

GE Energy

Consolidated* Pressure Relief Valves Nuclear Service Valves

Pressure relief solutions
for the nuclear industry

- Safety Relief Valves
- Safety Valves



imagination at work



Advanced Technology and Equipment Manufactured and Tested at Alexandria Facility

Equipped with advanced tools, equipment and technology, GE Energy's facility in Alexandria, Louisiana, is certified to produce nuclear valves that offer the reliability and trusted performance customers expect from GE's Consolidated product line.

In addition to full manufacturing capabilities, our ISO 9001-certified facility supports research and development testing and production testing. It is one of the few sites in the United States that holds National Board Certification for air, water and steam valve testing. In addition, the facility features a nuclear cleanroom that helps to ensure the integrity and precision crucial to nuclear valve design and manufacturing.

The 247,000-square-foot factory sits on 92 acres and includes an additional 56,000 square feet of office space.

Manufacturing

From Computer Numerically Controlled (CNC) machining and turning centers to paint booths and air compressors, GE's Alexandria facility incorporates some of the latest machinery and best practices for the production of nuclear valves for critical and demanding applications.

The facility is equipped with both electronic and manual manufacturing equipment, and our on-site tools enable valve manufacturing processes ranging from early production phases to final cleaning and painting. Advanced tooling includes:

- CNC Machining Centers
- CNC Turning Centers
- Teach Lathes
- Manual Machines
- Material Moving Equipment and Hoists





Testing

Detailed product testing is performed at the Alexandria facility to support the durability and quality of GE's Consolidated nuclear valves.

R&D Test Facility

- **Steam Test Facility**
Capacity: 10,000 lbs/hr
Pressure: 250 psig
- **Air Test Facility**
Capacity: 3500 scfm
Pressure: 1000 psig
- **Water Test Stand**
Capacity: 500 gpm
Pressure: 10,000 psig

Production Test Facility

- **Steam Test Facility**
Pressure: 2,000 psig
- **Air Test Facility**
Pressure: 5,500 psig
- **Water Test Facility**
Pressure: 10,000 psig

Clean Room

Large enough to meet projected requirements as well as current customer needs, the cleanroom complex at the Alexandria facility has been built and equipped to meet precise customer specifications.

The atmosphere is strictly controlled to minimize undesirable elements within the facility that could potentially compromise valve integrity. Certain chemicals and other materials are kept out of the cleanroom area. These include: free halogens; heavy metals, such as mercury, lead, or their compounds; hydrocarbons, including oil, grease, and cellulose; and materials of unknown composition. Solvents are neutral and non-reactive, or in accordance with customer specifications. Additionally, cleanroom personnel wear approved safety gear to help prevent contamination.

- Valve body/parts are lowered into the cleaning tank for a wash and rinse.
- Oven for dry cleaning valve parts has a maximum heat generating capability of 500°F. An oven is also available for drying completed valves.
- After cleaning and drying, valve assembly is completed on stainless steel tables prior to test.
- After being completely assembled and cleaned, the safety valves are moved by an overhead monorail system in the cleanroom.
- The valves are sealed to prevent re-contamination.
- Nuclear parts are inspected, cleaned, and packaged in the cleanroom per the required nuclear packaging specifications.
- After nuclear valves have been set and tested in the test room, they are returned to the cleanroom for cleaning, final painting and packaging as required.



Boiling Water Reactor

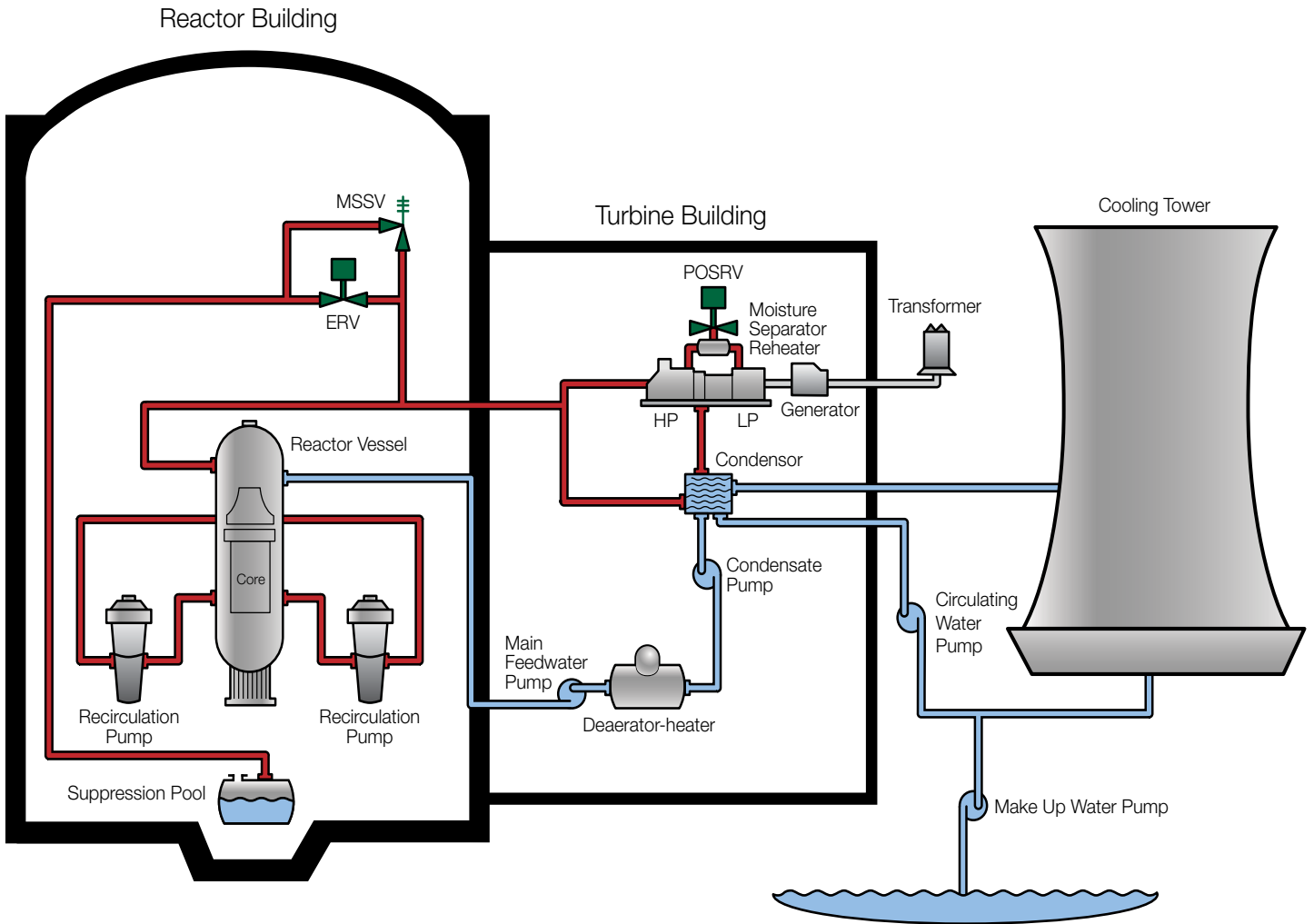
Reliability and Trusted Performance

Boiling water reactors (BWR) may have many spring-loaded safety valves, pilot-operated valves and/or spring-loaded mechanical assist valves, depending on plant design and steam capacity. These valves help protect against reactor system over-pressurization in accordance with ASME Code requirements, as well as serving as operating valves. The actual percentage of total generating capacity represented by installed safety valves is determined by the reactor manufacturer and the Atomic Energy Commission through a detailed analysis of possible pressure transients in the system.

As shown in the figure on page five, these valves discharge directly into the dry well, water pool or suppression chamber of the containment vessel. The main steam header has spring, pilot-operated or spring-loaded mechanical assist valves set at about 1,125 psig. Their main use is to keep the safety valves from opening. Since the steam in the single-cycle BWR is radioactive, any discharge from these relief valves is fed to the reactor suppression chamber and discharged under water. Water is subsequently treated, with radioactive materials being removed before disposal. The capacity of each valve may be as high as 800,000 lbs/hour of steam.

Conventional safety relief valves throughout the plant pumping system are comparable to those used in existing fossil-fuel power plants. Forged steel valves of the required pressure class are manufactured to quality levels, including non-destructive testing and third party inspection, in accordance with the Pump and Valve Code requirements for Nuclear Classes 1, 2 and 3 as designated by the design specifications.





MSSV – MAIN STEAM SAFETY VALVE
(3700 Series)

ERV – ELECTROMATIC RELIEF VALVE
(1525 VX Series)

POSRV – PILOT OPERATED SAFETY RELIEF VALVE
(13900 Series)



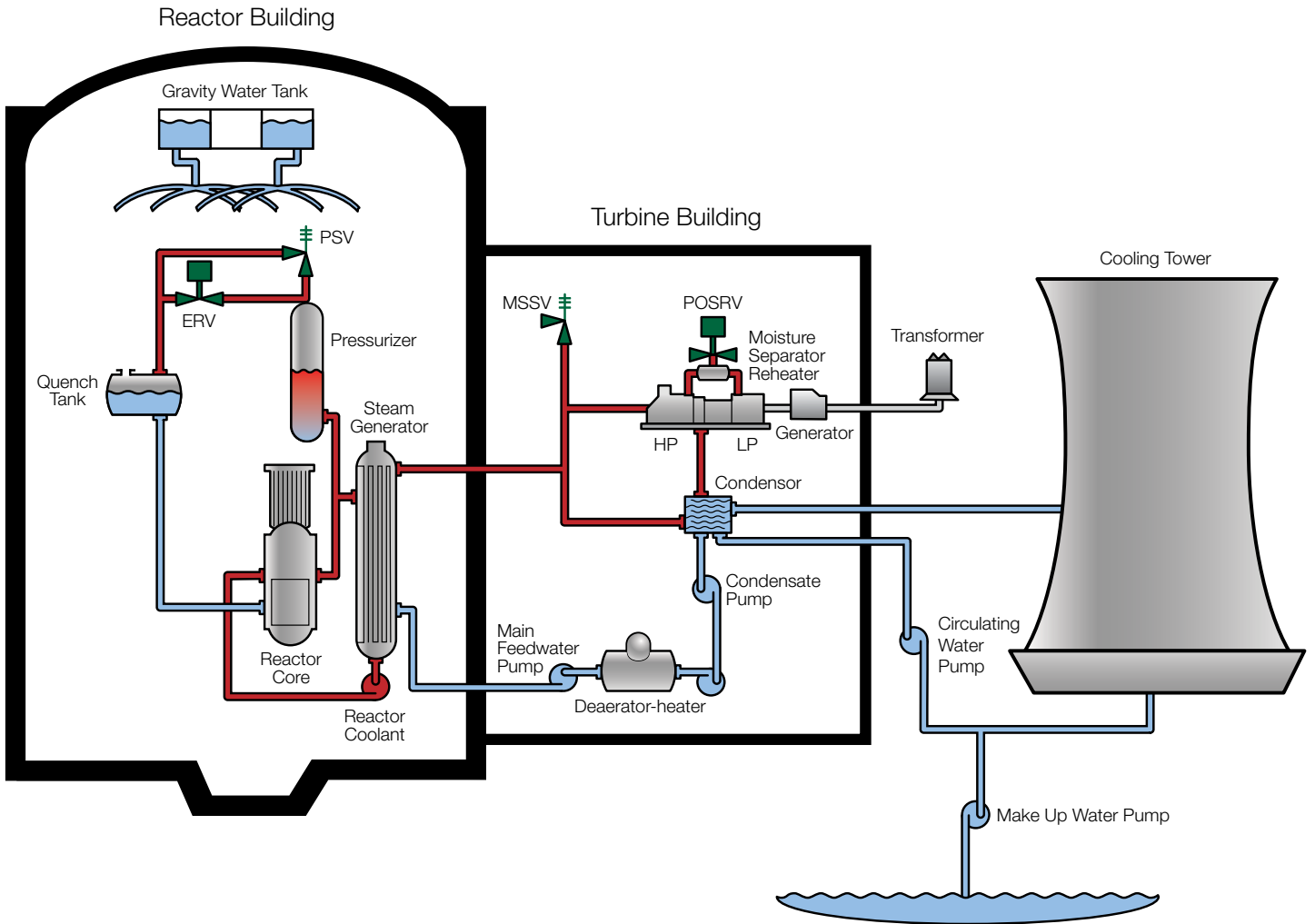
Pressurized Water Reactor

Maintaining High Industry Standards

A primary loop is located inside the containment vessel, and a secondary loop sends steam to the turbine. Water in the primary loop is radioactive; steam in the secondary loop is not radioactive. The pressurizer in the primary system is equipped with several power-actuated relief valves set above operating pressure in addition to the spring-loaded safety valves required by the ASME Code. The released steam is discharged under water in a quench tank. This water must also be treated for disposal to remove radioactive materials in the released steam. The actual percentage of total generating capacity represented by installed safety valves on a pressurized water reactor (PWR) is determined by the reactor manufacturer and the Atomic Energy Commission through a detailed analysis of possible pressure transients in the system. Secondary steam valves are selected for full generating capacity of the heat exchangers. A current problem with pressurizer relief valves is that the water in the primary loop contains some boric acid and releases a certain amount of hydrogen. It is extremely difficult to keep a safety relief valve tight against hydrogen infiltration because acid tends to seep into tiny openings, fouling the seat. Remedies include the thermodisc and low spindle bearing points, which are standard on GE's Consolidated valves. Other remedies include anti-simmer devices and water seals ahead of the valves.

Forged steel valves of the required pressure class are manufactured to quality levels, including non-destructive testing and third-party inspection, in accordance with the Pump and Valve Code requirements for Nuclear Classes 1, 2, and 3 as designated by the design specifications.





MSSV – MAIN STEAM SAFETY VALVE
(3700 Series)

PSV – PRESSURIZER SAFETY VALVE
(31700 Series)

ERV – ELECTROMATIC RELIEF VALVE
(1525 VX Series)

POSRV – PILOT OPERATED SAFETY RELIEF VALVE
(13900 Series)



Pressure Relief Valves for Nuclear Service

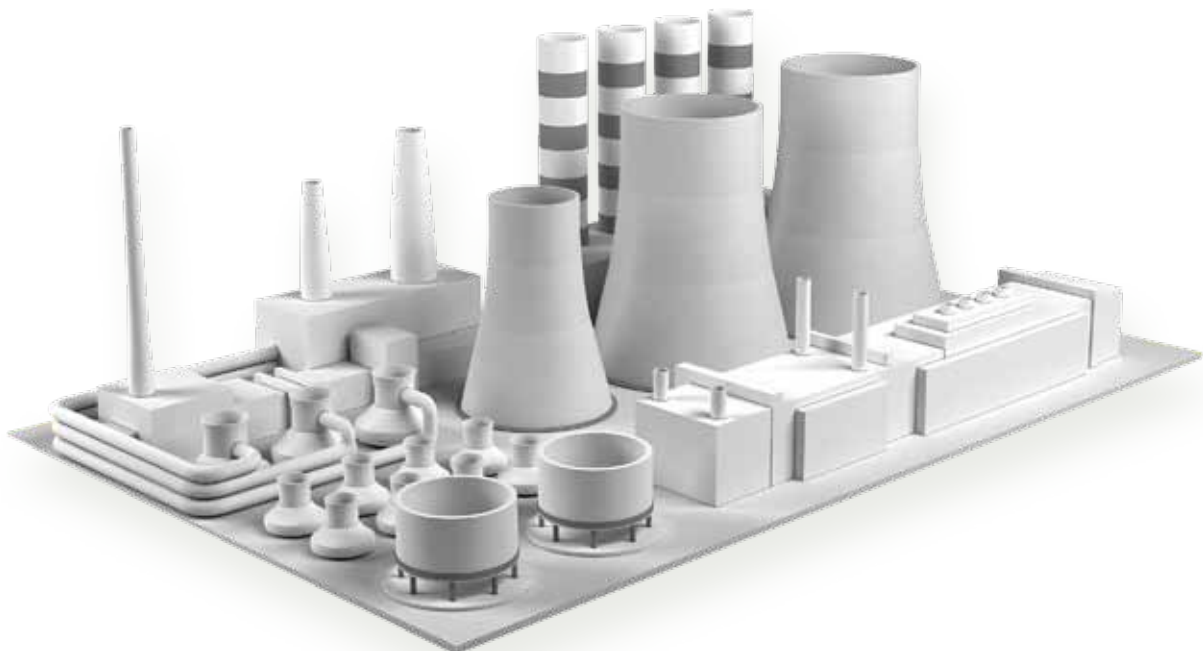
Designed for ASME Section III, Class 1, 2 and 3 Valve Specifications, as well as ASME Section VIII, Safety Related, and Section I for Commercial Applications

Proven Dependability

For more than 100 years, Consolidated pressure relief valves have been recognized for dependability and reliability. As one of the first nuclear valve product lines in the 1960s, Consolidated valves have been trusted for decades for their dependability in nuclear applications.

Committed to developing products that meet our customers' needs while maintaining high industry standards, GE listens carefully to our customers and stays informed of the challenges they face. As a result, we can configure, engineer, and manufacture valves that help address real-world issues. Simultaneously, we work closely with regulatory organizations to meet the requirements specified in industry codes such as ASME.

GE's line of Consolidated nuclear pressure relief valves comply with several ASME sections, making them a good choice for a range of applications. Our nuclear service valves meet ASME Section III, Class 1, 2 and 3 valve specifications, as well as ASME Section VIII, Safety Related, and Section I, Commercial Applications.



Certified Quality

GE maintains strict standards for product manufacturing and testing through an ASME-approved Quality Assurance Program. In addition, our facility holds ISO-9001 Quality System Certification, and we work to achieve further quality by setting internal standards that exceed those set by regulatory organizations. The Quality Management System and Design Control procedures outline exacting design criteria and testing parameters. Only after a valve has gone through a rigorous quality program does it receive GE's Consolidated Green Tag* symbol, demonstrating that it meets or exceeds compliance mandates.

Expert Technical Support throughout the Product Life Cycle

Our service organization stands behind each nuclear service valve with the expertise, technical skill and application knowledge customers have come to expect from GE. 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. We can also offer guidance on solving difficult challenges and issues.

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

WITH A RANGE OF STYLES, MODELS, OPTIONS AND CONFIGURATIONS, GE'S CONSOLIDATED NUCLEAR SAFETY VALVES AND SAFETY RELIEF VALVES ARE WELL-SUITED FOR MANY DIFFERENT PROCESS AND STEAM SERVICE APPLICATIONS, INCLUDING:

- PRIMARY, SECONDARY AND AUXILIARY SYSTEMS
- MAIN STEAM SYSTEMS FOR BWRs AND PWRs
- REACTOR COOLANT SYSTEM FOR PWRs
- PRIMARY PLANT PRESSURE VESSELS MAIN STEAM GENERATORS
- PRIMARY VESSEL SERVICE CLOSED LOOP SYSTEMS
- MOISTURE SEPARATOR RE-HEATER SYSTEMS
- SAFETY INJECTION SYSTEMS
- CHEMICAL AND VOLUME CONTROL SYSTEMS
- VENTILATING SYSTEMS
- NITROGEN BLANKETING SYSTEM



Consolidated Nuclear Service Valve Products



Type 3700
Main Steam Safety Valve

The type 3700 valve is configured specifically to meet the stringent requirements of ASME Section III, Class 1 and Class 2. This valve is the primary pressure relief on main steam systems in BWR and PWR reactors.

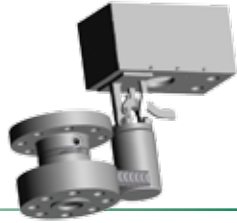
Inlet Sizes:	2 1/2" through 10"
Outlet Sizes:	6" through 12"
Orifice Sizes:	3, 4, 6, 7, Q, 8, R, RR, S and T
Set Pressure Range:	50 to 1500 psig
Temperature Range:	Up to 600°F
Materials:	Carbon Steel / Alloy Steel
Reactor Service:	Boiling Water, Pressurized Water
Typical Application:	Primary plant pressure vessels and main steam generators
Certification:	ASME Section III, Class I for BWR and Class 2 for PWR, NV-Stamped



Type 31700
Pressurizer Safety Valve

The type 31700 valve is configured to meet ASME Nuclear Code, Section III. This valve offers primary overpressure protection in reactor coolant systems in PWR reactors.

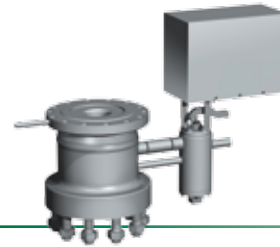
Inlet Sizes:	1 1/2" through 6"
Outlet Sizes:	8"
Orifice Sizes:	1, 3, 5, 6, K, L, M, N, and P
Set Pressure Range:	100 to 3000 psig
Temperature Range:	Up to 700°F
Materials:	Stainless Steel
Reactor Service:	Pressurized Water
Typical Application:	Primary vessel service and closed loop systems
Certification:	ASME Section III, Class I, NV-Stamped



Type 31533VX Power Operated Relief Valve

The type 31533VX power-operated relief valve (PORV) is configured to meet ASME Nuclear Code, Section III, Class 1, in PWR reactors.

Inlet Sizes:	2 1/2"
Outlet Sizes:	4"
Orifice Sizes:	13/16 through 1 5/8"
Set Pressure Range:	300 to 2500 psig
Temperature Range:	Up to 1050°F
Materials:	Stainless Steel
Reactor Service:	Pressurized Water
Typical Application:	Primary vessel service and closed loop systems
Certification:	ASME Section III, N-Stamped



Type 1525VX Electromatic Relief Valve

The type 1525VX Electromatic relief valve is configured to meet ASME Nuclear Code, Section III, Class 1, for BWR reactors.

Inlet Sizes:	6"
Outlet Sizes:	8"
Orifice Sizes:	3.860"
Set Pressure Range:	100 to 1500 psig
Temperature Range:	Up to 700°F
Materials:	Carbon Steel
Reactor Service:	Boiling Water
Typical Application:	Primary vessel service and closed loop systems
Certification:	ASME Section III, N-Stamped



Consolidated Nuclear Service Valve Products



**Type 1541-3, 1543-3
Safety Valve**

The type 1541-3 and 1543-3 valves are configured to meet ASME Nuclear Code, Section III, Class 3, Section VIII, Safety Related, and Section I, Commercial. This spring-loaded safety valve product line is certified for air system protection service within nuclear power plant processes.

Inlet Sizes:	1/2" through 2 1/2"
Outlet Sizes:	3/4" through 2 1/2"
Orifice Sizes:	D, E, F, G, H and J
Set Pressure Range:	15 to 300 psig
Temperature Range:	Up to 420°F
Materials:	Stainless Steel
Reactor Service:	Air System Protection
Typical Application:	Auxiliary Safety Systems
Certification:	ASME Section III, Class 3, NV-Stamped ASME Section VIII, Safety Related ASME Section I, Commercial



**Type 1900
Safety Relief Valve**

The type 1900 valve is configured to meet ASME Nuclear Code, Section III, Class 3, and Section VIII, Safety Related and Commercial. This valve meets numerous application requirements and is well suited for the demanding requirements of nuclear applications.

Inlet Sizes:	1" through 12"
Outlet Sizes:	2" through 16"
Orifice Sizes:	D, E, F, G, H, J, K, L, M, N, P, Q, R, T, U, V and W
Set Pressure Range:	15 to 3000 psig
Temperature Range:	Up to 700°F
Materials:	Carbon Steel, Stainless Steel or Monel
Typical Application:	Various Nuclear and Balance of Plant Applications
Certification:	ASME Section III, Class 3 ASME Section VIII, Safety Related and Commercial



Type 19000 Safety Relief Valve

The type 19000 valve is configured to meet ASME Nuclear Code, Section III and Section VIII. This valve meets numerous application requirements and is well suited for the demanding requirements of nuclear applications. Its short-fixed blowdown makes it a good choice for thermal relief services.

Inlet Sizes:	1/2" to 2"
Outlet Sizes:	1"
Orifice Sizes:	.096 through .567"
Set Pressure Range:	15 to 3000 psig
Temperature Range:	Up to 700°F
Materials:	Carbon Steel, Stainless Steel or Monel
Typical Application:	Various Nuclear and Balance of Plant Applications
Certification:	ASME Section III, Class 1, 2 or 3, NV-Stamped ASME Section VIII, Safety Related



Type 13900 Pilot Operated Safety Relief Valve

The type 13900 pilot-operated safety relief valve is configured for high-capacity steam overpressure protection for moisture separator reheater systems.

Inlet Sizes:	16" to 20" flanged
Outlet Sizes:	18" through 24" flanged
Orifice Sizes:	114, 143.1, 176.7 and 201 sq. in.
Set Pressure Range:	50 psig to 300 psig
Temperature Range:	250°F to 550°F
Materials:	Carbon Steel with Stainless Steel trim
Typical Application:	Moisture Separator Reheater Systems
Certification:	ASME Section VIII, PED and SQL



Consolidated Safety Relief Valve Products



**Type 2478
Pressure Relief Valve**

The type 2478 pressure relief valve features an enclosed design for safety-related applications.



**Type 2900
Pilot Operated Safety Relief Valve**

The type 2900 pilot-operated safety relief valve combines the strengths of two products into one—the 1900 safety relief valve and the 3900 POSRV. The 2900 POSRV is configured to replace spring-loaded relief valves without requiring modified outlet piping.

Inlet Sizes:	1/2" through 2 1/2"
Outlet Sizes:	3/4" through 2 1/2"
Orifice Sizes:	D, E, F, G, H and J
Set Pressure Range:	15 to 300 psig
Temperature Range:	-325°F to 406°F
Materials:	Cast need space between bronze and bonnet, brass base and trim and PTFE soft seats
Certification:	Non-Coded

Inlet Sizes:	1" through 12"
Outlet Sizes:	2" through 16"
Orifice Sizes:	Seventeen sizes – D through W
Set Pressure Range:	15 to 6250 psig
Temperature Range:	-40°F to 505°F
Materials:	Stainless steel pilot with carbon steel main valve and stainless steel trim
Certification:	ASME Section I Code Case 2446 and ASME Section VIII, PED and SQL



Type 3900 Pilot Operated Safety Relief Valve

The type 3900 pilot-operated safety relief valve is a non-flowing design available in a modulating or pop action pilot. The 3900 POSRV offers overpressure protection for many pressurized systems in the nuclear industry.

Inlet Sizes:	1" through 10"
Outlet Sizes:	2" through 10"
Orifice Sizes:	Fourteen sizes – D through T
Set Pressure Range:	15 to 6250 psig
Temperature Range:	-40°F to 505°F
Materials:	Stainless steel pilot with carbon steel main valve and stainless steel trim
Certification:	ASME Section VIII, PED and SQL



Type 4900 Pilot Operated Safety Relief Valve

The type 4900 pilot-operated safety relief valve is a tubeless valve offering overpressure protection for many pressurized systems in the nuclear industry.

Inlet Sizes:	1" to 8" flanged
Outlet Sizes:	2" through 10" flanged
Orifice Sizes:	Fourteen sizes – D through T
Set Pressure Range:	15 psig to 7200 psig
Temperature Range:	-40°F to 505°F
Materials:	Stainless steel pilot with carbon steel main valve and stainless steel trim
Certification:	ASME Section VIII, PED and SQL



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