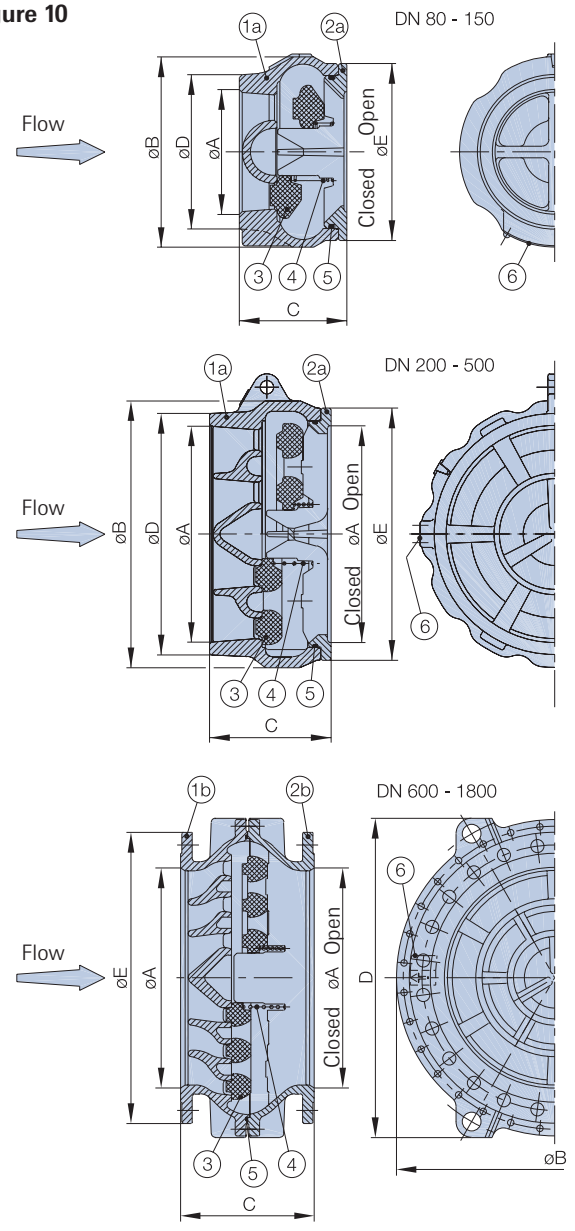
Medium	Bodies					Axial disc		Spring	
	Ductile iron + Epoxy	Stainless steel	Aluminium bronze	Ductile NiResist alloy	Duplex	Polyurethane	PTFE	Stainless steel	Inconel
Cold water	•					•		•	
Hot water	•					•		•	
Demineralized water		•				•		•	
Sea water			•	•	•	•			•
Drinking water	•	•				•		•	
Heating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

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)

Figure 10



	DN (mm)	Size (inch)	ØA	ØB	C	D	ØE	Weight (Kg)
Wafer body	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
Flanged body	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

(1) The choice of the axial disc material depends on the application parameters, please contact factory.
(2) External diameter and drilling in accordance with the flange standards.
(3) Dimensions in mm, weights in kg are given as guide

Maximum working pressure

DN (mm)	80	100	125	150	200	250	300	350	400	450	500	600	700	800	900	1000	1200	1400	1600	1800
Size (inch)	**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

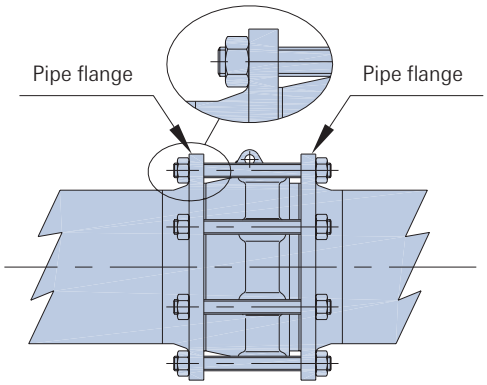
* at ambient temperature

Mounting between flanges

DN (mm)		80	100	125	150	200	250	300	350	400	450	500	600	700	800	900	1000	1200	1400	1600	1800
Size (inch)		**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																				
ANSI B 16.5	Class 150															See ANSI B16.47 A					
	Class 300																				
ANSI B16.47 A	Class 150					See ANSI B 16.5															
MSS SP 44	Class 150																				
AWWA C207	Tables 2-3-4-5																				

Notes: ▭ : Possible for all versions

Figure 11: DN80 to DN500 (3″ to 20″):
Wafer mounting



Example of a test on DN700 (28″) carried out on every single valve of our production

Figure 12:
DN600 to DN1800 (24″ to 72″):
Flanged mounting (raised face type)

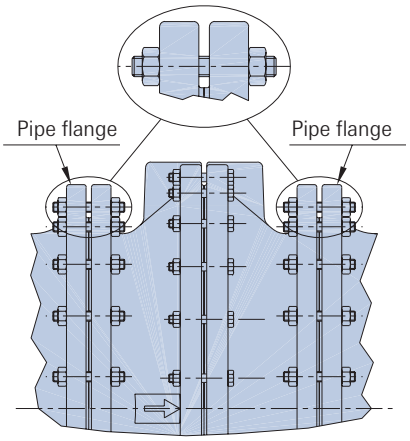
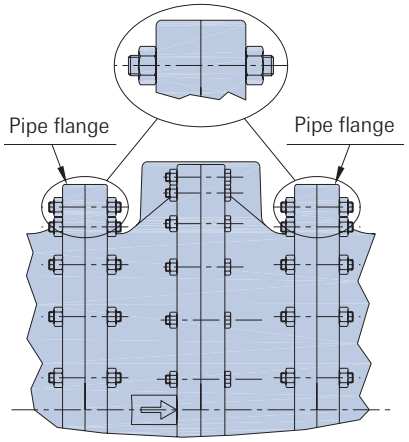


Figure 13: On request
(DN600 to DN1800):
Flanged mounting (flat face type)



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

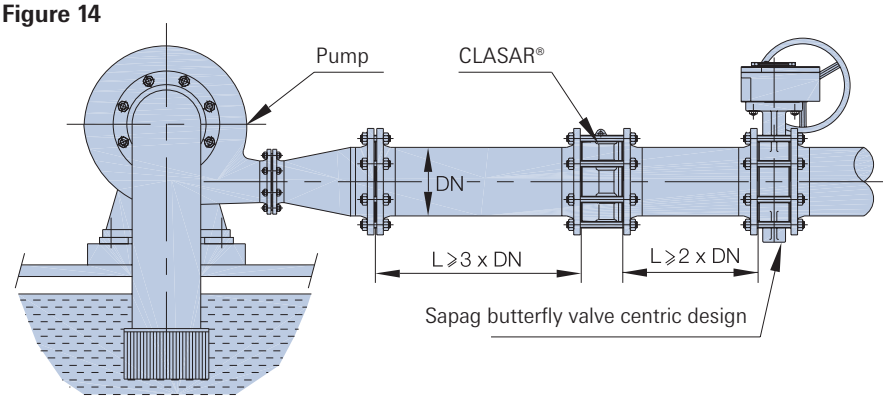


Figure 15

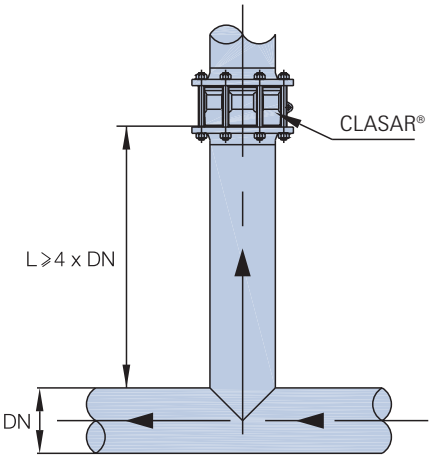
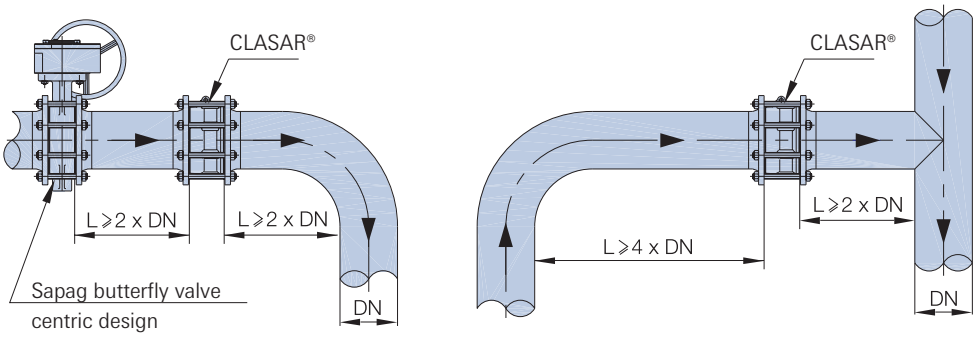


Figure 16



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

Body and backing plate
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 (mm)
DN80 (3") - DN1800 (72")

Flanges: type
(For class flanges, precise the standard)
See page 6

PS
Working pressure (CWP)

Valve options
FF Flat face
Approvals and certificates:
P Potable water approved
X ATEX approved

Notes:
(1) The choice of the material depends on the application parameters, please contact factory.

Example of CLASAR's wide diameter range

Examples

1. CLASAR® with body and counter flange in ductile iron, axial disc in polyurethane, spring in stainless steel, DN200 for mounting between flanges defined by EN1092 in PN16, with a working pressure of 10 bar

CLASAR® 20111-200 PN16 PS10: **2 0 1 1 1 - 200 PN16 PS10**

- Working pressure (10 bar max)
- Flanges (EN 1092 PN16)
- DN (200)
- Spring (Stainless steel)
- Body and backing plate (Ductile iron)
- Axial disc (Polyurethane)

2. Same check valve but potable water approved (ACS) with a working pressure of 10 bar.

CLASAR® 20111-200 PN16 PS10 P(ACS): **2 0 1 1 1 - 200 PN16 PS10 P(ACS)**

- Potable water approved (ACS)
- Working pressure (10 bar max)
- Flanges (EN 1092 PN16)
- DN (200)
- Body and backing plate (Ductile iron)
- Axial disc (Polyurethane)
- Spring (Stainless steel)

Some manufacturing steps within the manufacturing process of CLASAR®