Instruction for filling and refilling of the detection cylinder

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Safety warning
Use protective goggles during the entire work process.

Foreword
This manual describes two different activities: *filling* the detection cylinder or *refilling* of a triggered detection cylinder.

*Filling* the detection cylinder means that the cylinder has not been filled with nitrogen and, or detector fluid before.

*Refilling* the detection cylinder means that the cylinder has been drained because of activation or other reasons.

The difference between the two procedures is the amount of fluid that will be needed to fill the detection cylinder. For refilling you might need to drain remaining fluid in order to ensure that a correct amount of fluid will be refilled.

Control before filling

- If you know that the detector cylinder is empty go to the stage “Filling of fluid” on page 4. However check the weight before and compare with the table below to be sure.

- If the detector cylinder is entire or partially drained, you need to decide the amount of fluid to be refilled. For that continue to “Control of fluid level” below.

Control of fluid level

The detection cylinder cannot be entirely drained of fluid approximately 50ml of fluid will always be left in the cylinder because of the design. In order to decide if a detection cylinder is empty or not, please weigh the cylinder and compare the detection cylinder with the table below.

<table>
<thead>
<tr>
<th>Type of detection cylinder</th>
<th>Part no.</th>
<th>Weight entirely empty</th>
<th>Weight with 50 ml fluid left</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 pressure switch with L- connector</td>
<td>FM-1656</td>
<td>1280 g</td>
<td>1330 g</td>
</tr>
<tr>
<td>2 pressure switches with L- connector</td>
<td>FM-1656-02</td>
<td>1320 g</td>
<td>1370 g</td>
</tr>
<tr>
<td>1 pressure switch with T- connector</td>
<td>FM-1657</td>
<td>1290 g</td>
<td>1340 g</td>
</tr>
<tr>
<td>2 pressure switches with T- connector</td>
<td>FM-1657-02</td>
<td>1330 g</td>
<td>1380 g</td>
</tr>
</tbody>
</table>
Emptying of fluid

1. In order to drain the remaining amount of fluid from the detection cylinder first pressurize the detection cylinder by applying some compressed air.

2. Pressurize with approximately 3-7 bars (45-100 psi) of compressed air or with nitrogen according to page 6.
   Alternative method:
   See "Pressurizing" on page 6 for details and leave the detection tube in the detection cylinder in order to lead away the fluid.

3. When the detection cylinder is pressurized place/hold the cylinder vertical with the pressure gauge upwards.
   Place the detection tube in a suitable container.
   Gently open the ball valve and drain the fluid.

4. When the pressure has evened out (equalized), close the ball valve on the detection bottle. The detection cylinder is now empty, proceed to the next step, "Filling of fluid" page 4.
Filling of fluid with “Refilling kit detection cylinder” part no. FM-1970

1. Assemble the parts as shown on the picture for detection cylinder with:
   
   • L-fitting

   • T-fitting

   **Note:** use delivered* end plug to seal the system.

   *If the end plug is missing, use a standard pneumatic end plug Ø6mm

   **Note:** connection of the tubes and vacuum ejector. **Note the direction of the ejector**

   Markings on the ejector:
   P blue tube => Compressed air
   V orange tube => Vacuum
2. Connect the blue tube to a source of compressed air. (at least 6 bar)

   Open the ball valve on the detection cylinder

   Wait for about 10-15 seconds for vacuum level to occur inside the detection cylinder.

   Close the ball valve on the detection cylinder.

   Disconnect the compressed air.

3. Disconnect the vacuum ejector from the orange tube.

   In order to disconnect the tubes, apply pressure on the outer ring and pull the tube out.

4. Fill **500ml** of detection fluid into the plastic bottle if the detection cylinder never has been filled.

   If the detection cylinder has been previously filled, fill **450ml** of detection fluid into the plastic bottle.

   Place the orange tube in the plastic bottle and make sure it reaches the bottom.

   Open the ball valve on the detection cylinder and wait until the content in the plastic cylinder has been absorbed into the detection cylinder.

   When the vacuum is gone and the pressure has evened out (equalized), close the ball valve on the detection cylinder.

Pressurizing

Safety precautions
Use protective goggles during the entire work process.

Only use $N_2$ nitrogen gas 99.999%

Before you start the gas filling procedure you need to know which pressure the detection cylinder is to be filled with.

The detection cylinder is to be pressurized with nitrogen gas and the exact pressure depends on the length of the detection tube used in the system and if the detection tube is pre-filled or not.

The detection cylinder is to be filled with:
- 31 bars for 8 to 14 meters detection tube that is not pre-filled with detection fluid.
- 24 bars for pre-filled detection tube longer than 14 meters.
- 24 bars for non pre-filled detection tube below 8 meters.

Tools/parts needed:
- Nitrogen gas tube with pressure regulator 0-35 bar.
- A piece of detection tube (Part no. 40380) 20-30 cm
- Gas filling tool part no. 1975 or similarly tool.

- If you have access to the gas filling tool part no. 1975 go to page 7.
- If you do not have access to part no. 1975 proceed to page 8.
Pressurizing with gas filling tool part no. FM-1975

1. Connect the filling tool (part no. FM-1975) with the detection cylinder according to the picture through a piece of detection tube (part no. FM-40380). Then connect the filling tool to the gas regulator and the nitrogen gas tube.

   **Note!** Handle the pressure gauge with care.

2. Adjust the gas regulator to specified outlet pressure and open the flow.

   Open ball valve (A).

   Very gently open the ball valve on the detection cylinder. (B).

   Wait until the pressure has evened (equalized) out and no flow noises can be heard.

   Close the ball valve (B) on the detection cylinder.

   Turn off the gas supply (A).

   Close the main valve on the nitrogen tube.

   **Note:** there is still pressure between the ball valves (A) and (B)!

   To relieve the pressure, disconnect the quick release.

3. Disassemble all equipment from the detection cylinder, as the detection cylinder is ready to be used.

   In order to disconnect the tubes, apply pressure on the outer ring and pull the tube out.
   (Also applies for the T/L-fittings on the detection cylinder)
Pressurizing with temporary tool

1. If you do not have access to the gas filling tool part no. FM-1975 you can assemble standard components into a similarly tool.

   Example:

   A connected to A'
   B connected to the detection cylinder through a piece of detection tube (part no. FM-40380)
   C connected to the gas regulator on the nitrogen gas tube.

2. Adjust the gas regulator to specified outlet pressure and open the flow.

   Make sure relief valve (C) is closed.

   Open ball valve (B).

   Open the ball valve on the detection cylinder (A) very gentle
   Wait until the pressure evens out (equalized) and no flow noises can be heard.

   Close the ball valve (A) on the detection cylinder.

   Close the gas supply at ball valve (B).

   Close the main valve on the nitrogen gas tube.

   Note: there is still pressure between the ball valves (A) and (B)!
4. If a similarly tool has been used, open ball valve (C) to relieve the pressure from the tool.

If there is no relief valve you can cut the detection tube (B) to relieve the pressure in order to disassemble the filling tool.

5. Disassemble all equipment from the detection cylinder, as the detection cylinder is ready to be used.

In order to disconnect the tubes, apply pressure on the outer ring and pull the tube out.
(Also applies for the T/L-fittings on the detection cylinder)

**Maintenance of the vacuum ejector**

The vacuum ejector does not work if there is fluid inside.

If fluid has entered the ejector, rinse the ejector thoroughly/properly with water and blow it dry prolonged with compressed air in all orifices.