BULLETIN B-412
METRIC

CONTROL & AUTOMATION

PROFIX™
Control Ball Valve

HABONIM
Industrial Valves & Actuators

DEDICATED TO INNOVATION

Introduction

Habonim has extended its range to meet industrial demands for flow control systems that are accurate, flexible, cost efficient and maintenance friendly. Many complex requirements come into play when designing flow process operations, and no other valve design available today offers a more cost effective solution without compromising flow control functionality.

ProfiX™ provides excellent performance, even in the harshest environments, offering a compact lightweight design solution; step-less characterized control of pressure and flow for fast response times, wide rangeability and bubble-tight shutoff for increased valve longevity even in the most demanding conditions. Critical features include high pressure drop capacity with straight-through flow, high Cv, and large exhaust capacity with added design features for ease of maintenance and zero backlash.

Habonim provides world-class technical expertise in design, tech-support, sales, project management, QA, and every phase of manufacturing. All Habonim products are comprised of quality components throughout, to insure reliability, stability and design flexibility for a range of applications including; power generation, oil and gas production, petrochemical, chemical, pulp and paper, medical and pharmaceutical, and general industrial.

V-Port & V-Ball Valve Solutions

Superior Flow Control that's Versatile and Cost-Efficient

V-Port and V-Ball valves offer a viable alternative to other valve types including globe valves, which tend to be large, expensive and can't always guarantee bubble-tight shut-off.

ProfiX™'s V-design provides high rangeability and precision throttling required for clean or dirty liquids and gases as well as fibrous suspension applications. The streamlined flow passage allows for high recovery, maximum efficiency and excellent erosion resistance. Balls come in a variety of slot shapes and can be custom designed to meet any control requirement.

Superior control performance is designed into the geometry of the downstream characterized V-Port to provide accurate control parameters. The precision laser cut 'V' shape enables inherent equal percentage flow characteristics, and the 'Slot' design enables inherent downstream linear flow characteristics.

To support your special process needs, custom configured openings for both seats and balls are also available. Designed with flexibility in mind, ProfiX™'s unique control valve components can be easily altered by simply changing the trim.

V-Port Seat Construction

A new standard in performance is achieved with Habonim's V-Port valve assembly, comprised of a ball and laser cut characterized metal seat, lapped together into a single seamless component.

Both the ball and characterized metal seat are surface treated and hard coated, (DHN-standard, LTPN-optional) to resist abrasion and galling. A Nitride coating is applied as standard, produced by a thermo-chemical diffusion process that transforms the outer base-metal layer of the ball and seat to a hard matrix.

A standard profile seat located upstream, maintains the preload of the floating ball, and metal seat downstream. The end result is a superior control valve, with bubble-tight factory tested shut-off, exceeding ANSI class VI shut-off.

The V-Port design is applicable for rugged environments such as steam control, (maximum pressure drop of 20 bar), high differential pressure (maximum pressure drop of 35 bar), and abrasive media. If control characteristics need to be modified, then changes to the complete ball seat assembly (marked under the same part number), must also be made.

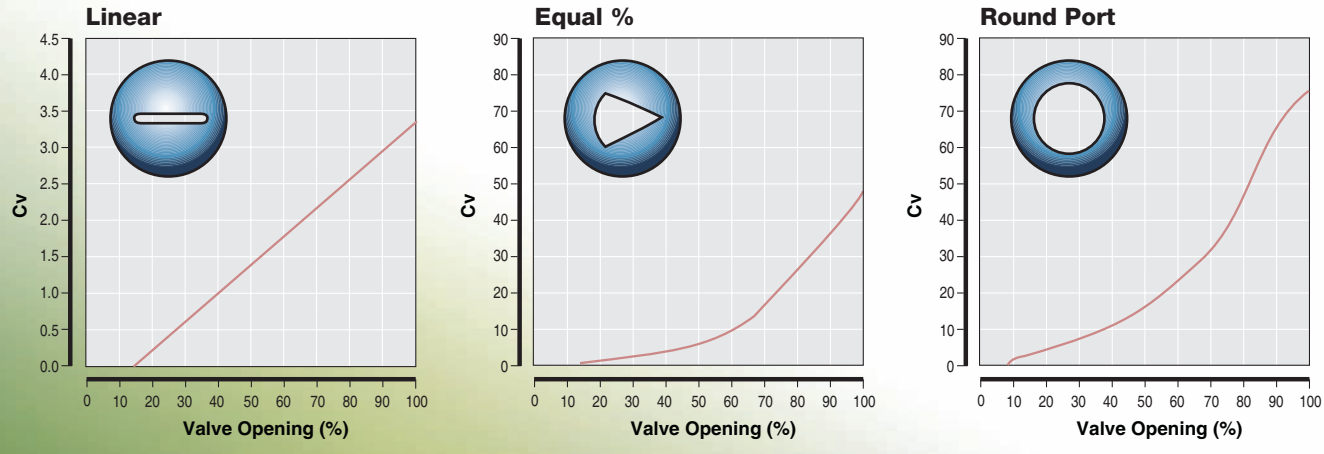
Characterized V-Balls

This is an alternative control valve solution, for less demanding control applications, such as clear liquid at a maximum pressure drop of 6 bar, or clean gas at a maximum pressure drop of 10 bar, and temperatures of 120°C max. for either.

The design is comprised of a floating characterized ball, mounted between two seats, maintaining trim preload and bubble-tight shut-off. The V-Ball exerts low-torque requirements therefore it's suitable for smaller actuators. Smaller actuators mean less weight, and space saving, cost efficient operation.

Characterized V-Balls come in a variety of 'V' and 'Slot' shapes, and can be custom designed to meet any control requirement. The V-Ball is available in a wide range of high-alloy materials and coatings for high-corrosive applications.

Characterized Flow Diagrams

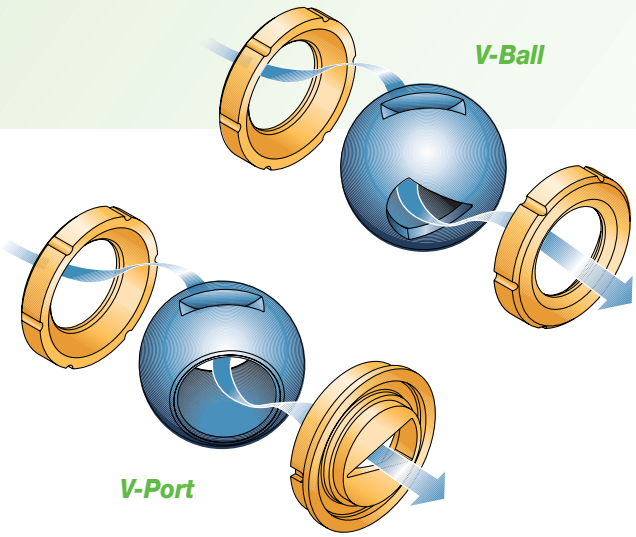


Design Simplicity

It takes no more effort than usually required for a routine maintenance procedure, to convert a standard Habonim quarter-turn ball valve into an accurate, efficient flow control valve assembly. Habonim provides a ready made conversion kit designed to adapt standard valves for flow control operations, which includes a V-Ball configuration, stem and gland packing.

Parts feature a V-Ball with high tensile, tight tolerance stem design, hard wearing gland packing and thrust bearing, plus seat and seal materials sustainable for the most demanding flow control operations. Adaptation for a V-Port configuration is also available, which includes a change in the downstream valve design.

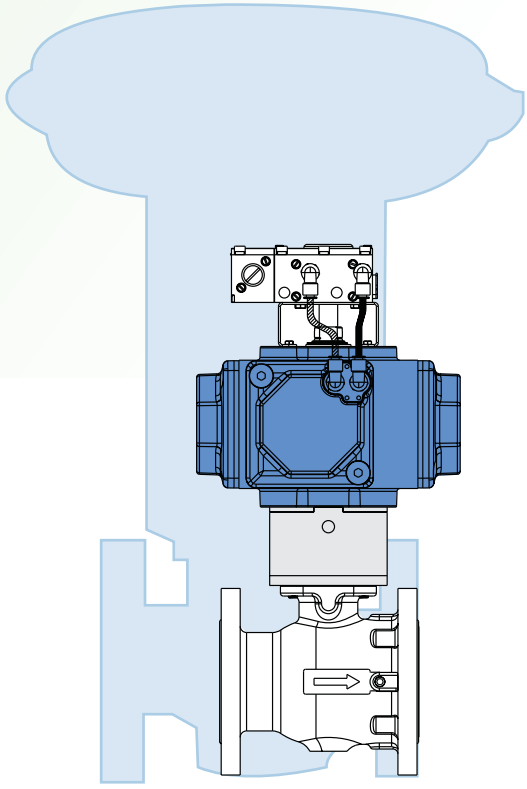
To switch hydraulic features, such as a factory demand for increased flow, ProfiX™ can be easily upgraded by simply changing the valve trim. It's a fast, efficient operation that takes no more time than a regular maintenance call. This would be impossible to achieve using standard globe valves that require costly, time-consuming valve replacements to do the same job.



Less Weight - Smaller Size

ProfiX™ streamlined design dissipates less energy and hence demonstrates a higher flow coefficient (Cv) value, compared with other valve types (such as tortuous globe valve design), with ball valves typically exhibiting a high Cv rating. This means a smaller size ball valve can be used to handle the same flow as a larger size globe valve.

An entire flow system comprised of smaller valves doing the same job as larger ones will require less space on the line, weigh less and provide a more cost efficient and maintenance friendly solution.



Zero Seat Leakage

ProfiX™ undergoes meticulous machining and stringent factory testing to ensure bubble-tight shut-off for zero leakage. Leak-tight operation is provided by either of two characterized flow control options. The V-Port option is comprised of a characterized metal seat lapped-in with the ball for a perfect fit, and aided by an upstream spring effect soft-seat, for positive preload. The characterized V-Ball option uses a configuration of two soft-seats.

Both characterized 'V' options afford zero leakage in the most demanding applications, and across a wide range of temperature and pressure requirements. Other valve types, such as globe valves have been proven completely ineffective in providing bubble-tight shut off without the use of a secondary shut-off valve assembly.

Compact Actuation

Habonim's compact, state-of-the-art pneumatic actuator creates a control package that is small yet efficient. The operating torque of a quarter turn control ball valve is totally independent of the flow direction therefore a relatively small quarter-turn actuator is sufficient to operate the control unit.

With globe valves, the flow to open (FTO) fail to close (FC) direction can be problematic, and requires the use of a considerably stronger pneumatic actuator to overcome hydraulic forces and instability if the gradient direction is reversed.

For the complete 4-piston pneumatic actuator catalogue please refer to Habonim **Bulletin B-360**.

Minimum Hysteresis / Outstanding Repeatability

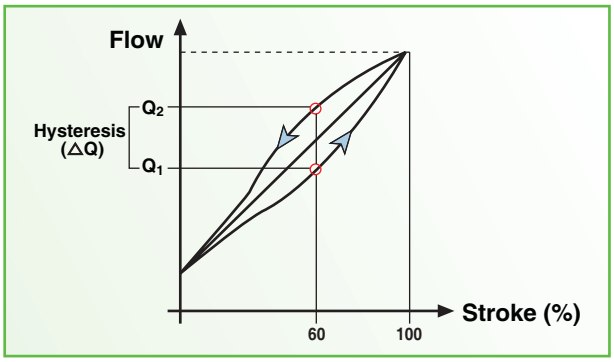
Optimum control loop performance often hinges on a few carefully designed moving parts within the valve assembly, and how well they work together. The most vulnerable areas in a standard quarter turn valve are the torque transmission shaft between the positioner and the segmented ball; i.e. [ball-stem], [stem-coupler], [coupler-actuator], [actuator-positioner].

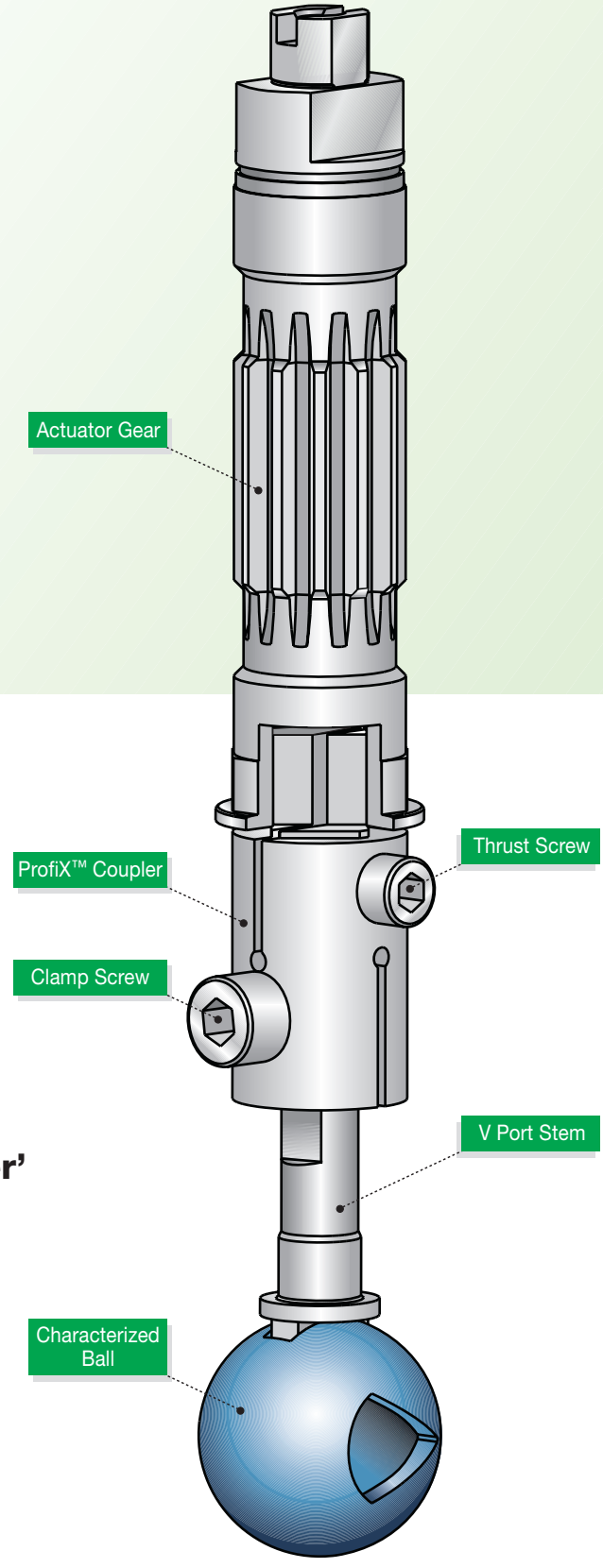
Considerable engineering expertise has gone into the design and manufacture of these connecting surfaces for the tightest fit possible to provide uniform movement of all parts along the line of rotation.

Through advanced component design, Habonim ensures that all these adjoining parts are carefully engineered to eliminate problems such as backlash, leakage and hysteresis, within a 2% (max) accuracy guaranteed for the overall control unit.

This ensures the resulting flow control exhibits exceptional consistency of performance - repeatability, and minimum hysteresis.

Test results measuring identical flow input from both directions illustrates the negligible difference between up-scale and down-scale load.

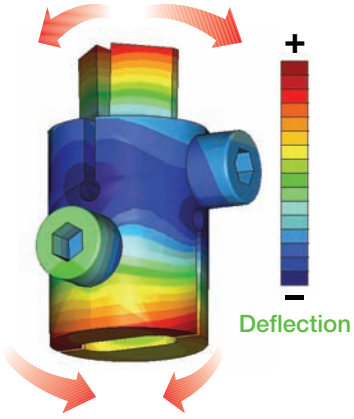




Exclusive Habonim 'ProfiX™ Coupler'

Habonim's 'ProfiX™ Coupler' design is based on the inherent 'flexibility' of the stainless steel. Two grooves allow the Coupler to clamp the valve stem from one side, while locking the actuator gear in place from the other side.

The 'ProfiX™ Coupler' assures repeatability, zero backlash, and virtually no hysteresis for the complete control unit.



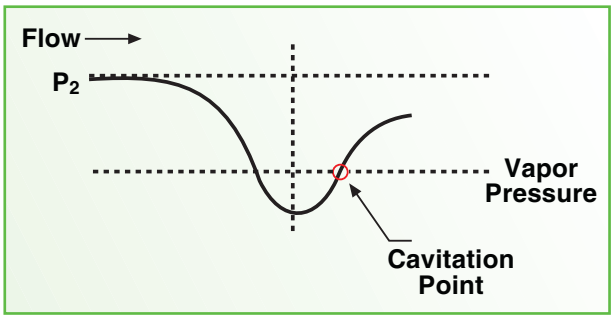
Less Packing Wear

The ProfiX™ quarter-turn ball valve operation is far less prone to leakage due to resilient seat and seal designs that deliver tighter shut-off, and a stem sealing that requires less torque output from the actuator. This translates into longer lasting, continuous valve operation with minimum upkeep. The ProfiX™ rotary movement makes it safe and simple to automate; thus ideal for flow control operations. In contrast, the linear movement of globe valves has a tendency to seize-up, is susceptible to blockages, and requires constant maintenance to deal with stem leakage problems.

ProfiX™ is fitted with specially designed packing configurations. A variety of packing materials are available, all suited to a range of demanding control applications including aggressive media, extreme temperature, and from deep vacuum conditions to high pressure. The end result is a high endurance control valve assembly that's simply more cost effective and maintenance friendly than any other type of actuated valve.

Less Cavitation Damage

ProfiX™ offers a streamlined configuration less prone to cavitation damage. As liquid passes through the Vena Contracta, there is an increase in velocity, accompanied by a substantial decrease in pressure. If the pressure in this area falls below the vapor pressure of the flowing liquid, vaporization (boiling) occurs. Vapor bubbles continue downstream where velocity decreases and pressure recovers. The vapor bubbles then collapse or implode.



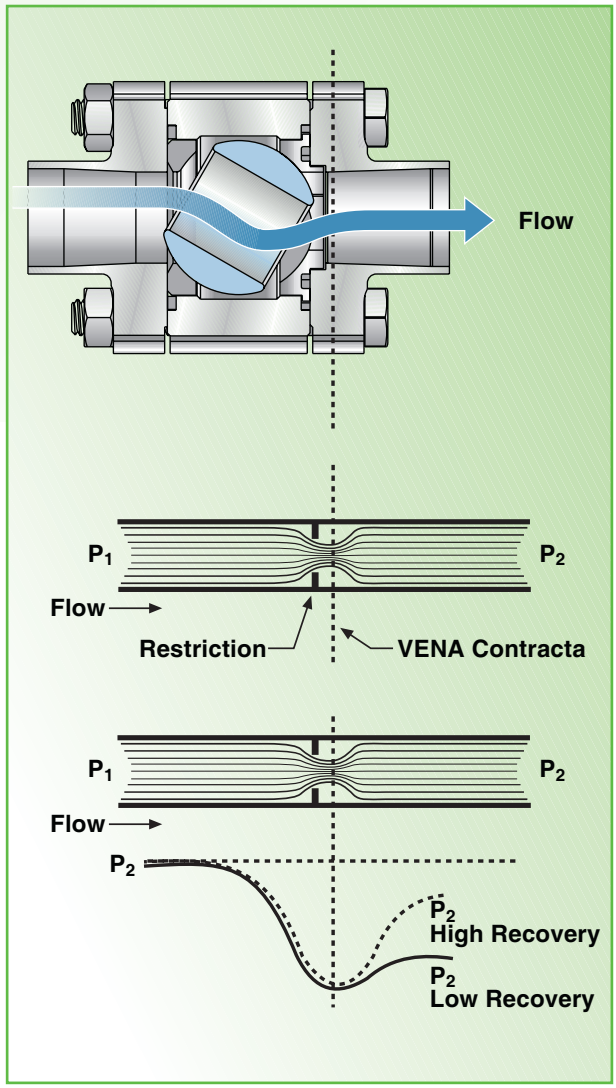
These imploding vapor bubbles can produce serious cavitation damage, indicated by a pitting of the metal surfaces on the valve, leading to real maintenance problems. The way globe valves are designed, this damage occurs inside the valve casing, causing an erosive effect that may eventually result in costly valve replacement. However, with a ball valve such as ProfiX™, no damages occurs to the valve itself in the event of cavitation, as it is apparent only downstream of the valve seat area beyond the valve envelope.

Habonim R&D engineers have developed a new line of anti-cavitation Trim's for severe applications. A grid of tubular holes facilitates linear or equal flow percentage characteristics that greatly reduce noise and vibration as well as limiting cavitation damage. The grid is electro-eroded into the down-stream metal seat and then lapped for a perfect match with the ball. The complete set is hardened to eliminate galling and increase erosion resistance.

High Recovery

A high recovery valve is designed to dissipate relatively little flow stream energy due to streamlined internal contours and minimal flow turbulence. Therefore pressure downstream of the valve 'Vena Contracta', recovers to a high percentage of its inlet value.

The streamlined interior design of ProfiX™ dissipates far less energy resulting in higher recovery and a more cost efficient flow process, especially when compared with tortuous flow globe valve design.



Surface Treatment and Coatings

ProfiX™ utilizes the most advanced surface treatment processes and coatings on its components for longer valve operating life and increased resistance to wear. ProfiX™'s ball and characterized metal seat configuration are specifically treated to combat abrasion and galling. The result is improved performance, lower running costs and less maintenance, especially in extreme environments.

ProfiX™ undergoes various surface treatments and coatings designed to combat friction, corrosion and wear. Among them, diffusion hardening is a common, cost-effective method of improving wear and resistance to galling.

Nitriding (DHN)

The Nitriding method is a surface treatment technique produced by a thermo-chemical diffusion process that significantly increases the surface hardness and wear resistance of austenitic stainless steels.

The outer base metal layer of ProfiX™'s ball and characterized metal seat is transformed to a hard matrix by "pressing" nitrogen molecules into the austenitic structure and hence increasing the strain of the outer layer resulting in a harder surface. This process is limited to a minimum PH level of 6.0 or above.

Low Temperature Plasma Nitriding (LTPN)

Conventional plasma nitriding can sometimes result in diminished corrosion resistance; therefore the recent use of low temperature thermo-chemical processes have shown improvements in high hardness and good corrosion resistance of austenitic stainless steels.

Low temperature plasma nitriding at temperatures around 400°C present significant hardening effect on the austenitic AISI 316 stainless steel surface. Typically it gives a nitride layer up to 20 µm thick, and with the micro-hardness on the treated surface can be as high as 75 HRC, while it is no more than 25 HRC on the untreated surface. As a result, the wear resistance of the stainless steel is improved without affecting corrosion resistance.

Additional coatings such as Stellite and chrome can be provided upon request. Contact Habonim for further information.

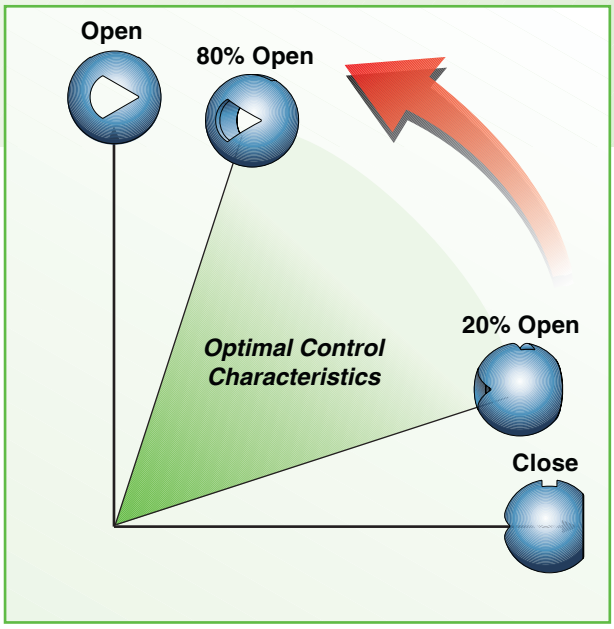
Wide Rangeability and Stability

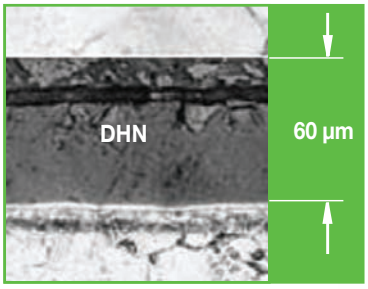
Control valve rangeability can be described as the ratio of maximum controllable flow to the minimum controllable flow. The ProfiX™ ball valve offers an inherently high flow ratio. When the valve is stroked wide open, and when it is at 15% opening, the ratio is 1:50.

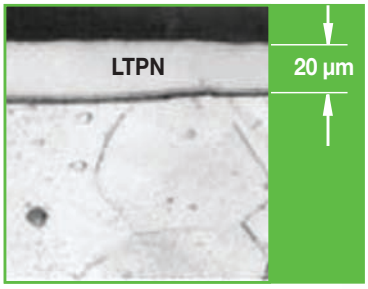
This unique advantage allows diversity of process parameters while still using the same control unit. However, optimum control of the flow through the valve is best exhibited in a range between 20%- 80% of rotation and not at the full span due to instability of the hydraulic flow curve outside the limits of this range.

There are optimum limits to rangeability since the number of position steps is constant, good control is sacrificed if the range is too wide. For example: a control range of 1:200 will destabilize the process parameters for movement <5% affecting the gradient of the flow characteristic.

The ProfiX™ design offers a wide rangeability with maximum stability of process conditions, especially compared with other traditional narrow range valves.







Calculations

Flow Equation		
Fluid	**Service Condition**	**Equation**
Liquid	Sub-critical condition $\triangle P < F_L^2 (P_1 - P_v)$	$C_V = 1.17 \cdot Q_L \cdot \sqrt{\frac{G_L}{\triangle P}}$ or $C_V = \frac{1.17 \cdot W_L}{\sqrt{\triangle P \cdot G_L}}$
	Critical condition $\triangle P \geqq F_L^2 (P_1 - P_v)$	$C_V = \frac{1.17 \cdot Q_L}{F_L} \cdot \sqrt{\frac{G_L}{(P_1 - P_v)}}$ or $C_V = \frac{1.17 \cdot W_L}{F_L \cdot \sqrt{(P_1 - P_v) \cdot G_L}}$
Gas	$X < F_K \cdot X_T$	$C_V = \frac{Q_g}{387 \cdot P_1 \cdot Y} \cdot \sqrt{\frac{G_g \cdot T_1 \cdot Z}{X}}$ or $C_V = \frac{W_g}{27.1 \cdot Y \cdot \sqrt{X \cdot P_1 \cdot \gamma_1}}$
	$X \geqq F_K \cdot X_T$	$C_V = \frac{Q_g}{258 \cdot P_1} \cdot \sqrt{\frac{G_g \cdot T_1 \cdot Z}{F_K \cdot X_T}}$ or $C_V = \frac{W_g}{18.1 \cdot \sqrt{F_K \cdot X_T \cdot P_1 \cdot \gamma_1}}$
Saturated Steam	$X < F_K \cdot X_T$	$C_V = \frac{W_g}{19.3 \cdot P_1 \cdot Y \cdot \sqrt{X}}$
	$X \geqq F_K \cdot X_T$	$C_V = \frac{W_g}{12.9 \cdot P_1 \cdot \sqrt{F_K \cdot X_T}}$
Superheated Steam	$X < F_K \cdot X_T$	$C_V = \frac{W_g \cdot (1 + 0.00126 \cdot \triangle t)}{19.3 \cdot P_1 \cdot Y \cdot \sqrt{X}}$
	$X \geqq F_K \cdot X_T$	$C_V = \frac{W_g \cdot (1 + 0.00126 \cdot \triangle t)}{12.9 \cdot P_1 \cdot \sqrt{F_K \cdot X_T}}$

Glossary

C_V : Valve flow coefficient
F_L : Liquid pressure recovery factor of a valve without attached fittings (dimensionless) - **Refer to Table 1**
G_L : Liquid specific gravity (1.0 for water @ 15°C)
P_1 : Upstream absolute static pressure (kgf/cm²A)
P_2 : Downstream absolute static pressure (kgf/cm²A)
P_v : Absolute vapour pressure of liquid at inlet temperature (kgf/cm²A) - **Refer to Table 2**
$\triangle P$: Differential pressure (P_1-P_2) (kgf/cm²)
Q_L : Volumetric flow rate of liquid (m³/h)
W_L : Weight or mass flow rate of liquid (t/h)
G_g : Gas specific gravity - **Refer to Table 3**
Q_g : Volumetric flow rate of gas (m³/h)
X : Ratio of pressure drop ($\triangle P/P_1$)
X_T : Pressure drop ratio factor (dimensionless) - **Refer to Table 1**
W_g : Gas or steam mass flow rate (kg/h)
γ_1 : Specific gravity, upstream conditions (kg/m³).
F_K : Ratio of specific heat factors, (dimensionless) - **Refer to Table 3**

Y : Expansion factor = $1 - \frac{X}{3 \cdot F_K \cdot X_T}$

T_1 : Absolute upstream temperature (K)
$\triangle t$: Upstream superheated steam temperature (°C)
Z : Compressibility factor, dimensionless = 1

Table 1

		Percent of Valve Rotation (Degree of Rotation)										
		0(0)	10(9)	20(18)	30(27)	40(36)	50(45)	60(54)	70(63)	80(72)	90(81)	100(90)
Equal %	F_L	0.00	0.96	0.95	0.94	0.93	0.92	0.90	0.88	0.86	0.82	0.75
	X_T	0.00	0.72	0.65	0.60	0.54	0.48	0.42	0.36	0.28	0.16	0.12
Round Port	F_L	0.00	0.92	0.91	0.91	0.90	0.86	0.80	0.72	0.61	0.61	0.50
	X_T	0.00	0.78	0.74	0.71	0.67	0.62	0.56	0.49	0.38	0.26	0.15

Table 2

Pv Factor		
Liquid	**Formula**	**Pv**
Acetone	C_2H_4	47.861
Acetic Acid	$C_2H_4O_2$	0.0273
Ammonia	NH_3	0.7310
Benzene	C_6H_6	0.1621
Butane	C_4H_{10}	2.89
Carbon Dioxide	CO_2	58.420
Ethene	C_2H_6	47.861
Ethanol	C_2H_6O	0.1029
Ethylene Glycol	$C_2H_4(OH)_2$	69.58 e-6
Glycerin	$C_3H_5(OH)_3$	110.50 e-9
Nitrogen	-	0.988
OIL WT32	-	205.48 e-6
OIL WT46	-	306.59 e-6
Sulfur Dioxide	SO_2	3.3929
Water	H_2O	0.0238

Table 3

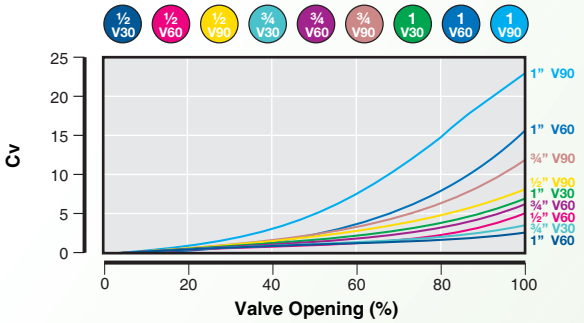
Gg and Fk Factors			
Gas	**Formula**	**Gg**	**Fk**
Air	-	1.00	1.00
Ammonia	NH_3	0.59	0.92
Argon	Ar	1.38	1.19
Carbon Dioxide	CO_2	1.52	0.91
Carbon Monoxide	CO	0.97	1.01
Ethylene	C_2H_4	0.97	0.87
Chlorine	Cl_2	2.49	0.96
Ethene	C_2H_8	1.05	0.87
Helium	H_e	0.14	1.19
Hydrogen	H_2	0.07	1.00
Methane	CH_4	0.55	0.90
Oxygen	O_2	1.10	1.00
Nitrogen	N_2	0.97	1.00
Saturated Steam	H_2O	-	0.94
Superheated Steam	H_2O	-	0.94

Habonim's valve sizing software (HVS) is now available to support your application.
*Please refer to **page 16***

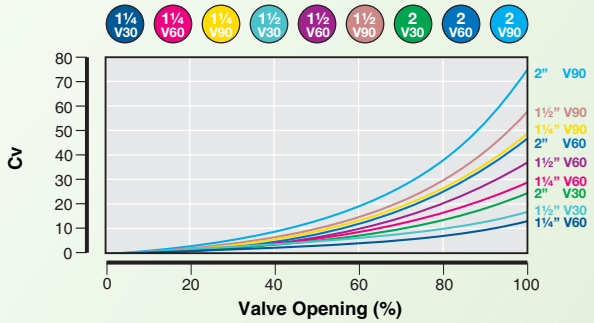
Flow Coefficient - Cv

Equal %

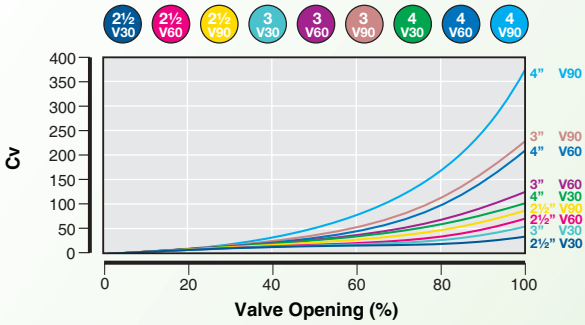
½”- 1”



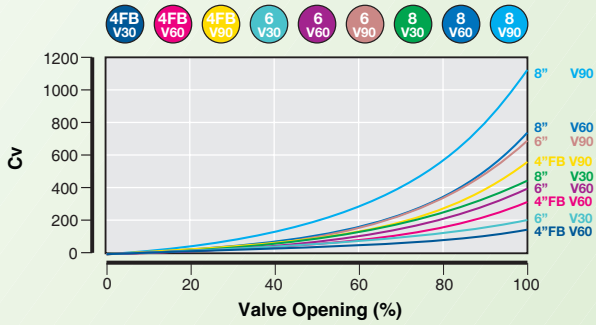
1¼”- 2”



2½”- 4”



4”FB - 8”

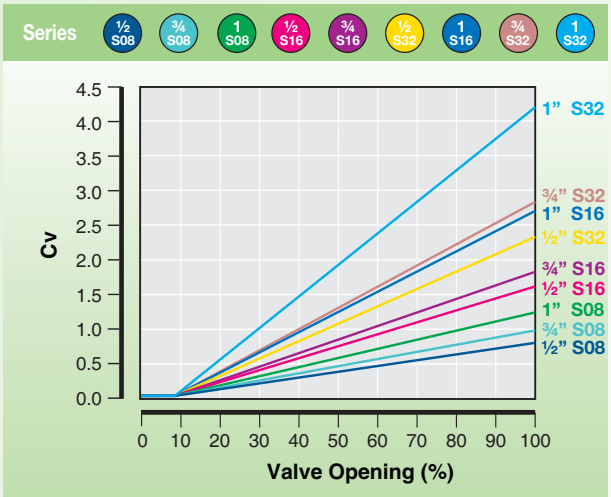


Valve Size	V Shape	Percent of Valve Rotation (Degree of Rotation)										
		0(0)	10(9)	20(18)	30(27)	40(36)	50(45)	60(54)	70(63)	80(72)	90(81)	100(90)
½”	V30	0.00	0.05	0.118	0.236	0.405	0.624	0.880	1.200	1.550	1.954	2.380
	V60	0.00	0.07	0.161	0.378	0.670	1.000	1.450	2.050	2.780	3.710	4.960
	V90	0.00	0.10	0.230	0.570	1.050	1.770	2.710	3.740	4.940	6.270	8.100
¾”	V30	0.00	0.02	0.13	0.27	0.44	0.65	0.94	1.30	1.75	2.37	3.20
	V60	0.00	0.10	0.27	0.57	1.04	1.55	2.21	2.93	3.85	5.04	6.48
	V90	0.00	0.10	0.40	0.86	1.62	2.60	3.73	5.22	6.87	8.80	11.20
1”	V30	0.00	0.06	0.178	0.420	0.840	1.460	2.230	3.160	4.130	5.300	6.900
	V60	0.00	0.13	0.350	0.924	1.720	2.640	4.070	5.780	8.150	10.950	15.170
	V90	0.00	0.22	0.810	1.680	3.050	4.600	6.960	9.950	13.720	18.590	23.200
1¼”	V30	0.00	0.11	0.344	0.811	1.621	2.818	4.304	6.099	7.971	10.229	13.317
	V60	0.00	0.24	0.676	1.783	3.320	5.095	7.855	11.155	15.730	21.134	29.278
	V90	0.00	0.43	1.563	3.242	5.887	8.878	13.433	19.204	26.480	35.879	50.200
1½”	V30	0.00	0.17	0.598	0.989	1.679	2.875	4.600	6.670	9.856	13.513	17.733
	V60	0.00	0.26	0.713	2.036	3.611	6.440	9.890	13.800	19.320	27.945	37.375
	V90	0.00	0.48	1.281	3.335	6.095	10.350	14.835	21.160	29.210	41.200	58.200
2”	V30	0.00	0.19	0.800	1.900	3.100	4.900	6.860	9.540	13.160	17.900	24.400
	V60	0.00	0.34	0.970	2.880	5.400	8.200	12.100	17.700	25.100	34.300	48.400
	V90	0.00	0.55	1.571	4.200	8.100	12.600	18.300	26.900	37.600	53.200	74.600
2½”	V30	0.00	0.38	1.010	2.470	4.200	6.400	9.240	13.320	18.260	24.300	32.300
	V60	0.00	0.54	1.340	4.180	8.400	11.300	17.300	25.100	36.000	52.200	70.000
	V90	0.00	0.77	2.140	6.340	11.900	16.700	24.800	34.000	48.000	64.000	84.000
3”	V30	0.00	0.50	1.600	3.700	7.200	11.600	17.600	24.700	32.400	42.300	52.900
	V60	0.00	0.81	1.860	6.340	12.700	20.400	32.200	47.900	67.000	93.100	122.000
	V90	0.00	1.22	3.040	9.370	19.100	28.600	47.300	73.900	112.500	162.000	225.000
4”	V30	0.00	1.00	1.000	4.500	11.500	20.500	31.500	43.700	58.000	79.000	102.000
	V60	0.00	1.47	2.660	8.500	18.290	31.800	43.000	68.000	104.000	148.600	206.000
	V90	0.00	2.18	4.890	13.400	28.000	45.400	73.000	111.100	166.000	240.000	360.000
4”FB	V30	0.00	1.53	1.530	6.885	17.595	31.365	48.195	66.861	88.740	120.870	156.060
	V60	0.00	2.25	4.070	13.005	27.984	48.654	65.790	104.040	159.120	227.358	315.180
	V90	0.00	3.34	7.482	20.502	42.840	69.462	111.690	169.983	253.980	367.200	550.800
6”	V30	0.00	1.91	1.910	8.595	21.965	39.155	60.165	83.467	110.780	150.890	194.820
	V60	0.00	2.81	5.081	16.235	34.934	60.738	82.130	129.880	198.640	283.826	393.460
	V90	0.00	4.16	9.340	25.594	53.480	86.714	139.430	212.201	317.060	458.400	687.600
8”	V30	0.00	3.15	3.150	14.175	36.225	64.575	88.000	137.655	218.000	298.000	421.000
	V60	0.00	4.63	8.379	26.775	57.614	91.000	135.450	214.200	327.600	468.090	723.000
	V90	0.00	6.87	15.404	42.210	88.200	143.010	229.950	349.965	522.900	756.000	1134.000

Flow Coefficient - Cv

Linear

½”- 1”

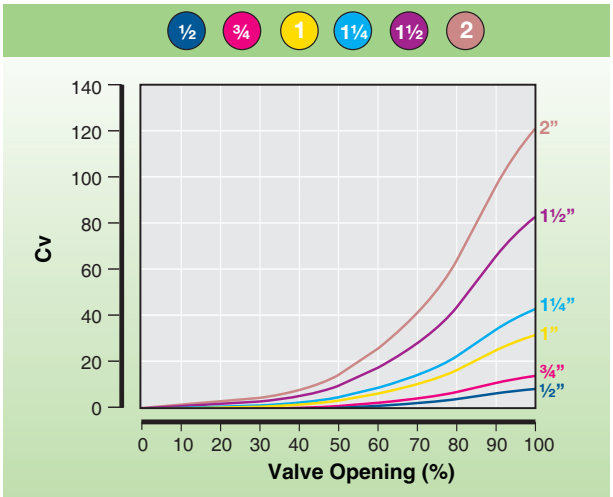


Valve Size	Slot Shape	Percent of Valve Rotation (degree of Rotation)					
		0(0)	10(9)	20(18)	30(27)	40(36)	50(45)
½”	0.8	0.00	0.00	0.038	0.078	0.120	0.162
	1.6	0.00	0.00	0.107	0.224	0.347	0.475
	3.2	0.00	0.00	0.187	0.383	0.583	0.770
¾”	0.8	0.00	0.00	0.05	0.11	0.16	0.21
	1.6	0.00	0.00	0.14	0.28	0.43	0.57
	3.2	0.00	0.00	0.23	0.47	0.73	0.98
1”	0.8	0.00	0.00	0.080	0.152	0.225	0.304
	1.6	0.00	0.00	0.238	0.495	0.739	0.988
	3.2	0.00	0.00	0.374	0.765	1.170	1.600

Valve Size	Slot Shape	Percent of Valve Rotation (degree of Rotation)				
		60(54)	70(63)	80(72)	90(81)	100(90)
½”	0.8	0.202	0.242	0.284	0.324	0.366
	1.6	0.595	0.720	0.840	0.970	1.111
	3.2	0.957	1.152	1.360	1.574	1.800
¾”	0.8	0.27	0.33	0.38	0.44	0.49
	1.6	0.71	0.86	1.01	1.16	1.33
	3.2	1.24	1.50	1.76	2.00	2.30
1”	0.8	0.380	0.463	0.545	0.618	0.710
	1.6	1.232	1.473	1.728	1.965	2.210
	3.2	2.035	2.450	2.900	3.316	3.700

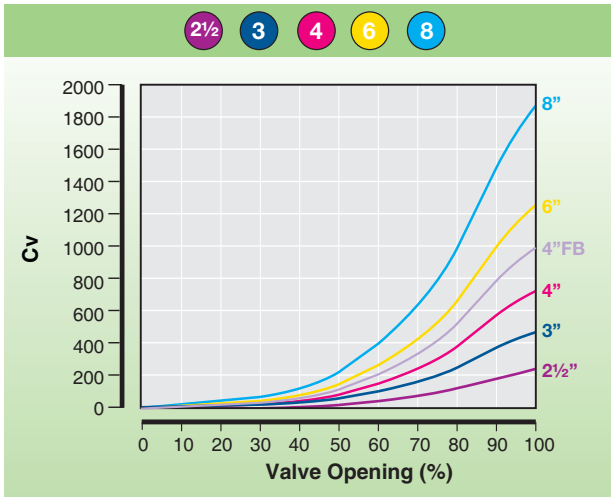
Round

½”- 2”



Round

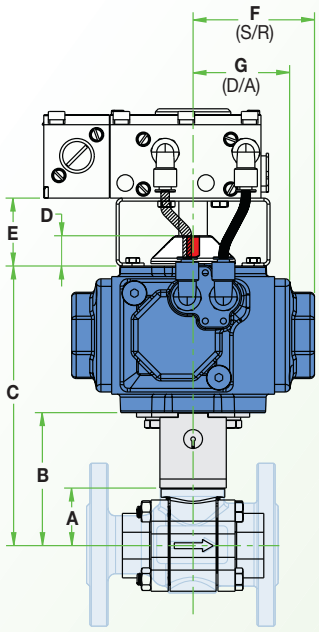
2½”- 8”

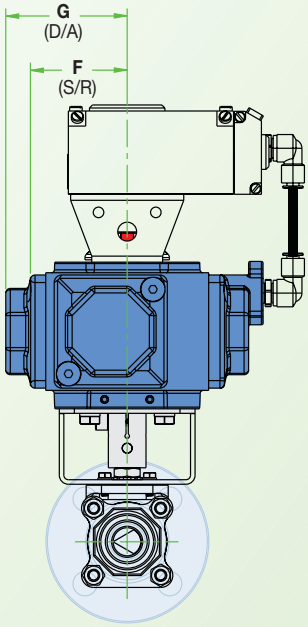


Valve Size	Valve Opening % (Degrees Rotation)										
	0(0)	10(9)	20(18)	30(27)	40(36)	50(45)	60(54)	70(63)	80(72)	90(81)	100(90)
½”	0.00	0.15	0.29	0.46	0.70	1.09	1.76	2.60	4.30	6.40	8.00
¾”	0.00	0.21	0.43	0.70	1.05	1.62	2.64	4.00	6.40	9.60	12.00
1”	0.00	0.58	1.15	1.90	2.80	4.30	7.00	10.50	17.00	26.00	32.00
* 1¼”	0.00	0.83	1.65	2.67	4.05	6.50	10.00	15.20	24.60	36.00	42.80
1½”	0.00	1.48	2.95	4.75	7.20	11.00	18.00	27.00	44.00	65.50	82.00
2”	0.00	2.16	4.33	6.95	10.50	16.20	26.40	39.60	64.00	96.00	120.00
* 2½”	0.00	4.30	9.10	15.60	23.70	34.60	52.50	83.00	126.00	185.00	256.00
3”	0.00	8.20	16.20	26.00	40.00	61.00	100.00	148.00	240.00	360.00	450.00
4”	0.00	13.10	26.00	42.10	63.10	97.20	159.00	238.00	385.00	575.00	720.00
* 4”FB	0.00	16.00	31.00	51.00	76.00	117.00	192.00	288.00	465.00	695.00	870.00
** 6”	0.00	18.40	36.70	59.00	90.00	138.00	224.00	338.00	545.00	815.00	1020.00
** 8”	0.00	34.00	68.00	109.00	165.00	254.00	415.00	620.00	1010.00	1500.00	1880.00

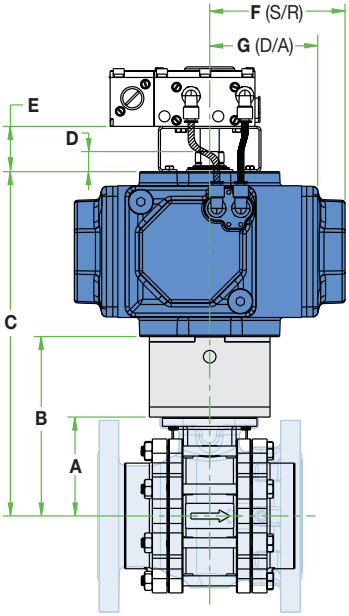
* Available with N47P Series only
** Available with N31P/N32P Series only

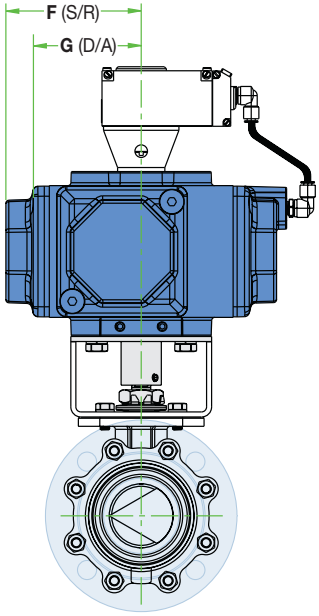
Dimensions ½”- 2½”





Dimensions 3”- 8”



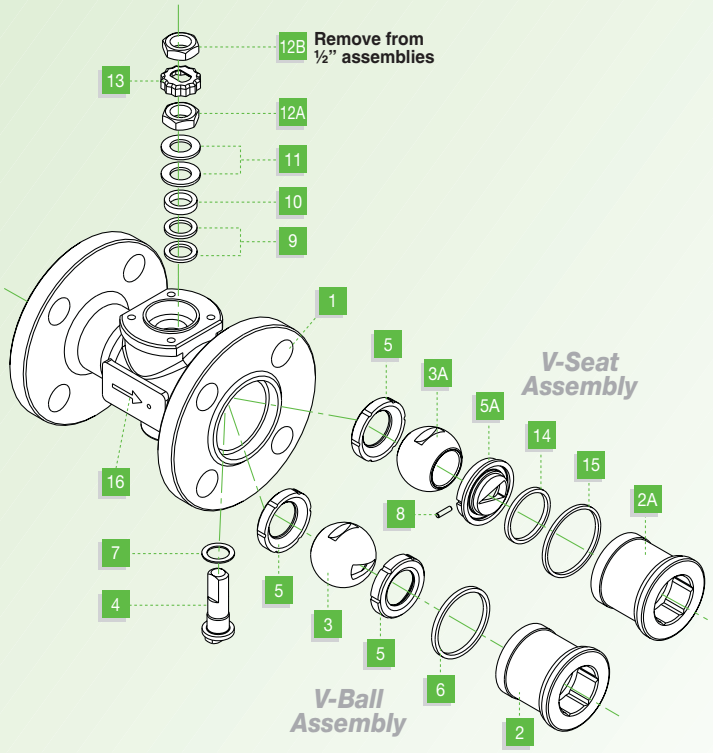


Valve Size	Actuator Size	N47P & N31P Series						
		A	B	C	D	E	F (S/R)	G (D/A)
½”	C20	29.0	69.0	149.7	20	45	65.5	51.0
¾”	C20	31.4	71.4	152.1	20	45	65.5	51.0
1”	C25	38.2	88.2	185.4	20	45	80.5	66.0
* 1¼”	C25	42.6	92.6	189.8	20	45	80.5	66.0
1½”	C25	43.6	103.6	200.8	20	45	80.5	66.0
2”	C30	48.3	108.3	205.5	20	45	93.0	75.5
* 2½”	C35	70.0	180.0	265.5	20	45	111.0	91.0
3”	C45	98.3	178.3	342.3	20	45	134.5	110.5
4”	C60	114.1	194.1	411.6	30	55	180.0	142.5
* 4”FB	C60	124.0	204.0	421.5	30	55	180.0	142.5
** 6”	C75	157.4	257.4	527.4	30	55	218.5	171.0
** 8”	C75	185.2	285.2	555.2	30	55	218.5	171.0

* Available with N47P Series only
** Available with N31P/N32P Series only

For general assembly drawings of Control valves other than N47P & N31P please contact Habonim

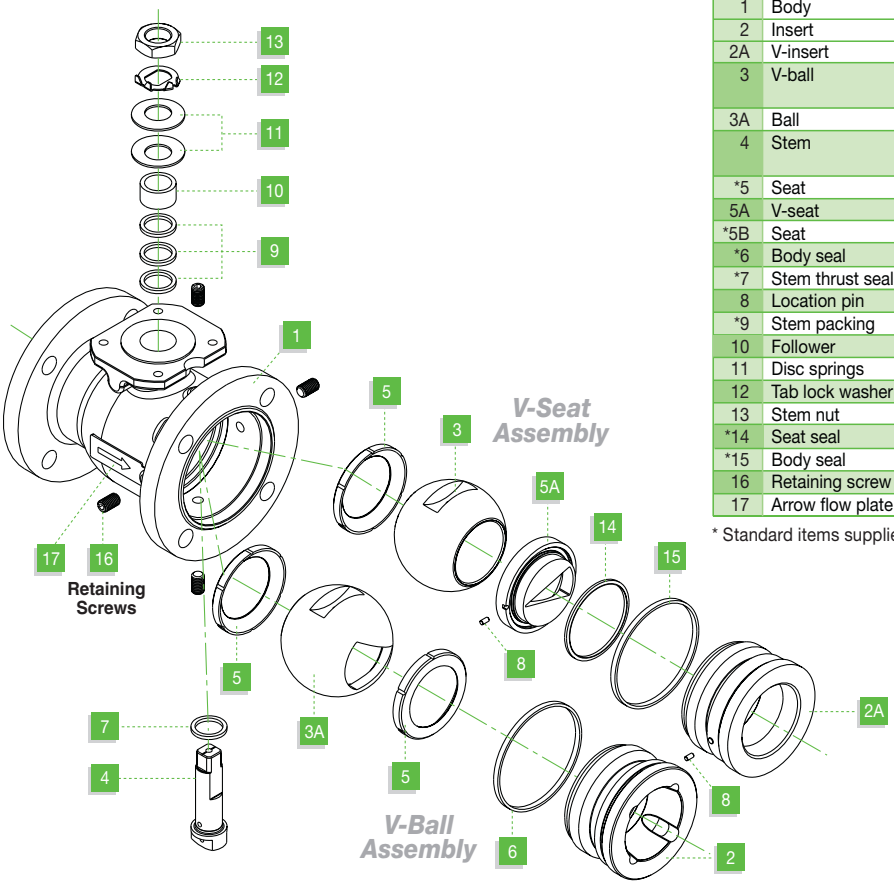
½"-2" End Entry Control Valve



Item	Description	Material Specifications	Qty.
1	Body	Carbon St. ASTM A216 WCB	1
2	Insert	Stainless St. ASTM A351 CF8M, DUPLEX,	1
2A	V-insert	ALLOY 20, HASTELOY C22, MONEL	1
3	V-ball	Stainless St. ASTM A276 316/316L, DUPLEX, ALLOY 20, HASTELOY C22, MONEL	1
3A	Ball	Stainless St. 316 DHN / LTPN	1
4	Stem	Stainless St. ASTM A276 316/316L, DUPLEX, ALLOY 20, HASTELOY C22, MONEL	1
*5	Seat	RPTFE, NRG, PEEK, DELRIN	2
5A	V-seat	Stainless St. 316 DHN / LTPN	1
*5B	Seat	RPTFE, NRG, PEEK, DELRIN	1
*6	Body seal	PTFE, RPTFE, Graphite	1
*7	Stem thrust seal	PEEK, NYLATRON	1
8	Location pin	Stainless St. A276 316/316L	1
*9	Stem packing	NRG, RPTFE, VITON, Graphite	1
**10	Follower	Stainless St. ASTM B783 316L	1
11	Disc springs	Stainless St. 17-7PH	2
12A	Stem nut	Stainless St. ASTM A194 316	1
12B	Stem nut	Stainless St. ASTM A194 316	1
13	Locking clip	Stainless St. ASTM A164 304	1
*14	Seat seal	PTFE, RPTFE, Graphite	1
*15	Body seal	PTFE, RPTFE, Graphite	1
16	Arrow flow plate	Stainless St.	1

* Standard items supplied in repair kits.
** Two followers are used on ½"& ¾"

3"-8" End Entry Control Valve



Item	Description	Material Specifications	Qty.
1	Body	Carbon St. ASTM A216 WCB	1
2	Insert	Stainless St. ASTM A351 CF8M, DUPLEX,	1
2A	V-insert	ALLOY 20, HASTELOY C22, MONEL	1
3	V-ball	Stainless St. ASTM A276 316/316L, DUPLEX, ALLOY 20, HASTELOY C22, MONEL	1
3A	Ball	Stainless St. 316 DHN / LTPN	1
4	Stem	Stainless St. ASTM A276 316/316L, DUPLEX, ALLOY 20, HASTELOY C22, MONEL	1
*5	Seat	RPTFE, NRG, PEEK, DELRIN	2
5A	V-seat	Stainless St. 316 DHN / LTPN	1
*5B	Seat	RPTFE, NRG, PEEK, DELRIN	1
*6	Body seal	PTFE, RPTFE, Graphite	1
*7	Stem thrust seal	PEEK, NYLATRON	1
8	Location pin	Stainless St. A276 316/316L	2
*9	Stem packing	NRG, RPTFE, VITON, Graphite	1
10	Follower	Stainless St. ASTM B783 316L	1
11	Disc springs	Stainless St. 17-7PH	2
12	Tab lock washer	Stainless St. ASTM A240 304	1
13	Stem nut	Carbon St. ZINC plated	1
*14	Seat seal	PTFE, RPTFE, Graphite	1
*15	Body seal	PTFE, RPTFE, Graphite	1
16	Retaining screw	Stainless St. DIN 914 A2-70	4-8
17	Arrow flow plate	Stainless St.	1

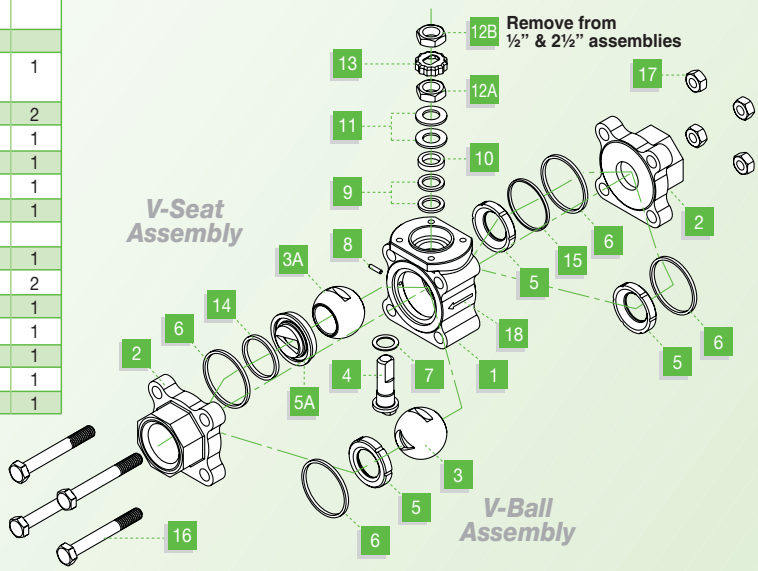
* Standard items supplied in repair kits.

¼"-2½" Three Piece Control Valve

Item	Description	Material Specifications	Qty.
1	Body	Carbon St. ASTM A216 WCB Stainless St. ASTM A351 CF8M, DUPLEX, ALLOY 20, HASTELOY C22, MONEL	1
2	End connector	Carbon St. ASTM A216 WCB Stainless St. ASTM A351 CF3M, DUPLEX, ALLOY 20, HASTELOY C22, MONEL	2
3	V-ball	Stainless St. ASTM A276 316/316L, DUPLEX, ALLOY 20, HASTELOY C22, MONEL	1
3A	Ball	Stainless St. 316 DHN / LTPN	
4	Stem	Stainless St. ASTM A276 316/316L, DUPLEX, ALLOY 20, HASTELOY C22, MONEL	1
*5	Seat	RPTFE, NRG, PEEK, DELRIN	2
5A	V-seat	Stainless St. 316 DHN / LTPN	1
*6	Body seal	PTFE, RPTFE, Graphite	1
*7	Stem thrust seal	PEEK, NYLATRON	1
8	Location pin	Stainless St. A276 316/316L	1
*9	Stem packing	NRG, RPTFE, VITON, Graphite	
10	Follower	Stainless St. ASTM B783 316L	1
11	Disc springs	Stainless St. 17-7PH	2
12A	Stem nut	Stainless St. ASTM A194 316	1
12B	Stem nut	Stainless St. ASTM A194 316	1
13	Locking clip	Stainless St. ASTM A164 304	1
*14	Seat seal	PTFE, RPTFE, Graphite	1
*15	Body ring	Stainless St. ASTM A276 316	1

Item	Description	Material Specifications	Qty.
16	Body bolt	Stainless St. ISO 4014 A2-70	4
17	Body nut	Carbon St. ISO 4014 GR 8.8 ZINC plated	4
18	Arrow flow plate	Stainless St.	1

* Standard items for repair kits
** Two followers are used on ½"& ¾"

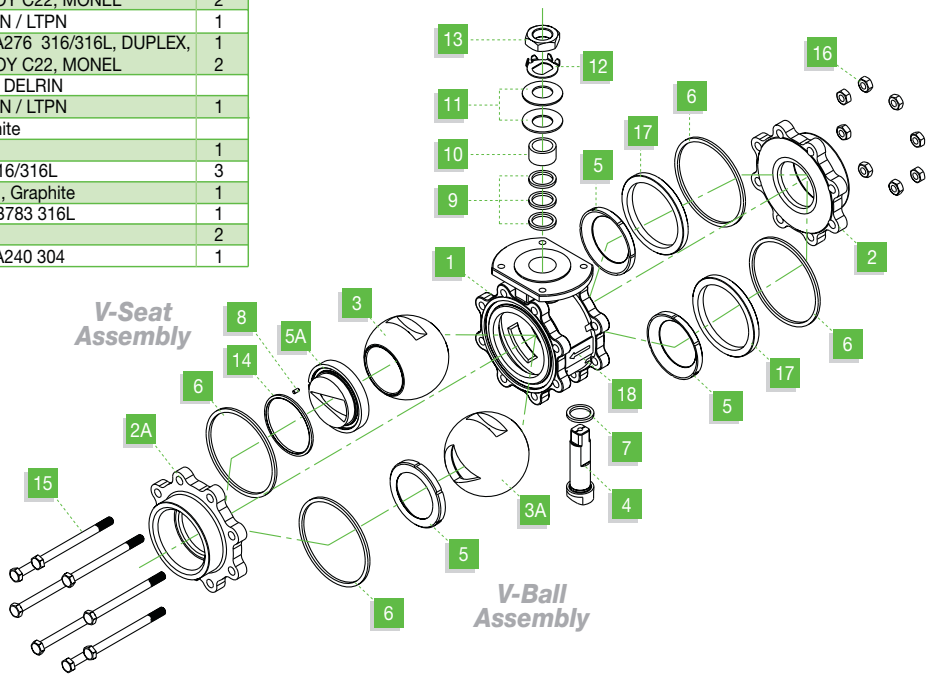


3"-4"FB Three Piece Control Valve

Item	Description	Material Specifications	Qty.
1	Body	Carbon St. ASTM A216 WCB Stainless St. ASTM A351 CF8M, DUPLEX, ALLOY 20, HASTELOY C22, MONEL	1 2
2	End connector	Carbon St. ASTM A216 WCB Stainless St. ASTM A351 CF3M, DUPLEX, ALLOY 20, HASTELOY C22, MONEL	1 1 1
2A	V-end	Carbon St. ASTM A216 WCB	1
3	V-ball	Stainless St. ASTM A276 316/316L, DUPLEX, ALLOY 20, HASTELOY C22, MONEL	1 2
3A	Ball	Stainless St. 316 DHN / LTPN	1
4	Stem	Stainless St. ASTM A276 316/316L, DUPLEX, ALLOY 20, HASTELOY C22, MONEL	1 2
*5	Seat	RPTFE, NRG, PEEK, DELRIN	
5A	V-seat	Stainless St. 316 DHN / LTPN	1
*6	Body seal	PTFE, RPTFE, Graphite	
*7	Stem thrust seal	PEEK, NYLATRON	1
8	Location pin	Stainless St. A276 316/316L	3
*9	Stem packing	NRG, RPTFE, VITON, Graphite	1
10	Follower	Stainless St. ASTM B783 316L	1
11	Disc spring	Stainless St. 17-7PH	2
12	Tab lock washer	Stainless St. ASTM A240 304	1

Item	Description	Material Specifications	Qty.
13	Stem nut	Stainless St. ASTM A194 316	1
14	Seat seal	PTFE, RPTFE, Graphite	1
15	Body bolt	Stainless St. ISO 4014 A2-70	8
16	Body nut	Carbon St. ISO 4014 GR 8.8 ZINC plated	8
17	Seat retaining	Stainless St. ASTM A351 CF8M	1
18	Arrow flow plate	Stainless St.	1

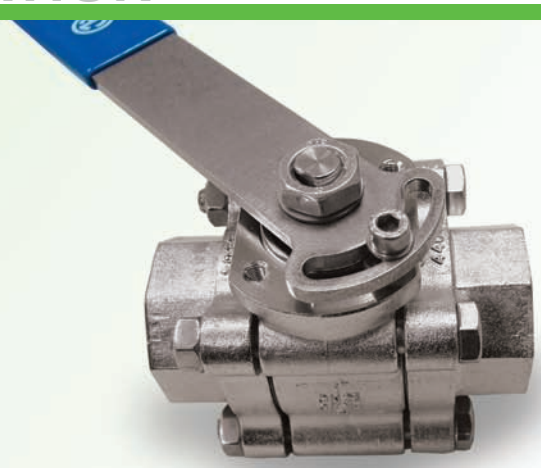
* Standard items for repair kits



Manual Control

Habonim has developed a convenient and economical manual operation control valve package that provides a cost effective flow control solution for process applications that don't demand dynamic adjustment or the use of a fully automated control unit with sensors, positioners and various additional control devices.

If your flow process is stable, and accurate dynamic adjustment is not an issue, then Habonim's manual control package allows you to manually set the process parameters to a specified angular ball position.



Habonim's angular positioning device is comprised of a polished stainless steel 'Scale' (0°- 90°), mounted on top of the valve's ISO pad. The oval handle is designed with an integral pointer that indicates angular opening position.

The ball valve offers the same high standard of functionality you've come to expect from all Habonim control products such as flow characteristics, high tensile strength stem (17-4PH), and joints with tight tolerances for reduction of hysteresis and more.

To avoid unintentional rotation of the valve stem, Habonim's special multi-position lockable handle is also available.

ProfiX™ D Series

New Generation 3-Way Control Valve

ProfiX™ D Series 3-way control valve, fitted with a V-Port characterized metal seat, provides accurate diverting or mixing over a wide range of flow rates for various applications.

Diverting

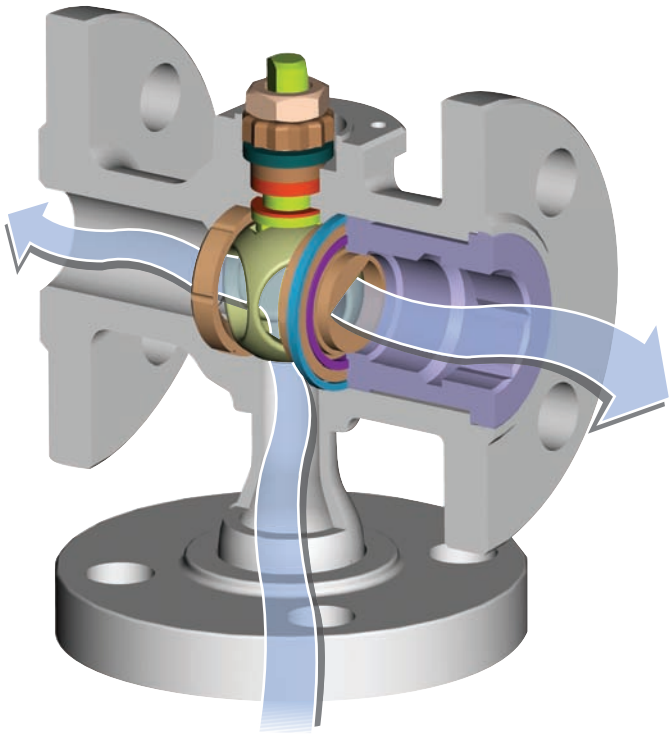
Diverter valves direct flow from the inlet towards the two outlets simultaneously. The percentage of valve opening is determined by the process requirement translated into a PLC signal. A T-Port ball lapped with a V-notch metal seat on one side provides equal percentage hydraulic characteristics for the flow process loop. The round port on the other side of the ball re-circulates the surplus flow while eliminating increased pressure in the valve inlet.

Mixing

Mixing valves are designed to combine the flow of two inlets into a single outlet. They are used in industrial applications where specific concentrations must be combined and regulated or temperature maintained. Optimum performance may be achieved with equal pressure on both inlets.

Applications for the ProfiX™ D Control Valve Series for both flow configurations (diverting or mixing) include: refineries, chemical plants and oil production; where boilers, coolers, heaters and condensers are used. Also ideal for engines, turbines, gear boxes and heat exchanges; where air cooling, fuel and lube oil preheating, co-generation and engine jacket water demand precise control requirements.

The ProfiX™ D Series can also be fitted with a range of accessories from position feedback to full control capabilities.



Dynamic Performance Valve Positioners

Sturdy, compact positioning units for a comprehensive range of applications

Habonim supplies a range of positioners that assure precise positioning of the valve stem in accordance with the controller output, and are skillfully designed to overcome hysteresis, packing box friction, valve plug unbalance due to pressure drop, and many other control system drawbacks.

A sturdy design means positioners perform to exacting requirements while remaining relatively maintenance free even in the most challenging conditions such as high vibration, temperature variations, hazardous and corrosive environments.

Habonim offers a complete line of accurate control valve positioners for a wide range of quarter-turn valve applications including; pneumatic, electro-pneumatic, explosion-proof, intrinsically safe, intelligent and digital.

This can also include Hart, Profibus and Foundation Fieldbus units upon request.

Advanced Features

Options include high flow valves, direct mount or industry standard discrete mount housings, 3-15 PSI pneumatic control signals, 4-20 mA angle retransmit, limit switches, Clear Cone position monitor and I/P converters (either simple or with various explosion proof options). Installation flexibility means positioners can be mounted on any actuator using VDI / VDE 3845 NAMUR drive.

Easy to Calibrate and Characterize

Modifications are unquestionably convenient, with easy calibration and quick reversal of rotational sense without special tools or additional parts, and fast change of response characteristic cams.

Technical Specifications

Linearity:	±0.2% of span
Hysteresis:	0.2% of span
Repeatability:	0.1% of span
Input Signal:	4 to 20mA / 10 to 50 VDC
Air Supply Pressure:	140kPa (Standard Output) 240kPa (Doubled output)
Air Consumption:	Max. 4 Nl/min. or 0.24 Nm^3/ hr at 140 kPa (20 psi) air supply pressure
Output Air Capacity:	Max. 110 Nl/min. or 6.6 Nm^3/ hr at 140 kPa (20 psi) air supply pressure
Output Signal:	20 to 100kPa (Standard Output) 40 to 200kPa (Doubled output)
Operating Temperature Limits:	-40 to 80°C (-40 to 176°F) (General use)
Air Supply, Output Signal, Output Gauge Connections:	Rc1/4 or 1/4 NPT female
Electrical Connection:	G1/2, G3/4, 1/2 NPT or 3/4 NPT female

CONTROL & AUTOMATION

PROFIX

How to order The HABONIM ProfiX™ Valve Identification Code

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	.	.	30
1	0			N	4	7	P	–	6	6	6	M	P	T	/	B	S	P	T	–	V	3	0			
Size		Service			Series				Body	End	Ball	Stem	Seat	Seal		End Connection					Special Application					

Size		
Code	inch	mm
02	¼"	8
03	⅜"	10
05	½"	15
07	¾"	20
10	1"	25
12	1¼"	32
15	1½"	40
20	2"	50
25	2½"	65
30	3"	80
40	4"	100
60	6"	150
80	8"	200

Series
N47P[1]
N31P[2]
N32P[3]
N73P[3]
N74P[3]
N77P[3]
N78P[3]

Body / End [7] Ball / Stem [7]	
4	Carbon Steel
6	S. St. 316
M	17-4PH
W	Hasteloy-C22
A	Alloy-20
S	SMO254

Upstream Seat [8]	
C	PCTFE
K	Carbon Filled PEEK®
L	Virgin PEEK®
M	Metal
P	NRG
R	15% Glass Filled PTFE
Y	Derlin®

Seal	
B	Buna "N" Shore 90
E	EPDM (EPR)
G	Expanded Graphite
I	Impregnated Graphite
R	15% Glass Filled PTFE
T	PTFE
U	UHMWPE
V	Viton®

End Connection [7]	
NPT	-
BSPT	-
BW	Buttweld SCH 40
SW	Socket Weld
Flange	
#150	-
#300	-
PN16	-
PN40	-

Other end connections are available on request.

Characterized Downstream Metal Seat [4] & Characterized Ball [6]	
S08	0.8 mm Slot [5]
S16	1.6 mm Slot [5]
S32	3.2 mm Slot [5]
V30	30°V Shape
V60	60°V Shape
V90	90°V Shape
SB08	0.8 mm Slot Ball [5]
SB16	1.6 mm Slot Ball [5]
SB32	3.2 mm Slot Ball [5]
VB30	30°V Ball
VB60	60°V Ball
VB90	90°V Ball

Ball & Downstream Seat Surface Treatment / Coating	
DHN	Standard
PN	Low Temperature Plasma Nitriding
ST	Stellite
Cr	Chrome

[1] Available sizes ¼"- 4" F.B.
[2] Available sizes ½"- 8", with the exception of 1¼" and 2½"
[3] Available sizes ½"- 6", with the exception of 1¼" and 2½"
[4] Ball/Characterized Seat Assembly base material available only with stainless steel AISI 316
[5] Various standard slot options available for up to 1" valve size.
[6] Exotic material trims available only with Characterized Ball.
[7] Various additional designs and materials are available; please refer to the Habonim coding system, 47P catalogue, Bulletin P-111 (page 16)
[8] Also used as a downstream seat with a characterized ball.

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Habonim's Valve Sizing software (HVS) is now available to support your applications.

HVS accurately calculates the process Cv, valve opening percentage, velocity, critical condition warnings, predicted noise levels and more.

HVS Applies to:

- Single-phase fluids
- Gases
- Liquids
- Saturated and superheated steam

According to ANSI/ISA-75.01.01-2002 (IEC 60534-2-1 Mod) equations.

HVS software provides the most comprehensive database of flow coefficient parameters available anywhere. More than **5800** different fluid properties are at your fingertips to calculate fluid constants i.e. density, vapour pressure, critical pressure etc. In addition it calculates the temperature for saturated steam at a given pressure.

Program output is displayed as a list of Habonim control valves that meet the process capacity requirements and the valve selection criteria. The user is then able to generate an engineering data sheet for the chosen valve, listing all relevant data.

HVS is a copy protected program downloadable from the Habonim web site at **www.habonim.com**

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