BULLETIN B-411
METRIC



CONTROL & AUTOMATION VALVES

"N" SERIES

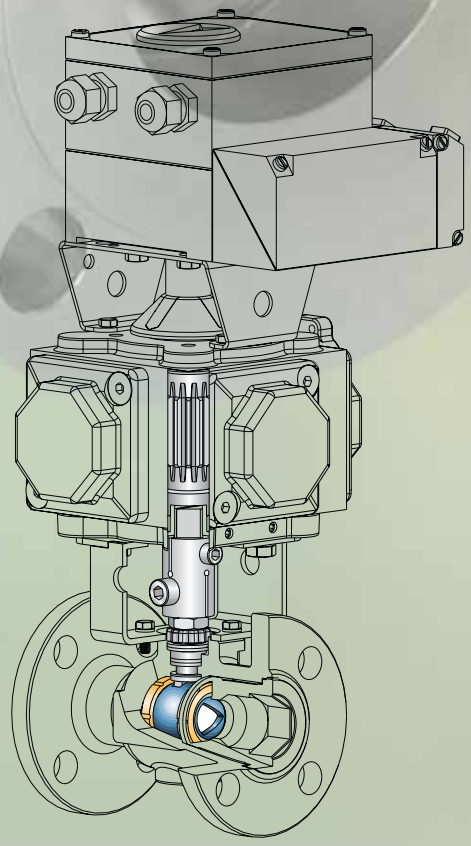
HABONIM
Industrial Valves & Actuators

DEDICATED TO INNOVATION

Introduction

Habonim control solutions respond with innovation and insight to industry demands for a flow control valve assembly that is not only accurate, but 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 better flow control functionality at a fraction of the cost.

Ball valves generally outperform all other types of valves in a control loop, even in the harshest environments. Ball valves offer 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, large exhaust capacity, and dirt tolerance with added design features for ease of maintenance and zero backlash.



Habonim engineering team provides world-class technical expertise in design, tech-support, sales, 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 the use of bulky, expensive globe valves in flow control operations. Habonim's modified ball valve construction, combined with a newly designed control element, addresses market demands for an accurate, cost-efficient and extremely versatile control valve assembly.

Characterized Ball

Superior control performance is designed into the geometry of the V-Ball to provide accurate control of downstream flow rates. Precision cut V-Balls and Slotted Balls allow you to match the control performance of globe valves, while benefiting from the economy and maintenance ease of smaller, lightweight ball valves. Designed with flexibility in mind, CV and control characteristics can be easily altered by simply changing the ball.

The V- design provides high rangeability and precision throttling required on fibrous suspension applications, as well as clean or dirty liquids and gases. The straight through flow passage allows for maximum efficiency and excellent erosion resistance. Balls come in a variety of slot shapes and can be custom designed to meet any control requirement. V-Balls are furnished within a wide range of high-alloy materials and coatings.

Characterized Metal Seat

A new standard in performance and maintenance functionality is achieved with Habonim's V-Port ball valve construction. It is comprised of a Ball and 'characterized' metal seat, lapped into a single seamless component and operating to Shut-off Class VI.

The V-Port design is applicable for rugged environments like steam control, high differential pressure, and abrasive media. V-Port seats come in a variety of slot shapes to fit almost any application and can be customized as required. Many ball/seat sets are interchangeable for true maintenance ease.

Both the ball and characterized metal seat are surface treated and hard coated 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. Additional special coatings are also available.

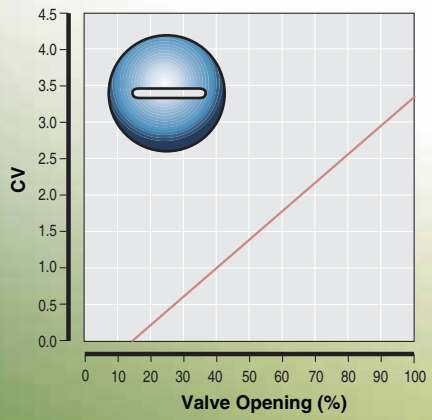
Slot Port

V-Ball

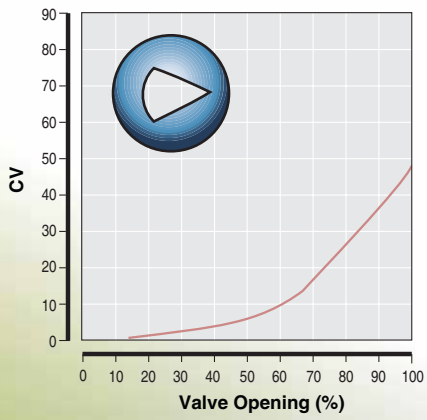
V-Port

Round Port

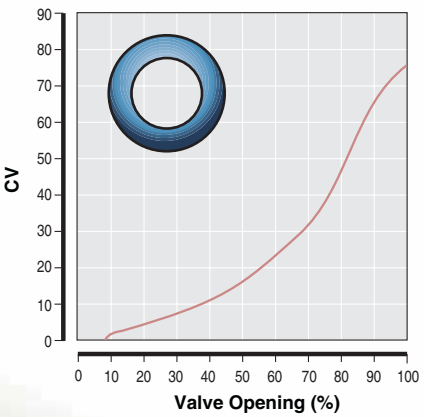
Linear



Equal %



Quick Opening

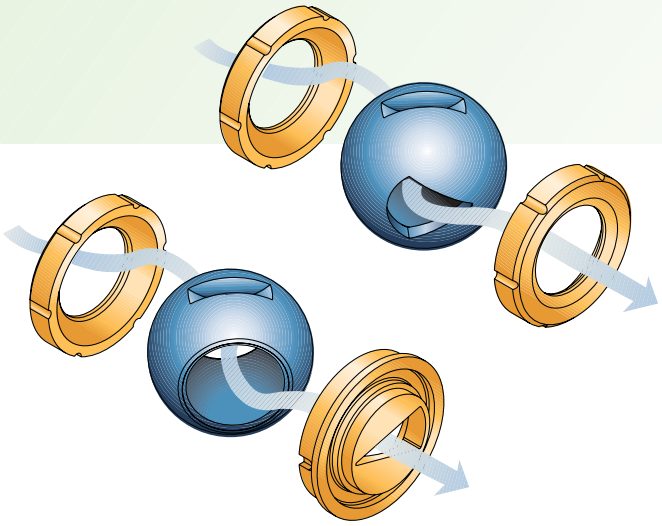


Design Simplicity

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, high 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, Habonim control valves 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 would require costly, time-consuming valve replacements to do the same job.



Zero Seat Leakage

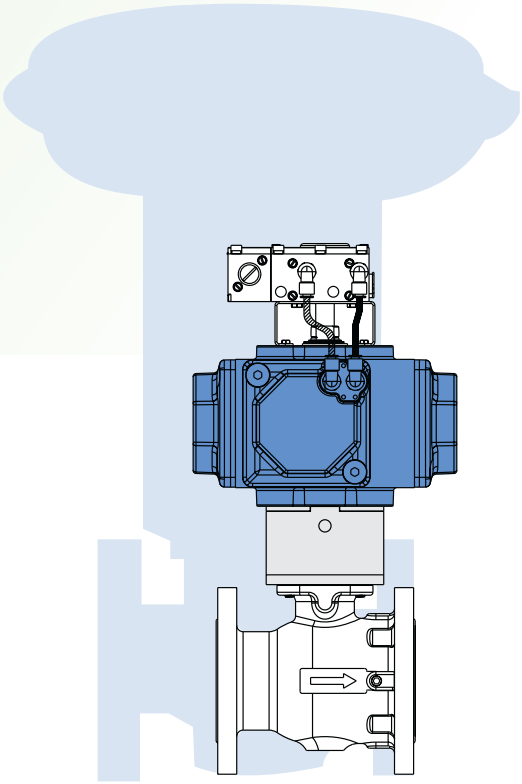
Habonim control valves undergo meticulous machining and stringent factory testing to ensure bubble-tight shut-off for zero leakage. Leak-tight operation is provided by either of two characterized flow control options. The V-port option is comprised of a segmented metal seat lapped-in with the ball for a perfect fit, and aided by an upstream spring effect soft-seat, for positive upload. The characterized V-ball option is a segmented V-Ball using 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.

Less Weight - Smaller Size

Habonim's streamlined control valve design dissipates less energy and hence demonstrates a higher flow coefficient (Cv) value compared to a tortuous globe valve design. Ball valves typically exhibit higher Cv ratings than globe valves for the same size valve. That means a ball valve used to handle the same flow as a globe valve will be smaller.

This translates into big savings when designing flow process operations, since ball valves from one to two sizes down from a globe valve can be used for the same application. 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 be more cost efficient and maintenance friendly.



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.

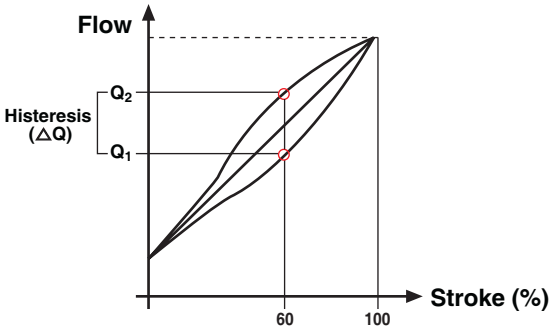
With globe valves, the flow to open (FTO) fail to close (FC) direction can be problematic, and requires the use of a considerably stronger pneumatic actuator to overcome hydraulic forces and instability if the gradient direction is reversed.

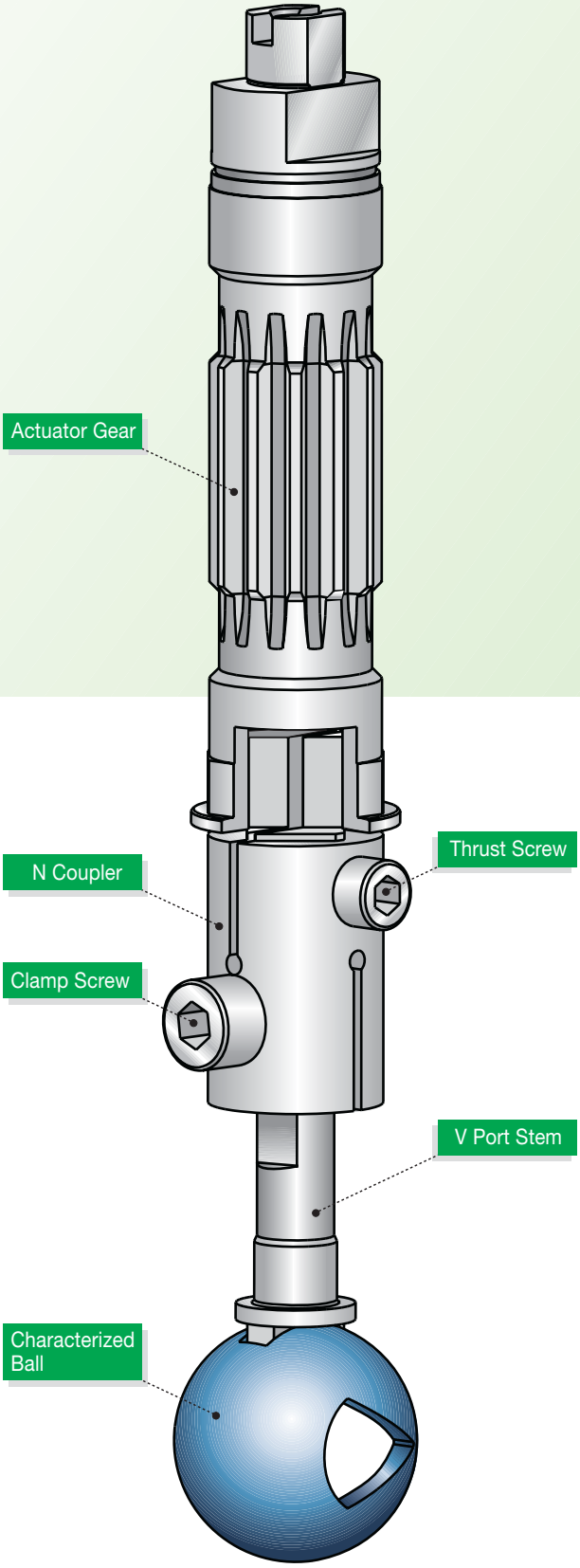
complete 4-piston pneumatic actuator catalogue please refer to Habonim **Bulletin B-360**.

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 characterized ball; i.e. ball-stem, the stem-coupler, the coupler-actuator, and the actuator-positioner.
Habonim's engineering team has gone to great lengths to design and manufacture of these connecting surfaces for the tightest fit possible to provide uniform movement of all parts along the line of rotation.

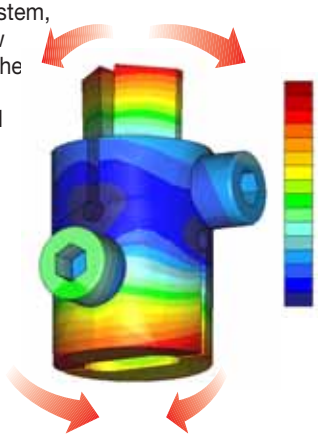
Through advanced component design, Habonim ensures that all these adjoining parts are carefully engineered to eliminate problems of backlash, leakage and Hysteresis, within a 2% (max) accuracy, guaranteed for the overall control unit.
This ensures the resulting flow control exhibits exceptional consistency 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 'N Coupler'

Habonim's 'N Coupler' design is based on the inherent 'flexibility' of the stainless steel. Two grooves are sliced half-way across the length of the coupler at 90° angles. These grooves allow the coupler to clamp the valve stem, and keep the bottom cap screw secure, while the upper side of the coupler is pressed against the pinion groove walls by a second upper cap screw. The result is a special coupler situated between the valve stem and actuator pinion that affords zero backlash, and virtually eliminates hysteresis. The 'N Coupler' assures repeatability of the complete control unit; i.e. valve stem and actuator pinion operate in perfect synchronization at all times.



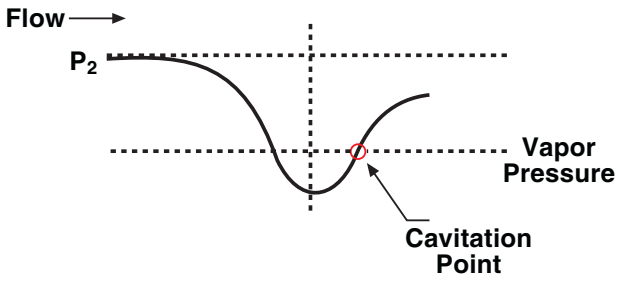
Less Packing Wear

Habonim 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. That translates into longer lasting, continuous valve operation with minimum upkeep. The rotary movement of the ball valve makes it safe and simple to automate; thus ideal for flow control operations. In contrast, the linear movement of Globe Vales has a tendency to seize-up, is susceptible to blockages, and requires constant maintenance to deal with stem leakage problems.

Habonim Control Valves are 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

Habonim Control Valves offer 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.



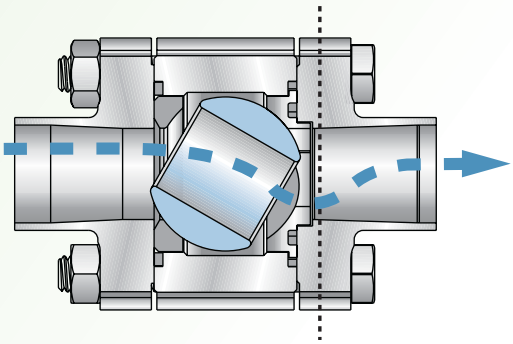
These imploding vapor bubbles can produce serious cavitation damage, indicated by a pitting of the metal surfaces on the valve, leading to real maintenance problems. The way globe valves are designed, this damage occurs inside the valve casing, causing an erosive effect that may eventually result in costly valve replacement. With ball valves however, such as Habonim's N Series, if cavitation does occur, it is apparent only downstream of the valve seat area beyond the valve envelope, causing no damage to the actual valve itself.

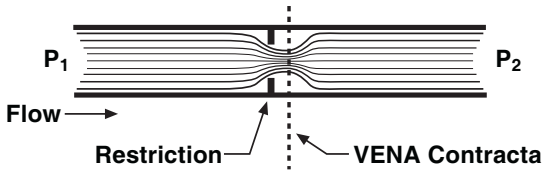
Habonim R&D engineers have developed a new line of anti-cavitation Trim's for severe applications. A grid of tubular holes facilitates linear or equal flow percentage characteristics that greatly reduce noise and vibration as well as limiting cavitation damage. The grid is electro-eroded into the down-stream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

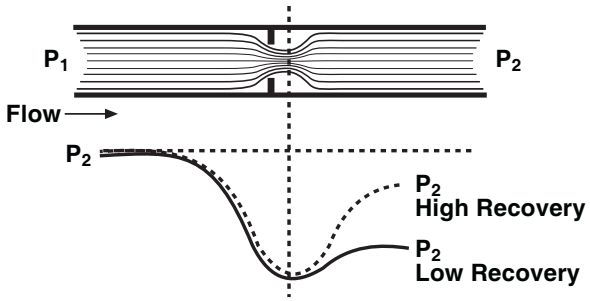
High Recovery

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 Habonim control valves dissipates far less energy resulting in higher recovery and a more cost efficient flow process, especially when compared with tortuous flow globe valve design.







Wide Rangeability and Stability

Control valve Rangeability can be described as the ratio of maximum controllable flow to the minimum controllable flow. Habonim's segmented 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.

Habonim control valve design offers a wide Rangeability with maximum stability of process conditions, especially compared with other traditional narrow range valves.

Surface Treatment and Coatings

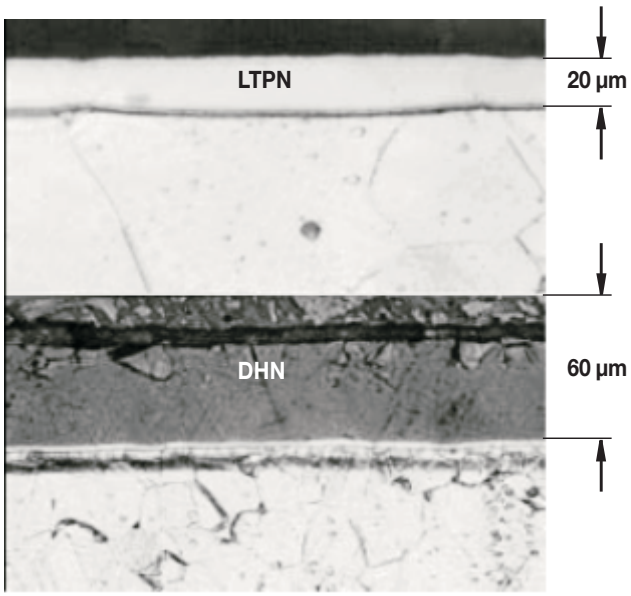
Habonim control valve components utilize the most advanced surface treatment processes and coatings for longer valve operating life and increased resistance to wear. Habonim's ball and characterized metal seat configuration are specifically treated to combat abrasion and galling. The result is improved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

Habonim applies 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 Habonim'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.

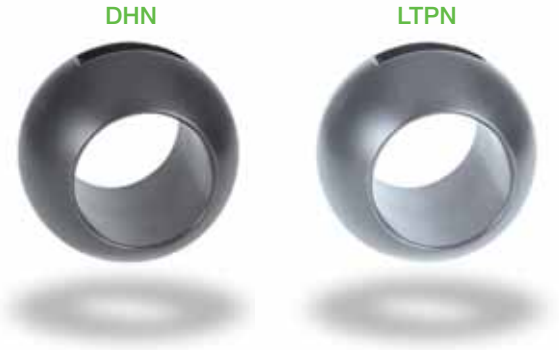


Low Temperature Plasma Nitriding (LTPN)

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

Low temperature plasma nitriding of stainless steels 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 can be provided upon request. Contact Habonim for further information.



Nomenclature

Flow Equation		
Fluid	Service Condition	Equation
Liquid	Sub-critical condition $\triangle P < F_L^2 (P_1-P_V)$	$C_V = 1.17 \cdot Q_L \cdot \sqrt{\frac{G_L}{\triangle P}}$ (*1) or $C_V = \frac{1.17 \cdot W_L}{\sqrt{\triangle P \cdot G_L}}$
	Critical condition $\triangle P \geq F_L^2 (P_1-P_V)$	$C_V = \frac{1.17 \cdot Q_L}{F_L} \cdot \sqrt{\frac{G_L}{(P_1 - P_V)}}$ 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 $C_V = \frac{W_g}{27.1 \cdot Y \cdot \sqrt{X \cdot P_1 \cdot \gamma_1}}$
	$X \geq F_K \cdot X_T$	$C_V = \frac{Q_g}{285 \cdot P_1} \cdot \sqrt{\frac{G_g \cdot T_1 \cdot Z}{F_K \cdot X_T}}$ or $C_V = \frac{W_g}{18.1 \cdot \sqrt{F_K \cdot X_T \cdot P_1 \cdot \gamma_1}}$
Saturated Steam	$X < F_K \cdot X_T$	$C_V = \frac{W_g}{19.3 \cdot P_1 \cdot Y \cdot \sqrt{X}}$
	$X \geq F_K \cdot X_T$	$C_V = \frac{W_g}{12.9 \cdot P_1 \cdot \sqrt{F_K \cdot X_T}}$
Superheated Steam	$X < F_K \cdot X_T$	$C_V = \frac{W_g \cdot (1+0.00126 \cdot \triangle t)}{19.3 \cdot P_1 \cdot Y \cdot \sqrt{X}}$
	$X \geq F_K \cdot X_T$	$C_V = \frac{W_g \cdot (1+0.00126 \cdot \triangle t)}{12.9 \cdot P_1 \cdot \sqrt{F_K \cdot X_T}}$

C_V : Valve flow coefficient

Liquid:

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)
P_1 : Upstream absolute static pressure (kgf/cm²A)
P_2 : Downstream absolute static pressure (kgf/cm²A)
P_v : Absolute vapor pressure of liquid at inlet temperature (kgf/cm²A) - **Refer to Table 2**
P : Different pressure (P1-P2) (kgf/cm²A)
Q_L : Volumetric flow rate of liquid (m³/h)
W_L : Weight or mass flow rate of liquid (t/h)

Gas:

G_g : Gas specific gravity - **Refer to Table 3**
Q_g : Gas volumetric specific gravity (Nm³/h)
X : Ratio of pressure drop (P/P1)
X_T : Pressure drop ratio factor (dimensionless) - **Refer to Table 4**
W_g : Gas or steam mass flow rate (kg/h)
γ_1 : Specific gravity, upstream conditions (kg/m³).
F_K : Ratio of specific heats factor, (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 (*2)

Calculations

?? ???	?? ???	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 %	FL	0.00	0.96	0.95	0.94	0.93	0.92	0.90	0.88	0.86	0.82	0.75
	Xt	0.00	0.72	0.65	0.60	0.54	0.48	0.42	0.36	0.28	0.16	0.12
Quick Opening	FL	0.00	0.92	0.91	0.91	0.90	0.86	0.80	0.72	0.61	0.61	0.50
	Xt	0.00	0.78	0.74	0.71	0.67	0.62	0.56	0.49	0.38	0.26	0.15

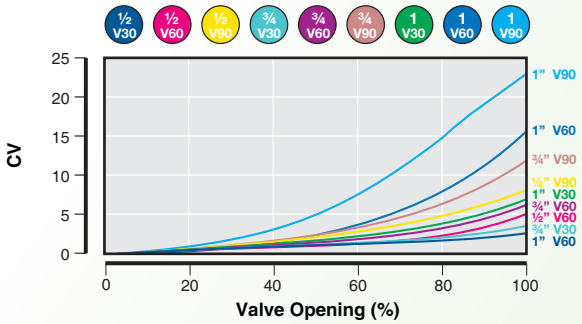
Gg and Fk Factors		
Liquid	Formula	Pv
Acetone	C_2H_4	47.861
Acetic Acid	$C_2H_4O_2$	0.0273
Ammonia	NH_3	0.7310
Benzene	C_6H_6	0.1621
Butane	C_4H_{10}	2.89
Carbon Dioxide	CO_2	58.420
Ethan	C_2H_6	47.861
Ethanol	C_2H_6O	0.1029
Ethylene Glycol	$C_2H_4(OH)_2$	69.58 e-6
Glycerin	$C_3H_5(OH)_3$	110.50 e-9
OIL WT15	-	305.38 e-6
OIL WT32	-	205.48 e-6
OIL WT46	-	306.59 e-6
Sulfur Dioxide	SO_2	3.3929
Water	H_2O	0.0238

Gg and Fk Factors			
Gas	Formula	Gg	Fk
Air	-	1.00	1.00
Acetylene	C_2H_2	0.90	0.91
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
Ethan	C_2H_8	1.05	0.87
Helium	H_e	0.14	1.19
Hydrogen	H_2	0.07	1.00
Methan	CH_4	0.55	0.90
Oxygen	O_2	1.10	1.00
Sulfurous acid (gas)	SO_2	2.21	0.89
Propane	C_3H_8	1.56	0.81
Nitrogen	N_2	0.97	1.00
Nitrogen Monoxide	NO	1.03	1.00
Saturated Steam	H_2O	-	0.94
Superheated Steam	H_2O	-	0.94

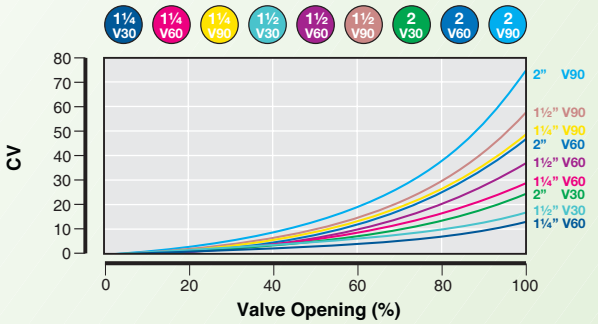
Flow Coefficient - CV

Equal %

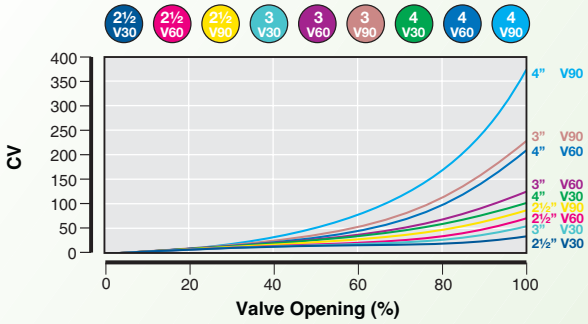
½"- 1"



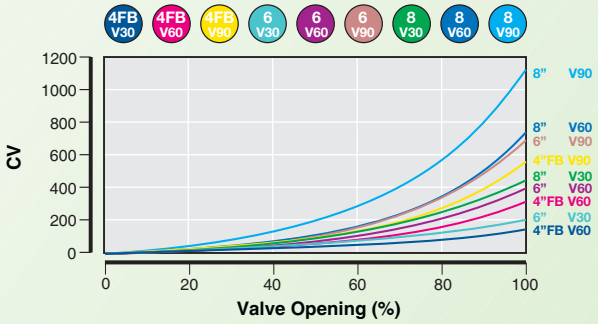
1¼"- 2"



2½"- 4"



4"FB - 8"

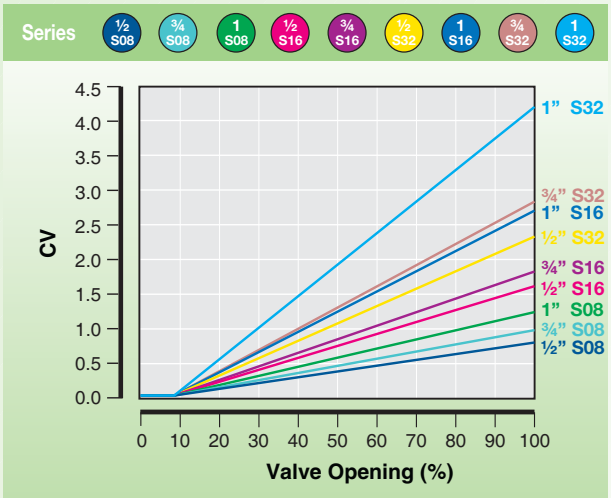


Valve Size	V Shape	Percent of Valve Rotation (Degree of Rotation)										
		0(0)	10(9)	20(18)	30(27)	40(36)	50(45)	60(54)	70(63)	80(72)	90(81)	100(90)
½"	V30	0.00	0.05	0.118	0.236	0.405	0.624	0.880	1.200	1.550	1.954	2.380
	V60	0.00	0.07	0.161	0.378	0.670	1.000	1.450	2.050	2.780	3.710	4.960
	V90	0.00	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"

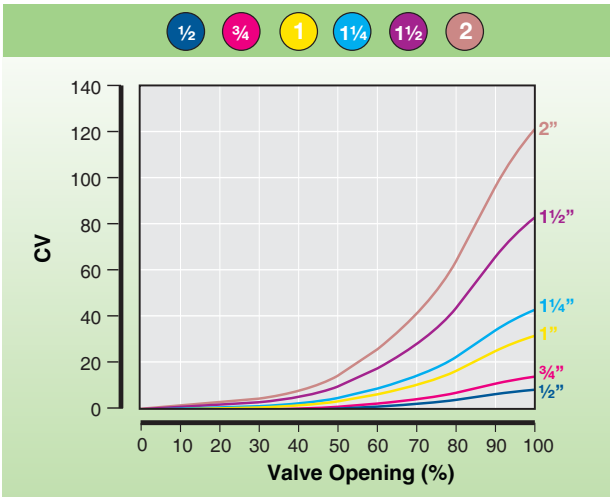


Valve Size	Slot Shape	Percent of Valve Rotation (degree of Rotation)					
		0(0)	10(9)	20(18)	30(27)	40(36)	50(45)
½"	0.8	0.00	0.00	0.038	0.078	0.120	0.162
	1.6	0.00	0.00	0.107	0.224	0.347	0.475
	3.2	0.00	0.00	0.187	0.383	0.583	0.770
¾"	0.8	0.00	0.00	0.05	0.11	0.16	0.21
	1.6	0.00	0.00	0.14	0.28	0.43	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

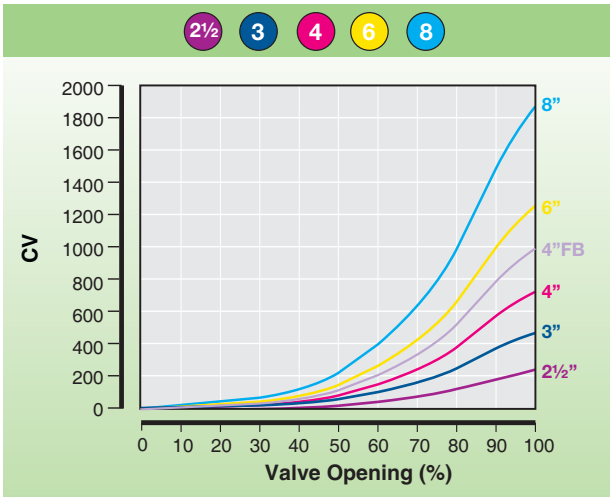
Round

½"- 2"



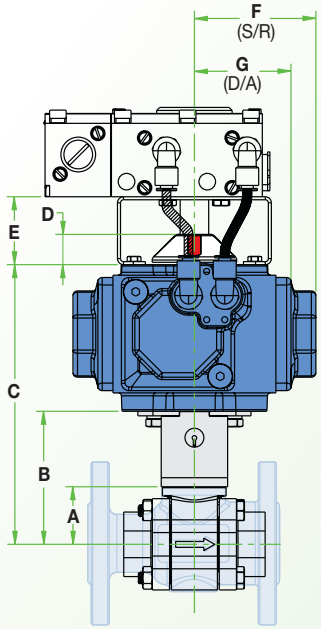
Round

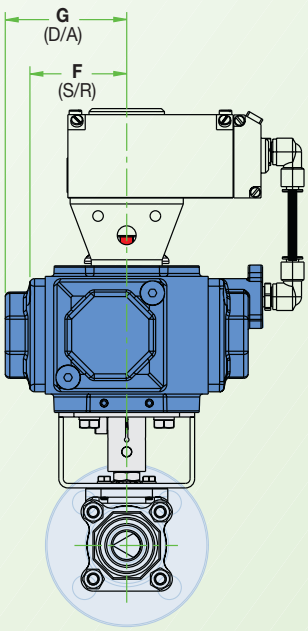
2½"- 8"



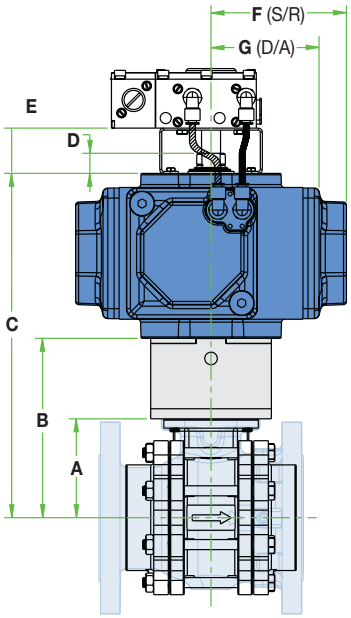
Valve Size	Valve Opening % (Degrees Rotation)										
	0(0)	10(9)	20(18)	30(27)	40(36)	50(45)	60(54)	70(63)	80(72)	90(81)	100(90)
½"	0.00	0.15	0.29	0.46	0.70	1.09	1.76	2.60	4.30	6.40	8.00
¾"	0.00	0.21	0.43	0.70	1.05	1.62	2.64	4.00	6.40	9.60	12.00
1"	0.00	0.58	1.15	1.90	2.80	4.30	7.00	10.50	17.00	26.00	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											
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

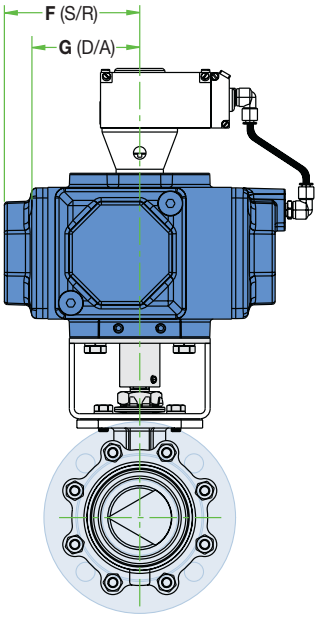
Dimensions ½”- 2½”





Dimensions 3”- 8”

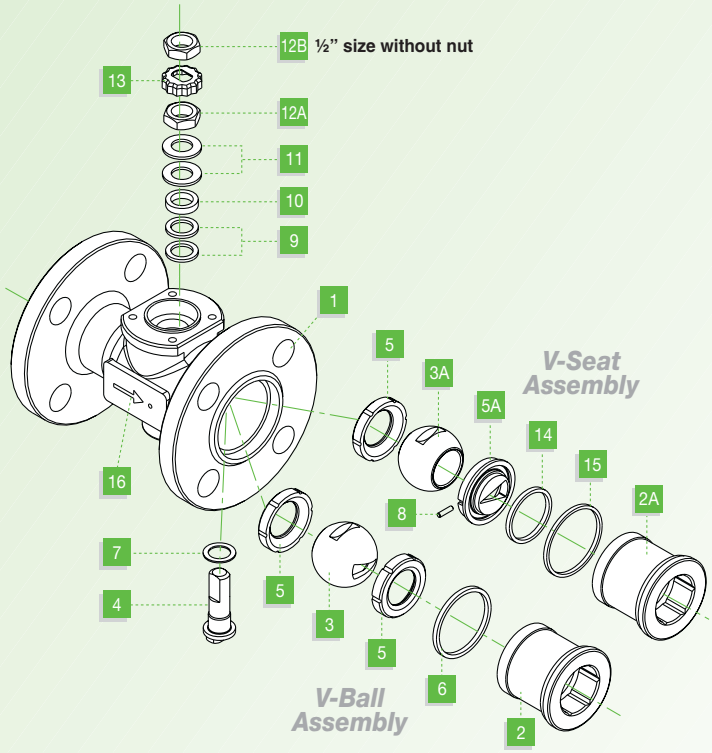




Valve Size	Actuator Size	N47P & N31P Series						
		A	B	C	D	E	F (S/R)	G (D/A)
½”	C20	29.0	69.0	149.7	20	45	65.5	51.0
¾”	C20	31.4	71.4	152.1	20	45	65.5	51.0
1”	C25	38.2	88.2	185.4	20	45	80.5	66.0
* 1¼”	C25	42.6	92.6	189.8	20	45	80.5	66.0
1½”	C25	43.6	103.6	200.8	20	45	80.5	66.0
2”	C30	48.3	108.3	205.5	20	45	93.0	75.5
* 2½”	C35	70.0	108.3	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								
** 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

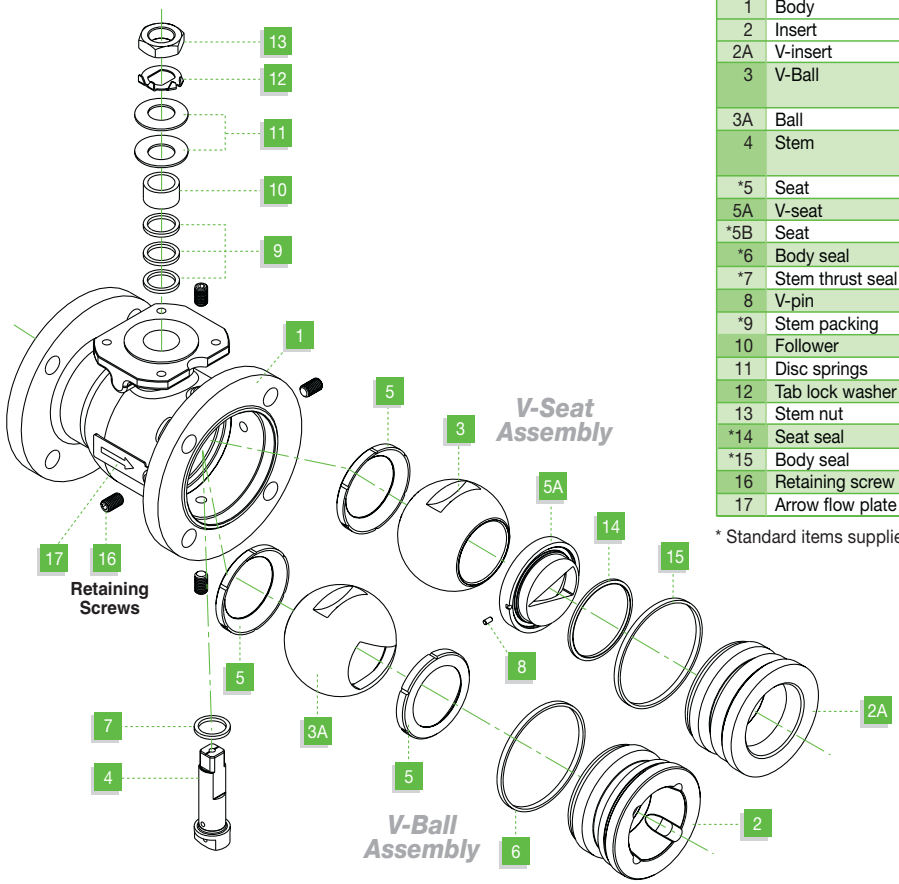
½”-2” End Entry Control Valve



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	V-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
12	Stem nut	Stainless St. ASTM A194 316	1
12A	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”-6” 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	V-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
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

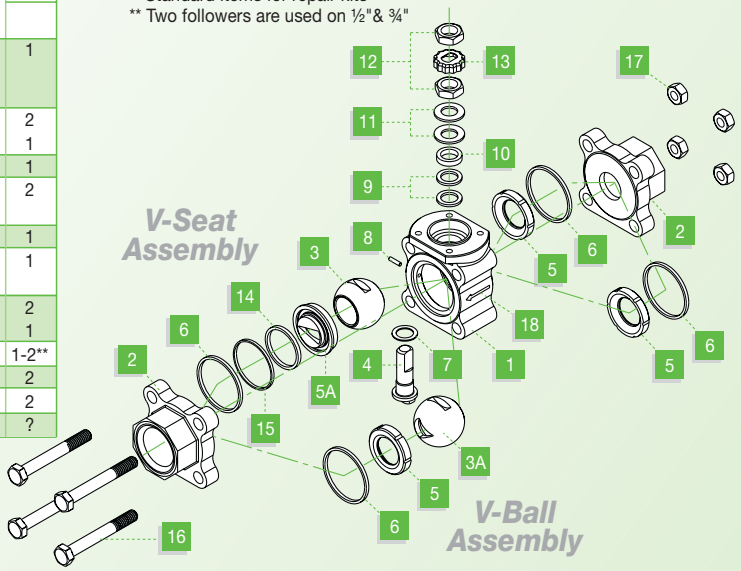
* Standard items supplied in repair kits.

¼"-2½" Three Piece Control Valve

Item	Description	Material Specifications	Qty.
1	Body	Stainless St. ASTM A351 CF8M, Carbon St. A105, WCB, Hasteloy C, Hasteloy C22, Alloy 20, Monel, Duplex, Super Duplex	1
2	End connector	Stainless St. ASTM A351 CF3M, Carbon St. A105, WCB, Hasteloy C, Hasteloy C22, Alloy 20, Monel, Duplex, Super Duplex	2
3	Ball	Stainless St. ASTM A351 CF8M Hasteloy C, Hasteloy C22, Alloy 20, Monel, Duplex, Super Duplex	1
3A			
4	Stem	Stainless St. ASTM A276 316 / 316L Hasteloy C, Hasteloy C22, Alloy 20, Monel, Duplex, Super Duplex	1
*5	Seat	PTFE, RPTFE, NRG, PEEK, TFM, UHMWPE, VESPEL, DELRIN	2 1
5A	V-seat	Stainless St.	1
*6	Body seal	PTFE, RPTFE, TFM, UHMWPE, Graphite, Metal O-Ring	2
*7	Stem thrust seal	RPTFE, NRG, PEEK, TFM, UHMWPE, VESPEL	1
8	V-pin	NYLATRON Stainless St. ASTM A582 303	1
*9	Stem packing	PTFE, RPTFE, NRG, TFM, UHMWPE Graphite	2 1
10	Follower	Stainless St. ASTM B783 316L	1-2**
11	Disc spring	Stainless St. ASTM A693 17-7PH	2
12	Stem nut	Stainless St. ASTM A194 316	2
12A	Stem nut	????????	?

Item	Description	Material Specifications	Qty.
13	Locking clip	Stainless St. ASTM A164 304	1
14	Seat seal	Virgin PTFE	1
15	Body ring	ASTM A276 316	1
16	Body bolt	Stainless St. ISO 4014 A2-70 Carbon St. ISO 4014 GR 8.8 zinc plated	1
17	Body nut	Stainless St. ISO 4032 A2-70 Carbon St. ISO 4032 GR 8.8 zinc plated	1

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

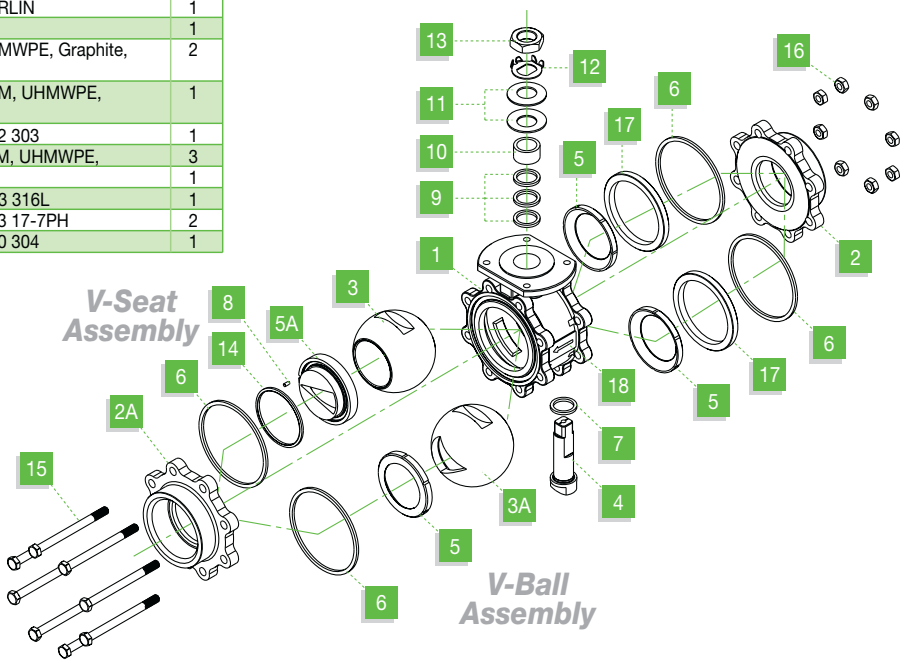


3"-4" Three Piece Control Valve

Item	Description	Material Specifications	Qty.
1	Body	Stainless St. ASTM A351 CF8M Carbon St. ASTM A216 WCB	1
2	End connector	Stainless St. ASTM A351 CF8M Carbon St. ASTM A216 WCB	2 1
2A	V-end	Stainless St.	1
3	Ball	Stainless St. ASTM A351 CF8M	1
3A	V-ball	Stainless St.	1
4	Stem	Stainless St. ASTM 276 316 / 316L	1
*5	Seat	PTFE, RPTFE, NRG, PEEK, TFM, UHMWPE, VESPEL, DERLIN	2 1
5A	V-seat	Stainless St.	1
*6	Body seal	PTFE, RPTFE, TFM, UHMWPE, Graphite, Metal O-ring	2
*7	Stem thrust seal	RPTFE, NRG, PEEK, TFM, UHMWPE, VESPEL, NYLATRON	1
8	V-pin	Stainless St. ASTM A582 303	1
*9	Stem packing	PTFE, RPTFE, NRG, TFM, UHMWPE,	3
		Graphite	1
10	Follower	Stainless St. ASTM B783 316L	1
11	Disc spring	Stainless St. ASTM A693 17-7PH	2
12	Tab lock washer	Stainless St. ASTM A240 304	1

Item	Description	Material Specifications	Qty.
13	Stem nut	Carbon St. ZINC plated	1
14	Seat seal	PTFE	1
15	Body bolt	Stainless St. ISO 4014 A2-70 Carbon St. ISO 4014 GR 8.8 ZINC plated	1
16	Body nut	Stainless St. ISO 4032 A4-70	8
17	Seat retaining	Stainless St. ASTM A351 CF8M	1
18	Arrow flow plate	??????	1

* Standard items for repair kits



Manual Control

A fully automated control unit comprises of sensors, control unit, positioner, and control valve. In most processes you can't avoid using the above components due to accuracy and the dynamic behavior of the measured parameter. Occasionally there is no necessity requiring the use of an expensive package, either the process is stable or the accuracy is insignificant. The only important matter is to set the process manually to a definite and known angular ball position.

The Habonim angular position device comprises of a polished stainless steel scale (0-90°), mounted on top of the Habonim valve ISO pad, and an oval handle with an integral pointer to indicate valves's ball position.

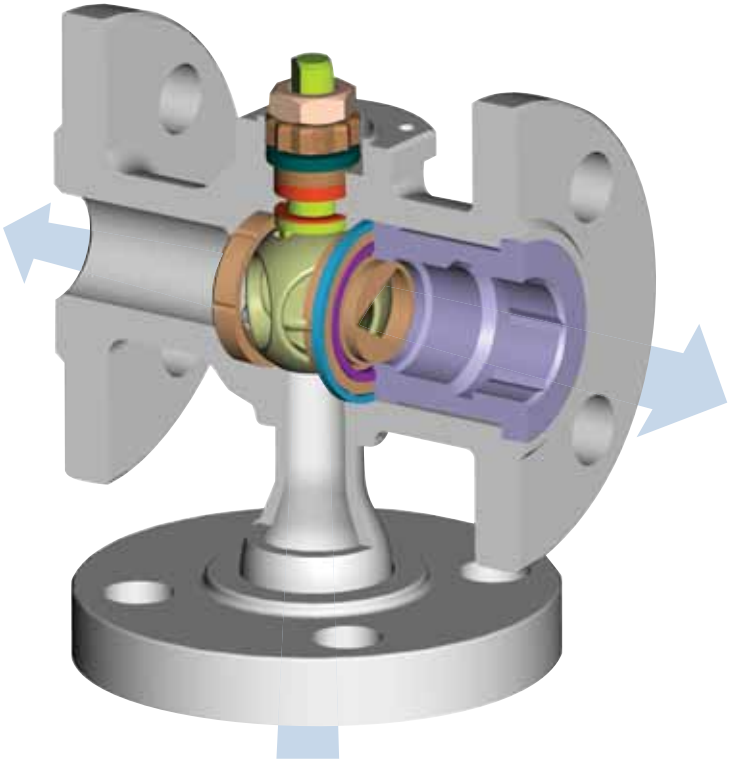
The ball valve has all of Habonim's features for control i.e. equal percentage, linear or modified flow characteristics. Reduction of hysteresis is achieved by producing a ball and stem set with tight engagement tolerances, a high tensile 17-4PH stem and more.

To avoid unintentional rotation of the valve stem, a multi-position lockable handle is also available.

ND Series

New Generation 3-way Control Valve

Habonim's ND 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 ND 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 ND 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 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, 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.

Hart, Profibus and Foundation Fieldbus units as well as other positioners can be fitted 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)
Supply Air, 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 VALVES "N" SERIES

How to order The HABONIM "N" 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	.	.	.	30
1	0	A	F	B	4	7	P	–	6	6	6	6	T	G	/	B	S	P	T	P	0	4	3		
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 High Tensile

Seat	
C	PCTFE
K	Carbon Filled PEEK®
L	Virgin PEEK®
M	Metal
P	NRG
R	15% Glass Filled PTFE

Seal	
B	Buna "N" Shore 90
E	EPDM (EPR)
G	Expanded Graphite
I	Impregnated Graphite
J	25% Glass Filled PTFE
K	Kalrez®
M	PTFE Coated S. St O-Ring
N	Neoprene
R	15% Glass Filled PTFE
T	PTFE
U	UHMWPE
V	Viton®

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

Characterized Downstream Metal Seat [4] & Characterized Ball [6]	
5	S08 (0.8 mm Slot)[5]
5	S16 (1.6 mm Slot)[5]
5	S32 (3.2 mm Slot)[5]
-	V30 (30°V)
-	V60 (60°V)
-	V90 (90°V)

Surface Treatment / Coating	
DHN	Standard
PN	Low Temperature Plasma Nitriding
ST	Stellite
Cr	Chrome

Other end connections are available on request.

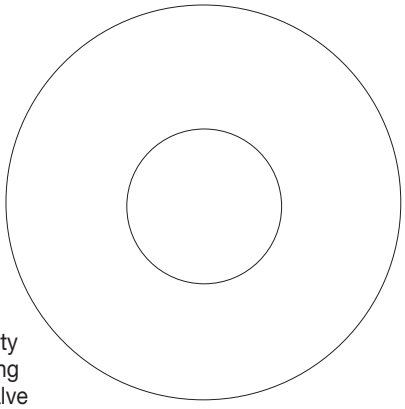
[1] Available sizes ½"- 4" F.B.
[2] Available sizes ½"- 8", with the exception of 1¼" and 2½"
[3] Available sizes ½"- 6", with the exception of 1¼" and 2½"
[4] Ball/Characterized Seat Set base material available only with stainless steel AISI 316
[5] Various standard slot options available for up to 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)

The **Habonim Valve Sizing (HVS) software** is now available to support your applications.

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

HVS Applies to:
- single-phase fluids
- liquids
- gases
- saturated & 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 program inputs, process data, calculated data, valve ordering information including easy administrative features, and all relevant fluid data.

HVS is a copy protected program downloadable from the Habonim web site at www.habonim.com
Once you've signed-in and complied with the terms and conditions for using the HVS database, you'll have one of the leading control valve software applications at your command. The HVS package also includes free new-release software revisions, product updates, newsletters and more.

HABONIM
Industrial Valves & Actuators

Headquarters Habonim ISRAEL
Tel: +972-4-6914911, Fax: +972-4-6914902
sales_international@habonim.com

ISRAEL
Tel: +972-4-6914903
Fax: +972-4-6914935
sales_israel@habonim.com

North America
Toll Free Phone: 1-866-261-8400
Toll Free Fax: 1-866-243-9959
sales_usa@habonim.com

U.K.
Habonim UK
Tel: +44-1633-484554
Fax: +44-1633-482252
sales@habonimuk.com

Asia Pacific
Habonim-Vaas
sales_asiapacific@vaasval.com

Europe
Habonim Europe
Tel: +972-4-6914733
Fax: +972-4-6914703
sales_europe@habonim.com

China
Habonim China
Tel: +86-21-6473-8523
Fax: +86-21-6445-3191
sales_china@habonim.com

India
Habonim - VAAS
Tel: +91-44-5224-8500
Fax: +91-44-5215-2473
sales@vaasval.com

www.habonim.com

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