

MasoneilanTM Nuclear Service Control Valves



Masoneilan
a Baker Hughes business



Our references

- **European Pressurized Reactors:** Globally the largest reference list covering 80 % of all applications for the EPR
 - Flamanville 3 (France) and Hinkley Point C (UK): roughly 80 valves each, including Turbine bypass to condenser, Turbine by pass to atm, Minflow FW valves, Moisture separators drains valves, feed tank supply and all BOP valves
 - **Taishan 1 & 2 (China):** roughly 200 valves, including Turbine bypass to condenser, Minflow FW valves, sampling valves, Emergency feed water valves, reactor coolant system with chemical and volumetric control valves, safety injection valves, liquid and gaseous effluent treatment, Generator drain valves – 70% of the control valves reactor scope
- **France: 900, 1300, 1500 MW plants:** 15,000 valves working inside the 58 Edf units, including inside and outside containment applications
- **Belgium:** Doel 3 & 4, Tihange 2 & 3
- **Spain:** Asco Vandellos, Almaraz 1 & 2, Cofrentes
- **UK:** Sizewell B
- **Sweden:** Ringhals 1/2/3/4, Forsmark 1/2/3, Oskarshamn 3
- **Romania:** Cernavoda with Candu reactors
- **China CPR 1000, AP 1000 and Candu reactors:** roughly 2,000 valves installed in 38 units of nuclear power plants. Ling Ao phase 1 & 2, Daya Bay 1 & 2, Liaoning Hongyanhe 3 to 6, Fujian Ningde 1 to 4, Yangjiang 1 to 6, Hainan Changjiang 1 & 2, Fujian Fuqing 1 to 4, Guangxi Fangchenggang 1 & 2, Lufeng 1 & 2, Tianwan 5 & 6, Qinshan phase I, II, III (including Fangjiashan) : Turbine bypass to condenser, FW control valves, Effluent treatment, Moisture separator drains valves, Atmosphere Steam Dump control valve
- **China Hualong N° 1 reactors:** Fangchenggang 3 & 4, Fuqing 5 & 6 : FW and effluent treatment, bypass to condenser
- **Korea:** Ulchin 1 & 2, Shin Kori
- **Japan:** 9,000 control valves in most of the PWR and BWR reactors, including outside containment applications, heater drains, and other turbine island valves
- **South Africa:** Koeberg 1 & 2
- **USA:** 9,000 control valves and safety valves in most of the 99 PWR and BWR reactors in the USA, including inside and outside containment applications, FW control, heater drains, atmospheric dump and other turbine Island valves
- **USA:** 1,100 main steam safety valves and pressurizer safety valves
- **Canada (Candu reactors):** inside containment valves roughly 50 each in Bruce, Darlington, Pickering stations.

Masoneilan control valves, rotary and reciprocating valves, severe service control valves, pneumatic regulators and field instrumentation are high technology products recognized worldwide in the nuclear industry since the 60's. From the first French nuclear power plant up to most recent EPR reactors, thousands of Masoneilan control valves and instruments have been installed and maintained on primary and secondary circuits (manufacturing according to DESP, RCCM or ASME codes).

In January 2015, a **Nuclear Centre Of Excellence (COE)** has been inaugurated in Condé French manufacturing plant.. More than 35 engineers are working to serve Best-In-Class our Customers and are fully dedicated to Nuclear segment.

- **Efficiency:** in one single place, experts are directly connected to nuclear processes. Nuclear activities are managed as a product line and Centre Of Excellence bears full responsibilities to give instructions and take decisions
- **Expertise:** Condé French plant has more than 50 years of experience in nuclear codes and technology and is tailored to customer's most demanding requirements.

Nuclear Certified Quality

Baker Hughes maintains strict standards for Masoneilan nuclear control valves manufacturing and testing through **ESPN-Module H** and **ASME Stamp N&NPT** approved Quality Assurance programs. In addition, Condé French facility holds ISO-9001 Quality System Certification, and is working to achieve further quality by setting internal standards that exceed those set by regulatory organizations. The Quality Management System and Design Control procedures outline design criteria and testing parameters.

Experts are providing Technical Support throughout the Product Life Cycle Service organization stands behind each Masoneilan nuclear service control valve, with the expertise, technical skills and application knowledge that Customers expect from Baker Hughes. We continually build upon a history of best practices, and our sales team is well qualified to help you select the right valve for your facility, application and specifications. Nuclear COE also provides guidance and technical solutions in solving difficult challenges and issues.

Our aftermarket support services team has the in-depth industry knowledge, product familiarity and implementation skills to help maintain continuous operations and cost-effective performance.

Culture of Nuclear Safety

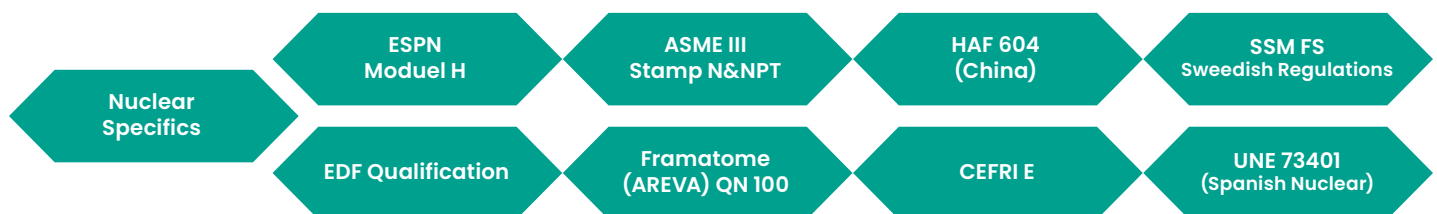
Because Safety is the deed of every woman and man at her or his scale, Baker Hughes Condé France invites all employees to share concerns about Nuclear Safety.

Baker Hughes develops a genuine Culture of Nuclear Safety among them, encouraging communication, dialogue and interrogative attitude.

Condé Nuclear
COE : Valve
Solutions and
Services
Dedicated to the
Nuclear Industry



Nuclear Center Of Excellence – Baker Hughes Condé Facility, France

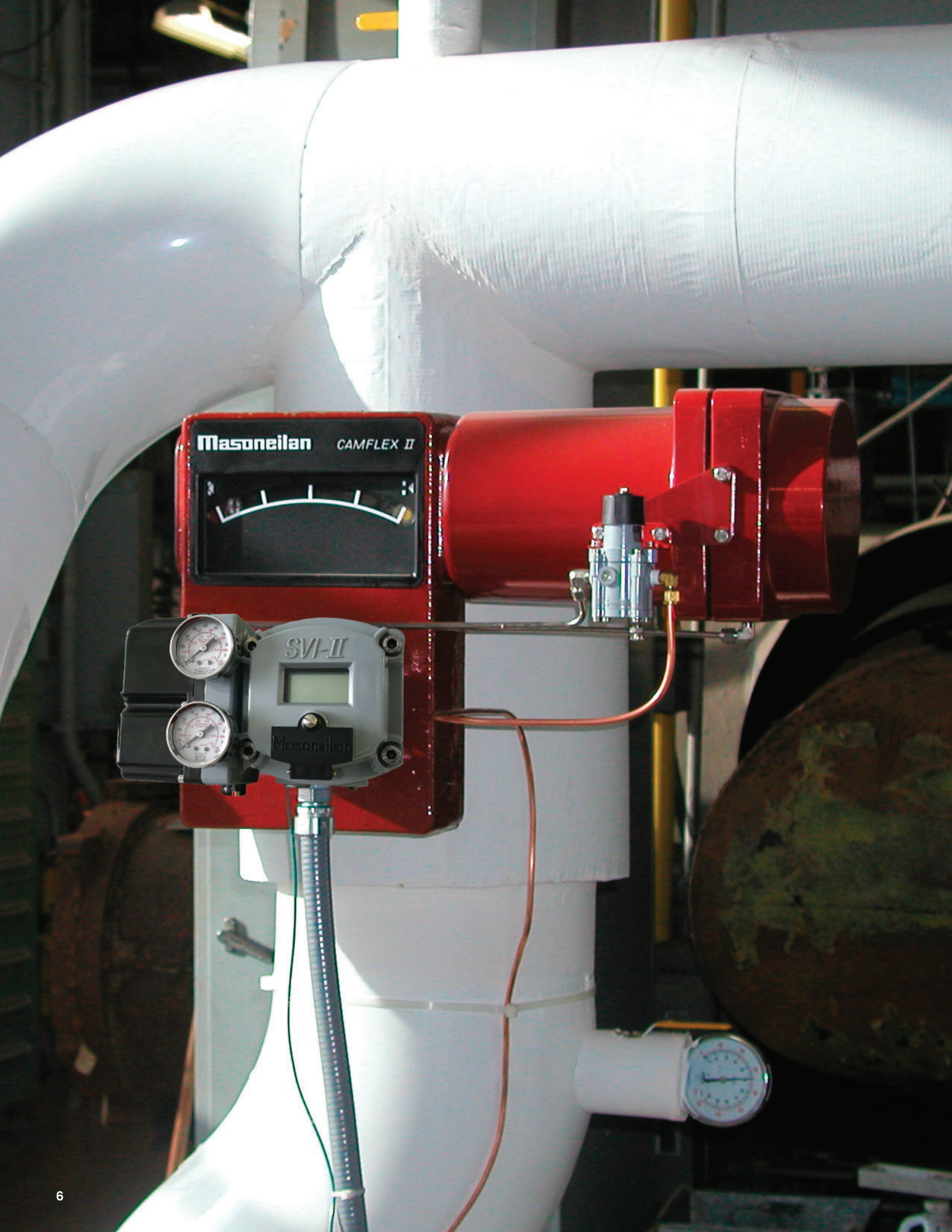


French Nuclear COE Certifications

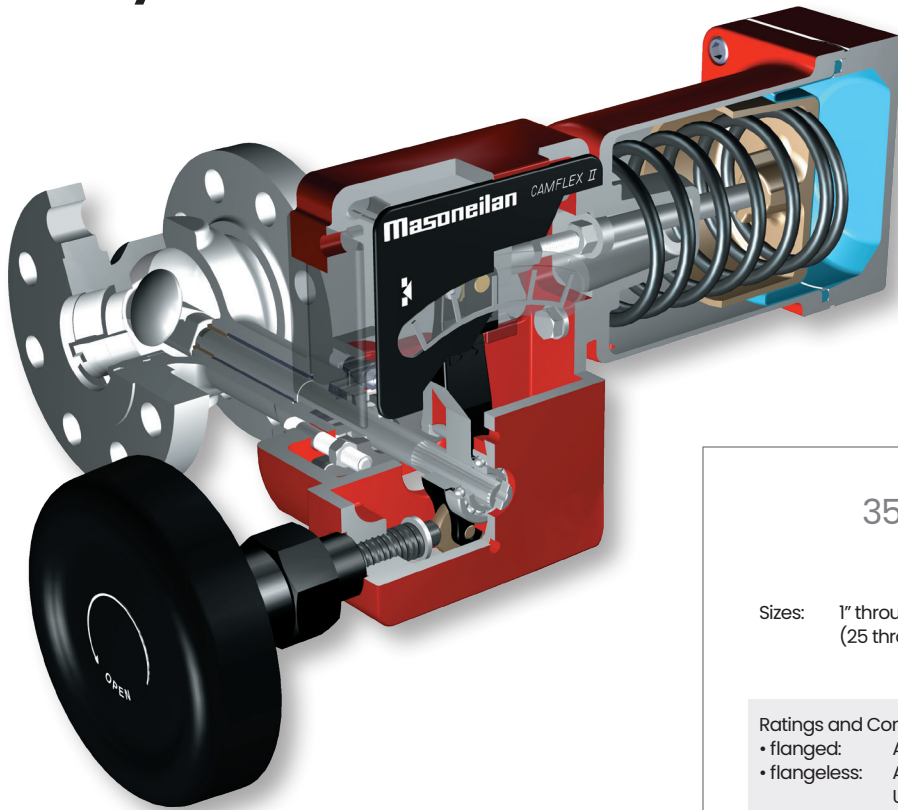


I AM THE KEY
TO NUCLEAR
SAFETY





Rotary Control Valves



35002 Series *Camflex™ II* Eccentric Plug

Sizes: 1" through 16"
(25 through 400 mm)

Ratings and Connections:

- flanged: ANSI 150 - 600
- flangeless: ANSI 150 - 600
UNI-DIN 10 - 100
- screwed: NPT (1" through 2")

Body Materials:

- carbon steel
- stainless steel
- high nickel alloy

Actuators:

- model 35 spring diaphragm
- 70 Series cylinder

Trim:

- eccentric rotary plug

Inherent Characteristic:

- linear

As the original eccentric plug rotary valve, the 35002 Series Camflex valve combines quality performance and features with an economical design. The Camflex valve offers versatility and broad application. It is now supplied with the EF seal solution to reduce fugitive emissions.

Typical Applications:

- Low pressure heaters drain
- Ventilation system

Single-Seat Control Valves



21000 Series Globe & Angle Top-Guided Valve

Sizes: 3/4" through 8"
(20 through 200 mm)

Ratings and Connections:

- flanged: ANSI 150 – 2500
UNI-DIN 10 – 400
- welded: BW or SW
- screwed: NPT 3/4" through 2"
(20 through 50 mm)

Body Materials:

- carbon steel
- stainless steel
- chrome-moly

Actuators:

- model 87/88 multi-spring diaphragm
- cylinder
- electric

Trims:

- single seat plug top guided.
- *Lo-dB™* and anti-cavitation trims, single or double stage are available
- bellows seal

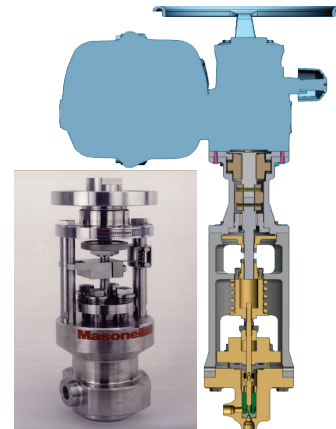
Inherent Characteristic:

- linear or equal percentage

The 21000 Series control valve is a heavy top-guided unbalanced design with noise attenuation and anti-cavitation trim options. It can handle a variety of process applications ranging from standard service conditions to more severe applications. It also includes standard bellows seal and soft seat configurations.

Typical Applications:

- Low pressure heater drain
- Effluent treatment
- Gland steam system turbine



28000 Series *VariPak™* Micro-Trim Globe Valve

Sizes: 1" (25 mm) standard
1/2" through 3/4"
(15 through 20 mm)
available on request

Ratings and Connections:

- flanged: ANSI 150 – 600
- flangeless for mounting between
flanges: ANSI 150 – 2500
UNI-DIN 10 – 400
- welded

Body Materials:

- stainless steel
- monel
- hastelloy C
- alloy 20

Actuator:

- integral spring diaphragm
- electric

Trims:

- full stellite needle plug
- multistep trim available
- bellows seal

Inherent Characteristic:

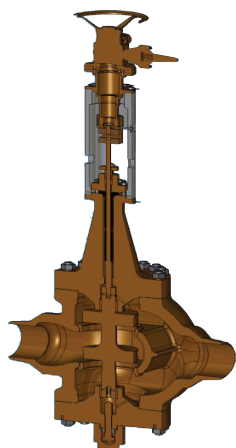
- linear

The 28000 Series VariPak is a compact globe style valve specifically for microflow control. The VariPak includes an adjustable *Cy* feature between 100 percent and 40 percent that can meet applications requiring finer control. It is available with bellows seal and anti-cavitation trim options.

Typical Applications:

- Microflow applications
- Waste treatment plant
- Primary pump cleaning injection
- Effluent treatment system
- Sampling system

Double-Seat Control Valves



10000 Series Double-Seated Globe Valve

Sizes: 2" through 24"
(50 through 600 mm)

Ratings and Connections:

- flanged: ANSI 150 - 1500
UNI-DIN 10 - 250
- welded: BW or SW

Body Materials:

- carbon steel
- stainless steel
- chrome-moly

Actuators:

- model 87/88 multi-spring diaphragm
- cylinder
- electric

Trims:

- V-port or contoured plug
- top and bottom guided

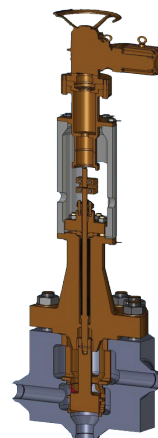
Inherent Characteristic:

- linear, quick opening or equal percentage

The 10000 Series is a double-ported valve with top and bottom stem guiding. This design is suitable for high-pressure drop applications where dirty fluid conditions exist. The 10000 Series is widely used in hydrocarbon processing applications.

Typical Applications:

- Safety injection accumulator



80000 Series 3-Way Diverting or Combining Valve

Sizes: 1" through 10"
(25 through 250 mm)

Ratings and Connections:

- flanged: ANSI 150 - 600
UNI-DIN 10 - 100
- welded: BW or SW
ANSI 900 - 2500 on request

Body Materials:

- carbon steel
- stainless steel
- chrome-moly

Actuators:

- model 87/88 multi-spring diaphragm
- model 37/38 spring diaphragm
- cylinder

Trim:

- v-port plug

Inherent Characteristic:

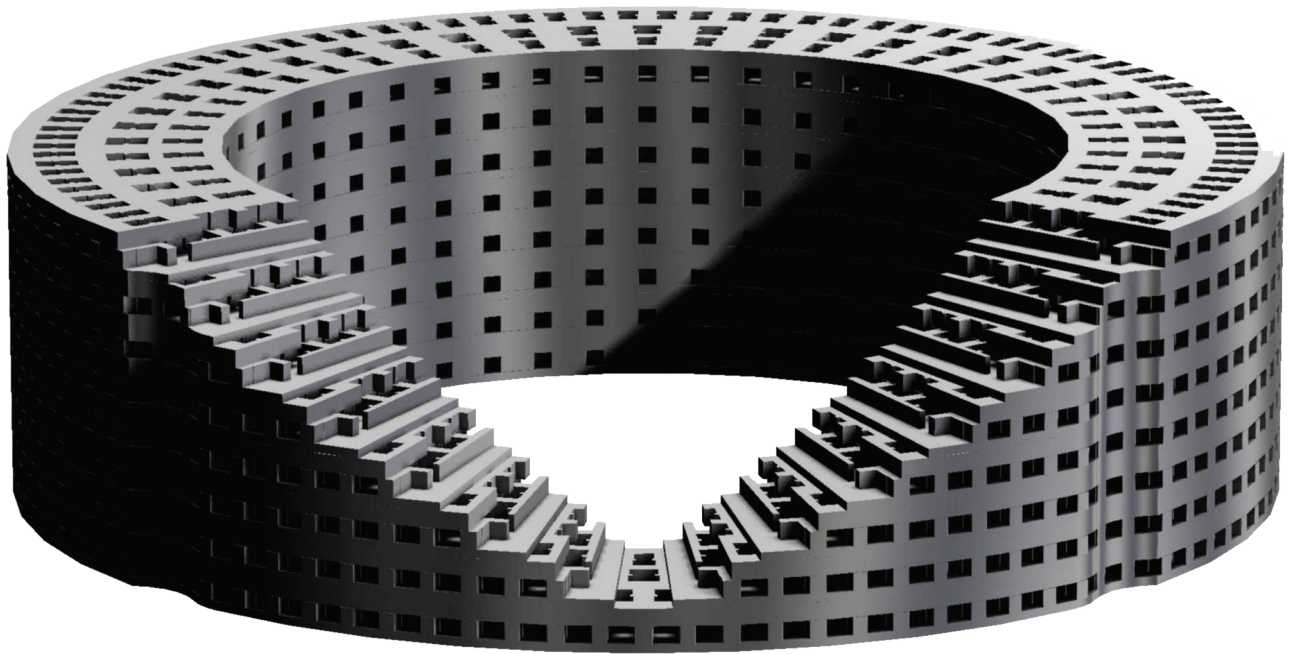
- linear

The 80000 Series is a line of three-way control valves for either combining or diverting applications. Its key features include high flow capacities and low-pressure recoveries, resulting in efficient flow control performance.

Typical Applications:

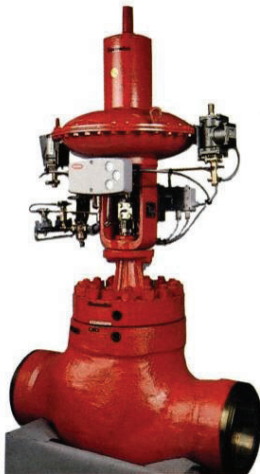
- Volumetric and chemical control system
- Turbine bearings lubrication system
- Reactor coolant storage

Stacked Plate Technology



V-LOG™ Energy Management Trim is manufactured from a brazed stack of laser-cut plates, each with a series of 90 degree turns used to redirect the flow of the process fluid through a high-resistant flow path. Each stage also includes an expansion and contraction in area for maximum pressure reduction efficiency. Further, each valve body is contoured to account for flow expansion and trim area velocity to manage the total system noise, offering customers a compact energy management control valve.

Cage-Guided Control Valves



41005 Series Globe & Angle Style Valve

Sizes: 2" through 24"
(50 through 600 mm)

Ratings and Connections:

- flanged: ANSI 150 – 2500
UNI-DIN 10 – 400
- welded: BW or SW

Body Materials:

- carbon steel
- stainless steel
- chrome-moly

Actuators:

- model 87/88 multi-spring diaphragm
- model 37/38 spring diaphragm
- cylinder
- electric

Trims:

- balanced with seal ring or pilot cage-guided trim
- Lo-dB: low noise for steam anti-cavitation for liquid

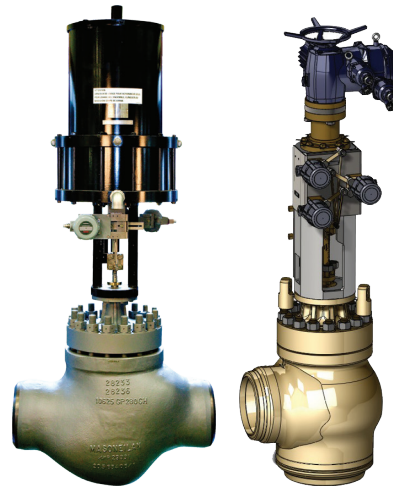
Inherent Characteristic:

- linear or equal percentage

The 41005 Series is a heavy-duty valve design with balanced trim configurations. It offers cage guiding for added stability and the versatility to offer noise attenuation and anti-cavitation solutions. Available with various balancing seal options including auxiliary pilot design for unmatched high-temperature performance.

Typical Applications:

- HP heaters drains
- Moisture separator drains
- Feed tank supply
- Main feedwater valves



41005 Series Turbine Bypass to Condenser 41005 Series Steam Bypass to Atmosphere

Sizes: 4" through 36"
(100 through 900 mm)

Ratings and Connections:

- flanged: ANSI 150-2500
UNI-DIN 10 – 400
- welded: BW

Body Materials:

- carbon steel
- stainless steel
- chrome-moly

Actuators:

- model 37/38 spring-opposed diaphragm
- cylinder
- electric

Trims:

- balanced cage-guided trim.
- Lo-dB, anti-cavitation and *VRT™* (Variable Resistance Trim), single and multiple cages, V-LOG are available

Inherent Characteristic:

- linear or equal percentage

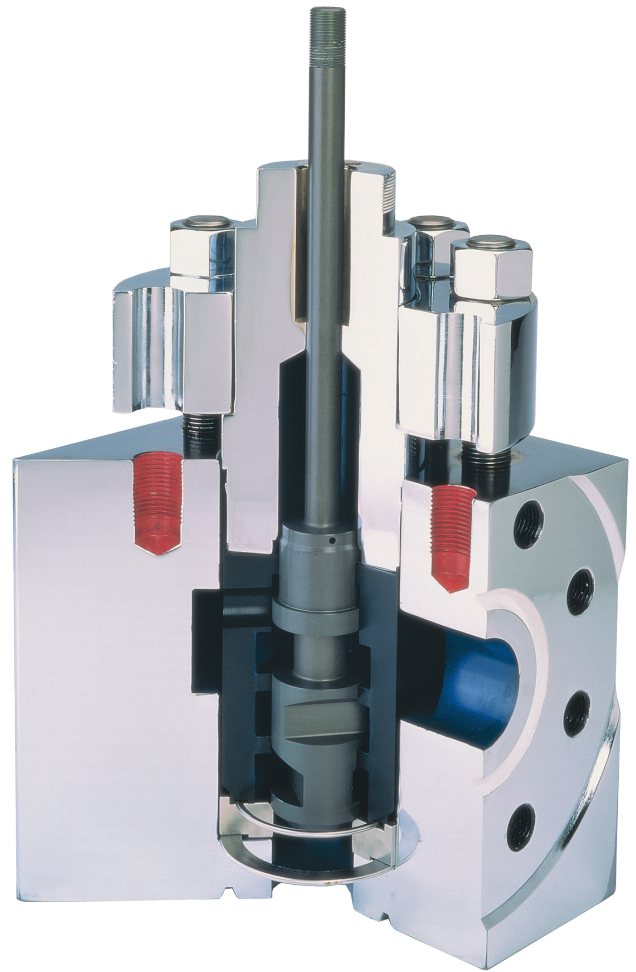
The 41005 Series features an enlarged body. It offers cage guiding for added stability and the versatility to offer noise attenuation and anti-cavitation solutions. Available with various balancing seal options including auxiliary pilot design for unmatched high-temperature performance.

Typical Applications:

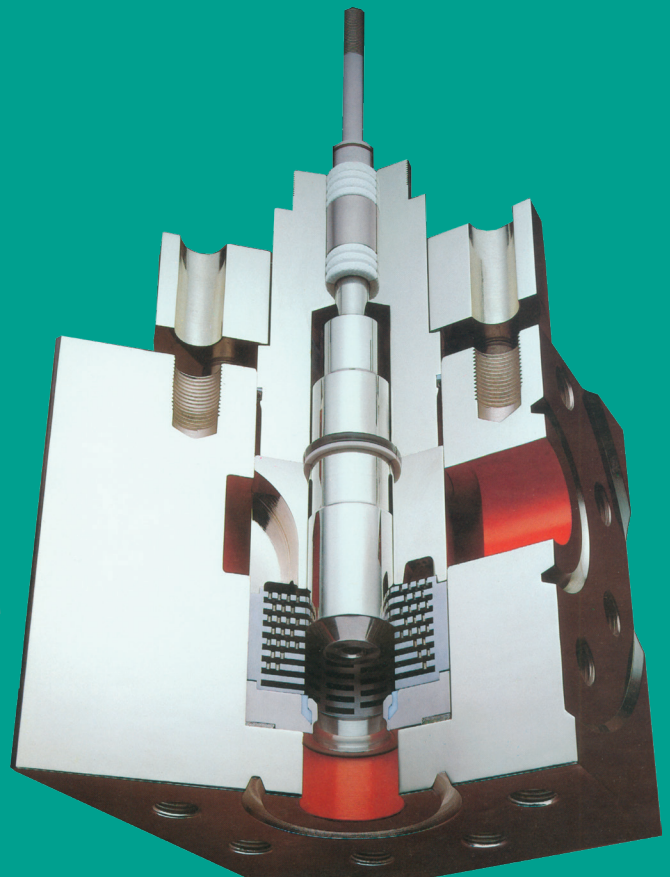
- Turbine bypass
- Bypass to atmosphere

Axial Flow Technology

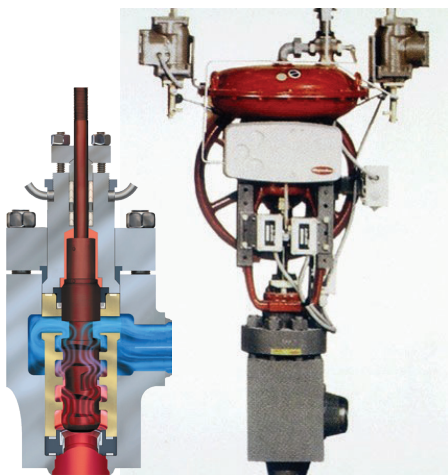
Axial Flow trims offer multi-stage designs for the control of high-pressure liquids without the damaging effects of cavitation, erosion, and vibration. The unique flow design of the *LincolnLog™* develops the required resistance for throttling but also affords ample clearance for the passage of large particulate. The optional soft seat is specifically for boiler feedwater applications and offers long-term Class VI shut-off at demanding pressures.



Variable Resistance Trim (VRT), consists of a brazed stack of drilled plates which efficiently channel the flow through multiple turns in a tortuous path configuration. The design is primarily used in high-pressure drop liquid applications. VRT is typically packaged within standard Masoneilan globe and angle valve bodies.



Severe Service Control Valves



78400-18400 Series LincolnLog

Sizes: 1" through 12"
(25 through 300 mm)

Ratings and Connections:

- flanged: ANSI 600 - 2500
UNI-DIN 100 - 400
- welded: BW or SW

Body Materials:

- carbon steel
- stainless steel
- chrome-moly

Actuators:

- model 37/38 spring-opposed diaphragm
- model 87/88 multi-spring-opposed diaphragm
- cylinder
- electric

Trims:

- axial flow technology
- multi-stage, cage-guided, anti-cavitation trim
- Class VI available on request

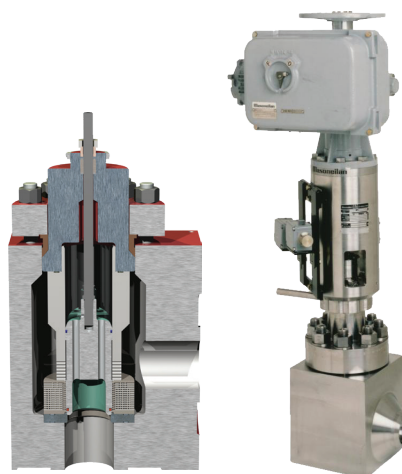
Inherent Characteristic:

- linear

The 18400 and 78400 Series valve is used in high-pressure liquid service applications to help eliminate cavitation.

Typical applications:

- Emergency feed water
- Steam generator drains
- Minimum flow feed water pump



41017 Series Globe Style 79000 Series Angle Style with VRT Trim

Sizes: 1" through 6"
(25 through 150 mm)

Ratings and Connections:

- flanged: ANSI 600-2500
UNI-DIN 100-400
- welded: BW

Body Materials:

- carbon steel
- stainless steel
- chrome-moly

Actuators:

- model 87/88 multi-spring diaphragm
- model 37/38 spring diaphragm
- cylinder
- electric

Trim:

- multi-stage VRT trim design and VRT partial stack design for control over a wide range of applications

Inherent Characteristic:

- linear

The 79000 Series valves offer anti-cavitation service with control over a wide range of operating conditions, such as the ramp-up transition of a normal feedwater pump.

Typical Applications:

- Small flow feed water control
- Feedwater pump start-up valve
- Charging valve : volumetric & chemical control system

Advanced Smart Instruments





SVI Advanced Performance Digital Valve Positioner

Communication / Control Platform:

- 4-20mA with HART® (SVI II AP)
- FOUNDATION® Fieldbus H1 (SVI FF)

Pneumatics:

- 20 – 150 psi Supply pressure
- Single, High Flow Single, or Double-acting

Operating Temperature:

- -40°C to +85°C

Materials:

- Aluminum (painted) or Stainless Steel Housing
- Composite Polymers and Stainless Steel Pneumatics

I/O:

- 4-20mA output (AP only)
- (2) Configurable Switches
- Discrete Input
- Remote Positioner Sensor Input (Remote Sensor optional)

Mounting / Feedback:

- Non-Contact magnetic position feedback
- Rotary or Linear
- Stainless Steel brackets for all Masoneilan and major valve brands

Certifications:

- Explosion / Flame / Dust-proof and Intrinsically safe
- FM, FMC, ATEX, IECEx
- Regional – NEPSI, Taiwan TS, CCOE, CU-TR, AZS, UZ, INMETRO, JIS, KOSHA, IA

Diagnostics:

- Standard or Advanced levels available
- Continuous, Online, and Offline Diagnostics/Methods

Configuration / Monitoring Interfaces :

- Local Display with Pushbuttons (Optional)
- ValVue Device Diagnostic and Configuration Tool
- DTM or eDDL – seamless integration into leading asset management systems

The Advanced Performance SVI Digital Valve Positioner models offer superior control technology for pneumatically actuated valves. Field proven, non-contact magnetic position feedback provides high precision with extreme reliability in harsh conditions. Mounting brackets for most major valve/actuator brands and optional Display with Pushbuttons promote quick and easy installation and commissioning. Available with either 4-20mA with HART® (SVI II AP) or FOUNDATION® Fieldbus (SVI FF), integration into control systems is seamless, especially when paired with ValVue software. Valve and Positioner health are monitored and analyzed through the various continuous, online, and offline diagnostics, which make the Advanced Performance positioners a perfect selection to increase control valve and plant efficiency.



12400 Series Digital Level Transmitter/Controller

Range: 14" through 120" (355 through 3048 mm)

Ratings and Connections:

- Flanged: ANSI 150 – 2500
UNI-DIN 10 – 100
- Screwed: NPT-F (1 1/2", 2")
- Welded

Body Materials:

- Carbon steel
- Stainless steel
- Chrome-moly

Displacer Materials:

- Stainless steel
- Other materials on request

Torque Tube Materials:

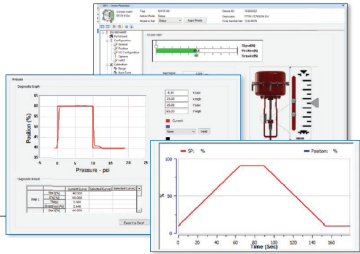
- Inconel
- Stainless steel
- Other materials on request

Electronic Instrument:

- HART protocol
- 4 – 20 mA signal
- ATEX, FM, CSA, JIS, CU TR, CRN, IEC, INMETRO, CCOE, IA, KOSHA, NEPSI, TAIWAN TS and IEC between main approvals
- SIL2 safety certified
- Optional 2 built-in level switches
- Optional second 4-20 mA output signal

The Masoneilan 12400 Series Instrument is a two-wire loop-powered, digital-displacement type level transmitter or controller with HART communication. This high performance instrument is easily set-up and calibrated with either ValVue communication software, EDDL, DTM, a hand-held communicator, or local pushbuttons and digital display. This versatility allows the operator to configure, calibrate, and perform other functions either at the instrument or from the control room.

Masoneilan Stand Alone or Integrated Softwares



ValVue 3 Device Diagnostics & Configuration Tool

Key Features:

- Common interface for all instruments
- Time stamped Audit Trail provides full documentation of all changes managed by the application
- Automatic device monitoring with NAMUR 107 compliant alerts
- Provide specific task authorization with user level access control
- Easy PDF Report generation

Benefits:

- Automates standard device commissioning steps with Sequencer to get more done, consistently and accurately
- Enables easy compliance validation for audit reports
- Enhances security by requiring user authentication
- Shorter training cycles by using the same basic interface for all field devices

ValVue 3 is compatible with:

- SVI II AP
- SVI II ESD
- SVI 1000
- DLT 12400
- SVI FF
- DLT 12300

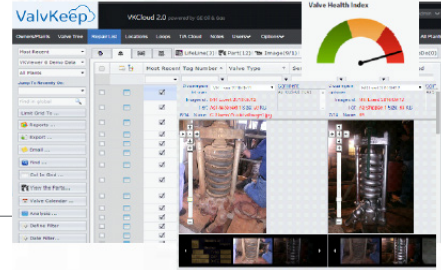
ValVue 3 supports the following connections:

- Hart Modem
- wirelessHART® gateways
- FF Modem
- Emerson AMS OPC
- HART® Multiplexors

Masoneilan additionally offers fully interoperable DTMs for host integration in the following systems:

- Yokogawa PRM v3.04+
- Honeywell FDM v400+
- Schneider Electric Foxboro FDM
- Emerson AMS v12.5+
- Rockwell Automation FactoryTalk v2.31+
- ABB 800xA v5+

ValVue 3 is a powerful and user-friendly interface designed for set-up, configuration, and diagnostics of Masoneilan instruments. ValVue improves Maintenance team efficiency by automating set up, calibration, and diagnostics procedures which is particularly helpful during plant outages.



Valve Lifecycle Management by Baker Hughes

Baker Hughes provides complete valve lifecycle management (VLM) solution from initial setup/ commissioning through turnaround/outage support. Utilizing Baker Hughes extensive valve experience, valve optimized tools, and local service teams help Reliability and Maintenance managers:

- Prioritize valve maintenance activities
- Identify opportunities for process optimization
- Simplify troubleshooting activities
- Optimize valve spares inventory

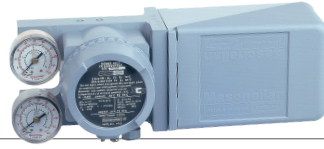
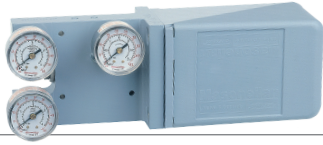
During plant operations, VLM service subscribers receive valve fleet health reports detailing which valves need to be slotted for repair BEFORE they impact process operations. Similarly, VLM reports can be used to plan valve overhaul operations during outages providing information to overhaul valves based on operating condition rather than time based techniques reducing valves repaired by as much as 50%.

These services are often provided with no additional hardware required, regardless of valve/positioner brand.

Unlock the hidden power of your digital invest with Baker Hughes Valve Lifecycle Management Services.



Pneumatic Instruments



4700/4800 Series Pneumatic & Electro-Pneumatic Positioner

Control Signals:

4700/4800P

- 3-15 psig
- 6-30 psig

4700/4800E

- 4-20mA

Pneumatics:

4700/4800P

- Direct
- Reverse
- 100 psi maximum supply pressure

4700/4800E

- Direct
- 100 psi maximum supply pressure

Operating Temperature:

- -40°C to +85°C

Materials:

- Aluminum (painted) housing
- Stainless Steel Pneumatics

Mounting / Feedback:

- Integrated position feedback
- Rotary or Linear cam settings
- Stainless Steel brackets for all Masoneilan and major valve brands

Certifications:

- Explosion proof and Intrinsically safe
- North America, Canada, ATEX
- Regional – CCOE, CU-TR, INMETRO, IA, UA TR

The model 4700/4800P and 4700/4800E are control valve positioners that use a precision feedback cam for accurate positioning, fast response, and customized control characteristics. These positioners can be used with either rotary or liner actuators in applications where only pneumatic or 4-20mA control signals exist.



Model 4411 Electro-Pneumatic Transducer

Output capacity:

- 12 scfm (20.4 Nm³/h)

Signals:

- Input: 4 - 20 mA (100 mA max)
- Output: 3 - 15 psig, 6 - 30 psig

Certification:

- Explosion proof and intrinsically safe enclosure rating per IP 66 and NEMA X

The 4411 I/P is manufactured with Reedex™ digital-micro valve technology for fast response. It is not sensitive to vibration.

- Low air consumption
- Adjustable tight shut-off feature



496 Series Position Switches and Transmitters¹

Configurations:

- Electromechanical Limit Switch:
 - quantity 1 or 2
 - single or double pole
 - double throw
- Inductive Proximity Detector Switch:
 - quantity 1 or 2
- Potentiometric Position Transmitter
- Opto-Electronics Position Transmitter

Certifications:

- Explosion-proof / Intrinsically safe
- North America, Canada, ATEX
- Regional – NEPSI / Taiwan TS, CCOE, CU-TR / AZ, UA, KOSHA, IA

The 496 Series instrumentation can be configured as electro-mechanical switches, proximity switches, or position transmitters. These devices offer high resistance to vibration and electrical interference for reliable valve-mounted performance.

Mechanical and electrical components can operate in harsh environments and are approved for use with various hazardous area ratings in most countries.



78 Series Air Filter Regulator and Air Lock Up Valves¹

Air Filter Regulator Model 78-40:

- Inlet pressure rating: 210 psi
- Pressure set range : 5-100 psi
- Filter: Polyethylene (5µm)
- Temperature range: -40°C to 83°C, option for -50°C to 60°C or 0 to 100°C

The Model 78-40 air filter regulators are compact, lightweight, high performance pressure reducing valves. They are used primarily for supplying a stable source of air to process control equipment, such as control valve positioners and current to pneumatic transducers. These regulators are externally adjustable for fine tuning and include a locking feature for maintaining output pressure at the desired level. The compact design is easy to mount onto a range of equipment using various methods and orientations.

Transfer/Lock Up Valves Model 78-80:

- Transfer valve pressure: 250 psi
- Max signal pressure: 150 psi
- Temperature range: -30°C to 83°C

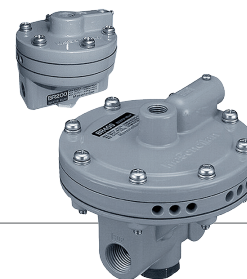
Version 78-80S:

- Cv In to Out: 0.8
- Cv Out to Ex: 1.3

Version 78-80H:

- Cv In to Out: 4.5
- Cv Out to Ex: 5.0

The Model 78-80 transfer valve is used to switch the air flow from one port to another, when the signal pressure becomes lower than the set pressure in case of the air failure. The 3-way transfer valve can be also used as the lockup valve by plugging off the exhaust port. The lockup valve is used to lock the control valve in its last position (Air-Failure-Lock) by confining the air pressure in the actuator, when the signal pressure becomes lower than the set pressure in case of the air failure. When the failed air pressure is recovered above the set pressure, the locked position is released and the control valve will go back to the normal operation.



BR200/BR400 High Capacity Volume Booster Relays¹

Input/Output Ratio:

- 1:1

Maximum Supply/Signal Pressure:

- 150 psi

Temperature range:

- -30°C to +83°C, option for -50°C to +60°C or 0°C to +100°C

Maximum Cv BR200:

- Supply: 1.2
- Exhaust: 1.2

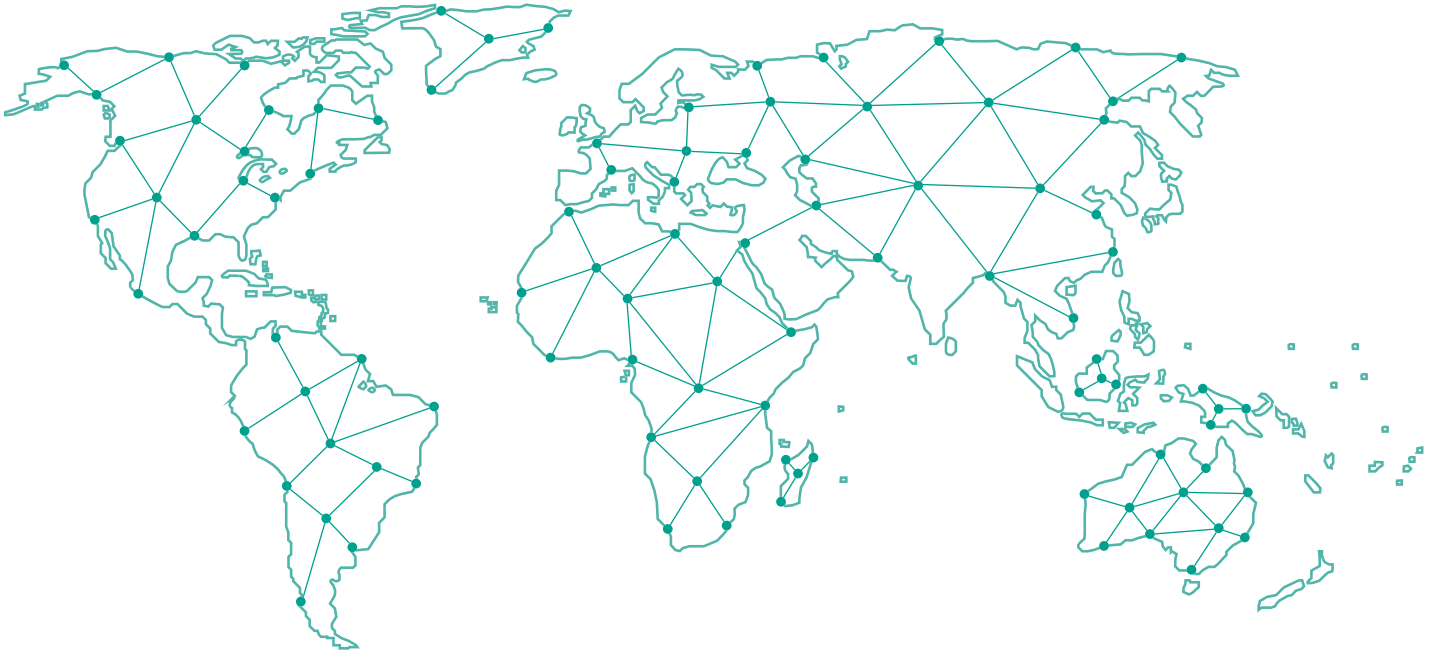
Maximum Cv BR400:

- Supply: 2.6
- Exhaust: 2.4

Model BR200 and BR400 pneumatic booster relays offer high capacity air volume boost for faster, dynamic control valve system response. These devices feature a 1:1 input-to-output ratio with a maximum supply and signal pressure of 150 psi. The BR200 and BR400 also include an integrated internal bypass valve for sensitivity optimization and dynamic response optimization. These devices also have integrated filters in both the supply and signal ports and are configured using stainless steel components and corrosion resistant finishes for a robust and reliable assembly.

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