STA1311 SERIES EXTERNAL PRESSURE RELIEF VALVE INSTRUCTION MANUAL

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!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.

Install, operate and maintain all equipment in accordance with federal, state, and local codes and these instructions. The installation in most states must also comply with ANSI CGA 6.2.1

Only personnel trained in the proper procedures, codes, standards and regulations of the NH3 Industry should install, maintain and service this equipment.
Be sure all instructions are read and understood before installation, operation and maintenance. These instructions must be passed along to the end user of the product.

!GENERAL WARNING!

Aforementioned products are mechanical devices that are subject to wear, contaminants, corrosion, and aging of components made of materials such as rubber and metal. Over time these devices will eventually become inoperative. The safe service life of these products will reflect the environment and conditions of use that they are subjected to. Regular inspection and maintenance is essential.

WARNING: These products contain a chemical known to the state of California to cause cancer and birth defects or reproductive harm

APPLICATION:

Designed for use with NH3 storage containers as a primary pressure relief valve on ASME above ground bulk plant installations. All working components are external to the container connection away from possible product contaminants. Compatible with **ALL** 1-1/4" FNPT multiple head units including ME902S-16, ME903S-16, and ME904S-16 Series Quad-Port Manifolds.

FEATURES:

- Aluminum Body Construction
- All non-ferrous Internal Components
- Provided with weep hole for drainage
- STA1311A = 250 PSI
- STA1311B = 265 PSI

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 anhydrous ammonia 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:

- Hydrostatic pressures due to overfilling.
- High pressures resulting from exposure of the container to excessive external heat.
- High pressures due to improper purging of the container.

NOTE

Consult ANSI CGA 6.2.1 for anhydrous ammonia, and/or any applicable local and state regulations governing the application and use of pressure relief valves.

SELECTION OF 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 B” for anhydrous ammonia.

NOTE

The set pressure of a pressure relief valve depends upon the design pressure of the container.

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

From ANSI K61.1-1999, 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.

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	258	85	845	150	1350	230	1920	360	2760	850	5590	1500	8900
25	310	90	885	155	1390	240	1980	370	2830	900	5850	1550	9140
30	360	95	925	160	1420	250	2050	380	2890	950	6120	1600	9380
35	408	100	965	165	1460	260	2120	390	2950	1000	6380	1650	9620
40	455	105	1010	170	1500	270	2180	400	3010	1050	6640	1700	9860
45	501	110	1050	175	1530	280	2250	450	3320	1100	6900	1750	10090
50	547	115	1090	180	1570	290	2320	500	3620	1150	7160	1800	10330
55	591	120	1120	185	1600	300	2380	550	3910	1200	7410	1850	10560
60	635	125	1160	190	1640	310	2450	600	4200	1250	7660	1900	10800
65	678	130	1200	195	1670	320	2510	650	4480	1300	7910	1950	11030
70	720	135	1240	200	1710	330	2570	700	4760	1350	8160	2000	11260
75	762	140	1280	210	1780	340	2640	750	5040	1400	8410		
80	804	145	1310	220	1850	350	2700	800	5300	1450	8650		

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 3.146.
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 rate of discharge may be interpolated for intermediate values of surface area. For containers with total outside surface area greater than 2,500 square feet, the required flow rate can be calculated using the formula, Flow Rate in CFM Air = 22.11 A 0.82 where A = outside surface area of the container in square feet.

Conversion Factor

ft2 x 0.092 903 = m2
CFM x 0.028 317 = m3/min
ft x 0.304 8 = m

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!CAUTION!

Contact or inhalation of ammonia and its vapors can cause serious injury or death. NH3 must be released outdoors in air currents that will insure dispersion to prevent exposure to people and livestock.

An abundant supply of clean water must be readily available and easily accessible as a means of providing IMMEDIATE First Aid treatment for exposure to anhydrous ammonia.

Consult ANSI CGA 6.2.1 and/or any applicable regulations governing the application and use of pressure relief valves and relief valve manifolds. Make sure you are thoroughly trained before you attempt to install, inspect or maintain this equipment.

INSTALLATION

***Proper installation is essential to the safe operation of the relief valve manifold and pressure relief valves.** Install the STA1311 series relief valve manifold 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 approved leak detector.
8. After installation is complete, replace protective cap onto relief valve.

Pipeaways may be required by local codes, laws and regulations depending on the installation. Use only approved adapters on STA1311 series relief valves. Adapters not designed specifically for piping away 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 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.

INSPECTION AND MAINTENANCE

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 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 each relief 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 DAMAMGED 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.

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 Re-adjustment:

Pressure relief valves are factory set to discharge at specified pressures.

IF THERE ARE ANY INDICATIONS OF TAMPERING OR RE-ADJUSTING, REPLACE THE VALVE.

6. Seat Leakage:

Check for leaks in the seating area using a noncorrosive leak detection 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.

For Additional Information Read:

8. Moisture, Foreign 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 with approved leak detection solution.

REPLACE THE VALVE IF THERE IS ANY INDICATION OF CORROSION OR LEAKAGE AT THE CONNECTION BETWEEN THE MANIFOLD 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.

!WARNING!

REPLACEMENT OF PRESSURE RELIEF VALVES

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 or death. The useful safe service life of a pressure relief valve with NH3 applications is 5 years after specified installation date (see DOT regulations effective 7/01/2004).

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 installation can shorten the safe life of a relief valve. The gas dealer must observe and determine the safe useful life of relief valves in his systems.

1. ANSI CGA 6.2.1, "American National Standard Safety for Requirements for the Storage and Handling of anhydrous Ammonia. Refer to all local codes or authority having jurisdiction.

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

STA1311 series pressure relief valves are tested and listed by Underwriters Laboratories, Inc., in accordance with UL 132. Construction and performance of pressure relief valves are consistently checked at the factory by UL and ASME audits.

!WARNING!

Never attempt to repair or change the setting of pressure relief valves. Any changes in settings or repairs in the field will void manufacturer warranty and product listings, and may create a serious hazard.

While the functioning of a pressure relief valve appears to be relatively simple, the assembly and test procedure used to manufacture these 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.

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.

Pipe-Away Adapters

Approved pipe-away adapters are available for most 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.