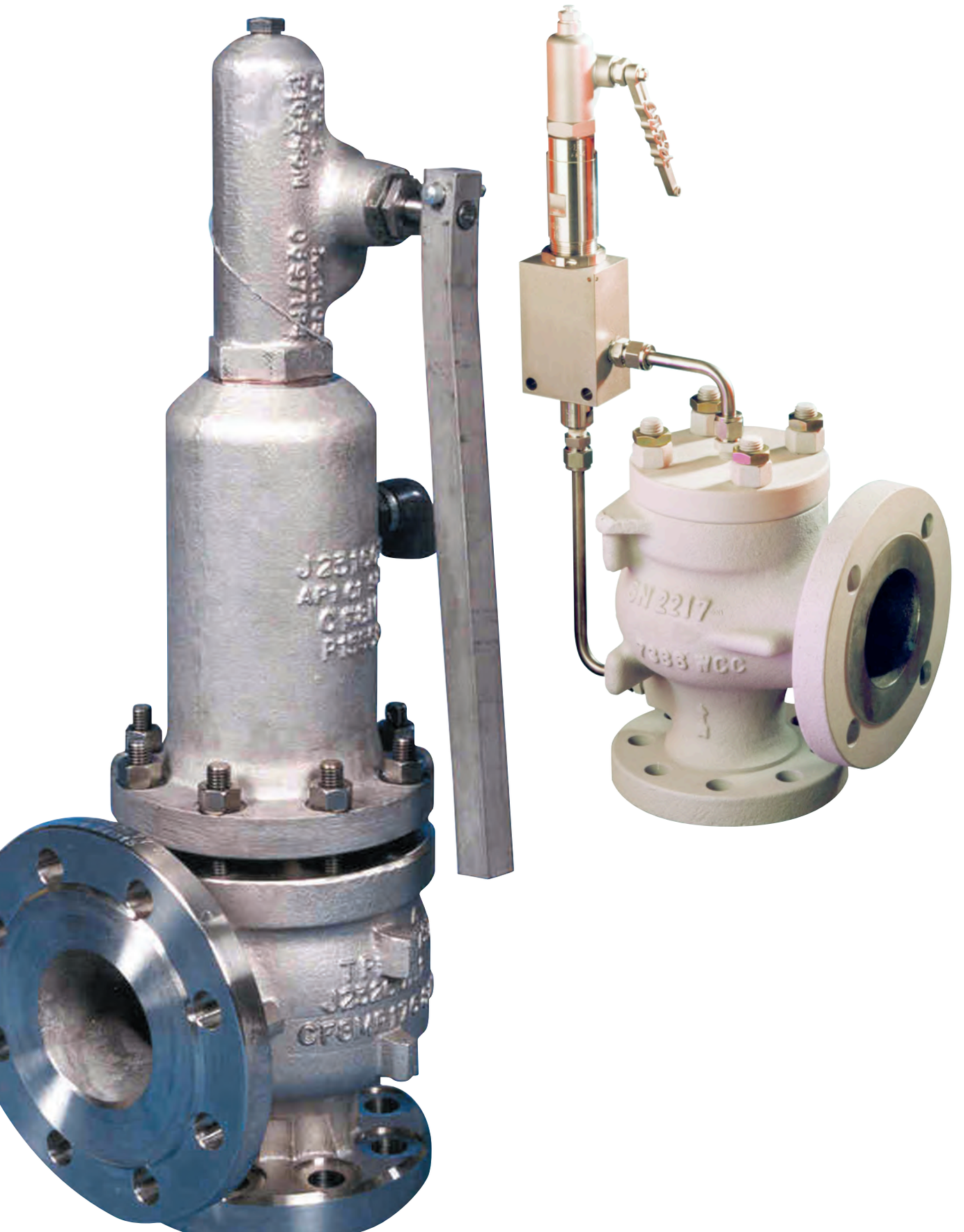
SARASIN-RSBD

Pressure Safety Valves & Safety Devices

Technical Information

Excellent
Engineering
Solutions



Quality assurance (division)

Weir operates quality programmes to cover the full scope of their activities. Comprehensive quality systems have been developed to serve the power, oil and gas and industrial markets which they serve.

The company holds approvals to or complies with:

- ASME Section III 'N', 'NPT', 'NV'
- ASME Section I 'V'
- ASME Section VIII 'UV'
- EN ISO 9001: 2008
- EN ISO 14001: 2004
- OHSAS 18001: 2007
- API Q1 TO API LICENCES API 6D (6D-0182) AND API 6A (6A-0445)
- API STD 520
- API STD 526
- API STD 527
- API STD 2000
- ISO 4126

6A-0445
6D-0182

The Quality systems have been approved for the supply of products to meet the requirements of the Pressure Equipment Directive (PED) and compliance modules A, D1, H, B&D have been applied in categories I through IV respectively.

The company is committed to compliance with legislation and has an established environment and health and safety policy.

An ongoing commitment to customer care is met through the process of continuous improvement and the further development of our systems and processes towards meeting ISO 9001:2008.

Valve Testing Facilities

All pressure containing items are hydrostatically tested, seat leakage tested and functionally tested. In addition, gas, packing emission, cryogenic and advanced functional testing can be arranged.

Material testing facilities

- Non-destructive examination by radiography, ultrasonics, magnetic particle and liquid penetrant.
- Chemical analysis by computer controlled direct reading emission spectrometer.
- Mechanical testing for tensile properties at ambient and elevated temperatures, bend and hardness testing. Charpy testing at ambient, elevated and sub-zero temperatures.

Further technical information can be obtained from our Web site: http://www.weirpowerindustrial.com

Sarasin-RSBD

Weir manufactures the Sarasin-RSBD range of pressure safety valves and safety devices for oil and gas, petrochemical and chemical industries, pipelines, thermal and nuclear power plants, sugar refineries and pulp mills.

The Sarasin-RSBD range of products is manufactured in accordance with ASME, API and ISO standards and therefore can meet most of worldwide customers requirements. The company holds approvals or complies with:

EN ISO 9001:2008 - EN ISO 14001:2004
OHSAS 18001:2007
PED 97/23/EC Module B+D Category IV
ATEX 94/9/EC
ASME Section I 'V' - ASME Section VIII 'UV'
API STD 520 - API STD 526 - API STD 527
API STD 2000
ISO 4126
SELO (China)
RTN (Russia)

Specifically, Weir can design and manufacture special valves to meet special customer requirements.

CONTENTS

Spring Loaded Pressure Relief Valves

Body in carbon steel, stainless steel, alloy and exotic materials; with bellows, lever and other accessories, to ensure suitability for all service conditions.

Starflow S5 (steam only)
ASME Section VIII Div. 1
(UV Stamp)
API Std 526
Full Nozzle - Enlarged guide
Inlet size : 1" to 12"
Rating : 150# to 2500#
Temp : up to 540°C

Starflow P3/P4/P5
ASME Section VIII Div. 1
(UV Stamp)
API Std 526
Full Nozzle
Inlet size : 1" to 12"
Rating : 150# to 2500#
Temp : -196°C up to +540°C

63 Series
ISO 4126
Semi-nozzle
Inlet size : ¾" to 10"
Rating : 150# to 300#
Temp : -196°C up to +330°C

9 Series
ASME Section VIII Div. 1
Portable PRV - Full nozzle
Screwed/Flanged/Welded
Size : ½" to 1 ½"
Rating : 150# to 2500#
Temp : -196°C up to +400°C

Starvalve
Changeover Valves
Low pressure drop COV
Standard COV
Combined valve with linkage system
Sizes : ½" - 10"
Pressure : up to 100 barg
Temp : -196 °C up to +427 °C
Mat : CS - SS

Pilot Operated Pressure Relief Valves

The Sarasin-RSBD pilot-operated pressure relief valve is an autonomous valve. It does not need any auxiliary source of power to operate. The advanced technology of Sarasin-RSBD valves has been adopted by the nuclear industry, French and U.S. Navies and by the Oil & Gas industries. It is complementary to the range of spring-loaded pressure relief valves and covers a wide field of applications including severe conditions.

76 Series
Full nozzle
API spring loaded PRV dimensions

78 Series
Semi nozzle
API POPRV dimensions

86 Series
Hot service - Full nozzle
API spring loaded PRV dimensions
Set pressure : up to 180 barg
Temp : up to 550°C

Advantages of the Sarasin-RSBD Pilot-operated pressure relief valve

- leak-free pilot
- on-off opening, fully open or closed (limited maintenance)
- perfect tightness (no production loss)
- perfect operation, even with capacities smaller than those rated for all types of fluids
- excellent repeatability and reliability
- adjustable blowdown (pop action)
- no pressure/flow limit
- with additional equipment (solenoid valve), the pressure relief valve can be used as a discharge valve.

To meet the most varied requirements, Sarasin-RSBD selects the appropriate pilot detector for the pressure relief valve required (semi or full nozzle, with bellows, piston etc.)

71 Series
Portable - Full nozzle

Gas - Liquid
Modulating action

Gas
Pop action

High temperature steam - Gas
Pop action

Codes, Standards, Directives, Regulations

AFNOR: Association Française de Normalisation (French Association for Standardisation)

AISI: American Iron and Steel Institute

ANSI: American National Standards Institute

API: American Petroleum Institute

- API Standard 520 - Sizing, selection and installation of pressure-relieving devices in refineries
  Part I - Sizing and selection
  Part II - Installation
- API Standard 521 – Guide for pressure-relieving and depressuring Systems
- API Standard 526 - Flanged Steel Pressure Relief Valves
- API Standard 527 - Testing and acceptance for set pressure and seat tightness of pressure relief valves
- API Recommended Practice 576 - Inspection of pressure relieving devices
- API Standard 2000 - Venting atmospheric and low-Pressure Storage Tanks

AS: Australian Standards

ASME: American Society of Mechanical Engineers

- Boiler and Pressure Vessel Code: compilation of rules and guidance covering numerous types of construction
  - Section I – Power Boilers
  - Section II – Materials
    - SA 216 - Carbon-steel castings suitable for fusion welding for high-temperature service
    - SA 217 - Martensitic stainless steel and alloy steel castings for pressure-containing parts suitable for high-temperature service
    - SA 351 - Austenitic steel castings for pressure containing parts
    - SA 494 - Nickel and nickel alloy castings
  - Section III – Nuclear
  - Section IV – Heating Boilers
  - Section VII – Care of Power Boilers
  - Section VIII – Rules for construction of pressure Vessels
  - Section IX – Welding and Brazing Qualification
  - Section XII – Transportation Tanks
- ASME Standards
  - B16.25 - Butt welding Ends
  - B16.34 – Valves – Flanged, threaded and welding ends
  - B16.36 - Orifice Flanges
  - B16.5 – Pipe flanges and flanged fittings
  - B31.1 – Power piping
  - B31.3 – Process piping
  - B31.4 – Pipeline transportation systems for liquid hydrocarbons and other liquids
  - B31.8 - Gas transmission and distribution Systems
  - PTC 25 - Pressure Relief Devices

ASTM: American Society for testings and materials

BSi: British Standard Institution

CEN: Comité Européen de Normalisation (European Committee for Standardization)

- EN 764 – Pressure Equipment
  - Part 1: Terminology - Pressure, temperature, volume, nominal size
  - Part 2: Quantities, symbols and units
  - Part 3: Definition of parties involved
  - Part 4: Establishment of technical delivery conditions for metallic materials
  - Part 5: Compliance and Inspection Documentation of Materials
  - Part 6: Structure and content of operating instructions
  - Part-7: Pressure systems for unfired pressure vessel
- EN 1092 - Flanges and their joints - Circular flanges for pipes, valves, fittings and accessories, PN designated
  - Part 1: Steel flanges
  - Part 3: Copper alloy flanges
  - Part 4: Aluminium alloy flanges
- EN 1759 - Flanges and their joint - Circular flanges for pipes, valves, fittings and accessories, Class designated
  - Part 1: Steel flanges, NPS 1/2 to 24
  - Part 3: Copper alloy flanges
  - Part 4: Aluminium alloy flanges
- EN 10204 - Metallic products - Types of inspection documents
- EN 12516 - Industrial valves - Shell design strength
- EN 13445 - Unfired Pressure Vessel
  - Part 1: General
  - Part 2: Materials
  - Part 3: Design
  - Part 4: Fabrication
  - Part 5: Inspection and testing
- EN 13648 - Cryogenic vessels - Safety devices for protection against excessive pressure
  - Part 1: Safety valves for cryogenic service
  - Part 2: Bursting disc safety devices for cryogenic service
  - Part 3: Determination of required discharge - Capacity and sizing

DIN: Deutsches Institutes für Normung (German Institute for Standardization)

EUROPEAN DIRECTIVE

- PED 97/23/EC: Pressure Equipment Directive
- SPVD 87/404/EC: Simple Pressure Vessels Directive
- TPED 99/36/EC: Transportable Pressure Equipment Directive
- ATEX 94/9/EC: Directive which provides the technical requirements to be applied to equipment intended for use in potentially explosive atmospheres. The Directive is named after the French “ATmosphère EXplosible”
- 80/181/EEC: Units of measurements

ISO: International Organization for Standardization

- ISO 4126: Safety devices for protection against excessive pressure
  - Part 1 - Safety valves
  - Part 2 - Bursting disc safety devices
  - Part 3 - Safety valves and bursting disc safety devices in combination
  - Part 4 - Pilot-operated safety valves
  - Part 5 - Controlled safety pressure relief systems (CSPRS)
  - Part 6 - Application, selection and installation of bursting disc safety devices
  - Part 7 - Common data
- ISO 15156 / NACE MR0175 - Petroleum and natural gas industries—Materials for use in H2S-containing environments in oil and gas production: This new standard is the result of a six-year effort by NACE, EFC and ISO/TC 67/WG 7. The standard is based, in the main, upon NACE MR0175 and the European Federation of Corrosion Reports 16 and 17. The new standard provides methods for the qualification and selection of metals resistant to cracking in sour oil and gas production.
- ISO 23251 (CEN/TC 12) - Petroleum, petrochemical and natural gas industries - Pressure-relieving and depressuring systems

JIS: Japanese Industral Standards

- JIS B 8210 – Steam boilers and pressure vessels – Spring loaded safety valve
- JIS B 8225 – Safety valves – measuring methods for coefficient of discharge

KSA: Korean Standard Association

- KS B 6216 – Spring loaded safety valves for steam boilers and pressure vessels

MSS: Manufacturers Standardization Society (of the valves and fittings industry)

- SP-25: Standard marking systems for valves, Fittings, Flanges and Unions (not applicable to pressure safety valves – please refer to ASME B&PVC, Section VIII, UG129)
- SP-44 - Steel Pipeline Flanges
- SP-55 - Quality Standard for Steel Castings for Valves, Flanges, Fittings, and Other Piping Components - Visual Method for Evaluation of Surface Irregularities
- SP-61 - Pressure Testing of Steel Valves (not applicable to pressure safety valves – please refer to API STD 527)

NACE International: National Association of Corrosion Engineers

- MR0175 / ISO 15156 (please read above ISO 15156)
- MR0103 - Materials Resistant to Sulphide Stress Cracking in Corrosive Petroleum Refining Environments

NB: National Board (of Boiler and Pressure Vessel Inspectors)

GOST:

- RTN – Use licence from RosTechNadzor organism
- Gost R conformity certificate – from RostechRegulirovanie
- Gost R explosionproof cert
- Gost R metrology certificate

FORMER

A.D. Merkblatt A2 – German PSV Requirements Standards for Unfired Pressure Vessel

BS 6759 – English PSV Requirements Standards

DIN 2501 – Flanges, Connecting and Dimensions

FD E 29-421: General requirements of installation for PSV and RD

NF E 29-203 – Steel Flanges and collars – Terminology – Specifications

NF E 29-005 – Pressure and temperatures ratios of steel components

NF E 29-410 / 411 / 412 / 413 / 414: French PSV requirements standards

TRD 421 / 721: German SV Requirements Standards for Steam Boilers

Nomenclature

Symbol	Designation	Unit	
		USCS	SI
A	Calculated orifice area required to prevent the pressurised equipment from exceeding its MAWP.	in^2	cm^2
C	Gas constant (table 2), using ratio of specific heats 'k'		
G	Specific gravity of a liquid (or a gas) at a flowing temperature referred to water (or air) at standard conditions.		
k	Specific heat ratio $k = C_P/C_V$. If unknown use k = 1.001		
K	Flow coefficient $K = K_D \times 0.9$		
K_D	Effective coefficient of discharge relating the actual versus the theoretical PSV flow rate. Exception: for API STD 520 sizing on steam, gas or vapor, K_D has a fixed value (0.975).		
K_B	Capacity correction factor due to back pressure		
K_C	Dimensionless capacity factor when a rupture disc is combined with a PSV. When a rupture disc does not have a published K_C, then a K_C value of 0.9 shall be used provided than the flow area is equal to or greater than the inlet of the PSV.		
K_N	Napier factor – correction factor for the Napier steam flow equation Value 1 if $P_1 \leq 1515$ psia (104.45 bara) Equation $(0.1906 \times P_1 - 1000) / (0.2292 \times P_1 - 1061)$ when 1515 psia < $P_1 \leq 3215$ psia (221.67 bara)		
K_P	Correction factor due to overpressure for uncertified valve on liquid. For 10% overpressure, $K_P = 0.6$		
K_{SC}	Supercritical steam correction factor		
K_{SH}	Superheat steam correction factor (table3)		
K_U	Correction factor used to adjust for the type of units used in the sizing equation		
K_V	Viscosity correction factor as determined from Figure 4 or from the following equation: $[0.9935 + (2.878/R^{0.5}) + (342.75/R^{1.5})]^{-1}$		
K_W	Correction factor due to back pressure (table 3). If the BP is atmospheric, use a value for K_W of 1.0.		
M	Molecular weight of the gas or vapour at inlet relieving conditions.		
MAWP	Maximum Allowable Working Pressure		
P	Set pressure	psig	barg
P_1	Gas: Relieving pressure, absolute P_1 = P + overpressure + atmospheric pressure Liquid: Relieving pressure, relative P_1 = P + overpressure	psia psig	bara barg
P_2	Gas: Back pressure Liquid: Back pressure	psia psig	bara barg
Q	Required flow rate through the device (for liquid)	US gpm	m^3/hr
T	Relieving temperature of the inlet gas or vapour	°R=°F+460	K=°C+273
V	Required flow rate through the device scfm at 14.7 psia and 60°F Nm^3/hr at 1.013 bara and 15.5°C	scfm	Nm^3/hr
W	Required flow rate through the device (for gas)	lb/hr	kg/hr
Z	Compressibility factor – if unknown, use Z = 1		

Sizing formulas

	USCS Units		SI Units	
	ASME Section VIII div.1 ISO 4126	**API STD 520**	**ASME Section VIII div.1 ISO 4126**	**API STD 520**
Vapors or Gases (Mass Flow Rate Sizing)	$A = \frac{W\,(T\,Z)^{0.5}}{C\,K\,P_1\,K_B\,M^{0.5}}$	$A = \frac{W\,(TZ)^{0.5}}{C\,K_D\,P_1\,K_B\,M^{0.5}}$	$A = \frac{K_U\,W\,(T\,Z)^{0.5}}{C\,K\,P_1\,K_B\,M^{0.5}}$ $K_U = 1.3164$	$A = \frac{K_U\,W\,(T\,Z)^{0.5}}{C\,K_D\,P_1\,K_B\,M^{0.5}}$ $K_U = 1.3164$
Vapors or Gases (Volumetric Flow Rate Sizing)	$A = \frac{V\,(T\,Z\,M)^{0.5}}{C\,K\,P_1\,K_B\,K_U}$ $K_U = 6.32$ $A = \frac{V\,(T\,Z\,G)^{0.5}}{K_U\,C\,K\,P_1\,K_B}$ $K_U = 1.175$	$A = \frac{V\,(T\,Z\,M)^{0.5}}{C\,K_D\,P_1\,K_B\,K_U}$ $K_U = 6.32$ $A = \frac{V\,(TZG)^{0.5}}{K_U\,C\,K_D\,P_1\,K_B}$ $K_U = 1.175$	$A = \frac{V\,(T\,Z\,M)^{0.5}}{C\,K\,P_1\,K_B\,K_U}$ $K_U = 17.024$ $A = \frac{V\,(T\,Z\,G)^{0.5}}{C\,K\,P_1\,K_B\,K_U}$ $K_U = 3.159$	$A = \frac{V\,(T\,Z\,M)^{0.5}}{C\,K_D\,P_1\,K_B\,K_U}$ $K_U = 17.024$ $A = \frac{V\,(T\,Z\,G)^{0.5}}{C\,K_D\,P_1\,K_B\,K_U}$ $K_U = 3.159$
Steam (1)	$A = \frac{W}{K_U\,K\,P_1\,K_B\,K_{SH}\,K_N}$ $K_U = 51.5$	$A = \frac{W}{K_U\,K_D\,P_1\,K_B\,K_{SH}\,K_N}$ $K_U = 51.5$	$A = \frac{W}{K_U\,K\,P_1\,K_B\,K_{SH}\,K_N}$ $K_U = 52.5$	$A = \frac{W}{K_U\,K_D\,P_1\,K_B\,K_{SH}\,K_N}$ $K_U = 52.5$
Liquids Certified Volumetric Flow Rate Sizing	$A = \frac{Q\,G^{0.5}}{K\,K_U\,K_V\,K_W\,(P_1-P_2)^{0.5}}$ $K_U = 38$	$A = \frac{Q\,G^{0.5}}{K_D\,K_U\,K_V\,K_W\,(P_1-P_2)^{0.5}}$ $K_U = 38$	$A = \frac{Q\,G^{0.5}}{K\,K_U\,K_V\,K_W\,(P_1-P_2)^{0.5}}$ $K_U = 5.092$	$A = \frac{Q\,G^{0.5}}{K_D\,K_U\,K_V\,K_W\,(P_1-P_2)^{0.5}}$ $K_U = 5.092$
Liquids Non certified Volumetric Flow Rate Sizing		$A = \frac{Q\,G^{0.5}}{K_D\,K_P\,K_U\,K_V\,K_W\,(P_1-P_2)^{0.5}}$ $K_U = 38$ $K_P = 1$ for P1=1.25P $K_P = 0.6$ for P1=1.1P		$A = \frac{Q\,G^{0.5}}{K_D\,K_P\,K_U\,K_V\,K_W\,(P_1-P_2)^{0.5}}$ $K_U = 5.092$ $K_P = 1$ for P1=1.25P $K_P = 0.6$ for P1=1.1P
Air	$A = \frac{V\,T^{0.5}}{K_U\,K\,P_1\,K_B}$ $K_U = 418$	$A = \frac{V\,T^{0.5}}{K_U\,K_D\,P_1\,K_B}$ $K_U = 418$	$A = \frac{V\,T^{0.5}}{K_U\,K\,P_1\,K_B}$ $K_U = 1125$	$A = \frac{V\,T^{0.5}}{K_U\,K_D\,P_1\,K_B}$ $K_U = 1125$

(1) : not applicable to ISO 4126

K and K_D Factors

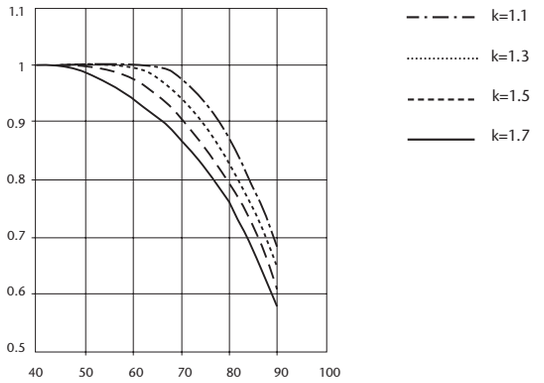
	K		K_D	
PSV series	**Gas, Vapor, Steam**	**Liquid**	**Gas, Vapor, Steam**	**Liquid**
P (Starflow)	0.876	0.631	0.975	0.701
9	0.823	0.632	0.975	0.702
76	0.848		0.975	0.65
78	0.878	0.857	0.975	0.952
86	0.848		0.975	
V (Starsteam)	0.878			

Set pressures and overpressure limits for pressure safety valves

The below table is compliant with ASME B&PV Code Section VIII Division 1 and API STD 520.

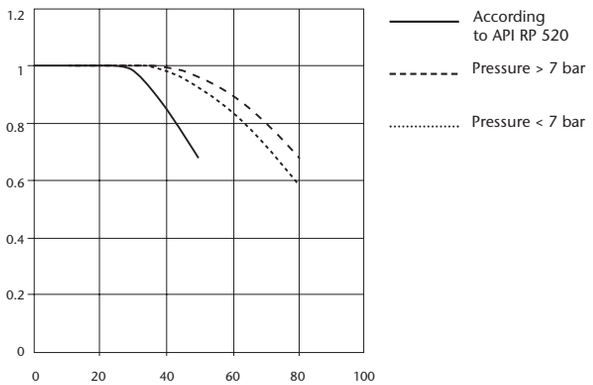
	Single Valve		Multiple Valves	
	Maximum Set Pressure (%)	Maximum Overpressure (%)	Maximum Set Pressure (%)	Maximum Overpressure (%)
Blocked discharge				
1st valve	100	110	100	116
Additional valve			105	116
Fire case				
1st valve	100	121	100	121
Additional valve			105	121
Supplem. valve			110	121

Fig. 1 - K_B: Back pressure correction factor (constant back pressure, conventional valve without bellows) gas + steam



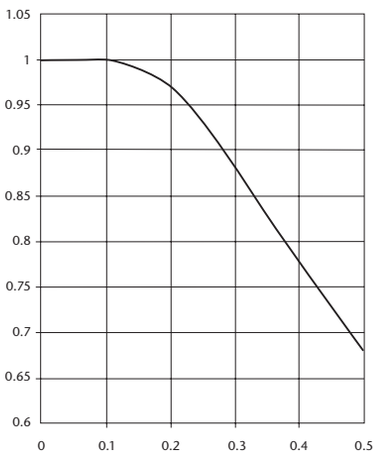
$$\text{Absolute back pressure ratio} = \frac{\text{Absolute back pressure}}{\text{Absolute relieving pressure}}$$

Fig. 2 - K_B: Back pressure correction factor (balanced bellows valve only) gas + steam at 10% overpressure



$$\text{Absolute back pressure ratio} = \frac{\text{Gauge back pressure}}{\text{Gauge relieving pressure}}$$

Fig. 3 - K_W: Back pressure correction factor (variable back pressure, balanced bellows valve on liquid service only)



$$\text{Gauge back pressure ratio} = \frac{\text{Gauge back pressure}}{\text{Set pressure}}$$

Back pressure correction factor, compressible fluids

Constant back pressure

When a pressure relief valve is discharging against a constant superimposed back pressure, its flow rate may be affected by the back pressure only if the flow is sub-critical, i.e. when the ratio of the back pressure (absolute) to the relieving pressure (absolute) is above the critical point which is very close to 0.55.

Therefore K_B, back pressure correction factor, may be found as follows :

a) Calculate absolute back pressure ratio :

$$= \frac{\text{Absolute back pressure}}{\text{Set pressure + overpressure + atmospheric pressure}}$$

b) If ratio is less than or equal to 0.55, use $K_B = 1$

c) If ratio is over 0.55, enter Fig. 1 to find in relation with the appropriate $k = C_p/C_v$ value

Variable back pressure

Where the back pressure is variable but does not exceed 10% of the set pressure, a conventional pressure relief valve may be used, provided the corresponding set pressure variation is acceptable.

If the variable back pressure exceeds 10% of the set pressure, a balanced bellows valve should be used. The pressure relief valve flow rate may be affected by the back pressure. Therefore, K_B, back pressure correction factor, may be found as follows :

a) Calculate gauge back pressure ratio :

$$\frac{\text{Maximum back pressure}}{\text{Set pressure}}$$

b) Enter Fig. 2 to find K_B in relation with the appropriate overpressure value.

Back pressure correction factor, incompressible fluids

Balanced bellows relief valves discharging incompressible fluids against a variable back pressure have their capacity affected by back pressure. Back pressure correction factor for bellows valves on incompressible fluid service may be found as follows:

a) Calculate gauge back pressure ratio :

$$\frac{\text{Maximum back pressure}}{\text{Set pressure}}$$

b) Enter Fig. 3 to find K_W

Viscosity Correction Factor

When sizing a relief valve for a viscous liquid service, it is required to first size as if the liquid is non viscous. K_V value is then considered as 1.0. The result is named preliminary required discharge area, A_{R1}.

From API STD 526, the next larger orifice, A_S, has then to be selected. It is used to determine the Reynold's number, R, from one of the following equation:

USCS Units	
$R = \frac{2{,}800\ Q\ G}{CP\ \sqrt{A_S}}$	$R = \frac{12{,}700\ Q}{U\ \sqrt{A_S}}$
SI Units	
$R = \frac{31{,}321\ Q\ G}{\mu\ \sqrt{A_S}}$	$R = \frac{142{,}028\ Q}{U\ \sqrt{A_S}}$

*** Note = not recommended when viscosity less than 100 SSU.**

Where

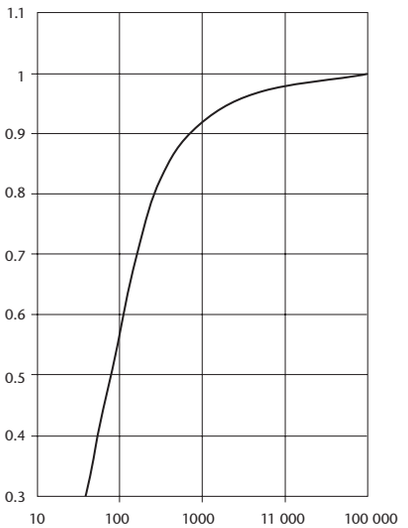
A_{R1} : preliminary required discharge area (USCS in^2 - SI cm^2)
A_S : selected discharge area (USCS in^2 - SI cm^2)
U : viscosity at the flowing temperature, in Seybolt Universal Seconds (SSU)
μ : absolute viscosity at the flowing temperature, in centipoise

When R is determined, it is required to obtain the K_V value from Figure 4. or from the following equation :

$$K_V = [\ 0.9935 + (2.878 / R^{0.5}) + (342.75 / R^{1.5})\ ]^{-1}$$

Then A_{R1} must be corrected using the K_V value, in order to determine A_{R2}. If the corrected area, A_{R2}, exceed the selected orifice A_S, then the above method must be repeated using the next larger orifice available in API STD 526.

Fig. 4 - K_V: Viscosity correction factor



R : REYNOLDS number

Remarks on sizing formulas

Critical flow on compressible fluids and steam

The sizing formula for compressible fluid is based on critical flow conditions, i.e. when sonic velocity is reached at the valve throat. These conditions are reached when the upstream pressure, absolute, exceeds twice the downstream pressure, absolute.

When these conditions are not attained (i.e. when the set pressure is less than 1 bar, or when the back pressure is high), a back pressure correction factor K_B should be considered. This coefficient reduces the flow rate of the valve for a given relieving pressure.

Flow with back pressure = flow without back pressure x K_B

Superheated steam

The steam sizing formula is based on saturated steam conditions. When the steam is in superheated conditions, a capacity correction factor for steam expansion K_{SH}, should be considered. This coefficient reduces the flow rate of the valve for a given relieving pressure.

Wet steam

Although some standards such as ISO 4126 allow an increase of the mass-flow rate for a given valve at given relieving conditions for wet steam relief, provided the steam quality is in excess of 90%, there is no such allowance in the ASME Code or API standard. Care should therefore be taken to use this allowance only when permitted by the applicable Codes and Standards.

Table 1 : Molecular weights, ratio of specific heat (C_p/C_v), gas constant "C"

Gas	Molecular weights	C_p/C_v	C	C/356
Acetylene	26	1.28	345	0.969
Hydrochloric acid	36.5	1.40	356	1.000
Air	29	1.40	356	1.000
Ammonia	17	1.33	351	0.986
Argon	40	1.66	377	1.059
Nitrogen	28	1.40	356	1.000
Benzene	78	1.10	327	0.919
Chloride	71	1.36	352	0.989
Cyclohexane	84	1.08	324	0.910
Carbon disulphide	76	1.21	338	0.949
Carbon dioxide	44	1.28	345	0.969
Sulphur dioxide	64	1.26	342	0.961
Ethane	30	1.22	339	0.952
Ethylene	28	1.20	337	0.947
Natural gas	19	1.27	345	0.969
Helium	4	1.66	377	1.059
Hexane	86	1.08	324	0.910
Hydrogen	2	1.40	356	1.000
Hydrogen sulphide	34	1.32	348	0.978
Iso-Butane	58	1.11	328	0.921
Methane	16	1.30	346	0.972
Methyl alcohol	32	1.20	337	0.947
Methyl chloride	50.5	1.20	337	0.947
Carbon monoxide	28	1.40	356	1.000
N-Butane	58	1.11	328	0.921
Oxygen	32	1.40	356	1.000
Pentane	72	1.09	325	0.913
Propane	44	1.14	331	0.930
Water vapour/Steam	18	1.30	347	0.975

Table 2 : Gas constants ''C'' and first flow number ''N_c'' versus $k=C_p/C_v$

k	C	N_c	k	C	N_c
1.00	315	0.607	1.52	366	0.704
1.02	318	0.611	1.54	368	0.707
1.04	320	0.615	1.56	369	0.710
1.06	322	0.620	1.58	371	0.713
1.08	324	0.624	1.60	372	0.716
1.10	327	0.628	1.62	374	0.719
1.12	329	0.632	1.64	376	0.722
1.14	331	0.637	1.66	377	0.725
1.16	333	0.641	1.68	379	0.728
1.18	335	0.645	1.70	380	0.731
1.20	337	0.648	1.72	382	0.734
1.22	339	0.652	1.74	383	0.736
1.24	341	0.656	1.76	384	0.739
1.26	343	0.660	1.78	386	0.742
1.28	345	0.637	1.80	387	0.744
1.30	347	0.667	1.82	388	0.747
1.32	349	0.671	1.84	390	0.750
1.34	351	0.674	1.86	391	0.752
1.36	352	0.678	1.88	392	0.755
1.38	354	0.681	1.90	394	0.758
1.40	356	0.685	1.92	395	0.760
1.42	358	0.688	1.94	397	0.762
1.44	359	0.691	1.96	398	0.765
1.46	361	0.695	1.98	399	0.767
1.48	363	0.698	2.00	400	0.770
1.50	364	0.701	2.02	401	0.772
			2.20	412	0.793

Table 3 : K_{SH} Superheat correction factor

	Steam temperature in ˚C																	
Bara	**205.0**	**225.0**	**250.0**	**275.0**	**300.0**	**325.0**	**350.0**	**375.0**	**400.0**	**425.0**	**450.0**	**475.0**	**500.0**	**525.0**	**550.0**	**575.0**	**600.0**	**625.0**
5.0	0.991	0.968	0.942	0.919	0.896	0.876	0.857	0.839	0.823	0.807	0.792	0.778	0.765	0.752	0.740	0.728	0.717	0.706
7.5	0.995	0.972	0.946	0.922	0.899	0.878	0.859	0.841	0.824	0.808	0.793	0.779	0.766	0.753	0.740	0.729	0.717	0.707
10.0	0.985	0.973	0.950	0.925	0.902	0.880	0.861	0.843	0.825	0.809	0.794	0.780	0.766	0.753	0.741	0.729	0.718	0.707
12.5	0.981	0.976	0.954	0.928	0.905	0.883	0.863	0.844	0.827	0.810	0.795	0.781	0.767	0.754	0.741	0.729	0.718	0.707
15.0	-	-	0.957	0.932	0.907	0.885	0.865	0.846	0.828	0.812	0.796	0.782	0.768	0.755	0.742	0.730	0.718	0.708
17.5	-	-	0.959	0.935	0.910	0.887	0.866	0.847	0.829	0.813	0.797	0.782	0.769	0.756	0.743	0.731	0.719	0.708
20.0	-	-	0.960	0.939	0.913	0.889	0.868	0.849	0.831	0.814	0.798	0.784	0.769	0.756	0.744	0.731	0.720	0.708
22.5	-	-	0.963	0.943	0.916	0.892	0.870	0.850	0.832	0.815	0.799	0.785	0.770	0.757	0.744	0.732	0.720	0.709
25.0	-	-	-	0.946	0.919	0.894	0.872	0.852	0.834	0.816	0.800	0.785	0.771	0.757	0.744	0.732	0.720	0.710
27.5	-	-	-	0.948	0.922	0.897	0.874	0.854	0.835	0.817	0.801	0.786	0.772	0.758	0.745	0.733	0.721	0.710
30.0	-	-	-	0.949	0.925	0.899	0.876	0.855	0.837	0.819	0.802	0.787	0.772	0.759	0.746	0.733	0.722	0.710
32.5	-	-	-	0.951	0.929	0.902	0.879	0.857	0.838	0.820	0.803	0.788	0.773	0.759	0.746	0.734	0.722	0.711
35.0	-	-	-	0.953	0.933	0.905	0.881	0.859	0.840	0.822	0.804	0.789	0.774	0.760	0.747	0.734	0.722	0.711
37.5	-	-	-	0.956	0.936	0.908	0.883	0.861	0.841	0.823	0.806	0.790	0.775	0.761	0.748	0.735	0.723	0.711
40.0	-	-	-	0.959	0.940	0.910	0.885	0.863	0.842	0.824	0.807	0.791	0.776	0.762	0.748	0.735	0.723	0.712
42.5	-	-	-	0.961	0.943	0.913	0.887	0.864	0.844	0.825	0.808	0.792	0.776	0.762	0.749	0.736	0.724	0.713
45.0	-	-	-	-	0.944	0.917	0.890	0.866	0.845	0.826	0.809	0.793	0.777	0.763	0.749	0.737	0.725	0.713
47.5	-	-	-	-	0.946	0.919	0.892	0.868	0.847	0.828	0.810	0.793	0.778	0.764	0.750	0.737	0.725	0.713
50.0	-	-	-	-	0.947	0.922	0.894	0.870	0.848	0.829	0.811	0.794	0.779	0.765	0.751	0.738	0.725	0.714
52.5	-	-	-	-	0.949	0.926	0.897	0.872	0.850	0.830	0.812	0.795	0.780	0.765	0.752	0.738	0.726	0.714
55.0	-	-	-	-	0.952	0.930	0.899	0.874	0.851	0.831	0.813	0.797	0.780	0.766	0.752	0.739	0.727	0.714
57.5	-	-	-	-	0.954	0.933	0.902	0.876	0.853	0.833	0.815	0.798	0.782	0.767	0.753	0.739	0.727	0.715
60.0	-	-	-	-	0.957	0.937	0.904	0.878	0.855	0.834	0.816	0.798	0.783	0.768	0.753	0.740	0.727	0.716
62.5	-	-	-	-	0.960	0.940	0.907	0.880	0.856	0.836	0.817	0.799	0.783	0.768	0.754	0.740	0.728	0.716
65.0	-	-	-	-	0.964	0.944	0.910	0.882	0.859	0.837	0.818	0.801	0.784	0.769	0.754	0.741	0.729	0.716
67.5	-	-	-	-	0.966	0.946	0.913	0.885	0.860	0.839	0.819	0.802	0.785	0.769	0.755	0.742	0.729	0.717
70.0	-	-	-	-	-	0.947	0.916	0.887	0.862	0.840	0.820	0.802	0.786	0.770	0.756	0.742	0.729	0.717
72.5	-	-	-	-	-	0.949	0.919	0.889	0.863	0.842	0.822	0.803	0.788	0.771	0.756	0.743	0.730	0.717
75.0	-	-	-	-	-	0.951	0.922	0.891	0.865	0.843	0.823	0.805	0.788	0.772	0.757	0.744	0.730	0.718
77.5	-	-	-	-	-	0.953	0.925	0.893	0.867	0.844	0.824	0.806	0.788	0.772	0.758	0.744	0.731	0.719
80.0	-	-	-	-	-	0.955	0.928	0.896	0.869	0.846	0.825	0.806	0.789	0.773	0.758	0.744	0.732	0.719
82.5	-	-	-	-	-	0.957	0.932	0.898	0.871	0.847	0.827	0.807	0.790	0.774	0.759	0.745	0.732	0.719
85.0	-	-	-	-	-	0.960	0.935	0.901	0.873	0.849	0.828	0.809	0.791	0.775	0.760	0.746	0.732	0.720
87.5	-	-	-	-	-	0.963	0.939	0.903	0.875	0.850	0.829	0.810	0.792	0.776	0.760	0.746	0.733	0.721
90.0	-	-	-	-	-	0.966	0.943	0.906	0.877	0.852	0.830	0.811	0.793	0.776	0.761	0.747	0.734	0.721
92.5	-	-	-	-	-	0.970	0.947	0.909	0.879	0.853	0.832	0.812	0.794	0.777	0.762	0.747	0.734	0.721
95.0	-	-	-	-	-	0.973	0.950	0.911	0.881	0.855	0.833	0.813	0.795	0.778	0.763	0.748	0.734	0.722
97.5	-	-	-	-	-	0.977	0.954	0.914	0.883	0.857	0.834	0.814	0.796	0.779	0.763	0.749	0.735	0.722
100.0	-	-	-	-	-	0.981	0.957	0.917	0.885	0.859	0.836	0.815	0.797	0.780	0.764	0.749	0.735	0.722
102.5	-	-	-	-	-	0.984	0.959	0.920	0.887	0.860	0.837	0.816	0.798	0.780	0.764	0.750	0.736	0.723
105.0	-	-	-	-	-	-	0.961	0.923	0.889	0.862	0.838	0.817	0.799	0.781	0.765	0.750	0.737	0.723
107.5	-	-	-	-	-	-	0.962	0.925	0.891	0.863	0.839	0.818	0.799	0.782	0.766	0.751	0.737	0.724
110.0	-	-	-	-	-	-	0.963	0.928	0.893	0.865	0.840	0.819	0.800	0.782	0.766	0.751	0.737	0.724
112.5	-	-	-	-	-	-	0.964	0.930	0.893	0.865	0.840	0.819	0.799	0.781	0.765	0.750	0.736	0.723
115.0	-	-	-	-	-	-	0.964	0.931	0.894	0.865	0.840	0.818	0.798	0.780	0.764	0.749	0.735	0.722
117.5	-	-	-	-	-	-	0.965	0.932	0.894	0.865	0.839	0.817	0.797	0.780	0.763	0.748	0.734	0.721
120.0	-	-	-	-	-	-	0.966	0.933	0.894	0.864	0.839	0.817	0.797	0.779	0.762	0.747	0.733	0.719
122.5	-	-	-	-	-	-	0.967	0.935	0.895	0.864	0.839	0.816	0.796	0.778	0.761	0.746	0.732	0.718
125.0	-	-	-	-	-	-	0.967	0.936	0.896	0.864	0.838	0.816	0.796	0.777	0.760	0.745	0.731	0.717
127.5	-	-	-	-	-	-	0.968	0.937	0.896	0.864	0.838	0.815	0.795	0.776	0.759	0.744	0.729	0.716
130.0	-	-	-	-	-	-	0.969	0.939	0.896	0.864	0.837	0.814	0.794	0.775	0.758	0.743	0.728	0.715
132.5	-	-	-	-	-	-	0.971	0.940	0.897	0.864	0.837	0.813	0.792	0.774	0.757	0.741	0.727	0.713
135.0	-	-	-	-	-	-	0.972	0.942	0.897	0.863	0.837	0.813	0.792	0.773	0.756	0.740	0.725	0.712
137.5	-	-	-	-	-	-	0.974	0.944	0.897	0.863	0.836	0.812	0.791	0.772	0.755	0.739	0.724	0.711
140.0	-	-	-	-	-	-	0.976	0.946	0.897	0.863	0.835	0.811	0.790	0.771	0.753	0.737	0.723	0.709
142.5	-	-	-	-	-	-	0.978	0.947	0.898	0.862	0.834	0.810	0.789	0.770	0.752	0.736	0.721	0.707
145.0	-	-	-	-	-	-	-	0.948	0.898	0.862	0.833	0.809	0.787	0.768	0.751	0.734	0.720	0.706
147.5	-	-	-	-	-	-	-	0.948	0.898	0.862	0.832	0.808	0.786	0.767	0.749	0.733	0.719	0.704
150.0	-	-	-	-	-	-	-	0.948	0.899	0.861	0.832	0.807	0.785	0.766	0.748	0.732	0.717	0.703
152.5	-	-	-	-	-	-	-	0.947	0.899	0.861	0.831	0.806	0.784	0.764	0.746	0.730	0.716	0.070
155.0	-	-	-	-	-	-	-	0.947	0.899	0.861	0.830	0.804	0.782	0.763	0.745	0.728	0.714	0.700
157.5	-	-	-	-	-	-	-	0.946	0.899	0.860	0.829	0.803	0.781	0.761	0.743	0.727	0.712	0.698
160.0	-	-	-	-	-	-	-	0.945	0.900	0.859	0.828	0.802	0.779	0.759	0.741	0.725	0.710	0.696
162.5	-	-	-	-	-	-	-	0.945	0.900	0.859	0.827	0.801	0.778	0.757	0.739	0.723	0.708	0.694
165.0	-	-	-	-	-	-	-	0.945	0.900	0.858	0.826	0.799	0.776	0.756	0.738	0.721	0.706	0.692
167.5	-	-	-	-	-	-	-	0.944	0.900	0.857	0.825	0.797	0.774	0.754	0.736	0.719	0.704	0.690
170.0	-	-	-	-	-	-	-	0.944	0.900	0.856	0.823	0.796	0.773	0.752	0.734	0.717	0.702	0.688
172.5	-	-	-	-	-	-	-	0.944	0.900	0.855	0.822	0.794	0.771	0.750	0.732	0.715	0.700	0.686
175.0	-	-	-	-	-	-	-	0.944	0.900	0.854	0.820	0.792	0.769	0.748	0.730	0.713	0.698	0.684
177.5	-	-	-	-	-	-	-	0.944	0.900	0.853	0.819	0.791	0.767	0.746	0.728	0.711	0.696	0.681
180.0	-	-	-	-	-	-	-	0.944	0.901	0.852	0.817	0.789	0.765	0.744	0.725	0.709	0.694	0.679
182.5	-	-	-	-	-	-	-	0.945	0.901	0.851	0.815	0.787	0.763	0.742	0.723	0.706	0.691	0.677
185.0	-	-	-	-	-	-	-	0.945	0.901	0.850	0.814	0.785	0.761	0.739	0.720	0.704	0.689	0.674
187.5	-	-	-	-	-	-	-	0.945	0.901	0.849	0.812	0.783	0.758	0.737	0.718	0.701	0.686	0.671
190.0	-	-	-	-	-	-	-	0.946	0.901	0.847	0.810	0.781	0.756	0.734	0.715	0.698	0.683	0.669
192.5	-	-	-	-	-	-	-	0.948	0.901	0.846	0.808	0.778	0.753	0.732	0.713	0.696	0.681	0.666
195.0	-	-	-	-	-	-	-	0.950	0.900	0.844	0.806	0.776	0.750	0.729	0.710	0.693	0.677	0.663
197.5	-	-	-	-	-	-	-	0.952	0.899	0.842	0.803	0.773	0.748	0.726	0.707	0.690	0.674	0.660
200.0	-	-	-	-	-	-	-	0.960	0.899	0.840	0.801	0.770	0.745	0.723	0.704	0.687	0.671	0.657
202.5	-	-	-	-	-	-	-	0.960	0.899	0.839	0.798	0.767	0.742	0.720	0.701	0.683	0.668	0.654
205.0	-	-	-	-	-	-	-	-	0.899	0.837	0.795	0.764	0.738	0.717	0.697	0.680	0.665	0.651
207.5	-	-	-	-	-	-	-	-	0.898	0.834	0.792	0.761	0.735	0.713	0.694	0.677	0.661	0.647
210.0	-	-	-	-	-	-	-	-	0.896	0.832	0.790	0.758	0.732	0.710	0.691	0.673	0.658	0.643
212.5	-	-	-	-	-	-	-	-	0.894	0.829	0.786	0.754	0.728	0.706	0.686	0.669	0.654	0.640
215.0	-	-	-	-	-	-	-	-	0.892	0.826	0.783	0.750	0.724	0.702	0.682	0.665	0.650	0.636
217.5	-	-	-	-	-	-	-	-	0.891	0.823	0.779	0.746	0.720	0.698	0.679	0.661	0.646	0.631
220.0	-	-	-	-	-	-	-	-	0.887	0.820	0.776	0.743	0.716	0.694	0.674	0.657	0.641	0.627

Sizing examples according to API STD 520

1 - COMPRESSIBLE FLUID (Gas, Vapour, Steam)

A - Without back pressure

• Data :

Fluid : air at ambient temperature (15°C)

M = 29 (table 1)

Z = 1 (perfect gas)

k = 1.40 (table 1)

C = 356 (table 2)

Flowing temperature, absolute

T = 15 + 273 = 288 K

Required flow :

W = 12247 kg/h

Set pressure :

P = 41.38 barg.

Overpressure :

α = 10%

Back pressure :

P_b = atmosphere

P_b = 1.013 bar abs.

Absolute relieving pressure P_1 = P + overpressure + atmospheric pressure

P_1 = 1.10 x P + 1.013 = 46.53 bar abs.

Absolute back pressure ratio :

100 x P_b/P_1 = 2%

• The absolute back pressure ratio being less than 50%, the critical conditions are attained at valve throat and there is no correction for back pressure, K_B = 1

• K = 0.975

• To find the required discharge area, solve :

$$A = \frac{K_U W\sqrt{TZ}}{C K P_1 K_B \sqrt{M}} \quad \text{with } K_U=1.3164$$

A = 3.15 cm^2

• Select the next larger orifice (see Orifice Tables):

A' = 3.24 cm^2 (orifice G)

The valve flow rate, (including the 0.9 safety factor) is :

W' = (A'/A) x W

W' = 12597 kg/h

• Valve selection

API STD 520 recommend to use a spring loaded valve. For an API Std 526 SRV (Starflow series), go to the G orifice selection table (see the relevant catalogue) with the relieving temperature, 15°C, and find the valve model number suitable for a set pressure of 41.38 bar : P73G2.

As there is no back pressure : select the conventional type and material code 330. For air service, specify lift lever if required by applicable code.

Valve model number P 73 G2 330.

Option : lift lever (if necessary).

Dimensions :

A = 123.8 mm - B = 152.4 mm

Inlet DN 1 ½" x 300 lbs - outlet DN 3" x 150 lbs

Weight : 25 kg

B - With constant back pressure

B -1 Critical flow

Same data as above, with a constant back pressure.

P_b = 13.8 bar

P_b = 13.8 bar + 1.013 bar abs.

P_b = 14.813 bar abs

Absolute back pressure ratio

P_b(abs)/P_1(abs), in %

100 x P_b/P_1 = 32%

• Since the absolute back pressure is less than 50%, the critical conditions are attained at valve throat and there is no correction for back pressure : K_B = 1. See diagram 1.

• Valve sizing and selection same as above ; see § A.

Note : the set pressure of the valve on the test bench shall be the actual set pressure minus the back pressure, i.e. 27.58 bar.

B -2 Sub-critical flow

Same data as above, with a constant back pressure big enough to generate sub-critical conditions.

P_b = 31 bar

P_b = 31 bar + 1.013 bar abs.

P_b = 32.013 bar abs

Absolute back pressure ratio :

100 x P_b/P_1 = 69%

• Since the absolute back pressure is more than 50%, the flow is sub-critical through the valve throat. The correction factor for back pressure, K_B, is obtained from diagram 1, knowing k = 1.4.

K_B = 0.925

Required discharge area :

$$A = \frac{K_U W\sqrt{TZ}}{C K P_1 K_B \sqrt{M}} \quad \text{with } K_U=1.3164$$

A = 3.40cm^2

• Next larger orifice,

A' = 5.06 cm^2 (orifice H)

Valve flow is :

W' = (A'/A) x W

W' = 18.226 kg/h

• Valve selection (same as paragraph A)
Valve model number : P23 H2 330
Option : lift lever (if necessary)
Dimensions :
A = 130.2 mm - B = 123.8 mm
Inlet 2" x 300 lbs - outlet 3" x 150 lbs

Note : the valve set pressure on the test bench will be the actual set pressure minus the back pressure, i.e. : 10.38 bar.

C - With variable back pressure

C-1 The variable back pressure does not exceed 10% of the set pressure.

Same data as above with a variable back pressure $P_b(V)$.
$P_b(V) = 0$ at 4.13 bar
Gauge back pressure ratio : $P_b(V)/P_1$; %
$100 \times P_b(V)/P_1 = 10\%$

• Since the gauge back pressure is less than 10% it is generally acceptable to use a conventional valve without any provision for back pressure.

• Valve selection : same as § B-1 above.

C-2 The variable back pressure exceeds 10% of the set pressure.

Same data as above with a variable back pressure $P_b(V)$, so that :
$P_b(V) = 0$ at14.5 bar
Gauge back pressure ratio : $P_b(V)/P1$; %
$100 \times P_b(V)/P1 = 35\%$

• Since the gauge back pressure ratio is more than 10%, it is recommended to use a balanced bellows valve. The capacity of the valve for a given overpressure is affected by a back pressure correction factor, K_B, for balanced bellows valves on compressible fluids, given by diagram 2.
$K_B = 0.94$
Required discharge area :

$$A = \frac{K_U W\sqrt{TZ}}{C K P_1 K_B \sqrt{M}} \quad \text{with } K_U=1.3164$$

$A = 3.35 cm^2$

• Next larger orifice,
$A' = 5.06 cm^2$ (orifice H)
Valve flow is :
$W' = (A'/A) \times W$
$W' = 18.498$ kg/h

• Valve selection :
Valve model number : P23 H2 430 (430 for balanced bellows valve)
Option : lift lever (if necessary)
Dimensions :
A = 130.2 mm - B = 123.8 mm
Inlet 2" x 300 lbs - outlet 3" x 150 lbs

Note : the set pressure of the valve on the test bench will be the actual set pressure without any correction for back pressure.

2 - STEAM

A - Saturated steam

• Data :
Required flow of saturated steam :
W = 45360 kg/h
Set pressure :
P = 34.5 bar
Overpressure :
$\alpha = 10\%$
Absolute relieving pressure P_1 = P + overpressure + atmospheric pressure
$P_1 = 1.10 \times P + 1.013 = 38.96$ bar abs.

• STARFLOW discharge coefficient - K = 0.975

To find the discharge area, solve :

$$A = \frac{W}{K_U K P_1 K_B K_{SH} K_N}$$

$A = 22.79 cm^2$

• Select the next larger orifice :
$A' = 23.2 cm^2$ (orifice M)
The valve flow rate (including the 0.9 safety factor) is :
$W' = (A'/A) \times W$
$W' = 46176$ kg/h

• Valve selection (see above)
Valve model number : P46 M2 530
Option : none
Dimensions :
A = 177.8 mm - B = 184.1 mm
Inlet 4" x 300 lbs - outlet 6" x 150 lbs

B - Superheated steam

Same data as above, with a relieving temperature of 540°F/282°C

• Superheat correction factor, from table 3 :
$K_{SH} = 0.96$ $K_{SH} = 0.96$

• Required discharge area :

(USCS)

$$A = \frac{W}{K_U K P_1 K_B K_{SH} K_N}$$

with $K_U=51.5$

$A = 3.68 in.^2$

(SI)

$$A = \frac{W}{K_U K P_1 K_B K_{SH} K_N}$$

with $K_U=52.5$

$A = 23.76 cm^2$

• Next larger orifice :
$A' = 4.34 in.^2/28 cm^2$ (orifice)

• Valve selection (same as above) :
Valve model number P46N2 530
Option : none
Dimensions : A 73/4"/196.8 mm - B = 81/4"/209.5 mm
Inlet 4"-300 lbs - Outlet 6"-150 lbs
Weight 300 lbs/136 kg

3 - INCOMPRESSIBLE FLUID (Liquids)

• Data : Type P valve (with Kd = 0.701 certified)
Specific gravity :
$G = 1$
Required flow :
$Q = 54.48\ m^3/h$
Set pressure :
$P = 10.34$ bar
Overpressure :
$\alpha = 10\%$
Back pressure :
P_b = atmosphere
Discharge coefficient :
$K = 0.701$
To find the required discharge area, solve :

$$A = \frac{Q\sqrt{G}}{K\ K_W\ K_V\ K_U\ \sqrt{1.1P - P_b}} \quad \text{with } K_U=5.092$$

$K = 0.701$
K_W and $K_V = 1$
$A = 4.51\ cm^2$

• Select the next larger orifice
$A' = 5.06\ cm^2$ (orifice H)
Actual flow of the valve is :

$$= \frac{A'}{A} \times W$$

$$= 61.12\ m^3/h$$

• Valve selection

Go to the H orifice selection table, with relieving temperature (ambient), and find the valve model number suitable for a set pressure of 10.34 bar : P73 H1. As there is no back pressure : select the conventional type and material code 330.
Valve model number : P73 H 1330
Dimensions :
A = 130.2 mm - B = 123.8 mm
Inlet 1½" x 150 lbs - outlet 3" x 150 lbs

Example of sizing according to ASME Section VIII DIV.1

1 - COMPRESSIBLE FLUID (Gas, Vapour, Steam)

A - Without back pressure

• Data :
Fluid : air at ambient temperature (15°C)
M = 29 (table 1)
Z = 1 (perfect gas)
k = 1.40 (table 1)
C = 356 (table 2)
Flowing temperature, absolute
T = 15 + 273 = 288 K
Required flow :
$W = 12247$ kg/h
Set pressure :
$P = 41.38$ barg
Overpressure :
$\alpha = 10\%$
Back pressure :
P_b = atmospheric
$P_b = 1.013$ bar abs.
Absolute relieving pressure P_1 = P + overpressure + atmospheric pressure
$P_1 = 1.10 \times P + 1.013 = 46.53$ bar abs.
Absolute back pressure ratio :
$100 \times P_b/P_1 = 2\%$

• The absolute back pressure ratio being less than 50%, the critical conditions are attained at valve throat and there is no correction for back pressure, $K_B = 1$

• STARFLOW discharge coefficient : K = 0.975

• To find the required minimum discharge area, solve :

$$A = \frac{K_U W\sqrt{TZ}}{C\,K\,P_1\,K_B\,\sqrt{M}} \quad \text{with } K_U=1.3164$$

$A = 3.15\ cm^2$

• Select the next larger orifice,
$A' = 3.8\ cm^2$ (orifice G)
The valve flow rate (including the 0.9 safety factor) is :
$W' = (A'/A) \times W$
$W' = 12597$ kg/h

• Valve selection

Go to the G orifice selection table with the relieving temperature, 15°C, and find the valve model number suitable for a set pressure of 41.38 bar : P 75 G2
As there is no back pressure : select the conventional type and material code 330. For air service, specify lift lever if required by applicable code.
Valve model number P 73 G2 330.
Option : lift lever (if necessary).
Dimensions :
A = 123.8 mm - B = 152.4 mm
Inlet 1 ½" x 300 lbs - outlet 3" x 150 lbs

B - With constant back pressure

B-1 Critical flow

Same data as above, with a constant back pressure.
$P_b = 13.8$ bar
$P_b = 13.8$ bar + 1.013 bar abs.
$P_b = 14.813$ bar abs
Absolute back pressure ratio
P_b(abs)/P_1(abs), in %
$100 \times P_b/P_1 = 32\%$

• Since the absolute back pressure is less than 50%, the critical conditions are attained at valve throat and there is no correction for back pressure : K_B=1.

• Valve sizing and selection same as above; see §A.

Note : the set pressure of the valve on the test bench shall be the actual set pressure minus the back pressure, i.e. 27.58 bar.

B-2 Sub-critical flow
Same data as above, with a constant back pressure big enough to generate sub-critical conditions.
P_b = 31 bar
P_b = 31 bar + 1.013 bar abs.
P_b = 32.013 bar abs
Absolute back pressure ratio :
100 x P_b/P_1 = 69%

• Since the absolute back pressure is more than 50%, the flow is sub-critical through the valve throat. The correction factor for back pressure, K_B, is obtained from diagram 1, knowing k = 1.4.
K_B = 0.925
Required discharge area :

$$A = \frac{K_U W\sqrt{TZ}}{C K P_1 K_B \sqrt{M}} \quad \text{with } K_U=1.3164$$

$A = 3.40 cm^2$

• Next larger orifice
A' = 5.06 cm^2 (orifice H)
Valve flow is :
W' = (A'/A) x W
W' = 18.226 kg/h

• Valve selection (same as above)
Valve model number : P23 H2 330
Option : lift lever (if necessary)
Dimensions :
A = 130.2 mm - B = 123.8 mm
Inlet 2" x 300 lbs - outlet 3" x 150 lbs

Note : the valve set pressure on the test bench will be the actual set pressure minus the back pressure, i.e. 10.38 bar.

C - With variable back pressure

C-1 The variable back pressure does not exceed 10% of the set pressure. Same data as above with a variable back pressure $P_b(V)$.
$P_b(V)$ = 0 to 4.13 bar
Gauge back pressure ratio : $P_b(V)/P_1$; %
100 x $P_b(V)/P_1$ = 10%

• Since the gauge back pressure is less than 10% it is generally acceptable to use a conventional valve without any provision for back pressure.

• Valve selection : same as § B-1 above.

C-2 The variable back pressure exceeds 10% of the set pressure. Same data as above with a variable back pressure $P_b(V)$, so that :
$P_b(V)$ = 0 to 14.5 bar
Gauge back pressure ratio : $P_b(V)/P_1$; %
100 x $P_b(V)/P_1$ = 35%

• Since the gauge back pressure ratio is more than 10%, it is recommended to use a balanced bellows valve. The capacity of the valve for a given overpressure is affected by a back pressure correction factor, K_B, for balanced bellows valves on compressible fluids, given by diagram 2.
K_B = 0.94
Required discharge area :

$$A = \frac{K_U W\sqrt{TZ}}{C K P_1 K_B \sqrt{M}} \quad \text{with } K_U=1.3164$$

$A = 3.35 cm^2$

• Next larger orifice,
A' = 5.06 cm^2 (orifice H)
The valve flow is :
W' = (A'/A) x W
W' = 18.498 kg/h

• Valve selection :
Valve model number : P23 H2 430 (430 for balanced bellows valves)
Option : lift lever (if necessary)
Dimensions :
A = 130.2 mm - B = 123.8 mm
Inlet 2" x 300 lbs - outlet 3" x 150 lbs

Note : the set pressure of the valve on the test bench will be the actual set pressure without any correction for back pressure.

2 - STEAM

A - Saturated steam

• Data :
Required flow of saturated steam :
W = 45360 kg/h
Set pressure :
P = 34.5 bar
Overpressure :
a = 10%
Absolute relieving pressure P_1 = P + overpressure + atmospheric pressure
P_1 = 1.10 x P + 1.013 = 38.96 bar abs.

• STARFLOW discharge coefficient : K = 0.975

To find the discharge area, solve :

$$A = \frac{W}{K_U K P_1 K_B K_{SH} K_N} \quad \text{with } K_U=52.5$$

$A = 22.79 cm^2$
• Select the next larger orifice :
A' = 23.2 cm^2 (orifice M)

The valve flow rate (including the 0.9 safety factor) is :

$W' = (A'/A) \times W$

$W' = 46176$ kg/h

- Valve selection (see above)

Valve model number : P46 M2 530
Option : none
Dimensions :
A = 177.8 mm - B = 184.1 mm
Inlet 4" x 300 lbs - outlet 6" x 150 lbs

B - Superheated steam

Same data as above, with a relieving temperature of 540°F/282°C

- Superheat correction factor, from table 3:

$K_{SH} = 0.96$ $K_{SH} = 0.96$

- Required discharge area:

(USCS) (SI)

$$A = \frac{W}{K_U K P_1 K_B K_{SH}} \qquad A = \frac{W}{K_U K P_1 K_B K_{SH}}$$

with K_U=51.5 with K_U=52.5

$A = 3.68$ in.^{2} $A = 23.76$ cm^2

- Next larger orifice:

A' = 4.34 in.^{2}/28 cm^2 (orifice)

- Valve selection (same as above):

Valve model number P46N2 530
Option : none
Dimensions : A 7¾"/196.8 mm - B = 8¼"/209.5 mm
Inlet 4"-300 lbs - Outlet 6"-150 lbs
Weight 300 lbs/136 kg

3 - INCOMPRESSIBLE FLUID (Liquid)

- Data : Type P valve (with $K_1 = 0.63$)

Specific gravity :
$G = 1$
Required flow
$Q = 54.48$ m^3/h
Set pressure :
$P = 10.34$ bar
Overpressure :
$\alpha = 10\%$
Back pressure :
P_b = atmosphere
Discharge coefficient :
$K = 0.63$
To find the required discharge area, solve :

$$A = \frac{Q\sqrt{G}}{K K_W K_V K_U \sqrt{1.1P - P_b}} \quad \text{with } K_U = 5.092$$

K_W and $K_V = 1$
$A = 5.26$ cm^2

- Select next larger orifice

A' = 5.73 cm^2 (orifice H)

Actual flow of the valve is :

$$W' = \frac{A'}{A} \times W$$

$W' = 59.35$ m^3/h

- Valve selection

Go to the H orifice selection table, with relieving temperature (ambient), and find the valve model number suitable for a set pressure of 10.34 bar : P73 H1. As there is no back pressure : select the conventional type and material code 330.
Valve model number : P73 H 1330
Dimensions :
A = 130.2 mm - B = 123.8 mm
Inlet 1½" x 150 lbs - outlet 3" x 150 lbs

Orifice tables

P series (Starflow)

Orifice	D	E	F	G	H	J	K	L	M	N	P	Q	R	T	V	W
Actual in²	0.134	0.273	0.373	0.589	0.881	1.457	2.097	3.284	4.093	4.987	7.215	12.91	17.81	28.87	46.75	70.10
API in²	0.11	0.196	0.307	0.503	0.785	1.287	1.838	2.853	3.6	4.34	6.38	11.05	16	26	-	-
Actual cm²	0.865	1.76	2.406	3.800	5.684	9.400	13.52	21.42	26.42	32.16	46.55	83.53	114.9	186.2	301.6	452.3
API cm²	0.71	1.26	1.98	3.24	5.06	8.30	11.86	18.41	23.2	28.0	41.2	71.2	103.2	167.8	-	-

9 series

Orifice	B	D	E	F	G
Actual in²	0.044	0.124	0.222	0.352	0.568
API in²	-	0.11	0.196	0.307	0.503
Actual cm²	0.283	0.801	1.431	2.27	3.664
API cm²	-	0.71	1.26	1.98	3.24

76 series

Orifice	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	W
Actual in²	0.124	0.222	0.352	0.568	0.887	1.457	2.097	3.232	4.065	5.143	7.069	12.915	15.9	22.19	28.27	39.44	61.63
API in²	0.11	0.196	0.307	0.503	0.785	1.287	1.838	2.853	3.6	4.34	6.38	11.05	16	-	26	-	-
Actual cm²	0.80	1.43	2.27	3.66	5.72	9.40	13.52	20.85	26.22	33.18	45.60	83.32	102.58	143.16	182.39	254.47	397.61
API cm²	0.71	1.26	1.98	3.24	5.06	8.30	11.86	18.41	23.2	28	41.2	71.2	103.2	-	167.8	-	-

78 series

Orifice	D	E	F	G	H	J	K	L	M	N	P	Q	R	T
Actual in²	0.124	0.222	0.352	0.568	0.887	1.457	2.097	3.229	4.095	5.143	7.069	12.915	15.904	28.274
API in²	0.11	0.196	0.307	0.503	0.785	1.287	1.838	2.853	3.6	4.34	6.38	11.05	16	26
Actual cm²	0.80	1.43	2.27	3.66	5.72	9.40	13.529	20.83	26.42	33.18	45.60	83.32	102.61	182.41
API cm²	0.71	1.26	1.98	3.24	5.06	8.30	11.86	18.41	23.2	28	41.2	71.2	103.2	167.8

86 series

Orifice	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	W
Actual in²	0.124	0.222	0.352	0.568	0.887	1.457	2.097	3.232	4.065	5.143	7.069	12.915	15.9	22.19	28.27	39.44	61.63
API in²	0.11	0.196	0.307	0.503	0.785	1.287	1.838	2.853	3.6	4.34	6.38	11.05	16	-	26	-	-
Actual cm²	0.80	1.43	2.27	3.66	5.72	9.40	13.52	20.85	26.22	33.18	45.60	83.32	102.58	143.16	182.39	254.47	397.61
API cm²	0.71	1.26	1.98	3.24	5.06	8.30	11.86	18.41	23.2	28	41.2	71.2	103.2	-	167.8	-	-

V series (Starsteam)

Orifice	1	2	3	4	5	6	Q	R	RR	T
Actual in²	0.996	1.667	2,758	3,983	5.303	7.069	11.056	15.904	19.296	27.391
Actual cm²	6.424	10.752	17.795	25.697	34.212	45.604	71.331	102.608	124.492	176.715

P Series (Starflow) Selection Tables

How to use the selection tables

The correct Starflow model number may be selected by using the following selection tables or the selection diagrams on the following pages. These tables and have been established according to API STD 526 last edition, whilst the diagrams have been established according to ASME B16.34 last edition. There are selection tables and selection diagrams for each orifice size from D to T (API STD 526) +V and W (ASME B16.34).

When the valve orifice size has been selected according to the duty requirements as well as the applicable sizing formula or capacity table (see the sizing section in our technical information catalogue), select the applicable selection table or diagram. In the applicable selection table or diagram, for the specified service temperature, select the valve in accordance with the required set pressure. Selection diagrams should be used for interpolations.

The table or diagram then specifies the 5 first digits of the Starflow coding system. The table also shows the 3 following digits which refer to the service conditions (conventional-balanced bellows steam), as well as the inlet and outlet sizes and ratings, the maximum allowable back pressure and the body and spring materials.

Refer to the table of dimensions for geometric data and weight.

Example :

What is the model number for a 'D' orifice, set at 40 barg and 135°C ?

- Go to the 'D' orifice selection chart and find the location of the intersection 135°C - 40 barg
- Read the model number : P12D2330 (conventional), 1" x D x 2" rating 300 lbs, inlet 1" - 300 lbs, outlet 2" - 150 lbs, A = 104.8 mm, B = 114.3 mm, weight : 18 kg.

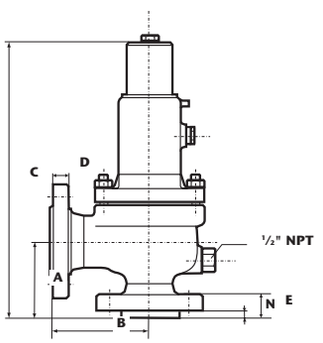
Notes :

These tables and diagrams have been issued according to API STD 526 and ASME B16.34. Therefore they do not take into consideration such parameters as corrosion and special service requirements. This data should be considered when selecting a model number. Refer to the section of this catalogue dealing with the different bills of material.

ORIFICE : D
0.71 cm²
0.11 in²

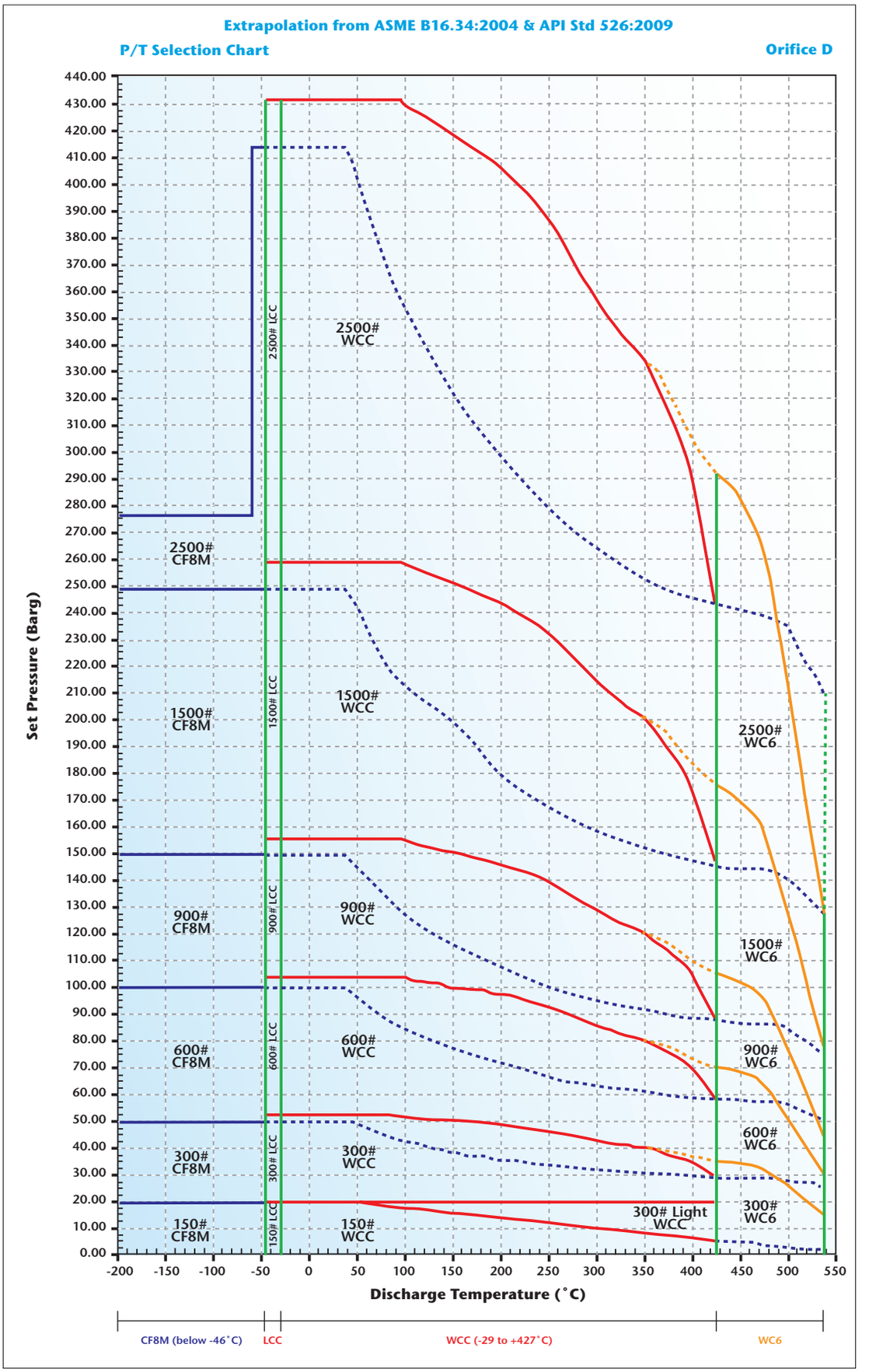
P Series (Starflow) Selection Tables
According to API Std 526 : (edition 2009)

INLETx ORIFICEx OUTLET	ANSI FLANGE RATING Inlet	Outlet	Model Number	Conven-tional	Bellows	Steam service	MAX. SET PRESSURE barg (psig) -268°C to -47°C (-450°F to -51°F)	-46°C to -29°C (-50°F to -21°F)	-29°C to +38°C (-20°F to 100°F)	<232°C (<450°F)	<427°C (<800°F)	<538°C (<1000°F)	MAX. BACK PRESSURE (1) barg (psig) Conven-tional	Bellows	MATERIALS Body	Spring
1 D 2	150	150	P12D1	330	430	530			19.8 (285)	13 (185)	5.5 (80)		19.8 (285)	16 (230)		
1 D 2	300	150	P12D7	330	430	530			19.8 (285)	19.8 (285)	19.8 (285)		19.8 (285)	16 (230)		
1 D 2	300	150	P12D2	330	430	530			51 (740)	42.4 (615)	29 (410)		19.8 (285)	16 (230)		
1 D 2	600	150	P12D3	330	430	530			102 (1480)	85 (1235)	58 (825)		19.8 (285)	16 (230)	SA 216 Gr. WCC	Alloy Steel
1½ D 2	900	300	P72D4	330	430	530			153 (2220)	128 (1845)	86 (1235)		41 (600)	35 (500)		
1½ D 2	1500	300	P72D5	330	430	530			255 (3705)	213 (3080)	144 (2060)		41 (600)	35 (500)		
1½ D 3 (4)	2500	300	P73D6	330	430	530			414 (6000)	414 (6000)	240 (3430)		51 (740)	35 (500)		
1 D 2	300	150	P12D2	332	432	502					35 (510)	16 (225)	19.8 (285)	16 (230)		
1 D 2	600	150	P12D3	332	432	502					70 (1015)	32 (445)	19.8 (285)	16 (230)	SA 216	High Temp.
1½ D 2	900	300	P72D4	332	432	502					105 (1525)	46 (670)	41 (600)	35 (500)	Gr. WC6	Alloy
1½ D 2	1500	300	P72D5	332	432	502					176 (2540)	79 (1115)	41 (600)	35 (500)		Steel
1½ D 3 (4)	2500	300	P73D6	332	432	502					293 (4230)	128 (1860)	51 (740)	35 (500)		
1 D 2	150	150	P12D1	319	419			19.8 (285)					19.8 (285)	16 (230)		
1 D 2	300	150	P12D7	319	419			19.8 (285)					19.8 (285)	16 (230)		
1 D 2	300	150	P12D2	319	419			51 (740)					19.8 (285)	16 (230)		
1 D 2	600	150	P12D3	319	419			102 (1480)					19.8 (285)	16 (230)	SA 352 Gr. LCC	Alloy Steel
1½ D 2	900	300	P72D4	319	419			153 (2220)					41 (600)	35 (500)		
1½ D 2	1500	300	P72D5	319	419			255 (3705)					41 (600)	35 (500)		
1½ D 3 (4)	2500	300	P73D6	319	419			414 (6000)					51 (740)	35 (500)		
1 D 2	150	150	P12D1	316	416		19 (275)						19 (275)	16 (230)		
1 D 2	300	150	P12D7	316	416		19 (275)						19 (275)	16 (230)		
1 D 2	300	150	P12D2	316	416		50 (720)						19 (275)	16 (230)		
1 D 2	600	150	P12D3	316	416		99 (1440)						19 (275)	16 (230)	SA 351 Gr. CF8M	Stainless Steel
1½D 2	900	300	P72D4	316	416		149 (2160)						41 (600)	35 (500)		
1½ D 2	1500	300	P72D5	316	416		248 (3600)						41 (600)	35 (500)		
1½ D 3 (4)	2500	300	P73D6	316	416		276 (4000)						50 (720)	35 (500)		



INLETx ORIFICEx OUTLET	ANSI FLANGE RATING Inlet	Outlet	MODEL NUMBER	A(2) mm (in)	B(2) mm (in)	C mm (in)	D mm (in)	E mm (in)	N mm (in)	Approximate weight (3) kg (lbs)
1 D 2	150	150	P12D1	104.8 (4-⅛)	114.3 (4-½)	375 (15)	19.1 (¾)	31 (1-¼)	12 (½)	18 (40)
1 D 2	300	150	P12D7	104.8 (4-⅛)	114.3 (4-½)	375 (15)	19.1 (¾)	31 (1-¼)	12 (½)	18 (40)
1 D 2	300	150	P12D2	104.8 (4-⅛)	114.3 (4-½)	375 (15)	19.1 (¾)	31 (1-¼)	12 (½)	18 (40)
1 D 2	600	150	P12D3	104.8 (4-⅛)	114.3 (4-½)	375 (15)	19.1 (¾)	31 (1-¼)	12 (½)	19 (42)
1½ D 2	900	300	P72D4	104.8 (4-⅛)	139.7 (5-½)	480 (19)	22.4 (⅞)	46 (1-13/16)	13 (½)	35 (77)
1½ D 2	1500	300	P72D5	104.8 (4-⅛)	139.7 (5-½)	480 (19)	22.4 (⅞)	46 (1-13/16)	13 (½)	36 (79)
1½ D 3(4)	2500	300	P73D6	139.7 (5-½)	177.8 (7)	505 (20)	28.4 (1⅛)	59 (2-5/16)	13 (½)	45 (99)

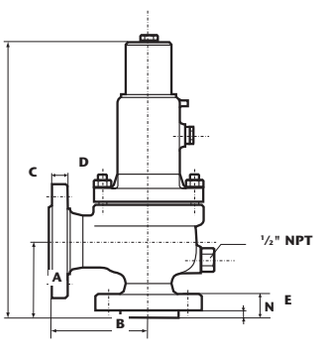
(1) Max. back pressure limits at 38°C; for higher temp. refer to ASME B16.5 flange ratings for conventional valves
(2) Tolerances for A and B : ± 1.6 mm (±1/16 in)
(3) Valves with lifting lever : add 10%
(4) 2½'' outlet flange on request in conformity with API Std 526 ed.84, model becomes P75D6


Extrapolation from ASME B16.34:2004 & API Std 526:2009
P/T Selection Chart
Orifice D
Set Pressure (Barg)
Discharge Temperature (˚C)
2500# WCC
1500# WCC
900# WCC
600# WCC
300# WCC
150# WCC
300# Light WCC
2500# CF8M
1500# CF8M
900# CF8M
600# CF8M
300# CF8M
150# CF8M
2500# WC6
1500# WC6
900# WC6
600# WC6
300# WC6
2500# LCC
1500# LCC
900# LCC
600# LCC
300# LCC
150# LCC
CF8M (below -46˚C)
LCC
WCC (-29 to +427˚C)
WC6

ORIFICE : E
1.26 cm²
0.196 in²

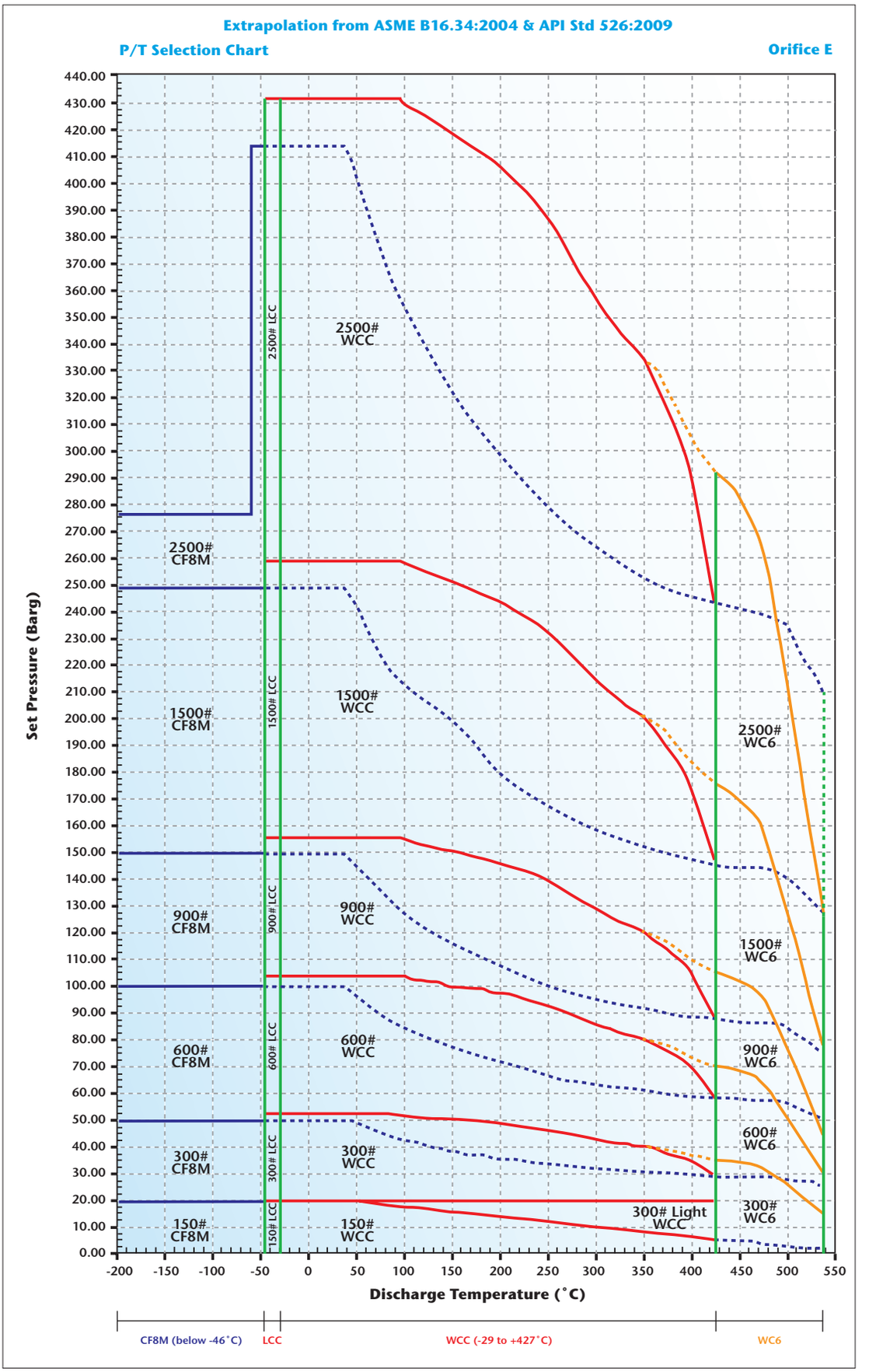
P Series (Starflow) Selection Tables
According to API Std 526 : (edition 2009)

INLETx ORIFICEx OUTLET	ANSI FLANGE RATING Inlet	Outlet	Model Number	Conven-tional	Bellows	Steam service	MAX. SET PRESSURE barg (psig) -268°C to -47°C (-450°F to -51°F)	-46°C to -29°C (-50°F to -21°F)	-29°C to +38°C (-20°F to 100°F)	<232°C (<450°F)	<427°C (<800°F)	<538°C (<1000°F)	MAX. BACK PRESSURE (1) barg (psig) Conven-tional	Bellows	MATERIALS Body	Spring
1 E 2	150	150	P12E1	330	430	530			19.8 (285)	13 (185)	5.5 (80)		19.8 (285)	16 (230)		
1 E 2	300	150	P12E7	330	430	530			19.8 (285)	19.8 (285)	19.8 (285)		19.8 (285)	16 (230)		
1 E 2	300	150	P12E2	330	430	530			51 (740)	42.4 (615)	29 (410)		19.8 (285)	16 (230)		
1 E 2	600	150	P12E3	330	430	530			102 (1480)	85 (1235)	58 (825)		19.8 (285)	16 (230)	SA 216	Alloy
1½ E 2	900	300	P72E4	330	430	530			153 (2220)	128 (1845)	86 (1235)		41 (600)	35 (500)	Gr. WCC	Steel
1½ E 2	1500	300	P72E5	330	430	530			255 (3705)	213 (3080)	144 (2060)		41 (600)	35 (500)		
1½ E 3 (4)	2500	300	P73E6	330	430	530			414 (6000)	414 (6000)	240 (3430)		51 (740)	35 (500)		
1 E 2	300	150	P12E2	332	432	502					35 (510)	16 (225)	19.8 (285)	16 (230)		
1 E 2	600	150	P12E3	332	432	502					70 (1015)	32 (445)	19.8 (285)	16 (230)	SA 216	High Temp.
1½ E 2	900	300	P72E4	332	432	502					105 (1525)	46 (670)	41 (600)	35 (500)	Gr. WC6	Alloy
1½ E 2	1500	300	P72E5	332	432	502					176 (2540)	79 (1115)	41 (600)	35 (500)		Steel
1½ E 3 (4)	2500	300	P73E6	332	432	502					293 (4230)	128 (1860)	51 (740)	35 (500)		
1 E 2	150	150	P12E1	319	419			19.8 (285)					19.8 (285)	16 (230)		
1 E 2	300	150	P12E7	319	419			19.8 (285)					19.8 (285)	16 (230)		
1 E 2	300	150	P12E2	319	419			51 (740)					19.8 (285)	16 (230)		
1 E 2	600	150	P12E3	319	419			102 (1480)					19.8 (285)	16 (230)	SA 352	Alloy
1½ E 2	900	300	P72E4	319	419			153 (2220)					41 (600)	35 (500)	Gr. LCC	Steel
1½ E 2	1500	300	P72E5	319	419			255 (3705)					41 (600)	35 (500)		
1½ E 3 (4)	2500	300	P73E6	319	419			414 (6000)					51 (740)	35 (500)		
E 2	150	150	P12E1	316	416		19 (275)						19 (275)	16 (230)		
1 E 2	300	150	P12E7	316	416		19 (275)						19 (275)	16 (230)		
1 E 2	300	150	P12E2	316	416		50 (720)						19 (275)	16 (230)		
1 E 2	600	150	P12E3	316	416		99 (1440)						19 (275)	16 (230)	SA 351	Stainless
1½ E 2	900	300	P72E4	316	416		149 (2160)						41 (600)	35 (500)	Gr. CF8M	Steel
1½ E 2	1500	300	P72E5	316	416		248 (3600)						41 (600)	35 (500)		
1½ E 3 (4)	2500	300	P73E6	316	416		276 (4000)						50 (720)	35 (500)		



INLETx ORIFICEx OUTLET	ANSI FLANGE RATING Inlet	Outlet	MODEL NUMBER	A(2) mm (in)	B(2) mm (in)	C mm (in)	D mm (in)	E mm(in)	N mm (in)	Approximate weight (3) kg (lbs)
1E2	150	150	P12E1	104.8 (4-⅛)	114.3 (4-½)	375 (15)	19.1 (¾)	31 (1-¼)	12 (½)	18 (40)
1E2	300	150	P12E7	104.8 (4-⅛)	114.3 (4-½)	375 (15)	19.1 (¾)	31 (1-¼)	12 (½)	18 (40)
1E2	300	150	P12E2	104.8 (4-⅛)	114.3 (4-½)	375 (15)	19.1 (¾)	31 (1-¼)	12 (½)	18 (40)
1E2	600	150	P72E3	104.8 (4-⅛)	114.3 (4-½)	375 (15)	19.1 (¾)	31 (1-¼)	12 (½)	19 (42)
1½ E 2	900	300	P72E4	104.8 (4-⅛)	139.7 (5-½)	480 (19)	22.4 (⅞)	46 (1-¹³⁄₁₆)	13 (½)	35 (77)
1½ E 2	1500	300	P72E5	104.8 (4-⅛)	139.7 (5-½)	480 (19)	22.4 (⅞)	46 (1-¹³⁄₁₆)	13 (½)	36 (79)
1½ E 3(4)	2500	300	P73E6	139.7 (5-½)	177.8 (7)	505 (20)	28.4 (1-½)	59 (2-⅜)	13 (½)	45 (99)

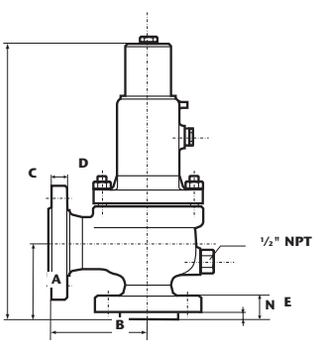
(1) Max. back pressure limits at 38°C; for higher temp. refer to ASME B16.5 flange ratings for conventional valves
(2) Tolerances for A and B : ± 1.6 mm (±1⁄8 in)
(3) Valves with lifting lever : add 10%
(4) 2½'' outlet flange on request in conformity with API Std 526 ed. 84, model becomes P75E6


Extrapolation from ASME B16.34:2004 & API Std 526:2009
P/T Selection Chart
Orifice E
Set Pressure (Barg)
Discharge Temperature (˚C)
2500# WCC
1500# WCC
900# WCC
600# WCC
300# WCC
150# WCC
300# Light WCC
2500# CF8M
1500# CF8M
900# CF8M
600# CF8M
300# CF8M
150# CF8M
2500# LCC
1500# LCC
900# LCC
600# LCC
300# LCC
150# LCC
2500# WC6
1500# WC6
900# WC6
600# WC6
300# WC6
CF8M (below -46˚C)
LCC
WCC (-29 to +427˚C)
WC6

ORIFICE : F
1.98 cm²
0.307 in²

P Series (Starflow) Selection Tables
According to API Std 526 : (edition 2009)

INLETx ORIFICEx OUTLET	ANSI FLANGE RATING Inlet	Outlet	Model Number	Conven-tional	Bellows	Steam service	MAX. SET PRESSURE barg (psig) -268°C to -47°C (-450°F to -51°F)	-46°C to -29°C (-50°F to -21°F)	-29°C to +38°C (-20°F to 100°F)	<232°C (<450°F)	<427°C (<800°F)	<538°C (<1000°F)	MAX. BACK PRESSURE (1) barg (psig) Conven-tional	Bellows	MATERIALS Body	Spring
1½ F 2	150	150	P72F1	330	430	530			19.8 (285)	13 (185)	5.5 (80)		19.8 (285)	16 (230)		
1½ F 2	300	150	P72F7	330	430	530			19.8 (285)	19.8 (285)	19.8 (285)		19.8 (285)	16 (230)		
1½ F 2	300	150	P72F2	330	430	530			51 (740)	42.4 (615)	29 (410)		19.8 (285)	16 (230)		
1½ F 2	600	150	P72F3	330	430	530			102 (1440)	85 (1235)	58 (825)		19.8 (285)	16 (230)	SA 216 Gr. WCC	Alloy Steel
1½ F 3 (4)	900	300	P73F4	330	430	530			153 (2220)	128 (1845)	85 (1235)		51 (740)	34 (500)		
1½ F 3 (4)	1500	300	P73F5	330	430	530			255 (3705)	213 (3080)	144 (2060)		51 (740)	34 (500)		
1½ F 3 (4)	2500	300	P73F6	330	430	530			345 (5000)	345 (5000)	240 (3430)		51 (740)	34 (500)		
1½ F 2	300	150	P72F2	332	432	502					35 (510)	15 (225)	19.8 (285)	16 (230)		
1½ F 2	600	150	P72F3	332	432	502					70 (1015)	31 (445)	19.8 (285)	16 (230)	SA 216	High Temp.
1½ F 3 (4)	900	300	P73F4	332	432	502					105 (1525)	46 (670)	51 (740)	34 (500)	Gr. WC6	Alloy
1½ F 3 (4)	1500	300	P73F5	332	432	502					175 (2540)	77 (1115)	51 (740)	34 (500)		Steel
1½ F 3 (4)	2500	300	P73F6	332	432	502					292 (4230)	128 (1860)	51 (740)	34 (500)		
1½ F 2	150	150	P72F1	319	419			19.8 (285)					19.8 (285)	16 (230)		
1½ F 2	300	150	P72F7	319	419			19.8 (285)					19.8 (285)	16 (230)		
1½ F 2	300	150	P72F2	319	419			51 (740)					19.8 (285)	16 (230)		
1½ F 2	600	150	P72F3	319	419			102 (1440)					19.8 (285)	16 (230)	SA 352 Gr. LCC	Alloy Steel
1½ F 3 (4)	900	300	P73F4	319	419			153 (2220)					51 (740)	34 (500)		
1½ F 3 (4)	1500	300	P73F5	319	419			255 (3705)					51 (740)	34 (500)		
1½ F 3 (4)	2500	300	P73F6	319	419			345 (5000)					51 (740)	34 (500)		
1½ F 2	150	150	P72F1	316	416		19 (275)						19 (275)	16 (230)		
1½ F 2	300	150	P72F7	316	416		19 (275)						19 (275)	16 (230)		
1½ F 2	300	150	P72F2	316	416		50 (720)						19 (275)	16 (230)		
1½ F 2	600	150	P72F3	316	416		99 (1440)						19 (275)	16 (230)	SA 351 Gr. CF8M	Stainless Steel
1½ F 3 (4)	900	300	P73F4	316	416		149 (2160)						50 (720)	34 (500)		
1½ F 3 (4)	1500	300	P73F5	316	416		152 (2200)						50 (720)	34 (500)		
1½ F 3 (4)	2500	300	P73F6	316	416		234 (3400)						50 (720)	34 (500)		

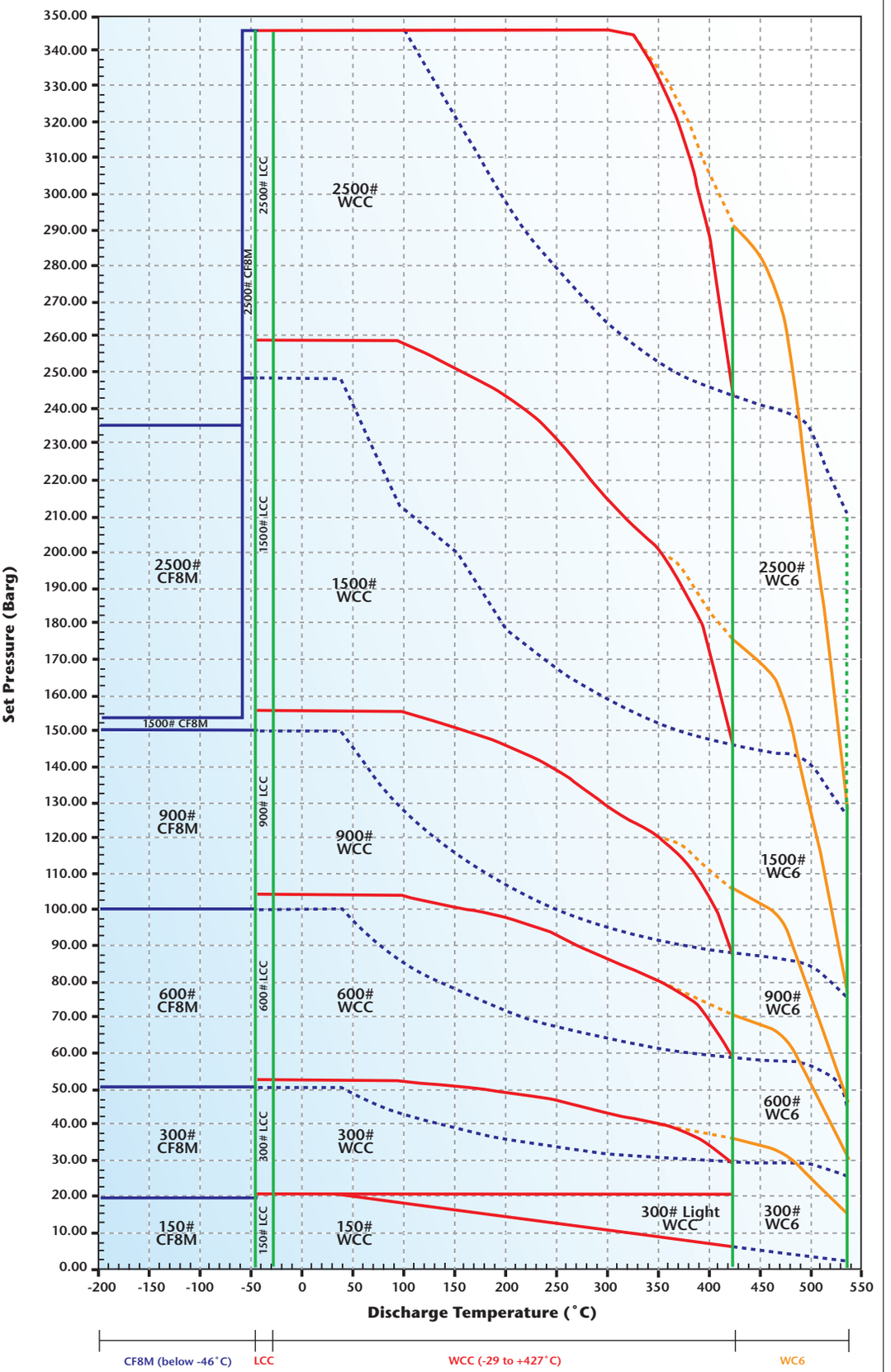


INLETx ORIFICEx OUTLET	ANSI FLANGE RATING Inlet	Outlet	MODEL NUMBER	A(2) mm (in)	B(2) mm (in)	C mm (in)	D mm (in)	E mm (in)	N mm (in)	Approximate weight (3) kg (lbs)
1½ F 2	150	150	P72F1	123.8 (4-7/8)	120.7 (4-3/4)	455 (18)	19.1 (3/4)	34 (1-5/16)	12 (1/2)	25 (55)
1½ F 2	300	150	P72F7	123.8 (4-7/8)	120.7 (4-3/4)	455 (18)	19.1 (3/4)	36 (1-3/8)	12 (1/2)	27 (60)
1½ F 2	300	150	P72F2	123.8 (4-7/8)	152.4 (6)	455 (18)	19.1 (3/4)	36 (1-3/8)	12 (1/2)	27 (60)
1½ F 2	600	150	P72F3	123.8 (4-7/8)	152.4 (6)	455 (18)	19.1 (3/4)	36 (1-3/8)	12 (1/2)	31 (68)
1½ F 3 (4)	900	300	P73F4	123.8 (4-7/8)	165.1 (6-1/2)	505 (20)	28.4 (1-1/8)	46 (1-13/16)	13 (1/2)	44 (97)
1½ F 3 (4)	1500	300	P73F5	123.8 (4-7/8)	165.1 (6-1/2)	505 (20)	28.4 (1-1/8)	46 (1-13/16)	13 (1/2)	44 (97)
1½ F 3 (4)	2500	300	P73F6	139.7 (5-1/2)	177.8 (7)	505 (20)	28.4 (1-1/8)	59 (2-5/16)	13 (1/2)	48 (108)

(1) Max. back pressure limits at 38°C; for higher temp. refer to ASME B16.5 flange ratings for conventional valves
(2) Tolerances for A and B : ± 1.6 mm (±1/16 in)
(3) Valves with lifting lever : add 10%
(4) 2½'' outlet flange on request in conformity with API Std 526 ed. 84, model becomes P75F

Extrapolation from ASME B16.34:2004 & API Std 526:2009

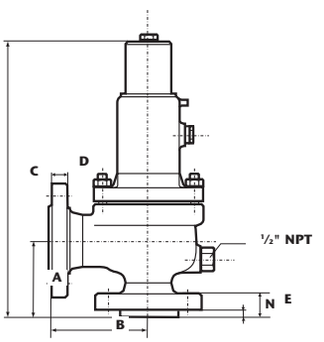
P/T Selection Chart **Orifice F**



ORIFICE : G
3.24 cm²
0.503 in²

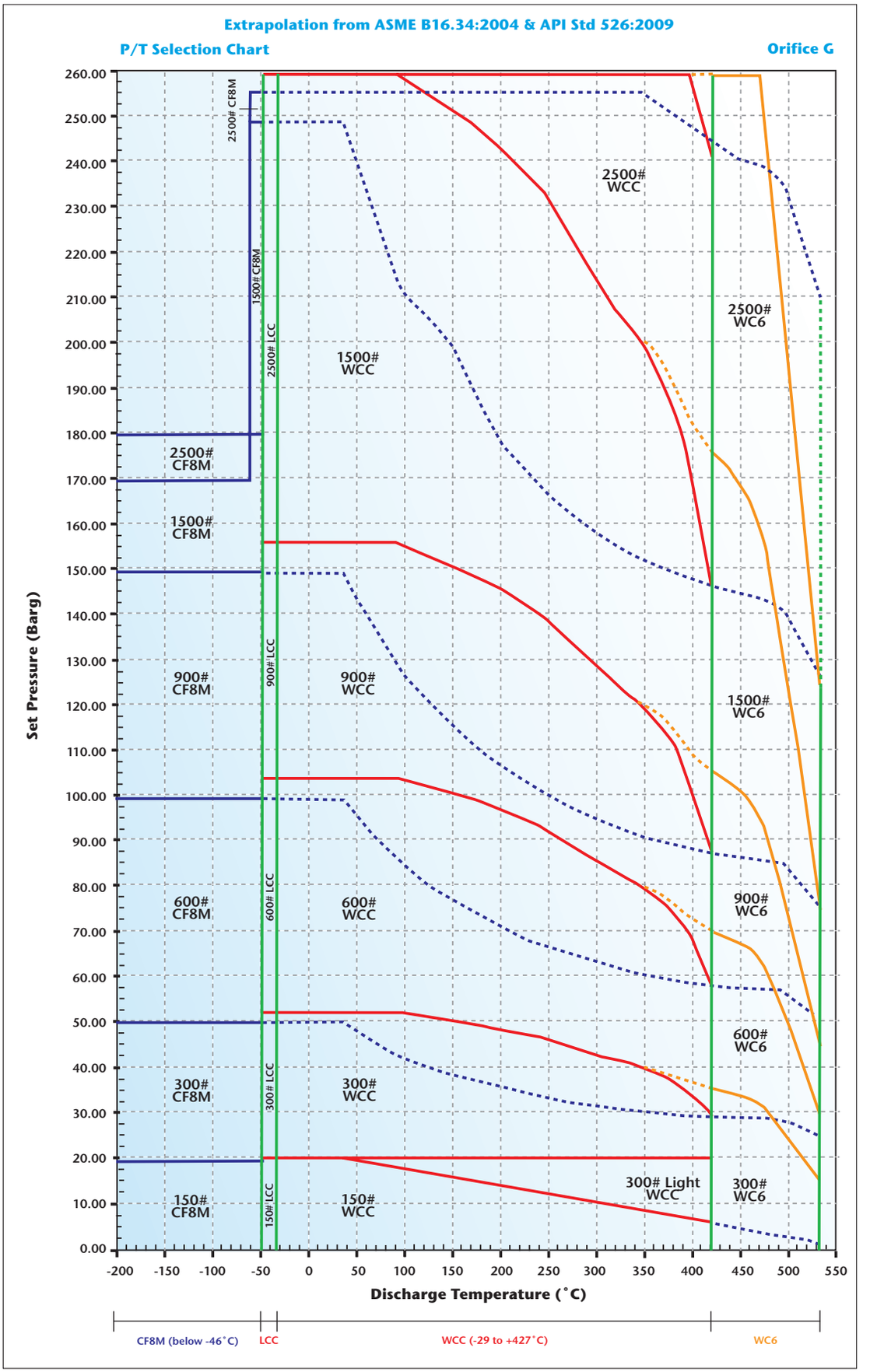
P Series (Starflow) Selection Tables
According to API Std 526 : (edition 2009)

INLETx ORIFICEx OUTLET	ANSI FLANGE RATING Inlet	Outlet	Model Number	Conven-tional	Bellows	Steam service	MAX. SET PRESSURE barg (psig) -268°C to -47°C (-450°F to -51°F)	-46°C to -29°C (-50°F to -21°F)	-29°C to +38°C (-20°F to 100°F)	<232°C (<450°F)	<427°C (<800°F)	<538°C (<1000°F)	MAX. BACK PRESSURE (1) barg (psig) Conven-tional	Bellows	MATERIALS Body	Spring
1½ G 3 (4)	150	150	P73G1	330	430	530			19.8 (285)	13 (185)	5.5 (80)		19.8 (285)	16 (230)		
1½ G 3 (4)	300	150	P73G7	330	430	530			19.8 (285)	19.8 (285)	19.8 (285)		19.8 (285)	16 (230)		
1½ G 3 (4)	300	150	P73G2	330	430	530			51 (745)	42.4 (615)	29 (410)		19.8 (285)	16 (230)		
1½ G 3 (4)	600	150	P73G3	330	430	530			102 (1440)	85 (1235)	58 (825)		19.8 (285)	16 (230)	SA 216	Alloy
1½ G 3 (4)	900	300	P73G4	330	430	530			153 (2220)	127 (1845)	85 (1235)		51 (740)	32 (470)	Gr. WCC	Steel
2 G 3	1500	300	P23G5	330	430	530			255 (3705)	212 (3080)	144 (2060)		51 (740)	32 (470)		
2 G 3	2500	300	P23G6	330	430	530			255 (3705)	255 (3705)	240 (3430)		51 (740)	32 (470)		
1½ G 3 (4)	300	150	P73G2	332	432	502					35 (510)	15 (225)	19.8 (285)	16 (230)		
1½ G 3 (4)	600	150	P73G3	332	432	502					70 (1015)	31 (445)	19.8 (285)	16 (230)	SA 216	High Temp.
1½ G 3 (4)	900	300	P73G4	332	432	502					105 (1525)	46 (670)	51 (740)	34 (500)	Gr. WC6	Alloy
2 G 3	1500	300	P23G5	332	432	502					175 (2540)	77 (1115)	51 (740)	34 (500)		Steel
2 G 3	2500	300	P23G6	332	432	502					255 (3705)	128 (1860)	51 (740)	34 (500)		
1½ G 3 (4)	150	150	P73G1	319	419			19.8 (285)					19.8 (285)	16 (230)		
1½ G 3 (4)	300	150	P73G7	319	419			19.8 (285)					19.8 (285)	16 (230)		
1½ G 3 (4)	300	150	P73G2	319	419			51 (745)					19.8 (285)	16 (230)		
1½ G 3 (4)	600	150	P73G3	319	419			102 (1440)					19.8 (285)	16 (230)	SA 352	Alloy
1½ G 3 (4)	900	300	P73G4	319	419			153 (2220)					51 (740)	32 (470)	Gr. LCC	Steel
2 G 3	1500	300	P23G5	319	419			255 (3705)					51 (740)	32 (470)		
2 G 3	2500	300	P23G6	319	419			255 (3705)					51 (740)	32 (470)		
1½ G 3 (4)	150	150	P73G1	316	416		19 (275)						19 (275)	16 (230)		
1½ G 3 (4)	300	150	P73G7	316	416		19 (275)						19 (275)	16 (230)		
1½ G 3 (4)	300	150	P73G2	316	416		50 (720)						19 (275)	16 (230)		
1½ G 3 (4)	600	150	P73G3	316	416		99 (1440)						19 (275)	16 (230)	SA 351	Stainless
1½ G 3 (4)	900	300	P73G4	316	416		110 (1600)						50 (720)	34 (500)	Gr. CF8M	Steel
2 G 3	1500	300	P23G5	316	416		169 (2450)						50 (720)	34 (500)		
2 G 3	2500	300	P23G6	316	416		179 (2600)						50 (720)	34 (500)		



INLETx ORIFICEx OUTLET	ANSI FLANGE RATING Inlet	Outlet	MODEL NUMBER	A(2) mm (in)	B(2) mm (in)	C mm (in)	D mm (in)	E mm (in)	N mm (in)	Approximate weight (3) kg (lbs)
1½ G 3 (4)	150	150	P73G1	123.8 (4-7/8)	120.7 (4-3/4)	455 (18)	23.9 (15/16)	31 (1-1/4)	12 (1/2)	22 (48)
1½ G 3 (4)	300	150	P73G7	123.8 (4-7/8)	120.7 (4-3/4)	455 (18)	23.9 (15/16)	34 (1-5/16)	12 (1/2)	23 (51)
1½ G 3 (4)	300	150	P73G2	123.8 (4-7/8)	152.4 (6)	455 (18)	23.9 (15/16)	36 (1-3/8)	12 (1/2)	25 (55)
1½ G 3 (4)	600	150	P73G3	123.8 (4-7/8)	152.4 (6)	455 (18)	23.9 (15/16)	36 (1-3/8)	12 (1/2)	26 (57)
1½ G 3 (4)	900	300	P73G4	123.8 (4-7/8)	165.1 (6-1/2)	505 (20)	28.4 (1-1/8)	46 (1-13/16)	13 (1/2)	42 (93)
2 G 3	1500	300	P23G5	155.6 (6-1/8)	171.5 (6-3/4)	570 (23)	28.4 (1-1/8)	51 (2)	16 (5/8)	55 (121)
2 G 3	2500	300	P23G6	155.6 (6-1/8)	171.5 (6-3/4)	570 (23)	28.4 (1-1/8)	67 (2-5/8)	16 (5/8)	61 (134)

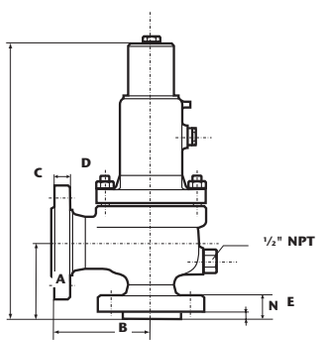
(1) Max. back pressure limits at 38°C; for higher temp. refer to ASME B16.5 flange ratings for conventional valves
(2) Tolerances for A and B : ± 1.6 mm (±1/16 in)
(3) Valves with lifting lever : add 10%
(4) 2½'' outlet flange on request in conformity with API Std 526 ed. 84, model becomes P75G


Extrapolation from ASME B16.34:2004 & API Std 526:2009
P/T Selection Chart
Orifice G
Set Pressure (Barg)
Discharge Temperature (˚C)
2500# CF8M
1500# CF8M
2500# LCC
900# LCC
600# LCC
300# LCC
150# LCC
2500# CF8M
1500# CF8M
900# CF8M
600# CF8M
300# CF8M
150# CF8M
2500# WCC
1500# WCC
900# WCC
600# WCC
300# WCC
150# WCC
2500# WC6
1500# WC6
900# WC6
600# WC6
300# WC6
300# Light WCC
CF8M (below -46˚C)
LCC
WCC (-29 to +427˚C)
WC6

ORIFICE : H
5.06 cm²
0.785 in²

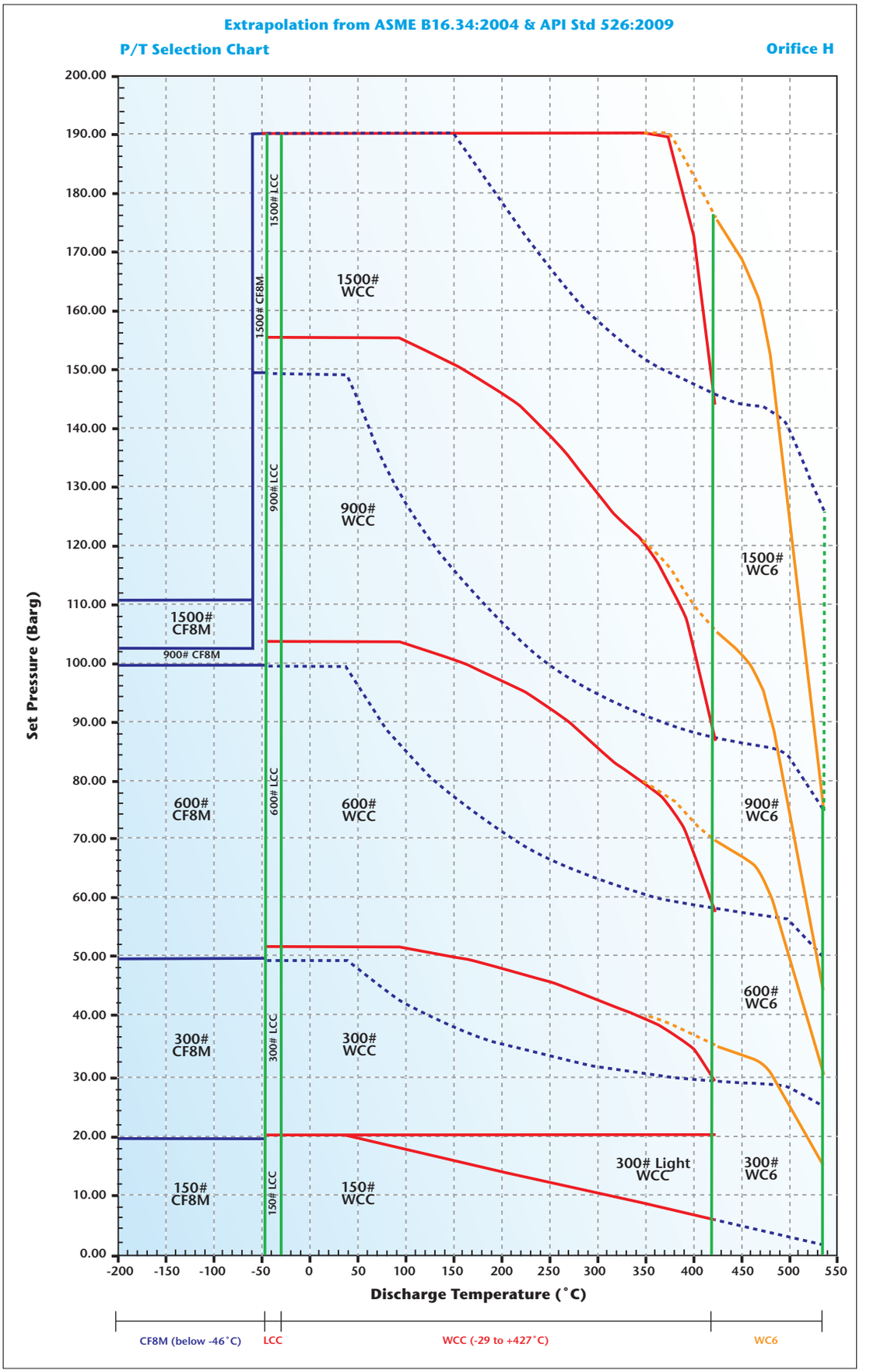
P Series (Starflow) Selection Tables
According to API Std 526 : (edition 2009)

INLETx ORIFICEx OUTLET	ANSI FLANGE RATING Inlet	Outlet	Model Number	Conven-tional	Bellows	Steam service	MAX. SET PRESSURE barg (psig) -268°C to -47°C (-450°F to -51°F)	-46°C to -29°C (-50°F to -21°F)	-29°C to +38°C (-20°F to 100°F)	<232°C (<450°F)	<427°C (<800°F)	<538°C (<1000°F)	MAX. BACK PRESSURE (1) barg (psig) Conven-tional	Bellows	MATERIALS Body	Spring
1½ H 3	150	150	P73H1	330	430	530			19.8 (285)	13 (185)	5.5 (80)		19.8 (285)	16 (230)		
1½ H 3	300	150	P73H7	330	430	530			19.8 (285)	19.8 (285)	19.8 (285)		19.8 (285)	16 (230)		
2 H 3	300	150	P23H2	330	430	530			51 (740)	42.4 (615)	29 (410)		19.8 (285)	16 (230)		
2 H 3	600	150	P23H3	330	430	530			102 (1480)	85 (1235)	58 (825)		19.8 (285)	16 (230)	SA 216 Gr. WCC	Alloy Steel
2 H 3	900	150	P23H4	330	430	530			153 (2220)	127 (1845)	85 (1235)		19.8 (285)	16 (230)		
2 H 3	1500	300	P23H5	330	430	530			190 (2750)	190 (2750)	144 (2060)		51 (740)	29 (415)		
2 H 3	300	150	P23H2	332	432	502					35 (510)	15 (225)	19.8 (285)	16 (230)		
2 H 3	600	150	P23H3	332	432	502					56 (815)	31 (445)	19.8 (285)	16 (230)	SA 216 Gr. WC6	High Temp. Alloy Steel
2 H 3	900	150	P23H4	332	432	502					84 (1225)	46 (670)	19.8 (285)	16 (230)		
2 H 3	1500	300	P23H5	332	432	502					141 (2040)	77 (1115)	51 (740)	29 (415)		
1½ H 3	150	150	P73H1	319	419			19.8 (285)					19.8 (285)	16 (230)		
1½ H 3	300	150	P73H7	319	419			19.8 (285)					19.8 (285)	16 (230)		
2 H 3	300	150	P23H2	319	419			51 (740)					19.8 (285)	16 (230)	SA 352	Alloy
2 H 3	600	150	P23H3	319	419			102 (1480)					19.8 (285)	16 (230)	Gr. LCC	Steel
2 H 3	900	150	P23H4	319	419			153 (2220)					19.8 (285)	16 (230)		
2 H 3	1500	300	P23H5	319	419			190 (2750)					51 (740)	29 (415)		
1½ H 3	150	150	P73H1	316	416		19 (275)						19 (275)	16 (230)		
1½ H 3	300	150	P73H7	316	416		19 (275)						19 (275)	16 (230)		
2 H 3	300	150	P23H2	316	416		50 (720)						19 (275)	16 (230)	SA 351	Stainless
2 H 3	600	150	P23H3	316	416		99 (1440)						19 (275)	16 (230)	Gr. CF8M	Steel
2 H 3	900	150	P23H4	316	416		102 (1485)						19 (275)	16 (230)		
2 H 3	1500	300	P23H5	316	416		110 (1600)						29 (415)	29 (415)		



INLETx ORIFICEx OUTLET	ANSI FLANGE RATING Inlet	Outlet	MODEL NUMBER	A(2) mm (in)	B(2) mm (in)	C mm (in)	D mm (in)	E mm (in)	N mm (in)	Approximate weight (3) kg (lbs)
1½ H 3	150	150	P73H1	130.2 (5-1/8)	123.8 (4-7/8)	460 (18)	23.9 (15/16)	33 (1-5/16)	14 (9/16)	23 (51)
1½ H 3	300	150	P73H7	130.2 (5-1/8)	123.8 (4-7/8)	460 (18)	23.9 (15/16)	36 (1-3/8)	14 (9/16)	25 (55)
2 H 3	300	150	P23H2	130.2 (5-1/8)	123.8 (4-7/8)	460 (18)	23.9 (15/16)	38 (1-1/2)	14 (9/16)	27 (60)
2 H 3	600	150	P23H3	154 (6-1/16)	161.9 (6-3/8)	515 (20)	23.9 (15/16)	41 (1-9/16)	14 (9/16)	38 (84)
2 H 3	900	150	P23H4	154 (6-1/16)	161.9 (6-3/8)	570 (22-1/2)	23.9 (15/16)	55 (2-1/16)	14 (9/16)	51 (112)
2 H 3	1500	300	P23H5	154 (6-1/16)	161.9 (6-3/8)	570 (22-1/2)	28.4 (1-1/8)	55 (2-1/16)	14 (9/16)	55 (121)

(1) Max. back pressure limits at 38°C; for higher temp. refer to ASME B16.5 flange ratings for conventional valves
(2) Tolerances for A and B : ± 1.6 mm (±1/16 in)
(3) Valves with lifting lever : add 10%

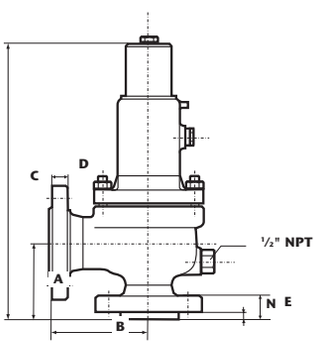

Extrapolation from ASME B16.34:2004 & API Std 526:2009
P/T Selection Chart
Orifice H
Set Pressure (Barg)
Discharge Temperature (˚C)
1500# WCC
900# WCC
600# WCC
300# WCC
150# WCC
1500# WC6
900# WC6
600# WC6
300# WC6
300# Light WCC
1500# CF8M
900# CF8M
600# CF8M
300# CF8M
150# CF8M
1500# LCC
900# LCC
600# LCC
300# LCC
150# LCC
CF8M (below -46˚C)
LCC
WCC (-29 to +427˚C)
WC6

ORIFICE : J
8.30 cm²
1.287 in²

P Series (Starflow) Selection Tables

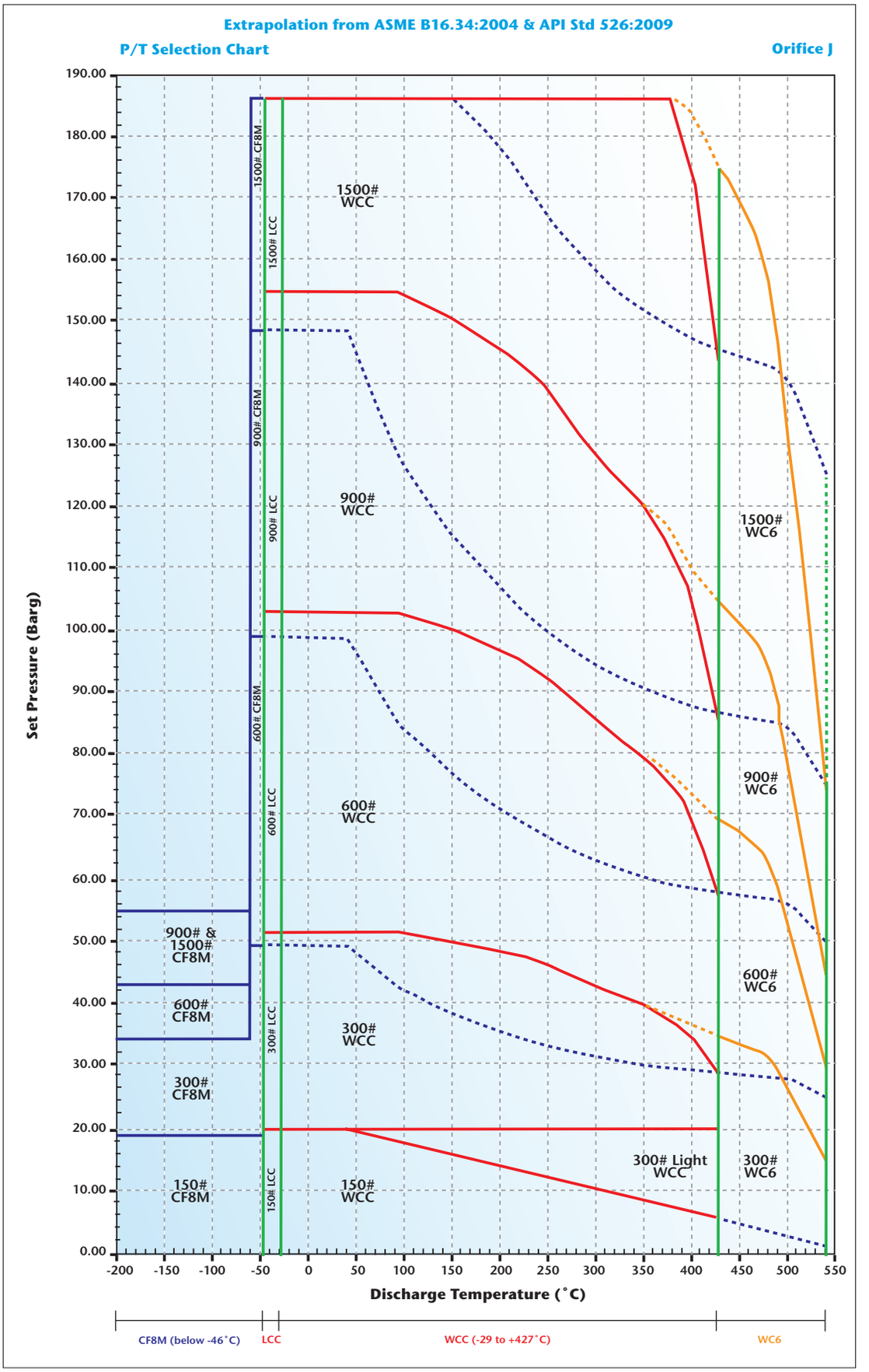
According to API Std 526 : (edition 2009)

INLETx ORIFICEx OUTLET	ANSI FLANGE RATING Inlet	Outlet	Model Number	Conventional	Bellows	Steam service	MAX. SET PRESSURE barg (psig) -268°C to -47°C (-450°F to -51°F)	-46°C to -29°C (-50°F to -21°F)	-29°C to +38°C (-20°F to 100°F)	<232°C (<450°F)	<427°C (<800°F)	<538°C (<1000°F)	MAX. BACK PRESSURE (1) barg (psig) Conventional	Bellows	MATERIALS Body	Spring
2 J 3	150	150	P23J1	330	430	530			19.8 (285)	13 (185)	5.5 (80)		19.8 (285)	16 (230)		
2 J 3	300	150	P23J7	330	430	530			19.8 (285)	19.8 (285)	19.8 (285)		19.8 (285)	16 (230)		
3 J 4 (5)	300	150	P34J2	330	430	530			51 (740)	42.4 (615)	29 (410)		19.8 (285)	16 (230)	SA 216	Alloy
3 J 4 (5)	600	150	P34J3	330	430	530			102 (1480)	85 (1235)	58 (825)		19.8 (285)	16 (230)	Gr. WCC	Steel
3 J 4	900	150	P34J4	330	430	530			153 (2220)	127 (1845)	85 (1235)		19.8 (285)	16 (230)		
3 J 4	1500	300	P34J5	330	430	530			186 (2700)	186 (2700)	144 (2060)		41 (600)	16 (230)		
3 J 4 (5)	300	150	P34J2	332	432	502					35 (510)	15 (225)	19.8 (285)	16 (230)		
3 J 4 (5)	600	150	P34J3	332	432	502					56 (815)	31 (445)	19.8 (285)	16 (230)	SA 216	High Temp.
3 J 4	900	150	P34J4	332	432	502					84 (1225)	46 (670)	19.8 (285)	16 (230)	Gr. WC6	Alloy
3 J 4	1500	300	P34J5	332	432	502					141 (2040)	77 (1115)	41 (600)	16 (230)		Steel
2 J 3	150	150	P23J1	319	419			19.8 (285)					19.8 (285)	16 (230)		
2 J 3	300	150	P23J7	319	419			19.8 (285)					19.8 (285)	16 (230)		
3 J 4 (5)	300	150	P34J2	319	419			51 (740)					19.8 (285)	16 (230)	SA 352	Alloy
3 J 4 (5)	600	150	P34J3	319	419			102 (1480)					19.8 (285)	16 (230)	Gr. LCC	Steel
3 J 4	900	150	P34J4	319	419			153 (2220)					19.8 (285)	16 (230)		
3 J 4	1500	300	P34J5	319	419			186 (2700)					41 (600)	16 (230)		
2 J 3	150	150	P23J1	316	416		19 (275)						19 (275)	16 (230)		
2 J 3	300	150	P23J7	316	416		19 (275)						19 (275)	16 (230)		
3 J 4 (5)	300	150	P34J2	316	416		34 (500)						19 (275)	16 (230)	SA 351	Stainless
3 J 4 (5)	600	150	P34J3	316	416		43 (625)						19 (275)	16 (230)	Gr. CF8M	Steel
3 J 4	900	150	P34J4	316	416		55 (800)						19 (275)	16 (230)		
3 J 4	1500	300	P34J5	316	416		55 (800)						41 (600)	16 (230)		



INLETx ORIFICEx OUTLET	ANSI FLANGE RATING Inlet	Outlet	MODEL NUMBER	A(2) mm (in)	B(2) mm (in)	C mm (in)	D mm (in)	E mm (in)	N mm (in)	Approximate weight (3) kg (lbs)
2 J 3	150	150	P23J1	136.5 (5-3/8)	123.8 (4-7/8)	515 (20)	23.9 (15/16)	33 (1-5/16)	14 (9/16)	33 (73)
2 J 3	300	150	P23J7	136.5 (5-3/8)	123.8 (4-7/8)	515 (20)	23.9 (15/16)	38 (1-1/2)	14 (9/16)	35 (77)
3 J 4 (5)	300	150	P34J2	184.1 (7-1/4)	181 (7-1/8)	550 (22)	23.9 (15/16)	44 (1-3/4)	14 (9/16)	49 (108)
3 J 4 (5)	600	150	P34J3	184.1 (7-1/4)	181 (7-1/8)	590 (23)	23.9 (15/16)	47 (1-7/8)	14 (9/16)	60 (132)
3 J 4	900	150	P34J4	184.1 (7-1/4)	181 (7-1/8)	765 (30)	23.9 (15/16)	54 (2-1/16)	14 (9/16)	97 (213)
3 J 4	1500	300	P34J5	184.1 (7-1/4)	181 (7-1/8)	765 (30)	31.8 (1-1/4)	64 (2-1/2)	14 (9/16)	108 (238)

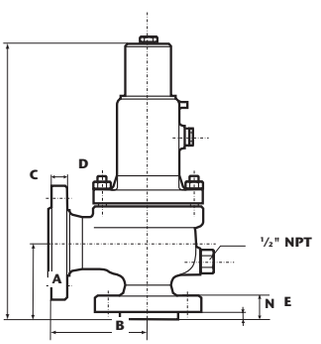
(1) Max. back pressure limits at 38°C; for higher temp. refer to ASME B16.5 flange ratings for conventional valves
(2) Tolerances for A and B : ± 1.6 mm (±1/16 in)
(3) Valves with lifting lever : add 10%
(5) 2 1/2'' inlet flange on request in conformity with API Std 526 ed. 84, model becomes P54J


Extrapolation from ASME B16.34:2004 & API Std 526:2009
P/T Selection Chart
Orifice J
Set Pressure (Barg)
190.00
180.00
170.00
160.00
150.00
140.00
130.00
120.00
110.00
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
1500# CF8M
1500# LCC
900# CF8M
900# LCC
600# CF8M
600# LCC
300# LCC
150# LCC
1500# WCC
900# WCC
600# WCC
300# WCC
150# WCC
1500# WC6
900# WC6
600# WC6
300# WC6
300# Light WCC
900# & 1500# CF8M
600# CF8M
300# CF8M
150# CF8M
-200 -150 -100 -50 0 50 100 150 200 250 300 350 400 450 500 550
Discharge Temperature (˚C)
CF8M (below -46˚C)
LCC
WCC (-29 to +427˚C)
WC6

ORIFICE : K
11.86 cm²
1.838 in²

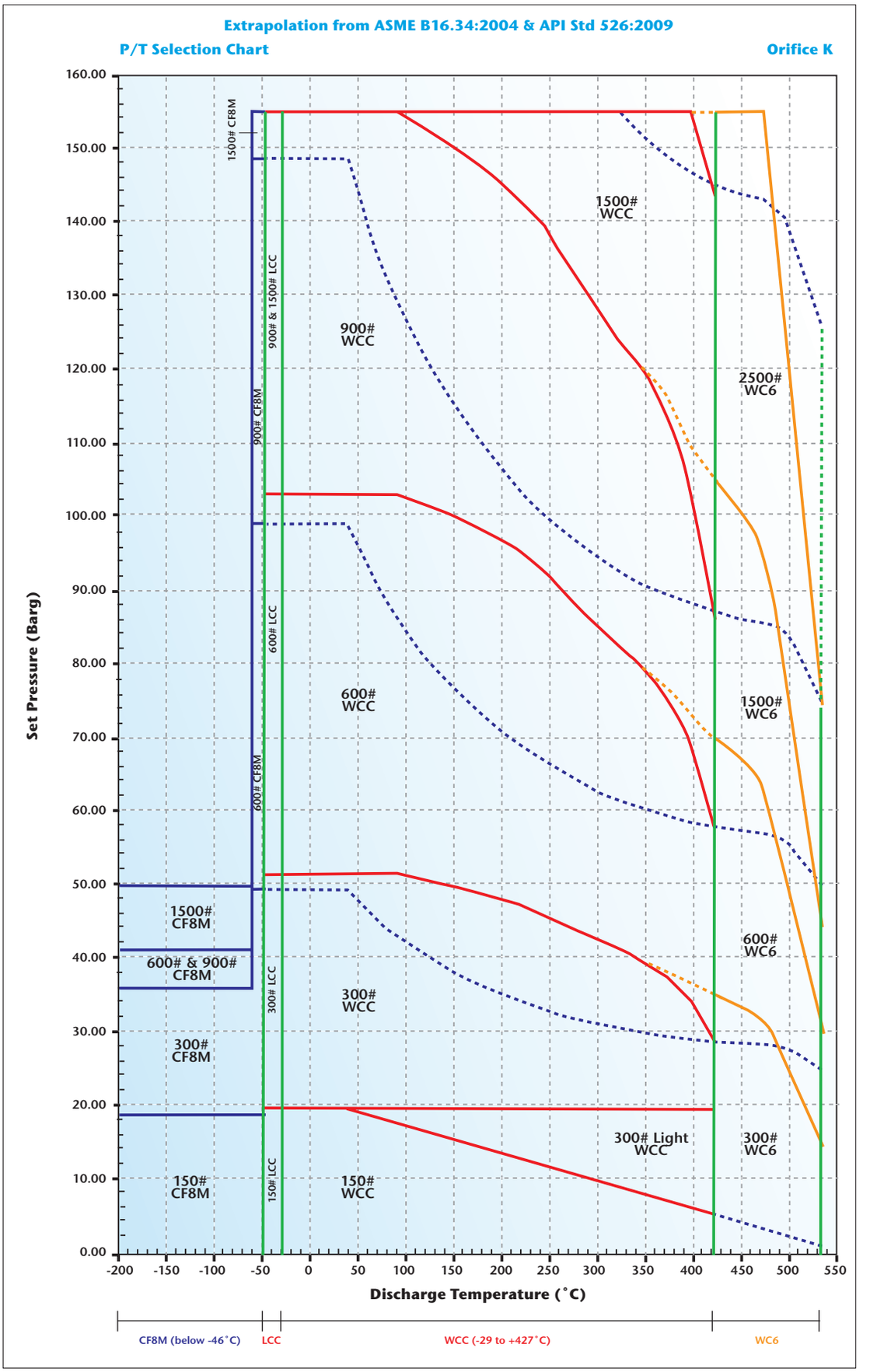
P Series (Starflow) Selection Tables
According to API Std 526 : (edition 2009)

INLETx ORIFICEx OUTLET	ANSI FLANGE RATING Inlet	Outlet	Model Number	Conventional	Bellows	Steam service	MAX. SET PRESSURE barg (psig) -268°C to -47°C (-450°F to -51°F)	-46°C to -29°C (-50°F to -21°F)	-29°C to +38°C (-20°F to 100°F)	<232°C (<450°F)	<427°C (<800°F)	<538°C (<1000°F)	MAX. BACK PRESSURE (1) barg (psig) Conventional	Bellows	MATERIALS Body	Spring
3 K 4	150	150	P34K1	330	430	530			19.8 (285)	13 (185)	5.5 (80)		19.8 (285)	10 (150)		
3 K 4	300	150	P34K7	330	430	530			19.8 (285)	19.8 (285)	19.8 (285)		19.8 (285)	10 (150)		
3 K 4	300	150	P34K2	330	430	530			51 (740)	42.4 (615)	29 (410)		19.8 (285)	10 (150)	SA 216	Alloy
3 K 4	600	150	P34K3	330	430	530			102 (1480)	85 (1235)	58 (825)		19.8 (285)	14 (200)	Gr. WCC	Steel
3 K 6	900	150	P36K4	330	430	530			153 (2220)	127 (1845)	85 (1235)		19.8 (285)	14 (200)		
3 K 6	1500	300	P36K5	330	430	530			153 (2220)	153 (2220)	144 (2060)		41 (600)	14 (200)		
3 K 4	300	150	P34K2	332	432	502					35 (510)	15 (225)	19.8 (285)	10 (150)		
3 K 4	600	150	P34K3	332	432	502					56 (815)	31 (445)	19.8 (285)	14 (200)	SA 216	High Temp.
3 K 6	900	150	P36K4	332	432	502					84 (1225)	46 (670)	19.8 (285)	14 (200)	Gr. WC6	Alloy
3 K 6	1500	300	P36K5	332	432	502					141 (2040)	77 (1115)	41 (600)	14 (200)		Steel
3 K 4	150	150	P34K1	319	419			19.8 (285)					19.8 (285)	10 (150)		
3 K 4	300	150	P34K7	319	419			19.8 (285)					19.8 (285)	10 (150)		
3 K 4	300	150	P34K2	319	419			51 (740)					19.8 (285)	10 (150)	SA 352	Alloy
3 K 4	600	150	P34K3	319	419			102 (1480)					19.8 (285)	14 (200)	Gr. LCC	Steel
3 K 6	900	150	P36K4	319	419			153 (2220)					19.8 (285)	14 (200)		
3 K 6	1500	300	P36K5	319	419			153 (2220)					41 (600)	14 (200)		
3 K 4	150	150	P34K1	316	416		19 (275)						19 (275)	10 (150)		
3 K 4	300	150	P34K7	316	416		19 (275)						19 (275)	10 (150)		
3 K 4	300	150	P34K2	316	416		36 (525)						19 (275)	10 (150)	SA 351	Stainless
3 K 4	600	150	P34K3	316	416		41 (600)						19 (275)	14 (200)	Gr. CF8M	Steel
3 K 6	900	150	P36K4	316	416		41 (600)						19 (275)	14 (200)		
3 K 6	1500	300	P36K5	316	416		52 (750)						41 (600)	14 (200)		



INLETx ORIFICEx OUTLET	ANSI FLANGE RATING Inlet	Outlet	MODEL NUMBER	A(2) mm (in)	B(2) mm (in)	C mm (in)	D mm (in)	E mm (in)	N mm (in)	Approximate weight (3) kg (lbs)
3 K 4	150	150	P34K1	155.5 (6-1/8)	161.9 (6-3/8)	580 (23)	23.9 (15/16)	39 (1-1/4)	14 (9/16)	49 (108)
3 K 4	300	150	P34K7	155.5 (6-1/8)	161.9 (6-3/8)	580 (23)	23.9 (15/16)	45 (1-3/4)	14 (9/16)	54 (120)
3 K 4	300	150	P34K2	155.5 (6-1/8)	161.9 (6-3/8)	580 (23)	23.9 (15/16)	45 (1-3/4)	14 (9/16)	56 (123)
3 K 4	600	150	P34K3	184.1 (7-1/4)	181 (7-1/8)	635 (25)	23.9 (15/16)	47 (1-7/8)	14 (9/16)	68 (150)
3 K 6	900	150	P36K4	198.4 (7-13/16)	215.9 (8-1/2)	785 (31)	25.4 (1)	53 (2-1/16)	14 (9/16)	112 (247)
3 K 6	1500	300	P36K5	196.8 (7-3/4)	215.9 (8-1/2)	785 (31)	36.6 (1-7/16)	63 (2-7/16)	14 (9/16)	125 (275)

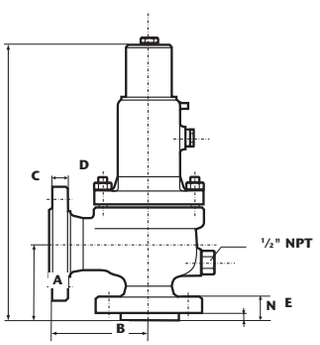
(1) Max. back pressure limits at 38°C; for higher temp. refer to ASME B16.5 flange ratings for conventional valves
(2) Tolerances for A and B : ± 1.6 mm (±1/16 in)
(3) Valves with lifting lever : add 10%


Extrapolation from ASME B16.34:2004 & API Std 526:2009
P/T Selection Chart
Orifice K
Set Pressure (Barg)
160.00
150.00
140.00
130.00
120.00
110.00
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
1500# CF8M
900# & 1500# LCC
900# CF8M
600# LCC
600# CF8M
300# LCC
150# LCC
1500# WCC
900# WCC
600# WCC
300# WCC
150# WCC
2500# WC6
1500# WC6
600# WC6
300# WC6
1500# CF8M
600# & 900# CF8M
300# CF8M
150# CF8M
300# Light WCC
-200 -150 -100 -50 0 50 100 150 200 250 300 350 400 450 500 550
Discharge Temperature (˚C)
CF8M (below -46˚C)
LCC
WCC (-29 to +427˚C)
WC6

ORIFICE : L
18.41 cm²
2.853 in²

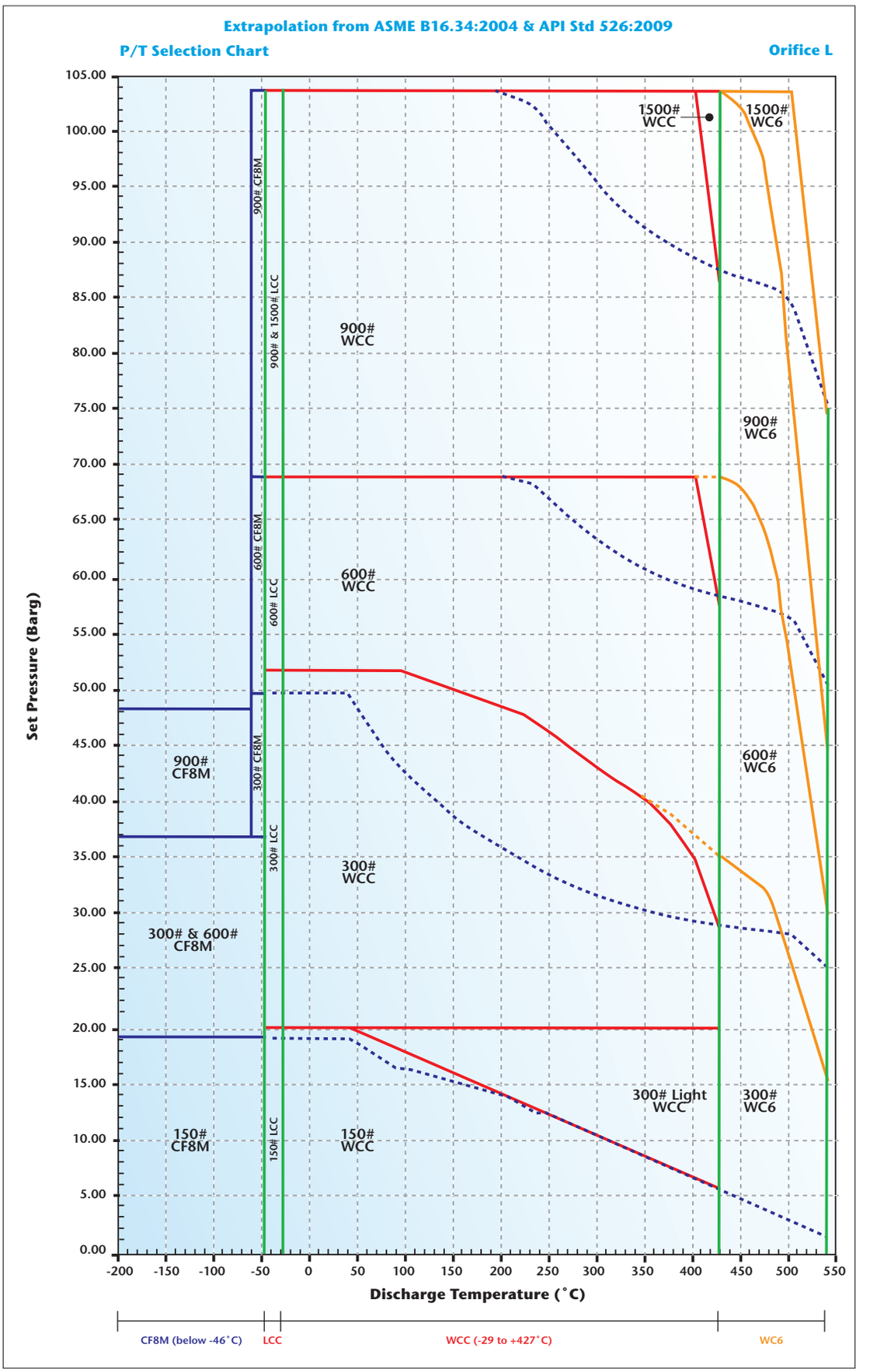
P Series (Starflow) Selection Tables
According to API Std 526 : (edition 2009)

INLETx ORIFICEx OUTLET	ANSI FLANGE RATING Inlet	Outlet	Model Number	Conventional	Bellows	Steam service	MAX. SET PRESSURE barg (psig) -268°C to -47°C (-450°F to -51°F)	-46°C to -29°C (-50°F to -21°F)	-29°C to +38°C (-20°F to 100°F)	<232°C (<450°F)	<427°C (<800°F)	<538°C (<1000°F)	MAX. BACK PRESSURE (1) barg (psig) Conventional	Bellows	MATERIALS Body	Spring
3 L 4	150	150	P34L1	330	430	530			19.8 (285)	13 (185)	5.5 (80)		19.8 (285)	7 (100)		
3 L 4	300	150	P34L7	330	430	530			19.8 (285)	19.8 (285)	19.8 (285)		19.8 (285)	7 (100)		
4 L 6	300	150	P46L2	330	430	530			51 (740)	42.4 (615)	28 (410)		19.8 (285)	12 (170)	SA 216	Alloy
4 L 6	600	150	P46L3	330	430	530			69 (1000)	69 (1000)	57 (825)		19.8 (285)	12 (170)	Gr. WCC	Steel
4 L 6	900	150	P46L4	330	430	530			103 (1500)	103 (1500)	85 (1235)		19.8 (285)	12 (170)		
4 L 6	1500	150	P46L5	330	430	530				103 (1500)	103 (1500)		19.8 (285)	12 (170)		
4 L 6	300	150	P46L2	332	432	502					35 (510)	16 (225)	19.8 (285)	12 (170)		
4 L 6	600	150	P46L3	332	432	502					69 (1000)	31 (445)	19.8 (285)	12 (170)	SA 216	High Temp.
4 L 6	900	150	P46L4	332	432	502					103 (1500)	46 (670)	19.8 (285)	12 (170)	Gr. WC6	Alloy
4 L 6	1500	150	P46L5	332	432	502					103 (1500)	76 (1115)	19.8 (285)	12 (170)		Steel
3 L 4	150	150	P34L1	319	419			19.8 (285)					19.8 (285)	7 (100)		
3 L 4	300	150	P34L7	319	419			19.8 (285)					19.8 (285)	7 (100)		
4 L 6	300	150	P46L2	319	419			51 (740)					19.8 (285)	12 (170)	SA 352	Alloy
4 L 6	600	150	P46L3	319	419			69 (1000)					19.8 (285)	12 (170)	Gr. LCC	Steel
4 L 6	900	150	P46L4	319	419			103 (1500)					19.8 (285)	12 (170)		
3 L 4	150	150	P34L1	316	416		19 (275)						19 (275)	7 (100)		
3 L 4	300	150	P34L7	316	416		19 (275)						19 (275)	7 (100)		
4 L 6	300	150	P46L2	316	416		37 (535)						19 (275)	12 (170)	SA 351	Stainless
4 L 6	600	150	P46L3	316	416		37 (535)						19 (275)	12 (170)	Gr. CF8M	Steel
4 L 6	900	150	P46L4	316	416		48 (700)						19 (275)	12 (170)		



INLETx ORIFICEx OUTLET	ANSI FLANGE RATING Inlet	Outlet	MODEL NUMBER	A(2) mm (in)	B(2) mm (in)	C mm (in)	D mm (in)	E mm (in)	N mm (in)	Approximate weight (3) kg (lbs)
3 L 4	150	150	P34L1	155.6 (6-1/8)	165.1 (6-1/2)	580 (23)	23.9 (15/16)	39 (1-1/2)	14 (9/16)	51 (112)
3 L 4	300	150	P34L7	155.6 (6-1/8)	165.1 (6-1/2)	580 (23)	23.9 (15/16)	45 (1-3/4)	14 (9/16)	57 (126)
4 L 6	300	150	P46L2	179.4 (7-1/16)	181 (7-1/8)	785 (31)	25.4 (1)	49 (1-15/16)	15.5 (5/8)	95 (210)
4 L 6	600	150	P46L3	179.4 (7-1/16)	203.2 (8)	845 (34)	25.4 (1)	56 (2-1/4)	15.5 (5/8)	115 (254)
4 L 6	900	150	P46L4	196.9 (7-3/4)	222.2 (8-3/4)	875 (35)	25.4 (1)	68 (2-11/16)	14.5 (9/16)	140 (310)
4 L 6	1500	150	P46L5	196.9 (7-3/4)	222.2 (8-3/4)	875 (35)	25.4 (1)	68 (2-11/16)	14.5 (9/16)	155 (342)

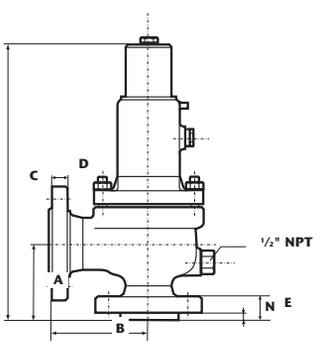
(1) Max. back pressure limits at 38°C; for higher temp. refer to ASME B16.5 flange ratings for conventional valves
(2) Tolerances for A and B : ± 1.6 mm (±1/16 in)
(3) Valves with lifting lever : add 10%


Extrapolation from ASME B16.34:2004 & API Std 526:2009
P/T Selection Chart
Orifice L
Set Pressure (Barg)
105.00
100.00
95.00
90.00
85.00
80.00
75.00
70.00
65.00
60.00
55.00
50.00
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
900# CF8M
900# & 1500# LCC
600# CF8M
600# LCC
300# CF8M
300# LCC
150# LCC
900# CF8M
300# & 600# CF8M
150# CF8M
1500# WCC
1500# WC6
900# WCC
900# WC6
600# WCC
600# WC6
300# WCC
300# Light WCC
300# WC6
150# WCC
-200 -150 -100 -50 0 50 100 150 200 250 300 350 400 450 500 550
Discharge Temperature (˚C)
CF8M (below -46˚C)
LCC
WCC (-29 to +427˚C)
WC6

ORIFICE : M
23.2 cm²
3.60 in²

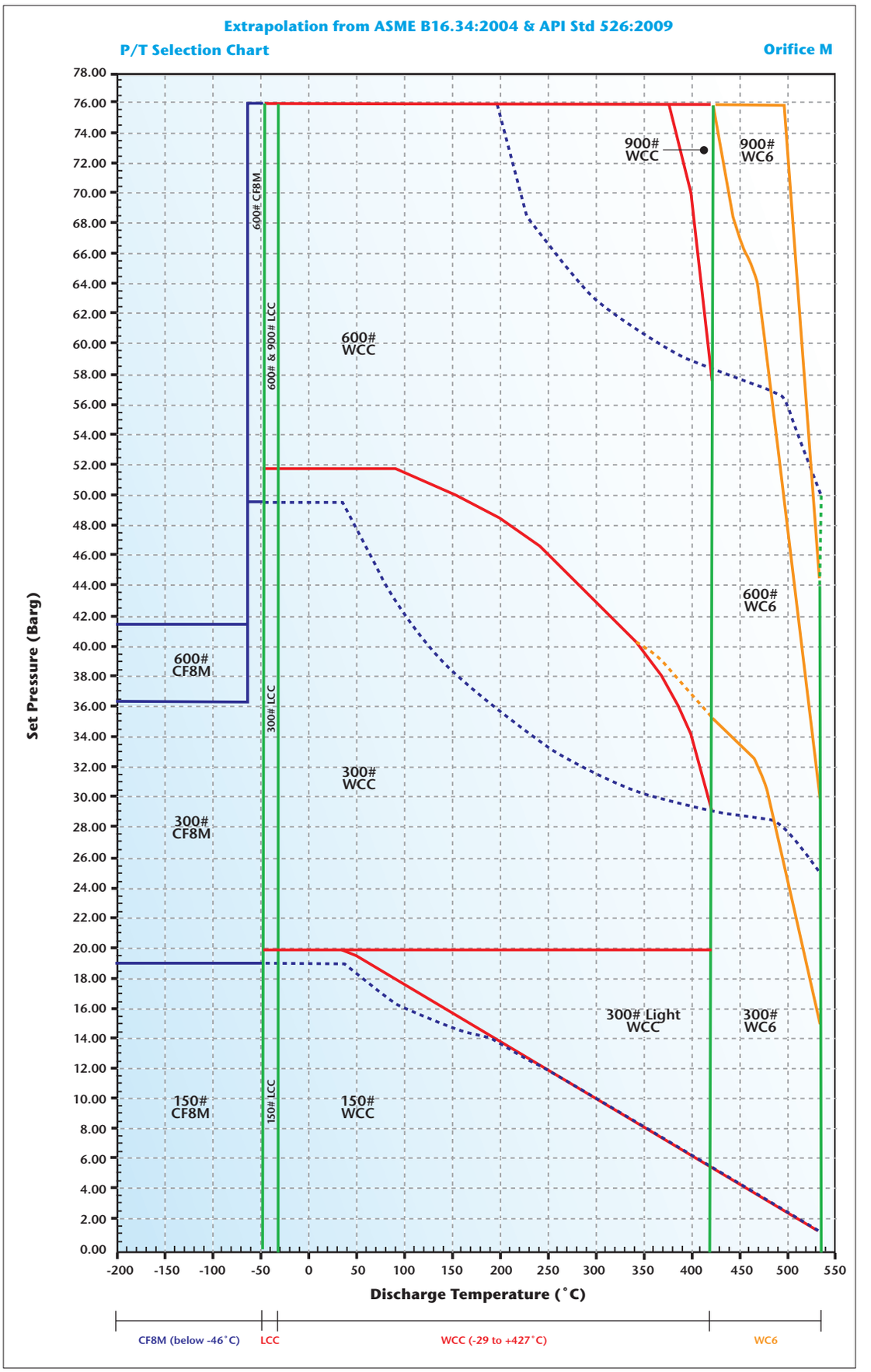
P Series (Starflow) Selection Tables
According to API Std 526 : (edition 2009)

INLETx ORIFICEx OUTLET	ANSI FLANGE RATING Inlet	Outlet	Model Number	Conventional	Bellows	Steam service	MAX. SET PRESSURE barg (psig) -268°C to -47°C (-450°F to -51°F)	-46°C to -29°C (-50°F to -21°F)	-29°C to +38°C (-20°F to 100°F)	<232°C (<450°F)	<427°C (<800°F)	<538°C (<1000°F)	MAX. BACK PRESSURE (1) barg (psig) Conventional	Bellows	MATERIALS Body	Spring
4 M 6	150	150	P46M1	330	430	530			19.8 (285)	13 (185)	5.5 (80)		19.8 (285)	5.5 (80)	SA 216 Gr. WCC	Alloy Steel
4 M 6	300	150	P46M7	330	430	530			19.8 (285)	19.8 (285)	19.8 (285)		19.8 (285)	5.5 (80)		
4 M 6	300	150	P46M2	330	430	530			51 (740)	42.4 (615)	28 (410)		19.8 (285)	11 (160)		
4 M 6	600	150	P46M3	330	430	530			76 (1100)	76 (1100)	57 (825)		19.8 (285)	11 (160)		
4 M 6	900	150	P46M4	330	430	530				76 (1100)	76 (1100)		19.8 (285)	11 (160)		
4 M 6	300	150	P46M2	332	432	502					35 (510)	16 (225)	19.8 (285)	11 (160)	SA 216 Gr. WC6	High Temp. Alloy Steel
4 M 6	600	150	P46M3	332	432	502					70 (1015)	31 (445)	19.8 (285)	11 (160)		
4 M 6	900	150	P46M4	332	432	502					76 (1100)	46 (670)	19.8 (285)	11 (160)		
4 M 6	150	150	P46M1	319	419			19.8 (285)					19.8 (285)	5.5 (80)	SA 352 Gr. LCC	Alloy Steel
4 M 6	300	150	P46M7	319	419			19.8 (285)					19.8 (285)	5.5 (80)		
4 M 6	300	150	P46M2	319	419			51 (740)					19.8 (285)	11 (160)		
4 M 6	600	150	P46M3	319	419			76 (1100)					19.8 (285)	11 (160)		
4 M 6	150	150	P46M1	316	416		19 (275)						19 (275)	5.5 (80)	SA 351 Gr. CF8M	Stainless Steel
4 M 6	300	150	P46M7	316	416		19 (275)						19 (275)	5.5 (80)		
4 M 6	300	150	P46M2	316	416		36 (525)						19 (275)	11 (160)		
4 M 6	600	150	P46M3	316	416		41 (600)						19 (275)	11 (160)		



INLETx ORIFICEx OUTLET	ANSI FLANGE RATING Inlet	Outlet	MODEL NUMBER	A(2) mm (in)	B(2) mm (in)	C mm (in)	D mm (in)	E mm (in)	N mm (in)	Approximate weight (3) kg (lbs)
4 M 6	150	150	P46M1	177.8 (7)	184.1 (7-1/4)	725 (29)	25.4 (1)	40 (1-9/16)	14 (9/16)	85 (187)
4 M 6	300	150	P46M7	177.8 (7)	184.1 (7-1/4)	725 (29)	25.4 (1)	48 (1-7/8)	14 (9/16)	88 (194)
4 M 6	300	150	P46M2	177.8 (7)	184.1 (7-1/4)	785 (31)	25.4 (1)	48 (1-7/8)	14 (9/16)	95 (210)
4 M 6	600	150	P46M3	177.8 (7)	203.2 (8)	845 (34)	25.4 (1)	54 (2-1/8)	14 (9/16)	115 (254)
4 M 6	900	150	P46M4	196.8 (7-3/4)	222.2 (8-3/4)	950 (38)	25.4 (1)	68 (2-1 1/16)	14 (9/16)	165 (364)

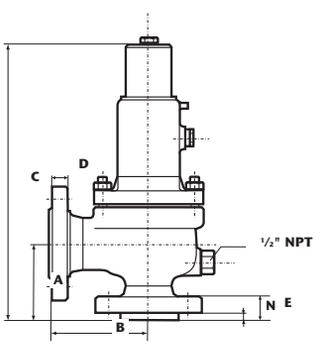
(1) Max. back pressure limits at 38°C; for higher temp. refer to ASME B16.5 flange ratings for conventional valves
(2) Tolerances for A and B : ± 1.6 mm (±1/16 in)
(3) Valves with lifting lever : add 10%


Extrapolation from ASME B16.34:2004 & API Std 526:2009
P/T Selection Chart
Orifice M
Set Pressure (Barg)
Discharge Temperature (˚C)
600# CF8M
600# & 900# LCC
600# WCC
900# WCC
900# WC6
600# WC6
300# LCC
300# WCC
300# CF8M
300# Light WCC
300# WC6
150# CF8M
150# LCC
150# WCC
CF8M (below -46˚C)
LCC
WCC (-29 to +427˚C)
WC6

ORIFICE : N
28 cm²
4.34 in²

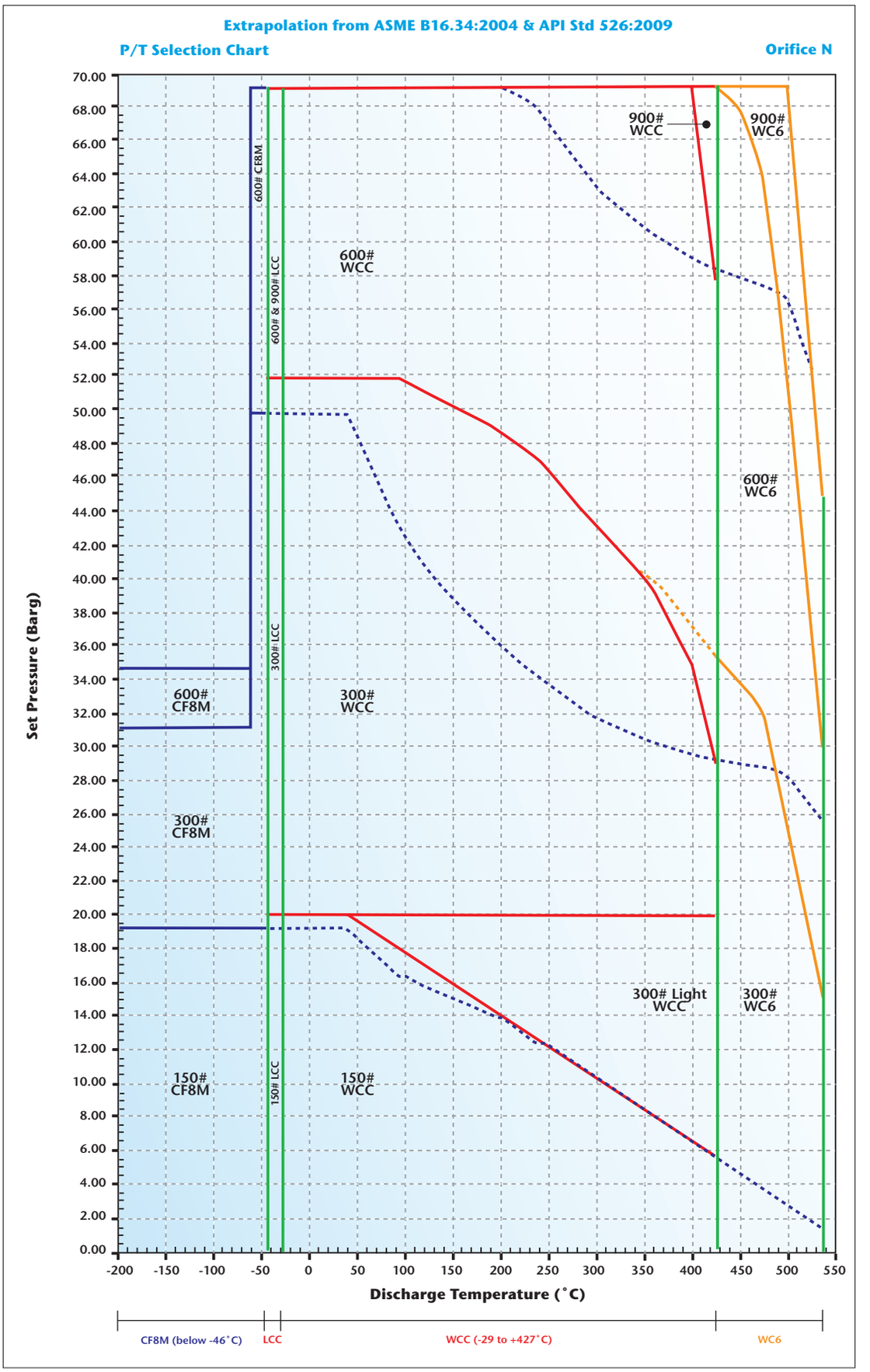
P Series (Starflow) Selection Tables
According to API Std 526 : (edition 2009)

INLETx ORIFICEx OUTLET	ANSI FLANGE RATING Inlet	Outlet	Model Number	Conven-tional	Bellows	Steam service	MAX. SET PRESSURE barg (psig) -268°C to -47°C (-450°F to -51°F)	-46°C to -29°C (-50°F to -21°F)	-29°C to +38°C (-20°F to 100°F)	<232°C (<450°F)	<427°C (<800°F)	<538°C (<1000°F)	MAX. BACK PRESSURE (1) barg (psig) Conven-tional	Bellows	MATERIALS Body	Spring
4 N 6	150	150	P46N1	330	430	530			19.8 (285)	13 (185)	5.5 (80)		19.8 (285)	5.5 (80)		
4 N 6	300	150	P46N7	330	430	530			19.8 (285)	19.8 (285)	19.8 (285)		19.8 (285)	5.5 (80)	SA 216 Gr. WCC	Alloy Steel
4 N 6	300	150	P46N2	330	430	530			51 (740)	42.4 (615)	28 (410)		19.8 (285)	11 (160)		
4 N 6	600	150	P46N3	330	430	530			69 (1000)	69 (1000)	57 (825)		19.8 (285)	11 (160)		
4 N 6	900	150	P46N4	330	430	530				69 (1000)	69 (1000)		19.8 (285)	11 (160)		
4 N 6	300	150	P46N2	332	432	502					35 (510)	16 (225)	19.8 (285)	11 (160)	SA 216 Gr. WC6	High Temp. Alloy Steel
4 N 6	600	150	P46N3	332	432	502					69 (1000)	31 (445)	19.8 (285)	11 (160)		
4 N 6	900	150	P46N4	332	432	502					69 (1000)	46 (670)	19.8 (285)	11 (160)		
4 N 6	150	150	P46N1	319	419			19.8 (285)					19.8 (285)	5.5 (80)		
4 N 6	300	150	P46N7	319	419			19.8 (285)					19.8 (285)	5.5 (80)	SA 352 Gr. LCC	Alloy Steel
4 N 6	300	150	P46N2	319	419			51 (740)					19.8 (285)	11 (160)		
4 N 6	600	150	P46N3	319	419			69 (1000)					19.8 (285)	11 (160)		
4 N 6	150	150	P46N1	316	416		19 (275)						19 (275)	5.5 (80)		
4 N 6	300	150	P46N7	316	416		19 (275)						19 (275)	5.5 (80)	SA 351 Gr. CF8M	Stainless Steel
4 N 6	300	150	P46N2	316	416		31 (450)						19 (275)	11 (160)		
4 N 6	600	150	P46N3	316	416		34 (500)						19 (275)	11 (160)		



INLETx ORIFICEx OUTLET	ANSI FLANGE RATING Inlet	Outlet	MODEL NUMBER	A(2) mm (in)	B(2) mm (in)	C mm (in)	D mm (in)	E mm (in)	N mm (in)	Approximate weight (3) kg (lbs)
4 N 6	150	150	P46N1	196.8 (7-3/4)	209.5 (8-1/4)	750 (30)	25.4 (1)	40 (1-9/16)	14 (9/16)	95 (210)
4 N 6	300	150	P46N7	196.8 (7-3/4)	209.5 (8-1/4)	750 (30)	25.4 (1)	48 (1-7/8)	14 (9/16)	100 (220)
4 N 6	300	150	P46N2	196.8 (7-3/4)	209.5 (8-1/4)	810 (32)	25.4 (1)	48 (1-7/8)	14 (9/16)	105 (232)
4 N 6	600	150	P46N3	196.8 (7-3/4)	222.2 (8-3/4)	870 (34)	25.4 (1)	54 (2-1/8)	14 (9/16)	125 (276)
4 N 6	900	150	P46N4	196.8 (7-3/4)	222.2 (8-3/4)	990 (39)	25.4 (1)	59 (2-5/16)	14 (9/16)	210 (460)

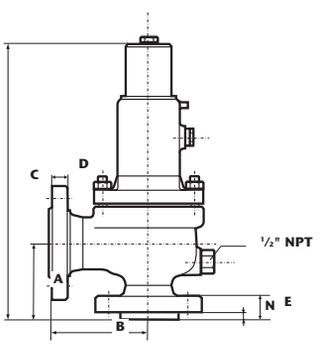
(1) Max. back pressure limits at 38°C; for higher temp. refer to ASME B16.5 flange ratings for conventional valves
(2) Tolerances for A and B : ± 1.6 mm (±1/16 in)
(3) Valves with lifting lever : add 10%


Extrapolation from ASME B16.34:2004 & API Std 526:2009
P/T Selection Chart
Orifice N
Set Pressure (Barg)
Discharge Temperature (˚C)
600# CF8M
600# & 900# LCC
300# LCC
150# LCC
900# WCC
900# WC6
600# WCC
600# WC6
600# CF8M
300# WCC
300# CF8M
300# Light WCC
300# WC6
150# CF8M
150# WCC
CF8M (below -46˚C)
LCC
WCC (-29 to +427˚C)
WC6

ORIFICE : P
41.2 cm²
6.38 in²

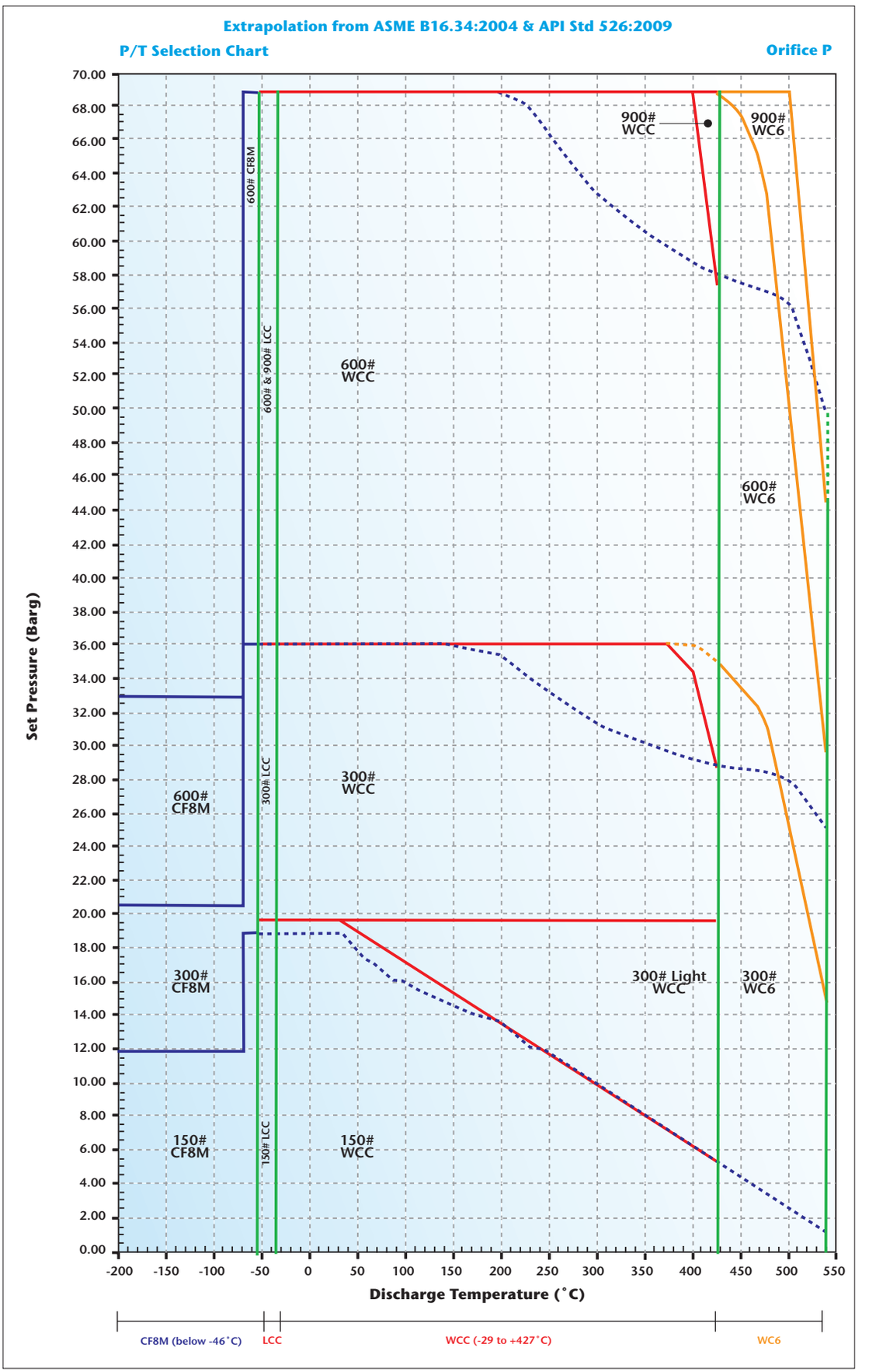
P Series (Starflow) Selection Tables
According to API Std 526 : (edition 2009)

INLETx ORIFICEx OUTLET	ANSI FLANGE RATING Inlet	Outlet	Model Number	Conventional	Bellows	Steam service	MAX. SET PRESSURE barg (psig) -268°C to -47°C (-450°F to -51°F)	-46°C to -29°C (-50°F to -21°F)	-29°C to +38°C (-20°F to 100°F)	<232°C (<450°F)	<427°C (<800°F)	<538°C (<1000°F)	MAX. BACK PRESSURE (1) barg (psig) Conventional	Bellows	MATERIALS Body	Spring
4 P 6	150	150	P46P1	330	430	530			19.8 (285)	13 (185)	5.5 (80)		19.8 (285)	5.5 (80)		
4 P 6	300	150	P46P7	330	430	530			19.8 (285)	19.8 (285)	19.8 (285)		19.8 (285)	5.5 (80)	SA 216 Gr. WCC	Alloy Steel
4 P 6	300	150	P46P2	330	430	530			36.2 (525)	36.2 (525)	28 (410)		19.8 (285)	10 (150)		
4 P 6	600	150	P46P3	330	430	530			69 (1000)	69 (1000)	57 (825)		19.8 (285)	10 (150)		
4 P 6	900	150	P46P4	330	430	530				69 (1000)	69 (1000)		19.8 (285)	10 (150)		
4 P 6	300	150	P46P2	332	432	502					35 (510)	16 (225)	19.8 (285)	10 (150)	SA 216 Gr. WC6	High Temp. Alloy Steel
4 P 6	600	150	P46P3	332	432	502					69 (1000)	31 (445)	19.8 (285)	10 (150)		
4 P 6	900	150	P46P4	332	432	502					69 (1000)	46 (670)	19.8 (285)	10 (150)		
4 P 6	150	150	P46P1	319	419			19.8 (285)					19.8 (285)	5.5 (80)		
4 P 6	300	150	P46P7	319	419			19.8 (285)					19.8 (285)	5.5 (80)	SA 352 Gr. LCC	Alloy Steel
4 P 6	300	150	P46P2	319	419			36 (525)					19.8 (285)	10 (150)		
4 P 6	600	150	P46P3	319	419			69 (1000)					19.8 (285)	10 (150)		
4 P 6	150	150	P46P1	316	416		12 (175)						12 (175)	5.5 (80)		
4 P 6	300	150	P46P7	316	416		12 (175)						12 (175)	5.5 (80)	SA 351 Gr. CF8M	Stainless Steel
4 P 6	300	150	P46P2	316	416		21 (300)						19 (275)	10 (150)		
4 P 6	600	150	P46P3	316	416		33 (486)						19 (275)	10 (150)		



INLETx ORIFICEx OUTLET	ANSI FLANGE RATING Inlet	Outlet	MODEL NUMBER	A(2) mm (in)	B(2) mm (in)	C mm (in)	D mm (in)	E mm (in)	N mm (in)	Approximate weight (3) kg (lbs)
4 P 6	150	150	P46P1	181 (7-1/8)	228.6 (9)	795 (32)	25.4 (1)	40 (1-9/16)	14 (9/16)	105 (232)
4 P 6	300	150	P46P7	181 (7-1/8)	228.6 (9)	795 (32)	25.4 (1)	46 (1-13/16)	14 (9/16)	110 (242)
4 P 6	300	150	P46P2	225.4 (8-7/8)	254 (10)	850 (34)	25.4 (1)	48 (1-7/8)	14 (9/16)	125 (276)
4 P 6	600	150	P46P3	225.4 (8-7/8)	254 (10)	875 (35)	25.4 (1)	54 (2-1/8)	14 (9/16)	145 (320)
4 P 6	900	150	P46P4	225.4 (8-7/8)	254 (10)	1180 (47)	25.4 (1)	59 (2-5/16)	14 (9/16)	250 (550)

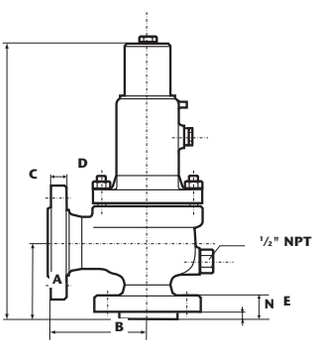
(1) Max. back pressure limits at 38°C; for higher temp. refer to ASME B16.5 flange ratings for conventional valves
(2) Tolerances for A and B : ± 1.6 mm (±1/16 in)
(3) Valves with lifting lever : add 10%


Extrapolation from ASME B16.34:2004 & API Std 526:2009
P/T Selection Chart
Orifice P
Set Pressure (Barg)
Discharge Temperature (˚C)
600# CF8M
600# & 900# LCC
300# LCC
150# LCC
900# WCC
900# WC6
600# WCC
600# WC6
300# WCC
600# CF8M
300# CF8M
300# Light WCC
300# WC6
150# CF8M
150# WCC
CF8M (below -46˚C)
LCC
WCC (-29 to +427˚C)
WC6

ORIFICE : Q
71.2 cm²
11.05 in²

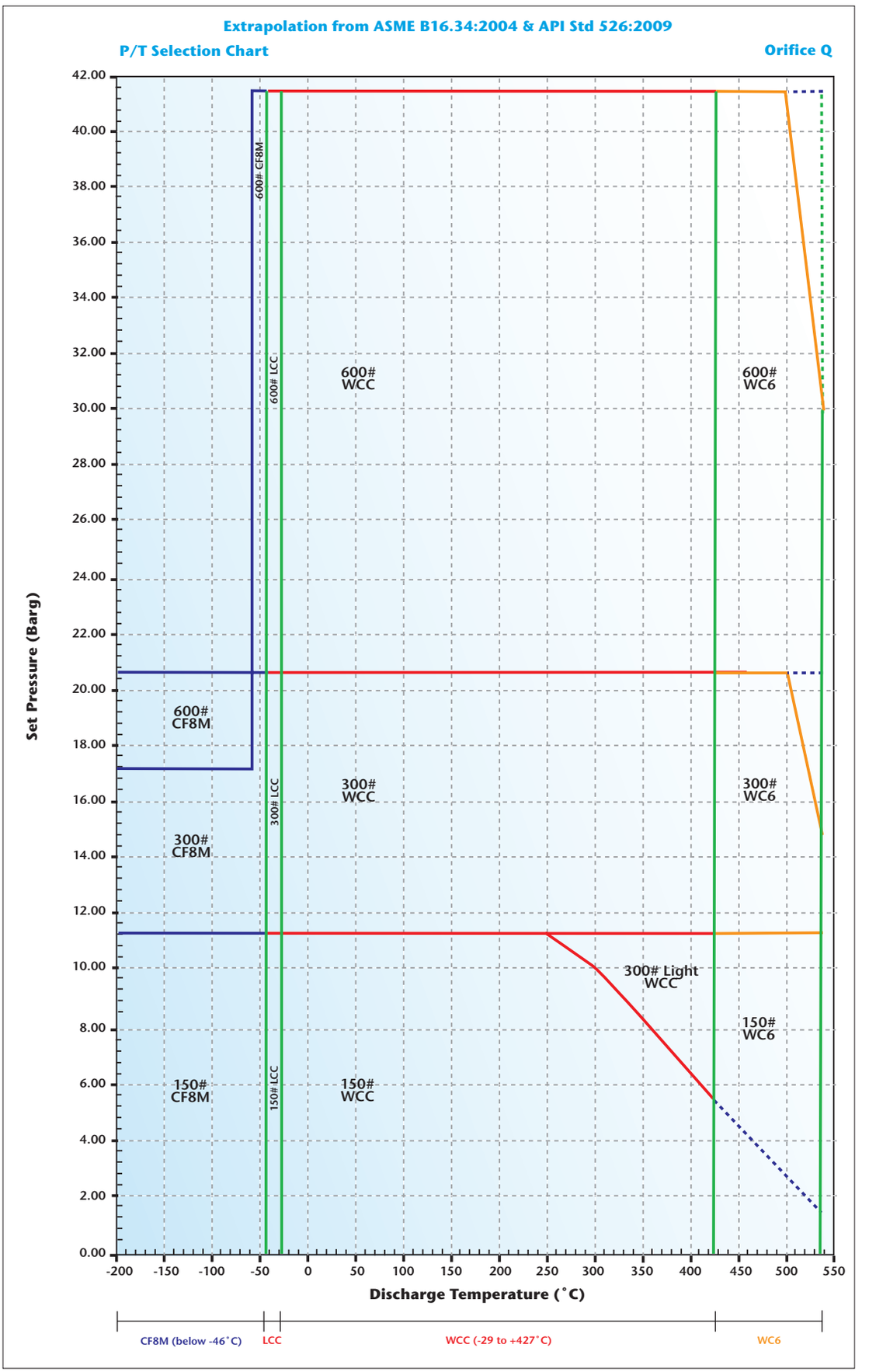
P Series (Starflow) Selection Tables
According to API Std 526 : (edition 2009)

INLETx ORIFICEx OUTLET	ANSI FLANGE RATING Inlet	Outlet	Model Number	Conventional	Bellows	Steam service	MAX. SET PRESSURE barg (psig) -268°C to -47°C (-450°F to -51°F)	-46°C to -29°C (-50°F to -21°F)	-29°C to +38°C (-20°F to 100°F)	<232°C (<450°F)	<427°C (<800°F)	<538°C (<1000°F)	MAX. BACK PRESSURE (1) barg (psig) Conventional	Bellows	MATERIALS Body	Spring
6 Q 8	150	150	P68Q1	330	430	530			11 (165)	11 (165)	5.5 (80)		8 (115)	5 (70)		
6 Q 8	300	150	P68Q7	330	430	530			11 (165)	11 (165)	11 (165)		8 (115)	5 (70)	SA 216	Alloy
6 Q 8	300	150	P68Q2	330	430	530			21 (300)	21 (300)	21 (300)		8 (115)	8 (115)	Gr. WCC	Steel
6 Q 8	600	150	P68Q3	330	430	530			41 (600)	41 (600)	41 (600)		8 (115)	8 (115)		
6 Q 8	300	150	P68Q2	332	432	502					11 (165)	11 (165)	8 (115)	8 (115)	SA 216	High Temp.
6 Q 8	600	150	P68Q3	332	432	502					41 (600)	31 (445)	8 (115)	8 (115)	Gr. WC6	Alloy Steel
6 Q 8	150	150	P68Q1	319	419			11 (165)					8 (115)	5 (70)		
6 Q 8	300	150	P68Q7	319	419			11 (165)					8 (115)	5 (70)	SA 352	Alloy
6 Q 8	300	150	P68Q2	319	419			21 (300)					8 (115)	8 (115)	Gr. LCC	Steel
6 Q 8	600	150	P68Q3	319	419			41 (600)					8 (115)	8 (115)		
6 Q 8	150	150	P68Q1	316	416		11 (165)						8 (115)	5 (70)		
6 Q 8	300	150	P68Q7	316	416		11 (165)						8 (115)	5 (70)	SA 351	Stainless
6 Q 8	300	150	P68Q2	316	416		17 (250)						8 (115)	8 (115)	Gr. CF8M	Steel
6 Q 8	600	150	P68Q3	316	416		21 (300)						8 (115)	8 (115)		



INLETx ORIFICEx OUTLET	ANSI FLANGE RATING Inlet	Outlet	MODEL NUMBER	A(2) mm (in)	B(2) mm (in)	C mm (in)	D mm (in)	E mm (in)	N mm (in)	Approximate weight (3) kg (lbs)
6 Q 8	150	150	P68Q1	239.7 (9-7/16)	241.3 (9-1/2)	950 (38)	28.6 (1-1/8)	45 (1-3/4)	18 (11/16)	215 (474)
6 Q 8	300	150	P68Q7	239.7 (9-7/16)	241.3 (9-1/2)	950 (38)	28.6 (1-1/8)	57 (2-1/4)	18 (11/16)	230 (507)
6 Q 8	300	150	P68Q2	239.7 (9-7/16)	241.3 (9-1/2)	1070 (43)	28.6 (1-1/8)	57 (2-1/4)	18 (11/16)	255 (562)
6 Q 8	600	150	P68Q3	239.7 (9-7/16)	241.3 (9-1/2)	1140 (45)	28.6 (1-1/8)	68 (2-11/16)	18 (11/16)	305 (672)

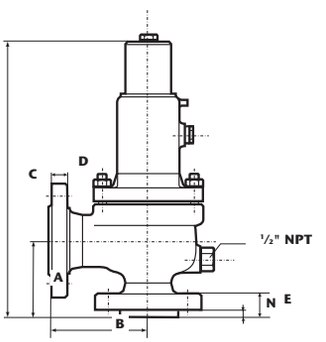
(1) Max. back pressure limits at 38°C; for higher temp. refer to ASME B16.5 flange ratings for conventional valves
(2) Tolerances for A and B : ± 3.2 mm (±1/8 in)
(3) Valves with lifting lever : add 10%


Extrapolation from ASME B16.34:2004 & API Std 526:2009
P/T Selection Chart
Orifice Q
Set Pressure (Barg)
Discharge Temperature (˚C)
42.00
40.00
38.00
36.00
34.00
32.00
30.00
28.00
26.00
24.00
22.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
-200
-150
-100
-50
0
50
100
150
200
250
300
350
400
450
500
550
600# CF8M
600# LCC
600# WCC
600# WC6
600# CF8M
300# LCC
300# WCC
300# WC6
300# CF8M
300# Light WCC
150# WC6
150# CF8M
150# LCC
150# WCC
CF8M (below -46˚C)
LCC
WCC (-29 to +427˚C)
WC6

ORIFICE : R
103.2 cm²
16.00 in²

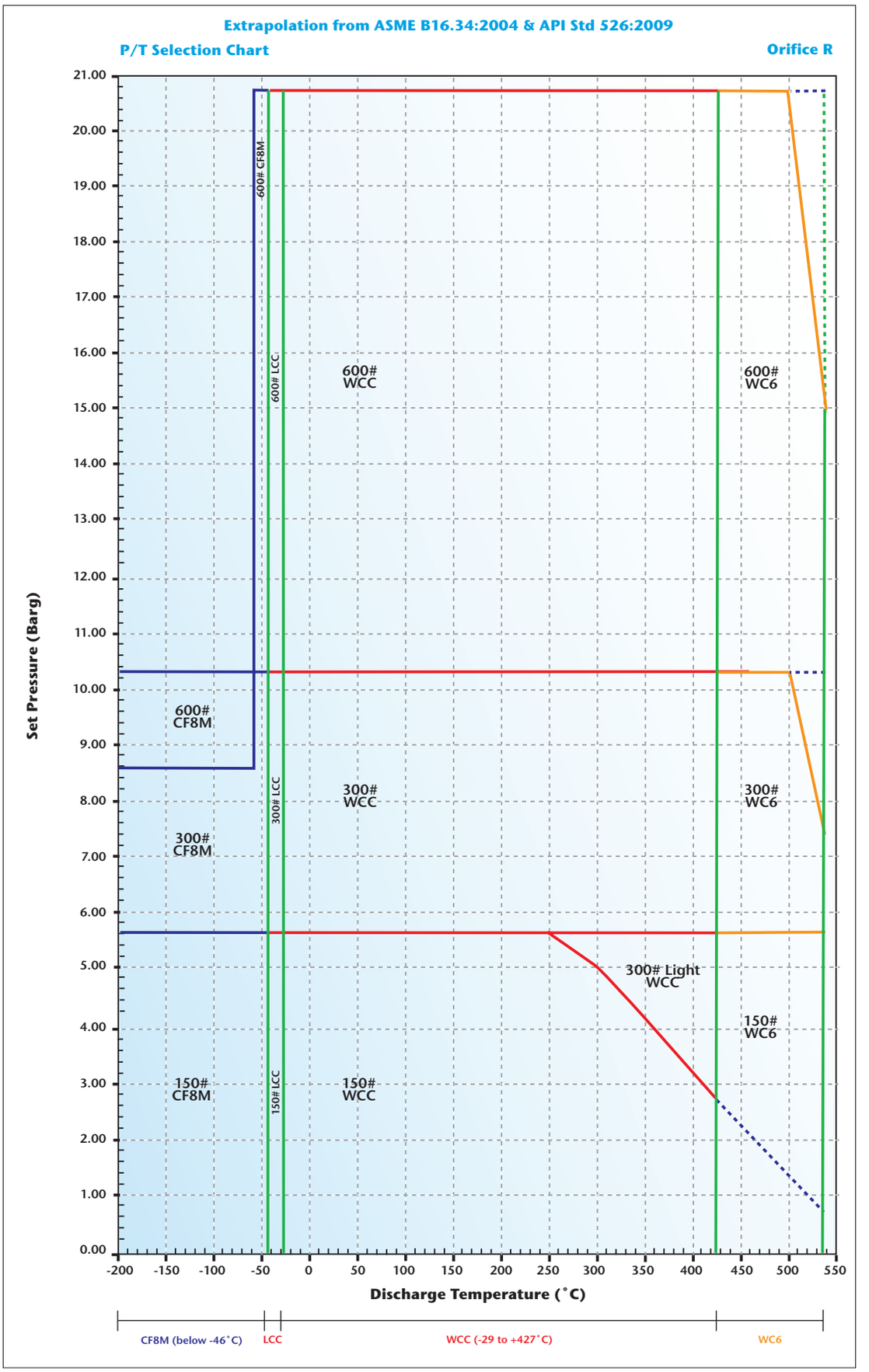
P Series (Starflow) Selection Tables
According to API Std 526 : (edition 2009)

INLETx ORIFICEx OUTLET	ANSI FLANGE RATING Inlet	Outlet	Model Number	Conventional	Bellows	Steam service	MAX. SET PRESSURE barg (psig) -268°C to -47°C (-450°F to -51°F)	-46°C to -29°C (-50°F to -21°F)	-29°C to +38°C (-20°F to 100°F)	<232°C (<450°F)	<427°C (<800°F)	<538°C (<1000°F)	MAX. BACK PRESSURE (1) barg (psig) Conventional	Bellows	MATERIALS Body	Spring
6 R 8	150	150	P68R1	330	430	530			7 (100)	7 (100)	5.5 (80)		4 (60)	4 (60)		
6 R 8	300	150	P68R7	330	430	530			7 (100)	7 (100)	7 (100)		4 (60)	4 (60)	SA 216	Alloy
6 R 10	300	150	P69R2	330	430	530			16 (230)	16 (230)	16 (230)		7 (100)	7 (100)	Gr. WCC	Steel
6 R 10	600	150	P69R3	330	430	530			21 (300)	21 (300)	21 (300)		7 (100)	7 (100)		
6 R 8	300	150	P69R2	332	432	502					7 (100)	7 (100)	4 (60)	4 (60)	SA 216	High Temp.
6 R 10	600	150	P69R3	332	432	502					21 (300)	21 (300)	7 (100)	7 (100)	Gr. WC6	Alloy Steel
6 R 8	150	150	P68R1	319	419			7 (100)					4 (60)	4 (60)		
6 R 8	300	150	P68R7	319	419			7 (100)					4 (60)	4 (60)	SA 352	Alloy
6 R 10	300	150	P69R2	319	419			16 (230)					7 (100)	7 (100)	Gr. LCC	Steel
6 R 10	600	150	P69R3	319	419			21 (300)					7 (100)	7 (100)		
6 R 8	150	150	P68R1	316	416		3.8 (55)						3.8 (55)	3.8 (55)		
6 R 8	300	150	P68R7	316	416		3.8 (55)						3.8 (55)	3.8 (55)	SA 351	Stainless
6 R 10	300	150	P69R2	316	416		10 (150)						7 (100)	7 (100)	Gr. CF8M	Steel
6 R 10	600	150	P69R3	316	416		14 (200)						7 (100)	7 (100)		



INLETx ORIFICEx OUTLET	ANSI FLANGE RATING Inlet	Outlet	MODEL NUMBER	A(2) mm (in)	B(2) mm (in)	C mm (in)	D mm (in)	E mm (in)	N mm (in)	Approximate weight (3) kg (lbs)
6 R 8	150	150	P68R1	239.7 (9-7/16)	241.3 (9-1/2)	950 (38)	28.6 (1-1/8)	45 (1-3/4)	18 (11/16)	215 (474)
6 R 8	300	150	P68R7	239.7 (9-7/16)	241.3 (9-1/2)	950 (38)	28.6 (1-1/8)	57 (2-1/4)	18 (11/16)	230 (507)
6 R 10	300	150	P69R2	239.7 (9-7/16)	266.7 (10-1/2)	1070 (43)	30.2 (1-3/16)	57 (2-1/4)	18 (11/16)	275 (606)
6 R 10	600	150	P69R3	239.7 (9-7/16)	266.7 (10-1/2)	1140 (45)	30.2 (1-3/16)	68 (2-11/16)	18 (11/16)	325 (716)

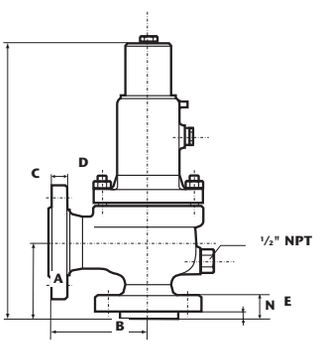
(1) Max. back pressure limits at 38°C; for higher temp. refer to ASME B16.5 flange ratings for conventional valves
(2) Tolerances for A and B : ± 3.2 mm (±1/8 in)
(3) Valves with lifting lever : add 10%


Extrapolation from ASME B16.34:2004 & API Std 526:2009
P/T Selection Chart
Orifice R
Set Pressure (Barg)
Discharge Temperature (˚C)
600# CF8M
600# LCC
600# WCC
600# WC6
600# CF8M
300# LCC
300# WCC
300# WC6
300# CF8M
300# Light WCC
150# WC6
150# CF8M
150# LCC
150# WCC
CF8M (below -46˚C)
LCC
WCC (-29 to +427˚C)
WC6

ORIFICE : T
168 cm²
26.00 in²

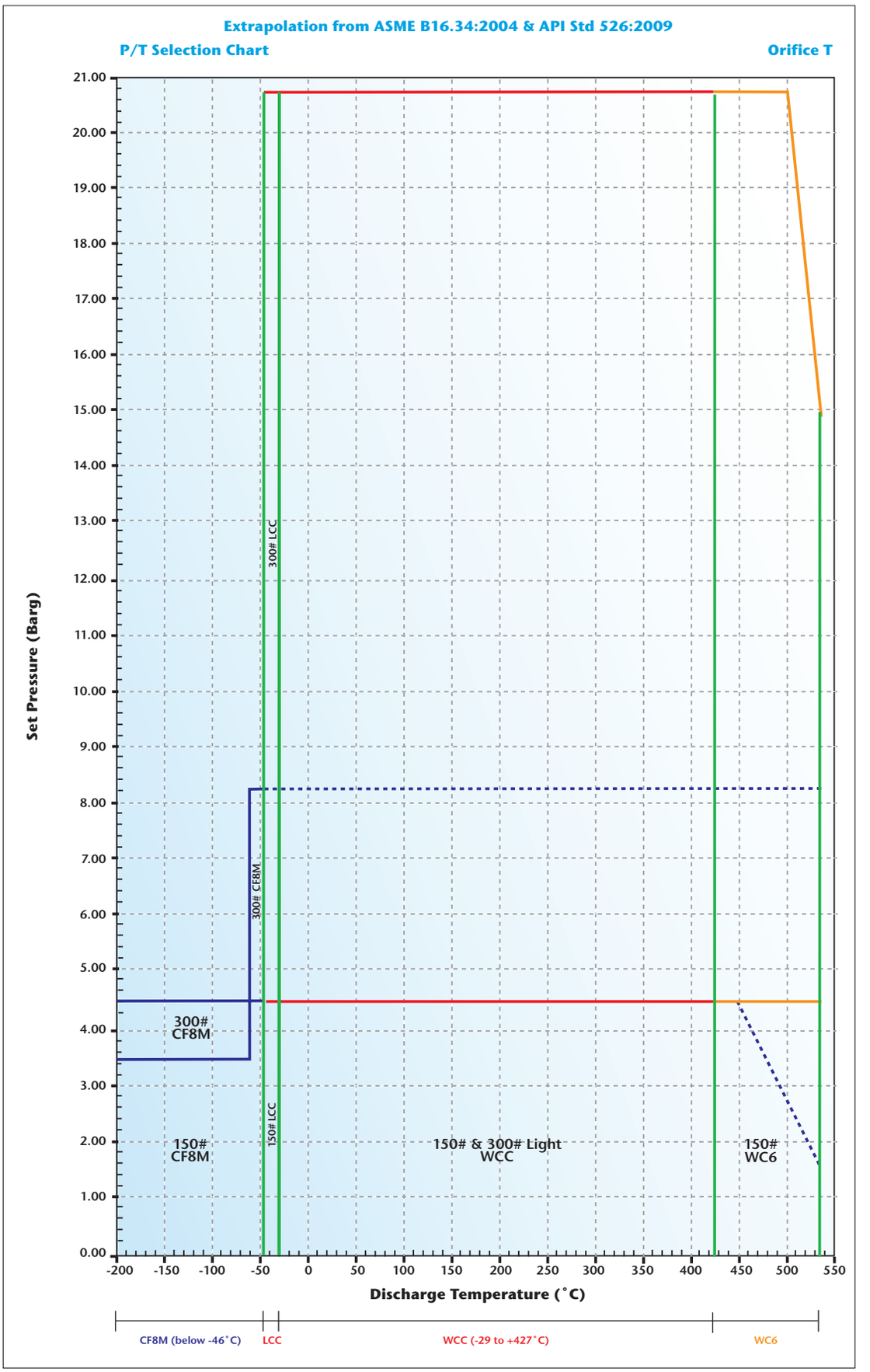
P Series (Starflow) Selection Tables
According to API 526 : (edition 2009)

INLETx ORIFICEx OUTLET	ANSI FLANGE RATING Inlet	Outlet	Model Number	Conventional	Bellows	Steam service	MAX. SET PRESSURE barg (psig) -268°C to -47°C (-450°F to -51°F)	-46°C to -29°C (-50°F to -21°F)	-29°C to +38°C (-20°F to 100°F)	<232°C (<450°F)	<427°C (<800°F)	<538°C (<1000°F)	MAX. BACK PRESSURE (1) barg (psig) Conventional	Bellows	MATERIALS Body	Spring
8 T 10	150	150	P89T1	330	430	530			4.5 (65)	4.5 (65)	4.5 (65)		2 (30)	2 (30)		
8 T 10	300	150	P89T7	330	430	530			4.5 (65)	4.5 (65)	4.5 (65)		2 (30)	2 (30)	SA 216	Alloy
8 T 10	300	150	P89T2	330	430	530			8 (120)	8 (120)	8 (120)		4 (60)	4 (60)	Gr. WCC	Steel
8 T 10	300	150	P89T3	330	430	530			21 (300)	21 (300)	21 (300)		7 (100)	7 (100)		
8 T 10	300	150	P89T2	332	432	502					8 (120)	8 (120)	4 (60)	4 (60)	SA 216	High Temp.
8 T 10	300	150	P89T3	332	432	502					21 (300)	16 (225)	7 (100)	7 (100)	Gr. WC6	Alloy Steel
8 T 10	150	150	P89T1	319	419			4.5 (65)					2 (30)	2 (30)		
8 T 10	300	150	P89T7	319	419			4.5 (65)					2 (30)	2 (30)	SA 352	Alloy
8 T 10	300	150	P89T2	319	419			8 (120)					4 (60)	4 (60)	Gr. LCC	Steel
8 T 10	300	150	P89T3	319	419			21 (300)					7 (100)	7 (100)		
8 T 10	150	150	P89T1	316	416		3.5 (50)						2 (30)	2 (30)		
8 T 10	300	150	P89T7	316	416		3.5 (50)						2 (30)	2 (30)	SA 351	Stainless
8 T 10	300	150	P89T2	316	416		4.5 (65)						4 (60)	4 (60)	Gr. CF8M	Steel



INLETx ORIFICEx OUTLET	ANSI FLANGE RATING Inlet	Outlet	MODEL NUMBER	A(2) mm (in)	B(2) mm (in)	C mm (in)	D mm (in)	E mm (in)	N mm (in)	Approximate weight (3) kg (lbs)
8 T 10	150	150	P89T1	276.2 (10-7/8)	279.4 (11)	1020 (41)	30.2 (1-3/16)	49 (1-15/16)	18 (11/16)	290 (640)
8 T 10	300	150	P89T7	276.2 (10-7/8)	279.4 (11)	1020 (41)	30.2 (1-3/16)	61 (2-3/8)	18 (11/16)	310 (683)
8 T 10	300	150	P89T2	276.2 (10-7/8)	279.4 (11)	1200 (48)	30.2 (1-3/16)	61 (2-3/8)	18 (11/16)	340 (749)
8 T 10	300	150	P89T3	276.2 (10-7/8)	279.4 (11)	1200 (48)	30.2 (1-3/16)	61 (2-3/8)	18 (11/16)	350 (772)

(1) Max. back pressure limits at 38°C; for higher temp. refer to ASME B16.5 flange ratings for conventional valves
(2) Tolerances for A and B : ± 3.2 mm (±1/8 in)
(3) Valves with lifting lever : add 10%


Extrapolation from ASME B16.34:2004 & API Std 526:2009
P/T Selection Chart
Orifice T
Set Pressure (Barg)
21.00
20.00
19.00
18.00
17.00
16.00
15.00
14.00
13.00
12.00
11.00
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
300# LCC
300# CF8M
150# LCC
300# CF8M
150# CF8M
150# & 300# Light WCC
150# WC6
-200 -150 -100 -50 0 50 100 150 200 250 300 350 400 450 500 550
Discharge Temperature (˚C)
CF8M (below -46˚C)
LCC
WCC (-29 to +427˚C)
WC6

ORIFICE : V
301.6 cm² (actual)
46.75 in² (actual)

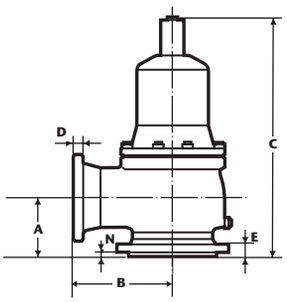
ORIFICE : W
452.3 cm² (actual)
70.10 in² (actual)

P Series (Starflow) Selection Tables
According to ASME B16.34

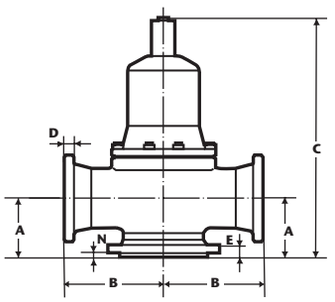
INLETx ORIFICEx OUTLET	ANSI FLANGE RATING Inlet	Outlet	Model Number	Conventional	Bellows	Steam service	MAX. SET PRESSURE barg (psig) -268°C to -47°C (-450°F to -51°F)	-46°C to -29°C (-50°F to -21°F)	-29°C to +38°C (-20°F to 100°F)	<232°C (<450°F)	<427°C (<800°F)	<538°C (<1000°F)	MAX. BACK PRESSURE (1) barg (psig) Conventional	Bellows	MATERIALS Body	Spring
10 V 14	150	150	P9BV1	330	430	530			7.1 (103)	7.1 (103)	5.5 (80)		2 (30)	3 (45)	SA 216 Gr. WCC	Alloy Steel
10 V 14	300	150	P9BV7	330	430	530			7.1 (103)	7.1 (103)	5.5 (80)		2 (30)	3 (45)		
10 V 14	300	150	P9BV2	330	430	530			20 (290)	20 (290)	20 (290)		4 (60)	3 (45)		
10 V 14	150	150	P9BV1	332	432	532					5.5 (80)	5.5 (80)	2 (30)	3 (45)	SA 216 Gr. WC6	High Temp. Alloy Steel
10 V 14	300	150	P9BV7	332	432	532					7.1 (103)	7.1 (103)	2 (30)	3 (45)		
10 V 14	300	150	P9BV2	332	432	532					20 (290)	20 (290)	4 (60)	3 (45)		
10 V 14	150	150	P9BV1	319	419			7.1 (103)					2 (30)	3 (45)	SA 352 Gr. LCC	Alloy Steel
10 V 14	300	150	P9BV7	319	419			7.1 (103)					2 (30)	3 (45)		
10 V 14	300	150	P9BV2	319	419			20 (290)					4 (60)	3 (45)		
10 V 14	150	150	P9BV1	316	416		7.1 (103)						2 (30)	3 (45)	SA 351 Gr. CF8M	Stainless Steel
10 V 14	300	150	P9BV7	316	416		7.1 (103)						2 (30)	3 (45)		
10 V 14	300	150	P9BV2	316	416		20 (290)						4 (60)	3 (45)		

12 W 12	150	150	PAAW1	330	430	530			6.3 (91)	6.3 (91)	5.5 (80)		2 (30)	2 (30)	SA 216 Gr. WCC	Alloy Steel
12 W 12	300	150	PAAW7	330	430	530			6.3 (91)	6.3 (91)	5.5 (80)		2 (30)	2 (30)		
12 W 12	300	150	PAAW2	330	430	530			20 (290)	20 (290)	20 (290)		4 (60)	4 (60)		
12 W 12	150	150	PAAW1	332	432	532					5.5 (80)	5.5 (80)	2 (30)	2 (30)	SA 216 Gr. WC6	High Temp. Alloy Steel
12 W 12	300	150	PAAW7	332	432	532					6.3 (91)	6.3 (91)	2 (30)	2 (30)		
12 W 12	300	150	PAAW2	332	432	532					20 (290)	20 (290)	4 (60)	4 (60)		
12 W 12	150	150	PAAW1	319	419			6.3 (91)					2 (30)	2 (30)	SA 352 Gr. LCC	Alloy Steel
12 W 12	300	150	PAAW7	319	419			6.3 (91)					2 (30)	2 (30)		
12 W 12	300	150	PAAW2	319	419			20 (290)					4 (60)	4 (60)		
12 W 12	150	150	PAAW1	316	416		6.3 (91)						2 (30)	2 (30)	SA 351 Gr. CF8M	Stainless Steel
12 W 12	300	150	PAAW7	316	416		6.3 (91)						2 (30)	2 (30)		
12 W 12	300	150	PAAW2	316	416								4 (60)	4 (60)		

Orifice V



Orifice W



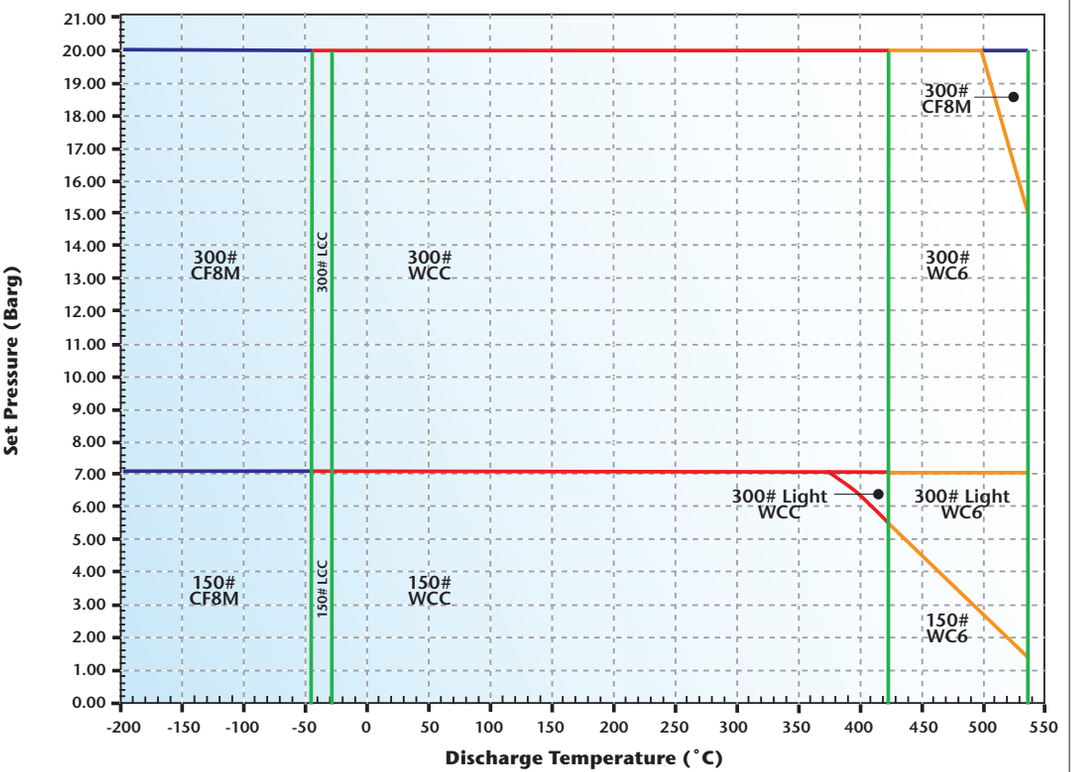
INLETx ORIFICEx OUTLET	ANSI FLANGE RATING Inlet	Outlet	MODEL NUMBER	A(2) mm (in)	B(2) mm (in)	C mm (in)	D mm (in)	E mm (in)	N mm (in)	Approximate weight (3) kg (lbs)
10 V 14	150	150	P9BV1	380 (14-15/16)	370 (14-9/16)	1370 (53-15/16)	35 (1-3/8)	59 (2-5/16)	28 (1-1/8)	470 (1080)
10 V 14	300	150	P9BV7	380 (14-15/16)	370 (14-9/16)	1370 (53-15/16)	35 (1-3/8)	77.5 (3-1/16)	28 (1-1/8)	530 (1215)
10 V 14	300	150	P9BV2	380 (14-15/16)	370 (14-9/16)	1620 (63-3/4)	35 (1-3/8)	77.5 (3-1/16)	28 (1-1/8)	780 (1790)

12 W 12	150	150	PAAW1	328 (12-15/16)	430 (16-15/16)	1375 (54-1/8)	31.8 (1-1/4)	61 (2-3/8)	28 (1-1/8)	580 (1330)
12 W 12	300	150	PAAW7	328 (12-15/16)	430 (16-15/16)	1375 (54-1/8)	39 (1-9/16)	82 (3-1/4)	28 (1-1/8)	650 (1330)
12 W 12	300	150	PAAW2	328 (12-15/16)	430 (16-15/16)	1650 (64-15/16)	39 (1-9/16)	82 (3-1/4)	28 (1-1/8)	830 (1900)

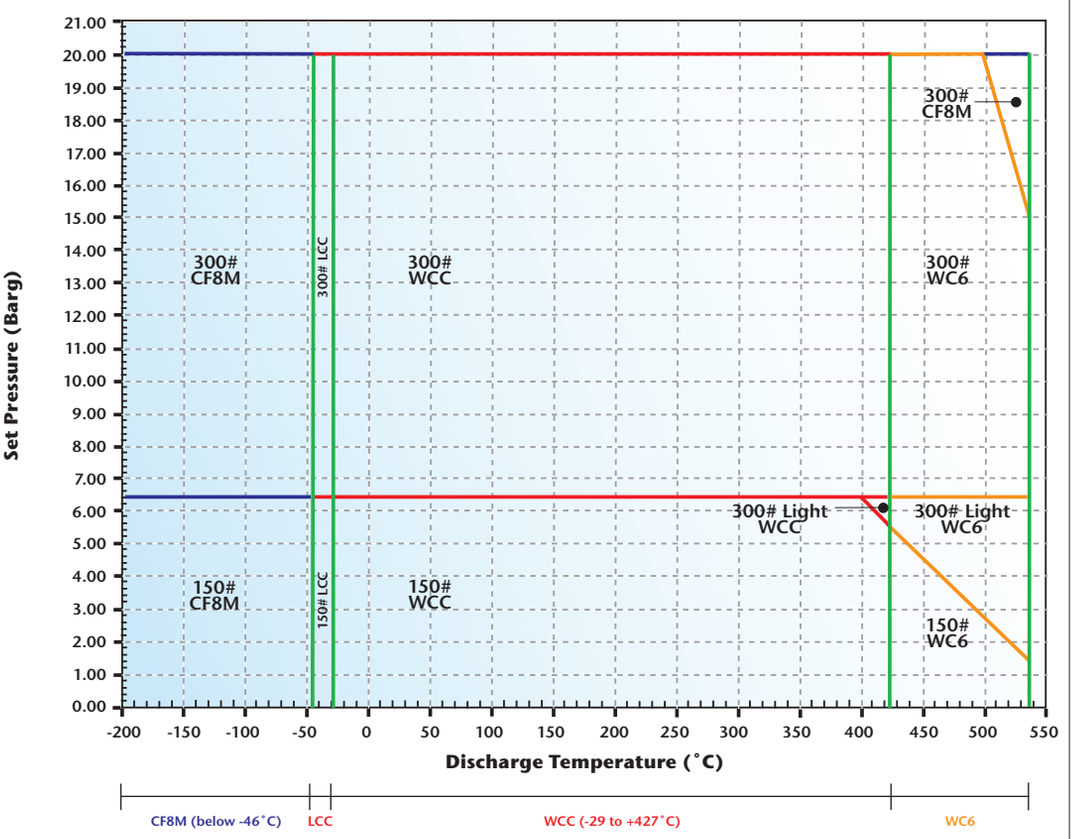
(2) Tolerances for A and B : ± 3.2 mm (±1/8 in)
(3) Valves with lifting lever : add 5%

Extrapolation from ASME B16.34:2004

P/T Selection Chart Orifice V



P/T Selection Chart Orifice W



P Series (Starflow)Capacity Tables

Sizing a valve using capacity tables

For air, steam or water it can be quicker to size the valves using the capacity tables rather than the sizing formulas.

Example of sizing

Required flow : 5 800 Nm^3/h of air
Set pressure : 42 bar
Overpressure : 10%

Using the air capacity table, with a set pressure of 42 bar, we find an orifice F (1.98 cm^2), with a capacity of 6 193 Nm^3/h.

This capacity includes the safety margin of 0.9. (as per ASME and ISO requirements).

P Series (Starflow) Capacity Tables

Air Calculation according to API STD 520 Capacities in Nm^3/hr at 0˚C at 10% overpressure

Orifices	D	E	F	G	H	J	K	L	M	N	P	Q	R	T
cm² / Set pressure - barg	0.71	1.26	1.98	3.24	5.06	8.30	11.86	18.41	23.22	28	41.2	71.2	103.2	168
1	99	176	277	454	708	1162	1660	2577	3250	3920	5767	9967	14446	23517
1.5	125	222	349	572	893	1464	2092	3248	4096	4940	7269	12561	18207	29639
2	151	268	421	690	1077	1767	2524	3919	4943	5960	8770	15155	21967	35760
2.5	177	314	494	808	1261	2069	2957	4590	5789	6980	10271	17750	25727	41882
3	203	360	566	926	1446	2372	3389	5260	6635	8000	11772	20344	29488	48003
3.5	229	406	638	1044	1630	2674	3821	5931	7481	9021	13273	22938	33248	54124
4	255	452	710	1162	1815	2976	4253	6602	8327	10041	14775	25533	37008	60246
4.5	280	498	782	1280	1999	3279	4685	7273	9173	11061	16276	28127	40768	66367
5	306	544	854	1398	2183	3581	5117	7944	10019	12081	17777	30721	44529	72489
5.5	332	590	926	1516	2368	3884	5549	8614	10865	13102	19278	33316	48289	78610
6	358	635	999	1634	2552	4186	5982	9285	11711	14122	20779	35910	52049	84731
6.5	384	681	1071	1752	2736	4489	6414	9956	12557	15142	22281	38504	55810	90853
7	410	727	1143	1870	2921	4791	6846	10627	13403	16162	23782	41099	59570	96974
8	462	819	1287	2106	3290	5396	7710	11968	15095	18203	26784	46287	67090	109217
8.5	487	865	1359	2224	3474	5698	8142	12639	15941	19223	28285	48882	70851	115338
9	513	911	1431	2342	3658	6001	8574	13310	16787	20243	29787	51476	74611	121460
9.5	539	957	1504	2460	3843	6303	9007	13981	17634	21264	31288	54070	78371	127581
10	565	1003	1576	2579	4027	6606	9439	14652	18480	22284	32789	56664	82132	133703
11	617	1095	1720	2815	4396	7210	10303	15993	20172	24324	35791	61853	89652	145945
12	669	1186	1864	3051	4764	7815	11167	17335	21864	26365	38794	67042	97173	158188
13	720	1278	2009	3287	5133	8420	12032	18676	23556	28405	41796	72230	104693	170431
14	772	1370	2153	3523	5502	9025	12896	20018	25248	30446	44799	77419	112214	182674
15	824	1462	2297	3759	5871	9630	13760	21360	26940	32486	47801	82608	119735	194917
16	875	1554	2442	3995	6239	10235	14624	22701	28632	34527	50803	87796	127255	207160
18	979	1737	2730	4467	6977	11444	16353	25384	32017	38608	56808	98173	142296	231645
20	1082	1921	3019	4940	7714	12654	18082	28068	35401	42688	62813	108551	157338	256131
22	1186	2105	3307	5412	8452	13864	19810	30751	38785	46769	68818	118928		
24	1289	2288	3596	5884	9189	15073	21539	33434	42169	50850	74823	129305		
26	1393	2472	3884	6356	9927	16283	23267	36117	45554	54931	80827	139682		
28	1496	2656	4173	6829	10664	17493	24996	38801	48938	59012	86832	150060		
30	1600	2839	4462	7301	11402	18703	26724	41484	52322	63093	92837	160437		
32	1703	3023	4750	7773	12139	19912	28453	44167	55707	67174	98842	170814		
34	1807	3206	5039	8245	12877	21122	30182	46850	59091	71255	104847	181191		
36	1910	3390	5327	8717	13614	22332	31910	49533	62475	75336	110852	191569		
38	2014	3574	5616	9190	14352	23541	33639	52217	65859	79417	116856	201946		
40	2117	3757	5904	9662	15089	24751	35367	54900	69244	83498	122861	212323		
42	2221	3941	6193	10134	15827	25961	37096	57583	72628	87579	128866			
44	2324	4125	6482	10606	16564	27171	38824	60266	76012	91660	134871			
46	2428	4308	6770	11079	17302	28380	40553	62949	79396	95741	140876			
48	2531	4492	7059	11551	18039	29590	42282	65633	82781	99822	146880			
50	2635	4676	7347	12023	18777	30800	44010	68316	86165	103903	152885			
52	2738	4859	7636	12495	19514	32009	45739	70999	89549	107983	158890			
54	2842	5043	7925	12967	20252	33219	47467	73682	92933	112064	164895			
56	2945	5227	8213	13440	20989	34429	49196	76366	96318	116145	170900			
58	3049	5410	8502	13912	21727	35639	50924	79049	99702	120226	176904			
60	3152	5594	8790	14384	22464	36848	52653	81732	103086	124307	182909			
65	3411	6053	9512	15565	24308	39872	56974	88440	111547	134510	197921			
70	3669	6512	10233	16745	26152	42897	61296	95148	120008	144712	212933			
75	3928	6971	10955	17926	27995	45921	65617	101856	128468					
80	4187	7430	11676	19106	29839	48945	69939	108564	136929					
85	4446	7889	12398	20287	31683	51970	74260	115272						
90	4704	8348	13119	21467	33526	54994	78582	121980						
95	4963	8808	13840	22648	35370	58018	82903	128688						
100	5222	9267	14562	23829	37214	61042	87224	135396						
110	5739	10185	16005	26190	40901	67091	95867							
120	6257	11103	17448	28551	44589	73139	104510							
130	6774	12021	18891	30912	48276	79188	113153							
140	7291	12940	20334	33273	51963	85236	121796							
150	7809	13858	21776	35634	55651	91285	130439							
160	8326	14776	23219	37995	59338	97334								
170	8844	15694	24662	40356	63026	103382								
180	9361	16612	26105	42717	66713	109431								
190	9878	17531	27548	45079	70401	115479								
200	10396	18449	28991	47440										
220	11431	20285	31877	52162										
240	12465	22122	34763	56884										
260	13500	23958	37648	61606										
280	14535	25794	40534											
300	15570	27631	43420											
320	16605	29467	46306											
340	17639	31304	49192											
360	18674	33140	52077											
380	19709	34977												
400	20744	36813												
420	21779	38649												

P Series (Starflow) Capacity Tables

Saturated Steam Calculation according to API STD 520 Capacities T/hr at 10% overpressure

Orifices	D	E	F	G	H	J	K	L	M	N	P	Q	R	T
cm² / Set pressure - barg	0.71	1.26	1.98	3.24	5.06	8.30	11.86	18.41	23.22	28	41.2	71.2	103.2	168
1	0.08	0.14	0.21	0.35	0.55	0.90	1.28	1.99	2.51	3.02	4.45	7.69	11.14	18.13
1.5	0.10	0.17	0.27	0.44	0.69	1.13	1.61	2.50	3.16	3.81	5.60	9.69	14.04	22.85
2	0.12	0.21	0.32	0.53	0.83	1.36	1.95	3.02	3.81	4.60	6.76	11.69	16.94	27.57
2.5	0.14	0.24	0.38	0.62	0.97	1.60	2.28	3.54	4.46	5.38	7.92	13.69	19.84	32.29
3	0.16	0.28	0.44	0.71	1.11	1.83	2.61	4.06	5.12	6.17	9.08	15.69	22.74	37.01
3.5	0.18	0.31	0.49	0.80	1.26	2.06	2.95	4.57	5.77	6.96	10.23	17.69	25.64	41.73
4	0.20	0.35	0.55	0.90	1.40	2.30	3.28	5.09	6.42	7.74	11.39	19.69	28.54	46.45
4.5	0.22	0.38	0.60	0.99	1.54	2.53	3.61	5.61	7.07	8.53	12.55	21.69	31.44	51.17
5	0.24	0.42	0.66	1.08	1.68	2.76	3.95	6.13	7.73	9.32	13.71	23.69	34.34	55.89
5.5	0.26	0.45	0.71	1.17	1.83	2.99	4.28	6.64	8.38	10.10	14.86	25.69	37.23	60.61
6	0.28	0.49	0.77	1.26	1.97	3.23	4.61	7.16	9.03	10.89	16.02	27.69	40.13	65.33
6.5	0.30	0.53	0.83	1.35	2.11	3.46	4.95	7.68	9.68	11.68	17.18	29.69	43.03	70.05
7	0.32	0.56	0.88	1.44	2.25	3.69	5.28	8.19	10.33	12.46	18.34	31.69	45.93	74.77
8	0.36	0.63	0.99	1.62	2.54	4.16	5.95	9.23	11.64	14.04	20.65	35.69	51.73	84.21
8.5	0.38	0.67	1.05	1.72	2.68	4.39	6.28	9.75	12.29	14.82	21.81	37.69	54.63	88.93
9	0.40	0.70	1.10	1.81	2.82	4.63	6.61	10.26	12.94	15.61	22.97	39.69	57.53	93.65
9.5	0.42	0.74	1.16	1.90	2.96	4.86	6.94	10.78	13.60	16.40	24.13	41.69	60.43	98.37
10	0.44	0.77	1.22	1.99	3.11	5.09	7.28	11.30	14.25	17.18	25.28	43.69	63.33	103.09
11	0.48	0.84	1.33	2.17	3.39	5.56	7.94	12.33	15.55	18.76	27.60	47.69	69.13	112.54
12	0.52	0.91	1.44	2.35	3.67	6.03	8.61	13.37	16.86	20.33	29.91	51.69	74.93	121.98
13	0.56	0.99	1.55	2.53	3.96	6.49	9.28	14.40	18.16	21.90	32.23	55.70	80.73	131.42
14	0.60	1.06	1.66	2.72	4.24	6.96	9.94	15.44	19.47	23.48	34.54	59.70	86.53	140.86
15	0.64	1.13	1.77	2.90	4.53	7.43	10.61	16.47	20.77	25.05	36.86	63.70	92.32	150.30
16	0.68	1.20	1.88	3.08	4.81	7.89	11.28	17.50	22.08	26.62	39.17	67.70	98.12	159.74
18	0.75	1.34	2.11	3.44	5.38	8.82	12.61	19.57	24.69	29.77	43.80	75.70	109.72	178.62
20	0.83	1.48	2.33	3.81	5.95	9.76	13.94	21.64	27.30	32.92	48.43	83.70	121.32	197.50
22	0.91	1.62	2.55	4.17	6.52	10.69	15.28	23.71	29.91	36.06	53.06	91.70		
24	0.99	1.76	2.77	4.54	7.09	11.62	16.61	25.78	32.52	39.21	57.69	99.70		
26	1.07	1.91	3.00	4.90	7.65	12.56	17.94	27.85	35.13	42.36	62.32	107.71		
28	1.15	2.05	3.22	5.27	8.22	13.49	19.27	29.92	37.73	45.50	66.95	115.71		
30	1.23	2.19	3.44	5.63	8.79	14.42	20.61	31.99	40.34	48.65	71.58	123.71		
32	1.31	2.33	3.66	5.99	9.36	15.35	21.94	34.06	42.95	51.80	76.21	131.71		
34	1.39	2.47	3.89	6.36	9.93	16.29	23.27	36.13	45.56	54.94	80.84	139.71		
36	1.47	2.61	4.11	6.72	10.50	17.22	24.61	38.19	48.17	58.09	85.47	147.71		
38	1.55	2.76	4.33	7.09	11.07	18.15	25.94	40.26	50.78	61.24	90.11	155.72		
40	1.63	2.90	4.55	7.45	11.63	19.09	27.27	42.33	53.39	64.38	94.74	163.72		
42	1.71	3.04	4.78	7.81	12.20	20.02	28.60	44.40	56.00	67.53	99.37			
44	1.79	3.18	5.00	8.18	12.77	20.95	29.94	46.47	58.61	70.68	104.00			
46	1.87	3.32	5.22	8.54	13.34	21.88	31.27	48.54	61.22	73.82	108.63			
48	1.95	3.46	5.44	8.91	13.91	22.82	32.60	50.61	63.83	76.97	113.26			
50	2.03	3.61	5.67	9.27	14.48	23.75	33.94	52.68	66.44	80.12	117.89			
52	2.11	3.75	5.89	9.63	15.05	24.68	35.27	54.75	69.05	83.26	122.52			
54	2.19	3.89	6.11	10.00	15.62	25.61	36.60	56.81	71.66	86.41	127.15			
56	2.27	4.03	6.33	10.36	16.18	26.55	37.93	58.88	74.27	89.56	131.78			
58	2.35	4.17	6.56	10.73	16.75	27.48	39.27	60.95	76.88	92.70	136.41			
60	2.43	4.31	6.78	11.09	17.32	28.41	40.60	63.02	79.49	95.85	141.04			
65	2.63	4.67	7.33	12.00	18.74	30.74	43.93	68.19	86.01	103.72	152.61			
70	2.83	5.02	7.89	12.91	20.16	33.08	47.26	73.37	92.53	111.58	164.19			
75	3.03	5.38	8.45	13.82	21.59	35.41	50.60	78.54	99.06					
80	3.23	5.73	9.00	14.73	23.01	37.74	53.93	83.71	105.58					
85	3.43	6.08	9.56	15.64	24.43	40.07	57.26	88.88						
90	3.63	6.44	10.12	16.55	25.85	42.40	60.59	94.06						
95	3.83	6.79	10.67	17.46	27.27	44.74	63.92	99.23						
100	4.03	7.15	11.23	18.37	28.69	47.07	67.26	104.40						
110	4.43	7.85	12.34	20.19	31.54	51.73	73.92							
120	4.82	8.56	13.45	22.01	34.38	56.40	80.59							
130	5.22	9.27	14.57	23.84	37.22	61.06	87.25							
140	5.62	9.98	15.68	25.66	40.07	65.72	93.91							
150	6.02	10.69	16.79	27.48	42.91	70.39	100.58							
160	6.42	11.39	17.90	29.30	45.75	75.05								
170	6.82	12.10	19.02	31.12	48.60	79.72								
180	7.22	12.81	20.13	32.94	51.44	84.38								
190	7.62	13.52	21.24	34.76	54.28	89.04								
200	8.02	14.23	22.35	36.58										

P Series (Starflow) Capacity Tables

Water **Calculation according to API STD 520** **Capacities m^3/hr at 10% overpressure**

Orifices	D	E	F	G	H	J	K	L	M	N	P	Q	R	T
cm^2 / Set pressure - barg	0.71	1.26	1.98	3.24	5.06	8.30	11.86	18.41	23.22	28	41.2	71.2	103.2	168
1	2.66	4.73	7.4	12.2	19.0	31	44	69	87	105	155	267	387	630
1.5	3.26	5.79	9.1	14.9	23.2	38	54	85	107	129	189	327	474	772
2	3.77	6.68	10.5	17.2	26.8	44	63	98	123	149	219	378	547	891
2.5	4.21	7.47	11.7	19.2	30.0	49	70	109	138	166	244	422	612	996
3	4.61	8.19	12.9	21.1	32.9	54	77	120	151	182	268	463	670	1092
3.5	4.98	8.84	13.9	22.7	35.5	58	83	129	163	196	289	500	724	1179
4	5.33	9.45	14.9	24.3	38.0	62	89	138	174	210	309	534	774	1260
4.5	5.65	10.03	15.8	25.8	40.3	66	94	146	185	223	328	567	821	1337
5	5.96	10.57	16.6	27.2	42.4	70	99	154	195	235	346	597	866	1409
5.5	6.25	11.08	17.4	28.5	44.5	73	104	162	204	246	362	626	908	1478
6	6.52	11.58	18.2	29.8	46.5	76	109	169	213	257	379	654	948	1544
6.5	6.79	12.05	18.9	31.0	48.4	79	113	176	222	268	394	681	987	1607
7	7.05	12.50	19.7	32.2	50.2	82	118	183	230	278	409	707	1024	1667
8	7.53	13.37	21.0	34.4	53.7	88	126	195	246	297	437	755	1095	1782
8.5	7.76	13.78	21.7	35.4	55.3	91	130	201	254	306	451	779	1129	1837
9	7.99	14.18	22.3	36.5	56.9	93	133	207	261	315	464	801	1161	1891
9.5	8.21	14.57	22.9	37.5	58.5	96	137	213	268	324	476	823	1193	1942
10	8.42	14.95	23.5	38.4	60.0	98	141	218	275	332	489	845	1224	1993
11	8.83	15.68	24.6	40.3	63.0	103	148	229	289	348	513	886	1284	2090
12	9.23	16.37	25.7	42.1	65.8	108	154	239	302	364	535	925	1341	2183
13	9.60	17.04	26.8	43.8	68.4	112	160	249	314	379	557	963	1396	2272
14	9.97	17.68	27.8	45.5	71.0	116	166	258	326	393	578	999	1448	2358
15	10.31	18.31	28.8	47.1	73.5	121	172	267	337	407	599	1034	1499	2441
16	10.65	18.91	29.7	48.6	75.9	125	178	276	348	420	618	1068	1548	2521
18	11.30	20.05	31.5	51.6	80.5	132	189	293	370	446	656	1133	1642	2674
20	11.91	21.14	33.2	54.4	84.9	139	199	309	390	470	691	1194	1731	2818
22	12.49	22.17	34.8	57.0	89.0	146	209	324	409	493	725	1253		
24	13.05	23.15	36.4	59.5	93.0	153	218	338	427	515	757	1308		
26	13.58	24.10	37.9	62.0	96.8	159	227	352	444	536	788	1362		
28	14.09	25.01	39.3	64.3	100.4	165	235	365	461	556	818	1413		
30	14.59	25.89	40.7	66.6	104.0	171	244	378	477	575	846	1463		
32	15.07	26.74	42.0	68.8	107.4	176	252	391	493	594	874	1511		
34	15.53	27.56	43.3	70.9	110.7	182	259	403	508	612	901	1557		
36	15.98	28.36	44.6	72.9	113.9	187	267	414	523	630	927	1602		
38	16.42	29.14	45.8	74.9	117.0	192	274	426	537	647	953	1646		
40	16.84	29.89	47.0	76.9	120.0	197	281	437	551	664	977	1689		
42	17.26	30.63	48.1	78.8	123.0	202	288	448	564	681	1002			
44	17.67	31.35	49.3	80.6	125.9	207	295	458	578	697	1025			
46	18.06	32.06	50.4	82.4	128.7	211	302	468	591	712	1048			
48	18.45	32.75	51.5	84.2	131.5	216	308	478	603	728	1071			
50	18.83	33.42	52.5	85.9	134.2	220	315	488	616	743	1093			
52	19.21	34.08	53.6	87.6	136.9	225	321	498	628	757	1114			
54	19.57	34.73	54.6	89.3	139.5	229	327	507	640	772	1136			
56	19.93	35.37	55.6	90.9	142.0	233	333	517	652	786	1157			
58	20.28	36.00	56.6	92.6	144.6	237	339	526	663	800	1177			
60	20.63	36.61	57.5	94.1	147.0	241	345	535	675	814	1197			
65	21.47	38.11	59.9	98.0	153.0	251	359	557	702	847	1246			
70	22.28	39.54	62.1	101.7	158.8	260	372	578	729	879	1293			
75	23.06	40.93	64.3	105.3	164.4	270	385	598	754					
80	23.82	42.27	66.4	108.7	169.8	278	398	618						
85	24.55	43.58	68.5	112.1	175.0	287	410	637						
90	25.27	44.84	70.5	115.3	180.1	295	422	655						
95	25.96	46.07	72.4	118.5	185.0	303	434	673						
100	26.63	47.26	74.3	121.5	189.8	311	445	691						
110	27.93	49.57	77.9	127.5	199.1	327	467							
120	29.17	51.77	81.4	133.1	207.9	341	487							
130	30.37	53.89	84.7	138.6	216.4	355	507							
140	31.51	55.92	87.9	143.8	224.6	368	526							
150	32.62	57.89	91.0	148.9	232.5	381	545							
160	33.69	59.78	93.9	153.7	240.1	394								
170	34.72	61.62	96.8	158.5	247.5	406								
180	35.73	63.41	99.6	163.1	254.7	418								
190	36.71	65.15	102.4	167.5	261.6	429								
200	37.66	66.84	105.0	171.9										
220	39.50	70.10	110.2	180.3										
240	41.26	73.22	115.1	188.3										
260	42.94	76.21	119.8	196.0										
280	44.57	79.09	124.3											
300	46.13	81.86	128.6											
320	47.64	84.55	132.9											
340	49.11	87.15	137.0											
360	50.53	89.68	140.9											
380	51.92	92.13												
400	53.27	94.53												
420	54.58	96.86												

P Series (Starflow) Capacity Tables

Air Calculation according to API STD 520 Capacities at 10% overpressure scfm at 32˚F

Orifices	D	E	F	G	H	J	K	L	M	N	P	Q	R	T
sq.in / Set pressure - Psig	0.110	0.196	0.307	0.503	0.785	1.287	1.838	2.853	3.60	4.34	6.38	11.05	16	26
10	52	92	145	237	370	606	866	1344	1696	2045	3006	5207	7540	12252
15	63	112	176	288	449	736	1051	1632	2059	2483	3650	6322	9153	14874
20	74	132	207	338	528	866	1237	1920	2423	2921	4293	7436	10767	17496
25	85	152	238	389	607	996	1422	2208	2786	3358	4937	8550	12380	20118
30	96	171	269	440	687	1126	1608	2495	3149	3796	5580	9665	13994	22740
35	107	191	299	491	766	1255	1793	2783	3512	4234	6224	10779	15608	25362
40	118	211	330	541	845	1385	1978	3071	3875	4671	6867	11893	17221	27984
45	129	231	361	592	924	1515	2164	3358	4238	5109	7510	13008	18835	30606
50	141	250	392	643	1003	1645	2349	3646	4601	5547	8154	14122	20448	33228
55	152	270	423	694	1082	1775	2534	3934	4964	5984	8797	15236	22062	35851
60	163	290	454	744	1162	1904	2720	4222	5327	6422	9441	16351	23675	38473
65	174	310	485	795	1241	2034	2905	4509	5690	6860	10084	17465	25289	41095
70	185	330	516	846	1320	2164	3090	4797	6053	7297	10727	18580	26903	43717
75	196	349	547	896	1399	2294	3276	5085	6416	7735	11371	19694	28516	46339
80	207	369	578	947	1478	2424	3461	5373	6779	8173	12014	20808	30130	48961
85	218	389	609	998	1557	2553	3647	5660	7142	8610	12658	21923	31743	51583
90	229	409	640	1049	1637	2683	3832	5948	7505	9048	13301	23037	33357	54205
95	240	428	671	1099	1716	2813	4017	6236	7868	9486	13944	24151	34970	56827
100	252	448	702	1150	1795	2943	4203	6523	8231	9923	14588	25266	36584	59449
110	274	488	764	1252	1953	3202	4573	7099	8958	10799	15875	27495	39811	64693
120	296	527	826	1353	2112	3462	4944	7674	9684	11674	17162	29723	43038	69937
130	318	567	888	1454	2270	3721	5315	8250	10410	12549	18448	31952	46265	75181
140	340	606	950	1556	2428	3981	5685	8825	11136	13425	19735	34181	49493	80425
150	362	646	1012	1657	2587	4241	6056	9401	11862	14300	21022	36410	52720	85669
160	385	685	1073	1759	2745	4500	6427	9976	12588	15176	22309	38638	55947	90914
180	429	764	1197	1962	3062	5019	7168	11127	14040	16926	24882	43096	62401	101402
200	473	843	1321	2165	3378	5539	7910	12278	15492	18677	27456	47553	68855	111890
220	518	923	1445	2368	3695	6058	8651	13429	16945	20428	30030	52011	75310	122378
240	562	1002	1569	2570	4012	6577	9393	14580	18397	22178	32603	56468	81764	132866
260	606	1081	1693	2773	4328	7096	10134	15730	19849	23929	35177	60926	88218	143355
280	651	1160	1817	2976	4645	7615	10875	16881	21301	25680	37751	65383	94672	153843
300	695	1239	1940	3179	4962	8134	11617	18032	22754	27431	40324	69841	101127	164331
320	740	1318	2064	3382	5278	8654	12358	19183	24206	29181	42898	74298		
340	784	1397	2188	3585	5595	9173	13100	20334	25658	30932	45472	78756		
360	828	1476	2312	3788	5912	9692	13841	21485	27110	32683	48045	83213		
380	873	1555	2436	3991	6228	10211	14583	22636	28562	34434	50619	87671		
400	917	1634	2560	4194	6545	10730	15324	23787	30015	36184	53192	92128		
420	961	1713	2683	4397	6862	11249	16066	24937	31467	37935	55766	96586		
440	1006	1792	2807	4600	7178	11769	16807	26088	32919	39686	58340	101043		
460	1050	1871	2931	4802	7495	12288	17548	27239	34371	41436	60913	105500		
480	1095	1950	3055	5005	7811	12807	18290	28390	35823	43187	63487	109958		
500	1139	2029	3179	5208	8128	13326	19031	29541	37276	44938	66061	114415		
520	1183	2109	3303	5411	8445	13845	19773	30692	38728	46689	68634	118873		
540	1228	2188	3426	5614	8761	14364	20514	31843	40180	48439	71208	123330		
560	1272	2267	3550	5817	9078	14884	21256	32994	41632	50190	73782	127788		
580	1316	2346	3674	6020	9395	15403	21997	34144	43084	51941	76355	132245		
600	1361	2425	3798	6223	9711	15922	22738	35295	44537	53691	78929	136703		
650	1472	2622	4108	6730	10503	17220	24592	38173	48167	58068	85363			
700	1583	2820	4417	7237	11295	18518	26446	41050	51798	62445	91797			
750	1694	3018	4727	7745	12086	19816	28299	43927	55428	66822	98231			
800	1805	3215	5036	8252	12878	21114	30153	46804	59059	71199	104665			
850	1916	3413	5346	8759	13670	22411	32006	49681	62689	75575	111099			
900	2026	3611	5656	9266	14461	23709	33860	52558	66320	79952	117534			
950	2137	3808	5965	9774	15253	25007	35714	55436	69950	84329	123968			
1000	2248	4006	6275	10281	16045	26305	37567	58313	73581	88706	130402			
1100	2470	4401	6894	11295	17628	28901	41274	64067	80842					
1200	2692	4797	7513	12310	19211	31497	44981	69822						
1300	2914	5192	8132	13324	20795	34093	48689	75576						
1400	3136	5587	8752	14339	22378	36688	52396	81330						
1500	3358	5983	9371	15354	23961	39284	56103	87085						
1600	3579	6378	9990	16368	25545	41880	59810							
1700	3801	6773	10609	17383	27128	44476	63517							
1800	4023	7169	11228	18397	28711	47072	67225							
1900	4245	7564	11848	19412	30295	49668	70932							
2000	4467	7959	12467	20426	31878	52263	74639							
2200	4911	8750	13705	22455	35044	57455	82053							
2400	5354	9541	14944	24484	38211	62647								
2600	5798	10331	16182	26513	41378	67838								
2800	6242	11122	17421	28542										
3000	6686	11913	18659	30572										
3200	7129	12703	19897	32601										
3400	7573	13494	21136	34630										
3600	8017	14284	22374	36659										
3800	8461	15075	23613											
4000	8904	15866	24851											
4500	10014	17842	27947											
5000	11123	19819	31043											

P Series (Starflow) Capacity Tables

Saturated steam Calculation according to API STD 520 Capacities at 10% overpressure lbs/hr

Orifices	D	E	F	G	H	J	K	L	M	N	P	Q	R	T
sq.in / Set pressure - Psig	0.110	0.196	0.307	0.503	0.785	1.287	1.838	2.853	3.60	4.34	6.38	11.05	16	26
10	142	252	395	648	1011	1657	2367	3674	4636	5589	8216	14230	20605	33483
15	172	306	480	786	1227	2012	2874	4460	5628	6785	9975	17276	25014	40648
20	202	360	565	925	1444	2367	3380	5247	6620	7981	11733	20321	29424	47814
25	233	414	649	1064	1660	2721	3887	6033	7613	9177	13491	23366	33834	54980
30	263	468	734	1202	1876	3076	4393	6819	8605	10373	15249	26412	38243	62145
35	293	522	818	1341	2093	3431	4900	7606	9597	11570	17008	29457	42653	69311
40	324	577	903	1480	2309	3786	5406	8392	10589	12766	18766	32502	47062	76476
45	354	631	988	1618	2525	4140	5913	9178	11581	13962	20524	35548	51472	83642
50	384	685	1072	1757	2742	4495	6419	9964	12573	15158	22283	38593	55882	90808
55	415	739	1157	1895	2958	4850	6926	10751	13566	16354	24041	41639	60291	97973
60	445	793	1241	2034	3174	5204	7433	11537	14558	17550	25799	44684	64701	105139
65	475	847	1326	2173	3391	5559	7939	12323	15550	18746	27558	47729	69110	112304
70	505	901	1411	2311	3607	5914	8446	13110	16542	19942	29316	50775	73520	119470
75	536	955	1495	2450	3823	6268	8952	13896	17534	21138	31074	53820	77930	126636
80	566	1009	1580	2589	4040	6623	9459	14682	18526	22335	32833	56866	82339	133801
85	596	1063	1664	2727	4256	6978	9965	15468	19518	23531	34591	59911	86749	140967
90	627	1117	1749	2866	4472	7333	10472	16255	20511	24727	36349	62956	91158	148132
95	657	1171	1834	3004	4689	7687	10978	17041	21503	25923	38108	66002	95568	155298
100	687	1225	1918	3143	4905	8042	11485	17827	22495	27119	39866	69047	99978	162464
110	748	1333	2088	3420	5338	8751	12498	19400	24479	29511	43383	75138	108797	176795
120	809	1441	2257	3698	5771	9461	13511	20972	26464	31903	46899	81229	117616	191126
130	869	1549	2426	3975	6203	10170	14524	22545	28448	34296	50416	87319	126435	205457
140	930	1657	2595	4252	6636	10880	15537	24118	30432	36688	53933	93410	135254	219788
150	991	1765	2764	4529	7069	11589	16550	25690	32417	39080	57449	99501	144074	234120
160	1051	1873	2934	4807	7501	12298	17564	27263	34401	41472	60966	105592	152893	248451
180	1172	2089	3272	5361	8367	13717	19590	30408	38370	46257	67999	117773	170531	277113
200	1294	2305	3611	5916	9232	15136	21616	33553	42338	51041	75033	129955	188170	305775
220	1415	2521	3949	6470	10097	16555	23642	36698	46307	55825	82066	142136	205808	334438
240	1536	2737	4287	7025	10963	17973	25668	39843	50275	60610	89099	154318	223446	363100
260	1657	2953	4626	7579	11828	19392	27695	42988	54244	65394	96133	166499	241085	391763
280	1779	3169	4964	8134	12694	20811	29721	46134	58213	70179	103166	178681	258723	420425
300	1900	3385	5303	8688	13559	22230	31747	49279	62181	74963	110199	190862	276361	449087
320	2021	3601	5641	9243	14424	23649	33773	52424	66150	79747	117232	203044		
340	2143	3818	5980	9797	15290	25067	35799	55569	70119	84532	124266	215225		
360	2264	4034	6318	10352	16155	26486	37826	58714	74087	89316	131299	227407		
380	2385	4250	6656	10906	17021	27905	39852	61859	78056	94101	138332	239588		
400	2506	4466	6995	11461	17886	29324	41878	65004	82025	98885	145366	251770		
420	2628	4682	7333	12015	18751	30743	43904	68150	85993	103670	152399	263951		
440	2749	4898	7672	12570	19617	32161	45930	71295	89962	108454	159432	276133		
460	2870	5114	8010	13124	20482	33580	47957	74440	93930	113238	166466	288314		
480	2991	5330	8349	13679	21347	34999	49983	77585	97899	118023	173499	300496		
500	3113	5546	8687	14233	22213	36418	52009	80730	101868	122807	180532	312677		
520	3234	5762	9025	14788	23078	37836	54035	83875	105836	127592	187565	324859		
540	3355	5978	9364	15342	23944	39255	56062	87020	109805	132376	194599	337040		
560	3476	6194	9702	15897	24809	40674	58088	90166	113774	137160	201632	349222		
580	3598	6410	10041	16451	25674	42093	60114	93311	117742	141945	208665	361403		
600	3719	6626	10379	17006	26540	43512	62140	96456	121711	146729	215699	373585		
650	4022	7167	11225	18392	28703	47059	67206	104319	131632	158690	233282			
700	4325	7707	12071	19778	30867	50606	72271	112182	141554	170651	250865			
750	4628	8247	12918	21165	33030	54153	77337	120044	151476	182612	268449			
800	4932	8787	13764	22551	35194	57700	82402	127907	161397	194573	286032			
850	5235	9327	14610	23937	37357	61246	87468	135770	171319	206534	303615			
900	5538	9868	15456	25323	39520	64793	92533	143633	181240	218495	321198			
950	5841	10408	16302	26710	41684	68340	97599	151496	191162	230456	338782			
1000	6144	10948	17148	28096	43847	71887	102664	159359	201084	242417	356365			
1100	6751	12028	18840	30868	48174	78981	112795	175084	220927					
1200	7357	13109	20532	33641	52501	86075	122926	190810						
1300	7963	14189	22225	36413	56828	93169	133057	206536						
1400	8569	15269	23917	39186	61155	100263	143189	222262						
1500	9176	16350	25609	41959	65482	107357	153320	237987						
1600	9782	17430	27301	44731	69809	114451	163451							
1700	10388	18510	28993	47504	74136	121545	173582							
1800	10995	19591	30685	50276	78463	128639	183713							
1900	11601	20671	32378	53049	82790	135733	193844							
2000	12207	21751	34070	55821	87117	142827	203975							
2200	13420	23912	37454	61366	95770	157015	224237							
2400	14633	26073	40839	66911	104424	171203								
2600	15845	28234	44223	72456	113078	185390								
2800	17058	30394	47607	78001										

P Series (Starflow) Capacity Tables

Water **Calculation according to API STD 520** **Capacities at 10% overpressure usgpm**

Orifices	D	E	F	G	H	J	K	L	M	N	P	Q	R	T
sq.in / Set pressure - Psig	0.110	0.196	0.307	0.503	0.785	1.287	1.838	2.853	3.60	4.34	6.38	11.05	16	26
10	142	252	395	648	1011	1657	2367	3674	4636	5589	8216	14230	20605	33483
15	172	306	480	786	1227	2012	2874	4460	5628	6785	9975	17276	25014	40648
20	202	360	565	925	1444	2367	3380	5247	6620	7981	11733	20321	29424	47814
25	233	414	649	1064	1660	2721	3887	6033	7613	9177	13491	23366	33834	54980
30	263	468	734	1202	1876	3076	4393	6819	8605	10373	15249	26412	38243	62145
35	293	522	818	1341	2093	3431	4900	7606	9597	11570	17008	29457	42653	69311
40	324	577	903	1480	2309	3786	5406	8392	10589	12766	18766	32502	47062	76476
45	354	631	988	1618	2525	4140	5913	9178	11581	13962	20524	35548	51472	83642
50	384	685	1072	1757	2742	4495	6419	9964	12573	15158	22283	38593	55882	90808
55	415	739	1157	1895	2958	4850	6926	10751	13566	16354	24041	41639	60291	97973
60	445	793	1241	2034	3174	5204	7433	11537	14558	17550	25799	44684	64701	105139
65	475	847	1326	2173	3391	5559	7939	12323	15550	18746	27558	47729	69110	112304
70	505	901	1411	2311	3607	5914	8446	13110	16542	19942	29316	50775	73520	119470
75	536	955	1495	2450	3823	6268	8952	13896	17534	21138	31074	53820	77930	126636
80	566	1009	1580	2589	4040	6623	9459	14682	18526	22335	32833	56866	82339	133801
85	596	1063	1664	2727	4256	6978	9965	15468	19518	23531	34591	59911	86749	140967
90	627	1117	1749	2866	4472	7333	10472	16255	20511	24727	36349	62956	91158	148132
95	657	1171	1834	3004	4689	7687	10978	17041	21503	25923	38108	66002	95568	155298
100	687	1225	1918	3143	4905	8042	11485	17827	22495	27119	39866	69047	99978	162464
110	748	1333	2088	3420	5338	8751	12498	19400	24479	29511	43383	75138	108797	176795
120	809	1441	2257	3698	5771	9461	13511	20972	26464	31903	46899	81229	117616	191126
130	869	1549	2426	3975	6203	10170	14524	22545	28448	34296	50416	87319	126435	205457
140	930	1657	2595	4252	6636	10880	15537	24118	30432	36688	53933	93410	135254	219788
150	991	1765	2764	4529	7069	11589	16550	25690	32417	39080	57449	99501	144074	234120
160	1051	1873	2934	4807	7501	12298	17564	27263	34401	41472	60966	105592	152893	248451
180	1172	2089	3272	5361	8367	13717	19590	30408	38370	46257	67999	117773	170531	277113
200	1294	2305	3611	5916	9232	15136	21616	33553	42338	51041	75033	129955	188170	305775
220	1415	2521	3949	6470	10097	16555	23642	36698	46307	55825	82066	142136	205808	334438
240	1536	2737	4287	7025	10963	17973	25668	39843	50275	60610	89099	154318	223446	363100
260	1657	2953	4626	7579	11828	19392	27695	42988	54244	65394	96133	166499	241085	391763
280	1779	3169	4964	8134	12694	20811	29721	46134	58213	70179	103166	178681	258723	420425
300	1900	3385	5303	8688	13559	22230	31747	49279	62181	74963	110199	190862	276361	449087
320	2021	3601	5641	9243	14424	23649	33773	52424	66150	79747	117232	203044		
340	2143	3818	5980	9797	15290	25067	35799	55569	70119	84532	124266	215225		
360	2264	4034	6318	10352	16155	26486	37826	58714	74087	89316	131299	227407		
380	2385	4250	6656	10906	17021	27905	39852	61859	78056	94101	138332	239588		
400	2506	4466	6995	11461	17886	29324	41878	65004	82025	98885	145366	251770		
420	2628	4682	7333	12015	18751	30743	43904	68150	85993	103670	152399	263951		
440	2749	4898	7672	12570	19617	32161	45930	71295	89962	108454	159432	276133		
460	2870	5114	8010	13124	20482	33580	47957	74440	93930	113238	166466	288314		
480	2991	5330	8349	13679	21347	34999	49983	77585	97899	118023	173499	300496		
500	3113	5546	8687	14233	22213	36418	52009	80730	101868	122807	180532	312677		
520	3234	5762	9025	14788	23078	37836	54035	83875	105836	127592	187565	324859		
540	3355	5978	9364	15342	23944	39255	56062	87020	109805	132376	194599	337040		
560	3476	6194	9702	15897	24809	40674	58088	90166	113774	137160	201632	349222		
580	3598	6410	10041	16451	25674	42093	60114	93311	117742	141945	208665	361403		
600	3719	6626	10379	17006	26540	43512	62140	96456	121711	146729	215699	373585		
650	4022	7167	11225	18392	28703	47059	67206	104319	131632	158690	233282			
700	4325	7707	12071	19778	30867	50606	72271	112182	141554	170651	250865			
750	4628	8247	12918	21165	33030	54153	77337	120044	151476	182612	268449			
800	4932	8787	13764	22551	35194	57700	82402	127907	161397	194573	286032			
850	5235	9327	14610	23937	37357	61246	87468	135770	171319	206534	303615			
900	5538	9868	15456	25323	39520	64793	92533	143633	181240	218495	321198			
950	5841	10408	16302	26710	41684	68340	97599	151496	191162	230456	338782			
1000	6144	10948	17148	28096	43847	71887	102664	159359	201084	242417	356365			
1100	6751	12028	18840	30868	48174	78981	112795	175084	220927					
1200	7357	13109	20532	33641	52501	86075	122926	190810						
1300	7963	14189	22225	36413	56828	93169	133057	206536						
1400	8569	15269	23917	39186	61155	100263	143189	222262						
1500	9176	16350	25609	41959	65482	107357	153320	237987						
1600	9782	17430	27301	44731	69809	114451	163451							
1700	10388	18510	28993	47504	74136	121545	173582							
1800	10995	19591	30685	50276	78463	128639	183713							
1900	11601	20671	32378	53049	82790	135733	193844							
2000	12207	21751	34070	55821	87117	142827	203975							
2200	13420	23912	37454	61366	95770	157015	224237							
2400	14633	26073	40839	66911	104424	171203								
2600	15845	28234	44223	72456	113078	185390								
2800	17058	30394	47607	78001										
3000	18271	32555	50992	83547										
3200	19483	34716	54376	89092										
3400	20696	36876	57760	94637										
3600	21909	39037	61145	100182										
3800	23121	41198	64529											
4000	24334	43358	67913											
4500	27365	48760	76374											
5000	30397	54162	84835											

ENGLISH	FRENCH	RUSSIAN	CHINESE
Accumulation	Accumulation	“Накопление, аккумуляция”	蓄能
Adjusting Ring	Bague de réglage	Регулировочное кольцо	调节环
Adjusting Screw	Vis de réglage	Подстроечный винт	调节螺栓
Adjusting Screw Locknut	Ecrou de vis de réglage	Контргайка подстроечного винта	调节螺栓防松螺母
Alloy Steel	Acier allié	Легированная сталь (зд.: теплостойкая сталь)	合金钢
Area	Aire	Площадь	面积
Backflow Preventer	Dispositif anti-retour	Обратный клапан	返流抑止器
Backpressure	Contre-pression	Противодавление	背压
Balanced Bellows	Soufflet d’équilibrage	Разгруженные сильфоны	平衡式波纹管
Barometric	Barométrique	Барометрический	大气压力的
Base Stud	Goujon de corps	Основная шпилька	底部螺栓
Bellows	Soufflet	Сильфоны	波纹管
Blowdown	Chute de pression à la refermeture	Продувка	启闭压差
Body	Corps	Корпус	阀体
Bolt	Boulon	Болт	螺栓
Bolted Bonnet	Chapeau boulonné	Фланцевая крышка	螺栓固定式阀盖
Bolted Cap	Capuchon boulonné	Фланцевый кожух	螺栓固定式阀帽
Bonnet	Chapeau	Крышка	阀盖
Bonnet	(Gaine)	Крышка	阀盖
Bonnet Stud	Goujon de chapeau	Шпилька крышки	阀盖螺栓
Boxing	Emballage	“Упаковка, тара”	填料涵
Brass	Laiton	Латунь	黄铜
Breathing Valve	Soupape de respiration	Дыхательный клапан	呼吸阀
Buffer	Tampon	“Буфер; амортизатор, глушитель, демпфер”	缓冲器
Bug Screen	Filtre à insecte	Сетка от насекомых	防虫网
Built-up back pressure	Contre-pression engendrée	Переменное противодавление	排放背压
Cap	Capuchon	“Кожух, крышка”	阀帽
Cap screw	Vis de capuchon	“Винт крышки, винт кожуха”	螺纹式阀帽
Capacity	Capacité	Пропускная способность	容量
Carbon Steel	Acier carbone	Углеродистая сталь	碳钢
Change-over Valve	Robinet de jumelage	Переключающий клапан	切换阀
Class	Classe	Класс	(压力)磅级
Closed Bonnet	Chapeau fermé	Закрытая крышка	封闭式阀盖
Component	Composant	Компонент	成份
Compressibility Factor	Facteur de compressibilité	Коэффициент сжимаемости	压缩系数
Compression Screw	Vis de compression	Нажимной винт винт	压紧螺钉
Compression Screw Locknut	Ecrou vis de compression	Контргайка нажимного винта	压紧螺钉锁紧螺母
Conventional	Conventionnel	“Обычный, обыкновенный, традиционный”	常规式
Corrosive Service	Service corrosif	Агрессивная среда	腐蚀工旷

Cover Plate	Couvercle	Крышка	盖板
Cover Plate Assembly	Ensemble de couvercle	Крышка в сборе	盖板装配
Customer	Client	Заказчик	客户
Delivery	Livraison	Поставка	交货
Density	Masse spécifique	Плотность	密度
Design	Conception	Конструкция; компоновка; проект	设计
Design Pressure	Pression de calcul	Расчётное давление	设计压力
Design Temperature	Température maximale/ minimale admissible (TS)	Расчётная температура	设计温度
Dirty service	Service chargé	Загрязнённая среда	恶劣工况
Disc	Clapet	“Диск, плунжер”	阀板
Disc Collar	Ecrou de clapet	Буртик плунжера	阀板环口
Disc Holder	Porte-clapet	Направляющая плунжера	阀板支架
Disc Retainer	Jonc de clapet	Стопор плунжера; фиксатор плунжера	阀板固定器
Discharge	Décharge	“Выпуск, сброс”	排放
Dome	Dôme	Колпак	阀腔
Drain	Drain	“Дренаж, дренировать”	排放
Duplex	Duplex	“Двухсторонний, двойной; сплав Duplex”	双向的
Feature	Caractéristique	“Особенность, характеристика”	特点
Filter	Filtre	Фильтр	过滤器
Fittings	Raccords	Фитинги	紧固件
Flange	Bride	Фланец	法兰
Flat Disc	Clapet plat	“Плоский плунжер, плоский диск”	平的阀板
Floating Washer	Bague flottante	Плавающая шайба	可移动的衬垫
Flow	Flux	“Расход (среды), поток”	流体
Flow Coefficient	Coefficient de débit	“Коэффициент расхода, условная пропускная способность”	流量系数
Flowrate	Débit	Расход рабочей среды	流量
Fluid	Fluide	Жидкость	流动性
Full nozzle	Buse longue	Полнопроходный	全喷嘴
Gag	Verrou	Заглушка	堵丝
Gas	Gaz	Газ	气体
Gasket	Joint d’étanchéité	Прокладка	衬垫
Guide	Guide	Направляющая	导向
Guide Pin	Vis de blocage de tige	Направляющий штифт	导销
Hard Faced	Face durcie	Наваренный твёрдым сплавом	硬表面
Hastelloy	Hastelloy	Сплав Hastelloy	哈司合金
High temperature	Haute température	Высокая температура	高温
Holder Ring	Déflecteur	Опорное кольцо	固定器环
Inlet	Entrée	Вход	入口
Insert Spring Seal	Joint de tige	Прокладка стержня	嵌入式弹簧密封
Insulation	Calorifuge	Изоляция	绝缘
Leak	Fuite	Протечка	泄漏

Leaking	Fuyard	Утечка	泄漏
Lever	Levier	Рычаг	手柄
Lift Stop	Butée	Ограничитель подъёма	提升限制器
Lifting Gear	Came de levier	Подъёмный механизм	提升齿轮
Liquid	Liquide	Жидкость	液体
Low Pressure Valve	Soupape basse pression	Клапан низкого давления	低压阀
Low Temperature	Basse température	Низкая температура	低温
Lower Adjusting Ring	Bague de réglage inférieure	Нижнее регулировочное кольцо	下游调节环
Lower Adjusting Ring Pin	Vis de blocage de la bague de réglage inférieure	Штифт нижнего регулировочного кольца	下游调节环销
Lower Spring Washer	Rondelle d'appui inférieure du ressort	Нижняя шайба пружины	底部弹簧垫圈
Malleable Iron	Fonte malléable	Ковкий чугун	球铁
Manual	Manuel	Ручной	手动
Manual Blowdown	Ouverture manuelle	Ручная продувка	手动启闭压差
Material	Matière	Материал	材料
Max. Allowable Working Pressure	(Pression de design)	Максимально-допустимое рабочее давление	设计压力 (最大允许工作压力)
Max. Allowable Working Pressure	Pression maximale) admissible (PS	Максимальное рабочее давление	设计压力 (最大允许工作压力)
Max. Expected Working Pressure	Pression d'exploitation maximum autorisée	Макимальное разрешённое рабочее давление сосуда	最大期望操作压力
Modulating Action	Ouverture modulée	Режим регулирования	调节动作
Modulator	Modulateur	Регулятор	调节器
Molecular Weight (MW)	Masse Moléculaire	Молекулярный вес	摩尔重量
Monel	Monel	Монелль-металл	蒙乃尔合金
Multiple Valve	Soupape multiple	"Составной клапан, манифольд"	阀组
Nameplate	Plaque signalétique	Табличка	铭牌
Nickel Copper Alloy	Alliage Nickel Cuivre	Медно-никелевый сплав	镍铜合金
Nomenclature	Nomenclature	"Номенклатура, перечень, список"	术语
Nozzle	Buse	"Патрубок, сопло"	喷嘴
Nut	Ecrou	Гайка	螺母
Open Bonnet	Chapeau ouvert	Открытая крышка	槽形阀盖
Operating Pressure	Pression de service	Рабочее давление	操作压力
Orifice	Orifice	"Сопло, отверстие"	孔口
Orifice Area	Surface de l'orifice	Площадь сопла	孔口面积
O-ring	Joint torique	Кольцо круглого сечения	O形环
Outlet	Sortie	Выход	出口
Overlap Collar	Bague d'étranglement	Перекрывающая втулка	搭接环口
Overpressure	Surpression	Сверхдавление	过压

Packaging	Emballage	“Упаковка, укладка; укупорка”	包装
Packed Lever	Levier étanche	Рычаг с уплотнением	封闭式提升板手
Penalties	Pénalités	“Штрафы, пени”	罚款
Pilot Operated Safety Relief Valve	Soupape de sureté pilotée	Импульсное предохранительное устройство (ИПУ)	先导式安全释放阀
Pitot Tube	Tube de Pitot	Трубка Пито	空/风速管
Plain Lever	Levier simple	Прямой рычаг	普通式提升手柄
Plug	Bouchon	Плунжер	插销
Pop Action	Ouverture instantanée	“Мгновенное открытие (“”хлопок””)”	突跳式
Pressure	Pression	Давление	压力
Pressure Relief Valve	Soupape de sureté	Предохранительный клапан	压力释放阀
Raised Face (RF)	Face surélevée (FS)	Фланец с соединительным выступом	凸面
Release Nut	Ecrou de levage	Фиксирующая гайка	释放螺母
Relief Valve	Soupape de sureté	Предохранительный клапан	释放阀
Relieving Temperature	Température de décharge	Температура сброса	释放温度
Ring Tool Joint (RTJ)	Face de joint annulaire	Фланцы под овальную металлическую прокладку	环垫接头
Safety Relief Valve	Soupape de sureté	Предохранительный клапан	安全释放阀
Safety Valve	Soupape de sureté	Предохранительный клапан	安全阀
Screwed Cap	Capuchon vissé	Резьбовая крышка	螺纹式阀帽
Seal	Etanchéité	Уплотнение	密封
Seat	Siège	Седло	阀座衬套
Seat Bushing	Buse	Втулка седла	阀座衬套
Seat O-Ring	Joint du siège	Седельное кольцо круглого сечения	阀座O形环
Semi-nozzle	Buse courte	Неполнопроходной	半喷嘴
Sensing Line	Tube d’alimentation du pilote	Импульсная линия	传感线
Sensing Tube	Connecteur	Импульсная трубка	传感管路
Set of Gasket	Jeu de joints	Набор прокладок	衬垫包
Set Pressure	Pression de début d’ouverture	Давление настройки	整定压力
Shipment	Transport	Транспортировка	装船
Size	Taille	Размер	尺寸
Slotted Bonnet	Chapeau ouvert	Разрезная крышка	槽形阀盖
Soft Seat	Siège souple	Мягкое седло	软阀座
Sour Gas	Gaz acide	Кислый газ	酸性气体
Spare parts	Pièces détachées	Запасные части	备品备件
Specific Gravity	Densité	удельный вес	TBA
Spindle	Tige	Шпиндель	阀轴
Split Pin	Goupille	Шплинт	开口销
Spring	Ressort	Пружина	弹簧
Spring Loaded Safety Relief Valve	Soupape à ressort	Пружинный предохранительный клапан	弹簧载荷式安全释放阀
Spring Washer	Rondelle ressort	“Пружинная шайба, тарельчатая пружина”	弹簧垫圈

Stainless Steel	Acier inox	Нержавеющая сталь	不锈钢
Standard	Norme	Норма	标准
Steam	Vapeur (d'eau)	Пар	蒸汽
Steam Jacket	Enveloppe de réchauffage	Паровая рубашка	蒸汽夹套
Stellite Deposit	Dépôt de stellite	Стеллитовая наплавка	司太力合金堆焊
Stem	Tige	Шток	阀轴
Stud	Goujon	Шпилька	柱头螺栓
Temperature	Température	Температура	温度
Test Bench	Banc d'essai	Испытательный стенд	测试台
Test Gag	Verrou d'essai	Испытательная заглушка	实验堵丝
Thread (female)	Taraudage	Резьба (внутренняя)	阴螺纹
Thread (male)	Filetage	Резьба (наружная)	阳螺纹
Thrust Bearing	Roulement à bille	"Упорный подшипник, упор"	止推轴承
Tightness	Etanchéité	Плотность (герметичность)	紧密
Top Lever	Came de levier	Верхний рычаг	顶部手柄
Top Plate	Plaque	Верхняя тарелка	顶部金属板
Top Plate Assembly	Ensemble de plaque	Верхняя тарелка в сборе	顶部金属板装配
Type	Type	Тип	类型
Unit	Unité	Блок	单位
Upper Adjusting Ring	Bague de réglage supérieure	Верхнее регулировочное кольцо	上部调节环
Upper Adjusting Ring Pin	Vis de blocage de la bague de réglage supérieure	Штифт верхнего регулировочного кольца	上部调节环销
Upper Ring Pin	Vis de blocage de la bague de réglage supérieure	Штифт верхнего кольца	上部环销
Upper Spring Washer	Rondelle d'appui supérieure du ressort	Верхняя пружинная шайба (тарельчатая пружина)	顶部弹簧衬垫
Vacuum Valve	Soupape de dépression	Вакуумный клапан	真空阀
Value	Valeur	"Значение, величина"	数值
Vapor (from a fluid)	Vapeur (d'un fluide)	Пар	水汽
Vent Bug Screen	Ecran à insectes	Сетка от насекомых	出口防虫网
Viscosity	Viscosité	Вязкость	粘度
Washer retainer	Bague de retenue	Фиксатор шайбы	衬垫固定器
Weather shield	Capot de protection	Защитный кожух	耐腐蚀保护罩
Weight	Masse	Вес	重量
Yoke	Arcade	Бугель	支架(轭状物)
Yoke Rod	Colonnette	Стойка бугеля	支架杆

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