PRESSURE RELIEF VALVE WARNING

INSPECTION

A pressure relief valve discharges when some extraordinary circumstance causes an over pressure condition in the container. If a pressure relief valve is known to have discharged, the relief valve, as well as the entire system, should be immediately and thoroughly inspected to determine the reason for the discharge. In the case of discharge due to fire, the valve should be removed from service and replaced.

> Relief valves should be inspected each time the container is filled but no less than once a year. If there is any doubt about the condition of the valve, it must be replaced.

> WARNING: Eye protection must be worn when performing inspection on relief valves under pressure. Never look directly into a relief valve under pressure or place any part of your body where the relief valve discharge could impact it. In some cases a flashlight and small mirror are suggested to assist when making visual inspections.

In the case of a pressure relief valve that has opened due to a pressure beyond its start-to-discharge setting, the chances of foreign material lodging between the seat and the disc is low, however the possibility is always present. If the relief valve continues to leak at pressure below its start-to-discharge setting it must be replaced.

If there is any doubt about the condition of the relief valve, or if the relief valve has not been protected by a cap for some time, it should be replaced before refilling the container.

Inspection Checklist:

1. Cap: Check that the protective cap is in place over the valve or pipeaway stack outlet and has a snug fit. The protective cap helps protect the relief valve against possible malfunction caused by rain, sleet, snow, ice, sand, dirt, pebbles, insects, other debris and contamination. Replace damaged or missing caps at once and keep a cap in place at all times.

2. Weep Holes: Inspect and clear debris from the relief valve weep holes. Dirt, ice, paint, and other foreign particles can prevent proper drainage from the valve body. If the weep holes cannot be cleared, replace the valve.

3. Relief Valve Spring: Exposure to high concentrations of water, salt, industrial pollutants, chemicals and contaminants could cause metal parts to fail including the relief valve spring. If the coating on the relief valve spring is cracked or chipped, replace the valve.

4. Physical Damage: Ice accumulations and improper installation could cause mechanical damage. If there are any indications of damage, replace the valve.

5. Tampering or Readjustment: Pressure relief valves are factory set to discharge at specified pressures. If there are any indications of tampering or readjusting, replace the valve.

6. Seat Leakage: Check for leaks in the seating area using Marshall Excelsior leak detector solution. If there is any indication of leakage, replace the valve. Never force a relief valve closed and continue to leave it in service. This could result in damage to the valve and possible rupture of the container or piping on which the valve is installed.

7. Corrosion: Replace the valve if there are any signs of corrosion or contamination.

8. Moisture, Foreign Particles or Contaminants in the Valve: Foreign material such as paint, tar or ice in relief valve parts can impair the proper functioning of the valves. Grease placed in the valve body may harden over time or collect contaminants, thereby impairing the proper operation of the relief valve. Do not place grease in the valve body; replace the valve if there are any indications of moisture or foreign matter in the valve.

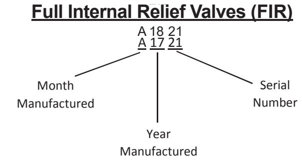
9. Corrosion or Leakage at Container Connection: Check container to valve connection using Marshall Excelsior leak detector solution. Replace the valve if there is any indication of corrosion or leakage at the connection between the valve and container.

> CAUTION: Never plug the outlet of a pressure relief valve. Any device used to stop the flow of a properly operating pressure relief valve that is venting an over pressurized container can cause severe consequences.

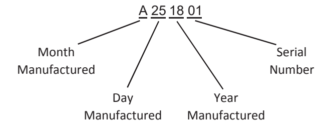
PRODUCT AGE

To determine the product's age, check the product for a date code consisting of a series of letters and numbers.

Full Internal Relief Valves (FIR)



Semi Internal Relief Valves (SIR) & External Relief Valves



OPERATION OF PRESSURE RELIEF VALVES

Pressure relief valves are set and sealed by the manufacturer to function at a specific "start-to-discharge" pressure in accordance with UL 132. This set pressure is marked on the relief valve and depends on the design requirement of the container to be protected by the relief valve. If the container pressure reaches the start-to-discharge pressure, the relief valve will open a slight amount as the seat disc begins to move slightly away from the seat. If the pressure continues to rise despite the initial discharge through the relief valve, the seat disc will move to a full open position with a sudden "pop". This popping sound is from which the term "pop-action" is derived.

Whether the relief valve opens a slight amount or pops wide open, it will start to close if the pressure in the container diminishes. After the pressure has decreased sufficiently, the relief valve spring will force the seat disc against the seat tightly enough to prevent any further escape of product. The pressure at which the valve closes tightly is referred to as the "re-seal" or "blow-down" pressure. Generally, the re-seal pressure will be lower than the start-to-discharge pressure.

Requirements for Pressure Relief Valves

Every container used for storing or hauling LP-Gas and NH_3 must be protected by a pressure relief valve. These valves are designed to protect the container against the development of hazardous conditions which might be created by any of the following:

- High pressures resulting from exposure of the container to excessive external heat.
- High pressures due to the use of incorrect fuel.
- High pressures due to improper purging of the container.

> Consult NFPA #58 for LP-Gas and ANSI #K61.1 for NH_3, and/or any applicable local and state regulations governing the application and use of pressure relief valves.

Selection of MEC Pressure Relief Valves for ASME Containers

The rate of discharge required for a given container is determined by the calculation of the surface area of the container as shown in "Chart A" for LP-Gas and "Chart B" for NH_3.

> The set pressure of a pressure relief valve depends upon the design pressure of the container. Refer to NFPA #58 "Liquefied Petroleum Gas Code" for more information.

Chart A - Minimum Required Rate of Discharge for LP-Gas Pressure Relief Valves Used on ASME Containers

From NFPA Code #58, Table 5.9.2.6 (2024 Edition)

Minimum required rate of discharge in cubic feet per minute of air at 120% of the maximum permitted start-to-discharge pressure relief valves to be used on containers other than those constructed in accordance with Interstate Commerce specification.

Surface Area Sq. Ft.	Flow Rate CFM Air	Surface Area Sq. Ft.	Flow Rate CFM Air	Surface Area Sq. Ft.	Flow Rate CFM Air	Surface Area Sq. Ft.	Flow Rate CFM Air	Surface Area Sq. Ft.	Flow Rate CFM Air	Surface Area Sq. Ft.	Flow Rate CFM Air	Surface Area Sq. Ft.	Flow Rate CFM Air
20 or less	626	85	2050	150	3260	230	4630	360	6690	850	13540	1500	21570
25	751	90	2150	155	3350	240	4800	370	6840	900	14190	1550	22160
30	872	95	2240	160	3440	250	4960	380	7000	950	14830	1600	22740
35	990	100	2340	165	3530	260	5130	390	7150	1000	15470	1650	23320
40	1100	105	2440	170	3620	270	5290	400	7300	1050	16100	1700	23900
45	1220	110	2530	175	3700	280	5450	450	8040	1100	16720	1750	24470
50	1330	115	2630	180	3790	290	5610	500	8760	1150	17350	1800	25050
55	1430	120	2720	185	3880	300	5760	550	9470	1200	17960	1850	25620
60	1540	125	2810	190	3960	310	5920	600	10170	1250	18570	1900	26180
65	1640	130	2900	195	4050	320	6080	650	10860	1300	19180	1950	26750
70	1750	135	2990	200	4130	330	6230	700	11550	1350	19780	2000	27310
75	1850	140	3080	210	4300	340	6390	750	12220	1400	20380		
80	1950	145	3170	220	4470	350	6540	800	12880	1450	20980		

Surface area = Total outside surface area of container in square feet.

When the surface area is not stamped on the name plate or when the marking is not legible, the area can be calculated by using one of the following formulas:

1. Cylindrical container with hemispherical heads. Area (in sq. ft.) = overall length (ft.) x outside diameter (ft.) x 3.1416
2. Cylindrical container with other than hemispherical heads. Area (in sq. ft.) = [overall length (ft.) + .3 outside diameter (ft.)] x outside diameter (ft.) x 3.1416.
3. Spherical container. Area (in sq. ft.) = outside diameter (ft.) squared x 3.1416.

Flow Rate CFM Air = Required flow capacity in cubic feet per minute of air at standard conditions, 60°F. and atmospheric pressure (14.7 psia).

The flow rate discharge may be interpolated for intermediate values of surface area. For containers with total outside surface area greater than 2000 square feet, the required flow rate can be calculated using the formula. Flow Rate in CFM Air = 53.632 $A^{0.82}$. Where A = total outside surface area of the container in square feet.

Valves not marked "Air" have rate marking in cubic feet per minute of liquefied petroleum gas. These can be converted to ratings in cubic feet per minute of air by multiplying the liquefied petroleum gas ratings by the factors listed below. Air flow ratings can be converted to ratings in cubic feet per minute of liquefied petroleum gas by dividing the air ratings by the factors listed below.

Air Conversion Factors

Container Type	100	125	150	175	200
Air Conversion Factor	1.162	1.142	1.113	1.078	1.010

Chart B - Minimum Required Rate of Discharge for Anhydrous Ammonia Pressure Relief Valves Used on ASME Containers

From ANSI/CGA G-2.1-2023, Appendix A

Minimum required rate of discharge in cubic feet per minute of air at 120% of the maximum permitted start-to-discharge pressure for pressure relief valves to be used on containers other than those constructed in accordance with United States Department of Transportation cylinder specifications.

Pressure relief valves for excessive heat or fire protection used on containers covered by Sections 6, 11, and 12 shall be constructed to discharge at not less than the rates required in Appendix A before the pressure is in excess of 121% of the MAWP of the container. Relief protection for any other reason shall use ASME UG-125 UG-126, UG-127, UG-128, UG-129, UG-130, UG-131, UG-132, UG-133, UG-134, UG-135, and UG-136 [18].

Surface area, ft^2	Flow rate ft^3/min air	Surface area, m^2	Flow rate m^3/min air	Surface area, ft^2	Flow rate ft^3/min air	Surface area, m^2	Flow rate m^3/min air	Surface area, ft^2	Flow rate ft^3/min air	Surface area, m^2	Flow rate m^3/min air	Surface area, ft^2	Flow rate ft^3/min air	Surface area, m^2	Flow rate m^3/min air
20	258	1.9	7.3	145	1 310	13.5	37.1	340	2640	31.6	74.6	1350	8160	125.4	231.0
25	310	2.3	8.8	150	1 350	13.9	38.1	350	2700	32.5	76.3	1400	8410	130.1	237.9
30	360	2.8	10.2	155	1 390	14.4	39.2	360	2760	33.5	78.1	1450	8650	134.7	244.9
35	408	3.3	11.6	160	1 420	14.9	40.2	370	2830	34.4	79.9	1500	8900	139.4	251.8
40	455	3.7	12.9	165	1 460	15.3	41.2	380	2890	35.3	81.7	1550	9140	144.0	258.7
45	501	4.2	14.2	170	1 500	15.8	42.2	390	2950	36.2	83.4	1600	9380	148.6	265.5
50	547	4.7	15.5	175	1 530	16.3	43.2	400	3010	37.2	85.2	1650	9620	153.3	272.3
55	591	5.1	16.7	180	1 570	16.7	44.3	450	3320	41.8	93.8	1700	9860	157.9	279.0
60	635	5.6	18.0	185	1 600	17.2	45.3	500	3620	46.5	102.3	1750	10 090	162.6	285.7
65	678	6.0	19.2	190	1 640	17.7	46.3	550	3910	51.1	110.6	1800	10 330	167.2	292.4
70	720	6.5	20.4	195	1 670	18.1	47.3	600	4200	55.7	118.8	1850	10 560	171.9	299.0
75	762	7.0	21.6	200	1 710	18.6	48.3	650	4480	60.4	126.8	1900	10 800	176.5	305.6
80	804	7.4	22.8	210	1 780	19.5	50.2	700	4760	65.0	134.8	1950	11 030	181.2	312.2
85	845	7.9	23.9	220	1 850	20.4	52.2	750	5040	69.7	142.6	2000	11 260	185.8	318.8
90	885	8.4	25.1	230	1 920	21.4	54.1	800	5300	74.3	150.4	2050	11 490	190.5	325.3
95	925	8.8	26.2	240	1 980	22.3	56.0	850	5590	79.0	158.0	2100	11 720	195.1	331.8
100	965	9.3	27.3	250	2 050	23.2	57.9	900	5850	83.6	165.6	2150	11 950	199.7	338.3
105	1010	9.8	28.5	260	2 120	24.2	59.8	950	6120	88.3	173.1	2200	12 180	204.4	344.7
110	1050	10.2	29.6	270	2 180	25.1	61.7	1000	6380	92.9	180.6	2250	12 400	209.0	351.1
115	1090	10.7	30.7	280	2 250	26.0	63.6	1050	6640	97.6	187.9	2300	12 630	213.7	357.5
120	1120	11.2	31.7	290	2 320	26.9	65.4	1100	6900	102.2	195.2	2350	12 850	218.3	363.8
125	1160	11.6	32.8	300	2 380	27.9	67.3	1150	7160	106.8	202.5	2400	13 080	223.0	370.2
130	1200	12.1	33.9	310	2 450	28.8	69.1	1200	7410	111.5	209.7	2450	13 300	227.6	376.5
135	1240	12.5	35.0	320	2 510	29.7	70.9	1250	7660	116.1	216.8	2500	13 520	232.3	382.8
140	1280	13.0	36.0	330	2 570	30.7	72.8	1300	7910	120.8	223.9	2550	13 739	236.9	389.0

NOTES

Surface area = total outside surface area of container in square feet. When the surface area is not stamped on the name plate or when the marking is not legible, the area can be calculated by using one of the following formulas:

(1) Cylindrical container with hemispherical heads—Area = overall length (ft) x OD (ft) x 3.1416

(2) Cylindrical container with other than hemispherical heads—Area = (overall length [ft] + 0.3 OD [ft]) x OD (ft) x 3.1416

(3) Spherical container—Area = OD (ft^2) x 3.1416

Flow rate ft^3/min air = ft^3/min of air required at standard conditions, 60 °F (15.6 °C) and atmospheric pressure (14.7 psia, [101.3 kPa, abs])

The rate of discharge may be interpolated for intermediate values of surface area. For containers with total outside surface area greater than 2500 ft^2, the required flow rate can be calculated using the formula:

Flow rate ft^3/min air = $22.11\ A^{0.82}$

Where:

A = outside surface area of the container in square feet

Conversion factors:

- ft^2 x 0.092903 = m^2
- ft^3/min x 0.028 317 = m^3/min
- ft x 0.3048 = m

INSTALLATION

WARNING: Failure to follow these instructions or to properly install and maintain this equipment could result in an explosion and/or fire causing property damage and personal injury or death. Marshall Excelsior Company equipment must be installed, operated and maintained in accordance with all federal, state and local codes and Marshall Excelsior Company instructions. The installation in most states must also comply with NFPA standards 58 and 59, and ANSI K61.1. Only personnel trained in the proper procedures, codes, standards and regulations of the LP-Gas and NH_3 industries should install, maintain and service this equipment.
Be sure all instructions are read and understood before installation, peration and maintenance. These instructions must be passed along to the end user of the product.

CAUTION: Contact or inhalation of liquid propane, ammonia and their vapors can cause serious injury or death! NH_3 and LP-Gas must be released outdoors in air currents that will insure dispersion to prevent exposure to people and livestock. LP-Gas must be kept far enough from any open flame or other source of ignition to prevent fire or explosion! LP-Gas is heavier than air and will not disperse or evaporate rapidly if released in still air.

Consult NFPA Codes 58 and 59 / ANSI K61.1 and/or any applicable regulations governing the application and use of pressure relief valves. Make sure you are thoroughly trained before you attempt any valve installation, inspection or maintenance.

Proper installation is essential to the safe operation of pressure relief valves. Install MEC pressure relief valves using the following steps:

1. Check that the valve is clean and free of foreign material in the valve inlet and outlet.
2. Verify that the relief valve start-to-discharge setting and flow rate is correct for the application.
3. Apply a suitable PTFE thread sealant compound to the external NPT threads.
4. Inspect the relief valve inlet and valve seat to ensure no thread sealant or foreign material is present.
5. Install relief valve into container port or manifold using appropriate wrench until leak tight joint is achieved.
6. Check for damage and proper operation after valve installation.
7. After the container is charged with product, check joints for leakage using Marshall Excelsior leak detector.
8. After installation is complete, replace protective cap onto relief valve.

Pipeaways and deflectors may be required by local codes, laws and regulations depending on the installation. Use only MEC adapters on MEC relief valves. Adapters not designed specifically for piping away MEC relief valves, such as those with 90° turns will reduce internal diameters, and decrease flow dramatically. These should never be used as they can cause the relief valve to chatter and eventually destroy itself.

The addition of deflectors, pipeaway adapters and piping will restrict the flow. To properly protect any container, the total system flow must be sufficient to relieve pressure at the pressure setting of the relief valve in accordance with all applicable codes.

REPLACEMENT OF PRESSURE RELIEF VALVES

WARNING: Under normal conditions, the useful safe service life of a pressure relief valve is 10 years from the original date of manufacture. However, the safe useful life of the valve may be shortened and replacement required in less than 10 years depending on the environment in which the valve lives. Inspection and maintenance of pressure relief valves is very important. Failure to properly inspect and maintain pressure relief valves could result in personal injuries or property damage.

The safe useful life of pressure relief valves can vary greatly depending on the environment in which they live.

Relief valves are required to function under widely varying conditions. Corrosion, aging of the resilient seat disc and friction all proceed at different rates depending upon the nature of the specific environment and application. Gas impurities, product misuse and improper installations can shorten the safe life of a relief valve. The LP-Gas dealer must observe and determine the safe useful life of relief valves in his systems.

For Additional Information Read:

1. NFPA # 58, “Storage and Handling of Liquefied Petroleum Gases”.
2. NFPA # 59, “LP-Gases and Utility Gas Plants

Relief valves in service beyond their service life can exhibit the following degradation in function:

- They may leak at pressures below the set pressure.
- They may open and fail to properly reseat.
- They may open at higher than set pressure.

These failures to function properly are due primarily to four “environmental” conditions:

1. Corrosion of metal parts (particularly springs) which result in the component parts failing to perform.
2. Deterioration of synthetic rubber seat disc material.
3. Clogging or “cementing” of the movable relief valve components so that their movement is restricted.
4. Debris on the valve seat after the relief valve opens, effectively preventing the valve from resealing.

Corrosion is caused by water, corrosive atmospheres of salt and high industrial pollutants, chemicals, and contaminants. High concentrations can attack the metal parts vigorously. No suitable metals are totally resistant to such corrosion.

Synthetic rubber and seat disc materials can also be attacked by impurities in the gas and corrosive atmospheres, particularly those with sulphur dioxide. There are no suitable rubber materials which resist all contaminants.

“Cementing” of relief valve parts can be caused by normal industrial atmospheres containing particles of dirt, iron oxide, metal chips, etc. combined with water, oil, or grease. Ice collecting in recessed valves could cause failure to open. Paint and tar in relief valves also cause failure to function properly.

RELIEF VALVE SAFETY INFORMATION

Repair and Testing: MEC Pressure Relief Valves are tested and listed by Underwriters Laboratories, Inc., in accordance with UL 132 and NFPA Code #58. Construction and performance of MEC Pressure Relief Valves are consistently checked at the factory by UL and ASME audits Therefore, testing of MEC Pressure Relief Valves in the field is not necessary.

Any pressure relief valves which shows evidence of leakage, other improper operation or is suspect as to its performance must be replaced immediately using approved procedures.

While the functioning of a pressure relief valve appears to be relatively simple, the assembly and test procedure used to manufacture these MEC products is rather complex. Highly specialized test fixtures and specially trained personnel are necessary to attain proper relief valve settings. These fixtures and personnel are available only at the factory.

WARNING: Never attempt to repair or change the setting of MEC Pressure Relief Valves. Any changes in settings or repairs in the field will void the MEC warranty and product listings, and may create a serious hazard.

PIPEAWAY ADAPTERS: Pipeaway adapters are available for most MEC Pressure Relief Valves, where it is required or desirable to pipe the discharge above or away from the container. Each adapter is designed to sever if excessive stress is applied to the vent piping—thus leaving the relief valve intact and fully operative.