WALWORTH®

Since 1842

CAST STEEL SAFETY AND RELIEF VALVE

CATALOG

www.walworth.com

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Introduction

WALWORTH Safety and Relief Cast Steel Valves

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CE TÜV CERT YARMOUTH RESEARCH AND TECHNOLOGY QMS REGISTERED ISO 9001 Certificate Number: 0038

WALWORTH

WALWORTH is one of the world´s most comprehensive industrial valve manufacturers. Founded in 19th century by James Walworth, the Company has consistently dedicated itself to improvements in design and manufacturing of an array of valves exceptionally suited for the world´s fluid control sector. We satisfy all end use industries and comprehensive customer requirements by adhering to the most demanding quality standards.

WALWORTH relies on its broad experience in supplying valves to the petrochemical, oil & gas, petroleum, power generation, pulp and paper, cryogenic and geothermal industries, among others.

Over the years, Walworth has produced over 40,000 different types of products and serves as a global supplier to various markets utilizing the expertise of over 500 trained employees.

Our manufacturing system includes: utilization of Company directed raw material warehouses; modern and newly acquired specialized machinery; welding processes such as SMAW, GMAW, SAW, PAW; assembly testing for all low pressure, high pressure, and at low or high temperatures; painting and coating processes; export crating and shipment.

WALWORTH is capable of providing the world´s most comprehensive industrial valve line to the North American, Central American, South American, European and African markets. WALWORTH is proud to meet and satisfy the precise demands of our customers throughout the world by providing a quality product, competitive cost, and excellent service.

WALWORTH VALUES

MISSION
WALWORTH manufactures and supplies world-class valves and components for the flow control industry through exceptional service, competitive pricing, and consistently, on-time deliveries.

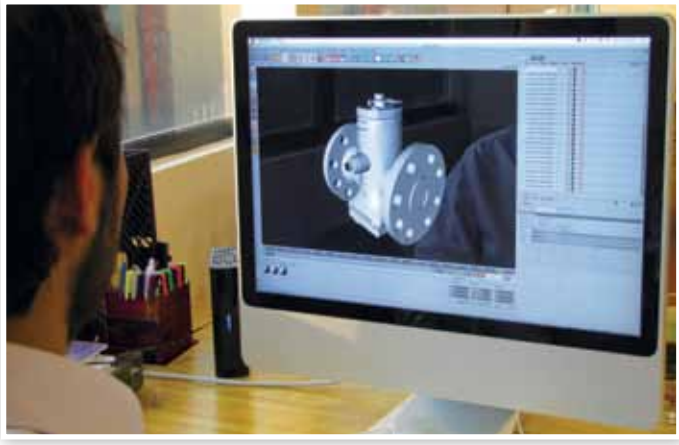
VISION
To be the world leader of unparalleled valve manufacturing and supply, WALWORTH:

- Set the standard for product quality in the flow control industry.
- Exceed the service expectations of our customers.
- Forge enduring relationships with customers, team members, and community.
- Hire, develop, and retain experienced and dedicated team members.

WALWORTH ENGINEERING CONTROL

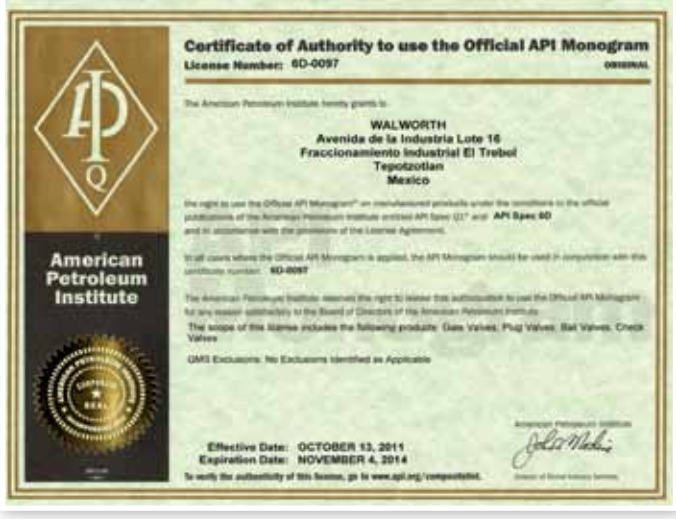
WALWORTH products are manufactured following strict international standards recognized all over the world, such as API, ANSI, ASME, ASTM, MSS, NACE, AWWA, BSI, and CSA, among others. Our Engineering team consistently monitors, updates and incorporates these standards and makes any applicable changes that affect the design, regulations, and/or performance of our products.

Our designs use the most advanced technology and equipment, finite elements, and CAD system programs to ensure proper assembly and performance. From conception to calculation to detailed drawings for manufacturers, WALWORTH is a leader in development of new products that meet the needs of the current valve market.



WALWORTH QUALITY SYSTEM

Throughout the years, WALWORTH has developed its Quality System which is an integral part of our manufacturing policy. Our primary goal is to provide products that meet and exceed market standards. In this sense, WALWORTH is an ISO-9001 Audited and Certified Company that has achieved major certifications worldwide. Our system includes the selection of raw materials from approved vendors and rigorous oversight of our manufacturing process that is vital to quality control. The use of serial numbers allows WALWORTH the ability to not only ensure the quality of components used but to monitor and trace the fabrication process as well.



Certificate of Authority to use the Official API Monogram
License Number: 6D-0097
ORIGINAL
WALWORTH
Avenida de la Industria Lote 16
Fraccionamiento Industrial El Trebol
Tepotzotlan
Mexico
API Spec 6D
6D-0097
Gate Valves, Plug Valves, Ball Valves, Check Valves
QMS Exclusions: No Exclusions Identified as Applicable
American Petroleum Institute
Effective Date: OCTOBER 13, 2011
Expiration Date: NOVEMBER 4, 2014

Certificate API-6D No. 6D-0097 issued by American Petroleum Institute to apply on Gate valves, Plug valves, Ball valves and Check valves manufactured in accordance with API-6D specification.

Certificate of Authority to use the Official API Monogram
License Number: 6A-0234
ORIGINAL
WALWORTH
Avenida de la Industria Lote 16
Fraccionamiento Industrial El Trebol
Tepotzotlan
Mexico
API Spec 6A
6A-0234
Valves at PSL 1 and 2
QMS Exclusions: No Exclusions Identified as Applicable
American Petroleum Institute
Effective Date: OCTOBER 13, 2011
Expiration Date: NOVEMBER 4, 2014

Certificate API-6A No. 6A-0234 from American Petroleum Institute to apply on valves at psig, 1 through 4.

QMS REGISTERED

Certificate of Registration

APIQR® REGISTRATION NUMBER
0038

This certifies that the quality management system of

WALWORTH
Avenida de la Industria Lote 16
Fraccionamiento Industrial El Trebol
Tepotzotlan
Mexico

has been assessed by the American Petroleum Institute Quality Registrar (APIQR®) and found it to be in conformance with the following standard

ISO 9001:2008

The scope of this registration and the approved quality management system applies to the

Design and Manufacture of Valves

APIQR® approves the organization's justification for excluding:

No Exclusions Identified as Applicable

Effective Date: November 4, 2011
Expiration Date: November 4, 2014
Registered Since: November 4, 2011

Manager of Operations, APIQR

Certificate ISO-9001 No. 0038 issued by American Petroleum Institute since April 1999.

Certificate

Quality-Assurance System
acc. to Directive 97/23/EC

Certificate no.: 01 202 USA/Q-10 0012

Name and address of the manufacturer: Walworth Industrial de Válvulas, S.A. de C.V.
Av. De la Industria Lote 16,
Fracc. Industrial El Trebol,
Tepotzotlán, Edo. de México,
CP 54600, Mexico

Herewith we certify that the above-mentioned manufacturer operates a quality system according to the European Directive 97/23/EC. The manufacturer has the permission to affix the following CE marking to pressure equipment described and manufactured in accordance to the scope covered by this Quality-Assurance System:

CE 0035

Tested acc. to Directive 97/23/EC: QS-System (Modul H)
(The QS-Modules E1, E, D1, and D are performed by Module H1)

Audit report no.: USA/Q-10 0012

Scope: Design and Manufacturing of industrial valves in accordance with the attached Scope of Validity.

Manufacturing plant/supplier: Av. De la Industria Lote 16,
Fracc. Industrial El Trebol,
Tepotzotlán, Edo. de México,
CP 54600, Mexico

Valid until: April 07, 2013

Cologne, April 08, 2010 Dr.-Ing. Wichert

TÜV Rheinland-Certification Body for Pressure Equipment
TÜV Rheinland Industrie Service GmbH
Notified Body ID-No. 0035
Am Grauen Stein, D-51105 Köln

www.tuv.com

TÜVRheinland®
Precisely Right.

Certificate as per PED 97/23/EC Module H to stamp CE products.

CFE Una empresa de clase mundial

LAPEM

LABORATORIO DE PRUEBAS DE EQUIPOS Y MATERIALES

CONSTANCIA DE CALIFICACIÓN DE PROVEEDOR

NUMERO 082/11

SE HACE CONSTAR QUE LA EMPRESA CUYOS DATOS SE DESCRIBEN A CONTINUACIÓN:

RAZÓN SOCIAL: INDUSTRIAL DE VALVULAS, S. A. DE C.V.
PLANTA O DIVISIÓN: PLANTA (MAIN)
DOMICILIO: Avenida de la Industria No. 16, Fracc. Industrial El Trebol, 54600 TEPOTZOTLAN EDO.DE MEX MEXICO

HA SIDO EVALUADA CONFORME A LOS PROCEDIMIENTOS ESTABLECIDOS EN ESTA GERENCIA, HABIENDO SIDO CALIFICADA COMO PROVEEDOR APROBADO PARA EL SUMINISTRO DE LOS BIENES O SERVICIOS INDICADOS AL REVERSO.

LOS RESULTADOS, CONDICIONES, COMPROMISOS Y DETALLES DE LA ACTIVIDAD ESTÁN EXPRESADOS EN EL REPORTE DE REFERENCIA, TENIENDO ESTA CONSTANCIA LA VIGENCIA ESPECIFICADA, RESERVÁNDONOS EL DERECHO DE MODIFICARLA EN CUALQUIER MOMENTO, SI LAS CONDICIONES QUE LE DIERON ORIGEN SON ALTERADAS.

ESTA CONSTANCIA DE CALIFICACION CANCELA CUALQUIER OTRA CONSTANCIA O DOCUMENTO DE CALIFICACION EMITIDO CON ANTERIORIDAD PARA LA EMPRESA ARRIBA SEÑALADA.

FECHA DE EMISIÓN | VIGENCIA: 8 Meses a partir de su emisión

REPORTE DE REFERENCIA: SE - 900175 - 24

ING. JORGE THOMAS LOMELI
Jefe Depto. Evaluación y Desarrollo de Proveedores

ING. LUIS JAVIER FREYRE RIZO
Gerente de LAPEM

Certificate of Reliable Supplier No. 082/11 issued by CFE in accordance with ISO-9001 Quality Assurance System.

PETROLEOS MEXICANOS

GRUPO TECNICO DE EVALUACION DE PROVEEDORES E INSPECCION DE BIENES

Nº REPORTE GTE-SGC-0172007
NORMAS NMX-CC-9001:2008
ISO – 9001: 2008

CONSTANCIA DE PROVEEDOR CONFIABLE

Nº 0552/2007

INDUSTRIAL DE VALVULAS, S.A. DE C.V. (101-I-439)
AV. INDUSTRIA, LOTE 16
FRACC. INDUSTRIAL EL TREBOL
TEPOTZOTLAN, EDO. DE MEX. C.P. 54600
TEL. 5899 1700

DE ACUERDO CON LA AUDITORIA A SU SISTEMA DE GESTION DE LA CALIDAD EFECTUADA POR PETROLEOS MEXICANOS Y ORGANISMOS SUBSIDIARIOS, CONFORME AL PROCEDIMIENTO GTE/PS-007/99, SE OTORGA LA PRESENTE CONSTANCIA PARA EL SUMINISTRO DE LOS SIGUIENTES PRODUCTOS:

FABRICANTE DE VALVULAS DE ACERO FUNDIDO COMPUERTA API 6D, GLOBO ASME B16.34, RETENCION, COMPUERTA, BOLA, MACHO API 6D, VALVULAS DE ACERO FORJADO COMPUERTA, GLOBO RETENCION API 602, MARIPOSA AWWA C504, SEGURIDAD Y ALIVIO.

ESTA CONSTANCIA SE EXTIENDE, EN EL ENTENDIDO DE QUE PETROLEOS MEXICANOS EFECTUARA AUDITORIAS DE SEGUIMIENTO A SU SISTEMA DE GESTION DE LA CALIDAD, RESERVANDOSE EL DERECHO DE REVOCAR SU VALIDEZ, DE ACUERDO CON LOS RESULTADOS QUE SE OBTENGAN Y NO EXIME AL PROVEEDOR DE PRESENTAR SUS PRODUCTOS PARA VERIFICACION DE LA CALIDAD, CUANDO ASI SE LE REQUIERA.

FECHA DE EMISION: JUNIO / 2007
FECHA DE EXPIRACION: JUNIO / 2009

LIC. JAIME CONTRERAS ZEPEDA
PRESIDENTE

LUISA MAGDALENA FLORES DELGADO
SECRETARIO EJECUTIVO

ING. JESUS MENDOZA RODRIGUEZ
SECRETARIO TECNICO

Certificate NMX-CC-9001 (Mexican Standards ISO-9001) No. 0552/2007 issued by PEMEX in accordance with ISO-9001 Quality Assurance System.

In addition to the Quality System Certifications, WALWORTH has achieved the following specific product certifications:

TÜV CERT

TÜVRheinland®
Precisely Right.

CERTIFICATE

Certificate No.: 01 202 USA-TA-09-79768

Concerning the Agreement with the Technical Requirements in:

TA-Luft 2002, VDI 2440 Nov. 2000, Sec. 3.3.1.3

Test report: 209140 Datum: 03 December, 2009

Client: Industrial de Valvulas, S.A. de C.V.

Manufacturer's Address: Av. De la Industria Lote 16 Fracc. Industrial El Trebol, Tepotzotlan, Edo. De Mexico, CP 54600

The stem sealing system and internal flange connection have been successfully tested to meet the tightness criteria of ≤ 10^{-6} mbar x l/(s x m) with a helium mass spectrometer under the following conditions. The BFV Valve with the examined mechanical shaft seals fulfills the requirements of Section 5.2.6.4 of The German Clean Air Act, (TA-Luft), (Leakage Verification) in accordance with Section 3.3.1.3 of VDI 2440 (Rev. 2000).

Kind of Valve:	Walworth API 600 Gate Valve	
Valve Type:	4 Inch, Class 300, Figure 8288F WCB Body / CR 13 Stem & Disc / HF Seat	
Sealing System:	Graphite Seals	
Nominal Size, Nominal Pressure:	4 Inch, ANSI 300	
Inspection Media/Pressure:	Helium / 51 Bars	Temperature = Ambient
Switching Cycles: (2/min):	0 Cycles	Total Cycles 500
Leakage Rate : [mbar - l / sec]	8.2e-7 (mbar – l/sec)	3.7e-6 (mbar – l/sec)
Testing Method:	Helium Leak Test – VDI 3440, Appendix A	

Testing Laboratory: Yarmouth Research and Technology
Matthew J Wasielewski, PE
484 Walnut Hill Road, N. Yarmouth, ME USA
www.yarmouthresearch.com

TÜV Rheinland North America, Inc.
Industrial Services Division, Newtown, CT., USA
Kasuma J. Santos, Jr. – Examiner

TA Luft Certificate (Fugitive Emission) Approval ISO-5211 Top Flange, Anti-Static Device.

YARMOUTH RESEARCH AND TECHNOLOGY

PROJECT SUMMARY

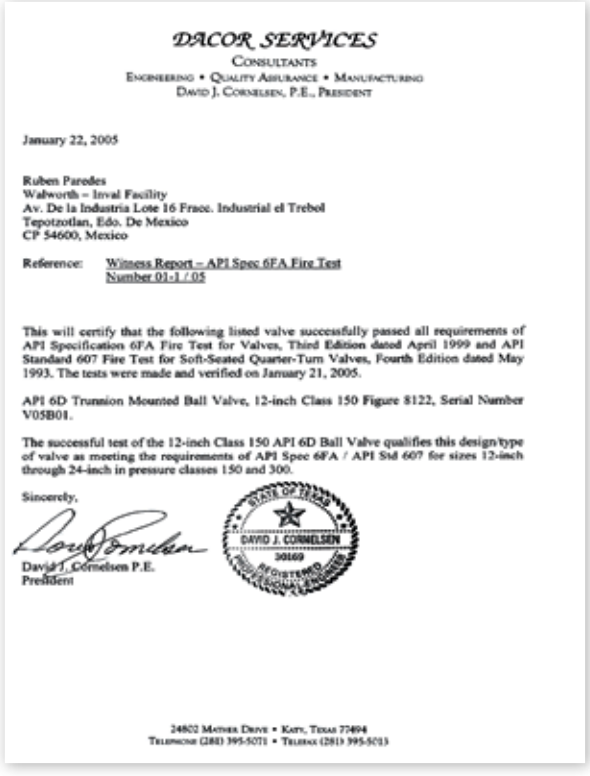
Project Number: 99069
Customer: The Walworth Company
Contact: David Cornelsen
Date(s) of Test: 12/9/99 – 12/20/99
Product(s) Tested: One 6" Class 300 Gate Valve with Empak-Mex EAF-100-001 packing.
Purpose of Test: The test was conducted to evaluate the valve's stem sealing performance at ambient and at 350° F as related to the 1990 Amendments to the Clean Air Act requirements. Leakage measurements were conducted in accordance with 40 CFR Part 60, Appendix A, Method 21.
Conclusion: Three thermal cycles from ambient to 350 deg. F were conducted throughout 3500 open/close cycles with the valve pressurized to 645 psig. The valve was cycled with a 45 RPM gear motor coupled to the handwheel. One packing nut adjustment was required at cycle number 300 to maintain leakage levels below 100 PPMv.

At cycle number 3500, the packing leakage was 25-29 PPMv with the stem static. The packing nuts were tightened from 12/14 ft-lb back to 28 ft-lb and leakage decreased to about 1 PPMv.

See the attached data sheets for more information.

Test Witness:
Matthew J. Wasielewski, P. E., President
YARMOUTH RESEARCH AND TECHNOLOGY

Certificates of Ultra Low Fugitive Emissions No. 20985-3, 8 & 16 in accordance with ISO-15848-1 "Industrial Valves"- Measurement, Test and Qualification Procedures for Fugitive Emissions" "Part 1: Classification System and Qualification Procedures for Type Testing of Valves".



DACOR SERVICES
CONSULTANTS
ENGINEERING • QUALITY ASSURANCE • MANUFACTURING
DAVID J. CORNELSEN, P.E., PRESIDENT

January 22, 2005

Ruben Paredes
Walworth – Inval Facility
Av. De la Industria Lote 16 Fracc. Industrial el Trebol
Tepotzotlan, Edo. De Mexico
CP 54600, Mexico

Reference: Witness Report – API Spec 6FA Fire Test Number 03-1 / 05

This will certify that the following listed valve successfully passed all requirements of API Specification 6FA Fire Test for Valves, Third Edition dated April 1999 and API Standard 607 Fire Test for Soft-Seated Quarter-Turn Valves, Fourth Edition dated May 1993. The tests were made and verified on January 21, 2005.

API 6D Trunnion Mounted Ball Valve, 12-inch Class 150 Figure 8122, Serial Number V05B01.

The successful test of the 12-inch Class 150 API 6D Ball Valve qualifies this design/type of valve as meeting the requirements of API Spec 6FA / API Std 607 for sizes 12-inch through 24-inch in pressure classes 150 and 300.

Sincerely,

David J. Cornelsen P.E.
President

STATE OF TEXAS
DAVID J. CORNELSEN
90169
REGISTERED
PROFESSIONAL ENGINEER

24802 Mather Drive • Katy, Texas 77494
Telephone (281) 395-5071 • Telefax (281) 395-5013

Fire Test Certificate No. 04/04 in accordance with API-6FA and API Standard API-607 for Trunnion Ball Valves in accordance with API-6D.

Type 1S/P3 Series

FUGITIVE EMISSION TEST CERTIFICATE

Name of Manufacturer: Walworth
Description of Valve: 3 inch Class 300 Gate Valve
S2060 with Ultra Low Emissions Packing
Test Specification: ISO 15848-1 (2006) -Industrial valves — Measurement, test and qualification procedures for fugitive Emissions Part 1: Classification system and qualification procedures for type testing of valves
Test Parameters: Endurance Class: CO1 – 500 Cycles; Performance Class: BH
Temperature Classes: Ambient, 200C, 400C, -20C; Pressure Class: ANSI 300
Test Date: August 2009; Certificate Number: 209083-3

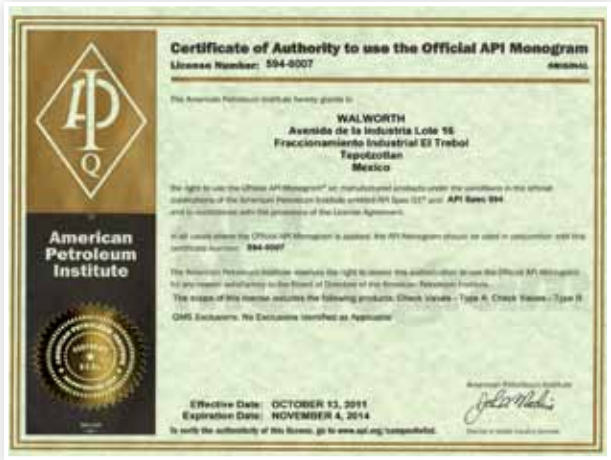
RESULTS

The packing qualifies to Class B leakage levels with no readings above 3.9 e-5 atm cc/sec throughout the tests.

This certificate refers to the above mentioned product for the test conducted. This certificate does not imply assessment of the production of the product and future performance.

Laboratory Information
Name: Yarmouth Research and Technology
Address: 434 Walnut Hill Road, North Yarmouth, ME 04097 USA
Tester: Matthew Wasielewski, PE, info@yarmouthresearch.com, www.yarmouthresearch.com, (207) 829-5359

Emissions after 500 cycles at ambient and 350 °F issued by Yarmouth Research and Technology Lab for 3 inch Class 300 Gate Valve After 500 cycles the measurement result was less than 50 ppm.



Certificate of Authority to use the Official API Monogram
License Number: 594-0007

WALWORTH
Avenida de la Industria Lote 16
Fraccionamiento Industrial El Trebol
Tepotzotlan
Mexico

American Petroleum Institute

Effective Date: OCTOBER 13, 2011
Expiration Date: NOVEMBER 4, 2014

Certificate API-594 No. 594-0007 issued by American Petroleum Institute to apply on Check Valves-Type A; Check Valves Type B manufactured in accordance with API-594 specification.

FUGITIVE EMISSION TEST CERTIFICATE

Name of Manufacturer: Walworth
Description of Valve: 8 inch Class 300 Gate Valve
S2060 with Ultra Low Emissions Packing
Test Specification: ISO 15848-1 (2006) -Industrial valves — Measurement, test and qualification procedures for fugitive Emissions Part 1: Classification system and qualification procedures for type testing of valves
Test Parameters: Endurance Class: CO1 – 500 Cycles; Performance Class: BH
Temperature Classes: Ambient, 200C, 400C, -20C; Pressure Class: ANSI 300
Test Date: August 2009; Certificate Number: 209083-8

RESULTS

The packing qualifies to Class B leakage levels with no readings above 6.1 e-5 atm cc/sec throughout the tests.

This certificate refers to the above mentioned product for the test conducted. This certificate does not imply assessment of the production of the product and future performance.

Laboratory Information
Name: Yarmouth Research and Technology
Address: 434 Walnut Hill Road, North Yarmouth, ME 04097 USA
Tester: Matthew Wasielewski, PE, info@yarmouthresearch.com, www.yarmouthresearch.com, (207) 829-5359

Emissions after 500 cycles at ambient and 350 °F issued by Yarmouth Research and Technology Lab for 8 inch Class 300 Gate Valve After 500 cycles the measurement result was less than 50 ppm.

Certificate of Authority to use the Official API Monogram
License Number: 600-0109

WALWORTH
Avenida de la Industria Lote 16
Fraccionamiento Industrial El Trebol
Tepotzotlan
Mexico

American Petroleum Institute

Effective Date: OCTOBER 13, 2011
Expiration Date: NOVEMBER 4, 2014

API-600 Certificate No. 600-0109 issued by American Petroleum Institute to apply on Bolted Bonnet Steel Gate Valves manufactured in accordance with API-600 specification.

FUGITIVE EMISSION TEST CERTIFICATE

Name of Manufacturer: Walworth
Description of Valve: 16 inch Class 150 Gate Valve
S2060 with Ultra Low Emissions Packing
Test Specification: ISO 15848-1 (2006) -Industrial valves — Measurement, test and qualification procedures for fugitive Emissions Part 1: Classification system and qualification procedures for type testing of valves
Test Parameters: Endurance Class: CO1 – 500 Cycles; Performance Class: BH
Temperature Classes: Ambient, 200C, 400C, -20C; Pressure Class: ANSI 150
Test Date: August-September 2009; Certificate Number: 209083-16

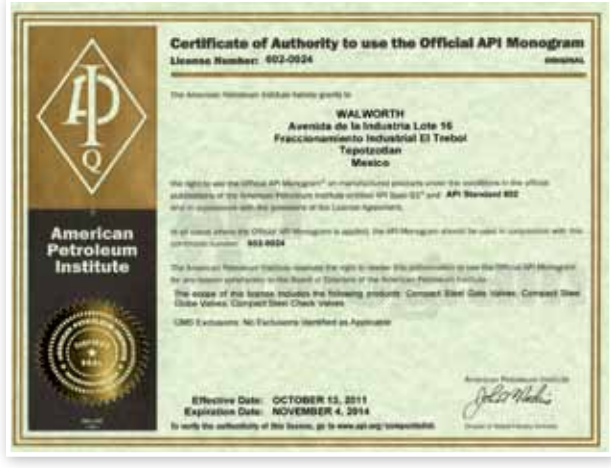
RESULTS

The packing qualifies to Class B leakage levels with no readings above 7.8 e-5 atm cc/sec throughout the tests.

This certificate refers to the above mentioned product for the test conducted. This certificate does not imply assessment of the production of the product and future performance.

Laboratory Information
Name: Yarmouth Research and Technology
Address: 434 Walnut Hill Road, North Yarmouth, ME 04097 USA
Tester: Matthew Wasielewski, PE, info@yarmouthresearch.com, www.yarmouthresearch.com, (207) 829-5359

Emissions after 500 cycles at ambient and 350 °F issued by Yarmouth Research and Technology Lab for 16 inch Class 150 Gate Valve After 500 cycles the measurement result was less than 50 ppm.



Certificate of Authority to use the Official API Monogram
License Number: 602-0024

WALWORTH
Avenida de la Industria Lote 16
Fraccionamiento Industrial El Trebol
Tepotzotlan
Mexico

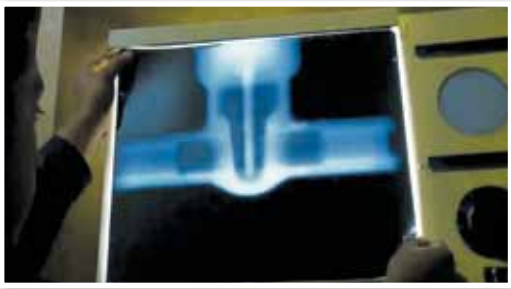
American Petroleum Institute

Effective Date: OCTOBER 13, 2011
Expiration Date: NOVEMBER 4, 2014

API-602 Certificate No. 602-0024 issued by American Petroleum Institute to apply on Compact Steel Gate Valves, Compact Steel Globe Valves, and Compact Steel Check Valves manufactured in accordance with API-602 specification.

QUALITY CONTROL EQUIPMENT

In order to ensure that WALWORTH products comply with international quality standards, in-house equipment is kept for monitoring control. Some of this equipment includes:



X-Ray Examination Equipment. WALWORTH has its own Ir-92 source in-house for the radiographic examination (RT) of castings from 0.100" up to 2 1/2" wall thickness to verify the soundness of the casting raw material.

PMI Equipment. A new generation of Positive Material Identification Equipment gives WALWORTH the capability to perform quick chemical analysis on incoming raw materials and on pieces after assembly to certify that materials used were produced and assembled in accordance with WALWORTH's and our Customer's specifications.

Magnetic Particle Test. On a random basis for standard products or when a Customer requests MT Certification, WALWORTH has magnetic particle test equipment to perform on ferromagnetic materials.

Penetrant Test Examination. WALWORTH has the personnel and materials to perform PT examination by solvent removable or water washable techniques. NDT personnel are ASNT Certified.

Test Loop. A complete Laboratory Test loop exists for design validation of WALWORTH products. The test is performed at maximum design pressure, advances the valves from 3000 to 5000 cycles, and requires more than four months to complete.

Pressure Gradient Test Loop. This test loop simulates live environment conditions and differential pressures to verify the valve design and flow characteristics.

Metrology of Laboratory. WALWORTH developed a calibration and/or verification system all the equipment used in its facilities. This ensures our ability to trace measurements, control products, and comply with international standards.

Fire Test Facilities. WALWORTH has the facilities to perform fire tests in accordance with API requirements. The test exposes the valve to a fire flame at 1400 to 1800 °F (761 to 980 °C) to verify proper seal of the valve.

Low Fugitive Emissions Test. This test is performed when a Customer requires low fugitive emissions certification. Our Lab has its own LFE test equipment that is capable of measuring less than 20 ppm in both, static and mechanical, conditions at either ambient temperature or thermal cycle operations.

Ultrasonic Testing Equipment. Using ultrasonic techniques, we can detect sub surface flaws in materials and evaluate castings and forgings that cannot be radiographed. In addition, we utilize these techniques to measure the wall thickness of castings and forgings.

Tensile Test Equipment. We use this equipment to verify the mechanical properties of materials used for manufacturing. WALWORTH tests samples on a random basis even though we receive MTRs from our suppliers and foundries.

Hardness Test Equipments. In both lab and shop tests, WALWORTH uses hardness testing equipment, such as Rockwell B, C, Brinell, or Vickers to ensure compliance with specifications.

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE

These valves work to release overpressure in a piping system. **WALWORTH** offers these kinds of valves as a solution for the automatic release of pressure from either a boiler, pressure vessel or other systems when the pressure or temperature exceed preset limits.

WALWORTH offers the following standard types of materials:

a) Carbon Steel WCC
b) Stainless Steel CF8 & CF8M
c) Low Carbon Steel LC3

TRIM materials:
a) Stainless Steel 316

Orifice Designation

Orifice	Minimum Area (API)		Minimum Area (ASME) actual	
	inches	mm²	inches	mm²
D	0.110	71	0.1279	83
E	0.196	126	0.2279	147
F	0.307	198	0.3568	230
G	0.503	325	0.5849	377
H	0.785	506	0.9127	589
J	1.287	830	1.496	965
K	1.838	1186	2.138	1379
L	2.853	1841	3.317	2140
M	3.60	2323	4.186	2701
N	4.34	2800	5.047	3256
P	6.38	4116	7.417	4785
Q	11.05	7129	12.85	8290
R	16.0	10323	18.60	12000
T	26.0	16774	30.21	18464

Inlet size (Screwed)		Model	Minimum Area (ASME) actual	
inches	mm		inches²	mm²
½, ¾, 1	13, 19, 25	1S20	0.110	71
¾	19	1S50	0.126	81
1	25	1S50	0.226	146
1 ½ , 2	28, 51	1S50	0.522	337

Type 1S-30 Series

Product Range

Type	Size	Inlet X Oulet Flange Class	Ends
Safety and Relief Steel Valves	1" x 2" to 8" x 10"	150 x 150, 300 x 150, 600 x 150 psig.	RF or RTJ
Type	**Size**	**Set Pressure**	**Ends**
Portable Safety and Relief Steel Valves	3/4" x 1" / 2" x 2"	Up to 2000 psig / Up to 5000 psig	Threaded, Socket Weld or RF or RTJ
Safety and Relief Steel Valves	1" x 2" to 8" x 10"	15 to 1480 psig	RF or RTJ

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
CONVENTIONAL TYPE 1S SERIES AS PER ASME SECTION VIII

The conventional purpose of Cast Steel Safety and Relief Valves is to relieve overpressure inside a pressure vessel, power boiler, piping or any other type of system at a certain flow. This design covers almost all possible applications; its eductor tube removes the pressure from the bonnet, assuring the proper valve operation.

Design characteristics

- Relief capacity according to ASME B & PVC SECT. VIII DIV. 1
- Orifice area according to ASME B & PVC SECT. VIII DIV. 1
- Distance between faces according to API 526
- Flange dimensions according to ASME B16.5
- NACE service according to MR-01-75 or MR-01-03
- Tests according to API 527

① WALWORTH Cast Steel Safety and Relief Valves can be built with a standard cap (screwed), flanged cap, plain lever, or packed lever.

② The spindle head is attached to the disc holder by a pressure retainer and a housing at the disc holder. This ensemble is very secure and hard to break.

③ The disc housing at the disc holder has a similar design to the one of a rod, so during difficult service conditions or in the event of a misalignment, the disc may adjust itself and keep a hermetic seal.

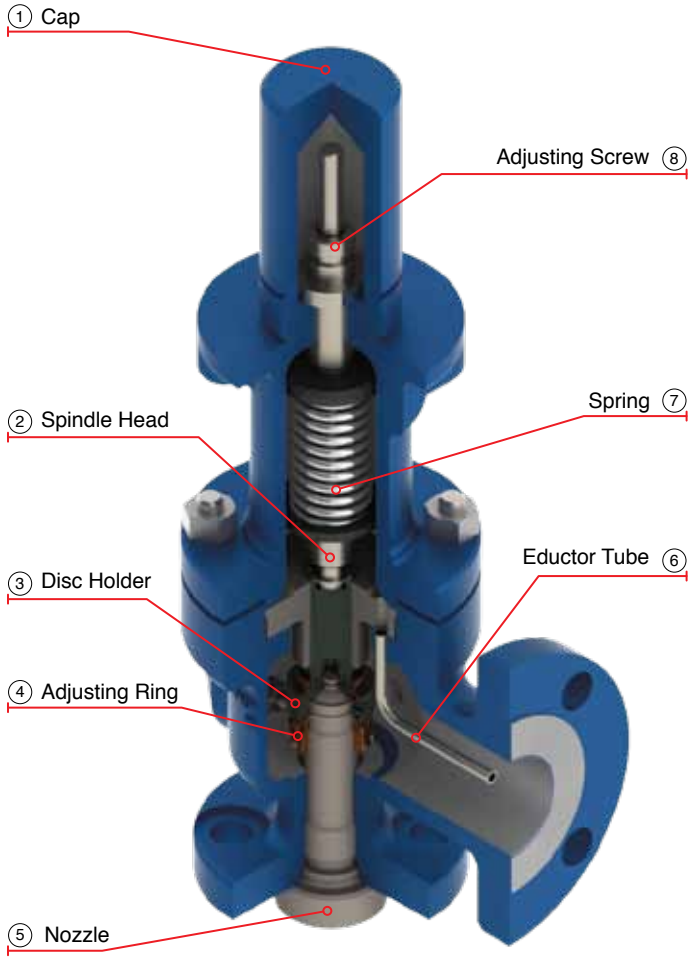
④ The adjusting ring is the element that adjusts the blowdown or differential pressure; by raising it the blowdown increases (closure pressure decreases), and by handing down the blowdown decreases (closure pressure increases). The ideal blowdown configuration closes the valve at the operation pressure of the system on which the valve is installed.

⑤ The orifice at the superior area of the nozzle is the one that defines the valve capacity. The inlet mechanism of this element is designed according to ASME specifications.

⑥ The eductor tube connects the valve Bonnet to the outlet in order to avoid the accumulation of pressure at the bonnet and ensures a proper operation of the valve.

⑦ WALWORTH offers springs in different types of materials to meet your process necessities. The standard spring is made out of Carbon Steel; Alloy Steel with a high content of Tungsten for high temperature service, and Austenitic Stainless Steel for low temperatures.

⑧ The adjusting screw is the element that compresses the spring to a certain position to define the set pressure of the valve. WALWORTH personnel pay a lot of attention to this element.



Type 1S Series

Blowdown Settings

The steel safety and Relief Valves have in their design a secondary orifice and a ring that can be adjusted to reduce the forces that raise the seal disc, in order to obtain the complete lift that will provide the flow capacity required in a shorter time. The maximium relief capacity is obtained in any normal position of the adjusting ring. This is achievable because of the design of the disc holder forms a pressure storage chamber, and the secondary orifice gives the flow a 180° direction.

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
CONVENTIONAL TYPE 1S SERIES AS PER ASME SECTION VIII

Design Features

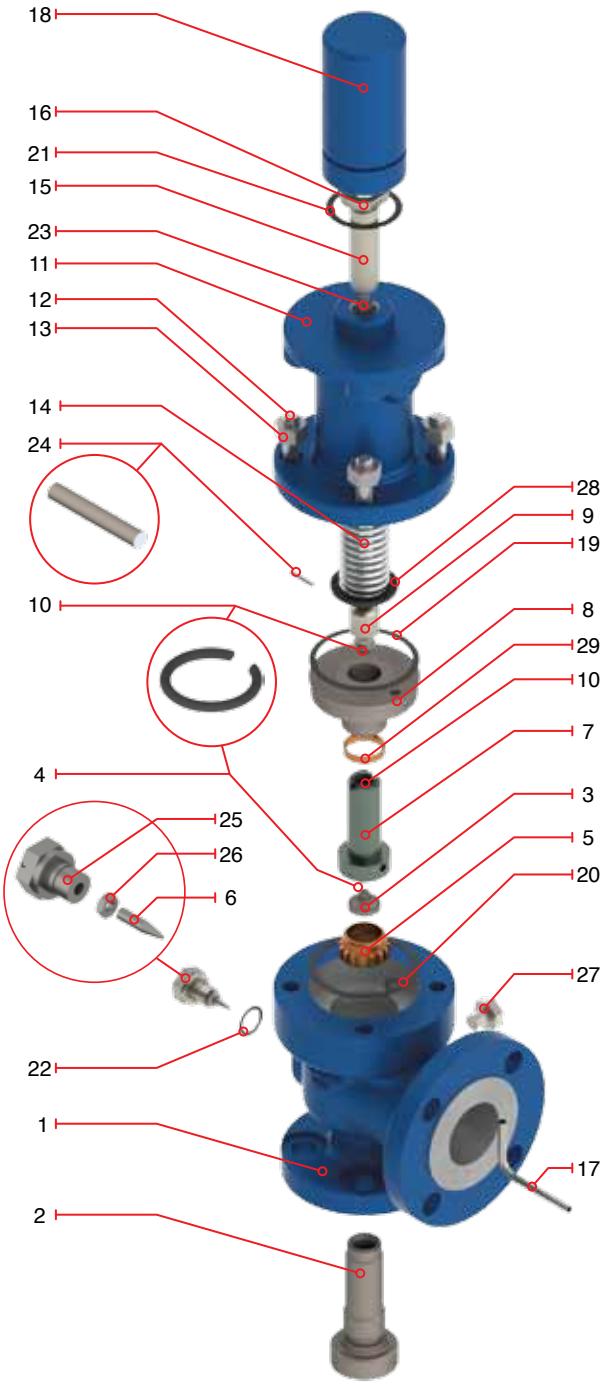
- Orifice from “D” to “T”
- Inlet size x outlet size from 1”x 2” to 8”x 10” flanged ends
- Class 150x150 to 600x150
- Closed Bonnet
- Full Nozzle
- Screwed Cap
- Actuated by Chrome Alloy 32°F (0 °C)up to 428°F (220 °C) Inconel X750 -328 °F(-200 °C) up to 1022 °F(550 °C)
- Minimum Set Pressure 15 psig (1.05 kg/cm^2)

  *Valves with set pressure less than 15 psig cannot be stamped with the ASME stamp.

Regular Bill of Materials

No.	Description	Trim WCC S1
1	Body	ASME SA-216 GRADE WCC
2	Nozzle	ASME SA-276 TYPE 316/SA-351 GR. CF8M
3	Disc	ASME SA-276 TYPE 316/SA-351 GR. CF8M
4	Disc Retainer Ring	UNS N07750 (INCONEL X-750)
5	Adjusting Ring	ASME SA-276 TYPE 316/SA-351 GR. CF8M
6	Adjusting Ring Pin	ASME SA-276 TYPE 316
7	Disc Holder	ASME SA-276 TYPE 316/SA-351 GR. CF8M
8	Guide	ASME SA-276 TYPE 316/SA-351 GR. CF8M
9	Spindle Head	ASME SA-276 TYPE 410
10	Spindle Retainer	UNS N07750 (INCONEL X-750)
11	Bonnet	ASME SA-216 GRADE WCC
12	Base Stud	ASME SA-193 GRADE B7
13	Base Stud Nut	ASME SA-194 GRADE 2H
14	Spring	CHROME ALLOY / INCONEL X-750
15	Adjusting Screw	ASME SA-276 TYPE 410
16	Nut Adjusting Screw	ASME SA-276 TYPE 410
17	Eductor Tube	ASME SA-213 TYPE 304
18	Cap	UNS G10180/ASME SA-216 GRADE WCC
19	Bonnet Gasket	UNS G10100
20	Guide Gasket	UNS G10100
21	Cap Gasket	UNS G10100
22	Adjusting Ring Gasket	UNS G10100
23	Spindle	ASME SA-276 TYPE 410
24	Spindle Head Pin	ASME SA-276 TYPE 410
25	Adjusting Ring Pin Head	ASME SA-276 TYPE 316
26	Nut	ASME SA-194 GR. 8
27	Plug	COMMERCIAL STEEL
28	Spring Washer	ASME SA-240 TYPE 410
29	Limit Washer**	ASME SA-276 TYPE 316
30	Identification Plate**	ALUMINIUM

*Limit washer is only used at orifices “D” and “E”
**Not shown



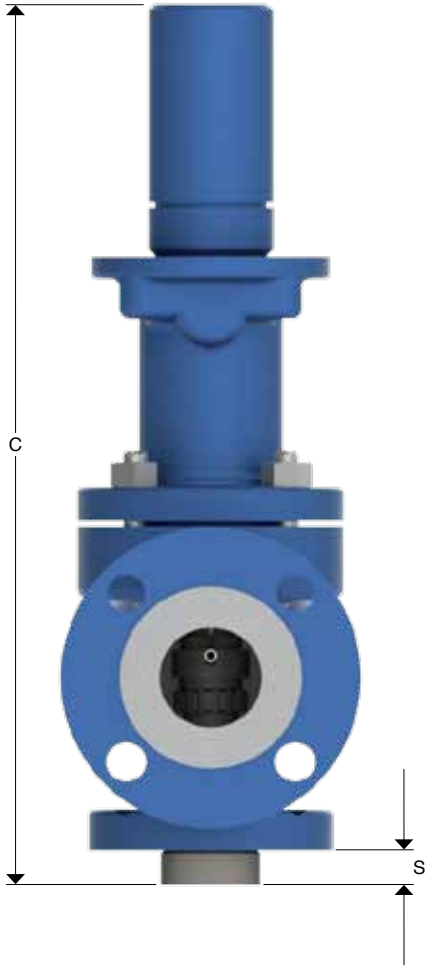
Type 1S Series

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
CONVENTIONAL TYPE 1S SERIES AS PER ASME SECTION VIII
Dimensions and weights

Orifice	Type	Size	Flange Class	A		B		C		D		S		Weight	
				inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	pounds	kg
D	1S11D	1 X 2	150 x 150	4 1/8	104.8	4 1/2	114.3	17	431.8	5 5/16	134.9	1 1/8	28.6	40.0	18.1
	1S21D	1 X 2	300 x 150	4 1/8	104.8	4 1/2	114.3	17	431.8	5 5/16	134.9	1 3/8	34.9	40.0	18.1
	1S31D	1 X 2	300 x 150	4 1/8	104.8	4 1/2	114.3	17 1/2	444.5	5 5/16	134.9	1 3/8	34.9	50.0	22.7
	1S61D	1 X 2	600 x 150	4 1/8	104.8	4 1/2	114.3	17 1/2	444.5	5 5/16	134.9	1 3/8	34.9	50.0	22.7
E	1S11E	1 X 2	150 x 150	4 1/8	104.8	4 1/2	114.3	17	431.8	5 5/16	134.9	1 1/8	28.6	40.0	18.1
	1S21E	1 X 2	300 x 150	4 1/8	104.8	4 1/2	114.3	17	431.8	5 5/16	134.9	1 3/8	34.9	40.0	18.1
	1S31E	1 X 2	300 x 150	4 1/8	104.8	4 1/2	114.3	17 1/2	444.5	5 5/16	134.9	1 3/8	34.9	50.0	22.7
	1S61E	1 X 2	600 x 150	4 1/8	104.8	4 1/2	114.3	17 1/2	444.5	5 5/16	134.9	1 3/8	34.9	50.0	22.7
F	1S11F	1 1/2 X 2	150 x 150	4 7/8	123.8	4 3/4	120.7	17 3/4	450.9	5 5/16	134.9	1 1/4	31.8	45.0	20.4
	1S21F	1 1/2 X 2	300 x 150	4 7/8	123.8	4 3/4	120.7	17 3/4	450.9	5 5/16	134.9	1 1/2	38.1	45.0	20.4
	1S31F	1 1/2 X 2	300 x 150	4 7/8	123.8	6	152.4	18 1/4	463.6	5 5/16	134.9	1 9/16	39.7	50.0	22.7
	1S61F	1 1/2 X 2	600 x 150	4 7/8	123.8	6	152.4	19	482.6	6 1/8	155.6	1 9/16	39.7	60.0	27.2
G	1S11G	1 1/2 X 3	150 x 150	4 7/8	123.8	4 3/4	120.7	17 3/4	450.9	5 5/16	134.9	1 1/4	31.8	55.0	24.9
	1S21G	1 1/2 X 3	300 x 150	4 7/8	123.8	4 3/4	120.7	17 3/4	450.9	5 5/16	134.9	1 1/2	38.1	55.0	24.9
	1S31G	1 1/2 X 3	300 x 150	4 7/8	123.8	6	152.4	18 1/4	463.6	5 5/16	134.9	1 9/16	39.7	60.0	27.2
	1S61G	1 1/2 X 3	600 x 150	4 7/8	123.8	6	152.4	19	482.6	6 1/8	155.6	1 9/16	39.7	65.0	29.5
H	1S11H	1 1/2 X 3	150 x 150	5 1/8	130.2	4 7/8	123.8	19 1/2	495.3	6 1/8	155.6	1 1/4	31.8	60.0	27.2
	1S21H	1 1/2 X 3	300 x 150	5 1/8	130.2	4 7/8	123.8	19 1/2	495.3	6 1/8	155.6	1 9/16	39.7	60.0	27.2
	1S31H	2 X 3	300 x 150	5 1/8	130.2	4 7/8	123.8	20 1/4	514.4	6 1/8	155.6	1 11/16	42.9	65.0	29.5
	1S61H	2 X 3	600 x 150	6 1/16	154.0	6 3/8	161.9	23	584.2	6 7/8	174.6	1 11/16	42.9	85.0	38.6
J	1S11J	2 X 3	150 x 150	5 3/8	136.5	4 7/8	123.8	21 1/4	539.8	6 11/16	169.9	1 5/16	33.3	75.0	34.0
	1S21J	2 X 3	300 x 150	5 3/8	136.5	4 7/8	123.8	21 1/4	539.8	6 11/16	169.9	1 9/16	39.7	75.0	34.0
	1S31J	3 X 4	300 x 150	7 1/4	184.2	7 1/8	181.0	23 3/4	603.3	7 1/4	184.2	1 13/16	46.0	100.0	45.4
	1S61J	3 X 4	600 x 150	7 1/4	184.2	7 1/8	181.0	28 3/4	730.3	9	228.6	1 13/16	46.0	170.0	77.1
K	1S11K	3 X 4	150 x 150	6 1/8	155.6	6 3/8	161.9	24 1/2	622.3	7 1/4	184.2	1 7/16	36.5	110.0	49.9
	1S21K	3 X 4	300 x 150	6 1/8	155.6	6 3/8	161.9	24 1/2	622.3	7 1/4	184.2	1 13/16	46.0	115.0	52.2
	1S31K	3 X 4	300 x 150	6 1/8	155.6	6 3/8	161.9	28	711.2	7 3/4	196.9	1 15/16	49.2	140.0	63.5
	1S61K	3 X 4	600 x 150	7 1/4	184.2	7 1/8	181.0	29 1/4	743.0	7 3/4	196.9	1 15/16	49.2	150.0	68.0
L	1S11L	3 X 4	150 x 150	6 1/8	155.6	6 1/2	165.1	28 3/4	730.3	8 7/8	225.4	1 7/16	36.5	140.0	63.5
	1S21L	3 X 4	300 x 150	6 1/8	155.6	6 1/2	165.1	28 3/4	730.3	8 7/8	225.4	1 13/16	46.0	145.0	65.8
	1S31L	4 X 6	300 x 150	7 1/16	179.4	7 1/8	181.0	32	812.8	9 1/2	241.3	1 15/16	49.2	220.0	99.8
	1S61L	4 X 6	600 x 150	7 1/16	179.4	8	203.2	32	812.8	9 1/2	241.3	2 3/16	55.6	230.0	104.3
M	1S11M	4 X 6	150 x 150	7	177.8	7 1/4	184.2	29 3/4	755.7	9 3/8	238.1	1 5/8	41.3	185.0	83.9
	1S21M	4 X 6	300 x 150	7	177.8	7 1/4	184.2	29 3/4	755.7	9 3/8	238.1	1 15/16	49.2	190.0	86.2
	1S31M	4 X 6	300 x 150	7	177.8	7 1/4	184.2	32	812.8	9 3/8	238.1	1 15/16	49.2	230.0	104.3
	1S61M	4 X 6	600 x 150	7	177.8	8	203.2	36 1/4	920.8	10 3/4	273.1	2 3/16	55.6	300.0	136.1
N	1S11N	4 X 6	150 x 150	7 3/4	196.9	8 1/4	209.6	33	838.2	10 1/8	257.2	1 5/8	41.3	220.0	99.6
	1S21N	4 X 6	300 x 150	7 3/4	196.9	8 1/4	209.6	33	838.2	10 1/8	257.2	1 15/16	49.2	225.0	102.1
	1S31N	4 X 6	300 x 150	7 3/4	196.9	8 1/4	209.6	34 1/4	870.0	10 1/2	266.7	1 15/16	49.2	260.0	117.9
	1S61N	4 X 6	600 x 150	7 3/4	196.9	8 3/4	222.3	39	990.6	11 3/4	298.5	2 3/16	55.6	360.0	163.3
P	1S11P	4 X 6	150 x 150	7 1/8	181.0	9	228.6	34 1/4	870.0	11	279.4	1 5/8	41.3	260.0	117.9
	1S21P	4 X 6	300 x 150	7 1/8	181.0	9	228.6	34 1/4	870.0	11	279.4	1 15/16	49.2	270.0	122.5
	1S31P	4 X 6	300 x 150	8 7/8	225.4	10	254.0	41	1041.4	11 1/2	292.1	1 15/16	49.2	350.0	158.8
	1S61P	4 X 6	600 x 150	8 7/8	225.4	10	254.0	43 1/2	1104.9	13 7/8	352.4	2 3/16	55.6	530.0	240.4
Q	1S11Q	6 X 8	150 x 150	9 7/16	239.7	9 1/2	241.3	41	1041.4	13 5/8	346.1	1 13/16	46.0	430.0	195.0
	1S21Q	6 X 8	300 x 150	9 7/16	239.7	9 1/2	241.3	41	1041.4	13 5/8	346.1	2 1/4	57.2	445.0	201.9
	1S31Q	6 X 8	300 x 150	9 7/16	239.7	9 1/2	241.3	43 1/4	1098.6	14	355.6	2 1/4	57.2	530.0	240.4
	1S61Q	6 X 8	600 x 150	9 7/16	239.7	9 1/2	241.3	46	1168.4	14 1/4	362.0	2 11/16	68.3	645.0	292.6
R	1S11R	6 X 8	150 x 150	9 7/16	239.7	9 1/2	241.3	43	1092.2	14 1/2	368.3	1 13/16	46.0	495.0	224.5
	1S21R	6 X 8	300 x 150	9 7/16	239.7	9 1/2	241.3	43	1092.2	14 1/2	368.3	2 1/4	57.2	510.0	231.3
	1S31R	6 X 10	300 x 150	9 7/16	239.7	10 1/2	266.7	45 1/2	1155.7	14 1/2	368.3	2 1/4	57.2	550.0	249.5
	1S61R	6 X 10	600 x 150	9 7/16	239.7	10 1/2	266.7	47 1/2	1206.5	15 1/8	384.2	2 11/16	68.3	675.0	306.2
T	1S11T	8 X 10	150 x 150	10 7/8	276.2	11	279.4	47 1/2	1206.5	16 1/2	419.1	1 15/16	49.2	620.0	281.2
	1S21T	8 X 10	300 x 150	10 7/8	276.2	11	279.4	47 1/2	1206.5	16 1/2	419.1	2 7/16	61.9	640.0	290.3
	1S31-1T	8 X 10	300 x 150	10 7/8	276.2	11	279.4	50 1/4	1276.4	16 1/2	419.1	2 7/16	61.9	675.0	306.2
	1S31-2T	8 X 10	600 x 150	10 7/8	276.2	11	279.4	53 3/8	1355.7	16 1/2	419.1	2 7/16	61.9	840.0	381.0

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
CONVENTIONAL TYPE 1S SERIES AS PER ASME SECTION VIII
Dimensions and weights

Type 1S Series



Type 1S Series

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
BELLOWS TYPE 1S-30 SERIES AS PER ASME SECTION VIII

Balanced valves a have bellows that isolates the bonnet and superior parts of the valve from corrosive fluids. It also eliminates the effects of counter pressure.

Design characteristics:

- Relief capacity according to ASME B & PVC SECT. VIII DIV. 1
- Orifice area according to ASME B & PVC SECT. VIII DIV. 1
- Distance between faces according to API 526
- Flange dimensions according to ASME B16.5
- NACE service according to MR-01-75 or MR-01-03
- Tests according to API 527

① WALWORTH Steel Safety and Relief Valves can be built with a standard cap (screwed), flanged cap, plain lever, or packed lever.

② The spindle head is attached to the disc holder by a pressure retainer and a housing at the disc holder. This ensemble is very secure and hard to break.

③ The disc housing at the disc holder has a similar design to the one of a rod, so during difficult service conditions or in the event of a misalignment, the disc may adjust itself and keep a hermetic seal.

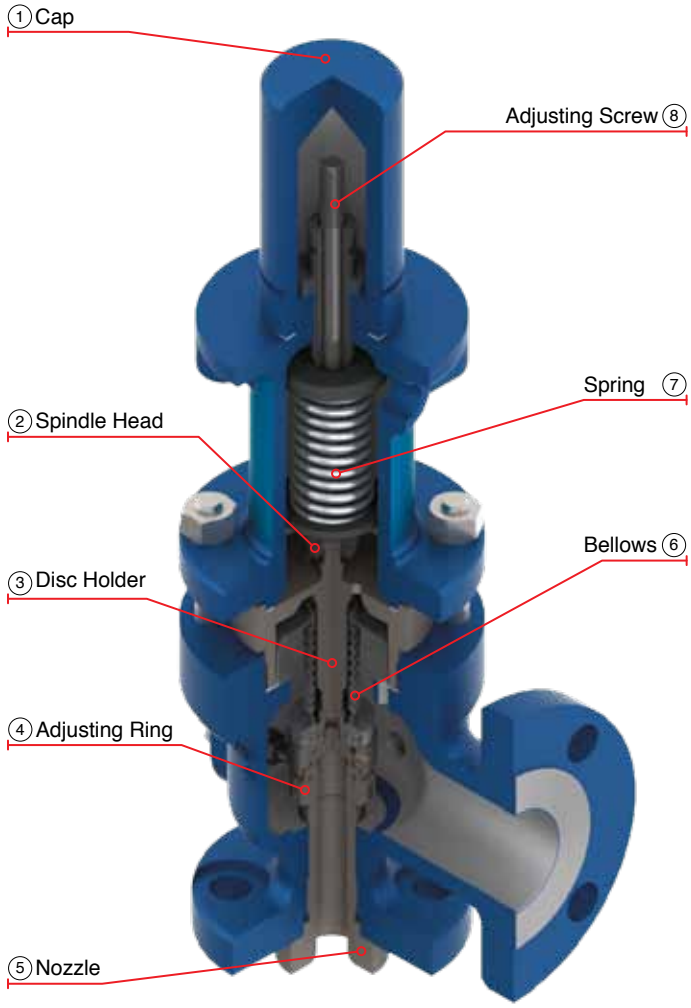
④ The adjusting ring is the element that adjusts the blowdown or differential pressure; by raising it the blowdown increases (closure pressure decreases), and by handing down the blowdown decreases (closure pressure increases). The ideal blowdown configuration closes the valve at the operation pressure of the system on which the valve is installed.

⑤ The orifice at the superior area of the nozzle is the one that defines the valve capacity. The inlet mechanism of this element is designed according to ASME specifications.

⑥ The bellows isolates the bonnet and superior parts of the valve from counter pressure and corrosive fluids in order that the valve may operate properly at conditions of fluctuating counter pressure.

⑦ WALWORTH offers springs in different types of materials to meet your process necessities. The standard spring is made out of Carbon Steel; Alloy Steel with a high content of Tungsten for high temperature service, and Austenitic Stainless Steel for low temperatures.

⑧ The adjusting screw is the element that compresses the spring to a certain position to define the set pressure of the valve. WALWORTH personnel pay a lot of attention to this element.



TYPE 1S-30 SERIES

Blowdown Settings

The steel safety and Relief Valves have in their design a secondary orifice and a ring that can be adjusted to reduce the forces that raise the seal disc, in order to obtain the complete lift that will provide the flow capacity required in a shorter time. The maximium relief capacity is obtained in any normal position of the adjusting ring. This is achievable because of the design of the disc holder. It forms a pressure storage chamber, and the secondary orifice gives the flow a 180° direction.

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
BELLOWS TYPE 1S-30 SERIES AS PER ASME SECTION VIII

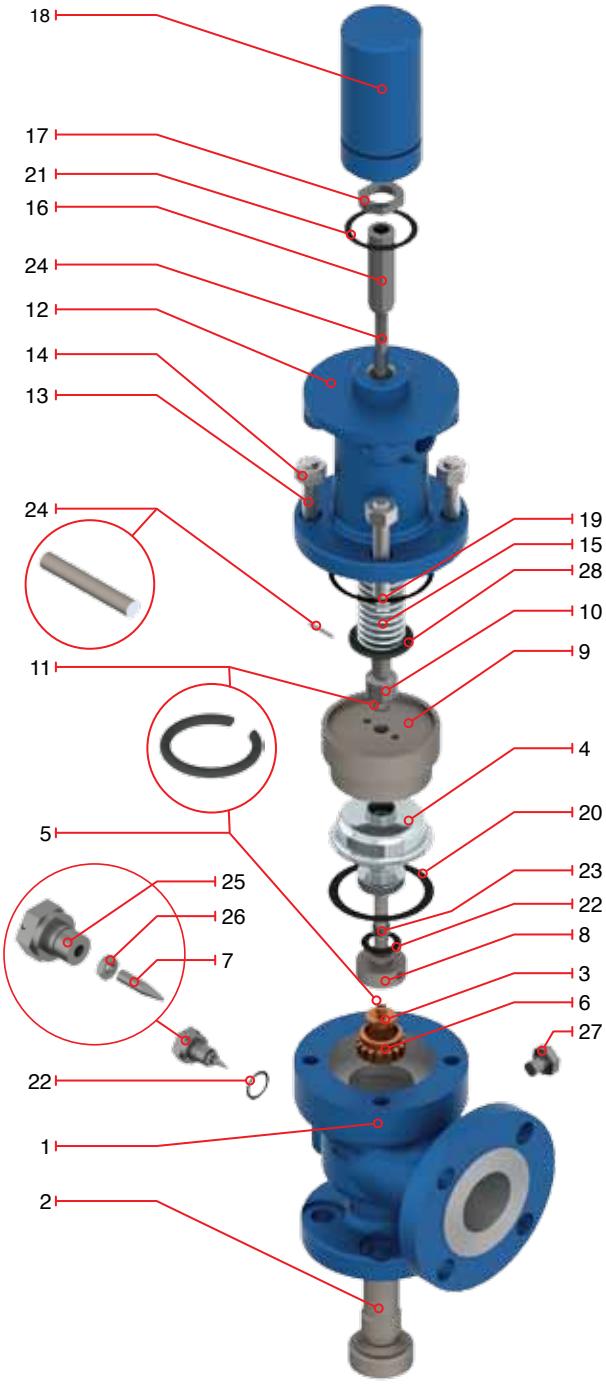
Design Features

- The bellows isolates the bonnet and superior parts of the valve from counter pressure and corrosive fluids in order that the valve may operate properly at conditions of fluctuating counter pressure.
- Orifice from “D” to “T”
- Inlet size x outlet size from 1”x 2” to 8”x 10” flanged ends
- Class 150x150 to 600x150
- Closed Bonnet
- Full Nozzle
- Screwed Cap
- Actuated by Chrome Alloy 32°F (0 °C)up to 428°F (220 °C) Inconel
- X750 -328 °F(-200 °C) up to 1022 °F(550 °C)
- Minimum Set Pressure 15 psig (1.05 kg/cm2)
  *Valves with set pressure less than 15 psig cannot be stamped with the ASME stamp.

Regular Bill of Materials

No.	Description	Trim WCC S1
1	Body	ASME SA-216 GRADE WCC
2	Nozzle	ASME SA-276 TYPE 316/SA-351 GR. CF8M
3	Disc	ASME SA-276 TYPE 316/SA-351 GR. CF8M
4	Disc Retainer Ring	UNS N07750 (INCONEL X-750)
5	Adjusting Ring	ASME SA-276 TYPE 316/SA-351 GR. CF8M
6	Adjusting Ring Pin	ASME SA-276 TYPE 316
7	Disc Holder	ASME SA-276 TYPE 316/SA-351 GR. CF8M
8	Guide	ASME SA-276 TYPE 316/SA-351 GR. CF8M
9	Spindle Head	ASME SA-276 TYPE 410
10	Spindle Retainer	UNS N07750 (INCONEL X-750)
11	Bonnet	ASME SA-216 GRADE WCC
12	Base Stud	ASME SA-193 GRADE B7
13	Base Stud Nut	ASME SA-194 GRADE 2H
14	Spring	CHROME ALLOY / INCONEL X-750
15	Adjusting Screw	ASME SA-276 TYPE 410
16	Nut Adjusting Screw	ASME SA-276 TYPE 410
17	Eductor Tube	ASME SA-213 TYPE 304
18	Cap	UNS G10180/ASME SA-216 GRADE WCC
19	Bonnet Gasket	UNS G10100
20	Guide Gasket	UNS G10100
21	Cap Gasket	UNS G10100
22	Adjusting Ring Gasket	UNS G10100
23	Spindle	ASME SA-276 TYPE 410
24	Spindle Head Pin	ASME SA-276 TYPE 410
25	Adjusting Ring Pin Head	ASME SA-276 TYPE 316
26	Adjusting Ring Nut	ASME SA-194 GR. 8
27	Plug	COMMERCIAL STEEL
28	Spring Washer	ASME SA-240 TYPE 410
29	Limit Washer**	ASME SA-276 TYPE 316
30	Identification Plate**	ALUMINIUM

*Limit washer is only used at orifices “D” and “E”
**Not shown



TYPE 1S-30 SERIES

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
BELLOWS TYPE 1S-30 SERIES AS PER ASME SECTION VIII

Dimensions and weights

Orifice	Type	Size	Flange Class	A		B		C		D		S		Weight	
				inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	pounds	kg
D	1S11-30D	1 X 2	150 x 150	4 1/8	104.8	4 1/2	114.3	18	457.2	5 5/16	134.9	1 1/8	28.6	40.0	18.1
	1S21-30D	1 X 2	300 x 150	4 1/8	104.8	4 1/2	114.3	18	457.2	5 5/16	134.9	1 3/8	34.9	40.0	18.1
	1S31-30D	1 X 2	300 x 150	4 1/8	104.8	4 1/2	114.3	18 1/2	469.9	5 5/16	134.9	1 3/8	34.9	50.0	22.7
	1S61-30D	1 X 2	600 x 150	4 1/8	104.8	4 1/2	114.3	18 1/2	469.9	5 5/16	134.9	1 3/8	34.9	50.0	22.7
E	1S11-30E	1 X 2	150 x 150	4 1/8	104.8	4 1/2	114.3	18	457.2	5 5/16	134.9	1 1/8	28.6	40.0	18.1
	1S21-30E	1 X 2	300 x 150	4 1/8	104.8	4 1/2	114.3	18	457.2	5 5/16	134.9	1 3/8	34.9	40.0	18.1
	1S31-30E	1 X 2	300 x 150	4 1/8	104.8	4 1/2	114.3	18 1/2	469.9	5 5/16	134.9	1 3/8	34.9	50.0	22.7
	1S61-30E	1 X 2	600 x 150	4 1/8	104.8	4 1/2	114.3	18 1/2	469.9	5 5/16	134.9	1 3/8	34.9	50.0	22.7
F	1S11-30F	1 1/2 X 2	150 x 150	4 7/8	123.8	4 3/4	120.7	18 3/4	476.3	5 5/16	134.9	1 1/4	31.8	45.0	20.4
	1S21-30F	1 1/2 X 2	300 x 150	4 7/8	123.8	4 3/4	120.7	18 3/4	476.3	5 5/16	134.9	1 1/2	38.1	45.0	20.4
	1S31-30F	1 1/2 X 2	300 x 150	4 7/8	123.8	6	152.4	19 1/4	489.0	5 5/16	134.9	1 9/16	39.7	50.0	22.7
	1S61-30F	1 1/2 X 2	600 x 150	4 7/8	123.8	6	152.4	20	508.0	6 1/8	155.6	1 9/16	39.7	60.0	27.2
G	1S11-30G	1 1/2 X 3	150 x 150	4 7/8	123.8	4 3/4	120.7	19	482.6	5 5/16	134.9	1 1/4	31.8	55.0	24.9
	1S21-30G	1 1/2 X 3	300 x 150	4 7/8	123.8	4 3/4	120.7	19	482.6	5 5/16	134.9	1 1/2	38.1	55.0	24.9
	1S31-30G	1 1/2 X 3	300 x 150	4 7/8	123.8	6	152.4	19 1/2	495.3	5 5/16	134.9	1 9/16	39.7	60.0	27.2
	1S61-30G	1 1/2 X 3	600 x 150	4 7/8	123.8	6	152.4	20 1/4	514.4	6 1/8	155.6	1 9/16	39.7	65.0	29.5
H	1S11-30H	1 1/2 X 3	150 x 150	5 1/8	130.2	4 7/8	123.8	19 1/2	495.3	6 1/8	155.6	1 1/4	31.8	60.0	27.2
	1S21-30H	1 1/2 X 3	300 x 150	5 1/8	130.2	4 7/8	123.8	19 1/2	495.3	6 1/8	155.6	1 9/16	39.7	60.0	27.2
	1S31-30H	2 X 3	300 x 150	5 1/8	130.2	4 7/8	123.8	20 1/4	514.4	6 1/8	155.6	1 11/16	42.9	65.0	29.5
	1S61-30H	2 X 3	600 x 150	6 1/16	154.0	6 3/8	161.9	23	584.2	6 7/8	174.6	1 11/16	42.9	85.0	38.6
J	1S11-30J	2 X 3	150 x 150	5 3/8	136.5	4 7/8	123.8	21 1/4	539.8	6 11/16	169.9	1 5/16	33.3	75.0	34.0
	1S21-30J	2 X 3	300 x 150	5 3/8	136.5	4 7/8	123.8	21 1/4	539.8	6 11/16	169.9	1 9/16	39.7	75.0	34.0
	1S31-30J	3 X 4	300 x 150	7 1/4	184.2	7 1/8	181.0	23 3/4	603.3	7 1/4	184.2	1 13/16	46.0	100.0	45.4
	1S61-30J	3 X 4	600 x 150	7 1/4	184.2	7 1/8	181.0	28 3/4	730.3	9	228.6	1 13/16	46.0	170.0	77.1
K	1S11-30K	3 X 4	150 x 150	6 1/8	155.6	6 3/8	161.9	24 1/2	622.3	7 1/4	184.2	1 7/16	36.5	110.0	49.9
	1S21-30K	3 X 4	300 x 150	6 1/8	155.6	6 3/8	161.9	24 1/2	622.3	7 1/4	184.2	1 13/16	46.0	115.0	52.2
	1S31-30K	3 X 4	300 x 150	6 1/8	155.6	6 3/8	161.9	28	711.2	7 3/4	196.9	1 15/16	49.2	140.0	63.5
	1S61-30K	3 X 4	600 x 150	7 1/4	184.2	7 1/8	181.0	29 1/4	743.0	7 3/4	196.9	1 15/16	49.2	150.0	68.0
L	1S11-30L	3 X 4	150 x 150	6 1/8	155.6	6 1/2	165.1	28 3/4	730.3	8 7/8	225.4	1 7/16	36.5	140.0	63.5
	1S21-30L	3 X 4	300 x 150	6 1/8	155.6	6 1/2	165.1	28 3/4	730.3	8 7/8	225.4	1 13/16	46.0	145.0	65.8
	1S31-30L	4 X 6	300 x 150	7 1/16	179.4	7 1/8	181.0	32	812.8	9 1/2	241.3	1 15/16	49.2	220.0	99.8
	1S61-30L	4 X 6	600 x 150	7 1/16	179.4	8	203.2	32	812.8	9 1/2	241.3	2 3/16	55.6	230.0	104.3
M	1S11-30M	4 X 6	150 x 150	7	177.8	7 1/4	184.2	29 3/4	755.7	9 3/8	238.1	1 5/8	41.3	185.0	83.9
	1S21-30M	4 X 6	300 x 150	7	177.8	7 1/4	184.2	29 3/4	755.7	9 3/8	238.1	1 15/16	49.2	190.0	86.2
	1S31-30M	4 X 6	300 x 150	7	177.8	7 1/4	184.2	32	812.8	9 3/8	238.1	1 15/16	49.2	230.0	104.3
	1S61-30M	4 X 6	600 x 150	7	177.8	8	203.2	36 1/4	920.8	10 3/4	273.1	2 3/16	55.6	300.0	136.1
N	1S11-30N	4 X 6	150 x 150	7 3/4	196.9	8 1/4	209.6	33	838.2	10 1/8	257.2	1 5/8	41.3	220.0	99.6
	1S21-30N	4 X 6	300 x 150	7 3/4	196.9	8 1/4	209.6	33	838.2	10 1/8	257.2	1 15/16	49.2	225.0	102.1
	1S31-30N	4 X 6	300 x 150	7 3/4	196.9	8 1/4	209.6	34 1/4	870.0	10 1/2	266.7	1 15/16	49.2	260.0	117.9
	1S61-30N	4 X 6	600 x 150	7 3/4	196.9	8 3/4	222.3	39	990.6	11 3/4	298.5	2 3/16	55.6	360.0	163.3
P	1S11-30P	4 X 6	150 x 150	7 1/8	181.0	9	228.6	34 1/4	870.0	11	279.4	1 5/8	41.3	260.0	117.9
	1S21-30P	4 X 6	300 x 150	7 1/8	181.0	9	228.6	34 1/4	870.0	11	279.4	1 15/16	49.2	270.0	122.5
	1S31-30P	4 X 6	300 x 150	8 7/8	225.4	10	254.0	41	1041.4	11 1/2	292.1	1 15/16	49.2	350.0	158.8
	1S61-30P	4 X 6	600 x 150	8 7/8	225.4	10	254.0	43 1/2	1104.9	13 7/8	352.4	2 3/16	55.6	530.0	240.4
Q	1S11-30Q	6 X8	150 x 150	9 7/16	239.7	9 1/2	241.3	41	1041.4	13 5/8	346.1	1 13/16	46.0	430.0	195.0
	1S21-30Q	6 X8	300 x 150	9 7/16	239.7	9 1/2	241.3	41	1041.4	13 5/8	346.1	2 1/4	57.2	445.0	201.9
	1S31-30Q	6 X8	300 x 150	9 7/16	239.7	9 1/2	241.3	43 1/4	1098.6	14	355.6	2 1/4	57.2	530.0	240.4
	1S61-30Q	6 X8	600 x 150	9 7/16	239.7	9 1/2	241.3	46	1168.4	14 1/4	362.0	2 11/16	68.3	645.0	292.6
R	1S11-30R	6 X8	150 x 150	9 7/16	239.7	9 1/2	241.3	43	1092.2	14 1/2	368.3	1 13/16	46.0	495.0	224.5
	1S21-30R	6 X8	300 x 150	9 7/16	239.7	9 1/2	241.3	43	1092.2	14 1/2	368.3	2 1/4	57.2	510.0	231.3
	1S31-30R	6 X 10	300 x 150	9 7/16	239.7	10 1/2	266.7	45 1/2	1155.7	14 1/2	368.3	2 1/4	57.2	550.0	249.5
	1S61-30R	6 X 10	600 x 150	9 7/16	239.7	10 1/2	266.7	47 1/2	1206.5	15 1/8	384.2	2 11/16	68.3	675.0	306.2
T	1S11-30T	8 X 10	150 x 150	10 7/8	276.2	11	279.4	47 1/2	1206.5	16 1/2	419.1	1 15/16	49.2	620.0	281.2
	1S21-30T	8 X 10	300 x 150	10 7/8	276.2	11	279.4	47 1/2	1206.5	16 1/2	419.1	2 7/16	61.9	640.0	290.3
	1S31-30-1T	8 X 10	300 x 150	10 7/8	276.2	11	279.4	50 1/4	1276.4	16 1/2	419.1	2 7/16	61.9	675.0	306.2
	1S31-30-2T	8 X 10	600 x 150	10 7/8	276.2	11	279.4	53 3/8	1355.7	16 1/2	419.1	2 7/16	61.9	840.0	381.0

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
BELLOWS TYPE 1S-30 SERIES AS PER ASME SECTION VIII
Dimensions and weights

TYPE 1S-30
SERIES

TYPE 1S-30
SERIES

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
SOFT SEAT TYPE 1S/XDA SERIES AS PER ASME SECTION VIII

The Cast Steel Safety and Relief Valve soft seat types (resilient) can be conventional or bellowed and its selection method and dimensions depend on the selected type. This design keeps a maximium seal for long periods of time, its operation is near the set pressure, and its seal is fully hermetic.

Design characteristics

- Relief capacity according to ASME B & PVC SECT. VIII DIV. 1
- Orifice area according to ASME B & PVC SECT. VIII DIV. 1
- Distance between faces according to API 526
- Flange dimensions according to ASME B16.5
- NACE service according to MR-01-75 or MR-01-03
- Tests according to API 527

① WALWORTH Steel Safety and Relief Valves can be built with a standard cap (screwed), flanged cap, plain lever or packed lever.

② The spindle head is attached to the disc holder by a pressure retainer and a housing at the disc holder. This ensemble is very secure and hard to break.

③ Soft seat or resilent allows no leaks.

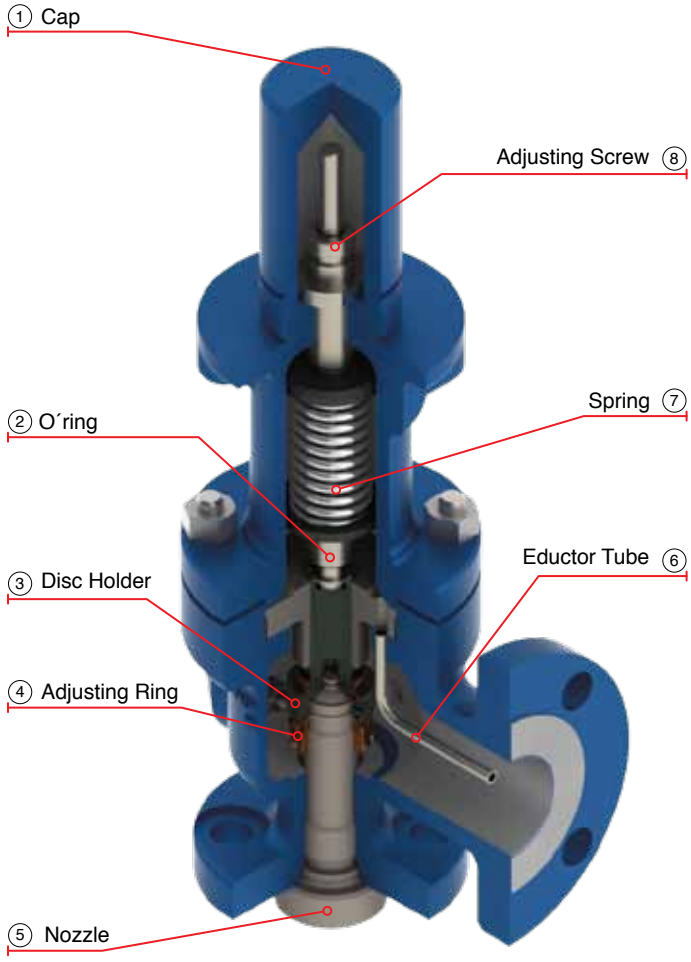
④ The adjusting ring is the element that adjusts the blowdown or differential pressure; by raising it the blowdown increases (closure pressure decreases), and by handing down the blowdown decreases (closure pressure increases). The ideal blowdown configuration closes the valve at the operation pressure of the system on which the valve is installed.

⑤ The orifice at the superior area of the nozzle is the one that defines the valve capacity. The inlet mechanism of this element is designed according to ASME specifications.

⑥ The eductor tube connects the valve bonnet to the outlet in order to avoid the accumulation of pressure at the bonnet and ensures proper operation of the valve.

⑦ WALWORTH offers springs in different types of materials to meet your process necessities. The standard spring is made out of Carbon Steel; Alloy Steel with a high content of Tungsten for high temperature service, and Austenitic Stainless Steel for low temperatures.

⑧ The adjusting screw is the element that compresses the spring to a certain position in order to define the set pressure of the valve. WALWORTH personnel pay a lot of attention to this element.



TYPE 1S-XDA SERIES

Blowdown Settings

The steel safety and Relief Valves have in their design a secondary orifice and a ring that can be adjusted to reduce the forces that raise the seal disc in order to obtain the complete lift that will provide the flow capacity required in a shorter time. The maximium relief capacity is obtained in any normal position of the adjusting ring. This is achievable because of the design of the disc holder. It forms a pressure storage chamber, and the secondary orifice gives the flow a 180° direction.

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
SOFT SEAT TYPE 1S/XDA SERIES AS PER ASME SECTION VIII

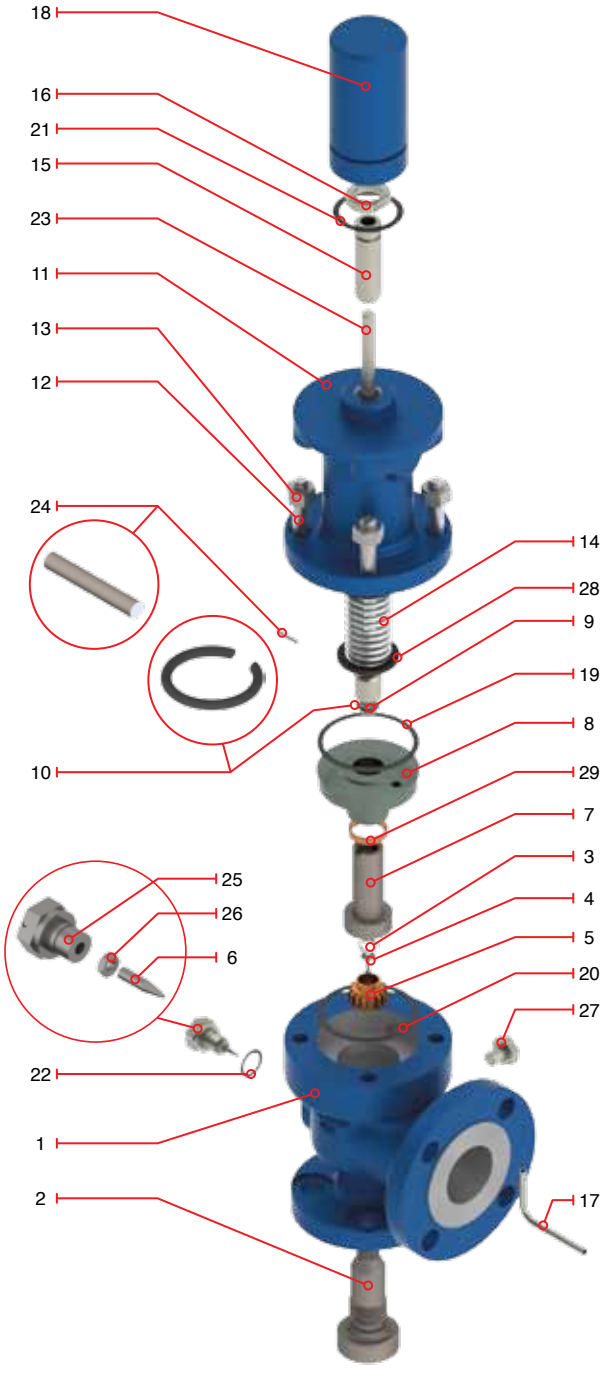
Design Features

- Orifice from “D” to “T”
- Inlet size x outlet size from 1”x 2” to 8”x 10” flanged ends
- Class 150x150 to 600x150
- Closed Bonnet
- Full Nozzle
- Screwed Cap
- Actuated by Chrome Alloy 32°F (0 °C)up to 428°F (220 °C)
  Inconel X750 -328 °F(-200 °C) up to 1022 °F(550 °C)
- Minimum Set Pressure 15 psig (1.05 kg/cm^2)
  *Valves with set pressure less than 15 psig cannot be stamped with the ASME stamp.

Regular Bill of Materials

No.	Description	Trim WCC S1
1	Body	ASME SA-216 GRADE WCC
2	Nozzle	ASME SA-276 TYPE 316/SA-351 GR. CF8M
3	Disc	ASME SA-276 TYPE 316/SA-351 GR. CF8M
4	Disc Retainer Ring	UNS N07750 (INCONEL X-750)
5	Adjusting Ring	ASME SA-276 TYPE 316/SA-351 GR. CF8M
6	Adjusting Ring Pin	ASME SA-276 TYPE 316
7	Disc Holder	ASME SA-276 TYPE 316/SA-351 GR. CF8M
8	Guide	ASME SA-276 TYPE 316/SA-351 GR. CF8M
9	Spindle Head	ASME SA-276 TYPE 410
10	Spindle Retainer	UNS N07750 (INCONEL X-750)
11	Bonnet	ASME SA-216 GRADE WCC
12	Base Stud	ASME SA-193 GRADE B7
13	Base Stud Nut	ASME SA-194 GRADE 2H
14	Spring	CHROME ALLOY / INCONEL X-750
15	Adjusting Screw	ASME SA-276 TYPE 410
16	Nut Adjusting Screw	ASME SA-276 TYPE 410
17	Eductor Tube	ASME SA-213 TYPE 304
18	Cap	UNS G10180/ASME SA-216 GRADE WCC
19	Bonnet Gasket	UNS G10100
20	Guide Gasket	UNS G10100
21	Cap Gasket	UNS G10100
22	Adjusting Ring Gasket	UNS G10100
23	Spindle	ASME SA-276 TYPE 410
24	Spindle Head Pin	ASME SA-276 TYPE 410
25	Adjusting Ring Pin Head	ASME SA-276 TYPE 316
26	Nut	ASME SA-194 GR. 8
27	Plug	COMMERCIAL STEEL
28	Spring Washer	ASME SA-240 TYPE 410
29	Limit Washer**	ASME SA-276 TYPE 316
30	Identification Plate***	ALUMINIUM

*Limit washer is only used at orifices “D” and “E”
**Not shown



TYPE 1S-XDA SERIES

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
OPEN BONNET TYPE 1S/P3 SERIES AS PER ASME SECTION VIII

The open bonnet type of the steel safety and relief valve provides a high hermetic rate on the seats, ideal for water, steam and organic generators because the open bonnet keeps the spring at an appropriate operating temperature.

Design characteristics

- Relief capacity according to ASME B & PVC SECT. VIII DIV. 1
- Orifice area according to ASME B & PVC SECT. VIII DIV. 1
- Distance between faces according to API 526
- Flange dimensions according to ASME B16.5
- NACE service according to MR-01-75 or MR-01-03
- Tests according to API 527

① The plain lever ensures the valve can only be triggered manually.

② The spindle head is attached to the disc holder by a pressure retainer and a housing at the disc holder. This ensemble is very secure and hard to break.

③ The disc housing at the disc holder has a similar design to the one of a rod, so during difficult service conditions or in the event of a misalignment, the disc may adjust itself and keep a hermetic seal.

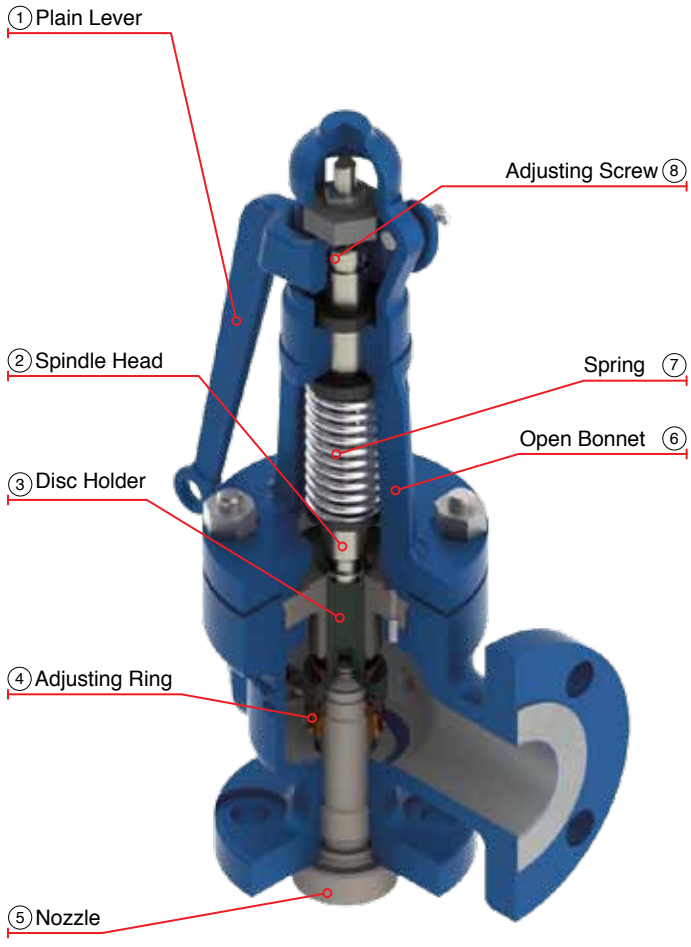
④ The adjusting ring is the element that adjusts the blowdown or differential pressure; by raising it the blowdown increases (closure pressure decreases), and by handing down the blowdown decreases (closure pressure increases). The ideal blowdown configuration closes the valve at the operation pressure of the system on which the valve is installed.

⑤ The orifice at the superior area of the nozzle is the one that defines the valve capacity. The inlet mechanism of this element is designed according to ASME specifications.

⑥ An open bonnet avoids exposing the spring to high temperatures and improves its performance.

⑦ WALWORTH offers springs in different types of materials to meet your process necessities. The standard spring is made out of Carbon Steel; Alloy Steel with a high content of Tungsten for high temperature service, and Austenitic Stainless Steel for low temperatures.

⑧ The adjusting screw is the element that compresses the spring to a certain position to define the set pressure of the valve. WALWORTH personnel pay a lot of attention to this element.



TYPE 1S/P3 SERIES

Blowdown Settings

The steel safety and Relief Valves have in their design a secondary orifice and a ring that can be adjusted to reduce the forces that raise the seal disc, in order to obtain the complete lift that will provide the flow capacity required in a shorter time. The maximium relief capacity is obtained in any normal position of the adjusting ring. This is achievable because of the design of the disc holder. It forms a pressure storage chamber, and the secondary orifice gives the flow a 180° direction.

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
OPEN BONNET TYPE 1S/P3 SERIES AS PER ASME SECTION VIII

Design Features

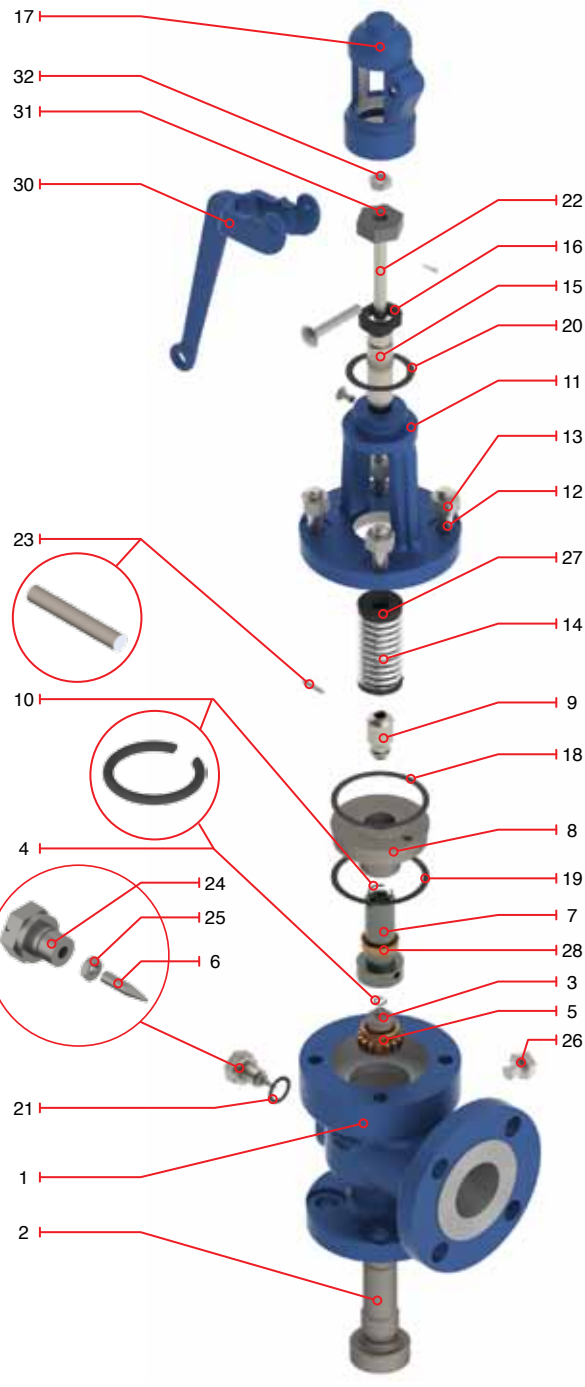
- Orifice from “D” to “T”
- Inlet size x outlet size from 1”x 2” to 8”x 10” flanged ends
- Class 150x150 to 600x150
- Open Bonnet
- Full Nozzle
- Screwed Cap
- Actuated by Chrome Alloy 32°F (0 °C)up to 428°F (220 °C) Inconel X750 -328 °F(-200 °C) up to 1022 °F(550 °C)
- Minimum Set Pressure 15 psig (1.05 kg/cm^2)

  *Valves with set pressure less than 15 psig cannot be stamped with the ASME stamp.

Regular Bill of Materials

No.	Description	Trim WCC S1
1	Body	ASME SA-216 GRADE WCC
2	Nozzle	ASME SA-276 TYPE 316/SA-351 GR. CF8M
3	Disc	ASME SA-276 TYPE 316/SA-351 GR. CF8M
4	Disc Retainer Ring	UNS N07750 (INCONEL X-750)
5	Adjusting Ring	ASME SA-276 TYPE 316/SA-351 GR. CF8M
6	Adjusting Ring Pin	ASME SA-276 TYPE 316
7	Disc Holder	ASME SA-276 TYPE 316/SA-351 GR. CF8M
8	Guide	ASME SA-276 TYPE 316/SA-351 GR. CF8M
9	Spindle Head	ASME SA-276 TYPE 410
10	Spindle Retainer	UNS N07750 (INCONEL X-750)
11	Bonnet	ASME SA-216 GRADE WCC
12	Base Stud	ASME SA-193 GRADE B7
13	Base Stud Nut	ASME SA-194 GRADE 2H
14	Spring	CHROME ALLOY / INCONEL X-750
15	Adjusting Screw	ASME SA-276 TYPE 410
16	Nut Adjusting Screw	ASME SA-276 TYPE 410
17	Cap	UNS G10180/ASME SA-216 GRADE WCC
18	Bonnet Gasket	UNS G10100
19	Guide Gasket	UNS G10100
20	Cap Gasket	UNS G10100
21	Adjusting Ring Gasket	UNS G10100
22	Spindle	ASME SA-276 TYPE 410
23	Spindle Head Pin	ASME SA-276 TYPE 410
24	Adjusting Ring Pin Head	ASME SA-276 TYPE 316
25	Nut	ASME SA-194 GR. 8
26	Plug	COMMERCIAL STEEL
27	Spring Washer	ASME SA-240 TYPE 410
28	Limit Washer**	ASME SA-276 TYPE 316
29	Identification Plate***	COMMERCIAL STEEL
30	Lever	ASME SA-216 GRADE WCC
31	Nut Jam	COMMERCIAL STEEL
32	Nut	COMMERCIAL STEEL

*Limit washer is only used at orifices “D” and “E”
**Not shown



TYPE 1S/P3 SERIES

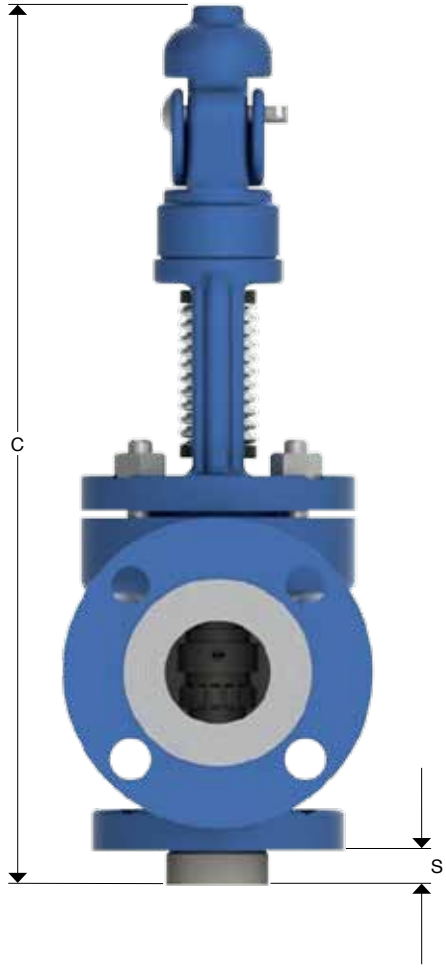
WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
OPEN BONNET TYPE 1S/P3 SERIES AS PER ASME SECTION VIII

Dimensions and weights

Orifice	Type	Size	Flange Class	A		B		C		D		S		Weight	
				inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	pounds	kg
D	1S11D/P3/P3	1 X 2	150 x 150	4 1/8	104.8	4 1/2	114.3	18 1/4	463.3	5 5/16	134.9	1 1/8	28.6	45.0	20.4
	1S21D/P3/P3	1 X 2	300 x 150	4 1/8	104.8	4 1/2	114.3	18 1/4	463.3	5 5/16	134.9	1 3/8	34.9	45.0	20.4
	1S31D/P3	1 X 2	300 x 150	4 1/8	104.8	4 1/2	114.3	18 1/4	463.3	5 5/16	134.9	1 3/8	34.9	50.0	22.7
	1S61D/P3	1 X 2	600 x 150	4 1/8	104.8	4 1/2	114.3	19	482.6	5 5/16	134.9	1 3/8	34.9	60.0	27.2
E	1S11E/P3	1 X 2	150 x 150	4 1/8	104.8	4 1/2	114.3	18 1/4	463.3	5 5/16	134.9	1 1/8	28.6	45.0	20.4
	1S21E/P3	1 X 2	300 x 150	4 1/8	104.8	4 1/2	114.3	18 1/4	463.3	5 5/16	134.9	1 3/8	34.9	45.0	20.4
	1S31E/P3	1 X 2	300 x 150	4 1/8	104.8	4 1/2	114.3	18 1/4	463.3	5 5/16	134.9	1 3/8	34.9	50.0	22.7
	1S61E/P3	1 X 2	600 x 150	4 1/8	104.8	4 1/2	114.3	19	482.6	5 5/16	134.9	1 3/8	34.9	60.0	27.2
F	1S11F/P3	1 1/2 X 2	150 x 150	4 7/8	123.8	4 3/4	120.7	19	482.6	5 5/16	134.9	1 1/4	31.8	45.0	20.4
	1S21F/P3	1 1/2 X 2	300 x 150	4 7/8	123.8	4 3/4	120.7	19	482.6	5 5/16	134.9	1 1/2	38.1	45.0	20.4
	1S31F/P3	1 1/2 X 2	300 x 150	4 7/8	123.8	6	152.4	19	482.6	5 5/16	134.9	1 9/16	39.7	50.0	22.7
	1S61F/P3	1 1/2 X 2	600 x 150	4 7/8	123.8	6	152.4	19	482.6	6 1/8	155.6	1 9/16	39.7	60.0	27.2
G	1S11G/P3	1 1/2 X 3	150 x 150	4 7/8	123.8	4 3/4	120.7	19	482.6	5 5/16	134.9	1 1/4	31.8	55.0	24.9
	1S21G/P3	1 1/2 X 3	300 x 150	4 7/8	123.8	4 3/4	120.7	19	482.6	5 5/16	134.9	1 1/2	38.1	55.0	24.9
	1S31G/P3	1 1/2 X 3	300 x 150	4 7/8	123.8	6	152.4	19	482.6	5 5/16	134.9	1 9/16	39.7	60.0	27.2
	1S61G/P3	1 1/2 X 3	600 x 150	4 7/8	123.8	6	152.4	19	482.6	6 1/8	155.6	1 9/16	39.7	65.0	29.5
H	1S11H/P3	1 1/2 X 3	150 x 150	5 1/8	130.2	4 7/8	123.8	22 1/16	560.4	6 1/8	155.6	1 1/4	31.8	60.0	27.2
	1S21H/P3	1 1/2 X 3	300 x 150	5 1/8	130.2	4 7/8	123.8	22 1/16	560.4	6 1/8	155.6	1 9/16	39.7	60.0	27.2
	1S31H/P3	2 X 3	300 x 150	5 1/8	130.2	4 7/8	123.8	22 1/16	560.4	6 1/8	155.6	1 11/16	42.9	65.0	29.5
	1S61H/P3	2 X 3	600 x 150	6 1/16	154.0	6 3/8	161.9	23	584.2	6 7/8	174.6	1 11/16	42.9	85.0	38.6
J	1S11J/P3	2 X 3	150 x 150	5 3/8	136.5	4 7/8	123.8	28	711.2	6 11/16	169.9	1 5/16	33.3	75.0	34.0
	1S21J/P3	2 X 3	300 x 150	5 3/8	136.5	4 7/8	123.8	28	711.2	6 11/16	169.9	1 9/16	39.7	75.0	34.0
	1S31J/P3	3 X 4	300 x 150	7 1/4	184.2	7 1/8	181.0	29	736.6	7 1/4	184.2	1 13/16	46.0	100.0	45.4
	1S61J/P3	3 X 4	600 x 150	7 1/4	184.2	7 1/8	181.0	28 3/4	730.3	9	228.6	1 13/16	46.0	170.0	77.1
K	1S11K/P3	3 X 4	150 x 150	6 1/8	155.6	6 3/8	161.9	28 1/8	714.4	7 1/4	184.2	1 7/16	36.5	110.0	49.9
	1S21K/P3	3 X 4	300 x 150	6 1/8	155.6	6 3/8	161.9	28 1/8	714.4	7 1/4	184.2	1 13/16	46.0	115.0	52.2
	1S31K/P3	3 X 4	300 x 150	6 1/8	155.6	6 3/8	161.9	28 1/8	714.4	7 3/4	196.9	1 15/16	49.2	140.0	63.5
	1S61K/P3	3 X 4	600 x 150	7 1/4	184.2	7 1/8	181.0	29 1/4	743.0	7 3/4	196.9	1 15/16	49.2	150.0	68.0
L	1S11L/P3	3 X 4	150 x 150	6 1/8	155.6	6 1/2	165.1	31 1/16	798.0	8 7/8	225.4	1 7/16	36.5	140.0	63.5
	1S21L/P3	3 X 4	300 x 150	6 1/8	155.6	6 1/2	165.1	31 1/16	798.0	8 7/8	225.4	1 13/16	46.0	145.0	65.8
	1S31L/P3	4 X 6	300 x 150	7 1/16	179.4	7 1/8	181.0	32	812.8	9 1/2	241.3	1 15/16	49.2	220.0	99.8
	1S61L/P3	4 X 6	600 x 150	7 1/16	179.4	8	203.2	32	812.8	9 1/2	241.3	2 3/16	55.6	230.0	104.3
M	1S11M/P3	4 X 6	150 x 150	7	177.8	7 1/4	184.2	36 1/4	920.8	9 3/8	238.1	1 5/8	41.3	185.0	83.9
	1S21M/P3	4 X 6	300 x 150	7	177.8	7 1/4	184.2	36 1/4	920.8	9 3/8	238.1	1 15/16	49.2	190.0	86.2
	1S31M/P3	4 X 6	300 x 150	7	177.8	7 1/4	184.2	36 1/4	920.8	9 3/8	238.1	1 15/16	49.2	230.0	104.3
	1S61M/P3	4 X 6	600 x 150	7	177.8	8	203.2	36 1/4	920.8	10 3/4	273.1	2 3/16	55.6	300.0	136.1
N	1S11N/P3	4 X 6	150 x 150	7 3/4	196.9	8 1/4	209.6	39	990.6	10 1/8	257.2	1 5/8	41.3	220.0	99.6
	1S21N/P3	4 X 6	300 x 150	7 3/4	196.9	8 1/4	209.6	39	990.6	10 1/8	257.2	1 15/16	49.2	225.0	102.1
	1S31N/P3	4 X 6	300 x 150	7 3/4	196.9	8 1/4	209.6	39	990.6	10 1/2	266.7	1 15/16	49.2	260.0	117.9
	1S61N/P3	4 X 6	600 x 150	7 3/4	196.9	8 3/4	222.3	39	990.6	11 3/4	298.5	2 3/16	55.6	360.0	163.3
P	1S11P/P3	4 X 6	150 x 150	7 1/8	181.0	9	228.6	41 3/4	1060.5	11	279.4	1 5/8	41.3	260.0	117.9
	1S21P/P3	4 X 6	300 x 150	7 1/8	181.0	9	228.6	41 3/4	1060.5	11	279.4	1 15/16	49.2	270.0	122.5
	1S31P/P3	4 X 6	300 x 150	8 7/8	225.4	10	254.0	41 3/4	1060.5	11 1/2	292.1	1 15/16	49.2	350.0	158.8
	1S61P/P3	4 X 6	600 x 150	8 7/8	225.4	10	254.0	41 3/4	1060.5	13 7/8	352.4	2 3/16	55.6	530.0	240.4
Q	1S11Q/P3	6 X 8	150 x 150	9 7/16	239.7	9 1/2	241.3	46	1168.4	13 5/8	346.1	1 13/16	46.0	430.0	195.0
	1S21Q/P3	6 X 8	300 x 150	9 7/16	239.7	9 1/2	241.3	46	1168.4	13 5/8	346.1	2 1/4	57.2	445.0	201.9
	1S31Q/P3	6 X 8	300 x 150	9 7/16	239.7	9 1/2	241.3	46	1168.4	14	355.6	2 1/4	57.2	530.0	240.4
	1S61Q/P3	6 X 8	600 x 150	9 7/16	239.7	9 1/2	241.3	46	1168.4	14 1/4	362.0	2 11/16	68.3	645.0	292.6
R	1S11R/P3	6 X 8	150 x 150	9 7/16	239.7	9 1/2	241.3	47 1/2	1206.5	14 1/2	368.3	1 13/16	46.0	495.0	224.5
	1S21R/P3	6 X 8	300 x 150	9 7/16	239.7	9 1/2	241.3	47 1/2	1206.5	14 1/2	368.3	2 1/4	57.2	510.0	231.3
	1S31R/P3	6 X 10	300 x 150	9 7/16	239.7	10 1/2	266.7	47 1/2	1206.5	14 1/2	368.3	2 1/4	57.2	550.0	249.5
	1S61R/P3	6 X 10	600 x 150	9 7/16	239.7	10 1/2	266.7	47 1/2	1206.5	15 1/8	384.2	2 11/16	68.3	645.0	292.6
T	1S11T/P3	8 X 10	150 x 150	10 7/8	276.2	11	279.4	50 1/4	1276.4	16 1/2	419.1	1 15/16	49.2	620.0	281.2
	1S21T/P3	8 X 10	300 x 150	10 7/8	276.2	11	279.4	50 1/4	1276.4	16 1/2	419.1	2 7/16	61.9	640.0	290.3
	1S31-1T/P3	8 X 10	300 x 150	10 7/8	276.2	11	279.4	50 1/4	1276.4	16 1/2	419.1	2 7/16	61.9	675.0	306.2
	1S31-2T/P3	8 X 10	600 x 150	10 7/8	276.2	11	279.4	50 1/4	1276.4	16 1/2	419.1	2 7/16	61.9	690.0	313.0

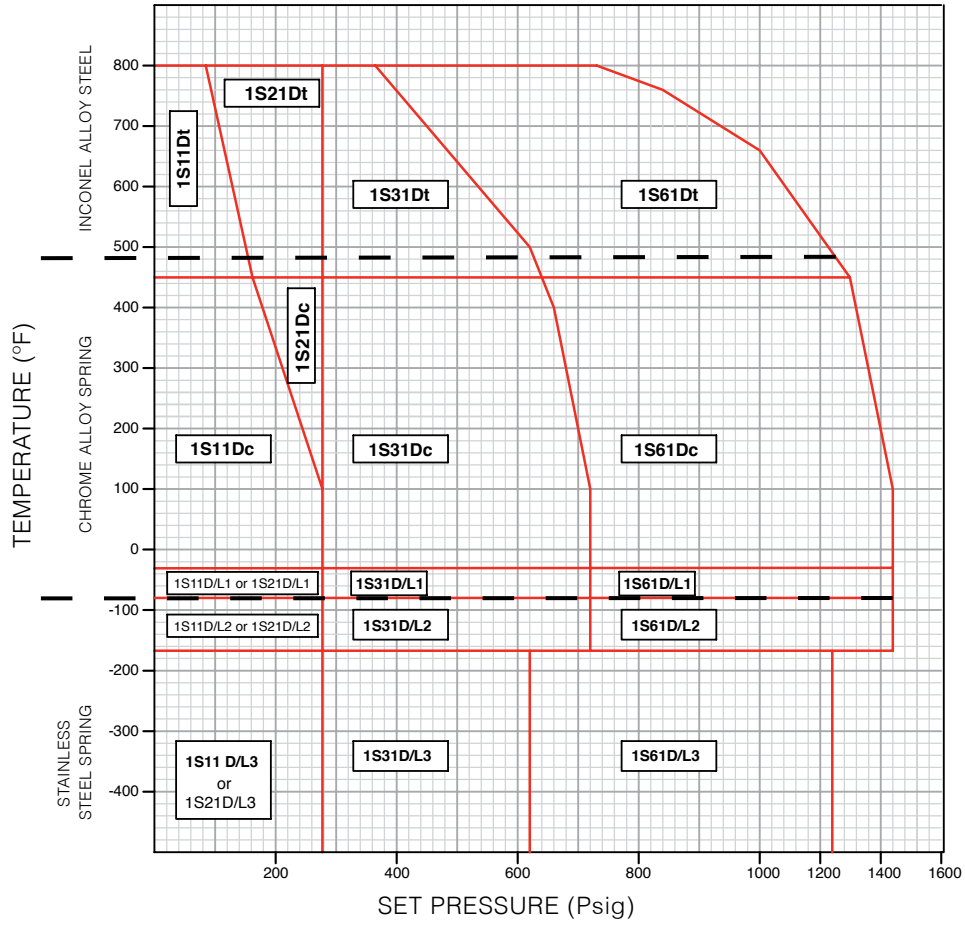
WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
OPEN BONNET TYPE 1S/P3 SERIES AS PER ASME SECTION VIII
Dimensions and weights

TYPE 1S/P3 SERIES



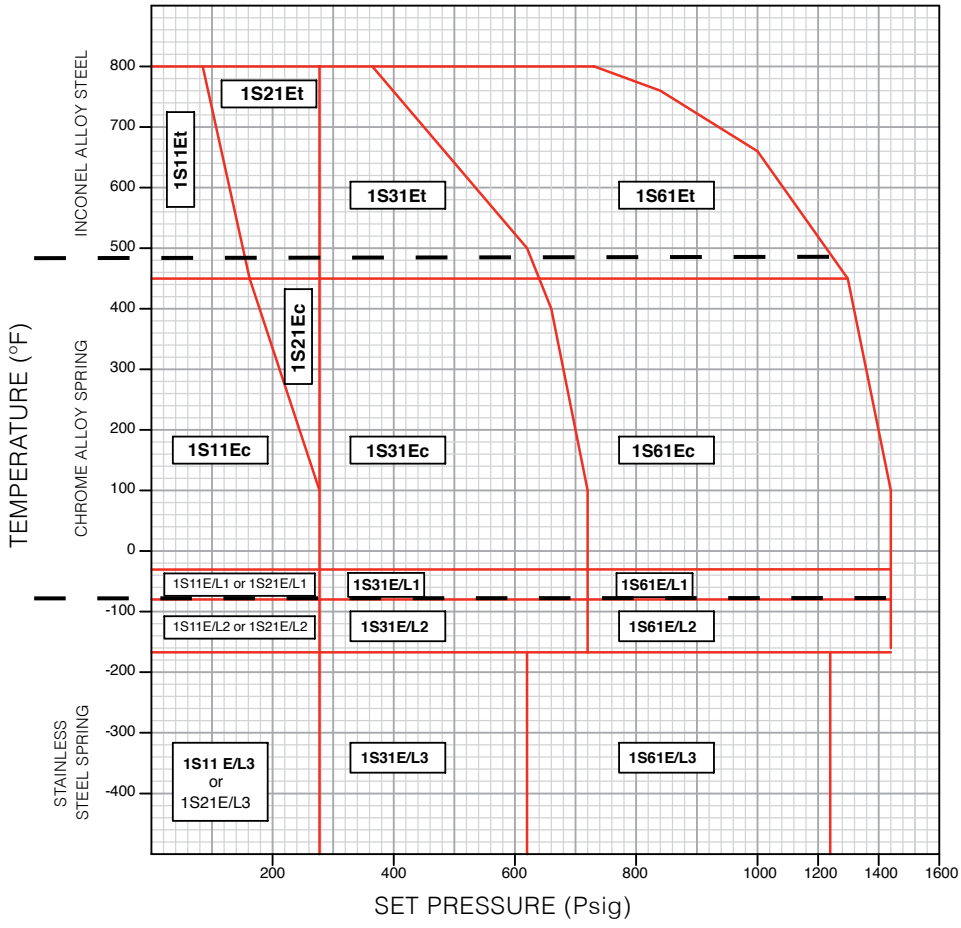
TYPE 1S/P3 SERIES

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
SELECTION INDEX FOR VAPORS, GASES AND LIQUIDS
1S AND 1S-30 SERIES ORIFICE D API AREA 0.110 INCHES²



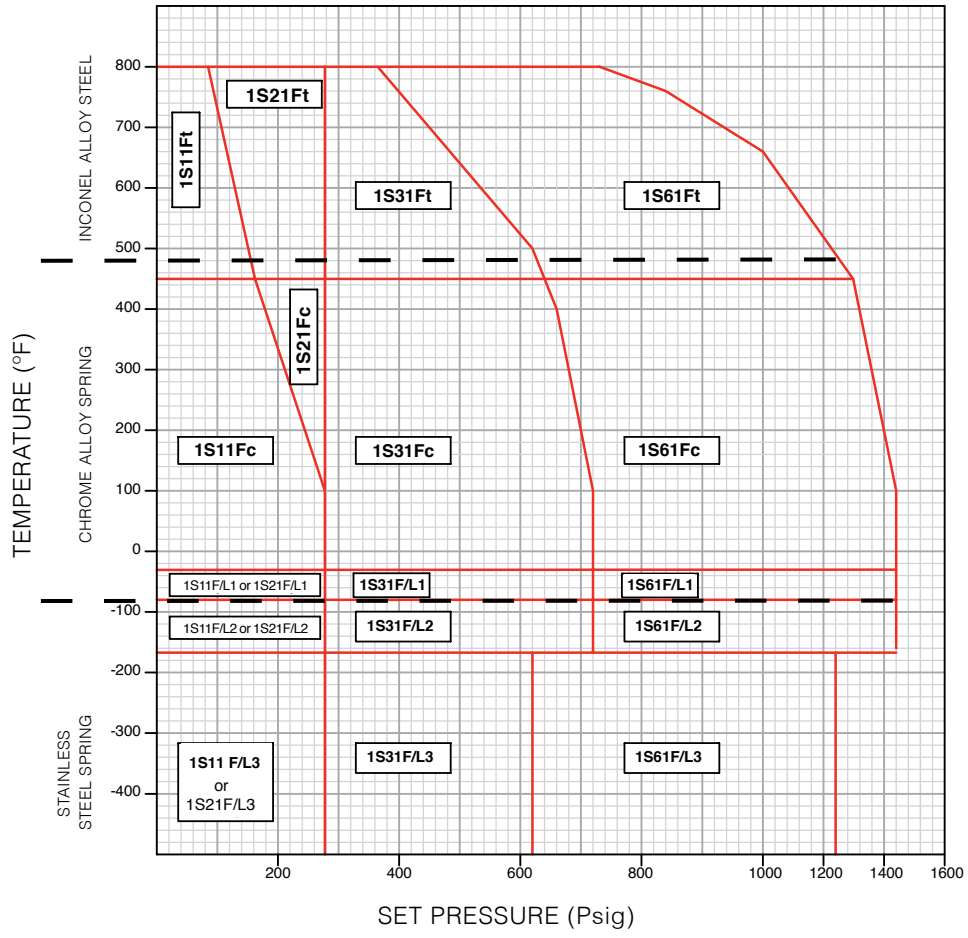
Model and Valve Type		Valve Size	ANSI Flange Class		Inlet Pressure and Temperature Limits						Backpressure Limit at 100°F	
Conventional	Bellows	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	-450°F -151°F	-150°F -76°F	-75°F -21°F	-20°F +100°F	450°F	800°F	Conventional	Bellows
1S11 Dc	1S11-30 Dc	1X2	150#	150#	-	-	-	285#	185#	-	285#	230#
1S21 Dc	1S21-30 Dc	1X2	300#	150#	-	-	-	285#	285#	-	285#	230#
1S31 Dc	1S31-30 Dc	1X2	300#	150#	-	-	-	740#	615#	-	285#	230#
1S61 Dc	1S61-30 z	1X2	600#	150#	-	-	-	1480#	1235#	-	285#	230#
1S11 Dt	1S11-30 Dt	1X2	150#	150#	-	-	-	-	185#	80#	285#	230#
1S21 Dt	1S21-30 Dt	1X2	300#	150#	-	-	-	-	285#	285#	285#	230#
1S31 Dt	1S31-30 Dt	1X2	300#	150#	-	-	-	-	615#	410#	285#	230#
1S61 Dt	1S61-30 Dt	1X2	600#	150#	-	-	-	-	1238#	825#	285#	230#
1S11 D/L1	1S11-30 D/L1	1X2	150#	150#	-	-	275#	-	-	-	275#	230#
1S21 D/L1	1S21-30 D/L1	1X2	300#	150#	-	-	275#	-	-	-	275#	230#
1S31 D/L1	1S31-30 D/L1	1X2	300#	150#	-	-	720#	-	-	-	275#	230#
1S61 D/L1	1S61-30 D/L1	1X2	600#	150#	-	-	1440#	-	-	-	275#	230#
1S11 D/L2	1S11-30 D/L2	1X2	150#	150#	-	275#	-	-	-	-	275#	230#
1S21 D/L2	1S21-30 D/L2	1X2	300#	150#	-	275#	-	-	-	-	275#	230#
1S31 D/L2	1S31-30 D/L2	1X2	300#	150#	-	720#	-	-	-	-	275#	230#
1S61 D/L2	1S61-30 D/L2	1X2	600#	150#	-	1440#	-	-	-	-	275#	230#
1S11 D/L3	1S11-30 D/L3	1X2	150#	150#	275#	-	-	-	-	-	275#	230#
1S21 D/L3	1S21-30 D/L3	1X2	300#	150#	275#	-	-	-	-	-	275#	230#
1S31 D/L3	1S31-30 D/L3	1X2	300#	150#	615#	-	-	-	-	-	275#	230#
1S61 D/L3	1S61-30 D/L3	1X2	600#	150#	1235#	-	-	-	-	-	275#	230#

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
SELECTION INDEX FOR VAPORS, GASES AND LIQUIDS
1S AND 1S-30 SERIES ORIFICE E API AREA 0.196 INCHES^2



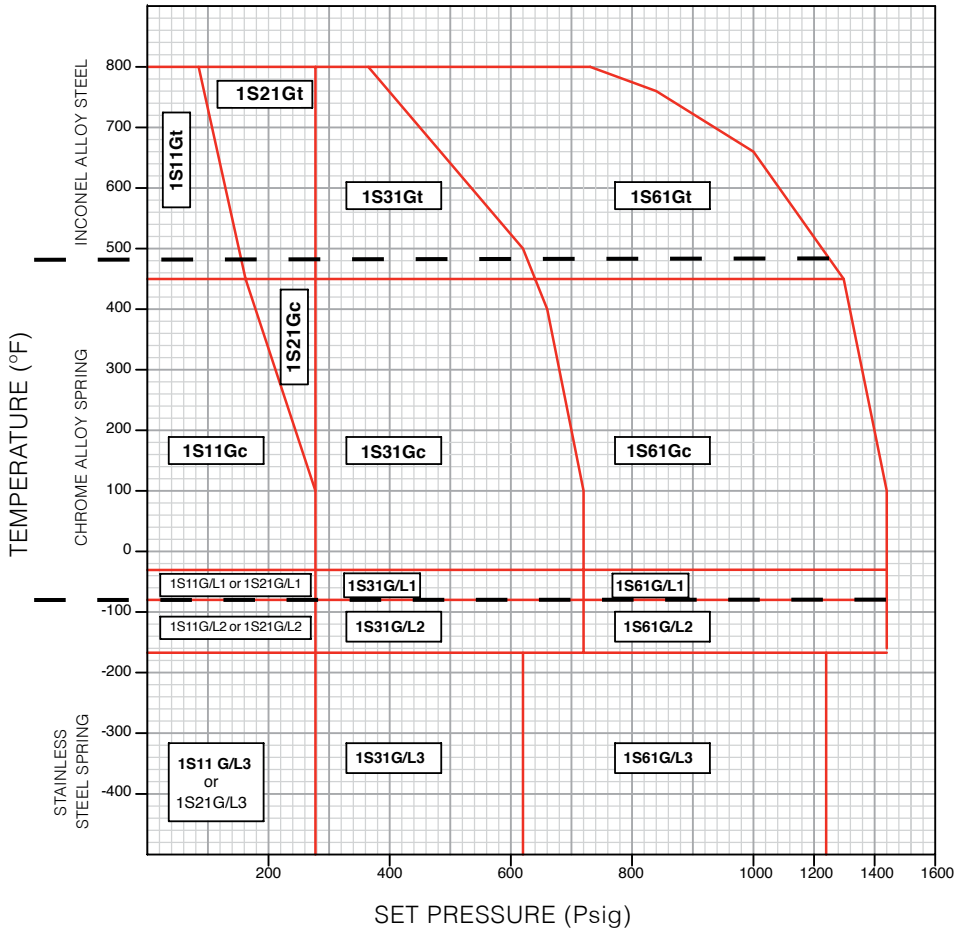
Model and Valve Type		Valve Size	ANSI Flange Class		Backpressure and Temperature Inlet Limits						Backpressure Limit at 100°F	
Conventional	Bellows	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	-450°F -151°F	-150°F -76°F	-75°F -21°F	-20°F +100°F	450°F	800°F	Conventional	Bellows
1S11 Ec	1S11-30 Ec	1X2	150#	150#	-	-	-	285#	185#	-		
1S21 Ec	1S21-30 Ec	1X2	300#	150#	-	-	-	285#	285#	-	285#	230#
1S31 Ec	1S31-30 Ec	1X2	300#	150#	-	-	-	740#	615#	-	285#	230#
1S61 Ec	1S61-30 Ec	1X2	600#	150#	-	-	-	1480#	1235#	-	285#	230#
1S11 Et	1S11-30 Et	1X2	150#	150#	-	-	-	-	185#	80#	285#	230#
1S21 Et	1S21-30 Et	1X2	300#	150#	-	-	-	-	285#	285#	285#	230#
1S31 Et	1S31-30 Et	1X2	300#	150#	-	-	-	-	615#	410#	285#	230#
1S61 Et	1S61-30 Et	1X2	600#	150#	-	-	-	-	1235#	825#	285#	230#
1S11 E/L1	1S11-30 E/L1	1X2	150#	150#	-	-	275#	-	-	-	275#	230#
1S21 E/L1	1S21-30 E/L1	1X2	300#	150#	-	-	275#	-	-	-	275#	230#
1S31 E/L1	1S31-30 E/L1	1X2	300#	150#	-	-	720#	-	-	-	275#	230#
1S61 E/L1	1S61-30 E/L1	1X2	600#	150#	-	-	1440#	-	-	-	275#	230#
1S11 E/L2	1S11-30 E/L2	1X2	150#	150#	-	275#	-	-	-	-	275#	230#
1S21 E/L2	1S21-30 E/L2	1X2	300#	150#	-	275#	-	-	-	-	275#	230#
1S31 E/L2	1S31-30 E/L2	1X2	300#	150#	-	720#	-	-	-	-	275#	230#
1S61 E/L2	1S61-30 E/L2	1X2	600#	150#	-	1440#	-	-	-	-	275#	230#
1S11 E/L3	1S11-30 E/L3	1X2	150#	150#	275#	-	-	-	-	-	275#	230#
1S21 E/L3	1S21-30 E/L3	1X2	300#	150#	275#	-	-	-	-	-	275#	230#
1S31 E/L3	1S31-30 E/L3	1X2	300#	150#	615#	-	-	-	-	-	275#	230#
1S61 E/L3	1S61-30 ED/L3	1X2	600#	150#	1235#	-	-	-	-	-	275#	230#

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
SELECTION INDEX FOR VAPORS, GASES AND LIQUIDS
1S AND 1S-30 SERIES ORIFICE F API AREA 0.307 INCHES²



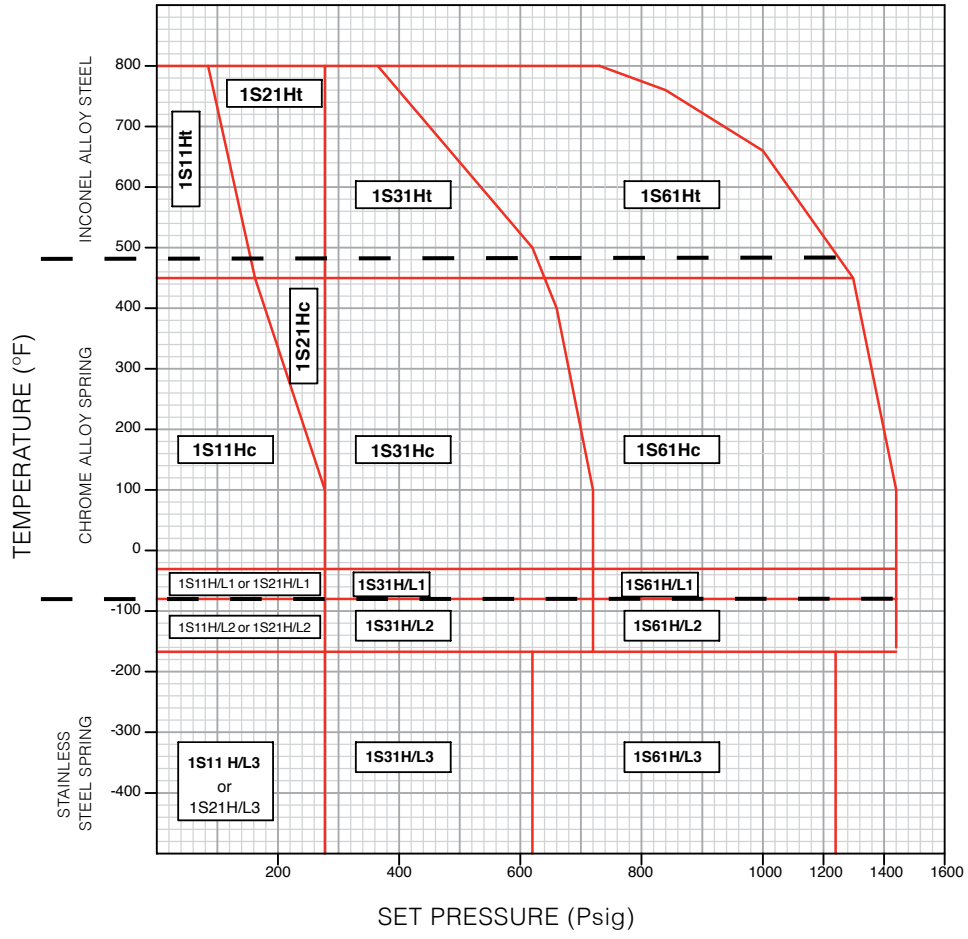
Model and Valve Type		Valve Size	ANSI Flange Class		Backpressure and Temperature Inlet Limits						Backpressure Limit at 100°F	
Conventional	Bellows	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	-450°F -151°F	-150°F -76°F	-75°F -21°F	-20°F +100°F	450°F	800°F	Conventional	Bellows
1S11 Fc	1S11-30 Fc	1-1/2x2	150#	150#	-	-	-	285#	185#	-	285#	230#
1S21 Fc	1S21-30 Fc	1-1/2x2	300#	150#	-	-	-	285#	285#	-	285#	230#
1S31 Fc	1S31-30 Fc	1-1/2x2	300#	150#	-	-	-	740#	615#	-	285#	230#
1S61 Fc	1S61-30 Fc	1-1/2x2	600#	150#	-	-	-	1480#	1235#	-	285#	230#
1S11 Ft	1S11-30 Ft	1-1/2x2	150#	150#	-	-	-	-	185#	80#	285#	230#
1S21 Ft	1S21-30 Ft	1-1/2x2	300#	150#	-	-	-	-	285#	285#	285#	230#
1S31 Ft	1S31-30 Ft	1-1/2x2	300#	150#	-	-	-	-	615#	410#	285#	230#
1S61 Ft	1S61-30 Ft	1-1/2x2	600#	150#	-	-	-	-	1235#	825#	285#	230#
1S11 F/L1	1S11-30 F/L1	1-1/2x2	150#	150#	-	-	275#	-	-	-	275#	230#
1S21 F/L1	1S21-30 F/L1	1-1/2x2	300#	150#	-	-	275#	-	-	-	275#	230#
1S31 F/L1	1S31-30 F/L1	1-1/2x2	300#	150#	-	-	720#	-	-	-	275#	230#
1S61 F/L1	1S61-30 F/L1	1-1/2x2	600#	150#	-	-	1440#	-	-	-	275#	230#
1S11 F/L2	1S11-30 F/L2	1-1/2x2	150#	150#	-	275#	-	-	-	-	275#	230#
1S21 F/L2	1S21-30 F/L2	1-1/2x2	300#	150#	-	275#	-	-	-	-	275#	230#
1S31 F/L2	1S31-30 F/L2	1-1/2x2	300#	150#	-	720#	-	-	-	-	275#	230#
1S61 F/L2	1S61-30 F/L2	1-1/2x2	600#	150#	-	1440#	-	-	-	-	275#	230#
1S11 F/L3	1S11-30 F/L3	1-1/2x2	150#	150#	275#	-	-	-	-	-	275#	230#
1S21 F/L3	1S21-30 F/L3	1-1/2x2	300#	150#	275#	-	-	-	-	-	275#	230#
1S31 F/L3	1S31-30 F/L3	1-1/2x2	300#	150#	615#	-	-	-	-	-	275#	230#
1S61 F/L3	1S61-30 F/L3	1-1/2x2	600#	150#	1235#	-	-	-	-	-	275#	230#

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
SELECTION INDEX FOR VAPORS, GASES AND LIQUIDS
1S AND 1S-30 SERIES ORIFICE G API AREA 0.503 INCHES²



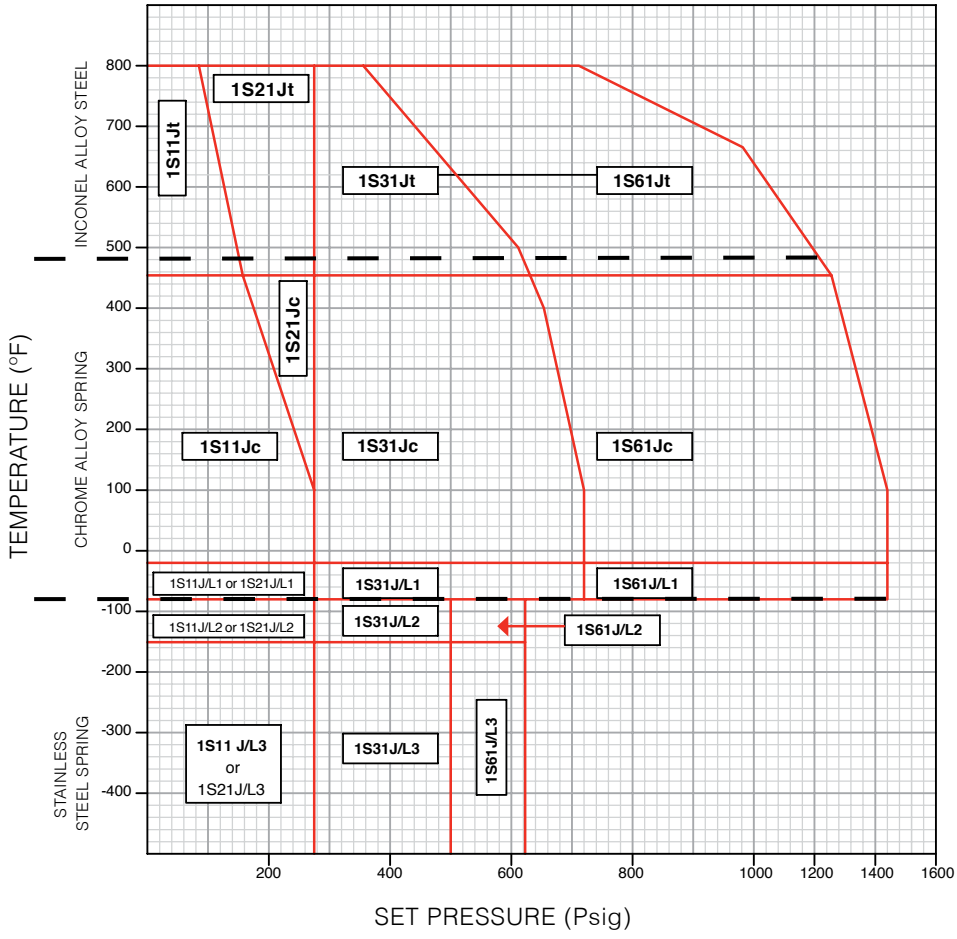
Model and Valve Type		Valve Size	ANSI Flange Class		Backpressure and Temperature Inlet Limits						Backpressure Limit at 100°F	
Conventional	Bellows	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	-450°F -151°F	-150°F -76°F	-75°F -21°F	-20°F +100°F	450°F	800°F	Conventional	Bellows
1S11 Gc	1S11-30 Gc	1-1/2x3	150#	150#	-	-	-	285#	185#	-	285#	230#
1S21 Gc	1S21-30 Gc	1-1/2x3	300#	150#	-	-	-	285#	285#	-	285#	230#
1S31 Gc	1S31-30 Gc	1-1/2x3	300#	150#	-	-	-	740#	615#	-	285#	230#
1S61 Gc	1S61-30 Gc	1-1/2x3	600#	150#	-	-	-	1480#	1235#	-	285#	230#
1S11 Gt	1S11-30 Gt	1-1/2x3	150#	150#	-	-	-	-	185#	80#	285#	230#
1S21 Gt	1S21-30 Gt	1-1/2x3	300#	150#	-	-	-	-	285#	285#	285#	230#
1S31 Gt	1S31-30 Gt	1-1/2x3	300#	150#	-	-	-	-	615#	410#	285#	230#
1S61 Gt	1S61-30 Gt	1-1/2x3	600#	150#	-	-	-	-	1235#	825#	285#	230#
1S11 G/L1	1S11-30 G/L1	1-1/2x3	150#	150#	-	-	275#	-	-	-	275#	230#
1S21 G/L1	1S21-30 G/L1	1-1/2x3	300#	150#	-	-	275#	-	-	-	275#	230#
1S31 G/L1	1S31-30 G/L1	1-1/2x3	300#	150#	-	-	720#	-	-	-	275#	230#
1S61 G/L1	1S61-30 G/L1	1-1/2x3	600#	150#	-	-	1440#	-	-	-	275#	230#
1S11 G/L2	1S11-30 G/L2	1-1/2x3	150#	150#	-	275#	-	-	-	-	275#	230#
1S21 G/L2	1S21-30 G/L2	1-1/2x3	300#	150#	-	275#	-	-	-	-	275#	230#
1S31 G/L2	1S31-30 G/L2	1-1/2x3	300#	150#	-	720#	-	-	-	-	275#	230#
1S61 G/L2	1S61-30 G/L2	1-1/2x3	600#	150#	-	1440#	-	-	-	-	275#	230#
1S11 G/L3	1S11-30 G/L3	1-1/2x3	150#	150#	275#	-	-	-	-	-	275#	230#
1S21 G/L3	1S21-30 G/L3	1-1/2x3	300#	150#	275#	-	-	-	-	-	275#	230#
1S31 G/L3	1S31-30 G/L3	1-1/2x3	300#	150#	615#	-	-	-	-	-	275#	230#
1S61 G/L3	1S61-30 G/L3	1-1/2x3	600#	150#	1235#	-	-	-	-	-	275#	230#

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
SELECTION INDEX FOR VAPORS, GASES AND LIQUIDS
1S AND 1S-30 SERIES ORIFICE H API AREA 0.785 INCHES²



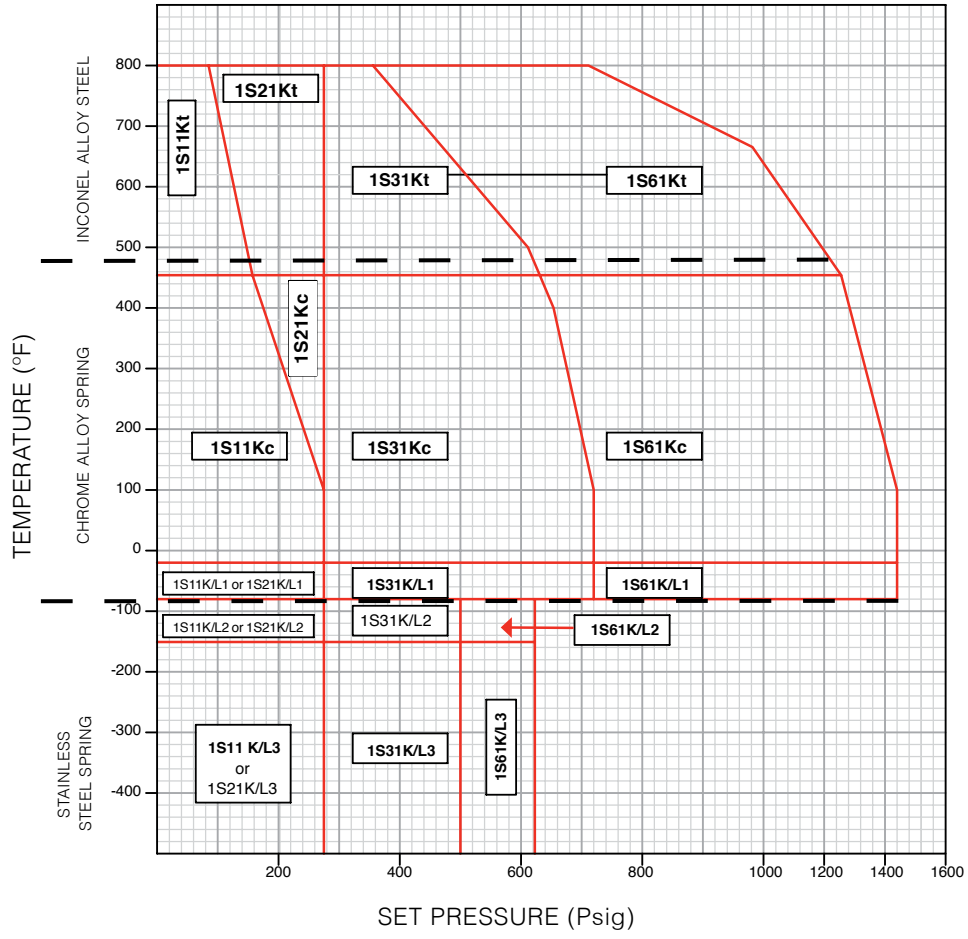
Model and Valve Type		Valve Size	ANSI Flange Class		Backpressure and Temperature Inlet Limits						Backpressure Limit at 100°F	
Conventional	Bellows	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	-450°F -151°F	-150°F -76°F	-75°F -21°F	-20°F +100°F	450°F	800°F	Conventional	Bellows
1S11 Hc	1S11-30 Hc	1-1/2x3	150#	150#	-	-	-	285#	185#	-	285#	230#
1S21 Hc	1S21-30 Hc	1-1/2x3	300#	150#	-	-	-	285#	285#	-	285#	230#
1S31 Hc	1S31-30 Hc	2X3	300#	150#	-	-	-	740#	615#	-	285#	230#
1S61 Hc	1S61-30 Hc	2X3	600#	150#	-	-	-	1480#	1235#	-	285#	230#
1S11 Ht	1S11-30 Ht	1-1/2x3	150#	150#	-	-	-	-	185#	80#	285#	230#
1S21 Ht	1S21-30 Ht	1-1/2x3	300#	150#	-	-	-	-	285#	285#	285#	230#
1S31 Ht	1S31-30 Ht	2X3	300#	150#	-	-	-	-	615#	410#	285#	230#
1S61 Ht	1S61-30 Ht	2X3	600#	150#	-	-	-	-	1235#	825#	285#	230#
1S11 H/L1	1S11-30 H/L1	1-1/2x3	150#	150#	-	-	275#	-	-	-	275#	230#
1S21 H/L1	1S21-30 H/L1	1-1/2x3	300#	150#	-	-	275#	-	-	-	275#	230#
1S31 H/L1	1S31-30 H/L1	2X3	300#	150#	-	-	720#	-	-	-	275#	230#
1S61 H/L1	1S61-30 H/L1	2X3	600#	150#	-	-	1440#	-	-	-	275#	230#
1S11 H/L2	1S11-30 H/L2	1-1/2x3	150#	150#	-	275#	-	-	-	-	275#	230#
1S21 H/L2	1S21-30 H/L2	1-1/2x3	300#	150#	-	275#	-	-	-	-	275#	230#
1S31 H/L2	1S31-30 H/L2	2X3	300#	150#	-	720#	-	-	-	-	275#	230#
1S61 H/L2	1S61-30 H/L2	2X3	600#	150#	-	1440#	-	-	-	-	275#	230#
1S11 H/L3	1S11-30 H/L3	1-1/2x3	150#	150#	275#	-	-	-	-	-	275#	230#
1S21 H/L3	1S21-30 H/L3	1-1/2x3	300#	150#	275#	-	-	-	-	-	275#	230#
1S31 H/L3	1S31-30 H/L3	2X3	300#	150#	615#	-	-	-	-	-	275#	230#
1S61 H/L3	1S61-30 H/L3	2X3	600#	150#	1235#	-	-	-	-	-	275#	230#

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
SELECTION INDEX FOR VAPORS, GASES AND LIQUIDS
1S AND 1S-30 SERIES ORIFICE J API AREA 1.287 INCHES^2



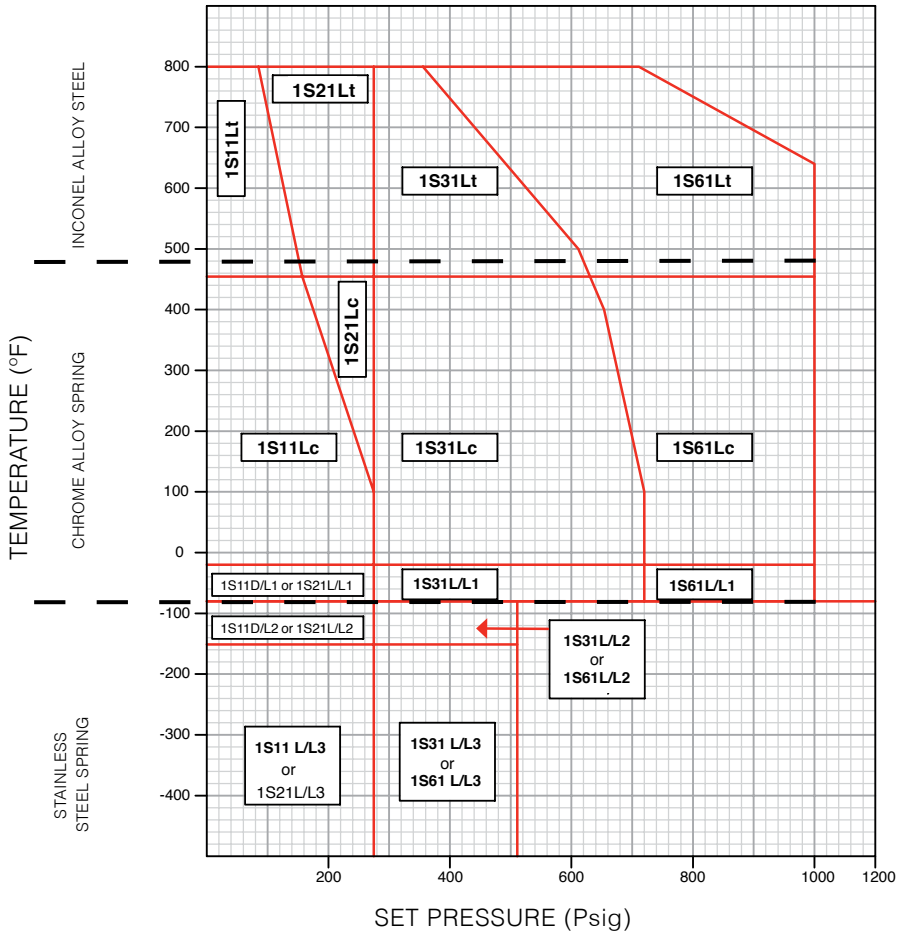
Model and Valve Type		Valve Size	ANSI Flange Class		Backpressure and Temperature Inlet Limits						Backpressure Limit at 100°F	
Conventional	Bellows	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	-450°F -151°F	-150°F -76°F	-75°F -21°F	-20°F +100°F	450°F	800°F	Conventional	Bellows
1S11 Jc	1S11-30 Jc	2X3	150#	150#	-	-	-	285#	80#	-	285#	230#
1S21 Jc	1S21-30 Jc	2X3	300#	150#	-	-	-	285#	285#	-	285#	230#
1S31 Jc	1S31-30 Jc	3X4	300#	150#	-	-	-	740#	410#	-	285#	230#
1S61 Jc	1S61-30 Jc	3X4	600#	150#	-	-	-	1480#	825#	-	285#	230#
1S11 Jt	1S11-30 Jt	2X3	150#	150#	-	-	-	-	185#	80#	285#	230#
1S21 Jt	1S21-30 Jt	2X3	300#	150#	-	-	-	-	285#	285#	285#	230#
1S31 Jt	1S31-30 Jt	3X4	300#	150#	-	-	-	-	615#	410#	285#	230#
1S61 Jt	1S61-30 Jt	3X4	600#	150#	-	-	-	-	1235#	825#	285#	230#
1S11 J/L1	1S11-30 J/L1	2X3	150#	150#	-	-	275#	-	-	-	275#	230#
1S21 J/L1	1S21-30 J/L1	2X3	300#	150#	-	-	275#	-	-	-	275#	230#
1S31 J/L1	1S31-30 J/L1	3X4	300#	150#	-	-	720#	-	-	-	275#	230#
1S61 J/L1	1S61-30 J/L1	3X4	600#	150#	-	-	1440#	-	-	-	275#	230#
1S11 J/L2	1S11-30 J/L2	2X3	150#	150#	-	275#	-	-	-	-	275#	230#
1S21 J/L2	1S21-30 J/L2	2X3	300#	150#	-	275#	-	-	-	-	275#	230#
1S31 J/L2	1S31-30 J/L2	3X4	300#	150#	-	500#	-	-	-	-	275#	230#
1S61 J/L2	1S61-30 J/L2	3X4	600#	150#	-	625#	-	-	-	-	275#	230#
1S11 J/L3	1S11-30 J/L3	2X3	150#	150#	275#	-	-	-	-	-	275#	230#
1S21 J/L3	1S21-30 J/L3	2X3	300#	150#	275#	-	-	-	-	-	275#	230#
1S31 J/L3	1S31-30 J/L3	3X4	300#	150#	500#	-	-	-	-	-	275#	230#
1S61 J/L3	1S61-30 J/L3	3X4	600#	150#	625#	-	-	-	-	-	275#	230#

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
SELECTION INDEX FOR VAPORS, GASES AND LIQUIDS
1S AND 1S-30 SERIES ORIFICE K API AREA 1.838 INCHES²



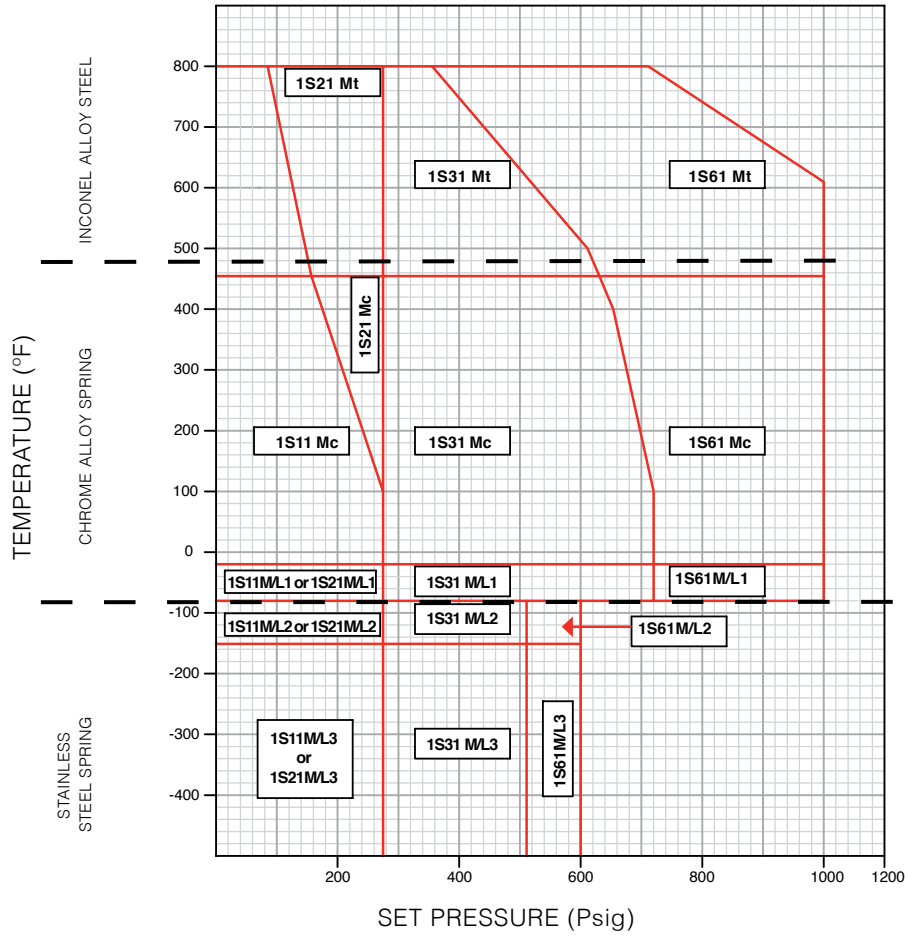
Model and Valve Type		Valve Size	ANSI Flange Class		Backpressure and Temperature Inlet Limits						Backpressure Limit at 100°F	
Conventional	Bellows	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	-450°F -151°F	-150°F -76°F	-75°F -21°F	-20°F +100°F	450°F	800°F	Conventional	Bellows
1S11 Kc	1S11-30 Kc	3X4	150#	150#	-	-	-	285#	185#	-	285#	150#
1S21 Kc	1S21-30 Kc	3X4	300#	150#	-	-	-	285#	285#	-	285#	150#
1S31 Kc	1S31-30 Kc	3X4	300#	150#	-	-	-	740#	615#	-	285#	150#
1S61 Kc	1S61-30 Kc	3X4	600#	150#	-	-	-	1480#	1235#	-	285#	200#
1S11 Kt	1S11-30 Kt	3X4	150#	150#	-	-	-	-	185#	80#	285#	150#
1S21 Kt	1S21-30 Kt	3X4	300#	150#	-	-	-	-	285#	285#	285#	150#
1S31 Kt	1S31-30 Kt	3X4	300#	150#	-	-	-	-	615#	410#	285#	150#
1S61 Kt	1S61-30 Kt	3X4	600#	150#	-	-	-	-	1235#	825#	285#	200#
1S11 K/L1	1S11-30 K/L1	3X4	150#	150#	-	-	275#	-	-	-	275#	150#
1S21 K/L1	1S21-30 K/L1	3X4	300#	150#	-	-	275#	-	-	-	275#	150#
1S31 K/L1	1S31-30 K/L1	3X4	300#	150#	-	-	720#	-	-	-	275#	150#
1S61 K/L1	1S61-30 K/L1	3X4	600#	150#	-	-	1480#	-	-	-	275#	200#
1S11 K/L2	1S11-30 K/L2	3X4	150#	150#	-	275#	-	-	-	-	275#	150#
1S21 K/L2	1S21-30 K/L2	3X4	300#	150#	-	275#	-	-	-	-	275#	150#
1S31 K/L2	1S31-30 K/L2	3X4	300#	150#	-	525#	-	-	-	-	275#	150#
1S61 K/L2	1S61-30 K/L2	3X4	600#	150#	-	600#	-	-	-	-	275#	200#
1S11 K/L3	1S11-30 K/L3	3X4	150#	150#	275#	-	-	-	-	-	275#	150#
1S21 K/L3	1S21-30 K/L3	3X4	300#	150#	275#	-	-	-	-	-	275#	150#
1S31 K/L3	1S31-30 K/L3	3X4	300#	150#	525#	-	-	-	-	-	275#	150#
1S61 K/L3	1S61-30 K/L3	3X4	600#	150#	600#	-	-	-	-	-	275#	200#

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
SELECTION INDEX FOR VAPORS, GASES AND LIQUIDS
1S AND 1S-30 SERIES ORIFICE L API AREA 2.853 INCHES²



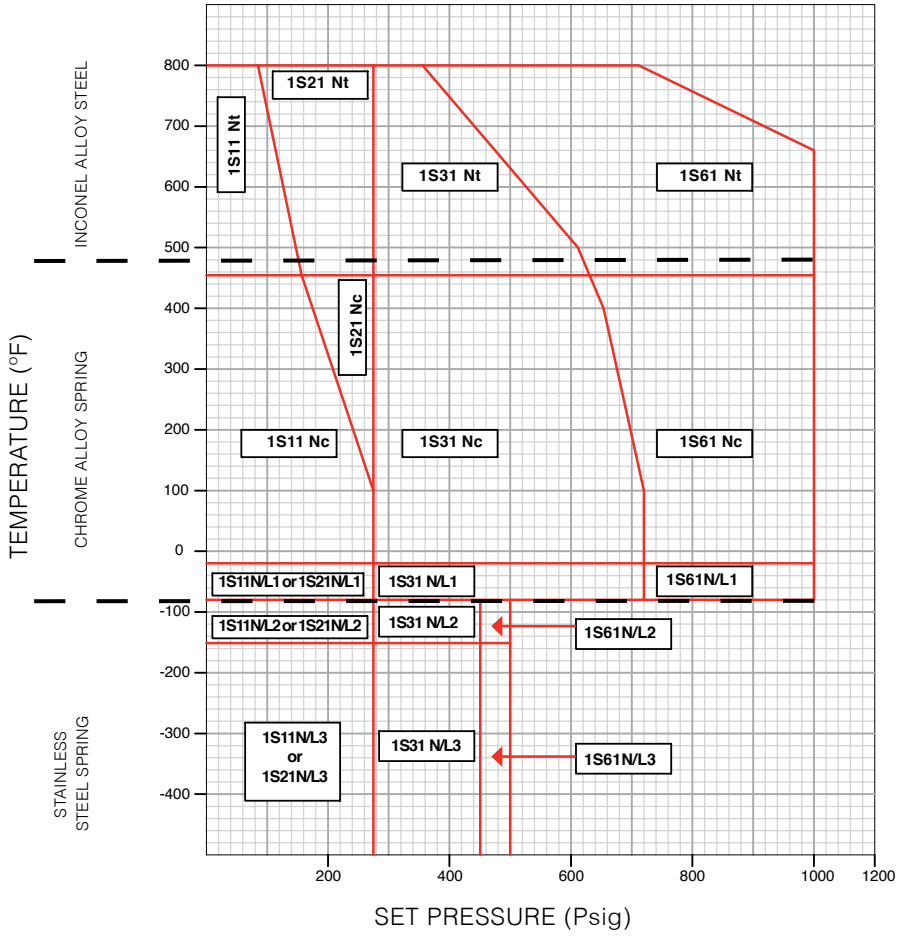
Model and Valve Type		Valve Size	ANSI Flange Class		Backpressure and Temperature Inlet Limits						Backpressure Limit at 100°F	
Conventional	Bellows	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	-450°F -151°F	-150°F -76°F	-75°F -21°F	-20°F +100°F	450°F	800°F	Conventional	Bellows
1S11 Lc	1S11-30 Lc	3X4	150#	150#	-	-	-	285#	185#	-	285#	100#
1S21 Lc	1S21-30 Lc	3X4	300#	150#	-	-	-	285#	285#	-	285#	100#
1S31 Lc	1S31-30 Lc	4X6	300#	150#	-	-	-	740#	615#	-	285#	170#
1S61 Lc	1S61-30 Lc	4X6	600#	150#	-	-	-	1000#	1000#	-	285#	170#
1S11 Lt	1S11-30 Lt	3X4	150#	150#	-	-	-	-	185#	80#	285#	100#
1S21 Lt	1S21-30 Lt	3X4	300#	150#	-	-	-	-	285#	285#	285#	100#
1S31 Lt	1S31-30 Lt	4X6	300#	150#	-	-	-	-	615#	410#	285#	170#
1S61 Lt	1S61-30 Lt	4X6	600#	150#	-	-	-	-	1000#	825#	285#	170#
1S11 L/L1	1S11-30 L/L1	3X4	150#	150#	-	-	285#	-	-	-	285#	100#
1S21 L/L1	1S21-30 L/L1	3X4	300#	150#	-	-	285#	-	-	-	285#	100#
1S31 L/L1	1S31-30 L/L1	4X6	300#	150#	-	-	740#	-	-	-	285#	170#
1S61 L/L1	1S61-30 L/L1	4X6	600#	150#	-	-	1000#	-	-	-	285#	170#
1S11 L/L2	1S11-30 L/L2	3X4	150#	150#	-	275#	-	-	-	-	285#	100#
1S21 L/L2	1S21-30 L/L2	3X4	300#	150#	-	275#	-	-	-	-	285#	100#
1S31 L/L2	1S31-30 L/L2	4X6	300#	150#	-	535#	-	-	-	-	285#	170#
1S61 L/L2	1S61-30 L/L2	4X6	600#	150#	-	535#	-	-	-	-	285#	170#
1S11 L/L3	1S11-30 L/L3	3X4	150#	150#	275#	-	-	-	-	-	285#	100#
1S21 L/L3	1S21-30 L/L3	3X4	300#	150#	275#	-	-	-	-	-	285#	100#
1S31 L/L3	1S31-30 L/L3	4X6	300#	150#	535#	-	-	-	-	-	285#	170#
1S61 L/L3	1S61-30 L/L3	4X6	600#	150#	535#	-	-	-	-	-	285#	170#

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
SELECTION INDEX FOR VAPORS, GASES AND LIQUIDS
1S AND 1S-30 SERIES ORIFICE M API AREA 3.600 INCHES²



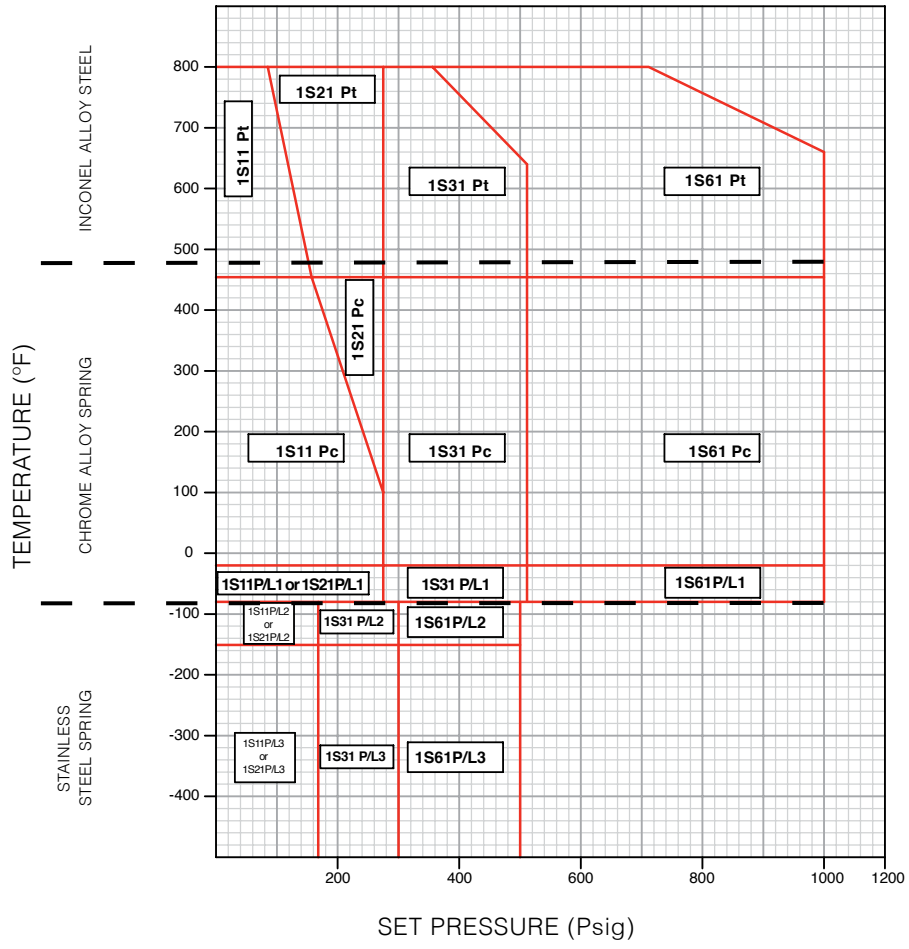
Model and Valve Type		Valve Size	ANSI Flange Class		Backpressure and Temperature Inlet Limits						Backpressure Limit at 100°F	
Conventional	Bellows	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	-450°F -151°F	-150°F -76°F	-75°F -21°F	-20°F +100°F	450°F	800°F	Conventional	Bellows
1S11 Mc	1S11-30 Mc	4X6	150#	150#	-	-	-	285#	185#	-	285#	80#
1S21 Mc	1S21-30 Mc	4X6	300#	150#	-	-	-	285#	285#	-	285#	80#
1S31 Mc	1S31-30 Mc	4X6	300#	150#	-	-	-	740#	615#	-	285#	160#
1S61 Mc	1S61-30 Mc	4X6	600#	150#	-	-	-	1100#	1100#	-	285#	160#
1S21 Mt	1S21-30 Mt	4X6	300#	150#	-	-	-	-	285#	285#	285#	80#
1S31 Mt	1S31-30 Mt	4X6	300#	150#	-	-	-	-	615#	410#	285#	160#
1S61 Mt	1S61-30 Mt	4X6	600#	150#	-	-	-	-	1100#	825#	285#	160#
1S11 M/L1	1S11-30 M/L1	4X6	150#	150#	-	-	285#	-	-	-	285#	80#
1S21 M/L1	1S21-30 M/L1	4X6	300#	150#	-	-	285#	-	-	-	285#	80#
1S31 M/L1	1S31-30 M/L1	4X6	300#	150#	-	-	740#	-	-	-	285#	160#
1S61 M/L1	1S61-30 M/L1	4X6	600#	150#	-	-	1100#	-	-	-	285#	160#
1S11 M/L2	1S11-30 M/L2	4X6	150#	150#	-	275#	-	-	-	-	285#	80#
1S21 M/L2	1S21-30 M/L2	4X6	300#	150#	-	275#	-	-	-	-	285#	80#
1S31 M/L2	1S31-30 M/L2	4X6	300#	150#	-	525#	-	-	-	-	285#	160#
1S61 M/L2	1S61-30 M/L2	4X6	600#	150#	-	600#	-	-	-	-	285#	160#
1S11 M/L3	1S11-30 M/L3	4X6	150#	150#	275#	-	-	-	-	-	285#	80#
1S21 M/L3	1S21-30 M/L3	4X6	300#	150#	275#	-	-	-	-	-	285#	80#
1S31 M/L3	1S31-30 M/L3	4X6	300#	150#	525#	-	-	-	-	-	285#	160#
1S61 M/L3	1S61-30 M/L3	4X6	600#	150#	600#	-	-	-	-	-	285#	160#

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
SELECTION INDEX FOR VAPORS, GASES AND LIQUIDS
1S AND 1S-30 SERIES ORIFICE N API AREA 4.34 INCHES^2



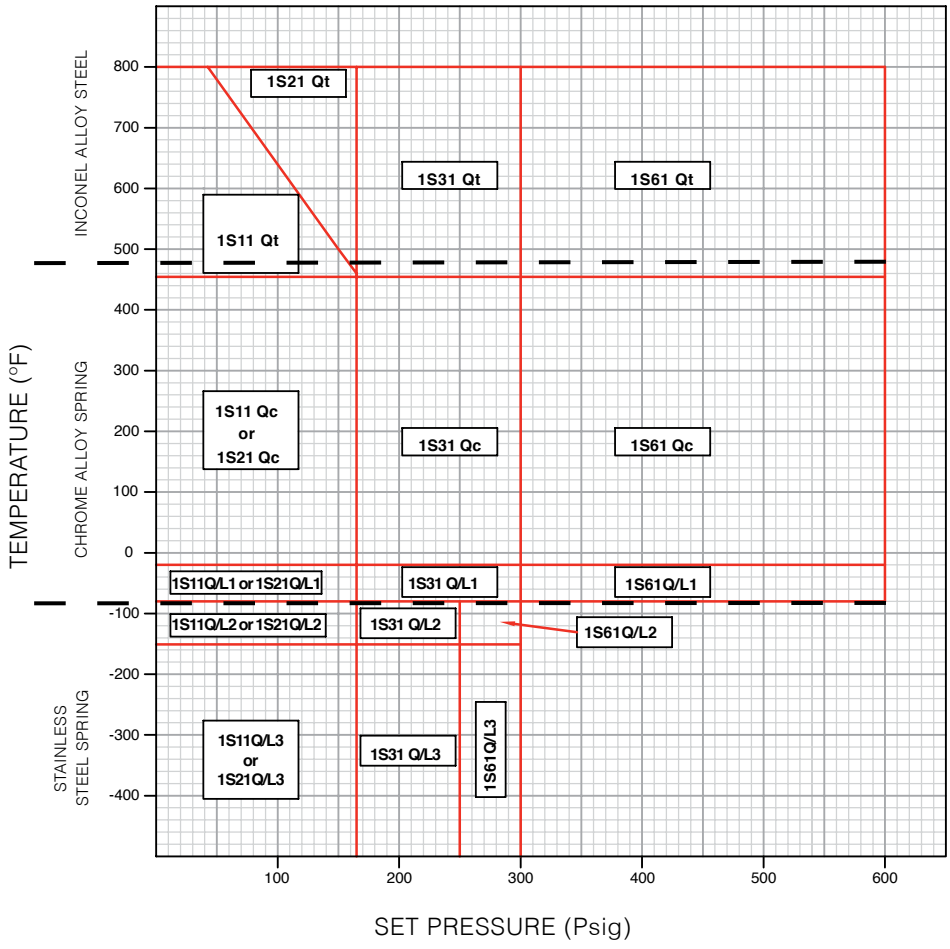
Model and Valve Type		Valve Size	ANSI Flange Class		Backpressure and Temperature Inlet Limits						Backpressure Limit at 100°F	
Conventional	Bellows	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	-450°F -151°F	-150°F -76°F	-75°F -21°F	-20°F +100°F	450°F	800°F	Conventional	Bellows
1S11 Nc	1S11-30 Nc	4X6	150#	150#	-	-	-	285#	185#	-	285#	80#
1S21 Nc	1S21-30 Nc	4X6	300#	150#	-	-	-	285#	285#	-	285#	80#
1S31 Nc	1S31-30 Nc	4X6	300#	150#	-	-	-	740#	615#	-	285#	160#
1S61 Nc	1S61-30 Nc	4X6	600#	150#	-	-	-	1000#	1000#	-	285#	160#
1S11 Nt	1S11-30 Nt	4X6	150#	150#	-	-	-	-	185#	80#	285#	80#
1S21 Nt	1S21-30 Nt	4X6	300#	150#	-	-	-	-	285#	285#	285#	80#
1S31 Nt	1S31-30 Nt	4X6	300#	150#	-	-	-	-	615#	410#	285#	160#
1S61 Nt	1S61-30 Nt	4X6	600#	150#	-	-	-	-	1000#	825#	285#	160#
1S11 N/L1	1S11-30 N/L1	4X6	150#	150#	-	-	285#	-	-	-	275#	80#
1S21 N/L1	1S21-30 N/L1	4X6	300#	150#	-	-	285#	-	-	-	275#	80#
1S31 N/L1	1S31-30 N/L1	4X6	300#	150#	-	-	740#	-	-	-	285#	160#
1S61 N/L1	1S61-30 N/L1	4X6	600#	150#	-	-	1000#	-	-	-	285#	160#
1S11 N/L2	1S11-30 N/L2	4X6	150#	150#	-	275#	-	-	-	-	275#	80#
1S21 N/L2	1S21-30 N/L2	4X6	300#	150#	-	275#	-	-	-	-	275#	80#
1S31 N/L2	1S31-30 N/L2	4X6	300#	150#	-	450#	-	-	-	-	285#	160#
1S61 N/L2	1S61-30 N/L2	4X6	600#	150#	-	500#	-	-	-	-	285#	160#
1S11 N/L3	1S11-30 N/L3	4X6	150#	150#	275#	-	-	-	-	-	275#	80#
1S21 N/L3	1S21-30 N/L3	4X6	300#	150#	275#	-	-	-	-	-	275#	80#
1S31 N/L3	1S31-30 N/L3	4X6	300#	150#	450#	-	-	-	-	-	275#	160#
1S61 N/L3	1S61-30 N/L3	4X6	600#	150#	500#	-	-	-	-	-	285#	160#

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
SELECTION INDEX FOR VAPORS, GASES AND LIQUIDS
1S AND 1S-30 SERIES ORIFICE P API AREA 6.38 INCHES^2



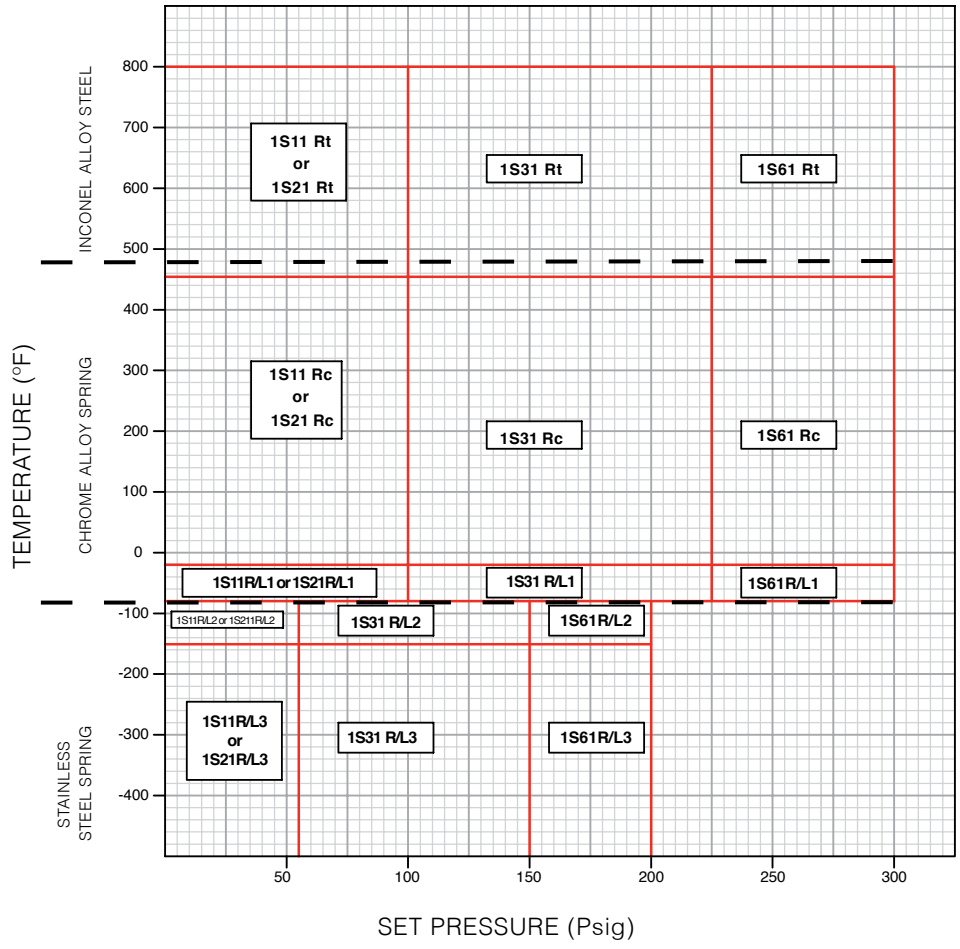
Model and Valve Type		Valve Size	ANSI Flange Class		Backpressure and Temperature Inlet Limits						Backpressure Limit at 100°F	
Conventional	Bellows	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	-450°F -151°F	-150°F -76°F	-75°F -21°F	-20°F +100°F	450°F	800°F	Conventional	Bellows
1S11 Pc	1S11-30 Pc	4X6	150#	150#	-	-	-	285#	185#	-	285#	80#
1S21 Pc	1S21-30 Pc	4X6	300#	150#	-	-	-	285#	285#	-	285#	80#
1S31 Pc	1S31-30 Pc	4X6	300#	150#	-	-	-	525#	525#	-	285#	150#
1S61 Pc	1S61-30 Pc	4X6	600#	150#	-	-	-	1000#	1000#	-	285#	150#
1S11 Pt	1S11-30 Pt	4X6	150#	150#	-	-	-	-	185#	80#	285#	80#
1S21 Pt	1S21-30 Pt	4X6	300#	150#	-	-	-	-	285#	285#	285#	80#
1S31 Pt	1S31-30 Pt	4X6	300#	150#	-	-	-	-	525#	410#	285#	150#
1S61 Pt	1S61-30 Pt	4X6	600#	150#	-	-	-	-	1000#	825#	285#	150#
1S11 P/L1	1S11-30 P/L1	4X6	150#	150#	-	-	275#	-	-	-	275#	80#
1S21 P/L1	1S21-30 P/L1	4X6	300#	150#	-	-	275#	-	-	-	275#	80#
1S31 P/L1	1S31-30 P/L1	4X6	300#	150#	-	-	525#	-	-	-	275#	150#
1S61 P/L1	1S61-30 P/L1	4X6	600#	150#	-	-	1000#	-	-	-	-	150#
1S11 P/L2	1S11-30 P/L2	4X6	150#	150#	-	175#	-	-	-	-	175#	80#
1S21 P/L2	1S21-30 P/L2	4X6	300#	150#	-	175#	-	-	-	-	175#	80#
1S31 P/L2	1S31-30 P/L2	4X6	300#	150#	-	300#	-	-	-	-	275#	150#
1S61 P/L2	1S61-30 P/L2	4X6	600#	150#	-	480#	-	-	-	-	275#	150#
1S11 P/L3	1S11-30 P/L3	4X6	150#	150#	175#	-	-	-	-	-	175#	80#
1S21 P/L3	1S21-30 P/L3	4X6	300#	150#	175#	-	-	-	-	-	175#	80#
1S31 P/L3	1S31-30 P/L3	4X6	300#	150#	300#	-	-	-	-	-	275#	150#
1S61 P/L3	1S61-30 P/L3	4X6	600#	150#	480#	-	-	-	-	-	275#	150#

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
SELECTION INDEX FOR VAPORS, GASES AND LIQUIDS
1S AND 1S-30 SERIES ORIFICE Q API AREA 11.05 INCHES²



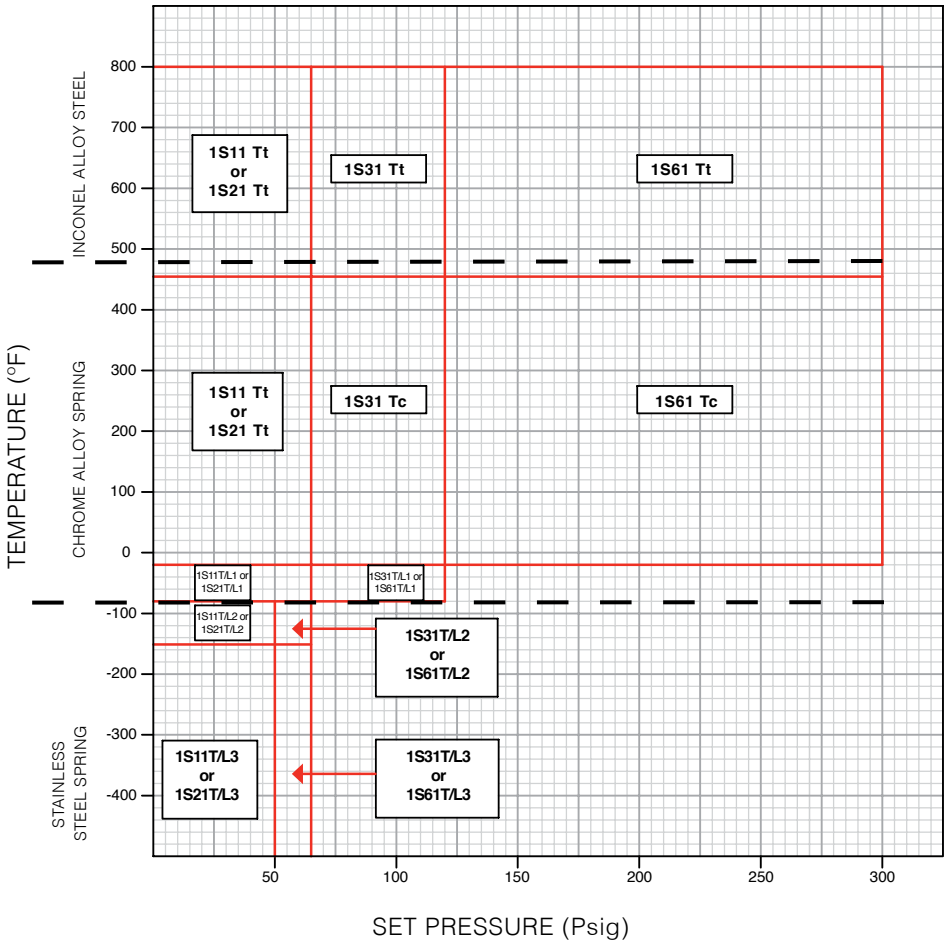
Model and Valve Type		Valve Size	ANSI Flange Class		Backpressure and Temperature Inlet Limits						Backpressure Limit at 100°F	
Conventional	Bellows	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	-450°F -151°F	-150°F -76°F	-75°F -21°F	-20°F +100°F	450°F	800°F	Conventional	Bellows
1S11 Qc	1S11-30 Qc	6X8	150#	150#	-	-	-	165#	165#	-	115#	70#
1S21 Qc	1S21-30 Qc	6X8	300#	150#	-	-	-	165#	165#	-	115#	70#
1S31 Qc	1S31-30 Qc	6X8	300#	150#	-	-	-	300#	300#	-	115#	115#
1S61 Qc	1S61-30 Qc	6X8	600#	150#	-	-	-	600#	600#	-	115#	115#
1S11 Qt	1S11-30 Qt	6X8	150#	150#	-	-	-	-	165#	80#	115#	70#
1S21 Qt	1S21-30 Qt	6X8	300#	150#	-	-	-	-	165#	165#	115#	70#
1S31 Qt	1S31-30 Qt	6X8	300#	150#	-	-	-	-	300#	300#	115#	115#
1S61 Qt	1S61-30 Qt	6X8	600#	150#	-	-	-	-	600#	600#	115#	115#
1S11 Q/L1	1S11-30 Q/L1	6X8	150#	150#	-	-	165#	-	-	-	115#	70#
1S21 Q/L1	1S21-30 Q/L1	6X8	300#	150#	-	-	165#	-	-	-	115#	70#
1S31 Q/L1	1S31-30 Q/L1	6X8	300#	150#	-	-	300#	-	-	-	115#	115#
1S61 Q/L1	1S61-30 Q/L1	6X8	600#	150#	-	-	600#	-	-	-	115#	115#
1S11 Q/L2	1S11-30 Q/L2	6X8	150#	150#	-	165#	-	-	-	-	115#	70#
1S21 Q/L2	1S21-30 Q/L2	6X8	300#	150#	-	165#	-	-	-	-	115#	70#
1S31 Q/L2	1S31-30 Q/L2	6X8	300#	150#	-	250#	-	-	-	-	115#	115#
1S61 Q/L2	1S61-30 Q/L2	6X8	600#	150#	-	300#	-	-	-	-	115#	115#
1S11 Q/L3	1S11-30 Q/L3	6X8	150#	150#	165#	-	-	-	-	-	115#	70#
1S21 Q/L3	1S21-30 Q/L3	6X8	300#	150#	165#	-	-	-	-	-	115#	70#
1S31 Q/L3	1S31-30 Q/L3	6X8	300#	150#	250#	-	-	-	-	-	115#	115#
1S61 Q/L3	1S61-30 Q/L3	6X8	600#	150#	300#	-	-	-	-	-	115#	115#

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
SELECTION INDEX FOR VAPORS, GASES AND LIQUIDS
1S AND 1S-30 SERIES ORIFICE R API AREA 16.0 INCHES²



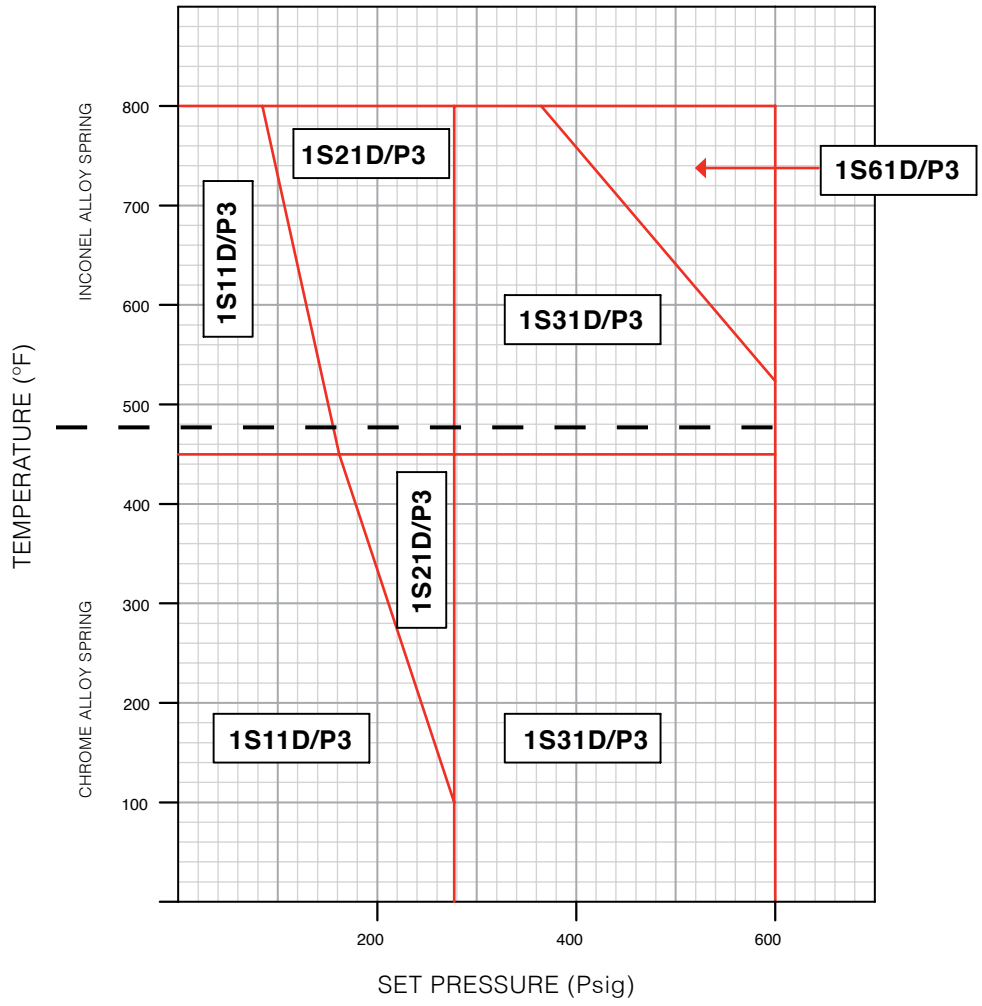
Model and Valve Type		Valve Size	ANSI Flange Class		Backpressure and Temperature Inlet Limits						Backpressure Limit at 100°F	
Conventional	Bellows	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	-450°F -151°F	-150°F -76°F	-75°F -21°F	-20°F +100°F	450°F	800°F	Conventional	Bellows
1S11 Rc	1S11-30 Rc	6X8	150#	150#	-	-	-	100#	100#	-	60#	60#
1S21 Rc	1S21-30 Rc	6X8	300#	150#	-	-	-	100#	100#	-	60#	60#
1S31 Rc	1S31-30 Rc	6X10	300#	150#	-	-	-	230#	230#	-	100#	100#
1S61 Rc	1S61-30 Rc	6X10	600#	150#	-	-	-	300#	300#	-	100#	100#
1S11 Rt	1S11-30 Rt	6X8	150#	150#	-	-	-	-	100#	80#	60#	60#
1S21 Rt	1S21-30 Rt	6X8	300#	150#	-	-	-	-	100#	100#	60#	60#
1S31 Rt	1S31-30 Rt	6X10	300#	150#	-	-	-	-	230#	230#	100#	100#
1S61 Rt	1S61-30 Rt	6X10	600#	150#	-	-	-	-	300#	300#	100#	100#
1S11 R/L1	1S11-30 R/L1	6X8	150#	150#	-	-	100#	-	-	-	60#	60#
1S21 R/L1	1S21-30 R/L1	6X8	300#	150#	-	-	100#	-	-	-	60#	60#
1S31 R/L1	1S31-30 R/L1	6X10	300#	150#	-	-	230#	-	-	-	100#	100#
1S61 R/L1	1S61-30 R/L1	6X10	600#	150#	-	-	300#	-	-	-	100#	100#
1S11 R/L2	1S11-30 R/L2	6X8	150#	150#	-	55#	-	-	-	-	55#	55#
1S21 R/L2	1S21-30 R/L2	6X8	300#	150#	-	55#	-	-	-	-	55#	55#
1S31 R/L2	1S31-30 R/L2	6X10	300#	150#	-	150#	-	-	-	-	100#	100#
1S61 R/L2	1S61-30 R/L2	6X10	600#	150#	-	200#	-	-	-	-	100#	100#
1S11 R/L3	1S11-30 R/L3	6X8	150#	150#	55#	-	-	-	-	-	55#	55#
1S21 R/L3	1S21-30 R/L3	6X8	300#	150#	55#	-	-	-	-	-	55#	55#
1S31 R/L3	1S31-30 R/L3	6X10	300#	150#	150#	-	-	-	-	-	100#	100#
1S61 R/L3	1S61-30 R/L3	6X10	600#	150#	200#	-	-	-	-	-	100#	100#

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
SELECTION INDEX FOR VAPORS, GASES AND LIQUIDS
1S AND 1S-30 SERIES ORIFICE T API AREA 26.0 INCHES²



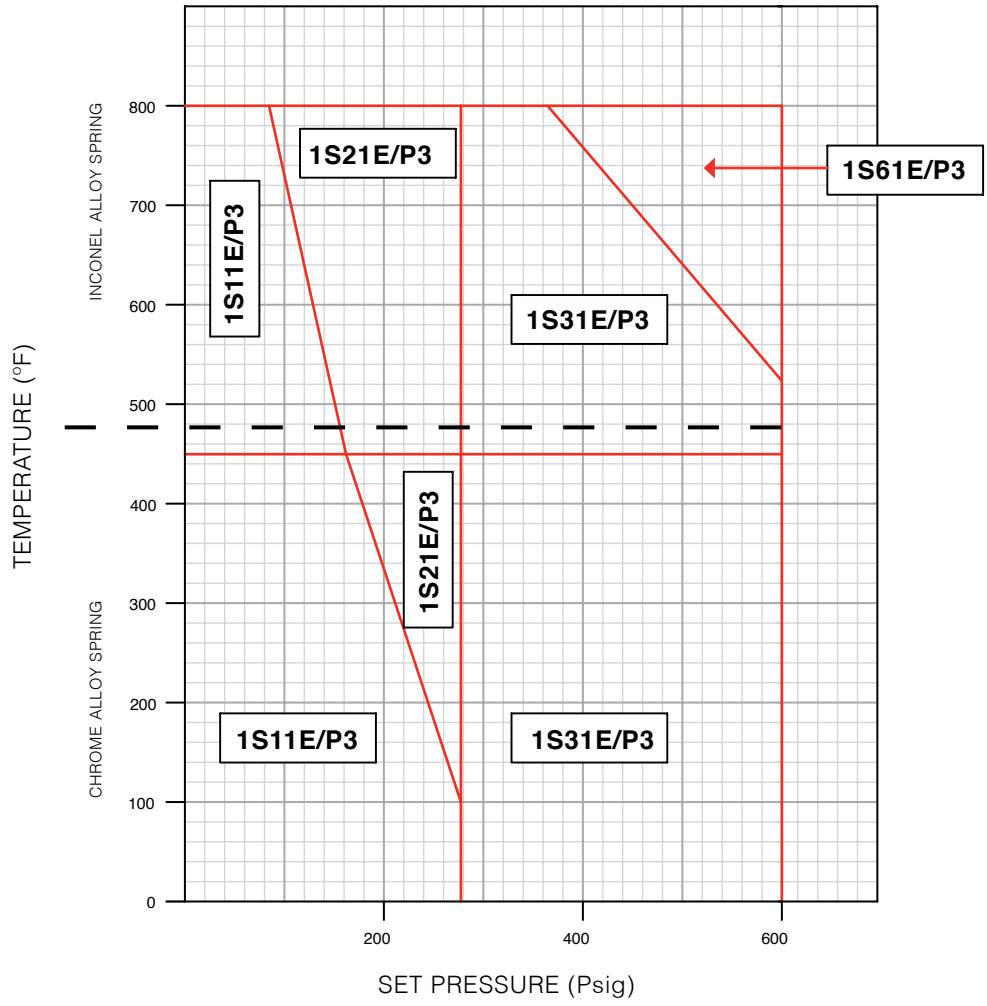
Model and Valve Type		Valve Size	ANSI Flange Class		Backpressure and Temperature Inlet Limits						Backpressure Limit at 100°F	
Conventional	Bellows	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	-450°F -151°F	-150°F -76°F	-75°F -21°F	-20°F +100°F	450°F	800°F	Conventional	Bellows
1S11 Tc	1S11-30 Tc	8X10	150#	150#	-	-	-	65#	65#	-	30#	30#
1S21 Tc	1S21-30 Tc	8X10	300#	150#	-	-	-	65#	65#	-	30#	30#
1S31-1Tc	1S31-30-1Tc	8X10	300#	150#	-	-	-	120#	120#	-	60#	60#
1S31-2Tc	1S31-30-2Tc	8X10	300#	150#	-	-	-	300#	300#	-	100#	100#
1S11 Tt	1S11-30 Tt	8X10	150#	150#	-	-	-	-	65#	65#	30#	30#
1S21 Tt	1S21-30 Tt	8X10	300#	150#	-	-	-	-	65#	65#	30#	30#
1S31-1Tt	1S31-30-1Tt	8X10	300#	150#	-	-	-	-	120#	120#	60#	60#
1S31-2Tt	1S31-30-2Tt	8X10	300#	150#	-	-	-	-	300#	300#	100#	100#
1S11 T/L1	1S11-30 T/L1	8X10	150#	150#	-	-	65#	-	-	-	30#	30#
1S21 T/L1	1S21-30 T/L1	8X10	300#	150#	-	-	65#	-	-	-	30#	30#
1S31-1T/L1	1S31-30-1T/L1	8X10	300#	150#	-	-	120#	-	-	-	60#	60#
1S31-2T/L1	1S31-30-2T/L1	8X10	300#	150#	-	-	120#	-	-	-	100#	100#
1S11 T/L2	1S11-30 T/L2	8X10	150#	150#	-	50#	-	-	-	-	30#	30#
1S21 T/L2	1S21-30 T/L2	8X10	300#	150#	-	50#	-	-	-	-	30#	30#
1S31-1T/L2	1S31-30-1T/L2	8X10	300#	150#	-	65#	-	-	-	-	60#	60#
1S31-2T/L2	1S31-30-2T/L2	8X10	300#	150#	-	65#	-	-	-	-	100#	100#
1S11 T/L3	1S11-30 T/L3	8X10	150#	150#	50#	-	-	-	-	-	30#	30#
1S21 T/L3	1S21-30 T/L3	8X10	300#	150#	50#	-	-	-	-	-	30#	30#
1S31-1T/L3	1S31-30-1T/L3	8X10	300#	150#	65#	-	-	-	-	-	60#	60#
1S31-2T/L3	1S31-30-2T/L3	8X10	300#	150#	65#	-	-	-	-	-	100#	100#

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
SELECTION INDEX FOR VAPORS, GASES AND LIQUIDS
1S/P3 SERIES ORIFICE D API AREA 0.110 INCHES²



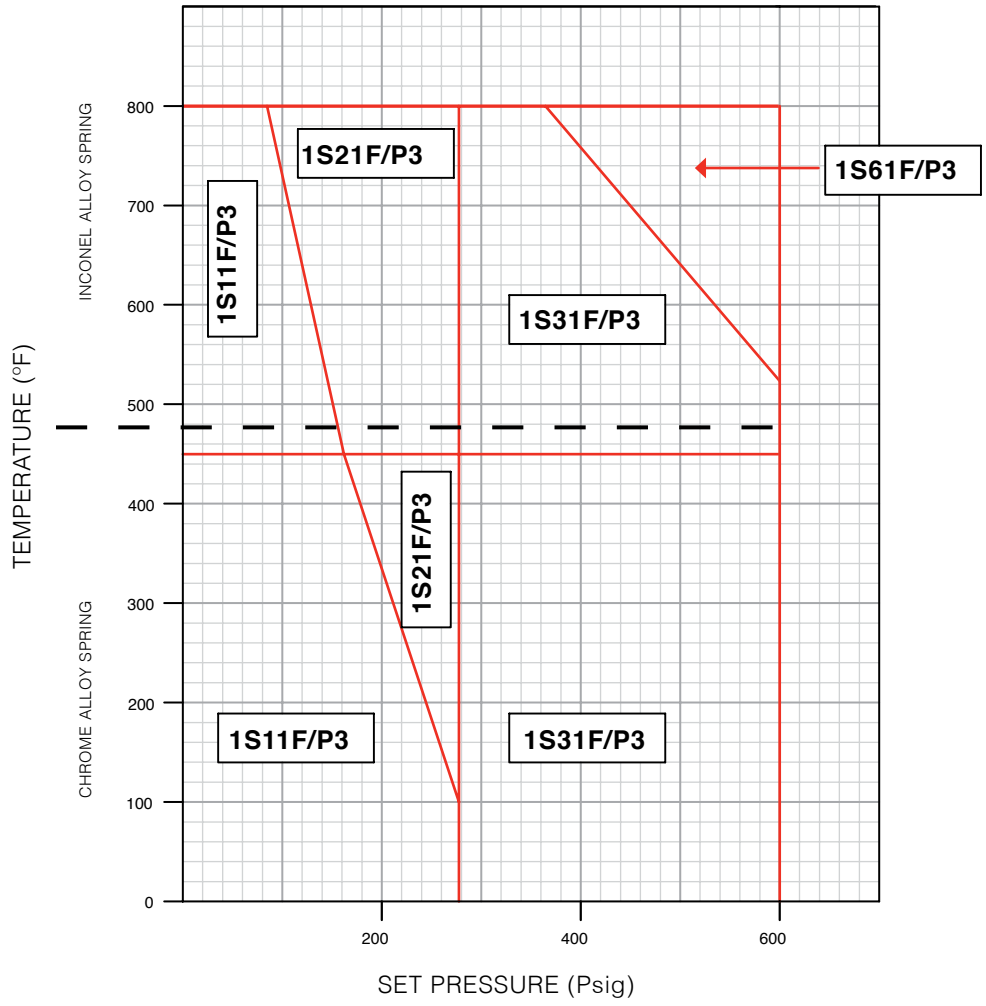
Model and Valve Type	Valve Size	ANSI Flange Class		Pressure and Temperature Inlet Limits			
	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	100°F	Saturated Steam	450°F	800°F
1S11 D/P3	1X2	150#	150#	285#	210#	185#	80#
1S21 D/P3	1X2	300#	150#	285#	285#	285#	285#
1S31 D/P3	1X2	300#	150#	600#	600#	600#	410#
1S61 D/P3	1X2	600#	150#	600#	600#	600#	600#

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
SELECTION INDEX FOR VAPORS, GASES AND LIQUIDS
1S/P3 SERIES ORIFICE E API AREA 0.196 INCHES^2



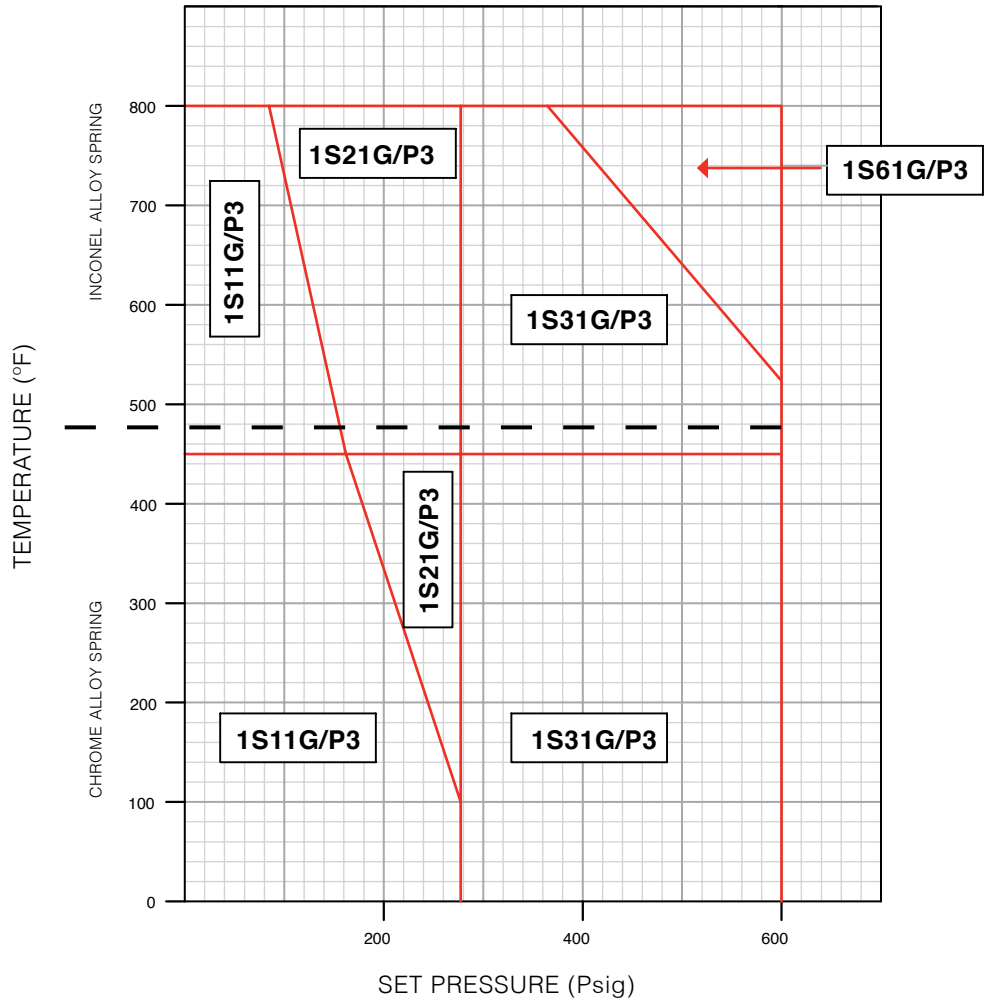
Model and Valve Type	Valve Size	ANSI Flange Class		Pressure and Temperature Inlet Limits			
	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	100°F	Saturated Steam	450°F	800°F
1S11 E/P3	1X2	150#	150#	285#	210#	185#	80#
1S21 E/P3	1X2	300#	150#	285#	285#	285#	285#
1S31 E/P3	1X2	300#	150#	600#	600#	600#	410#
1S61 E/P3	1X2	600#	150#	600#	600#	600#	600#

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
SELECTION INDEX FOR VAPORS, GASES AND LIQUIDS
1S/P3 SERIES ORIFICE F API AREA 0.307 INCHES²



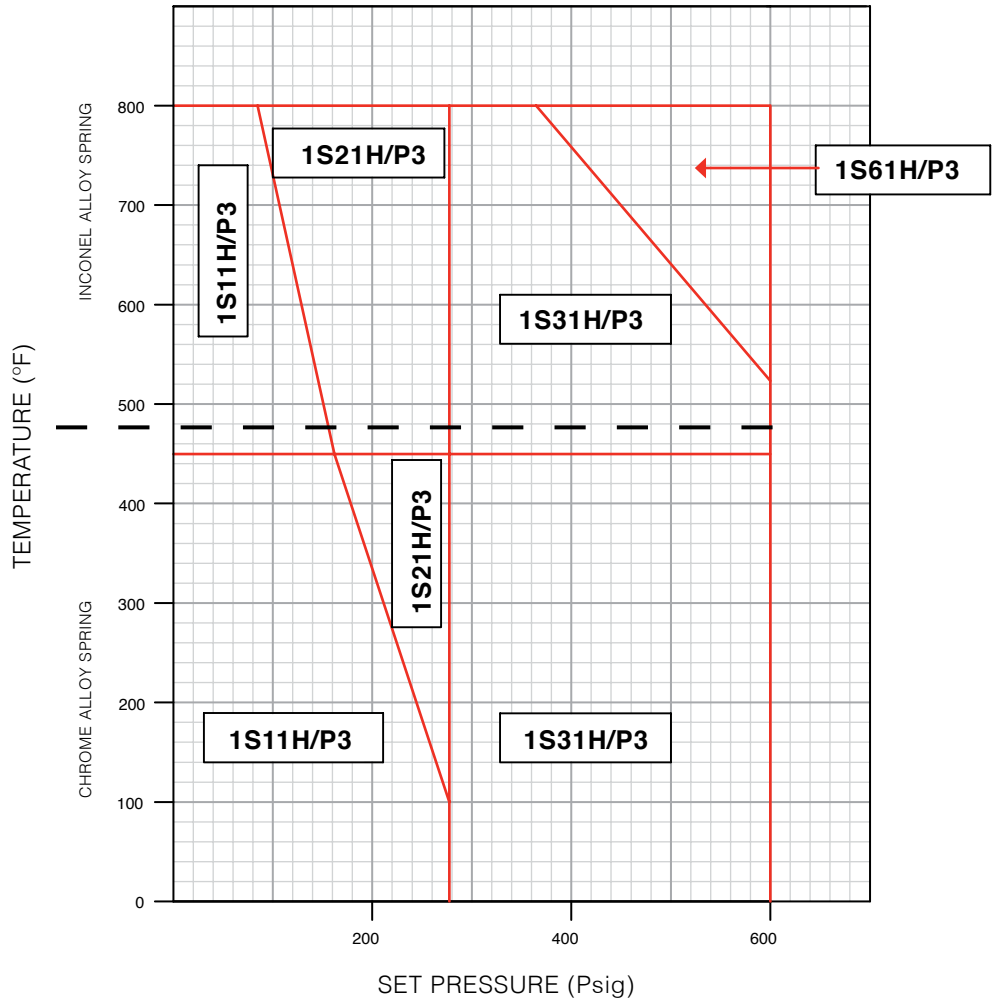
Model and Valve Type	Valve Size	ANSI Flange Class		Pressure and Temperature Inlet Limits			
	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	100°F	Saturated Steam	450°F	800°F
1S11 F/P3	11/2X2	150#	150#	285#	210#	185#	80#
1S21 F/P3	11/2X2	300#	150#	285#	285#	285#	285#
1S31 F/P3	11/2X2	300#	150#	600#	600#	600#	410#
1S61 F/P3	11/2X2	600#	150#	600#	600#	600#	600#

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
SELECTION INDEX FOR VAPORS, GASES AND LIQUIDS
1S/P3 SERIES ORIFICE G API AREA 0.503 INCHES^2



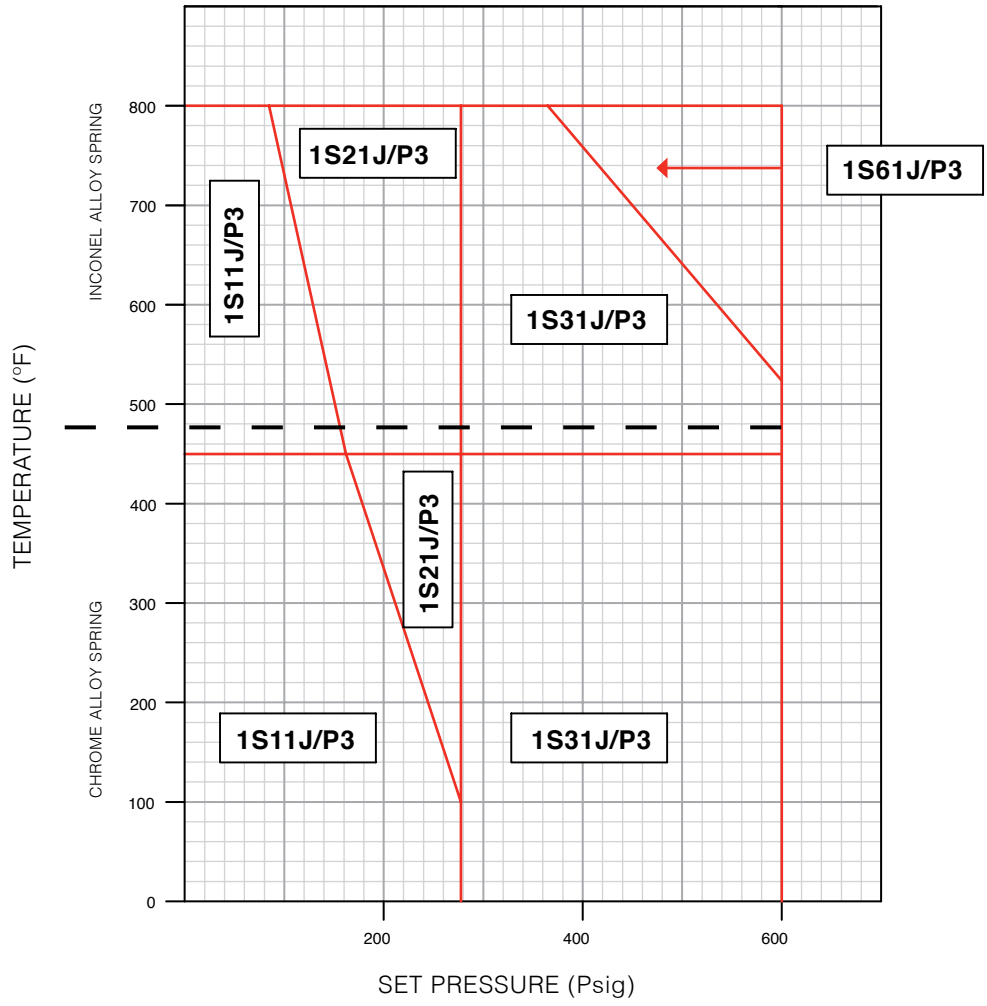
Model and Valve Type	Valve Size	ANSI Flange Class		Pressure and Temperature Inlet Limits			
	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	100°F	Saturated Steam	450°F	800°F
1S11 G/P3	11/2X3	150#	150#	285#	210#	185#	80#
1S21 G/P3	11/2X3	300#	150#	285#	285#	285#	285#
1S31 G/P3	11/2X3	300#	150#	600#	600#	600#	410#
1S61 G/P3	11/2X3	600#	150#	600#	600#	600#	600#

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
SELECTION INDEX FOR VAPORS, GASES AND LIQUIDS
1S/P3 SERIES ORIFICE H API AREA 0.785 INCHES^2



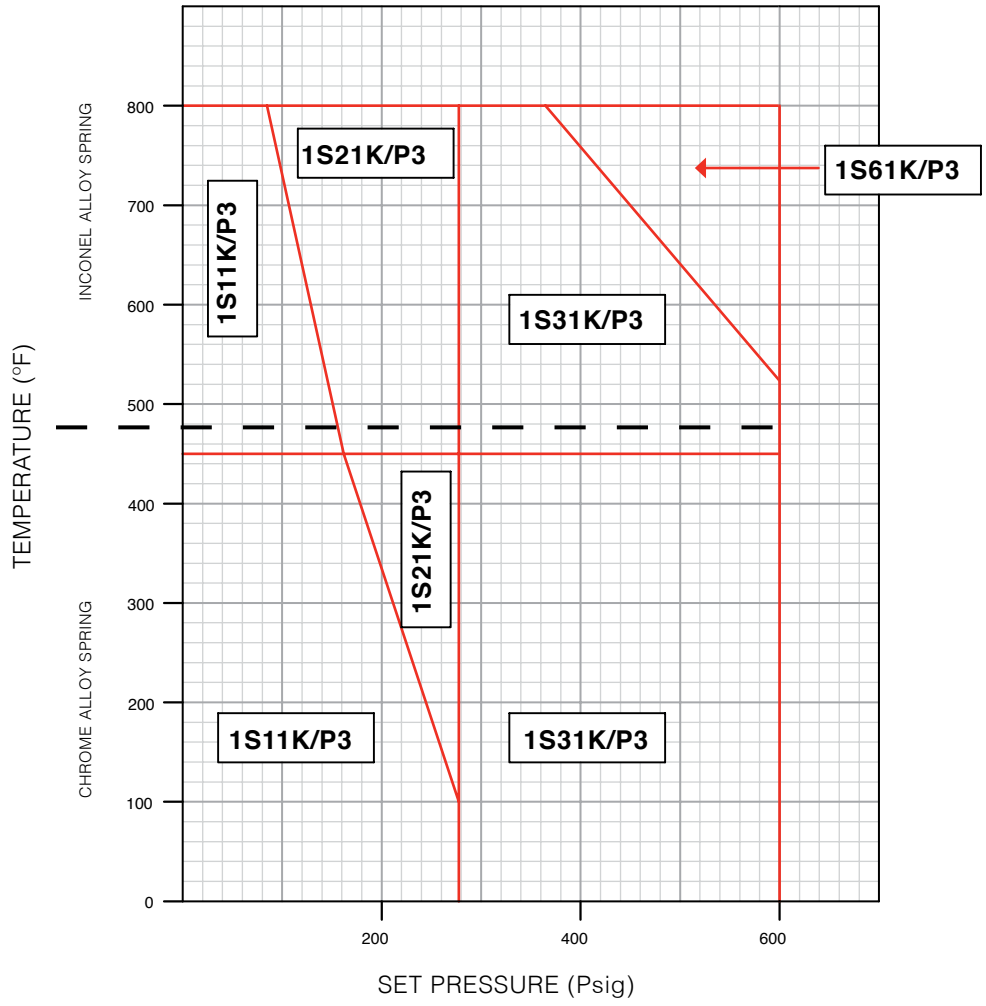
Model and Valve Type	Valve Size	ANSI Flange Class		Pressure and Temperature Inlet Limits			
	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	100°F	Saturated Steam	450°F	800°F
1S11 H/P3	11/2X3	150#	150#	285#	210#	185#	80#
1S21 H/P3	11/2X3	300#	150#	285#	285#	285#	285#
1S31 H/P3	2X3	300#	150#	600#	600#	600#	410#
1S61 H/P3	2X3	600#	150#	600#	600#	600#	600#

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
SELECTION INDEX FOR VAPORS, GASES AND LIQUIDS
1S/P3 SERIES ORIFICE J API AREA 1.287 INCHES²



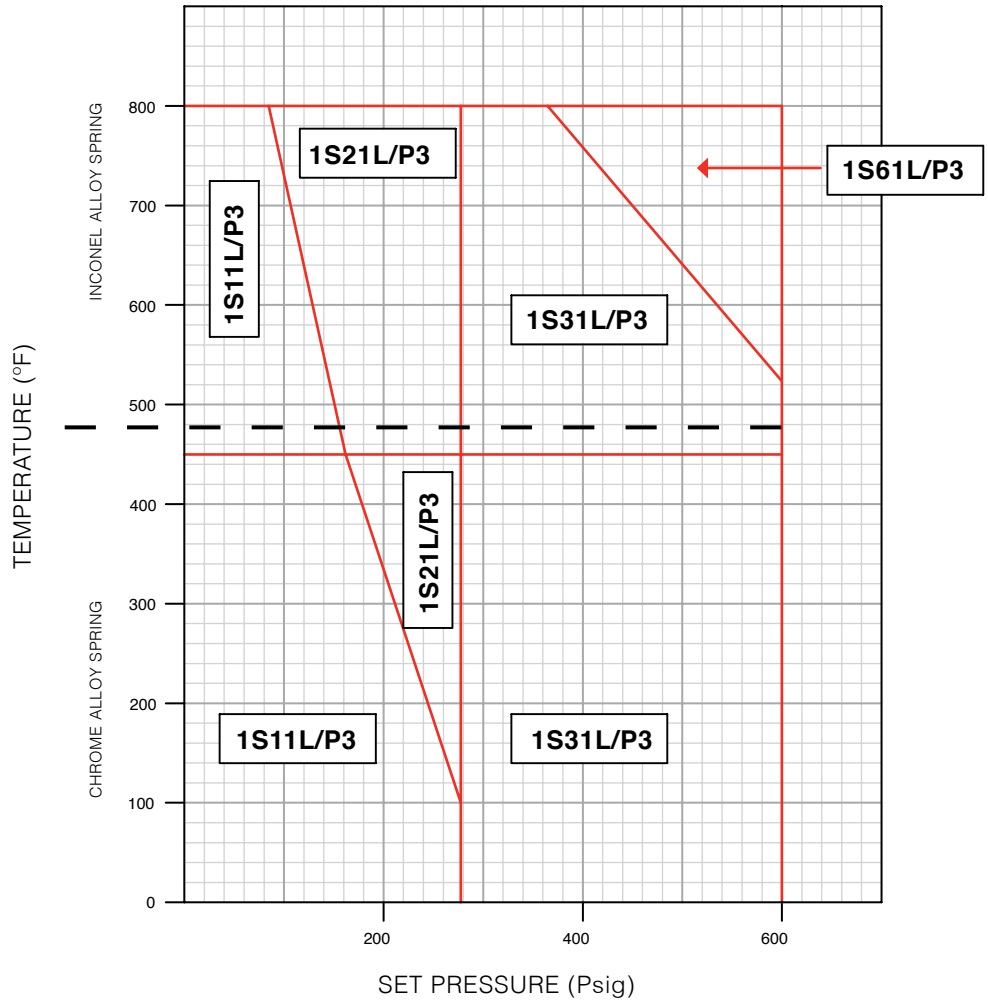
Model and Valve Type	Valve Size	ANSI Flange Class		Pressure and Temperature Inlet Limits			
	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	100°F	Saturated Steam	450°F	800°F
1S11 J/P3	2X3	150#	150#	285#	210#	185#	80#
1S21 J/P3	2X3	300#	150#	285#	285#	285#	285#
1S31 J/P3	3X4	300#	150#	600#	600#	600#	410#
1S61 J/P3	3X4	600#	150#	600#	600#	600#	600#

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
SELECTION INDEX FOR VAPORS, GASES AND LIQUIDS
1S/P3 SERIES ORIFICE K API AREA 1.838 INCHES²



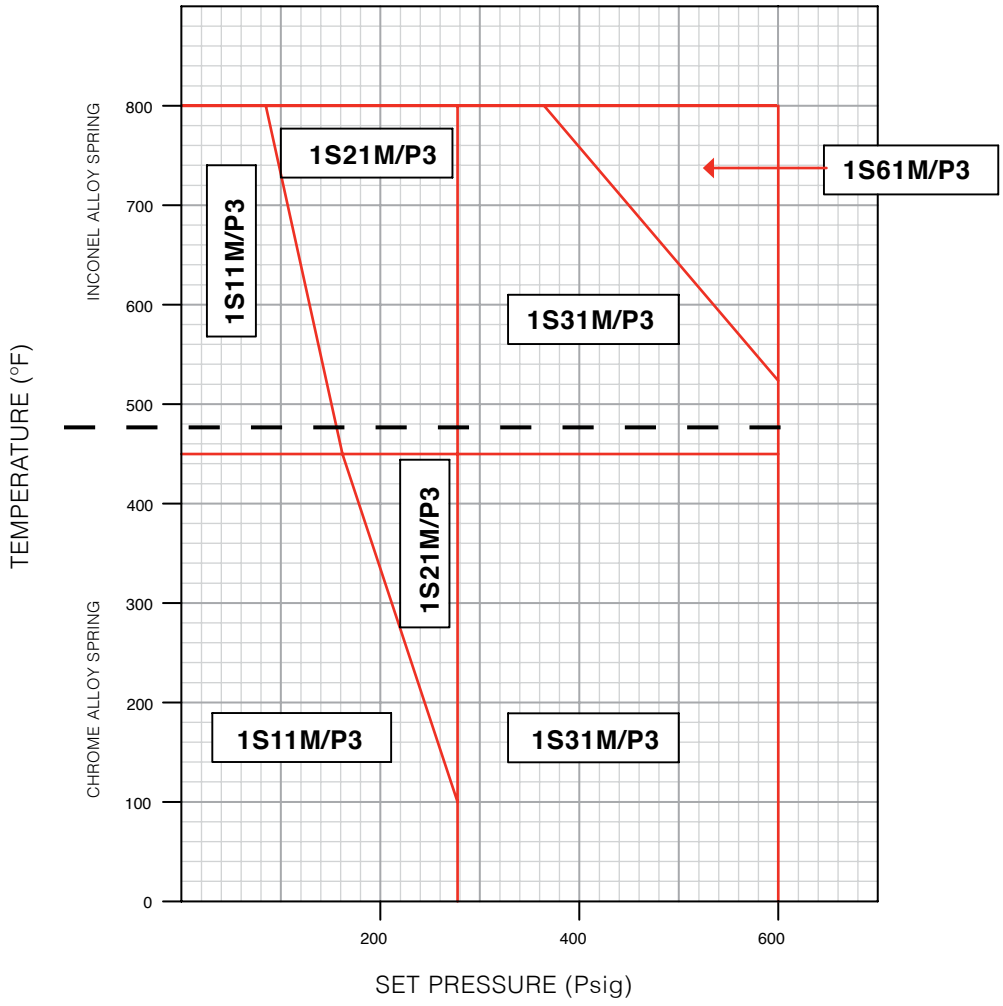
Model and Valve Type	Valve Size	ANSI Flange Class		Pressure and Temperature Inlet Limits			
	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	100°F	Saturated Steam	450°F	800°F
1S11 K/P3	3X4	150#	150#	285#	210#	185#	80#
1S21 K/P3	3X4	300#	150#	285#	285#	285#	285#
1S31 K/P3	3X4	300#	150#	600#	600#	600#	410#
1S61 K/P3	3X4	600#	150#	600#	600#	600#	600#

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
SELECTION INDEX FOR VAPORS, GASES AND LIQUIDS
1S/P3 SERIES ORIFICE L API AREA 2.853 INCHES²



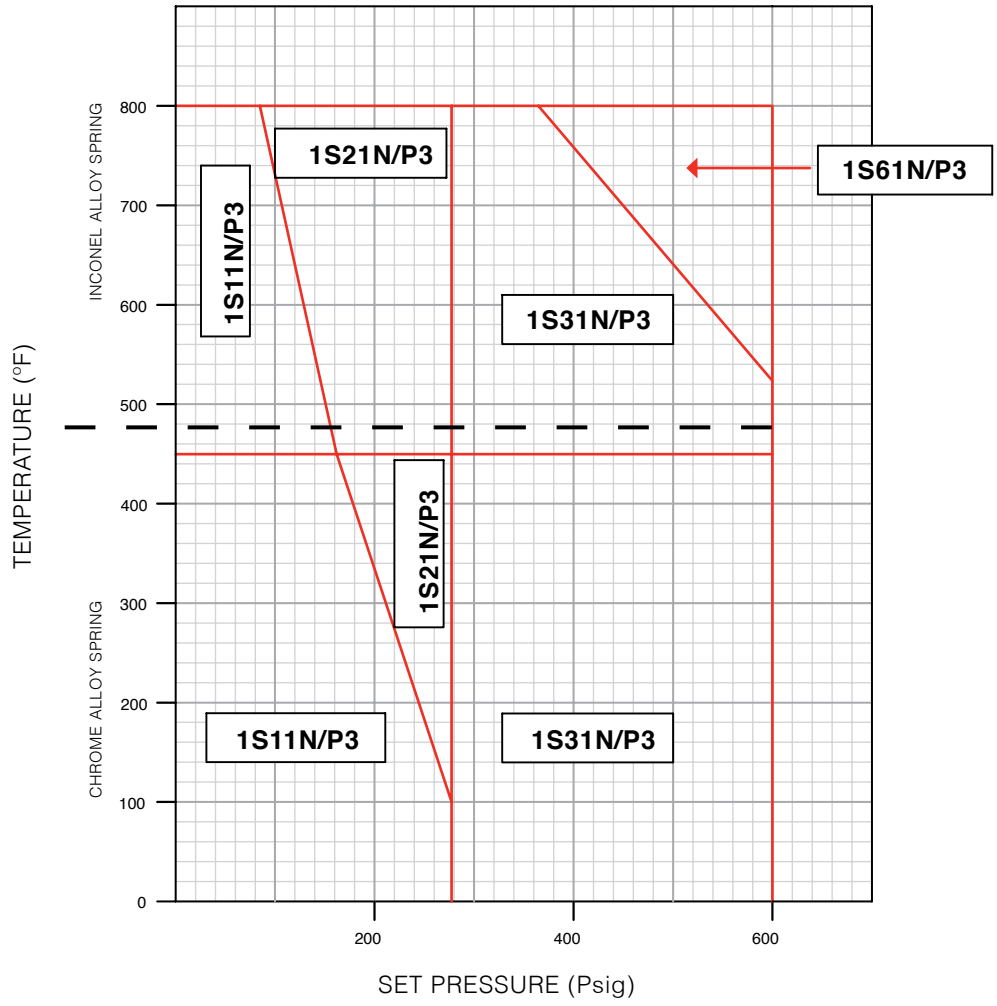
Model and Valve Type	Valve Size	ANSI Flange Class		Pressure and Temperature Inlet Limits			
	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	100°F	Saturated Steam	450°F	800°F
1S11 L/P3	3X4	150#	150#	285#	210#	185#	80#
1S21 L/P3	3X4	300#	150#	285#	285#	285#	285#
1S31 L/P3	4X6	300#	150#	600#	600#	600#	410#
1S61 L/P3	4X6	600#	150#	600#	600#	600#	600#

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
SELECTION INDEX FOR VAPORS, GASES AND LIQUIDS
1S/P3 SERIES ORIFICE M API AREA 3.60 INCHES²



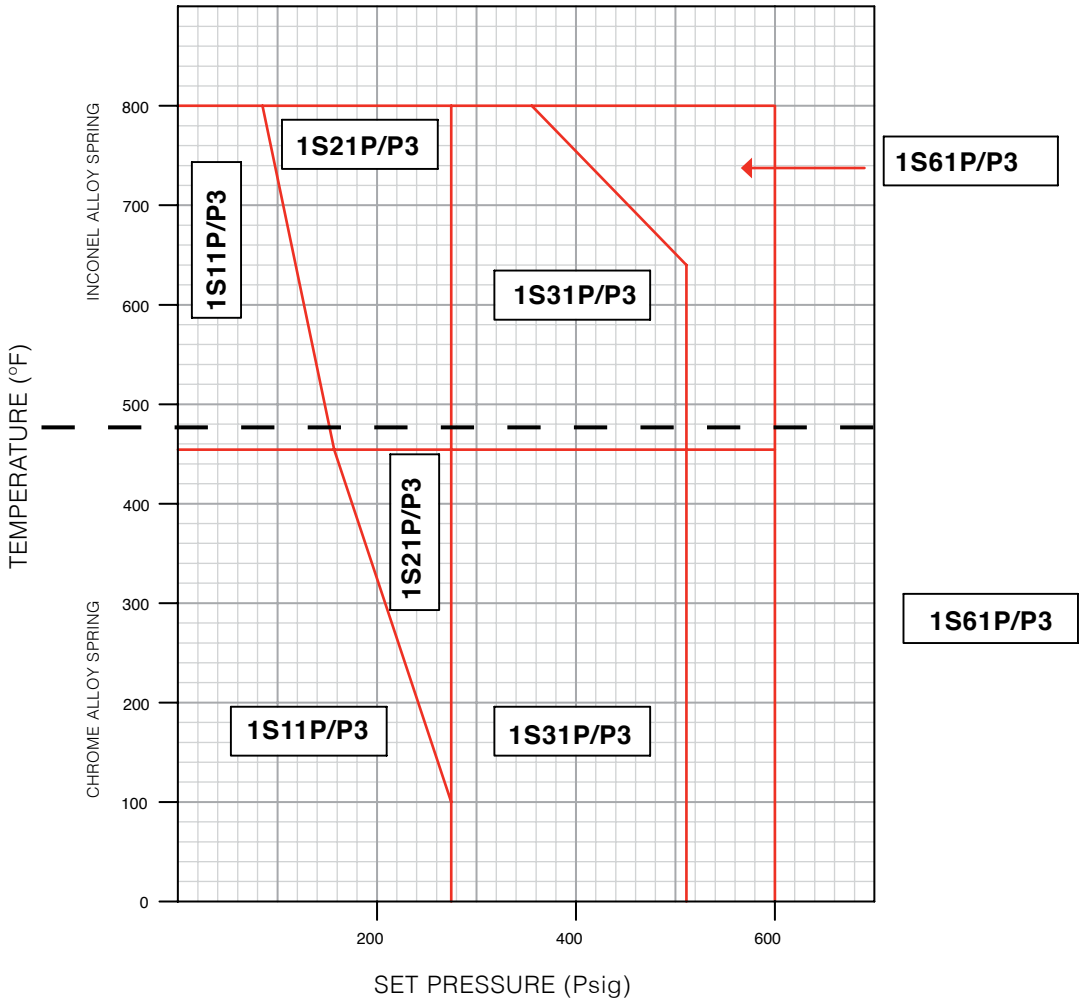
Model and Valve Type	Valve Size	ANSI Flange Class		Pressure and Temperature Inlet Limits			
	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	100°F	Saturated Steam	450°F	800°F
1S11 M/P3	4X6	150#	150#	285#	210#	185#	80#
1S21 M/P3	4X6	300#	150#	285#	285#	285#	285#
1S31 M/P3	4X6	300#	150#	600#	600#	600#	410#
1S61 M/P3	4X6	600#	150#	600#	600#	600#	600#

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
SELECTION INDEX FOR VAPORS, GASES AND LIQUIDS
1S/P3 SERIES ORIFICE N API AREA 4.34 INCHES²



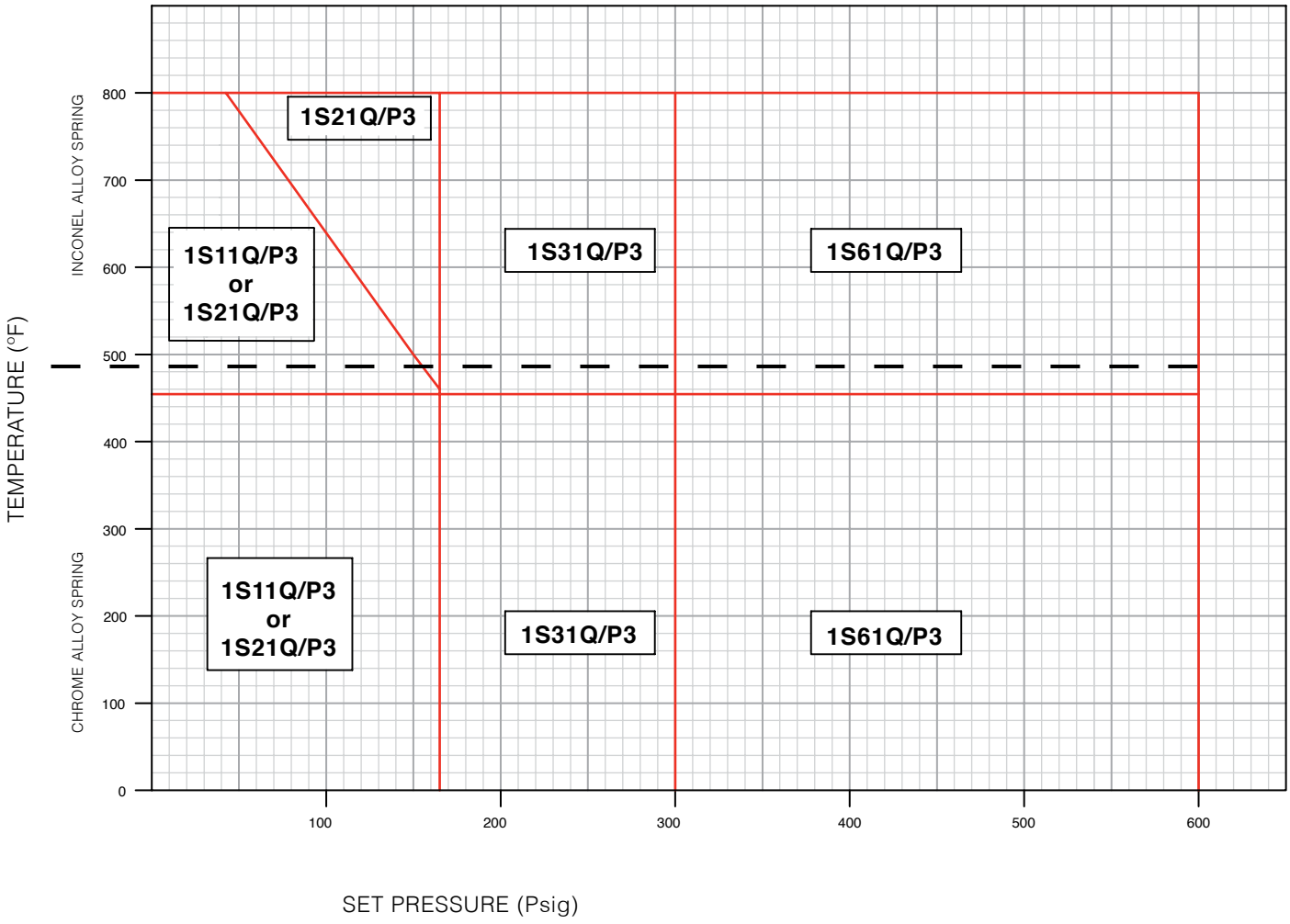
Model and Valve Type	Valve Size	ANSI Flange Class		Pressure and Temperature Inlet Limits			
	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	100°F	Saturated Steam	450°F	800°F
1S11 N/P3	4X6	150#	150#	285#	210#	185#	80#
1S21 N/P3	4X6	300#	150#	285#	285#	285#	285#
1S31 N/P3	4X6	300#	150#	600#	600#	600#	410#
1S61 N/P3	4X6	600#	150#	600#	600#	600#	600#

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
SELECTION INDEX FOR VAPORS, GASES AND LIQUIDS
1S/P3 SERIES ORIFICE P API AREA 6.38 INCHES^2



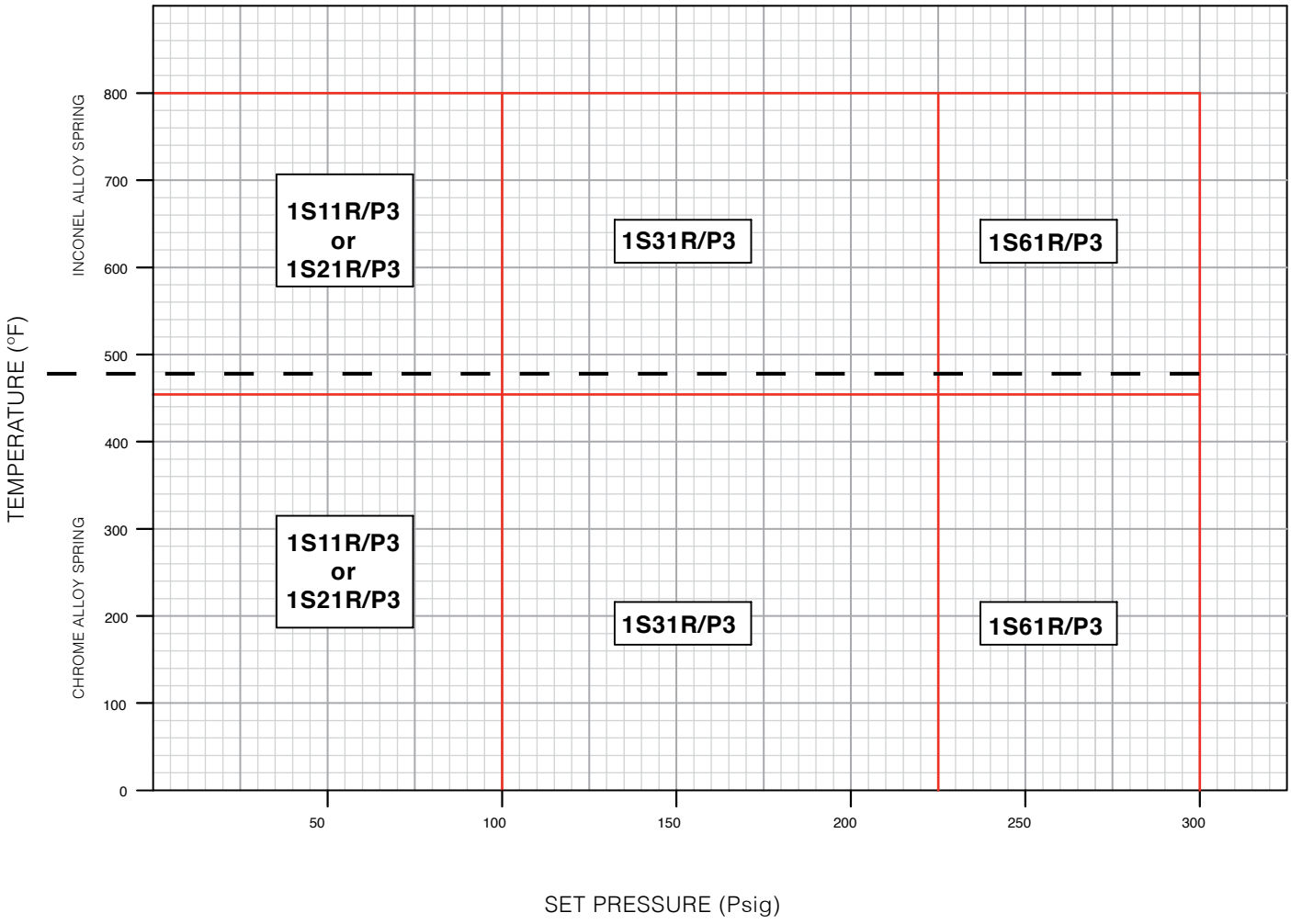
Model and Valve Type	Valve Size	ANSI Flange Class		Pressure and Temperature Inlet Limits			
	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	100°F	Saturated Steam	450°F	800°F
1S11 P/P3	4X6	150#	150#	285#	210#	185#	80#
1S21 P/P3	4X6	300#	150#	285#	285#	285#	285#
1S31 P/P3	4X6	300#	150#	525#	252#	525#	410#
1S61 P/P3	4X6	600#	150#	600#	600#	600#	600#

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
SELECTION INDEX FOR VAPORS, GASES AND LIQUIDS
1S/P3 SERIES ORIFICE Q API AREA 11.05 INCHES^2



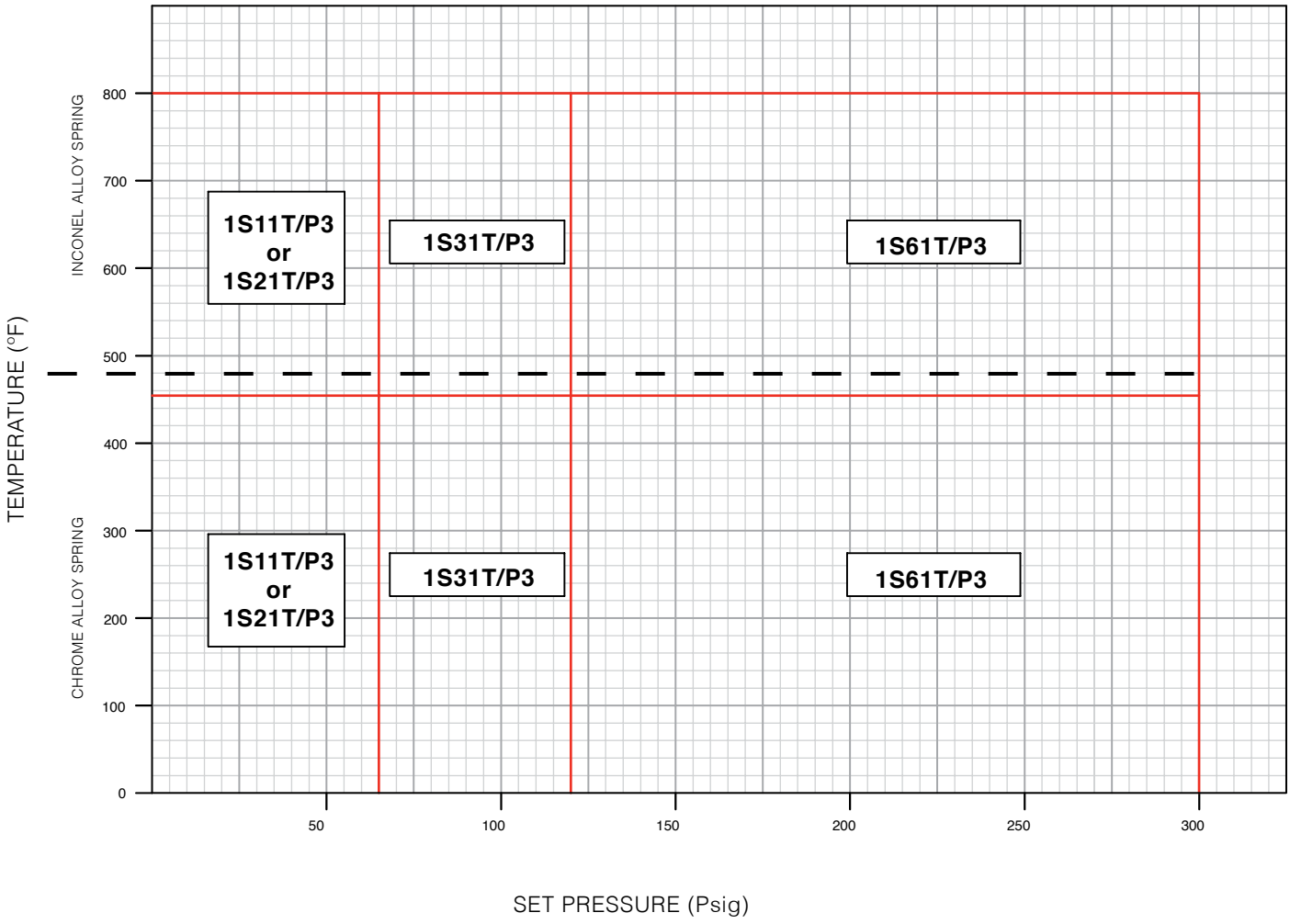
Model and Valve Type	Valve Size	ANSI Flange Class		Pressure and Temperature Inlet Limits			
	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	100°F	Saturated Steam	450°F	800°F
1S11 Q/P3	6X8	150#	150#	165#	165#	165#	80#
1S21 Q/P3	6X8	300#	150#	165#	165#	165#	165#
1S31 Q/P3	6X8	300#	150#	300#	300#	300#	300#
1S61 Q/P3	6X8	600#	150#	600#	600#	600#	600#

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
SELECTION INDEX FOR VAPORS, GASES AND LIQUIDS
1S/P3 SERIES ORIFICE R API AREA 16.0 INCHES^2



Model and Valve Type	Valve Size	ANSI Flange Class		Pressure and Temperature Inlet Limits			
	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	100°F	Saturated Steam	450°F	800°F
1S11 R/P3	6X8	150#	150#	100#	100#	100#	100#
1S21 R/P3	6X8	300#	150#	100#	100#	100#	100#
1S31 R/P3	6X10	300#	150#	230#	230#	230#	230#
1S61 R/P3	6X10	600#	150#	300#	300#	300#	300#

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
SELECTION INDEX FOR VAPORS, GASES AND LIQUIDS
1S/P3 SERIES ORIFICE T API AREA 26.0 INCHES²



Model and Valve Type	Valve Size	ANSI Flange Class		Pressure and Temperature Inlet Limits			
	Inlet x Outlet	Inlet R.F. or R.J.	Outlet R.F.	100°F	Saturated Steam	450°F	800°F
1S11 T/P3	8X10	150#	150#	65#	65#	65#	65#
1S21 T/P3	8X10	300#	150#	65#	65#	65#	65#
1S31-1T/P3	8X10	300#	150#	120#	120#	120#	120#
1S31-2T/P3	8X10	300#	150#	300#	300#	300#	300#

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
PORTABLE TYPE 1S50 SERIES (NON-ASME CODE)

The portable type 1S50 series steel safety and relief valves offer an economic solution, however, it is limited to a discharge area of 0.522 inch^2 (336.8 mm^2) and a maximum work pressure of 5000 psig (351 kg/cm^3). The standard connection of this valve is a NPT thread female in and out, yet can be supplied in any combination including welded and flanged ends.

Design Features

- Relief capacity according to ASME B & PVC SECT. VIII DIV. 1
- Orifice area according to ASME B & PVC SECT. VIII DIV. 1
- Distance between faces according to API 526
- Flange dimensions according to ASME B16.5
- NACE service according to MR-01-75 or MR-01-03
- Tests according to API 527

(1) WALWORTH Steel Safety and Relief Valves can be built with a standard cap (screwed), plain lever, or packed lever.

(2) The disc joint and the spindle head have a similar design to the one of a rod, so during difficult service conditions or in the event of a misalignment, the disc may adjust itself and keep a hermetic seal.

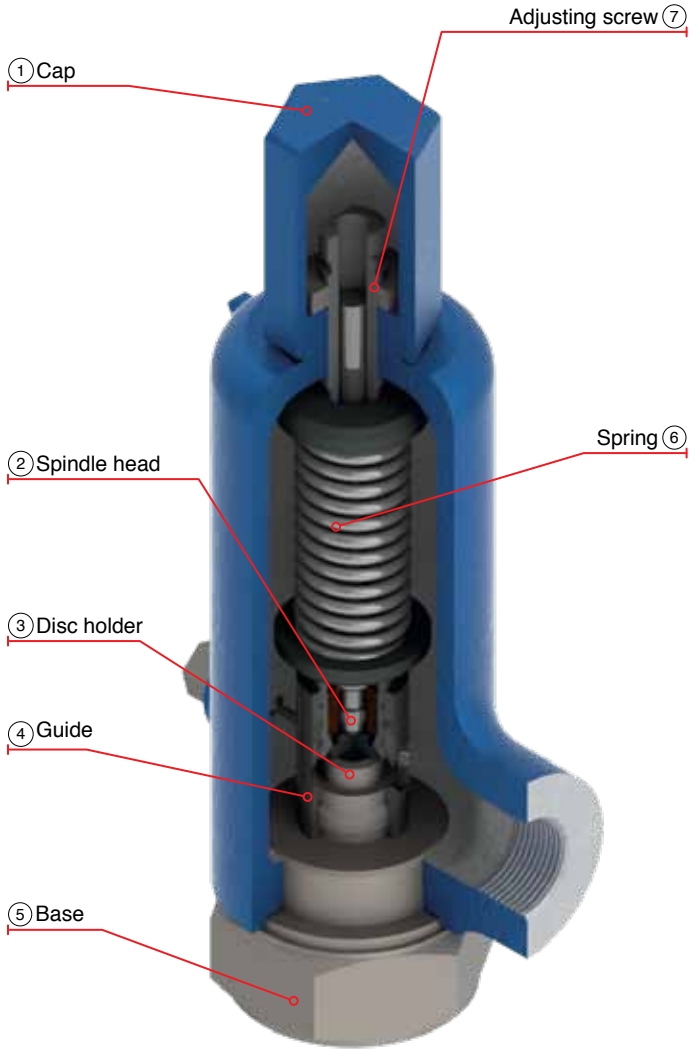
(3) The disc holder keeps the disc alligned to the seal area of the base. The disc holder and the disc retainer are ensembled with a TRUARC pin, and a slot on the disc holder, this ensemble is very secure and hard to break.

(4) The guide is the adjusting element that provides the capacity to regulate the blowdown or differential pressure. By raising it the blowdown increases (closure pressure decreases), and by handing down the blowdown decreases (closure pressure increases). The ideal blowdown is the one that makes the valve close at the operation pressure of the accessory on which the valve is installed.

(5) For portables (only), the base is the orifice at the superior area of the nozzle and defines the discharge valve capacity. The inside mechanism of this element is designed according to ASME specifications.

(6) WALWORTH offers springs in different types of materials to meet your process necessities. The standard spring is made out of Carbon Steel; Alloy Steel with a high content of Tungsten for high temperature service, and Austenitic Stainless Steel for low temperatures.

(7) The adjusting screw is the element that compresses the spring to a certain position to define the set pressure of the valve. WALWORTH personnel pay a lot of attention to this element.



TYPE 1S50 SERIES

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
PORTABLE TYPE 1S50 SERIES (NON-ASME CODE)

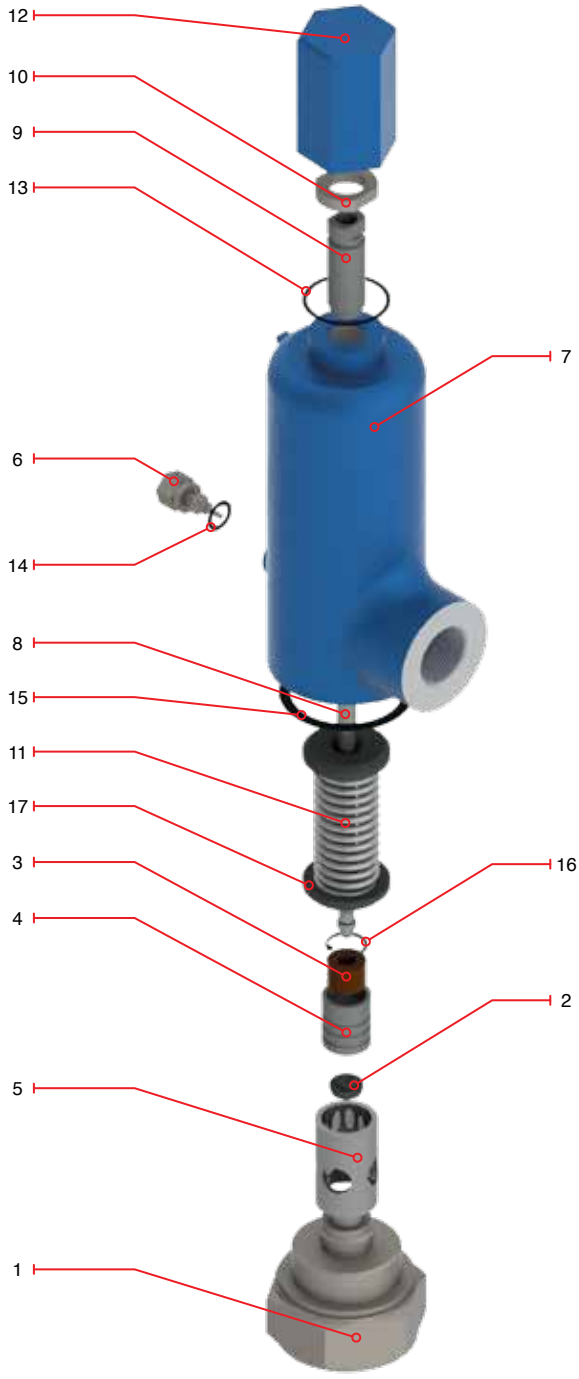
Design Features

- Orifices : 0.126 in^2, 0.226 in^2 and 0.522 in^2
- Inlet size x outlet size from ¾”x1” to 2”x2”
- Maximum set pressure 5000 psig
- Closed Bonnet
- Screwed Cap
- Actuated by Chrome Alloy 32°F (0 °C)up to 428°F (220 °C) Inconel X750 -328 °F(-200 °C) up to 1022 °F(550 °C)
- Minimum Set Pressure 5 psig (0.35 kg/cm^2)

Regular Bill of Materials

No	Description	Trim WCB S1
1	Base	ASTM A-276 Type 304
2	Disc	ASTM A-276 Type 316
3	Disc retainer	ASTM A-276 Type 304
4	Disc holder	ASTM A-276 Type 304
5	Guide	ASTM A-276 Type 416
6	Drive bolt	ASTM A-276 Type 304
7	Bonnet	ASTM A-216 Grade WCB
8	Spindle	ASTM A-276 Type 416
9	Adjusting screw	ASTM A-276 Type 416
10	Adjusting screw nut	ASTM A-276 Type 416
11	Spring	CHROME ALLOY / INCONEL X750
12	Cap	ASTM A-108 Gr. 1018
13	Cap gasket	ASTM A-635 Grade 1010
14	Drive bolt gasket	ASTM A-635 Grade 1010
15	Bonnet gasket	ASTM A-635 Grade 1010
16	TRUARC retainer	Commercial
17	Spring washer	ASTM A-108 Gr. 1018
18	ID sheet*	Aluminum

*Not shown



TYPE 1S50 SERIES

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
PORTABLE TYPE 1S50 SERIES (NON-ASME CODE)

1S50 Valve Type Threaded Ends (S)

Size	Model	A		B		C		D		Approx. weight	
		in	mm	in	mm	in	mm	in	mm	lb	kg
3/4 X 1	1S50c 1S50t	3 1/8	79.4	3 1/8	79.4	13	330.2	3 1/2	88.9	20.0	9.1
1 X 1 1/2		3 1/8	79.4	3 1/8	79.4	13	330.2	3 1/2	88.9	20.0	9.1
1 1/2 X 2		4 1/8	104.8	3 1/8	79.4	13	330.2	4 1/8	104.8	22.0	10.0
2 X 2		4 1/8	104.8	3 1/8	79.4	13	330.2	4 1/8	104.8	22.0	10.0

1S50 Valve Type Socket Weld Ends (SW)

Size	Model	A		B		C		J		K		L		M		Approx. weight	
		in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	lb	kg
3/4 X 1	1S50c 1S50t	4 1/2	114.3	3 1/8	79.4	14 3/8	365.1	1 1/3	33.8	5/8	15.9	1 4/57	27.2	1/2	12.7	20.0	9.1
1 X 1 1/2		4 1/2	114.3	3 1/8	79.4	14 3/8	365.1	1 43/47	48.6	5/8	15.9	1 1/3	33.9	5/8	15.9	20.0	9.1
1 1/2 X 2		4 5/8	117.5	3 1/8	79.4	14 1/2	368.3	2 13/32	61.1	5/8	15.9	1 43/47	48.6	5/8	15.9	22.0	10.0
2 X 2		5 3/8	136.5	3 1/8	79.4	15 1/4	387.4	2 13/32	61.1	5/8	15.9	2 13/32	61.1	5/8	15.9	22.0	10.0

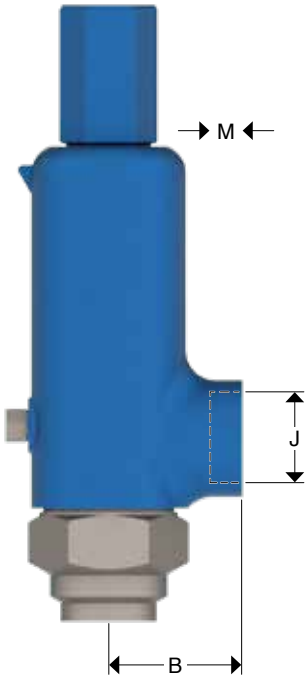
1S50 Valve Type Flanged Ends

Size	Model	Inlet RF o RTJ ANSI Std except thickness	Outlet ANSI Std except thickness		A		B		C		E RF o RTJ		F RF o RTJ		G RF o RTJ		H RF o RTJ	Approx. weight			
			Npt	150 or 300	in	mm	Npt sw in (mm)	Flanged in (mm)	in	mm	in	mm	in	mm	150 in (mm)	300 in (mm)	150 or 300 in (mm)	Threaded outlet lb	Threaded outlet kg	Flanged outlet lb	Flanged outlet kg
3/4 X 1	1S50c 1S50t	3/4-150	1 " Female	1" R.F. or R.T.J.	6	152.4	3 1/8 or (79.4)	6 1/4 or (158.8)	15 7/8	403.2	1	25.4	1/2	12.7	1 1/16 or (27)	1 3/16 or (30.2)	1/2 or (12.7)	22	10.0	25	11.3
		3/4-300			6	152.4			15 7/8	403.2	1 1/8	28.6	1/2	12.7				23	10.4	27	12.2
		3/4-600			6	152.4			15 7/8	403.2	1 1/8	28.6	1/2	12.7				23 1/2	10.7	27 1/2	12.5
		3/4-900			6 1/2	165.1			16 3/8	415.9	1 5/8	41.3	5/8	15.9				27	12.2	31	14.1
		3/4-1500			6 1/2	165.1			16 3/8	415.9	1 5/8	41.3	5/8	15.9				27	12.2	31	14.1
		3/4-2500			6 1/2	165.1			16 3/8	415.9	1 7/8	47.6	5/8	15.9				29	13.2	33	15.0
1 X 1 1/2	1S50c 1S50t	1-150	1 1/2" Female	1 1/2" R.F. or R.T.J.	6 1/4	158.8	3 1/8 or (79.4)	6 1/4 or (158.8)	16 1/8	409.6	1 1/16	27.0	1/2	12.7	1 1/16 or (27)	1 5/16 or (33.3)	1/2 or (12.7)	23	10.4	31	14.1
		1-300			6 1/4	158.8			16 1/8	409.6	1 3/16	30.2	1/2	12.7				24	10.9	32	14.5
		1-600			6 1/4	158.8			16 1/8	409.6	1 3/16	30.2	1/2	12.7				24 1/5	11.1	32 1/2	14.7
		1-900			7 1/4	184.2			17 1/8	435.0	1 3/4	44.5	5/8	15.9				28	12.7	36	16.3
		1-1500			7 1/4	184.2			17 1/8	435.0	1 3/4	44.5	5/8	15.9				28	12.7	36	16.3
		1-2500			7 1/4	184.2			17 1/8	435.0	2	50.8	5/8	15.9				33	15.0	41	18.6
1 1/2 X 2	1S50c 1S50t	1 1/2-150	2 " Female	2" R.F. or R.T.J.	7 1/8	181.0	3 1/8 or (79.4)	6 1/4 or (158.8)	17	431.8	1 3/16	30.2	1/2	12.7	13/8 or (34.9)	1 1/2 or (38.1)	3/8 or (9.5)	26 1/2	12.0	36	16.3
		1 1/2-300			7 1/8	181.0			17	431.8	1 3/16	30.2	1/2	12.7				30	13.6	39 1/2	17.9
		1 1/2-600			7 1/8	181.0			17	431.8	1 3/8	34.9	1/2	12.7				30	13.6	39 1/2	17.9
		1 1/2-900			8 1/4	209.6			18 1/8	460.4	1 7/8	47.6	5/8	15.9				37 1/2	17.0	47	21.3
		1 1/2-1500			8 1/4	209.6			18 1/8	460.4	1 7/8	47.6	5/8	15.9				37 1/2	17.0	47	21.3
		1 1/2-2500			8 1/4	209.6			18 1/8	460.4	2 3/8	60.3	5/8	15.9				47 1/2	21.5	57	25.9
2X2	1S50c 1S50t	2-150	2 " Female	2" R.F. or R.T.J.	7 1/8	181.0	3 1/8 or (79.4)	6 1/4 or (158.8)	18	457.2	1 1/4	31.8	1/2	12.7	13/8 or (34.9)	1 1/2 or (38.1)	3/8 or (9.5)	29 1/2	13.4	39	17.7
		2-300			7 1/8	181.0			18	457.2	1 1/8	28.6	5/8	15.9				31 1/2	14.3	41	18.6
		2-600			7 1/8	181.0			18	457.2	1 5/8	41.3	5/8	15.9				32 1/2	14.7	42	19.1
		2-900			8 1/4	209.6			19 1/8	485.8	2 1/8	54.0	5/8	15.9				43	19.5	32 1/2	14.7
		2-1500			8 1/4	209.6			19 1/8	485.8	2 1/8	54.0	5/8	15.9				43	19.5	32 1/2	14.7
		2-2500			8 1/4	209.6			19 1/8	485.8	2 5/8	66.7	5/8	15.9				51 1/2	23.4	61	27.7

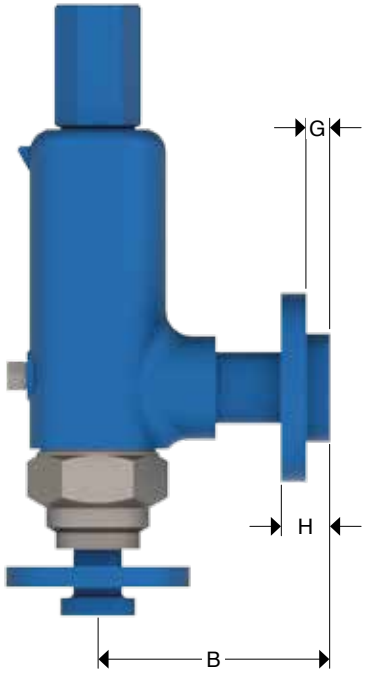
WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
PORTABLE TYPE 1S50 SERIES (NON-ASME CODE)

Dimensions and weights

1S50 Threaded Ends (Side)

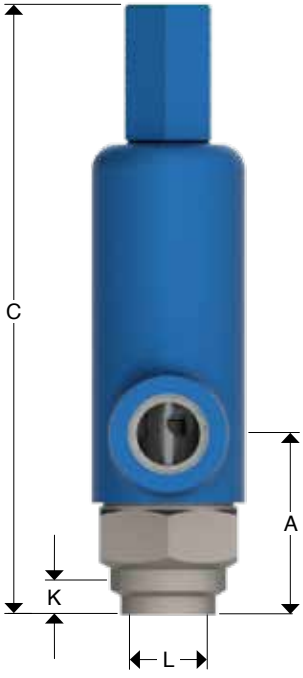


1S50 Socket Weld Ends (Side)

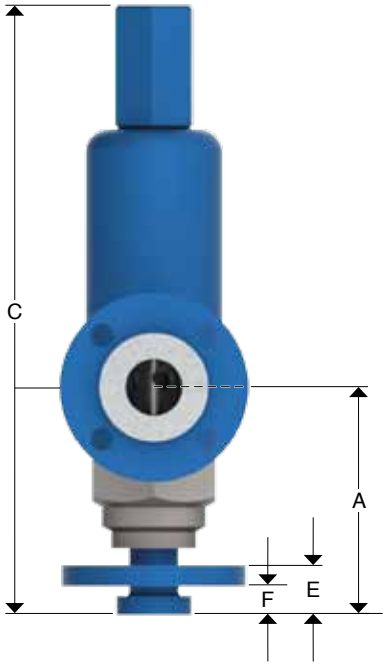


1S50 Flanged Ends (Side)

1S50 Threaded Ends (Front)



1S50 Socket Weld Ends (Front)



1S50 Flanged Ends (Front)

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
PORTABLE TYPE 1S20 SERIES (NON-ASME CODE)

The portable type 1S20 series steel safety and relief valves offer an economic solution, however, it is limited to a discharge area of 0.110 inch^2 (71 mm^2) and a maximum work pressure of 2000 psig (104.65 kg/cm^3). The standard connection of this valve is a NPT thread female in and out, yet can be supplied in any combination including welded and flanged ends.

Design Features

- Relief capacity according to ASME B & PVC SECT. VIII DIV. 1
- Orifice area according to ASME B & PVC SECT. VIII DIV. 1
- Distance between faces according to API 526
- Flange dimensions according to ASME B16.5
- NACE service according to MR-01-75 or MR-01-03
- Tests according to API 527

① WALWORTH steel safety and Relief Valves can be built with a standard cap (screwed), plain lever, or packed lever.

② The disc joint and the spindle head have a similar design to the one of a rod, so during difficult service conditions or in the event of a misalignment, the disc may adjust itself and keep a hermetic seal.

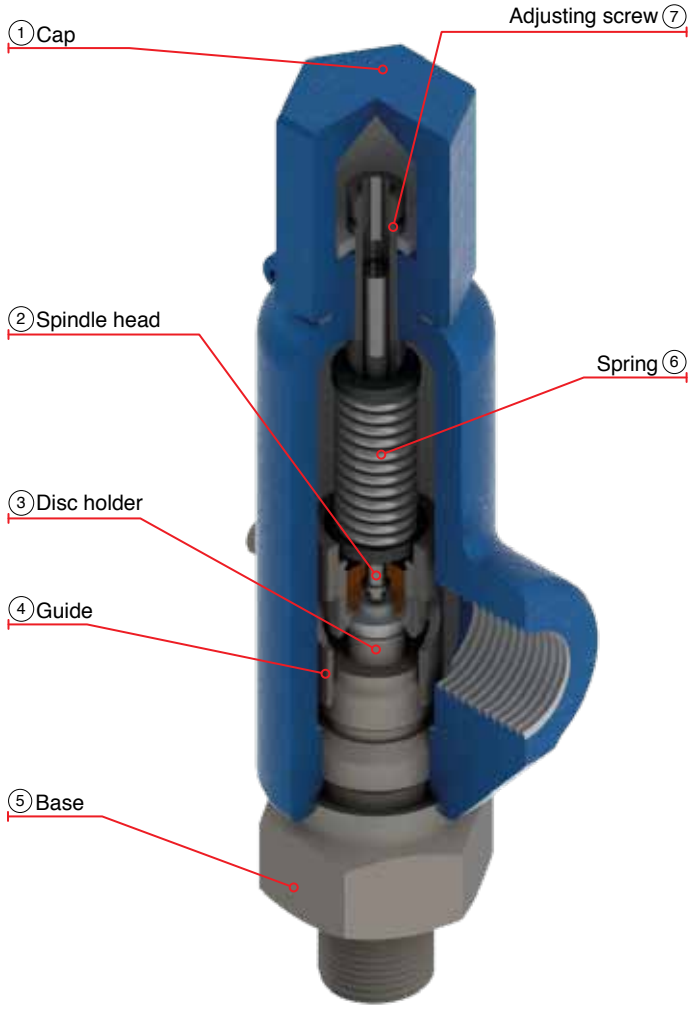
③ The disc holder keeps the disc alligned to the seal area of the base. The disc holder and the disc retainer are ensembled with a TRUARC pin, and a slot on the disc holder, this ensemble is very secure and hard to break.

④ The guide is the adjusting element that provides the capacity to regulate the blowdown or differential pressure, by raising it the blowdown increases (closure pressure decreases), and by handing down the blowdown decreases (closure pressure increases). The ideal blowdown is the one that makes the valve close at the operation pressure of the accessory on which the valve is installed.

⑤ For portables (only), the base is the orifice at the superior area of the nozzle and defines the discharge valve capacity. The inside mechanism of this element is designed according to ASME specifications.

⑥ WALWORTH offers springs in different types of materials to meet your processing needs. The standard spring is made of Carbon Steel for high temperature service in Alloy Steel with a high content of Tungsten and for low temperatures Austenitic Stainless Steel.

⑦ The adjusting screw is the element that compresses the spring to a certain position to define the set pressure of the valve. WALWORTH personnel pay a lot of attention to this element.



1S20 SERIES

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
PORTABLE TYPE 1S20 SERIES (NON-ASME CODE)

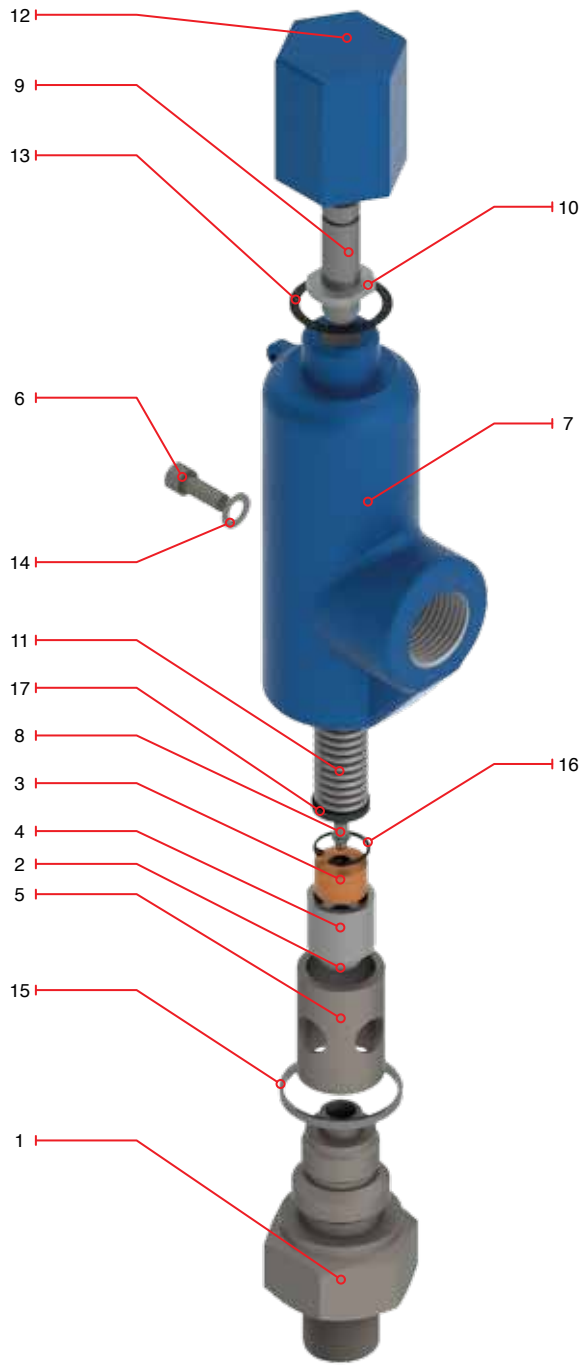
Design Features

- Orifices: 0.110 in^2
- Inlet size x outlet size from ½" x 1" to 1" x 1"
- Maximum operating pressure 2000 psig
- Closed Bonnet
- Screwed Cap
- Actuated by Chrome Alloy 32°F (0 °C)up to 428°F (220 °C) Inconel X750 -328 °F(-200 °C) up to 1022 °F(550 °C)
- Minimum Set Pressure 5 psig (0.35 kg/cm^2)

Regular Bill of Materials

No	Description	Trim WCB S1
1	Base	ASTM A-276 Type 304
2	Disc	ASTM A-276 Type 316
3	Disc retainer	ASTM A-276 Type 304
4	Disc holder	ASTM A-276 Type 304
5	Guide	ASTM A-276 Type 416
6	Drive bolt	ASTM A-276 Type 304
7	Bonnet	ASTM A-216 Grade WCB
8	Spindle	ASTM A-276 Type 416
9	Adjusting screw	ASTM A-276 Type 416
10	Adjusting screw nut	ASTM A-276 Type 416
11	Spring	CHROME ALLOY / INCONEL X750
12	Cap	ASTM A-108 Gr. 1018
13	Cap gasket	ASTM A-635 Grade 1010
14	Drive bolt gasket	ASTM A-635 Grade 1010
15	Bonnet gasket	ASTM A-635 Grade 1010
16	TRUARC retainer	Commercial
17	Spring washer	ASTM A-108 Gr. 1018
18	ID sheet*	Aluminum

*Not shown



1S20 SERIES

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
PORTABLE TYPE 1S20 SERIES (NON-ASME CODE)

1S20 Valve Type Threaded Ends (S)

Size	Model	A		B		C		D		Approx. weight	
		in	mm	in	mm	in	mm	in	mm	lb	kg
1/2 X 1	1S20c 1S20t	3 9/16	90.5	1 3/4	44.5	8 1/2	215.9	1 7/8	47.6	5.0	2.3
3/4 X 1		3 9/16	90.5	1 3/4	44.5	8 1/2	215.9	1 7/8	47.6	5.0	2.3
1 X1		3 9/16	90.5	1 3/4	44.5	8 1/2	215.9	1 7/8	47.6	5.0	2.3

1S20 Valve Type Socket Weld Ends (SW)

Size	Model	A		B		C		J		K		L		M		Approx. weight	
		in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	lb	kg
1/2 X 1	1S20c 1S20t	4 1/4	108	1 3/4	44.5	9 3/16	233.4	1 1/3	33.8	1/2	12.7	43/50	21.8	1/2	12.7	5.0	2.3
3/4 X 1		4 1/4	108	1 3/4	44.5	9 3/16	233.4	1 1/3	33.8	5/8	15.9	1 4/57	27.2	1/2	12.7	5.0	2.3
1 X1		4 1/4	108	1 3/4	44.5	9 3/16	233.4	1 1/3	33.8	5/8	15.9	1 1/3	33.9	1/2	12.7	5.0	2.3

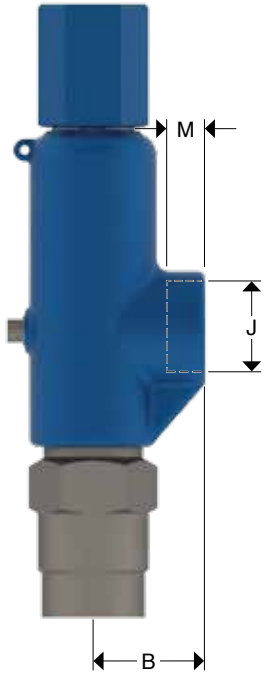
1S20 Valve Type Flanged Ends

Size	Model	Inlet RF o RTJ ANSI Std except thickness	Outlet ANSI Std except thickness		A		B		C		E RF o RTJ		F RF o RTJ		G RF o RTJ		H RF o RTJ	Approx. weight			
			Npt	150 or 300	in	mm	Npt sw in (mm)	Bridada in (mm)	in	mm	in	mm	in	mm	150 in (mm)	300 in (mm)	150 or 300 in (mm)	Threaded outlet lb	Threaded outlet kg	Flanged outlet lb	Flanged outlet kg
1/2 X 1	1S20c 1S20t	1/2-150	1 " Female	1" R.F. or R.T.J.	6	152.4	1 3/4 or (44.5)	4 7/8 or (123.8)	11	279.4	7/8	22.2	7/16	11.1	1 1/16 or (27)	1 3/16 or (30.2)	1/2 or (12.7)	6 1/2	2.9	10 1/2	4.8
		1/2-300			6	152.4			11	279.4	1	25.4	7/16	11.1				7	3.2	11	5.0
		1/2-600			6	152.4			11	279.4	1	25.4	7/16	11.1				7 1/2	3.4	11 1/2	5.2
		1/2-900			6 1/2	165.1			11 1/2	292.1	1 1/2	38.1	5/8	15.9				11 1/2	5.2	15	7.0
		1/2-1500			6 1/2	165.1			11 1/2	292.1	1 1/2	38.1	5/8	15.9				11 1/2	5.2	15	7.0
		1/2-2500			6 1/2	165.1			11 1/2	292.1	1 13/16	46	5/8	15.9				12 1/2	5.7	16	7.5
3/4 X 1	1S20c 1S20t	3/4-150	1 " Female	1" R.F. or R.T.J.	6 1/4	158.8	1 3/4 or (44.5)	4 7/8 or (123.8)	11 1/4	28538	1	25.4	1/2	12.7	1 1/16 or (27)	1 3/16 or (30.2)	1/2 or (12.7)	7	3.2	11	5.0
		3/4-300			6 1/4	158.8			11 1/4	28538	1 1/8	28.6	1/2	12.7				8	3.6	12	5.4
		3/4-600			6 1/4	158.8			11 1/4	28538	1 1/8	28.6	1/2	12.7				8 1/2	3.9	12 1/2	5.7
		3/4-900			6 3/4	171.5			11 3/4	298.5	1 5/8	41.3	5/8	15.9				11 1/2	5.2	15 1/2	7.0
		3/4-1500			6 3/4	171.5			11 3/4	298.5	1 5/8	41.3	5/8	15.9				11 1/2	5.2	15 1/2	7.0
		3/4-2500			6 3/4	171.5			11 3/4	298.5	1 5/8	41.3	5/8	15.9				13 1/2	6.1	17 1/2	7.9
1 X 1	1S20c 1S20t	1-150	1 " Female	1" R.F. or R.T.J.	6 1/2	165.1	1 3/4 or (44.5)	4 7/8 or (123.8)	11 1/2	292.1	1 1/16	27.0	1/2	12.7	1 1/16 or (27)	1 3/16 or (30.2)	1/2 or (12.7)	8	3.6	12	5.4
		1-300			6 1/2	165.1			11 1/2	292.1	1 3/16	30.2	1/2	12.7				9	4.1	13	5.9
		1-600			6 1/2	165.1			11 1/2	292.1	1 3/16	30.2	1/2	12.7				9 1/2	4.3	13 1/2	6.1
		1-900			7 1/2	190.5			12 1/2	317.5	1 3/4	44.5	5/8	15.9				13 1/2	6.1	17 1/2	7.9
		1-1500			7 1/2	190.5			12 1/2	317.5	1 3/4	44.5	5/8	15.9				13 1/2	6.1	17 1/2	7.9
		1-2500			7 1/2	190.5			12 1/2	317.5	2	50.8	5/8	15.9				21	9.5	25	11.3

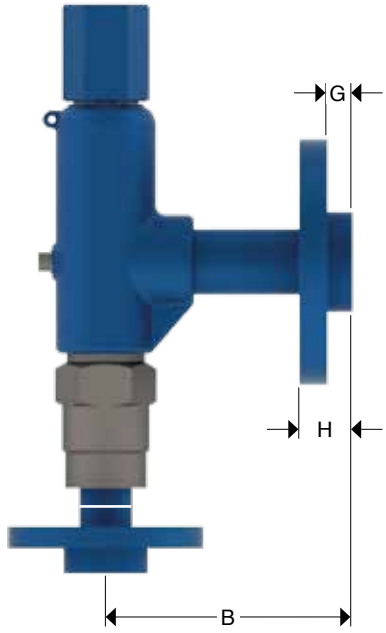
WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
PORTABLE TYPE 1S20 SERIES (NON-ASME CODE)

Dimensions and weights

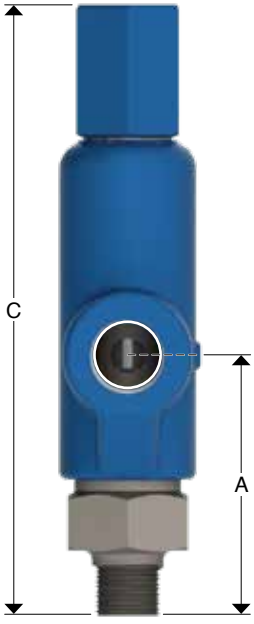
1S20 Threaded Ends (Side)



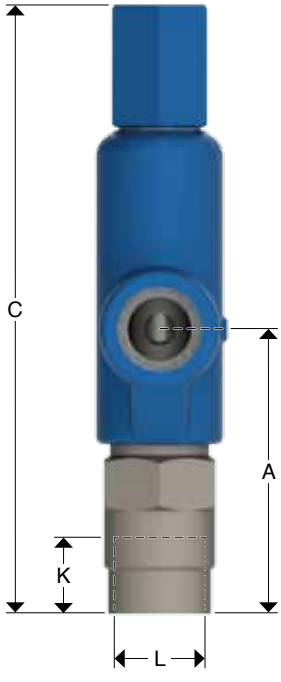
1S20 Socket Weld Ends (Side)



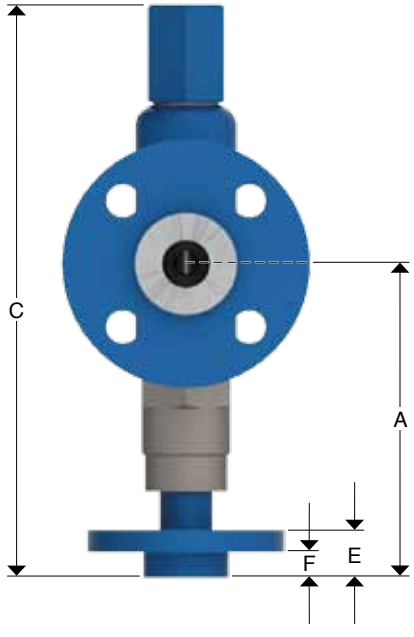
1S20 Flanged Ends (Side)



1S20 Threaded Ends (Front)



1S20 Socket Weld Ends (Front)



1S20 Flanged Ends (Front)

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
VALVE APPLICATION AND SELECTION

Below is the dimension methodology of a steel safety and relief valve which contains:

- Orifice selection to release certain fluid amount;
- Valve selection that fulfills the temperature and specific pressure requirements.

The American Petroleum Institute presents the following methodology through the use of formulas.

$$K_n = \frac{0.1906P_i - 1000}{.2292P_i - 1061}$$

Symbols:

A	Orifice area in²
Gcm	Required gas capacity SCFM
Vph	Required vapor capacity pounds per hour
Lgm	Required liquid capacity Gpm
S.G.	Specific gravity of gas (with reference to air = 1 @ 60ºF 14.7 psigA (atmospheric pressure) or of liquid (with reference to water = 70ºF, compressibility of liquid is usually ignorate) at actual discharge temperature
M	Molecular weight of single component liquid hydrocarbon
P_i	Flowing pressure, psigA (absolute)
C_i	Orifice coefficent
Ta	Saturation temperature absolute (ºF x 460) at pressure P_i
Z	Compressibility factor
ρ	Density (lb/ft3) air=0.0763lb/ft3 @ atmospheric pressure and 620ºF
V_F	Vapor correction factor applies to bellows valves only
F_L	Liquid correction factor applies to bellows valves only
Pb	Flowing back pressure
S_f	Superheat correction factor
K_n	Napier factor

Section	Overpressure	If P_i is less than	Kn	P_i PSIG Range	Kn	P_i is greater than	Kn
I	3%	1521	1.0	1521 to 3100	Calc.	N/A	~
VIII	10%	1424	1.0	1424 to 2903	Calc.	2903	1.0

Open Bonnet and conventional valve calculation formulas

Open Bonnet and conventional valves - 1S and 1S/pe series for constant overpressure under the 55% set pressure			
GASES: pounds per hour	$A = \frac{V_{ph}\sqrt{T_a}\sqrt{Z}}{C_1\sqrt{M}P_i 1.041}$	**VAPOR**: pounds per hour at 3% overpressure	$A = \frac{V_{ph}\sqrt{T_a}\sqrt{Z}}{50P_i 1.0184 S_r K_n}$
GASES: Square feet per minute Density ρ=0.0763 (S.G.)	$A = \frac{G_{cm}\rho\sqrt{T_a}\sqrt{Z}}{0.01735C_1\left(\sqrt{M}\right)P}$	**LIQUIDS**: Gallons per minute at 25% over pressure	$A = \frac{L_{gm}\sqrt{SG}}{27.4\left(\sqrt{1.25P_i - P_b}\right)}$
AIR: Square feet per minute	$A = \frac{G_{cm}\sqrt{T_a}}{414.07P_i}$	**LIQUIDS**: Gallons per minute at 10% overpressure	$A = \frac{L_{gm}\sqrt{SG}}{16.44\left(\sqrt{1.25P_i - P_b}\right)}$
VAPOR: pounds per hour to 10% overpressure	$A = \frac{V_{ph}\sqrt{T_a}\sqrt{Z}}{50P_i 1.019 S_r K_n}$		

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE
VALVE APPLICATION AND SELECTION

Bellows valves calculation formulas

Bellows valves allow you to keep the set pressure when exposed to variable back pressure. However, the formulas shown below differ from those of conventional valves.

Bellows valves - 1S-30 series for variable overpressure			
GASES: pounds per hour	$A = \frac{V_{ph}\sqrt{T_a}\sqrt{Z}}{C_1\sqrt{M}P_i 1.041 V_F}$	**VAPOR**: pounds per hour at 3% overpressure	$A = \frac{V_{ph}\sqrt{T_a}\sqrt{Z}}{50 P_i 1.0184 S_r K_n V_F}$
GASES: Square feet per minute Density ρ=0.0763 (S.G.)	$A = \frac{G_{cm}\rho\sqrt{T_a}\sqrt{Z}}{0.01735 C_1\left(\sqrt{M}\right)P V_F}$	**LIQUIDS**: Gallons per minute at 25% over pressure	$A = \frac{L_{gm}\sqrt{SG}}{27.4\left(\sqrt{1.25P_i - P_b}\right)L_F}$
AIR: Square feet per minute	$A = \frac{G_{cm}\sqrt{T_a}}{414.07 P_i V_F}$	**LIQUIDS**: Gallons per minute at 10% overpressure	$A = \frac{L_{gm}\sqrt{SG}}{16.44\left(\sqrt{1.25P_i - P_b}\right)L_F}$
VAPOR: pounds per hour to 10% overpressure	$A = \frac{V_{ph}\sqrt{T_a}\sqrt{Z}}{50 P_i 1.019 S_r K_n}$		

Portable valves calculation formulas

Portable valves - 1S50 & 1S20 series for constant overpressure under the 55% set pressure			
GASES: pounds per hour	$A = \frac{V_{ph}\sqrt{T_a}\sqrt{Z}}{0.82 C_1\sqrt{M}P_i}$	**VAPOR**: pounds per hour at 3% overpressure	$A = \frac{V_{ph}\sqrt{T_a}\sqrt{Z}}{50 P_i 1.0184 S_r K_n V_F}$
GASES: Square feet per minute Density ρ=0.0763 (S.G.)	$A = \frac{G_{cm}\rho\sqrt{T_a}\sqrt{Z}}{0.01367 C_1\left(\sqrt{M}\right)P}$	**LIQUIDS**: Gallons per minute at 25% over pressure	$A = \frac{L_{gm}\sqrt{SG}}{23.56\left(\sqrt{1.25P_i - P_b}\right)L_F}$
AIR: Square feet per minute	$A = \frac{G_{cm}\sqrt{T_a}}{357.9 P_i}$	**LIQUIDS**: Gallons per minute at 10% overpressure	$A = \frac{L_{gm}\sqrt{SG}}{14.136\left(\sqrt{1.25P_i - P_b}\right)L_F}$
VAPOR: pounds per hour to 10% overpressure	$A = \frac{V_{ph}\sqrt{T_a}\sqrt{Z}}{44.0325 P_i S_r K_n}$		

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE

Orifice calculation constants (Liquids)

Liquid	G.E.	G.E. Temp	√G.E.	Critical Temperature
ACETALDEHYDE	0.783	64	0.885	379
ACETIC ACID	1.049	68	1.024	611
ACETYLENE	0.791	66	0.889	455
AIR	0.817	110	0.904	270
AMMONIA	1.65	387	1.284	188
ARGON	0.879	68	0.938	551
BENZENE	0.621	68	0.788	306
BUTADIENE 1.3	0.579	68	0.761	307
N BUTANE	0.557	68	0.746	273
ISO BUTANE	1.101	35	1.049	88
CARBON DIOXIDE	1.263	68	1.124	523
CARBON DISULFIDE	0.814	318	0.902	218
CARBON MONOXIDE	1.56	29	1.249	291
CHLORINE	0.779	68	0.883	538
CYCLOHEXANE	0.734	60	0.857	655
N DECANE	0.997	212	0.998	--
DOWTHERM A	1.181	212	1.087	--
DOWTHERM E	0.546	126	0.739	90
ETHANE	0.789	68	0.888	469
ETHYL ALCOHOL	0.903	50	0.95	369
ETHYL CHLORIDE	0.566	152	0.752	49
ETHILENE(ETHENE)	1.494	63	1.222	386
FREON 11	1.486	22	1.219	234
FREON 12	1.419	42	1.191	205
FREON 22	1.538	30	1.24	295
FREOM 114	0.75	68	0.866	--
HELIUM	0.659	68	0.812	454
N HEXANE	0.0709	423	0.266	400
HYDROGEN CHLORIDE	0.815	60	0.903	--
HYDROGEN	0.415	263	0.644	116
HYDROGEN SULFIDE	0.792	68	0.89	464
METHANE	0.625	60	0.791	370
METHYL ALCOHOL	0.952	32	0.976	290
METHYL BUTANE	1.502	60	1.225	--
METHYL CHLORIDE	1.269	239	1.127	137
NATURAL GAS	1.026	422	1.013	233
NITRIC OXIDE	1.226	128	1.107	98
NITROGEN	0.718	68	0.847	613
NITROUS OXIDE	0.707	68	0.841	565
NONANE	1.014	60	1.007	--
N OCTANE	0.899	60	0.948	--
OXYGEN	0.993	60	0.996	--
N PENTANE	0.91	60	0.954	--
PROPANE	0.91	60	0.954	--
PROPYLENE	1.426	422	1.194	182
STEAM	0.631	60	0.794	386
STYRENE	0.585	49	0.765	206
SULFUR DIOXIDE	0.609	53	0.78	197
TOLUENE	1	39	1	706
STYRENE	0.906	68	0.952	706
SULFUR DIOXIDE	1.434	32	1.197	315
SULFIDRIC ACID	1.834	60	1.354	--
TOLUENE	0.866	68	0.931	609

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE

Orifice calculation constants (Gases and Vapors)

Gas	K	C1	M	√M	S.G.	Critical Temperature
ACETALDEHYDE	1.14	315	44.05	6.64	1.519	379
ACETIC ACID	1.15	316	60.05	7.76	2.071	611
ACETYLENE	1.26	325	26.04	5.1	0.898	97
AIR	1.4	338	28.97	5.39	1	22
AMMONIA	1.33	332	17.03	4.13	0.587	270
ARGON	1.67	360	39.94	6.32	1.381	188
BENZENE	1.12	313	78.11	8.84	2.89	551
BUTADIENE 1.3	1.12	313	54.09	7.36	1.922	306
N BUTANE	1.09	310	58.12	7.67	2.007	307
ISO BUTANE	1.09	310	58.12	7.67	2.007	273
CARBON DIOXIDE	1.3	329	44.01	6.64	1.53	88
CARBON DISULFIDE	1.21	322	76.13	8.72	2.628	523
CARBON MONOXIDE	1.4	338	28	5.29	0.967	218
CHLORINE	1.36	334	70.9	8.42	2.45	291
CYCLOHEXANE	1.09	310	84.16	9.17	2.905	538
N DECANE	1.03	303	142.28	11.93	4.91	655
DOWTHERM A	1.05	312	165	12.85	5.696	--
DOWTHERM E	--	299	147	12.12	5.074	--
ETHANE	1.22	323	30.07	5.48	1.05	90
ETHYL ALCOHOL	1.13	314	46.07	6.79	1.59	469
ETHYL CHLORIDE	1.19	320	64.52	8.03	2.22	369
ETHILENE(ETHENE)	1.26	325	28.05	5.3	0.977	49
FREON 11	1.14	315	137.13	11.72	4.742	386
FREON 12	1.14	315	120.92	11	4.147	234
FREON 22	1.18	319	86.48	9.3	2.985	205
FREOM 114	1.09	309	170.93	13.07	5.9	295
HELIUM	1.66	359	4	2	0.138	450
N HEXANE	1.06	306	86.17	9.29	2.97	454
HYDROGEN CHLORIDE	1.41	339	36.5	6.04	1.22	124
HYDROGEN	1.41	339	2.016	1.42	0.07	400
HYDROGEN SULFIDE	1.32	331	34.07	5.84	1.19	213
METHANE	1.31	330	16.04	4	0.555	116
METHYL ALCOHOL	1.2	321	32.04	5.66	1.11	464
METHYL BUTANE	1.08	308	72.15	8.5	2.49	370
METHYL CHLORIDE	1.2	321	50.49	7.1	1.742	290
NATURAL GAS	1.27	326	19	4.36	0.656	--
NITRIC OXIDE	1.4	338	30	5.48	1.036	137
NITROGEN	1.4	338	28	5.29	0.967	233
NITROUS OXIDE	1.3	329	44	6.63	1.519	98
NONANE	1.04	304	128.25	11.3	4.43	613
N OCTANE	1.05	305	114.22	10.69	3.94	565
OXYGEN	1.4	338	32.06	5.66	1.1	182
N PENTANE	1.07	307	72.15	8.5	2.49	386
PROPANE	1.13	314	44.09	6.64	1.55	206
PROPYLENE	1.15	316	44.08	6.49	1.476	197
STEAM	1.32	331	18.02	4.25	0.622	706
STYRENE	1.07	307	104.14	10.2	3.6	706
SULFUR DIOXIDE	1.29	328	64.06	8.004	2.26	315
TOLUENE	1.09	309	92.13	9.61	3.18	609

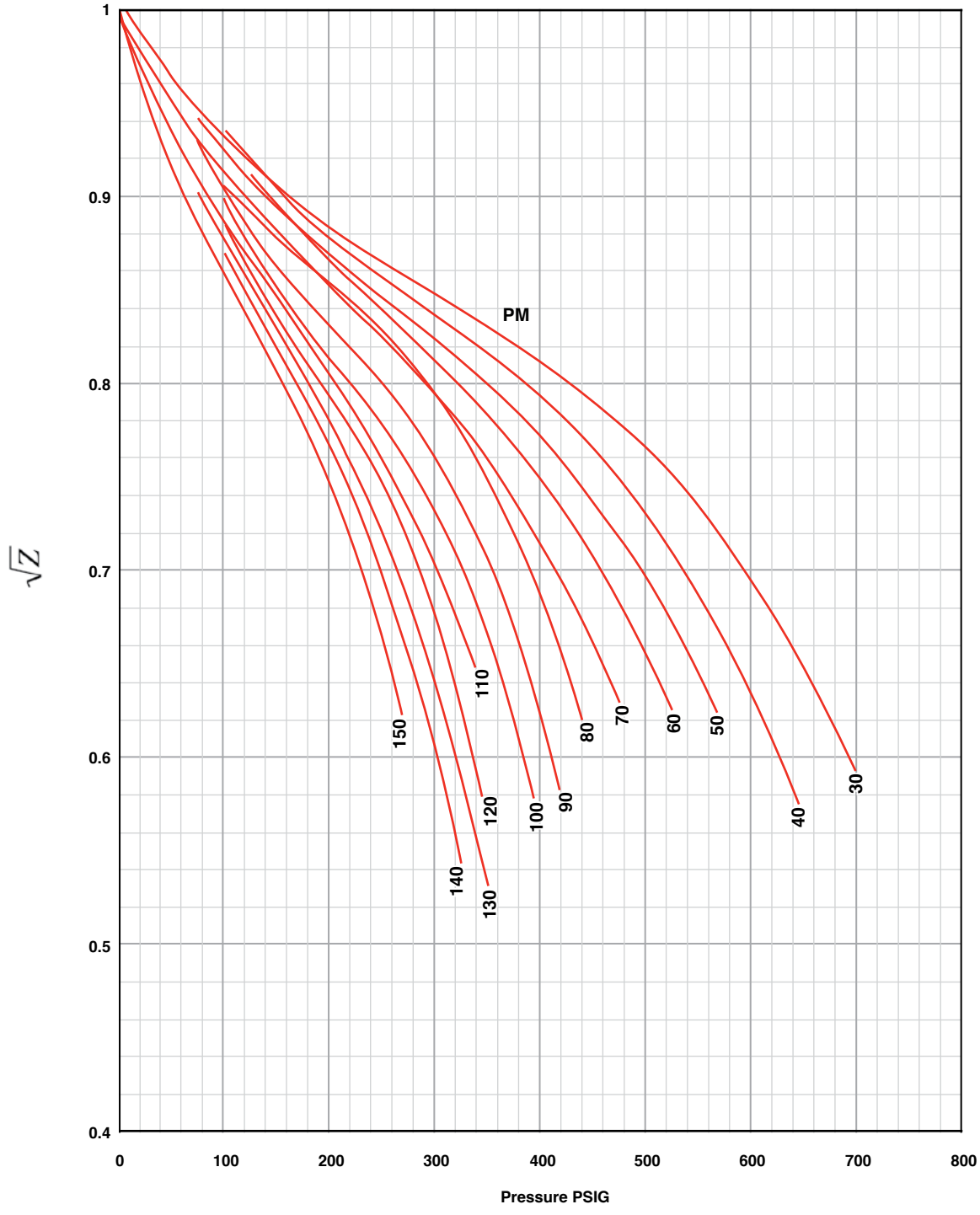
WALWORTH CAST STEEL SAFETY AND RELIEF VALVE

Superheat correction factor Sf

Set pressure (PSIG)	Saturated Steam Temp. °F	Temperature (°F)																																								
		280	300	320	340	360	380	400	420	440	460	480	500	520	5240	560	580	600	620	640	660	680	700	720	740	760	780	800	820	840	860	880	900	920	940	960	980	1000	1050	1100	1150	1200
15	250	1.00	1.00	1.00	0.99	0.99	0.98	0.98	0.97	0.96	0.95	0.94	0.93	0.92	0.91	0.90	0.89	0.88	0.87	0.86	0.86	0.85	0.84	0.83	0.83	0.82	0.81	0.81	0.80	0.79	0.79	0.78	0.78	0.77	0.76	0.76	0.75	0.75	0.74	0.72	0.71	0.70
20	259	1.00	1.00	1.00	0.99	0.99	0.98	0.98	0.97	0.96	0.95	0.94	0.93	0.92	0.91	0.90	0.89	0.88	0.87	0.86	0.86	0.85	0.84	0.83	0.83	0.82	0.81	0.81	0.80	0.79	0.79	0.78	0.78	0.77	0.77	0.76	0.75	0.75	0.74	0.72	0.71	0.70
40	287	--	1.00	1.00	1.00	0.99	0.99	0.98	0.97	0.96	0.95	0.94	0.93	0.92	0.91	0.90	0.89	0.88	0.87	0.87	0.86	0.85	0.84	0.84	0.83	0.82	0.82	0.81	0.80	0.79	0.79	0.78	0.78	0.77	0.77	0.76	0.75	0.75	0.74	0.73	0.71	0.70
60	308	--	--	1.00	1.00	0.99	0.99	0.98	0.97	0.96	0.95	0.94	0.93	0.92	0.91	0.90	0.89	0.88	0.87	0.87	0.86	0.85	0.84	0.84	0.83	0.82	0.82	0.81	0.80	0.80	0.79	0.78	0.78	0.77	0.77	0.76	0.76	0.75	0.74	0.73	0.71	0.70
80	324	--	--	--	1.00	1.00	0.99	0.99	0.98	0.97	0.96	0.94	0.93	0.92	0.91	0.90	0.89	0.89	0.88	0.87	0.86	0.85	0.84	0.84	0.83	0.82	0.82	0.81	0.80	0.80	0.79	0.78	0.78	0.77	0.77	0.76	0.76	0.75	0.74	0.73	0.71	0.70
100	338	--	--	--	--	1.00	1.00	0.99	0.98	0.97	0.96	0.95	0.94	0.93	0.92	0.91	0.90	0.89	0.88	0.87	0.86	0.85	0.85	0.84	0.83	0.82	0.82	0.81	0.80	0.80	0.79	0.78	0.78	0.77	0.77	0.76	0.76	0.75	0.74	0.73	0.71	0.70
120	350	--	--	--	--	1.00	1.00	0.99	0.98	0.97	0.96	0.95	0.94	0.93	0.92	0.91	0.90	0.89	0.88	0.87	0.86	0.85	0.85	0.84	0.83	0.82	0.82	0.81	0.80	0.80	0.79	0.78	0.78	0.77	0.77	0.76	0.76	0.75	0.74	0.73	0.71	0.70
140	361	--	--	--	--	--	1.00	1.00	0.99	0.98	0.96	0.95	0.94	0.93	0.92	0.91	0.90	0.89	0.88	0.87	0.86	0.85	0.85	0.84	0.83	0.82	0.82	0.81	0.80	0.80	0.79	0.78	0.78	0.77	0.77	0.76	0.76	0.75	0.74	0.73	0.71	0.70
160	371	--	--	--	--	--	1.00	1.00	0.99	0.98	0.97	0.95	0.94	0.93	0.92	0.91	0.90	0.89	0.88	0.87	0.86	0.86	0.85	0.84	0.83	0.82	0.82	0.81	0.80	0.80	0.79	0.79	0.78	0.77	0.77	0.76	0.76	0.75	0.74	0.73	0.71	0.70
180	380	--	--	--	--	--	--	1.00	0.99	0.98	0.97	0.96	0.95	0.93	0.92	0.91	0.90	0.89	0.88	0.87	0.86	0.86	0.85	0.84	0.83	0.82	0.82	0.81	0.80	0.80	0.79	0.79	0.78	0.77	0.77	0.76	0.76	0.75	0.74	0.73	0.71	0.70
200	388	--	--	--	--	--	--	1.00	0.99	0.99	0.97	0.96	0.95	0.93	0.92	0.91	0.90	0.89	0.88	0.87	0.86	0.86	0.85	0.84	0.83	0.83	0.82	0.81	0.81	0.80	0.79	0.79	0.78	0.77	0.77	0.76	0.76	0.75	0.74	0.73	0.72	0.71
220	395	--	--	--	--	--	--	1.00	1.00	0.99	0.98	0.96	0.95	0.94	0.93	0.92	0.91	0.90	0.88	0.88	0.87	0.86	0.85	0.84	0.84	0.83	0.82	0.81	0.81	0.80	0.79	0.79	0.78	0.78	0.77	0.76	0.76	0.75	0.74	0.73	0.72	0.71
240	403	--	--	--	--	--	--	--	1.00	0.99	0.98	0.97	0.95	0.94	0.93	0.92	0.91	0.90	0.89	0.88	0.87	0.86	0.85	0.84	0.84	0.83	0.82	0.81	0.81	0.80	0.79	0.79	0.78	0.78	0.77	0.76	0.76	0.75	0.74	0.73	0.72	0.71
260	409	--	--	--	--	--	--	--	1.00	0.99	0.98	0.97	0.95	0.94	0.93	0.92	0.91	0.90	0.89	0.88	0.87	0.86	0.85	0.85	0.84	0.83	0.82	0.81	0.81	0.80	0.79	0.79	0.78	0.78	0.77	0.76	0.76	0.75	0.74	0.73	0.72	0.71
280	416	--	--	--	--	--	--	--	1.00	1.00	0.99	0.97	0.96	0.95	0.93	0.92	0.91	0.90	0.89	0.88	0.87	0.86	0.85	0.85	0.84	0.83	0.82	0.82	0.81	0.80	0.80	0.79	0.78	0.78	0.77	0.77	0.76	0.75	0.74	0.73	0.72	0.71
300	422	--	--	--	--	--	--	--	--	1.00	0.99	0.98	0.96	0.95	0.93	0.92	0.91	0.90	0.89	0.89	0.87	0.86	0.85	0.85	0.84	0.83	0.82	0.82	0.81	0.80	0.80	0.79	0.78	0.78	0.77	0.77	0.76	0.75	0.74	0.73	0.72	0.71
350	436	--	--	--	--	--	--	--	--	1.00	1.00	0.99	0.97	0.96	0.94	0.93	0.92	0.91	0.89	0.89	0.88	0.86	0.85	0.85	0.84	0.83	0.82	0.82	0.81	0.81	0.80	0.79	0.78	0.78	0.77	0.77	0.76	0.76	0.74	0.73	0.72	0.71
400	448	--	--	--	--	--	--	--	--	--	1.00	0.99	0.98	0.96	0.95	0.93	0.92	0.91	0.90	0.89	0.88	0.86	0.85	0.85	0.84	0.84	0.83	0.82	0.81	0.81	0.80	0.79	0.79	0.78	0.77	0.77	0.76	0.76	0.74	0.73	0.72	0.71
450	460	--	--	--	--	--	--	--	--	--	--	1.00	0.99	0.97	0.96	0.94	0.93	0.92	0.90	0.89	0.88	0.87	0.86	0.86	0.85	0.84	0.83	0.82	0.82	0.81	0.80	0.79	0.79	0.78	0.78	0.77	0.76	0.76	0.74	0.73	0.72	0.71
500	470	--	--	--	--	--	--	--	--	--	--	1.00	0.99	0.98	0.96	0.94	0.93	0.92	0.91	0.90	0.89	0.87	0.86	0.86	0.85	0.84	0.83	0.82	0.82	0.81	0.80	0.79	0.79	0.78	0.78	0.77	0.76	0.76	0.74	0.73	0.72	0.71
550	480	--	--	--	--	--	--	--	--	--	--	--	1.00	0.99	0.97	0.95	0.94	0.92	0.91	0.90	0.89	0.87	0.86	0.86	0.85	0.84	0.83	0.82	0.82	0.81	0.80	0.80	0.79	0.78	0.78	0.77	0.76	0.76	0.74	0.73	0.72	0.71
600	489	--	--	--	--	--	--	--	--	--	--	--	1.00	0.99	0.98	0.96	0.94	0.93	0.91	0.90	0.89	0.88	0.86	0.86	0.85	0.84	0.83	0.83	0.82	0.81	0.80	0.80	0.79	0.78	0.78	0.77	0.76	0.76	0.75	0.73	0.72	0.71
650	497	--	--	--	--	--	--	--	--	--	--	--	--	1.00	0.99	0.97	0.95	0.94	0.92	0.91	0.90	0.88	0.87	0.86	0.86	0.85	0.84	0.83	0.82	0.81	0.81	0.80	0.79	0.78	0.78	0.77	0.77	0.76	0.75	0.73	0.72	0.71
700	506	--	--	--	--	--	--	--	--	--	--	--	--	1.00	0.99	0.97	0.96	0.94	0.93	0.91	0.90	0.89	0.87	0.87	0.86	0.85	0.84	0.83	0.82	0.81	0.81	0.80	0.79	0.79	0.78	0.77	0.77	0.76	0.75	0.73	0.72	0.71
750	513	--	--	--	--	--	--	--	--	--	--	--	--	1.00	1.00	0.98	0.96	0.94	0.93	0.92	0.90	0.89	0.87	0.87	0.86	0.85	0.84	0.83	0.83	0.82	0.81	0.80	0.79	0.79	0.78	0.77	0.77	0.76	0.75	0.73	0.72	0.71
800	520	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00	0.99	0.97	0.95	0.94	0.92	0.91	0.89	0.87	0.87	0.86	0.85	0.84	0.84	0.83	0.82	0.81	0.80	0.80	0.79	0.78	0.78	0.77	0.76	0.75	0.73	0.72	0.71
850	527	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00	0.99	0.98	0.96	0.94	0.93	0.92	0.90	0.88	0.88	0.87	0.86	0.84	0.84	0.83	0.82	0.81	0.81	0.80	0.79	0.78	0.78	0.77	0.76	0.75	0.74	0.72	0.71
900	533	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00	1.00	0.99	0.97	0.95	0.93	0.92	0.90	0.88	0.88	0.87	0.86	0.85	0.84	0.83	0.82	0.81	0.81	0.80	0.79	0.79	0.78	0.77	0.77	0.75	0.74	0.72	0.71
950	540	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00	0.99	0.97	0.95	0.94	0.92	0.90	0.88	0.88	0.87	0.86	0.85	0.84	0.83	0.82	0.82	0.81	0.80	0.79	0.79	0.78	0.77	0.77	0.75	0.74	0.72	0.71
1000	546	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00	0.99	0.98	0.96	0.94	0.93	0.91	0.89	0.89	0.87	0.86	0.85	0.84	0.83	0.83	0.82	0.81	0.80	0.79	0.79	0.78	0.77	0.77	0.75	0.74	0.72	0.71
1050	552	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00	1.00	0.99	0.97	0.95	0.93	0.91	0.89	0.89	0.88	0.87	0.85	0.85	0.84	0.83	0.82	0.81	0.80	0.80	0.79	0.78	0.77	0.77	0.75	0.74	0.73	0.71
1100	558	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00	0.99	0.98	0.95	0.94	0.92	0.89	0.89	0.88	0.87	0.86	0.85	0.84	0.83	0.82	0.81	0.81	0.80	0.79	0.78	0.78	0.77	0.75	0.74	0.73	0.71
1150	563	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00	0.99	0.98	0.96	0.94	0.92	0.90	0.90	0.88	0.87	0.86	0.85	0.84	0.83	0.82	0.81	0.81	0.80	0.79	0.78	0.78	0.77	0.76	0.74	0.73	0.71
1200	569	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00	0.99	0.98	0.97	0.95	0.92	0.90	0.90	0.89	0.87	0.86	0.85	0.84	0.83	0.82	0.81	0.81	0.80	0.79	0.78	0.78	0.77	0.76	0.74	0.73	0.71
1250	574	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00	0.99	0.97	0.95	0.93	0.91	0.90	0.89	0.88	0.86	0.85	0.85	0.84	0.83	0.82	0.81	0.80	0.79	0.79	0.78	0.77	0.76	0.74	0.73	0.72
1300	579	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00	0.99	0.98	0.96	0.93	0.91	0.91	0.89	0.88	0.87	0.86	0.85	0.84	0.83	0.82	0.81	0.80	0.79	0.79	0.78	0.77	0.76	0.74	0.73	0.72
1350	584	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00	0.99	0.98	0.96	0.94	0.91	0.91	0.90	0.88	0.87	0.86	0.85	0.84	0.83	0.82	0.81	0.80	0.80	0.79	0.78	0.78	0.76	0.74	0.73	0.72
1400	588	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00	1.00	0.99	0.97	0.94	0.92	0.92	0.90	0.89	0.87	0.86	0.85	0.84	0.83	0.82	0.81	0.81	0.80	0.79	0.78	0.78	0.76	0.75	0.73	0.72
1450	593	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00	0.99	0.98	0.95	0.93	0.92	0.90	0.89	0.88	0.86	0.85	0.84	0.83	0.82	0.81	0.81	0.80	0.79	0.78	0.78	0.76	0.75	0.73	0.72
1500	597	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00	0.99	0.98	0.95	0.94	0.92	0.91	0.89	0.88	0.87	0.86	0.84	0.84	0.83	0.82	0.81	0.80	0.79	0.78	0.78	0.76	0.75	0.73	0.72
1550	602	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00	0.99	0.99	0.96	0.94	0.93	0.91	0.90	0.88	0.87	0.86	0.85	0.84	0.83	0.82	0.81	0.80	0.79	0.79	0.78	0.76	0.75	0.73	0.72
1600	606	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00	1.00	0.99	0.97	0.94	0.93	0.91	0.90	0.88	0.87	0.86	0.85	0.84	0.83	0.82	0.81	0.80	0.79	0.79	0.78	0.76	0.75	0.73	0.72
1650	610	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00	0.99	0.97	0.95	0.94	0.92	0.90	0.89	0.87	0.86	0.85	0.84	0.83	0.82	0.81	0.80	0.80	0.79	0.78	0.76	0.75	0.73	0.72
1700	615	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00	0.99	0.98	0.96	0.94	0.92	0.91	0.89	0.88	0.87	0.85	0.84	0.83	0.82	0.81	0.81	0.80	0.79	0.78	0.77	0.75	0.73	0.72
1750	618	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00	0.99	0.98	0.96	0.95	0.93	0.91	0.89	0.88	0.87	0.85	0.84	0.83	0.82	0.82	0.81	0.80	0.79	0.78	0.77	0.75	0.73	0.72
1800	622	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00	0.99	0.99	0.97	0.95	0.93	0.91	0.90	0.88	0.87	0.86	0.85	0.84	0.83	0.82	0.81	0.80	0.79	0.78	0.77	0.75	0.73	0.72
1850	626	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00	1.00	0.99	0.97	0.95	0.93	0.92	0.90	0.89	0.87	0.86	0.85	0.84	0.83	0.82	0.81	0.80	0.79	0.79	0.77	0.75	0.74	0.72
1900	630	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00	1.00	0.99	0.98	0.96	0.94	0.92	0.90	0.89	0.87	0.86	0.85	0.84	0.83	0.82	0.81	0.80	0.79	0.79	0.77	0.75	0.74	0.72
1950	633	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00	0.99	0.98	0.97	0.94	0.92	0.91	0.89	0.88	0.86	0.85	0.84	0.83	0.82	0.81	0.80	0.80	0.79	0.77	0.75	0.74	0.72
2000	636	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00	0.99	0.99	0.97	0.95	0.93	0.91	0.89	0.88	0.87	0.85	0.84	0.83	0.82	0.81	0.80	0.80	0.79	0.77	0.75	0.74	0.72
2200	650	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00	1.00	0.99	0.99	0.97	0.95	0.93	0.91	0.89	0.88	0.86	0.85	0.84	0.83	0.82	0.81	0.80	0.79	0.77	0.76	0.74	0.73
2400	663	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00	1.00	0.99	0.98	0.96	0.94	0.92	0.90	0.89	0.87	0.86	0.85	0.84	0.83	0.82	0.81	0.80	0.78	0.76	0.74	0.73
2600	675	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00	1.00	0.99	0.99	0.98	0.96	0.94	0.92	0.90	0.88	0.87	0.85	0.84	0.83	0.82	0.81	0.80	0.78	0.76	0.75	0.73
2800	686	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00	1.00	0.99	0.99	0.98	0.95	0.93	0.91	0.89	0.88	0.86	0.85	0.84	0.83	0.82	0.81	0.79	0.77	0.75	0.73
3000	696	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00	1.00	0.99	0.98	0.97	0.94	0.92	0.90	0.89	0.87	0.86	0.84	0.83	0.82	0.81	0.79	0.77	0.75	0.73

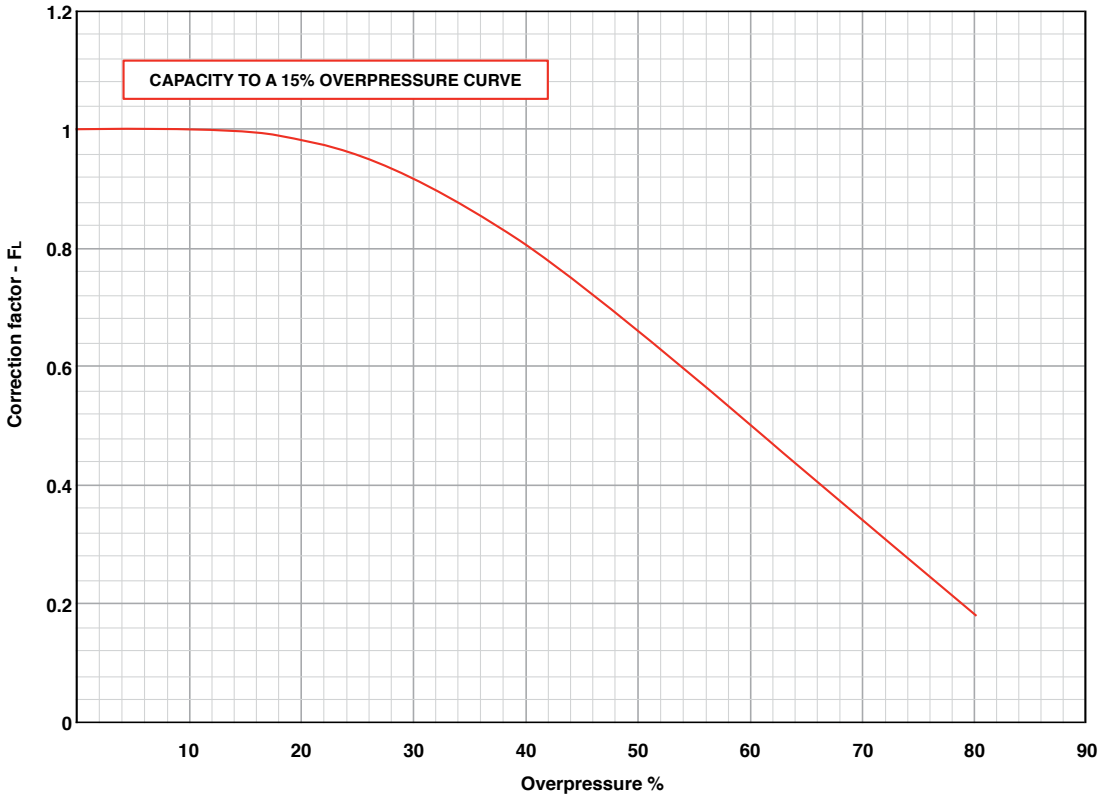
WALWORTH CAST STEEL SAFETY AND RELIEF VALVE

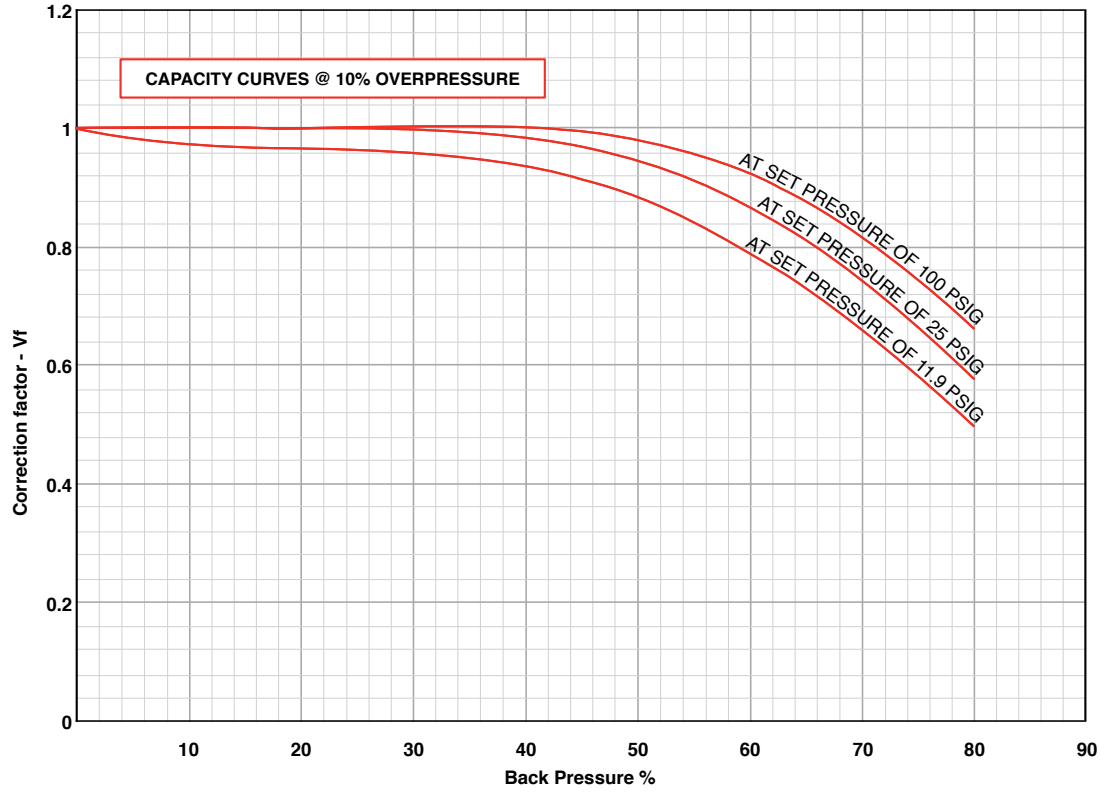
Compressibility factor $\sqrt{Z}$



WALWORTH CAST STEEL SAFETY AND RELIEF VALVE

Correction factors Fl y Vf





WALWORTH CAST STEEL SAFETY AND RELIEF VALVE

Special materials for corrosive services

Component	Inside Parts (except Spring) S2	Complete Valve (except Spring) S3	Complete Valve S4
Body or base	ASME SA-216 GRADE WCC	ASME SA-351 GRADE CF8M	ASME SA-351 GRADE CF8M
Nozzle	ASME SA-276 TYPE 316/SA-351 GR. CF8M	ASME SA-276 TYPE 316/SA-351 GR. CF8M	ASME SA-276 TYPE 316/SA-351 GR. CF8M
Disc	ASME SA-276 TYPE 316/SA-351 GR. CF8M	ASME SA-276 TYPE 316/SA-351 GR. CF8M	ASME SA-276 TYPE 316/SA-351 GR. CF8M
Disc retainer	UNS 07750 (INCONEL X750)	UNS 07750 (INCONEL X750)	UNS 07750 (INCONEL X750)
Adjusting ring	ASME SA-276 TYPE 316/SA-351 GR. CF8M	ASME SA-276 TYPE 316/SA-351 GR. CF8M	ASME SA-276 TYPE 316/SA-351 GR. CF8M
Adjusting ring bolt	ASME SA-276 TYPE 316	ASME SA-276 TYPE 316	ASME SA-276 TYPE 316
Disc holder	ASME SA-276 TYPE 316/SA-351 GR. CF8M	ASME SA-276 TYPE 316/SA-351 GR. CF8M	ASME SA-276 TYPE 316/SA-351 GR. CF8M
Guide	ASME SA-276 TYPE 316/SA-351 GR. CF8M	ASME SA-276 TYPE 316/SA-351 GR. CF8M	ASME SA-276 TYPE 316/SA-351 GR. CF8M
Spindle head	ASME SA-276 TYPE 316/TYPE 410(-30)	ASME SA-276 TYPE 316	ASME SA-276 TYPE 316
Spindle head retainer	UNS 07750 (INCONEL X750)	UNS 07750 (INCONEL X750)	UNS 07750 (INCONEL X750)
Bonnet	ASME SA-216 GRADO WCC	ASME SA-351 GRADE CF8M	ASME SA-351 GRADE CF8M
Bolt	ASME SA-193 GRADE B7	ASME SA-193 GRADE B8M	ASME SA-193 GRADE B8M
Bolt nut	ASME SA-194 GRADE 2H	ASME SA-194 GRADE 8M	ASME SA-194 GRADE 8M
Spring	ALLOY STEEL	ALLOY STEEL	ASME SA-276 TYPE 316(+)
Spring washer	UNS G10100	UNS G10100	ASME SA-276 TYPE 316
Adjusting screw	ASME SA-276 TYPE 316/TYPE 410 (-30)	ASME SA-276 TYPE 316	ASME SA-276 TYPE 316
Adjusting screw nut	ASME SA-276 TYPE 316/TYPE 410 (-30)	ASME SA-276 TYPE 316	ASME SA-276 TYPE 316
Eductor tube	ASME SA-269 TYPE 304	ASME SA-276 TYPE 316	ASME SA-276 TYPE 316
Cap	UNS G10180/ASME SA-216 GRADE WCC	ASME SA-276 TYPE 316/SA-351 GR. CF8M	ASME SA-276 TYPE 316/SA-351 GR. CF8M
Bonnet gasket	MONEL/UNS G10100 (-30)	MONEL	MONEL
Guide gasket	MONEL	MONEL	MONEL
Cap gasket	MONEL	MONEL	MONEL
Adjusting screw pin gasket	MONEL	MONEL	MONEL
Bellows gasket *	MONEL	UNS N066	MONEL
Bellows *	INCONEL 625 LFA	INCONEL 625 LFA	INCONEL 625 LCF A
Spindle	ASME SA-276 TYPE 316	ASME SA-276 TYPE 316	ASME SA-276 TYPE 316
Spindle head bolt	ASME SA-276 TYPE 316	ASME SA-276 TYPE 316	ASME SA-276 TYPE 316
Bolthead ring	ASME SA-276 TYPE 316	ASME SA-276 TYPE 316	ASME SA-276 TYPE 316
Jam nut	ASME SA-276 TYPE 316	ASME SA-276 TYPE 316	ASME SA-276 TYPE 316
Plug	COMMERCIAL	COMMERCIAL	COMMERCIAL
Limit washer**	ASME SA-276 TYPE 316	ASME SA-276 TYPE 316	ASME SA-276 TYPE 316

*Only Bellows Valves. ** Limit washer is only used in the “D“ and “E“ orifices.
For further information on spring materials call WALWORTH sales agents.

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE

Special materials for low temperature

Component	Inside Parts -21°F to -75°F L1	Complete Valve -76°F to -150°F L2	Complete Valve -151°F to -450°F L3
Body or base	ASME SA-351 GRADE CF8M	ASME SA-351 GRADE CF8M	ASME SA-351 GRADE CF8M
Nozzle	ASME SA-276 TYPE 316/SA-351 GR. CF8M	ASME SA-276 TYPE 316/SA-351 GR. CF8M	ASME SA-276 TYPE 316/SA-351 GR. CF8M
Disc	ASME SA-276 TYPE 316/SA-351 GR. CF8M	ASME SA-276 TYPE 316/SA-351 GR. CF8M	ASME SA-276 TYPE 316/SA-351 GR. CF8M
Disc retainer	UNS 07750 (INCONEL X750)	UNS 07750 (INCONEL X750)	UNS 07750 (INCONEL X750)
Adjusting ring	ASME SA-276 TYPE 316/SA-351 GR. CF8M	ASME SA-276 TYPE 316/SA-351 GR. CF8M	ASME SA-276 TYPE 316/SA-351 GR. CF8M
Adjusting ring pin	ASME SA-276 TYPE 316	ASME SA-276 TYPE 316	ASME SA-276 TYPE 316
Disc holder	ASME SA-276 TYPE 316/SA-351 GR. CF8M	ASME SA-276 TYPE 316/SA-351 GR. CF8M	ASME SA-276 TYPE 316/SA-351 GR. CF8M
Guide	ASME SA-276 TYPE 316/SA-351 GR. CF8M	ASME SA-276 TYPE 316/SA-351 GR. CF8M	ASME SA-276 TYPE 316/SA-351 GR. CF8M
Spindle head	ASME SA-276 TYPE 410	ASME SA-276 TYPE 316	ASME SA-276 TYPE 316
Spindle head retainer	UNS 07750 (INCONEL X750)	UNS 07750 (INCONEL X750)	UNS 07750 (INCONEL X750)
Bonnet	ASME SA-216 GRADE WCC	ASME SA-351 GR. CF8M	ASME SA-351 GR. CF8M
Bolt	ASME SA-193 GRADE B8M	ASME SA-193 GRADE B8M	ASME SA-193 GRADE B8M
Bolt nut	ASME SA-194 GRADE 8M	ASME SA-194 GRADE 8M	ASME SA-194 GRADE 8M
Spring	ALLOY STEEL	ASME SA-276 TYPE 316	ASME SA-276 TYPE 316
Spring washer	ASME SA-276 TYPE 316	ASME SA-276 TYPE 316	ASME SA-276 TYPE 316
Adjusting screw	ASME SA-276 TYPE 410	ASME SA-276 TYPE 316	ASME SA-276 TYPE 316
Adjusting screw nut	ASME SA-276 TYPE 410	ASME SA-276 TYPE 316	ASME SA-276 TYPE 316
Eductor tube	ASME SA-369 TYPE 304	ASME SA-369 TYPE 304	ASME SA-369 TYPE 304
Cap	UNS G10180/ASME SA-216 GRADE WC	ASME SA-276 TYPE 316/SA-351 GR. CF8M	ASME SA-276 TYPE 316/SA-351 GR. CF8M
Bonnet gasket	MONEL	MONEL	MONEL
Guide gasket	MONEL	MONEL	MONEL
Cap gasket	MONEL	MONEL	MONEL
Adjusting screw pin gasket	MONEL	MONEL	MONEL
Bellows gasket *	MONEL	MONEL	MONEL
Bellows *	UNS N06626 (INCONEL 625LCF)	INCONEL	ASME SA-276 TYPE 316
Spindle	ASME SA-276 TYPE 410	ASME SA-276 TYPE 316	ASME SA-276 TYPE 316
Spindle head bolt	ASME SA-276 TYPE 410	ASME SA-276 TYPE 316	ASME SA-276 TYPE 316
Bolthead ring	ASME SA-276 TYPE 316	ASME SA-276 TYPE 316	ASME SA-276 TYPE 316
Jam nut	ASME SA-276 TYPE 316	UNS G10180	UNS G10180
Plug	COMMERCIAL	COMMERCIAL	COMMERCIAL
Limit washer**	ASME SA-276 TYPE 316	ASME SA-276 TYPE 316	ASME SA-276 TYPE 316

*Only Bellows Valves. ** Limit washer is only used in the “D“ and “E“ orifices.
For further information on spring materials call WALWORTH sales agents.

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE

1S Series Valves Orifice Capacities for Air (USCS Units) ASME B & PVC, SECTION VIII DIV. 1

Capacities based on Ste Pressure plus 10% overpressure or 3 psig, whichever is greater.
Capacities in Standard feetof air per minute @ 60°F

Orifice Desgination	D	E	F	G	H	J	K	L	M	N	P	Q	R	T
Orifice Diameter	0.4035	0.5387	0.6740	0.8630	1.0780	1.3800	1.6500	2.0550	2.3086	2.5350	3.0730	4.0450	4.8670	6.2050
Orifice Area	0.1279	0.2279	0.3568	0.5849	0.9127	1.4957	2.1382	3.3168	4.1859	5.0471	7.4168	12.8507	18.6043	30.2394
Set Pressure	Discharge Capacity SCFM													
15	67	120	188	308	480	787	1125	1746	2203	2656	3903	6763	9791	15915
20	78	138	216	355	554	908	1297	2012	2540	3062	4500	7797	11288	18348
30	98	175	274	449	701	1148	1642	2546	3214	3875	5694	9866	14283	23215
40	121	215	337	553	862	1413	2020	3134	3955	4768	7007	12141	17576	28569
50	143	256	400	656	1024	1678	2399	3721	4696	5662	8320	14416	20870	33922
60	166	296	463	760	1185	1943	2777	4308	5437	6555	9633	16691	24164	39276
70	189	336	527	863	1347	2207	3156	4895	6178	7449	10946	18966	27458	44630
80	211	377	590	967	1509	2472	3534	5482	6919	8343	12259	21241	30751	49983
90	234	417	653	1070	1670	2737	3913	6070	7660	9236	13572	23516	34045	55337
100	257	457	716	1174	1832	3002	4291	6657	8401	10130	14885	25791	37339	60690
120	302	538	842	1381	2155	3531	5049	7831	9883	11917	17512	30342	43926	71398
140	347	619	969	1588	2478	4061	5806	9006	11365	13704	20138	34892	50514	82105
160	392	700	1095	1795	2801	4591	6563	10180	12848	15491	22764	39442	57101	92812
180	438	780	1221	2002	3124	5120	7320	11354	14330	17278	25390	43992	63688	103519
200	483	861	1348	2210	3448	5650	8077	12529	15812	19065	28016	48542	70276	114227
220	528	942	1474	2417	3771	6180	8834	13703	17294	20852	30642	53093	76863	124934
240	574	1022	1600	2624	4094	6709	9591	14878	18776	22639	33268	57643	83451	135641
260	619	1103	1727	2831	4417	7239	10348	16052	20258	24426	35895	62193	90038	146348
280	664	1184	1853	3038	4740	7768	11105	17226	21740	26214	38521	66743	96626	157055
300	709	1264	1979	3245	5063	8298	11863	18401	23223	28001	41147	71293	103213	167763
320	755	1345	2106	3452	5387	8828	12620	19575	24705	29788	43773	75844	-	-
340	800	1426	2232	3659	5710	9357	13377	20750	26187	31575	46399	80394	-	-
360	845	1507	2358	3866	6033	9887	14134	21924	27669	33362	49025	84944	-	-
380	891	1587	2485	4074	6356	10416	14891	23098	29151	35149	51651	89494	-	-
400	936	1668	2611	4281	6679	10946	15648	24273	30633	36936	54278	94044	-	-
420	981	1749	2737	4488	7003	11476	16405	25447	32115	38723	56904	98595	-	-
440	1026	1829	2864	4695	7326	12005	17162	26622	33598	40510	59530	103145	-	-
460	1072	1910	2990	4902	7649	12535	17920	27796	35080	42297	62156	107695	-	-
480	1117	1991	3116	5109	7972	13064	18677	28970	36562	44085	64782	112245	-	-
500	1162	2071	3243	5316	8295	13594	19434	30145	38044	45872	67408	116795	-	-
600	1389	2475	3874	6352	9911	16242	23219	36017	45455	54807	80539	139546	-	-
700	1615	2879	4506	7387	11527	18890	27005	41889	52865	63743	93670	162297	-	-
800	1841	3282	5138	8423	13143	21538	30790	47761	60276	72678	106800	185048	-	-
900	2068	3686	5769	9459	14759	24186	34576	53633	67687	81614	119931	207799	-	-
1000	2294	4089	6401	10494	16374	26834	38362	59505	75098	90549	133062	230550	-	-
1100	2521	4493	7033	11530	17990	29482	42147	65377	82508	-	-	-	-	-
1200	2747	4896	7664	12565	19606	32130	45933	71249	-	-	-	-	-	-
1300	2973	5300	8296	13601	21222	34778	49718	77121	-	-	-	-	-	-
1400	3200	5703	8928	14637	22838	37426	53504	82993	-	-	-	-	-	-
1500	3426	6107	9559	15672	24454	40074	57289	88865	-	-	-	-	-	-
2000	4558	8124	12718	20850	32533	53314	76217	-	-	-	-	-	-	-

NOTE: 1 Relieving capacities indicated are 90% of average capacity in accordance with the latest ASME Code requirements. For temperatures other than 60° F and specific gravities other than air use formula sizing method. SIZING: Refer to the sizing section for formulas for both ASME and API sizing. Valves may be sized for either ASME or API applications.

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE

1S Series Valves Orifice Capacities for Steam (USCS Units) ASME B & PVC, SECTION VIII DIV. 1

Capacities based on Ste Pressure plus 10% overpressure or 3 psig, whichever is greater.
Capacities in pounds per hour of saturated steam

Orifice Desgination	D	E	F	G	H	J	K	L	M	N	P	Q	R	T
Orifice Diameter	0.4035	0.5387	0.6740	0.8630	1.0780	1.3800	1.6500	2.0550	2.3086	2.5350	3.0730	4.0450	4.8670	6.2050
Orifice Area	0.1279	0.2279	0.3568	0.5849	0.9127	1.4957	2.1382	3.3168	4.1859	5.0471	7.4168	12.8507	18.6043	30.2394
Set Pressure	Discharge Capacity pph													
15	189	337	528	865	1350	2212	3162	4904	6189	7463	10966	19001	27508	44712
20	218	389	608	997	1556	2550	3645	5654	7136	8604	12643	21906	31714	51549
30	276	492	770	1262	1969	3226	4612	7154	9028	10886	15997	27717	40127	65222
40	339	605	947	1553	2423	3970	5675	8803	11110	13396	19686	34109	49380	80263
50	403	718	1124	1844	2876	4714	6739	10453	13192	15907	23375	40501	58634	95303
60	467	832	1302	2134	3330	5458	7802	12103	15274	18417	27064	46892	67887	110344
70	530	945	1479	2425	3784	6202	8866	13753	17356	20927	30753	53284	77141	125385
80	594	1058	1657	2716	4238	6946	9930	15402	19438	23438	34442	59676	86394	140425
90	657	1172	1834	3007	4692	7690	10993	17052	21520	25948	38131	66068	95648	155466
100	721	1285	2012	3298	5146	8434	12057	18702	23602	28459	41820	72459	104901	170507
120	848	1512	2367	3880	6054	9922	14184	22001	27766	33479	49198	85243	123408	200588
140	975	1739	2722	4462	6962	11409	16311	25301	31930	38500	56576	98027	141915	230670
160	1103	1965	3077	5044	7870	12897	18438	28600	36094	43521	63954	110810	160422	260751
180	1230	2192	3431	5626	8778	14385	20565	31899	40258	48542	71332	123594	178929	290832
200	1357	2419	3786	6208	9686	15873	22692	35199	44422	53562	78710	136377	197436	320914
220	1484	2646	4141	6790	10594	17361	24819	38498	48586	58583	86088	149161	215944	350995
240	1611	2872	4496	7371	11502	18849	26946	41798	52750	63604	93466	161944	234451	381076
260	1739	3099	4851	7953	12410	20337	29073	45097	56914	68625	100844	174728	252958	411158
280	1866	3326	5206	8535	13318	21825	31200	48397	61078	73646	108222	187511	271465	441239
300	1993	3552	5561	9117	14226	23313	33327	51696	65242	78666	115600	200295	289972	471321
320	2120	3779	5916	9699	15134	24801	35454	54995	69406	83687	122978	213078	-	-
340	2247	4006	6271	10281	16041	26288	37581	58295	73570	88708	130356	225862	-	-
360	2375	4233	6626	10863	16949	27776	39709	61594	77734	93729	137734	238646	-	-
380	2502	4459	6981	11445	17857	29264	41836	64894	81898	98749	145112	251429	-	-
400	2629	4686	7336	12026	18765	30752	43963	68193	86063	103770	152490	264213	-	-
420	2756	4913	7691	12608	19673	32240	46090	71492	90227	108791	159868	276996	-	-
440	2883	5140	8045	13190	20581	33728	48217	74792	94391	113812	167246	289780	-	-
460	3011	5366	8400	13772	21489	35216	50344	78091	98555	118832	174624	302563	-	-
480	3138	5593	8755	14354	22397	36704	52471	81391	102719	123853	182002	315347	-	-
500	3265	5820	9110	14936	23305	38192	54598	84690	106883	128874	189380	328130	-	-
600	3901	6953	10885	17845	27845	45631	65233	101187	127703	153978	226270	392048	-	-
700	4537	8087	12659	20755	32384	53071	75869	117684	148523	179082	263160	455966	-	-
800	5173	9221	14434	23664	36924	60510	86504	134182	169343	204186	300050	519884	-	-
900	5809	10354	16209	26574	41463	67949	97140	150679	190163	229289	336940	583801	-	-
1000	6445	11488	17983	29483	46003	75389	107775	167176	210983	254393	373831	647719	-	-
1100	7081	12622	19758	32392	50543	82828	118410	183673	231803	-	-	-	-	-
1200	7717	13755	21533	35302	55082	90268	129046	200170	-	-	-	-	-	-
1300	8353	14889	23307	38211	59622	97707	139681	216667	-	-	-	-	-	-
1400	8989	16023	25082	41121	64162	105147	150316	233164	-	-	-	-	-	-
1500	9625	17156	26856	44030	68701	112586	160952	249661	-	-	-	-	-	-
2000	12805	22824	35729	58577	91400	149784	214128	-	-	-	-	-	-	-

NOTE 1: Relieving capacities indicated are 90% of average capacity in accordance with the latest ASME Code requirements. Maximum permissible set pressure on steam is 2903 psig. 3000 psig capacities are included for interpolation purposes only SIZING: Refer to the sizing section for formulas for both ASME and API sizing. Valves may be sized for either ASME or API applications.

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE

1S Series Valves Orifice Capacities for Water (USCS Units) ASME B & PVC, SECTION VIII DIV. 1

Capacities based on Ste Pressure plus 10% overpressure or 3 psig, wichever is greater, zero psig back pressure. Capacities in gallons of water per minute @ 70°F, 90% or avarage capacity.

Orifice Desgination	D	E	F	G	H	J	K	L	M	N	P	Q	R	T
Orifice Diameter	0.4035	0.5387	0.6740	0.8630	1.0780	1.3800	1.6500	2.0550	2.3086	2.5350	3.0730	4.0450	4.8670	6.2050
Orifice Area	0.1279	0.2279	0.3568	0.5849	0.9127	1.4957	2.1382	3.3168	4.1859	5.0471	7.4168	12.8507	18.6043	30.2394
Set Pressure	Discharge Capacity GPM													
15	13	24	38	63	98	161	230	357	451	544	799	1385	2006	3258
20	15	27	43	71	111	182	260	404	510	614	904	1566	2267	3683
30	18	33	52	85	133	218	312	484	611	737	1083	1876	2716	4411
40	21	38	60	68	153	252	360	559	705	851	1250	2166	3136	5094
50	24	42	67	110	172	282	403	625	789	951	1398	2422	3506	5695
60	26	47	73	120	188	308	441	685	864	1042	1531	2653	3841	6239
70	28	50	79	130	203	333	476	739	933	1125	1654	2866	4149	6739
80	30	54	85	139	217	356	509	791	998	1203	1768	3064	4435	7204
90	32	57	90	147	230	378	540	839	1058	1276	1876	3250	4704	7641
100	34	60	95	155	243	398	570	884	1116	1345	1977	3426	4959	8054
120	37	66	104	170	266	436	624	968	1222	1474	2166	3753	5432	8823
140	40	71	112	184	287	471	674	1046	1320	1592	2339	4053	5867	9530
160	43	76	120	17	307	504	721	1118	1411	1702	2501	4333	6273	10188
180	45	81	127	209	326	535	764	1186	1497	1805	2653	4596	6653	10806
200	48	85	134	220	344	564	806	1250	1578	1903	2796	4845	7013	11391
220	50	90	141	231	360	591	845	1311	1655	1995	2933	5081	7355	11947
240	52	94	147	241	377	617	883	1370	1729	2084	3063	5307	7682	12478
260	54	97	153	251	392	643	919	1426	1799	2169	3188	5524	7996	12988
280	57	101	159	260	407	667	953	1479	1867	2251	3309	5733	8298	13478
300	59	105	164	270	421	690	987	1531	1933	2330	3425	5934	8589	13951
320	61	108	170	278	435	713	1019	1582	1996	2407	3537	1628	-	-
340	62	112	175	287	448	735	1051	1630	2058	2481	3646	6317	-	-
360	64	115	180	295	461	756	1081	1678	2117	2553	3752	6500	-	-
380	66	118	185	304	474	777	1111	1724	2175	2623	3855	6678	-	-
400	68	121	190	311	486	797	1140	1768	2232	2691	3955	6852	-	-
420	69	124	194	319	498	817	1168	1812	2287	2757	4052	7012	-	-
440	71	127	199	327	510	836	1195	1855	2341	2822	4148	7186	-	-
460	73	130	204	334	521	855	12222	1896	2393	2886	4241	7348	-	-
480	74	133	208	341	533	873	1248	1937	2445	2948	4332	7506	-	-
500	76	135	212	348	544	891	1274	1977	2495	3009	4422	7661	-	-
600	83	148	233	382	596	977	1396	2166	2733	3296	4844	8392	-	-
700	90	160	251	412	643	1055	1508	2339	2952	3560	5232	9064	-	-
800	96	171	269	441	688	1128	1612	2501	3156	3806	5593	9690	-	-
900	102	182	285	467	730	1196	1710	2653	3348	4037	5932	10278	-	-
1000	107	192	300	493	769	1291	1802	2796	3529	4255	6253	10834	-	-
1100	113	201	315	517	807	1322	180	2933	3701	-	-	-	-	-
1200	118	210	329	540	842	1381	1974	3063	-	-	-	-	-	-
1300	122	219	343	562	877	1438	2055	3188	-	-	-	-	-	-
1400	127	227	355	583	910	1492	2132	3309	-	-	-	-	-	-
1500	132	235	368	603	942	1544	2207	3425	-	-	-	-	-	-
2000	152	271	425	697	1088	1783	2549	-	-	-	-	-	-	-

NOTE 1: Relieving capacities indicated are 90% of average capacity in accordance with the latest ASME Code requirements.
SIZING: Refer to the sizing section for formulas for both ASME and API sizing. Valves may be sized for either ASME or API applications.

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE ACCESSORIES

Lift Gear

The purpose of the Lift Gear is to open the valve when the pressure system is less than the valve's set pressure. The basic types are: Plain Lever and Packed Lifting Gear. The lever can be used in the following cases:

1. For maintenance and the prevention of the disc from getting stuck as result of corrosion and sulfur deposits. We recommend that the operation pressure must be above 75% of the set pressure to avoid damage in the seal areas.
2. To remove strange particles beneath the seat, a periodic cleaning with the normal fluid pressure at the seat of the valve will help to prevent any damage to the seat of the valve and will help to preserve its lifetime
3. To purge the system to the atmosphere or to a discharge pipe.

Plain Lever

This ensemble is used where no hermetic seat is needed and where service conditions require opening the valve periodically. This ensemble shall not be used with pollutant or hazardous fluids or when the system has a back pressure.

Packed Lever

This ensemble is covered, which means there will be no leaks on the bonnet-lever joint when the valve is open or when the system has back pressure. This lever is used when the fluids are pollutant or hazardous.

WALWORTH CAST STEEL SAFETY AND RELIEF VALVE ACCESSORIES

Flanged Shell

WALWORTH valves are provided with a standard threaded cap and are also available with a flanged shell.

The valves are used for high pressure settings, and are compatible with the Packed Lifting Gear if the process requires an engineer's adjustment.

GAG

The purpose of the gag is to keep the valve shut when subjected to a pressure higher than the set pressure. The gag can be manually installed in the valve. The gag may not be installed during valve operation.

STEAM TEST LABORATORY

Testing equipment

WALWORTH's steel safety and relief valves are tested following ASME Sec. VIII Div. 1 code, which regulates the construction of the boiler and pressure vessel.

WALWORTH, we are entrusted our Clients' equipment and facilities and the security of their personnel. For this reason, we have implemented a steam test laboratory in which we test the performance of our valves.

DESIGN BASIS

All of **WALWORTH's** Valve Designs, when applicable, follow one or more of the following standards.

API — **American Petroleum Institute:**

- **520** Sizing, Selection and Installation of pressure-relieving devices in Refineries part I & II.
- **521** Pressure-relieving and Depressuring systems terminology.
- **526** Face to face dimensions for Safety and Relief valves.
- **527** Seat tightness of pressure relief valves.

ASME/ANSI — **American National Standard Institute:**

- **B2.1** Pipe threads.
- **B16.5** Steel pipe flanges and flanged fittings.
- **B16.34** Valves—Flanged, Threaded, and Welding End.

ASTM — **American Society for Testing and Materials:**

- **A-193** Alloy steel bolting material for high temperature service.
- **A-194** Carbon and alloy steel nuts for high pressure and high temperature service.
- **A-216** Standard specification for steel castings, carbon, suitable for fusion welding and for high temperature service.

ASME — **American Society of Mechanical Engineers:**

- **Section II** Part A, B and C.
- **Section VIII** Boiler and Pressure Vessel code for Unfired Pressure Vessels, divisions 1 and 2.

HOW TO ORDER

WALWORTH valves are designated by figure number system which describe their main characteristics. The valve identification system shown herein is intended to help our Customers choose the valve that suits their specific requirements and avoid mistakes when ordering.

Figure	TYPE OF VALVE	ORIFICE	SPRING MATERIAL	TRIM	SUPPLEMENTARY REQUIREMENTS
1S11= Class 150x150	-= Conventional type	D= 0.110 in²	C= CARBON STEEL	S1= Standard arrangement	XDA= Soft seat valve
1S21= Class 300x150	-30= Bellows type	E= 0.196 in²	T= TUNGSTEN STEEL	S2= Stainless steel 316 internal parts	XSG= Valve according to NACE MR-01-75
1S31= Class 300x150	/P3= Open Bonnet type	F= 0.307 in²		S3= Complete Valve in Stainless steel 316 (except spring)	Pal Pla= Valves supplied with plain lever
1S61= Class 600x150		G= 0.503 in²		S4= Complete Valve Stainless steel 316	Pal Emp= Valves supplied with packed lever
		H= 0.785 in²		L1= Low temperatures (-21°F to -75°F)	Gag= Valves supplied with gag
		J= 1.287 in²		L2= Low temperatures (-76°F to -150°F)	
		K= 1.838 in²		L3= Low temperatures (-151°F to -450°F)	
		L= 2.853 in²			
		M= 3.60 in²			
		N= 4.34 in²			
		P= 6.38 in²			
		Q= 11.05 in²			
		R= 16.0 in²			
		T= 26.0 in²			

The correct selection of a safety and relief valve must be aware of the inherent information of the service for which will be allocated. Below is a form with the minimum requirements for proper selection. The customer must provide the general information and the service conditions..

General info.	Example
Quantity of required valves	1
Model (1S, 1S-30, 1SXDA, 1S/P3, 1S50, 1S20)	1S
Cap type (threaded, flanged)	Threaded
Lever (not, flat, packed)	FLat
Gag (yes, no)	No
Other	-
Service conditions	
Fluid (liquid, gas or steam)	Steam
Required capacity (lb/hr, gal/min, SCFM)	53500 lb/hr
Molecular weight or S.G. to discharge Temp.	18
Viscosity at relief temp.	-
Operating pressure / Set pressure psig	150/165
Operating Temperature / Discharge temperature °F	370/380°F
Constant backpressure psig	0
Variable backpressure psig	
Selection	
Calculated area in²	6.20 in²
Selected orifice / area in²	P/7.417 in²
Selected figure / class	1S11/150x150
Size (inlet / outlet)	4x6

THE WALWORTH COMPANY GENERAL TERMS AND CONDITIONS

ACCEPTANCE: All quotations are for acceptance within 30 days from date of quotation unless extended in writing. In the event a purchase order is placed after this period of time. The WALWORTH Company reserves the right to requote base prices of all valves offered. All orders and contracts are subject to credit approval and acceptance by the WALWORTH Company.

FREIGHT: When prices are FOB point of shipment –no freight allowance, we will attempt to route shipments in the method which will result in the lowest cost unless otherwise instructed. All shipments will be freight charges collect except when stipulated on the purchase order, in which case you will be invoiced for all transportation charges. Delivery of material to a common carrier shall be considered to be delivery to Buyer and shall be at Buyer's risk thereafter. Claims of loss of or damage to material in transit shall be filed by the Buyer directly with the carrier.

PRICES: There will be added to all prices quoted sales, use, occupation or any other excise or similar tax which Seller may be required to pay or collect on or in connection with the sale. Seller shall be established by Federal, State or other government regulation with respect to the product(s) covered by the order which shall be lower than the price(s) specified in the order.

ESCALATION TERMS: Prices shown in this price schedule reflect the costs in effect at the time of publication. These prices will remain firm on all products with a quoted delivery of twenty–six (26) weeks or less. On products which have a scheduled delivery of more than twenty-six (26) weeks, the goods will be invoiced based on the applicable price sheet in effect at the time of shipment. In no event will the invoiced price be less than the price originally quoted.

PURCHASED COMPONENTS: (i.e. motors, gearing, etc.) Prices are quoted on supplier price in effect at time of quotation. Actual invoice Price will be adjusted in accordance with the supplier's escalation policy.

DEFERRED SHIPMENTS: If for any reason the customer desires to delay shipments more than 30 days after manufacturing is complete or to place a hold or stop to the order during the manufacturing cycle, The WALWORTH Company reserves the right to consider the order cancelled and to invoke cancellation charges per the schedule bellow.

CANCELLATION: After order acceptance by WALWORTH, items or completed orders may be cancelled and buyer will be charged for work performed, based on the following schedule:

- Five (5%) percent of prices of stock items.
- Ten (10%) percent of price of stock items ordered in quantities which exceed normal inventory levels.
- Five (5%) percent of prices prior to drawing submittal on made-to-order items.
- 15% after drawing approval, but prior to the start of castings.
- 30% to 50% during casting cycle, depending on the state of completion.
- 55% to 75% during machining and assembly operations, depending on the state of completion.
-100% after final assembly and test.

REMITTANCES: Remittances must be made to the address indicated on the invoice.

CREDIT TERMS: As quoted. Invoices on balances overdure will be subject to a service charge of 11/2 % per month on such indebtedness.

DELIVERIES: Shipments and deliveries shall at all times be subject to the approval of Seller's Credit Department. If the Buyer shall fail to make any payments according to the terms of the contract, Seller may, in addition to and not in limitation of its other rights and remedies, at its option, cancel all or any part of Buyer's incomplete contracts with Seller or may defer shipments of deliveries under Buyer's contracts with Seller except upon receipt of satisfactory security or for cash shipment.
All schedule of shipments are estimated as closely as possible and Seller will use its best efforts to ship within the time scheduled, but does not guarantee to do so. Schedules commence with the date Seller receives authorization to proceed with order, subject to the provisions of the next sentence. The order will not be released for manufacture until complete specifications and approved drawings (if drawing approval is required) are received at the plant of manufacture and the estimated schedule of shipment will commence with the date of such receipt.

Seller shall not be liable for any direct, indirect or consequential damage or loss caused by any delay in delivery, regardless of the cause of delay.
Without limiting the generality of the foregoing, Seller assumes no responsibility for delays in delivery resulting from fire, flood, accidents, riots, strikes, transportation delays, labor or material shortages, existing or future laws, acts of any governmental authority, or any other cause beyond Seller's control. Items offered from stock are subject to prior sale.

INSPECTION: Final inspection and acceptance of products must be made at the plant of manufacture, unless otherwise provided in the order and/ or in agreed upon specifications. Prices do not include charges for special tests or inspections performed at the request of the Buyer, unless called for in the order and/or in agreed upon specifications.

RETURNS: Permission in writing and return tagging instructions must be obtained from Seller before any goods returned for credit or adjustment will be acceptance. Where returned goods are accepted, a minimum charge of 25% of the invoice price will be made, plus freight from both directions and costs of reconditioning the material for resale as new.

WARRANTY CERTIFICATE: WALWORTH, exhibits this product Warranty, for a 12 month period in operation or 18 months in storage, whatever comes firs as of the date of product delivery.

WALWORTH, guarantees that products are fabricated according to quality, design and manufacturing standards and customer requirements as well. When the buyer expressly and in written confirms the non-compliance of such standards, WALWORTH is forced to comply with the repair, replacement or to issue the written authorization for the buyer or another agent, to replace or repair at no cost for the buyer, at WALWORTH fabrication costs, those parts confirmed as defective.

This warranty is valid when the material selection by the customer for the design, material arrangement (TRIM, bodies, ends, operation devices, etc.) internal and/ or external overlays had been the proper ones for the operation fluid.
This warranty is applicable if operation and service conditions are maintained as per the requirements of the product.

To validate the Warranty, the user is responsible of performing the proper maintenance according to what is stated in the Operation and Maintenance Manual applicable to the product. WALWORTH, reserves the right to request the records (evidence) to confirm the correct maintenance.

WALWORTH obligations are limited and will be released of any responsibility when the products are altered, repaired or replaced without WALWORTH' s written authorization.

Except of what is stated in this document WALWORTH waives and excludes any other warranty expressed or implied, for loss, direct damage, indirect damage or consequential of other products, processes, installations or equipment of the buyer or end user, either partial or total, due to material defects and/or work and/or WALWORTH product design.

DESIGN, ETC: Seller reserves the right to change design, materials or specifications without notice. There will be a charge for modifying an order after it has been entered when such change or modification results in additional engineering or clerical work for either The WALWORTH Company or our suppliers.

MINIMUM CHARGE: Orders totaling less than $100.00 USD net will be billed at a minimum charge of $100.00 USD. Repair parts will be billed at a minimum charge of $50.00 USD.

NOTE: We reserve the right to correct obvious clerical errors in quotations, invoices, and other contracts.

WALWORTH®

Since 1842

www.walworth.com

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