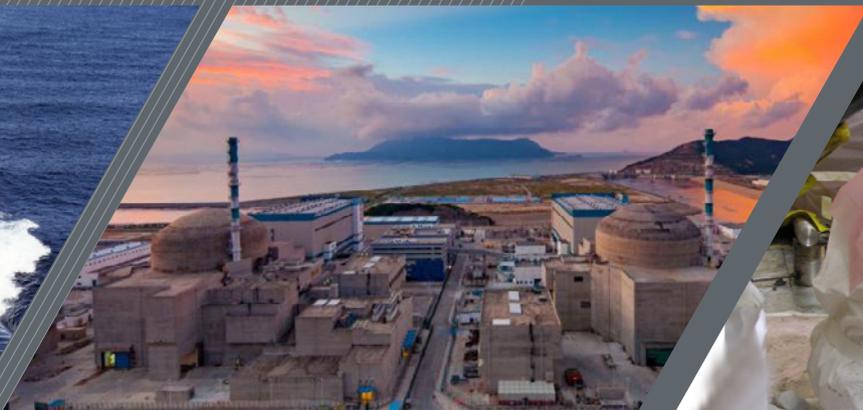


VALVES
FOR NUCLEAR
APPLICATIONS

VELAN



velan.com

VELAN

Founded in 1949 in Montreal – Canada, Velan Inc. employs over 1800 people located in 17 manufacturing plants worldwide.



ABOUT VELAN

Velan is one of the world's leading manufacturers of industrial valves, supplying forged and cast steel gate, globe, check, ball, butterfly and knife gate valves for critical applications in the chemical, petrochemical, oil & gas, fossil and nuclear power, cogeneration, pulp & paper and cryogenic industries.

KEY FIGURES :

- > FOUNDED IN 1949 BY MR. A.K. VELAN
- > 1800 EMPLOYEES WORLDWIDE
- > 17 MANUFACTURING SITES: CANADA (5), USA, UK, FRANCE (2), 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



CORPORATE PHILOSOPHY

The Velan corporate philosophy is to bring to the market new and innovative valve designs with special emphasis on quality, safety, ease of operation, simple in-line maintenance and most of all, long service life. The use of high quality materials, advanced manufacturing technology and automation in all stages of manufacturing ensures the highest possible quality.

THE LEADING CHOICE FOR NUCLEAR VALVES

With an installed base in 350 nuclear power reactors worldwide and with over 40 years of uninterrupted nuclear experience, Velan is the leading valve supplier for all nuclear reactor technologies: PWR, EPR, VVER, HUALONG, AP1000, BWR, PHWR, CANDU, FBR, AGR, HTR...

As an actor of upstream research and continuous innovation, Velan constantly develops new technologies in order to anticipate the technical and regulatory requirements of future generation of Nuclear Reactors such as GENIII PWR reactors, GENIV sodium cooled Fast Breeder and HTR reactors or GENV "TOKAMAK" fusion reactors.

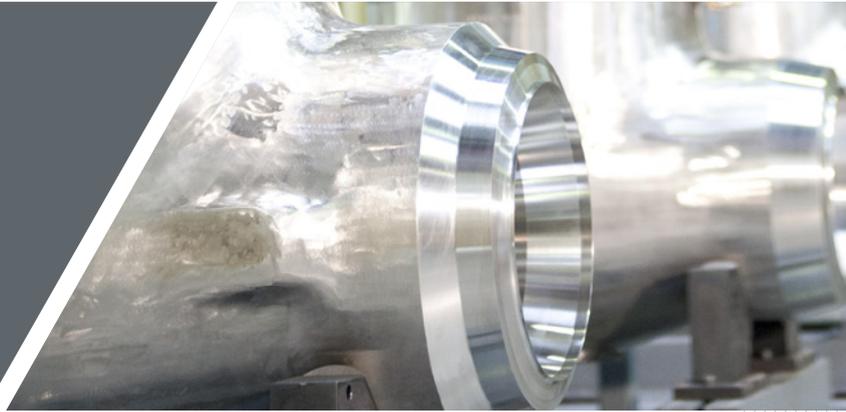


Velan France was established in 1974 for supplying the newborn French Nuclear Industry. Located in Lyon (France) in a modern 20 000 m² plant, Velan France is specialized in the design and manufacture of High performance valves for Nuclear, Cryogenic and specific applications.

HISTORY OF INNOVATION IN THE NUCLEAR INDUSTRY

- 1952** VELAN supplied valves to US navy for the first nuclear submarine (USS Nautilus).
- 1954** VELAN Pioneered the bellows seal technology and supplied 8500 bellows seal valves to Oak Ridge National Lab's research reactor (USA) in 1958.
- 1961** VELAN Pioneered the large size forged valve technology and supplied valves to 115 NPP in North America since that date.
- 1968** VELAN pioneered the emission free packing chamber and "live loading" technology that became industry's standard.
- 1971** VELAN first valve company to receive "N" stamp certification.
- 1972** First order for Russian reactors (Leningrad & Novovoronezhskiy).
- 1974** VELAN establishes in France to supply forged valves to all 58 French NPP according to RCCM standard (PWR technology) since that date.
- 2005** VELAN France selected to be the main supplier for the EPR technology and supplied all critical valves for OL3 (Finland), FA3 (France), Taishan 1&2 (China), HPC (UK) reactors.
- 2008** Velan has been chosen by major Chinese engineering companies to supply nuclear classified valves of CPR1000 and ACP1000 nuclear fleet. Velan got HAF604 certification.
- 2012** Velan awarded a contract for the Helium cooled High Temperature reactor in China.
- 2014** Velan Nuclear valves are selected for new Hualong-One Generation III reactor.
- 2015** Velan France receives ASME III certification for Construction of Nuclear Class I, II and III valves in Lyon manufacturing plant.
- 2018** Velan selected by ITER Organization to supply critical nuclear and cryogenic valves for ITER fusion reactor.
- 2019** Velan Nuclear globe valves ASME class 1&2 are selected for phase 2 of CAP1000 reactors in China.

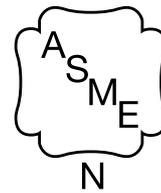
THE KEY TO NUCLEAR VALVE SOLUTIONS



TOTAL QUALITY COMMITMENT

Velan has always remained totally committed to offering products and services that not only meet, but exceed customer expectations. All VELAN products are certified by major classification societies and/or certification bodies to guarantee their performances and compliance with applicable codes, standards, directives and legislations including:

- > **ESPN (N1, N2, N3)**, European Directive related to Nuclear Pressure Equipment
- > **NPE (Q1, Q2, Q3)**, Nuclear Pressure Equipment (United Kingdom)
- > **PED**, Pressure Equipment Directive 97/23/EC and its translation under French law
- > **HAF 604**, Requirements applicable to components designed for Chinese Nuclear reactors and manufactured outside China
- > **OIT**, requirement applicable to imported components designed for Russian Nuclear Reactors.
- > **CEFRI**, French committee for the certification of companies training and monitoring personnel working under ionizing radiation.
- > **AEO**, status of safe authorized exporter, based on EC regulation



Our Integrated Management system is based on a continuous improvement of our processes in terms of organization, Environment & Sustainability and Health & Safety including the following certifications:

- > **ISO 9001**, Quality management system requirements
- > **ISO 14001**, Environmental management system requirements
- > **OHSAS 18001**, Industrial Health & Safety management system requirements
- > **ASME NQA-1**, Quality requirements applicable to components designed for ASME III nuclear Reactors



As a Global supplier of Nuclear valves, Velan masters major international nuclear construction codes including:

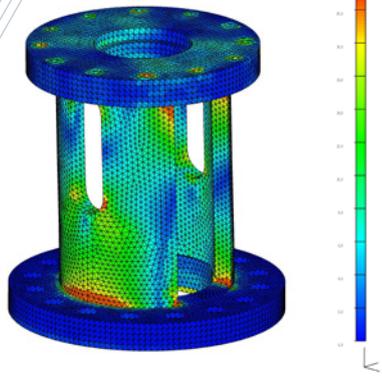
- > **ASME III – Stamp 'N' and 'NPT'**: Construction Rules for Mechanical components for Nuclear Reactors (USA)
- > **RCC-M**: Construction Rules for Mechanical Components for Nuclear Reactors (France)
- > **NP068 / PNAEG**: Construction Rules for Valves and Mechanical Components for Nuclear Reactors (Russia)





DESIGN CAPABILITIES

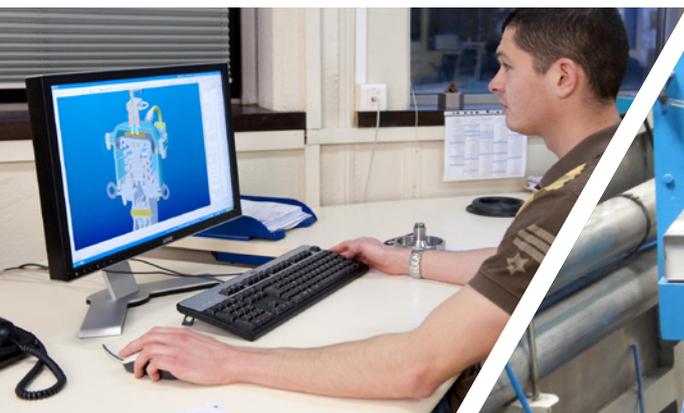
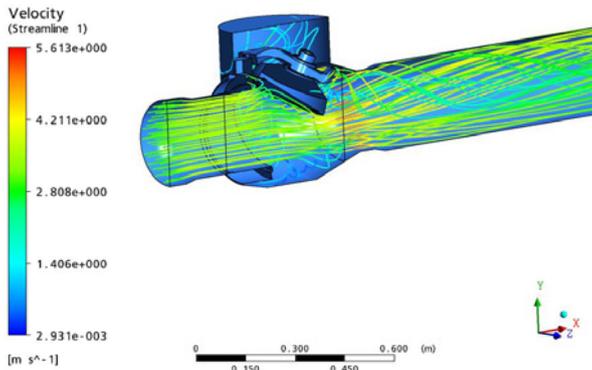
With over 50 years of experience in the nuclear industry, Velan France has brought together a team of over 50 engineers, technicians and experts who are the core of the Engineering Design Group. Advanced software applications, including finite element analysis, computational fluid dynamics and three dimensional solid modeling, help Velan to design superior quality valves complying with most demanding nuclear codes and international nuclear standards.



RESEARCH & DEVELOPMENT CAPABILITIES

Velan has a long lasting history of partnership with major Architect Engineers and Nuclear operators to develop innovative solutions for valve needs. Our research laboratory is equipped with advanced facilities such as steam and cavitation test loop, Cv loop, test benches and CAD-FEM softwares. Velan Research & Development department focuses on 4 main targets:

- Design of new products according to market demand and specific client requests
- Products qualifications to normal and accidental conditions
- Research for new technologies
- Products improvement for tightness, resistance to accidental conditions, Design Life and reliability. CV optimization, development of low maintenance products.



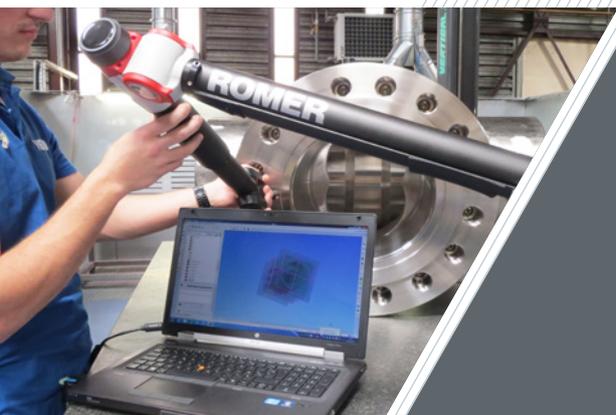
MANUFACTURING CAPABILITIES



Velan machinery and equipment are especially engineered to meet requirements of advanced small and large nuclear valves manufacturing technology.

ADVANCED 20 000 M² MANUFACTURING PLANT

- > MACHINING MEANS OF THE LATEST TECHNOLOGY INCLUDING CNC MACHINING CENTER, PLASMA HARD FACING STATIONS, 3D MEASURING MACHINES, CLEAN ASSEMBLY ROOM, TEST BENCHES UP TO 1000 BAR
- > INDUSTRIAL MEANS THAT MEET THE HIGH REQUIREMENTS AND LATEST STANDARDS OF THE NUCLEAR INDUSTRY





VELAN PRODUCT QUALIFICATIONS FOR NUCLEAR REACTORS

In order to demonstrate the performance and the reliability of its products during normal operating conditions and during accidental conditions, VELAN France has performed multiple product qualifications over the past 50 years. These qualifications are backed by more than 300 qualification reports certified by major nuclear operators and safety regulators or by independent third parties.

Most of these qualifications are performed in VELAN SAS R&D Laboratory or in independent laboratories such as SOPEMEA (France), WYLE (USA), AREVA KARLSTEIN (Germany), EDF RENARDIERES (France).

The qualification methodology is based on AMSE- QME-1 and/or specific requirements of Nuclear Operators.

QUALIFICATION FOR NORMAL OPERATING CONDITIONS

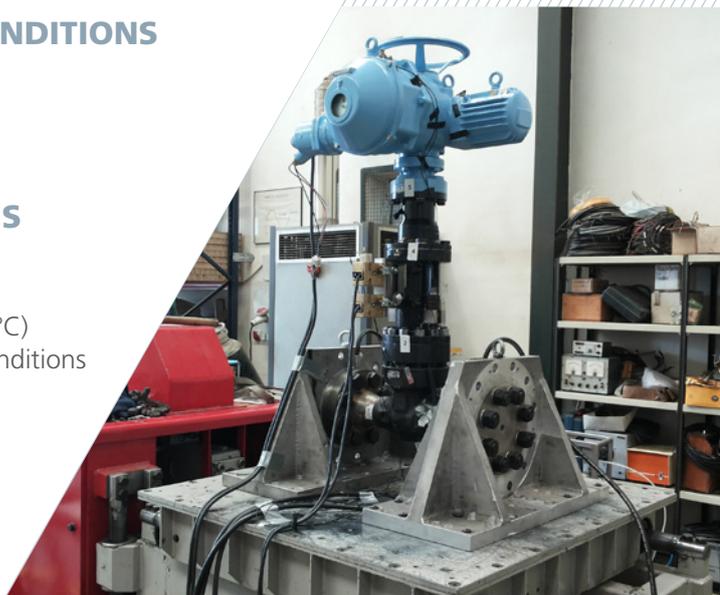
- 1000 to 3000 Cycling tests at Normal Operating conditions (Pressure/Temperature)
- Temperature Transient test (thermal chocks)

QUALIFICATION FOR ACCIDENTAL CONDITIONS

- Vibrations tests
- Seismic tests as per post Fukushima seismic spectra.
- Aging & irradiation test under LOCA conditions (5.5 Bar, 156°C)
- HELB (High Energy Line Break) closure test under full flow conditions

QUALIFICATION FOR POST-ACCIDENTAL CONDITIONS

- Activated Contaminated Water (Fluid with Solid Particles) under post accidental conditions
- Severe Accident conditions



VELAN « ONE PIECE FORGED BODY » TECHNOLOGY FOR NUCLEAR REACTORS SAFETY

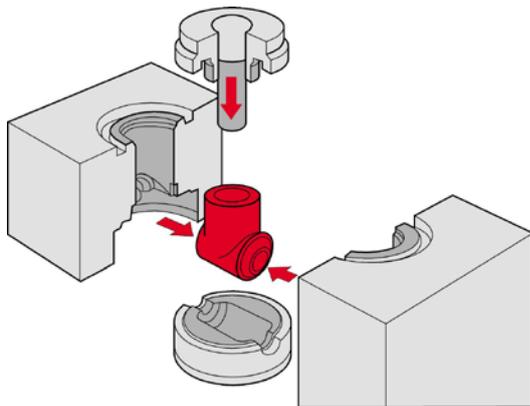


A considerable leap forward in Velan technology was the introduction of the “one piece forged body” for valves larger than 2” (50mm), and up to 24” (600 mm), for the safety improvement of the main primary system of PWR reactors. Velan forged valves offer greater strength and increased toughness for maximum reliability and safety. They have become the first choice of nuclear reactors, the nuclear navy and for all severe and critical applications in the chemical and hydrocarbon processing industries. Velan supplied forged valves Classes 1, 2 and 3 to over 350 Nuclear reactors worldwide in some 27 countries and to almost all reactor technologies (PWR, EPR, BWR, PHWR, LMFBR, HWLWR, AGR, GCR, EPR, LGR, VVER...).

Why Forgings?

When compared with castings, forged valve bodies offer the advantages of more uniform structure, greater density, higher strength integrity, enhanced dimensional characteristics and closer dimensional tolerances.

The directional structure (flowlines) is superior from an overall strength and stress standpoint against castings.



QUALITY ASSURANCE OF FORGINGS

Through the use of forgings, with their uniformity and high quality, the radiographic requirement for comparable Class 1 cast components is eliminated. The same attitude has been taken by the United States Navy when using forgings for valves and other components for nuclear submarines and aircraft carriers. All that is required by ASME Code is ultrasonic examination and magnetic particle or liquid penetrant testing in the finished condition. Rejections of forgings for inherent deficiencies found by U.T., M.T., or P.T. methods are rare. Procurement of parts, lead times can be controlled, resulting in more reliable valves deliveries.

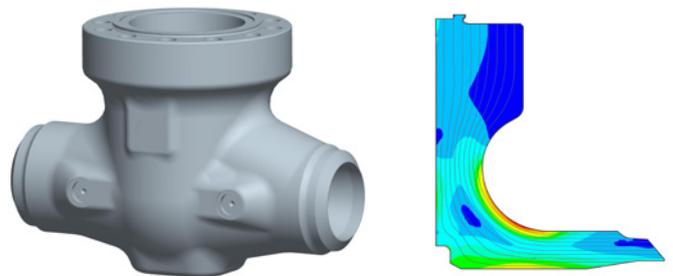


High Strength

Hot forgings promote recrystallization and grain refinement allowing the material to develop maximum possible strength and uniformity with a minimum variation from one piece to another. The grain flow closely follows the outline of the body and continuous flow lines decrease the susceptibility for fatigue or common failures.

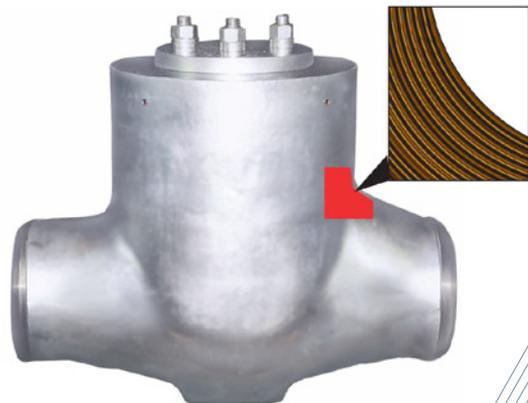
Structural Intensity

Forging eliminates internal flaws and produces a coherent and uniform metallurgical structure assuring optimum performance. Where stress and intergranular corrosion are a problem, a forging will assure a long life and trouble free service.



Reliability

The ability of forgings to meet design requirements consistently is one of the most important advantages and takes into account all the preceding characteristics to some degree. Dimensional and Metallurgical Uniformity Dimensional uniformity of closed-die forgings results in positive control of critical wall thickness, eliminating deficiencies caused by shifted cores in castings. A uniform metallurgical structure without internal flaws is assured by quality segregation-free billet and high impact forces achieved on 10 000 – 30 000 ton presses.



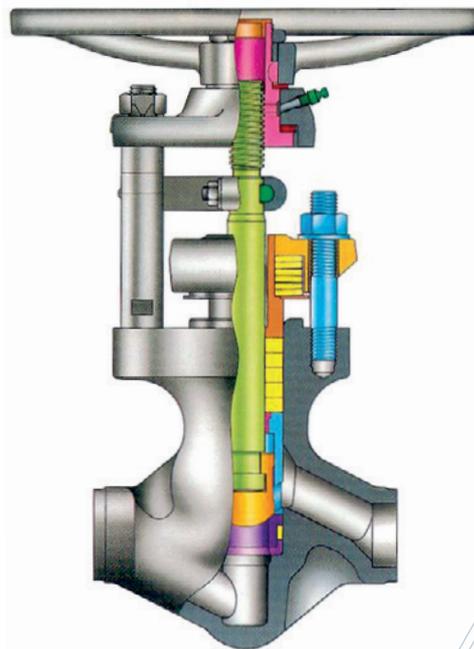
FATIGUE RESISTANCE TO CREEP UNDER TEMPERATURE IS MORE THAN 3 TIMES BETTER FOR FORGINGS.



VELAN RAMA® MODULAR MAINTENANCE VALVE TECHNOLOGY FOR GEN III NUCLEAR REACTORS



In partnership with major Nuclear Operators, VELAN has developed and qualified a specific range of Modular maintenance valves with the aim of reducing significantly the maintenance time and the radioactive dose level of maintenance personnel working inside the containment. The patented VELAN RAMA® modular Maintenance Globe valve, available from Sizes of ¼" (DN8) up to 6" (DN150) has a removable seat (not welded) that can be replaced in less than 15 minutes. Taking into account the fact that thousands of valves are installed inside the containment of a nuclear reactor, the RAMA® Globe valves offers significant in-line maintenance saving to the operator as well as a the improvement of personnel health during the whole life of the plant and has become an industry standard for most GEN III reactors.





VELAN COBALT FREE HARD FACING TECHNOLOGY FOR GEN III NUCLEAR REACTORS

The activation of Cobalt Isotopes inside the primary coolant systems has become a major concern for GEN III Nuclear reactors. In order to reduce the use of Cobalt Base Alloy, VELAN has developed alternative Hard Facing Materials using Iron bases or Nickel Bases and has qualified alternative arc plasma welding process using NOREM®02 and DELORO®40.

PHILOSOPHY FOR NUCLEAR VALVE DESIGN

- Lifetime up to 60 years
- Forged design
- Operating & Maintenance costs considered at design stage
- Low maintenance design
- Constant improvement of tightness and safety
- Cobalt free requirements: Iron alloy, Nickel alloy

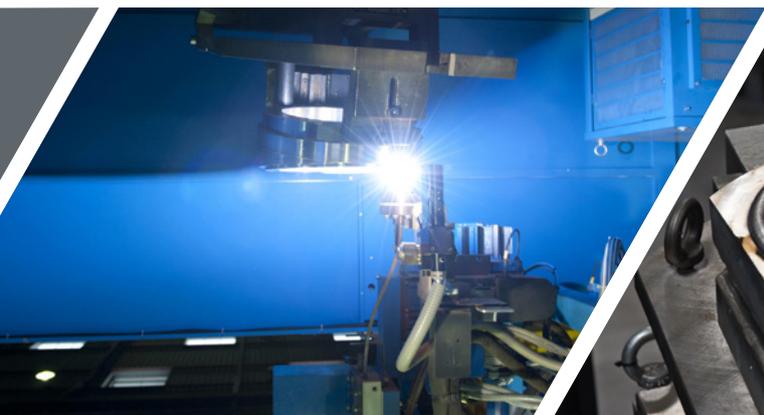
All input data are certified by tests

- Friction coefficients are measured with minimum and maximum values
- Calculation methods have been standardized, such as actuator sizing.

Prototype valves are qualified prior to the projects

- VELAN has launched anticipated first of kind valves for all important materials for ex.: Safety Injection System, Severe Accident Valves, MFIV...

Constant innovation for new nuclear reactor technologies



Velan offers one of the most comprehensive valve product lines for nuclear reactors available from any manufacturer. From shut-off or control application to the most severe, Velan has a solution. We produce qualified gate, globe, check, butterfly, control and engineered severe service valves in sizes up to 64" (1600 mm) and for services up to ASME Class 4500. Our products incorporate many unique design features for superior tightness, simple and quick in-line maintenance, cobalt free applications, increased reliability and up to 60 years' service life.

Built to order, our valves are available with a large selection of steel body materials, trims, options and accessories. With options such as bypasses and equalizers to special trims for severe control services, Velan can provide valves built to your specific applications. All Velan valves are available with qualified actuation packages according to your needs. This includes electric, pneumatic, hydraulic or oleo-pneumatic actuation with a complete range of controls and sensors.

SIZE RANGE		
1/4" - 2" (DN6-DN50)		
2" - 24" (DN50-DN600)		
Greater than 24" (DN600)		

ASME CLASS		
150		
300		
600		
900		
1500		
2500		
4500		

QUALIFICATIONS		
Normal Conditions (P&T)		
Seismic class 1A		
Thermal chock		
Vibrations & Aging		
LOCA (Loss Of Coolant Accident)		
SA - (Severe Accident)		
ACW - (Activated Contaminated Water)		
HELB (High Energy Line Break)		

TYPICAL REACTOR		
PWR / BWR / PHWR / AP1000		
EPR GEN-3		
VVER GEN-3		
AP1000 GEN-3		
Hualong GEN-3		
FBR GEN-4 (Sodium Cooled)		
HTR (High Temperature Reactors)		
Navy (Embarked reactor)		
Research Reactors		
Fusion reactors "TOKAMAK"		

SIZE RANGE		
1/4" - 2" (DN6-DN50)		
2" - 24" (DN50-DN600)		
Greater than 24" (DN600)		

ASME CLASS		
150		
300		
600		
900		
1500		
2500		
4500		

QUALIFICATIONS		
Normal Conditions (P&T)		
Seismic class 1A		
Thermal chock		
Vibrations & Aging		
LOCA (Loss Of Coolant Accident)		
SA - (Severe Accident)		
ACW - (Activated Contaminated Water)		
HELB (High Energy Line Break)		

TYPICAL REACTOR		
PWR / BWR / PHWR		
EPR GEN-3		
VVER GEN-3		
AP1000 GEN-3		
Hualong GEN-3		
FBR GEN-4 (Sodium Cooled)		
HTR (High Temperature Reactors)		
Navy (Embarked reactor)		
Research Reactors		
Fusion reactors "TOKAMAK"		

LARGE SIZE GATE VALVES

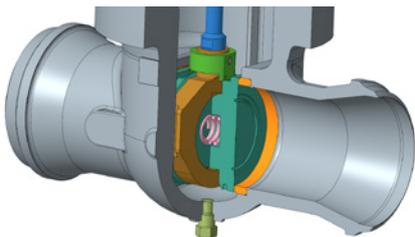
The **Velan flexible wedge**, with round geometry and stem low in the cavity, was pioneered by Velan in 1960. It has a large flexibility index within normal closing torques and allowable stresses to compensate for seat distortions caused by piping loads, thermal and pressure fluctuations, seal-welding of seats and cooling down of a valve closed hot. The major difference between a Velan flexible wedge valve and a parallel slide valve is a high wedging force acting on the seats, which adds to the primary fluid pressure force, resulting in superior tightness of seats and freedom from sticking. In addition, the wedge guiding minimizes seat rubbing and scuffing as seats are contacted only at last 5% of total travel, resulting in long cycle life.

Velan manufactures also one of the world's most advanced forged **parallel slide valves**. Our unique cage unit comprises all of the operating parts of the slide discs. The parallel slide valve design relies on the primary system pressure acting on the downstream disc for seat integrity. There is no wedging action or extra loading on the seats. As a result, closing torques are considerably lower, requiring less manual operating effort or smaller power actuators. Due to its inherent design, the parallel slide valve is not subject to thermal binding concerns, resulting in a distinct safety advantage in high pressure and temperature service.

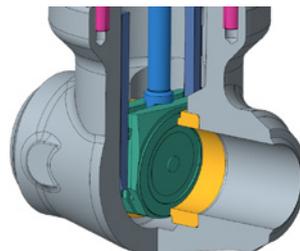
The **Split Wedge design (Double Disc)** is also an option that provides a "friction free" contact between the wedges and the seats. This design is particularly recommended for safety applications when 100% opening reliability is required.



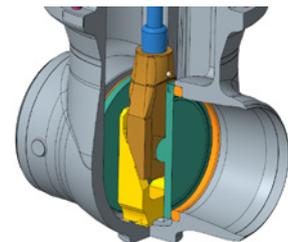
Parallel slide type option



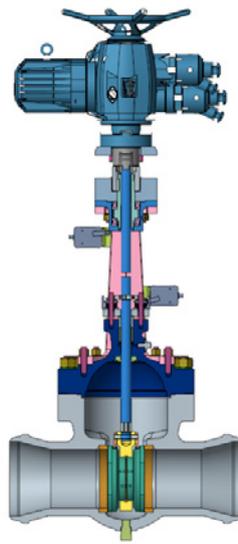
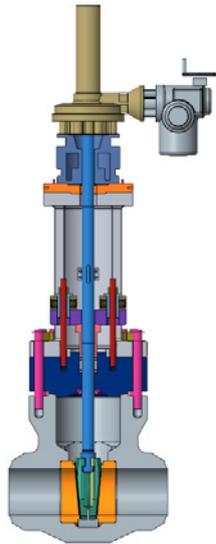
Flexible Wedge type option



Split-Wedge type option



LARGE SIZE GATE VALVES



TYPE	FLEXIBLE WEDGE FORGED GATE VALVE	PARALLEL SLIDE GATE VALVE	SPLIT WEDGE (DOUBLE DISC) GATE VALVE
DESIGN FEATURES	<ul style="list-style-type: none"> • One piece forged Body for superior safety and easier decontamination. • Flexible Wedge type. • Bolted Bonnet type for higher reliability and easier maintenance (Pressure Sealed type bonnet also available). • Low stem head in wedge cavity reduces height and weight of valve. Design pioneered by Velan. • Seating faces are hard-faced with Stellite 6 or Cobalt free alloy, ground and lapped to mirror finish. • Reinforced Body/Bonnet/Yoke super-structure for superior seismic resistance. • Hard faced back seat protects the stem packing in the fully open position. • Sizing to meet electric actuators switch off failure and prevent the valve integrity in case of failure of actuators torque switches. • Packing and gaskets in certified "PMUC" Nuclear grade materials with low Hallogen and Chloride contents for superior resistance to corrosion. • Manual, Electric or Pneumatic actuators. 	<ul style="list-style-type: none"> • Cast or forged Body. • Parallel Slide type. • Bolted Bonnet type for higher reliability and easier maintenance (Pressure Sealed type bonnet also available). • Seating faces are hard-faced with Stellite 6 or Cobalt free alloy, ground and lapped to mirror finish. • Reinforced Body/Bonnet/Yoke super-structure for superior seismic resistance. • Hard faced back seat protects the stem packing in the fully open position. • Sizing to meet electric actuators switch off failure and prevent the valve integrity in case of failure of actuators torque switches. • Packing and gaskets in certified "PMUC" Nuclear grade materials with low Hallogen and Chloride contents for superior resistance to corrosion. • A centralized Inconel spring distributes part of the load on both seats as well as compensating for seat wear. • Forged Cage Unit considerably reduces the weight and size of the Velan design compared to commonly used parallel slide valves with the "kangaroo pocket" in the bottom of the valves. • Manual, Electric or Pneumatic actuators. 	<ul style="list-style-type: none"> • Cast or Forged body. • Split Wedge (double disc) type. • Bolted Bonnet type for higher reliability and easier maintenance (Pressure Sealed type bonnet also available). • The double disc design minimize the risk of wearing. • Seating faces are hard-faced with Stellite 6 or Cobalt free alloy, ground and lapped to mirror finish. • Reinforced Body/Bonnet/Yoke super-structure for superior seismic resistance. • Hard faced back seat protects the stem packing in the fully open position. • Sizing to meet electric actuators switch off failure and prevent the valve integrity in case of failure of actuators torque switches. • Packing and gaskets in certified "PMUC" Nuclear grade materials with low Hallogen and Chloride contents for superior resistance to corrosion. • Manual, Electric or Pneumatic actuators.
SIZE	2" to 40" (DN50 - DN1000)	2" to 40" (DN50 - DN1000)	3" to 30" (DN80 - DN750)
PRESSURE RATING	Up to Class 2500	Up to Class 2500	Up to Class 1500
APPLICATIONS	<ul style="list-style-type: none"> • Shutoff function of Main Primary system and auxiliary safety systems. • Easy and quick maintenance. 	<ul style="list-style-type: none"> • Shutoff function of auxiliary safety systems especially for low effort pneumatic operated valves and High Temperature service. 	<ul style="list-style-type: none"> • Shutoff function of auxiliary safety systems when no wear and 100% opening reliability is required.
QUALIFICATIONS	<ul style="list-style-type: none"> • Cycling test under Normal working conditions (P&T). • Thermal transients test. • Seismic class 1A. • LOCA (Loss of Coolant Accident). • HELB (High Energy Line Break). • ACW (Activated contaminated Water). • QME-1 decontamination. 	<ul style="list-style-type: none"> • Cycling test under Normal working conditions (P&T). • Thermal transients test. • Seismic class 1A. • LOCA (Loss of Coolant Accident). 	<ul style="list-style-type: none"> • Cycling test under Normal working conditions (P&T). • Thermal transients test. • Seismic class 1A. • LOCA (Loss of Coolant Accident). • HELB (High Energy Line Break).

LARGE SIZE GLOBE VALVES

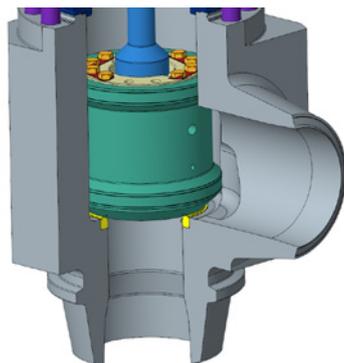
Velan globe valve's top and bottom-guided disc assures stem operation without side thrust caused by high pressure flow. The non-rotating stem results in lower friction of all moving parts and longer stem packing life.

All this resulting in smooth, easy operation and tight shutoff under extreme pressures.

Available in various body shapes (straight, angle or Y-pattern), Velan globe valves are extensively used for isolation or throttling functions in the reactor nuclear island. The angle type design has the advantage of offering a better flow coefficient, which reduces headloss in safety systems.

The RAMA® Modular Maintenance concept originally developed for small size valves has been extended to the whole Velan Large size Globe valve range in order to cope with the "low maintenance" concept of generation 3 nuclear reactors.

Lockable Angle Lift Globe Check Valves are also available. This concept combines shutoff and non-return valve functions in order to save space (and cost) in the reactor building of generation 3 reactors.

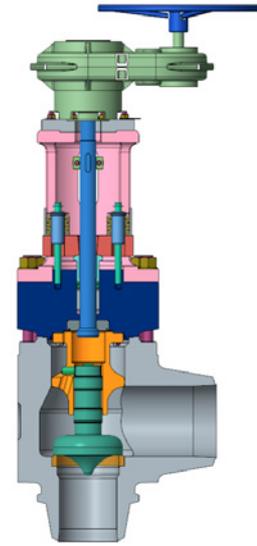
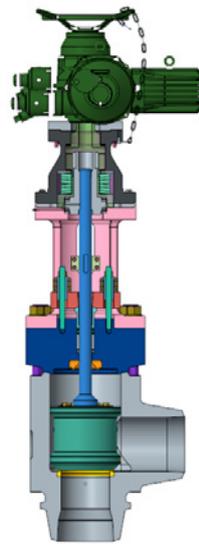
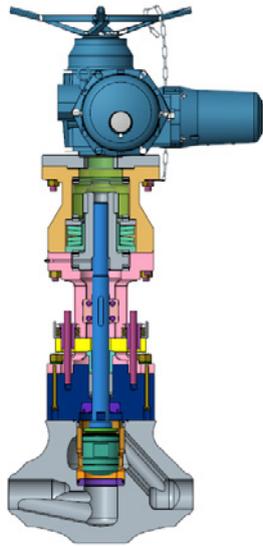


Welded seat and Modular maintenance type options



Modular maintenance type

LARGE SIZE GLOBE VALVES



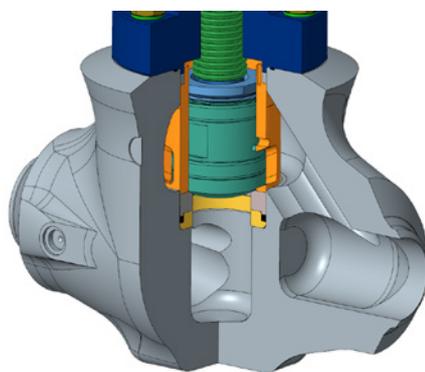
TYPE	RAMA® MODULAR MAINTENANCE GLOBE VALVE	ANGLE TYPE FORGED GLOBE VALVE	LOCKABLE ANGLE LIFT GLOBE CHECK VALVE
DESIGN FEATURES	<ul style="list-style-type: none"> • One piece forged Body for superior safety and easier decontamination. • Packing type sealing arrangement. • Bolted Bonnet type for higher reliability and easier maintenance. • Modular maintenance type with easy seat/trim removal (RAMA® Patented Design). • Sphere/cone contact between Plug/seat. • Integrated Spring Pak system for full absorption of the dynamic load during operation. • Seating faces are hard-faced with Stellite 6 or Cobalt free alloy, ground and lapped to mirror finish. • Reinforced Body/Bonnet/Yoke super-structure for superior seismic resistance. • Hard faced back seat protects the stem packing in the fully open position. • Sizing to meet electric actuators switch off failure and prevent the valve integrity in case of failure of actuators torque switches. • Packing and gaskets in certified "PMUC" Nuclear grade materials with low Hallogen and Chloride contents for superior resistance to corrosion. • Manual, Electric or Pneumatic actuators. 	<ul style="list-style-type: none"> • One piece forged Body for superior safety and easier decontamination. • Packing type sealing arrangement. • Bolted Bonnet type for higher reliability and easier maintenance. • Welded seat design. • Flat/Flat contact between Plug/seat. • Integrated Spring Pak system for full absorption of the dynamic load during operation. • Seating faces are hard-faced with Stellite 6 or Cobalt free alloy, ground and lapped to mirror finish. • Reinforced Body/Bonnet/Yoke super-structure for superior seismic resistance. • Hard faced back seat protects the stem packing in the fully open position. • Sizing to meet electric actuators switch off failure and prevent the valve integrity in case of failure of actuators torque switches. • Packing and gaskets in certified "PMUC" Nuclear grade materials with low Hallogen and Chloride contents for superior resistance to corrosion. • Manual, Electric or Pneumatic actuators. 	<ul style="list-style-type: none"> • Combines Check valve and Globe valve functions. • One piece forged Body for superior safety and easier decontamination. • Packing type sealing arrangement • Bolted Bonnet type for higher reliability and easier maintenance. • Welded seat design. • Flat/Flat contact between Plug/seat. • Integrated Spring Pak system for full absorption of the dynamic load during operation. • Seating faces are hard-faced with Stellite 6 or Cobalt free alloy, ground and lapped to mirror finish. • Reinforced Body/Bonnet/Yoke super-structure for superior seismic resistance. • Hard faced back seat protects the stem packing in the fully open position. • Sizing to meet electric actuators switch off failure and prevent the valve integrity in case of failure of actuators torque switches. • Packing and gaskets in certified "PMUC" Nuclear grade materials with low Hallogen and Chloride contents for superior resistance to corrosion. • Manual, Electric or Pneumatic actuators.
SIZE	2" to 24" (DN50 - DN600)	2" to 24" (DN50 - DN600)	3" to 24" (DN80 - DN600)
PRESSURE RATING	Up to Class 2500	Up to Class 2500	Up to class 2500
APPLICATIONS	<ul style="list-style-type: none"> • Shutoff function of Main Primary system and auxiliary safety systems. • Easy and quick maintenance. 	<ul style="list-style-type: none"> • Shutoff function of Main Primary system and auxiliary safety systems. 	<ul style="list-style-type: none"> • Shutoff function of Main Primary system and auxiliary safety systems. • Double function (Globe valve and Check valve) in order to save space inside reactor building.
QUALIFICATIONS	<ul style="list-style-type: none"> • Cycling test under Normal working conditions (P&T). • Thermal transients test. • Seismic class 1A. • LOCA (Loss of Coolant Accident). • HELB (High Energy Line Break). • ACW (Activated contaminated Water). 	<ul style="list-style-type: none"> • Cycling test under Normal working conditions (P&T). • Thermal transients test. • Seismic class 1A. • LOCA (Loss of Coolant Accident). • HELB (High Energy Line Break). • ACW (Activated contaminated Water). 	<ul style="list-style-type: none"> • Cycling test under Normal working conditions (P&T). • Thermal transients test. • Seismic class 1A. • LOCA (Loss of Coolant Accident). • HELB (High Energy Line Break). • ACW (Activated contaminated Water).

LARGE SIZE BELLOWS SEALED GLOBE VALVES

Velan Bellows sealed valves feature a formed multi-ply bellows welded to the stem and to the bottom of the bonnet, creating a hermetic seal or impermeable barrier for absolute tightness inside the nuclear containment. Bellows are available in stainless steel, Inconel, Hastelloy C or Monel and are designed and qualified for 5000 to 10 000 cycles according to the valve pressure class. In order to achieve absolute tightness, the bellows are coupled with a graphite qualified packing arrangement that can ensure the valve tightness in case of an unexpected bellows failure.

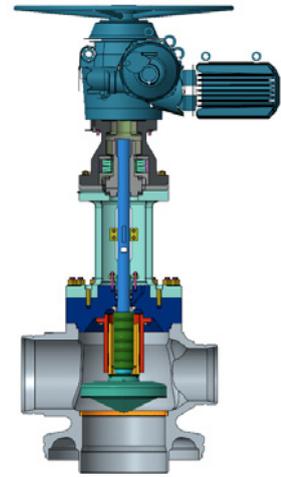
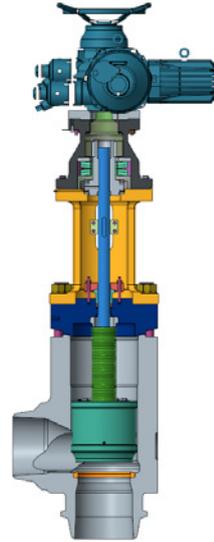
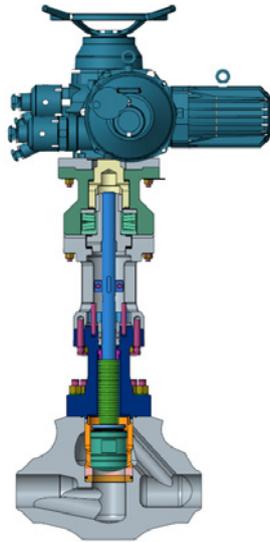
The non-rotating stem results in lower friction of all moving parts and longer stem packing life. All this resulting in smooth, easy operation and tight shutoff under extreme pressures. Available in various body shapes (straight, angle or 3-Ways), Velan bellows sealed globe valves are extensively used for isolation or throttling functions in the reactor nuclear island.

The RAMA® Modular Maintenance concept originally developed for small size valves has been extended to the whole Velan Large size Bellows Sealed Globe valve range in order to cope with the "easy maintenance" concept of generation 3 nuclear reactors.



Modular maintenance type option

LARGE SIZE BELLOWS SEALED GLOBE VALVES



TYPE	RAMA® MODULAR MAINTENANCE BELLOWS SEALED GLOBE VALVE	ANGLE TYPE FORGED BELLOWS SEALED GLOBE VALVE	3-WAY BELLOWS SEALED GLOBE VALVE
DESIGN FEATURES	<ul style="list-style-type: none"> • One piece forged Body for superior safety and easier decontamination. • Bellows sealed type sealing arrangement with secondary packing for absolute tightness. • Bolted Bonnet type for higher reliability and easier maintenance. • Modular maintenance type with easy seat/trim removal (RAMA® Patented Design). • Sphere/cone contact between Plug/seat • Integrated Spring Pak system for full absorption of the dynamic load during operation. • Seating faces are hard-faced with Stellite 6 or Cobalt free alloy, ground and lapped to mirror finish. • Reinforced Body/Bonnet/Yoke super-structure for superior seismic resistance. • Hard faced back seat protects the stem packing in the fully open position. • Sizing to meet electric actuators switch off failure and prevent the valve integrity in case of failure of actuators torque switches. • Packing and gaskets in certified "PMUC" Nuclear grade materials with low Hallogen and Chloride contents for superior resistance to corrosion. • Manual, Electric or Pneumatic actuators. 	<ul style="list-style-type: none"> • One piece forged Body for superior safety and easier decontamination. • Bellows sealed type sealing arrangement for absolute tightness. • Bolted Bonnet type for higher reliability and easier maintenance. • Welded seat design. • Flat/Flat contact between Plug/seat • Integrated Spring Pak system for full absorption of the dynamic load during operation. • Seating faces are hard-faced with Stellite 6 or Cobalt free alloy, ground and lapped to mirror finish. • Reinforced Body/Bonnet/Yoke super-structure for superior seismic resistance. • Hard faced back seat protects the stem packing in the fully open position. • Sizing to meet electric actuators switch off failure and prevent the valve integrity in case of failure of actuators torque switches. • Packing and gaskets in certified "PMUC" Nuclear grade materials with low Hallogen and Chloride contents for superior resistance to corrosion. • Manual, Electric or Pneumatic actuators. 	<ul style="list-style-type: none"> • One piece forged Body for superior safety and easier decontamination. • Bellows sealed type sealing arrangement for absolute tightness. • Bolted Bonnet type for higher reliability and easier maintenance. • Welded seat design. • Flat/Flat contact between Plug/seat • Integrated Spring Pak system for full absorption of the dynamic load during operation. • Seating faces are hard-faced with Stellite 6 or Cobalt free alloy, ground and lapped to mirror finish. • Reinforced Body/Bonnet/Yoke super-structure for superior seismic resistance. • Hard faced back seat protects the stem packing in the fully open position. • Sizing to meet electric actuators switch off failure and prevent the valve integrity in case of failure of actuators torque switches. • Packing and gaskets in certified "PMUC" Nuclear grade materials with low Hallogen and Chloride contents for superior resistance to corrosion. • Manual, Electric or Pneumatic actuators.
SIZE	2" to 24" (DN50 - DN600)	2" to 24" (DN50 - DN600)	3" to 24" (DN80 - DN600)
PRESSURE RATING	Up to Class 2500	Up to Class 2500	Up to class 1500
APPLICATIONS	<ul style="list-style-type: none"> • Shutoff function of Main Primary system and auxiliary safety systems. • Easy and quick maintenance. 	<ul style="list-style-type: none"> • Shutoff function of Main Primary system and auxiliary safety systems. 	<ul style="list-style-type: none"> • Diverting or mixing functions of Main Primary system and auxiliary safety systems.
QUALIFICATIONS	<ul style="list-style-type: none"> • Cycling test under Normal working conditions (P&T). • Thermal transients test. • Seismic class 1A. • LOCA (Loss of Coolant Accident). • HELB (High Energy Line Break). • ACW (Activated contaminated Water). 	<ul style="list-style-type: none"> • Cycling test under Normal working conditions (P&T). • Thermal transients test. • Seismic class 1A. • LOCA (Loss of Coolant Accident). • HELB (High Energy Line Break). • ACW (Activated contaminated Water). 	<ul style="list-style-type: none"> • Cycling test under Normal working conditions (P&T). • Thermal transients test. • Seismic class 1A. • LOCA (Loss of Coolant Accident). • ACW (Activated contaminated Water).

LARGE SIZE SWING CHECK VALVES

Check valves are installed to allow flow in one direction only and they protect systems that can be affected by reverse flow, such as a system shutdown. They are operated entirely by reaction to the direction of flow and therefore do not require any external actuation. Velan manufactures bolted bonnet swing check valves for use in a wide range of applications.

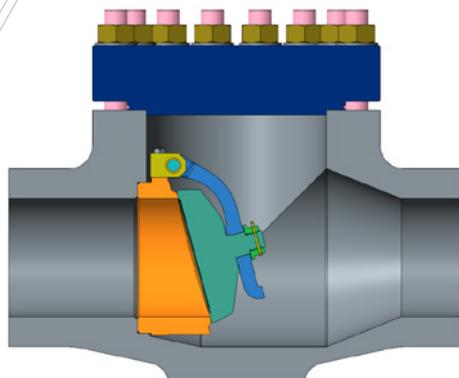
All moving parts are attached to the carrier and can be removed easily for service. Once the covers are removed, all parts are accessible for maintenance. Seating faces can be re-lapped.

The Velan Swing check valves are available in various pressure class (low pressure and high pressure) and are qualified for use as nuclear containment isolation valves.

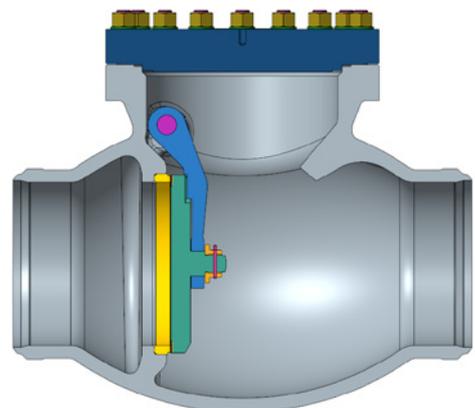
Lockable Swing Check Valves are also available. This concept combines shutoff and non-return valve functions in order to save space (and cost) in the reactor building of GEN-3 reactors and allow easy and safe in-line maintenance.



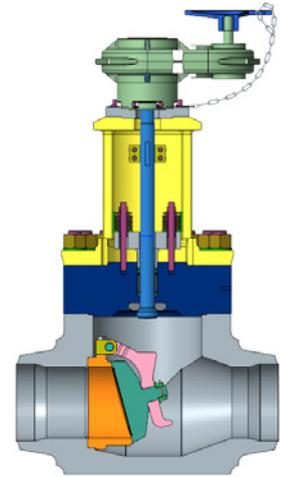
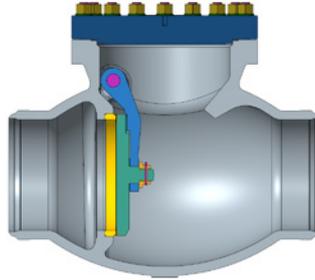
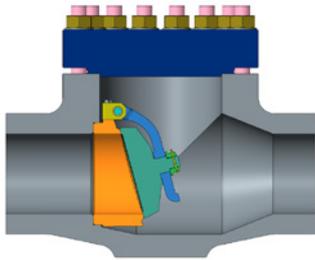
One Piece Forged Body



Cast Body



LARGE SIZE SWING CHECK VALVES



TYPE	HIGH PRESSURE FORGED SWING CHECK VALVE	LOW PRESSURE SWING CHECK VALVE	LOCKABLE SWING CHECK VALVE
DESIGN FEATURES	<ul style="list-style-type: none"> • One piece forged Body for superior safety and easier decontamination. • Forged seats close fitted and seal-welded to the body. • Lip Seal Welding (bolted bonnet) eliminates leakage to atmosphere. • Bolted Bonnet type for higher reliability and easier maintenance with Fully-encased wound gasket. • Seating faces are hard-faced with Stellite 6 or Cobalt free alloy, ground and lapped to mirror finish. • Gaskets in certified "PMUC" Nuclear grade materials with low Hallogen and Chloride contents for superior resistance to corrosion. 	<ul style="list-style-type: none"> • Cast or Forged Body for superior safety and easier decontamination. • Forged seats close fitted and seal-welded to the body. • Lip Seal Welding (bolted bonnet) eliminates leakage to atmosphere. • Bolted Bonnet type for higher reliability and easier maintenance with Fully-encased wound gasket. • Seating faces are hard-faced with Stellite 6 or Cobalt free alloy, ground and lapped to mirror finish. • Gaskets in certified "PMUC" Nuclear grade materials with low Hallogen and Chloride contents for superior resistance to corrosion. 	<ul style="list-style-type: none"> • One piece forged Body for superior safety and easier decontamination. • Forged seats close fitted and seal-welded to the body. • Lip Seal Welding (bolted bonnet) eliminates leakage to atmosphere. • Bolted Bonnet type for higher reliability and easier maintenance with Fully-encased wound gasket. • Seating faces are hard-faced with Stellite 6 or Cobalt free alloy, ground and lapped to mirror finish. • Gaskets in certified "PMUC" Nuclear grade materials with low Hallogen and Chloride contents for superior resistance to corrosion. • Manual, Electric or Pneumatic actuators.
SIZE	2" to 40" (DN50 - DN1000)	2" to 40" (DN50 - DN1000)	3" to 24" (DN50 - DN600)
PRESSURE RATING	Up to Class 2500	Up to Class 600	Up to Class 1500
APPLICATIONS	<ul style="list-style-type: none"> • Non return function for Main Primary system and auxiliary safety systems. • Containment Isolation. 	<ul style="list-style-type: none"> • Non return function for Main Primary system and auxiliary safety systems. • Containment Isolation. 	<ul style="list-style-type: none"> • Combined Shutoff and Non return function for Main Primary system and auxiliary safety systems. • Containment Isolation.
QUALIFICATIONS	<ul style="list-style-type: none"> • Cycling test under Normal working conditions (P&T). • Thermal transients test. • Seismic class 1A. • LOCA (Loss of Coolant Accident). • HELB (High Energy Line Break). • ACW (Activated contaminated Water). 	<ul style="list-style-type: none"> • Cycling test under Normal working conditions (P&T). • Thermal transients test. • Seismic class 1A. • LOCA (Loss of Coolant Accident). • ACW (Activated contaminated Water). 	<ul style="list-style-type: none"> • Cycling test under Normal working conditions (P&T). • Thermal transients test. • Seismic class 1A. • LOCA (Loss of Coolant Accident).

SMALL SIZE FORGED VALVES

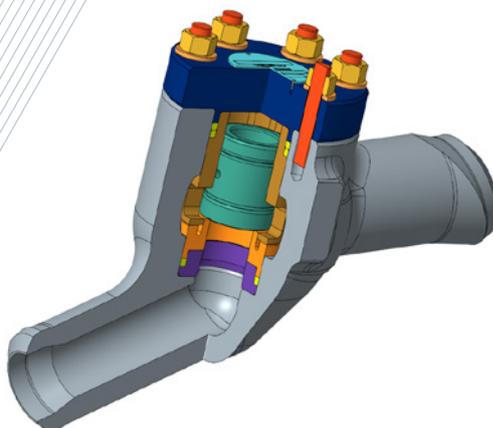
Velan manufactures one of the largest range of small size forged valves for nuclear reactors of sizes from 1/4" to 2". The range includes globe valves, bellows sealed globe valves and check valves available with various body shapes (straight, Y-pattern or 'Z' type) and various designs (Bolted bonnet, lip-seal welded bonnet or modular maintenance) according to their service and the application.

Velan small forged valves are extensively used for isolation or throttling functions in the reactor nuclear island as well as for specific safety functions and containment isolation.

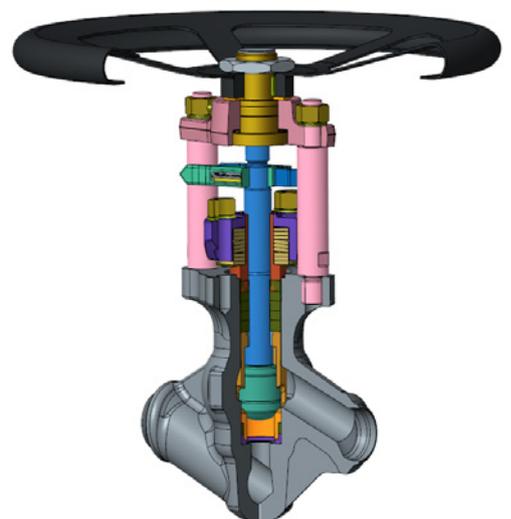
In order to ensure quick maintenance of the large number of small valves installed inside the containment of GEN-3 nuclear reactors (and therefore save time and working personal exposure to radiation), Velan implemented and qualified with great success the RAMA® modular maintenance concept on most of the products of the range.



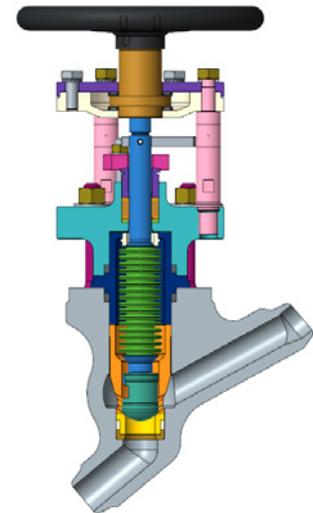
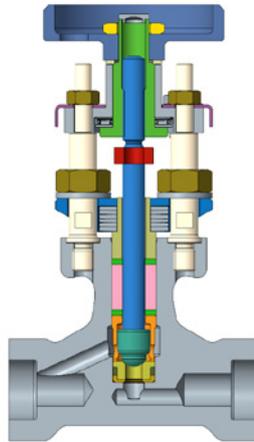
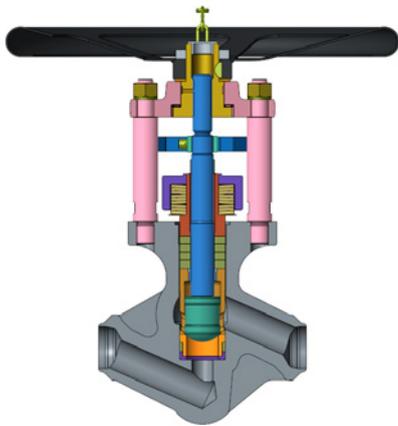
CLAMA modular maintenance lift check valve



RAMA modular maintenance globe valve

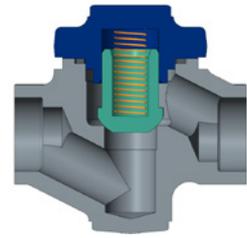
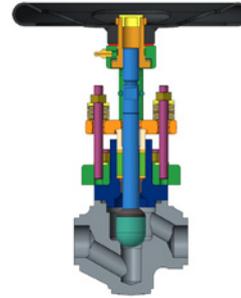
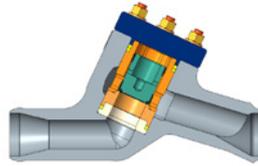
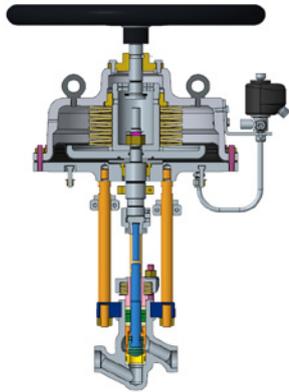


SMALL SIZE FORGED VALVES



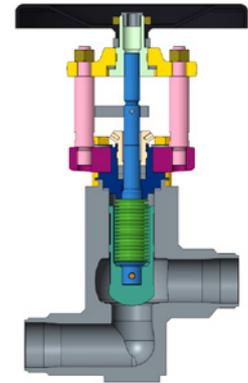
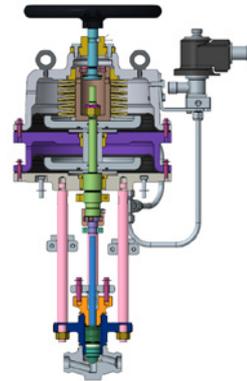
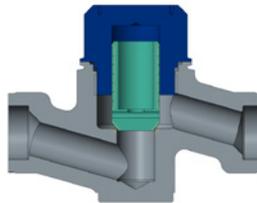
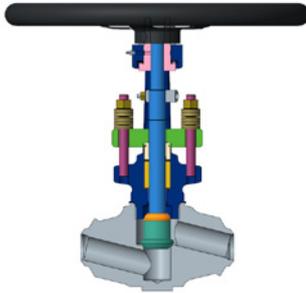
TYPE	RAMA3® MODULAR MAINTENANCE GLOBE VALVE	RAMA4® MODULAR MAINTENANCE INSTRUMENTATION VALVE	RAMA3® MODULAR MAINTENANCE BELLOWS SEALED GLOBE VALVE
DESIGN FEATURES	<ul style="list-style-type: none"> • One piece forged Body for superior safety and easier decontamination. • Packing type sealing arrangement. • Modular maintenance type with easy seat/trim/packing removal (RAMA® Patented Design). • Sphere/cone contact between Plug/seat. • Integrated Spring Pak system for full absorption of the dynamic load during operation. • Seating faces are hard-faced with Stellite 6 or Cobalt free alloy, ground and lapped to mirror finish. • Reinforced super-structure for superior seismic resistance for motorized valves. • Sizing to meet electric actuators switch off failure and prevent the valve integrity in case of failure of actuators torque switches. • Packing and gaskets in certified "PMUC" Nuclear grade materials with low Hallogen and Chloride contents for superior resistance to corrosion. • Linear or equal percentage Flow Characteristics available for Throttling services. • Welded ends (SW or BW). • Manual, Electric or Pneumatic actuators. 	<ul style="list-style-type: none"> • One piece forged Body for superior safety and easier decontamination. • Packing type sealing arrangement. • Modular maintenance type with easy seat/trim removal (RAMA® Patented Design). • Sphere/cone contact between Plug/seat. • Integrated Spring Pak system for full absorption of the dynamic load during operation. • Packing and gaskets in certified "PMUC" Nuclear grade materials with low Hallogen and Chloride contents for superior resistance to corrosion. • For Instrumentation purpose. • Welded ends (SW or BW). • Manual operation. 	<ul style="list-style-type: none"> • One piece forged Body for superior safety and easier decontamination. • Bellows Sealed with secondary Packing type sealing arrangement. • Y pattern or Straight type Body. • Modular maintenance type with easy seat/trim/packing removal (RAMA® Patented Design). • Sphere/cone contact between Plug/seat. • Integrated Spring Pak system for full absorption of the dynamic load during operation. • Seating faces are hard-faced with Stellite 6 or Cobalt free alloy, ground and lapped to mirror finish. • Reinforced super-structure for superior seismic resistance for motorized valves. • Sizing to meet electric actuators switch off failure and prevent the valve integrity in case of failure of actuators torque switches. • Packing and gaskets in certified "PMUC" Nuclear grade materials with low Hallogen and Chloride contents for superior resistance to corrosion. • Linear or equal percentage Flow Characteristics available for Throttling services. • Welded ends (SW or BW). • Manual, Electric or Pneumatic actuators.
SIZE	3/8" to 2" (DN10 - DN50)	1/4" to 1/2" (DN6 - DN15)	3/8" to 2" (DN10 - DN50)
PRESSURE RATING	Up to Class 2500	Up to Class 2500	Up to class 1500
APPLICATIONS	<ul style="list-style-type: none"> • Isolation or Throttling services in auxiliary safety systems when quick maintenance is required. 	<ul style="list-style-type: none"> • Instrumentation function of auxiliary safety systems when quick maintenance is required. 	<ul style="list-style-type: none"> • Isolation or Throttling services in auxiliary safety systems when quick maintenance and absolute sealing are required.
QUALIFICATIONS	<ul style="list-style-type: none"> • Cycling test under Normal working conditions (P&T). • Thermal transients test. • Seismic class 1A. • LOCA (Loss of Coolant Accident). • ACW (Activated contaminated Water). 	<ul style="list-style-type: none"> • Cycling test under Normal working conditions (P&T). • Thermal transients test. • Seismic class 1A. • LOCA (Loss of Coolant Accident). • ACW (Activated contaminated Water). 	<ul style="list-style-type: none"> • Cycling test under Normal working conditions (P&T). • Thermal transients test. • Seismic class 1A. • LOCA (Loss of Coolant Accident). • ACW (Activated contaminated Water).

SMALL SIZE FORGED VALVES



TYPE	RAMA3® MODULAR MAINTENANCE PNEUMATIC LOCA QUALIFIED GLOBE VALVE	CLAMA® MODULAR MAINTENANCE CONTAINMENT ISOLATION CHECK VALVE	PN100 BOLTED BONNET GLOBE VALVE	PN100 BOLTED BONNET PISTON TYPE CHECK VALVE
DESIGN FEATURES	<ul style="list-style-type: none"> • One piece forged Body for superior safety and easier decontamination. • Packing type sealing arrangement. • Modular maintenance type with easy seat/trim/packing removal (RAMA® Patented Design). • Sphere/cone contact between Plug/seat • Integrated Spring Pak system for full absorption of the dynamic load during operation. • Seating faces are hard-faced with Stellite 6 or Cobalt free alloy, ground and lapped to mirror finish. • Reinforced super-structure for superior seismic resistance for motorized valves. • Packing and gaskets in certified "PMUC" Nuclear grade materials with low Hallogen and Chloride contents for superior resistance to corrosion. • Linear or equal percentage Flow Characteristics available for Throttling services. • Welded ends (SW or BW). • VELAN Pneumatic Saprng return "fail safe" actuator LOCA qualified. 	<ul style="list-style-type: none"> • One piece forged Body for superior safety and easier decontamination. • Piston type. • Y pattern body for better flow coefficient. • Modular maintenance type with easy seat/trim/packing removal (CLAMA® Patented Design). • Flat contact between Plug/seat. • Seating faces are hard-faced with Stellite 6 or Cobalt free alloy, ground and lapped to mirror finish. • Gaskets in certified "PMUC" Nuclear grade materials with low Hallogen and Chloride contents for superior resistance to corrosion. • Welded ends (SW or BW). 	<ul style="list-style-type: none"> • One piece forged Body for superior safety and easier decontamination. • Packing type sealing arrangement • Bolted bonnet. • Sphere/cone contact between Plug/seat. • Seating faces are hard-faced with Stellite 6. • Sizing to meet electric actuators switch off failure and prevent the valve integrity in case of failure of actuators torque switches. • Packing and gaskets in certified "PMUC" Nuclear grade materials with low Hallogen and Chloride contents for superior resistance to corrosion. • Linear or equal percentage Flow Characteristics available for Throttling services. • Welded ends (SW or BW). • Manual, Electric or Pneumatic actuators. 	<ul style="list-style-type: none"> • One piece forged Body for superior safety and easier decontamination. • Bolted bonnet. • Piston type (Spring assisted). • Seating faces are hard-faced with Stellite 6. • Welded ends (SW or BW.)
SIZE	3/8" to 2" (DN10 - DN50)	1/2" to 2" (DN15 - DN50)	3/8" to 2" (DN10 - DN50)	1/2" to 2" (DN15 - DN50)
PRESSURE RATING	Up to Class 1500	Up to Class 2500	Class 600	Class 600
APPLICATIONS	<ul style="list-style-type: none"> • Safety 'Fail Safe' Isolation of auxiliary safety systems when quick maintenance is required. 	<ul style="list-style-type: none"> • Non-return and Containment isolation function in auxiliary safety systems when quick maintenance is required. 	<ul style="list-style-type: none"> • Isolation or Throttling services in auxiliary safety systems. 	<ul style="list-style-type: none"> • Non-return and Containment isolation function in auxiliary safety systems.
QUALIFICATIONS	<ul style="list-style-type: none"> • Cycling test under Normal working conditions (P&T). • Thermal transients test. • Seismic class 1A. • LOCA (Loss of Coolant Accident). • ACW (Activated contaminated Water). 	<ul style="list-style-type: none"> • Cycling test under Normal working conditions (P&T). • Thermal transients test. • Seismic class 1A. • LOCA (Loss of Coolant Accident). • ACW (Activated contaminated Water). 	<ul style="list-style-type: none"> • Cycling test under Normal working conditions (P&T). • Thermal transients test. • Seismic class 1A. • LOCA (Loss of Coolant Accident). 	<ul style="list-style-type: none"> • Cycling test under Normal working conditions (P&T). • Thermal transients test. • Seismic class 1A. • LOCA (Loss of Coolant Accident).

SMALL SIZE FORGED VALVES



TYPE	PN250 LIP-SEAL WELDED BONNET GLOBE VALVE	PN250 LIP-SEAL WELDED BONNET CHECK VALVE	PN250 LIP-SEAL WELDED BONNET PNEUMATIC GLOBE VALVE LOCA QUALIFIED	'Z' TYPE BODY BELLOWS SEALED GLOBE VALVE
DESIGN FEATURES	<ul style="list-style-type: none"> • One piece forged Body for superior safety and easier decontamination. • Packing type sealing arrangement. • Lip Seal Welded Bonnet for absolute tightness inside containment. • Sphere/cone contact between Plug/seat. • Seating faces are hard-faced with Stellite 6. • Reinforced super-structure for superior seismic resistance for motorized valves. • Packing and gaskets in certified "PMUC" Nuclear grade materials with low Hallogen and Chloride contents for superior resistance to corrosion. • Linear or equal percentage Flow Characteristics available for Throttling service. • Welded ends (SW or BW). • Manual, Electric or Pneumatic actuators. 	<ul style="list-style-type: none"> • One piece forged Body for superior safety and easier decontamination. • Lip Seal Welded Bonnet for absolute tightness inside containment. • Piston type. • Seating faces are hard-faced with Stellite 6. • Welded ends (SW or BW). 	<ul style="list-style-type: none"> • One piece forged Body for superior safety and easier decontamination. • Packing type sealing or Bellows sealed with secondary packing arrangement. • Lip Seal Welded Bonnet for absolute tightness inside containment. • Sphere/cone contact between Plug/seat. • Seating faces are hard-faced with Stellite 6. • Reinforced super-structure for superior seismic resistance for motorized valves. • Packing and gaskets in certified "PMUC" Nuclear grade materials with low Hallogen and Chloride contents for superior resistance to corrosion. • Linear or equal percentage Flow Characteristics available for Throttling services. • Welded ends (SW or BW). • VELAN Pneumatic Spring return "fail safe" actuator LOCA qualified. 	<ul style="list-style-type: none"> • One piece forged Body for superior safety and easier decontamination. • Bellows sealed with secondary packing arrangement. • Bolted bonnet. • Sphere/cone contact between Plug/seat. • Seating faces are hard-faced with Stellite 6 or Cobalt free alloy. • Reinforced super-structure for superior seismic resistance for motorized valves. • Packing and gaskets in certified "PMUC" Nuclear grade materials with low Hallogen and Chloride contents for superior resistance to corrosion. • Linear or equal percentage Flow Characteristics available for Throttling services. • Welded ends (SW or BW). • Manual, Electric or Pneumatic actuators.
SIZE	3/8" to 2" (DN10 - DN50)	1/2" to 2" (DN15 - DN50)	3/8" to 2" (DN10 - DN50)	3/8" to 3" (DN10 - DN80)
PRESSURE RATING	Class 1500	Class 1500	Class 1500	Class 1500
APPLICATIONS	<ul style="list-style-type: none"> • Isolation or Throttling services in auxiliary safety systems. 	<ul style="list-style-type: none"> • Non-return and Containment isolation function in auxiliary safety systems. 	<ul style="list-style-type: none"> • Safety "Fail Safe" Isolation of auxiliary safety systems when absolute sealing is required. 	<ul style="list-style-type: none"> • Safety Isolation or throttling function in auxiliary safety systems of VVER reactors when absolute sealing is required.
QUALIFICATIONS	<ul style="list-style-type: none"> • Cycling test under Normal working conditions (P&T). • Thermal transients test. • Seismic class 1A. • LOCA (Loss of Coolant Accident). 	<ul style="list-style-type: none"> • Cycling test under Normal working conditions (P&T). • Thermal transients test. • Seismic class 1A. • LOCA (Loss of Coolant Accident). 	<ul style="list-style-type: none"> • Cycling test under Normal working conditions (P&T). • Thermal transients test. • Seismic class 1A. • LOCA (Loss of Coolant Accident). 	<ul style="list-style-type: none"> • Cycling test under Normal working conditions (P&T). • Thermal transients test. • Seismic class 1A. • LOCA (Loss of Coolant Accident).

SEVERE APPLICATIONS CONTROL VALVES

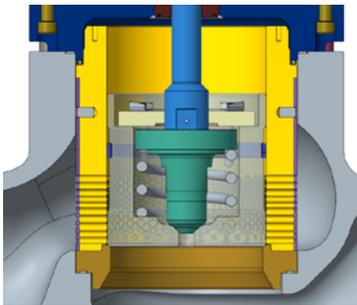
In order to control the flow or the pressure in safety auxiliary systems of nuclear reactors, control valves are considered as an essential safety component of the process. The control valves used must handle high differential pressures that can generate cavitation phenomena and/or raise the noise level causing their deterioration.

Velan has developed a specific range of control valves for GEN-3 reactors using specific multi-stage systems, needle plug and/or pilot operated plug arrangements in order to accurately control flow or pressure and substantially reduce the cavitation and noise during operation. All these systems are designed using computational Fluid Dynamics analysis and are validated and qualified on Velan ZEPHIR cavitation test loop especially designed for cavitation measurement.

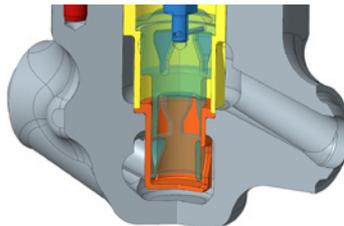
Available in sizes from 1/2" (DN15) to 24" (DN600) and in various body shapes (straight, angle or 3-way), with packing sealing or bellows sealed sealing, Velan control valves are extensively used for control functions in the reactor nuclear island of VVER and EPR reactors. The RAMA® Modular Maintenance concept originally developed for small size valves is also applied (when possible) to Velan control valve range in order to cope with the "easy maintenance" concept of GEN-3 nuclear reactors.



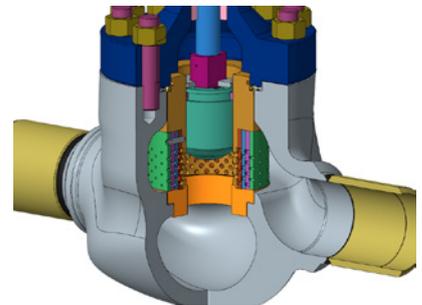
**EDEL® pilot operated
plug system**



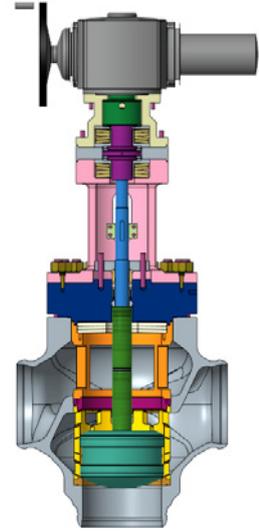
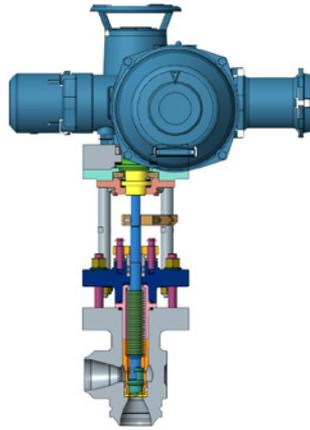
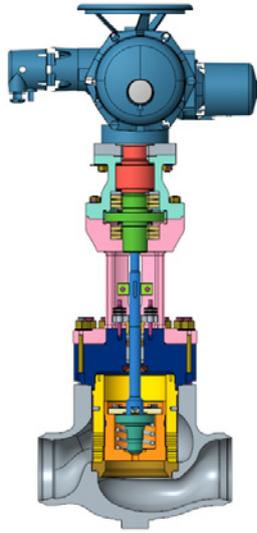
**Specific cage system for Fluid
with activated particles**



**Single-stage or multi-stages
cage systems**



SEVERE APPLICATIONS CONTROL VALVES



TYPE	STRAIGHT TYPE BODY CONTROL VALVE	ANGLE TYPE BODY CONTROL VALVE	3-WAY TYPE BODY CONTROL VALVE
DESIGN FEATURES	<ul style="list-style-type: none"> • Packing type sealing or Bellows sealed with secondary packing arrangement. • Bolted Bonnet type for higher reliability and easier maintenance. • Welded seat or Modular maintenance type with easy seat/trim removal (RAMA® Patented Design). • Standard or Multi-cage type. • Standard plug / needle plug or Pilot Operated plug (EDEL® Patented system). • Integrated Spring Pak system for full absorption of the dynamic load during operation. • Seating faces are hard-faced with Stellite 6 or Cobalt free alloy, ground and lapped to mirror finish. • Reinforced Body/Bonnet/Yoke super-structure for superior seismic resistance. • Hard faced back seat protects the stem packing in the fully open position. • Sizing to meet electric actuators switch off failure and prevent the valve integrity in case of failure of actuators torque switches. • Packing and gaskets in certified "PMUC" Nuclear grade materials with low Halogen and Chloride contents for superior resistance to corrosion. • Linear, Equal-percent or specific flow characteristics. • Rangeability from 50 to 300 or specifically adjusted to the application. • Manual or Electric actuators. 	<ul style="list-style-type: none"> • Packing type sealing or Bellows sealed with secondary packing arrangement. • Bolted Bonnet type for higher reliability and easier maintenance. • Welded seat or Modular maintenance type with easy seat/trim removal (RAMA® Patented Design). • Standard or Multi-cage type. • Standard plug / needle plug or Pilot Operated plug (EDEL® Patented system). • Integrated Spring Pak system for full absorption of the dynamic load during operation. • Seating faces are hard-faced with Stellite 6 or Cobalt free alloy, ground and lapped to mirror finish. • Reinforced Body/Bonnet/Yoke super-structure for superior seismic resistance. • Hard faced back seat protects the stem packing in the fully open position. • Sizing to meet electric actuators switch off failure and prevent the valve integrity in case of failure of actuators torque switches. • Packing and gaskets in certified "PMUC" Nuclear grade materials with low Halogen and Chloride contents for superior resistance to corrosion. • Linear, Equal-percent or specific flow characteristics. • Rangeability from 50 to 500 or specifically adjusted to the application. • Manual or Electric actuators. 	<ul style="list-style-type: none"> • Packing type sealing or Bellows sealed with secondary packing arrangement. • Bolted Bonnet type for higher reliability and easier maintenance. • Welded seat or Modular maintenance type with easy seat/trim removal (RAMA® Patented Design). • Standard or Multi-cage type. • Standard plug / needle plug or Pilot Operated plug (EDEL® Patented system). • Integrated Spring Pak system for full absorption of the dynamic load during operation. • Seating faces are hard-faced with Stellite 6 or Cobalt free alloy, ground and lapped to mirror finish. • Reinforced Body/Bonnet/Yoke super-structure for superior seismic resistance. • Hard faced back seat protects the stem packing in the fully open position. • Sizing to meet electric actuators switch off failure and prevent the valve integrity in case of failure of actuators torque switches. • Packing and gaskets in certified "PMUC" Nuclear grade materials with low Halogen and Chloride contents for superior resistance to corrosion. • Linear, Equal-percent or specific flow characteristics. • Rangeability from 50 to 500 or specifically adjusted to the application. • Manual or Electric actuators.
SIZE	1/2" (DN15) to 24" (DN15 - DN600)	1/2" (DN15) to 24" (DN15 - DN600)	1/2" (DN15) to 24" (DN15 - DN600)
PRESSURE RATING	Up to Class 2500	Up to Class 2500	Up to Class 2500
APPLICATIONS	• Control function of Main Primary system and auxiliary safety systems of EPR and VVER reactors.	• Control function of Main Primary system and auxiliary safety systems of EPR and VVER reactors.	• Diverting or mixing control functions of Main Primary system and auxiliary safety systems of EPR and VVER reactors.
QUALIFICATIONS	<ul style="list-style-type: none"> • Cycling test under Normal working conditions (P&T). • Thermal transients test. • Seismic class 1A. • LOCA (Loss of Coolant Accident). • ACW (Activated contaminated Water). 	<ul style="list-style-type: none"> • Cycling test under Normal working conditions (P&T). • Thermal transients test. • Seismic class 1A. • LOCA (Loss of Coolant Accident). • ACW (Activated contaminated Water). 	<ul style="list-style-type: none"> • Cycling test under Normal working conditions (P&T). • Thermal transients test. • Seismic class 1A. • LOCA (Loss of Coolant Accident). • ACW (Activated contaminated Water).

SPECIFIC PRODUCTS / APPLICATIONS FOR NUCLEAR REACTORS

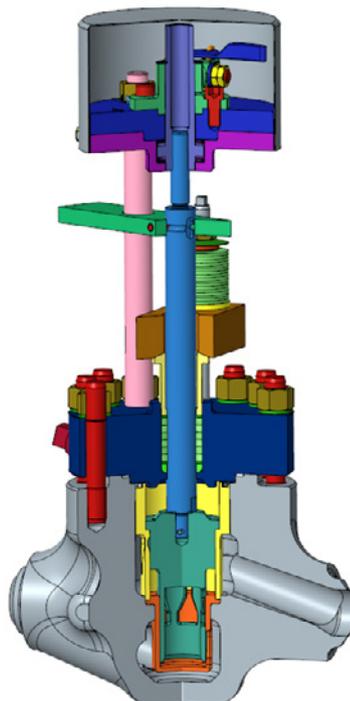
Taking advantage of 60 years of continuous experience in the nuclear industry, VELAN has developed and qualified products dedicated to specific safety systems or safety functions of nuclear reactors.

For Water or Heavy Water cooled reactors, these applications are mainly dedicated to safety isolation purposes such as MFIV (Main Feed Isolation Valve) or MSIV (Main Steam Isolation Valve), the protection the Main feed water lines against Water Hammers such as MFDCV (Main Feed Water Damped Check Valve), the mitigation of the reactor in post accidental conditions such as SAV (Pressurizer Severe Accident Valve) or DARIS (Flow adjustment of the safety Injection system) control valve, the improvement of containment isolation such as double housing gate valves or AECTE check valves, or the development of smart accessories such as EQUIBAR® automatic by-pass systems or...

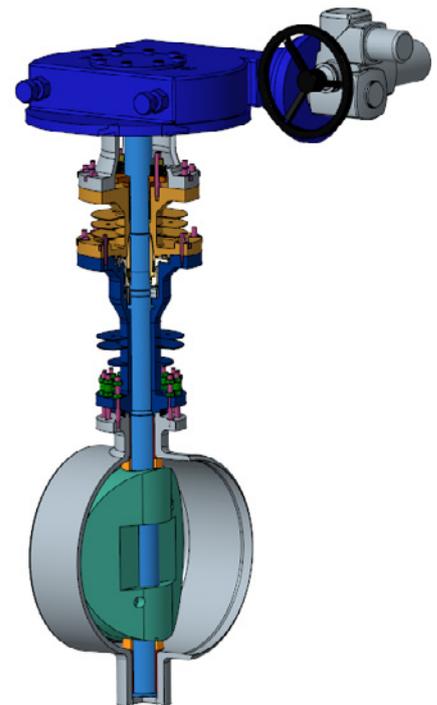
For sodium cooled FBR reactors, these applications are dedicated to safe shutoff and control of main liquid sodium lines as well as the Main Isolation of the secondary liquid sodium loop of GEN IV Fast breeder sodium cooled reactors.

For Nuclear Fusion reactors and "TOKAMAK" reactors, these applications are mainly dedicated to the shutoff or the control of the liquid Helium lines at super-cryogenic temperature, as well as valves subject to high level of irradiation and high magnetic fields.

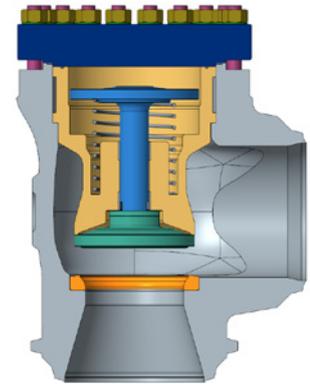
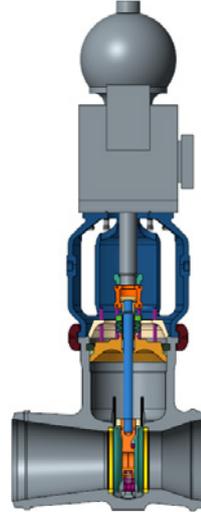
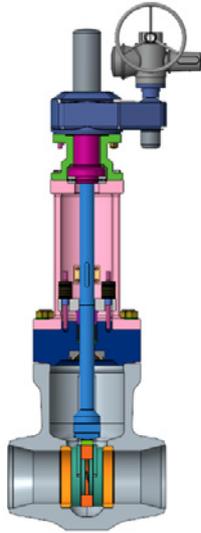
DARIS control valve for safety injection system



Liquid sodium main isolation valve for FBR reactor

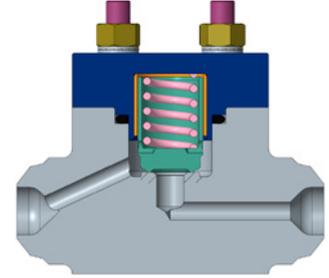
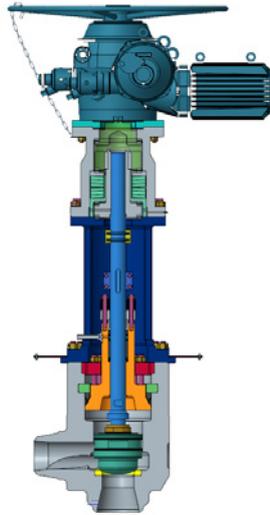
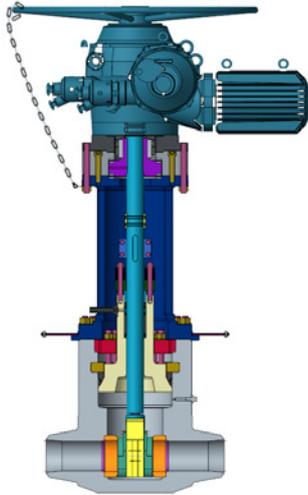


SPECIFIC PRODUCTS

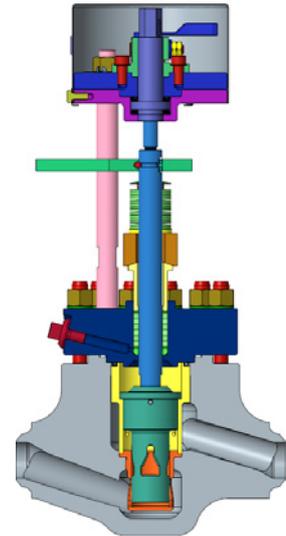
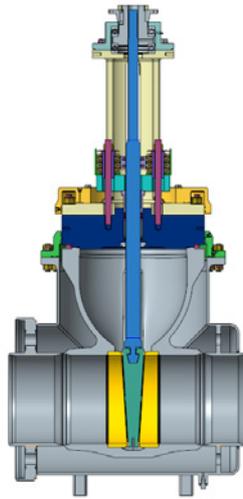
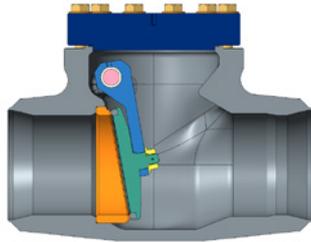


TYPE	MFIV - MAIN FEED ISOLATION GATE VALVES	MSIV - MAIN STEAM ISOLATION GATE VALVES	MFDCV - MAIN FEED DAMPED CHECK VALVE
DESIGN FEATURES	<ul style="list-style-type: none"> Gate valve with Cast or forged Body Parallel Slide disc (MFIV) or flexible wedge type (MFLIV). Bolted Bonnet type for higher reliability and easier maintenance. Low stem head in wedge cavity reduces height and weight of valve. Design pioneered by Velan. Seating faces are hard-faced with Stellite 6. Reinforced Body/Bonnet/Yoke super-structure for superior seismic resistance. Hard faced back seat protects the stem packing in the fully open position. Sizing to meet electric actuators switch off failure and prevent the valve integrity in case of failure of actuators torque switches. Packing and gaskets in certified "PMUC" Nuclear grade materials with low Hallogen and Chloride contents for superior resistance to corrosion. Electrical actuators. 	<ul style="list-style-type: none"> Gate valve with Cast body. Pressure Sealed type. The double disc design minimize the risk of wearing. Seating faces are hard-faced with Stellite 6. Reinforced Body/Bonnet/Yoke super-structure for superior seismic resistance. Hard faced back seat protects the stem packing in the fully open position. Sizing to meet electric actuators switch off failure and prevent the valve integrity in case of failure of actuators torque switches. Packing and gaskets in certified "PMUC" Nuclear grade materials with low Hallogen and Chloride contents for superior resistance to corrosion. Oleo-pneumatic actuator providing full closure in less than 3 to 5 s. 	<ul style="list-style-type: none"> Angle type or Y pattern body lift check valve valve with Cast or forged Body. Controlled closure using the hydraulic damper. Bolted Bonnet type for higher reliability and easier maintenance. Seating faces are hard-faced with Stellite 6. Reinforced Body/Bonnet/Yoke super-structure for superior seismic resistance. Hard faced back seat protects the stem packing in the fully open position. Packing and gaskets in certified "PMUC" Nuclear grade materials with low Hallogen and Chloride contents for superior resistance to corrosion. Closing time: 0.5 s (or as per customer request).
SIZE	10" (DN250), 18" (DN450) and 20" (DN500)	18" (DN450), 30" (DN750)	16" (DN400), 18" (DN450) and 20" (DN500)
PRESSURE RATING	Class 900	Class 900	Class 900
APPLICATIONS	<ul style="list-style-type: none"> Safety Shutt down of the Main feed water ARE system of EPR and HUALONG reactors. 	<ul style="list-style-type: none"> Safety Shutt down of the Main Steam system of PWR reactors. 	<ul style="list-style-type: none"> Protection of the Main feed water ARE system of EPR and HUALONG reactors against Water Hammers resulting from HELB.
QUALIFICATIONS	<ul style="list-style-type: none"> Cycling test under Normal working conditions (P&T). Thermal transients test. Seismic class 1A. HELB (High Energy Line Break). 	<ul style="list-style-type: none"> Cycling test under Normal working conditions (P&T). Thermal transients test. Seismic class 1A. HELB (High Energy Line Break). 	<ul style="list-style-type: none"> Cycling test under Normal working conditions (P&T). Thermal transients test. Seismic class 1A. HELB (High Energy Line Break).

SPECIFIC PRODUCTS

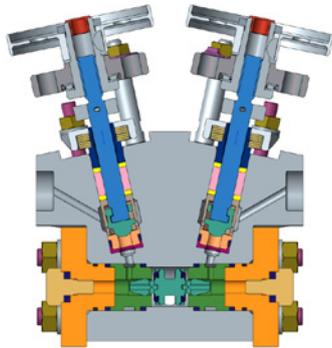


TYPE	SAV - PRESSURIZER SEVERE ACCIDENT GATE VALVE	SAV - PRESSURIZER SEVERE ACCIDENT GLOBEVALVE	AECTE - SA CONTAINMENT ISOLATION CHECK VALVE
DESIGN FEATURES	<ul style="list-style-type: none"> • Gate valve with forged Body. • Parallel Slide disc. • Pressure Sealed bonnet. • Seating faces are hard-faced with Stellite 6. • Reinforced Body/Bonnet/Yoke super-structure for superior seismic resistance. • Hard faced back seat protects the stem packing in the fully open position. • Sizing to meet electric actuators switch off failure and prevent the valve integrity in case of failure of actuators torque switches. • Packing and gaskets in certified "PMUC" Nuclear grade materials with low Hallogen and Chloride contents for superior resistance to corrosion. • Electrical actuators. 	<ul style="list-style-type: none"> • Angle type globe valve with forged Body. • Pressure Sealed bonnet. • Seating faces are hard-faced with Stellite 6. • Reinforced Body/Bonnet/Yoke super-structure for superior seismic resistance. • Hard faced back seat protects the stem packing in the fully open position. • Sizing to meet electric actuators switch off failure and prevent the valve integrity in case of failure of actuators torque switches. • Packing and gaskets in certified "PMUC" Nuclear grade materials with low Hallogen and Chloride contents for superior resistance to corrosion. • Electrical actuators 	<ul style="list-style-type: none"> • One piece forged Body for superior safety and easier decontamination. • Lift check valve, spring loaded with specific opening set pressure. • Soft seat for superior tightness. • Gaskets in certified "PMUC" Nuclear grade materials with low Hallogen and Chloride contents for superior resistance to corrosion. • Welded ends (SW or BW).
SIZE	6" (DN150)	6" (DN150)	1/2" to 2" (DN15 - DN50)
PRESSURE RATING	Class 2100	Class 2100	Class 300
APPLICATIONS	<ul style="list-style-type: none"> • Release of the Main Primary system coolant (RCP system) of EPR reactors in post accidental conditions. 	<ul style="list-style-type: none"> • Release of the Main Primary system coolant (RCP system) of EPR reactors in post accidental conditions. 	<ul style="list-style-type: none"> • Anti-Thermal Binding Containment isolation Check valve for severe accident conditions.
QUALIFICATIONS	<ul style="list-style-type: none"> • Cycling test under Normal working conditions (P&T). • Thermal transients test. • Seismic class 1A. • Severe Accident Conditions. 	<ul style="list-style-type: none"> • Cycling test under Normal working conditions (P&T). • Thermal transients test. • Seismic class 1A. • Severe Accident Conditions. 	<ul style="list-style-type: none"> • Cycling test under Normal working conditions (P&T). • Thermal transients test. • Seismic class 1A. • Severe Accident Conditions.



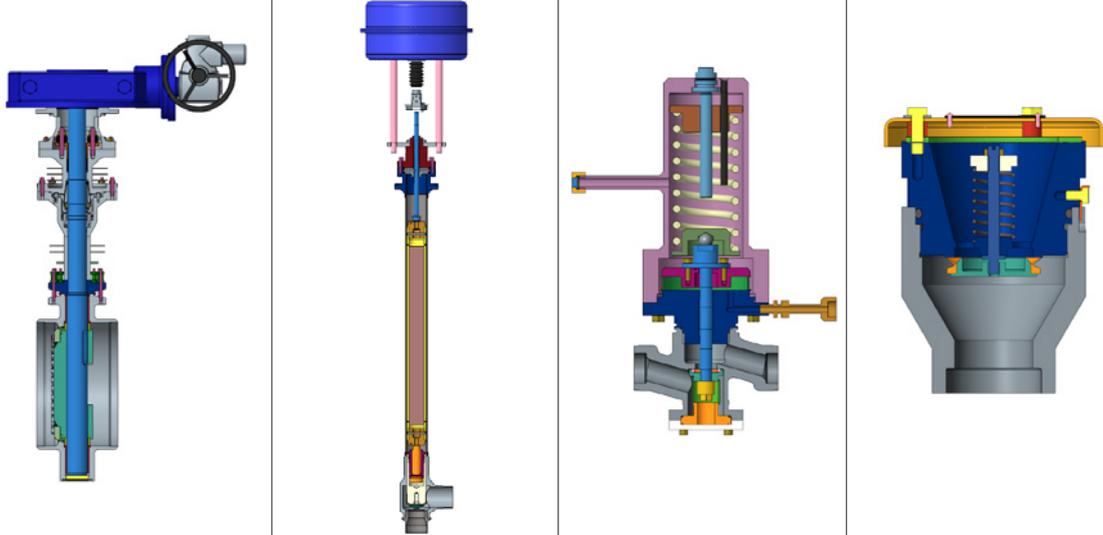
TYPE	SA CONTAINMENT ISOLATION SWING CHECK VALVE	DOUBLE SHELL GATE VALVE FOR CONTAINMENT ISOLATION	DARIS - DIAPHRAGM ADJUSTMENT FOR SAFETY INJECTION SYSTEM
DESIGN FEATURES	<ul style="list-style-type: none"> • Cast body • Swing check valve • Soft seat for superior tightness • Gaskets in certified "PMUC" Nuclear grade materials with low Hallogen and Chloride contents for superior resistance to corrosion. • Welded ends (SW or BW) 	<ul style="list-style-type: none"> • Gate valve with Cast or forged Body • Parallel Slide disc or flexible wedge type. • Double Shell welded to the valve body and the reactor containment . • Bolted Bonnet type for higher reliability and easier maintenance. • Seating faces are hard-faced with Stellite 6 or cobalt free. • Reinforced Body/Bonnet/Yoke super-structure for superior seismic resistance. • Hard faced back seat protects the stem packing in the fully open position. • Sizing to meet electric actuators switch off failure and prevent the valve integrity in case of failure of actuators torque switches. • Packing and gaskets in certified "PMUC" Nuclear grade materials with low Hallogen and Chloride contents for superior resistance to corrosion. • Electrical or Pneumatic actuators. 	<ul style="list-style-type: none"> • Packing type sealing Globe valve for throttling service • Bolted Bonnet type for higher reliability and easier maintenance • Modular maintenance type with easy seat/trim removal (RAMA® Patented Design). • Cage Type. • Standard plug or Pilot Operated. • Seating faces are hard-faced with Stellite 6 or Cobalt free alloy, ground and lapped to mirror finish. • Reinforced Body/Bonnet/Yoke super-structure for superior seismic resistance. • Hard faced back seat protects the stem packing in the fully open position. • Packing and gaskets in certified "PMUC" Nuclear grade materials with low Hallogen and Chloride contents for superior resistance to corrosion. • Linear flow characteristics. • Manual operator.
SIZE	3" to 12" (DN80 - DN300)	3" (DN80) to 24" (DN600)	6" (DN150)
PRESSURE RATING	Class 300	Up to class 1500	Class 1500
APPLICATIONS	<ul style="list-style-type: none"> • Containment isolation swing Check valve for severe accident conditions. 	<ul style="list-style-type: none"> • Reactor Containment Isolation function. 	<ul style="list-style-type: none"> • Flow adjustment of the safety Injection system in post accidental conditions.
QUALIFICATIONS	<ul style="list-style-type: none"> • Cycling test under Normal working conditions (P&T). • Thermal transients test. • Seismic class 1A. • Severe Accident Conditions. 	<ul style="list-style-type: none"> • Cycling test under Normal working conditions (P&T). • Thermal transients test • Seismic class 1A • LOCA (Loss of Coolant Accident) 	<ul style="list-style-type: none"> • Cycling test under Normal working conditions (P&T). • Thermal transients test. • Seismic class 1A. • LOCA (Loss of Coolant Accident). • ACW (Activated Contaminated Water)).

SPECIFIC PRODUCTS



TYPE	EQUIBAR® - 3-WAY AUTOMATIC BY PASS SYSTEM	LIQUID SODIUM GLOBE VALVE FOR FBR REACTORS	LIQUID SODIUM GATE VALVE FOR FBR REACTORS
DESIGN FEATURES	<ul style="list-style-type: none"> • Self-actuated over-pressure relief device. • Connected to the Inlet, body cavity and outlet of Gate valves. • Provides bi-directional tight shut-off. • Eliminates Thermal Binding or Over pressurization phenomenoms in gate valves. • Modular maintenance type with easy seat/trim removal (RAMA® Patented Design). • Packing and gaskets in certified "PMUC" Nuclear grade materials with low Hallogen and Chloride contents. 	<ul style="list-style-type: none"> • Forged Body for superior safety and easier decontamination. • Design for High temperature service according to RCCM-RX. • Bellows Sealed with secondary Packing type sealing arrangement. • Y pattern or Straight type Body. • Bolted bonnet lip-seal welded. • Sphere/cone contact between Plug/seat. • Integrated Spring Pak system for full absorption of the dynamic load during operation. • Seating faces are hard-faced with Stellite 6. • Reinforced super-structure for superior seismic resistance for motorized valves. • Linear or equal percentage Flow Characteristics available for Throttling services. • BW Welded ends. • Manual, Electric or Pneumatic actuators. 	<ul style="list-style-type: none"> • Forged Body Gate valve. • Split Wedge type (Double disc) for high temperature transients. • Design for High temperature service according to RCCM-RX. • Frozen seal sealing using solidification of Sodium with secondary packing. • Bolted bonnet lip-seal welded. • Integrated Spring Pak system for full absorption of the dynamic load during operation. • Seating faces are hard-faced with Stellite 6. • Reinforced super-structure for superior seismic resistance for motorized valves. • BW Welded ends. • Manual or Electric actuators.
SIZE	1/2" (DN15)	1/2" (DN15) to 6" (DN150)	3" (DN80) to 14" (DN350)
PRESSURE RATING	Class 1500	Class 150	Class 150
APPLICATIONS	<ul style="list-style-type: none"> • 3-way by-pass of gate valves to eliminate thermal binding or over-pressurization phonomenoms. 	<ul style="list-style-type: none"> • Shutoff or control function of liquid sodium (550°C) auxiliary systems of Fast breeder sodium cooled reactors. 	<ul style="list-style-type: none"> • Shutoff function of liquid sodium (550°C) auxiliary systems of Fast breeder sodium cooled reactors.
QUALIFICATIONS	<ul style="list-style-type: none"> • Cycling test under Normal working conditions (P&T). • Thermal transients test. • Seismic class 1A. • LOCA (Loss of Coolant Accident). 	<ul style="list-style-type: none"> • Cycling test under Normal working conditions (P&T). • Thermal transients test. • Seismic class 1A. • LOCA (Loss of Coolant Accident). 	<ul style="list-style-type: none"> • Cycling test under Normal working conditions (P&T). • Thermal transients test. • Seismic class 1A.

SPECIFIC PRODUCTS



TYPE	LIQUID SODIUM MAIN ISOLATION BUTTERFLY VALVE FOR FBR REACTORS	LIQUID HELIUM CRYOGENIC CONTROL VALVE FOR NUCLEAR FUSION REACTORS	PRESSURE REGULATORS AND BACK PRESSURE VALVES	VACUUM BREAKER
DESIGN FEATURES	<ul style="list-style-type: none"> • Forged Body butterfly valve. • Triple offset disc design. • Design for High temperature service according to RCCM-RX. • Specific pentented sealing arrangement. • Seat / Disc faces are hard-faced with Stellite 6. • Reinforced super-structure for superior seismic resistance for motorized valves. • BW Welded ends. • Manual or Electric actuators 	<ul style="list-style-type: none"> • Cryogenic Globe control valve with Forged Body. • Designed to ASME B31.3. • Angle, Straight of 3-way type body. • Design for applications down to 1.2 K°. • Bellows sealed with secondary packing. • Soft Seat suitable for cryogenic temperature. • BW Welded ends. • Linear, Equal-percent or specific flow characteristics. • Rangeability from 100 or specifically adjusted to the application. • Manual or Pneumatic Actuators. 	<ul style="list-style-type: none"> • Forged design. • Designed to RCC-M. • Straight body. • Bellows sealed . • Soft Seat suitable for gas or Hydrogen service • Welded ends 	<ul style="list-style-type: none"> • Forged design. • Designed to RCC-M. • Angle body. • Soft Seat suitable for very low delta-P. • Welded ends.
SIZE	16" (DN400) to 30" (DN700)	1/4" (DN6) to 12" (DN300)	DN15 to DN25	DN 40 to DN50
PRESSURE RATING	Class 150	Up to Class 600	Class 150	Class 150
APPLICATIONS	<ul style="list-style-type: none"> • Main Isolation valve of the secondary liquid sodium loop of GEN IV Fast breeder sodium cooled reactors.. 	<ul style="list-style-type: none"> • Non return function for Main Primary system and auxiliary safety systems. • Containment Isolation. 	<ul style="list-style-type: none"> • Release flow in order to keep upstream pressure constant, or keep downstream pressure constant. 	<ul style="list-style-type: none"> • Protection of tanks against vacuum.
QUALIFICATIONS	<ul style="list-style-type: none"> • Cycling test under Normal working conditions (P&T). • Thermal transients test. • Seismic class 1A. 	<ul style="list-style-type: none"> • Irradiation and magnetic field. 	<ul style="list-style-type: none"> • Nuclear environment. 	<ul style="list-style-type: none"> • Nuclear environment.

MAINTENANCE & ON SITE SERVICES

Velan is one of the few valve manufacturers to have a specific and dedicated maintenance department, able to perform training, valve maintenance and upgrading in inside nuclear reactors containments.

Our teams, composed of 45 highly qualified engineers and technicians in mechanical engineering, electricity, welding and machining, are able to serve our clients everywhere in the world.

With over 50 years of on-site technical assistance and maintenance work in severe environments, Velan guarantees to plant owners the satisfactory operation of their installations.



Valves Maintenance
Diagnostic services
NDE/COFREND
Machining
Welding expert

Hard facing thickness measurement: OMERUS®
Inline test bench: METEOR®
Inside containment work certification (CEFRI)

FIELD SERVICES

TECHNICAL ASSISTANCE

- Technical support to maintenance teams of end users
- Hotline linked with Velan plant
- Expertise on Velan valves during maintenance works
- Training of end users' team
- Pre-outages preparation

INTEGRATED SERVICES DURING OUTAGES

- Overall maintenance of the global population of on-off, or control valves during plant outages
- Diagnostic & non-intrusive maintenance
- Settings & Requalification
- Management of valve maintenance works



SAFETY MODIFICATIONS & UPGRADING

ON SITE WORK (INSIDE CONTAINEMENT) WITH HIGH SAFETY REQUIREMENTS:

- Upgrade of electrical actuators
- Welding
- Air supply instrumentation

PREVENTIVE MAINTENANCE

REAL PARTNERSHIP WITH DESIGN & TECHNICAL TEAMS OF NUCLEAR OPERATORS



MAINTENANCE TOOLS



METEOR®

Modular Equipment for Tightness Evaluation and On-site Requalification

OMERUS®

Tool for Measuring Hard Facing Deposit Coating Thickness

STEPHAN

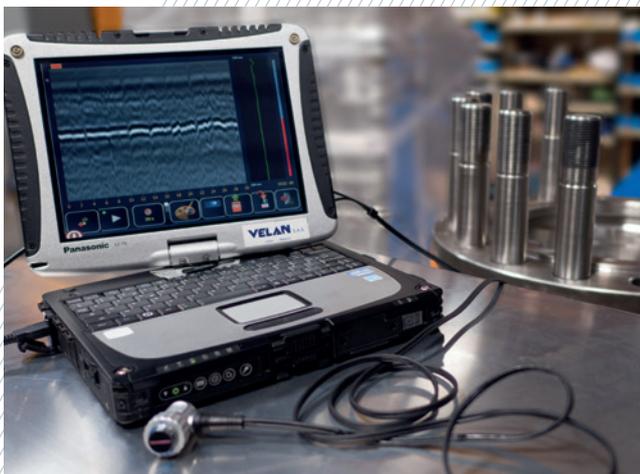
Calibration tool for Velan pneumatic actuators

VELSCAN

On site diagnostic system for air operated actuators

3D Measurement with portable measuring arms

Special tools for Handling, Tightening, Assembling/Disassembling, Lapping & Machining



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