

Safety device for aluminium CO₂ fire extinguishers 2 kg and 5 kg, model Tyco with screw type valves and lateral hose outlet (rotated through 90°)

Material description:

2 kg and 5 kg CO₂ fire extinguishers made of aluminium and equipped with SIAN 234 type pressure handle valves with cylindrical connecting thread M25 x 2 and o-ring seal are on the market; the outlet is lateral (rotated through 90°).

The aluminium cylinders for the 2 kg extinguisher are manufactured by *Luxfer + MES* and have identical measurements; the cylinders for the 5 kg extinguishers are supplied by two manufacturers, *Luxfer Great Britain* and *MES, Turkey*. This results in a height difference between the cylinders of approx. 15 mm.

The valve is of a type with an outlet mounted laterally on the valve (rotated through 90°).

Basis of the test:

Valves have come loose from the cylinders in several cases. The fracture is located on the part of the valve (outer) thread that does not touch the inner thread of the cylinder in screwed in state.

To prevent any risk to staff, fire extinguishers which may have defective valves must not be removed from the wall mounts without a safety device. Without the safety device, a higher load on the valve may occur on removal; this can lead to damage to defective valves. The consequence would be that the valve would be propelled by the cylinder pressure of up to 190 bar - in case of higher temperatures – thus endangering operating staff and any bystanders. Removal of the misting nozzle, hose and horn must be avoided under all circumstances because unfastening the thread exerts additional force on the valve which could lead to damage.

The safety device must be fitted to the extinguishers while they are mounted on the wall bracket to allow for safe removal from the wall bracket and emptying (by actuating the pressure lever valve). The cylinders must only be emptied in the safety device.

Description of the safety devices:

The safety device is a welded design with a milled retaining plate at the top for fitting onto the valve. 2 flat bars are attached at the sides; they point downward to a traverse strut and the base. The traverse strut at the bottom, clamping bolt and the locating plate are used to clamp the cylinder. At the bottom there is a sheet metal base. The top surface of the retaining plate is additionally milled to accommodate the valve with the outlet rotated through 90° (see Figures 1-4).



Fig. 1: Retainer 2 kg cylinder



Fig. 2: Retainer 5 kg cylinder



Fig. 3: Retaining plate 2 kg cylinder



Fig. 4: Retaining plate 5 kg cylinder

Using the safety devices:

Read and observe the instruction manual by Tyco or Total.

Tests performed:

The fire extinguishers were exposed to a water pressure test with the the valve in the safety device.

In the case of the 5 kg cylinder, water escaped through a gap between the cylinder and the valve when the pressure exceeded approx. 70 bar so that a further pressure increase with the present pressure pump was impossible.

In the case of the 2 kg cylinder, water escaped through a gap between the cylinder and the valve when the pressure exceeded approx. 90 bar so that a further pressure increase with the present pressure pump was again impossible.

The devices were then tested in the scope of a hydraulic pressure test. The valve was clamped in the retaining plate of the safety device and a pressure of 200 bar was applied to the pressure action surface of the valve by means of a hydraulic cylinder. The deformation was measured by the attached measuring sensors.

The device on the 5 kg cylinder exhibited a deformation of approx. 1.5 mm at 200 bar. No permanent deformation of the retaining plate was determined after releasing the pressure.

The device on the 2 kg cylinder exhibited a deformation of approx. 3.5 mm at 200 bar. No permanent deformation of the retaining plate was determined after releasing the pressure. However, a permanent deformation of the complete safety device of approx. 2.5 mm was determined.

Neither valve could have broken out of the retaining system.

The weld seams on the flat bars on the retaining plate did not break off or fracture during the pressure test.

Safety instructions:

Operating staff must be informed that, in case of valve failure, gas must be expected to escape through a gap between the valve and the cylinder, but that the valve is still retained safely by the safety device. In this case, the device must be taken outdoors without delay and watched until the device has emptied completely. The safety device must not be removed until emptying has been completed and the valve has been secured in open position.

The maximum possible pressure in the fire extinguishers is limited to 190 bar by the bursting disc (according to Total).

The safety devices are only suitable for safe removal of the 2 kg and 5 kg aluminium CO₂ fire extinguishers from the wall bracket with subsequent safe emptying of the fire extinguishers via the SIAN 234 valve with lateral hose outlet (hose outlet rotated through 90°). The safety device was not tested for fire extinguishers with other cylinders and other valve designs.

Results of the test:

The safety devices for the aluminium CO₂ fire extinguishers 2 kg and 5 kg, model Tyco, with screw type valves and lateral hose outlet (hose outlet rotated through 90°) can be used in the manner presented to us.

The devices must not be used in case of a valve fracture.

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