



HFC-227ea FIRE SUPPRESSION SYSTEM





AN INTRODUCTION TO NAFFCO

NAFFCO was founded in Dubai, UAE to become the world's leading producer and supplier of life safety solutions. By recognizing the importance and convenience of having easy access to multiple safety services, we became specialized by offering complete solutions under one roof for all types of high quality firefighting equipment, fire protection systems, fire alarms, addressable emergency systems, security systems, custom-made vehicles such as fire trucks, ambulances, mobile hospitals and airport rescue firefighting vehicles (ARFF).

With the most talented and dedicated employees from around the world, NAFFCO has over 450 passionate engineers and over 3 million square feet of manufacturing facilities. We are currently exporting to over 100 countries worldwide.

Our products have been consistently certified by UL, FM, BSI, LPCB and Global Mark according to the latest International Quality Standard for their strict adherence to ISO 9001 quality management system and certified for ISO 14001 environmental management systems and BS OHSAS 18001 for occupational safety by UL DQS.

Our success is driven by our passion to protect; our vision is to become the world's number one provider of innovative solutions in protecting life, environment and property.





Manufacturing

NAFFCO manufacturing department has the latest technology, state-of-the-art machines (CNC machines, hydraulic shearing and bending machines, all types of welding machines - MIG, TIG, ARC etc.), and a complete machine shop that enable us to meet the needs of any production requirement.

NAFFCO has the ability to introduce the latest technological systems & equipment in the fire safety field. Our engineers and technicians are well qualified & experienced in producing quality products.

The department is equipped with full-fledged testing facilities to test the equipment as per NFPA, BS-EN and Civil Defense standards & requirements, and to meet the customers specifications.

Considering the above facilities and excellence in engineering capabilities, NAFFCO can meet any challenges to produce bulk quantities of fire safety materials.



NAFFCO HFC-227ea Clean Extinguishing Agent

NAFFCO HFC-227ea is included in the NFPA 2001 Standard on Clean Agent Fire Extinguishing Systems. At the concentrations of use NAFFCO HFC-227ea can be safely used to protect normally occupied areas. It is a clean agent and it does not leave residues after discharge and it is electrically non-conductive; it can be used to protect electronic and delicate equipment. NAFFCO HFC-227ea does not deplete the ozone layer and the Low Global Warming Potential makes it an overall environmentally acceptable product. NAFFCO HFC-227ea is US EPA Approved and UL Recognized.

Physical Properties

NAFFCO HFC-227ea is a colorless and odorless liquefied gas. When it is released to the atmosphere it vaporizes quickly, creating a homogeneous agent/air mix throughout the enclosure.

Physical Properties

Molecular Weight	170.03
Boiling Point @ 760 mm Hg (@14.7 psia)	3°F
Critical Temperature	214°F
Critical Pressure	422 psi
Critical Density	38.76
Vapour Pressure @ 20 °C, (68°F)	66.28 psia
Freezing Point	-204 °F
Viscosity of Liquid @ 25 °C, (77 °F)	0.433 lb/ft
Solubility of Water in Agent @ 21 °C, (71 °F) % by weight (ppm)	0.06
Specific Heat of Liquid @ 25 °C, (77 °F) kJ/kg °C	0.282 Btu/lb °F
Heat of Vaporization @ Boiling Point at 25°C, (77 °F) kJ/kg	56.7 Btu/lb

Design Concentrations

NAFFCO HFC-227ea can be used to extinguishing Class A fuels (surface fires of ordinary combustible materials), Class B fuels (flammable liquids and gases) and Class C fuels (fire involving energized equipment) occurring within a confined space.

Design Concentrations

Hazard Type	% by volume	W/V, lb/ft ³ @ 700F
Class A (surface fires), including plastic materials typically found in electrical/electronic equipment	0.032	
Class B Flammable Liquids	8.6	0.043
Class C Electrical	7.0	0.034

NAFFCO-227 360-psi Modular (Single Cylinder) Systems

A 360-psi modular system is a single cylinder system using welded cylinders from 67 to 592 lbs. pressurized with Nitrogen at 360 psi. It includes cylinder, dip tube, discharge valve with pressure gauge/switch, manual lever release and the solenoid electrical actuator. The agent flows from the cylinder through a hose into the pipework, which ends with one or more nozzles. The systems can be actuated through the solenoid mounted on the discharge valve by an electric signal sent by the control panel. For the manual actuation it is necessary to access the manual lever release, remove the safety seal and pull the lever.

Schematic drawing for NAFFCO-227 360-psi Modular Systems

Modular cylinder typical installation for NAFFCO 65/360valve cylinders

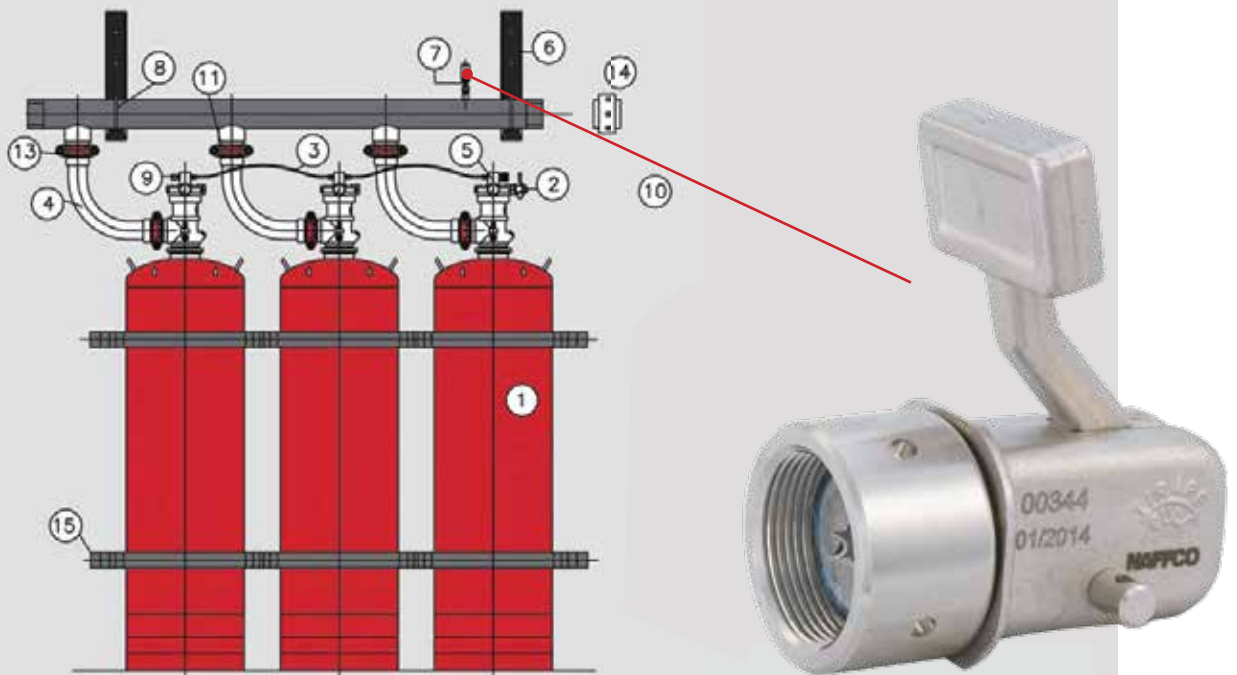
N.	Description	N.	Description
1	Modular cylinder with NAFFCO 65/360 valve	5	Grooved Flexible coupling E-77 for 3" Victaulic
2	Manual Release lever	6	Modular cylinder bracket
3	Electric Actuator valve 13 W/24 V	7	Discharge Nozzle
4	Rigid discharge hose 2 1/2" 2,5-3		

NAFFCO-227 360-psi Centralized (Up to Three Cylinders) Systems

A 360-psi centralized system is a multiple cylinder systems using welded cylinders from 67 lbs. to 590 lbs. pressurized with Nitrogen at 360 psi. For systems using up to three cylinders, the first cylinder (master cylinder) is equipped with a manual lever release and a solenoid electrical actuator and operates all the other (auxiliary) cylinders. All cylinders must be filled with the same amount of agent. For centralized systems using cylinders of 190 lbs., 300 lbs., 430 lbs. and 590 lbs. the pressure in the master cylinder is directed to the pneumatic head with rupture disc mounted on top of each auxiliary cylinder valve through a line of high-pressure hoses.

For centralized systems using 100 lbs. cylinders the pressure in the master cylinder is directed from the pneumatic solenoid or manual actuator through a line of hoses to cones with rupture discs mounted on each valve. The systems can be actuated through the solenoid mounted on the master discharge valve by an electric signal sent by the control panel. For the manual actuation it is necessary to access the manual lever release, remove the safety seal and pull the lever.

Schematic drawing for NAFFCO-227 360-psi Centralized Systems with up to three cylinders



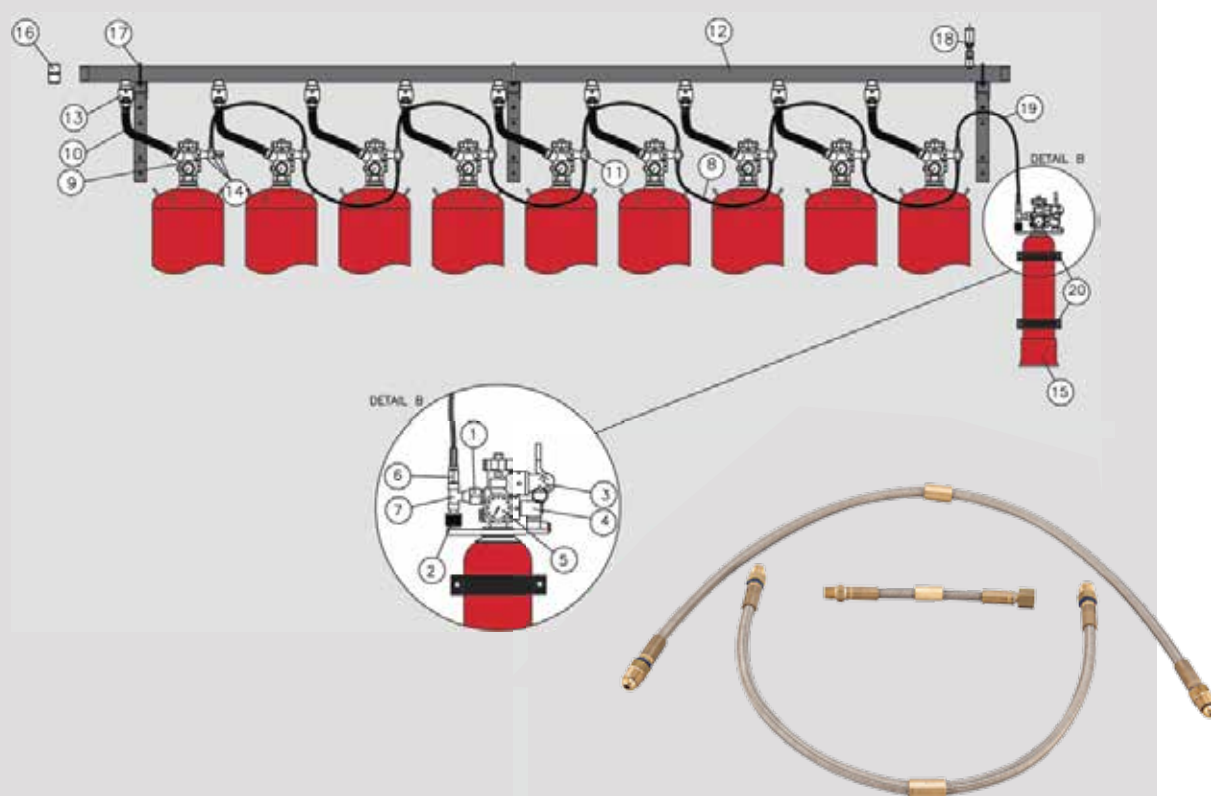
N.	Description	N.	Description
1	Master cylinder with NAFFCO 65/360 valve	9	Decompression screw, model "C"
2	Manual Release lever	10	Discharge Manifold
3	PTFE flexible hose G. ¼"	11	Check Valve Ø 2 ½" for 4" manifold
4	Rigid discharge hose 2 ½"	12	Electric Actuator
5	2 way Pneumatic head for NAFFCO 65/360 valve	13	Grooved Flexible coupling E-77 for 3" Victaulic
6	Manifold seat for 190, 430 and 590 lb cylinders	14	NPT Manifold joining nut
7	Manifold Pressure Switch	15	Cylinder Brackets
8	Manifold "U" fixing		

NAFFCO-227 360-psi Centralized (More Than Three Cylinders) Systems

A 360-psi centralized system with more than three cylinders is operated by a 3-liter pilot cylinder filled with Nitrogen pressurized at 1,450 psi. The pilot cylinder is equipped with both manual lever release and solenoid electrical actuator. The pressure from the pilot cylinder is directed toward the auxiliary cylinder pneumatic heads through a line of hoses and bursts the discs of pneumatic cones. A single pilot cylinder can operate up to 40 cylinders.

The systems can be actuated through the solenoid mounted on the valve of the pilot cylinder by an electric signal sent by the control panel. For the manual actuation it is necessary to access the manual lever release of the pilot cylinder, remove the safety seal and pull the lever.

Schematic drawing for NAFFCO 227 360-psi Centralized Systems with more than three cylinders

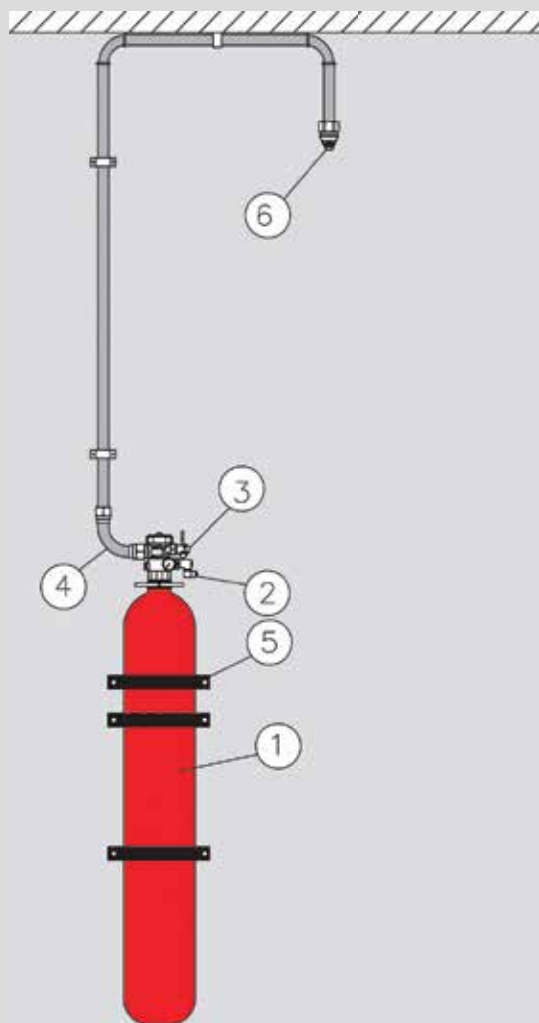


Pos.	Description	Pos.	Description
1	Reduction 21.8" to 1/4" H-H	11	2 way pneumatic cone
2	Depressurization valve 1/4"	12	Discharge manifold
3	Manual release	13	Check valve
4	Electric actuator	14	1 way pneumatic cone + "L" screw
5	Pressure gauge	15	N2 pilot cylinder
6	Coupling 1/4" to hose	16	Blind cap threaded NPT
7	Tee 1/4" male to 2 x 1/4" female	17	Manifold Rack
8	Pneumatic hose 1/4"	18	Pressure switch
9	NAFFCO 25/360 valve	19	Release hose 1/4" x 700
10	Release hose	20	Rack with straps pilot cylinder

NAFFCO-227 600-psi Modular (Single Cylinder) Systems

A 600-psi modular system is a single cylinder system using seamless cylinders from 12 lbs. to 300 lbs. pressurized with Nitrogen at 600 psi. It includes cylinder, dip tube, discharge valve with pressure gauge and switch, manual lever release and solenoid electrical actuator. The agent flows from the cylinder through a hose into the pipework, which ends with one or more nozzles. The systems can be actuated through the solenoid mounted on the discharge valve by an electric signal sent by the control panel. For the manual actuation it is necessary to access the manual lever release, remove the safety seal and pull the lever.

Schematic drawing for NAFFCO -227 600-psi Modular Systems



Pos.	Description
1	Modular cylinder
2	Electric actuator
3	Manual release
4	Release hose
5	Bracket
6	Nozzle



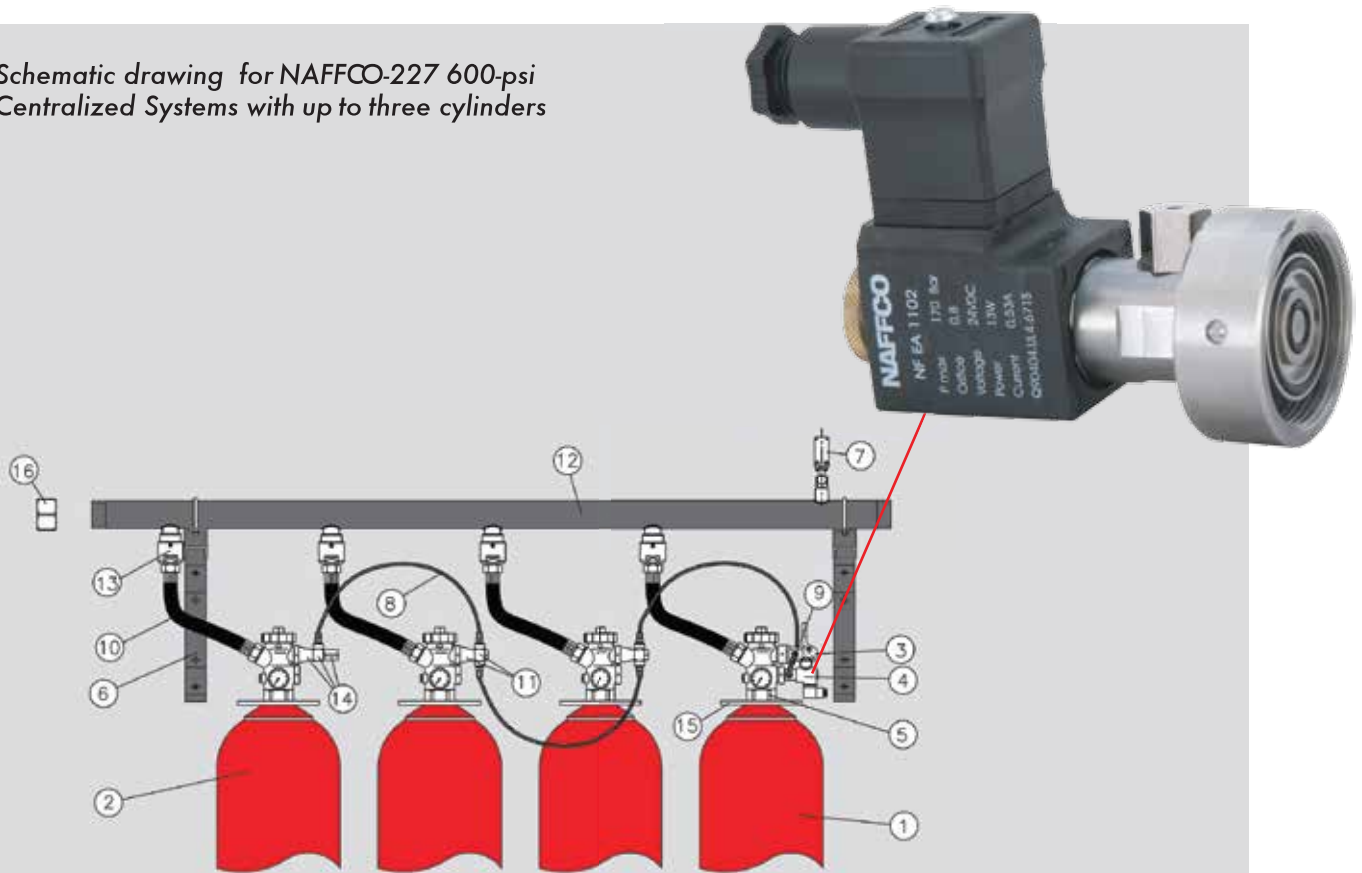
NAFFCO-227 600-psi Centralized (Up to Eight Cylinders) Systems

A 600 psi centralized system is a multiple cylinder systems using seamless cylinders from 100 lbs. to 300 lbs. pressurized with Nitrogen at 600 psi. For systems with up to eight cylinders, the first cylinder (master cylinder) is equipped with a manual lever release and a solenoid electrical actuator and operates all the other (auxiliary) cylinders. All cylinders must be filled with the same amount of agent.

The pressure in the master cylinder is directed from a pneumatic solenoid or manual lever actuator through a line of hoses to the cones mounted on each valve with rupture discs.

The systems can be actuated through the solenoid mounted on the master discharge valve by an electric signal sent by the control panel. For the manual actuation it is necessary to access the manual lever release, remove the safety seal and pull the lever.

Schematic drawing for NAFFCO-227 600-psi Centralized Systems with up to three cylinders

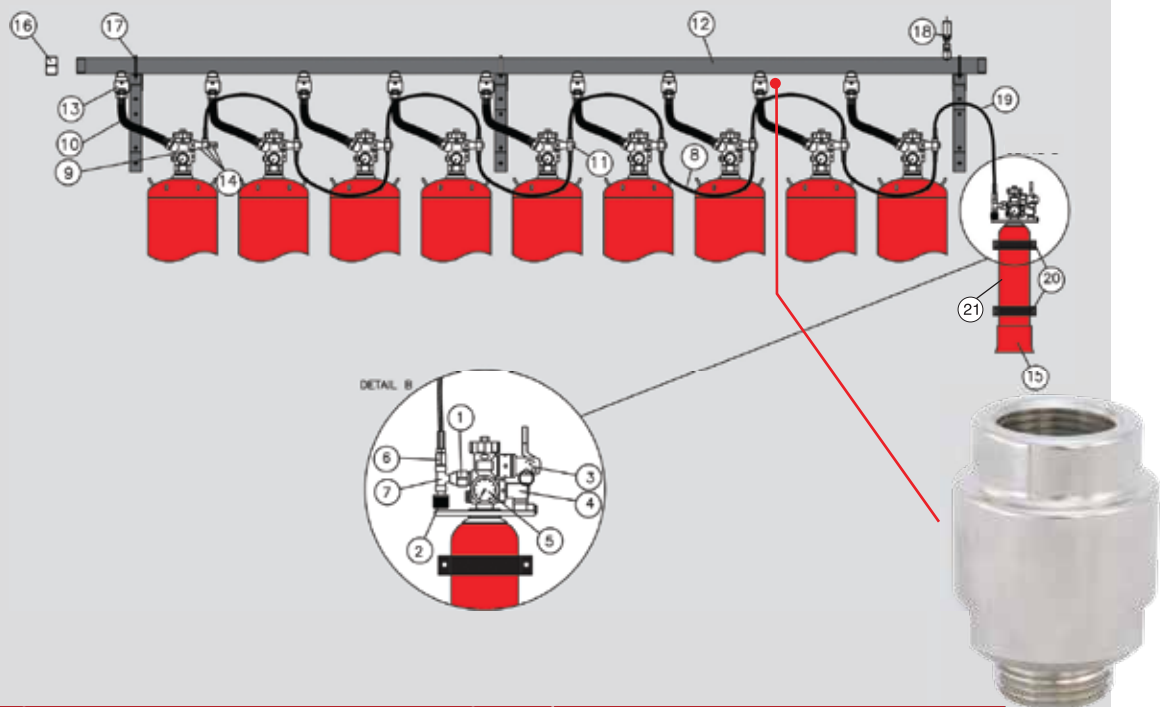


Pos.	Description	Pos.	Description
1	Master cylinder (NAFFCO 25/600 valve)	9	Release hose 1/8"
2	Auxiliary cylinder (NAFFCO 25/600 valve)	10	Flex Release hose
3	Manual pneumatic release	11	2 way pneumatic cone
4	Electric actuator fitted with 1/8" pneum. outlet	12	Discharge manifold
5	NAFFCO 25/600 valve	13	1" Check valve
6	Rack with straps	14	1 way pneumatic cone + "L" screw
7	Pressure switch	15	NAFFCO 25/600 cylinder flange
8	Release hose 1/4"	16	Blind cap threaded NPT

NAFFCO-227 600-psi Centralized (More Than Eight Cylinders) Systems

A 600-psi centralized system is a multiple cylinder systems using seamless cylinders from 100 lbs. to 300 lbs. pressurized with Nitrogen at 600 psi. A 3-liter pilot cylinder filled with Nitrogen pressurized at 1,450 psi operates systems with more than three cylinders. The pilot cylinder is equipped with both manual lever release and solenoid electrical actuator. The pressure from the pilot cylinder is directed toward the auxiliary cylinders through the actuators and a pneumatic line and bursts the discs of pneumatic cones mounted on their valves. A single pilot cylinder can operate up to 40 cylinders. The systems can be actuated through the solenoid mounted on the discharge valve of the pilot cylinder by an electric signal sent by the control panel. For the manual actuation it is necessary to access the manual lever release of the pilot cylinder, remove the safety seal and pull the lever.

Schematic drawing for NAFFCO-227 600-psi Centralized Systems with more than three cylinders

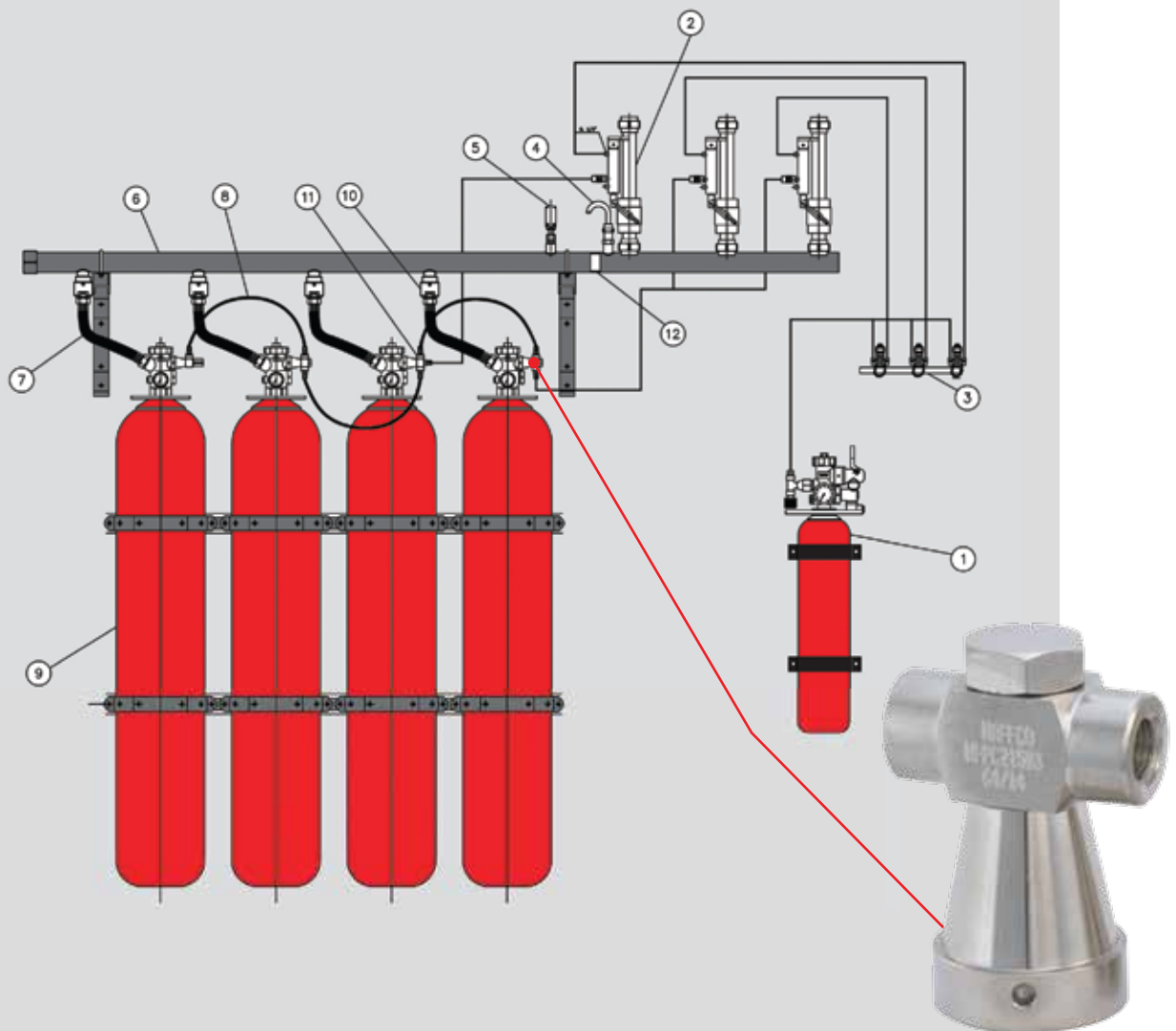


Pos.	Description	Pos.	Description
1	Reduction 21.8" to 1/4" H-H	12	Discharge manifold
2	Depressurization valve 1/4"	13	Check valve
3	Manual release	14	1 way pneumatic cone + "L" screw
4	Electric actuator	15	NAFFCO 25/600 cylinder flange
5	Pressure gauge	16	Blind cap threaded NPT
6	Coupling 1/4" to hose	17	Manifold Rack
7	Tee 1/4" male to 2 x 1/4" female	18	Pressure switch
8	Pneumatic hose 1/4"	19	Release hose 1/4" x 700
9	NAFFCO 25/600 valve	20	Rack with straps pilot cylinder
10	Release hose	21	N2 pilot cylinder
11	2 way pneumatic cone		

NAFFCO-227 600-psi Selector Valve Systems

A 600 psi centralized system with selector valves is a multiple cylinder system using seamless cylinders from 190 lbs. to 300 lbs. and it is designed to protect alternatively more than one enclosure. NAFFCO selector valves come in different sizes, from 2-1/2" to 4". It is a cost effective solution that in some cases allows reducing the number of cylinders and the amount of agent, but would not protect more than one enclosure at a time.

Schematic drawing for NAFFCO-227 600-psi Selector Valve Systems



Pos.	Description	Pos.	Description
1	N2 pilot cylinder	7	Discharge hose
2	Selector valve	8	Release hose 1/4" x 700
3	Solenoid Bracket	9	Cylinder
4	Manifold safety disk	10	Check valve
5	Pressure switch	11	3 way pneumatic cone
6	Discharge manifold	12	NPT Joint

NAFFCO-227 Discharge Valves

All NAFFCO-227 (360-psi and 600-psi) valves for NAFFCO-227 systems are heavy-duty pressure differential valves made of nickel-plated brass. They are supplied with a pressure gauge/switch and can be actuated manually, pneumatically and or electrically:

- NAFFCO 25/360
model for 67 lb
welded containers.

- NAFFCO 40/360
model for 100 lb
welded containers.



- NAFFCO 65/360
model for 190,300,
430 and 590 lb
welded containers.



- NAFFCO 20/600
model for 12, 33,
and 67 lb seamless
containers.



- NAFFCO 25/600
model for 100
and 170 lb seamless
containers.



- NAFFCO 40/600
model for 190, 250
and 300 lb seamless
containers.

NAFFCO Actuators

Solenoid Electrical Actuators.

These are electric devices that allow the actuation of the valves by means of an electric signal sent by a control panel or by a push button release. There are two models, one for single cylinder systems and one for multiple cylinders.



Manual Lever Release.

These allow the manual actuation of the valve and consist of a lever that manually pushes a needle against a rupture disc located on the valve body. The bursting of the disk opens the valve. It comes in two models, one for modular systems and one for multiple cylinder systems.

It incorporates a safety pin to prevent accidental discharges.



Pilot cylinder.

It operates multiple cylinder systems and can be used to operate any kind of systems (modular and centralized) remotely as well. It is filled with Nitrogen pressurized at 1,450psi and can operate up to 40 cylinders.



Discharge Components

Flex Discharge Hoses.

Are made of synthetic rubber and come in two sizes, $\frac{3}{4}$ " and 1". The 1" model is available for modular systems and centralized systems that allow a 1" check valve at one end.



Rigid Discharge Hoses.

Are made of steel pipe and come in two sizes, 1-1/2" for NAFFCO 40/360 and NAFFCO 40/600 valves and 2-1/2" for NAFFCO 65/360 valve. Both sizes are available for modular and centralized systems.



Check Valves.

These devices prevent the gas flowing back from the manifold to the cylinders. They are always located between the discharge hose connected to the cylinder and the discharge manifold. Sizes are 1", 2" and 3".



Discharge Nozzles and Diaphragms.

The discharge nozzles, manufactured from chromed steel, come in different sizes, from $\frac{1}{2}$ " to 2". Each size is available with either 360° or 180° dispersal patterns. The nozzle consists of a head with multiple orifices or ports, which allow the optimum vaporization and distribution of the agent, and an internal diaphragm of calculated diameter that controls the agent flow.



Manifold Pressure Switch.

The pressure switch closes or opens an electric circuit when the agent is discharged through the manifold. The electric signal can be monitored by a control panel and used to operate other electrical devices. Once activated it can be re-armed manually.





After-Sales Service

NAFFCO has been a trusted and reliable service partner over the decades of experience and relation with clients, thanks to its in-house capabilities and the scattered plants and service facilities in the region.

NAFFCO service centers are a state of the art facility that utilize the latest technologies and the most precise equipment to supply the market with UL Listed NAFFCO-227 fire suppression systems, the facilities provide more efficient service to clients across United Arab Emirates and other parts of the region with a significant improvement of delivery time, service and after sales services.

NAFFCO Filling and Service facilities have been recognized by Underwriters Laboratories(UL) to be one of the first facilities in the region who offers a 360 degrees around the product starting from assembly, filling leak testing, nozzle drilling any applying the quality seal of UL -mark beside a 24/7 refilling, service and after services by a well-trained and skilled technicians in their fields.

Flow Calculations

The flow of NAFFCO HFC-227ea through the pipes is a complex two-phase flow. The analysis of the flow process is made economically possible by the use of a UL Listed NAFFCO HFC-227ea Flow Calculation Computer Program, the NF 4.0, developed by Hughes Associates, Inc. This program is interfaced with, and depends on NAFFCO component specific data.



Quality System

National Fire Fighting Manufacturing FZCO is certified to ISO 9001 Quality System by manufacturing processes are based on a quality system that ensures the use of raw material confirming to relevant International Standards. Our in process production is monitored by work standards & quality plans confirming to relevant International standards enabling us to deliver quality products.

Approvals

NAFFCO has successfully achieved ISO 9001 Quality Management system certified by UL, LPCB & BV. Further we have achieved Product certification from UL, FM, LPCB, BSI, CE & SAI Global on wide range of products which include Fire Extinguishers, Fire Hose Reels, Centrifugal Fire Pumps, Diesel Engine for driving Fire pumps, Fire doors, Fire Fighting equipment & Certification for Fire Alarm systems installations.

Engineering Capabilities

NAFFCO is backed by a team of professionals who are well qualified and specialized in their respective field via - Design, Development, Production and Project Implementation. Our investment in applied research and development program concentrates on innovations that meets customer needs.





Serving Over 100 Countries Worldwide



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In line with NAFFCO policy for continuous product development,
NAFFCO has the right to change specifications without prior notice.