

Integral Accumulator Filling Device for Diaphragm Accumulators DFM

1. Application

Filling devices DFM are used for checking and changing the gas filling pressure in diaphragm accumulators with a M28x1,5 gas connection and an M8x10 gas filling screw with hex socket head. Included is a box 210 x 230 x 80 and items 5–13 as can be seen in → Fig. , these include a pressure gauge for a specific pressure range. Other pressure gauges must be ordered separately. As diaphragm accumulators are pressure vessels and are subject to the *European directive on pressure equipment* (for exceptions see document; → European Directive on Pressure Equip. 97/23/EC (abridged information) – Technical Principles from page 10.15), it must be ensured that the safety required in this document particularly in relation to excessive pressure is provided. As during filling from nitrogen cylinders with 200 bar or 300 bar cylinder pressure, this pressure can be significantly higher than one of the following pressures,

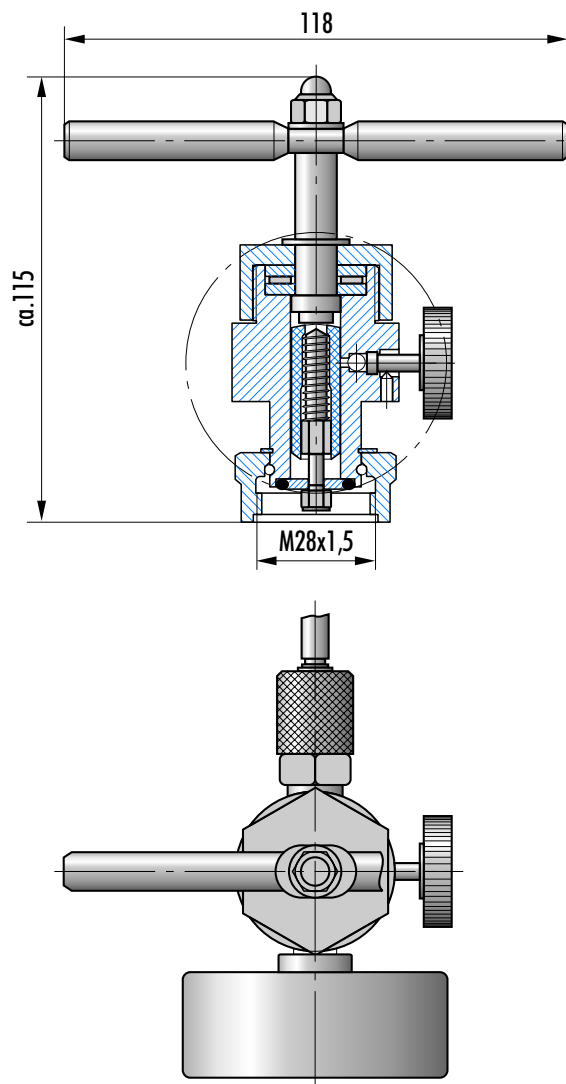
- permissible operating pressure of the diaphragm accumulator
- permissible gas filling pressure of the diaphragm accumulator
- permissible display range of the related pressure gauge

measures must be taken to prevent exceeding the pressure. It is therefore recommended only to entrust specialist personnel with the testing and filling tasks and under no circumstances to connect the filling device directly to the nitrogen cylinder with some sort of adapter, but to use a cylinder pressure reducer with an admission pressure to suit the cylinder filling pressure and an outlet pressure covering the required gas filling pressure. For the connection to such a pressure reducer, hoses with connection nuts G1/4 and G1/2 RH DIN 8542 are available (→ 3. Article List DFM, page 9.55).

1.1 Selection, installation and operation

→ Guidelines for Selection, Installation and Operation – Technical Principles from page 10.3 with notes on the selection of a suitable gas filling pressure.

2. Installation Drawing



3. Article List DFM

Type	Article No.		Display range of the pressure gauge [bar]	Upper limit for perm. excess operating pressure [bar]	Article No. individual pressure gauge
	G1/4	G1/2			
DFM 40	040-1315-113-	014 012	0–40	25	063-2417-023-040
DFM 100	100-1315-113-	014 012	0–100	60	063-2417-023-100
DFM 250	250-1315-113-	014 012	0–250	160	063-2417-023-250
DFM 400	400-1315-113-	014 012	0–400	250	063-2417-023-400

3.1 Article list for spare parts

Spare parts DFM	
Spare part	Article No.
Gas filling screw M8x10	008-1015-034-019
Usit ring U 9,3x13,3x1	008-1015-024-009

4. Operating Instructions for Filling Device DFM

4.1 Changing gas filling pressure

- de-pressurise diaphragm accumulator 1 on the fluid side and check in un-pressurised state. Unscrew protective cap 2 from the gas connection 3 M28x1,5. Carefully undo gas filling screw 4 using 6 mm hex socket wrench (angled screwdriver in accordance with DIN 911) approx. 1/4 of a turn.
- close drain screw 5 on the filling device 6 by screwing in to the stop.
- screw filling device 6 **with** hose 7 to the gas connection 3 on the diaphragm accumulator 1 (during this process ensure that O-ring 8 is fitted and correctly seated in its guide groove) and connect hose connection 13 to outlet connection 14 on the pressure reducer 15 (cylinder valve 16 and shut-off valve 17 are still closed).
- then slowly open cylinder valve 16 and adjust the required gas filling pressure with the aid of adjustment 18 and the pressure gauge 19. Open shut-off valve 17.
- engage screwdriver 10 in the hex socket head on the gas filling screw 4 by turning the handle 11 back and forwards and undo this anti-clockwise slowly such that gas can flow out. Keep shut-off valve 17 open and allow nitrogen to flow out until the pressure gauge 12 indicates the required gas filling pressure. Close shut-off valve 17 and cylinder valve 16 and wait for temperature to settle in the diaphragm accumulator 1. On a pressure increase, blow off to the required value by opening the drain screw 5 and then close again. If the pressure drops, repeat filling process.
- when the gas filling pressure is as required, tighten gas filling screw 4 using screwdriver 10 clockwise. Open drain screw 5 and allow nitrogen to escape from the filling device 6.

- unscrew filling device 6 from the diaphragm accumulator 1. Tighten gas filling screw 4 using hex socket head wrench to 20⁺⁵ Nm and refit protective cap 2 to gas connection 3 M28x1,5.

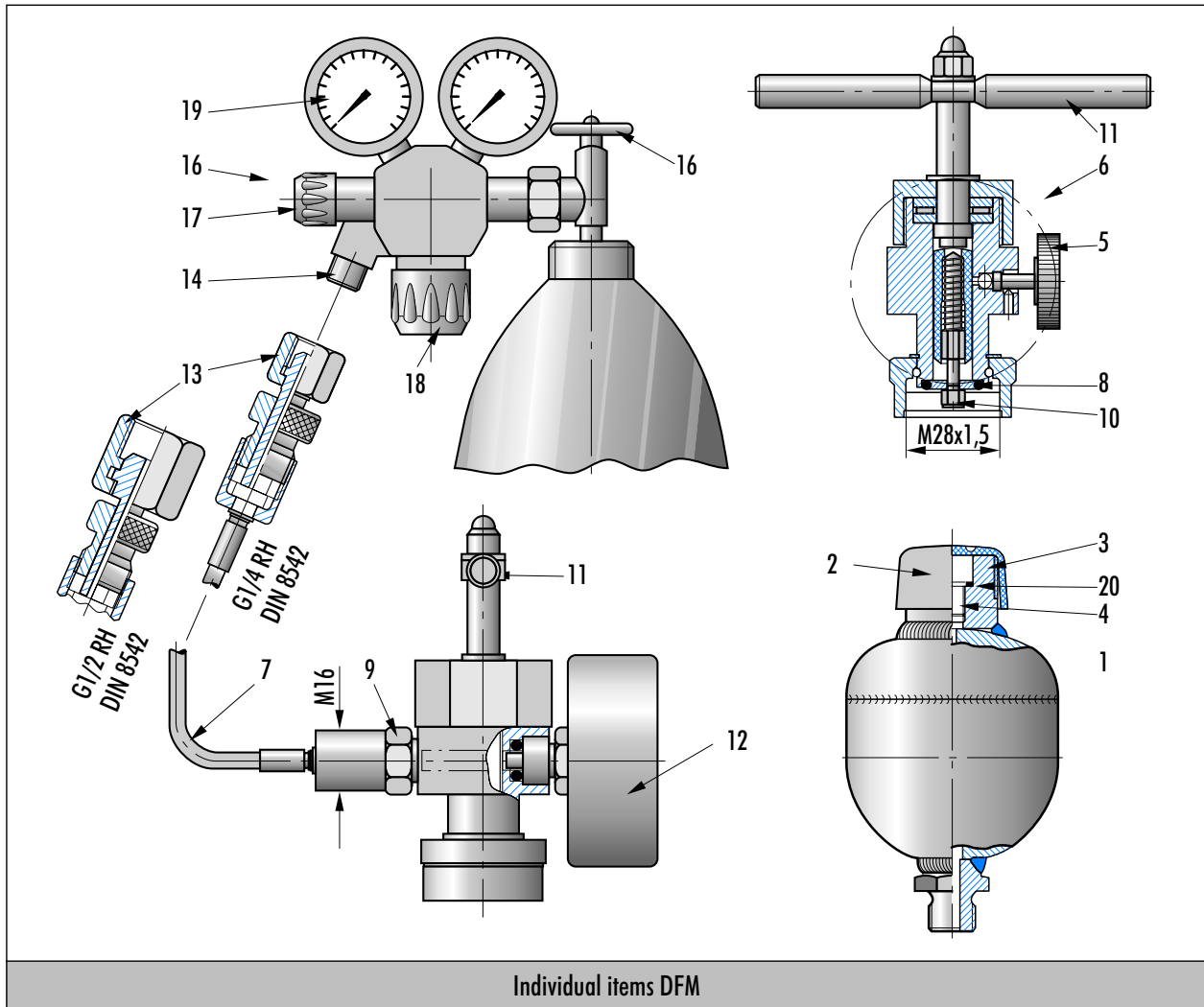
4.2 Replacing the Usit ring 20

If damage is suspected or leaks are found, the Usit ring 20 is to be replaced, for this purpose the gas filling pressure must be completely blown off (mostly after very long use in service and/or with large pressure differences in the flow of filling gas).

To blow off the pressure, follow the first 3 steps in → 4.1 Changing gas filling pressure and then open the drain screw 5 until the pressure gauge 12 indicates the value zero. After unscrewing the filling device 6, the gas filling screw 4 can be completely unscrewed and the Usit ring 20 replaced with a new ring. During this process attention is to be paid to a clean and undamaged sealing surface. After refitting the gas filling screw 4, the filling procedure as per → 4.1 Changing gas filling pressure can be started to change the gas filling pressure from zero to the required value.

4.3 Gas filling pressure check

- de-pressurise diaphragm accumulator 1 on the fluid side and check in un-pressurised state. Unscrew protective cap 2 from the gas connection 3 M28x1,5. Carefully undo gas filling screw 4 using 6 mm hex socket wrench (angled screwdriver in accordance with DIN 911) approx. 1/4 of a turn.
- close drain screw 5 on the filling device 6 by screwing in to the stop.
- screw filling device 6 **without** hose 7 to the gas connection 3. During this process ensure that the O-ring 8 is fitted and correctly seated in its guide groove.



(⚠ Attention! The non-return valve 9 fitted to the hose connection is only effective when hose 7 is unscrewed).

After fitting the filling device 6, engage screwdriver 10 in the hex socket head of the gas filling screw 4 by turning the lever 11 back and forward and then slowly undo the screw anticlockwise, such that the gas can flow into the filling device 6.

(Explanation: the gas filling screw 4 cannot be completely unscrewed from the threaded bore with the filling device 6 completely fitted. The gas flows out via an overflow slot which forms a connection to the outside on unscrewing and at the same time can be used as a pressure warning device on inadvertent loosening, as the gas flowing out causes a hissing noise.)

The pressure of the gas can be read on pressure gauge 12 and corresponds to the gas filling pressure at room temperature once a steady state has been achieved.

- when the gas filling pressure is as required, tighten gas filling screw 4 using screwdriver 10 clockwise. Open drain screw 5 and allow nitrogen to escape from the filling device 6.
- unscrew filling device 6 from the diaphragm accumulator 1. Tighten gas filling screw 4 using hex socket head wrench to 20^{+5} Nm and refit protective cap 2 to gas connection 3 M28x1,5.

Comment: as every check results in a small loss in gas filling pressure due to the internal volume of the filling device, you are advised that it is possible to perform a gas filling pressure check on the fluid side, → 2. Guidelines for Selection, Installation and Operation, from page 10.3.