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Design, Installation & Service Manual

TOMCO FOGEX

WATER MIST SYSTEM

Fire Protection Systems for Machinery Spaces, Special Hazard Machinery Spaces, Combustion Turbine Enclosures up to 17,657cu.ft. (500cu.meters).

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SECTION 1

Tomco Fogex®
Water Mist Fire Protection System

Introduction

SECTION 1

INTRODUCTION

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1-1 Purpose

The intent of this manual is to provide the user with the information to design, install and maintain the Tomco Fire Systems Fogex® Water Mist Fire Protection System. All components used within this system including, pump controllers, fire alarm control panels, detection devices shall be FM approved.

1-2 Description

A. Water mist is defined by **NFPA 750** as a water mist spray for which the dv0.99 for the flow–weighted cumulative volumetric distribution of water droplets is less than 1,000 microns at the minimum design operating pressure of the water mist nozzle.

B. Water Mist is divided into three categories:

1. **Low Pressure** – where the distribution piping is exposed to pressure of 175 psi (12.1 bar) or less.
2. **Intermediate Pressure –** where the distribution piping is exposed to pressures greater than 175 psi (12.1 bar) but less than 500 psi (34.5 bar).
3. **High Pressure –** where the distribution system piping is exposed to pressure of 500 psi (34.5 bar) or greater.

C. The water mist distribution system is divided into two categories:

1. **Single Fluid System** – a water mist system utilizing a single piping system to supply each nozzle.
2. **Twin Fluid System –** a water mist system in which water and atomizing media are separately supplied to and mixed at the water mist nozzle.

D. Water mist is divided into three categories for system applications:

1. **Local Application Systems** are designed and installed to provide complete distribution of mist around the hazard or object to be protected. The system shall be designed to protect an object or hazard in an enclosed, unenclosed, or open outdoor condition. The system shall be actuated by automatic nozzles or by an independent detection system.
2. **Total Compartment Application Systems** are designed and installed to provide complete protection of an enclosure or space. The complete protection of an enclosure or space shall be achieved by the simultaneous operation of all nozzles in the space by manual or automatic means.
3. **Zoned Application Systems** are a subset of the compartment system and are designed to protect a predetermined portion of the compartment by the activation of a selected group of nozzles.

1-3 FOGEX HIGH PRESSURE WATER MIST SYSTEM for machinery spaces, special hazard machinery and combustion turbine enclosures for land applications.

The Fogex Water Mist Fire Protection System has been developed as an alternative to Halons, Carbon Dioxide, other gaseous fire suppression agents.

Fogex is an environmentally-safe fire extinguishing system using atomized water mist to achieve fire suppression and extinguishment. Fogex has a zero Ozone Depletion Potential and zero Global Warming Potential and is suitable for land base systems only.

Fogex is lightweight, environmentally safe, practical and relatively inexpensive to install and maintain. Fogex operates at 1,450 psi (100 bar) pressure and at temperature ranges from 40°F (4°C) is designed to 130°F (54°C). It is an engineered system designed to protect a total flood hazard area.

Fogex uses approximately 10% of the volume of water compared to a conventional sprinkler system. The volume of water and the number of nozzles required to accomplish fire suppression is determined using the Fogex design and standard hydraulic calculations in regards to the hazard being protected. Placement of nozzles has been established by conducting actual fire testing.

The uniquely designed Fogex nozzles generate a mixture of very fine water droplet sizes, generally under 100 microns mean value diameter (M.V.D.). Fine droplets absorb heat more quickly and convert to steam. Fogex nozzles have varying water flow rates depending on their operating pressures.

The number of nozzles, their location, size and geometry comprise an important part of system design and Tomco Fire Systems provides expert engineering designs to suit the specific hazards.

Maintaining and servicing your Fogex system on a regular interval will ensure that your investment is protected and that the system is fully operational and will perform according to its design. System maintenance should be conducted in accordance with NFPA 750 and the operation and service section of this manual.

This manual covers only the aspects of design, installation and servicing of the Fogex Water Mist Fire Protection System and does not include aspects pertaining to fire detection. However, FM approved detection, control and alarm devices should be used. It is intended to serve as a basic installation manual for the qualified installer of Tomco Fire System's Fogex Water Mist Fire Protection System.

1-4 Limitations of Water Mist Systems

A water mist system shall not be used for direct application to materials that react with water to produce significant amounts of heat or hazardous products. These materials include the following:

a). Reactive metals, such as lithium, sodium, potassium, magnesium, titanium, zirconium, uranium and plutonium.
b). Metal alkoxides, such as sodium meth-oxide
c). Metal amides, such as sodium amide
d). Carbides, such as calcium carbide
e). Halides, such as benzoyl chloride and aluminium chloride
f). Hydrides, such as lithium aluminium hydride
g). Oxy-halides, such as phosphorus oxy-bromide
h). Silanes, such as tri-chloro-methyl-silane
i). Sulfides, such as phosphorus penta-sulfide
j). Cyanates, such as methyl-iso-cyanate

Water mist systems shall not be used for direct application to liquefied gases at cryogenic temperatures (such as liquefied natural gas) that boils violently when heated with water.

1-5 Comparison Chart - Fogex Water Fog System - V - Other Technologies

Activity/Features	Sprinkler	Halon	CO2	Fogex
Non-Toxic	Yes	No	No	Yes
Extinguish Class A&B Fires	No	Yes	Yes	Yes
Environmental Safe	Yes	No	No	Yes
Requiring Fire Pump *	Yes	No	No	Yes
Light Weight	No	Yes	No	Yes
Service Accessibility	Yes	Yes	Yes	Yes
High Heat Absorption	Yes	No	No	Yes
Cost Effectiveness	No	No	No	Yes
Running Time (in-built safety)	N/A	No	No	Yes
Evacuation Plan Requirement **	No	Yes	Yes	No
Service & Refill Cost Effectiveness	N/A	No	No	Yes

* Depending on size and design of system installed - generally small enclosures/cabinets etc do not require auxiliary fire pump.

** Fogex does not produce any toxic gases or by-products however evacuation is a procedural safety requirement in the event of a fire due to toxic gases being liberated as a result of combustion.

⚠ WARNING- Installation, servicing or recharging of the high pressure water mist system shoul storage cylinders, nitrogen cylinders, manifold, and hoses could contain gas under high pressu are not followed.

1-6 Safety

SECTION 2

Tomco Fogex® Water Mist Fire Protection System

HIGH PRESSURE CYLINDER SYSTEMS

SECTION 2

HIGH PRESSURE CYLINDER SYSTEMS

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SYSTEM TYPES:

For smaller applications, a self contained Fogex water storage Pressure Skid Module (PSM) can be provided to protect the fire hazard(s). When a self contained PSM is used system pressurization is accomplished with a regulated supply of dry nitrogen gas. The quantity of water and dry nitrogen gas must be sufficient to operate the system under full design pressure for the recommended system running time or a minimum of 18.5 minutes in accordance with NFPA 750 Standards and/or manufacturer specifications.

For larger fire hazard spaces, it may be more economical and efficient to use a high pressure reciprocating piston pump system. A pump system may also be used for protection of smaller fire hazards if this is the preference. Pumps are electrically driven units and shall conform to NFPA 750 and NFPA 20.

2-0 Water Storage Pressure Cylinders

The cylinders are made of quality steel, DOT approved. They should be hydrostatically pressure tested at regular intervals as per the enclosed maintenance schedule to ascertain their structural integrity. The water storage pressure cylinders are painted red externally and are internally plastic-lined with an approved method to reduce the possibility of corrosion or water staining. It also enhances the life expectancy of the cylinders. The water cylinders are available in three sizes, 18 gallons (67L), 13 gallons (50L and 21 gallons (80L).

The water storage cylinders are pressure tested and rated by approving authorities. The water storage cylinders should be filled with clean potable water (preferably distilled water).

The water storage pressure cylinders should not be located in areas where they may be subject to adverse atmospheric conditions or to potential damage due to mechanical, chemical or other causes. Where potentially damaging conditions exist, suitable enclosures or guards must be provided and fitted. Where severe cold climatic conditions prevail, enclose the cylinder within a temperature regulated enclosure.

The water cylinder is supplied with a 316 grade stainless steel actuator head assembly, Part No. 980030, and a 316 stainless steel internal pick-up tube. The actuator head assembly comprises a number of inlet and outlet ports, i.e. for a pressure gauge, water/gas inlets, water outlet port and a safety relief burst disc port. The actuator head flow is restricted to approximately 17 GPM at full system design pressure. A low liquid level indicator is provided on each water cylinder to monitor 10% loss of water.

2-1 Nitrogen Cylinders

The nitrogen cylinders have a capacity of 21 gallons (80L), 18 gallons (67L) and 13 gallons (50L), and are charged with 2,900 psi (200 bar) of dry nitrogen at 59°F (15°C). The cylinder is seamless with a working pressure of 2,900 psi (200 bar) and a test pressure of 5,000 psi. The cylinder is DOT approved. The nitrogen cylinders are painted black to differentiate between the red water cylinders.

A PSM may have more than one nitrogen cylinder, which is dependent upon the number of water cylinders required. For each 18 gal (67L) water cylinder one 21 gal (80L) nitrogen cylinder is required. The first nitrogen cylinder, identified as the master cylinder, is fitted with a 24VDC solenoid actuator, cylinder control head and mechanical override. The additional nitrogen cylinders (if required) will be identified as the slave cylinders and will be fitted with a pneumatic actuator that will be activated by the pressure from the master cylinder. (See Fig. 2.1)

The master nitrogen cylinder is provided with an emergency mechanical release to activate the system in the event the electrical operation of the system has failed.

WARNING- Before assembly or system activation, make sure activation pins on the solenoid actuator, mechanical actuator and pneumatic actuator have been re-set and are in the normally operating position. If the red marking on the activating pin can be seen, see instructions on Section 6 of this manual for resetting instructions.

The nitrogen cylinders are provided with a pressure gauge with low pressure contacts to monitor loss of nitrogen pressure. The switch is set at 2,200 psi (150 bar) and will transfer the contacts should the nitrogen pressure fall below the set pressure.

2-2 Pressure Skid Module (PSM) Assembly

High pressure water cylinders and nitrogen cylinders can either be pre-assembled with pressure gauges and pressure relief devices on a steel skid (or frame)or shipped un-assembled for assembly in the field. Alternatively the PSM can be bolted against a nearby wall. A typical drawing of a PSM assembly for a twelve cylinder skid (fig 2.2) can be found at the end of this section. Smaller or larger skids are possible and fabricated to suit specific applications. The skids are constructed from steel and epoxy coated red. The PSM should display the following information:

- Manufacturer name and/or trade name
- Date of Manufacture
- Serial Number
- System Operating Pressure
- Description of Contents
- Tare Weight

Tomco's PSMs also have a 316 stainless steel name plate riveted or screwed into place and the FM approval logo is engraved thereon together with Tomco's product batch number displaying the year of manufacture in accordance with Quality Assurance procedures.

A typical PSM comprised of one water cylinder and one dry Nitrogen gas cylinder is shown in fig. 2.3 at the end of this section.

2-3 Determining and Locating System Components

System cylinders should be located according to the following criteria;

- Outside of actual fire hazard area but within maximum piping allowances
- Against a stable support wall
- Easily accessible for service and visual inspection
- Away from traffic and tampering

2-4 High Pressure Gas Manifold

A high pressure stainless steel 316 gas block manifold, P/N 980029, with eight (8) gas inlets and two (2) gas outlets that has a working pressure of 2,900 psi (200 bar) and a 5,800 psi (400 bar) hydrostatic test pressure. This manifold can be used to connect one nitrogen cylinders to water cylinders. Any unused ports can be blanked off with a stainless steel plug.

Any spare gas outlet ports on the high pressure gas manifold can used for gas "bleed-off" and should be fitted with an FM approved Tomco Fire Systems stainless steel manual ball valve. This bleed-off port is provided to facilitate gas venting when the system has to be serviced.

CAUTION!! – The high pressure gas manifolds may contain nitrogen gas at extremely high pressures and serious personal injury or death may result if tampered with by inexperienced technicians. Always ensure that any remaining gas within the gas manifolds and hose fittings is bled-off first before attempting to remove or service any of the fittings or cylinders. **This safety procedure must be followed very closely to avoid sustaining personal injury.**

The arrangement for the water storage cylinders is typically in "parallel" meaning that the gas outlet ports from the high pressure gas manifolds connect via stainless steel tubing to the inlet ports of the actuator head assemblies that are screwed onto the water storage cylinders. The water outlet ports on the actuator head assemblies will then connect to the system piping. A series of water storage cylinders can be connected together to deliver the correct water flow and desired system running time (see figure 2.3, 2.4, 2.5).

The quantity of water storage cylinders that can be connected together depends on the volume of water required to operate the water mist nozzles for the desired system running time. Generally the quantity of cylinders needed to operate the nozzles will be determined by the number and type of nozzles used and the output in gallons per minute per actuator head assembly. The maximum water flow for the actuator head assembly at 1,450 psi (100 bar) minimum system pressure is approximately 17 GPM which is restricted by the size of the internal stainless steel pick-up tube.

Should increased volumes of water be required to operate a larger quantity of water mist nozzles then it will be necessary to connect several water cylinders in parallel to provide the desired water flow for the required system running time.

High pressure nitrogen cylinders for system pressurization are fitted with approved high pressure nitrogen pressure regulator(s) that have high gas output flows to deliver a continuous volume of gas at constant pressure. The regulators are factory set a pressure of 1,600 psi (110 bar) and cannot be field adjusted.

2-5 Pressure Cylinder Size & Water Requirements

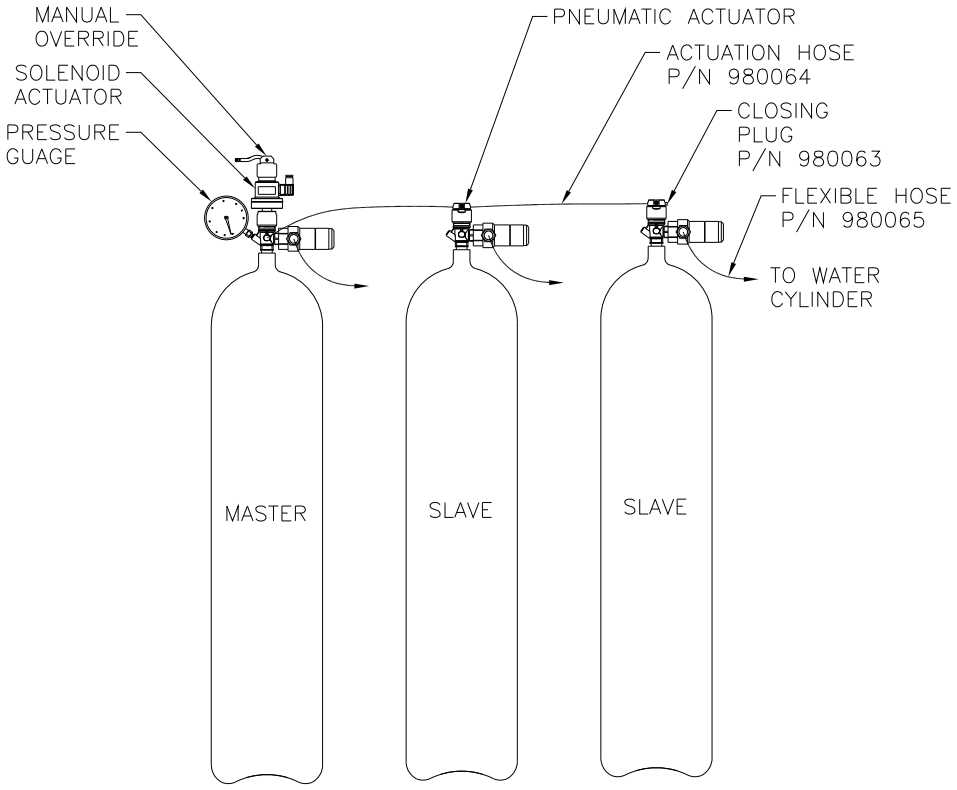
The size and quantity of water storage pressure cylinders is determined by the volume of water required for extinguishment and quantity multiplied by the minimum run time of 18.5 minutes, plus a safety margin of 10%.

When PSMs are used in lieu of a fire pump (or where PSMs are used as a “first-shot”) then the volume of water and gas used shall be in accordance with the design section of this manual.

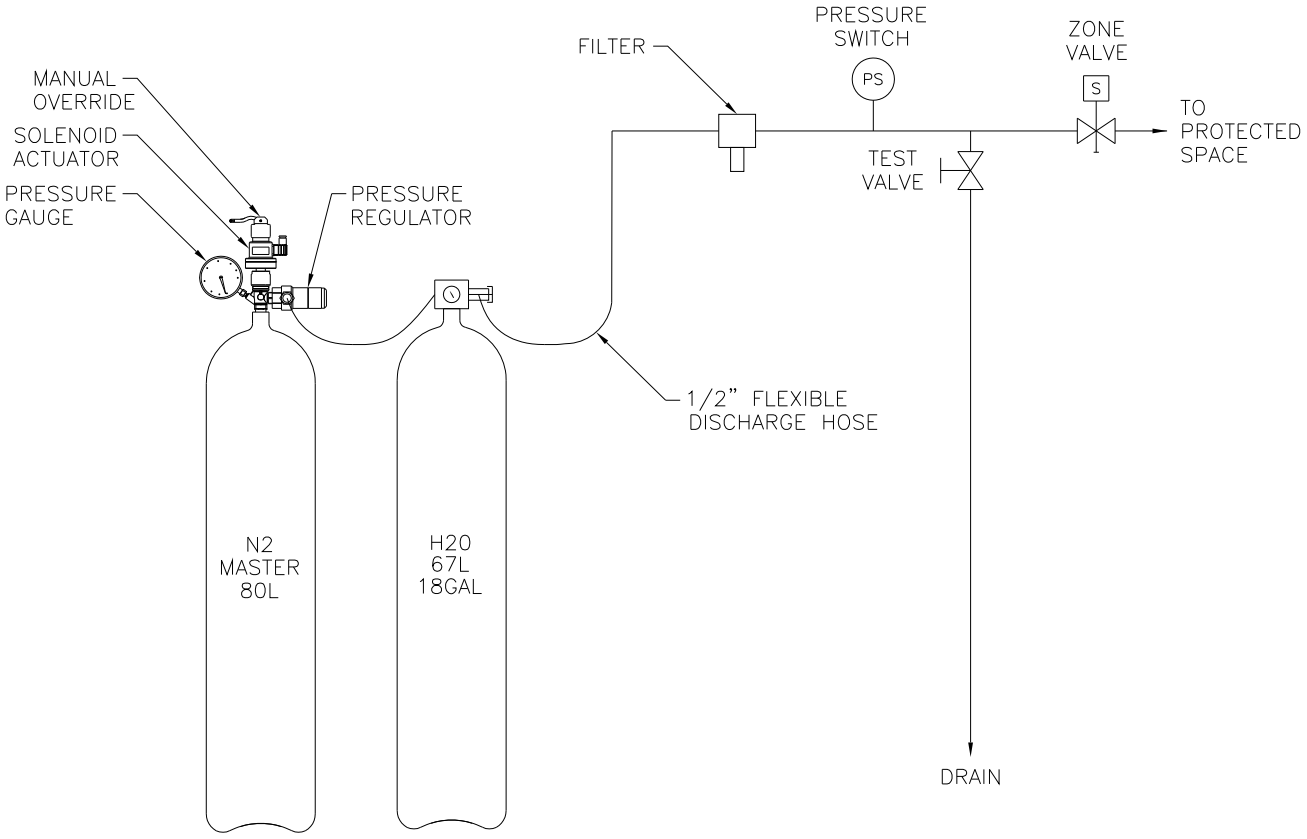
Where more than one fire hazard area is protected by a PSM or if system cannot be recharged within 24 hours it may be necessary to provide a back-up PSM to enable a second shot. The PSMs can be manifolded together if additional fire fighting capability is required or if system running time is to be increased.

24VDC solenoid zone valves are used to direct water flow to the appropriate fire hazard area. The systems shall use an approved high pressure stainless steel non-return valve to prevent water or gas to return to an emptied skid unit.

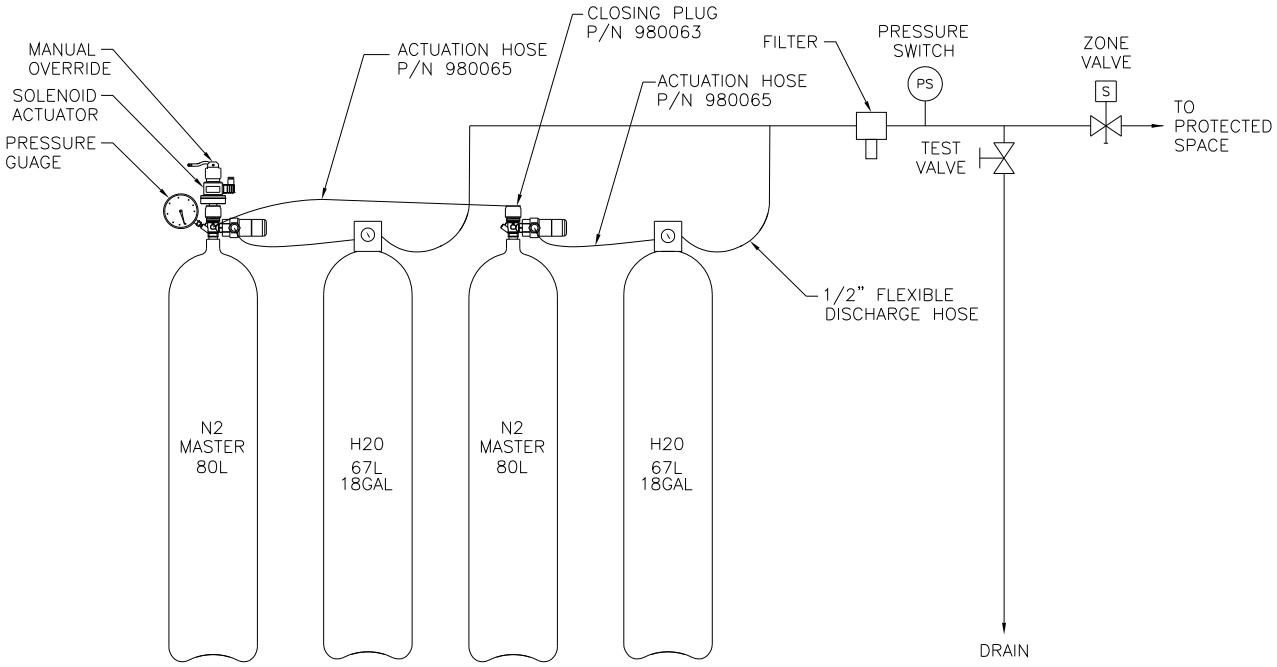
Fogex Pressure Storage Module



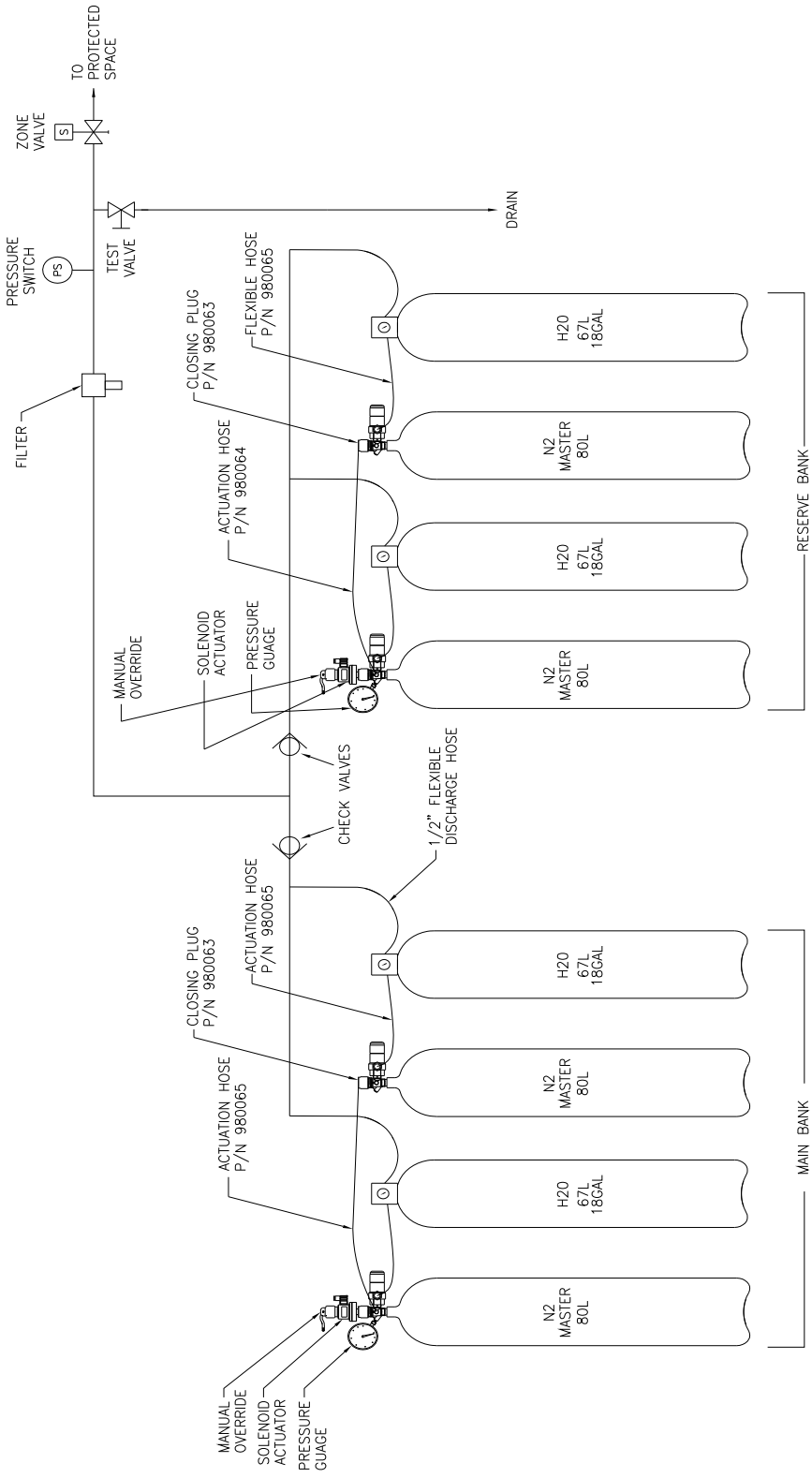
Nitrogen Cylinder Master/ Slave Arrangement Figure 2.1



Typical Nitrogen/ Water Cylinder Arrangement Figure 2.3



Multiple Nitrogen/ Water Cylinder Arrangement Figure 2.4



Typical Main And Reserve Nitrogen/ Water Cylinder Arrangement Figure 2.5

SECTION 3

Tomco Fogex® Water Mist Fire Protection System

System Design Criteria

SECTION 3

SYSTEM DESIGN CRITERIA

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3-1 Hazard Analysis

A fire hazard analysis shall be conducted to determine both the design of the system and the type of detection and activation required. The Fogex high pressure system is F.M Approved for total flooding of machinery spaces, special hazard machinery spaces and combustion turbine enclosures, up to 17,657ft^3 (500m^3). Marine systems are not approved.

3-2 Requirements for System Design

Tomco fire Sysytems will require specific information regarding the project in order to design the fire extinguishing system. This information should include the following:

1) Name of the customer.

2) Name of project.

3) Fire hazard overall dimensions and material of construction.

4) Description of fire hazards to be protected.

5) Dimensions of spaces requiring fire protection system.

6) Auxiliary power supplies for system operation, power ratings, phase, Voltage.

7) Generator sets, their location, ratings and dimensions.

8) Fuel type, location, volume and dimensions of fuel tanks.

9) Plans and drawings of all spaces requiring protection (if unavailable, then detailed sketches will suffice).

10) Dimensions and location of special areas requiring protection and fire control boards.

11) Water supply and flow and pressure ratings.

12) Details of any pre-existing fire protection systems, including water pumps and their capacity, pressure ratings, location etc.

13) Any other relevant information that may be useful to assist designing the system.

3-3 Working Plans

Working plans are prepared and submitted to the customer upon request. Any variations to the working plans require permission from the manufacturer and/or authority having jurisdiction and must also be in agreement with the customer.

Working plans are prepared by Tomco Fire Systems to clearly show and identify components to be installed. Working plans are descriptive and informative and shall provide the following information that pertains to the design of the system:

a). Name of project and customer.

b). Project location.

c). Legends.

d). Location and construction of partitions and walls.

e). Location of fire walls, stairways, emergency exits, and corridors.

f). Schematic diagram showing enclosure cross section.

g). Description of water storage vessels installed in the system; their internal volume; pressure; location.

h). Description of nozzles, their location, size, type, orifice size.

i). Description of pipes installed; nominal size; location of water mains; valves; pressure ratings; drain pipes & plugs.

j). Description of electric cables and conduits installed; colour coding; volt and amperes ratings; conductor material; gauge.

k). Plan view of the protected areas showing ventilation points; exhaust fans; dimensions of fire hazard area and enclosures; water supply reticulation; gate valves; pumps; piping; nozzles; detection; alarm bells; control panel; and location of controlled devices e.g. dampers and shutters, and instructional signage; water hydrants; electrical shut-down switches.

l). Isometric view of the water fog distribution system; lengths and diameters of pipes; fittings including reducers and strainers; orientation of fittings; nozzles including sizes and types; flow rates and nozzle geometry.

m). Complete step by step description of the water mist system sequence of operations including functioning of abort and maintenance switches; delay timers; and emergency power shutdown procedures. Fogex engineers provide this information in a report or manual.

n). Electrical diagrams and details on signalling devices.

o). Number and location of audible and visual indicating devices and number and location of detectors.

p). All other information that may be reasonably required by the customer or authority having jurisdiction.

3-4 Hydraulic Calculations

Hydraulic calculations for the Fogex water fog fire protection system are professionally prepared and submitted to the customer and to the authority having jurisdiction for approval on all systems. Calculations are by Tomco Fire Systems using an approved computer software program.

3-5 Summary Specification Sheets

Summary specification sheets (where requested) are prepared and provided by Tomco Fire Systems to the customer and may show all or any of the following information:

a). Date of system installation.

b). Name of customer.

c). Name of project.

d). Description of hazard.

e). Name and address of contractor supplying water fog system, including telephone and facsimile numbers, and 24 hour emergency numbers.

f). Name of approving authority.

g). System design requirements.

h). Design of water application, volumes and space protected.

i). Minimum rate of water application (18 minutes).

j). If protection is in zones, then zone boundaries are to be delineated; dimensions of zones; branch and nozzle locations; main water supply pipes; control panel.

3-6 Detailed Work Sheets

Design work sheets will be submitted by Tomco Fire Systems to the customer upon request and shall contain all the following information:

a). Sheet number.

b). Name and address of contractor supplying the water mist system.

c). Number of nozzles fitted; their make; type; size; flow rates; orifice size; name of manufacturer; material of construction.

d). Hydraulic reference points.

e). Pipe sizes fitted or installed; pipe centres; diameters; material of construction; lengths; flanges & fittings; reducing bushes; brackets or hangers.

f). Friction loss in psi (bars) per feet (meter) of pipe.

g). Velocity pressure and normal pressure where applicable.

h). System drainage points and drain plugs.

i). Pipe grids and system layout.

j). Type, make, length and pressure ratings on flexible hoses and fittings.

k). Pipe thread type.

l). Water pump specifications, including location, flow rates, working pressure, kilowatt or horsepower rating of drive motors.

m). Location of water valves; check valves; one way flow valves.

n). Location of fire control panel; electrical requirements to operate system; detectors including types and location; alarms and indicator devices.

3-7 Fogex Nozzles

The number of Fogex water mist nozzles for a risk area is based on the fire hazards requiring protection and dimension criteria of the risk area. The water mist nozzles are positioned to provide uninterrupted water mist momentum, maximum spray coverage and trajectory. The nozzles are supplied with built-in 316 grade stainless steel screens to prevent blockage.

Fogex nozzles are manufactured of TP 316 stainless steel. The nozzles are pickled and passivated to resist corrosion and staining. The nozzles are fully serviceable and interchangeable. They are engineered to yield optimal flow rates, water spray flux densities, spray patterns and spray momentum. Fogex nozzles do not have any moving or rotating parts that may malfunction and are therefore extremely reliable. Fogex nozzles produce a very fine atomised water mist (or fog) pattern .The nozzles have been tested in accordance FM Approvals Standards.

3-8 Fogex Nozzles for Land Applications:

Nozzle Type	FMRC Design Pressure (minimum)	Water Flow Rate	K-Factor	Nozzle Coverage (m²) / (FT)
FOGEX F20	1,450 psi (100 Bar)	6.4/min@100bar 1.7gpm@1450psi	0.64L/min/bar^{½} 0.45gpm@1450psi^{½}	≤12m²(132ft²)
FOGEX F27	1,450 psi (100 Bar)	5.3 /min@100bar 1.4gpm@1450psi	0.53/min/ bar^{½} 0.36gpm/psi^{½}	≤12m² (132ft²)

* water flow rate gal/min @1,450 psi

Nozzle Spacings:

Nozzle Type	Nozzle Spacings (metres) / (feet)	Nozzle Heights (metres) / (feet)
FOGEX F20	3 x 4m(10 x 13.2ft)	5.0m (16.5ft)
FOGEX F27	3 x 4m(10 x 13.2ft)	5.0 m (16.5ft)

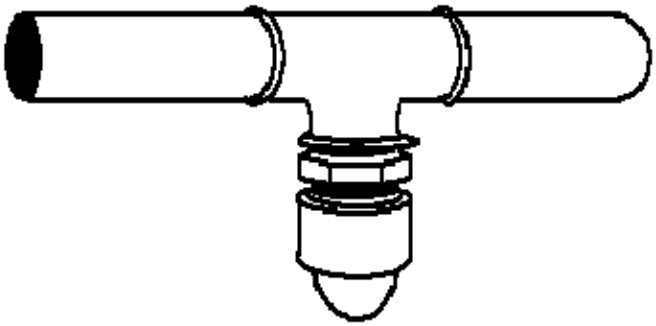
Design Criteria for Total Flooding Fogex Fire Protection System for the following risk areas.

Risk Area	Max Protection (M^3)/(FT^3)	Grid Matrix (metres) (feet)	Nozzle Type	Max Ceiling Ht (metres) (feet)	System Design Pressure (Bar)	Flow Rate	
						Gal /min	Litres /min
Oil Tank rooms	500 / 17,650	3m x 4m 10ft x 13.2 ft	Fogex F20	5.0 16.5	100 1,450 psi	1.7	6.4
Diesel Gen. Rooms	500 / 17,650	3m x 4m 10ft x 13.2 ft	Fogex F20	5.0 16.5	100 1,450 psi	1.7	6.4
Machinery spaces	500 / 17,650	3m x 4m 10ft x 13.2 ft	Fogex F20	5.0 16.5	100 1,450 psi	1.7	6.4
Combustion turbines	500 / 17,650	3m x 4m 10ft x 13.2 ft	Fogex F20	5.0 16.5	100 1,450 psi	1.7	6.4
Transformer Vaults	500 / 17,650	3m x 4m 10ft x 13.2 ft	Fogex F20	5.0 16.5	100 1,450 psi	1.7	6.4
Lubrication Skids	500 / 17,650	3m x 4m 10ft x 13.2 ft	Fogex F20	5.0 16.5	100 1,450 psi	1.7	6.4

Fogex F20 Deluge Nozzle

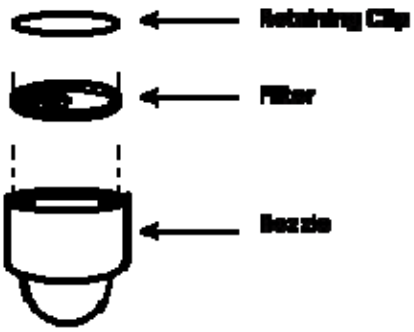
Fogex F27 Deluge Nozzle

FOGEX F20 NOZZLE – TEE-PIECE & EXPLODED VIEW



FOGEX F20 Nozzle

TEE - PIECE CONFIGURATION



FOGEX F20 NOZZLE

EXPLODED VIEW

Title FOGEX F20 NOZZLE & TEE PIECE CONFIGURATION	

3-9 Nozzle Spacings and Location

The maximum horizontal spacing between nozzles is 10ft (3m) x 13.2ft (4m) at a maximum height of 16.5ft (5m) per manufacturer specifications. The nozzle spacings and ceiling heights should not be exceeded.

3-10 Total Flooding Applications:

Fogex F20 nozzles are used for Total Flooding applications in land applications under NFPA 750 Standards and F.M. product approval Listings. The maximum grid spacing is 10ft by 13.2ft (3m x 4m). The maximum ceiling height for the Fogex F20 nozzle is 16.5ft (5.0m).

Fogex F20 multiple orifice full cone nozzles have a 70º spray angle to provide adequate spray coverage and penetration from a 16.5ft (5.0m) ceiling height.

The minimum system operating pressure for the most remote nozzle is 1,450 psi (100 bars). The minimum system discharge time shall be 18.5 minutes.

3-11 Door Screen Nozzles:

The Fogex F27 nozzles are used for screening nozzles. They must be installed at ceiling level and three feet (1m) from the wall above the door opening. The F27 nozzles are used to screen the oxygen from entering into the fire hazard areas. Installing Fogex F27 nozzles is a requirement and should be considered after a risk analysis of the fire hazard enclosure has been conducted. However where large open access ways are encountered exceeding 43ft^2 (4.0m²) in opening then Fogex F27 door screen nozzles must be installed to screen-off any possible free oxygen from entering the fire hazard enclosure. Generally for doorways up to 3ft (1.0m) wide, 1 Fogex F27 nozzle shall be installed; for doorway openings up to 6.6ft (2.0m) wide, 2 Fogex F27 nozzles should be installed. If one nozzle is required it shall be installed on the centerline of the opening. If two nozzle are required they should be installed 3 feet (1m) to the right and left of the centerline of the opening. For openings wider that 6ft (2.0m) consult the factory. It is recommended that all openings be provided with fire rated closures that will automatically close upon system activation.

3-12 General Installation Requirements:

The distance of nozzles from walls should not exceed one-half of the allowable distance between nozzles. Where nozzles are fitted on branch lines or between lines that run up and down pitched or curved surfaces, the nozzles are installed in accordance with the manufacturer's specifications. For advice on nozzle location please contact Tomco Fire Systems for assistance.

The Fogex water mist system is designed and installed to achieve complete mist distribution within the fire risk area. This is achieved by simultaneous operation of all "open type" nozzles in the fire risk area or fire zone by manual or automatic means. Fogex nozzles must be installed on the ceiling level of fire hazard enclosures. Wall mounted nozzles are not permitted.

3-13 Land Applications:

For installation and use in machinery spaces and combustion turbine enclosures special hazard machinery spaces on land. The Fogex system minimum operating pressure is 1,450 psi (100 bars). The Fogex system offers protection against Class B (hydrocarbon fuel) fires including hydrocarbon fuels with the severity of concealed n-Heptane pan fires and flowing or spraying Diesel, oil or n-Heptane fires.

In combustion turbine applications Fogex F20 nozzles should not be installed in such a way as to cause a direct “hard” impingement onto hot turbine surfaces. Careful nozzle installation will ensure that adequate mist distribution throughout the combustion turbine enclosure will be achieved without excessive mist impacting upon hot turbine components. This is to ensure that metallic turbine components may not become damaged to rapid surface cooling during mist discharge.

Fogex F20 nozzles can be placed on opposite ends of a combustion turbine enclosure on the ceiling so that the spray momentum is diagonally opposing to each other during system activation. Direct impingement on turbine casings is not permitted.

3-14 Nozzle Maintenance & Cleaning

It is absolutely imperative that nozzle cleanliness is maintained at all times. Fogex nozzles should be checked at least once every twelve (12) months as part of recommissioning procedures and fire safety requirements. Fogex nozzles may be removed and replaced with work shop serviced nozzles which have been checked for evidence of corrosion; blockage; mechanical damage due to knocks; blockage due to painting over; abuse and other abnormal conditions.

Defective nozzles should be removed and replaced with new nozzles and the defective nozzles brought to the attention of the customer. It is recommended that at least one annual check-up is implemented and where severe conditions prevail more frequent check-ups may be required. Dust blow-off caps can be supplied as an option. When removing or reinstalling Fogex nozzles always use the Fogex tool J-001 to avoid damaging the nozzle or defacing its markings. Photo of tool J-001 is enclosed herein.

For nozzle maintenance it is best to contact Tomco Fire Systems for assistance.

Caution: Do not force large diameter wires through the nozzle orifices during cleaning as this may damage the nozzles. Also, do not over-tighten nozzles and fittings – just tighten firmly. Always use proper tools to avoid defacing or damaging the nozzles. Use Teflon thread tape when installing nozzles to pipes.

Fogex Tool- J001

Used for installing or removing Fogex open deluge or automatic glass bulb nozzles. The tool prevents nozzle damage.

Fogex Nozzle Dust Caps

3-15 Nozzles - Spares

It is recommended that spare Fogex nozzles be carried as part of emergency inventory for maintenance purposes. Generally five (5%) percent is a suitable number of spare nozzles and is accepted throughout industry as standard practice.

PLEASE NOTE CAREFULLY:

When designing and installing water mist systems and particularly when positioning and locating water mist nozzles, always ensure that nozzles are not installed near to or next to a solid obstruction. This will affect the nozzles water spray trajectory and may make the system unreliable and cause a failure to extinguish a fire.

When large diameter pipes or air conditioning ducts etc exist or suspend from a ceiling near to where Fogex nozzles are to be installed, always ensure that the nozzles are located or installed below the horizontal centreline of the obstructions, e.g. large diameter pipes or air conditioning ducts. Never install the nozzles above these obstructions because the spray trajectory will be directed to spray away from the vertical throw and into a “curved throw” following around the obstruction. This arises due to the “venturi effect”. This is portrayed in the appended schematics. The water mist spray will therefore not penetrate the seat of a fire but will deflect to another region. This is typical for all water mist systems irrespective of manufacturer.

Fire testing conducted at independent fire & research laboratories has demonstrated that fires often may not be extinguished if the nozzles have not been placed properly especially where solid obstructions are prevalent. Air conditioning ducts are a good example where this occurs and larger diameter pipes exceeding 2”-3” in diameter. It is advisable to install the water mist nozzles so that they surpass the horizontal centreline, i.e. below of such objects that are suspended from the ceilings.

Similarly vertical solid obstructions like support pillars or tanks and other machinery inside buildings and basements etc will cause a deflection of spray trajectory to “curve” around these objects and will interfere with the straight spray trajectory originating from the water mist nozzles. The designer should check the aim of the nozzle during cold

discharge tests to verify his design tenacity during commissioning stages. The spray trajectory deflection will not arise immediately but will become prevalent after at least 30 seconds to 1 minute continuous discharge.

SECTION 4

Tomco Fogex® Water Mist Fire Protection System

Installation Standards

SECTION 4

INSTALLATION STANDARDS

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4-0 Distribution Pipework Standards

When Pressure Skid Modules (PSM's) are used they are connected to the main piping system by way of a flexible connection. The flexible connection is of a swivel type design. Fogex open type nozzles and are used in the system is a "dry pipe" network. All fixed pipe-work should be from 316 stainless-steel materials using threaded, flanged, welded or compression type fittings.

After system installation all piping and fittings shall be tested to 150% of rated working pressure for 10 minutes, followed by 110 minutes at the working pressure without pressure loss. A drop in pressure or visible leakage shall indicate pressure loss. NFPA 750 12.2.2.3.1

All stainless steel pipe work should be thoroughly cleaned or flushed prior to installation to remove foreign particles that could cause nozzle blockages. It is imperative that system hygiene is maintained at all times. It is best to clean pipes as they are being installed thus making the work easier. Ensure that all pipe ends that have been cut or threaded are properly "de-burred" prior to installation.

4-1 Drain Pipes

Drain plugs may be installed to enable the pipe-work to be drained of water after the system has been activated or for maintenance purposes. The drain plug is located at the lowest point to facilitate drainage under gravity. The drain plug is fitted to enable easy access. Drain pipes and plugs must not terminate in blind spaces and are fitted with a turned down elbow. Drain pipes and plugs should be arranged in such a way to avoid exposing any part of the nozzle system to freezing conditions.

4-2 Valve Installations

The electric 24 vdc actuator zone valves shall be installed in the horizontal position with the solenoid in the upright position and located in an accessible location so as to enable control of the water supply. Valves connecting to a water supply and sectional control valves in branch pipes to nozzles are designed to be supervised to be able to open by one of the following methods:

a). Automatic from approved releasing panel

b). Manually from by-pass values

When zone valves are installed overhead they should be positioned so that the indicating feature is visible from below and are easily accessible and/or operable. Where there is more than one source of water supply a check valve is installed in each connection. Check valves are always installed as per their listings and in a vertical or horizontal position.

Manual ball valves have a lockable handle so that the valve can be installed in a "normally open" or "normally closed" position. System installers should verify in which position the valves must be installed either in a closed or open position and then lock the valve in that position.

4-3 Pipe & Tube Standards

System piping shall be comprised of TP 304 or TP 316 stainless steel pipe with compression type, flanged, welded or threaded fittings. Piping shall meet in accordance with ASME B31.1 power piping code and NFPA 750 standards. Minimum pipe size shall be ¾' (20mm).

Materials and Dimensions	**Standard**
Stainless Steel	ASTM A312

Note: Bending of pipe shall be permitted in accordance with NFPA 750, paragraph 5.3.6.

All Stainless steel pipes that are connected by threading must have a tapered NPT type thread and shall conform to ANSI B1.20.1

4-4 Tube Thickness & Pressure Ratings

All piping should be TP 304 or TP 316 Stainless steel construction having physical and chemical characteristics such that deterioration under stress can be predicted with reliability. When piping or tubing is installed in extremely corrosive regions special corrosive resistant materials or coatings shall be used. The piping used is in accordance with relevant industry standards and according to approving authorities. The internal pressure used for calculating the thickness of the pipe wall is 1.5 times the maximum operating pressure of the water mist system at a pipe temperature 130°F (54°C). Stainless steel Schedule 10S or Schedule 40 pipes are satisfactory for Fogex systems.

4-5 Flexible Piping & Fittings

All flexible piping, tubing or hoses are as per approved materials and pressure ratings and are compatible with the Fogex System. All fittings used on piping have a corrosion resistance at least equivalent to wrought copper fittings conforming to *ANSI B16.22.*

4-6 Pipe or Tube Bending

Bending of pipe or tube is permitted when bends are made with no kinks, ripples, distortions, reductions in diameter, or any noticeable deviations from round. The minimum radius of a bend is 2 pipe diameters for pipe sizes up to 1-1/2"O.D. and smaller, and 4 pipe diameters for pipe sizes for 2" tubing. Pipe or tube bending shall conform to NFPA standard 750, paragraph 5.3.6.

4-7 Fittings

Pipe fittings used on the Fogex water mist system shall meet or exceed NFPA 750, paragraph 5.4:

Materials and Dimensions	**Standard**
Stainless Steel Fittings	ANSI A403/A403M

Screwed unions shall be used on pipes larger than 2" and where used are of types listed for the specific use. A one-piece reducing bushing is acceptable wherever a change is made in the size of pipe. Where stainless steel or other suitable tubing is joined with

compression-type fittings the manufacturer's pressure and temperature ratings of the fittings must be observed. All fittings used for the Fogex system shall have tapered NPT threads.

4-8 Use of Thread Sealants

Avoid using thread sealing joint compounds or thread lubricants as these tend to cause blockages to Fogex nozzles and filters. Instead use only Teflon thread tape on joints ensuring that thread tape dos not enter the pipes or components that may cause potential blockages downstream. Use of thread tape should comply with their listings and/or manufacturer specifications. All threads used in joints and fittings conform to *ANSI B1.20.1, Pipe Threads, General Purpose Standards*. Use of thread tapes conform to *AS 1272 – NFPA 750 5.4.3.4 Standards.* Sealing compounds shall be applied only to the male threads of the joint.

4-9 Welding & Brazing Standards

All welding shall be performed by qualified personnel is according to relevant standards and in accordance with *Section 1X of the Boiler and Pressure Vessel Code, Specification for Qualification of Welders for Piping and Tubing, Level AR-3* or equivalent. Brazing fluxes used should not be of a highly corrosive type. Welding and Brazing alloys used should have a melting point above 1000°F (538°C).

4-10 Pipe Hangers & Brackets

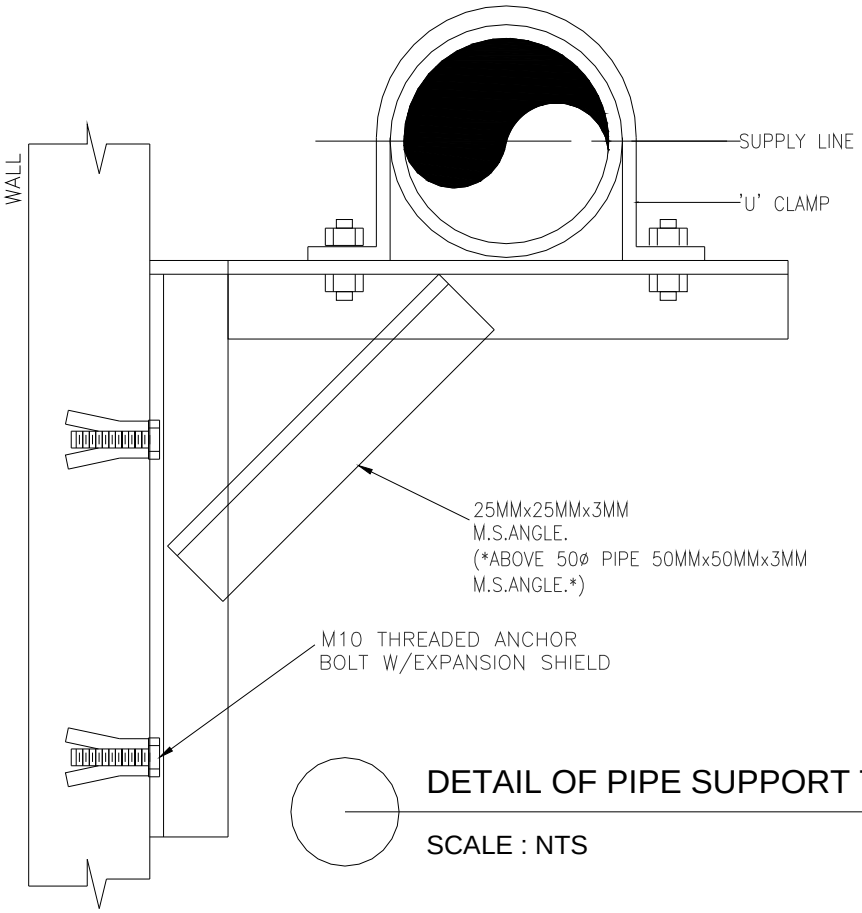
Pipe hangers or brackets are of quality metal construction and are of a suitable type for the system pipe-work. Hangers and brackets are of heavy duty metal design capable of supporting at least 5 times the weight of a water filled pipe. The structure supporting the brackets and pipes must be inspected first to ascertain its capability and integrity to withstand the weight imposed upon it. Pipe hangers or brackets are installed to offer a uniform weight distribution along the length of pipe(s) and must be of the correct size for the pipe work to avoid resonance vibrations. Hangers and supports must conform to NFPA 750 paragraph 5.5. and be FM Approved.

4-11 Pipe Color Coding

All pipe-work or tubing used on the Fogex water fog system must be installed in accordance with relevant standards and likewise are color coded usually red. Where pipes or tubes are installed with markings or other identifying labels etc these must not be painted over or removed unless an appropriate authority having jurisdiction over the system is consulted first and permission given to do so. Markings belonging to the Manufacturer must not be tampered with, painted, concealed or removed without permission being obtained first.

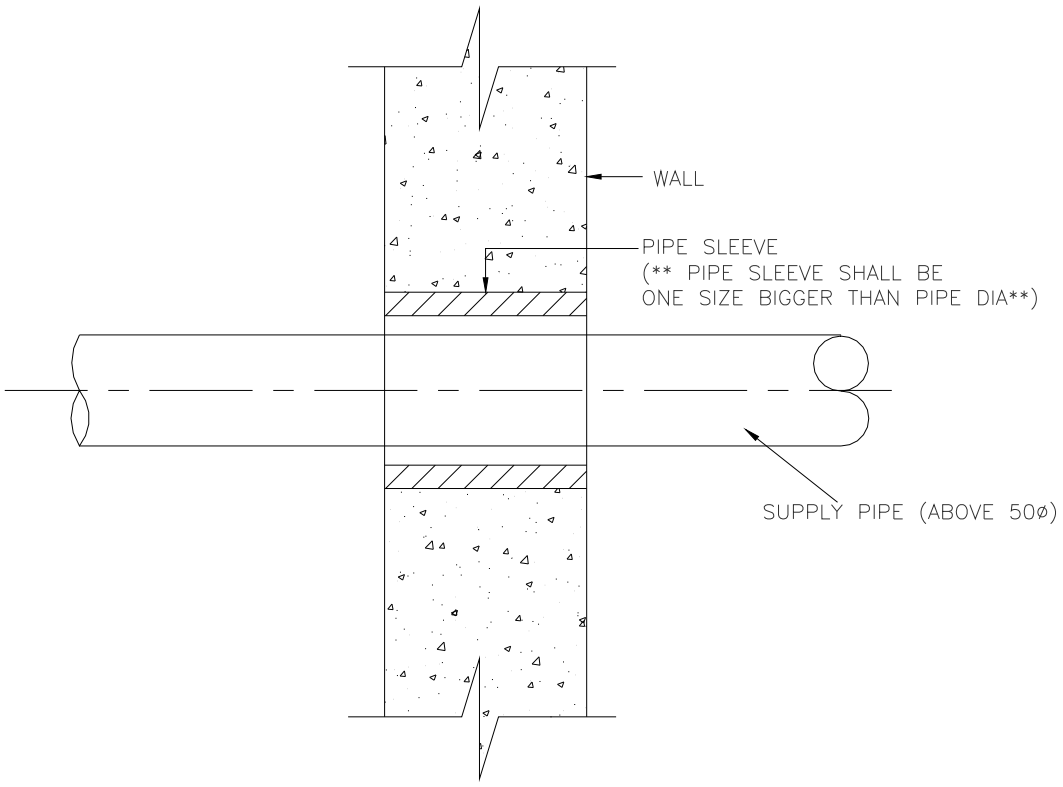
4-12 Typical Installations – Schematics

The following section provides some typical installations and configurations for pipe penetrations through masonry walls, typical pump controllers diagram, pipe bracket assemblies, Fogex automatic water mist nozzles arrangements and installations (which also extends to include Fogex deluge nozzles), water supply tank and fire pumps set up etc. These are offered as a guide to Fogex system designers.



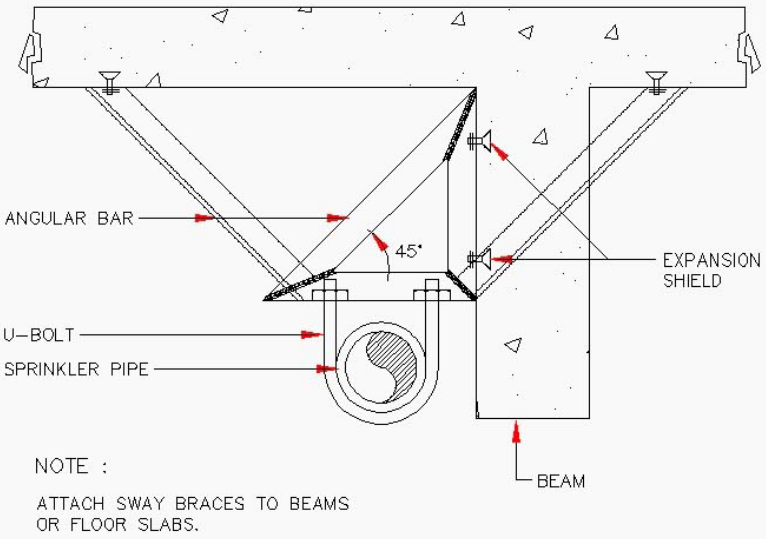
DETAIL OF PIPE SUPPORT THR'U WALL

SCALE : NTS



PIPE SLEEVE DETAIL

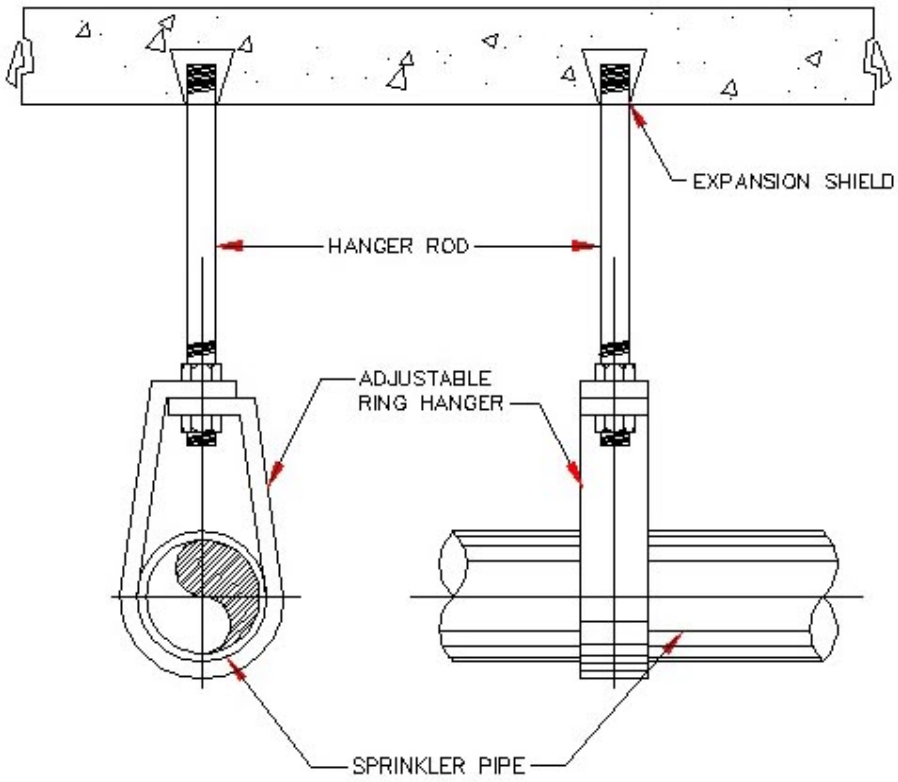
SCALE : NTS

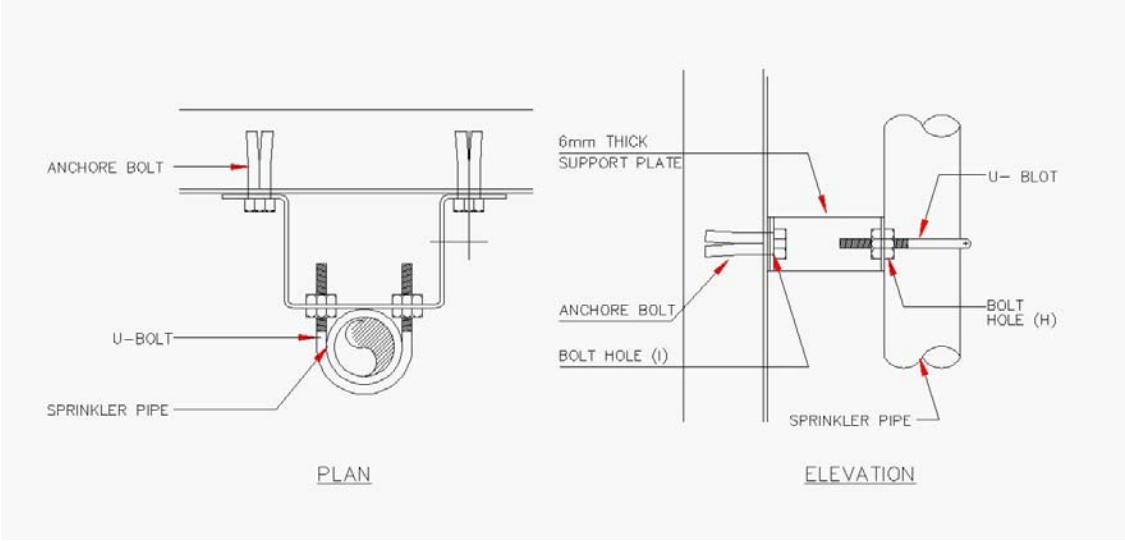


NOTE :

ATTACH SWAY BRACES TO BEAMS
OR FLOOR SLABS.

FIRE SUPPORT ALTERNATIVES


EXPANSION SHIELD
HANGER ROD
ADJUSTABLE
RING HANGER
SPRINKLER PIPE


ANCHORE BOLT
U-BOLT
SPRINKLER PIPE
PLAN
6mm THICK
SUPPORT PLATE
U- BLOT
ANCHORE BOLT
BOLT HOLE (I)
BOLT
HOLE (H)
SPRINKLER PIPE
ELEVATION

SECTION 5

Tomco Fogex® Water Mist Fire Protection System

System Components

SECTION 5

SYSTEM COMPONENTS

Table of Contents

5-0 Electric Actuated Zone Valves

Fogex Water Mist System zone valves are designed to operate utilizing electrical service for actuation. When a system is designed to actuate automatically, actuation is via electrical signals originating from the fire control panel sent to the appropriate electric zone valve to open and a start the fire pump (if provided).

Similarly when Fogex PSMs are used in lieu of fire pumps, the signal originating from the fire control panel is sent to the appropriate electric zone valve and to the nitrogen actuator solenoid to open and discharge nitrogen pressure into the water cylinders.

The 24 vdc electric valves are manufactured from 304 grade stainless steel and are one-directional valves installed in a "normally closed" position. The valves are closed when the solenoid is de-energized and opens when the solenoid is energized. The valves must be installed in the horizontal position with the solenoid in the upright position.

Valves are available in five sizes, i.e. ½", ¾", 1", 1½" and 2" NPT threads. The maximum system operating pressure for the valve is 1,600 psi (110 bar).

SIZE	PART No.	WEIGHT	CURRENT DRAW
1/2" NPT	980012	11.5lbs (5.2KG)	0.96 AMPS @ 24VDC
3/4" NPT	980013	11.5lbs (5.2KG)	1.38 AMPS @ 24VDC
1" NPT	980014	13lbs (6.0KG)	1.38 AMPS @ 24VDC
1 1/2" NPT	980015	24lbs (11.0KG)	1.38 AMPS @ 24VDC
2" NPT	980016	36lbs (16.4KG)	1.38 AMPS @ 24VDC

The 24 vdc electric solenoid valves function by receiving an electrical input signal from the fire alarm panel, and are held open until the electrical signal is removed

5-1 Manual Ball Valves

Tomco Fire Systems has a complete range of manual, 316 stainless steel high pressure ball valves for use with the Fogex system. Each ball valve is designed with a full port, meaning that there are no restrictions to cause excessive pressure losses. Manual ball valves are manufactured to exacting standards and in accordance with our Quality Assurance procedures. Manual ball valves are manufactured in five sizes ranging from ½", ¾", 1", 1.5" and 2". They have an operating pressure of 2,500 psig.

SIZE	PART No.	WEIGHT
1/2" NPT	980017	3lbs (1.4KG)
3/4" NPT	980018	4lbs (1.8KG)
1" NPT	980019	5lbs (2.3KG)
1 1/2" NPT	980020	11lbs (5.0KG)
2" NPT	980021	16lbs (7.3KG)

TFE seats are standard for ball valves ensuring a water-tight shut-off. Details and specifications of the manual ball valves can be found on the equipment data sheet.

The ball valves have a lockable feature to prevent tampering by unauthorized persons. Valves can be installed and locked in the closed or open position.

5-2 Pressure Switches

A discharge pressure switch part no. 990024 is installed downstream in the water distribution line(s) as a means to verify system operation and that the pipe work is pressurised. The pressure switch has N/O contacts and an operating pressure range from 300-3,000 psi (20 bar and up to 200 bar). When the system is activated the pressure inside the water distribution line will increase and once the desired pressure settings are attained the pressure switch will send a signal to the fire control panel to indicate system operating status. If the pressure is below 1,160 psi (80 bar) a signal will not report indicating that either that there is an open pipe network or that a nozzle is missing or a section valve is possibly shut thereby preventing water flow.

5-3 Non-return Check Valves

When a pump system is used to deliver water under pressure to the nozzle distribution grid and particularly when two or more high pressure pump sets are manifolded together to deliver the correct water flow and pressure, non-return valves shall be installed to prevent pressurized water from returning to another pump. This is required to avoid pump damage and to avoid water by-passing to a non-used (idle) pump.

Non-return valves are supplied, from ½" up to 2" sizes. The high pressure non-return valves can be mounted in any position either vertical or horizontal. It is important to install the non-return valves in the proper direction of water flow as marked on the non-return valves. The non-return valves are designed to withstand hydrostatic test pressures in excess of 5,800 psi (400 bar) to ensure maximum life cycle integrity and a trouble-free service life.

SIZE	PART No.
1/2" NPT	980007
3/4" NPT	980008
1" NPT	980009
1 1/2" NPT	980010
2" NPT	980011

The non-return valves shall also be installed onto the Fogex water storage systems (PSM's) when two or more cylinder systems are manifolded together. This is to ensure that water does not return to an emptied system.

5-4 High Pressure Cylinders – Actuator Head Assemblies

The actuator head assembly Part No. 980030 for water cylinders are manufactured from 316 grade stainless steel. They have an internal 316 grade Stainless steel pick-up tube. The Stainless steel pick-up tubes are cut to the desired length depending on the dimensions of the steel water cylinders.

PSMs can be activated in one of two ways; first, by operating the manual override Part No. 980062 on the nitrogen cylinder or secondly, by activating the electric 24VDC actuator Part No. 980027 automatically on the nitrogen cylinder from the FM Approved Releasing Control Panel. Opening of the high pressure nitrogen valves will release dry

nitrogen gas into the water cylinders to pressurize the cylinders and to cause water to flow out to the nozzles. The nitrogen entering into the actuator head assembly is pressure regulated to the desired system operating pressure, i.e. 1,600 psi (110 bar) by an approved high flow pressure regulator Part No. 980031.

The actuator heads on the high pressure PSMs are fitted with a pressure gauge Part No. 980037 to show the system pressure status at all times. The pressure gauge is constructed of Stainless steel to avoid corrosion. The pressure gauge is calibrated to show pressure readings in both psi and bar on the gauge face. The pressure gauge face dial is filled with oil.

5-5 High Pressure In-Line Water Filters

In-line water filters must be used for Fogex systems. An in-line water filter should be installed on the water delivery side after the pump. The in-line water filters will provide maximum system protection to prevent nozzle blockages, and can also be installed on the system side of the zone valves.

The in-line basket type water filters are rated to 2,180 PSI (150 bar) pressure and have a design test pressure exceeding 8,700 PSI (600 bar). The water filters are supplied in various sizes, i.e. ½", ¾", 1", 1½" and 2" sizes with NPT threads. The filters are fully serviceable with an internal Stainless steel triple mesh filter cartridge to capture dirt. The filters can be dismantled for maintenance purposes by removing the cartridge housing. The internal filter cartridges are designed to withstand 2,180 psi (150 bar) crush resistance pressure to ensure maximum reliability and a trouble-free service life.

SIZE	PART No.
1/2" NPT	980002
3/4" NPT	980003
1" NPT	980004
1 1/2" NPT	980005
2" NPT	980006

The water filters are manufactured from 316 grade stainless steel to withstand corrosion and system working pressures. It is important to install the water filters in the direction of water flow as indicated by the arrow engraved on the filter housing.

5-6 Pumps

The Fogex Fire Protection System can operate with the use of three, high pressure pumps in lieu of stored pressure skid modules (PSM's). Only the pumps shown on the table below shall be installed and used with the Fogex System. Other pump models that are not approved by the system manufacturer or the approving authorities may render the approval and design null and void. Pumps supplying water mist systems shall conform to the listing and manufacturer specifications and be in accordance with NFPA 20 Guidelines.

Fogex pumps are sized to supply the required water demand. The pumps can be connected to the fire service water main (see Fig. 5.1) or an atmospheric water storage tank that is capable of delivering water through the system's piping and nozzle networks at the recommended flow rates and operating pressure. The pump delivery pressure must not fluctuate significantly (± 5% acceptable). Pumps should be sized to deliver 110% of the water demand for the specified system design in accordance with NFPA 750

standards. It is recommened to size pumps with a slightly larger water flow to compensate for differing tolerances on the pump units, nozzles and pipe friction losses etc.

Pumps supplying the water mist system as the primary source are automatically controlled and must have sufficient capacity to meet the system demand. Pumps should be installed in easily accessible areas and should not be installed in areas where they could be subjected to damage by adverse atmospheric, mechanical, chemical or other causes. Pumps have been tested to comply with NFPA 20 and NFPA 750 standards. Pumps should be provided with Factory Test Certificates.

Electric driven Fogex pumps are rated to comply with the systems requirements and the electrical supply must be in accordance with NFPA 20, chapter 9 standards to the area being protected to ensure safe and uninterrupted operation. Electric motors are selected to provide sufficient power rating for continuous operation under full load. Where an external electrical power supply is not reliable then a Diesel driven back-up pump should be considered.

When a number of smaller pumps are used in lieu of one large pump the pumps can be manifolded together as a skid unit. All pumps that are interconnected should be via 316 stainless steel water manifolds.

When a number of positive displacement pumps are used together to obtain the total water supply necessary for protection of the fire hazard area, Fogex non-return valves (check valves) must be installed to avoid undue back-pressure between the pumps and to prevent water under pressure from returning to any idle or unused pumps. Pump sets must have a pressure relief device and water by-pass line installed to allow excess water to recirculate to the water storage tank to avoid pump damage.

High pressure pumps for the Fogex system are models KE30, KF36, and MS55. The pumps will deliver the desired pressure ranges depending on the volume of water flow required (see chart below).

Part No.	Mod.	L/Min.	US GPM	BAR	PSI	RPM	HP	KW
980034	KE30	70	18.8	130	1,850	1,450	24	17.8
980035	KF36	122	32.2	160	2,320	800	50	37
980036	MS55	316	83.4	125	1,800	1,500/1,800	100	75

Pump controllers shall be listed fire pump controllers or listed limited service controllers for pumps less than 30hp installed in accordance with NFPA 20 standard for the installation of stationary pumps for fire protection.

5.7 Nitrogen Solenoid Actuator

Electrical actuation of a nitrogen cylinder is accomplished by a nitrogen solenoid actuator Part No. 980027 interfaced thru an FM Approved releasing panel. The solenoid actuator has a nominal operating voltage of 24VDC @ 0.5 amps ± 10% electrical classification NEMA 4x (IP65).

5.8 Pneumatic Actuator

The pneumatic actuator Part No. 980061 is used to actuate the “slave” nitrogen cylinders. The actuator is mounted to the pressure differential valves on the nitrogen cylinder and activated by nitrogen pressure from the master nitrogen cylinder.

5.9 Manual Actuator

The manual actuator Part No. 980062 is installed on top of the solenoid actuator on the nitrogen cylinder to provide and emergency manual release that is fully mechanical that can be used to activate the “master” nitrogen cylinder be direct means in case of failure to the normal electrical operation of the solenoid. Manual activation is accomplished by pulling the safety pin and pushing the lever handle in a downward motion.

5.10 Pressure Regulator

The pressure regulator Part No. 980031 is used to reduce the nitrogen pressure to 1600 PSI (110 BAR) system operating pressure to the water cylinders. The pressure regulator mounts directly to the pressure differential valve on the nitrogen cylinder and is factory set and is not field adjustable. A pressure regulator is required on both the master and slave nitrogen cylinders.

5.11 Water Flexible Discharge Bend

The water cylinder flexible discharge bend Part No. 980064 as a 1/2” extra heavy flexible hose which connects the outlet of the water cylinder actuation head to the system piping or header manifold. The discharge bend is TP304 stainless steel and has 1/2" NPT swivel connection on the one end and a 1/2” NPT union connection on the other end.

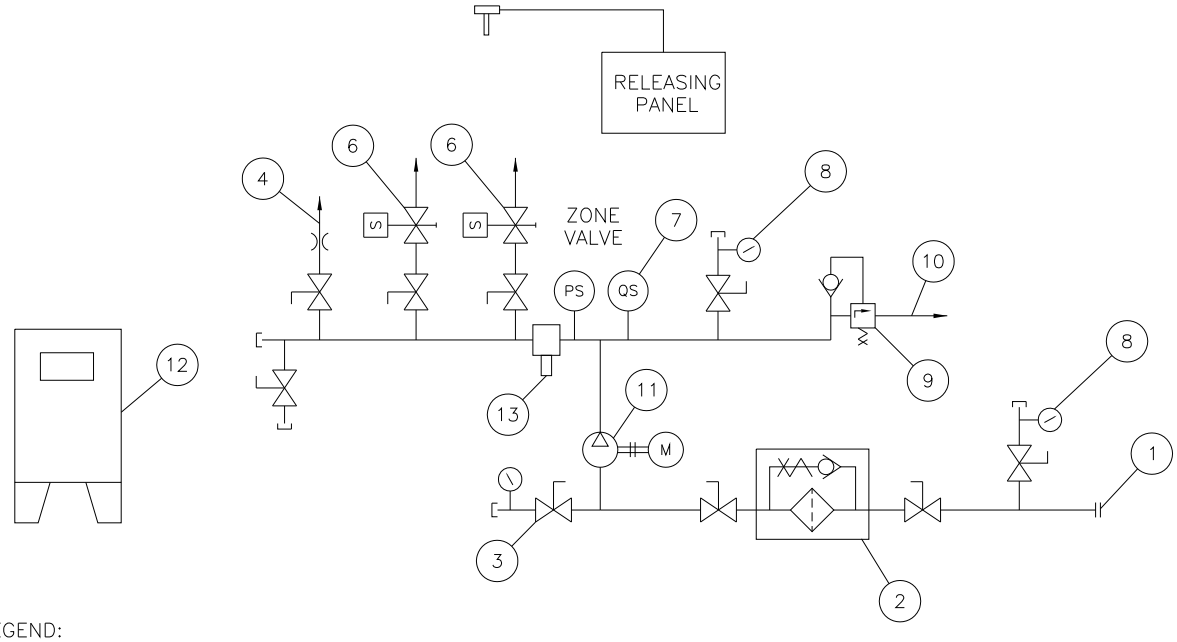
5.12 Strainers

In-line strainers must be installed on all Fogex Systems, on the water inlet suction proceeding the pump or on the water fill line to the storage tank or cylinders. The in-line strainers are rated for 1440 PSI (100 BAR) pressure and are supplied in the following pipe sizes.

SIZE	PART No.
1/2” NPT	980043
3/4” NPT	980044
1” NPT	980045
1 1/2” NPT	980046
2” NPT	980047

5.13 Nozzles

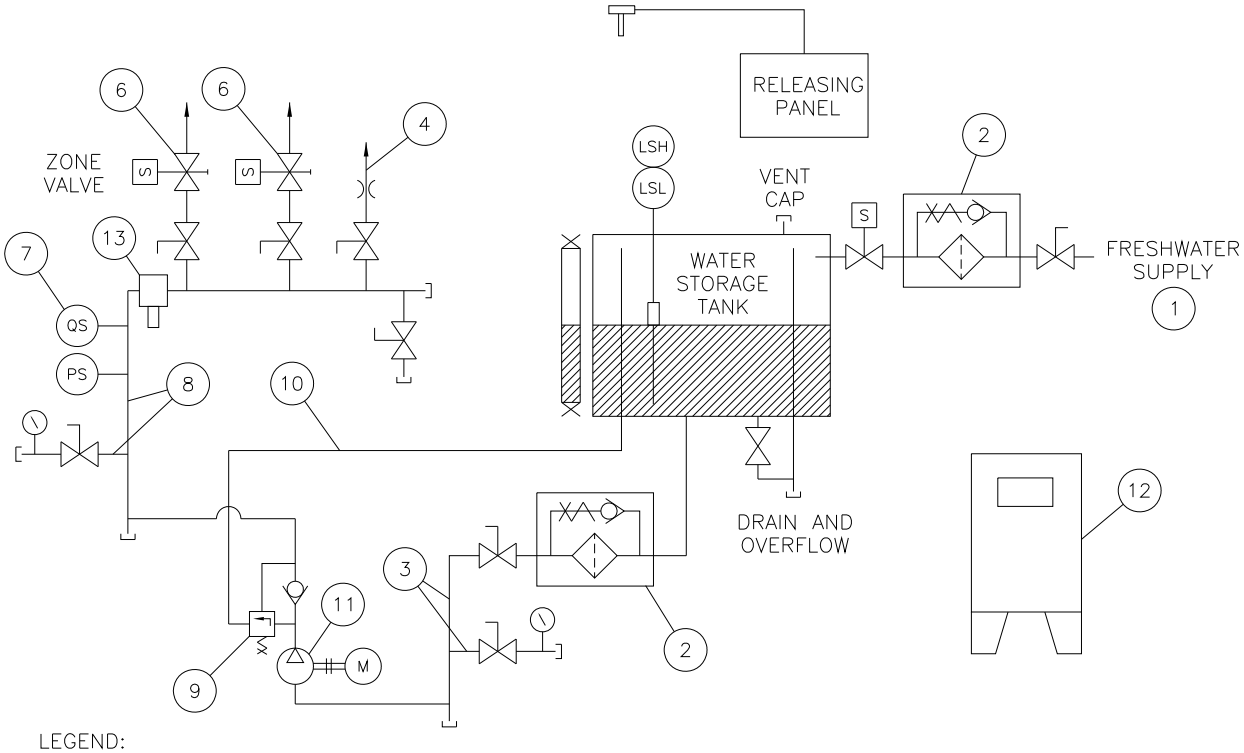
There are two types of Fogex nozzles that are available, the F20 and F27. The F20 nozzle is used on open head total flood deluge systems and the F27 nozzle is used for screening un-enclosable openings to prevent oxygen entering the protected area. Refer to the design section of this manual for nozzle spacing flow rates and maximum allowable ceiling heights. The nozzle tool J001 Part No. 980068 should be used for installing or removing Fogex nozzles to prevent damage to nozzles. Dust caps Part No. 980106 are available for dirty environments to prevent blockage of nozzle orifice.



LEGEND:

1. FRESHWATER FILL SUPPLY
2. FILTERS OR STRAINER WITH BYPASS
3. SUCTION MANIFOLD WITH GAUGE
4. TEST CONNECTION WITH FLOWMETER
5. ISOLATION VALVE FOR SELECTOR VALVE
6. SOLENOID ACTUATED SELECTOR VALVE
7. PRESSURE AND LOW SWITCHES CONNECTED TO CONTROLLER
8. DISCHARGE MANIFOLD WITH PRESSURE GAUGE
9. UNLOADER VALVE
10. UNLOADER VALVE DISCHARGE LINE
11. POSITIVE DISPLACEMENT PUMP
12. PUMP CONTROLLER
13. FILTER

Typical Pump Taking Suction From Water Supply Figure 5.1



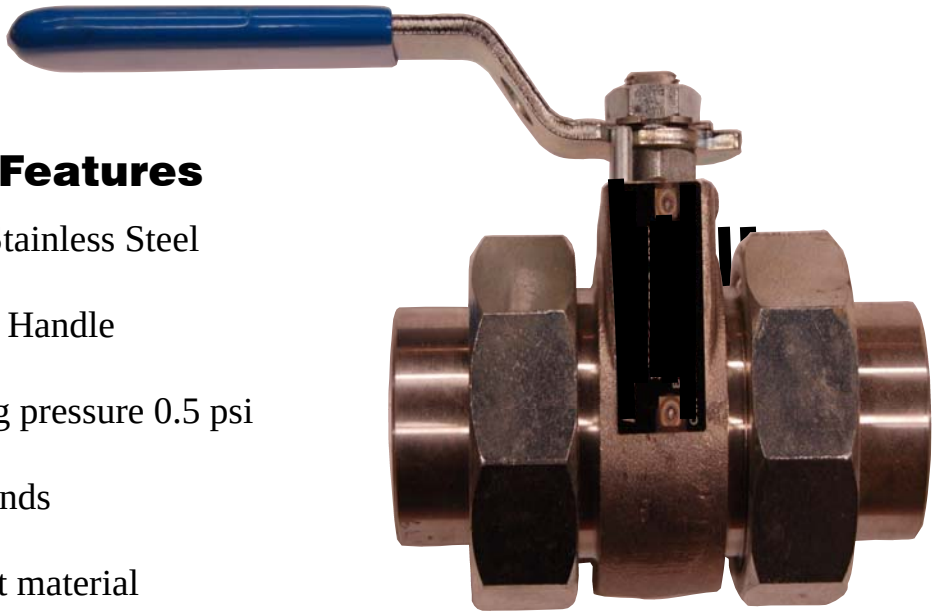
LEGEND:

1. FRESHWATER FILL SUPPLY
2. STRAINER WITH BYPASS
3. SUCTION MANIFOLD WITH GAUGE
4. TEST CONNECTION WITH FLOWMETER
5. ISOLATION VALVE FOR SELECTOR VALVE
6. SOLENOID ACTUATED SELECTOR VALVE
7. PRESSURE AND LOW SWITCHES CONNECTED TO CONTROLLER
8. DISCHARGE MANIFOLD WITH PRESSURE GAUGE
9. UNLOADER VALVE
10. UNLOADER VALVE DISCHARGE LINE
11. POSITIVE DISPLACEMENT PUMP
12. PUMP CONTROLLER
13. FILTER

Typical Pump Taking Suction From Storage Tank Figure 5.2

Data Sheet

Ball Valves



Key Features

- TP316 Stainless Steel
- Locking Handle
- Cracking pressure 0.5 psi
- Union Ends
- TFE seat material
- Full port no restrictions

Size	Part No.	Weight
1/2” NPT	**980017**	3 lbs (1.4kg)
3/4” NPT	**980018**	4 lbs (1.8kg)
1” NPT	**980019**	5 lbs (2.3kg)
1 1/2” NPT	**980020**	11 lbs (5.0kg)
2” NPT	**980021**	16 lbs (7.3kg)

DESCRIPTION

Tomco Fire Systems has a complete range of F.M. Approved manual, 316 stainless steel high pressure ball valves for use with the Fogex system. Each ball valve is designed with a full port, meaning that there are no restrictions to cause excessive pressure losses. Manual ball valves are manufactured to exacting standards and in accordance with our Quality Assurance procedures. They have an operating pressure of 2,500 psig.

TFE seats are standard for ball valves ensuring a water-tight shut-off. Details and specifications of the manual ball valves can be found on the equipment data sheet.

The ball valves have a lockable feature to prevent tampering by unauthorized persons. Valves can be installed and locked in the closed or open position

In addition, the ball valves can be provided with supervisory position switches.

TOMCO$_2$ FIRE SYSTEMS

7619 Hamilton Ave. Cincinnati, Ohio 45231 (513) 729-3473 www.tomcofiresystems.com

Data Sheet

Check Valves

Key Features

- TP316 Stainless Steel
- Metal to metal seats
- Cracking pressure 0.5 psi

Size	Part No.
1/2” NPT	980007
3/4” NPT	980008
1” NPT	980009
1 1/2” NPT	980010
2” NPT	980011

- Working pressure of 3000 psi
- Full port no restrictions

DESCRIPTION

When a pump set system is used to deliver water under pressure to the nozzle distribution grid and particularly when two or more high pressure pump sets are manifolded together to deliver the correct water flow and pressure, non-return valves shall be installed to prevent pressurized water from returning to another pump. This is required to avoid pump damage and to avoid water by-passing to a non-used (idle) pump.

Various sizes of non-return valves are supplied, from ½” up to 2” sizes. The high pressure non-return valves can be mounted in any position either vertical or horizontal. It is important to install the non-return valves in the proper direction of water flow as marked on the non-return valves. The non-return valves are designed to withstand hydrostatic test pressures in excess of 5,800 psi (400 bar) to ensure maximum life cycle integrity and a trouble-free service life.

The non-return valves shall also be installed onto the Fogex water storage systems (PSM’s) when two or more cylinder systems are manifolded together. This is to ensure that water does not return to an emptied system.

TOMCO2 FIRE SYSTEMS

7619 Hamilton Ave. Cincinnati, Ohio 45231 (513) 729-3473 www.tomcofiresystems.com

Data Sheet

Filters

Key Features

- TP316 Stainless Steel
- Removable Filter cartridge
- Triple stainless steel cartridge

Size	Part No.
1/2” NPT	980002
3/4” NPT	980003
1” NPT	980004
1 1/2” NPT	980005
2” NPT	980006

- Will not fail if filters are partly or completely blocked
- #20 Mesh screen

DESCRIPTION

Water filters must be used for all Fogex systems. A water filter should be installed on the water delivery side after the pump or down stream of any zone control valves. The in-line water filters provide maximum system protection to prevent nozzle blockage.

The water filters are rated to 2,180 psi (150 bar) pressure and have a design test pressure exceeding 8,700 PSI (600 bar). The water filters are supplied in various sizes, i.e. 1/2”, 3/4”, 1” , 1-1/2” and 2” sizes with NPT threads. The filters are fully serviceable with an internal Stainless steel triple mesh filter cartridge to capture dirt. The filters can be dismantled for maintenance purposes by removing the cartridge housing. Internal filter cartridges are designed to withstand 2,180 psi (150bar) crush resistance pressure to ensure maximum reliability and trouble-free service life.

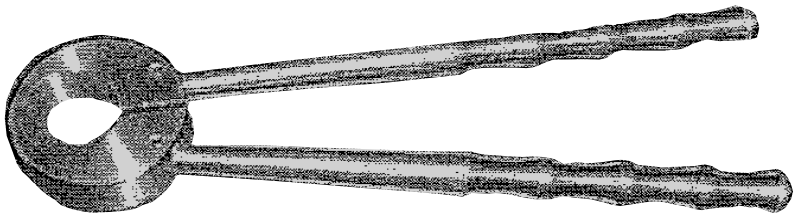
The water filters are manufactured from 316 grade stainless steel to withstand corrosion and system working pressures. It is important to install the water filters in the direction of water flow as indicated by the arrow engraved on the filter housing .

TOMCO2 FIRE SYSTEMS

7619 Hamilton Ave. Cincinnati, Ohio 45231 (513) 729-3473 www.tomcofiresystems.com

Data Sheet

Fogex® Nozzle Tool



Key Features

- Fits all Fogex deluge and automatic type Nozzles.
- Prevents nozzle damage and marking with ordinary spanners
- No adjustments required - One tool fits all nnozzles
- Sturdy Stainless steel construction for long life
- Part N^{o} 980068

TOMCO$_2$ FIRE SYSTEMS

7619 Hamilton Ave. Cincinnati, Ohio 45231 (513) 729-3473 www.tomcofiresystems.com

Data Sheet

Manual Actuator

DESCRIPTION

The manual actuator P/N 980062 is installed on top of the solenoid actuator to provide an emergency manual release that is fully mechanical that can be used to activate the nitrogen cylinder by direct means case of failure to the normal electrical operation of the solenoid.

Manual activation is accomplished by pulling the safety pin and pushing the lever handle in a downward motion.

NOTE: Before assembly or after activation, make sure the safety pin is installed and the tripping device (pin) has been reset. See Section 6 (Commissioning and Servicing) of the design, installation & Service manual for resetting instructions. Failure to assure the activating pin is in the non-activated position could cause system activation upon installing actuator

TOMCO2 FIRE SYSTEMS

7619 Hamilton Ave. Cincinnati, Ohio 45231 (513) 729-3473 www.tomcofiresystems.com

Data Sheet

Nitrogen Solenoid Actuator

DESCRIPTION

Electrical actuation of a nitrogen cylinder is accomplished by a nitrogen solenoid actuator P/N 980027 interfaced thru an FM approved releasing panel. A local manual override valve actuator must be installed on top of the actuator to provide and emergency manual override in case or failure to the automatic operation.

The solenoid actuator has nominal operating voltage of 24VDC @ 0.5amps ± 10%.

Electrical classification—NEMA 4x (IP65)

NOTE: Before assembly or after system activation check to make sure that the tripping device (pin) has been reset. See Section 6 (Commissioning and Servicing) of the design, Installation & Service Manual for resetting instructions.

Failure to assure the activating pin is in the non-activated position could cause system activation up installing the solenoid actuator.

TOMCO2 FIRE SYSTEMS

7619 Hamilton Ave. Cincinnati, Ohio 45231 (513) 729-3473 www.tomcofiresystems.com

Data Sheet

Nitrogen Cylinder Assembly (Master)

Key Features

- 24VDC Solenoid Actuator
- Emergency Mechanical Actuator
- 1600 psi Regulator
- Gauge w/ Low pressure switch
- Burst disc
- Dot rated
- Color Black

Part No.	Capacity	Weight Empty
980087	13gal (50L)	174lbs (79KG)
980086	18gal (67L)	201lbs (91.4KG)
980073	21gal (80L)	283lbs (128.6KG)

DESCRIPTION

The master nitrogen cylinder assembly is used to store nitrogen and upon activation is used to pressurize the water cylinders to expel the water into the system at 1600 psi

One master or slave cylinder will provide discharge pressure for up to three water cylinders. If additional nitrogen cylinders are required, a slave nitrogen cylinder can be added for three additional water cylinders.

There is no limit to the number of nitrogen cylinders and water cylinders the can be manifold together to provide the required volume of water.

The nitrogen cylinders are equipped with a custom control head that will require a special CGA adapter for refilling. The cylinders are Dot rated and can be refilled at a gas filling station.

TOMCO2 FIRE SYSTEMS

7619 Hamilton Ave. Cincinnati, Ohio 45231 (513) 729-3473 www.tomcofiresystems.com

Data Sheet

Nitrogen Cylinder Assembly (Slave)

Key Features

- Pneumatic Actuator
- 1600 psi Regulator
- Gauge w/ Low pressure switch
- Burst disc
- Dot rated
- Color Black

Part No.	Capacity	Weight Empty
980101	13gal (50L)	170lbs (77.3KG)
980102	18gal (67L)	197lbs (89.5KG)
980074	21gal (80L)	279lbs (127KG)

DESCRIPTION

The slave nitrogen cylinder assembly is used to store nitrogen and upon activation is used to pressurize the water cylinders to expel the water into the system at 1600 psi

One master or slave cylinder will provide discharge pressure for one water cylinder. If additional nitrogen cylinders are required, a slave nitrogen cylinder can be added for each additional water cylinder.

There is no limit to the number of nitrogen cylinders and water cylinders the can be manifold together to provide the required volume of water.

The nitrogen cylinders are equipped with a custom control head that will require a special CGA adapter for refilling. The cylinders are Dot rated and can be refilled at a gas filling station.

TOMCO2 FIRE SYSTEMS

7619 Hamilton Ave. Cincinnati, Ohio 45231 (513) 729-3473 www.tomcofiresystems.com

Data Sheet Nozzles

Key Features

- Open type Design
- Stainless Steel Construction
- No Moving Parts
- Low Flow Rate
- Fine Droplets
- Provided with screen to Prevent Blockage
- High pressure 1450 psi (100 bar)

DESCRIPTION

There are two types of Fogex nozzles that are available, the F20 (Part N^{o} 980032) and F27 (Part N^{o} 980033). The F20 nozzle is used on open head total flood deluge systems and the F27 is used for screening unenclosable openings to prevent oxygen entering the protected area.

Please refer to the design manual for nozzle spacing, flow rates and ceiling heights.

The nozzle J001 tool (Part N^{o} 980068) should be used for installing or removing Fogex nozzles to prevent damage to nozzles, dust caps (Part N^{o} 980106) are available for dirty environments.

Each nozzle is equipped with screen to prevent blockage of the small orifice. It is recommended that every nozzle on the system be replaced after each system discharge.

TOMCO$_2$ FIRE SYSTEMS

7619 Hamilton Ave. Cincinnati, Ohio 45231 (513) 729-3473 www.tomcofiresystems.com

Data Sheet

Pneumatic Actuator

DESCRIPTION

The pneumatic actuator P/N 980061 is used activate the “slave” nitrogen cylinders when two or more nitrogen cylinders are required.

The actuator is mounted to the pressure differential valve on the nitrogen cylinder and activated by pneumatic pressure from the master cylinder.

NOTE: Before assembly or after system activation check to make sure that the tripping device (pin) had been re-set. See Section 6 (Commissioning and Servicing) of the design, installation & Service manual for resetting instructions. Failure to assure the activating pin is in the non-activated position could cause system activation upon installing the pneumatic actuator.

TOMCO$_2$ FIRE SYSTEMS

7619 Hamilton Ave. Cincinnati, Ohio 45231 (513) 729-3473 www.tomcofiresystems.com

Data Sheet

Pressure Gauge

Key Features

- Stainless Steel case & bezel
- Pitospher bronze Bourdon tube
- Dual scale psi & bar
- Accuracy ± 2% FSD
- Temperature range - 40° to 180°F
- Pressure Range 0 - 3000 psi (0-280 BAR)
- Glycerin filled
- 4” Diameter
- 1/4” NPT bottom port
- Part N^{o} 980022

TOMCO$_2$ FIRE SYSTEMS

7619 Hamilton Ave. Cincinnati, Ohio 45231 (513) 729-3473 www.tomcofiresystems.com

Data Sheet

Pressure Regulator

DESCRIPTION

The pressure regulator P/N 980031 is used to reduce the nitrogen pressure to 1600 psi (110 bar) system operating pressure for the self contained pressure Skid Module (PSM) system. The pressure regulator mounts directly to the pressure differential valve on the nitrogen cylinder and factory set and is not field adjustable. A pressure regulator is required on both the master and slave nitrogen cylinders. The outlet of the regulator is connected directly to the inlet port on the water cylinder actuator head.

Material : Forged Brass

TOMCO2 FIRE SYSTEMS

7619 Hamilton Ave. Cincinnati, Ohio 45231 (513) 729-3473 www.tomcofiresystems.com

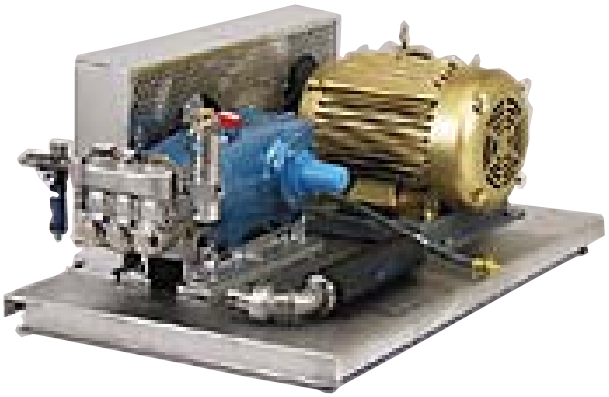
Data Sheet

Pumps

Key Features

- Three Sizes :

Part No. 980034 18.8 gpm @ 1850 psi (24hp)
980035 32.2 gpm @ 2320 psi (50hp)
980036 83.4 gpm @ 1800 psi (100hp)



- UL/FM Pump Controllers
- Complies with NFPA 20
- Can be Manifold together
- TEFC Motors

DESCRIPTION

The Fogex pumps Can be used in lieu of the stored pressure skid modules (PSM's), when larger quantities of water are required

The pump systems can be arranged to take suction from an atmospheric storage tank or directly from a water supply.

The pumps can be manifolded together to achieve greater flow capacity, depending on the total system demanded

Each pump should be provided with a UL/ FM Approved Fire pump controller that can be remote started from a Fire System Releasing Panel.

TOMCO2 FIRE SYSTEMS

7619 Hamilton Ave. Cincinnati, Ohio 45231 (513) 729-3473 www.tomcofiresystems.com

Data Sheet

Strainers

Key Features

- TP316 Stainless Steel
- 1/16” DIA, 132 holes/ sq in. Stainless Steel screen

Size	Part No.
1/2” NPT	980043
3/4” NPT	980044
1” NPT	980045
1 1/2” NPT	980046
2” NPT	980047

- High pressure 1440 psig
- Removable Cap for easy cleaning

DESCRIPTION

In-line Strainers must be used for all Fogex systems. An in-line strainer should be installed on the water suction inlet preceding the pump and installed on the water fill line to the storage tank. The in-line water strainers provide maximum system protection to prevent foreign material from entering the pump or water storage tanks.

The in-line strainers are rated 1440 psi (100 bar) pressure The water strainers are supplied in various sizes, i.e. 1/2”, 3/4”, 1” , 1-1/2” and 2” sizes with NPT threads. The strainers are fully serviceable with an internal Stainless steel wire screen filter to capture dirt. The strainers can be dismantled for maintenance purposes by removing the thread cap.

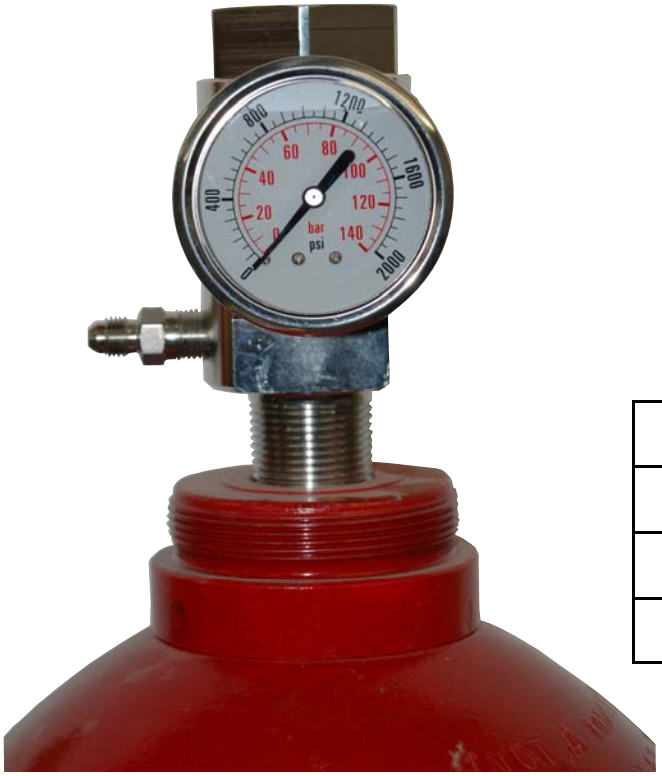
The water strainers are manufactured from 316 grade stainless steel to withstand corrosion and system working pressures. It is important to install the water strainers in the direction of water flow as indicated by the arrow engraved on the housing .

TOMCO2 FIRE SYSTEMS

7619 Hamilton Ave. Cincinnati, Ohio 45231 (513) 729-3473 www.tomcofiresystems.com

Data Sheet

Water Cylinder Assembly



Key Features

- Stainless steel control head
- Pressure Gauge
- Plastic lined cylinder
- Dot rated
- Color Red

Part No.	Capacity	Weight Empty
980088	13gal (50L)	167lbs (76KG)
980100	18gal (67L)	194lbs (88.2KG)
980075	21gal (80L)	276lbs (125.5KG)

DESCRIPTION

The water cylinders are non pressurized in the stand-by condition. When the system is activated, pressure from the nitrogen cylinder is connected to the water cylinder and the nitrogen pressure forces the water up the dip tube and into the piping network to the nozzle

The number of water cylinders that can be used on a systems is virtually unlimited.

The cylinders are plastic lined to prevent corrosion and particles from the system. Each cylinder is equipped with a liquid level indicator.

TOMCO$_2$ FIRE SYSTEMS

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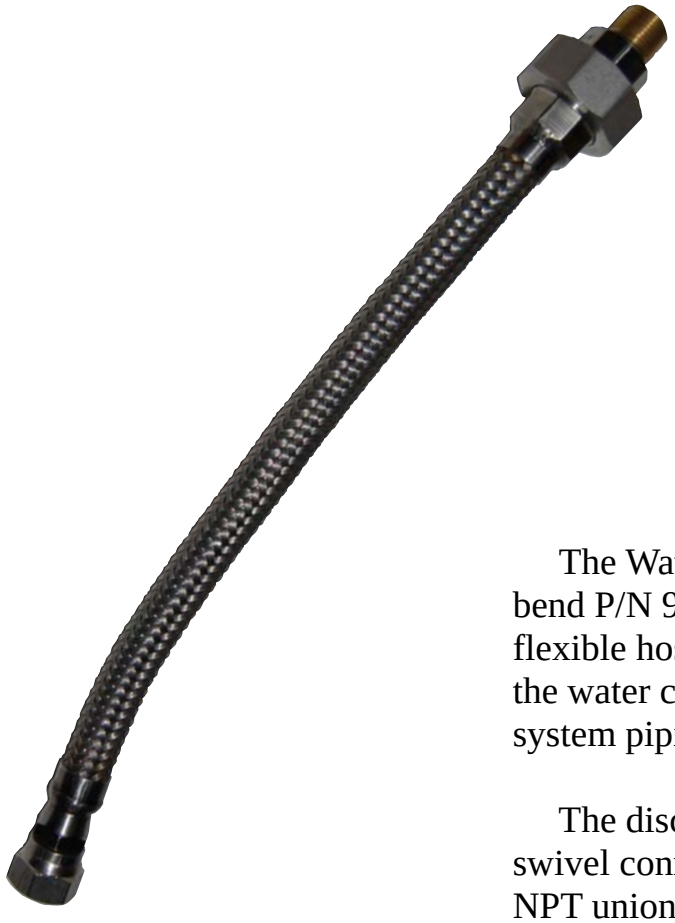
Data Sheet

Water Flexible Discharge Bend



DESCRIPTION

The Water Cylinder flexible discharge bend P/N 980064 is a 1/2” extra heavy flexible hose which connects the outlet of the water cylinder actuation head to the system piping or header manifold.

The discharge bend has a 1/2” NPT swivel connection on one end and a 1/2” NPT union connection on the other end.

Material : TP304 Stainless Steel

Working Pressure : 3000 psi

TOMCO2 FIRE SYSTEMS

7619 Hamilton Ave. Cincinnati, Ohio 45231 (513) 729-3473 www.tomcofiresystems.com

Data Sheet

Water Cylinder Pressure Gauge

Key Features

- Stainless Steel case & bezel
- Pitospher bronze Bourdon tube
- Accuracy ± 1.6% FSD
- Temperature range - 40° to 180°F
- Pressure Range 0 - 3000 psi (0-140 BAR)
- Glycerin filled
- 2” Diameter
- 1/4” NPT back port
- Part N^{o} 980037

TOMCO$_2$ FIRE SYSTEMS

7619 Hamilton Ave. Cincinnati, Ohio 45231 (513) 729-3473 www.tomcofiresystems.com

Data Sheet

Zone Control Valves

Key Features

- NEMA 4 enclosure
- Arrow on body indicates flow direction
- Requires power to open
- Supervisory position switch contacts close when valve is open
- Suitable for use with Approved Releasing Panel

Size	Part No.	Weight	Current Draw
1/2" NPT	**980012**	11.5lbs (5.2KG)	0.96amps @ 24VDC
3/4" NPT	**980013**	11.5lbs (5.2KG)	1.38amps @ 24VDC
1" NPT	**980014**	13lbs (6.0KG)	1.38amps @ 24VDC
1 1/2" NPT	**980015**	24lbs (11.0KG)	1.38amps @ 24VDC
2" NPT	**980016**	36lbs (16.4KG)	1.38amps @ 24VDC

DESCRIPTION

Fogex Water Mist System zone valves are designed to operate utilizing electrical service for actuation. When a system is designed to actuate automatically, actuation is via electrical signals originating from the fire control panel sent to the appropriate electric zone valve to open and a start the fire pump (if provided).

Similarly when Fogex PSMs are used in lieu of fire pumps, the signal originating from the fire control panel is sent to the appropriate electric zone valve and to the nitrogen actuator solenoid to open and discharge nitrogen pressure into the water cylinders.

The 24VDC electric valves are manufactured from 304 grade stainless steel and are one-directional valves installed in a "normally closed" position. The valves are closed when the solenoid is de-energized and opens when the solenoid is energized. The valves must be installed in the horizontal position with the solenoid in the upright position.

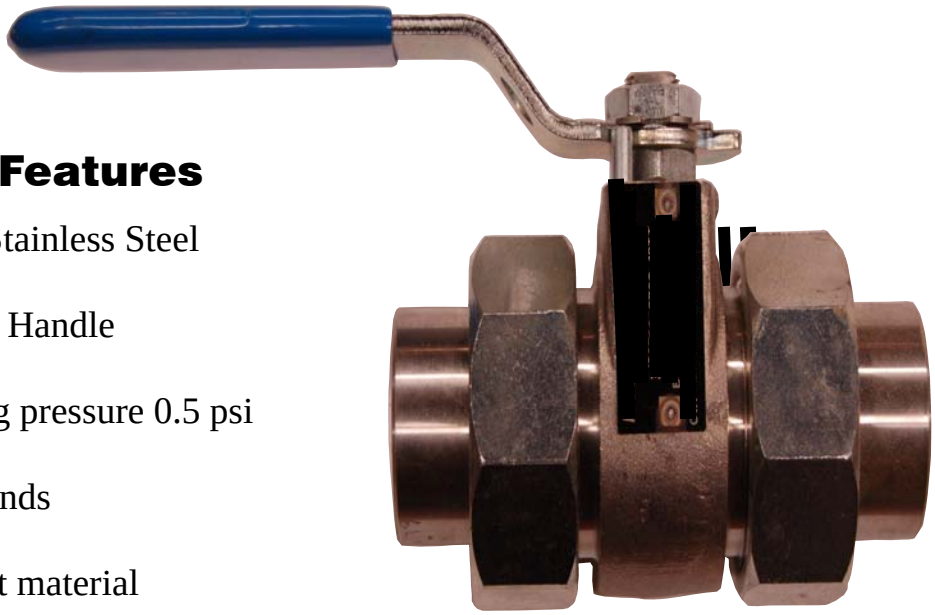
The 24VDC electric solenoid valves function by receiving an electrical input signal from the fire alarm panel, and are held open until the electrical signal is removed.

TOMCO2 FIRE SYSTEMS

7619 Hamilton Ave. Cincinnati, Ohio 45231 (513) 729-3473 www.tomcofiresystems.com

Data Sheet

Ball Valves



Key Features

- TP316 Stainless Steel
- Locking Handle
- Cracking pressure 0.5 psi
- Union Ends
- TFE seat material
- Full port no restrictions

Size	Part No.	Weight
1/2” NPT	**980017**	3 lbs (1.4kg)
3/4” NPT	**980018**	4 lbs (1.8kg)
1” NPT	**980019**	5 lbs (2.3kg)
1 1/2” NPT	**980020**	11 lbs (5.0kg)
2” NPT	**980021**	16 lbs (7.3kg)

DESCRIPTION

Tomco Fire Systems has a complete range of F.M. Approved manual, 316 stainless steel high pressure ball valves for use with the Fogex system. Each ball valve is designed with a full port, meaning that there are no restrictions to cause excessive pressure losses. Manual ball valves are manufactured to exacting standards and in accordance with our Quality Assurance procedures. They have an operating pressure of 2,500 psig.

TFE seats are standard for ball valves ensuring a water-tight shut-off. Details and specifications of the manual ball valves can be found on the equipment data sheet.

The ball valves have a lockable feature to prevent tampering by unauthorized persons. Valves can be installed and locked in the closed or open position

In addition, the ball valves can be provided with supervisory position switches.

TOMCO$_2$ FIRE SYSTEMS

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Data Sheet

Check Valves

Key Features

- TP316 Stainless Steel
- Metal to metal seats
- Cracking pressure 0.5 psi

Size	Part No.
1/2” NPT	980007
3/4” NPT	980008
1” NPT	980009
1 1/2” NPT	980010
2” NPT	980011

- Working pressure of 3000 psi
- Full port no restrictions

DESCRIPTION

When a pump set system is used to deliver water under pressure to the nozzle distribution grid and particularly when two or more high pressure pump sets are manifolded together to deliver the correct water flow and pressure, non-return valves shall be installed to prevent pressurized water from returning to another pump. This is required to avoid pump damage and to avoid water by-passing to a non-used (idle) pump.

Various sizes of non-return valves are supplied, from ½” up to 2” sizes. The high pressure non-return valves can be mounted in any position either vertical or horizontal. It is important to install the non-return valves in the proper direction of water flow as marked on the non-return valves. The non-return valves are designed to withstand hydrostatic test pressures in excess of 5,800 psi (400 bar) to ensure maximum life cycle integrity and a trouble-free service life.

The non-return valves shall also be installed onto the Fogex water storage systems (PSM’s) when two or more cylinder systems are manifolded together. This is to ensure that water does not return to an emptied system.

TOMCO2 FIRE SYSTEMS

7619 Hamilton Ave. Cincinnati, Ohio 45231 (513) 729-3473 www.tomcofiresystems.com

Data Sheet

Filters

Key Features

- TP316 Stainless Steel
- Removable Filter cartridge
- Triple stainless steel cartridge

Size	Part No.
1/2” NPT	980002
3/4” NPT	980003
1” NPT	980004
1 1/2” NPT	980005
2” NPT	980006

- Will not fail if filters are partly or completely blocked
- #20 Mesh screen

DESCRIPTION

Water filters must be used for all Fogex systems. A water filter should be installed on the water delivery side after the pump or down stream of any zone control valves. The in-line water filters provide maximum system protection to prevent nozzle blockage.

The water filters are rated to 2,180 psi (150 bar) pressure and have a design test pressure exceeding 8,700 PSI (600 bar). The water filters are supplied in various sizes, i.e. 1/2”, 3/4”, 1” , 1-1/2” and 2” sizes with NPT threads. The filters are fully serviceable with an internal Stainless steel triple mesh filter cartridge to capture dirt. The filters can be dismantled for maintenance purposes by removing the cartridge housing. Internal filter cartridges are designed to withstand 2,180 psi (150bar) crush resistance pressure to ensure maximum reliability and trouble-free service life.

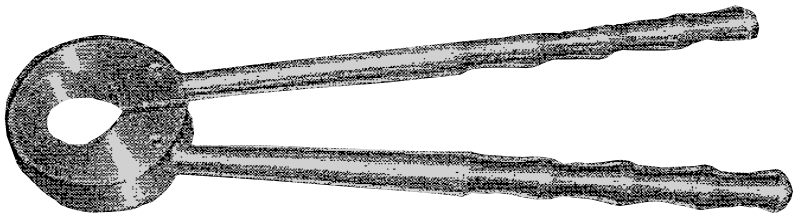
The water filters are manufactured from 316 grade stainless steel to withstand corrosion and system working pressures. It is important to install the water filters in the direction of water flow as indicated by the arrow engraved on the filter housing .

TOMCO2 FIRE SYSTEMS

7619 Hamilton Ave. Cincinnati, Ohio 45231 (513) 729-3473 www.tomcofiresystems.com

Data Sheet

Fogex® Nozzle Tool



Key Features

- Fits all Fogex deluge and automatic type Nozzles.
- Prevents nozzle damage and marking with ordinary spanners
- No adjustments required - One tool fits all nnozzles
- Sturdy Stainless steel construction for long life
- Part N^{o} 980068

TOMCO$_2$ FIRE SYSTEMS

7619 Hamilton Ave. Cincinnati, Ohio 45231 (513) 729-3473 www.tomcofiresystems.com

Data Sheet

Manual Actuator

DESCRIPTION

The manual actuator P/N 980062 is installed on top of the solenoid actuator to provide an emergency manual release that is fully mechanical that can be used to activate the nitrogen cylinder by direct means case of failure to the normal electrical operation of the solenoid.

Manual activation is accomplished by pulling the safety pin and pushing the lever handle in a downward motion.

NOTE: Before assembly or after activation, make sure the safety pin is installed and the tripping device (pin) has been reset. See Section 6 (Commissioning and Servicing) of the design, installation & Service manual for resetting instructions. Failure to assure the activating pin is in the non-activated position could cause system activation upon installing actuator

TOMCO2 FIRE SYSTEMS

7619 Hamilton Ave. Cincinnati, Ohio 45231 (513) 729-3473 www.tomcofiresystems.com

Data Sheet

Nitrogen Solenoid Actuator

DESCRIPTION

Electrical actuation of a nitrogen cylinder is accomplished by a nitrogen solenoid actuator P/N 980027 interfaced thru an FM approved releasing panel. A local manual override valve actuator must be installed on top of the actuator to provide and emergency manual override in case or failure to the automatic operation.

The solenoid actuator has nominal operating voltage of 24VDC @ 0.5amps ± 10%.

Electrical classification—NEMA 4x (IP65)

NOTE: Before assembly or after system activation check to make sure that the tripping device (pin) has been reset. See Section 6 (Commissioning and Servicing) of the design, Installation & Service Manual for resetting instructions.

Failure to assure the activating pin is in the non-activated position could cause system activation up installing the solenoid actuator.

TOMCO2 FIRE SYSTEMS

7619 Hamilton Ave. Cincinnati, Ohio 45231 (513) 729-3473 www.tomcofiresystems.com

Data Sheet

Nitrogen Cylinder Assembly (Master)

Key Features

- 24VDC Solenoid Actuator
- Emergency Mechanical Actuator
- 1600 psi Regulator
- Gauge w/ Low pressure switch
- Burst disc
- Dot rated
- Color Black

Part No.	Capacity	Weight Empty
980087	13gal (50L)	174lbs (79KG)
980086	18gal (67L)	201lbs (91.4KG)
980073	21gal (80L)	283lbs (128.6KG)

DESCRIPTION

The master nitrogen cylinder assembly is used to store nitrogen and upon activation is used to pressurize the water cylinders to expel the water into the system at 1600 psi

One master or slave cylinder will provide discharge pressure for up to three water cylinders. If additional nitrogen cylinders are required, a slave nitrogen cylinder can be added for three additional water cylinders.

There is no limit to the number of nitrogen cylinders and water cylinders the can be manifold together to provide the required volume of water.

The nitrogen cylinders are equipped with a custom control head that will require a special CGA adapter for refilling. The cylinders are Dot rated and can be refilled at a gas filling station.

TOMCO2 FIRE SYSTEMS

7619 Hamilton Ave. Cincinnati, Ohio 45231 (513) 729-3473 www.tomcofiresystems.com

Data Sheet

Nitrogen Cylinder Assembly (Slave)

Key Features

- Pneumatic Actuator
- 1600 psi Regulator
- Gauge w/ Low pressure switch
- Burst disc
- Dot rated
- Color Black

Part No.	Capacity	Weight Empty
980101	13gal (50L)	170lbs (77.3KG)
980102	18gal (67L)	197lbs (89.5KG)
980074	21gal (80L)	279lbs (127KG)

DESCRIPTION

The slave nitrogen cylinder assembly is used to store nitrogen and upon activation is used to pressurize the water cylinders to expel the water into the system at 1600 psi

One master or slave cylinder will provide discharge pressure for one water cylinder. If additional nitrogen cylinders are required, a slave nitrogen cylinder can be added for each additional water cylinder.

There is no limit to the number of nitrogen cylinders and water cylinders the can be manifold together to provide the required volume of water.

The nitrogen cylinders are equipped with a custom control head that will require a special CGA adapter for refilling. The cylinders are Dot rated and can be refilled at a gas filling station.

TOMCO2 FIRE SYSTEMS

7619 Hamilton Ave. Cincinnati, Ohio 45231 (513) 729-3473 www.tomcofiresystems.com

Data Sheet Nozzles

Key Features

- Open type Design
- Stainless Steel Construction
- No Moving Parts
- Low Flow Rate
- Fine Droplets
- Provided with screen to Prevent Blockage
- High pressure 1450 psi (100 bar)

DESCRIPTION

There are two types of Fogex nozzles that are available, the F20 (Part N^{o} 980032) and F27 (Part N^{o} 980033). The F20 nozzle is used on open head total flood deluge systems and the F27 is used for screening unenclosable openings to prevent oxygen entering the protected area.

Please refer to the design manual for nozzle spacing, flow rates and ceiling heights.

The nozzle J001 tool (Part N^{o} 980068) should be used for installing or removing Fogex nozzles to prevent damage to nozzles, dust caps (Part N^{o} 980106) are available for dirty environments.

Each nozzle is equipped with screen to prevent blockage of the small orifice. It is recommended that every nozzle on the system be replaced after each system discharge.

TOMCO$_2$ FIRE SYSTEMS

7619 Hamilton Ave. Cincinnati, Ohio 45231 (513) 729-3473 www.tomcofiresystems.com

Data Sheet

Pneumatic Actuator

DESCRIPTION

The pneumatic actuator P/N 980061 is used activate the “slave” nitrogen cylinders when two or more nitrogen cylinders are required.

The actuator is mounted to the pressure differential valve on the nitrogen cylinder and activated by pneumatic pressure from the master cylinder.

NOTE: Before assembly or after system activation check to make sure that the tripping device (pin) had been re-set. See Section 6 (Commissioning and Servicing) of the design, installation & Service manual for resetting instructions. Failure to assure the activating pin is in the non-activated position could cause system activation upon installing the pneumatic actuator.

TOMCO$_2$ FIRE SYSTEMS

7619 Hamilton Ave. Cincinnati, Ohio 45231 (513) 729-3473 www.tomcofiresystems.com

Data Sheet

Pressure Gauge

Key Features

- Stainless Steel case & bezel
- Pitospher bronze Bourdon tube
- Dual scale psi & bar
- Accuracy ± 2% FSD
- Temperature range - 40° to 180°F
- Pressure Range 0 - 3000 psi (0-280 BAR)
- Glycerin filled
- 4” Diameter
- 1/4” NPT bottom port
- Part N^{o} 980022

TOMCO$_2$ FIRE SYSTEMS

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Data Sheet

Pressure Regulator

DESCRIPTION

The pressure regulator P/N 980031 is used to reduce the nitrogen pressure to 1600 psi (110 bar) system operating pressure for the self contained pressure Skid Module (PSM) system. The pressure regulator mounts directly to the pressure differential valve on the nitrogen cylinder and factory set and is not field adjustable. A pressure regulator is required on both the master and slave nitrogen cylinders. The outlet of the regulator is connected directly to the inlet port on the water cylinder actuator head.

Material : Forged Brass

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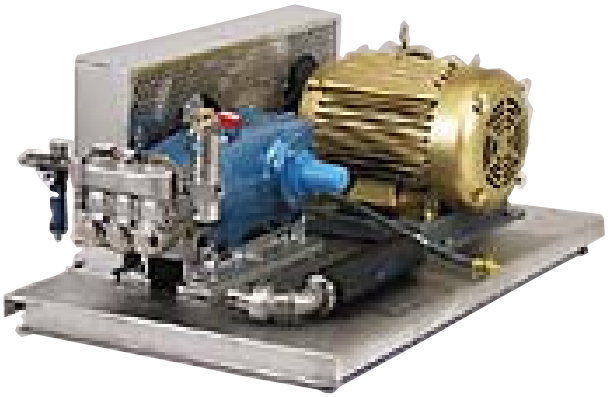
Data Sheet

Pumps

Key Features

- Three Sizes :

Part No. 980034 18.8 gpm @ 1850 psi (24hp)
980035 32.2 gpm @ 2320 psi (50hp)
980036 83.4 gpm @ 1800 psi (100hp)



- UL/FM Pump Controllers
- Complies with NFPA 20
- Can be Manifold together
- TEFC Motors

DESCRIPTION

The Fogex pumps Can be used in lieu of the stored pressure skid modules (PSM's), when larger quantities of water are required

The pump systems can be arranged to take suction from an atmospheric storage tank or directly from a water supply.

The pumps can be manifolded together to achieve greater flow capacity, depending on the total system demanded

Each pump should be provided with a UL/ FM Approved Fire pump controller that can be remote started from a Fire System Releasing Panel.

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Data Sheet

Strainers

Key Features

- TP316 Stainless Steel
- 1/16” DIA, 132 holes/ sq in. Stainless Steel screen

Size	Part No.
1/2” NPT	980043
3/4” NPT	980044
1” NPT	980045
1 1/2” NPT	980046
2” NPT	980047

- High pressure 1440 psig
- Removable Cap for easy cleaning

DESCRIPTION

In-line Strainers must be used for all Fogex systems. An in-line strainer should be installed on the water suction inlet preceding the pump and installed on the water fill line to the storage tank. The in-line water strainers provide maximum system protection to prevent foreign material from entering the pump or water storage tanks.

The in-line strainers are rated 1440 psi (100 bar) pressure The water strainers are supplied in various sizes, i.e. 1/2”, 3/4”, 1” , 1-1/2” and 2” sizes with NPT threads. The strainers are fully serviceable with an internal Stainless steel wire screen filter to capture dirt. The strainers can be dismantled for maintenance purposes by removing the thread cap.

The water strainers are manufactured from 316 grade stainless steel to withstand corrosion and system working pressures. It is important to install the water strainers in the direction of water flow as indicated by the arrow engraved on the housing .

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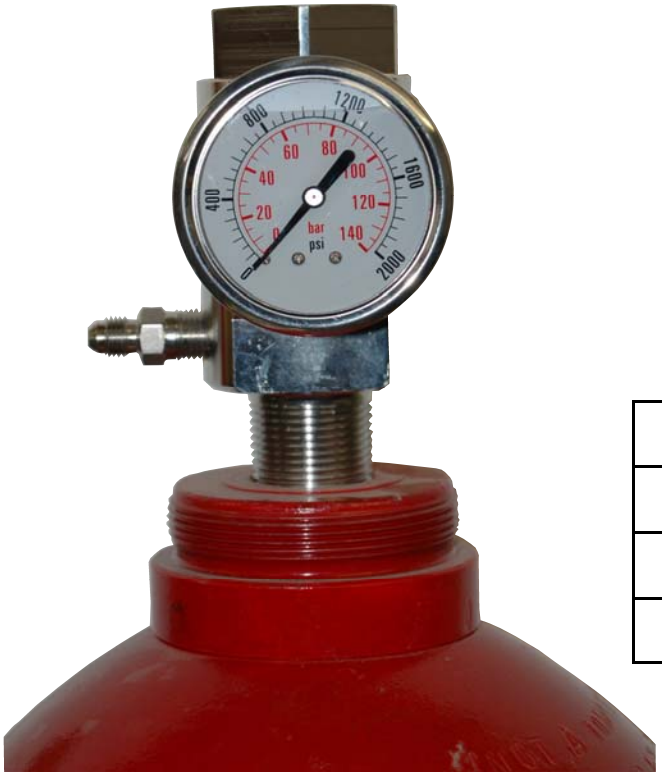
Data Sheet

Water Cylinder Assembly



Key Features

- Stainless steel control head
- Pressure Gauge
- Plastic lined cylinder
- Dot rated
- Color Red

Part No.	Capacity	Weight Empty
980088	13gal (50L)	167lbs (76KG)
980100	18gal (67L)	194lbs (88.2KG)
980075	21gal (80L)	276lbs (125.5KG)

DESCRIPTION

The water cylinders are non pressurized in the stand-by condition. When the system is activated, pressure from the nitrogen cylinder is connected to the water cylinder and the nitrogen pressure forces the water up the dip tube and into the piping network to the nozzle

The number of water cylinders that can be used on a systems is virtually unlimited.

The cylinders are plastic lined to prevent corrosion and particles from the system. Each cylinder is equipped with a liquid level indicator.

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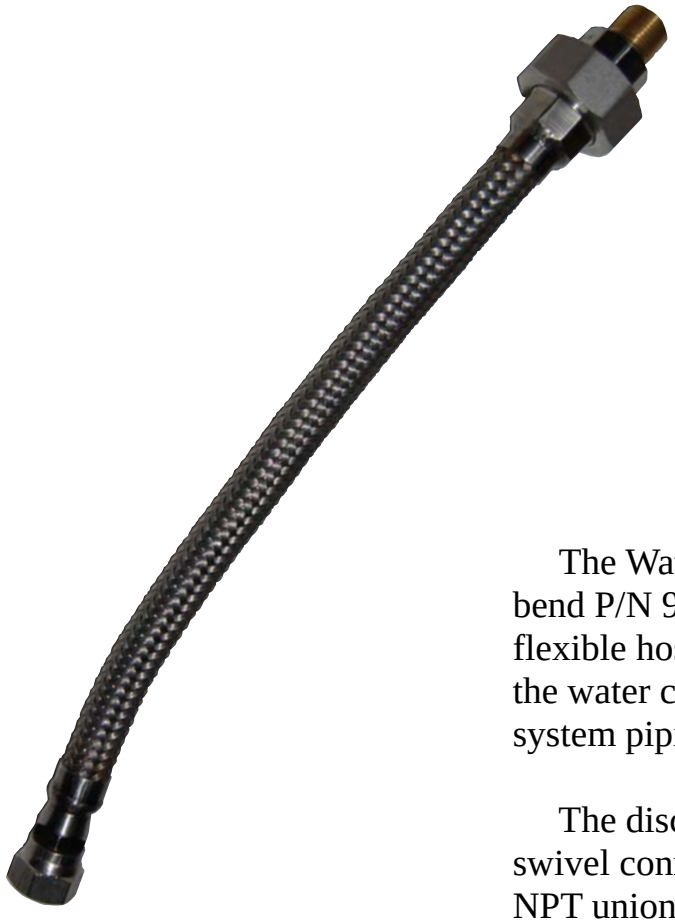
Data Sheet

Water Flexible Discharge Bend



DESCRIPTION

The Water Cylinder flexible discharge bend P/N 980064 is a 1/2” extra heavy flexible hose which connects the outlet of the water cylinder actuation head to the system piping or header manifold.

The discharge bend has a 1/2” NPT swivel connection on one end and a 1/2” NPT union connection on the other end.

Material : TP304 Stainless Steel

Working Pressure : 3000 psi

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Data Sheet

Water Cylinder Pressure Gauge

Key Features

- Stainless Steel case & bezel
- Pitospher bronze Bourdon tube
- Accuracy ± 1.6% FSD
- Temperature range - 40° to 180°F
- Pressure Range 0 - 3000 psi (0-140 BAR)
- Glycerin filled
- 2” Diameter
- 1/4” NPT back port
- Part N^{o} 980037

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Data Sheet

Zone Control Valves

Key Features

- NEMA 4 enclosure
- Arrow on body indicates flow direction
- Requires power to open
- Supervisory position switch contacts close when valve is open
- Suitable for use with Approved Releasing Panel

Size	Part No.	Weight	Current Draw
1/2" NPT	**980012**	11.5lbs (5.2KG)	0.96amps @ 24VDC
3/4" NPT	**980013**	11.5lbs (5.2KG)	1.38amps @ 24VDC
1" NPT	**980014**	13lbs (6.0KG)	1.38amps @ 24VDC
1 1/2" NPT	**980015**	24lbs (11.0KG)	1.38amps @ 24VDC
2" NPT	**980016**	36lbs (16.4KG)	1.38amps @ 24VDC

DESCRIPTION

Fogex Water Mist System zone valves are designed to operate utilizing electrical service for actuation. When a system is designed to actuate automatically, actuation is via electrical signals originating from the fire control panel sent to the appropriate electric zone valve to open and a start the fire pump (if provided).

Similarly when Fogex PSMs are used in lieu of fire pumps, the signal originating from the fire control panel is sent to the appropriate electric zone valve and to the nitrogen actuator solenoid to open and discharge nitrogen pressure into the water cylinders.

The 24VDC electric valves are manufactured from 304 grade stainless steel and are one-directional valves installed in a "normally closed" position. The valves are closed when the solenoid is de-energized and opens when the solenoid is energized. The valves must be installed in the horizontal position with the solenoid in the upright position.

The 24VDC electric solenoid valves function by receiving an electrical input signal from the fire alarm panel, and are held open until the electrical signal is removed.

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SECTION 6

Tomco Fogex® Water Mist Fire Protection System

Commissioning and Servicing

SECTION 6

COMMISSIONING AND SERVICING

Table of Contents

6-1 Operation and Maintenance Manuals

The commissioning and services section 6 of this manual should be provided to the customer that includes operation and maintenance instructions for the Fogex Water Mist System.

This section contains a sequential step-by-step procedure for safe operation and maintenance of the Fogex system. The Manufacturer's and / or Dealers address including office telephone and facsimile numbers and including emergency 24 hour numbers, will be provided with each system.

The manufacturer will provide a parts list with part numbers for all components installed on the completed Fogex system to the contractor or customer upon request.

6-2 Commissioning Certificates

The principal contractor who is responsible for installing the Fogex system is responsible for commissioning and for issuing the Commissioning Certificate. Commissioning of the completed system should be performed by fully trained personnel. The Commissioning Certificate must always be signed by a person having authority. The manufacturer will assist the principal contractor in commissioning the installed Fogex system if required.

6-3 Commissioning of Fogex Fire Protection System

The person authorized to perform commissioning of the Fogex system shall check the following:

a). All pipe-work for proper installation; signs of damage; unauthorised alterations; kinks; bends; leakage; and that all pipes are securely fastened to hangers or brackets to avoid undue lateral or vertical movement in piping should the system be activated.

b). All nozzles to ensure correct type and geometry; obstructions to nozzles; physical or chemical damage or indications of corrosion; filters and strainers.

c). Electrical cabling to ensure no loose or cut wires, frayed wires, physical damage via chemicals, heat or tampering; connections; polarity; voltage readings; negative ground points and condition of conduits. Ensure that AC and DC wiring is not combined in a common conduit or cable tray unless properly shielded and grounded and that installation is in accordance with the drawings.

d). Ensure pipe hangers and brackets are of the correct type and rating for the system and can support the pipe-work.

e). Water pressure ratings; valves, fittings and flexible hoses and connectors.

f). Detectors to ensure no damage or tampering to same and that all devices are fully operational.

g). Fire panel; check functions and modes with isolate switches; circuitry and ensure panel is fully operational. Check back-up batteries.

h). Check audible sounders; alarms; indicator and signalling devices, and ensure all devices are fully operational.

i). Check Fogex water storage pressure vessels and supporting brackets (if self storage vessels have been provided and used). Check for signs of damage, corrosion, tampering with, pressure readings, and ensure that actuators are properly installed in the reset condition, connected and operational. Check manual pull stations.

CAUTION- Check activation pin before installing actuators.

J). Check fire risk area to ensure that conditions have not changed in a significant manner, e.g. addition of new equipment, different dimensions to fire enclosure etc that may alter the performance criteria of the fire suppression system for which it was originally intended, specified or designed for.

k). Check condition of water pump and ensure it is connected to the systems main water supply line and check relief valves.

l). System Operational Testing should be performed in accordance with NFPA section 12.2.6

m.) Safety related items such as personnel training, warning signs, discharge alarms, self contained breathing apparatus, evacuation plans and drills shall be provided as required.

n). Ensure that commissioning and service section of the manual is provided.

o.) Issue Commissioning Certificate.

6-4 Recommissioning of Fogex Fire Protection System

Inspection and testing of Fogex Fire Protection System components shall be performed in accordance with table 13.2.2 of NFPA 750 or more frequently if system is installed in a harsh environment. Inspection and testing should be performed by authorised personnel (or suitably trained and qualified agents and shall include the following functions as a minimum:

a). Check pipe-work to ensure against corrosion, kinks, bends, and that the piping system is in compliance with the design and installation documents and hydraulic calculations.

b). Check nozzles to ensure compliance with design and the systems drawings. Nozzle geometry shall be checked. Examine nozzles for signs of damage (chemical/mechanical) and blockage. Nozzles showing any sign of damage may have to be exchanged with identical types that have been workshop serviced or new.

c). Check pipe supports and brackets to ensure piping is securely fastened to prevent unacceptable vertical or lateral movement during discharge.

d). Check electrical system to ensure all devices, components, signalling devices, detectors, alarms, control panels, indicators are properly connected. Where conditions permit a visual examination of electrical cables and conduits should be inspected against corrosion, tampering with, heat damage or damage through other elements.

e). Check detectors for operational efficiency and damage.

f). Check system water pump, including couplings, fittings, flexible hoses, engine drives and general state of repair. Start water pump is by-pass mode to ensure it functions satisfactorily.

g). Where provided and/or installed, check Fogex water storage pressure cylinders for any signs of damage to cylinders, tampering with, and general state of repair. Check serial numbers and record details.

h). Check Fogex water storage cylinder brackets or supports to ensure water storage cylinder are securely fastened and are mounted in upright position. Check for signs of damage or corrosion.

i). Check system actuator devices installed on Fogex water storage pressure vessels and ensure system is operational and has not been tampered with. Where electric zone valves are installed check capacitance and voltage readings. Ensure that system is not damaged in any way. Where manual pull cable devices are installed for actuation, ensure all devices are properly installed and are free of defects and fully operational. Check manual pull stations.

j). Check fire system control panel to ensure it is properly connected and is free of any damage or that it has not been tampered with. Check system functions via isolate switches. Ensure actuator devices are disconnected or immobilised first to avoid accidental actuation. Check that power is "on" at all times.

k). Check main valves and ensure that water supply is unobstructed and is provided to the system at all times upon actuation. Check in-line water filter to ensure no corrosion or blockage.

l). Check fire risk area or enclosure for any signs of modifications that may cause obstructions to nozzles or that the environment to be protected has not been varied.

m). Check that the customer has commissioning and service section of the manual regarding the Fogex System.

n). Issue Service and Inspection Report.

6-5 PUMP INSTALLATION INLET, OUTLET & DISCHARGE PIPELINES:

It is important that the internal diameter of the pump outlet hose (or pipe) is at least of the same diameter as that of the pump outlet connection to avoid excessive pressure. The pump should not be allowed to work more than 10% higher than the maximum operating pressure indicated on the pump label. The pumps have a safety relief valve installed to regulate the pressure and to dump excess water into by-pass mode.

Similarly the inlet supply line to the pump suction port should be at least the same size as the pump's inlet connection or slightly larger to avoid pump cavitation.

STARTING PROCEDURE:

Inadequate installation conditions can cause serious malfunctions in the best designed pump. All factors must be carefully considered otherwise the warranty will be voided.

When pulleys are used make sure that they are properly aligned to prevent possible slippage and damage and excessive wear. Under no circumstances should the pump be run dry.

- Make certain that the inlet strainer is clean
- Check the pump for oil
- Install pump lower than the water supply reservoir to enable gravity feed
- Reciprocating plunger pumps are not self priming. Pumps should not be installed above water supply tank.
- Avoid running the pump for more than 5 minutes in the by-pass mode.
- Ensure that the unloader valve is installed in the correct position
- Never block or plug the unloader valve.
- Use a suitable size by-pass water return line (i.e. equal to pumps inlet size)

STARTING PROCEDURE AFTER LONG TIME OF NON-OPERATION:

For pumps that have not been started for a long time, priming could be difficult because of valves becoming stuck. Do not extend the running time of plunger pumps in dry mode as this may cause premature pump failure.

LUBRICATION:

Before running the pump check the pump crank case for proper oil level. Use only oil specified by the manufacturer.

CAUTION: When operating pump in damp places or with high temperature fluctuations, oil must be changed frequently. Change the oil after the first 50 hours of operation and then oil change every 500 hours or every three to four months. When draining oil, clean crankcase inside removing all impurities.

TECHNICAL SERVICE GUIDE

For additional pump information, see pump literature & manuals provided with the pumps.

PUMP STARTER PANELS

Tomco Fire Systems uses FM approved Tornatech electric fire pump controllers for all its high pressure reciprocating piston pumps. Individual starter panels are supplied for each pump as per NFPA 20 Guidelines.

6-6 Alterations to Commissioning Certificates

In the event that a Commissioning Certificate requires alteration, the alterations shall be null and void unless accompanied by a new Commissioning Certificate to replace and supersede the previous Certificate. The new Commissioning Certificate shall be prepared on the principal contractor's stationary and be dated and signed by an authorised officer. Any alterations to the Certificate must be brought to the attention of the customer and to the authority having jurisdiction.

For copies and format of Commissioning Certificates contact the system manufacturer or your nearest Fogex distributor.

6-7 Owners Responsibilities

The responsibility for properly maintaining the Fogex water mist fire protection system shall be the obligation of the customer. The customer should periodically check the fire suppression system against any faults or conditions to ensure the system is fully operational and is in a good state of repair at all times.

Inspection, testing and maintenance activities shall be implemented in accordance with procedures and recommendations meeting or exceeding those established in this document and in accordance with the manufacturer's instructions. The above tasks should be performed by suitably qualified personnel who have developed competence through training.

The customer should promptly bring to the attention of the system manufacturer or dealer any noted deficiencies or repairs required, including damaged parts or impairments found while performing the inspection, test, and maintenance programs as stipulated or recommended in this document. Corrections and repairs shall be performed by the manufacturer's maintenance personnel or authorised agents.

The customer should give special attention to factors or conditions that might alter the requirements for a continued satisfactory and acceptable installation. Where changes in the occupancy, hazard, water supply, storage arrangements, structural modifications or other conditions that may affect the performance criteria of the system are identified the customer should promptly notify the manufacturer or dealer of the fire suppression system.

Where the Fogex Fire Protection System is returned to service following a discharge it shall be verified that it is working properly.

6-8 Operations and Test Procedures

The Fogex system comprises of a water mist fire protection system utilizing either fire pumps or high pressure water storage cylinders. The detection system circuitry should enable fault test, alarm test, isolate and reset functions. All necessary auxiliary functions, such as audible and visual warnings, engine shut-down, fire door closing and remote control functions for other ancillary devices, etc should be provided in accordance with F.M. Approvals.

"Off-the-shelf" fire control panels and accessories should not be used, unless FM Approved for releasing suppression systems.

6-9 Fire Detection System

The fire detection system is outside the scope of this Design, Installation & Service manual and is the responsibility of others to provide a FM Approved detection systems.

6-10 Operating Instructions and Sequence of Events

EXAMPLE OF SEQUENCE OF EVENTS

Step 1 Main fire panel alarm - LED will illuminate and all alarm devices will activate
Step 2 Shut down operating machinery or equipment automatically.
Step 3 Ensure fire situation exists inside hazard area (if possible and safe to do so)
Step 4 Evacuate area and conduct head count
Step 5 Ventilators, fire doors, dampers, windows etc should be designed to close automatically.
Step 6 Activate system by manual release station if system had not been activated automatically.

6-11 Servicing

Step 1: Disconnect Power to solenoid actuator Valve on nitrogen cylinder.

Before commencement of any recommissioning procedures the actuation wiring must be disconnected from the actuation valve.

Step 2: Inspect the Tare, Net & Aggregate of the Water Storage Pressure Cylinder(s)

Ensure that cylinder tare, net & aggregate tags are located at the neck of the pressure cylinder(s) and are clearly legible, check that tags comply with design specifications located on Commissioning Certificate.

Step 3: Weigh Water Storage Pressure Cylinder(s)

Ensure that for every cylinder that the aggregate weight complies with design specifications.

Step 4: Pressure Test the Cylinder(s)

Cylinders shall not be recharged without a hydrostatic test if more than 5 years have elapsed from the date of last test. Cylinders that have been in continuous service without discharging shall be permitted to be retained in service for a maximum of 12 years, after which they shall be discharged and retested.

Step 5: Ensure Pressure Gauge is Registering Correct Pressure

Locate the nitrogen pressure gauge and ensure that it is reading the correct pressure 2300psi (158bars) in accordance with the manufacturer specifications for that system.

Step 6: Inspect Pressure Cylinder Mounting Bracket

Ensure mounting bracket is firmly mounted in its correct location and that mounting screws or bolts are in satisfactory condition. If signs of wear and tear or corrosion are noted, replace defective parts with new ones. If signs exist on the cylinders to indicate frictional wear to surface of vessels, install insulation material to prevent undue wear through vibration or contact.

Step 7: Ensure Pressure Cylinders are firmly secured in Brackets

Look for any tell-tale signs of abrasive marks on the actual cylinder and attend to as in item 6 above).

Step 8: Inspect High Pressure Flexible Hoses

Visually inspect flexible hoses and couplings for any signs of damage or wear. Replace if deemed to be faulty. High pressure hoses should not show signs of “kinks” and should be replaced or hydrostatically every five years.

Step 9: Inspect Fire Control Panel Circuitry

Ensure circuitry and subsequent connections are free from debris and free of any corrosion, if any irreparable damage or corrosion exist return panel to

manufacturer for service. Inspection testing and maintenance shall be in accordance with the requirements of NFPA 72 and manufacturer's requirements.

Step 10: Nozzle Service / Exchange Program

Remove all Fogex nozzles from pipe work and replace with pre-serviced or new nozzles. Otherwise service existing nozzles on site by carefully dismantling every nozzle; wash all components in a 1% solution of mild detergent with water. Visually inspect all components for signs of corrosion, abrasion, blockage or damage of any kind. If satisfied there is none of the above problems, rinse components in clean fresh water, dry components and reassemble nozzle. Once the nozzle is reassembled firmly, ensure that there is unrestricted flow of air or water through it then install the nozzle(s) to the distribution pipe work. Use Fogex Tool J-001 for removal, disassembly, reassembly and retro-fitting of Fogex nozzles. Avoid using tools that may damage the nozzle or deface its identification markings or external appearance. This work should be performed by an authorized factory representative.

Step 11: Reinstate Water Fog System

After successful completion of testing, the system is ready for reinstatement. Ensure that the actuation wiring has NO actual or residual Voltage reading. Reconnect wire to electric actuator ball valve and ensure panel is functioning correctly.

Step 12: Issue Service Report

After successful completion of testing, a Service Report should be issued by a licensed distributor or accredited installer.

6-12 System Inspection After Activation

After each system operation, a representative sample of operated water mist nozzles in the activated zone shall be inspected. After each system operation, the system filters and strainers shall be cleaned or replaced.

6-13 Fogex System Maintenance

System maintenance should be regularly performed in accordance with section 13.3 of NFPA 750 to keep the system operable or to make repairs. The systems drawings, hydraulic calculations, test records, operations and maintenance manuals and any other reports or technical information provided by the manufacturer should be kept in safe keeping facilitating maintenance, repairs and proper care of the system and its components.

Preventative maintenance may include, but is not limited to, lubricating control valve stems, adjusting packing glands on valves and pumps, and cleaning filters or strainers.

Corrective maintenance may include but is not limited to replacing lmissing, corroded, or painted nozzles, replacing missing or loose pipe hangers, cleaning clogged fire pumps, replacing valve seats and gaskets, restoring heat in areas subject to freezing temperatures.

Emergency maintenance could include but is not limited to repairs due to piping failures caused by freezing or mechanical damage, repairs to broken water mains, and replacing frozen nozzles, defective electric power or alarm and detection system wiring and components.

Specific component replacement shall be in accordance with the manufacturer's specifications and warranties and the original system design. Spare components should be readily accessible and should be stored in a manner to prevent damage or contamination.

6-14 Training

All persons who might be expected to design, install, service, inspect, test, maintain, or operate the Fogex water mist fire protection system should be thoroughly trained in the functions they are expected to perform. Refresher training is recommended every two years.

6-15 Safety

Water mist is unlikely to present any significant hazard to personnel in most applications, however, direct impingement of the water mist could present an eye hazard. Water mist can reduce visibility and increase the time and difficulty in egress from an affected compartment

6-16 Recharge Instructions after System Activation:

A. First shut off all dry nitrogen gas valves located on nitrogen gas cylinders (if provided).
B. Un-lock manual bleed-off ball valve.
C. Open very slowly and carefully the manual bleed-off ball valve to expel any residual gas pressure from gas manifold and high pressure hoses.
D. Electrically close the electric actuator zone valve (by re-setting the control panel)
E. Disconnect the gas outlet high pressure hoses from the nitrogen cylinders and from the inlet ports of the Fogex actuator head assembly located on the water storage cylinders.
F. Disconnect the water outlet hoses (or pipe work) from the Fogex actuator head assemblies located on the water storage cylinders.
G. If water storage cylinders do not require hydrostatic pressure testing then fresh water can be filled via the water outlet ports of the Fogex actuator head assemblies. Please ensure first that the water outlet ports are not shut to enable internal air pressure build-up within the vessels to be vented out to enable water to fill the cylinders. Filling of the water storage cylinders can be accomplished with a hose connected to the gas inlet ports of the Fogex actuator head assemblies until a continuous stream of water is flowing from the water outlet ports. Ensure that all free gas is removed from within the water storage cylinders.

   Alternatively and more preferable, refilling of water can be performed via the water outlet port on the Fogex actuator head assemblies but first ensure that the gas inlet ports are open (i.e. not blanked off) so as to ensure that any internal air pressure build-up inside the cylinders can be vented to enable water to flow into the cylinders.

H. Re-connect the water outlet hoses (or pipe work) onto the water outlet ports on the Fogex actuator head assemblies.
I. Reconnect the gas inlet high pressure hoses into the gas inlet ports of the Fogex actuator head assemblies. Ensure all fittings are firmly tightened (do not over-tension fittings).
J. Remove solenoid actuator, manual actuator and pneumatic actuator from nitrogen cylinder.
K. Replace emptied dry nitrogen cylinders with full gas cylinders.
L. Re-install the solenoid actuator, manual actuator and pneumatic actuator on nitrogen cylinder.

CAUTION- Before installing the solenoid actuator, manual actuator or pneumatic actuator to the nitrogen cylinders, the actuators must be re-set in accordance with the following procedures; The red marking on the activating pin indicates whether the tripping device has been activated or not. If the red marking can be seen, then the tripping device is activated (Fig 6-1, View A-A). The actuators the have been operated (Red mark showing), must be re-set using the clamping device Part No. 980105 as shown in fig 6-2. The Clamping device should be threaded onto each actuator that had been activated to “push” the activating pin back up to the normal operating position.

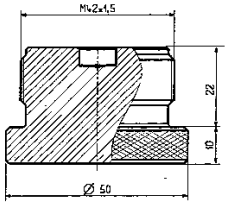

Fig 6-2 Clamping Device Part No. 980105

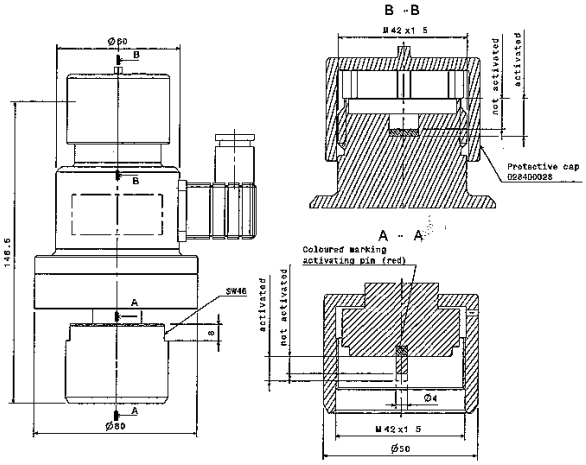

Fig 6-1 Nitrogen Solenoid Actuator

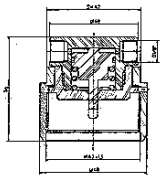

Fig 6-3 Pneumatic Actuator

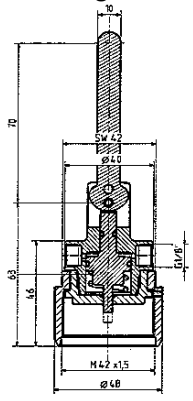

Fig 6-4 Manual Actuator

M. Close manual bleed-off valves (if used) and lock into closed position.
N. Reconnect all high pressure gas hoses to the high pressure gas manifolds and firmly tighten (do not over-tension fittings).
O. Finally, check settings and wiring and re-issue Commissioning Certificate.

WARNING!! This part of service or recharging should be performed only by fully trained or qualified personnel. The water storage cylinders, nitrogen cylinders and manifolds and hoses contain gas under high pressure. Severe personal injury or death can result if installation instructions and handling instructions are not followed..

Table 13.2.2 Maintenance of Water Mist Systems

Item	Task	Weekly	Monthly	Quarterly	Semi-Annually	Annually	Other
Water supply (general)	Check source pressure.			X			
	Check source quality (* first year).				X*	X	
	Test source pressure, flow, quantity, duration					X	
Water storage tanks	Check water level (unsupervised)	X					
	Check water level (supervised).			X			
	Check sight glass valves are open.		X				
	Check tank gauges, pressure.			X			
	Check all valves, appurtenances				X		
	Drain tank, inspect interior, and refill					X	
	Inspect tank condition (corrosion)					X	
	Check water quality.					X	
	Check water temperature.						Extreme weather
Water storage cylinder (high pressure)	Check water level (load cells)				X		
	Check water level (unsupervised).			X			
	Check support frame/restraints					X	
	Check vent plugs at refilling					X	
	Check cylinder pressure on discharge					X	
	Inspect filters on refill connection					X	
Additive storage cylinders	Inspect general condition, corrosion.			X			
	Check quantity of additive agent.				X		
	Test quality of additive agent.					X	
	Test additive injection, full discharge test.					X	
Water recirculation tank	Check water level (unsupervised).		X				
	Check water level (supervised)			X			
	Inspect supports, attachments.					X	
	Test low water level alarm.					X	
	Check water quality, drain, flush and refill					X	
	Test operation of float operated valve.					X	
	Test pressure at outlet during discharge					X	
	Test backflow prevention device (if present)					X	
	Inspect and clean filters, strainers, cyclone separator					X	
Compressed gas cylinders	Inspect support frame and cylinder restraints.			X			
	Check cylinder pressure (unsupervised)		X				
	Check cylinder pressure (supervised)			X			
	Check cylinder control valve is open		X				
	Check cylinder capacity and pressure rating					X	
	Check cylinder compliance specification.					X	
	Confirm compressed gas meets specifications (moisture, cylinder pressure)					X	
	Hydrostatic test cylinders						5–12 years
Plant air, compressors, and receivers	Check air pressure (unsupervised).	X					
	Check air pressure (supervised)		X				
	Start compressor.	X					
	Check compressor/receiver capacity, changes				X		
	Check compressed air moisture content.					X	
	Clean filters, moisture traps				X		
	Test full capacity, duration, and any changes in other demands					X	

Table 13.2.2 *Continued*

Item	Task	Weekly	Monthly	Quarterly	Semi-Annually	Annually	Other
Pumps and drivers	Inspection, testing, and maintenance shall be in accordance with the requirements of NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection*, and NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.*	X	X	X	X	X	
Standby pump	Inspect moisture trap, oil injection (pneumatic)			X			
	Check compressed gas supply, inlet air pressure		X				
	Check outlet water (standby) pressure.		X				
	Test start/stop pressure settings for standby pressure.			X			
Pneumatic valves	Check cylinder valves, master release valves		X				
	Inspect all tubing associated with release valves.			X			
	Test solenoid release of master release valve					X	
	Test manual release of master release valve					X	
	Test operation of slave valves.					X	
	Reset all pneumatic cylinder release valves.					X	
	Test on–off cycling of valves intended to cycle.					X	
System control valves	Inspection, testing, and maintenance shall be in accordance with the requirements of NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.*	X	X	X	X	X	
Control equipment	Inspection, testing, and maintenance shall be in accordance with the requirements of NFPA 72, *National Fire Alarm Code.*						
Water mist system piping and nozzles	Inspection, testing, and maintenance shall be in accordance with NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.*	X	X	X	X	X	
	Inspect sample of nozzle screens and strainers *(see 10.5.1.4).*						After discharge
Enclosure features, interlocks	Inspect enclosure integrity				X		
Ventilation	Test interlocked systems (e.g., ventilation shutdown)					X	
	Test shutdown of fuel/lubrication systems.					X	