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Flow Control

NARVIK

Narvik covers requirements for High Pressure Reducing Valves with a wide range of models, sizes and materials to satisfy all the specifications of the Power and Process Industry.

Features

- Universal actuator adaptor boss fits a variety of yokes.
- Inlet nozzle is available to various standards.
- Separarte seating surface opening and closing in ”zero - flow” condition.
- Cascade bushing provides multi - stage pressure reduction. Casted flutes split and reverse flow in each stage.
- Body forging in various materials. Construction in accordance with ANSI B16. 34 and TRD 110.
- Outlet nozzle is available to various standards.
- Stuffing box contains no asbestos components.
- Stem sized to balance hydraulic forces. Surface rolled and nitraded for low friction.
- Snubber ring prevents chattering.
- Radial bushing seal offering high sealing integrity.
- Cascade piston dissipates energy in high pressure discharge. Lands stellited to secure long service life.
- Outlet orifice provides back pressure.

General application

Let down valve for water and other liquids.
Max DeltaP = 407 Bar
Max temperature = 450°C

Techical data

Size: 1”-1 1/2”-2”-3”-4”-6”
(DN 25-40-50-80-100-150)

TÜV NORD ISO 9001

Narvik is constantly developing his range of products, therefore additional models, sizes, and materials outside the standard range can be offered. Please contact Narvik with your requirements.

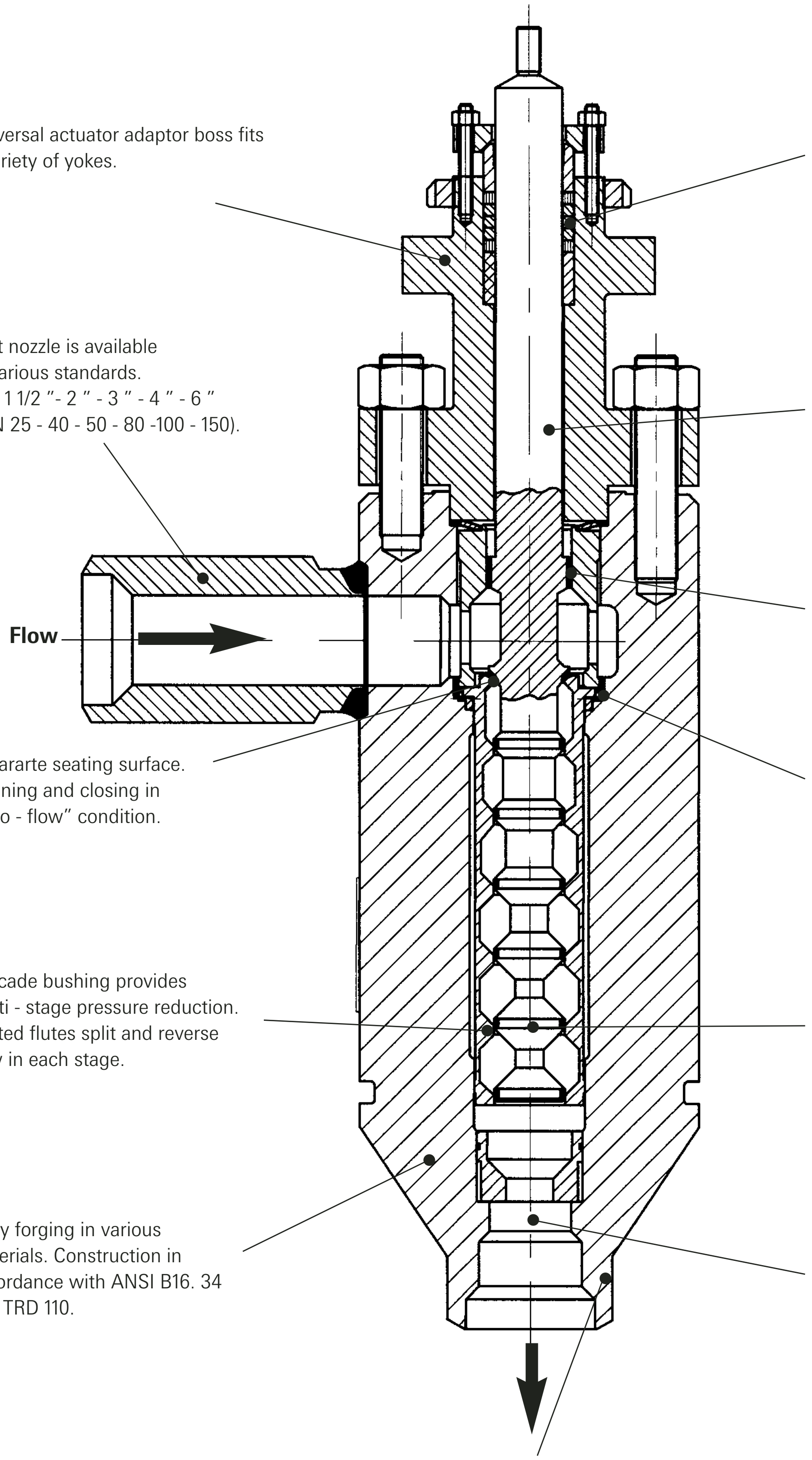
Universal actuator adaptor boss fits a variety of yokes.
Stuffing box contains no asbestos components.
Inlet nozzle is available to various standards. 1 ” - 1 1/2 ”- 2 ” - 3 ” - 4 ” - 6 ” (DN 25 - 40 - 50 - 80 -100 - 150).
Stem sized to balance hydraulic forces. Surface rolled and nitraded for low friction.
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Fig. 1

Operation principle

The Narvik Turbo - Cascade Valve splits the fluid flow into multiple streams and breaks down the high pressure in separate stages by including 90° changes in flow direction to dessipate energy. As shown in Figure 2, the cage or bushing has cast grooves which increase in depth or flow area as the fluid passes through the valve. The Turbo - Cascade Valve stem has precisely machined lobes that move up and down inside the fluted bushing. Varying the position of the lobes within the fluted bushing beares the area exposed to flow and thus controls valve capacity.
To increase flow area further, the diameter of the stem between the lobes decreases toward the valve outlet.
The increasingly larger flow area forces higher pressure drop on the upper inlet stages. This is to assure that the pressure at all points within the valve remains above the vapor pressure of the liquid, thus preventing cavitation. The greater the pressure reduction, the greater the possibility of cavitation, as shown in Figure 4 / Page - 04.

* Pressure breakdown lands.

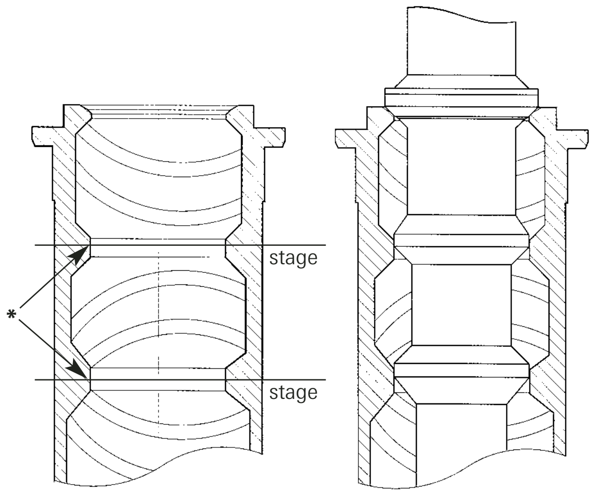


Fig. 2

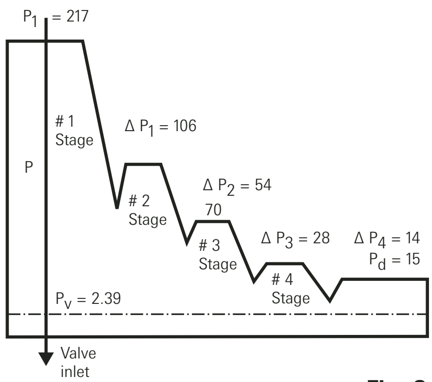


Fig. 3

Cut - away section of a Turbo - Cascade Valve bushing shows fluid passages (left) that provide staged pressure breakdown. With the cascade piston in the position shown (right), throtting of the flow is achieved.
Although only two stages are shown, up to six can be
provided for very high pressure differentials.

Application conditions

Q_b	= 137 m³/h	T	= 126°C
P_1	= 217 bar	P_v	= 2,39 bar
P_d	= 15 bar	S.G.	= 0,94
Δ P	= 202 bar	K_v	= 9,35

Controlled pressure reduction in Narvik valves helps prevent cavitation, which can occur if pressure drops below the vapor pressure of the liquid. Consult Narvik-Yarway for recommendations if the pressure at the outlet of the Turbo- Cascade Valve is near liquid vapor pressure.

Field of application

The Turbo - Cascade Valve find it' s greatest suitability in those applications involving pressure drops of the highest magnitude. In modern power station these are indentified as:

- Desuperheater spray water control in main and reheat cycles.
- Boiler feed pump by - pass system (see Fig. 8 / Page - 06).
- Boiler feed water control valve by - pass at start up or slow roll.
- Main steam line condensate drain.
- Pressure reducing of injection water for steam conditioning valves or low pressure desuperheating stations.
- In on - and off - shore water injection control for oil and gas wells.
- High pressure crude oil reduction.
- Assurance of drop - tight shut - off and longest periods of erosion free throttling make the Turbo - Cascade Valve the choice over all other control valves.

Pressure reduction capacity

The Turbo - Cascade Valve pressure reduction capability dependsono the number of pressure reductionstagesn incorporated into a given valve for a given set of conditions. Normally 1500 Psi (103 Bar) is the upper limit for two stages, four stages for 3000 Psi (207 Bar) and six stagesfora pressures up to 5900 Psi (407 Bar). All sizes can incorporate as many as six pressure - reduction stages. The fluted flow configuration of the internals effectively limitsfluido velocity at all points within the valve thus preventing a high operation sound pressure level in even the most severe pressure letdown situation. The design of the valve places the seating surfaces on the upstream or high pressure side with flow overtheo seat. This protects the seating surfaces from cavitation.
To protect against wiredrawing or erosion at the instant of opening or closing, a deadband on opening allows the sealing or seating surfaces to separate before appreciable flow begins.
The valve seat is not a part of the pressure reduction train.
These featurescombinen to provide lasting tight shutoff in high pressure service.

Fights erosion and cavitation damage

With conventional control valves, the normal erosive force of high velocity flow is evidend in wear and wiredrawing. There can be the even greater destructive force of cavitation depending upon internal design of the valve. In addition, the uncontrolled discharge of the fluid to the piping may lead to deterioration of the downstream system.
At any point in a high velocity flow stream where pressure is lower than the vapour pressure of the flowing media, the liquid boils or vapourizes. Vapour bubbles are entrained in the liquid and carried to a point in the system where the pressure may again be higher than vapour pressure, causing the bubbles to collapse, see Fig. 4. The implosions, accompanied by a crackling noise, release vast amounts of energy that can erode the metal surfaces.
Narvik Turbo-Cascade Valve works on the unique concept of splitting the main valve flow into multiple streams. The dimensions of the flutes determine the flow capacity and the number of stages is determined by the pressure differential. Pressure drops of the highest magnitudes are handled quietly and cavitation is avoided.

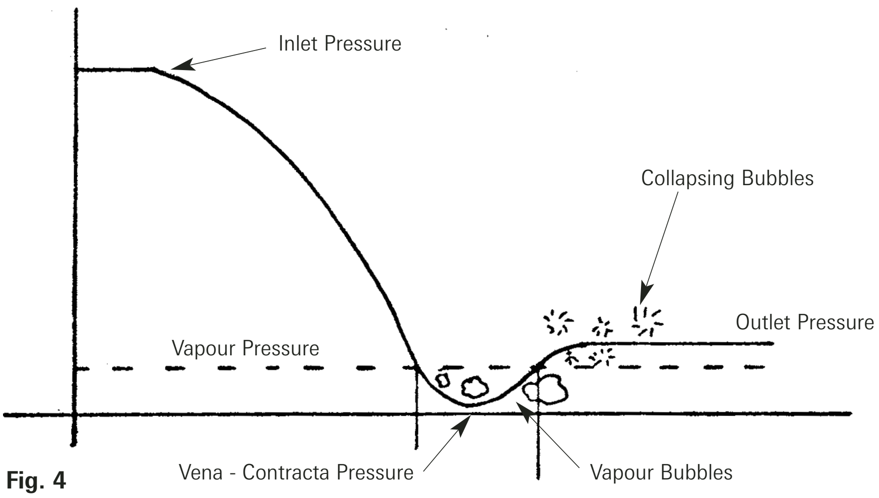


Fig. 4

Turbo - Cascade Valves are manufactured from three different standard materials. These are to the standards shown in the parts list (see Table - 2 / page - 08). Connections can be flanged, buttweld or socketweld to ANSI or DIN standards. All Turbo - Cascade Valves normally have equal inlet and outlet connections. Oversized connections may be available upon request. Turbo - Cascade Valves have standard and reduced capacity trim available for each size.

Ordering/sizing data

Liquid Data

Fluid type	
Inlet pressure	Bar
Outlet pressure	Bar
Inlet temperature	°C
Flow normal	t / hr
Flow max	t / hr
Flow min	t / hr

General

Pipe size	mm
Pipe schedule	

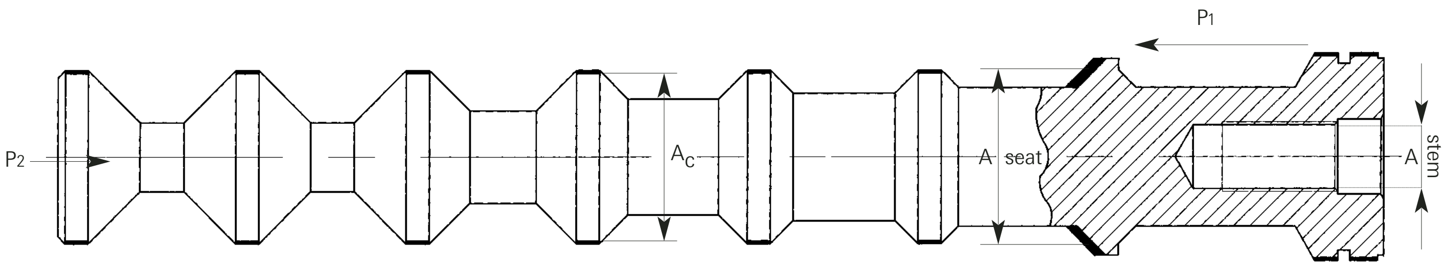
Definition

Kv	$= Q\sqrt{\frac{S.G.}{\Delta P}}$
Q	$= m^3/hr.$
S.G.	$= kg/dm^3$
Δ P	= Bar

Table 1 - Selection and Sizing Data of Unbalanced Turbo-Cascade Valves

Valve Size mm	Valve Size inch	Trim Size mm	Trim Size inch	Kv (Cv) - value at nr. of Stages 2	4	6	Valve Stroke mm	Valve Stroke inch	A seat cm 2	Ac cm 2	A stem cm 2	Ff Kg / Kg / cm 2
DN 25	1	14, 3	9/16	2, 00 (2, 30)	0, 93 (1, 10)	0, 74 (0, 87)	9, 53	3/8	2, 06	1, 610	1, 265	0, 516
		17, 5	1 1/16	3, 70 (4, 40)	1, 90 (2, 20)	1, 40 (1, 60)	9, 53	3/8	2, 90	2, 394	1, 265	0, 516
DN 40	1 1/2	17, 5	1 1/16	3, 70 (4, 40)	1, 90 (2, 20)	1, 40 (1, 60)	9, 53	3/8	2, 90	2, 394	1, 265	0, 516
		25, 4	1	6, 80 (8, 00)	4, 00 (4, 80)	3, 00 (3, 50)	13, 49	17/32	6, 54	5, 065	2, 850	0, 774
DN 50	2	35, 0	1 3/8	15, 30 (18, 00)	7, 60 (9, 00)	5, 40 (7, 00)	15, 88	5/8	11, 57	9, 580	7, 920	1, 610
		47, 6	1 7/8	22, 50 (26, 50)	14, 00 (16, 50)	11, 00 (13, 00)	19, 05	3/4	20, 50	17, 810	7, 920	1, 610
ΔP max. at water service		Bar :	103	207	407							
			Psi :	1500	3000	5900						

Actuator stem forces



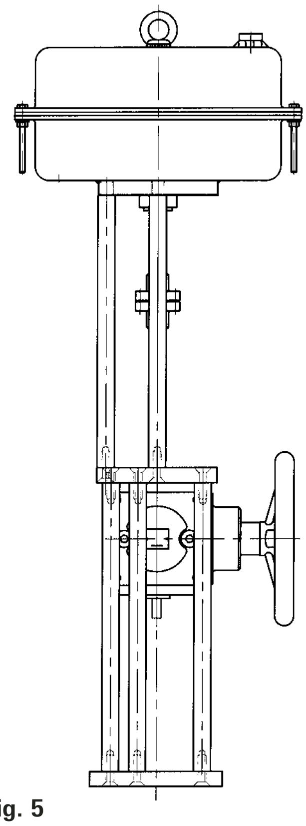
Unseating force

$F_u = 1,25\ P_1 (A_{seat} - A_{stem}) - (P_2 \times A_c) + (P_1 \times F_f)$ P in Bar, A in cm²

Operating force

$F_o = 1,25\ P_1 (A_c - A_{stem}) - (P_2 \times A_c) + (P_1 \times F_f)$

Actuators



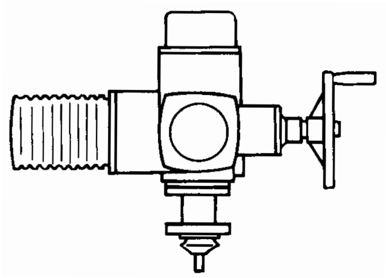


Fig. 6

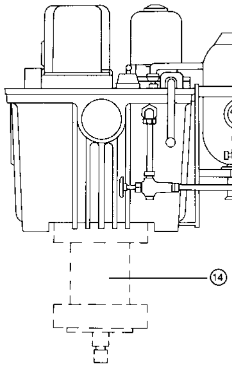


Fig. 5

Fig. 7

Pneumatic Diaphragm
Pneumatic actuators are available from Narvik. The actuator sets the valve in the open position in the event of air failure.
Other proprietary makes, and / or "fail - safe" requirements are available upon request.
Valve positioners are available in pneumatic or electro-pneumatic operation, depending upon customer preference.

Electric Actuators
Because of the adapted trim construction the Turbo-Cascade Valve can be equipped with "low - thrust" electric actuators. Narvik utilizes, as their standard electric actuator "AUMA" - units in both standard and Ex. drives.

Hydraulic Actuators
Upon request.

Each actuator - valve assembly is fully function tested at the Narvik-Yarway factory. A functional test certificate is issued for all valves supplied.

Boiler Feed Pump By - pass System

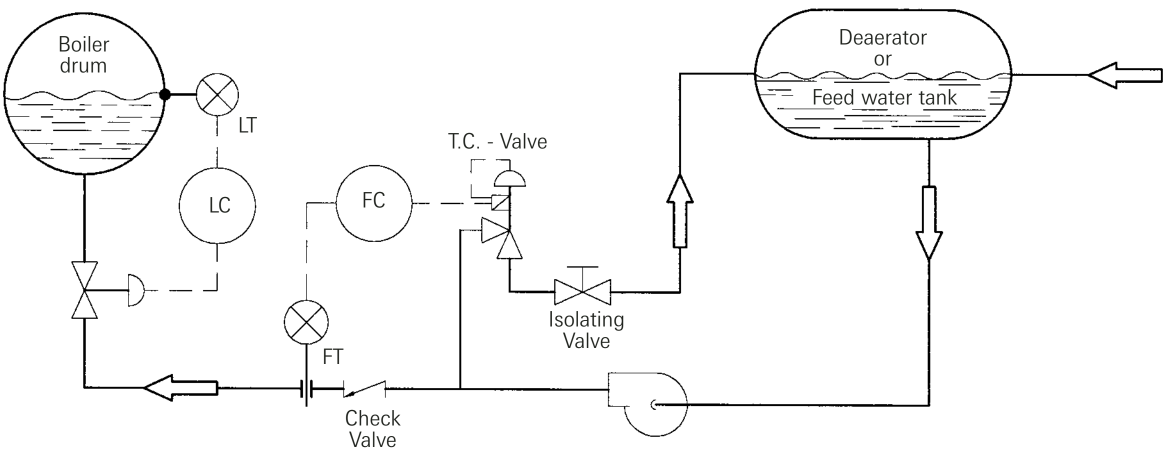
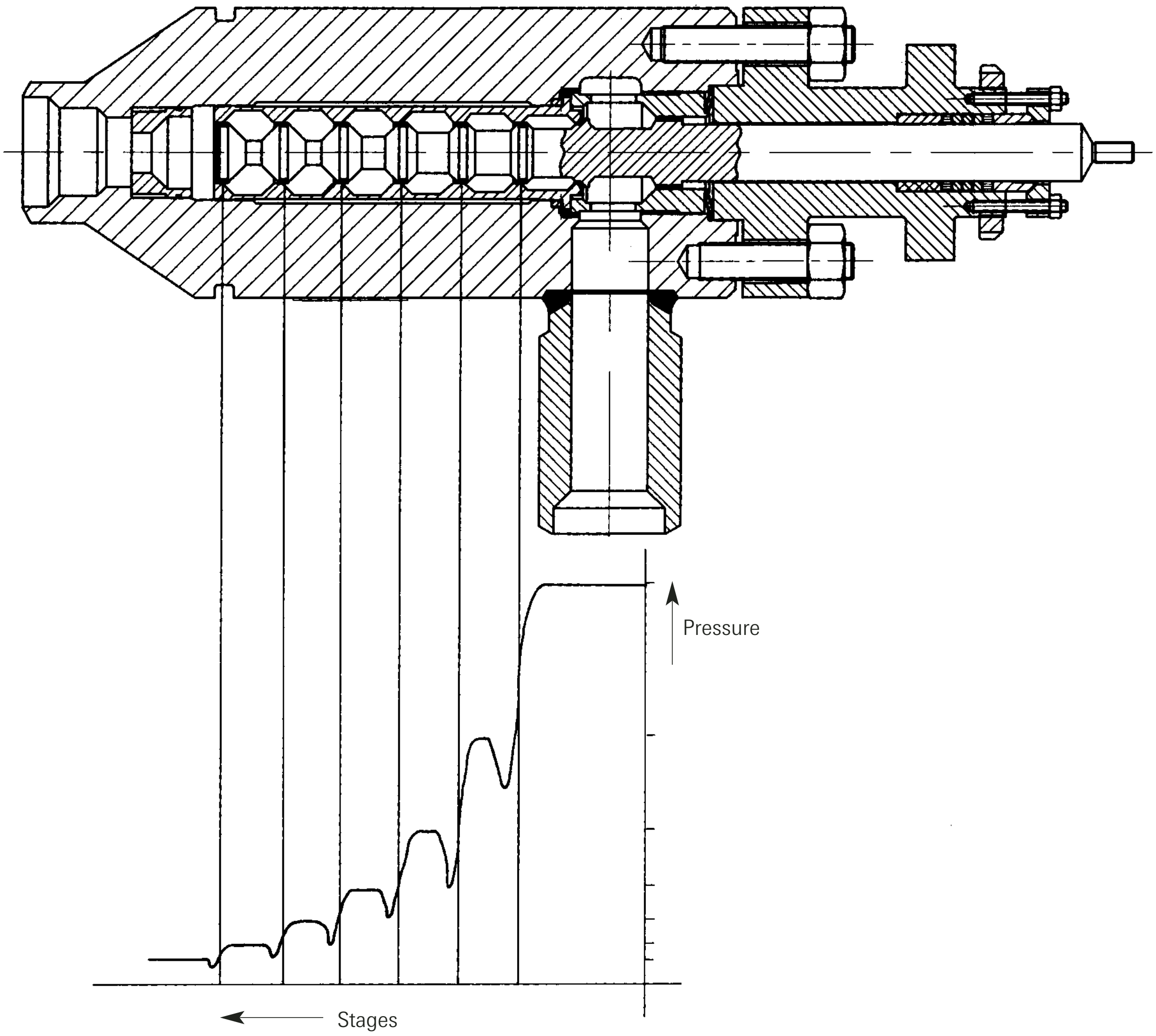


Fig. 8



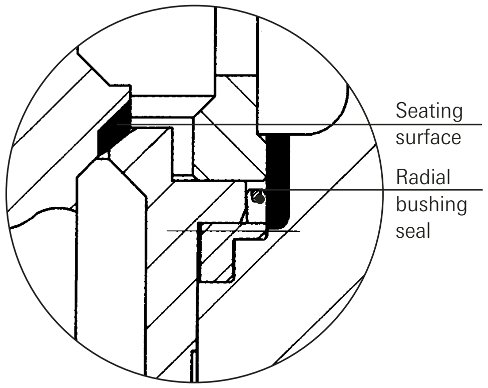
Typical pressure reduction per stage **Fig. 9**

Pressure drop pro stage		
2 stages	**4 stages**	**6 stages**
1st stage 76% of Δ P	1st stage 43% of Δ P	1st stage 44% of Δ P
2nd stage 24% of Δ P	2nd stage 28% of Δ P	2nd stage 25% of Δ P
	3rd stage 18% of Δ P	3rd stage 15% of Δ P
	4th stage 11% of Δ P	4th stage 8% of Δ P
		5th stage 5% of Δ P
		6th stage 3% of Δ P

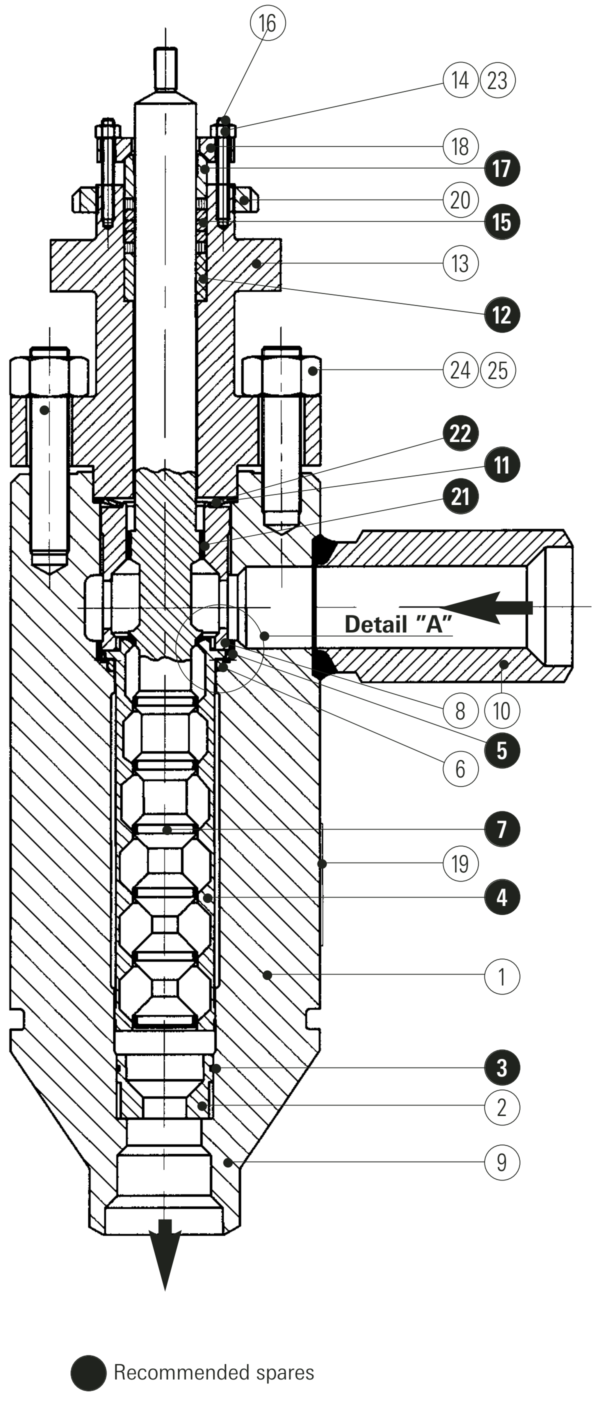
Table 2 - Standard Materials

Item	Name	Material	Equipment
1	Valve body	A105	C22 N
2	Orifice	A182 F 316	1. 4404
3	"O" - ring	Viton	Viton
4	Cascade bushing	17 - 4 PH	1. 4542
5	Radial Seal	Turcite 51	
6	Venting ring	A564 Gr. 630	
7**	Cascade piston	AISI 410	1. 4006
8	Spacer sleeve	AISI 410	1. 4006
9	Outlet nozzle	A105	C22 N
10	Inlet nozzle	A105	C22 N
11	Belville washer	PH 15 - 7 Mo	
12	Spacer	AISI 431 *	1. 4057 *
13	Bonnet	A105	C22 N
14	Nut	A194 2H	1. 4923
15	Packing set	Graphite	Graphite
16	Stud	A193 B7	1. 4923
17	Gland	AISI 431 *	1. 4057 *
18	Gland plate	AISI 304	1. 4301
19	Nameplate	AISI 304	1. 4301
20	Nut (FAG)	C. Steel	C. Steel
21	Piston ring (Snubber)	AISI 420	1. 4021
22	Gasket	St.St./Graphite	St.St./Graphite
23	Securing washer	Steel	Steel
24	Nuts	A194 2H	1. 4923
25	Studs	A193 B7	1. 4923

* Nitrided
** Stellited lands upon request



Detail "A"



Note

Other materials are available upon request.

Certification

Turbo - Cascade Valves are approved by authorized.
Authorities to comply with the requirements of ANSI B16. 34 and TRD 110.
All data subject to changes.

Table 3 - Dimensions (in mm)			
Diameter	**1 ″**	**1 1/2 ″**	**2 ″**
Nominal	**25**	**40**	**50**
A	Depending on nos. of Stages		
B	165	197	210
C	250	267	281
D •	722	1074	1074
E	32	32	32
F	M16 x 2, 00		
G	M90 x 2, 00		
H	91 + 0 / - 0,2		

* For stroke, see Table 1 / Page - 05.

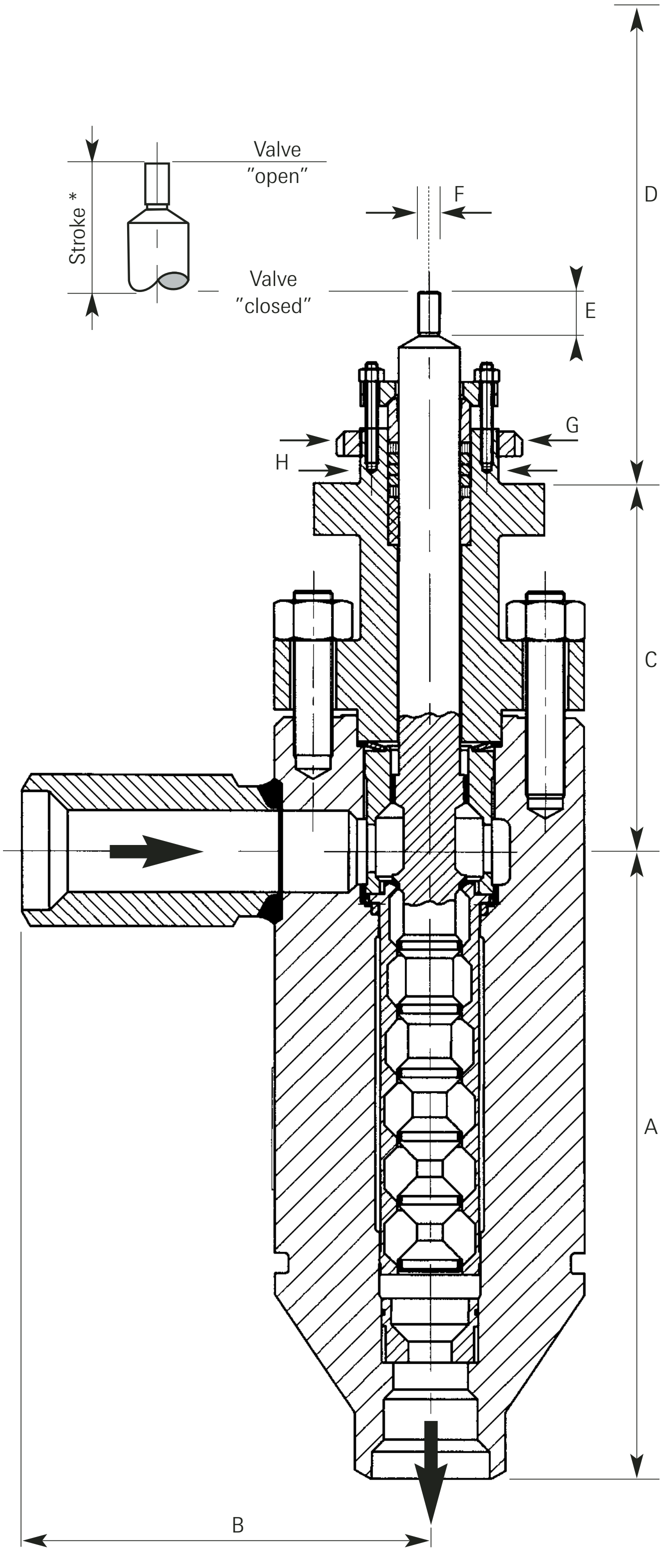
• Total height depends on Actuator type.

Note

Dimensions may be subject to change without prior notification. Narvik will provide a certified dimensional drawing upon request.

Table 4 - Connections *		
Model 39		
2 Stages	1″	class 900
	11/2 ″	class 1500
	2 ″	class 2500
	DN25	PN 160
	DN40	PN 250
	DN50	PN 320
		PN 400
4 Stages	1″	class 1500
	11/2 ″	class 2500
	2 ″	
	DN25	PN 160
	DN40	PN 250
	DN50	PN 320
		PN 400
6 Stages	1″	class 2500
	11/2 ″	
	2 ″	
	DN25	PN 320
	DN40	PN 400
	DN50	

* In - and outlet connections are available with flanged ends in accordance with ANSI B16. 34 (DIN 2600) and buttweld ends in accordance with ANSI B16. 25 (DIN 2559) up to 6 ″ (DN150).



Materials and Data of units supplied, may deviated from this Brochure.
Please consult Order documents in case of doubt.