VDCI mixproof valve technical description

The VDCI mixproof valve *performs two primary functions:*

- ***the orientation of fluids*** *in the same way as the standard DCX3-DCX4,*
- ***the bleeding of an air space between the plugs*** *which is intended to:*

1• direct the leakage flow out of the system and thereby prevent the mixing of two fluids flowing through the valve.

2• warn the user should there be a seal failure on either of the plugs.

This technology creates a ***physical barrier between the two fluids*** *allowing* ***different type of fluid*** *to flow through the valve. For example, one of the body compartments can be washed out while the other continues to convey a process fluid.*

What's more, by activating the plugs, the valve can be washed completely at the same time as the various pipelines. A single valve can therefore be used on circuits which traditionally required two single-sealing valves.

Mixproof valve technology *is constantly changing. The latest versions guarantee* ***minimal product loss*** *and risk of circuit contamination by the air space.*

These valves have successfully passed the EHEDG tests.

Design

The VDCI mixproof valve consists of six main subassemblies:
• a spherical body with branch outlets providing a variety of configurations,
• a one-piece lower plug equipped with a pressure counterbalance,
• a one-piece concentric upper plug (with floating seal),
• a single-acting main actuator incorporating an auxiliary upper plug break-away actuator,
• a complementary lower plug break-away module and a lower plug counterbalance guard.

These elements are clamped together for good centring and quick removal (from DN 38 to DN 150).

Thanks to the design and quality of manufacture, the components are fully interchangeable.

The body

The VDCI body is made from 316L stainless steel according to a technique that ensures a good level of homogeneity in the material. The spherical form of the bodies ensures optimum fluid flow and a reduction in pressure losses. Its extra-thick walls guarantee excellent mechanical strength as well as a sturdy valve assembly and therefore a firm support for the plugs on their bearing surface. This allows the design of important manifolds, without expansion device.

The polished interior finish (Ra = 0,8 µm) contributes to outstanding in-line cleanability. The branch pipes welded to the body provide standard combinations as well as special configurations on request.

Each nominal diameter corresponds to a particular sphere diameter guaranteeing minimum fluid retention inside the valve. Final hyperquenching regenerates the stainless steel and contributes to the geometric quality of the body.

Examples of the most common body configurations

These valves are designed as standard for vertical operation and ensure a natural fluid flow from the air space. However a slight incline (approx. 10°) is possible.

Type 01 

Type 02 

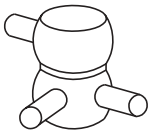
Type 03 

Type 04 

Type 05 

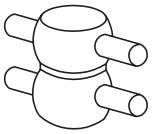
Type 06 

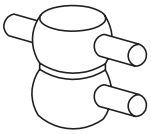
Type 07 

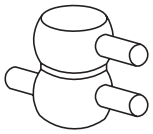
Type 08 

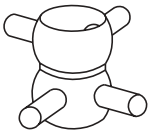
Type 09 

Type 10 

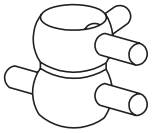
Type 11 

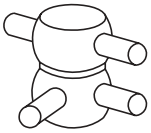
Type 12 

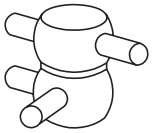
Type 13 

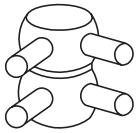
Type 14 

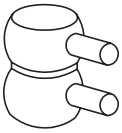
Type 15 

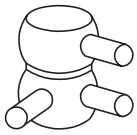
Type 16 

Type 17 

Type 18 

Type 19 

Type 20 

Type 21 

The plugs

The one-piece lower and upper plugs are made from 316L stainless steel. The design and the quality of surface finish reduce pressure losses. The stem and counterbalance are chromium-plated and guided by rings.

Apart from the PFA plug seals, valve seals are supplied in standard food grade materials.

A leakage indicator in the actuator lantern warns the user of a possible failure of the upper plug seals.

The lower plug is equipped with two concentric leakage chambers communicating with the inter-plug air space. The lower end of these chambers is threaded to take a flexible nozzle used for washing or internal sterilisation of the leakage chambers.

The floating seals

A PFA (PerFluoroAlcoxy) floating seal is clipped into each plug housing. Its floating arrangement makes for outstanding cleanability. On dilating, it allows circulation of the cleaning fluid around all sides.

Its plastomer structure also guarantees the absence of porosity or cracking, which can be sources of contamination and bacteria development.

The main actuator

The main VDCI actuator is composed of an outer 304L stainless steel cylinder, a lantern and a body mounting plate, pistons using the lower and upper plug stems, springs with an anticorrosion coating and a base held by a stainless steel retaining ring screwed onto the lantern.

It is delivered as standard with adjustable air fittings for 4/6 or 6/8 hoses. The main actuator is supplied from the side whereas the upper plug break-away actuator is supplied from the underside of the actuator.

Note :
1. Removing the internal break-away piston does not change the outer appearance.
2. An M18 detection lantern can be fitted directly.

The break-away actuator

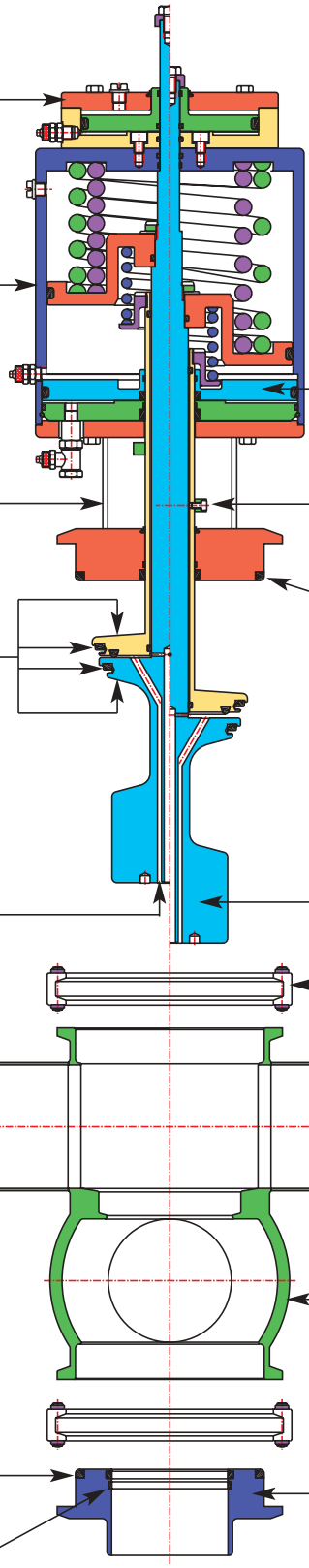
This complementary module is designed for the lower plug break-away function. It has a 304L stainless steel body and is positioned above the main actuator. The break-away piston is attached to the lower plug stem.

The counterbalance protection unit

The one-piece 316L stainless steel guard fits under the valve body and provides effective protection of the lower plug counterbalance.

A liquid or steam circulation system can be added as an option.

VDCI mixproof valve features



Modular break away actuator allows lifting of the lower plug.

Compact actuator without external flanges, with springs to ensure a high nominal sealing.

Optional switches on the lantern.

Upper and lower plugs equipped with PFA floating seal ensures maximum cleaning.

Double wall leakage indicator with possible cleaning of the plugs on each bearing face.

Sealing due to a flush seal for complete cleaning.

Perfect guidance of the counterbalance due to plastomer o'rings.

Break away piston of the upper plug.

Leak detection o'ring. Assembly of an aseptic plate possible.

Sealing due to a pinched seal for complete cleaning.

Counterbalance ensuring resistance against water hammer.

Actuators and shut-off units clamped together for quick removal.

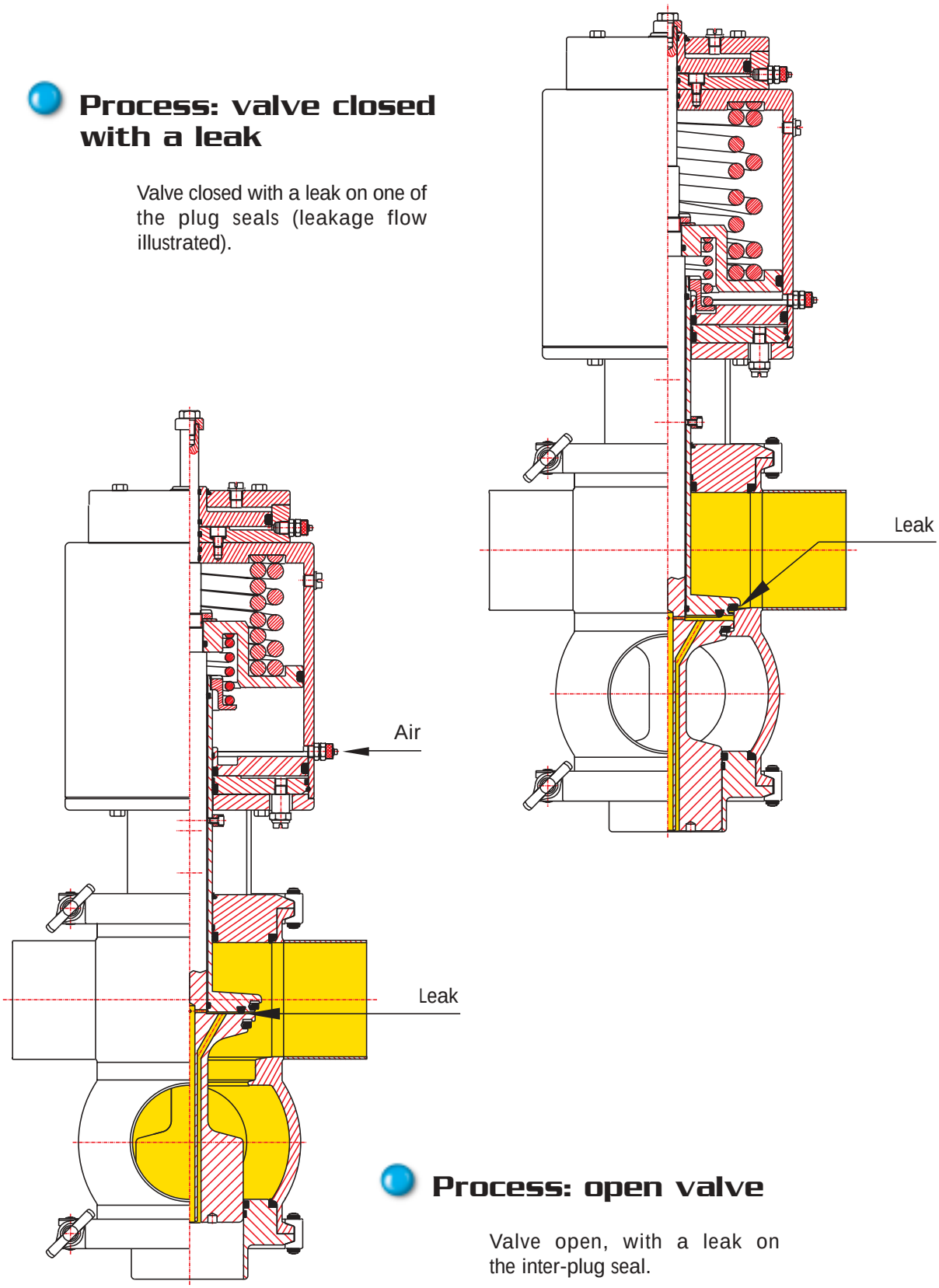
Extra thick body ensuring high resistance against mechanical and thermal distortions ; the spherical shape reduces pressure drop.

Solid counterbalance cover. Assembly of an aseptic plate possible.

VDCI mixproof valve operation

Process: valve closed with a leak

Valve closed with a leak on one of the plug seals (leakage flow illustrated).

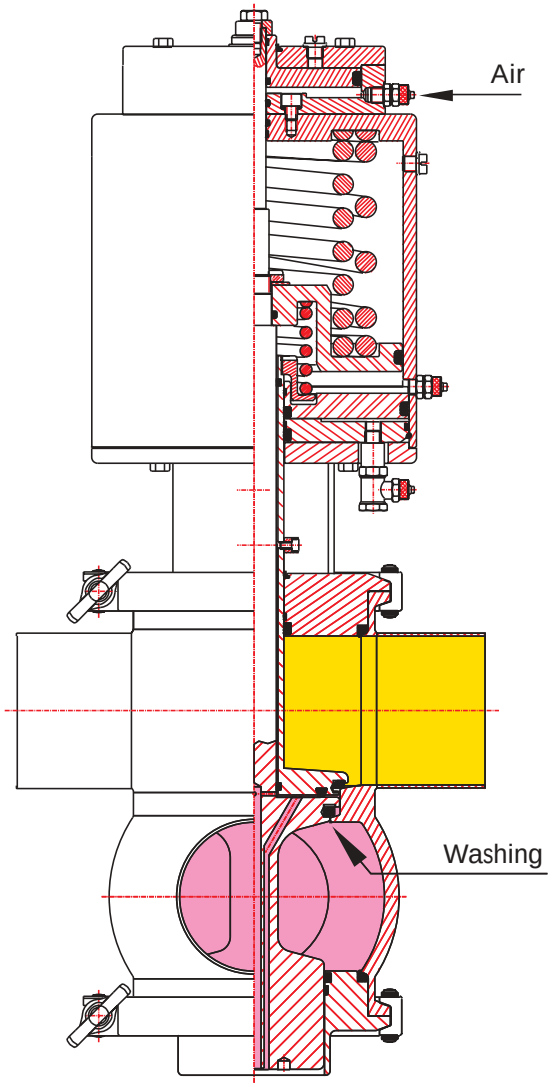


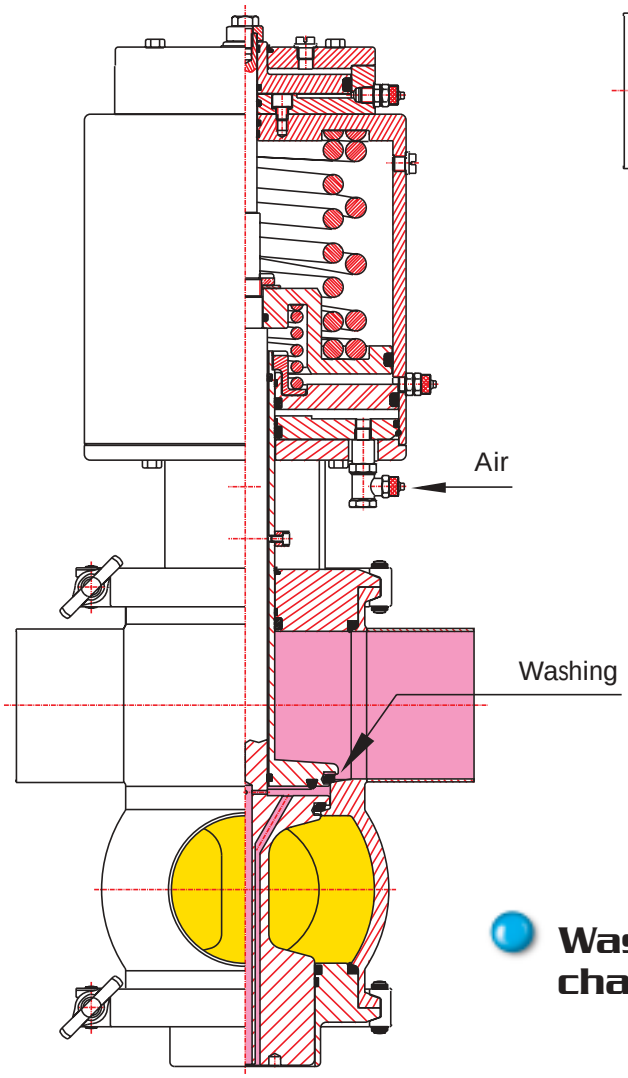
Process: open valve

Valve open, with a leak on the inter-plug seal.

Washing of the lower chamber

Washing the lower chamber with the lower plug in operation.



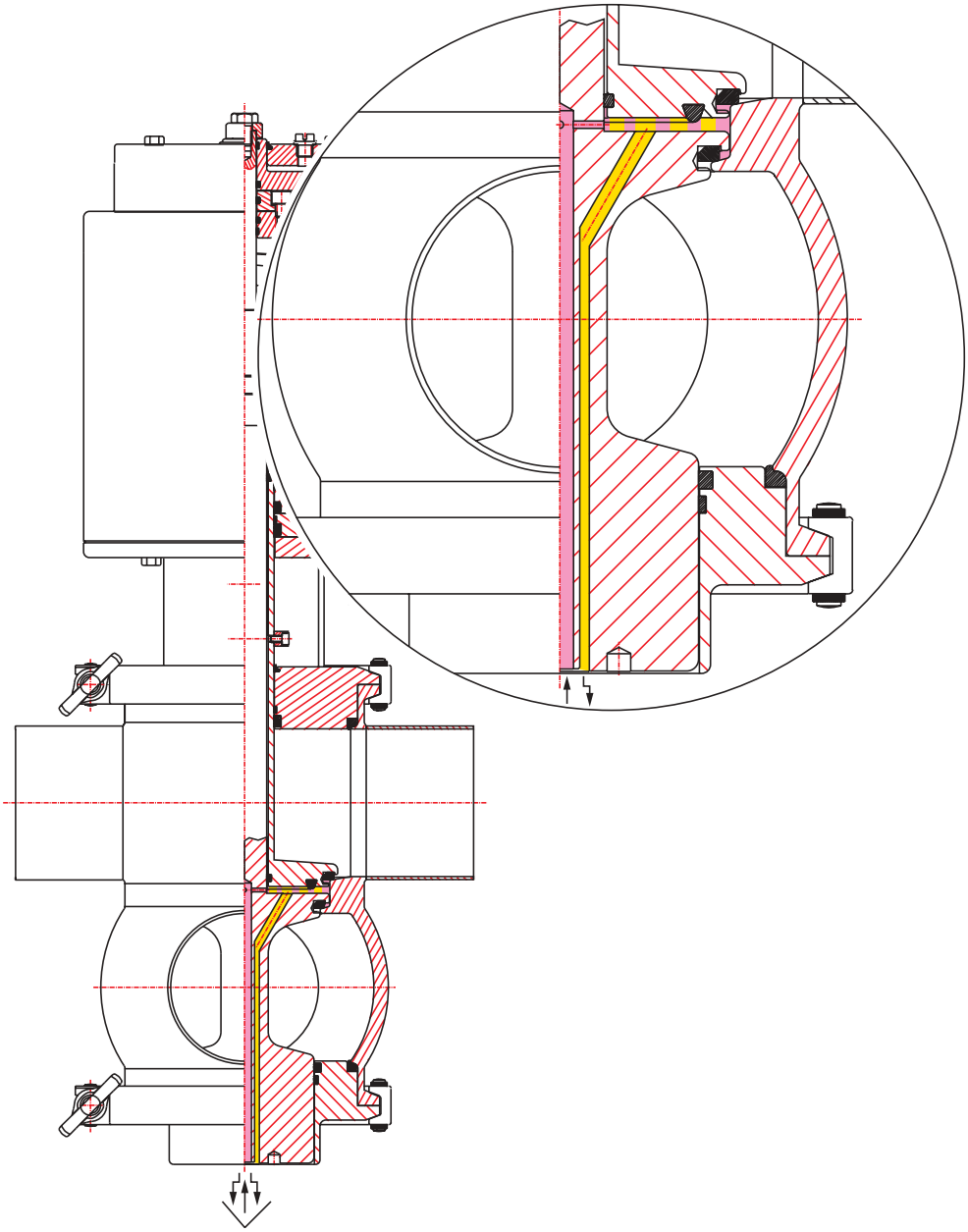


Washing of the upper chamber

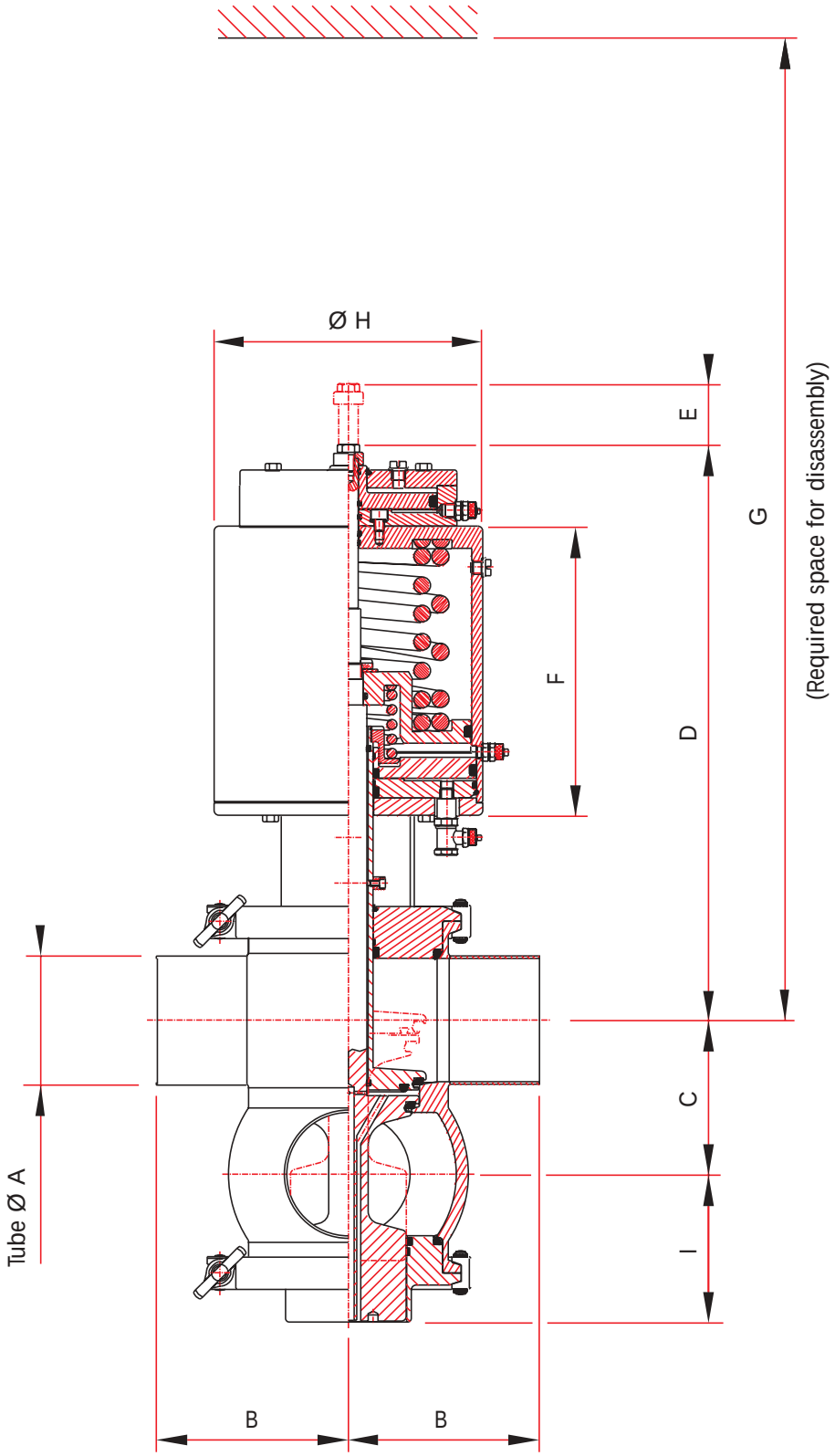
Washing the upper chamber with the upper plug in operation.

Washing of the air space

Washing the air space by forced circulation in the leakage chambers.



VDCI mixproof valve dimensions



VDCI mixproof valve dimensions

DN			Tube Ø A	B	C	D	Stroke E	F	G	Ø H	I	Weight in kg*
SMS	DIN	US										
38			38 x 1,2	105	55	353	25	179	530	128	72	22
		1" 1/2	38,1 x 1,65	105	55	353	25	179	530	128	72	22
	40		40 x 1	105	55	353	25	179	530	128	72	22
51			51 x 1,25	105	70	358	35	179	565	128	80	22
		2"	50,8 x 1,65	105	70	358	35	179	565	128	80	22
	50		53 x 1,5	105	70	358	35	179	565	128	80	22
63			63,5 x 1,6	130	85	400	35	204	640	167	95	43
		2" 1/2	63,5 x 1,65	130	85	400	35	204	640	167	95	43
	65		70 x 2	130	90	402	43	204	650	167	97	43
76			76 x 2	130	95	407	41	204	665	167	100	43
		3"	76 x 1,65	130	95	407	41	204	665	167	100	43
	80		85 x 2	155	110	455	50	234	750	218	110	78
		4"	101,6 x 2,1	155	125	465	50	234	795	218	120	87
104	100		104 x 2	155	125	465	50	234	795	218	120	87
	125		129 x 2	200	155	556	60	310	950	270	129	135
		6"	152,4 x 2,75	200	180	576	60	310	1020	270	139	145
	150		154 x 2	200	180	576	60	310	1020	270	139	145

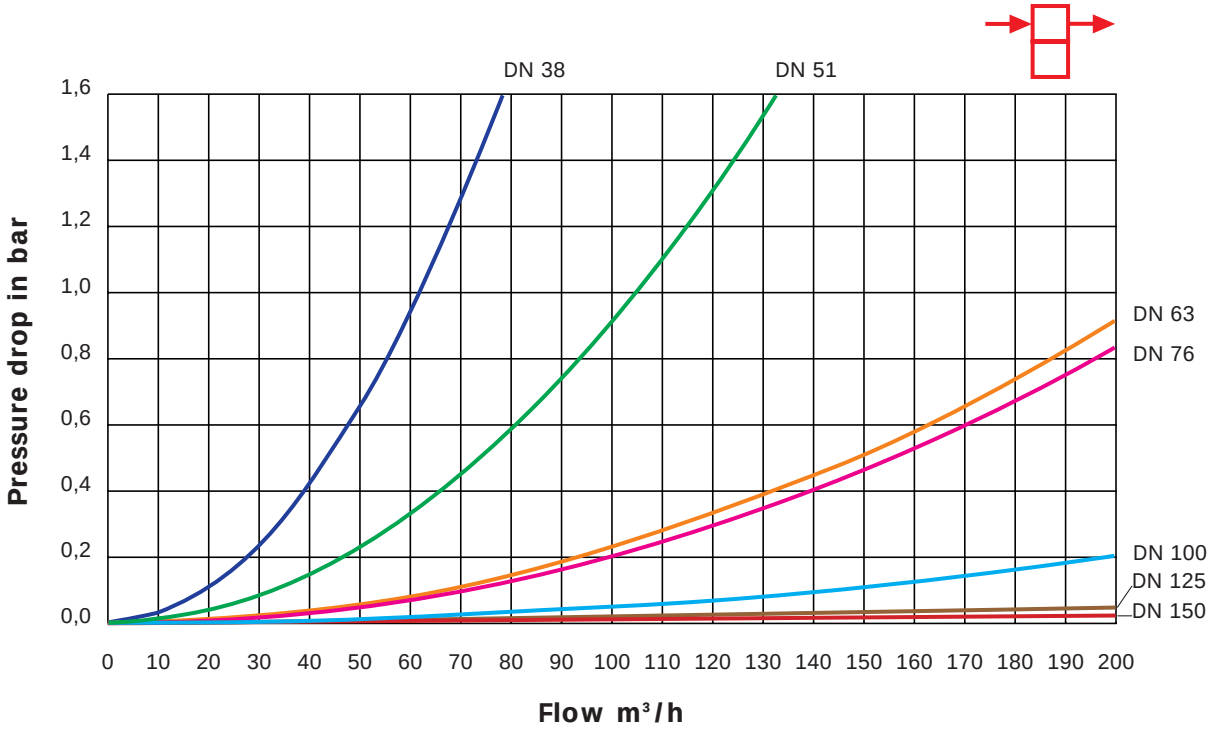
* Without control unit

VDCI mixproof valve working conditions

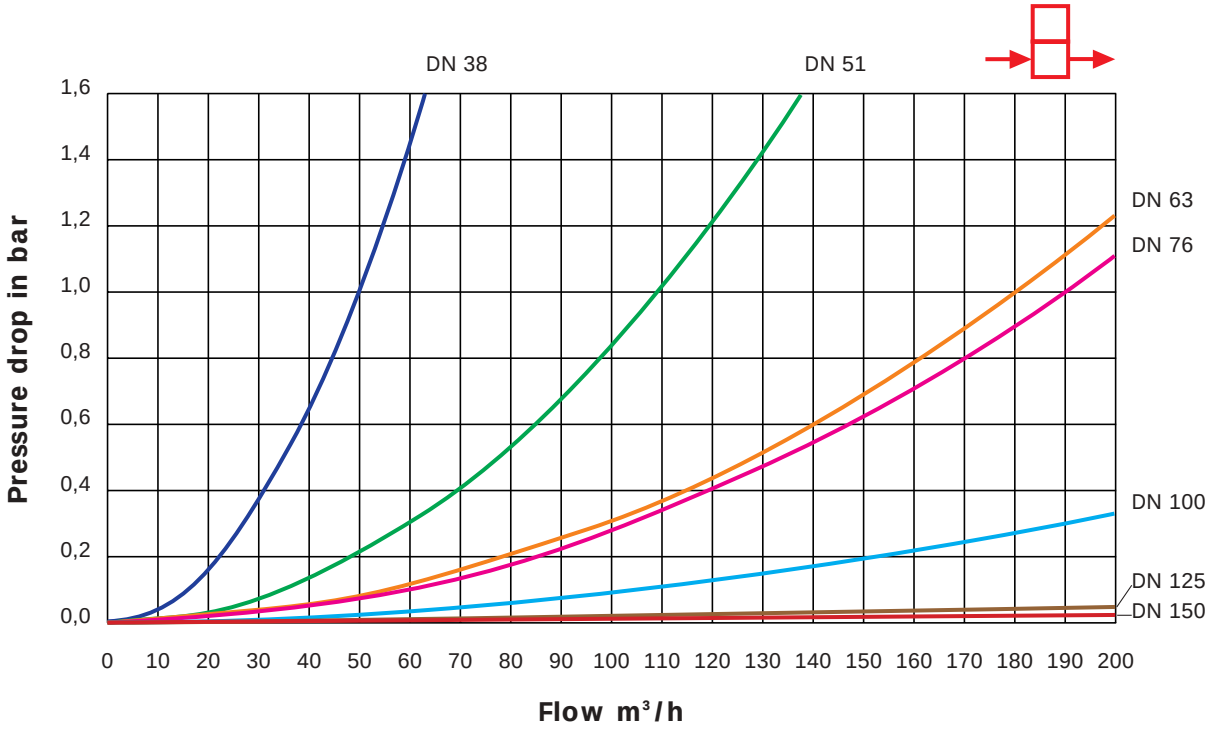
DN			Pressure drop (Kv)	Pressure drop (Cv)	Opening time (s)	Air consumption (Nl)
SMS	DIN	US				
38		1"1/2	44	51,04	4,2	2
51	50	2"	48	55,68	4,2	2
63		2"1/2	95	110,2	9	5
	65		97	112,52	9	6
76		3"	100	116	9	6
	80		170	197,2	10,8	11
104	100	4"	215	249,4	10,8	11
	125		400	464	17	21
	150	6"	465	539,4	17	21

FOR ALL DIAMETERS OF MIXPROOF VALVE		
Maximum temperature: +140 °C	Minimum temperature: -5 °C	Temperature difference: 120 °C
Maximum working pressure: 10 Bar	Vacuum resistance: 0,4 cm^3/s	Maximum sealing pressure: 12 Bar
Maximum supply pressure: 8 Bar	Minimum supply pressure: 5 Bar	

Pressure drop VDCI valve upper line

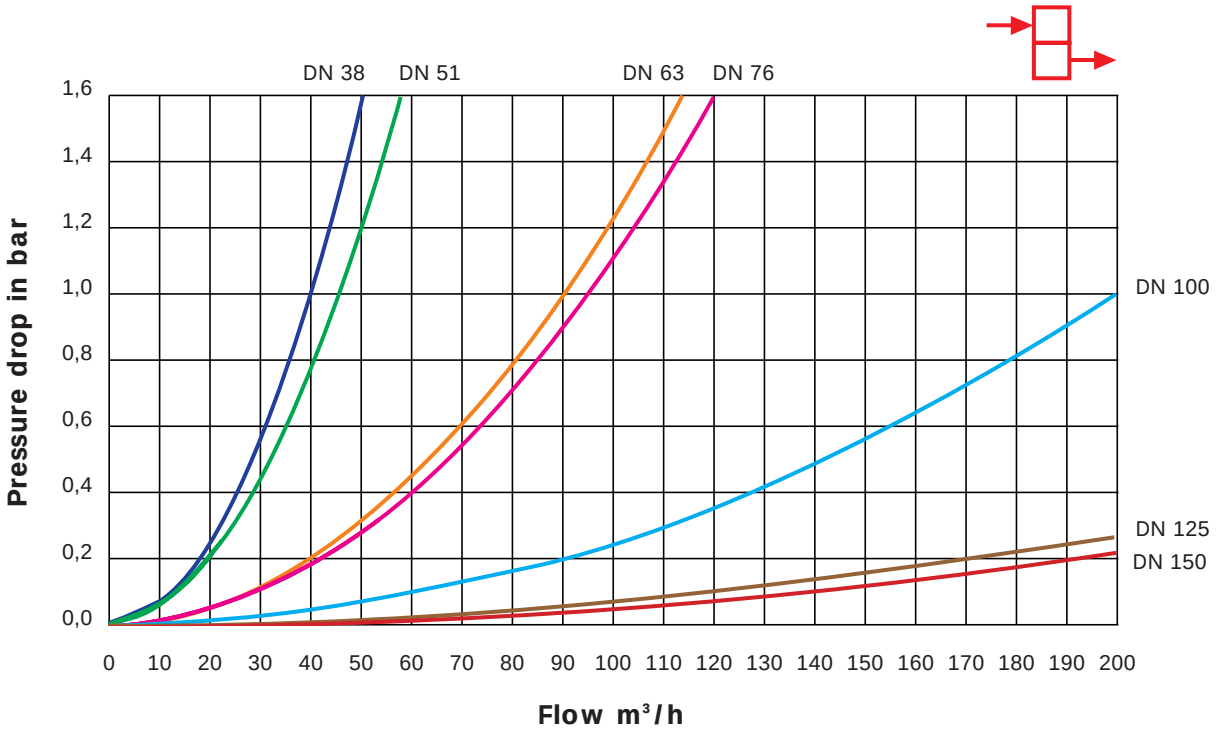


Pressure drop VDCI valve lower line

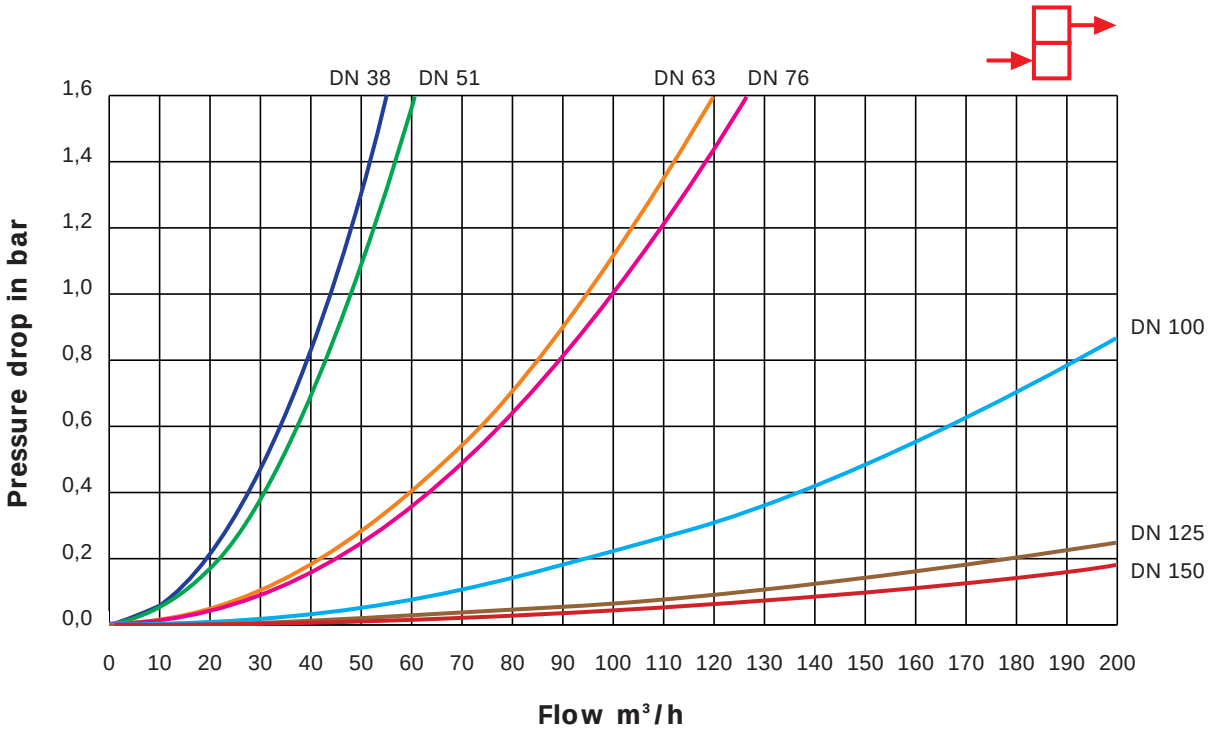


VDCI mixproof valve working conditions

Pressure drop VDCI valve upper → lower line



Pressure drop VDCI valve lower → upper line

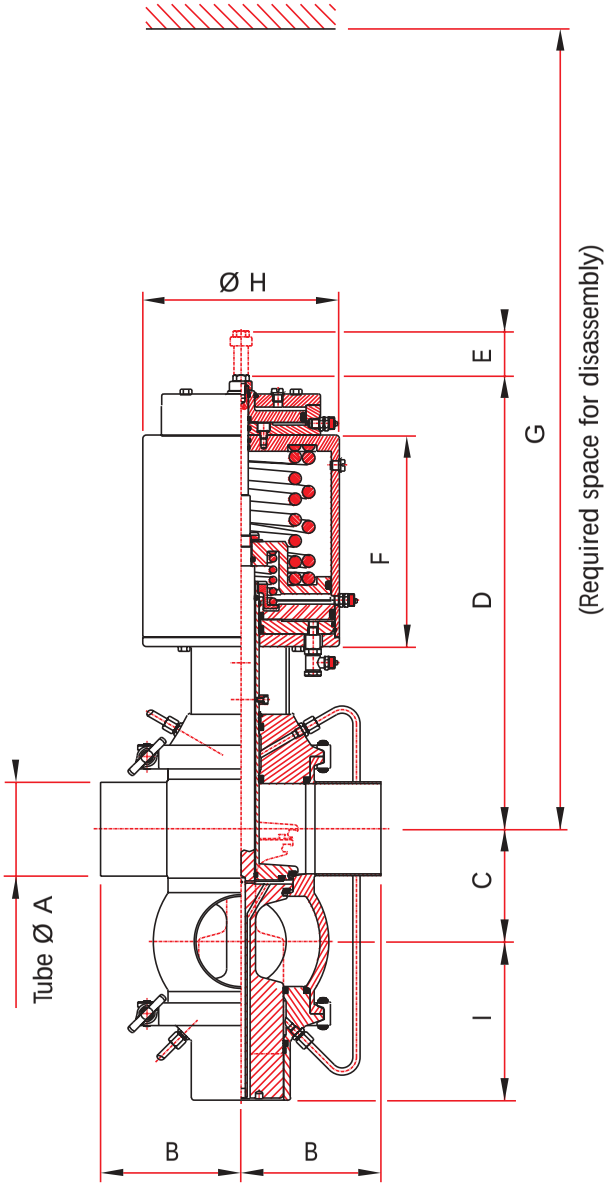


VDCI mixproof valve options

VDCI mixproof valve with steam bearing

DN			Tube Ø A	B	C	D	E	F	G	Ø H	I	Weight in kg*
SMS	DIN	US										
38			38 x 1,2	105	55	368	25	179	585	128	112	23
		1"1/2	38,1 x 1,65	105	55	368	25	179	585	128	112	23
	40		40 x 1	105	55	368	25	179	585	128	112	23
51			51 x 1,25	105	70	373	35	179	620	128	120	23
		2"	50,8 x 1,65	105	70	373	35	179	620	128	120	23
	50		53 x 1,5	105	70	373	35	179	620	128	120	23
63			63,5 x 1,6	130	85	434	35	204	720	167	140	46
		2"1/2	63,5 x 1,65	130	85	434	35	204	720	167	140	46
	65		70 x 2	130	90	436	43	204	730	167	142	46
76			76 x 2	130	95	441	41	204	745	167	145	46
		3"	76 x 1,65	130	95	441	41	204	745	167	145	46
	80		85 x 2	155	110	491	50	234	845	218	166	83
		4"	101,6 x 2,1	155	125	501	50	234	890	218	176	92
104	100		104 x 2	155	125	501	50	234	890	218	176	92
	125		129 x 2	200	155	595	60	310	1065	270	204	142
		6"	152,4 x 2,75	200	180	615	60	310	1135	270	214	152
	150		154 x 2	200	180	615	60	310	1135	270	214	152

* Without control unit



Design

The VDCI can be equipped with a steam or fluid circulation bearing. In this case, the actuator lantern and counterbalance cover are fitted with a circulating ring and are connected externally by an aseptic product feed pipe.

Technical specifications of this valve are the same as the base model specifications.

DEFINOX

VDCI FdC tank bottom mixproof valve technical description

This valve is designed ***to shut off the tank from the rest of the process circuit****. The mixproof technology allows the pipes to be cleaned right up to the tank bottom in total safety. The air space leakage indicator warns of a possible faulty seal.*

Design

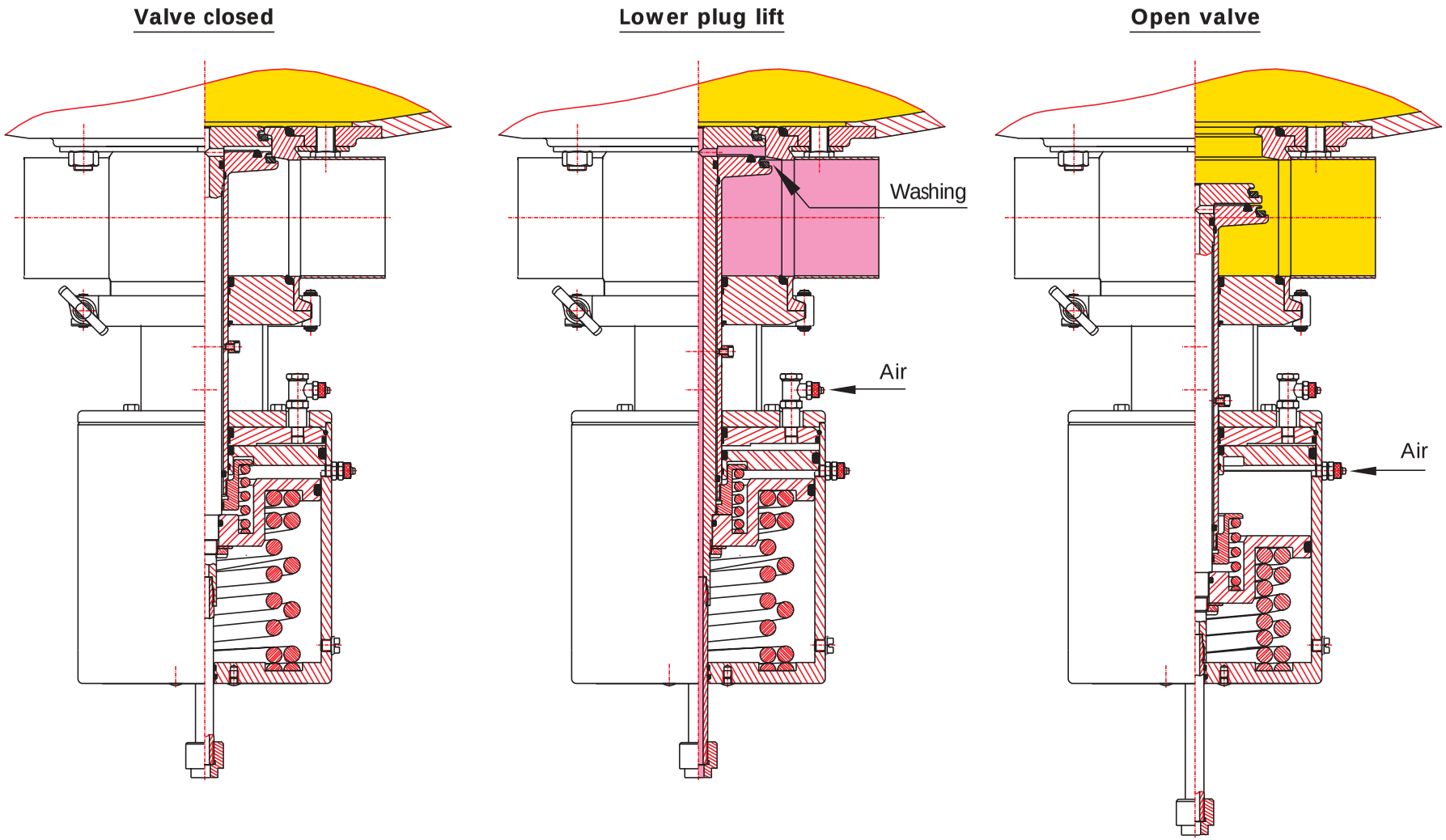
The tank bottom VDCI has similar characteristics to standard VDCI double block and bleed valves (floating seal, extra-thick body, strength, etc.), except for resistance to waterhammer. Thanks to the special shape of the plugs, a seal is formed tight up to the tank bottom. The leakage indicator is located on top of the actuator in this case. It also allows the air space to be washed by activating the lower plug (and possibly the upper plug).

The tank mixproof valve is designed on the standard VDCI model. A thick weld-on lip flange holds the spherical T or L body and screwed sectors provide angular orientation of the valve ends.

As the single air space crosses the entire lower plug, any flow can quickly be spotted. The break-away actuator is used to clean the air space and plug bearing surface during in-line washing operations. The design does not allow the usual units to be mounted on top of the actuator - only a lantern or stainless steel bracket-mounted detector can be fitted. The control solenoid valves are grouped together in this case. Several mixproof valves can be used on the same tank bottom panel to carry out a number of functions at the same time.

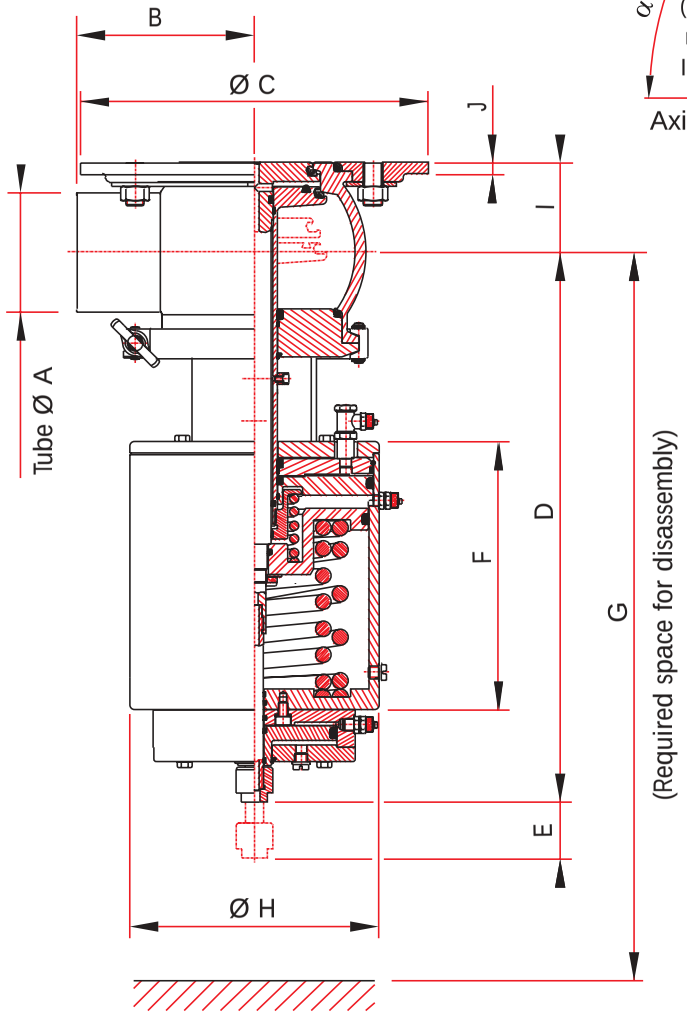
This mixproof valve can also be fitted with a steam bearing to sterilise the stem.

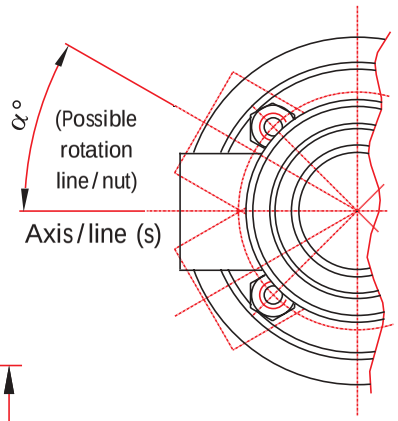
Fluids circulation (washing line)



VDCI FdC tank bottom mixproof valve dimensions

VDCI FdC valve



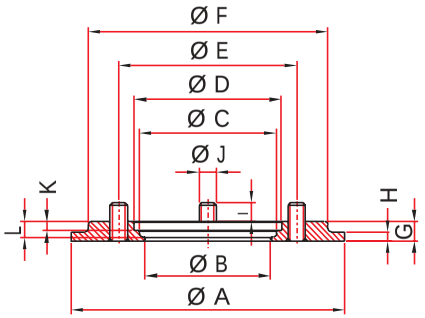


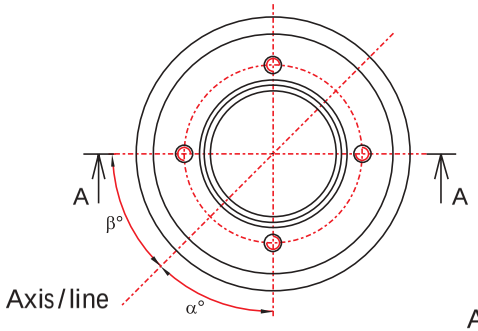
Partial bottom view body/flange

VDCI FdC flange

DN 51

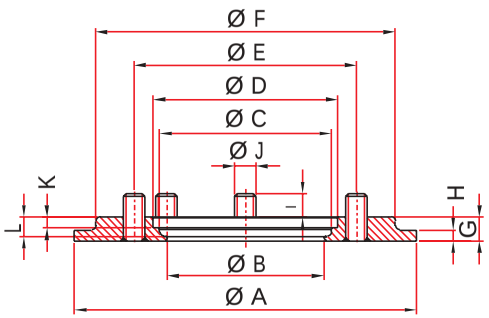
VIEW A-A

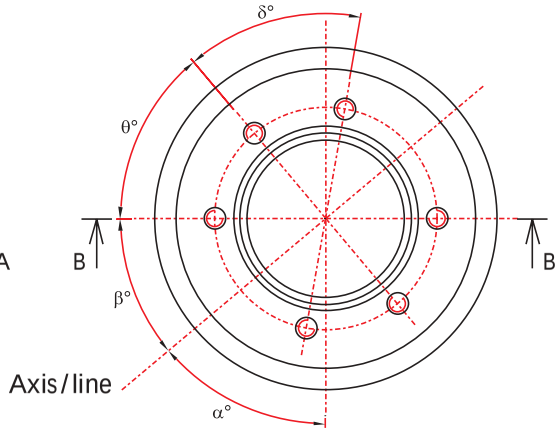




DN 63 to 104

VIEW B-B





VDCI FdC tank bottom mixproof valve dimensions

VDCI FdC valve

DN			Tube Ø A	B	Ø C	D	Stroke E	F	G	Ø H	I	J	α°	Weight in kg
SMS	DIN	US												
51			51 x 1,25	105	178	363	34	179	465	128	49	8	30°	20
		2"	50,8 x 1,65	105	178	363	34	179	465	128	49	8	30°	20
	50		53 x 1,5	105	178	363	34	179	465	128	49	8	30°	20
63			63,5 x 1,6	130	198	406	40	204	520	167	58	8	31°	35
		2" 1/2	63,5 x 1,65	130	198	406	40	204	520	167	58	8	31°	35
	65		70 x 2	130	198	408	40	204	530	167	61	8	30°	40
76			76 x 2	130	198	413	40	204	540	167	64	8	26°	40
		3"	76 x 1,65	130	198	413	40	204	540	167	64	8	26°	40
	80		85 x 2	155	268	461	49	234	625	218	68	10	23°	66
		4"	101,6 x 2,1	155	268	471	49	234	635	218	78	10	21°	75
104	100		104 x 2	155	268	471	49	234	635	218	78	10	21°	75

VDCI FdC flange

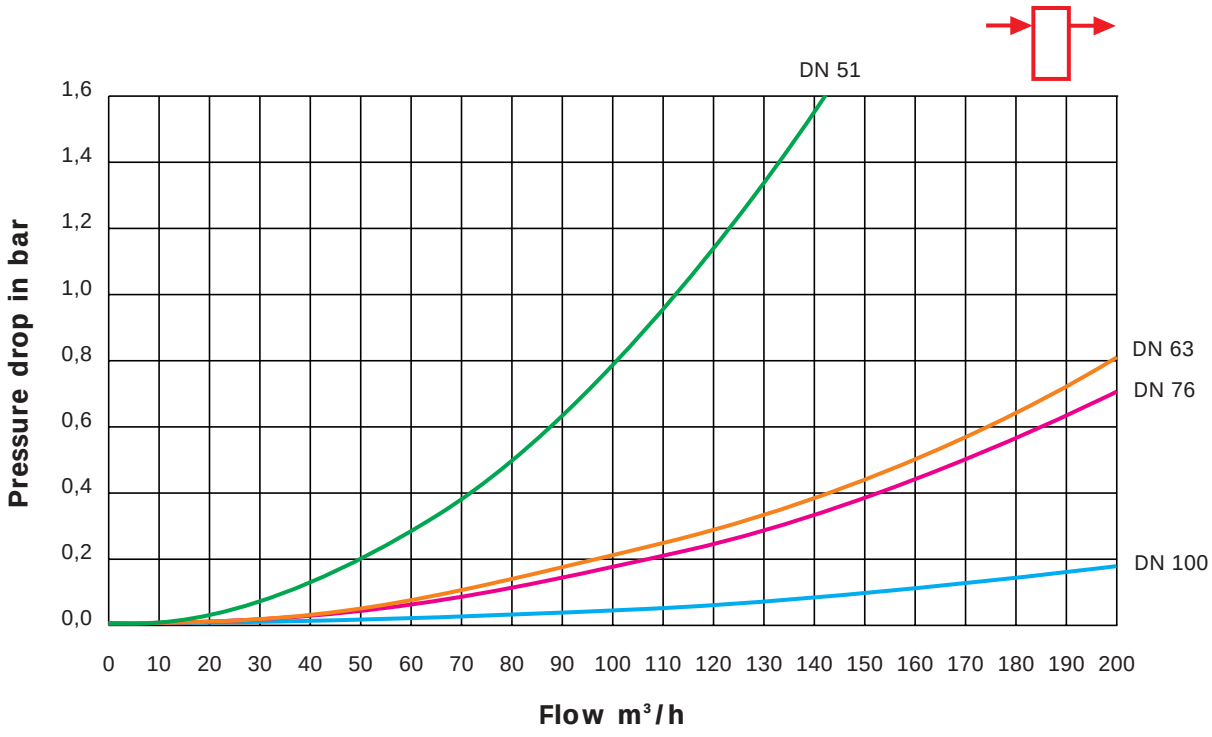
DN			Ø A	Ø B	Ø C	Ø D	Ø E	Ø F	G	H	I	Ø J	K	L	α°	β°	θ°	δ°
SMS	DIN	US																
51	50	2"	178,25 ±0,25	74 ±0,1	81	100,2 ±0,05	122	152	14 ±0,1	8	12	M10	8 ±0,1	12 ±0,1	45°	45°		
63		2" 1/2	198,25 ±0,25	106 ±0,1	113	123,2 ±0,05	145	175	16 ±0,1	8	14	M10	10 ±0,1	14 ±0,1	45°	45°	45°	45°
	65		198,25 ±0,25	106 ±0,1	113	123,2 ±0,05	145	175	16 ±0,1	8	14	M10	10 ±0,1	14 ±0,1	45°	45°	45°	45°
76		3"	198,25 ±0,25	106 ±0,1	113	123,2 ±0,05	145	175	16 ±0,1	8	14	M10	10 ±0,1	14 ±0,1	45°	45°	45°	45°
	80		267,85 ±0,15	146 ±0,1	155,2	184,2 ±0,05	208	245	17 ±0,1	10	16	M12	8,5 ±0,1	14 ±0,1	50°	40°	50°	50°
100	104	4"	267,85 ±0,15	146 ±0,1	155,2	184,2 ±0,05	208	245	17 ±0,1	10	16	M12	8,5 ±0,1	14 ±0,1	50°	40°	50°	50°

VDCI FdC tank bottom mixproof valve working conditions

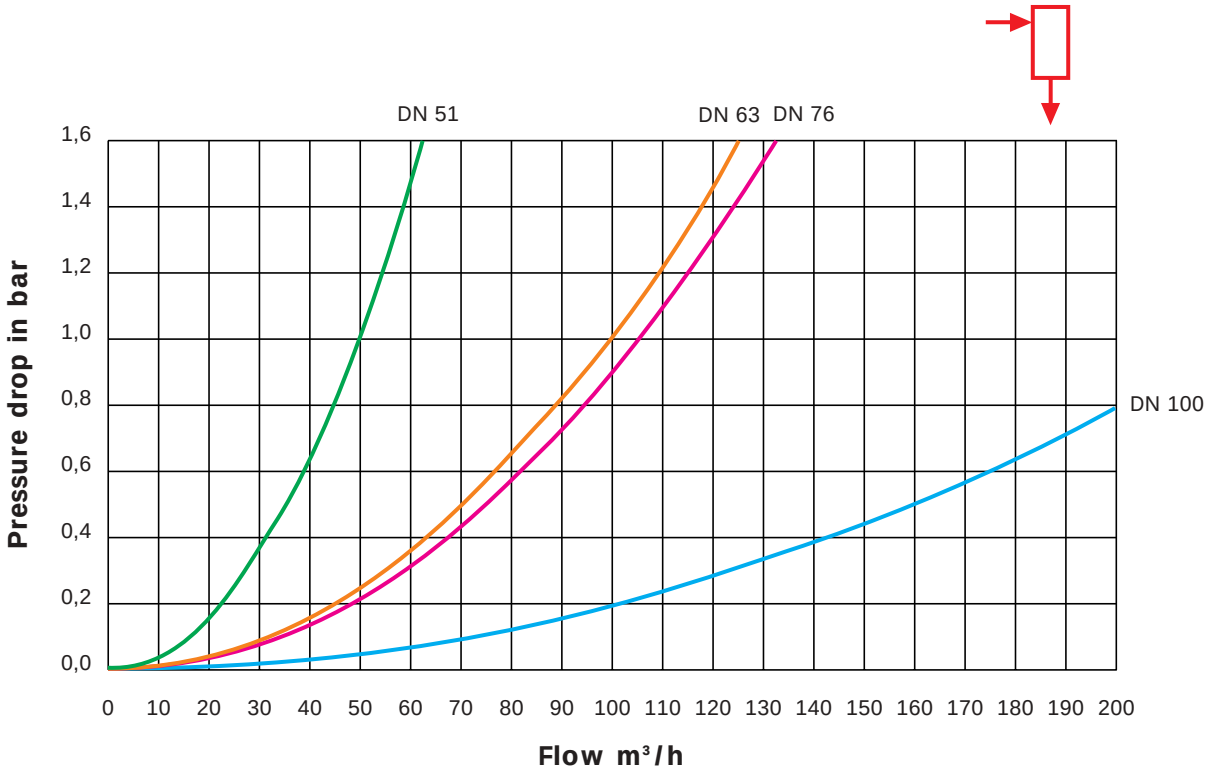
DN			Pressure drop (Kv)	Pressure drop (Cv)	Opening time (s)	Air consumption (Nl)
SMS	DIN	US				
51	50	2"	48	55,68	4,2	2
63		2"1/2	95	110,2	9	5
	65		97	112,52	9	6
76		3"	100	116	9	6
	80		170	197,2	10,8	11
104	100	4"	215	249,4	10,8	11

FOR ALL DIAMETERS OF TANK BOTTOM MIXPROOF VALVE		
Maximum temperature: +140 °C	Minimum temperature: -5 °C	Temperature difference: 120 °C
Maximum working pressure: 4 Bar	Vacuum resistance: 0,4 cm^3/s	Maximum sealing pressure: 5 Bar
Maximum supply pressure: 8 Bar	Minimum supply pressure: 5 Bar	

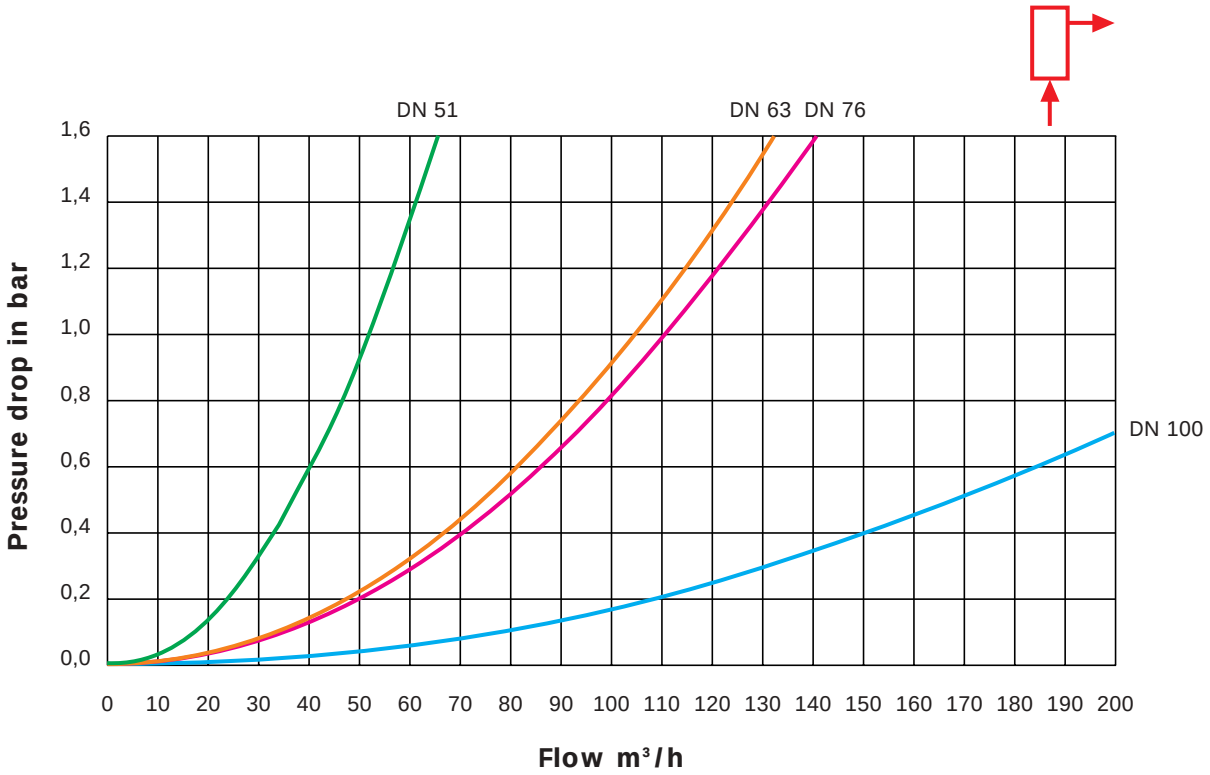
Pressure drop VDCI FdC valves upper line



Pressure drop VDCI FdC valve upper → lower line



Pressure drop VDCI FdC valve lower → upper line

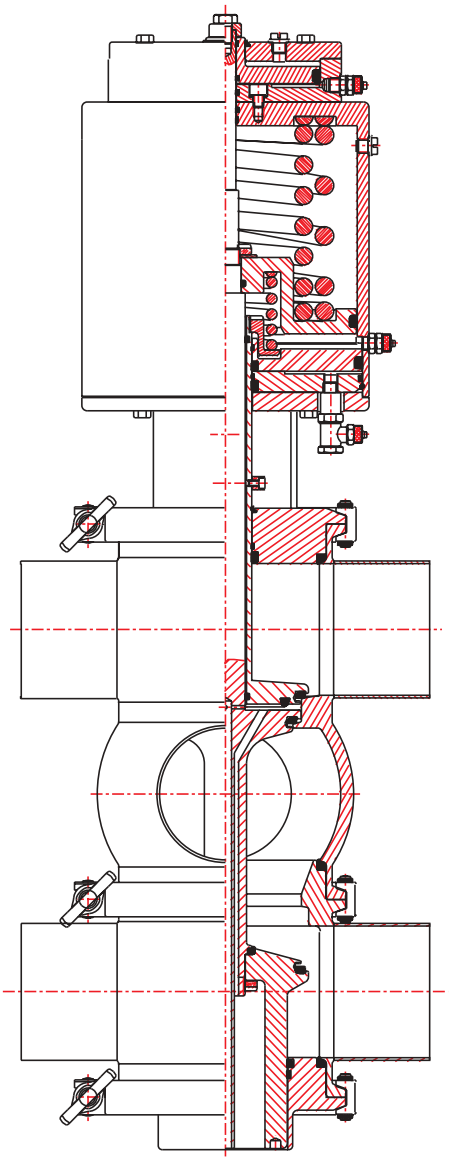


VDCI mixproof valve
3 bodies

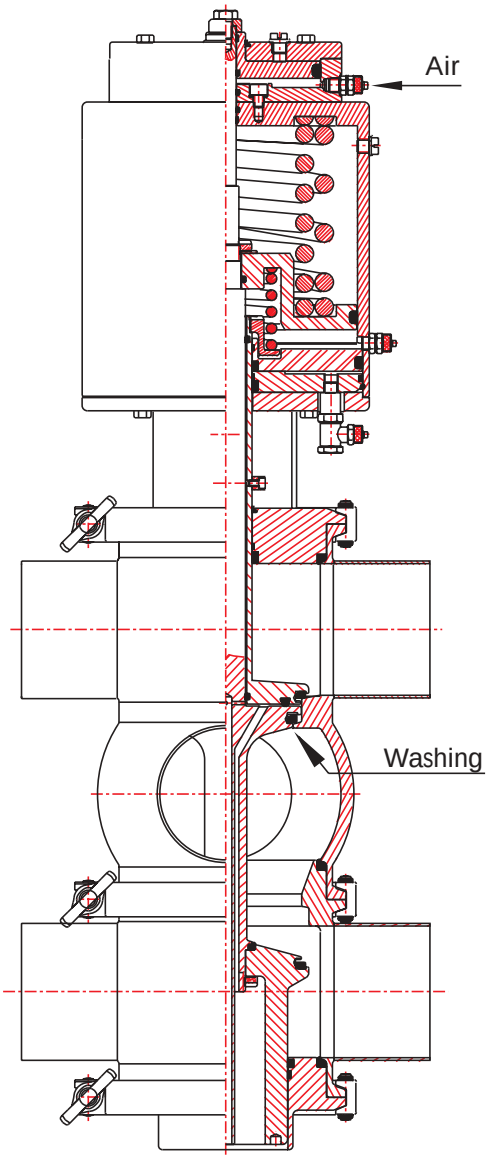
Design

The standard VDCI mixproof valve is essentially a shut-off valve. To change the direction of flow, Definox produces a double shut-off valve with upper shut-off function being performed by a double plug. This valve directs the liquid either to the upper body or the lower body. The double seal function is provided between the upper body and the centre body.

Valve closed
Upper line closed
Lower lines open



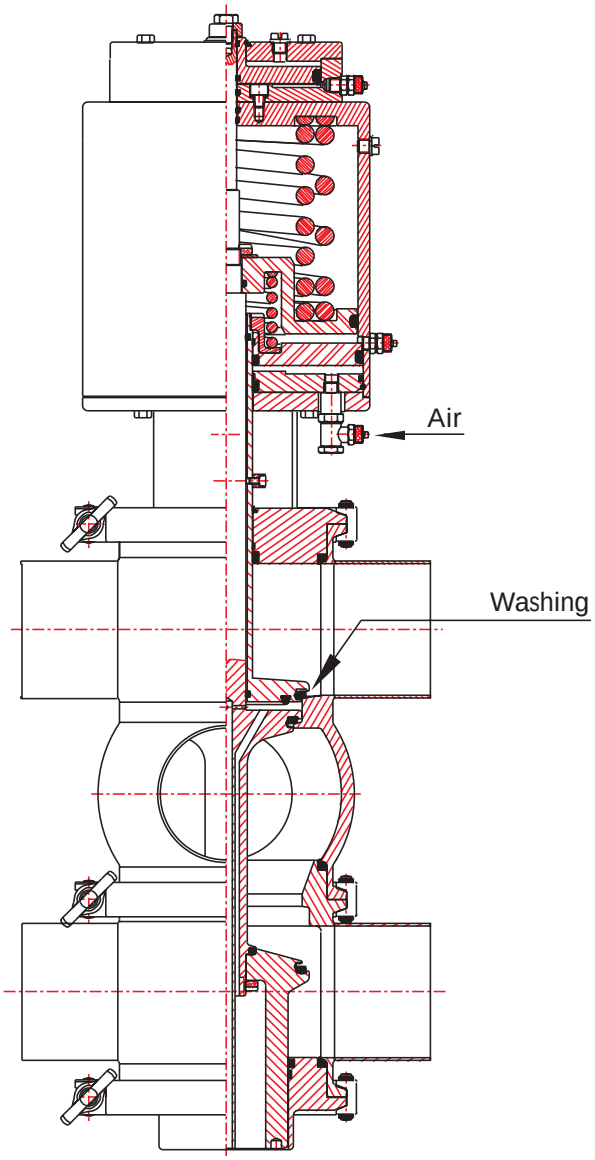
Lower plug lift



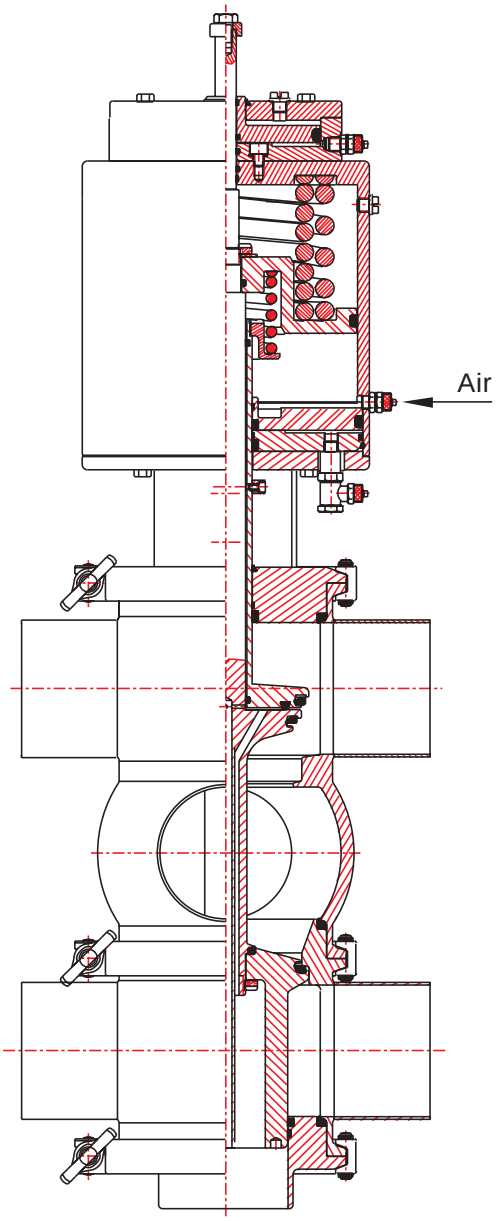
VDCI mixproof valve 3 bodies

This valve retains the general characteristics of the standard mixproof valve, particularly the possibility of activating the upper shut-off plugs. The pressure holding capacity is modified.

Upper plug lift



Valve open
Upper lines open
Lower line closed



VDCI SP mixproof valve leak free opening type

Design

Like the standard VDCI mixproof valve, the VDCI SP allows the two plugs to be operated independently to clean the air space and the seal bearing surfaces. The sliding seal on the bottom plug provides a total seal when the valve is operated, preventing product loss on opening.

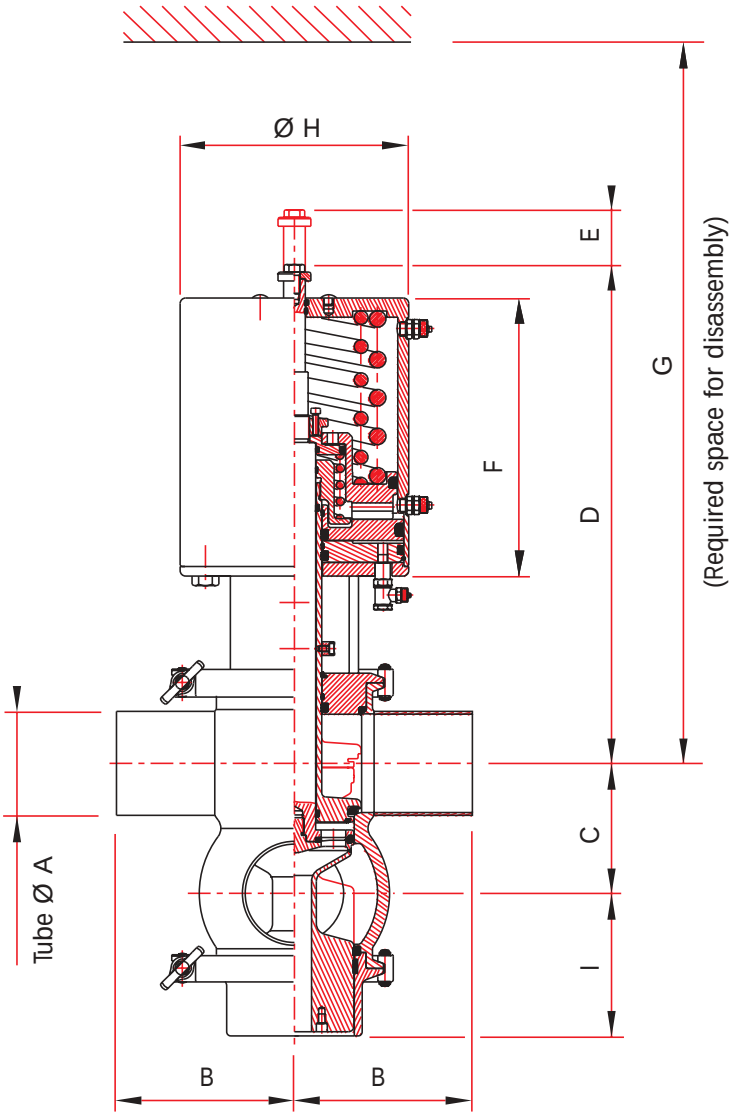
Working conditions

DN			Pressure drop (Kv)	Pressure drop (Cv)	Opening time (s)	Air consumption (Nl)
SMS	DIN	US				
38		1"1/2	46	53,36	4,2	2
51	50	2"	52	60,32	4,2	2
63		2"1/2	102	118,32	9	5
	65		104	120,64	9	6
76		3"	105	121,8	9	6
	80		180	208,8	10,8	11
104	100	4"	230	266,8	10,8	11

FOR ALL DIAMETERS OF VDCI SP MIXPROOF VALVE		
Maximum temperature: +100 °C	Minimum temperature: 0 °C	Temperature difference: 90 °C
Maximum working pressure: 10 Bar	Vacuum resistance: 0,7 cm^3/s	Maximum sealing pressure: 12 Bar
Maximum supply pressure: 8 Bar	Minimum supply pressure: 5 Bar	

VDCI SP mixproof valve
leak free opening type

Dimensions

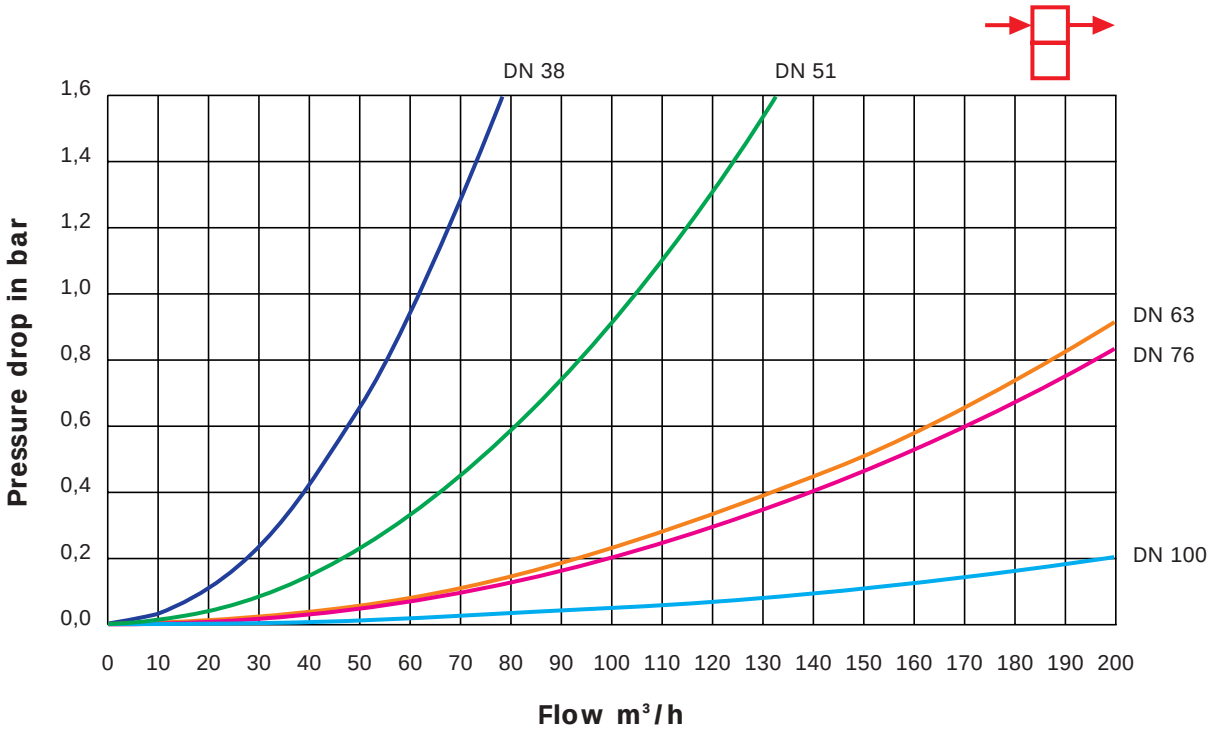


DN			Tube Ø A	B	C	D	E	F	G	Ø H	I	Weight in kg*
SMS	DIN	US										
38			38 x 1,2	105	57	314	29	179	495	128	76	18
		1"1/2	38,1 x 1,65	105	57	314	29	179	495	128	76	18
	40		40 x 1	105	57	314	29	179	495	128	76	18
51			51 x 1,25	105	70	320	38	179	525	128	82	19
		2"	50,8 x 1,65	105	70	320	38	179	525	128	82	19
	50		53 x 1,5	105	70	320	38	179	525	128	82	19
63			63,5 x 1,6	130	85	359	40	204	600	167	98	28
		2"1/2	63,5 x 1,65	130	85	359	40	204	600	167	98	28
	65		70 x 2	130	90	362	40	204	605	167	100	30
76			76 x 2	130	95	365	40	204	625	167	104	33
		3"	76 x 1,65	130	95	365	40	204	625	167	104	33
	80		85 x 2	130	110	365	47	204	648	167	115	61
		4"	101,6 x 2,1	155	125	416	50	234	750	218	127	70
104	100		104 x 2	155	125	416	50	234	750	218	127	70
	125		129 x 2	200	155	525	76	310	925	270	167	110
		6"	152,4 x 2,75	200	180	540	76	310	1000	270	180	120
	150		154 x 2	200	180	540	76	310	1000	270	180	120

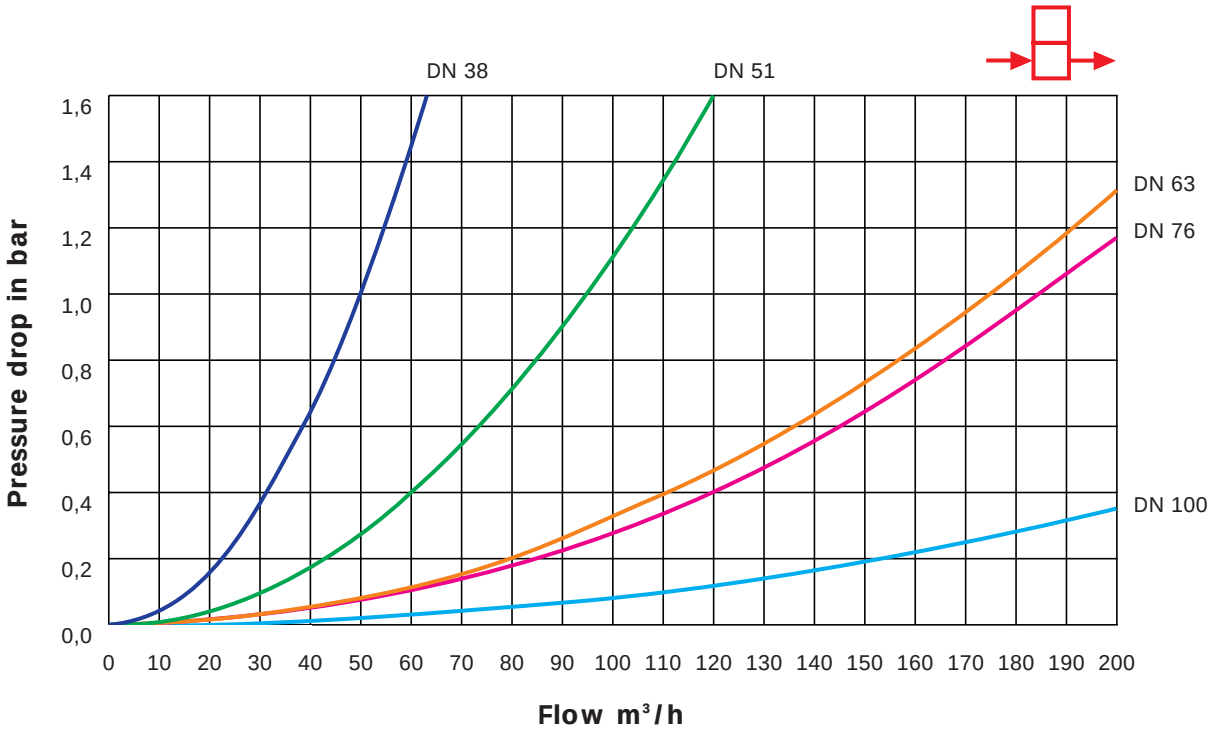
* Without control unit

VDCI SP mixproof valve
leak free opening type

Pressure drop VDCI SP valve upper line

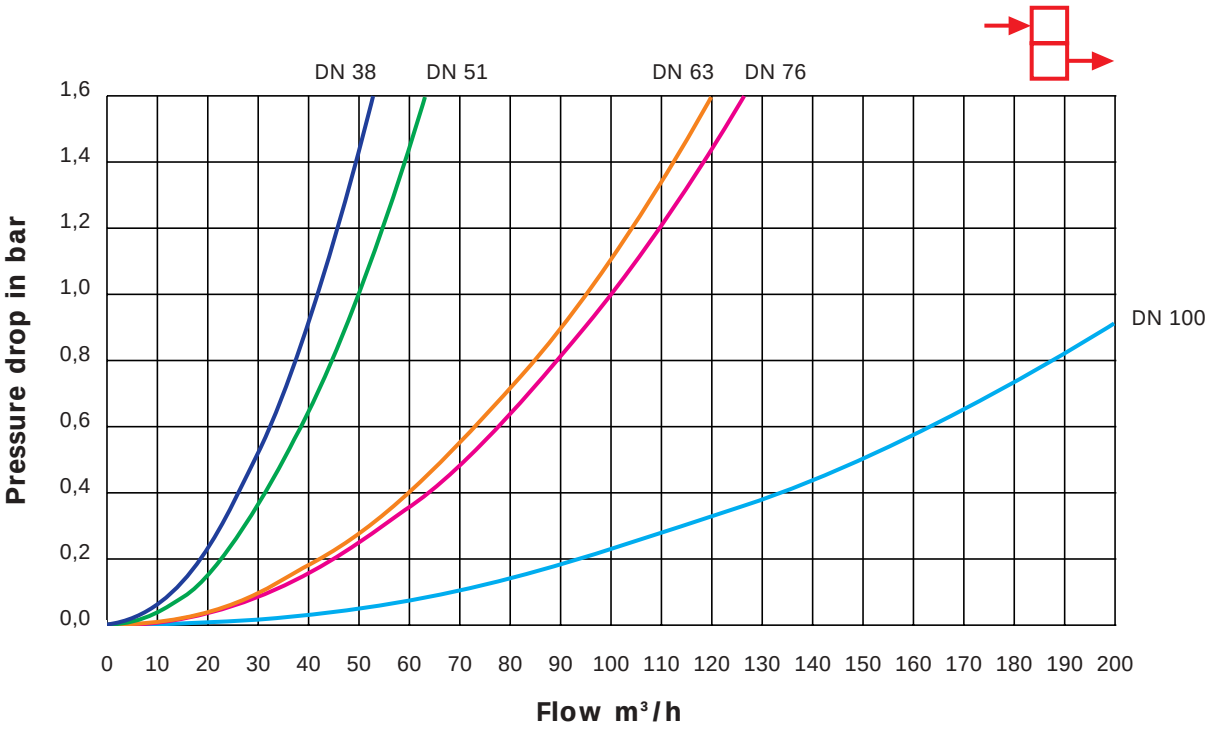


Pressure drop VDCI SP valve lower line

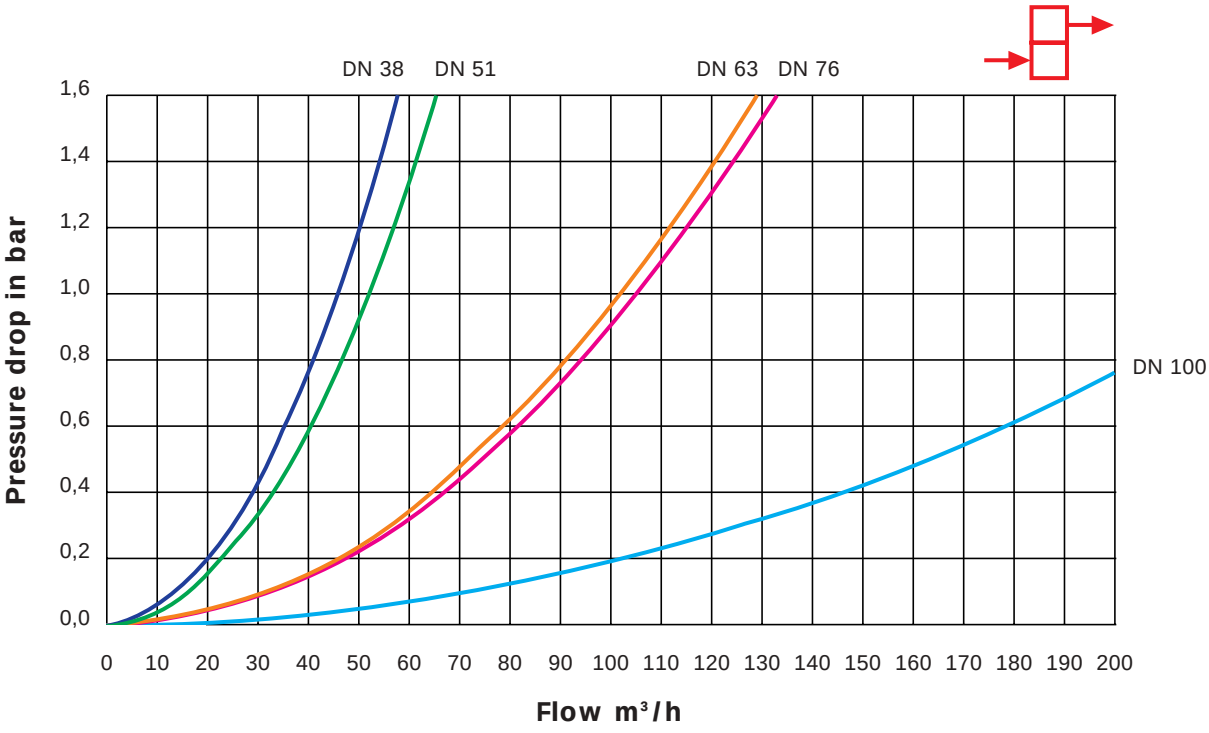


VDCI SP mixproof valve
leak free opening type

Pressure drop VDCI SP valve upper → lower line



Pressure drop VDCI SP valve lower → upper line



VDCI PMO mixproof valve

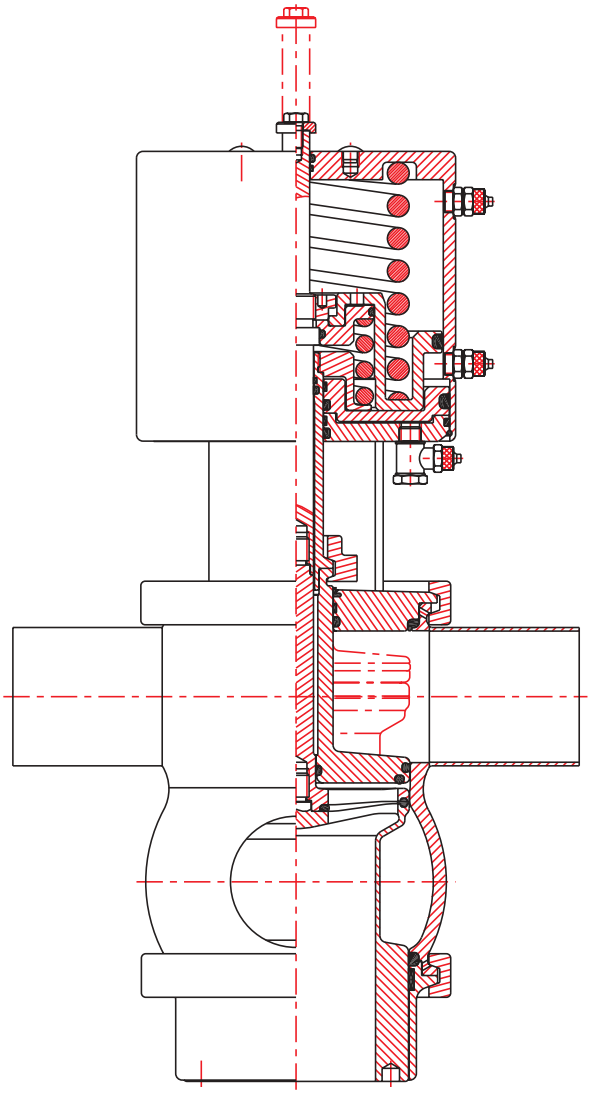
Design

In order to meet the particular standards of certain organizations (the FDA, for instance), DEFINOX has produced a PMO (Pasteurised Milk Ordinance) version.

It basically differs from the standard mixproof valve by a leakage section identical to the one on the process branch pipe. This requires a modification to its dimensional characteristics.

Note: The standard signal-back equipment on this model may be complemented by a device to detect that the plugs are raised during air space washing operations.

This valve retains the working conditions of the standard mixproof valve.



Standard signal back equipment suitable for VDCI - VDCI SP mixproof valves

Model	Signal back equipment & Fixing device	Components						Remarks
		Switch or Contact		Solenoid valve		Electronic		
		Reference	Characteristics	Reference	Characteristics	Reference	Characteristics	
Bracket	M18 switch on lantern (M 12 on request)	7007906 7007911 7007949 (M12)	PNP 10 - 36 V DC 20 - 250 V AC/DC PNP 10 - 36 V DC		None		None	1 or 2 switch(es) assembled Moulded cable: Lg 6 m
Classic control unit	***Figure 4*** Ø 130 control unit H: 120 fixed on the actuator st. st. or smoked housing for switches and 1 solenoid valve.	7007922 7007930 7007991	PNP 10 - 36 V DC 20 - 250 V AC/DC NAMUR	7007943 7007944 7007947 7007948	24 V AC/DC 2,5 W 48 V AC/DC 2,5 W 110 V AC 2,5 VA 220 V AC 2,5 VA		None	1 or 2 switch(es) assembled as well as 1 solenoid valve 3/2
	Figure 9 Ø 130 control unit H: 120 fixed on the actuator st. st. or smoked housing for switches and 1 to 3 solenoid valve(s).	7007922 7007930	PNP 10 - 36 V DC 20 - 250 V AC/DC	7009018 7009020 7009023 7009024	24 V DC* 24 V DC 48 V AC 110 V AC		None	1 or 2 switch(es) assembled as well as 1 to 3 solenoid valve(s)
Classic control unit sale stopped	Ø 170 control unit H: 230 fixed on the actuator st. st. or smoked housing for switches and 1 to 3 solenoid valve(s).	7007922 7007930	PNP 10 - 36 V DC 20 - 250 V AC/DC	7007952 7007953 7007958 7008969 7008919	Pneumatic interface 24 V DC 24 V AC 48 V AC 110 V AC		None	1 or 2 switch(es) assembled as well as 1 to 3 pneumatic modules
DN 130 control unit AS-i link	***Figure 8*** Ø 130 control unit H: 110 fixed on the actuator st. st. or smoked housing for switches, 1 solenoid valve and AS-I module	7008045	Prismatic switch	7810504 7007952	Pilot & Interface	7707999 7010015	AS-i module with link cable and vampire connector	1 or 2 switch(es) assembled and 1 solenoid valve
	Figure 10 Ø130 control unit H: 110 fixed on the actuator st. st. or smoked housing for switches, 2 to 3 solenoid valves & AS- i module	7008045	Prismatic switch 10 - 36 V DC	7009018 7009020	24 V DC* 24 V DC	7708001 7010015	AS-i module with link cable and vampire connector	1 or 2 switch(es) assembled as well as 2 to 3 solenoid valve(s)

* Lockable
(main actuator)

Standard signal back equipment suitable

for VDCI - VDCI SP mixproof valves

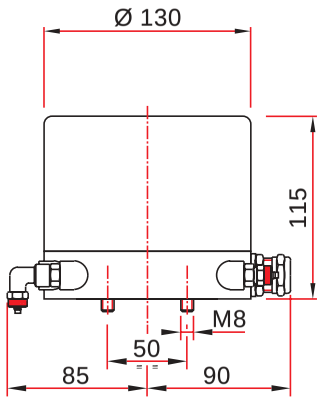
Photos and drawings of the figures mentioned on the data sheet

Fig. 4: Ø 130 control unit

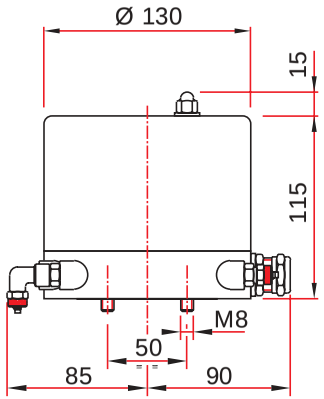
Fig. 8: Ø 130 control unit

Fig. 9: Ø 130 control unit

Fig. 10: Ø 130 control unit



Ø 130 standard control unit smoked housing



Ø 130 standard control unit st. st. housing

DEFINOX

Standard signal back equipment suitable for VDCI FdC tank bottom mixproof valves

Photos and drawings of the figures mentioned on the data sheet

Classic control box

AS-i link

Model	Signal back equipment & Fixing device	Components						Remarks
		Switch or Contact		Solenoid valve		Electronic		
		Reference	Characteristics	Reference	Characteristics	Reference	Characteristics	
Classic control unit	M18 switch on lantern (M 12 on request) Solenoid valve in a separate plastic or stainless steel box	7007906 7007911 7007949 (M12)	PNP 10 - 36 V DC 20 - 250 V AC/DC PNP 10 - 36 V DC	7007952 7007953 7007958 7008969 7008919	Pneumatic interface 24 V DC 24 V AC 48 V AC 110 V AC		None	Cabinet on wall or fixed onto the valve, 1 or 2 switch(es) assembled, as well as 1 to 3 pneumatic modules
AS-i link	M18 switch on lantern (M 12 on request) Solenoid valve in a separate plastic or stainless steel box	7007906 7007949 (M12)	PNP 10 - 36 V DC PNP 10 - 36 V DC	7008094 7008095	AS-i airbox Base for AS-i module		AS-i module with gland for AS-i cable	Cabinet on wall or fixed onto the valve, 1 or 3 solenoid valves assembled. Pneumatic links between actuators and cabinet

VDCI mixproof valve signal back equipment

The choice of signal back equipment depends on the functions to be performed.

Remarks regarding the standard signal back equipment

1 - On request, we can fit Eex microcontacts or Namur pneumatic switches in control units for explosive environments.

2 - Specific detection devices can be studied (lantern detection).

3 - The supply of a control unit includes the entry gland, wiring to the electric components terminal strip and the 4/6 or 6/8 (DN 80 to DN 150) pneumatic hose from the unit to the actuator.

4 - Standard signal-back equipment can also be complemented by the following accessories:

- rapid air release
- stainless steel or semi-rigid wiring
- stainless steel air connection
- etc…

Note : The VDCI leak free opening type and the VDCI 3 bodies are like the standard one.

AS-i network

The AS-i network provides a reliable, cost-effective valve networking solution.

An AS-i module installed in each of the signal back units allows the control of all pneumatic functions on DEFINOX valves (valve opening and closing, stroke of the plugs…) and read the information sent by the opening and closing sensors, via the AS-i network.

Advantages of the AS-i network

- Open standard.
- Quick and easy to install and put into operation.
- Quick to wire up due to the use of “vampire” connectors and a non-shielded two-core cable.
- Free topology.
- Several AS-i masters available (PLC couplers or Profibus-DP, Device-Net, Interbus-S, WorldFip, Modbus, Modbus-Plus or other gateways).
- Max. 62 nodes on AS-i network distributed over 100 m of cable (300 m with repeaters).
- Cycle time : approx. 5ms for 31 nodes and 10 ms for 62 nodes.
- Transmission error control mechanisms.
- Extension possibilities.