Instruction Manual – Gas and Liquid Manifolds for Cylinders or Ton Containers, Chlorine or Sulfur Dioxide

Horizontal Gas Cylinder Manifold

Horizontal Gas Ton Container Manifold
These instructions describe the installation, operation and maintenance of the subject equipment. Failure to strictly follow these instructions can lead to an equipment rupture that may cause significant property damage, severe personal injury and even death. If you do not understand these instructions, please call De Nora Water Technologies for clarification before commencing any work at +1 215-997-4000 and ask for a Field Service Manager. De Nora Water Technologies, Inc. reserves the rights to make engineering refinements that may not be described herein. It is the responsibility of the installer to contact De Nora Water Technologies, Inc. for information that cannot be answered specifically by these instructions.

Any customer request to alter or reduce the design safeguards incorporated into De Nora Water Technologies equipment is conditioned on the customer absolving De Nora Water Technologies from any consequences of such a decision.

De Nora Water Technologies has developed the recommended installation, operating and maintenance procedures with careful attention to safety. In addition to instruction/operating manuals, all instructions given on labels or attached tags should be followed. Regardless of these efforts, it is not possible to eliminate all hazards from the equipment or foresee every possible hazard that may occur. It is the responsibility of the installer to ensure that the recommended installation instructions are followed. It is the responsibility of the user to ensure that the recommended operating and maintenance instructions are followed. De Nora Water Technologies, Inc. cannot be responsible deviations from the recommended instructions that may result in a hazardous or unsafe condition.

De Nora Water Technologies, Inc. cannot be responsible for the overall system design of which our equipment may be an integral part of or any unauthorized modifications to the equipment made by any party other that De Nora Water Technologies, Inc.

De Nora Water Technologies, Inc. takes all reasonable precautions in packaging the equipment to prevent shipping damage. Carefully inspect each item and report damages immediately to the shipping agent involved for equipment shipped “F.O.B. Colmar” or to De Nora Water Technologies for equipment shipped “F.O.B Jobsite”. Do not install damaged equipment.

De Nora Water Technologies, COLMAR OPERATIONS
COLMAR, PENNSYLVANIA, USA
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1 INTRODUCTION

This manual describes pressure piping and manifolds used to conduct chlorine or sulfur dioxide gas or liquid manifolded to a cylinder or ton container.

1.1 Reference Data

The following literature may also be referenced:

Vacuum regulator, wall panel mounted, 2000 -10,000 PPD (40 - 200 kg/h) - Bulletin 105.6001

Cabinet mounted vacuum regulators - Bulletins 105.3800, 105.3810, 105.3820

Expansion Chamber - Bulletin 115.3005

Isolating Valve Assembly - Bulletin 120.3020

Vaporizer - Bulletin 115.6030

Gas line filters for Chlorine, Sulfur Dioxide or Ammonia - Bulletin 120.3050

Pressure Reducing Valve - Bulletins 115.6601, 115.6610, 115.6620

Piping systems for Dry Chlorine - Chlorine Institute Pamphlet #6

Manifold Piping for Vaporizers - Bulletin 115.3003

Manifolding Ton Containers for liquid withdrawal - Bulletin 115.3200.

Flexible Connector Arrangements - Bulletin 120.3002

Manifolds, Gas Cylinder Vertical and Horizontal, Chlorine or Sulfur Dioxide - Bulletin 120.3003

Horizontal Gas and Liquid Ton Container Manifolds for Chlorine or Sulfur Dioxide - Bulletin 120.3004

“Y” Strainer Gas Line Filters for Chlorine and Sulfur Dioxide - Bulletin 120.3051
2 COMPONENT DESCRIPTION

2.1 Gas and liquid pressure piping and manifolds are supplied either as complete assemblies, sub-assemblies or components for field assembly. These assemblies/components include:

2.1.1 Pipe or pipe nipples
3/4" or 1", seamless carbon steel, Grade B, Schedule 80, Type S, ASTM A-106

2.1.2 Fittings (tees, elbows, crosses, plugs, etc.)
3/4" or 1" forged steel, 3000 pound CWP, A-105

2.1.3 Expansion Chamber
Each section of liquid piping between valves should be equipped with an expansion chamber. This should have a capacity of at least 20% of the line volume which it protects, and should be mounted at the highest point of the line.

2.1.4 Isolating Valve
Isolating valves are used when it is desirable to break a pressure connection as on a flexible connector. The purpose of the isolating valve is to allow changing cylinders or containers without exposing the piping system to atmospheric moisture and minimize any gas emissions during the change-out procedure. Moisture inside a flexible connector combined with gas or liquid will cause corrosion. Keep isolating valves closed when changing containers.

2.1.5 Flexible Connectors:
3/8" O.D. zinc plated copper tubing used to connect containers to manifolds or manifolds to fixed equipment.

2.1.6 Header Valves
Header valves are used on manifolds to permit connection of containers to the manifold. Header valves are chlorine valves without a fusible plug.

2.1.7 Instruments
Pressure gauges, switches, etc.

2.1.8 Heaters
Heaters, when used, are for gas manifolds only. Manifold strip heaters are recommended for sulfur dioxide service. Chlorine gas service may utilize strip heaters for low ambient temperature conditions. Heaters maintain manifold piping temperature slightly higher than chlorine or sulfur dioxide container temperature to minimize gas liquefaction within the manifold.

a. Strip Heaters
55 watt, 120 or 240 Vac, 50/60 Hz

b. Drip Leg Heaters
25 watt, 120 or 240 Vac, 50/60 Hz.

2.1.9 Gaskets
Lead, 1/16" thick

2.1.10 Wall Mounting Brackets
3  PRINCIPLE OF OPERATION

Pressure and piping manifolds are used to conduct either gaseous or liquid chlorine or sulfur dioxide from one or more containers to the feed equipment.

3.1 Liquid Manifolds

Liquid manifolds must have protection against expansion when liquid is isolated between two shut-off valves. Cylinders are not manifolded. Ton containers may be manifolded, but must follow the procedures outlined in Bulletins 115.3003 and 115.3200.

3.2 Gas Manifolds

Gas manifolds can be protected against liquefaction by heat tracing, insulation and the use of pressure reducing valves. Gas manifolds for sulfur dioxide must be heat treated. Areas that pressure piping passes through must be the same temperature or progressively warmer to help reduce reliquefaction. Piping must be arranged so that a gentle slope (1%) back toward the source is provided. Direction changes from horizontal to vertical or from vertical to horizontal should be provided with drip legs to collect liquid droplets (Figures 1 and 2).
Figure 1 - Vertical Manifold for Gas Cylinders

Figure 2 - Horizontal Manifold for Gas Cylinders
4 INSTALLATION

4.1 Vertical Manifolds

Vertical manifolds are generally supplied with connections to either one, two, three or four chemical containers. The containers used with vertical manifolds are normally 100 or 150 pound cylinders. (Figure 1)

4.1.1 Each manifold must be cleaned and free of dirt, oil, grease or other contaminants.

4.1.2 Prior to assembly, the threads should be wrapped with Teflon tape or coated with a teflon based paste certified for liquid and gaseous service for a serviceable connection.

4.1.3 All pipe, fittings, instruments, connectors, etc. must be free of grease, oil and dirt. They must be cleaned and dried before being installed or used. Follow the recommendations of the Chlorine Institute referencing the following pamphlets:

Pamphlet #1 - Chlorine Basics
Pamphlet #6 - Piping Systems for Dry Chlorine
Pamphlet #9 - Chlorine Vaporizing Systems

Pamphlets may be obtained from The Chlorine Institute at www.chlorineinstitute.org.

4.1.4 Each vertical manifold should be mounted on a wall using the mounting brackets supplied. Connection to the wall should be made with molybolts, if connecting to masonry, or wood screws if connecting to wooden wall studs or a wooden wall panel.

4.1.5 The manifold must be mounted vertically at a height that permits the manifold connection to be above the cylinder or container valves.

4.1.6 Remove the plastic caps/plugs from the header valve and the valve adaptors.

4.1.7 Connect each flexible connector to a valve adaptor using the 1/16" thick lead gasket at each fitting. Never use other types of gaskets or gasket materials. Never re-use a lead gasket. Replace the lead gasket each time the chemical container is changed. If a flexible connector is not used for each connection provided, a pipe plug must be inserted to prevent a chemical leak.

4.1.8 Connect the heater to the nearest 120 or 240 Vac power supply, as applicable. Ensure the pad is activated by cautiously feeling the pipe temperature around the pad.

4.2 Horizontal Manifolds

Horizontal manifolds are supplied for either gas or liquid use. Horizontal manifolds are shipped as components, and must be assembled for use. (See Figure 2 for Cylinders, and Figure 3 for Ton Containers)

4.2.1 Prior to assembly, the threads should be wrapped with Teflon tape or coated with a teflon based paste certified for liquid and gaseous service for a serviceable connection.

4.2.2 All pipe, fittings, instruments, connectors, etc. must be free of grease, oil and dirt. They must be cleaned and dried before being installed or used. Follow the recommendations of the Chlorine Institute referencing the following pamphlets:

Pamphlet #1 - Chlorine Basics
Pamphlet #6 - Piping Systems for Dry Chlorine
Pamphlet #9 - Chlorine Vaporizing Systems

Pamphlets may be obtained from The Chlorine Institute at www.chlorineinstitute.org.
4.2.3 Horizontal manifolds may be wall mounted, or mounted on a supporting frame, usually channel or angle iron. To avoid possible traps, both the gas and liquid manifolds should be mounted above the ton containers. When both manifolds are required the gas manifold should be mounted above the liquid manifold.

4.2.4 All manifolds must be mounted with a slight slope (1%) toward the source of chemical.

4.2.5 Prior to assembly, the threads should be wrapped with Teflon tape or coated with teflon based paste certified for liquid and gaseous service for a serviceable connection. If a permanent connection is desired, a mixture of litharge and glycerin can be used.

4.2.6 For horizontal liquid manifolds, isolating valves are recommended at the container connection end of the flex connector only.

4.2.7 For horizontal gas manifolds, isolating valves are recommended at the container and manifold ends of the flex connectors.

4.2.8 Connect the heater to the nearest 120 or 240 Vac power supply, as applicable. Ensure the pad is activated by cautiously feeling the pipe temperature around the pad.

4.3 Manifolding Containers for Liquid Withdrawal

When a high discharge rate is required and a large volume source such as a tank car is not available nor is it practical to withdraw at that rate from a single ton container, additional ton containers are sometimes manifolded together to provide liquid flow to a vaporizer. Gas and liquid feed require different considerations. Proper system design and operation will avoid the possibility of overfilling a container. Refer to Bulletin 115.3200 for installation and operational considerations.

The building housing the ton container should provide an area for containers in use, as well as adequate storage area for an equal number of full containers.
Figure 3 - Horizontal Manifold for Gas Ton Container
5  OPERATION

5.1  Before being placed into service, all manifolds must be cleaned of debris, flushed with hot water, steam cleaned and dried to a -40°F (-40°C) dew point.

Cleaning may be with organic solvents but care must be taken to ensure that environmentally acceptable solvents are used. The Chlorine Institute Pamphlet #6 provides additional details.

IMPORTANT: All piping must be dried to a -40°F (-40°C) dew point before being placed into service. Protection after drying and before use must be provided by closing all valves, capping unconnected sections or sealing. Instruments and valves removed during cleaning operations must be cleaned, reassembled and sealed.

5.2  All piping must be pressure tested before being placed in operation. Testing should be done with dry air or nitrogen initially with a soap or commercial leak testing solution applied to all connections to test for leaks. Safety devices designed to protect the piping system must be removed and connections capped prior to testing.

5.3  After the initial pressure test with air or nitrogen, the ejector must be operational before chlorine or sulfur dioxide can be used to pressurize the piping. Leaks can again be determined using 26 degree Baume ammonia to test for chlorine, or a chlorine solution (household bleach) to test for sulfur dioxide leaks. A white cloud will appear at any leak.

5.4  If the installation shows no evidence of leaking, the piping system and manifold can be activated.

5.5  If the manifold or piping contains gas, all heaters, both strip and drip leg heaters, should be powered.

5.6  For liquid feed to a vaporizer, it is recommended that a minimum temperature of 55°F (12°C) be maintained around the containers. This will provide adequate pressure to transfer liquid from the container to the vaporizer.

If the ambient temperature can fall below 55°F (12°C) at any time, a heated house may be required for the container for optimum performance. The vaporizer’s pressure reducing valve is normally set with a downstream pressure of 40 psig (3 bar) at 32°F (0°C). If the liquid pressure is less than 40 psig (3 bar), or if the gas pressure is routed through areas with temperatures of less than 55°F (12°C), there is a possibility that liquefaction of the gas will occur. To compensate for this, it is recommended that the gas pressure piping be wrapped with strip heaters to maintain the piping at a constant temperature.
6  MAINTENANCE

6.1  Gas Manifolds
Gas manifolds require periodic maintenance for safe operation. Piping and flexible connectors should be inspected every six months. A cracking sound (when flexed) from the flexible connector indicates possible corrosion and replacement should be considered. The appearance of corrosion products at the joints are cause for an internal examination.

6.2  Liquid Manifolds
Liquid manifolds also require periodic inspection for maintenance and safety. Inspect the piping and flexible connectors every six months or when the vaporizer is maintained. Flexible connectors can be replaced when the entire system is shut down. To replace flexible connectors, refer to the shut down section of the vaporizer instruction manual 115.6030. Follow section 3.11 in Bulletin 115.6030, with one exception. Close the ton container valves, rather than the liquid supply valve at the vaporizer. This will permit the liquid to be removed from the manifold, piping and vaporizer to permit access in a safe manner.

6.3  Corrosion
When maintenance is to be performed, any apparent corrosion must be removed and the manifold cleaned (see section 5.1), before being placed into service. If corrosion is severe, replacement of severely corroded parts should be considered.