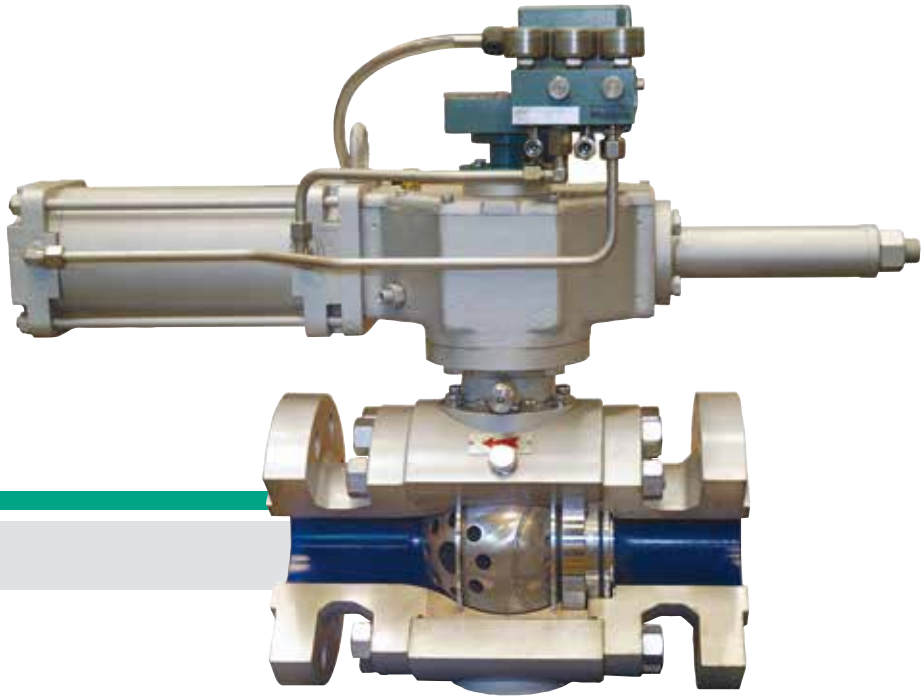
Pietro Fiorentini



Deltaflux

Control Ball Valves

DELTAFLUX - Control Ball Valves

Introduction

Deltaflux control ball valves is an ideal solution for all fluid control applications where high differential pressure or great flow rates are involved.
The refined design of the quarter turn trim allows offering simultaneously high flow rate coefficients (Cv) and minimum pressure drops in fully open position, thus creating a unique combination of capacity and rangeability.
Thanks to its versatility and to the available range, Deltaflux is the ideal solution for all special applications, as well as for use at high and low temperatures, and in aggressive environments.
Considering its features, **Deltaflux** is the ideal primary element for ESD (Emergency Shut Down) and HIPPS (High Integrity Pipeline Protection System) systems.

Deltaflux control ball valves are equipped with special regulating trims making it suitable for applications involving gases or liquids. Moreover, the trim is studied in order to hinder the formation of dirt deposits inside the same.

The trim configuration and the special geometries of **Deltaflux** allow attaining a high rangeability; moreover, they avoid overpressure within the valve body, thus obtaining a high noise reduction and a longer life-cycle of the sealing parts.

Deltaflux valves are a “Bolted body” project, thus they are easily maintainable. Sealing parts are interchangeable: Moreover, assembling of any kind of controls and accessories is quite easy.

Deltaflux valves, in their standard version, have been developed for a design temperature ranging from -29°C and + 121°C and for a storage temperature ranging from - 40 and + 60°C.

Deltaflux control ball valves are available up to a 48” diameter, thus allowing regulating also great fluid flow rates.

Fields of application:

- **Natural gas industry**
- **Energy**
- **Petrochemical industry**
- **Water transport**

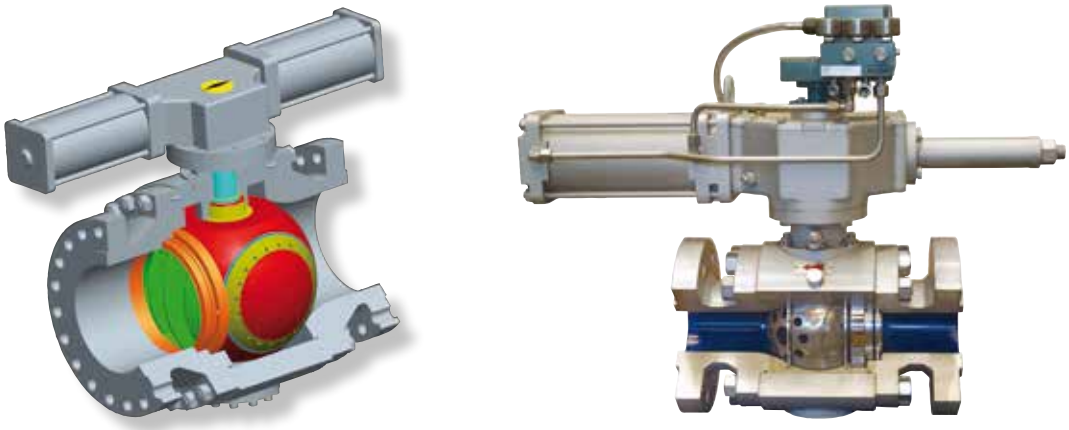


Fig.1 **DELTAFLUX** - From design to realization

Product range

Deltaflux valves are control ball valves equipped with quarter turn trim, which allows attaining a unique solution for those applications involving great fluid flow rates. **Deltaflux** valves can be used within systems controlling the flow rate or pressure on pipelines, limiting the flow rate at LNG terminal output, controlling the pressure on primary reduction plants or, thanks to the limited pressure drops involved, as control element on ESD and HIPPS emergency systems.

The wide range of materials and trims, both standard and customized, as well as of pneumatic, electric and electro-pneumatic actuators, allows selecting of specific control ball valves for each application.

Fig.2 **DELTAFLUX** - Control ball valves

DESIGNED TO MEET ALL NEEDS

- **HIGH CAPACITY**
- **RANGEABILITY RATIO (200:1)**
- **LOW NOISE LEVEL**
- **USE VERSATILITY**
- **METAL TO METAL TIGHTNESS**
- **HIGH PRESSURE DROP**

High integrity pressure protection system

Deltaflux valves, thanks to its special customized design can be used for HIPPS system for both gas and liquid medium. In this applications it is requested a quick closure time (t < 3 sec) avoiding damages for the water hammer effects on the valves or on the plant.

Thanks to **DELTAFLUX** valves it is possible to re-open the flow after the shut off in a way that can grant a modular re-pressurization of the downstream pipe to protect all the instrumentation. This can be reached without the use of a by-pass.
DELTAFLUX valves are complete of PFD (Probability of Failure on Demand) Assessment Report – SIL 3.

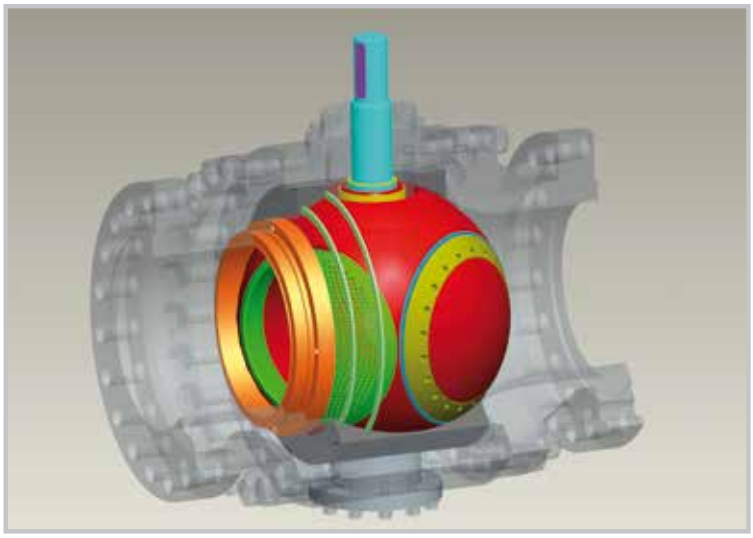


Fig.3 **DELTAFLUX** - Three-dimensional model

Features

Materials: **

Body:	ASTM A 350 LF2
Bonnet:	ASTM A350 LF2
Bolts & Nuts:	ASTM A193 – B7 ASTM A194 – 2H
Seat:	AISI 410 + TUNGSTEN CARBIDE
Ball:	ASTM A350 LF2/AISI 410 + TUNGSTEN CARBIDE
Stem:	Steel UNS 17400
Control trim:	S235JR + ENP 20µm/ASTM A350 LF2 + ENP 20µm
Seals:	Nitrile – Viton

Reference Standard

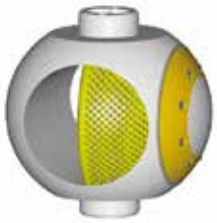
ASME B16.34	Rating according to ASME B16.34 (ANSI 150, 300, 600, 900, 1500);
API 6D	End to end dimension according to API 6D;
ASME B16.5	End flanges according to ASME B16.5, B16.47;
FCI 70-2-2003	Tightness class FCI 70-2;
NACE	NACE MR0175

REMARK: ** The materials indicated above refer to the standard models.
Different materials can be provided according to specific needs.

Control applications for gases and liquids

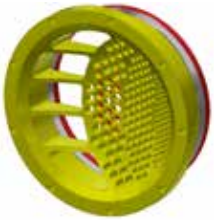
The need to transfer large flow rates with minimal pressure drops on the control ball valves requires a combination of wide capacity and high rangeability.
Valves with a quarter turn trim are characterized by a high capacity associated to a relevant recovery.
Within the framework of typical pressure reduction applications, high recovery results in conditions of critical heads, high speed and, consequently, noise associated to different nature problems.
Deltaflux valve is equipped with trims characterized by a low recovery factor, thus offering the optimal solution to such problems also under conditions of high differential pressures.
Deltaflux valve can be used also to control liquids.

Thanks to a special trim, it remarkably reduces negative effects of cavitation, such as the tear of surfaces close to the involved area, and the emission of noise typical of this phenomenon.



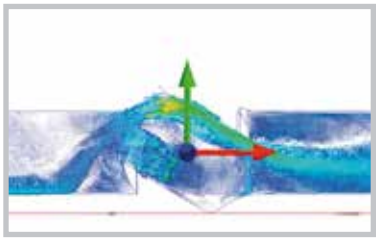
Trim 1 - Application for gas

Trim 2 - Application for liquids



Trim 3 - Generic applications

Fig.4 **DELTAFLUX** - Trim version



Example of analyzed fluid

Glossary

Whenever the static pressure, somewhere inside the valve, is less than or equal to the vapor pressure of the liquid, the fluid evaporates locally and vapor bubbles form in these areas.
These bubbles subsequently collapse, imploding when they pass downstream in an area of higher static pressure.
This phenomenon causes a noise frequently described as a sound similar to what could be heard if stones were present in the fluid.
Cavitation is accompanied by erosive effects that can quickly damage the parts involved.

One-way & two-way

Standard **Deltaflux** valves are available in both the one-way and two-way version.
The standard version is one-way and assures a tightness class V according to FCI 70-2 in the flow direction.
In the two-way version, the valve, equipped with specific seal for each flow direction, assures a tightness class V in the main flow direction and a tightness class IV for the reverse flow.

Fig.5 **DELTAFLUX** - Flow direction

Pneumatic actuators

Deltaflux control ball valves can be driven by pneumatic actuators.
Pneumatic actuators can be supplied with both simple action and double action, for any valve size. Moreover, they can be equipped with accessories able to meet any application or request requirements.

Electric actuators

Deltaflux control ball valves can be driven also by electric actuators.
The electric actuators used are available in both the multi-revolution and modulating version; both versions are characterized by all those features making them easy to use both locally and remotely.

Note

Each accessory is available upon customer's request for all valve sizes and configurations.
Moreover, it is possible to customize the production or develop solutions requested by the customer.
Always refer to Pietro Fiorentini S.p.A. for any explanation or feasibility study.

Deltaflux for regulating using a pneumatic signal

Actuator supplied with Natural Gas and driven by 4-20 mA signal.
In this configuration, Deltaflux control ball valves is characterized by the use of the electro-pneumatic positioner, installed on the Double Action Pneumatic control.
The positioner works in modulating mode thanks to the electric control signal (4-20 mA) coming from a pulse generator.
The electro-pneumatic positioner is in charge of assuring an excellent proportionality between the electro-pneumatic control signal feeding the valve and the actuator stroke.
The system can consists also of a reduction panel, equipped with filter and pressure reduction unit, to feed the electro-pneumatic positioner.
Moreover, it is possible to install also an anti-freeze pressure regulator directly on the main line (for applications using natural gas).
The system can be feed with both instrument air and line natural gas.

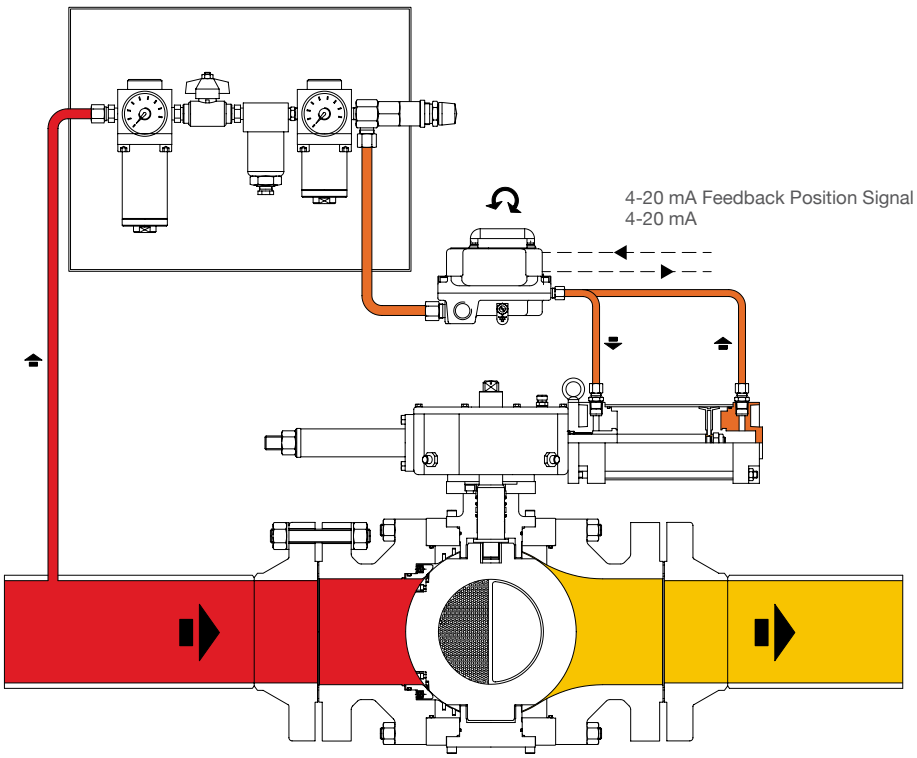


Fig.6 **DELTAFLUX** - Layout of a gas application

Deltaflux for regulating using a pneumatic signal

Actuator supplied with Natural gas and driven by pneumatic controller.
In this configuration, Deltaflux control ball valves, thanks to the use of an instrument suitable to control variables such as the pressure of liquids or gases, is able to compare the fluid pressure measured value with the set-point value.
The comparison between the two quantities generates a standard modulating signal of 3-15 psi that in its turn controls the pneumatic positioner assuring an excellent proportionality between the pneumatic signal feeding the valve and the actuator stroke.

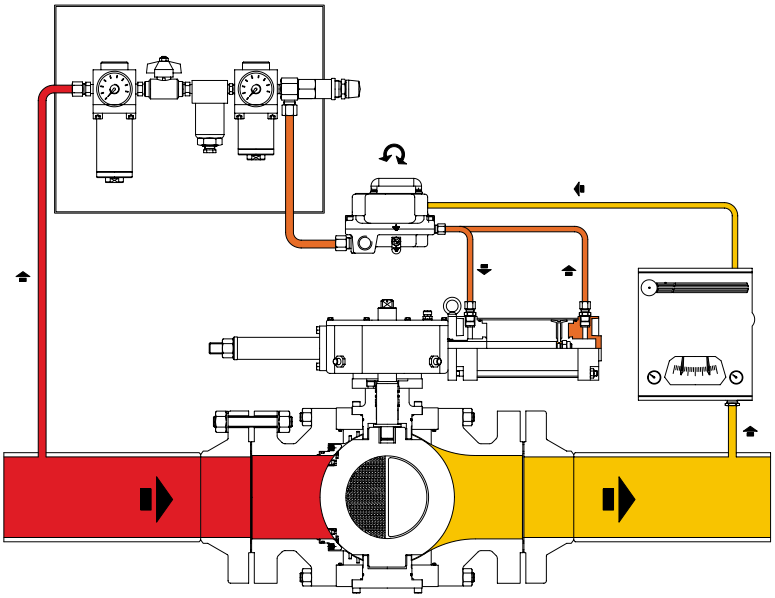


Fig.7 **DELTAFLUX** - Layout of a gas application

Deltaflux for regulating using a pneumatic signal and a Shut Off system

It is possible to install a safety device (line off), which immediately blocks gas flow, when due to a fault downstream pressure increases and reaches the maximum pre-set value for its operation.
Otherwise, the device can be enabled also manually by bringing Deltaflux valve immediately to closed (shut off) position thanks to the pneumatic control by simple action (fail to close).

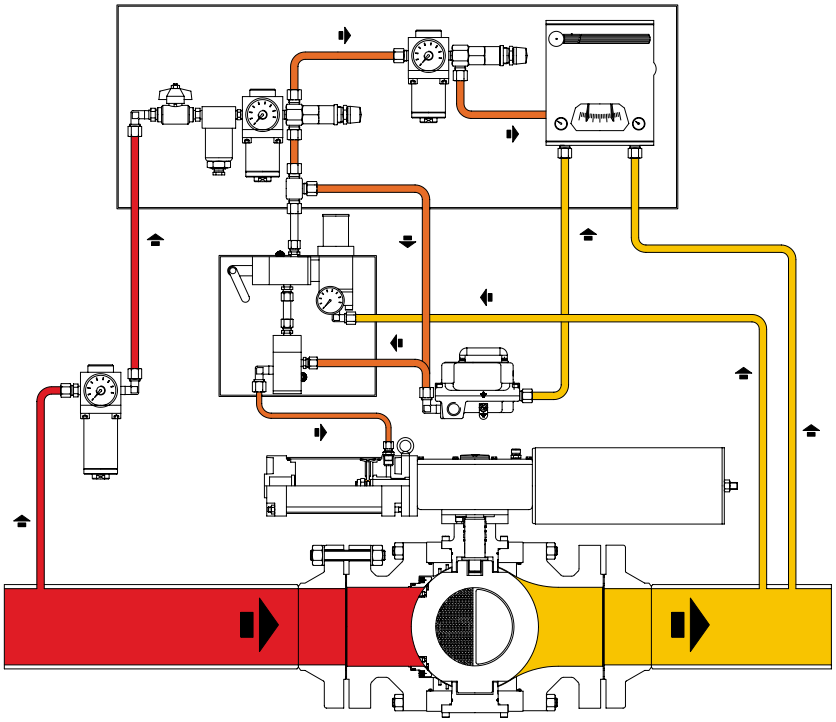


Fig.8 **DELTAFLUX** - Layout of a gas application

Deltaflux for regulating using a pneumatic signal and an in-line monitor

In this case, the Monitor emergency control ball valves is installed upstream of the service control ball valves, in the gas flow direction.
The monitor is an emergency control ball valves, which is in charge of taking over the main control ball valves operation, in case this latter due to an anomaly or fault allows the output pressure to reach the calibration pressure set for the monitor tripping.
The two devices are actually identical in terms of mechanical parts.
Only, the monitor has a tripping calibration higher than that of the main control ball valves.

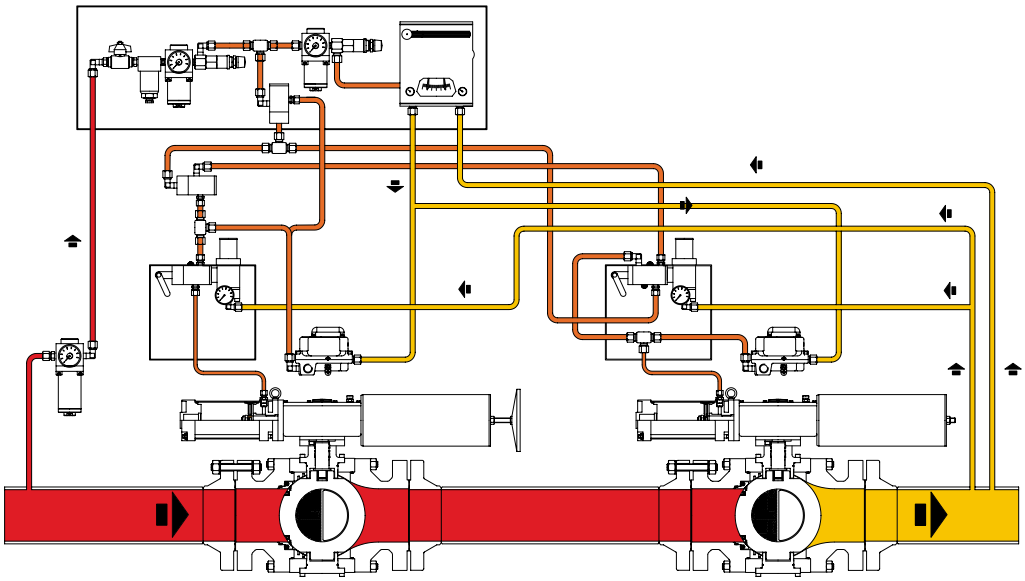
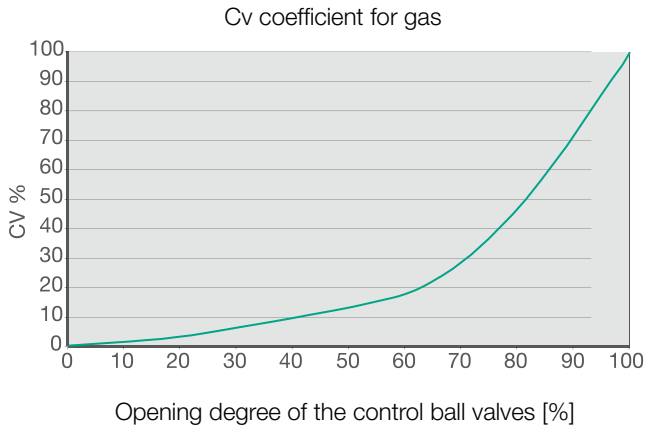


Fig.9 **DELTAFLUX** - Layout of a gas application

Flow rate coefficient

Here below there is the characteristic graphical representation of Cv of Deltaflux control ball valves.

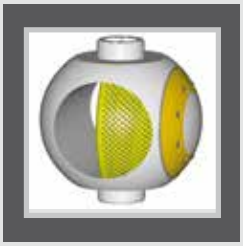


Flow rate coefficient

Given data are obtained by tests carried out both at internal laboratories and at primary international laboratories. The tables provide the Cv value at 100% of opening for each ball passage diameter.

Trim 1

Dn	Cv coefficient at 100% opening
2"	60
3"	150
4"	290
6"	650
8"	1225
10"	1975
12"	2825
14"	3475
16"	4675
18"	5950
20"	7500
24"	11100



Gas trim

Trim 2

Dn	Cv coefficient at 100% opening
2"	82
3"	215
4"	405
6"	1080
8"	1750
10"	2860
12"	3980
14"	5000
16"	6800
18"	8400
20"	10600
24"	16100

Liquid trim

Note: To verify the dimensioning and, in detail, for the dimensioning of Deltaflux control ball valves bigger than 24", always refer to Pietro Fiorentini S.p.A.

Note

Bigger sizes flow coefficients are available upon request.

This table provides the flow rate coefficient Cv, the recovery factor, and the incipient cavitation factor to be used in the formulas according to the valve opening degree.

Opening angle	Trim 1			Trim 2		
	Cv multiplier factor	Recovery factor F	Incipient cavitation factor Kc	Cv multiplier factor	Recovery factor F	Incipient cavitation factor Kc
10	0,007	0,91	0,83	0,001	0,96	0,92
15	0,023	0,91	0,83	0,005	0,96	0,92
20	0,035	0,9	0,81	0,01	0,96	0,92
30	0,071	0,89	0,79	0,03	0,96	0,92
40	0,14	0,87	0,75	0,07	0,95	0,9
50	0,23	0,84	0,7	0,125	0,94	0,87
60	0,34	0,8	0,63	0,24	0,91	0,8
70	0,47	0,74	0,51	0,42	0,84	0,64
80	0,67	0,66	0,4	0,67	0,71	0,4
90	1,00	0,55	0,55	1,00	0,55	0,25

EXAMPLE

Deltaflux control ball valve, Trim for gas, DN 12" at 30 degrees of opening angle:
Factor **Cv** = 2825 x 0,071 = 200.5
Recovery factor **F** = 0.89
Incipient cavitation factor **Kc** = 0.79

Overall dimensions & weight

FULL BORE: CLASS 150 - Fig.230-1

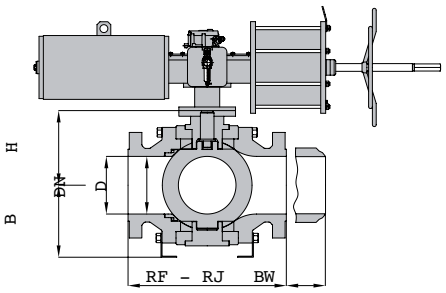
						Weight in Kg		Valve top	
DN	RF	RJ	BW	B	D	RF-RJ	BW	ØST*	ISO**
2”	178	191	216	100	51	26	24	CH22	F10
3”	203	216	283	125	76	57	55	CH22	F10
4”	229	241	305	145	102	82	78	CH22	F10
6”	394	406	457	230	152	136	126	CH27	F12
8”	457	470	521	265	203	335	315	Ø40	F14
10”	533	546	559	315	254	490	465	Ø40	F14
12”	610	622	635	355	305	720	685	Ø50	F16
14”	686	699	762	385	336	905	855	Ø50	F16
16”	762	775	838	420	387	1050	995	Ø60	F25
18”	864	876	914	470	438	1620	1534	Ø60	F25
20”	914	927	991	505	489	2110	1950	Ø80	F25
24”	1067	1080	1143	610	590	3072	2900	Ø80	F25

FULL BORE: CLASS 300 - Fig.230-3

						Weight in Kg		Valve top	
DN	RF	RJ	BW	B	D	RF-RJ	BW	ØST*	ISO**
2”	216	232	216	100	51	29	26	CH22	F10
3”	283	298	283	125	76	65	55	CH22	F10
4”	305	321	305	145	102	110	92	CH22	F10
6”	403	419	457	230	152	150	135	CH27	F12
8”	502	518	521	265	203	370	325	Ø40	F14
10”	568	584	559	315	254	530	460	Ø40	F14
12”	648	664	635	355	305	768	665	Ø50	F16
14”	762	778	762	385	336	940	560	Ø50	F16
16”	838	854	838	420	387	1430	1210	Ø60	F25
18”	914	930	914	470	438	1895	1690	Ø80	F25
20”	991	1010	991	505	489	2270	2031	Ø80	F25
24”	1143	1165	1143	610	590	3780	3468	Ø90	F30

FULL BORE: CLASS 600 - Fig.230-6

						Weight in Kg		Valve top	
DN	RF	RJ	BW	B	D	RF-RJ	BW	ØST*	ISO**
2”	292	295	292	100	51	34	26	CH22	F10
3”	356	359	356	125	76	70	61	CH22	F10
4”	432	435	432	145	102	134	118	Ø32	F12
6”	559	562	559	230	152	285	240	Ø40	F14
8”	660	664	660	265	203	480	420	Ø45	F14
10”	783	791	768	315	254	690	560	Ø50	F16
12”	838	841	838	355	305	925	775	Ø60	F25
14”	889	892	889	385	336	1240	1080	Ø80	F25
16”	991	994	991	420	387	1595	1345	Ø80	F25
18”	1092	1095	1092	470	438	2327	2065	Ø90	F30
20”	1194	1200	1194	505	489	2827	2509	Ø90	F30
24”	1397	1407	1307	610	590	4498	4190	Ø115	F35



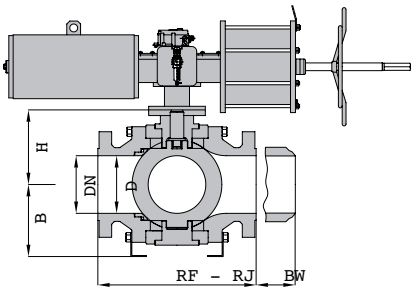
DELTAFLUX
FULL BORE

* Stem dimension
** Actuator coupling flange
Overall dimensions and sizes in mm

*** Bigger sizes dimensions & weights are available upon request

FULL BORE: CLASS 900 - Fig.230-9

						Weight in Kg		Valve top	
DN	RF	RJ	BW	B	D	RF-RJ	BW	ØST	ISO**
2"	368	371	368	110	51	53	53	CH22	F10
3"	381	384	381	130	76	98	98	Ø32	F12
4"	457	460	457	155	102	175	175	Ø32	F12
6"	610	613	610	191	152	395	395	Ø45	F14
8"	737	740	737	225	203	580	580	Ø50	F16
10"	838	841	838	280	254	850	850	Ø50	F16
12"	925	968	965	332	305	1250	1250	Ø80	F25
14"	1029	1038	1029	375	324	1640	1640	Ø80	F25
16"	1130	1140	1130	425	375	2050	2050	Ø90	F30



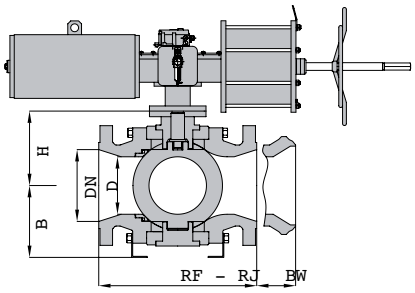
DELTAFLUX
FULL BORE

FULL BORE: CLASS 1500 - Fig.230-15

						Weight in Kg		Valve top	
DN	RF	RJ	BW	B	D	RF-RJ	BW	ØST	ISO**
2"	368	371	368	110	51	56	34	CH22	F10
3"	470	473	470	135	76	129	114	Ø32	F12
4"	546	549	546	160	102	209	146	Ø32	F12
6"	705	711	705	230	146	590	445	Ø45	F14
8"	832	841	832	270	194	780	560	Ø60	F25
10"	991	1000	991	325	241	1220	850	Ø80	F25
12"	1130	1146	1130	365	289	1690	1270	Ø80	F25
14"	1257	1276	1257	418	318	2850	2105	Ø90	F30
16"	1384	1406	1384	460	362	4100	3190	Ø115	F35

REDUCED BORE: CLASS 150 - Fig.260-1

						Weight in Kg		Valve top	
DN	RF	RJ	BW	B	D	RF-RJ	BW	ØST	ISO**
3" x 2"	203	216	283	100	51	30	27	CH22	F10
4" x 3"	229	241	305	125	76	65	60	CH22	F10
6" x 4"	394	406	457	145	102	91	84	CH22	F10
8" x 6"	457	470	521	230	152	165	155	CH27	F12
10" x 8"	533	546	559	265	203	350	325	Ø40	F14
12" x 8"	610	622	635	265	203	420	390	Ø40	F14
12" x 10"	610	622	762	315	254	540	505	Ø40	F14
14" x 10"	686	699	762	315	254	680	640	Ø40	F14
14" x 12"	686	699	838	355	305	730	680	Ø50	F16
16" x14"	762	775	914	385	336	980	930	Ø50	F16
18"x 16"	864	876	1143	420	387	1180	1115	Ø60	F25
20" x 18"	914	927	991	470	438	1710	1624	Ø60	F25
22" x 20"	991	1004	1092	505	489	2150	1980	Ø80	F25
24" x 20"	1067	1080	1143	505	489	2250	2070	Ø80	F25



DELTAFLUX
REDUCED BORE

REDUCED BORE: CLASS 300 - Fig.260-3

						Weight in Kg		Valve top	
DN	RF	RJ	BW	B	D	RF-RJ	BW	ØST	ISO**
3" x 2"	283	298	283	100	51	31	28	CH22	F10
4" x 3"	305	321	305	125	76	70	59	CH22	F10
6" x 4"	403	419	457	145	102	119	99	CH22	F10
8" x 6"	502	518	521	230	152	162	146	CH27	F12
10" x 8"	568	584	559	265	203	400	351	Ø40	F14
12" x 8"	648	664	635	265	203	426	374	Ø40	F14
12" x 10"	648	664	635	315	254	572	497	Ø50	F16
14" x 10"	762	778	762	315	254	610	529	Ø50	F16
14" x 12"	762	778	762	355	305	829	718	Ø50	F16
16" x14"	838	854	838	385	336	1015	929	Ø60	F25
18" x 16"	914	930	914	420	387	1544	1307	Ø60	F25
20" x 18"	991	1010	991	470	438	2047	1825	Ø80	F25
22" x 20"	1093	1115	1093	505	489	2452	2183	Ø90	F30
24" x 20"	1143	1165	1143	505	489	2610	2335	Ø90	F30

* Stem dimension
** Actuator coupling flange
Overall dimensions and sizes in mm

*** Bigger sizes dimensions & weights are available upon request

REDUCED BORE: CLASS 600 - Fig.260-6

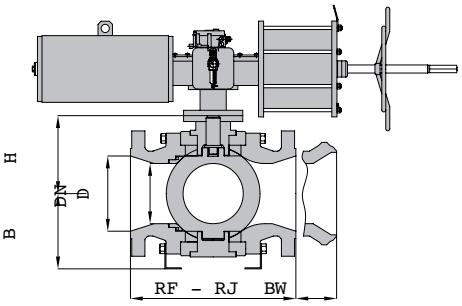
						Weight in Kg		Valve top	
DN	RF	RJ	BW	B	D	RF-RJ	BW	ØST	ISO**
3" x 2"	356	359	356	100	51	37	29	CH22	F10
4" x 3"	432	435	432	125	76	76	66	CH22	F10
6" x 4"	559	562	559	145	102	145	127	ff32	F12
8" x 6"	660	664	660	230	152	308	259	ff40	F14
10" x 8"	788	791	788	265	203	518	454	ff45	F14
12" x 8"	838	841	838	265	203	552	483	ff45	F14
12" x 10"	838	841	838	315	254	754	605	ff50	F16
14" x 10"	889	892	889	315	254	793	644	ff50	F16
14" x 12"	889	892	889	355	305	999	837	ff60	F25
16" x 14"	991	994	991	385	336	1339	1166	ff80	F25
18" x1 6"	1092	1095	1092	420	387	1723	1453	ff80	F25
20" x1 8"	1194	1200	1194	470	438	2513	2230	ff40	F35
22" x 2 0"	1296	1305	1296	505	489	3053	2710	ff90	F30
24" x 20"	1397	1407	1397	505	489	3251	2885	ff115	F350

REDUCED BORE: CLASS 900 - Fig.260-9

						Weight in Kg		Valve top	
DN	RF	RJ	BW	B	D	RF-RJ	BW	ØST	ISO**
3" x 2"	381	384	381	110	51	59	51	CH22	F10
4" x 3"	457	460	457	130	76	105	85	ff32	F12
6" x 4"	610	613	610	155	102	240	190	ff32	F12
8" x 6"	737	740	737	191	152	485	345	ff45	F14
10" x 8"	838	841	838	225	203	685	560	ff50	F16
12" x 10"	965	968	965	280	254	970	790	ff50	F16
14" x 10"	1029	1038	1029	280	254	1170	990	ff50	F16
16" x 12"	1130	1140	1130	332	305	1980	1710	ff80	F25
18" x 14"	1291	1232	1219	375	324	1050	1750	ff80	F25
20" x1 6"	1321	1333	1321	425	375	2630	1453	ff80	F30

CLASS 1500 - Fig.260-15

						Weight in Kg		Valve top	
DN	RF	RJ	BW	B	D	RF-RJ	BW	ØST	ISO**
3" x 2"	470	437	470	110	51	85	79	CH22	F10
4" x 3"	446	549	546	135	76	165	138	ff32	F12
6" x 4"	705	711	705	160	102	315	255	ff32	F12
8" x 6"	832	841	832	230	146	720	495	ff45	F14
10" x 8"	991	1000	991	270	194	950	590	ff60	F25
12" x 10"	1130	1146	1130	325	241	1350	910	ff80	F25
14" x 10"	1257	1276	1257	325	241	1585	1190	ff80	F25
16" x 12"	1384	1408	1384	365	289	2250	1310	ff90	F30
18" x 14"	1541	1559	1537	418	318	3320	2350	ff115	F35



DELTAFLUX
REDUCED BORE

* Stem dimension
** Actuator coupling flange
Overall dimensions and sizes in mm

*** Bigger sizes dimensions & weights are available upon request

Note: The execution with dimensions and pressure classes other than the ones given in the table can be assessed according to the specific needs.

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The data are not binding. We reserve the right to make eventual changes without prior notice.

CT-s 540-E May 2020