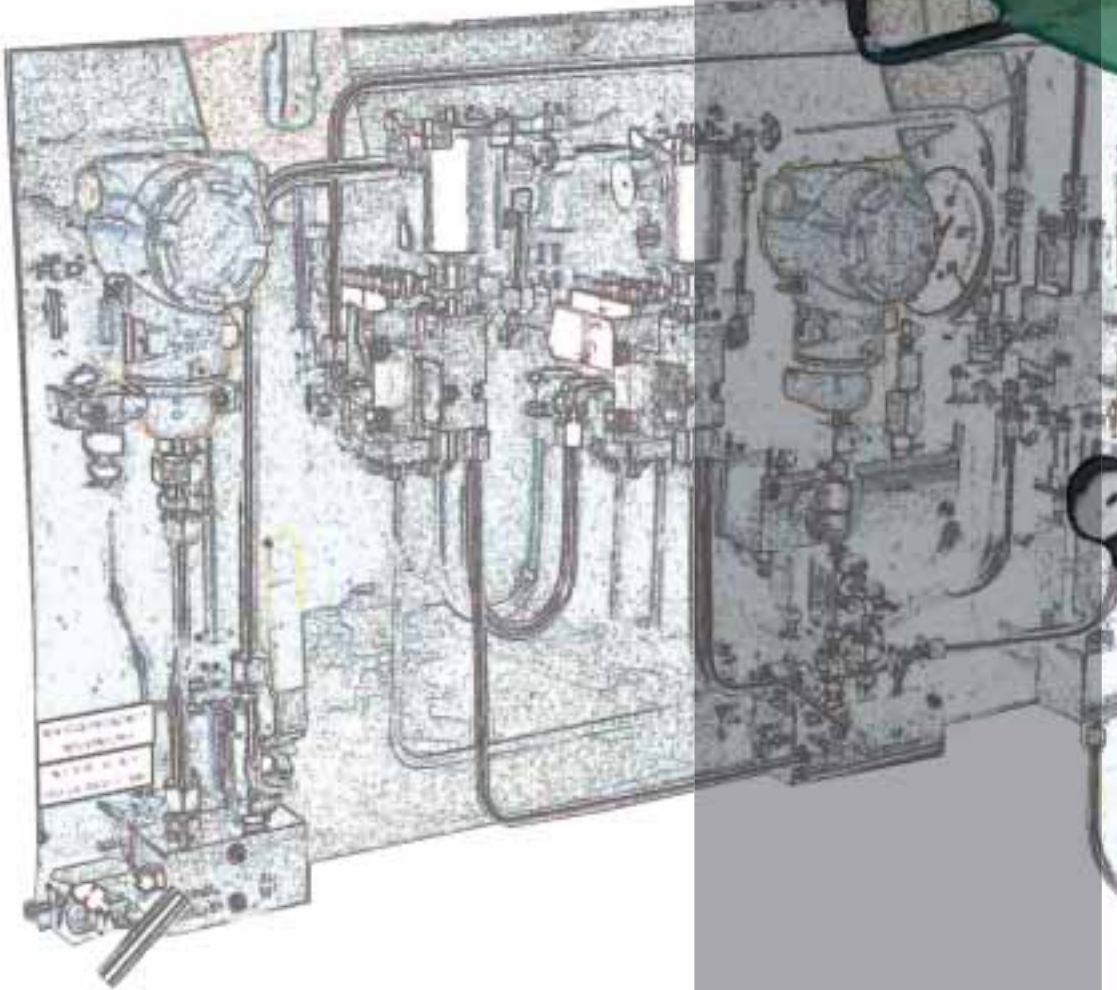




Control Valves



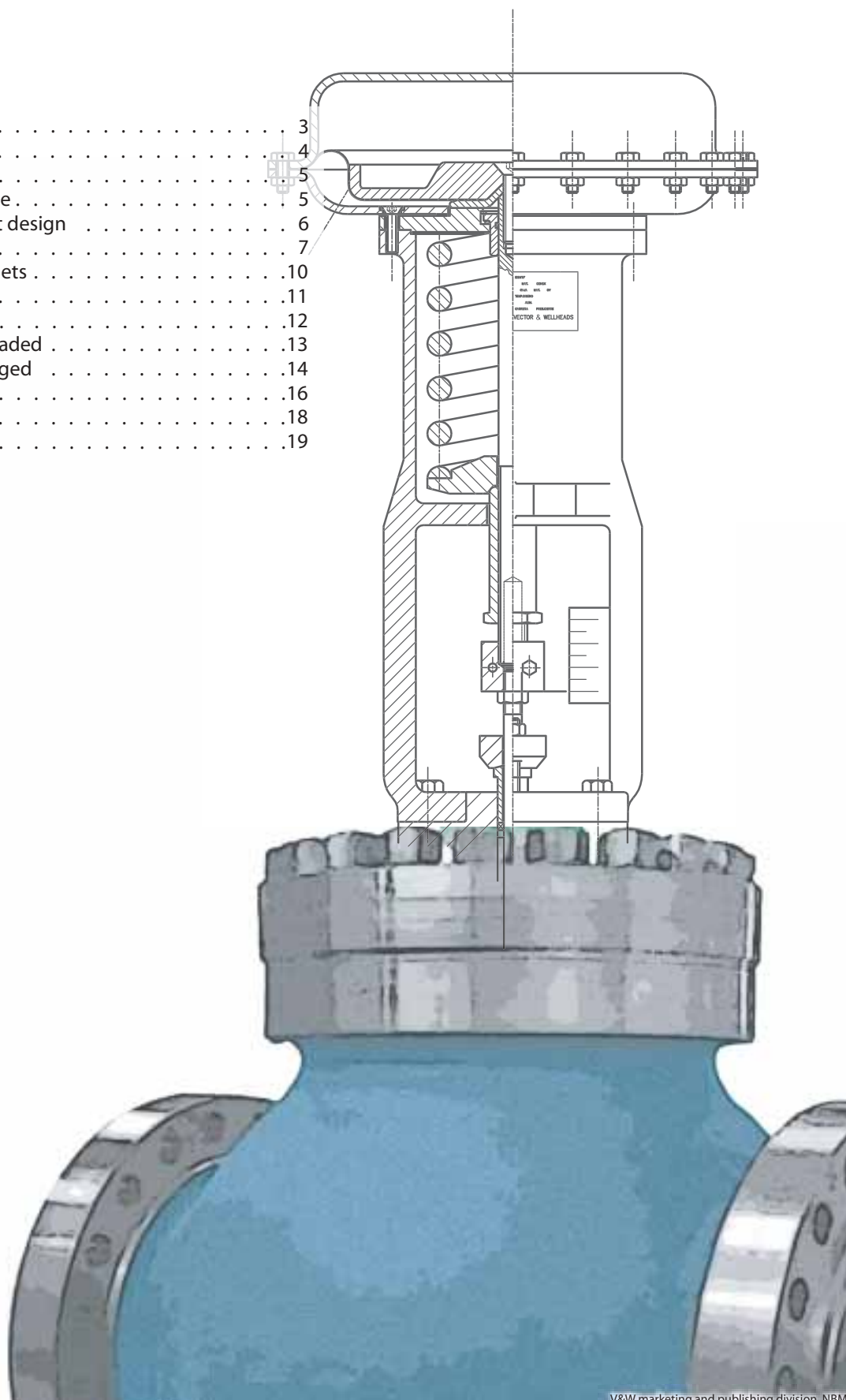
Control valves catalogue
Ref. VC-20035
September 2004 edition

Member of



energy valve group

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V&W marketing and publishing division, NBM.

Vector & Wellheads Engineering Division offer you the best solutions in the following fields:

Engineering

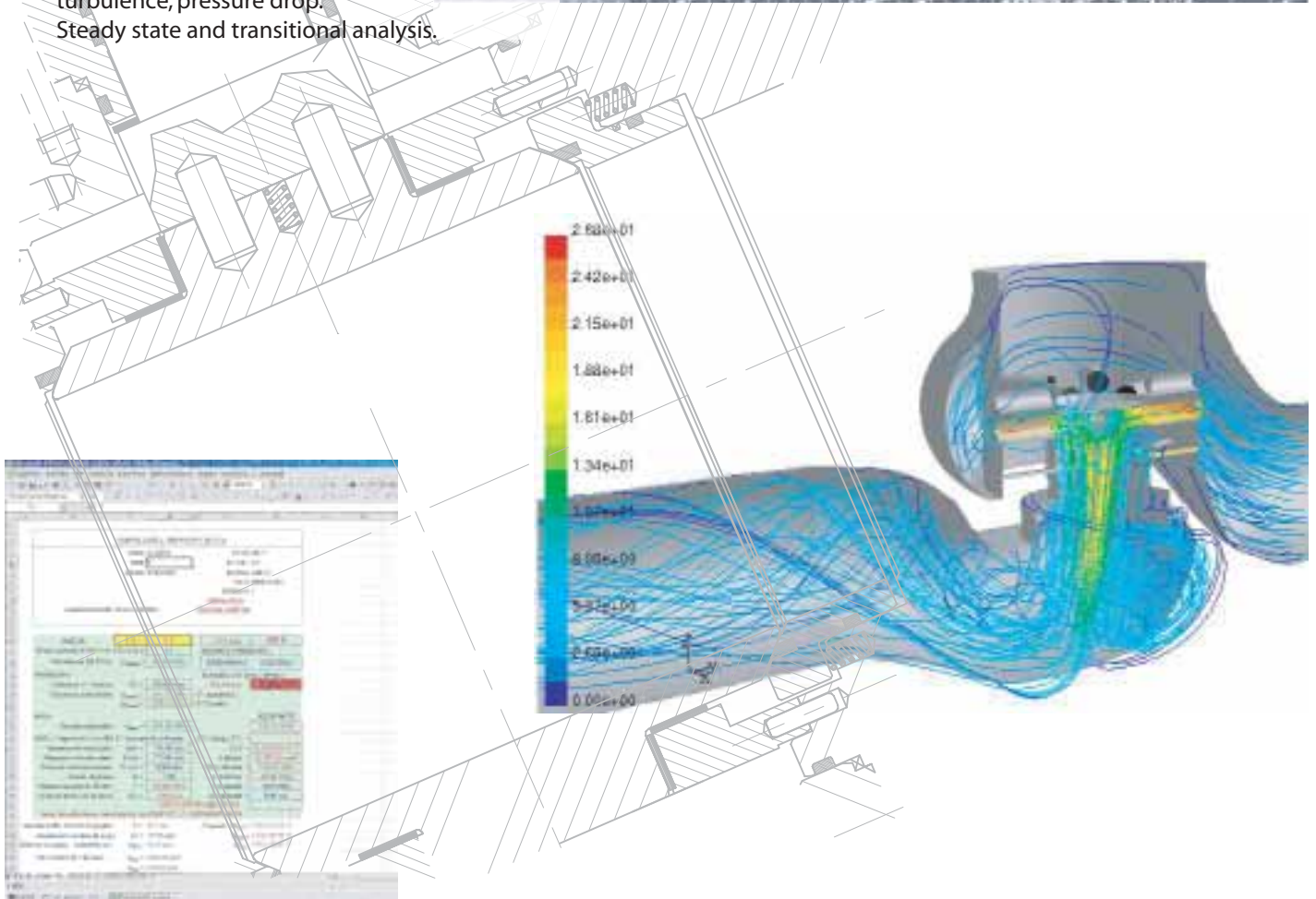
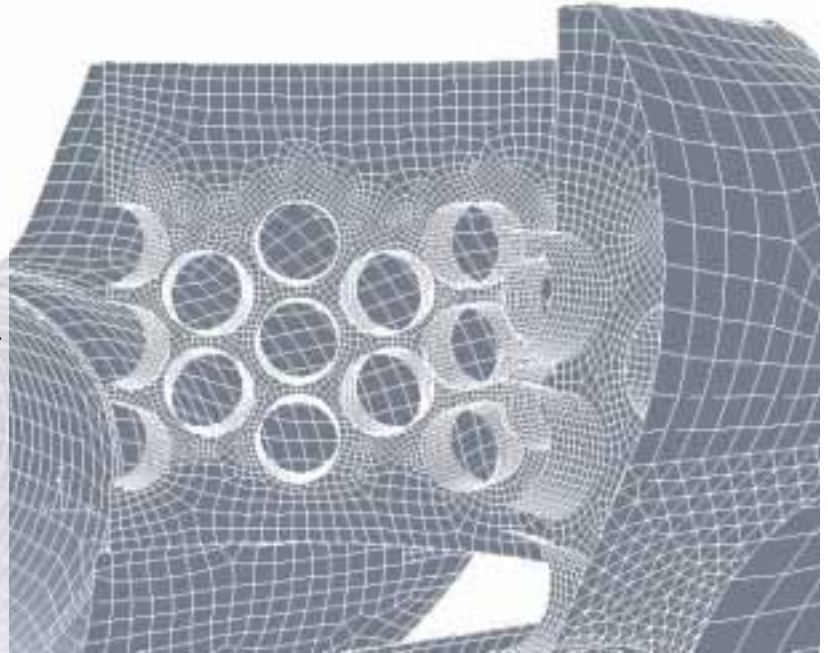
- Design of all kind of valves.
- Detail drawings.
- Assembly drawings.
- Calculations.
- NDT procedures, welding, tests, fabrication.
- Technical consulting.
- Process oriented valve and procedures selection.

Structural analysis

- Design, optimization and test of mechanical components (FEA).
- Analysis of installed valves.

Fluid mechanics

- Fluid system analysis.
- Distributions of flow, velocity, pressure, turbulence, pressure drop.
- Steady state and transitional analysis.

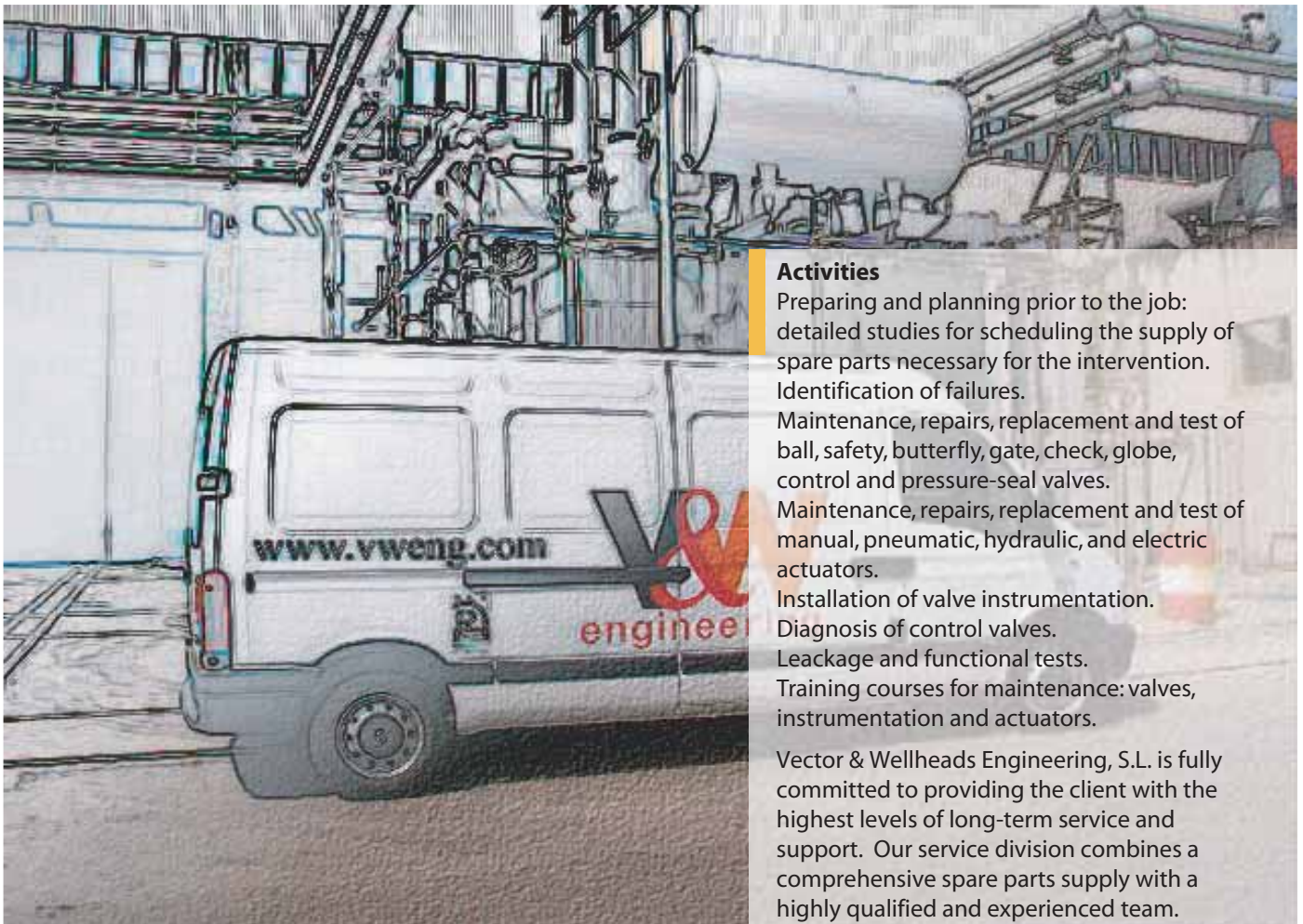


Service division



Formed by a highly qualified and experienced team, our service division is **available on a 24 hour basis** to meet urgent needs, capable of performing jobs at site during:

- Outage and start-up periods
- Installation
- Commissioning
- Supervision



Activities

Preparing and planning prior to the job: detailed studies for scheduling the supply of spare parts necessary for the intervention. Identification of failures.

Maintenance, repairs, replacement and test of ball, safety, butterfly, gate, check, globe, control and pressure-seal valves.

Maintenance, repairs, replacement and test of manual, pneumatic, hydraulic, and electric actuators.

Installation of valve instrumentation.

Diagnosis of control valves.

Leakage and functional tests.

Training courses for maintenance: valves, instrumentation and actuators.

Vector & Wellheads Engineering, S.L. is fully committed to providing the client with the highest levels of long-term service and support. Our service division combines a comprehensive spare parts supply with a highly qualified and experienced team.

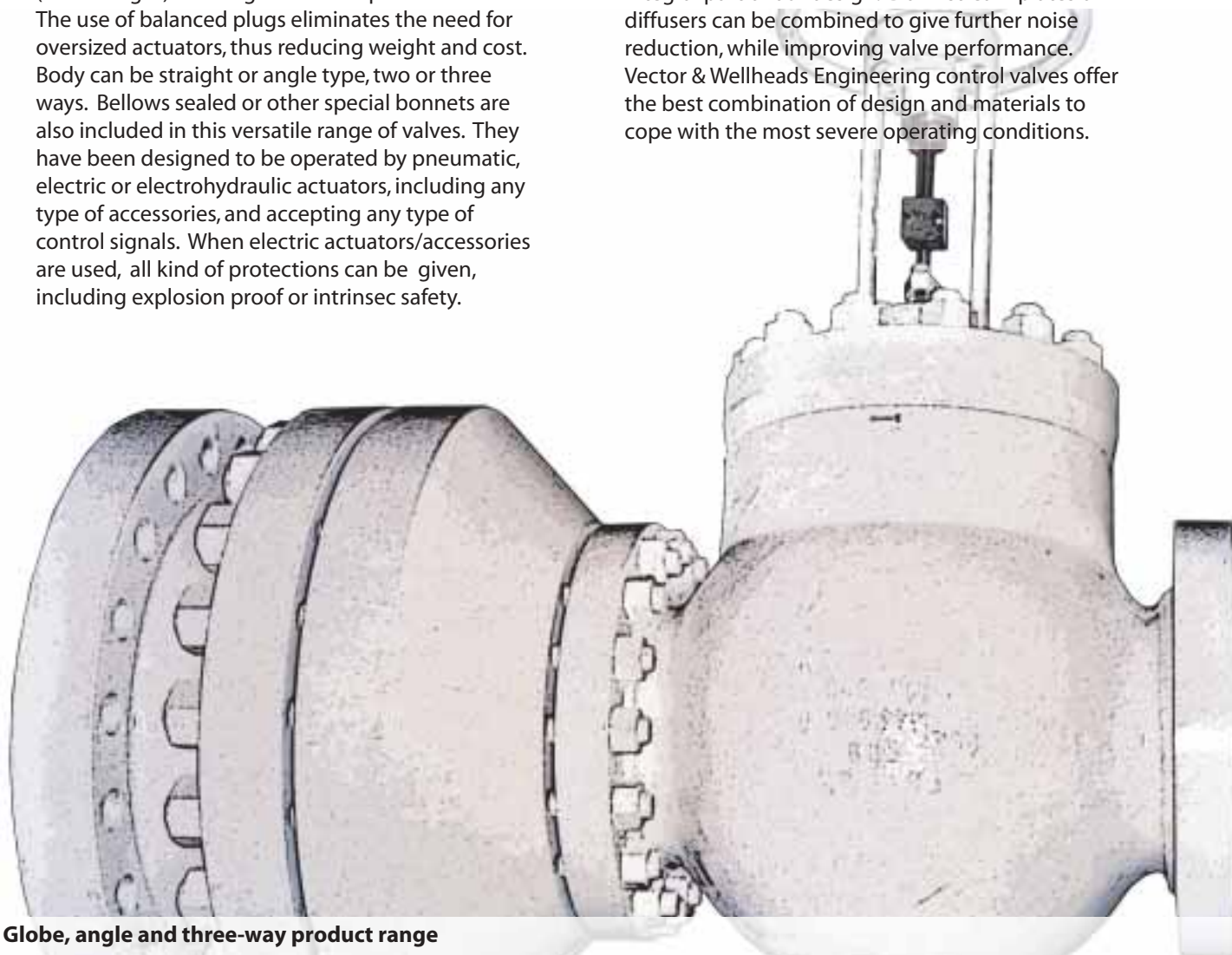
Heavy duty Cage guided

Design and features

Cage guided valves have been designed for sizes up to 26" (DN650) and pressure class ratings, depending on sizes, up to 2500# (PN400). They feature unbalanced plug for sizes up to 4" and balanced plug for sizes 3" and larger. The use of balanced plugs allows, however, Class IV and V seat leak rates, whichever the pressure or the temperature. Also, if temperature does not exceed 250 °C (482 °F), Class VI (bubble tight) can be given as an option. The use of balanced plugs eliminates the need for oversized actuators, thus reducing weight and cost. Body can be straight or angle type, two or three ways. Bellows sealed or other special bonnets are also included in this versatile range of valves. They have been designed to be operated by pneumatic, electric or electrohydraulic actuators, including any type of accessories, and accepting any type of control signals. When electric actuators/accessories are used, all kind of protections can be given, including explosion proof or intrinsic safety.

Special designs have been developed, mainly for use in power plants where high pressure and high temperature are usual conditions. They have been used successfully in power plants, gas, oil, fertilizers and other process industries. Noise and vibration have been reduced, and valve internals life have been extended as well.

Low noise trims and diffusers can be supplied as an integral part of our design. Downstream plates or diffusers can be combined to give further noise reduction, while improving valve performance. Vector & Wellheads Engineering control valves offer the best combination of design and materials to cope with the most severe operating conditions.



Globe, angle and three-way product range

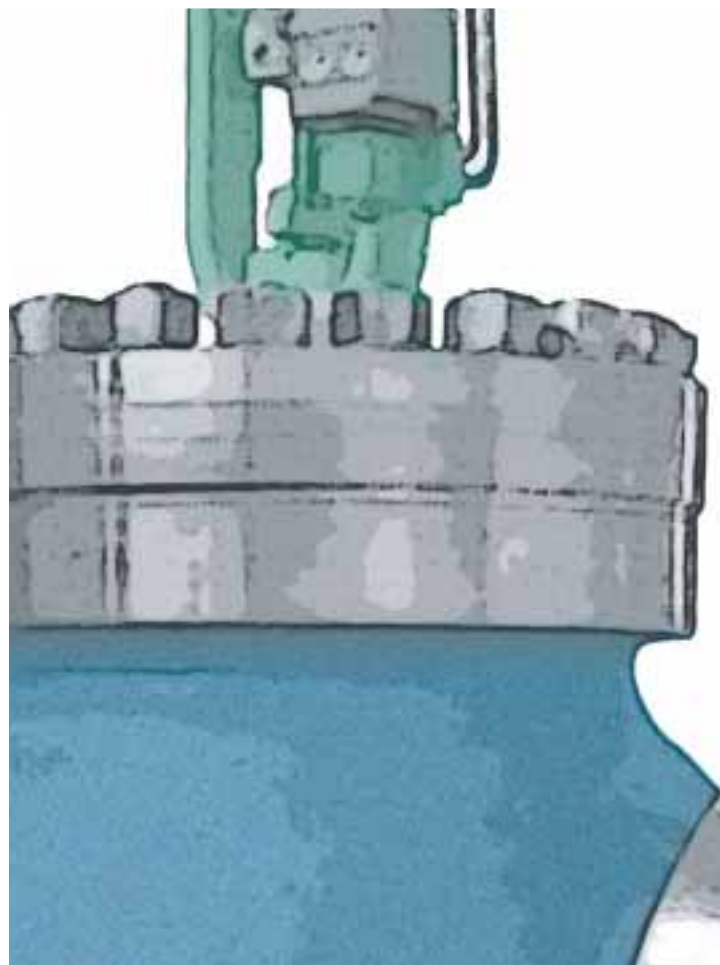
Body material	Body size		Pressure class		Ends
	ASME	DIN	ASME	DIN	
Cast steel	3/4" thru 2"	DN 20 thru DN 50	150 thru 2500	PN 10 thru PN 400	SW, BW, FLG
Cast steel	3" thru 26"	DN 80 thru DN 650	150 thru 2500	PN 10 thru PN 400	BW, FLG
Forged steel	3/4" thru 2"	DN 20 thru DN 50	150 thru 2500	PN 10 thru PN 400	SW, BW
Forged steel	3" thru 16"	DN 80 thru DN 400	150 thru 2500	PN 10 thru PN 400	BW

Trim design

The main function of a control valve is varying the flow rate of the fluid by producing a pressure drop. This results in an energy loss which is converted into turbulence and, as side effects, into vibration, noise and erosion. When handling high temperature water, cavitation is an added problem. To minimize wearing and provide long life internals, selection of the best suited type of trim has the upmost importance. Also, the correct materials have to be used.

Noise and cavitation problems are solved with special designs of internals.

Vector & Wellheads Engineering has the designs, the materials and the experience to offer the best choice for every application.



Valve body and bonnet

Pressure retaining parts include body, bonnet and bolting. Design is according to and meets all the ANSI, ASME and DIN applicable standards. Face to face dimensions are according to ISA S75.12, 15 and 16. Sealing of body-bonnet joint is achieved by spiral gaskets made from 304 SS wound with graphite or other filler materials. Gaskets are fully enclosed between the body and bonnet and they work under the principle of controlled compression. To achieve this, manufacturing / maintenance procedures provide the correct torques for every size of the bolting.

DELTA TRIM



Characteristic curves

Equal percentage
Modified equal percentage

ASME B16.104 Seat leakage	Temperature limit
Class IV STD	550 °C
Class V STD	

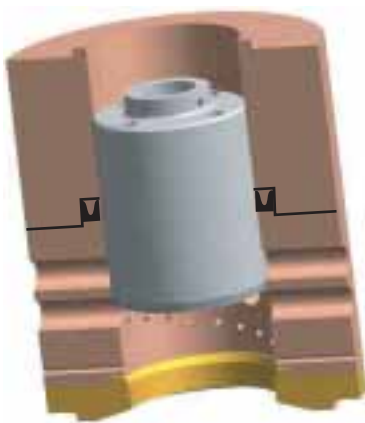
Design and features

Specially designed for low and medium flows combined with medium to high pressure drops, or when high rangeability is required. DELTA TRIM features a series of labyrinth grooves, machined into the seat ring along its throttling surface. They provide a stepping effect, so that pressure drop is divided among the grooves. This design reduces the amount of inner valve pressure recovery, and subsequent vapor formation.

Applications

High pressure desuperheater cooling water control.
Supercritical boiler start-up.
Reheat and superheat spray control.
Pump recirculation or by-pass in small size boiler.

STD or LNC cage



Characteristic curves

Linear
Equal percentage
Modified equal percentage

ASME B16.104 Seat leakage	Temperature limits
Class IV STD	250 °C (BSS)
Class V OPT	550 °C (USS)
Class VI OPT	

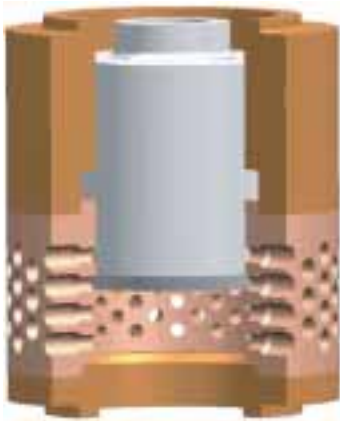
Design and features

STD cage is a hole pattern drilled cage, which provides thotrough rangeability with low cost cage design, thus reducing trim prices.
LNC cage adds excellent noise reduction features to the characteristics of STD cage. Both designs can be used with balanced plug (up to 250 °C) and unbalanced plug (up to 550 °C).
Spacing of the holes is carefully controled in order to restrain jet interaction and its associated turbulence, reducing noise levels to a minimum when used in gas service. LNC trim offers some of the advantages of multistage trims as well, preventing the damaging effects of cavitation and flashing in liquid service.

Applications

Low and medium pressure drop.
Tight shut off.
Low noise, with LNC cage.
Modulating and on/off control.
Small actuators.
General purpose applications.

CAVOID TRIM



Characteristic curves

Linear

ASME B16.104 Seat leakage	Temperature limit
Class IV STD Class V STD Class VI OPT	250 °C (BSS)
Class II OPT	550 °C (USS)

Design and features

The CAVOID trim is designed primarily for liquid service where low level cavitation exists. The cage features double drilled radial holes which provide a nozzle effect. Each nozzle is diametrically opposed by an identical nozzle. This design controls the position of the vena contracta, and directs the collapsing bubbles into the center of the cage, far away from the plug and cage wall.

CAVOID trim does not eliminate cavitation, but reduces its effects upon valve components, and its associated noise, vibration and erosion.

The cage guided balanced plug design provides stable operation during valve throttling, in addition to tight shut-off capability.

Applications

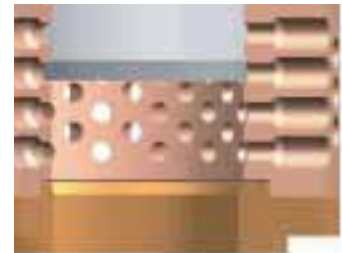
Medium and large flows.

Cavitating and flashing service.

Feedwater systems.

Condensed systems, (deaerator level control, drain services, etc.).

Condensed recirculation systems



MINI TRIM



Characteristic curves

Modified equal percentage

ASME B16.104 Seat leakage	Temperature limit
Class IV STD Class V OPT	550 °C

Design and features

The MINITRIM design is the most reasonable solution where very low flow rates are involved in control applications. Although a modified equal percentage characteristic is supplied as a standard, other characteristics (linear, equal percentage, tailored) are available to fit customer needs.

Made with hard materials, this internal can withstand the erosion caused by high velocity fluid flow for years.

Applications

Very low flows.

Tight shut-off.

Modulating and on/off applications



MULTICYLINDER TRIM



Characteristic curves

Linear
Equal percentage
Modified equal percentage

ASME B16.104 Seat leakage	Temperature limit
Class IV STD	250 °C (BSS)
Class V STD	
Class VI OPT	
<hr/>	
Class II OPT	550 °C (USS)

Design and features

The MULTICYLINDER trim divides the pressure drop in several stages. This feature is used in liquid service to eliminate cavitation, and in gas service to reduce noise to acceptable levels. Associated problems of vibration, excessive leakage and mechanical failure are thus prevented.

Applications

High pressure drop.
Large flows.
Very critical pressure drop steam or gas applications.
Very high pressure drop liquid applications for preventing cavitation and trim erosion damage.

DOUBLE TRIM



Characteristic curves

Linear
Equal percentage
Modified equal percentage

ASME B16.104 Seat leakage	Temperature limit
Class V STD	550 °C

Design and features

DOUBLE trim is specially designed for large size valves (4" and above), to give tight shut-off with balanced trim at high temperatures. It can be combined with STD or LNC cages, with flow direction from over the seat. DOUBLE trim permits minimum actuator size when tight shut-off is required.

Applications

High temperature service.
Medium and large flows.
Tight shut-off.
Low noise (with LDB cage).
HP and LP turbine bypass.
Steam dump.
Steam throttling to atmosphere or to a condenser.
Isolation.
Super-critical boiler start-up.

Materials

Body and bonnet materials

Material	Forged			Cast		
	ASTM	DIN name	DIN mat. n°	ASTM	DIN name	DIN mat n°
Carbon steel	A 105	C22.8	1.0460	A 216 WCB	GS-C25	1.0619
Alloy steel	A 182 F11	13CrMo44	1.7335	A 217 WC6	GS17CrMo55	1.7357
	A 182 F22	10CrMo9.10	1.7380	A 217 WC9	GS16CrMo19.10	1.7379
Stainless steel	A 182 F316	X5CrNiMo18.10	1.4401	A 351 CF8M	GXCrNiMo18.10	1.4408

Low carbon steel and special alloys such as Hastelloy, Monel, and others available upon request

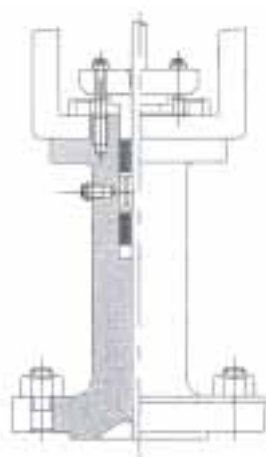
Trim materials

Material	AISI name	DIN name	DIN mat. n°	Hardness (HRC)
410 SS	AISI 410	X10Cr13	1.4006	34-38
420 SS	AISI 420	X20Cr13	1.4021	47-51
316 SS	AISI 316	X10CrNiTi18.9	1.4541	—

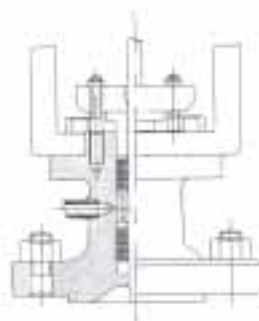
Selection of the internals material is based on two factors: corrosion resistance and wear resistance. Pressure drop and temperature conditions are considered to choose the best wear resistance material. Our standard selection is based on the table presented above. Nevertheless, optional materials as 17-4 PH, 440 stainless steel alloys, Hastelloy, Colmonoy, Tungsten carbide and other high hardness coatings are available upon request. NACE materials are also offered as an option.

Stem is chrome plated type 316 stainless steel, condition B.

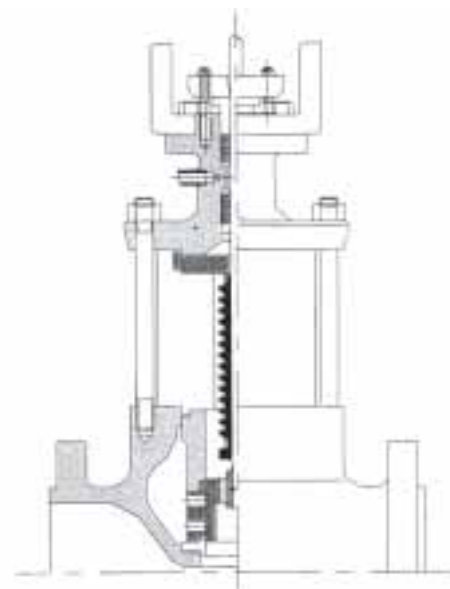
Special bonnets



Extended bonnet for high temperature or cryogenic applications.



Double packing bonnet to minimize leaks to atmosphere. Can also include leak off connection, lubricator or hydraulic seal.



Bellows sealed bonnet (zero leaks) for dangerous or radioactive fluids.

Electrical actuators

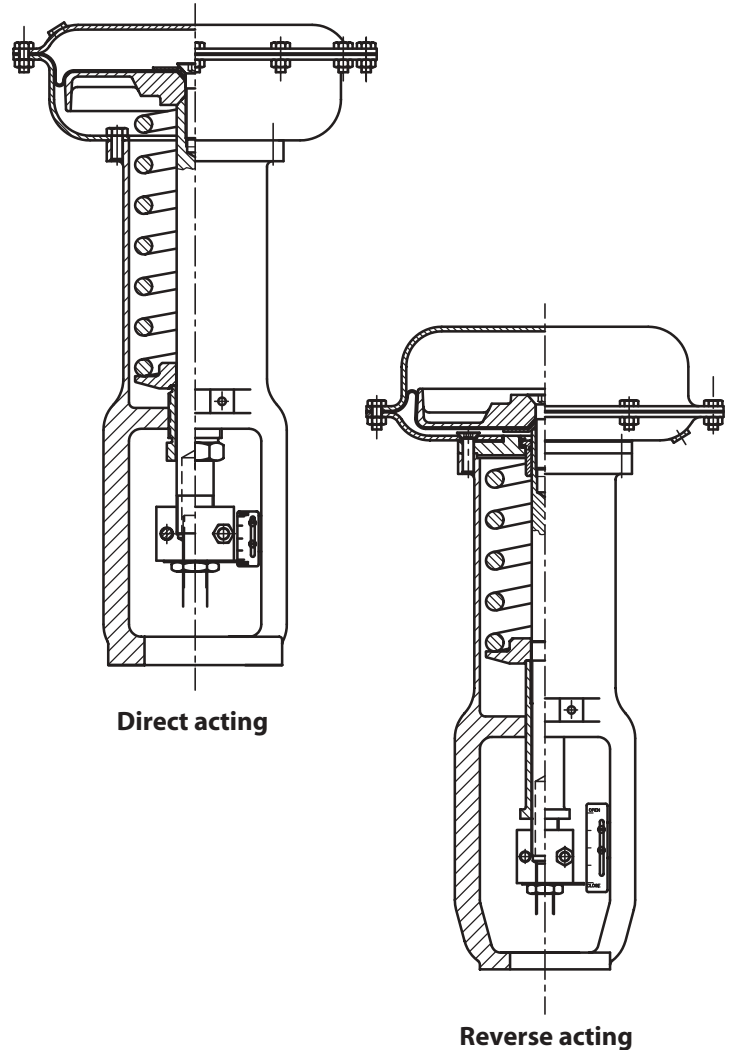
When electrical actuators are requested, any make following customer preferences is used. They accept 0-10 mA, 4-20 mA, or other signals. As standard, handwheel, limit switches, torque switches, thermal and other protections are included.

Diaphragm actuators

Vector & Wellheads Engineering valves can be operated by any type of actuators, at customer request. When pneumatic actuators are requested we use our well proved, stiff and versatile VW300 series model.

Special designs are available when seismic conditions are specified, to increase stiffness and natural frequency. Standard materials are WCB cast steel yoke, stamped steel for cover and base plates, reinforced Buna or Neoprene diaphragm. All parts are protected against rust and corrosion.

Any make of accessories: positioner, converter, air-sets, solenoids, limit switches and others. Handwheels are also fitted if necessary.



Maximum thrust, kgf

Model	Effective diaphragm area, cm ²	Direct acting travel (1)					Reverse acting travel				
		1"	2"	3"	4"	5"	1"	2"	3"	4"	5"
VW330	500	1770*	—	—	—	—	550	—	—	—	—
VW350	640	3230	2950*	—	—	—	1360	910	—	—	—
VW380	1000	5310	5020	4730*	—	—	2550	1820	1090	—	—
VW390	1000	5420	5250	5080	5360	4730*	3100	2560	2020	1480	940

(1) Thrust with 80 psi of air supply

(*) Maximum travel

Flow coefficient Cv at maximum travel

Contact Vector & Wellheads Engineering for complete Cv characteristic curves, or Cv values at intermediate travel positions.

Cage characterized

Cage style	Flow characteristic	Trim size	Valve size, in											
			3/4	1	1½	2	3	4	6	8	10	12	14	16
STD	Linear	Ful size	12	17	30	54	122	216	490	864	1350	1950	2650	3460
		1 reduction	8	11	21	38	85	150	343	605	945	1365	1855	2420
		2 reduction	6	8	14	24	55	100	220	390	610	880	1190	1560
	Equal percentage	Ful size	9	14	23	40	90	160	360	640	1000	1440	1960	2560
		1 reduction	6	9	16	28	63	112	252	450	700	1010	1370	1790
		2 reduction	4	6	10	18	41	72	162	290	450	650	880	1150
LNC	Linear	Ful size	11	15	27	49	110	195	440	780	1215	1750	2380	3110
		1 reduction	7	10	19	34	77	137	310	540	850	1225	1670	2175
		2 reduction	5	7	12	22	50	88	200	350	550	790	1070	1400
	Equal percentage	Ful size	8	12	20	36	81	144	325	580	900	1300	1760	2300
		1 reduction	5	8	14	25	57	100	230	405	630	910	1230	1610
		2 reduction	3	5	9	16	36	65	146	260	405	585	790	1035
CAVOID TRIM	Linear	Ful size	—	—	—	35	78	110	245	490	717	1265	1754	2372
		1 reduction	—	—	—	25	53	74	162	318	457	776	1084	1458
		2 reduction	—	—	—	14	31	38	100	198	287	484	676	920

Delta Trim plug characterized

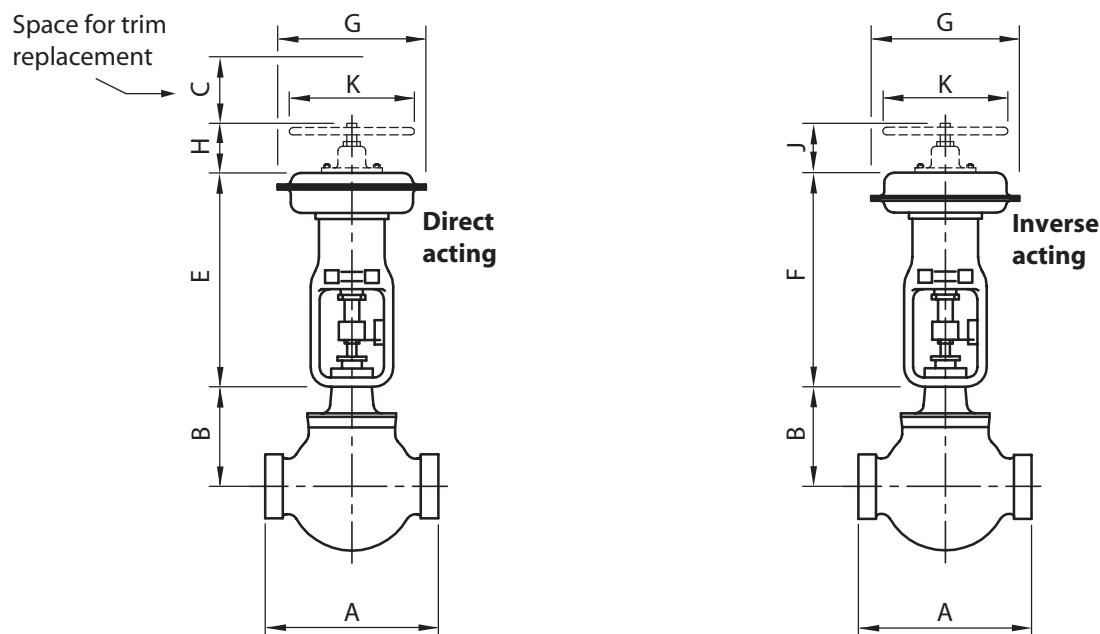
Flow characteristic	Trim size	Valve size			
		3/4	1	1½	2
Equal percentage	Full size	3.5	5.4	8.2	14.4
	1 reduction	2.2	3.5	5.4	8.2
	2 reduction	1.4	2.2	3.5	5.4
	3 reduction	0.86	1.4	2.2	3.5
	4 reduction	0.61	0.86	1.4	2.2
	5 reduction	0.33	0.61	0.86	1.4
Modified equal percentage	Full size	3.4	5.3	8.1	14.3
	1 reduction	2.1	3.4	5.3	8.1
	2 reduction	1.3	2.1	3.4	5.3
	3 reduction	0.82	1.3	2.1	3.4
	4 reduction	0.54	0.82	1.3	2.1
	5 reduction	0.31	0.54	0.82	1.3

Minitrim

Number	0	1	2	3	4	5	6	7	8
Cv	0.02	0.03	0.06	0.12	0.24	0.48	0.96	1.92	3.85

Available in 1" valve body only. Modified equal percentage characteristic curve.

Valve dimensions, BW / SW / threaded



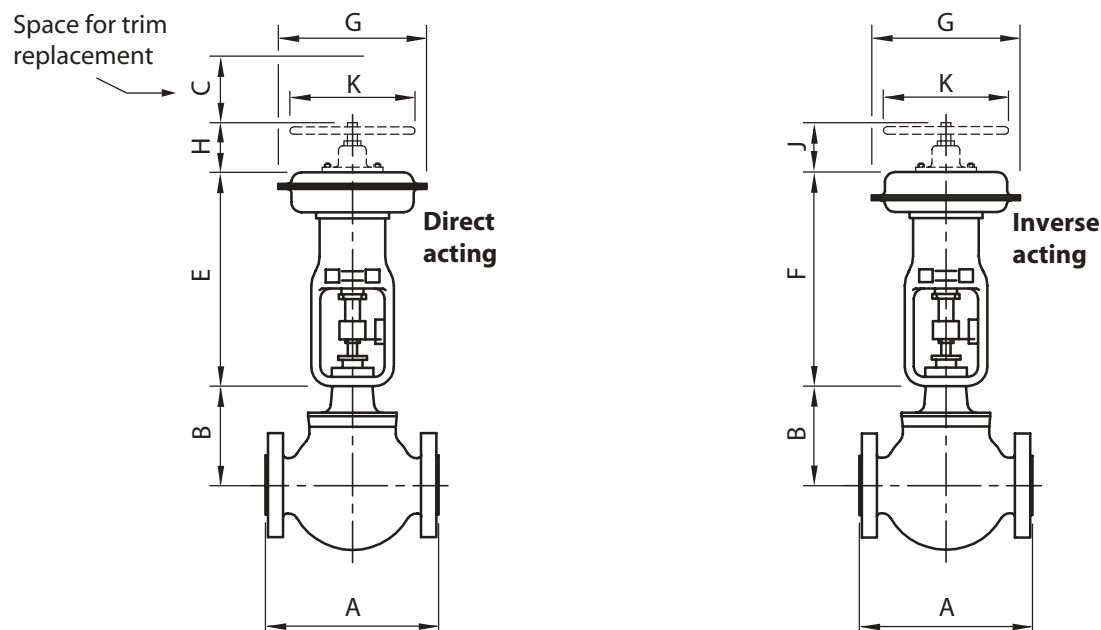
BW / SW / Threaded body, mm

Valve size		150#, 300#, 600#			900#, 1500#			2500#		
		A	B	C	A	B	C	A	B	C
3/4	DN 20	187	217	100	194	217	100	216	217	100
1	DN 25	187	217	100	194	217	100	216	217	100
1 1/2	DN 40	222	217	100	235	217	100	260	217	100
2	DN 50	254	217	100	292	217	100	318	217	100
3	DN 80	318	282	125	318	282	125	381	282	125
4	DN 100	318	282	125	318	282	125	381	282	125
6	DN 150	451	392	200	508	392	200	610	392	200
8	DN 200	543	457	250	610	457	250	762	457	250
10	DN 250	673	572	350	762	572	350	1016	572	350
12	DN 300	737	630	400	914	630	400	1118	630	400
14	DN 350	851	689	450	1064	689	450	1268	689	450
16	DN 400	1016	759	500	1114	759	500	1400	759	500

Pneumatic actuator dimensions, mm

Model	Dimensions					
	E	F	G	K	H (Direct)	J (Reverse)
VW330	462	500	292	254	152	165
VW350	594	719	384	457	273	267
VW380	764	781	457	457	273	292
VW390	835	889	457	457	245	298

Valve dimensions, flanged ASME Class 150 through 600



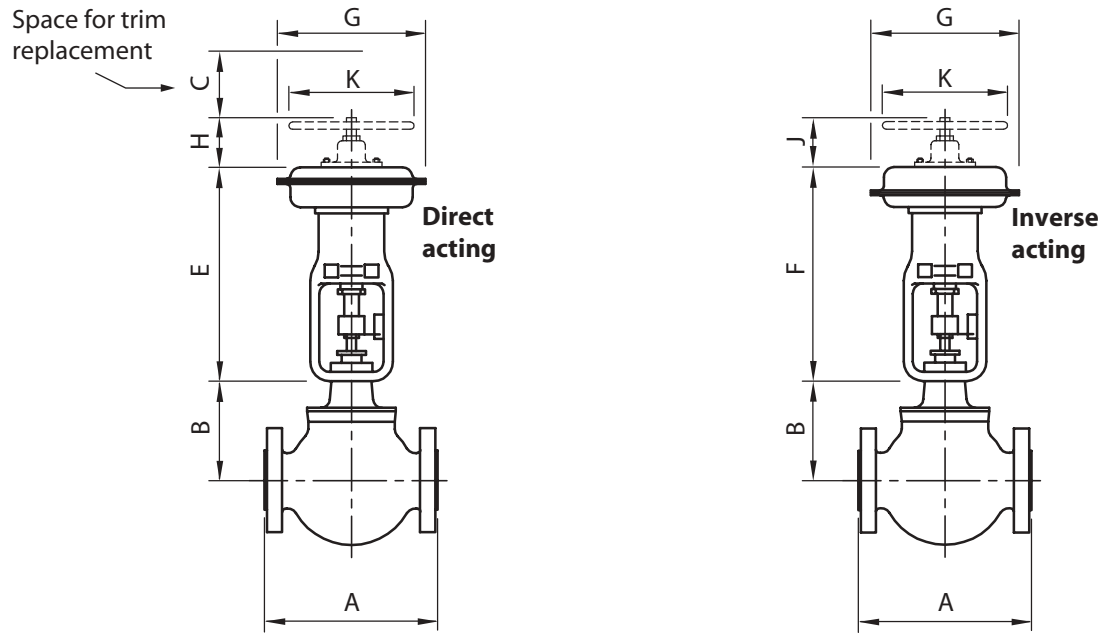
Flanged body, mm

Valve size		150#, PN 10, P 16/25			300#, PN 40			600#, PN 64, PN 100		
		A	B	C	A	B	C	A	B	C
3/4	DN 20	184	217	100	194	217	100	206	217	100
1	DN 25	184	217	100	197	217	100	210	217	100
1 1/2	DN 40	222	217	100	235	217	100	251	217	100
2	DN 50	254	217	100	267	217	100	286	217	100
3	DN 80	298	282	125	318	282	125	337	282	125
4	DN 100	352	320	150	368	320	150	394	320	150
6	DN 150	451	392	200	473	392	200	508	392	200
8	DN 200	543	457	250	568	457	250	610	457	250
10	DN 250	673	572	350	708	572	350	752	572	350
12	DN 300	737	630	400	775	630	400	819	630	400
14	DN 350	889	689	450	927	689	450	972	689	450
16	DN 400	1016	759	500	1057	759	500	1108	759	500

Pneumatic actuator dimensions, mm

Model	Dimensions					
	E	F	G	K	H (Direct)	J (Reverse)
VW330	462	500	292	254	152	165
VW350	594	719	384	457	273	267
VW380	764	781	457	457	273	292
VW390	835	889	457	457	245	298

Valve dimensions, flanged ASME Class 900 through 2500



Flanged body, mm

Valve size		900#, PN 160			1500#, PN 250			2500#, PN 320, PN 400		
		A	B	C	A	B	C	A	B	C
3/4	DN 20	273	217	100	273	217	100	308	217	100
1	DN 25	273	217	100	273	217	100	308	217	100
1 1/2	DN 40	311	217	100	311	217	100	359	217	100
2	DN 50	340	217	100	311	217	100	359	217	100
3	DN 80	387	282	125	406	282	125	498	282	125
4	DN 100	464	420	150	483	320	150	575	320	150
6	DN 150	600	392	200	692	392	200	819	392	200
8	DN 200	781	457	250	838	457	250	1022	457	250
10	DN 250	864	572	350	991	572	350	1270	572	350
12	DN 300	1016	630	400	1130	630	400	1321	630	400
14	DN 350	1257	689	450	1257	689	450	1471	689	450
16	DN 400	1422	759	500	1422	759	500	1621	759	500

Pneumatic actuator dimensions, mm

Model	Dimensions					
	E	F	G	K	H (Direct)	J (Reverse)
VW330	462	500	292	254	152	165
VW350	594	719	384	457	273	267
VW380	764	781	457	457	273	292
VW390	835	889	457	457	245	298

Other products

Gate valves

ASME Class	Bolted bonnet		Pressure Seal	
	From	To	From	To
150	2"	72"	—	—
300	2"	54"	—	—
600	2"	54"	2"	54"
900	2"	36"	2"	36"
1500	2"	24"	2"	24"
2500	2"	20"	2"	24"
4500	—	—	2"	24"

Globe valves

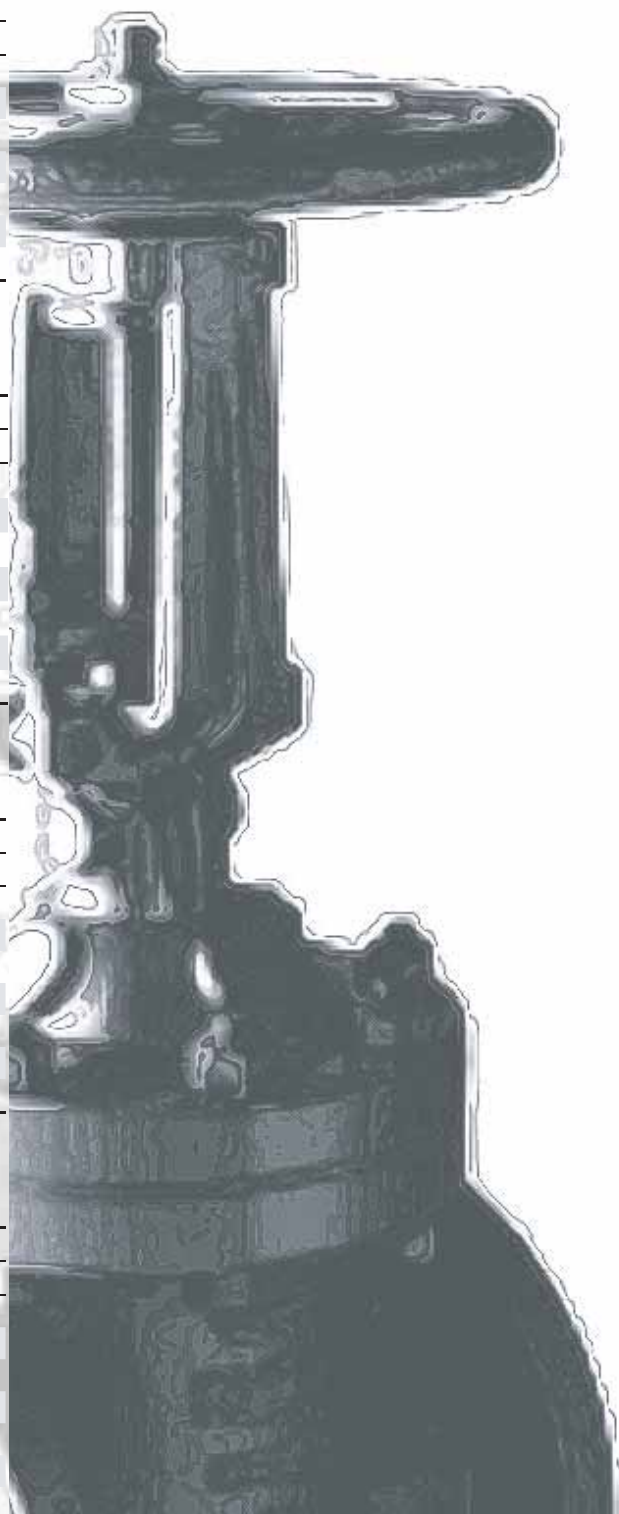
ASME Class	Bolted bonnet		Pressure Seal	
	From	To	From	To
150	3/8"	24"	—	—
300	3/8"	24"	—	—
600	3/8"	24"	2"	24"
900	3/8"	24"	2"	24"
1500	3/8"	24"	2"	24"
2500	3/8"	16"	2"	16"
4500	—	—	2"	6"

Swing check valves

ASME Class	Bolted bonnet		Pressure Seal	
	From	To	From	To
150	2"	64"	—	—
300	2"	54"	—	—
600	2"	54"	2"	54"
900	2"	36"	2"	36"
1500	2"	24"	2"	24"
2500	2"	20"	2"	20"
4500	—	—	2"	8"

Tilting disc check valves

ASME Class	Bolted bonnet		Pressure Seal	
	From	To	From	To
150	2"	36"	—	—
300	2"	36"	—	—
600	2"	24"	2"	30"
900	2"	20"	2"	24"
1500	2"	18"	2"	24"
2500	2"	12"	2"	16"
4500	—	—	2"	8"



See also: **V&W Ball valves catalogue, ref. BV-20034**
V&W Gate, globe and check valves catalogue, ref. GGC-20031
V&W Other products catalogue, ref. OP-20033



Piston check valves

ASME Class	Bolted bonnet		Pressure Seal	
	From	To	From	To
150	2"	10"	—	—
300	2"	10"	—	—
600	2"	10"	2"	16"
900	2"	10"	2"	16"
1500	2"	10"	2"	16"
2500	2"	10"	2"	12"
4500	—	—	2"	8"

Butterfly valves

AWWA Class	From	To
250	DN 80	DN 900
75	DN 1000	DN 1800

Diaphragm valves

ASME Class	From	To
150	2"	8"
300	2"	8"

Trunnion mounted ball valves

Full & reduced bore, soft & metal to metal seated

ASME Class	End entry		Top entry	
	From	To	From	To
150	2"	60"	2"	48"
300	2"	60"	2"	48"
600	2"	56"	2"	48"
900	2"	56"	2"	30"
1500	2"	30"	2"	24"
2500	2"	16"	2"	12"

Other valves and supplies

Plug valves.
 Safety valves.
 Through-conduit gate valves.
 Full bore check valves.
 Block & bleed gate valves.
 Cryogenic service valves (ball, gate, globe, check).
 Three way globe valves.
 Bellows sealed valves (globe, gate).
 Flanges, desuperheaters, piping, bolting, gaskets.
 Nuclear BLADE GUIDES.
 Turbine bypass systems.

Floating ball valves

Full & reduced bore

ASME Class	End entry		Forged steel top entry		Cast steel top entry	
	From	To	From	To	From	To
150	1/2"	8"	1/2"	2"	1/2"	6"
300	1/2"	8"	1/2"	2"	1/2"	6"
600	1/2"	6"× 4"	1/2"	2"	1/2"	6"
900	1/2"	2"	1/2"	2"	—	—
1500	1/2"	2"	1/2"	2"	—	—
2500	—	—	1/2"	2"	—	—

See also: **V&W Ball valves catalogue, ref. BV-20034**
V&W Gate, globe and check valves catalogue, ref. GGC-20031
V&W Other products catalogue, ref. OP-20033



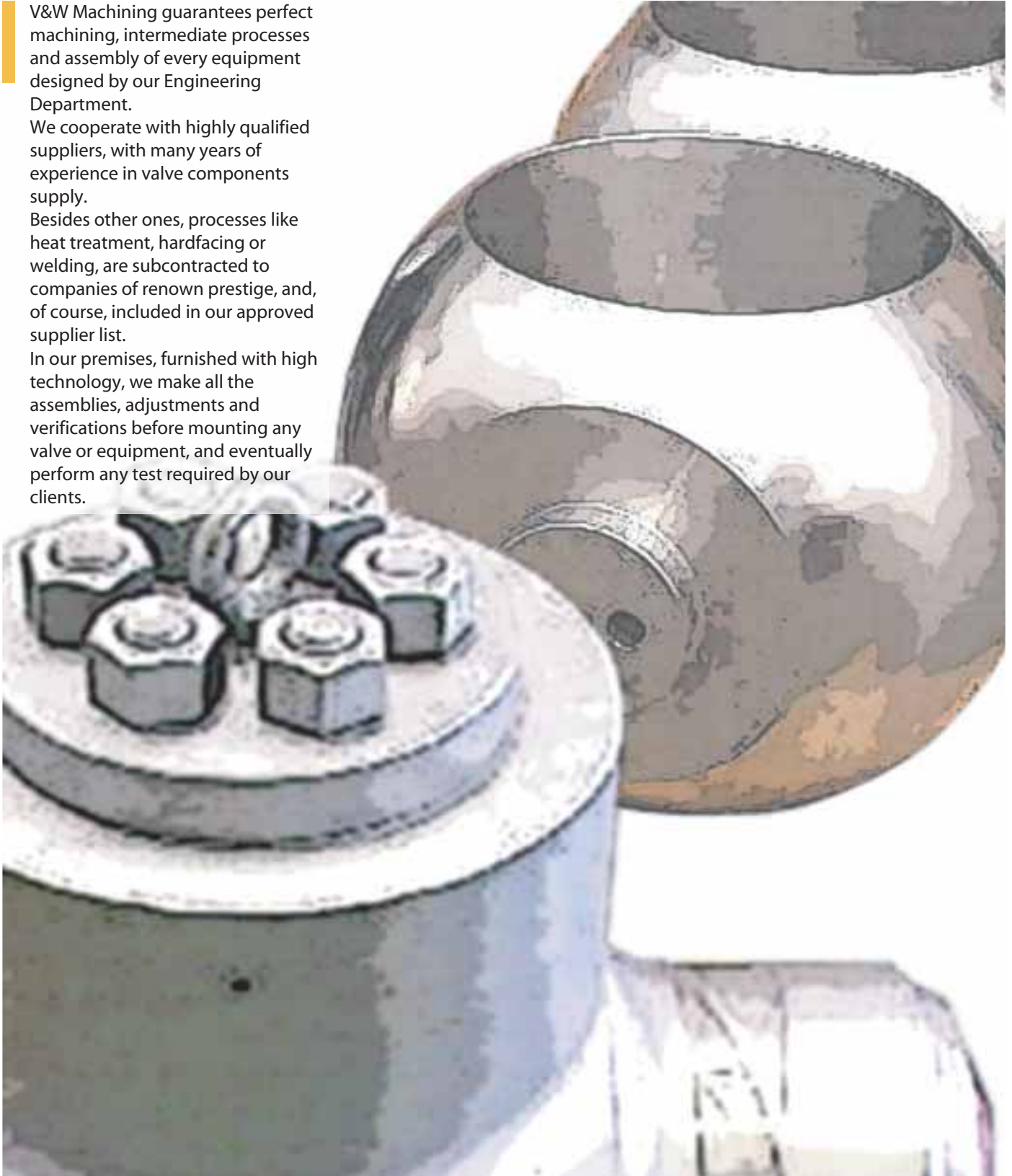
Machining division

V&W Machining guarantees perfect machining, intermediate processes and assembly of every equipment designed by our Engineering Department.

We cooperate with highly qualified suppliers, with many years of experience in valve components supply.

Besides other ones, processes like heat treatment, hardfacing or welding, are subcontracted to companies of renown prestige, and, of course, included in our approved supplier list.

In our premises, furnished with high technology, we make all the assemblies, adjustments and verifications before mounting any valve or equipment, and eventually perform any test required by our clients.



All Vector & Wellheads Engineering products are manufactured in strict accordance to our Quality Assurance Manual requirements, which covers all the production stages, including design, purchasing, manufacturing, welding, testing, etc.

Our excellent Quality Assurance Program has enabled us to obtain an **UNE-EN-ISO 9001 Certificate**.

Each aspect of our activity is based on operating within strictly defined procedures, including: ultrasonic, x-ray, magnetic particle inspection, welding, photoelasticity, and fire safe test.



Empresa Registrada
43/ER/12/02

ISO 9001:2000



Vector & Wellheads

Engineering, S.L. is a

leading supplier of

valves and related

products, used in the

petrochemical, nuclear,

fossil fired, oil & gas

and process industries.

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