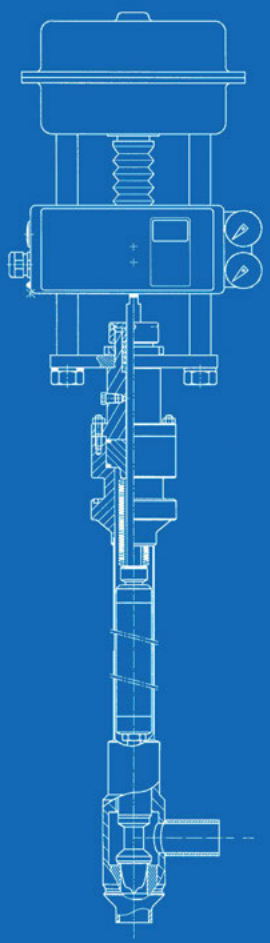
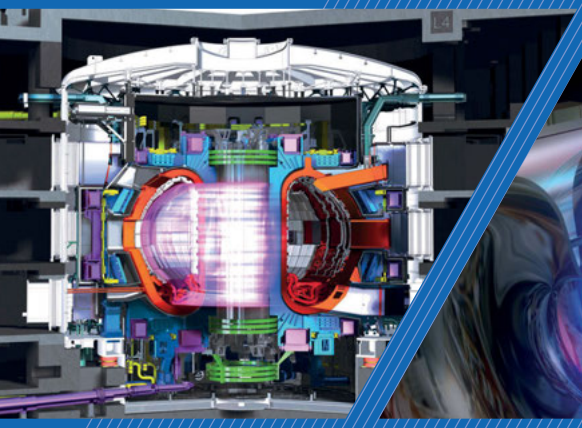
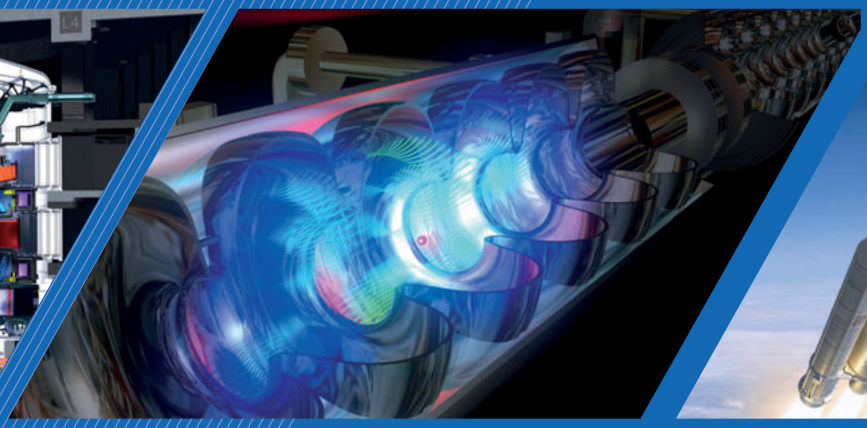


CRYOGENIC CONTROL VALVES

DOWN TO 1.2K (-272°C or -457°F)

VELAN





velan.com

ABOUT US

Velan group is one of the world's leading manufacturers of industrial steel and forged valves for chemical, petrochemical, oil & gas, fossil & nuclear power, congeneration, pulp & paper and cryogenic industries. Founded in 1949 in Montreal - Canada, Velan earned a reputation for excellence as a major supplier of gate, globe, check, ball butterfly and knife gate valves for most critical applications. With 17 specialized manufacturing plants in Canada, USA, Europe and Asia, Velan provides world's leading industries with best technical solutions and high quality products.

KEY FIGURES :

> FOUNDED IN 1949 BY MR. A.K. VELAN

> 2000 EMPLOYEES WORLDWIDE

> TURNOVER : 500 M$

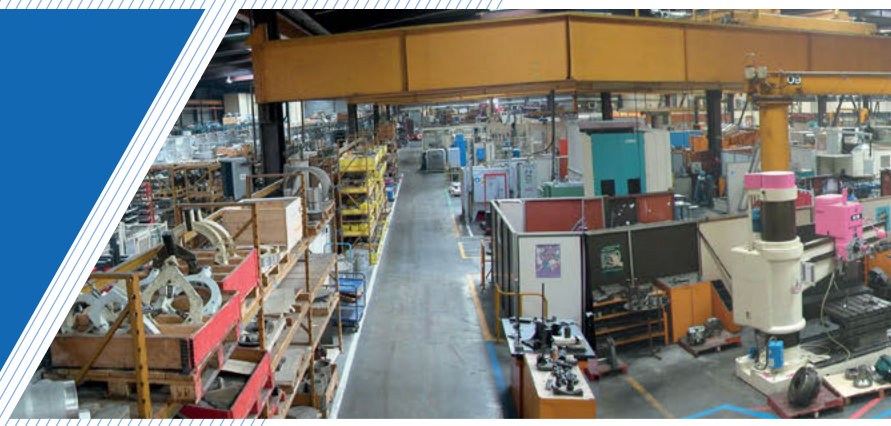
> 17 MANUFACTURING SITES :
CANADA (5), USA, FRANCE (2), UK, PORTUGAL, ITALY, SOUTH KOREA (3), TAIWAN, CHINA, INDIA

> 28 % OF THE CAPITAL FLOATING ON THE CANADIAN STOCK EXCHANGE

> A WORLDWIDE SALES & SERVICES NETWORK

> SPECIALIZED IN HIGH PERFORMANCE INDUSTRIAL VALVES

Located in 20 000 m^2 area, Velan manufacturing plant is equipped with last generation machining and industrial means.



VELAN FRANCE
CRYOGENIC SPECIAL SERVICES

VELAN France is a world leader in valves for Nuclear, LNG and Cryogenic applications. With our field experience and technical expertise, we are able to supply any major project requiring first-class quality and perfect reliability. Our cryogenic control valves and safety relief valves have been supplied for superconductivity applications, particle accelerators, nuclear fusion, rocket launching pads, Helium and Hydrogen liquefiers.

LNG

Liquefaction plants (LNG trains)

LNG carriers

Receiving terminals & Regasification plants

AEROSPACE FACILITIES

Rocket launch pads (LOx, LH2)

Rocket engine test benches (LOx, LH2)

Transonic Wind tunnels

RESEARCH LABS

Particle accelerators : CERN LHC

Super conducting Magnets

Nuclear fusion : Tokamak, ITER

-160°C
-256°F
113 K

-254°C
-425°F
19 K

-272°C
-457°F
1.2 K

DESIGN, RESEARCH AND DEVELOPMENT

With more than 40 years experience in valve industry, Velan France keeps developing new design approaches and technologies in cooperation with most progressive universities and national research centers. Velan design department is composed of 40 highly qualified engineers & technicians, with 4 major targets:

- Design of new products according to market demand and specific client requests
- Products qualifications
- Products improvement: tightness, resistance to accidental conditions such as earthquake, life expectancy
- CV optimization, development of easy maintenance

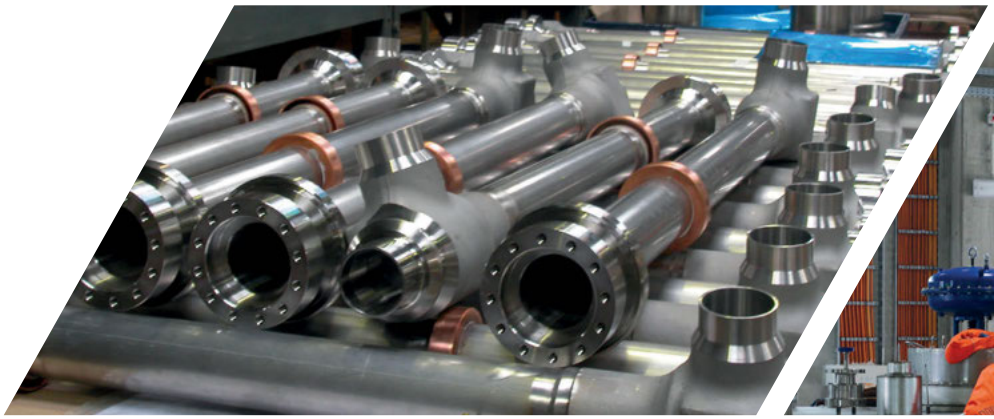
CODES & STANDARDS

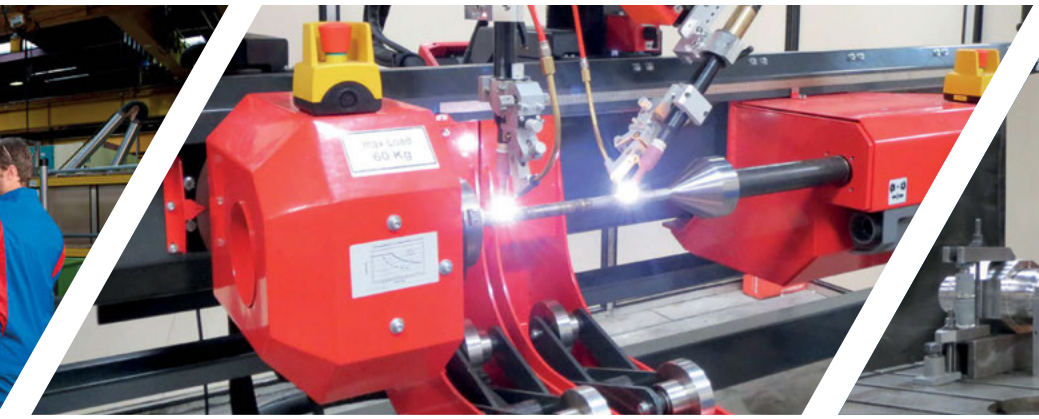
Velan products are complying with main European and international codes & standards as ESPN, European PED, RCCM, ASME III, Russian NP-068, ASME B16-34 in terms of materials, design and testing.

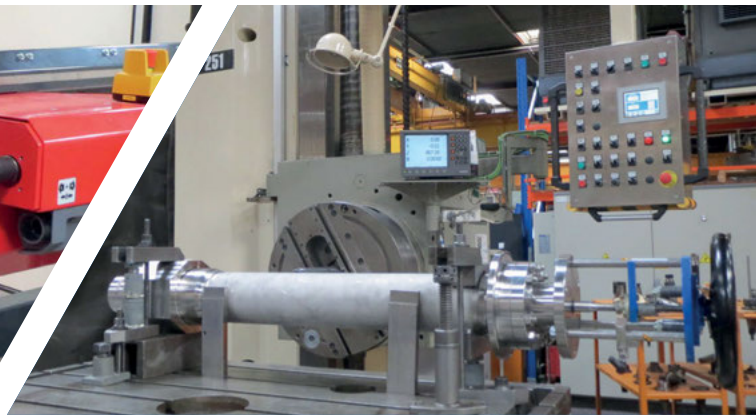
A WORLDWIDE MAINTENANCE & SERVICES SUPPORT

A qualified engineers team is able to ensure a worldwide on-site managed services 365 days/year:

- Mounting, setting & commissioning of valves
- Technical support to dedicated teams of end users
- Hotline linked with VELAN France plant
- Expertise on VELAN valves during maintenance
- Training of end user's team







CRYOGENIC BELLOWS SEALED CONTROL VALVES

Design Features

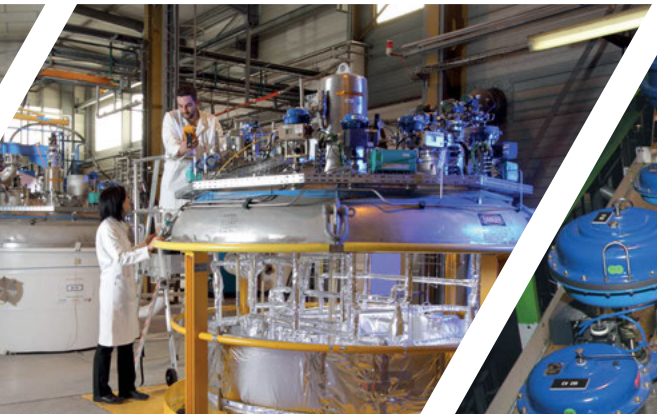
Fluid	Helium, Hydrogen, Oxygen, Nitrogen
Temperature	Down to 1.2 K (-272°C or -457°F)
Pressure rating	Class 150 to Class 300
Body type	Angle, Straight, Y pattern
End Connections	Butt Welding according to ANSI B16.25
Cold box adaptation	Welding flange
Cryogenic Extension	As per BS6364
Materials	Body and seat : 316L or 304L - Plug : Cu Al alloy or Stainless Steel
Flow characteristic	Linear or =% or on/off
Stem Tightness	Bellows Sealed
Seat Tightness Performance	10-4 mbar.l/s in standard
Across Body Tightness Performance	10-8 mbar.l/s in standard
Valve to Atmosphere Tightness Performance	10-5 mbar.l/s in standard
Tightness test means	Cryogenic test bench - Kellog method test bench - Mass spectrometer
Certificates	EN10204 3.1 for main constitutive parts of pressure shell
Codes & Certifications	ASME - RCCMRX - AD2000 W10 - DESP

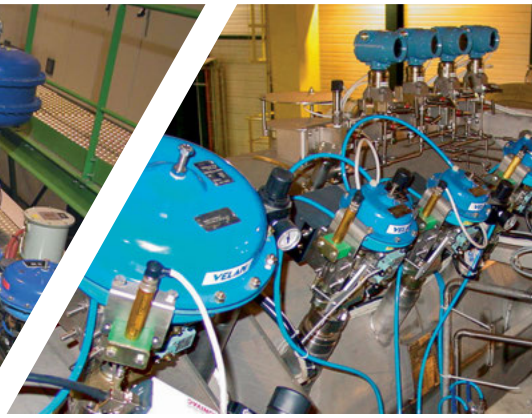
Accessories

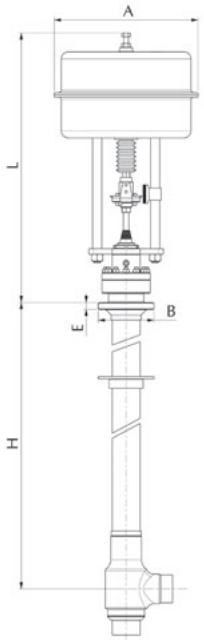
Actuation	Manual, Diaphragm actuator, Piston type actuator (on request)
Electro pneumatic positioner	4-20mA, Profibus, Hart protocole, Position transmitter, Explosion proof
Limit switches	Mechanical or Inductive
Tubing	Rilsan or Stainless steel
Air supply control	Air filter regulator with gauge provided in standard
Air exhaust	Solenoid valve
Slow operation	Needle valve
Fast operation	Booster or Quick exhaust valve
Low heat in leaks	Thermal collar (Cupro Aluminium)
Isolation	Vacuum jacket
BW ends	Pipe stubs

Severe conditions

Oxygen service	Degreasing
Explosive area	ATEX
Magnetic field area	Remote control (electronic part)
Radiation area	Seat Seal in VESPEL + Soft parts in EPDM + tubing in stainless steel







Straight on/off valve with fully stainless steel actuator and manual override

Straight manual valve with vacuum jacket and pipe stubs

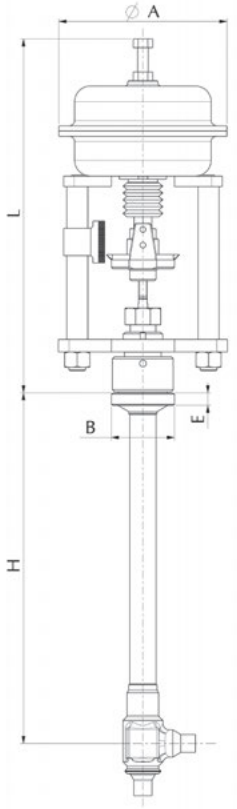
Angle control valve size ND250 with thermal collar

Standard Service Range for very low temperatures down to 1.2 K

Size (mm)	6	8	10	15	20	25	32	40	50	65	80	100	125	150	200	250	300
Size (in)	1/8"	1/4"	3/8"	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"	5"	6"	8"	10"	12"
H (mm)	650	650	650	650	650	650	650	875	875	875	875	1000	1000	1000	1000	1200	1200
L approx. (mm)	380	380	380	380	420	420	465	520	520	620	860	860	1100	1600	1600	1600	1600
Ø A (mm)	160	160	160	160	160	210	210	310	310	310	415	415	600	600	600	600	600
Ø B (mm)	60	60	60	60	80	80	80	120	120	160	200	250	250	250	250	450	450
E (mm)	12	12	12	12	15	15	15	15	15	15	10	15	15	15	15	15	15
Weight (Kg) Angle type	3	3	3	3	7	7	7	18	18	30	60	85	140	140	403	403	500
Weight (Kg) Straight type	4	4	4	4	9	9	9	27	27	50	130	200	450	450	550	550	650
CV max range (Angle type)*	0,06	0,06	0,06	0,06	3,75	3,75	3,75	20	20	45	75	130	190	available on request			
	0,8	1,5	3	6	15	18	24	52	70	120	186	270	430	600	720	1400	1900
CV max range (Straight type)*	0,06	0,06	0,06	0,06	3,75	3,75	3,75	30	30	45	75	130	190	available on request			
	0,8	1,1	1,5	3,5	10	13	16	36	48	96	115	216	300	420	520	1100	1500
Pipe Displacements (mm)	+/-3	+/-3	+/-3	+/-3	+/-3	+/-3	+/-3	+/-3	+/-3	+/-3	+/-3	+/-2	+/-2	+/-2	+/-2	+/-2	+/-2
Heat Leaks (W)**	0,5	0,5	0,5	0,5	0,9	0,9	0,9	1,9	1,9	2,8	5,3	10	12	12	18	23	30

Cv values are given with standard Rangeability R100 - Kv values = Cv ÷ 1,156
On/Off CV values are given on request * CV max values can be modified on request
** Heat leaks can be reduced on request

Angle control valve for warm temperatures (with short extension)

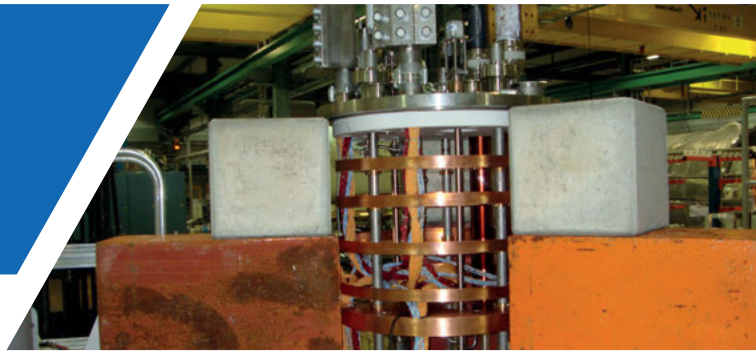


Standard Service Range for warm temperatures down to 213 K

Size (mm)	6	8	10	15	20	25	32	40	50	65	80	100	125	150	200	250	300
Size (in)	1/8"	1/4"	3/8"	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"	5"	6"	8"	10"	12"
H (mm)	130	130	130	130	300	300	300	370	370	370	450	450	450	450	Available on request		
L approx. (mm)	380	380	380	380	420	420	465	520	520	620	860	860	1100	1600			
Ø A (mm)	160	160	160	160	160	210	210	310	310	310	415	415	600	600			
Ø B (mm)	60	60	60	60	80	80	80	120	120	160	200	250	250	250			
E (mm)	12	12	12	12	15	15	15	15	15	15	10	15	15	15			
Weight (Kg) Angle type	3	3	3	3	7	7	7	18	18	30	60	85	140	140			
Weight (Kg) Straight type	4	4	4	9	9	9	9	27	27	50	130	200	450	450			
CV max range (Angle type)*	0,06	0,06	0,06	0,06	3,75	3,75	3,75	20	20	45	75	130	190	300			
	0,8	1,5	3	6	15	18	24	52	70	120	186	270	430	600			
CV max range (Straight type)*	0,06	0,06	0,06	0,06	3,75	3,75	3,75	30	30	45	75	130	190	300			
	0,8	1,1	1,5	3,5	10	13	16	36	48	96	115	216	300	420			
Pipe Displacements (mm)	+/-3	+/-3	+/-3	+/-3	+/-3	+/-3	+/-3	+/-3	+/-3	+/-3	+/-3	+/-2	+/-2	+/-2			

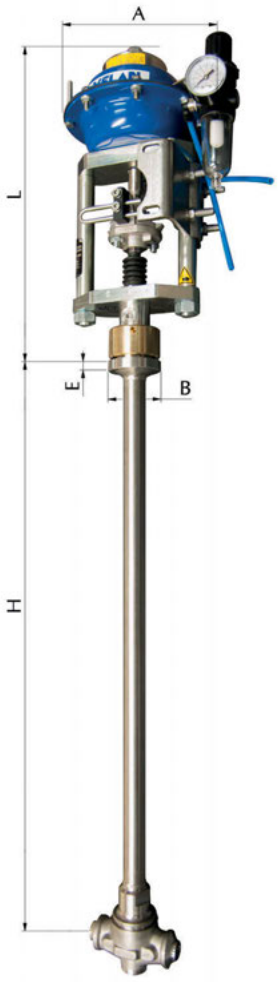
Cv values are given with standard Rangeability R100 - Kv values = Cv ÷ 1,156
On/Off CV values are given on request * CV max values can be modified on request

3 WAYS CRYOGENIC CONTROL VALVES



Design Features

Fluid	Helium, Hydrogen, Oxygen, Nitrogen
Temperature	Down to 1.2 K (-272°C or -457°F)
Pressure rating	Class 150 to Class 300
Body type	3 ways
End Connections	Butt Welding according to ANSI B16.9
Cold box adaptation	Welding flange
Cryogenic Extension	As per BS6364
Materials	Body and seat : 316L or 304L - Plug : Cu Al alloy or Stainless Steel
Flow characteristic	Linear or =% or on/off
Stem Tightness	Bellows Sealed
Seat Tightness Performance	10-4 mbar.l/s in standard
Across Body Tightness Performance	10-8 mbar.l/s in standard
Valve to Atmosphere Tightness Performance	10-5 mbar.l/s in standard
Tightness test means	Cryogenic test bench - Kellog method test bench - Mass spectrometer
Certificates	EN10204 3.1 for main constitutive parts of pressure shell
Codes & Certifications	ASME - RCCMRX - AD2000 W10 - DESP



Accessories

Actuation	Manual, Diaphragm actuator, Piston type actuator (on request)
Electro pneumatic positioner	4-20mA, Profibus, Hart protocole, Position transmitter, Explosion proof
Limit switches	Mechanical or Inductive
Tubing	Rilsan or Stainless steel
Air supply control	Air filter regulator with gauge
Air exhaust	Solenoid valve
Low heat in leaks	Thermal collar (Cupro Aluminium)

Standard Service Range

Size (mm)	6	8	10	15	20	25	32	40	50	65	80	100	125	150	200	250	300
Size (in)	1/8"	1/4"	3/8"	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"	5"	6"	8"	10"	12"
H (mm)	665	665	665	665	675	675	675	915	915	925	925	1067	1102	1102	Available on request		
L approx. (mm)	300	300	300	300	450	450	450	470	470	450	670	700	780	780			
Ø A (mm)	125	125	125	125	250	250	250	250	250	250	300	300	250	250			
Ø B (mm)	60	60	60	60	80	80	80	120	120	160	200	250	250	250			
E (mm)	12	12	12	12	15	15	15	15	15	15	10	15	15	15			
Weight (Kg)	4	4	4	4	9	9	9	27	27	50	130	200	450	450			
CV max (Angle)*	1,5	6,5	6,5	6,5	30	30	30	74	74	126	215	280	460	650			
CV max (Straight)*	1,3	5	5	5	23	23	23	61	61	98	170	226	350	520			
Pipe Displacements (mm)	+/-3	+/-3	+/-3	+/-3	+/-3	+/-3	+/-3	+/-3	+/-3	+/-3	+/-3	+/-2	+/-2	+/-2			
Heat leaks (W)**	0,5	0,5	0,5	0,5	0,9	0,9	0,9	1,9	1,9	2,8	5,3	10	12	12			

Cv values are given with standard Rangeability R100 - Kv values = Cv ÷ 1,156
On/Off CV values are given on request * CV max values can be modified on request ** Heat leaks can be reduced on request

CRYOGENIC PACKING SEALED CONTROL VALVES

Design Features

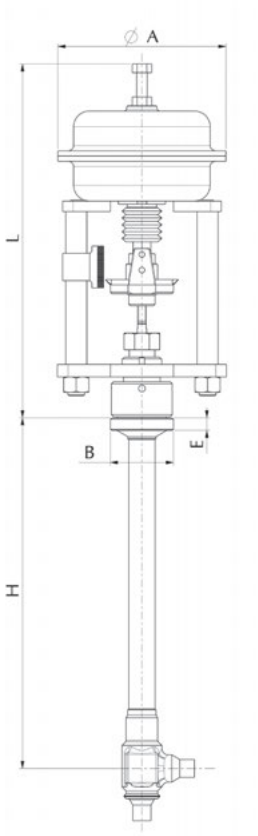
Fluid	Nitrogen, Oxygen
Temperature	Down to 77 K (-196°C or -320°F)
Pressure rating	Class 150 to Class 300
Body type	Angle, Straight, Y pattern
End Connections	Butt Welding according to ANSI B16.25
Cold box adaptation	Welding flange
Cryogenic Extension	As per BS6364
Materials	Body and seat : 316L or 304L - Plug : Cu Al alloy or Stainless Steel
Flow characteristic	Linear or =% or on/off
Stem Tightness	Packing Sealed
Seat Tightness Performance	10-4 mbar.l/s in standard
Across Body Tightness Performance	10-8 mbar.l/s in standard
Tightness test means	Cryogenic test bench - Kellog method test bench - Mass spectrometer
Certificates	EN10204 3.1 for main constitutive parts of pressure shell
Codes & Certifications	AD2000W10 – ASME – DESP

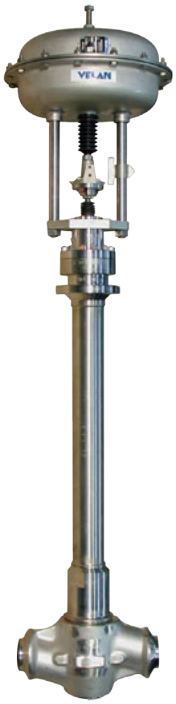
Accessories

Actuation	Manual, Diaphragm actuator, Piston type actuator (on request)
Electro pneumatic positioner	4-20mA, Profibus, Hart protocole, Position transmitter, Explosion proof
Limit switches	Mechanical or Inductive
Tubing	Rilsan or Stainless steel
Air supply control	Air filter regulator with gauge
Air exhaust	Solenoid valve
Slow operation	Needle valve
Fast operation	Booster or Quick exhaust valve
Isolation	Vacuum jacket
BW ends	Pipe stubs

Severe conditions

Oxygen service	Degreasing
Explosive area	ATEX
Magnetic field area	Remote control (electronic part)
Radiation area	Seat Seal in VESPEL + Soft parts in EPDM + tubing in stainless steel





Straight on/off valve with fully stainless steel actuator

Straight manual valve

Cryogenic test in Liquid Nitrogen

Standard Service Range

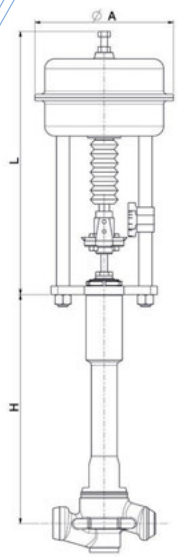
Size (mm)	6	8	10	15	20	25	32	40	50	65	80	100	125	150	200	250	300
Size (in)	1/8"	1/4"	3/8"	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"	5"	6"	8"	10"	12"
H (mm)	335	335	335	335	372	372	372	472	472	514	543	586	628	628	Available on request		
L approx. (mm)	380	380	380	380	420	420	465	520	520	620	860	860	1100	1150			
Ø A (mm)	160	160	160	160	160	210	210	310	310	310	415	415	600	600			
Ø B (mm)	60	60	60	60	80	80	80	120	120	160	200	250	250	250			
E (mm)	12	12	12	12	15	15	15	15	15	15	10	15	15	15			
Weight (Kg) Angle type	3	3	3	3	7	7	7	18	18	30	60	85	140	140			
Weight (Kg) Straight type	4	4	4	4	9	9	9	27	27	50	130	200	450	450			
CV max range (Angle type)*	0,06	0,06	0,06	0,06	3,75	3,75	3,75	20	20	45	75	130	190	300			
	0,8	1,5	3	6	15	18	24	52	70	120	186	270	430	600			
CV max range (Straight type)*	0,06	0,06	0,06	0,06	3,75	3,75	3,75	30	30	45	75	130	190	300			
	0,8	1,1	1,5	3,5	10	13	16	36	48	96	115	216	300	420			
Pipe Displacements (mm)	+/-3	+/-3	+/-3	+/-3	+/-3	+/-3	+/-3	+/-3	+/-3	+/-3	+/-3	+/-2	+/-2	+/-2			

Cv values are given with standard Rangeability R100 - Kv values = Cv ÷ 1,156
On/Off CV values are given on request * CV max values can be modified on request

HIGH PRESSURE & SEVERE APPLICATION CONTROL VALVES

Design Features

Fluid	Helium, Hydrogen, Oxygen, Nitrogen, Methan, Argon, Natural Gas
Temperature	Down to 19 K (-254°C or -425°F)
Pressure rating	Up to Class 2500
Body type	Straight
End Connections	Butt Welding according to ANSI B16.25 or Flanged
Cold box adaptation	Welding flange (on request)
Cryogenic Extension	As per BS6364
Materials	Depends on fluid, temperature and pressure class - available on request
Flow characteristic	Linear or =% or on/off
Stem Tightness	Bellows Sealed or Packing Sealed
Seat Tightness Performance	ANSI Class IV, V or VI
Across Body Tightness Performance	10-5 mbar.l/s
Tightness test means	Cryogenic test bench - Kellog method test bench - Mass spectrometer
Certificates	EN10204 3.1 for main constitutive parts of pressure shel
Codes & Certifications	ASME - RCCMRX - AD2000 W10 - DESP



Accessories

Actuation	Manual, Diaphragm actuator, Piston type actuator (on request)
Electro pneumatic positioner	4-20mA, Profibus, Hart protocole, Position transmitter, Explosion proof
Limit switches	Mechanical or Inductive
Tubing	Rilsan or Stainless steel
Air supply control	Air filter regulator with gauge provided in standard
Air exhaust	Solenoid valve
Slow operation	Needle valve
Fast operation	Booster or Quick exhaust valve
Low heat in leaks	Thermal collar (Cupro Aluminium)
Isolation	Vacuum jacket
BW ends	Pipe stubs

Severe conditions

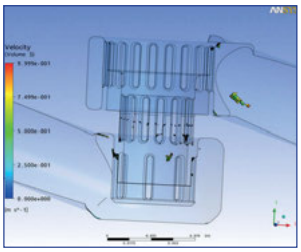
Oxygen service	Degreasing
Explosive area	ATEX
Cavitation	Multi-stage system
High shut off pressure	Multi-stage system + Edel technology pilot operated system

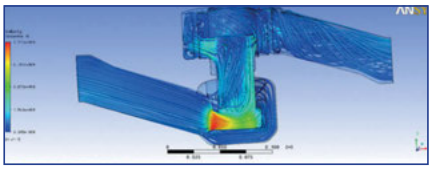
Cryogenic on/off valve size 14″ with multi-stage system and EDEL technology

MULTI-STAGE SYSTEM
ANTI CAVITATION - NOISE REDUCTION

In case of high differential pressure, cavitation and/or noise can occure in the valve which involve early deterioration.

VELAN has developped a multi-stage system according to Computational Fluid Dynamics analysis and tests to improve life time of the valve.



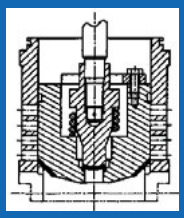



EDEL TECHNOLOGY PILOT OPERATED SYSTEM

EDEL pilot-operated valves allow the use of non-oversized actuators and provide high stability of control by reducing the load on the valve stem.The EDEL closure system is a metal pilot plug offering both good balance characteristics and tightness on closure.

Standard Service Range

	Class 150 to 2500				
Size (mm)	15	20	25	40	50
Size (in)	1/2"	3/4"	1"	1/2"	2"
H (mm)	350	350	350	445	480
L approx. (mm)	290	380	380	455	450
Ø A (mm)	160	210	210	310	310
Weight (Kg)	4	4	4	4	9
CV min	0,06	0,1	3,5	8	8
CV max	3	6,5	11	30	30




A small pilot plug opens first to reduce the load, and the main plug opens then with a smaller differential pressure.

	Class 1500 *							
Size (mm)	25	40	50	80	100	150	200	250
Size (in)	1"	1 1/2"	2"	3"	4"	6"	8"	10"
CV max =% single port	13	22	35	75	125	270	-	-
CV max =% Edel design	-	-	33	72	116	255	470	695
CV Linear On/Off single port	13	22	35	76	128	280	515	780

	Class 150 to 900 *										
Size (mm)	25	40	50	80	100	150	200	250	300	350	400
Size (in)	1"	1 1/2"	2"	3"	4"	6"	8"	10"	12"	14"	16"
CV max =% single port	13	26	46	100	157	307	501	742	1027	1309	1636
CV max =% Edel design	-	-	43	94	148	289	471	698	966	1230	1550
CV Linear On/Off single port	13	26	47	104	165	326	536	802	1120	1440	1800

* Dimension : please consult us (depends on Fluid, Temperature & Pressure class)
* Weight : please consult us (depends on Fluid, Temperature & Pressure class)

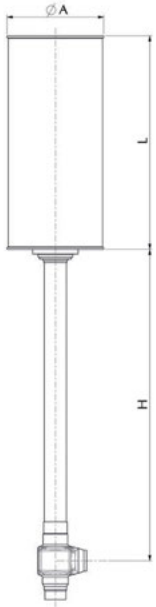
CRYOGENIC SAFETY RELIEF VALVES

Valve function

To protect the superfluid helium enclosures of super conducting magnets against over-pressure resulting from resistive transitions (QUENCH) as well as some of the cryogenic lines.

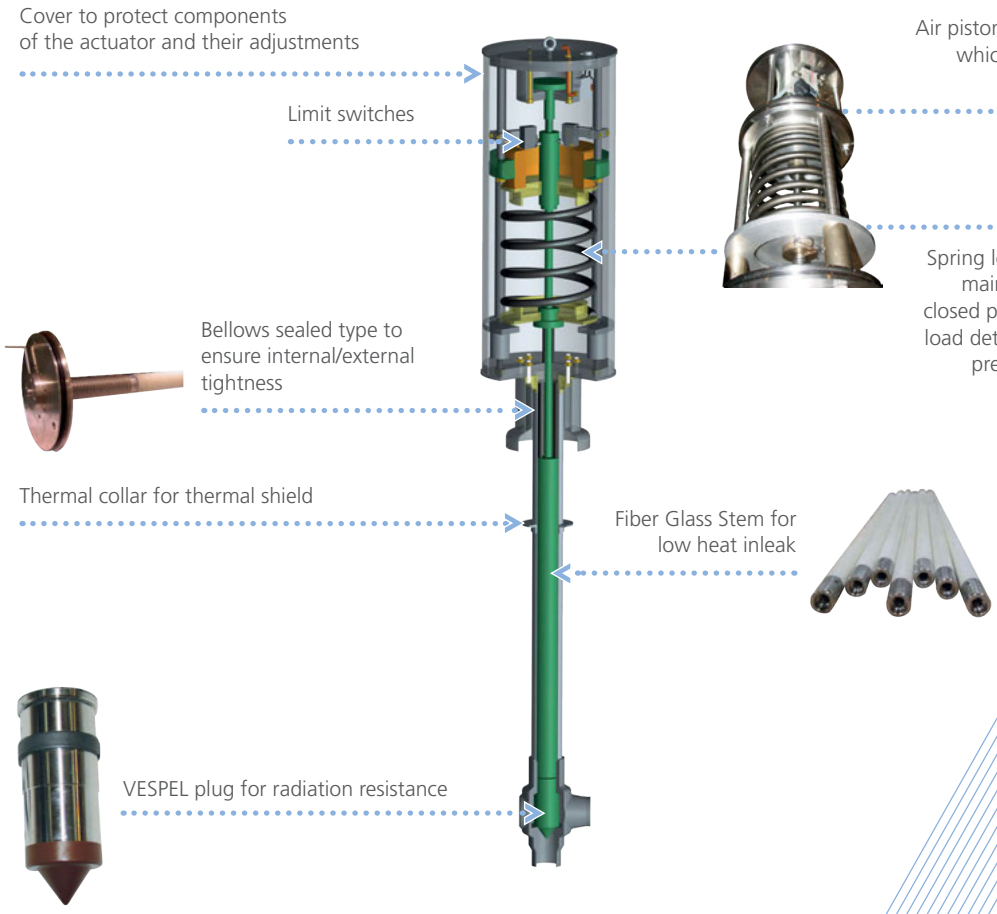
Design Features

Fluid	Helium
Temperature	Down to 1.2 K (-272°C or -457°F)
Pressure rating	PN25
Set pressure	1 bar up to 25 bar
Size	From DN15 to DN80 (from 1/2" to 3")
Body type	Angle
End Connections	Butt Welding according to ANSI B16.9
Cold box adaptation	Welding flange
Cryogenic Extension	As per BS6364
Materials	Body and seat : 316L or 304L - Plug : Stainless Steel
Flow characteristic	Linear or on/off
Stem Tightness	Bellows Sealed
Seat Tightness Performance	10-4 mbar.l/s in standard
Across Body Tightness Performance	10-8 mbar.l/s in standard
Valve to Atmosphere Tightness Performance	10-5 mbar.l/s in standard
Tightness test means	Cryogenic test bench - Kellog method test bench Mass spectrometer
Certificates	EN10204 3.1 for main constitutive parts of pressure shell
Codes & Certifications	ASME - RCCMRX - AD2000 W10 - DESP
Actuation	1 pneumatic cylinder + electro-distributor
Control	Solenoid valve or Piezo-electric valve
Remote control (on/off)	On request
Limit switches	Mechanical
Tubing	Stainless steel
Low heat in leaks	Thermal collar



Severe conditions

Magnetic field area	Control piloted by Piezo-electric valve
Radiation area	Seat Seal in VESPEL + Soft parts in EPDM



Standard Service Range

Size (mm)	6	8	10	15	20	25	32	40	50	65	80	100	125	150	200	250	300
Size (in)	1/8"	1/4"	3/8"	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"	5"	6"	8"	10"	12"
H (mm)	Available on request							675	675	Available on request							
L (mm)								685	685								
Ø A (mm)								248	248								
Total Weight (Kg)								56	56								
CV max*								35	35								
Pipe Displacements (mm)								+/-3	+/-3								
Heat leaks (mm)**								1,9	1,9								

Kv values = Cv ÷ 1,156
* CV max values can be modified on request ** Heat leaks can be reduced on request

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