

## Pressure-Relief Valves

Superior offers the most complete range of refrigeration relief valves in the industry. All valves have been designed, constructed and rated in accordance with ANSI/ASHRAE 15-1994 Standard Safety Code for Mechanical Refrigeration.

Each valve is stamped U.V./N.B. to indicate National Board certifications as to capacities. Certified National Board ratings are printed on the next page.

Minimum setting for all relief valves listed is 150 psi. These pressure-relief valves are all Teflon® seated, permitting their use in applications of either high or low temperatures where the

conventional rubber seated valves are often completely unsatisfactory.

Part Numbers indicate style and size of relief valve only — customer must specify pressure setting when ordering. **Standard pressure settings are available from 150-800 psi. Part Numbers for pressure settings 500-800 include a “C” as in “3000C-550”**

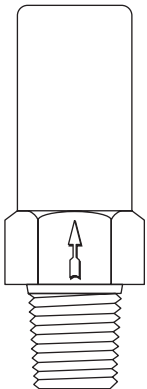
*Note: Prior to installation or during pressure vessel testing, Superior pressure-relief valves should not be discharged. Any dirt in the system may embed in the seat and prevent the pressure-relief valve from resealing properly.*

*Important: A pressure-relief valve is installed in a refrigeration system primarily to protect the receiver. Since it is not intended to be an overload or high-pressure cutout, we recommend that the pressure-relief valve be set at the working pressure marked on the receiver, regardless of the type of refrigerant used. The method for determining “set pressure” is outlined in ANSI/ASHRAE 15 Standard Safety Code for Mechanical Refrigeration.*

*Note: Pressure-relief valves cannot be returned to the factory. This policy helps maintain product integrity.*

*Teflon is a registered trademark of Dupont.*

### Atmospheric — Types 3000 & 3000C, 3001 & 3001C, 3002 & 3002C

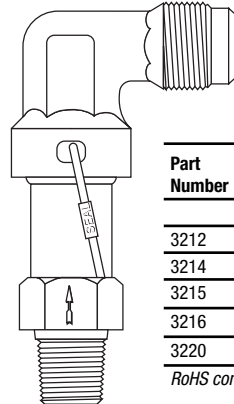


Part Number	Port Diameter	Size (Inches)		Weight (lbs.)	Weight (lbs.) C
		Inlet	Outlet		
NPT x					
3000	3/16	1/8	*	0.19	0.21
3001	3/16	1/4	*	0.19	0.21
3002	3/16	3/8	*	0.19	0.21

\* Atmospheric — No external connection.

RoHS compliant

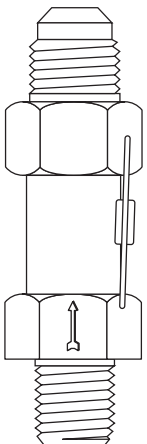
### Angle — Types 3212 & 3212C, 3214 & 3214C, 3215 & 3215C, 3216 & 3216C, 3220 & 3220C



Part Number	Port Diameter	Size (Inches)			Weight (lbs.)	Weight (lbs.) C
		Inlet	Outlet	SAE		
NPT x SAE						
3212	3/16	1/4	3/8	0.50	0.52	
3214	3/16	3/8	3/8	0.50	0.52	
3215	3/16	3/8	1/2	0.50	0.52	
3216	9/32	3/8	1/2	0.75	0.83	
3220	9/32	1/2	3/8	0.75	0.83	

RoHS compliant

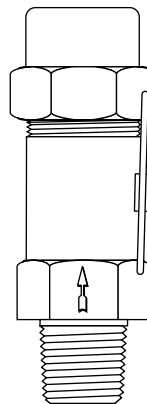
### Straight-Thru — Types 3012 & 3012C, 3014 & 3014C, 3015 & 3015C, 3016 & 3016C, 3020 & 3020C



Part Number	Port Diameter	Size (Inches)			Weight (lbs.)	Weight (lbs.) C
		Inlet	Outlet	SAE		
NPT x SAE						
3012	3/16	1/4	3/8	0.25	0.27	
3014	3/16	3/8	3/8	0.25	0.27	
3015	3/16	3/8	1/2	0.25	0.27	
3016	9/32	3/8	1/2	0.50	0.58	
3020	9/32	1/2	3/8	0.50	0.58	

RoHS compliant

### Female Connection — Types 3030, 3031, 3045, 3060 & 3075



Part Number	Port Diameter	Size (Inches)			Weight (lbs.)	Weight (lbs.) C
		Inlet	Outlet	FPT		
NPT x FPT						
3030	7/16	1/2	1/2	0.75	0.83	
3031	7/16	1/2	3/4	0.75	0.83	
3045	7/16	3/4	3/4	0.75	0.83	
3060	23/32	1	1	2.50	2.58	
3075	23/32	1 1/4	1 1/4	2.75	2.83	

RoHS compliant

## Pressure-Relief Valves

- Minimum setting: 150 PSIG.
- Body construction: brass.
- Seat material: 100% Teflon®.
- Spring material: stainless steel.
- Minimum temperature: -40° F.
- Maximum temperature: 325° F.
- Initial leak: set pressure ±3%.
- Full discharge: initial leak +10%.
- Reseat: by 80% of set pressure.
- ASME Certificate No.: 28,516.
- Canadian Registration No.: 0G8195.
- RoHS compliant.
- N.B. Certificate Nos.:
  - 3000 Series M54009
  - 3020 Series M54010
  - 3030 Series M54021
  - 3060 Series M54032

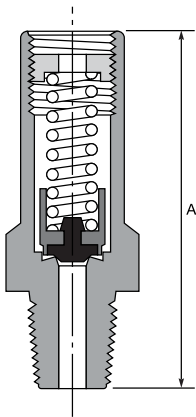
Teflon is a registered trademark of Dupont.

Discharge capacities shown in pounds air per minute.

To convert pounds air per minute to standard cubic feet per minute, multiply by 13.1.

### Atmospheric —

#### Types 3000 & 3000C, 3001 & 3001C, 3002 & 3002C



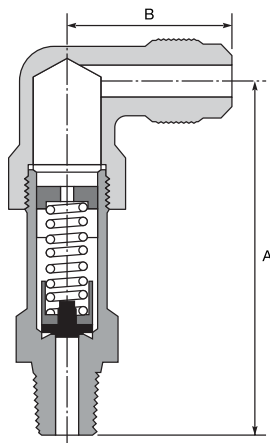
Pressure Setting	Discharge Capacity
<i>Part Numbers 3000, 3001, 3002</i>	
235	8.1
300	10.2
350	11.8
400	13.5
425	14.3
450	15.1
500	16.7
<i>Part Numbers 3000C, 3001C, 3002C</i>	
550	18.3
600	19.9
650	21.6
700	23.2
750	24.9
800	26.5

Part Number	Dimensions (Inches)	
	A	
<i>Settings</i>	150 to 500 psi (10.34 to 34.47 bar)	
3000	2.17	
3001	2.30	
3002	2.30	
<i>Settings</i>	501 to 600 psi (34.54 to 41.37 bar)	601 to 800 psi (41.44 to 55.16 bar)
3000C	2.17	2.42
3001C	2.30	2.55
3002C	2.30	2.55

Note: For IBCA numbers, consult factory

### Angle —

#### Types 3212 & 3212C, 3214 & 3214C, 3215 & 3215C, 3216 & 3216C, 3220 & 3220C



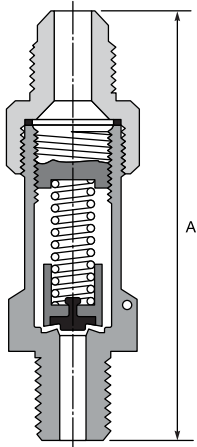
Pressure Setting	Discharge Capacity	
<i>Part Numbers 3212, 3214, 3215, 3216, 3220</i>		
	<b>3212, 3214, 3215</b>	<b>3216, 3220</b>
235	8.1	16.1
300	10.2	20.3
350	11.8	23.6
400	13.5	26.8
425	14.3	28.4
450	15.1	30.1
500	16.7	33.3
<i>Part Numbers 3212C, 3214C, 3215C, 3216C, 3220C</i>		
	<b>3212C, 3214C, 3215C</b>	<b>3216C, 3220C</b>
550	18.3	36.6
600	19.9	39.9
650	21.6	43.1
700	23.2	46.4
750	24.9	49.6
800	26.5	52.9

Part Number	Dimensions (Inches)			
	A		B	
<i>Settings</i>	150 to 500 psi (10.34 to 34.47 bar)			
3212	2.92		1.41	
3214	2.92		1.41	
3215	2.92		1.41	
3216	2.66		1.50	
3220	2.84		1.62	
<i>Settings</i>	501 to 600 psi (34.54 to 41.37 bar)		601 to 800 psi (41.44 to 55.16 bar)	
3212C	2.92	1.41	3.32	1.41
3214C	2.92	1.41	3.32	1.41
3215C	2.92	1.41	3.32	1.41
<i>Settings</i>	501 to 800 psi (34.54 to 55.16 bar)			
3216C	3.60		1.50	
3220C	3.80		1.62	

## Pressure-Relief Valves

### Straight-Thru –

Types 3012 & 3012C, 3014 & 3014C, 3015 & 3015C, 3016 & 3016C, 3020 & 3020C

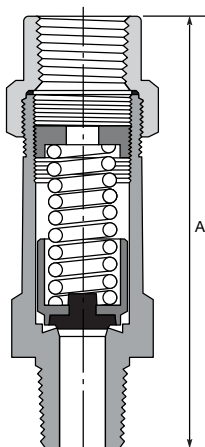


Pressure Setting	Discharge Capacity	
	3012, 3014, 3015	3016, 3020
<i>Part Numbers 3012, 3014, 3015, 3016, 3020</i>		
235	8.1	16.1
300	10.2	20.3
350	11.8	23.6
400	13.5	26.8
425	14.3	28.4
450	15.1	30.1
500	16.7	33.3
<i>Part Numbers 3012C, 3014C, 3015C, 3016C, 3020C</i>		
	3012C, 3014C, 3015C	3016C, 3020C
550	18.3	36.6
600	19.9	39.9
650	21.6	43.1
700	23.2	46.4
750	24.9	49.6
800	26.5	52.9

Part Number	Dimensions (Inches)	
	A	
<i>Settings</i>	<i>150 to 500 psi (10.34 to 34.47 bar)</i>	
3012	2.98	
3014	2.98	
3015	3.11	
3016	3.28	
3020	3.50	
<i>Settings</i>	<i>501 to 600 psi (34.54 to 41.37 bar)</i>	<i>601 to 800 psi (41.44 to 55.16 bar)</i>
3012C	2.98	3.35
3014C	2.98	3.35
3015C	3.11	3.47
<i>Settings</i>	<i>501 to 800 psi (34.54 to 55.16 bar)</i>	
3016C	4.13	
3020C	4.45	

### Female Connection –

Types 3030, 3031, 3045, 3060, 3075\*



Pressure Setting	Discharge Capacity	
	3030, 3045	3060, 3075
235	36.9	88.0
300	46.6	111.0
350	54.0	*
400	61.4	*
425	65.1	*
450	68.8	*

\* Not available at pressure settings above 300 psi.

Part Number	Dimensions (Inches)	
	A	
3030	3.69	
3031	4.00	
3045	4.00	
3060	4.87	
3075	5.12	

## Selection of Relief Valves for Commercial Refrigeration and Air Conditioning Applications Based on ANSI/ASHRAE Standard 15

To select a pressure-relief valve, it is necessary first to determine the discharge capacity required to protect the refrigerant-containing vessel under consideration. The ANSI/ASHRAE Standard 15 states that the required discharge capacity of a pressure-relief valve used on such a vessel is directly proportional to the size of the vessel. Once the size of the vessel to be protected is known, the required discharge capacity of the pressure-relief valve may then be determined by using the following formula:

$$C = fDL$$

- Where: C = minimum required discharge capacity of the pressure-relief device in pounds of air per minute (kg/sec).  
 f = factor dependent upon type of refrigerant<sup>1</sup>. (See Table 1 below)  
 D = outside diameter of vessel in feet (m).  
 L = length of vessel in ft. (m).

**Table 1**

<b>Refrigerant</b> .....	<b>Value of f</b>
<i>When used on the low side of a limited-charge cascade system (Values in parentheses are metric):</i>	
R-23, R-170, R-744, R-1150, R-508A, R-508B .....	1.0 (0.082)
R-13, R-13B1, R-503 .....	2.0 (0.163)
R-14 .....	2.5 (0.203)
<i>Other applications:</i>	
R-718 .....	0.2 (0.016)
R-717 .....	0.5 (0.041)
R-11, R-32, R-113, R-123, R-142b, R-152a, R-290, R-600, R-600a, R-764 .....	1.0 (0.082)
R-12, R-22, R-114, R-124, R-134a, R-401A, R-401B, R-401C, R-405A, R-406A, R-407C, R-407D, R-407E, R-409A, R-409B, R-411A, R-411B, R-411C, R-412A, R-414A, R-414B, R-500, R-1270 .....	1.6 (0.131)
R-143a, R-402B, R-403A .....	2.0 (0.163)
R-407A, R-408A, R-413A .....	2.0 (0.163)
R-115, R-402A, R-403B, R-404A, R-407B, R-410A, R-410B, R-502, R-507A, R-509A .....	2.5 (0.203)

Example: What is the required discharge capacity of a pressure-relief valve to be used on an R-22 receiver that is 14" in diameter and 42" long having a design working pressure of 320 psi?

Solution: D = 1.167 ft., L = 3.5 ft., and f = 1.6 from Table 1:  
 C = fDL = 1.6 x 1.167 x 3.5  
 C = 6.5 lbs. air/min.

In other words, under the conditions listed above, a receiver of this size requires a pressure-relief valve with a minimum discharge capacity of 6.5 pounds of air per minute at a pressure setting of 320 PSIG.

### Pressure-Relief Valve Settings

All pressure-relief valves are rated according to their discharge capacity either in pounds of air per minute or kg/sec. at a given pressure setting. Under the ANSI/ASHRAE 15 Standard, pressure-relief valves shall start to function at a pressure not to exceed the design pressure of the parts of the system protected.

Generally, a pressure-relief valve may be set so that its initial leak is 100% of the design working pressure of the pressure vessel, regardless of the type of refrigerant used. The method of determining set pressure is outlined in Section 9.2 of the ANSI/ASHRAE Standard 15.

Sherwood manufactures pressure-relief valves in standard settings of 235, 300, 350, 400, 425 and 450 PSIG. Relief valves with settings other than standard may be ordered from the factory at a slight additional cost.

### Capacity of Pressure-Relief Valves

Flow capacities of Superior pressure-relief valves are expressed in either pounds of air per minute or standard cubic feet per minute. To convert pounds of air per minute to standard cubic feet per minute, multiply by 13.1.

To determine the pressure-relief valve capacities at any pressure setting between 150 and 450 PSIG, use the following formula:

$$C = S(1.1P + 14.7)$$

- Where: C = Pressure-relief valve capacity in pounds of air per minute  
 P = Pressure setting of relief valve in PSIG  
 S = Pressure-relief valve flow factor

Values of "S" flow factor for each pressure-relief valve series are given in Table 2. Table 2 (pg. 23) gives the certified flow ratings in pounds of air per minute for all of the pressure-relief valve series at the standard pressure settings.

**Table 2**

CERTIFIED FLOW RATINGS — for standard settings

Flow capacity as determined by the National Board of Boiler and Pressure Vessel Inspectors in accordance with A.S.M.E. Code, Section VIII, Division 1, and as required by ANSI/ASHRAE Standard 15: Safety Code For Mechanical Refrigeration.

Series	3000		3020	3030	3060
Flow Factor "S"	0.0296		0.059	0.135	0.322
Part Number	3000, 3000C	3015, 3015C	3016, 3016C	3030	3060
	3001, 3001C	3212, 3212C	3020, 3020C	3031	3075
	3002, 3002C	3214, 3214C	3216, 3216C	3045	
	3012, 3012C	3215, 3215C	3220, 3220C		
	3014, 3014C				

Example: What is the flow capacity of a Sherwood 3045 pressure-relief valve set to 350 PSIG?

Solution: Referring to Table 2, we find that a 3045 pressure-relief valve is part of the 3030A Series and that its flow capacity is 54.0 lbs. air/min. The calculation goes as follows:

"S" factor from Table 2 for the 3030A Series is 0.135. Therefore:

$$C = S(1.1P+14.7) = 0.135 \times [(1.1) \times 350 + 14.7]$$

$$C = 54.0 \text{ lbs. air/min.}$$

To convert 54.0 lbs. air/min. to SCFM:

$$C = 54.0 \times 13.1 = 707.4 \text{ SCFM}$$

As you will note from Table 2, the higher the set pressure, the greater the flow capacity of the pressure-relief valve.

**General Regulations and Recommendations**

1. Pressure-relief valves are installed in a refrigeration system primarily to protect the receiver or other pressure vessel in the event of a fire or any other emergency high-pressure conditions. Fuse plugs protect only in the event of fire.
2. All systems must have a pressure-relief valve or a fuse plug installed in order to comply with the ANSI/ASHRAE Standard 15.
3. Pressure vessels with an internal gross volume of 3 ft.<sup>3</sup> (0.085 m<sup>3</sup>) or less shall use one or more pressure-relief devices or a fusible plug.  
*Note: Local codes may require pressure-relief valves on receivers smaller than 3 ft.<sup>3</sup>.*
4. Pressure vessels of more than 3 ft.<sup>3</sup> (0.085 m<sup>3</sup>) but less than 10 ft.<sup>3</sup> (0.285 m<sup>3</sup>) internal gross volume shall use one or more pressure-relief devices. Fusible plugs are not permitted and should not be used.

*Note: Relief valves are non-returnable. The policy helps maintain product integrity.*

5. Pressure vessels of 10 ft.<sup>3</sup> (0.285 m<sup>3</sup>) or more internal gross volume use a single rupture member or dual pressure-relief valves when discharging to the atmosphere. Dual pressure-relief valves are installed with a three-way valve to allow testing or repairs (See Sherwood 3155W Series Valves). A three-way valve used in conjunction with the dual pressure-relief valves is not considered a stop valve.
6. Fuse plugs are temperature responsive relief devices only, and for all practical purposes, can only be considered as protection for the receiver of the system in cases of fire when the fire is in the immediate vicinity of the fuse plug.
7. Sherwood recommends the use of spring-loaded pressure-relief devices, such as our four series of pressure-relief valves. They are pressure sensitive and add an additional protection against abnormal system pressures.
8. Sherwood pressure-relief valves are approved and tested as required by Section VIII, Division 1 of the ASME Boiler and Pressure Vessel Code. All valves have pertinent data marked on the side of the valve body as required by the ASME Boiler and Pressure Vessel Code.
9. The pressure-relief valve set pressure cannot be higher than the design working pressure of the pressure vessel it is protecting, but, if conditions permit, the pressure-relief valve set pressure should be at least 25% higher than the maximum normal operating pressure.
10. All pressure-relief valves installed on the high side must be in a vapor space as near to the receiver as practical. Stop valves cannot be placed in the line between the pressure-relief valve and the pressure vessel it is protecting. In general, the pressure-relief valve should be installed directly to the receiver above the liquid level or as near to the inlet of the receiver as practical. All pipe and fittings between the pressure-relief valve and the parts of the system it protects must have at least the same diameter of the pressure-relief valve inlet diameter.
11. The size of discharge pipe from a pressure-relief valve must not be less than the outlet size of the pressure-relief valve. See ANSI/ASHRAE Standard 15 for requirements and guidelines on discharge piping.
12. Prior to installation or during pressure vessel testing, Sherwood pressure-relief valves should not be discharged. Any dirt in the system may imbed in the seat and prevent the pressure-relief valve from resealing properly.
13. The statements in this document reflect and are taken directly from ANSI/ASHRAE Standard 15-1994 and ANSI/ASHRAE Addendum 15c-2000. Please consult these standards for any additional information.

