FOGMAKER
INTERNATIONAL AB

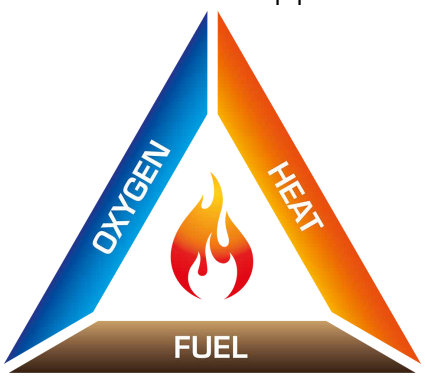
FOGMAKER
FIRE SUPPRESSION SYSTEM

- an introduction

Introduction

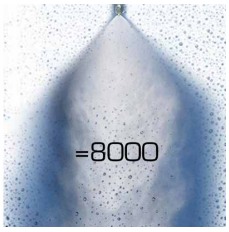
Fogmaker® is a registered trademark of fixed installed fire suppression systems for suppressing fires in the engine room or other enclosed spaces. Fogmakers fire suppression systems are used in buses, construction and forestry machinery, mining vehicles, racing cars and more.

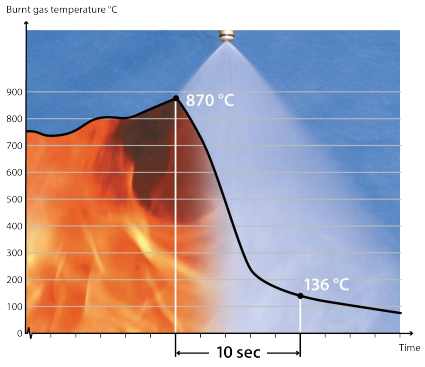
Fogmakers fire suppression system spreads a fine water mist over the fire which both cools the fire very effective and also displaces the air, so that the oxygen content drops in the protected volume. Fire suppression efficiency increases when the extinguishant evaporates. The extinguishant is water with antifreeze additive (optional) and a film-forming chemical which prevents re-ignition. Fogmaker's fire suppression system attacks all three elements of the fire triangle.



Fogmakers fire suppression system functions in confined spaces that are difficult to reach with powder and plain water. The system can be activated manually and/or automatically.

High pressure water mist is created by the high pressure in the piston accumulator (at 100 bar) in combination with custom-made nozzles. When the extinguishant passes the nozzle it is broken down into micro-droplets on Ø50 microns. 8,000 of these micro-droplets can fit in a drop of water on Ø1mm.





The Fogmaker fire suppression system has several external approvals, see website: www.fogmaker.com

Content

Fogmaker fire suppression system, overview bus

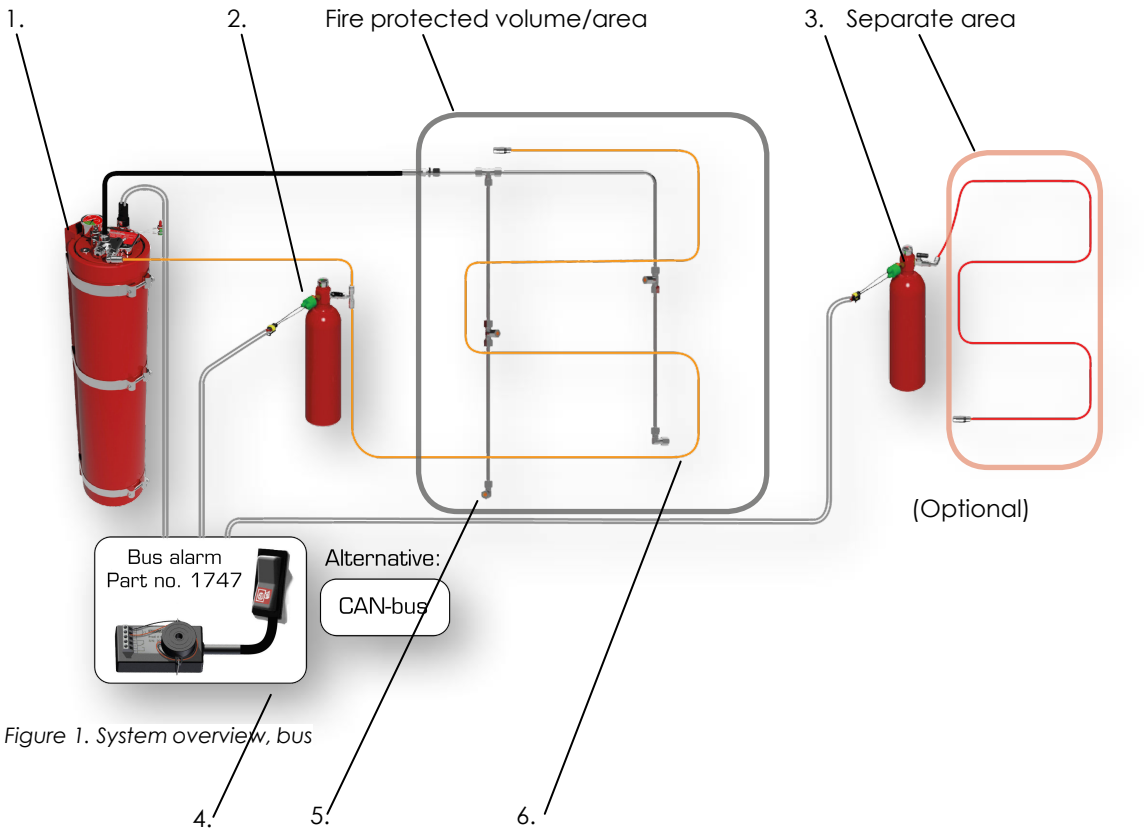


Figure 1. System overview, bus

Description of the Fogmaker system in a typical bus, see Figure 1:

1. Piston accumulator - single type.
2. Detector bottle connected to the piston accumulator.
3. (Optional) Novec ™ system can be installed in a separate space.
4. Bus alarm or CAN-bus connected to the pressure switch on piston accumulator and detector bottle (optional).
5. Distribution system with nozzles for extinguishant distribution is connected to the piston accumulator.
6. Hydro-pneumatic detector tube, the tube bursts if there is a fire.

Fogmaker fire suppression system, overview machine/other

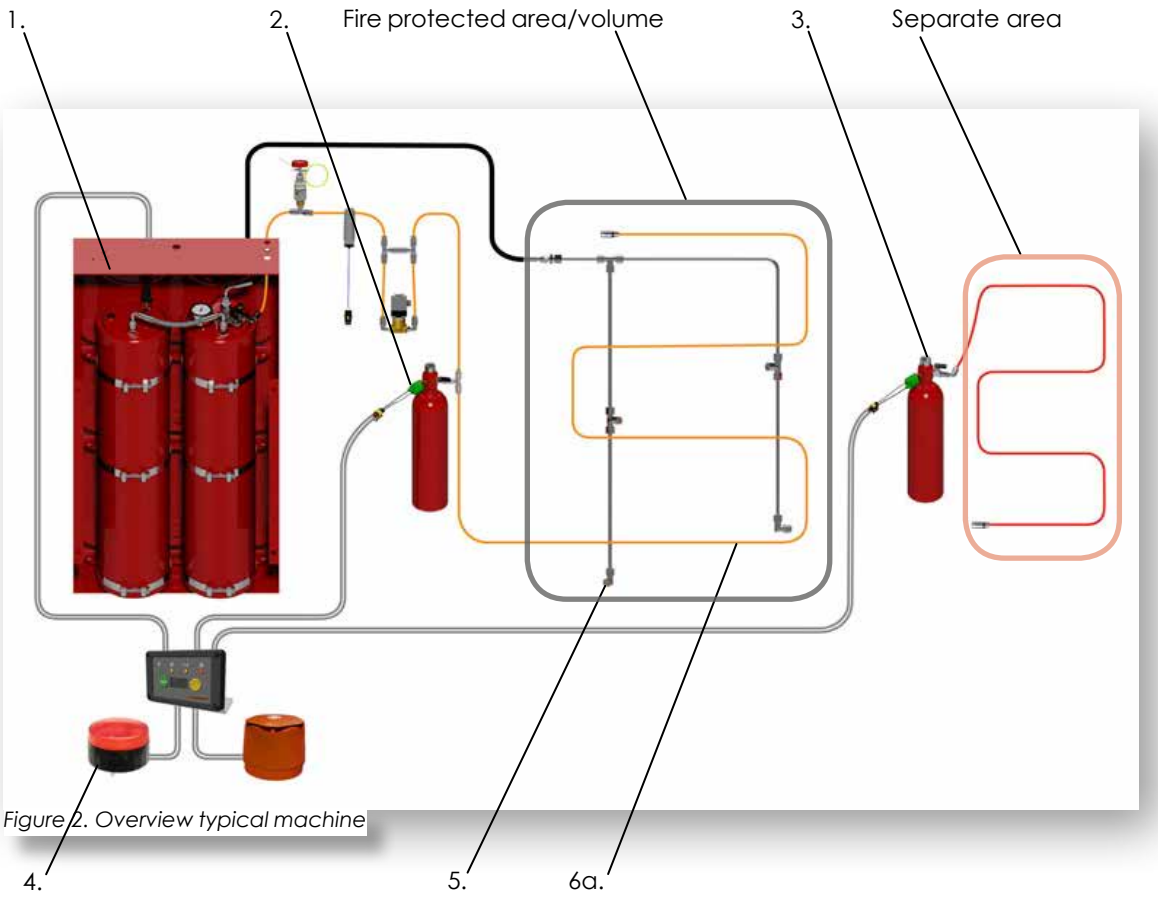


Figure 2. Overview typical machine

Description of machine- and other installations, see Figure 2

1. Piston accumulator - several cylinders as well as protection box.
2. Detector bottle connected to the piston accumulator.
3. (Optional) Novec ™ system can be installed in a separate space.
4. Pressure switch connected to the alarm panel and separate acoustic and visual alarm.
5. Distribution system with nozzles for extinguishant distribution is connected to the piston accumulator.
6. Hydro-pneumatic (Figure 2), electric (Figure 3) or mechanical activated system (Figure 4). Various punches and solenoid / semi-automatic function can be mounted on the detector tube, see page 11-12.

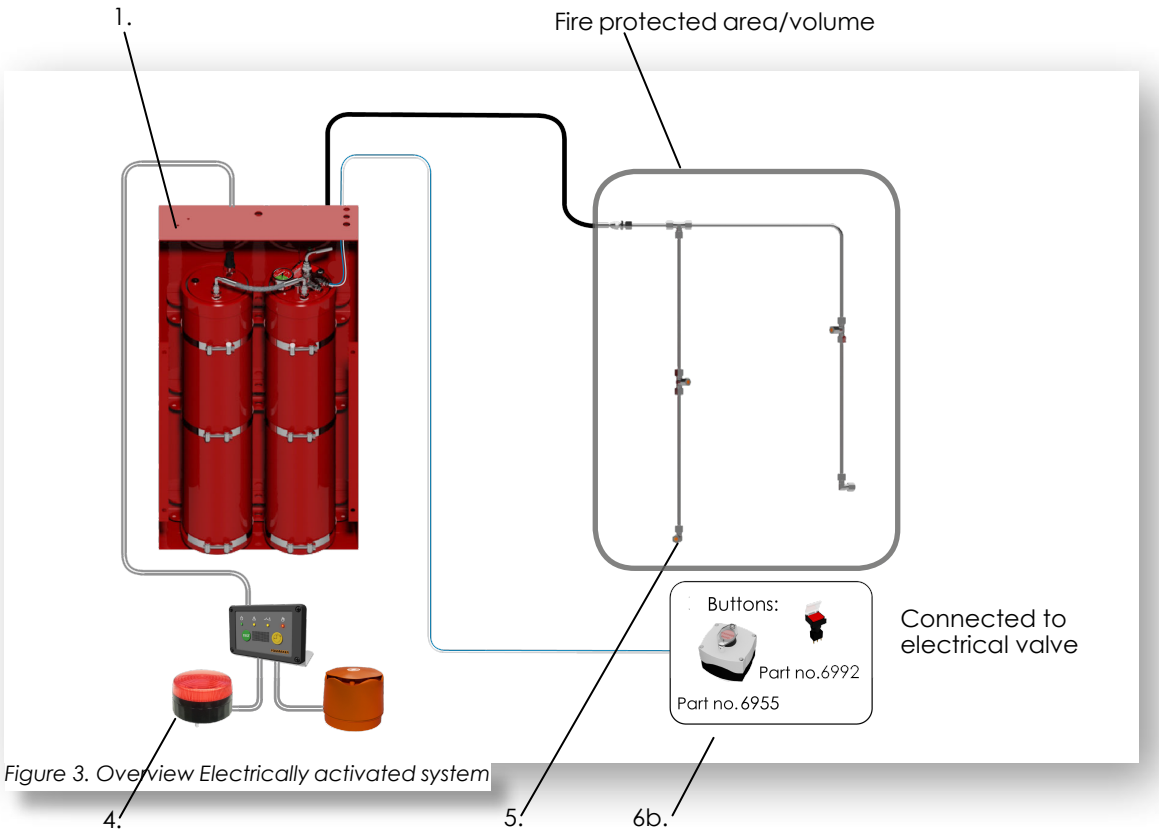


Figure 3. Overview Electrically activated system

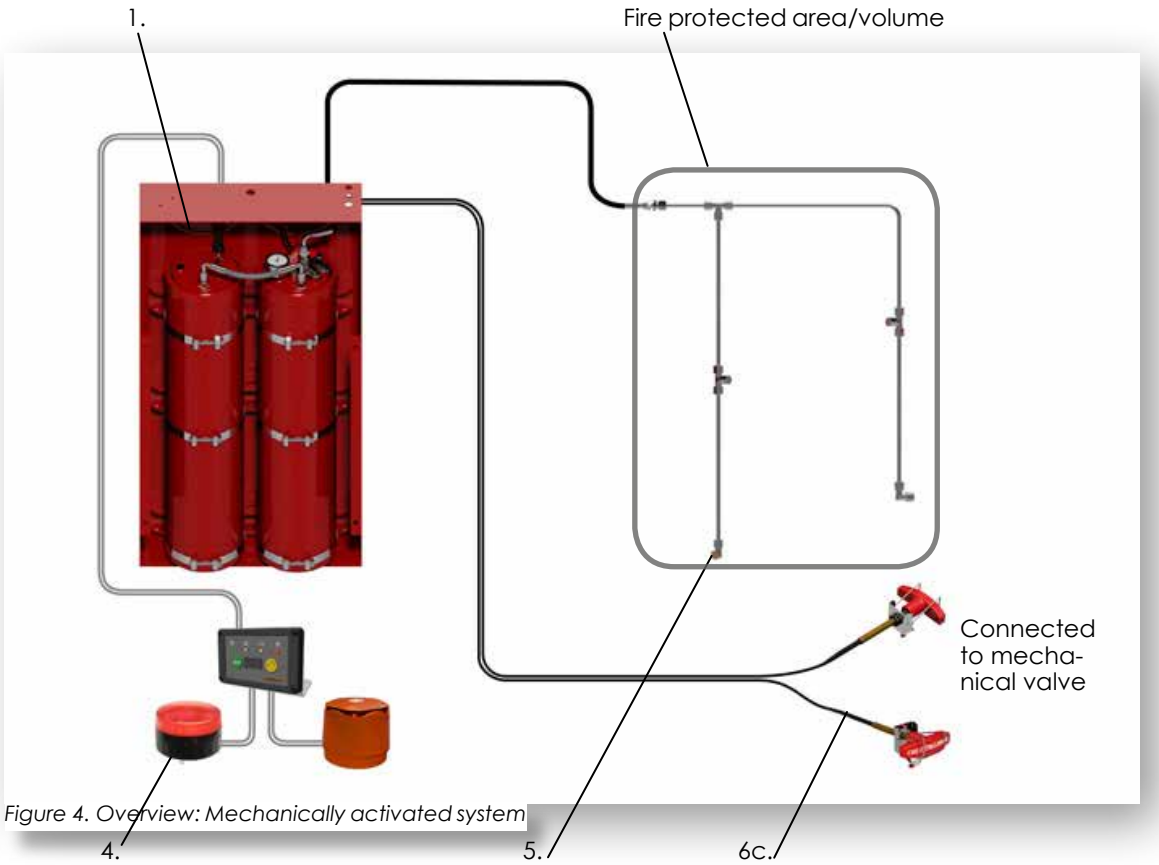


Figure 4. Overview: Mechanically activated system

Fogmaker components

1. Piston accumulator

Fogmaker's piston accumulator is a cylindrical container made of anodized aluminum, with a gas and a fluid side and a valve on the cylinder top, see Figure 7. The piston accumulator can be combined to double or triple extinguishers, see Figure 8-10.

The piston accumulator is pressurized to 100-105 bar at 20 ° C.

The piston accumulator is installed outside the fire-protected area. In buses, the containers are placed behind the ceiling panel or in the trunk. On machines, the containers are placed inside protection boxes on the outside of the machine, see Figure 11.

The valve

The valve opens and closes the piston accumulator so that the extinguishant can escape. The valve's high pressure piston is pressurized by the internal high pressure while the valve's low-pressure piston gives the opposite effect to the high pressure piston and thus prevents the release of the system, see Figure 5. The low pressure piston is pressurized by the detection system.

- On the valve (Item 6090- / 6091- / 6092-020) the red screw locks the valve lever by being screwed into the hole on the side of the valve body, see Figure 6 and Figure 13. The green cover screw should sit in the side of the valve and protect against dirt when the system is activated, see Figure 12.

The safety screw locks the valve's mechanism by preventing the valve lever's movement - and thus preventing the deployment of the piston accumulator, see Figure 6.

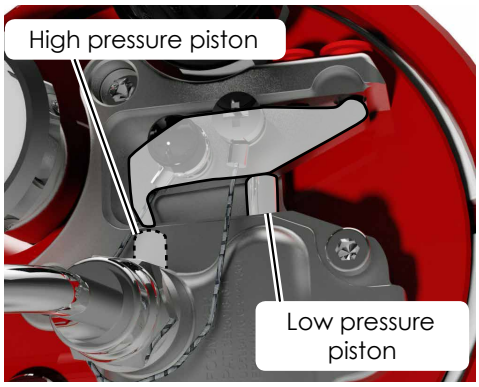


Figure 5. Valve pistons

Figure 6. Valve lever

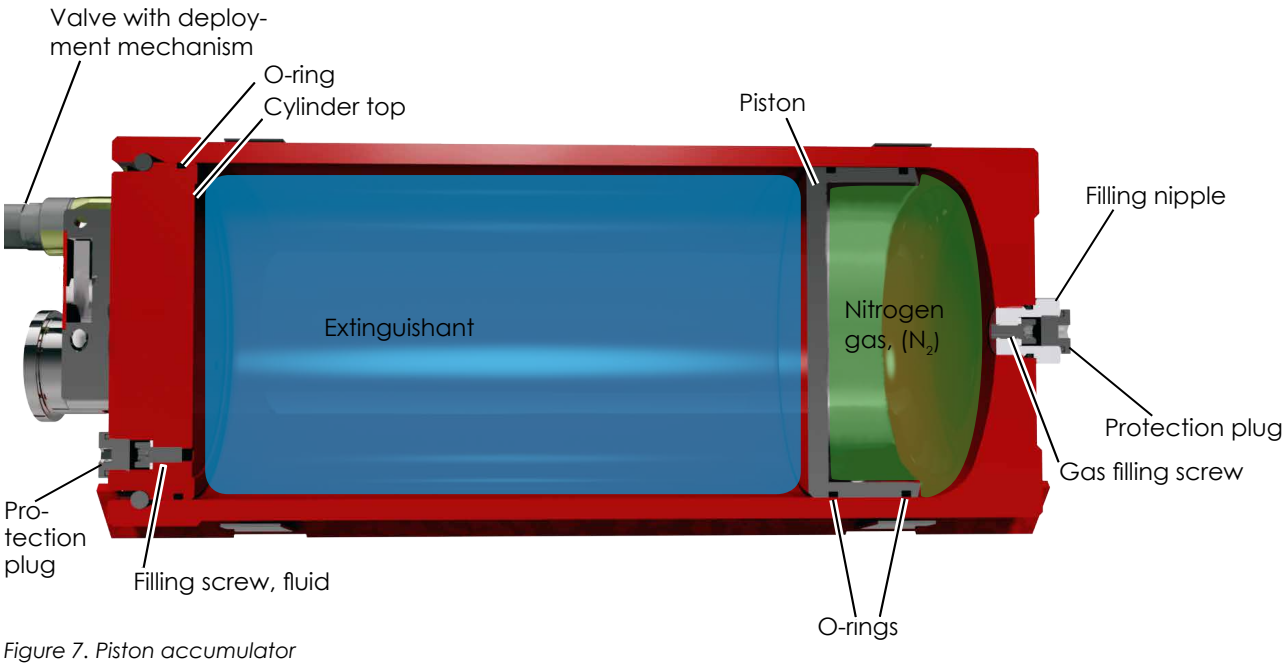


Figure 7. Piston accumulator

Figure 8. Piston accumulator, single

Figure 9. Piston accumulator, double

Figure 10. Piston accumulator, triple

Figure 11. Protection box

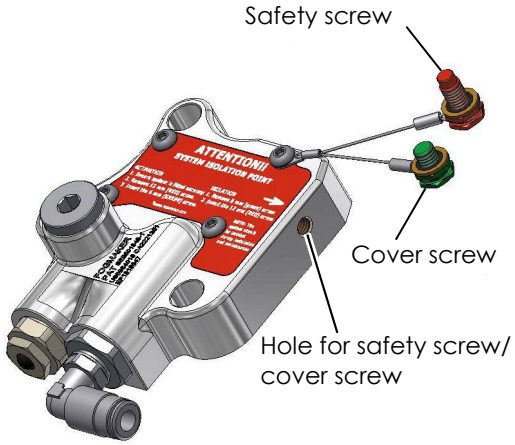


Figure 12. Safety screw not fitted

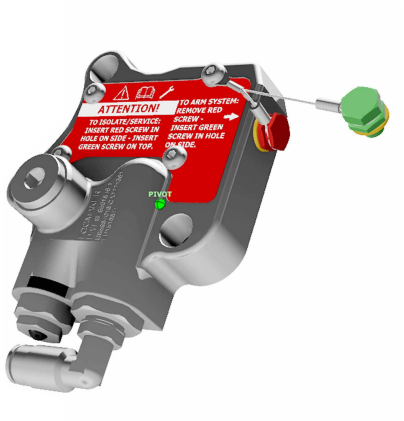


Figure 13. Safety screw in valve

Valve, different types

There are three different types of activation to Fogmakers valves:

- Hydropneumatic activation (Part No. 6092-020) - see page 10
- Electrical activation (Part No. 6091-020) - see below.
- Mechanical activation (Part No. 6090-020) - see opposite page.

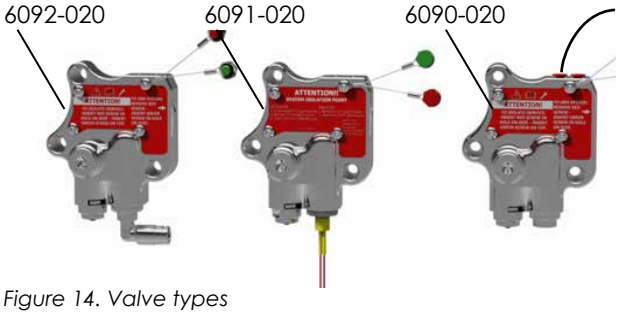


Figure 14. Valve types

Electrically activated valve

A Fogmaker fire suppression system can be electrically activated, then the piston accumulator has an electrically activated valve (Part No. 6091-010 / -020), see Figure 15. Deployment of the system is made by pressing a button connected to the powder charge/metron in the valve.
Either button (Item 6955) or (Item 6992) are being used and they are mounted in the driver area or on the side of the machine see Figure 16 and 17.
Electrical activation can be combined with mechanical activation.

Figure 15. Electrical activated valve

Figure 16. Push button box

Figure 17. Push button

Mechanically activated valve

Fogmakers fire suppression system with mechanical activation means that the piston accumulator has a mechanically activated valve, see Figure 18.

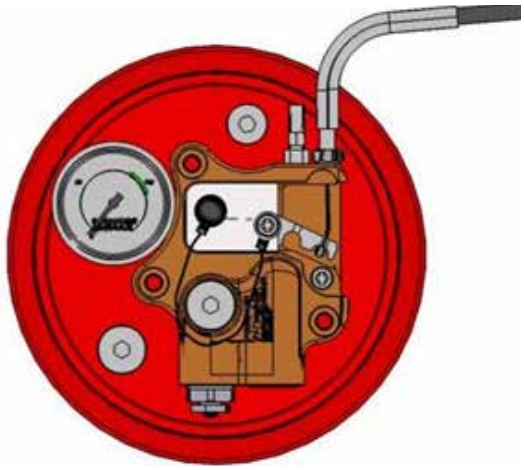


Figure 18. Mechanical fastening in the valve

This valve is connected to one or more wires with a pull handle, see Figure 19. When mounted in vehicles one handle is often placed near the operator / driver's seat and the other on the outside of the vehicle. Up to four handles can be mounted on the same machine.
The handles are fitted with a shackle lock which is sealed.

Wires are fastened with steel rubber clamps with a distance of 300mm along the cable sheath.

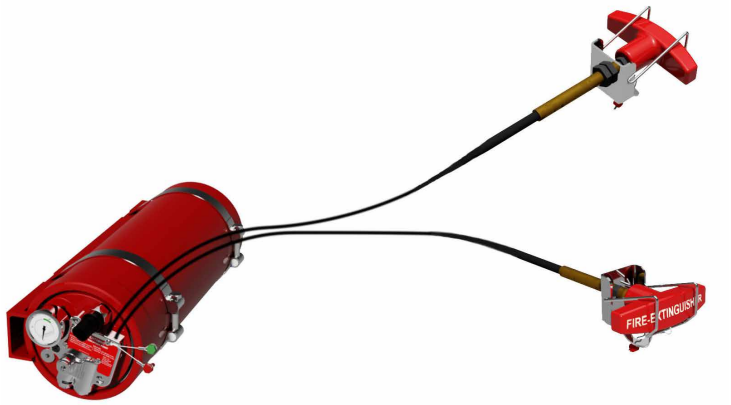


Figure 19. Mechanical activated valve

Signal module

On the valve, a signal module can be mounted (Part No. 6009-030), see Figure 20-21. The signal module alerts the driver if the safety screw is still mounted in the valve.

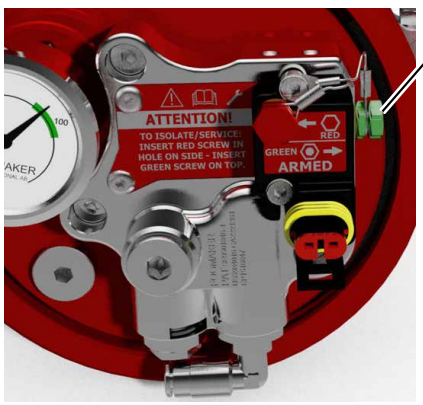


Figure 20. Signal module on valve

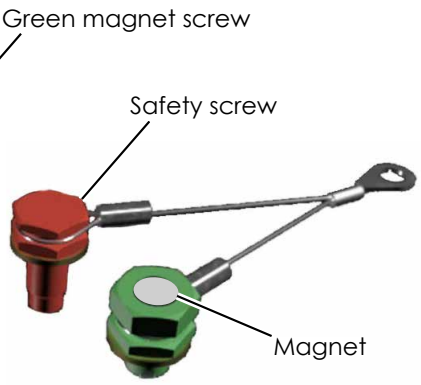


Figure 21. Safety screw and magnet screw

2. Detector bottle and hydropneumatic detection

Hydropneumatic detection means automatic activation of the fire suppression system in case of fire. The pressurized, fluid-filled detector tube, pressurized to 24 bar, bursts at a temperature of around 170°C. The detector tube is protected if necessary and outside fire-protected area with protection tube against damage, see Figure 22. In the fire-protected area sits a protective spiral around the tube, see Figure 26.

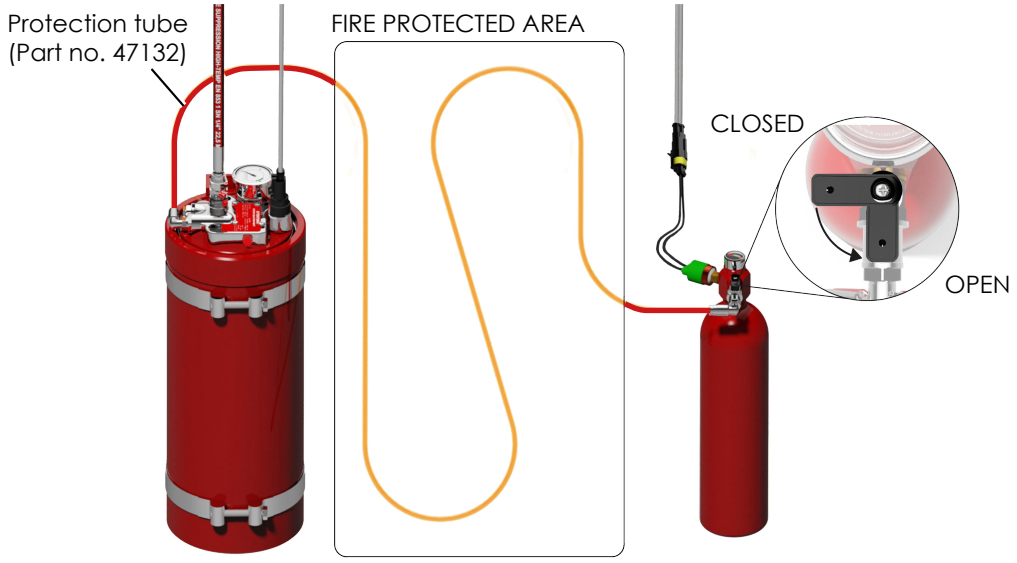


Figure 22. Hydropneumatic detection - activation with ball valve

The detector bottle contains liquid and nitrogen gas and is pressurized to 24 bar after installation, see Figure 23 and 24.
The detector bottle is equipped with one or two pressure switches that give an alarm if the pressure falls below 14 bar (and 5 bar, optional) in the detection system. The detector bottle has a ball valve to be opened to activate the system.

The detector bottle contains a riser, see Figure 24, which means that the bottle must be placed according to instructions for normal functioning.

A ball valve allows the hydro pneumatic detection system to be activated, see Figure 22. The valve should always be open except when working on the system.

Figure 23. Detector bottle (Part no. 1656)

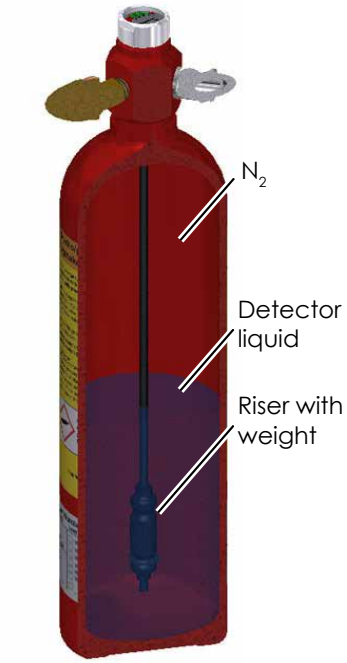


Figure 24. Detector bottle cross section

Figure 25. Pressure gauge on detector bottle

Installation of detector tube

The detector tube is mounted high up in the engine compartment and is mounted with clamps or cable ties. Stainless steel couplings can be used to connect detector tubes from different parts of the fire-protected area, see Figure 22.

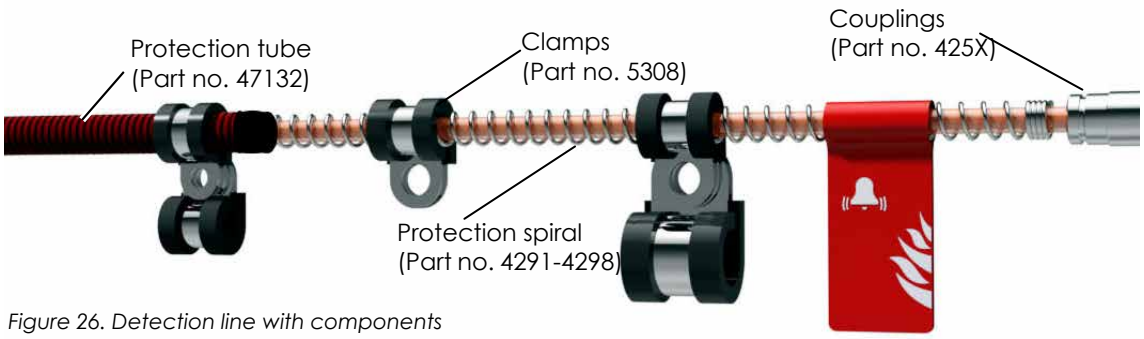


Figure 26. Detection line with components

Electrical/mechanical actuator on detection line

The electrically actuated punch and the mechanical punch, see Figure 27 and 29, are used to create manual activation options for the system's hydropneumatic detection. They are a complement to the fully automatic mode.

The electrically actuated punch (Part No. 1318) in Figure 27, is mounted on the detector tube and is connected to the activation button (Part No. 6992) placed in driver's compartment, see Figure 28. By pressing the button the punch punctures the detector tube and the detector liquid leaks out.

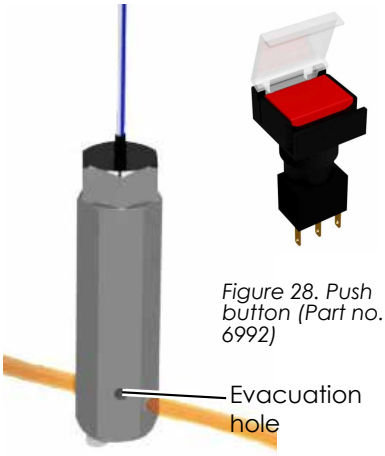


Figure 27. Electrical punch (Part no. 1318)

Figure 28. Push button (Part no. 6992)

The manual punch:

- Manual punch (Part No. 1316), see Figure 29.
- The ”Heavy-duty punch” (Part No. 1315-025), see Figure 30.

They are both fitted on the detector tube. By pulling out the safety latch and push down the handle detector liquid flows out and the system is activated.

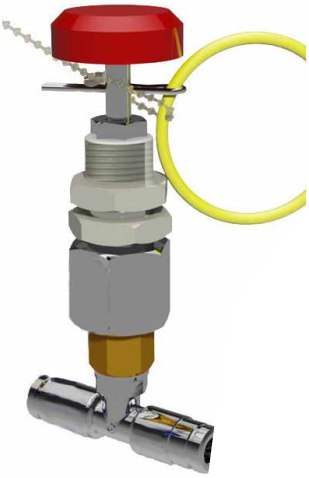


Figure 29. Mechanical punch (Part no. 1316)

Figure 30. Heavy-duty punch (Part no. 1315-025)

An evacuation tube can be connected to any punches, see Figure 31, this leads off detector liquid if the punch is installed in the passenger/driver’s area.

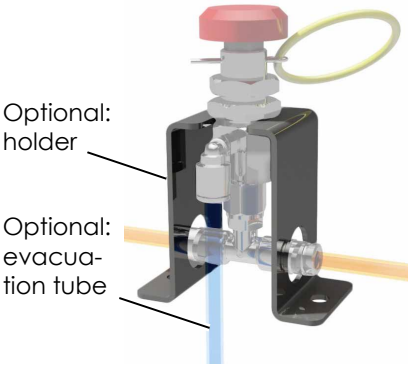


Figure 31. Holder (Part no. 1317-07)

Solenoid valve /Semiautomatic (optional)

The solenoid valve allows for semi-automatic function of the Fogmaker system. When the ignition is on, the solenoid valve is closed and the system then only signals an alarm if the detector tube bursts. When the ignition is turned off, the solenoid valve opens and the detection system opens all the way up to the piston accumulator. The system can then deploy if a fire occurred. This system option is linked to SBF127.

The arrow on the check valve point along the detector tube from the piston accumulator, see Figure 32.

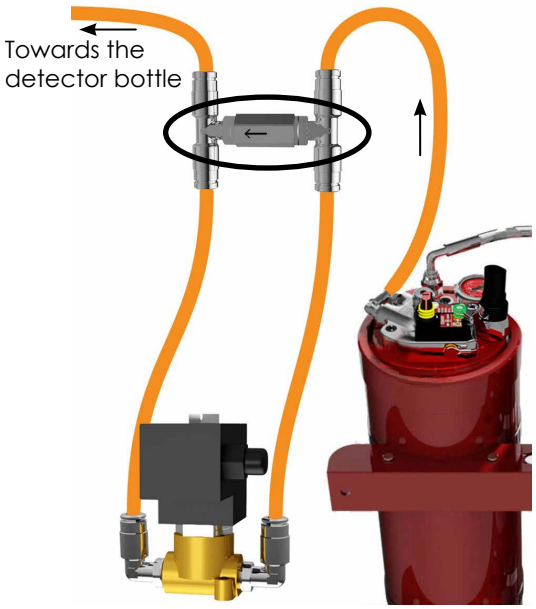


Figure 32. Fitting of solenoid valve

3. Distribution system

Fogmakers distribution system consists of distribution hoses, pipes, fittings and nozzles. They have the task of distributing extinguishing liquid from the piston accumulator into the fire-protected area, see Figure 33. Pipes and hydro-pneumatic tubing are fixed permanently into the engine compartment, see picture 34.

Figure 33. Distribution system

5.1 Nozzles

Figure 35 and 36 show the three different nozzle types avaliable.

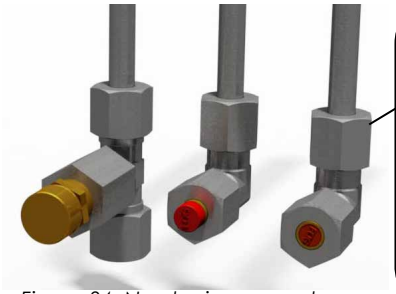


Figure 34. Nozzles in connectors

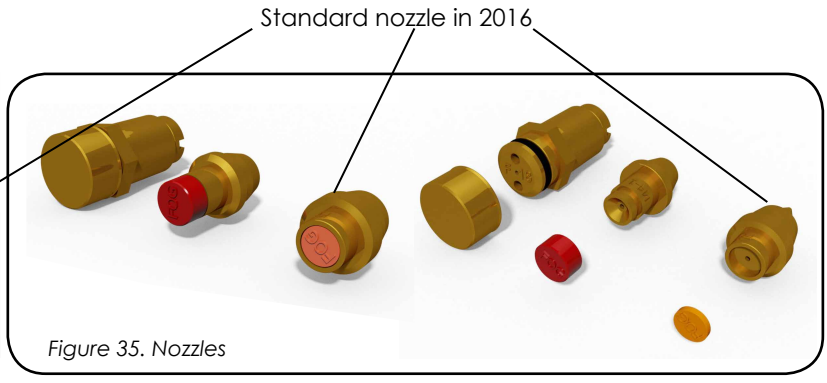


Figure 35. Nozzles

The previous generation of Fogmaker nozzles with brass hat has different shapes on the nozzle body, see Figure 37, Item 1500 (smooth), 1501 (lathed groove) and 15010 (hexagonal shape).
The later generations of Fogmaker nozzles with rubber nozzle cap has a designation stamped along the edge: ”F4-2” it says, for example, on the pink nozzle (Part No. 1502).

Figure 36. Nozzle types

4. Alarm

Pressure switch on the piston accumulator gives an alarm if the pressure falls below 80 bar (optional).
Pressure switche(s) on the detector bottle triggers an alarm if the pressure falls below 14 bar and 5 bar (optional).
The pressure switches are connected to an alarm panel or the CAN bus in the driver area, as well as extra separate sound and light signals when available.
See Figure 38 and 39 for an overview of the alarm panels that can be installed in different vehicles.

See next page for alarm panels.

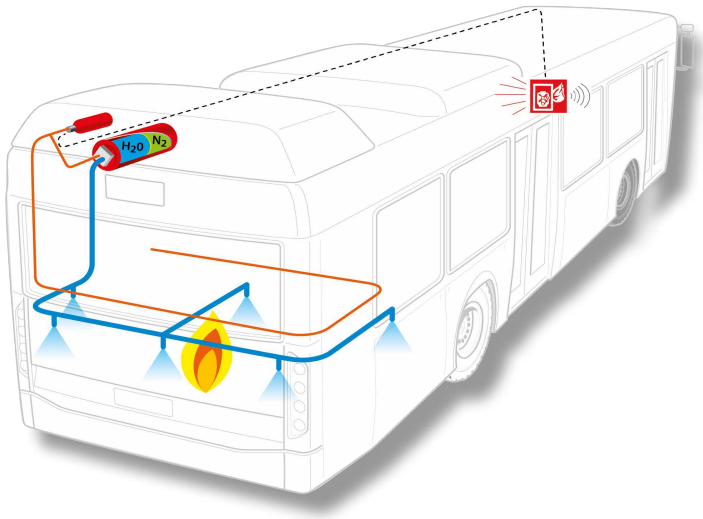


Figure 37. Overview: Fogmaker system in bus

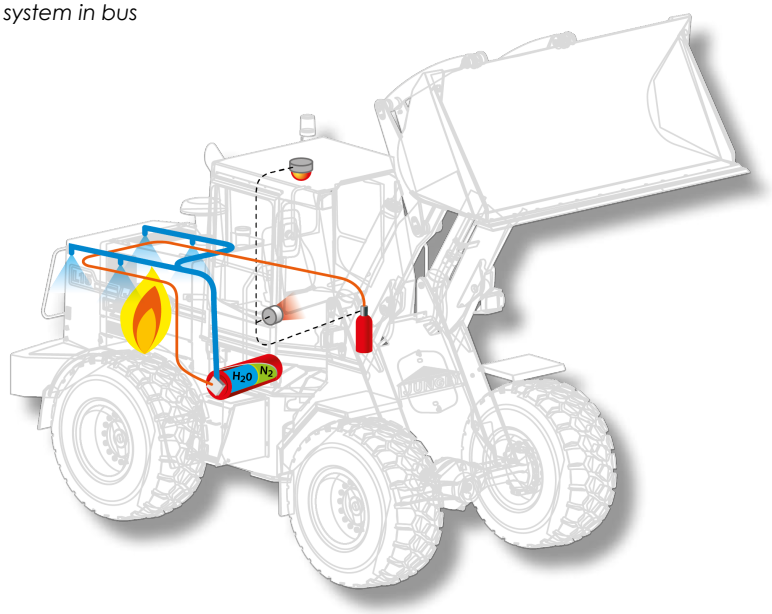


Figure 38. Overview: Fogmaker system in wheel loader

Alarm panels

See pictures of Fogmakers alarm panels, Figure 40 and 41. When machine installations are performed can also the acoustic and visual alarm be installed, see Figure 42 and 43.

Pressure switch on the piston accumulator and a second pressure switch on the detector cylinder is optional so the number of pressure switches installed may vary. Fire or error signal is emitted depending on the panel that is installed and the different number of pressure switches. See separate wiring diagram for each part.

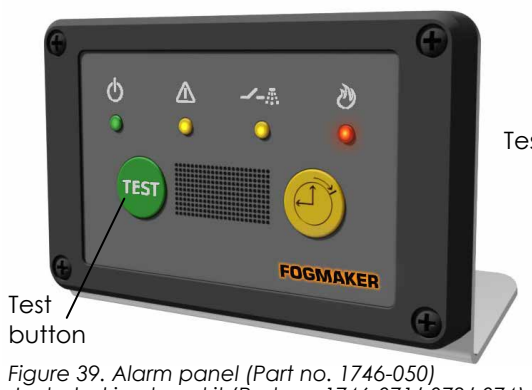


Figure 39. Alarm panel (Part no. 1746-050)
Included in alarm kit (Part no. 1746-071/-072/-074)

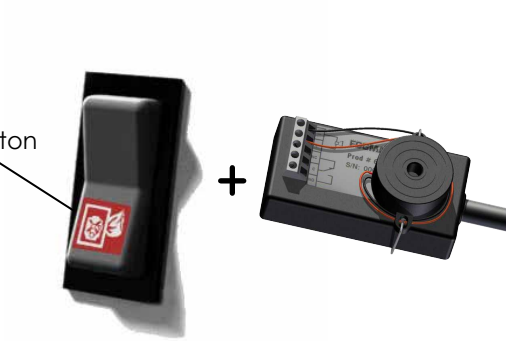


Figure 40. Alarm button (Part no. 6970)
Included in bus alarm kit (Part no. 1747-020-00/-12)

Figure 41. Acoustic alarm

Figure 42. Visual alarm

Other

Annual inspection and service are carried out on vehicles and other installations that have Fogmakers fire suppression system installed, see Table 1.

Service plan			
Time interval	Annual insp.	Service	Action
1 year inspection	•		
5 year service	•	•	
As needed	•	•	•
10 year revision	Performed by Fogmaker		

Table1. Service plan

Fogmaker International AB

Postal address:
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SE-352 45 Växjö, Sweden

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info@fogmaker.com